



High Torque, High Speed  
Stirrers, 1000 watt, up to  
6000rpm

code: RC-750/1000

More Details ➔



UV LED Curing System

code: UVA-60

More Details ➔



Deionized Water System,  
Tap Water Inlet, 90L/H

code: WPF-90D

More Details ➔



Separate Ice Making  
Machine

code: XBC-  
150/200/300/500/1000

More Details ➔



5kN, Tensile Testing  
Machines

code: UTM-508A2/513A2

More Details ➔



Portable  
Spectrophotometer for  
Color

code: NS800

More Details ➔



150liter Easywasher

code: WG-0160

More Details ➔



CMM/CFM Anemometer/  
Psychrometer Datalogger

code: AN340

More Details ➔



Personal Noise Dosimeter

code: SL355

More Details ➔



MINI LASER  
PHOTO/CONTACT  
TACHOMETER

code: RPM33

More Details ➔



3-Phase Graphical Power  
and Harmonics Analyzer

code: PQ3470

More Details ➔



Hardness Tester

code: MH180

More Details ➔



HD VideoScope Plumbing  
Kit with 10/30m Probe

code: HDV650-Series

More Details ➔



High Resolution Micro-Ohm  
Meter

code: UM200

More Details ➔



TEMPERATURE  
CONTROLLER/MONITOR

code: PTM-9957

More Details ➔



4-WIRE EARTH GROUND  
RESISTANCE TESTER

code: GRT300

More Details ➔

full  
2014  
Catalog



Multifunction 80 Watt  
Overhead Stirrer, 3000rpm

code: SRA/SRD-Series

More Details



3 liter Digital Furnaces, up  
to 1100degC

code: MSF 11/3

More Details



MINI Horizontal Gel  
Complete System+Power  
supply

code: MINI-ELECTRO

More Details



Semi Automated Plate  
Sealer

code: SealPlate

More Details



Shape, Size & Color  
Analyzer

code: Qualmaster

More Details



Particle Size & Shape  
Analyzer

code: PA20

More Details



Video Particle Counter with  
built-in Camera

code: VPC300

More Details



DUAL LASER IR THERMAL  
CONDENSATION SCANNER

code: IRT600

More Details



Low Temperature Vacuum  
Pump

code: ROVA-EZ

More Details



Oil circulators, up to  
250degC

code: OBHF-Series

More Details



Minicentrifuge for 2xPCR  
plates

code: MINI-PLATE-1

More Details



Smart Gradient PCR  
0.2mlx96, Touch Screen

code: PCRSQ-600

More Details



215x295mm UV  
Transilluminator

code: UV-LED

More Details



Large capacity, Rotary  
Evaporators, up to 50liter

code: ROVA-N5/10/20/50L

More Details



Integrated Thermostatic  
Magnetic Blenders

code: OBHR-Series

More Details



MULTIFUNCTION  
CALIBRATOR

code: PRC30

More Details

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Catalog





Digital Levels

code: MT-461101

More Details



Digital Scale Units  
(Horizontal Type)

code: MT-81210X

More Details



Digital Welding Gauges

code: MT-11820X

More Details



Digital Indicators

code: MT-31210X/31210X-D

More Details



Digital Thread Micrometers

code: MT-21190X

More Details



Small 3D Shaker

code: KDS-2016

More Details



Mini Digital Thickness  
Gauges

code: MT-315340/315341

More Details



Digital Depth Gauges

code: MT-12110X

More Details



Digital Height Gauges

code: MT-13110X

More Details



Universal Digital Caliper

code: MT-1101060

More Details



Table Scanning Electron  
Microscope, Magnification:  
X100,000

code: SEM-20/30

More Details



Hot wire ANEMOMETER +  
Air Flow + SD Card recorder

code: AM-42348D

More Details



Wide range, general  
purpose AC/DC MAGNETIC  
METER

code: MG-30038D

More Details



GEMOLOGIC MICROSCOPE  
MINI BATTERY OPERATION

code: GEM-MINI

More Details



Safety canisters for  
hazardous materials -FOR  
INPLANT USE

code: 05/10/20-KD/KK/KZ

More Details



Degas Digital Ultrasonic  
Baths -heater basket and  
COVER

code: DCG-H Series

More Details

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Catalog



Microscope Mechanical Stage

**code:** BMZ-168XY

More Details



Ultrasonic Thickness Gauges+Datalogger

**code:** TKG-150/250

More Details



Oxygen Sensor with Glass Fiber Optics

**code:** TECLAB

More Details



CLIP ANEMOMETER + type K/J Temp SD Card recorder

**code:** AM-4257SD

More Details



Anemometer, Humidity/temp., Barometer, Altitude, light

**code:** SP-9201

More Details



Gauge Blocks, box Grade 1

**code:** Gauge

32/38/47/83/8

More Details



1400-1700 deg. Elevator Furnaces

LF-14/16/17 Series

More Details



Metal Case Mantles, Digital Control, Up to 450°C

**code:** K-5 Series

More Details



Polycarbonate Thermostatic Water Baths

**code:** WB/WBS series

More Details



Microbiological incubator with forced convection, up to 80degC

**code:** DFI-N Series

More Details



Analytic balance 510gram/10mg

**code:** ASB-Y

More Details



Basic Digital Biological Microscope

**code:** DMBA210

More Details



Biological Safety Cabinets Class II

**code:** BSC-95/96/97

More Details



Digital Centrifuge, for 18 Tubes of 1.5/2ml, 14000rpm

**code:** ECEN-209

More Details



9 liter refrigerated circulator -20 deg c+level protector

**code:** WEL-118

More Details



Digital Ceramic Hotplate with stirrer 104x104mm 550 deg c

**code:** HSCD-7

More Details


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Catalog





HD VideoScope Plumbing  
Kit with 10/30m Probe

code: HDV650-Series

More Details 



High Resolution Micro-Ohm  
Meter

code: UM200

More Details 



TEMPERATURE  
CONTROLLER/MONITOR


code: PTM-9957

More Details 



4-WIRE EARTH GROUND  
RESISTANCE TESTER


code: GRT300

More Details 



FOLD-UP POCKET FOOD  
THERMOMETER

code: TM55

More Details 



Switching Power Supply


code: DCP42/

More Details



Hazardous Thermal Imaging  
Camera

IR-CAM-EX330

More Details 



-30 up to 25degC,  
Refrigeration Capacity  
Recyclable Coolers

code: WBLD-Series

More Details 

full  
2014  
Catalog



AM-4234SD

### AM-4234SD, SD card real time data recorder, wide range Air velocity, Air flow, Humidity, Dew point, Type K/J Temp. Hot Wire Anemometer

#### Features:

- Complete set with two probes : Hot wire anemometer probe and Humidity/Temp. probe.
- Combination of hot wire and standard thermistor, deliver rapid and precise measurements even at low air velocity value.
- Slim probe, ideal for grilles & diffusers.
- Air velocity : m/s, Ft/min, Km/h, Knot, Mile/h,
- Air flow ( CFM, CMM ) measurement.
- Air temperature ( °C, °C )
- Air Temp. used thermistor sensor, fast response time.
- Humidity : 10 to 95 %RH, Dew point, Wet bulb.
- Type K, Type J thermocouple thermometer.
- Real time SD memory card Datalogger, it Built-in Clock and Calendar, real time data recorder , sampling time set from 1 second to 3600 seconds.
- Manual datalogger is available ( set the sampling time to 0 ), during execute the manual datalogger function, it can set the different position ( location ) No. ( position 1 to position 99 ).
- Innovation and easy operation, computer is not need to setup extra software, after execute datalogger, just take away the SD card from the meter and plug in the SD card into the computer, it can down load the all the measured value with the time information ( year/month/date/

hour/minute/second ) to the Excel directly, then user can make the further data or graphic analysis by themselves

- SD card capacity : 1 GB to 16 GB
- LCD with green light backlight, easy reading
- Can default auto power off or manual power off
- Data hold, record max. and min. reading
- Microcomputer circuit, high accuracy.
- Power by UM3/AA ( 1.5 V ) x 6 batteries or DC 9V adapter
- RS232/USB PC COMPUTER interface
- Separate probe, easy for operation of different measurement environment
- Applications : Environmental testing, Air conveyors, Flow hoods, Clean rooms, Air velocity, Air balancing, Fans/motors/blowers, Furnace velocity, Refrigerated case, Paint spray booths.

#### General Specifications:

Model	AM-4234SD	
Circuit	Custom one-chip of microprocessor LSI circuit.	
Display	LCD size : 52 mm x 38 mm LCD with green backlight ( ON/OFF ).	
Function	Anemometer ( Air velocity, Air flow ). Humidity/Temp. meter. Type J/K thermometer.	
Measurement Unit	Air velocity : m/S (meters per second) Km/h (kilometers per hour) Ft/min ( FPM, feet per minute ) Knots ( nautical miles per hour ) Mile/h ( mph, miles per hour ) Air temperature : °C/°F Air flow : CMM, CFM.	
	Humidity/Temp. : %RH/ °C/°F Dew point ( Humidity ) : °C/°F Wet bulb ( Humidity ) : °C/°F	
	Type K/ Type J thermometer : °C, °F	
Sensor Structure	Air velocity & Air flow : Tiny glass bead thermistor.	
	Air temperature : Thermistor.	
	Humidity : Precision capacitance humidity sensor.	
	Type K, Type J thermometer : Type K/J thermocouple probe. * Probes are optional.	
Datalogger Sampling Time Setting range	Auto	1 second to 3600 seconds. @ Sampling time can set to 1 second, but memory data may loss.
	Manual	Push the data logger button once will save data one time. @ Set the sampling time to 0 second. @ Manual mode, can also select the 1 to 99 position ( Location ) no.
Memory Card	SD memory card. 1 GB to 16 GB. * It recommend use memory card 4 GB.	



Model	AM-4234SD	
Advanced setting	- Set clock time ( Year/Month/Date, Hour/Minute/ Second ) - Set sampling time - Auto power OFF management - Set beep Sound ON/OFF - Decimal point of SD card setting - SD memory card Format - Set thermometer type to Type K or Type J - Set temperature unit to °C or °F - Set air flow type ( CFM/USA, CMM/EURO )	
Temperature Compensation	Automatic temp. compensation for the Anemometer function and the type K/J thermometer.	
Data Hold	Freeze the display reading.	
Memory Recall	Maximum & Minimum value.	
Sampling Time of Display	Approx. 1 second.	
Data Output	RS 232/USB PC computer interface. - Connect the optional RS232 cable UPCB-02 will get the RS232 plug. - Connect the optional USB cable USB-01 will get the USB plug.	
Operating Temperature	0 to 50°C.	
Operating Humidity	Less than 85% R.H.	
Power Supply	* Alkaline or heavy duty DC 1.5 V battery ( UM3, AA ) x 6 PCs, or equivalent.	
	* DC 9V adapter input. ( AC/DC power adapter is optional ).	
Power Current	Normal operation ( w/o SD card save data and LCD Backlight is OFF ) : Approx. DC 30 mA.	
	When SD card save the data and LCD Backlight is OFF ) : Approx. DC 50 mA.	
Weight		347 g/ 0.76 LB. * Meter only
Dimension	Meter	182 x 73 x 47.5 mm
	Telescope Probe	Round, 12 mm Dia x 280 mm ( min. length ). Round, 12 mm Dia x 940 mm ( max. length ).
Accessories Included	* Instruction manual..... 1 PC * Hot wire telescope probe.....1 PC * Humidity/Temp. probe.....1 PC * Hard carrying case ( CA-06 ).....1 PC	
Optional Accessories	* 1.413 mS Conductivity Standard Solution..... CD-14	
	SD Card ( 2 G ). Type K thermocouple probe. AC to DC 9V adapter. USB cable, USB-01. RS232 cable, UPCB-02. Data acquisition software, SW-U801-WIN. Excel 'data acquisition software, SW-E802.	

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## Electrical Specifications (23±5):

## Air velocity

Measurement	Range	Resolution	Accuracy
m/s	0.2 to 5.0 m/s	0.01 m/s	±(5%+a) reading
	5.1 to 25.0 m/s	0.1 m/s	
Km/h	0.70 to 18.00 km/h 18.0 to 72.0 km/h	0.01 Km/h 0.1 Km/h	or
Mile/h ( mph )	0.50 to 11.20 mph 11.2 to 44.7 mph	0.01 mph 0.1 mph	
Knot	0.40 to 9.70 knot 9.7 to 38.8 knot	0.01 Knot 0.1 Knot	±(1%+a) full scale
Ft/min	40-3940 ft/min	0.1 Knots	

@ a = 0.1 m/s, 0.3 km/h, 0.2 mile/h, 0.2 knot, 20 ft/min.

## Air temperature

Measuring Range	0°C - 50°C/32°F - 122°F
Resolution	0.1°C/0.1°F
Accuracy	± 0.8°C/1.5°F

## Air flow

Measurement	Range	Resolution
CMM ( m <sup>3</sup> /min. )	0 to 45,000 CMM	0.001 to 1 CMM
CFM ( ft <sup>3</sup> /min. )	0 to 1,589,200 CFM	0.001 to 100 CFM

Measurement	Area
CMM ( m <sup>3</sup> /min. )	0.001 to 30.000 m <sup>2</sup>
CFM ( ft <sup>3</sup> /min. )	0.01 to 322.93 ft <sup>2</sup>

## Humidity/Temperature

	Resolution	Range	Accuracy
Humidity	0.1 % R.H.	5 % to 95 % R.H.	≥70% RH : ±(3% reading+1% RH)
			< 70% RH : ±3% RH
Temp.	0.1°C	0°C to 50°C, 32°F to 122°F	±0.8°C ±1.5°F

## Dew Point (Humidity)

	Resolution	Range
°C	0.1°C	-25.3°C to 48.9°C
°F	0.1°F	-13.5°F to 120.1°F

Remark :

\*Dew Point display value is calculated from the Humidity/Temp. measurement automatically.

\*The Dew Point accuracy is sum accuracy value of Humidity &amp; Temperature measurement.

## Wet bulb (Humidity)

	Resolution	Range
°C	0.1°C	-21.6°C to 50.0°C
°F	0.1°F	-6.9°F to 122.0°F

Remark :

\*Wet bulb display value is calculated from the Humidity/Temp. measurement automatically.

\*The Wet bulb accuracy is sum accuracy value of Humidity &amp; Temperature measurement.



AM-4234SD

### AM-4234SD, SD card real time data recorder, wide range Air velocity, Air flow, Humidity, Dew point, Type K/J Temp. Hot Wire Anemometer

#### Features:

- Complete set with two probes : Hot wire anemometer probe and Humidity/Temp. probe.
- Combination of hot wire and standard thermistor, deliver rapid and precise measurements even at low air velocity value.
- Slim probe, ideal for grilles & diffusers.
- Air velocity : m/s, Ft/min, Km/h, Knot, Mile/h,
- Air flow ( CFM, CMM ) measurement.
- Air temperature ( °C, °C )
- Air Temp. used thermistor sensor, fast response time.
- Humidity : 10 to 95 %RH, Dew point, Wet bulb.
- Type K, Type J thermocouple thermometer.
- Real time SD memory card Datalogger, it Built-in Clock and Calendar, real time data recorder , sampling time set from 1 second to 3600 seconds.
- Manual datalogger is available ( set the sampling time to 0 ), during execute the manual datalogger function, it can set the different position ( location ) No. ( position 1 to position 99 ).
- Innovation and easy operation, computer is not need to setup extra software, after execute datalogger, just take away the SD card from the meter and plug in the SD card into the computer, it can down load the all the measured value with the time information ( year/month/date/

hour/minute/second ) to the Excel directly, then user can make the further data or graphic analysis by themselves

- SD card capacity : 1 GB to 16 GB
- LCD with green light backlight, easy reading
- Can default auto power off or manual power off
- Data hold, record max. and min. reading
- Microcomputer circuit, high accuracy.
- Power by UM3/AA ( 1.5 V ) x 6 batteries or DC 9V adapter
- RS232/USB PC COMPUTER interface
- Separate probe, easy for operation of different measurement environment
- Applications : Environmental testing, Air conveyors, Flow hoods, Clean rooms, Air velocity, Air balancing, Fans/motors/blowers, Furnace velocity, Refrigerated case, Paint spray booths.

#### General Specifications:

Model	AM-4234SD	
Circuit	Custom one-chip of microprocessor LSI circuit.	
Display	LCD size : 52 mm x 38 mm LCD with green backlight ( ON/OFF ).	
Function	Anemometer ( Air velocity, Air flow ). Humidity/Temp. meter. Type J/K thermometer.	
Measurement Unit	Air velocity : m/S (meters per second) Km/h (kilometers per hour) Ft/min ( FPM, feet per minute ) Knots ( nautical miles per hour ) Mile/h ( mph, miles per hour ) Air temperature : °C/°F Air flow : CMM, CFM.	
	Humidity/Temp. : %RH/ °C/°F Dew point ( Humidity ) : °C/°F Wet bulb ( Humidity ) : °C/°F	
	Type K/ Type J thermometer : °C, °F	
Sensor Structure	Air velocity & Air flow : Tiny glass bead thermistor.	
	Air temperature : Thermistor.	
	Humidity : Precision capacitance humidity sensor.	
	Type K, Type J thermometer : Type K/J thermocouple probe. * Probes are optional.	
Datalogger Sampling Time Setting range	Auto	1 second to 3600 seconds. @ Sampling time can set to 1 second, but memory data may loss.
	Manual	Push the data logger button once will save data one time. @ Set the sampling time to 0 second. @ Manual mode, can also select the 1 to 99 position ( Location ) no.
Memory Card	SD memory card. 1 GB to 16 GB. * It recommend use memory card 4 GB.	



Model	AM-4234SD	
Advanced setting	- Set clock time ( Year/Month/Date, Hour/Minute/ Second ) - Set sampling time - Auto power OFF management - Set beep Sound ON/OFF - Decimal point of SD card setting - SD memory card Format - Set thermometer type to Type K or Type J - Set temperature unit to °C or °F - Set air flow type ( CFM/USA, CMM/EURO )	
Temperature Compensation	Automatic temp. compensation for the Anemometer function and the type K/J thermometer.	
Data Hold	Freeze the display reading.	
Memory Recall	Maximum & Minimum value.	
Sampling Time of Display	Approx. 1 second.	
Data Output	RS 232/USB PC computer interface. - Connect the optional RS232 cable UPCB-02 will get the RS232 plug. - Connect the optional USB cable USB-01 will get the USB plug.	
Operating Temperature	0 to 50°C.	
Operating Humidity	Less than 85% R.H.	
Power Supply	* Alkaline or heavy duty DC 1.5 V battery ( UM3, AA ) x 6 PCs, or equivalent.	
	* DC 9V adapter input. ( AC/DC power adapter is optional ).	
Power Current	Normal operation ( w/o SD card save data and LCD Backlight is OFF ) : Approx. DC 30 mA.	
	When SD card save the data and LCD Backlight is OFF ) : Approx. DC 50 mA.	
Weight		347 g/ 0.76 LB. * Meter only
Dimension	Meter	182 x 73 x 47.5 mm
	Telescope Probe	Round, 12 mm Dia x 280 mm ( min. length ). Round, 12 mm Dia x 940 mm ( max. length ).
Accessories Included	* Instruction manual..... 1 PC * Hot wire telescope probe.....1 PC * Humidity/Temp. probe.....1 PC * Hard carrying case ( CA-06 ).....1 PC	
Optional Accessories	* 1.413 mS Conductivity Standard Solution..... CD-14	
	SD Card ( 2 G ). Type K thermocouple probe. AC to DC 9V adapter. USB cable, USB-01. RS232 cable, UPCB-02. Data acquisition software, SW-U801-WIN. Excel 'data acquisition software, SW-E802.	

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## Electrical Specifications (23±5):

## Air velocity

Measurement	Range	Resolution	Accuracy
m/s	0.2 to 5.0 m/s	0.01 m/s	±(5%+a) reading
	5.1 to 25.0 m/s	0.1 m/s	
Km/h	0.70 to 18.00 km/h 18.0 to 72.0 km/h	0.01 Km/h 0.1 Km/h	or
Mile/h ( mph )	0.50 to 11.20 mph 11.2 to 44.7 mph	0.01 mph 0.1 mph	
Knot	0.40 to 9.70 knot 9.7 to 38.8 knot	0.01 Knot 0.1 Knot	±(1%+a) full scale
Ft/min	40-3940 ft/min	0.1 Knots	

@ a = 0.1 m/s, 0.3 km/h, 0.2 mile/h, 0.2 knot, 20 ft/min.

## Air temperature

Measuring Range	0°C - 50°C/32°F - 122°F
Resolution	0.1°C/0.1°F
Accuracy	± 0.8°C/1.5°F

## Air flow

Measurement	Range	Resolution
CMM ( m <sup>3</sup> /min. )	0 to 45,000 CMM	0.001 to 1 CMM
CFM ( ft <sup>3</sup> /min. )	0 to 1,589,200 CFM	0.001 to 100 CFM

Measurement	Area
CMM ( m <sup>3</sup> /min. )	0.001 to 30.000 m <sup>2</sup>
CFM ( ft <sup>3</sup> /min. )	0.01 to 322.93 ft <sup>2</sup>

## Humidity/Temperature

	Resolution	Range	Accuracy
Humidity	0.1 % R.H.	5 % to 95 % R.H.	≥70% RH : ±(3% reading+1% RH)
			< 70% RH : ±3% RH
Temp.	0.1°C	0°C to 50°C, 32°F to 122°F	±0.8°C ±1.5°F

## Dew Point (Humidity)

	Resolution	Range
°C	0.1°C	-25.3°C to 48.9°C
°F	0.1°F	-13.5°F to 120.1°F

Remark :

\*Dew Point display value is calculated from the Humidity/Temp. measurement automatically.

\*The Dew Point accuracy is sum accuracy value of Humidity &amp; Temperature measurement.

## Wet bulb (Humidity)

	Resolution	Range
°C	0.1°C	-21.6°C to 50.0°C
°F	0.1°F	-6.9°F to 122.0°F

Remark :

\*Wet bulb display value is calculated from the Humidity/Temp. measurement automatically.

\*The Wet bulb accuracy is sum accuracy value of Humidity &amp; Temperature measurement.



AM-4257SD

**AM-4257SD, CUP Anemometer****General Specifications:**

<b>Circuit</b>	Custom microprocessor LSI circuit.
<b>Display</b>	LCD size : 52 mm x 38 mm. LCD with green backlight (ON/OFF).
<b>Measurement Unit</b>	Air velocity: m/S (meters per second). Km/h (kilometers per hour). Ft/min (FPM, feet per minute). Knots (nautical miles per hour). Mile/h (mph, miles per hour) Air temperature: °C, °F Type K/ Type J thermometer: °C, °F
<b>Datalogger Sampling Time Setting range</b>	Auto: 1, 2, 5, 10, 30, 60, 120, 300, 600, 1800 3600 second. @ Sampling time can set to 1 second, but memory data may loss. Manual: Push the data logger button once will save data one time. @ Set the sampling time to 0 second. @ Manual mode, can also select the 1 to 99 position (Location) no.
<b>Data Hold</b>	SD memory card. 1 GB to 16 GB.
<b>Power off</b>	* Set clock time (Year/Month/Date, Hour/Minute/ Second) * Set sampling time * Auto power OFF management * Set beep Sound ON/OFF * Decimal point of SD card setting * SD memory card Format * Set thermometer type to Type K or Type J * Set temperature unit to °C or °F
<b>Data Hold</b>	Freeze the display reading.
<b>Temp. Compensation</b>	Automatic temp. compensation for the Anemometer function and the type K/J thermometer.
<b>Memory Recall</b>	Maximum & Minimum value.
<b>Data Output</b>	RS 232/USB PC computer interface. * Connect the optional RS232 cable UPCB-02 will get the RS232 plug. * Connect the optional USB cable USB-01 will get the USB plug.
<b>Operating Temperature</b>	0 to 50°C.
<b>Operating Humidity</b>	Less than 85% R.H.
<b>Power Supply</b>	* AAlkaline or heavy duty DC 1.5 V battery (UM3, AA) x 6 PCs, or equivalent. * ADC 9V adapter input. (AC/DC power adapter is optional).
<b>Power Current</b>	* Normal operation (w/o SD card save data and LCD Backlight is OFF): Approx. DC 15 mA. * When SD card save the data and LCD Backlight is OFF): Approx. DC 36 mA.
<b>Weight</b>	347 g/ 0.76 LB. * Meter only
<b>Dimension</b>	Main instrument: 182x73x47.5mm (7.1x2.9x1.9inch) Anemometer sensor head: Round, 72mm Dia.
<b>Accessories Included</b>	* Instruction manual.....1 PC * Anemometer probe.....1 PC * Hard carrying case ( CA-06 ).....1 PC
<b>Optional Accessories</b>	SD Card (2 G) * Type K thermocouple probe * AC to DC 9V adapter * USB cable, USB-01 * RS232 cable, UPCB-02 * Data acquisition software, SW-U801-WIN * Excel data acquisition software, SW-E802.

**Features:**

- Cup anemometer, available for the outside air speed measurement and recording.
- Cup probe is built in tripod fix nut.
- Air velocity : m/S, Ft/min, Km/h, Knots, Mile/h.
- Air temperature (°C, °F)
- Type K, Type J thermocouple thermometer.
- Air Temp. used thermistor sensor, fast response time.
- Real time SD memory card Datalogger, it Built-in Clock and Calendar, real time data recorder, sampling time set from 1 second to 3600 seconds.
- Manual datalogger is available (set the sampling time to 0), during execute the manual datalogger function, it can set the different position (location) No. (position 1 to position 99).
- Innovation and easy operation, computer is not need to setup extra software, after execute datalogger, just take away the SD card from the meter and plug in the SD card into the computer, it can down load the all the measured value with the time information (year/month/date/ hour/ minute/second) to the Excel directly, then user can make the further data or graphic analysis by themselves.
- SD card capacity : 1 GB to 16 GB.
- LCD with green light backlight, easy reading.
- Can default auto power off or manual power off.
- Data hold, record max. & min. reading.
- Microcomputer circuit, high accuracy.
- Power by UM3/AA (1.5 V) x 6 batteries or DC 9V adapter.
- RS232/USB PC COMPUTER interface.
- Separate probe, easy for operation of different measurement environment.
- Wide applications: use this anemometer to check air conditioning & heating systems, measure air velocities, wind temperature...etc.

**Air temperature**

<b>Measuring Range</b>	0°C - 50°C/32°F - 122°F
<b>Resolution</b>	0.1°C/0.1°F
<b>Accuracy</b>	± 0.8°C/1.5°F

**Electrical Specifications (23±5):****Air velocity**

Measurement	Range	Resolution	Accuracy
<b>m/S</b>	0.9 - 35.0 m/S	0.1 m/S	± ( 2%+0.2 m/S)
<b>Km/h</b>	2.5 - 126.0 Km/h	0.1 Km/h	± ( 2%+0.8 Km/h)
<b>Knot</b>	1.4 - 68.0 Knots	0.1 mph	± ( 2%+0.4 Knots)
<b>Ft/min</b>	144 - 6895 Ft/min	0.1 Knots	± ( 2%+40 Ft/min)
<b>Mile/h</b>	1.6 - 78.2 Mile/h	1 FPM	± ( 2%+0.4 Mile/h)

**Type K/J thermometer**

Sensor Type	Resolution	Range	Accuracy
<b>Type K</b>	0.1°C	-50.0 to 1300.0°C -50.1 to -100.0°C	± (0.4 % + 0.5°C) ± (0.4 % + 1°C)
	0.1°F	-58.0 to 2372.0°F -58.1 to -148.0°F	± (0.4 % + 1°F) ± (0.4 % + 1.8°F)
<b>Type J</b>	0.1°C	-50.0 to 1200.0°C -50.1 to -100.0°C	± (0.4 % + 0.5°C) ± (0.4 % + 1°C)
	0.1°F	-58.0 to 2192.0°F -58.1 to -148.0°F	± (0.4 % + 1°F) ± (0.4 % + 1.8°F)



BATHS

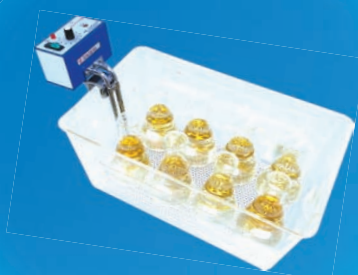
SHAKERS

STIRRERS

HOTPLATES

INCUBATORS

HEATING  
MANTLES



6

# BATHS

# WATER BATH FOR FULL VISIBILITY OF SAMPLES

## WB-Series, For Full Visibility Of Samples



Removable Modular Heating Assembly enables convenient cleaning of all parts & makes it usable in other vessels.



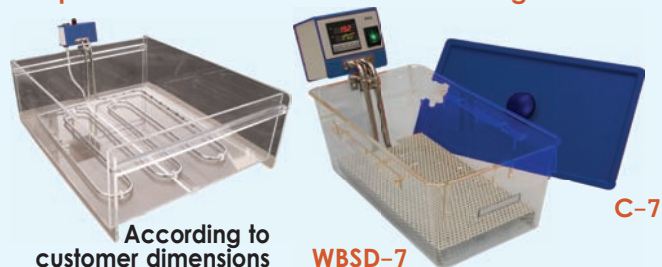
## Features:

- Low-cost fully compatible substitute for expensive Water Bath.
- Seamless transparent polycarbonate tank-withstands temperature 120°C.
- Fast-Acting thermostat also serves as low-water-level protector, preventing heating-element burn-out & fire hazard.
- Temperature setting in °C from ambient to +100°C
- Temperature control accuracy of approximately  $\pm 1^\circ\text{C}$  ensures precise test conditions
- Robust & reliable – designed for years of trouble-free service.

## Options:

### WB-Special:

### WBSD Series: With Digital Control



## WBSD Series, Transparent Polycarbonate Thermostatic Bath

Ideal for sample pre treatment in QC, pathology and educational purposes, routine laboratory purposes, procedures requiring visibility of reactions inside the vessels & as a 'personal' water bath for scientists needing only a small working area with a compact footprint. Temperature control accuracy of approximately  $\pm 0.2^\circ\text{C}$  ensures precise test conditions.

**Temp. Range:** from slightly above ambient to +100°C (with cover)  
**Accuracy:** approx.:  $0.3^\circ\text{C}$  at  $37^\circ\text{C}$  (depending on operating conditions).  
**Voltage:** 230 V, 50 Hz (or 120 V, 50/60 Hz).

## Accessories

Standard model	With safety thermostat model	Digital model	Bath capacity (Liters)	Inside dim's (cm) W1xD1xH1	Outside dim's (cm) W2xD2xH2	Watts	Bath cover model	Floating balls model	Evap. lid model
WB-3	WBS-3	WBSD-3	2.7	10 x 17 x 10	15 x 31 x 24	500	C-3	FB-3	–
WB-4	WBS-4	WBSD-4	4.5	10 x 27 x 10	16 x 41 x 24	600	C-4	FB-4	–
WB-5	WBS-5	WBSD-5	5.5	16 x 20 x 11	22 x 34 x 24	750	C-5	FB-5	EL-5
WB-7	WBS-7	WBSD-7	7.0	16 x 3 x 11	22 x 44 x 24	1000	C-7	FB-7	–
WB-8	WBS-8	WBSD-8	8.5	21 x 35 x 12	28 x 50 x 26	1000	C-8	FB-8	–
WB-11	WBS-11	WBSD-11	11.0	18 x 27 x 16	24 x 43 x 30	1200	C-11	FB-11	–
WB-14	WBS-14	WBSD-14	14.0	21 x 35 x 16	28 x 50 x 30	1500	C-14	FB-14	EL-14
WB-30	WBS-30	WBSD-30	30	32 x 51 x 18	38 x 66 x 24	*2000	C-30	FB-30	EL-30/8/11

\*1500W at 120V

## Accessories:



### Floating balls

A balls blanket of Floating Polypropylene Balls is most effective for reducing evaporation and loss of heat from the Water Bath. The Balls act as effectively as a lid (flat or gabled), while enabling immersion and removal of flasks & other vessels without having to lift a lid. Usable UP to  $110^\circ\text{C}$ .



### EL-30/8

### Evaporation lids

Evaporation Lids (EL) for use with WB and WBS Baths. Each Lid has openings equipped with concentric rings. The rings reduce the diameters of the openings to accommodate containers of all sizes. The EL-5 Lids, for use with WB(S)-5 Baths, have four 80mm diameter openings.

# IMMERSION CIRCULATOR

TEPS-1



**TEPS-1, Immersion Circulator – Basic Model**

**Features:**

- Temperature range: ambient to 100°C (with cooling +10 to 100°C).
- Accuracy: approx.  $\pm 0.3$  to  $\pm 1^\circ\text{C}$ .
- Pumping capacity: up to 12 l/min.
- Safety Cut Off.
- 12L/min max. head 2m.
- Immersion depth: min. 6cm, max. 15.5cm.
- Glass Thermometer
- **Optional: External circulation apparatus.**

TEPS-4



**TEPS-4, Digital Immersion Circulator**

**Features:**

- Digital set and display of actual operating temperatures.
- PID controller provides very precise temperature control.
- Adapts to many different containers.
- Temperature range: ambient +5°C to 100°C (with cooling -10°C to 100°C),
- Accuracy: approx.  $\pm 0.1^\circ\text{C}$ .
- Pumping capacity: up to 12 l/min.
- Immersion depth: minimum 6 cm, maximum 15.5 cm.
- Safety Cut Off.
- **Optional up to 200°C (for oil).**

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Model	TEPS-1	TEPS-4
Temperature range	up to 100°C	
Temperature stability	$\pm 0.3^\circ\text{C}$ to $1^\circ\text{C}$	$\pm 0.1^\circ\text{C}$
Controller	Basic analog	PID Digital
Readout	Thermometer	Digital °C/°F
Pumping flow	12 Liter/min	
Immersion	Minimum 6cm, Maximum 155mm	
Heater	1000Watt (optional, 1500, 2000watt)	
Over temp. safety	Adjustable	
Dimensions (mm)	W200xD240xH90 / W120xD140xH135	W200xD240xH90 / W120xD140xH135
Weight	2kg	2.3kg

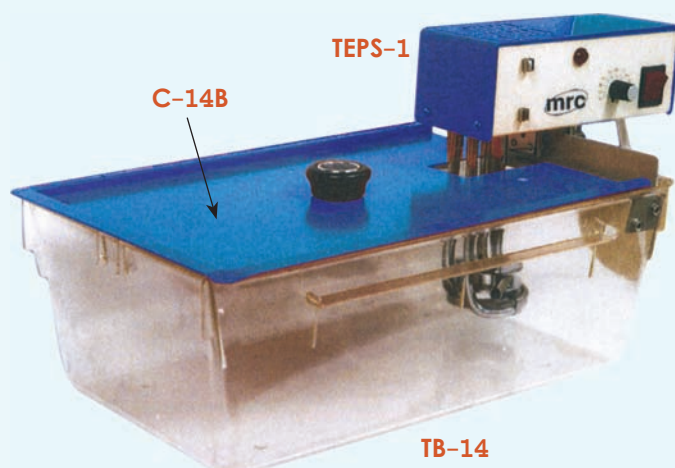
**TB-Series, Polycarbonate Tank TB Type For Immersion Thermostat / Circulator**

PC Tank with bridge for fixing immersion circulator TEPS-1/TEPS-4, Seamless Transparent Polycarbonate Tank – withstands 120°C. Heating circulators are commonly used for cell cultures, enzyme assays, coliform testing, DNA incubation & procedures.

<b>TB-7</b>	16x30x13cm-Height, 7 Liter
<b>TB-8</b>	21x35x14cm-Height, 8.5 Liter
<b>TB-11</b>	18x27x18cm-Height, 11 Liter
<b>TB-14</b>	21x35x18cm-Height, 14 Liter
<b>TB-30</b>	32x51x20cm-Height, 30 Liter

TEPS-1

C-14B



TB-14



# PORTABLE CLIP-ON DIGITAL IMMERSION CIRCULATOR



**TEPS-V6**

**TEPS-V6 SPL**

## Options:

### TEPS-V6SPL

Longer immersion heater for deep and large containers.



## TEPS-V6, Portable clip-on digital immersion circulator

MRC immersion heaters and water baths with a precise temperature controlled environment, to produce consistently perfect results. Ideal for sous vide and other demanding applications.

MRC immersion circulator is a space saving clip on heater/stirrer unit. It can be easily fitted to a standard stainless or polycarbonate gastronorm square tank or round (minimum depth 18cms) and maximum volume of approximately 60 Liters.

For large tanks and pots there are several immersion heaters with higher wattage and immersion lengths. Precise temperature achieved by PID high precision controller, accuracy and repeatability are guaranteed. Actual temperature is clearly displayed to 0.1°C. Temperature settings are retained in memory even after 'power off'.

Temperatures can be easily and rapidly set with the push button, wipe clean control panel. Easy clamping method, safety protection for low water level and optional sturdy handle for easy carrying.

The case is constructed from high quality stainless steel. If the water drops below the recommended minimum level or the unit is inadvertently switched.

## Applications:

- Laboratory water baths
- Calibration baths
- Sous vide.

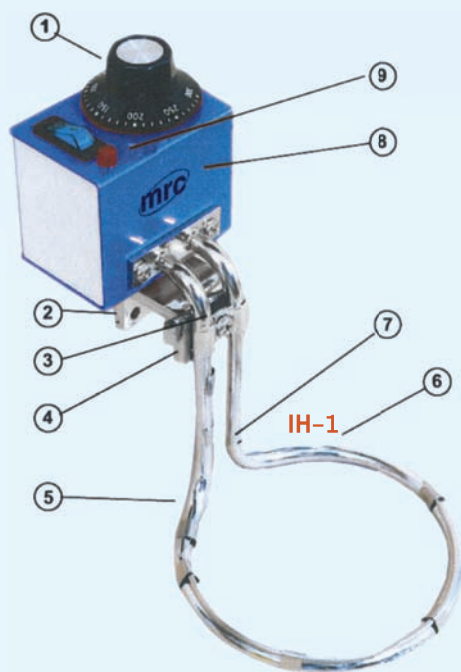
**TEPS-V6**



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Model	TEPS-V6
Display/resolution	Digital LED/0.1°C
Temp. range	Ambient + 5°C - 95°C
Temp. setting	Push button
Stability	±0.1°C
Display/resolution	Digital LED/1 min. increments
Dimensions (mm)	Stirrer case: W122 x D153 x H200 (includes handle) Guard: W122 x D132 x H148 Allow 90mm at rear of unit for mains cable/ventilation
Electrical supply	230V
Power consumption	1kW (Optional: 2000, 2600, 3000 watt)

# THERMOSTATIC CONTROLLED IMMERSION HEATERS



## IMMERSION HEATER IH-1

- 1- Temperature setting in °C
- 2- Threaded hole for attachment to stand
- 3- Height adjustment permits wide range of application
- 4- Mounting bracket (patented design) with teflon-tipped disc permitting secure clamping to all surfaces, including glass
- 5- Heating element chromium-plated copper sheath: also available in stainless steel on special order
- 6- Fast-acting thermostat also serves as low-level cut-out, preventing element burn-out and fire hazard
- 7- Shallow immersion depth (3 cm)
- 8- The control housing is located outside the vessel and thus protected against vapors and temperature effects
- 9- Indicator light

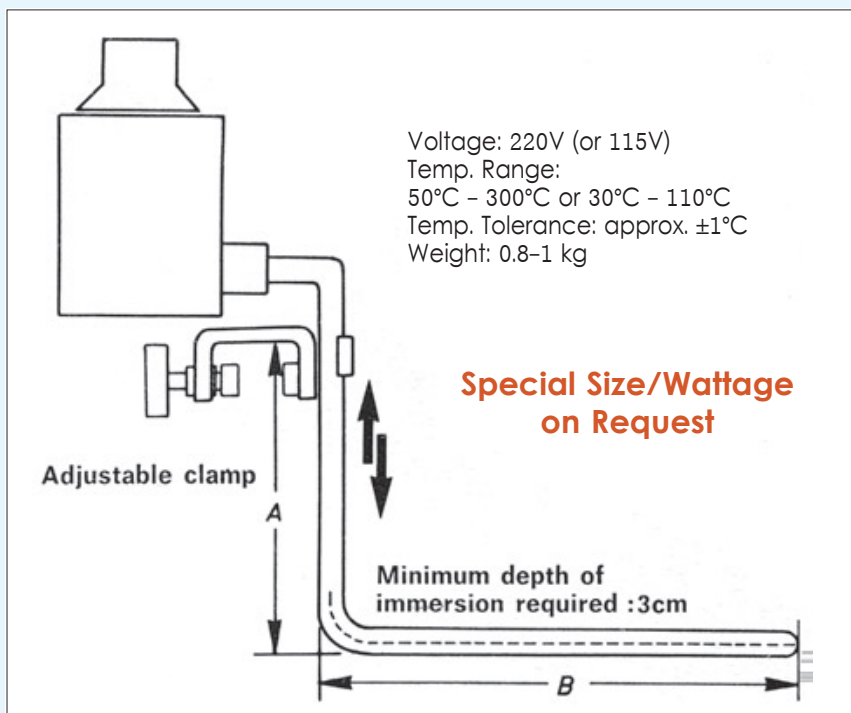


## IH-Series, Thermostatic Controlled Immersion Heaters

### Immersion heat:

Thermostatically Controlled Immersion Heaters.

Reliable element for accurately heating liquids to temperatures of up to 300°C with a tolerance of approx.  $\pm 1^\circ\text{C}$ . Designed for trouble-free application. Suitable for use in science and industry for: Distillation, evaporation, sterilization, rotary evaporation, ultrasonic cleaning, photographic bath etc.



Model 50-300°C	Digital 50-300°C	Model 50-110°C	Digital 50-110°C	Watts	"A" mm	"B" mmØ
IH3/13	IHSD-3/13	IH1/13	IHSD-1/13	500	100	130
IH3/15	IHSD-3/15	IH1/15	IHSD-1/15	750	110	150
IH3/17	IHSD-3/17	IH1/17	IHSD-1/17	750	120	170
IH3/19	IHSD-3/19	IH1/19	IHSD-1/19	1000	130	190
IH3/21	IHSD-3/21	IH1/21	IHSD-1/21	1000	150	210
IH3/23	IHSD-3/23	IH1/23	IHSD-1/23	1250	180	230
IH3/25	IHSD-3/25	IH1/25	IHSD-1/25	1500	200	250
IH3/27	IHSD-3/27	IH1/27	IHSD-1/27	1500	200	270

### Immersion heater Features:

- Easily converts any container into a thermostatically controlled bath from ambient to 300°C.
- Rugged, reliable, convenient, maintenance-free, energy-saving & reasonable priced.
- Fully valid substitute for expensive water and oil baths.
- Permits utilization of the entire contents of the container, without effecting the functioning of stirrers.
- Heat is applied directly to the liquid, ensuring rapid rise of temperature.
- Safe - fast acting thermostat server as low-water level cut out.
- You get the temperature you set.
- Control box is located on the outside and is unaffected by vaporous and temperature effects.

# DIGITAL PRECISE SHAKING WATER BATH

**WBT-200/400/401, Digital Precise Shaking Water Bath, 22 & 38 Liter, & Digital PID Control, Reciprocating Motion, 20~200rpm, to 100°C,  $\pm 0.1^\circ\text{C}$ , up to 1 Liter Flask**



These reciprocating water bath shakers are available in three models.

Model WBT-200 small platform 250x300mm, Model WBT-400 large platform 300x400mm & Model WBT-401 refrigerated to 0°C. Temperature control is precise, temp. range of 5°C above ambient to 100°C, speed range 20 – 200 rpm, heat loss and evaporation minimized with use of stainless steel hood cover.

Easy emptying through a drain at the lowest point.

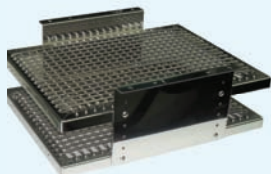
Micro processor temperature PID controller with dual display of measured temperature and set temperature.

**Electronically Controlled Shaking Mechanism Provides Quiet Reciprocating Motion and Precise Speed Control.**

## Options:

- Water level protector.
- Universal platform.
- Digital speed control.

## Optional: Tube Holders



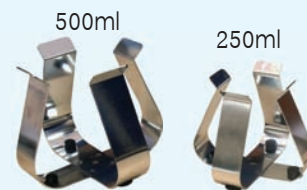
Universal Spring Racks



AC-220-30-16



**WBT-200D**  
**Optional: Dig. Speed Control**



Flask Holders

## Features:

Stainless Steel Bath for Superior Durability & High Thermal Efficiency • Innovative Easy-to-Use Digital PID Controller • Electronically Controlled Shaking Mechanism Provides Quiet Reciprocating Motion and Precise Speed Control • Universal Stainless Steel Spring Rack (Optional): for various kind of Flasks dishes and Tubes (optional) • Patent shaking mechanism: minimum noise and vibration.

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Model	WBT-200	WBT-400	WBT-401
System	Reciprocation shaking circulation		
Temp. range	Room temperature – 100℃		0℃-100℃
Temp. constancy	±0.1℃		
Temp. control	PID		
Temp sensor	PT-100Ω		
Inside material	SUS304		
Rate of shaking	20~200 rpm		
Shaking width	20 and 40 mm variable		
Shaking plate (mm)	W300xD250xH130	W400xD300xH160	
Refrigerator			1/4HP
Heater	1.0KW	1.6KW	
Safety devices	Short circuit breaker, over heat protector, sensor abnormality, refrigerator over protector		
Inside dimensions (mm)	W500xD300xH150	W600xD350xH180	
Outside dimensions (mm)	W700xD350xH300	W830xD415xH350	W980xD415xH430
Volume (Liters)	22.5	37.8	
Weight	25kg	30kg	53kg

capacity of flasks	50 ml	125 ml	250 ml	500 ml	1000 ml
WBT-200 number of flasks	20	12	6	4	2
WBT-400/401 number of flasks	35	20	12	6	4



# DIGITAL PRECISE CIRCULATION WATER BATH

## WBH-Series, Digital Precise Circulation Water Bath

There are 2 models with internal circulation pump, 10 & 20 Liters. The immersion circulator bridge can easily remove for easy cleaning of the tank.



WBH-100

WBH-200

### Features:

Ideal for Biotechnology, Clinical, Environmental, Medical, Petroleum, Food Industry, Pharmaceutical or Industrial Applications

- Powerful Circulation Pump Assures Temp. Uniformity.:

Internal and optional external

Circulation • Stainless Steel Bath(#304) for Superior

Durability & High Thermal Efficiency • Stainless Steel lid

Prevents Evaporation and keeps Constant Temperature.



External Circulation Option

Model	WBH-100	WBH-200	WBH-200I
Temp. range	Ambient +5°C to 100°C		
Temp. constancy	±0.1		
Temp. control	PID		
Internal circulating pump	9Liter/Minute		
External circulating pump	No	No	Yes
Heater	800W	1000W	
Safety devices	Short circuit, over head protector, sensor abnormality		
Bath opening (mm)	W200xD235xH150	W400xD295xH150	
Inside dimensions (mm)	W295xD235xH150	W495xD295xH150	
Outside dimensions (mm)	W340xD280xH320	W540xD340xH320	
Volume	10L	20L	
Weight	7ka	10ka	

## WBO-Series, Unstirred Up To 80°C Water Bath

The MRC stainless steel water bath are available in 2 sizes: 10 & 20 Liters. Model WBO-100 and WBO-200 unstirred bath are used for general applications in laboratories. They provides excellent temperature uniformity of the liquid. A PID temperature controller provides instant and accurate temperature. The tank of the bath is made of corrosion resistant stainless steel with round corners for easy cleaning. Include hood cover.



WBO-200

### Features:

- Ideal for biotechnology, clinical, environmental, medical, petroleum, food industry
- Stainless steel lid prevents evaporation & keeps constant temperature
- Excellent uniformity & stability
- Seamless, corrosion-resistant, stainless steel chamber
- Available in 10, 20 Liters
- Gable cover included.

### Applications:

- Incubate cultures
- Warm bacteriological media
- Perform chemical reactions
- Thaw samples.



WBO-100

Model	WBO-100	WBO-200
Temp. range	Room temperature ~ +5°C to 80°C	
Temp. constancy	±0.1	
Temp. control	PID	
Heater	300W	600W
Safety devices	Short circuit, over head protector, sensor abnormality	
Bath opening (mm)	W295xD235xH150	W495xD295xH150
Inside dimensions (mm)	W295xD235xH150	W495xD295xH150
Outside dimensions (mm)	W420xD280xH185	W620xD340xH185
Volume	10L	20L
Weight	6.5 kg	9 kg

# DIGITAL PRECISE REFRIGERATED BATH

## WBL-Series, Digital Precise Refrigerated Bath, Internal and External Circulator



WBL-200

WBL-100

### Refrigerated Circulating Baths

- Compact design.
- For external & internal temperature applications.
- Low noise level.
- Rapid cool down and heating time.
- Water drain for easy cleaning of the inner tank.
- Models WBL-200 has casters.
- Water level protector.
- Ideal for direct immersion of samples or external circulating system in the field of biotechnology and laboratories.
- Powerful circulation pump ensures temp. uniformity: internal and external circulation.
- Connection with evaporator or viscometer is applicable.

### Options:

- Display resolution to 0.01°C
- Build in RS-232/485
- PT-100Ω temperature probe for direct measurements and control of external systems
- Analog inputs and outputs for external programmer and temperature recorder.

Model	WBL-100	WBL-101	WBL-200
Temperature range	-30°C~100°C		
Temp. constancy	±0.1°C		
Temp. control	PID		
Temp. sensor	PT-100Ω		
Circulation pump	9L/min. max. head 2m	18L/min. max. head 7m	27L/min. max. head 7m
Heater	1600W		2500W
Refrigerator	1/3HP		1 HP
Safety devices	Short circuit breaker, over heat protector, sensor abnormality, overload protector		
Bath opening (mm)	W200xD150xH150		W300xD210xH180
Bath dimension	W200xD300xH150		W300xD360xH180
Outside dimensions	W315xD450xH630		W420xD530xH800
Volume	9.0L		19.4L
In/Output	9.5mm		12.5mm
Weight	35kg		63kg

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### Available Products Catalogs:



MRC LTD. Laboratory Products  
 Offices: 3 Hagavish st. Holon 5881702 Israel  
 Tel: 972-3-5595252 Fax: 972-3-5594529  
 Website: [www.mrclab.com](http://www.mrclab.com) E-mail: [mrc@mrclab.com](mailto:mrc@mrclab.com)  
 Fried Electric  
 Factory: 19 Marconi St. Haifa 31250 Israel

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THE STANDARDS INSTITUTION OF ISRAEL



BATHS

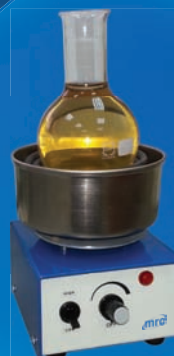
SHAKERS

STIRRERS

HOTPLATES

INCUBATORS

HEATING  
MANTLES



# HEATING MANTLES



# SPILLPROOF HEATING MANTLES

## Specialty Spillproof Heating Mantles



- Units are designed with a built-in stainless steel liner that gives electrical & mechanical protection against spillage & enables easy cleaning
- Built-in electronic controller regulates heating element from ambient to 750°C, 2 ranges: low & high
- Durable housing is chemically resistant
- Accept a large range of flasks
- For maximum operator protection, models are grounded should spillage or flask breakage occur
- All models include support rod holder at the back.

### Three Flask Size In One Mantle

#### Model K-1

- For flasks up to 1000ml.
- Stepless heat control.
- Operating temp. up to 750°C.

#### Model K-2

- For flasks up to 2000ml.



#### KM-1D

Optional: Digital Temp. control

#### Features:

- Three in one design accommodates 250, 500 or 1000ml round bottom flasks (K-1, KM-1).
- Three in one design accommodates 500, 1000 or 2000ml round bottom flasks (K-2, KM-2).
- Different vessel sizes, spill proof heater.
- Includes rear bracket for support rod.
- Stepless heat control up to 750°C (650°C with stirrer)
- Variable speed control up to 1800rpm (KM-1, KM-2).
- Heater on light.
- Element temperature range of ambient to 750°C.

### Heating Mantle With Magnetic Stirrers

#### Model KM-1/KM-2

- Steeples heat control up to 650°C
- Variable speed control up to 1800 RPM

## Specifications:

Analog Model	Digital Model	Temp. range	Capacity	Stirring	Dimensions	Weight	Watt
K-1	K-1D	up to 750°C	250-1000ml	-	W12xD17xD18cm	1.2kg	550
K-2	K-2D	up to 750°C	500-2000ml	-	W21xD20xD24cm	1.4kg	750
KM-1	KM-1D	up to 650°C	250-1000ml	up to 1600rpm	W16xD17xD23cm	2.3kg	550
KM-2	KM-2D	up to 650°C	500-2000ml	up to 1600rpm	W21xD20xD24cm	2.5kg	750

## E-Series, Multi Position Round Top Extraction Heater



#### E-6

- Optional: Aluminium top mould for round bottom flasks up to 250ml/500ml for extraction apparatus soxhlet.
- Digital temperature control.

The Multi Heating Apparatus offers such versatility that is suitable for many laboratory purposes: extractions, distillations, digestions, evaporation etc. The 6 separate heat controls allow the heaters to be used for several different projects or multiple runs of the same project. The Multi Heating Apparatus in conjunction with interchangeable top mould for round bottom flasks - solves the most varied heating problems.

#### Model E-6

- Six individual heat controls with pilot lights
- Built-in temperature regulator
- For 6 places, 220 Volt (on request 115 V), 2700 Watts (6x450 W)
- Approximate temp.: 40 - 450°C
- Hotplate top 85 mm. dia.
- Dimensions (WxHxD): 80x17x20 cm
- Accessories: Optional: 6 interchangeable aluminum top moulds for round bottom flasks up to 100 ml or 250 to 500ml (Kjeldahl flasks 500-800 ml)
- 4 support rods 800x12 mm. with 4 clamps.

**Model E-4** as described above, but for 4 places 220Volts 1800Watts (4x450W). DIM. (WxHxD): 60x17x20 cm.

# MULTI UNIT KJELDAHL APPARATUS

## K-Series, Multi Unit Macro Kjeldahl Apparatus



K-6

### Model K-6, 6 Positions

Up to 6 flasks • 220 Volt (or 110V), 6x550 Watt • Dimensions: (WxHxD) 80x19x20 cm (D includes rear bracket for support rod) • Nett weight: 6.8 Kgs.



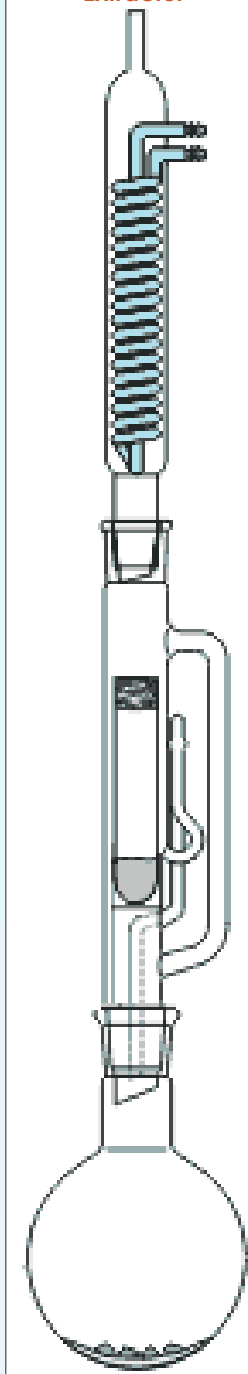
K-4

### Model: K-4, 4 Positions

Up to 4 flasks • 220 Volt (or 110 V), 4 x 550 Watt • Dimensions: (WxHxD) 60x19x20cm (D includes rear bracket for support rod) • Net weight: 4.8 Kgs.

- For flasks 250 up to 1000 ml.
- Spillproof–Stainless Steel Heater.
- Stepless– heat control.
- Operating temp.: up to 750°C.
- Includes 4 support rods and 4 clamps.
- Durable housing is chemically resistant.
- Built-in electronic controller regulates element temp. to 750°C, 2 ranges: low & high.
- Robust aluminium construction permits operation of the units as required by extraction and distillation processes.
- "Heat on" light for each recess indicates when power is being supplied to the heater.
- For maximum operator protection, models are grounded should spillage or flask breakage occur.
- Units are designed with a built-in stainless steel liner that gives electrical and mechanical protection against spillage & enables easy cleaning.
- Lower profile for space-saving convenience.
- Ideal for repetitive extracting (kjeldahl, soxhlet, and other extraction procedure), refluxing & distilling laboratory applications.
- Analog controller built-in system.
- Rods & clamps are offered as standard.
- Ideal for all brands round flasks.
- Highly-processed aluminium case offers robust standing, easy handling.

## Soxhlet Extractor



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### Soxhlet Extractors

For the extraction from solids with solvents. The solvent is recirculated continuously and distilled from the extracted sample before contacting the solid again. The extract is concentrated in the distillation flask. The method allows an effective separation with relatively small amounts of extracting solvents.

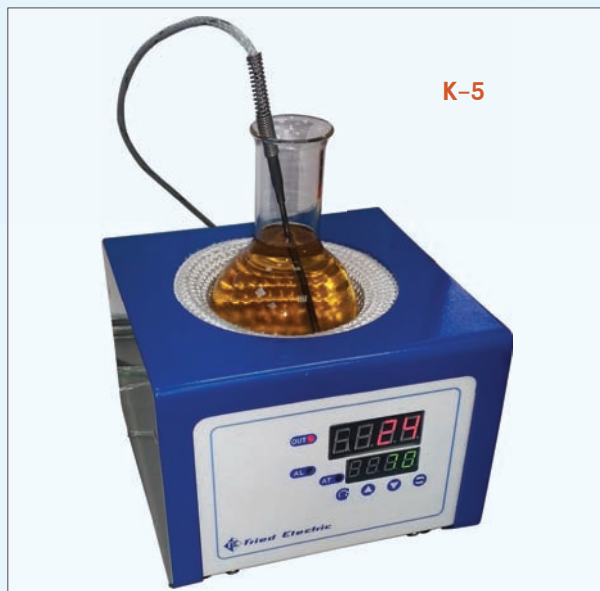
The complete apparatus consists of

- round bottom flask
- compact and robust designed extractor with NS 29/32 flask connection.



Cat.No.	Extractor ml	Condenser NS	Flask ml	Condenser
5.3600.25	30	29/32	100	dimroth
5.3600.31	70	34/35	100	dimroth
5.3600.37	100	45/40	250	dimroth
5.3600.43	150	45/40	250	dimroth
5.3600.46	200	45/40	250	dimroth
5.3600.49	250	45/40	500	dimroth
5.3600.52	300	60/46	500	dimroth
5.3600.58	500	60/46	1000	dimroth
5.3600.70	1000	71/51	2000	dimroth

# DIGITAL METAL CASE MANTLES



K-5

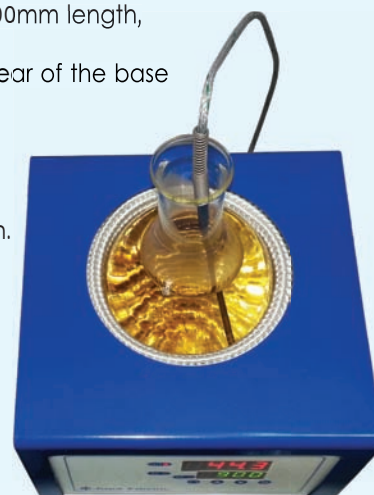
Aluminum housing is chemical resistant, tough, lightweight and easy to clean • Max. temp. 450°C • Full pid temperature controller. Ensure high temp stability. Process accuracy. Dual display of set value & process • 7 series mantles sizes available from 50 to 3liter • Unique air flow through ventilation slots beneath & around the case keeps the exterior safe to touch • Flexible coiled heating element provides good heat transfer while absorbing shock minimizing risk of flask breakage • Heating element and insulation form an easily replaceable heating cartridge • A "Heater On" light indicates when power is being supplied to the heaters • Aluminium housed case, rigid housing to support the weight of the vessel • Provide uniform heating of vessel without the danger of open frame • Covering only the bottom half of the vessels & provide full view of the contents of the vessel • Fabric mantles for effective heating & protection of glass vessels from thermal shock.

## K-5, Metal Case Mantles, Digital Control, Up to 450°C

- Digital set-point and read-out of actual temperature.
- PID microprocessor controller provides precise temperature regulation all over the temp. range, include the low temp close to the ambient
- External temp. sensor 200mm length, 3.2mm diameter
- Support device at the rear of the base to hold standard rod
- External sensor input.

### Options:

- Digital timer and ramp to temperature function.
- Programmer
- Separate Control box: You can have your controller separated for wide variety of applications for example for glove-box.
- Coming soon with magnetic Stirrer.



Model	Capacity	Power
K-5-50D	50ml	60W
K-5-100D	100ml	80W
K-5-250D	250ml	200W
K-5-500D	500ml	300W
K-5-1000D	1000ml	400W
K-5-2000D	2000ml	500W
K-5-3000D	3000ml	600W

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## K-5-3/6 Multi Position Heating Mantles With 3 or 6 Heating Places

Models	Capacity	Units	Total watts
K-5-3-250	250 ml	3	600W
K-5-3-500	500 ml	3	900W
K-5-3-1000	1000 ml	3	1200W
K-5-6-250	250 ml	6	1200W
K-5-6-500	500 ml	6	1800W
K-5-6-1000	1000 ml	6	2400W

- Temp. range up to 450°C
- Unique air flow ensure unit is safe to touch

- Independent digital temp. control to each channel
- Optional: Magnetic stirrer to each mantle.



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THE STANDARDS INSTITUTION OF ISRAEL





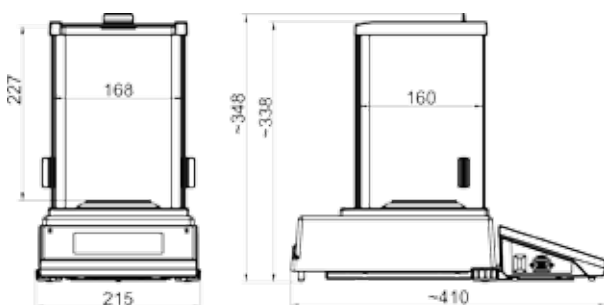
## ASB-Y Series, Analytical Balances



Analytical balances Series ASB-Y are designed with application of new electronic modules and up-to-date technological solutions. Measurement reliability & accuracy is assured by system of internal adjustment / calibration triggered by time flow or temperature conditions. Balances are operated through a modern electronic module touch panel covering a 5.7" color graphic display. Scales feature new version of implemented software ensuring easy and intuitive operation.

### Optional accessories:

- Anti-vibration table
- Printers
- Holders for glass vessels
- Tare and "Print" foot button
- Computer software
- Antistatic ionizer
- Ambient conditions module
- Density determination kit
- LCD additional display
- PC keyboard
- Additional adapter for pipettes calibration
- Power adapter with battery and charger
- Rack for under hook weighing
- Standard mass
- Antistatic cable
- Bar code scanner
- Cable RS 232



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Model	ASB-220-Y	ASB-310-Y	ASB-510-Y
Max capacity	220g	310g	510g
Minimal load	10mg	10mg	10mg
Readability	0.1mg	0.1mg	0.1mg
Tare range	-220g	-310g	-510g
Working temperature	+10° - +45°C		
Repeatability*	0.1mg	0.1mg (220g) 0.2mg (220g÷310g)	0.1mg (220g) 0.2mg (310g) 0.3mg (510g)
Linearity	±0.2mg	±0.3mg	±0.4mg
Stabilization time	3.5 s		
Sensitivity drift	2 ppm/°C in temperature +15° - +35°C		
Interface	2×USB, RS 232, Ethernet		
Power supply	110 ÷ 230V AC / 50 ÷ 60Hz / 13.5 ÷ 16V DC / 1.1A		
Adjustment/Calibration	internal (automatic)		
Display	5.7" touch screen		
Pan size	Ø85mm		

\*Repeatability as a standard deviation from 10 weighing cycles

**BLF-14/16/17 Seires, Elevator Furnaces**

BLF-14/16/17 series elevator furnace has many advantages of uniform temp. field, low surface temp., heating or cooling promptly, energy saving and so on. it is convenient to take material under high temperature. It is the ideal muffle furnace for power sintering, ceramic sintering, glass melting, high temperature experiment and quality inspection in Industry, Scientific research institutes, Universities, which offer Heating element of Sic and double layer structure with air cooling system between the double walled housing to help the furnace heat or cool promptly. Temperature controller is Shimaden 40-segments digital controller imported from us. The chamber is made of 1600 Polycrystalline alumina fibre imported from us. This furnace is the best choice for small mass production and sintering in high temperature.

**Features:**

- Temperature controller: Shimaden FP93
  - 40 programmable segments (Shimaden fp93 made in Israel), It can separate into 4,2,1 programs, ie. 4x10 segments.
  - FP93 have 6 PID controls, different PID are used for low, middle, high temperature for precise control.
  - Over-temperature and over-current protection, shutdown automatically when thermocouple is broken( it will shut down power when temperature is higher than 1420 or thermocouples is broken, "ON" on the board is off and "OFF" is on)
  - There is Fahrenheit (F) and Celsius (C) for option.
  - With 485 communication interface: which can stop the furnace automatically.
- Cover opening protection system: overtravel-limit switch is installed to protect user, it will cut off power when the cover is opened.
- Chamber: it is imported from Japan, good performance of heat preservation, high reflectivity, even temperature field, good ability of anti thermal expansion and cold contraction.
- Heating elements: This furnace is installed with Sic to ensure uniform temperature field and long service life.
- Leakage protection function: the furnace is installed with leakage air switch, it will cut off power Automatically when electricity leak or current exceed rated current.
- Software controlling system: this furnace can control every parameter directly and observe PV and SV on the computer by communication interface and software, computer can draw and save actual heating curve, it is convenient to call these dates at any time.
- Controlling system: Power control: Chint; Controlled silicon: Germany Semikron 106/16E; Trigger: Phase-shift trigger
- Elevator system: automatic elevator stainless steel electric push pole, push UP or DOWN button, the material will go up or down on the tray automatic.
- Overtravel-limit switch: when the elevator pole go up or down to the limit point, the switch will cut off power to stop overtravel.
- Advantage:
  - rod can be fixed round the chamber to ensure even temperature field.
  - it is convenient to take the material, specially under high temperature, to avoid burning user.
  - there are four poles to support the tray stably.

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Model	BLF-14-I	BLF-14-II	BLF-14-III	BLF-16-I	BLF-16-II	BLF-16-III	BLF-17-I	BLF-17-II	BLF-17-III
Chamber size(DxWxH)mm	200X200X200	250X250X250	300X300X300	200X200X200	250X250X250	300X300X300	200X200X200	250X250X250	300X300X300
Overall Dimen.(DxWxH)mm	660X675X1380	660X675X1430	710X725X1480	660X675X1380	660X675X1430	710X725X1480	660X675X1380	660X675X1430	710X725X1480
Net Wight (Kg)	-	-	-	265	280	310	265	280	310
Power (KW)	5.2	9	12	5.2	9	12	5.2	9	12
Voltage (V)	220		380	220		380	220		380
Phase	Single								
Max. Temperature	1400°C			1600°C			1700°C		
Constant temperature	1350°C			1550°C			1650°C		
Thermocouple	Type B								
Heating Element	Sic			MoSi2					
Heating Rate	≤30°C/min								
Recommended Heating Rate	≤15°C/min								
Temperature Accuracy	±1°C								
Temperature Controller	Shimaden fp93, with 4 programs and 40 segments (ie. 4 x 10 segments or 2 x 20 segments)								
Chamber Material	Polycrystalline 98% alumina fibre(for all models). Thermal expansion 8 cold contraction(for 17 series)								
Trigger	Phase-shift trigger								
Electric push pole power	150W								
Elevator rate of electric push pole	420mm/Min								



**BR300/BR350, Waterproof Borescope/Inspection Cameras**

Waterproof borescopes are completely submersible in water down to 1 meter for 1 hour. The built-in bright LED lamps illuminate dimly lit areas.

**Features:**

- Waterproof (IP67 rated), lightweight, handheld design for quick, easy, on-the-spot viewing in small openings
- Model BR300 – Borescope with 8mm diameter camera head with four bright LED lamps with dimmer
- Model BR350 – Borescope with 5.5mm diameter camera head with two bright LED lamps with dimmer
- Built-in waterproof 1m flexible gooseneck cable retains configured shape
- 68mm color TFT LCD monitor for detailed images
- 2x digital zoom for close-up viewing
- 180° image rotation on screen
- Glare-free, close-up field of view
- Low battery indicator
- Complete with camera probe and 1m flexible cable, 4 AA batteries, and hard case.

**Applications:**

- Underwater & marine applications
- Automotive maintenance/repair
- Pipe inspection/repair
- Industrial equipment inspection
- Construction sites, Workshops, & Laboratories
- Home Inspection.



Waterproof IP67



Automotive



Plumbing/Pipes

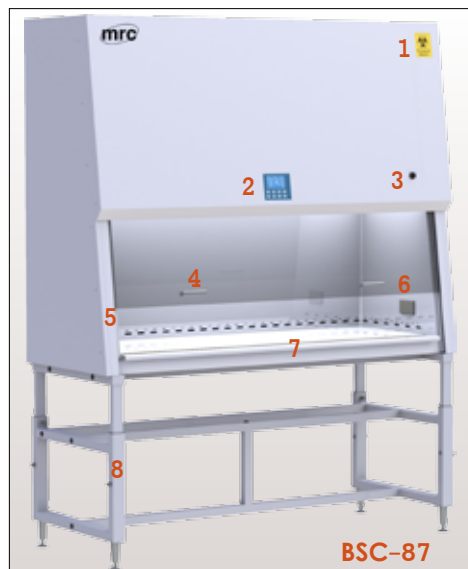
**Ordering Information:**

**BR300:** Waterproof Borescope/Inspection Camera (8mm diameter/1m cable)

**BR350:** Waterproof Borescope/Inspection Camera (5.5mm diameter/1m cable).

Model	BR300	BR350
Camera Shaft Diameter/Cable Length	8mm diameter/1m cable	5.5mm diameter/1m cable
Focus Distance from Object	2 to 7cm	1 to 4cm
LED lamps	4 LEDs with dimmer	2 LEDs with dimmer
Camera Viewing Direction	Viewing Angle 60°	
Minimum Bend Radius	30mm	
Camera resolution	640 x 480 pixels	320 x 240 pixels
Camera Zoom	2x Digital	
LCD Screen Type/Pixels	68mm color TFT/960 x 240 pixels	
Waterproof	IP67 rating (1 meter for 30 minutes)	
Battery life (continuous use)	Approx 3–4 hours	
Dimensions/Weight (w/o batteries)	249x94x43mm/380g	



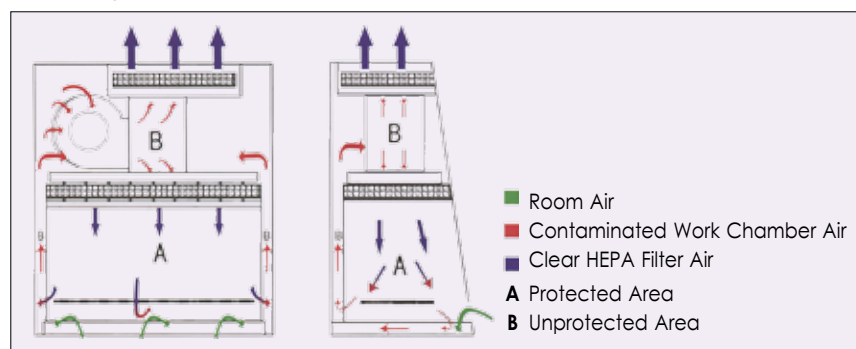


1. Biohazard Label.
2. LCD display / VFD Display.
3. Power Lock.
4. Handle.
5. Water & Gas Tap.
6. Waterproof Socket.
7. V Type Intake Grille.
8. Adjustable Base Stand.

### BSC-85 BSC-86, BSC-87, Class II

The Class II Biological Safety Cabinet is designed with inward air flow at a velocity to protect personnel, HEPA filtered vertical laminar air flow for product protection, and HEPA filtered exhausted air for environmental protection.

- Adjustable base stand, height range: 630-845mm.
- One Piece removable work table, V type intake grille (BSC-85/87).
- Large LCD display. You can find all information on the screen (BSC-85/87).
- VFD display: it can demonstrate various colors with high bright, even in the evening. It can work no less than 30,000 hours continually (BSC-86).



Water &  
Gas Tap



Waterproof  
Socket



V Type  
Intake Grille



LCD display



VFD Display

Model		BSC-85	BSC-86	BSC-87
External size (upper body) (WDH mm)		1100x740x1550	1421x850x1550mm	1886x750x1555
Internal size (WDH mm)		914x600x610	1220x665x650mm	1700x600x610
Base Stand		Adjustable height, range: 630mm-845mm		
Max Opening		450mm (20")		
Tested Opening		Safety Height ≤ 200mm (8")		
Average Airflow Velocity		Inflow Velocity: 0.53 m/s(105 fpm)		
		Downflow Velocity: 0.35 m/s(70 fpm)		
Airflow Volume	Inflow	349 m³/h (205 cfm)	465 m³/h (275 cfm)	649 m³/h (382 cfm)
	Down flow	61%: 550 m³/h (323 cfm)	67%: 956 m³/h (571 cfm)	61%: 1006 m³/h (592 cfm)
	Exhaust	39%: 349 m³/h (205 cfm)	33%: 465 m³/h (275 cfm)	39%: 649 m³/h (382 cfm)
HEPA Filter		Efficiency 99.999% at 0.3 um		
Noise		NSF 49 ≤ 61 dB / EN 12469 ≤ 58 dB		
Illumination		>850Lux		
Material		Working Area: 1.5mm 304 stainless steel and outside decorative plate		
		Frame: Cold-rolled steel sheets with electrostatic coating	Frame: Cold-rolled steel with anti-bacteria powder coating	Frame: Cold-rolled steel sheets with electrostatic coating
Motors		One ECM motor		
		Speed adjustable, high efficiency and low power consumption, 110V & 220V acceptable		
Glass Control		Manual	Motorized	Manual
Display		LCD	VFD	LCD
UV		18 W germicidal UV lamp	30 W germicidal UV lamp	40 W germicidal UV lamp
		Emission of 253.7 nanometers for most efficient decontamination		
Waterproof Socket		One, 5 holes, 500W(Max)		
Tap		Water Tap*1, Gas Tap*1		
Filter Guard Type		Aluminium Alloy		
Ground Resistance		< 0.10 Ω		
Consumption		260 W	400 W	300 W
Power Supply		AC 220V-110V, 50Hz/60Hz, Full load Amps: 9A, BTU/Hr. 1689		
Standard Accessory		Fluorescent lamp, UV lamp, 5m Power cord, Fuse tube(six), Base stand, SS water & gas taps		
Package Size (WxDxH)		1250x915x1890 mm	1600x1050x1870 mm	2040x915x1920 mm
Gross Weight		280 kg	330 kg	380 kg

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# COL-2000 SERIES COLPOSCOPE

(FDA 510K Number: K061306)

(ISO9001: 2000 Certificate Number 5300/2002137799)



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## FEATURES AND BENEFITS

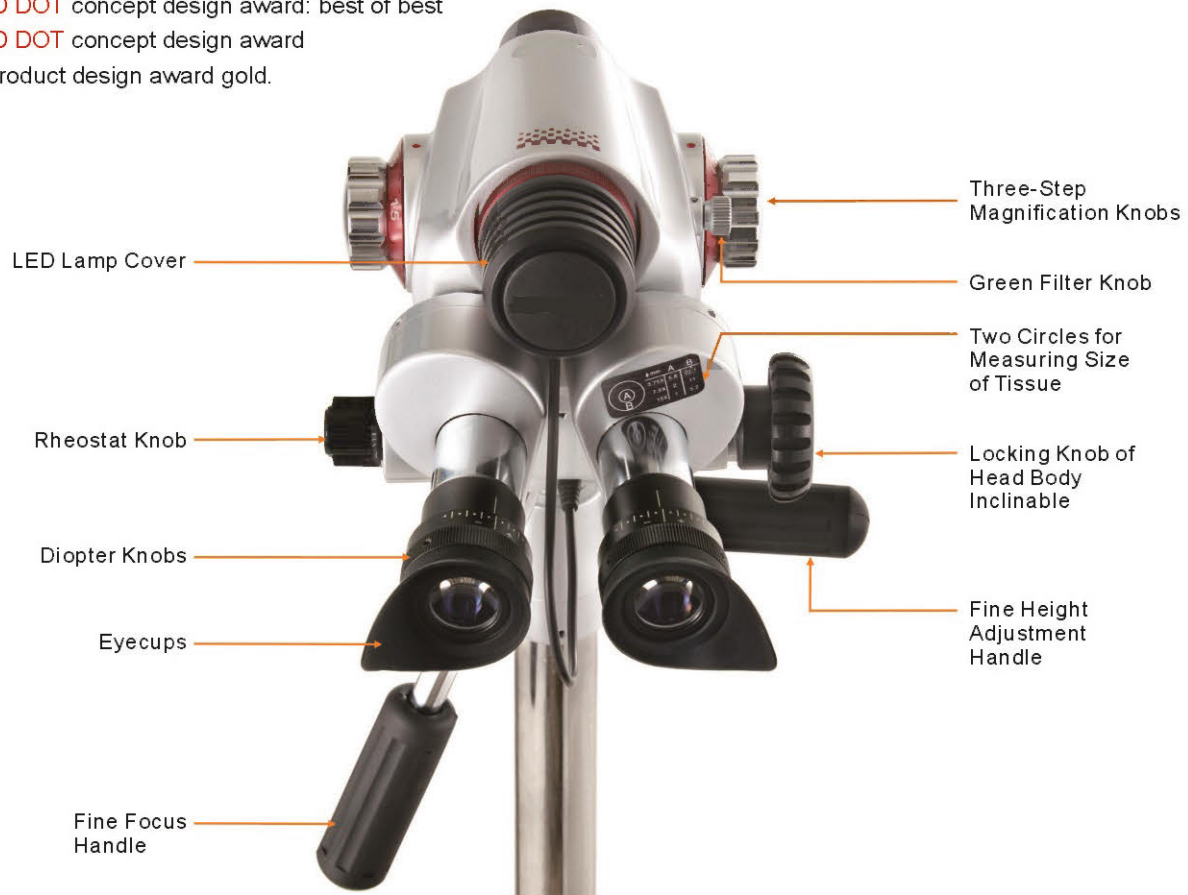
- Apochromatic Optic Design
- 3-Step Magnification and/or Single Magnification
- LED Illumination for Long Life & Low Cost
- Integrated Video Camera
- Two Optical Circles for Quick Measuring Size of Tissue
- Integrated Green Filter
- Compact, Light Weight Base with Wheels for Easily Maneuver
- Ergonomic Design for Long Time Precision Operation Comfortably
- Completely Assembled and Ready to Use

COL-2000 series colposcope is based on COL-1000 series platform which has been sold hundreds of units worldwide. It is a combination of classic aesthetics and modern technology.

2007 **RED DOT** concept design award: best of best

2008 **RED DOT** concept design award

2009 **IF** product design award gold.



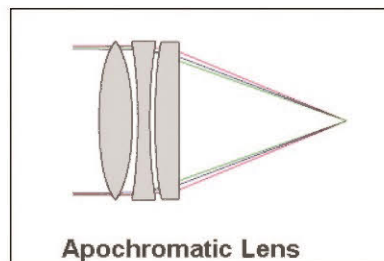
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## SUPERB OPTICAL FEATURES

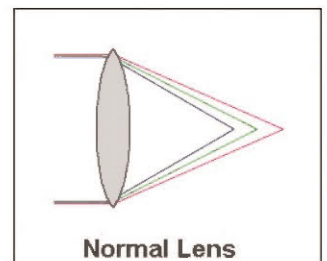
Our excellent optical design makes the colposcope with superb optical feature features, including:

1. High resolution
2. Real 3-Dimensional Precise Image Reproduction
3. Large depth of field
4. Wide Field of View
5. Good Contrast

Apochromatic optics design could correct the chromatic aberration of three types of colored light effectively. It ensures the reduction and saturation of image color and improves the resolution, contrast and view depth of image.



Color Aberrations from Visible Lights Are Corrected



Visible Light Refraction Forms Color Aberrations

## 3-STEP MAGNIFICATION AND/OR SINGLE MAGNIFICATION

3-step magnification (3.75x-7.5x-15x) provides larger magnifying range and more selection on magnification to meet the requirement of your practice, from lowest magnification for an overview to high magnification for precise and close inspection and treatment.

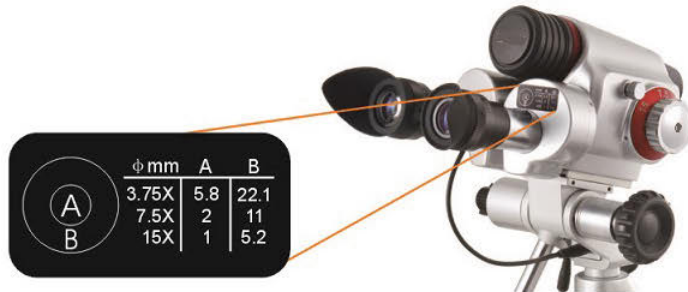




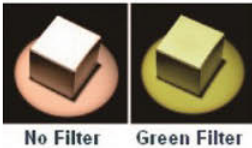
For matching your budget requirement, we supply single magnification model as well.



## TWO OPTICAL CIRCLES FOR QUICK MEASURING SIZE OF TISSUE



## INTEGRATED GREEN FILTER



Green filter can help you to recognize blood vessels.

## LED ILLUMINATION

LED coaxial illuminator provides pure white color light similar to the sun light to show the real color. The bulb life can be over 10,000 hours/10 years for lasting performance. It not only avoids the trouble of changing bulbs, but also saves your cost for the spare bulbs & electric charge.



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## INTEGRATED VIDEO CAMERA



An integrated video camera (1 CCD) is available in specific models. It is very convenient for the doctors to communicate with the patient by this device.

The images from integrated video camera can be inputted into a monitor or a TV set directly. Or it can be inputted into a computer by image collection with USB adapter or stored into a hard disk recorder.



## COMPACT, LIGHT WEIGHT BASE WITH WHEEL FOR EASILY MANEUVER

The colposcope is 11 kgs only. You can lift it easily. And it comes with three wheels on the base for you to move it easily



## ERGONOMIC DESIGN FOR LONG TIME PRECISION OPERATION COMFORTABLY

All ergonomic design assure you can work with our colposcope for long time precision operation most comfortably. It would avoid or reduce your problems on the back and neck.

## COMPLETELY ASSEMBLED AND READY TO USE

Alltion AC-2000 series colposcopes are delivered to customers with completely assembled unit in one carton. Any installation is not necessary. All you have to do is plug it in and/or connect it to your monitor or /TV set.



## SPECIFICATION OF ALLTION COL-2000 SERIES COLPOSCOPES

1. Total magnification 3.75x, 7.5x, 15x for 3-step models and 7.5x for single magnification models
2. 300mm focal length
3. Field of View: 79mm, 39mm, 19mm dia. For 3-step magnification models and 39mm for single magnification models
4. Depth of Field: 4.5mm, 1.13mm, 0.76mm for 3-step magnification models and 1.13mm for single magnification models.
5. Light intensity: >25,000 LUX
6. Individually adjustable eyepiece 16.7x
7. Right eyepiece with built-in two circles for you to measure the size of the problem you see.
8. Built-in rheostat for brightness adjustment
9. User-selectable built-in green filter for enhanced contrast
10. LED bulb is easily changeable.
11. Working Height: 950mm to 1250mm
12. Fine focus adjustment Handles
13. Two (Gross/Fine) height adjustment Handles
14. Unit is completely assembled and ready for use once power is on
15. Main Power Supply: 100V to 240V  
for 3-step magnification models and 1.13mm for single magnification models.

*Item and specification subject to change, please contact Alltion for current production information.*

CE FDA ISO

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Australian Distributors  
Importers & Manufacturers

Last	When the cleaning is completed, unplug the power cord, open the lid and retrieve the basket and the items. Empty the tank and clean both the outside and inside of the device with clean and dry cloth for next use. Keep the drainage valve closed. (for 6L and above units).
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**WARNING :** Strong acid or alkaline cleaning solution will cause corrosion, rust and even puncture of tank or machine body. To overcome this problem, dilute to mild PH solution or request for tank made of specific grade of stainless steel like SUS304.

## Specifications

Model	Tank Size	Overall Size	Capacity	Power	Heating power	Frequency
	(L×W×H)mm	(L×W×H)mm	L	W	W	KHz
DCG-80H	150×140×100	190×170×220	2	50	100	33-40
DCG-120H	240×140×100	275×170×240	3	100	100	
DCG-150H	300×155×150	330×180×310	6	150	300	
DCG-200H	300×240×150	330×270×310	9	200	300	
DCG-250H	330×300×150	360×330×310	13	300	400	
DCG-300H	500×300×150	550×330×310	20	400	500	
DCG-400H	500×300×200	550×330×360	27	500	500	

: Heating 0-80℃ temperature can be adjustable

: Time Setting 1-99 minutes can be adjustable

: Smart Control



**mrc**  
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# SMART ULTRASONIC CLEANER USER MANUAL

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## FEATURES

Normal and soft power control to resolve the cleaning blind spot .

Degas function for increase the cleaning effect.

Automatically ultrasonic frequency tracking.

User-friendly and clear panel.

Memory function.

Sleep mode.

LED display for temperature and timer.

High-performance transducers.

Patent products.

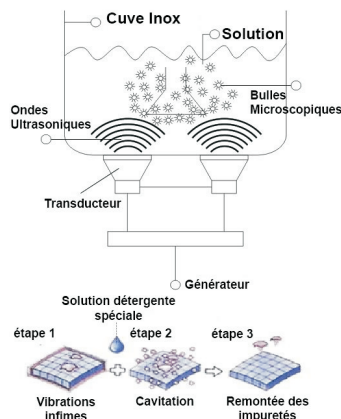
**Thank you for purchasing the ultrasonic cleaner. Please take the time to read these operating instructions before use and retain them for future reference. Failure to follow these instructions may lead to serious personal injury and damage to property.**



## INTRODUCTION

Ultrasonic cleaning is based on the cavitation effect caused by high frequency ultrasonic wave vibration signal in the fluid. Microscopic bubbles are formed, and they implode violently causing the cavitation which create an intense scrubbing action on the surface of the item being cleaned. The bubbles are small enough to penetrate microscopic crevices, cleaning them thoroughly and consistently.

Ultrasonic cleaning is extremely effective at removing dirt and grime which would normally require tedious manual cleaning by hand. It has been used to clean a wide variety of instruments and mechanical parts such as carburetors, returning them to almost "like new" condition without damage to delicate parts.



## PREPARATION:

Carefully unpack the cleaner and remove all traces of packing materials from it. Visually inspect the cleaner for any parts that may have become loose or damaged during transit.

### Contents:

- a: Main machine                      b: Soundproof lid                      c: Power cord
- d: Outlet filter                        e: Mesh basket                        f: User manual

1. Place the cleaner on a flat, clean surface where the cooling fans will receive adequate ventilation and ensure all controls are set to off. Also ensure the drain tap is in the closed position.
2. Ensure the power cord is securely plugged into the cleaner and that no part is likely to come into contact with moisture.
3. Carefully fill at least 1/2 of the tank with a solvent solution. For demanding cleaning we recommend a small amount of washing up liquid, this will help increase the cleaning performance. The cleaner is now ready for use.

## Attention

While the machine is working normally, ultrasonic and tank synergy gives a well-proportioned sound, and no shudder on the surface of the water, yet there is spray made by the tiny bubbles. If there are discontinuous surges, please add or release a little of washing solution in the tank, stopping the surges is better for the objects cleaning.

<b>Heating</b> 	2. When setting the temperature, if the setting temperature exceeds the environment temperature, press  key, the heating working, and indicator on. If below environment temperature, the heating couldn't start, and indicator turn off. 3. Heating won't shut off automatically, if you don't press  . 4. The device with memory function and acquiesce in the temperature you setting last time.
<b>Degas Mode</b> 	After timer and temperature setting, press  , the corresponding indicator on and the device will work in degas mode : working 6 seconds, and stop 2 seconds, then working 6 seconds,....cycle like this with countdown display. Intermittent operation of ultrasonic power for a quicker degassing of the cleaning liquid. If you want to transfer to other mode, just press  or  , then the "degas" indicator turn off and indicator for "normal" or "soft" turn on; If want to stop working, press  again, then both heating and ultrasonic will stop and the corresponding indicator turn off .
<b>Normal Mode</b> 	After timer and temperature setting, Press  "Normal" key, the corresponding indicator on and the device will work in normal mode: continuously working with full ultrasonic power and countdown display. If you want to transfer to other mode, just press  or  , the "normal" indicator turn off and indicator for "degas" or "soft" turn on; if you want to stop working, press  again, then both heating and ultrasonic will stop and the corresponding indicator turn off.
<b>Soft Mode</b> 	After timer and temperature setting, press  , the corresponding indicator on and the device will work in soft mode. If you want to transfer to other mode, just press  or  , the "soft" indicator turn off and indicator of "degas" or "normal" turn on; if you want to stop working, press  again, then both heating and ultrasonic will stop and the corresponding indicator turn off. <b>Note:</b> Degas, Normal and Soft cannot be operated simultaneously.

A:LED display temperature.  
 B :LED display cleaning time.  
 C:Heating button:Press this button for start/stop heating.

(Note:1:The new machine will display the ambient temperature when first time use.)

D:IncreaseTemperature :

Press this button to set the temperature.

Press one time to increase 1℃, holding the key to increase by 10℃

E:Temperature reduce:

Press this button to set the temperature.

Press one time to reduce 1℃,holding the key to reduce by 10℃ .

F:Degas:Fresh solutions with many air which reduce effective ultrasonic action.

Using Degas mode speeds up the degassing process and improves cleaning efficiency.

i:Soft:60% power for delicate applications .

:Normal 100% power to the tank for normal applications .






Timer increase :Press this button to set the cleaning time

Press one time to increase 1minute,holding the key to increase by 10minutes.

:Timer reduce :

Press one time to reduce 1minute,holding the key to reduce by 10minutes.

## OPERATION GUIDELINES

Step	Action
1.	Select your cleaning solution, fill at least ½ of solution into the tank. Do not exceed the filling line. <b>Note:</b> Do not ever use alcohol, gasoline or flammable solutions. Doing so could cause a fire or explosion. Use only water-based solutions.
2.	Place the items into a basket, Slowly lower the basket into tank, do not allow items to contact the tank bottom (solution should cover the items).
3.	Plug the cleaner into grounded outlet. <b>Note:</b> After the power on, the temperature you see on the machine is environment temperature. Time and temperature default as the last setting ones.(3 minutes default time for initial use)
Timer	Press   to setting the cleaning time. When timer count down to 00:00, the ultrasonic stop working. <b>Note:</b> The device with memory function and acquiesce in the time you setting last time.
Heating	Press  to start/stop heating. Press   to setting the temperature. <b>Note:</b> 1. To get the best cleaning result, the solution's temperature we suggest is 40-60℃. Warm water and dish washing liquid can soften grease and improve cleaning result.

## SAFETY PRECAUTIONS



### Keep it away from children !

This device is not intended to use by individuals with restricted physical sensory or metal capacities or those with lack of experience or knowledge, include children, unless they are supervised by an individual who is responsible for their safety or have received training in operating the device .



### Please read the following very carefully as failure to comply may invalidate your guarantee 28

## To avoid electrical shock:

- DO NOT run the cleaner continuously for more than one hour at a time, as doing so can damage the internal components.
- DO NOT operate the unit without fluid in the tank. Always ensure the fluid is no higher than the max mark, Always ensure there is a minimum depth of 7cm.
- DO NOT drop any item into the tank as this may cause damage to the transducer. Always place the items gently into the tank and use the basket whenever possible.
- The more items that you place in your cleaning bath the less efficient it will clean.It is not advised to overlap items. Always allow plenty of clear space between the items.
- Do keep the lid on during use. This will prevent splashes and reduce evaporation of the fluid.
- Never immerse the machine or power cord in water or other liquid.
- DO NOT touch the power plug with wet hands, especially when inserting or removing the plug.
- DO NOT touch the unit if the machine has fallen into water during operation. Remove the power plug from the socket first.
- DO NOT disassemble the machine, except by professionals.
- UNPLUG the power source while filling or emptying the tank.
- DO NOT spray water or liquid over the device and the control panel.
- DO NOT operate the cleaner without proper grounding.
- DO NOT place the device on a soft surface, where the vents could be blocked.
- Upon completion of the cleaning cycle, turn the heater knob off and isolate the machine from the electrical supply.
- Take care when adding or removing items from the cleaning tank as the fluid is likely to be hot and displaced fluid can damage the internal componentsAny displaced fluid must be dried up immediately.

- 16) In the event of failure/emergency, disconnect the mains supply by removing the plug from the mains socket.

## APPLICATION

Provided product is non-porous and can normally be immersed in water almost anything can be thoroughly cleaned. Here are some examples:

Health and Beauty	<b>Beauty and Chiropody Institutes:</b> scissors, scalpels, comedo removers, pincers, nippers, forceps and razors with the removal of organic tissue before sterilization treatments
	<b>Dental Practices and Dental Technician Laboratories:</b> dental instruments, removing organic and blood residues, cleaning hand pieces, drills, heads for ultrasonic ablators, glass objects and mirrors; the removal of cement from spatulas and plaster from prostheses.
Hospital and Laboratories	<b>Hospital Wards and Analysis Laboratories:</b> endoscopic probes, surgical instruments, glass containers in analysis laboratories with the removal of proteins, blood and organic tissue.
	<b>Tattoo Studios:</b> grips, tips and needles.
Goldsmithery and Silversmithery	Necklaces, bracelets, rings, precious stones, watch casings and straps, precision mechanical movements.
Manufacturing	Aerospace, Pharmaceutical, Defence, Automotive, Marine, Filtration, Moulding, Food and Beverage, Plating & Surface Finishing, Semi-Conductors.
Optical	During edging and polishing, debris and abrasives can scratch lenses. Ultrasonic cleaning can effectively protect the lenses.
Military	Reusable brass, gun parts, etc.
Regeneration	For cleaning dot matrix printers and photocopier ink cartridges.
Maintenance	Mobile phones, bicycle gears, air purifiers. It cleans out debris in tiny holes and crevices effectively.



## Items Not Suitable For Ultrasonic Cleaning

**Soft Jewelry:** Pearls, emerald, ivory, coral. Agate, sea turtle shells, etc.

**Welded, Plated and Glued Items:** Welded or plated metal items, glued items.

**Watches:** Except diver's watches with depth rating over 50m(150ft).

**Others:** Ceramic, camera filters with preexisting cracks.

## Unit front view/side view



A: Filling line

B: SUS304 tank

C: Plastic carrying handles

D: Draining

E: Warning marking

F: Soundproof lid

G: Anti-slide feet

## Unit back view



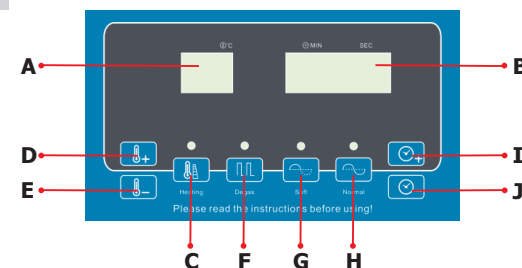
A: louver

B: Socket

C: QC pass sticker

D: Rating label

## Front panel





Last	When the cleaning is completed, unplug the power cord, open the lid and retrieve the basket and the items. Empty the tank and clean both the outside and inside of the device with clean and dry cloth for next use. Keep the drainage valve closed. (for 6L and above units).
------	--

**WARNING :** Strong acid or alkaline cleaning solution will cause corrosion, rust and even puncture of tank or machine body. To overcome this problem, dilute to mild PH solution or request for tank made of specific grade of stainless steel like SUS304.

## Specifications

Model	Tank Size	Overall Size	Capacity	Power	Heating power	Frequency
	(L×W×H)mm	(L×W×H)mm	L	W	W	KHz
DCG-80H	150×140×100	190×170×220	2	50	100	33-40
DCG-120H	240×140×100	275×170×240	3	100	100	
DCG-150H	300×155×150	330×180×310	6	150	300	
DCG-200H	300×240×150	330×270×310	9	200	300	
DCG-250H	330×300×150	360×330×310	13	300	400	
DCG-300H	500×300×150	550×330×310	20	400	500	
DCG-400H	500×300×200	550×330×360	27	500	500	

: Heating 0-80℃ temperature can be adjustable

: Time Setting 1-99 minutes can be adjustable

: Smart Control



**mrc**  
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E-Mail: mrc@mrcclab.com  
Web. site: www.mrcclab.com

## SMART ULTRASONIC CLEANER USER MANUAL

30



## FEATURES

Normal and soft power control to resolve the cleaning blind spot .

Degas function for increase the cleaning effect.

Automatically ultrasonic frequency tracking.

User-friendly and clear panel.

Memory function.

Sleep mode.

LED display for temperature and timer.

High-performance transducers.

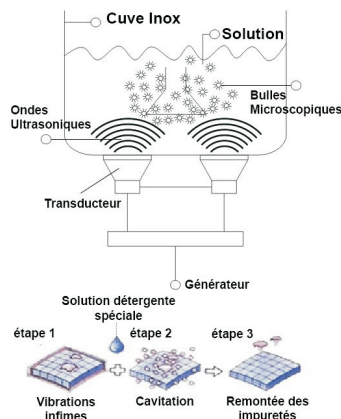
Patent products.

**Thank you for purchasing the ultrasonic cleaner. Please take the time to read these operating instructions before use and retain them for future reference. Failure to follow these instructions may lead to serious personal injury and damage to property.**

## INTRODUCTION

Ultrasonic cleaning is based on the cavitation effect caused by high frequency ultrasonic wave vibration signal in the fluid. Microscopic bubbles are formed, and they implode violently causing the cavitation which creates an intense scrubbing action on the surface of the item being cleaned. The bubbles are small enough to penetrate microscopic crevices, cleaning them thoroughly and consistently.

Ultrasonic cleaning is extremely effective at removing dirt and grime which would normally require tedious manual cleaning by hand. It has been used to clean a wide variety of instruments and mechanical parts such as carburetors, returning them to almost "like new" condition without damage to delicate parts.



## PREPARATION:

Carefully unpack the cleaner and remove all traces of packing materials from it. Visually inspect the cleaner for any parts that may have become loose or damaged during transit.

### Contents:

- a: Main machine
- b: Soundproof lid
- c: Power cord
- d: Outlet filter
- e: Mesh basket
- f: User manual

1. Place the cleaner on a flat, clean surface where the cooling fans will receive adequate ventilation and ensure all controls are set to off. Also ensure the drain tap is in the closed position.
2. Ensure the power cord is securely plugged into the cleaner and that no part is likely to come into contact with moisture.
3. Carefully fill at least 1/2 of the tank with a solvent solution. For demanding cleaning we recommend a small amount of washing up liquid, this will help increase the cleaning performance. The cleaner is now ready for use.






## Attention

While the machine is working normally, ultrasonic and tank synergy gives a well-proportioned sound, and no shudder on the surface of the water, yet there is spray made by the tiny bubbles. If there are discontinuous surges, please add or release a little of washing solution in the tank, stopping the surges is better for the objects cleaning.

Heating 	<p>2. When setting the temperature, if the setting temperature exceeds the environment temperature, press  key, the heating working, and indicator on. If below environment temperature, the heating couldn't start, and indicator turn off.</p> <p>3. Heating won't shut off automatically, if you don't press .</p> <p>4. The device with memory function and acquiesce in the temperature you setting last time.</p>
Degas Mode 	<p>After timer and temperature setting, press  , the corresponding indicator on and the device will work in degas mode: working 6 seconds, and stop 2 seconds, then working 6 seconds,....cycle like this with countdown display.</p> <p>Intermittent operation of ultrasonic power for a quicker degassing of the cleaning liquid.</p> <p>If you want to transfer to other mode, just press  or  , then the "degas" indicator turn off and indicator for "normal" or "soft" turn on; If want to stop working, press  again, then both heating and ultrasonic will stop and the corresponding indicator turn off.</p>
Normal Mode 	<p>After timer and temperature setting, Press  "Normal" key, the corresponding indicator on and the device will work in normal mode: continuously working with full ultrasonic power and countdown display.</p> <p>If you want to transfer to other mode, just press  or  , the "normal" indicator turn off and indicator for "degas" or "soft" turn on; if you want to stop working, press  again, then both heating and ultrasonic will stop and the corresponding indicator turn off.</p>
Soft Mode 	<p>After timer and temperature setting, press  , the corresponding indicator on and the device will work in soft mode. If you want to transfer to other mode, just press  or  , the "soft" indicator turn off and indicator of "degas" or "normal" turn on; if you want to stop working, press  again, then both heating and ultrasonic will stop and the corresponding indicator turn off.</p> <p><b>Note:</b> Degas, Normal and Soft cannot be operated simultaneously.</p>

- A:LED display temperature.  
 B :LED display cleaning time.  
 C:Heating button:Press this button for start/stop heating.  
 (Note:1:The new machine will display the ambient temperature when first time use.)  
 D:IncreaseTemperature :  
 Press this button to set the temperature.  
 Press one time to increase 1℃, holding the key to increase by 10℃  
 E:Temperature reduce:  
 Press this button to set the temperature.  
 Press one time to reduce 1℃,holding the key to reduce by 10℃ .  
 F:Degas:Fresh solutions with many air which reduce effective ultrasonic action.  
 Using Degas mode speeds up the degassing process and improves cleaning efficiency.  
 i:Soft:60% power for delicate applications .  
 :Normal 100% power to the tank for normal applications .  
 Timer increase :Press this button to set the cleaning time  
 Press one time to increase 1minute,holding the key to increase by 10minutes.  
 :Timer reduce :  
 Press one time to reduce 1minute,holding the key to reduce by 10minutes.

## OPERATION GUIDELINES

Step	Action
1.	Select your cleaning solution, fill at least ½ of solution into the tank. Do not exceed the filling line. <b>Note:</b> Do not ever use alcohol, gasoline or flammable solutions. Doing so could cause a fire or explosion. Use only water-based solutions.
2.	Place the items into a basket, Slowly lower the basket into tank, do not allow items to contact the tank bottom (solution should cover the items).
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### Please read the following very carefully as failure to comply may invalidate your guarantee 32

## To avoid electrical shock:

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## APPLICATION

Provided product is non-porous and can normally be immersed in water almost anything can be thoroughly cleaned. Here are some examples:

Health and Beauty	<b>Beauty and Chiropody Institutes:</b> scissors, scalpels, comedo removers, pincers, nippers, forceps and razors with the removal of organic tissue before sterilization treatments
	<b>Dental Practices and Dental Technician Laboratories:</b> dental instruments, removing organic and blood residues, cleaning hand pieces, drills, heads for ultrasonic ablators, glass objects and mirrors; the removal of cement from spatulas and plaster from prostheses.
Hospital and Laboratories	<b>Hospital Wards and Analysis Laboratories:</b> endoscopic probes, surgical instruments, glass containers in analysis laboratories with the removal of proteins, blood and organic tissue.
	<b>Tattoo Studios:</b> grips, tips and needles.
Goldsmithery and Silversmithery	Necklaces, bracelets, rings, precious stones, watch casings and straps, precision mechanical movements.
Manufacturing	Aerospace, Pharmaceutical, Defence, Automotive, Marine, Filtration, Moulding, Food and Beverage, Plating & Surface Finishing, Semi-Conductors.
Optical	During edging and polishing, debris and abrasives can scratch lenses. Ultrasonic cleaning can effectively protect the lenses.
Military	Reusable brass, gun parts, etc.
Regeneration	For cleaning dot matrix printers and photocopier ink cartridges.
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**Watches:** Except diver's watches with depth rating over 50m(150ft).

**Others:** Ceramic, camera filters with preexisting cracks.

## Unit front view/side view



A: Filling line

B: SUS304 tank

C: Plastic carrying handles

D: Draining

E: Warning marking

F: Soundproof lid

G: Anti-slide feet

## Unit back view



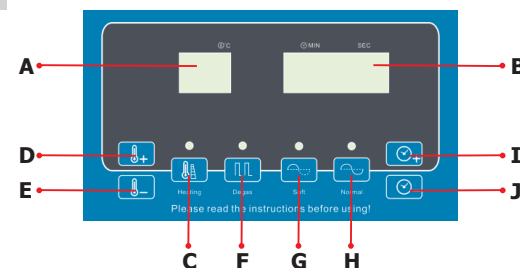
A: Louver

B: Socket

C: QC pass sticker

D: Rating label

## Front panel





## DCG-H Series, Digital Ultrasonic Cleaners with Degas Function

### Features:

- Turbo power: Normal and soft function to resolve the cleaning blind spot
- Auto-degas function for laboratory purposes
- Memory function
- Automatically ultrasonic frequency tracking
- LED display for temperature and timer
- Timer: 1-99 minutes
- Temperature: 0-80°C
- POSCO SUS304 tank. Stamping tank without welding gap for better waterproof
- User-friendly and clear panel.
- High-performance transducer systems
- Drainage and cool fan are available for 6L and above volume models, convenient to use.
- Ultrasonic Frequency: 40KHz.



### Applications:

- Hospital and Dental Clinics
- Optical Stores and Makers
- Biology and Chemical Labs
- Jewelry Store & Maker
- Watch Service Shops
- Mobilephone and Electronics Service Shops
- Shooting Clubs
- Printing Shops
- Automotive shop
- Hardware
- Tatoo
- Aerospace & marine parts.

Model	DCG-80H	DCG-120H	DCG-150H	DCG-200H	DCG-250H	DCG-300H	DCG-400H
Volume (Liters)	2	3	6	9	13	20	27
Internal tank size (LxWxH) (mm)	150x140x100	240x140x100	300x155x150	300x240x150	355x325x150	500x300x150	500x300x200
External dimension (LxWxH) (mm)	190x170x220	270x170x240	330x180x310	330x270x310	360x330x310	550x330x310	550x330x360
Ultrasonic power	50W	100W	150W	200W	300W	400W	500W
Heating Power	100W	100W	300W	300W	400W	500W	500W
Net weight	3kg	3.8kg	6kg	9kg	11kg	14.5kg	15.5kg

**DCP42, 160W Single Continuous Switching Power Supply with USB**

Continuous switching Power Supply offers high efficiency electrical power conversion for greater energy conservation and lighter weight.

**DCP42****Features:**

- Constantly calculates and adjusts the Voltage and Current limit points according to available maximum power (160W)
- At maximum current (10A), voltage is limited to 16V; at maximum voltage (42V), current is limited to 3.8A
- Dual action rotary encoder control with push knob for fine and coarse tuning
- Remote control for Programming, Output Voltage/Current, and ON/OFF using supplied software, driver, and USB
- Three on-board user-defined Voltage/Current presets
- Store 20 presets with up to 999 cycles each on a PC via USB and supplied Software
- Software also includes DC Ramp and Waveform Generator
- Complete with power cord, software, and USB cable.

**Applications:**

- Laboratory use
- Bench Testing, Service, and Repair
- Research and Development facilities
- Educational and Institutional Training.

**Specifications:**

Model	DCP42
Output Voltage	0 to 42V
Output Current	0 to 10A
Basic Accuracy	$\pm(0.2\%+5 \text{ counts})$
Load Voltage Regulation	$\leq 0.15\%$ (10–100% rated current)
Line Voltage Regulation	$\leq 0.02\%$ (90–264V AC)
Load Current Regulation	$\leq 0.5\%$ (10–90% rated voltage)
Line Current regulation	$\leq 0.1\%$ (90–264V AC)
Ripple and Noise	$\leq 5\text{m Vrms}$ , $\leq 50\text{m Vp-p}$
Memory Card	SD memory card. 1 GB to 16 GB.

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**DCP60, 600W Single Output Lab Grade Switching Power Supply**

High efficiency switching power supply with low ripple and noise is ideal for demanding laboratory applications. Remotely control power ON/OFF and Voltage/Current output. Designed for Laboratory use but excellent for bench technicians, engineers, and educational facilities.

**DCP60****Features:**

- 60V/10A output
- Maximum current can be limited to 5A using front panel auxiliary output on the front panel (10A main output is on the back panel)
- Three user-defined Voltage and Current presets
- Dual action rotary encoder control with push knob for fine and coarse tuning
- Remote control for Output Voltage/Current and On/Off
- Complete with power cord.

**Specifications:**

Model	DCP60
Output Voltage	1 to 60V
Output Current	1 to 10A
Basic Accuracy	$\pm(0.2\%+3 \text{ digits})$
Load Voltage Regulation	50mV
Line Voltage Regulation	20mV
Load Current Regulation	100mA
Line Current regulation	50mA
Ripple and Noise	$\leq 5\text{m Vrms}$ , $\leq 100\text{m Vp-p}$
Dimensions/Weight	200 x 90 x 215mm/2.6kg





### DFI-N Series, 50 Liter, 70 Liter, 140 Liter, 240 Liter Incubators

Precise incubating, Micro-processor based temperature controller up to  $\pm 0.1^{\circ}\text{C}$ .  
 Silent hot conditioned axial fan and the unique design of air circulation for uniformity up to  $\pm 1.5\%$ .  
 Patented ventilator featured with safe & easy access for exhausting of damp and fume, fast cool-down and ultra-low intrinsic temperature close to ambient.  
 Available with power-on modes of standby and auto restart after power failure for additional reliable and uninterrupted operation.  
 Bright cool white temperature screen, easy access symbolic key icon and status display.  
 Hair-style polished stainless steel interior and rounded corner bottom for easy cleaning and long service life.  
 Adjustable shelves for more space & different heights.

#### Applications:

Applicable fields of medical Is & pharmaceuticals, life science, agriculture, food industries and, electric and electronics

#### Specifications:



DFI-240N

Model	DFI-50N	DFI-70N	DFI-140N	DFI-240N
Temp. range	Room temperature $80^{\circ}\text{C}$			
Temp. constancy	$\pm 0.1^{\circ}\text{C} \sim 0.3^{\circ}\text{C}$			
Temp. uniformity	$\pm 1.5 \sim 2.0\%$			
Temp. control	PID			
Heater: Oven	240W		375W	500W
Inside Material	SUS-304, hair style polishing			
Timer	Auto start-up, Auto shut-up			
Safety devices	Protection and warning against short-open-circuit temperature sensor High-temperature cutout and low-temperature alarm Independent over temperature cutout (STB), RCD ATC (Absolute Temperature Calibration), Auto start-up or standby after power fail ure			
Inside dimensions (mm)	W400xD400xH320	W440xD400xH400	W550xD550xH460	W640xD610xH610
Outside dimensions (mm)	W510xD550xH698	W550xD550xH778	W660xD705xH858	W750xD765xH1008
Capacity (Liters)	50	70	140	240
Shelves/Maximum	2/3	2/4	2/5	3/7
Power input	220-240V- 50/60Hz, 100V- 50/60Hz, 120V-50/60Hz			
Observation window	Yes			
Insulation material	Rock wool			
Door gasket	Silicone rubber			
Duty cycle	Continuous			
Air convection mode	Forced convection			

# Mechanical Convection Ovens/Incubator Operation Manual **DFO-N/DFI-N-Series**



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PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION

3, Hagavish st. Israel 58817 Tel: 972 3 5595252, Fax: 972 3 5594529 mrc@mrclab.com

**MRC.VER.01-7.13**

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## Preface

In order to make the equipment fully functional and ensure safety of the equipment, property, specimens and the operator, read this manual carefully and completely. When you have any question that cannot be explained by this manual, consult your local MRC distributors or supporting technicians at MRC. It is our pleasure to provide services for you.

### General safety notes

The equipment is not applicable for heating, drying or conditioning of specimen which is intrinsically explosive, flammable or toxic or, which may liberate hazardous substances under normal operating temperature conditions!

The equipment is intended for heating, drying, conditioning of specimen which may liberate steam or other gas mixture. This leads to potential hazards of high temperatures, fire, fume and the general hazards related to the application of electrical energy.

Further hazard sources may arise from the type of material being treated and by the fracture of the container and other glass vessels.

It is not possible to cover all possibilities; they remain largely within the responsibility and the judgment of the operator!

The equipment must only be used as intended and described in these Operating Instructions. This includes operation by suitably trained qualified personnel.

The maximum temperature deviation both in normal condition and in electro-magnetic interference field according to IEC 61326-1 is  $\pm 0.5$  °C.

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### Classes of the EMC standard IEC 61326-1

Class A: Equipment for operation only on networks without connected domestic areas;

Class B: Equipment for operation on networks with connected domestic areas.

### Valid for Europe

The equipment is designed in accordance with EMC requirements of EN 61326-1 Class B. Class B equipment is suitable for operation on networks with connected domestic areas.

### Valid for USA

Instructions for Class A digital devices as follows:

"This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC (Federal Communication Commission) Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense."

"This device complies with Part 15 of the FCC (Federal Communication Commission) Rules. Operation

is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.”

### Valid for Canada

“This Class A digital apparatus complies with Canadian ICES-003” (ICES=Interference Causing Equipment Standards).

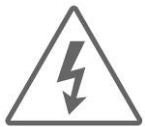
«Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada».



Caution, Class A equipment must not be operated in power networks with connected domestic areas!

### Important symbols

For your safety, pay attention to these important symbols as follows, during moving, installing operating and maintenance. The equipment is designed for safe operation because of your attention!



Warning, possibility of electric shock!

Inappropriate operation may cause hazard of electric shock and result in serious personal injury or death!



Caution, hot surface or area!

Accidental touching or approaching may cause burn hazard!



Caution, important note, and always refer to operating instructions (this document) for detailed information!

The equipment must be operated by well trained qualified personnel only!

Wrong operation may cause personal injury, damage and/or mal-function of the equipment!

## Chapter 1 Safety instructions

### 1.1 Normal operating environment

The equipment is designed for safe operation under ambient conditions as follows:

- indoor use;
- altitude up to 2,000 m;
- temperature 5 °C to 40 °C;
- maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C;
- mains supply voltage fluctuations up to  $\pm 10$  % of the nominal voltage;
- transient overvoltage up to the levels of overvoltage category II;
- temporary overvoltages occurring on the mains supply;
- Pollution degree 2 or less of the intended environment.



Excessive high or low temperature and/or humidity will significantly degrade electric safety of the equipment!

### 1.2 Safety warning



Not applicable for heating, drying or conditioning of specimen which is intrinsically explosive, flammable or toxic or, which may liberate hazardous substances under normal operating temperature conditions!



The dielectric strength of the oven may be degraded if after transport or storage in humid conditions. The oven shall be powered and conditioned at 105°C for at least 1h before commissioned for normal use. Warning, hazard of possible electric shock during the dry-out!

### 1.3 Caution



Caution, Risk of burn hazard!

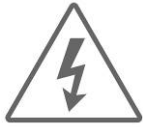
Do not touch or approach parts or area with high temperature, for example, observation window, area of door seal and exhaust opening!



Pull the operating temperature of the oven as close as possible to the ambient before attempting to open the door or shut down the equipment. There may be hazards of burn or fire, misoperation of a fire alarmer, deformation or distortion of the specimen!



	<p>The minimum distance away from the back of the oven to the wall, furniture or other installations shall be 300mm!</p> <p>Install the oven away from overhead fire sensors, where opening of the door or exhausting of the fume is possible, in avoidance of triggering of an erroneous fire alarm!</p> <p>The oven must not be mounted on a surface of flammable or temperature sensitive materials, where a hazard could be caused by hot items falling from the oven, for example when the door is opened!</p>
	<p>Keep the oven away from hot-air emitting equipment, direct sunshine, strong magnetic field and electric sparks!</p> <p>Neither contamination of high concentration dust or corrosive gas, nor strong airflow surrounds!</p>
	<p>Voltage, frequency and current for power supply must meet the requirements as designated on the nameplate! Use power socket matching the power plug of the equipment. Hot line (L) and neutral line (N) for single phase equipment must not be reversed!</p>
	<p>Socket for power supply must be equipped with protective ground (PE) to prevent against hazard of possible electric shock.</p>
	<p>Connect the power from behind the equipment. Plug in and remove the cable by directly holding the plug. No dragging of cable in any part. Protect the cable from being damaged by contacting with the hot surface of the equipment, exhausting hot air or mouse etc!</p>
	<p>Keep clear of inlets of bottom plenum and outlets of back plenum for the circulating hot air. Excessive hoarding of specimen or blockage of the air circulating may cause localized temperature distribution and triggering the over temperature protection device resulting in hazard of overheating and over temperature!</p>
	<p>Bare wire resistance heating device is incorporated for lower heating. Do not put specimen with high humidity or dripping water into the oven. Never try to insert conductive wire or similar material into the inlet openings of the bottom plenum. Never put specimen or apply pressure directly on top of the bottom plenum. Disconnect the power supply immediately and clear the foreign item if any conductive particle penetrates into the bottom plenum!</p>
	<p>The minimum distance to the wall, furniture or other installations shall be 300mm.</p> <p>No hoarding of flammable or temperature sensitive materials nearby!</p> <p>No overhead fire sensors in avoidance of triggering of an erroneous fire alarm!</p> <p>Connect the opening to an extraction system if the operating of the oven could lead to liberation of hazardous air or gas mixture! The rating of the connection shall be at least the maximum possible exhausting temperature! If necessary for safety additional temperature limiting and warning devices shall be installed for the extraction system!</p>



Do not disassemble or exchange assembly parts and electric circuits by unauthorized personnel! Hazard of possible electric shock! In case of repairing, contact authorized local MRC distributor or MRC maintenance engineer.

Always remove the mains plug from the socket before cleaning, moving, maintenance or repairing!



The first time powering up after repairing or standstill for long period, or at designated intervals under normal use, check the functionality of the following parts or components:

Breaking capability of the residual current circuit breaker (RCD) at one month intervals!

Cutout capability of the over temperature protection device (STB) at six months intervals!

Air tightness of the door seal and the ventilator at three months intervals!

## Chapter 2 Installing and operating

### 2.1 Installing

#### 2.1.1 Unpacking

Unpack the equipment and sort the accessories respectively and carefully. The packing carton, pallet, packing buffering stuffs etc, are designed for one shipment only. For future shipment, prepare the packing materials as well as the way of packing as received.

Check the equipment and accessories for potential transport damages. If there is any damage visible on the equipment, a claim must be filled in writing with the freight forwarder; a notification to the freight forwarder is obligatory so that the shipment can be examined. Inform MRC for any missing accessories and servicing or repairing.

Accessories lists(DFO-50N)

Part Number	Qty	Descriptions	Remarks
DSBE1801	1	Operating instructions	This document
ERSG0110	1	Fuse (250V~/10A)	Breaking capacity: 1,500A
BJKA0332	8	Clips, Assembled	
JSBZ0606	2	Wire shelves	Assembled

Accessories lists(DFO/DFI-70N)

Part Number	Qty	Descriptions	Remarks
DSBE1801	1	Operating instructions	This document
ERSG0110	1	Fuse (250V~/10A)	Breaking capacity: 1,500A
BJKA0332	8	Clips, Assembled	
JSBZ0607	2	Wire shelves	Assembled

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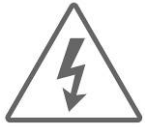
Accessories lists(DFO-40N)

Part Number	Qty	Descriptions	Remarks
DSBE1801	1	Operating instructions	This document
ERSG0111	1	Fuse (250V~/12A)	Breaking capacity: 1,500A
BJKA0332	8	Clips, Assembled	
JSBZ0608	2	Wire shelves	Assembled

Accessories lists(DFO/DFI-240N)

Part Number	Qty	Descriptions	Remarks
DSBE1801	1	Operating instructions	This document
ERSG0112	1	Fuse (250V~/15A)	Breaking capacity: 1,500A
BJKA0332	8	Clips, Assembled	
JSBZ0609	2	Wire shelves	Assembled





Do not disassemble or exchange assembly parts and electric circuits by unauthorized personnel! Hazard of electric shock!

In case of damaged shipment and dent, deformation or distortion of the enclosure, contact authorized local MRC distributor or MRC personnel.

## 2.1.2 Installing

Install the equipment on a rigid, nonflammable surface and well-ventilated place. If the equipment is installed on an unstable surface or floor, abnormal noise may be generated. The bench should be 400~500mm high for ease of operation. Keep enough space between wall and back of the equipment for better ventilation.

The voltage, frequency and current of the power supply must be rated at least the same as those designated on the name plate of the equipment. The switch board is recommended to be on the back right side of the equipment and equipped with outlet matching the power plug of the equipment with protective ground (PE), and rated capacity of the residual current circuit breaker (RCD) of the equipment.



The minimum distance away from the back of the oven to the wall, furniture or other installations shall be 300mm!

Install the oven away from overhead fire sensors, where opening of the door or exhausting of the fume is possible, in avoidance of triggering of an erroneous fire alarm!

The oven must not be mounted on a surface of flammable or temperature sensitive materials, where a hazard could be caused by hot items falling from the oven, for example when the door is opened!



Keep the oven away from hot-air emitting equipment, direct sunshine, strong magnetic field and electric sparks!

Neither contamination of high concentration dust or corrosive gas, nor strong airflow surrounds!



Voltage, frequency and current for power supply must meet the requirements as designated on the nameplate! Use power socket matching the power plug of the equipment. Hot line (L) and neutral line (N) for single phase equipment must not be reversed!



Socket for power supply must be equipped with protective ground (PE) to prevent against hazard of possible electric shock.

## 2.2 Descriptions

### 2.2.1 Front view (Fig1)



Reset access for STB  
Testing access for STB



Door interlock switch

**Fig1 Front view**

- ① Door lock
- ② Ventilating adjustment knob
- ③ Magnet coin for door switch
- ④ Controller panel and keypad
- ⑤ Reset access for STB
- ⑥ Residual current circuit breaker (RCD)
- ⑦ Testing access for STB (DFO)
- ⑧ Door interlock switch

In case accessible current is increasing to a value higher than 30 mA under either normal use or single fault condition, the residual current circuit breaker (RCD) is incorporated for protection against possible electric shock. The increased accessible current could be from deteriorated electric parts or wet atmosphere of the oven etc. Regular check of the RCD is requirement for safety. Refer to 4.2 for detailed procedures.

If any over temperature happens **STB** alarm is displayed, whether it is from shortage sensor, malfunction of the controller, or localized heating, the over temperature protection thermostat (STB) is incorporated for protection against overheating and over temperature. Regular check of the STB is requirement for safety. Refer to 4.3 for detailed procedures.



The first time powering up after repairing or standstill for long period, or at designated intervals under normal use, check the functionality of the following parts or components:

Breaking capability of the residual current circuit breaker (RCD) at one month intervals!

Cutout capability of the over temperature protection device (STB) at six months intervals!

The ventilating adjustment knob (Fig 1 ②) used to activate the ventilator located at the back of the oven (Fig 2 ①), allows adjusting of the exchange of the fresh air and hot air. It is highly recommended to open the ventilator when low operating temperature, cooling down from higher operating temperature or high humidity within the oven is expected. The ventilator shall be closed when the operating temperature is maintained at 100°C or higher.

### 2.2.2 Back view (Fig 2)

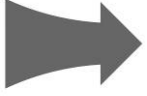




**Fig 2 Back view**

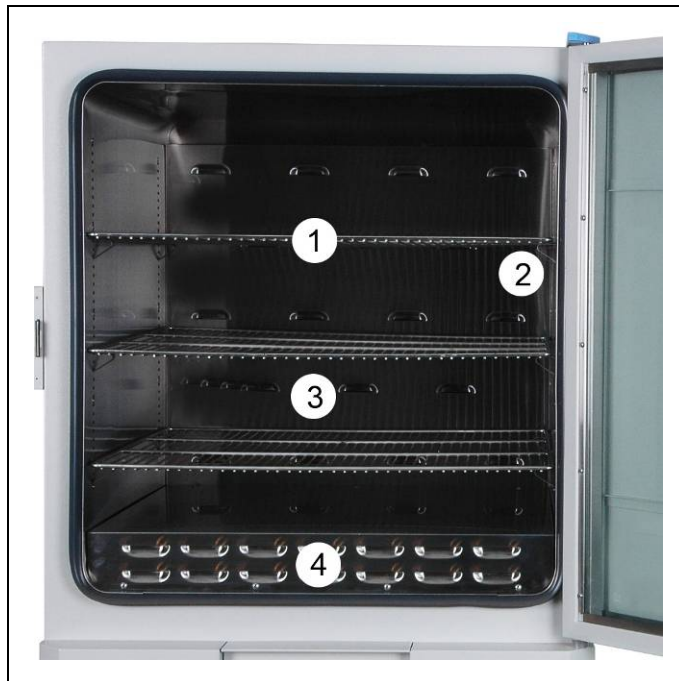
① Ventilator

② Power input (15A max)



	<p>The minimum distance to the wall, furniture or other installations shall be 300mm.          No hoarding of flammable or temperature sensitive materials nearby!          No overhead fire sensors in avoidance of triggering of an erroneous fire alarm!</p> <p>Connect the opening to an extraction system if the operating of the oven could lead to liberation of hazardous air or gas mixture! The rating of the connection shall be at least the maximum possible exhausting temperature! If necessary additional temperature limiting and warning devices shall be installed for the extraction system!</p>
	<p>Hazards of burn or fire!</p> <p>Exhausting temperature of the ventilator may be extremely high. Do not touch or approach!</p> <p>Keep clear of any flammable or temperature sensitive materials away from the exhausting hot air!</p>
	<p>Regular check of the air tightness of the ventilator is necessary for efficient and safe operation of the oven. Intervals of 3 months for normal use, or the first time powering up after repairing or standstill for long period, are recommended.</p>

### 2.2.3 Interior view (Fig 3)



**Fig 3 Interior view**

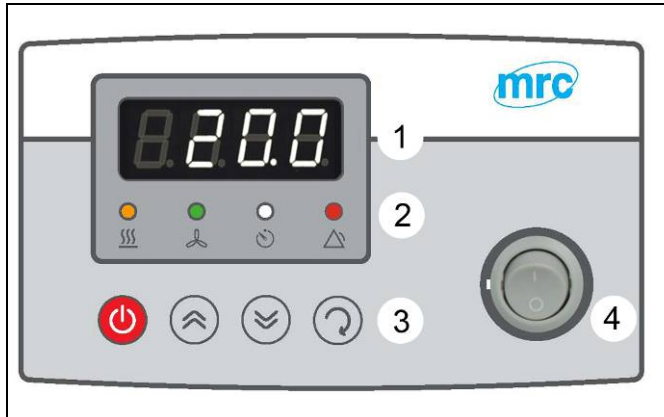
- ① Wire shelves
- ② Clips for wire shelf
- ③ Outlets of back plenum
- ④ Inlets of bottom plenum

Remove ties, if any, for wire shelves before powering on. Adjust the height of shelves for ease of operation. Keep clear of specimen away from inlets of the bottom and outlets of the back plenums. Any obstacle of air circulation may cause problem of temperature regulation, localized overheating, or damage of the specimen and equipment.

	Keep clear of inlets of bottom plenum and outlets of back plenum for the circulating hot air. Excessive hoarding of specimen or blockage of the air circulating may cause localized temperature distribution and triggering the over temperature protection device resulting in hazard of overheating and over temperature!
	Bare wire resistance heating device is incorporated for lower heating. Do not put specimen with high humidity or dripping water into the oven. Never try to insert conductive wire or similar material into the inlet openings of the bottom plenum. Never put specimen or apply pressure directly on top of the bottom plenum. Disconnect the power supply immediately and clear the foreign item if any conductive particle penetrates into the bottom plenum!
	Regular check of the air tightness of the door seal is necessary for efficient and safe operation of the oven. Intervals of 3 months for normal use, or the first time powering up after repairing or standstill for long period, are recommended. Refer to 4.1 for detailed procedures.

## Chapter 3 Controller descriptions and operation

### 3.1 Controller panel (Fig 4)



**Fig 4 Controller panel**



- ① Display for temperature and working parameters
- ② Status indicators
- ③ Keyboard
- ④ Power switch



#### 3.1.1 Display for temperature and working parameters

Normally it displays the oven temperature once switched on and initiated or OFF when standstill.

Other possible symbols include: SEt, Ht, Lt, Auto, Atc, dEFt, ESc, door, Stb. Related definitions are as follows:

**SEt:** Setting of working temperature, must be 5°C higher than low limit Lt and 5°C lower than the high limit Ht. The temperature setting beyond the scope will not be accepted.

**Ht:** This parameter is an absolute value and used for reminding only. When temperature in the oven is higher than the set value, Ht is displayed. The controller will trigger a beeping alarm and disable the heating. While the actual temperature is higher than the Ht setting, the Ht may be set to a higher value by pressing  so that Ht beeping can be cleared. If the actual temperature is recovered to lower than the Ht setting, the Ht alarm will disappear automatically with seconds of delay, or may be cleared immediately by pressing . The heating is possible only if the Ht is cleared.

**Lt:** This parameter is an absolute value and used for reminding only. When temperature in the oven is lower than the set value, Lt is displayed. The controller will trigger a beeping alarm. While the actual temperature is lower than the Lt setting, the Lt may be set to a lower value by pressing  so that Lt beeping can be cleared. If the actual temperature is recovered to higher than the Lt setting, the Lt alarm will disappear automatically with seconds of delay, or may be cleared immediately by pressing .


**Auto:** Select between AoFF and Aon, which means manually starting and automatically starting.

**Atc:** Absolute temperature calibration (ATC), when the temperature displayed differs from the temperature measured by a standard thermometer, ATC is used to calibrate the display.

**AS:** Timer for automatic starting. Valid only when the equipment is in standstill mode. The equipment will be initiated automatically once the set time elapses. The equipment may be started




immediately when  is operated regardless of the remaining AS time.

ASd: Timer for automatic terminating. Valid only when equipment is in running mode. The equipment will be terminated automatically once the set time elapses. The equipment may be terminated immediately when  is operated regardless of the remaining ASd time.



dEFt: Return to the factory default setting. It may be used when system halts or any other abnormal situation occurs.



ESc: Exit the SEt menu.


door: The interlock for the oven door. When the door is open with temperature control in operation, door alarm is triggered with beeping and door displayed. The heater and circulating fan are disabled while alarm continues. When the door is closed, the door alarm will be cleared and, the heating and circulating fan resume automatically.

Stb: The independent over temperature device (STB) is triggered, resulting from over temperature of the oven, or localized overheating of the bottom plenum. Once SAFE alarm is triggered,  LED flashes for warning and both the heating and circulating fan are disabled. The warning and protection against heating and circulating are locked even if the STB is recovered. Manual resetting is possible only when the temperature within the bottom is lower than 300°C.

### 3.1.2 Working status indicating

 Heating: Press the  key for more than 2 seconds to initiate the circulating fan. Orange LED will be steadily lit with full power heating; When LED flashes, the heating power is automatically adjusted to meet actual need. LED flashing frequency keeps constant when temperature is stabilized.

 Circulating fan: Press the  key for more than 2 seconds to initiate the circulating fan with LED on, after which the heating operation is possible.

 Timer: According to the case of use, if oven has the time function, LED flashes when timer is working.

 Alarmer: Red LED is on, when there is beeping and warning is triggered.

The warning or error of the sensor may be accompanied by the following:

Er01: Warning of temperature sensor short-circuit.

Er02: Warning of temperature sensor open-circuit.

ourh: Warning of the oven temperature far beyond Ht.

### 3.1.3 The key functions and navigate the menu (Fig 4)

There're 4 keys as follows, the function and their operation are summarized and listed in the table:



KEY	NO	FUNCTION	OPERATION	REMARKS
	1	Initiate or terminate fan circulating	Press and hold the key for more than 2 seconds	Temperature regulating is possible only if the circulating fan is initiated.
	2	Set the working temperature	Press the button for less than 1 second	After showing <b>SEt</b> , press  to enter, change the digits by pressing  , accept the setting by pressing .
	3	Set the working parameters	Press and hold the key for more than 2 seconds	<p>a) <b>Ht</b> is first displayed, press  for <b>Lt</b>, <b>Auto</b>, <b>Atc</b> <b>AS</b>, <b>ASd</b> and <b>dEFt</b>, use <b>ESC</b> for exit;</p> <p>b) Press  to enter for change of a definite setting of the working parameter, for example <b>Ht</b>.</p> <p>Change the digits or setting by pressing  , accept the setting by pressing , or confirmed and exit automatically in 4 seconds.</p>
	4	Move between settings or increase the value	Press the key shortly	
	5	Move between settings or decrease the value	Press the key shortly	

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### 3.2 Set the working parameters

#### 1) Set the working temperature

Refer to No.2 in the table.

#### 2) Set high temperature limit value

Press for more than 2 seconds until **Ht** is displayed. Press to enter **Ht** setting. Original **Ht** value is displayed, and press to get the desired value. Press to confirm and exit the set up screen or exit automatically in 4 seconds.

#### 3) Set low temperature limit value

Press for more than 2 seconds until **Ht** is displayed. Scroll the menu by until screen displays **Lt**. Press to enter **Lt** setting. Original **Lt** value is displayed, and press to get the desired value. Press to confirm and exit the set up screen or exit automatically in 4

seconds.

### 3.3 Constant temperature control

- 1) Connect the power by inserting the power plug, or engage the circuit breaker on the right side of the equipment.

Turn on power switch and the controller runs self-check to display: 8888, LED on, software version number u1.94, AoFF (Aon will show up if Auto is set to Aon) settings for Ht、Lt. Refer to 3.5 for procedures about Aon and AoFF setting. The software version number may change with technique updates.





- 2) Check and/or set the working temperature, refer to No.2 in the table.

If the equipment is in the standby state, press  for more than 2 seconds, the circulating fan will start to operate and the heater is on if the setting is higher than the actual temperature.

- 3) When the temperature in the oven is lower than the set value, heating LED is on and the equipment is in operation and start to heat. When the set temperature and actual temperature are quite different, heating LED will be steadily lit with full power heating and the temperature will go up with full speed. As the temperature approaches the set point, the LED flashes as desired and the controller decreases the power for the heater. With the actual temperature equals to the set temperature, the controller keeps the temperature by constant power output.

- 4) To terminate the temperature control, press  for more than 2 seconds. The circulating fan and heater are stopped. The LEDs go off, and the display shows OFF.







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	Connect the power from behind the equipment. Plug in and remove the cable by directly holding the plug. No dragging of cable in any part. Protect the cable from being damaged by contacting with the hot surface of the equipment or mouse etc!
	<p>Hazards of burn or fire!</p> <p>Exhausting temperature of the ventilator may be extremely high.</p> <p>Do not touch or approach! Keep clear of any flammable or temperature sensitive materials away from the exhausting hot air!</p>
	Keep clear of inlets of bottom plenum and outlets of back plenum for the circulating hot air. Excessive hoarding of specimen or blockage of the air circulating may cause localized temperature distribution and triggering the over temperature protection device resulting in hazard of overheating and over temperature!
	Bare wire resistance heating device is incorporated for lower heating. Do not put specimen with high humidity or dripping water into the oven. Never try to insert conductive wire or similar material into the inlet openings of the bottom plenum. Never put specimen or apply pressure directly on top of the bottom plenum. Disconnect the power supply immediately and clear the foreign item if any conductive particle penetrates into the bottom plenum!



Regular check of the air tightness of the door seal and the ventilator is necessary for efficient and safe operation of the oven. Intervals of 3 months for normal use, or the first time powering up after repairing or standstill for long period, are recommended. Refer to 4.1 for detailed procedures.

### 3.4 Absolute temperature calibration (ATC)








- 1) If the temperature display is away from the actual temperature as measured by standard thermometer, the display temperature needs to be calibrated by this function.
- 2) Set the oven at temperature of 100.0°C(DFO) or 50°C(DFI) for calibration. Wait until temperature is stabilized. Read the temperature of the standard thermometer.
- 3) Press  for more than 2 seconds until screen displays **Ht**. Scroll the menu by  until screen displays **Atc**. Press  to enter. Original value will show up, then press   to modify the value as available from the standard thermometer. Press  to confirm and exit the set up screen or exit automatically in 4 seconds.



The temperature in the oven must be kept in constant and the standard thermometer be kept in the oven center for at least 30 minutes, before performing calibration. During heating up or cooling down, the temperature distribution is not even and the readings both from thermometer and the controller are not typical thus not appropriate for calibration.

### 3.5 Auto setting for **Aon** and **Aoff**







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Press  for more than 2 seconds until screen displays **Ht**. Scroll the menu by  until **Auto** is displayed, then press  to enter. Use   to select between **Aon** and **Aoff**. For automatic power-on function, use **Aon**, and press  to confirm and exit the setting. In this case, the equipment will automatically resumes to the status before power being interrupted. If the mode is set to **Aoff**, press the  for more than 2 seconds to start the equipment in any situation.




**Auto** mode setting is designed to protect the equipment from power failure and make it efficient, uninterrupted operation. You are recommended to set **Aon** mode if operating for more than 24 hours is desired.








### 3.6 Timer for automatic starting (optional)

- 1) This function is valid in standstill mode.
- 2) Press  for more than 2 seconds to display **Ht**, scroll the menu by  until **AS** is displayed, then press  to enter. Press   to get the desired value, press  to confirm and exit the set up screen or exit automatically in 4 seconds.







- 3) The timer starts to count down immediately and the decimal point of the first digit flashes. When the time of **AS** elapses, the circulation fans start automatically to initiate constant temperature control. Heating and constant temperature control will be executed automatically according to the difference between **SEt** value and actual temperature. It is possible to adjust the **AS** time before it counts down to zero following the above step #2.
- 4) The equipment may be initiated immediately when  is operated regardless of the remaining **AS** time.

### 3.7 Timer for automatic terminating (optional)

- 1) This function is valid in running mode.
- 2) Press  for more than 2 seconds to display **Ht**, scroll the menu by  until **ASd** is displayed, then press  to enter. Press   to get the desired value, press  to confirm and exit the set up screen or exit automatically in 4 seconds.
- 3) The timer starts to count down immediately and the decimal point of the first digit flashes. When the time of **ASd** elapses, the circulation fans and heating stop automatically to show **OFF**. It is possible to adjust the **ASd** time before it counts down to zero following the above step #2.
- 4) The equipment may be terminated immediately when  is operated regardless of the remaining **ASd** time.


### 3.8 Set default parameters

- 5) It may be used to recover data and functional parameters when system halts or any other abnormal situation occurs.
- 6) Press  for more than 2 seconds until screen display **Ht**. Scroll the menu by  until **dEFt** is displayed, then press  for more than 2 seconds until **dEFt** flashes. Press  again for less than 1 second to accept the default setting until **done** is displayed and it exits automatically.



Accidental power failure or interference, the abnormal situation will happen such as the equipment may not be able to achieve normal temperature controlling, alarm may not be cleared or abnormal temperature displays etc. Try **dEFt** command first to recover default settings.

### 3.9 Terminate operating

- 1) Press  for more than 2 seconds. The circulating fan and the heater stop simultaneously.
- 2) Disconnect the power by turning off the power switch, removing the power plug, or disengaging the residual current circuit breaker (RCD).



Pull the operating temperature of the oven as close as possible to the ambient before attempting to shut down the equipment. There may be hazards of burn or fire, misoperation of a fire alarmer, deformation or distortion of the specimen!

## Chapter 4 Maintenance

### 4.1 Regular maintenance

- 1) Clean the interior and exterior of the equipment periodically to keep the equipment clean;
- 2) Check for air tightness of the door seal and the ventilator;
- 3) Check fixing screws periodically, and if any loose, fix it.



Fig 5 Check air tightness of the gasket

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Check air tightness of the door gasket as follows:

- 1) Close the door as for normal use;
- 2) Attempt to insert a piece of paper in between door glass and left, top and right part of the door gasket. There shall exist no gap for a piece of paper in any part of the sealing strip;
- 3) Open the door, put another piece of paper in between door glass and the lower part of the door gasket. There shall be some resistance for you to remove the paper.



Remove the plug from power line before cleaning. Use soft dry tissue to clean the interior of the oven and avoid any splashing or washing!

If any water or other materials fall into the equipment containing electric and/or electronic parts and components, disconnect the power immediately. Power on only after water is completely evaporated or removed.




Regular check of the air tightness of the door gasket is necessary for efficient and safe operation of the oven. Intervals of 3 months for normal use, or the first time powering up after repairing or standstill for long period, are recommended.


## 4.2 Regular check of the RCD

Regular check of the RCD is required for safe operation. Intervals of one month for normal use, or the first time powering up after repairing or standstill for long period, are recommended for regular check of the functionality. Check the RCD as follows:



- 1) Engage  to its on position as for normal use;




- 2) Press , and if functional, the RCD will be disengaged with a click; If the RCD is not disengaged during the test, do not attempt to operate the oven any longer but call for a service;



- 3) Press  before attempting to engage the RCD to its on position again (Fig 1 ⑥).

## 4.3 Regular check of the STB

Regular check of the STB is required for safe operation. Intervals of six months for normal use, or the first time powering up after repairing or standstill for long period, are recommended for regular check of the functionality. Check the STB as follows:

- 1) Set the temptature of oven at the highest temperature, start up oven with full power heating to 150°C;
- 2) Use a thin and long tool to insert the testing access for STB to cut-off the fan. Note:keep inserting and make sure the fan stop work while testing .The circulation is at the fault and the temperature of bottom plenum heater nearby is high.caution: risk of overheating!
- 3) The STB will be triggered in about 200~300s, if functional, with  $s_{tb}$  displayed and beeping and  LED alarm by the controller; If the STB is not triggered in 360s, take off the testing tool immediately, switch off the controller and call for a service;
- 4) Take off the testing tool after inspection, and wait until the temperature within the bottom plenum goes down. Use a tip tool (Fig 1 ⑤) to reset the STB as shown in the picture and reboot the controller.

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The first time powering up after repairing or standstill for long period, or at designated intervals under normal use, check the functionality of the following parts or components:

Breaking capability of the residual current circuit breaker (RCD) at one month intervals!

Cutout capability of the over temperature protection device (STB) at six months intervals!

Inspection for independence over temperature protection device (STB) may result in hazard of over temperature! The inspection must be operated by trained eligible engineer, take care of the risk of over temperature for all the inspection. For incubator Oven ,the highest temperature is 200°C,the heater may work without full power while inspection because of constant temperature control resulting in temprarure increasing slowly so that over temperature protection device (STB) can't reach the trigger temperature.

#### 4.4 Checking and replacing the fuse (Fig 6)

With the mains plug connected and power switch in “on” position and if no LED and digits display, check the fuse first. If any doubt that checking and replacing fuse is necessary, use a fuse with the same size and capacity as rated and do as follows:

- 1) Make sure the mains plug has been removed;
- 2) Unloosen the two screws as shown, remove the cove plate and check or replace the fuse (Fig 6);
- 3) Replace the cover plate and fasten the two screws.

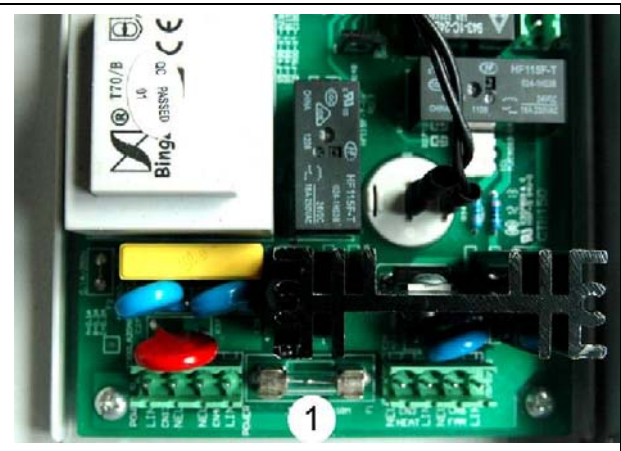


Do not disassemble or exchange assembly parts and electric circuits! Hazard of possible electric shock!

Except for replacing the fuse, there is no other part necessary for customer to disassemble or repair. If repairing is desired, contact with authorized engineer.



Loosen the screws and disassemble the controller cover for checking and replacing the fuse or checking, fixing or measuring Pt100.



Checking and replacing of the fuse  
(Check Table in 2.1.1 for fuse capacity)

**Fig 6 Disassemble the controller cover for checking of the PCBA**



Always remove the mains plug from the power socket when performing checking or replacing the fuse, and never use any fuse different from the original one. Secure the fuse once checked or replaced. For servicing or maintenance, call authorized service engineer.

#### 4.5 Clear error, warning and alarm

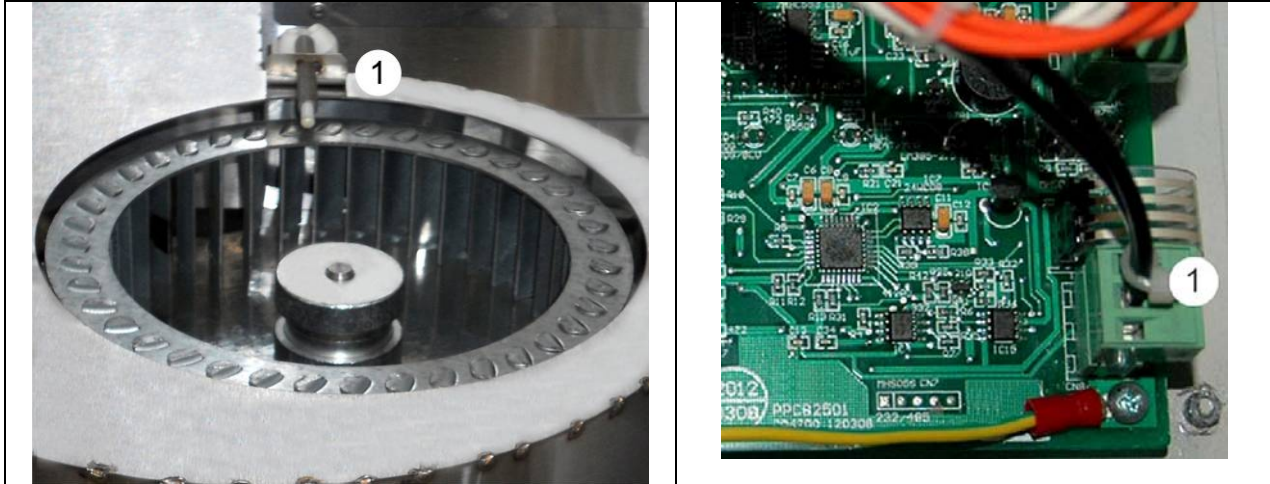
When the oven displays Er01, Er02, check the connections of the Pt100 where necessary. There are two locations that loose connections of the sensor are possible, with one in the bottom plenum and the other at PCBA.

Er01 and Er02 are indications for short-circuit or open-circuit of the temperature sensor PT100.

For inspection, disconnect the power, and check the sensor within the bottom plenum first. Loosen the screws for the bottom plenum at the front and on the top. Remove the bottom plenum. The



ceramic sensor is located around the circulating fan, and check for the fixing and make sure that no short-circuit or open-circuit occurs. If necessary, a multimeter may be used for the resistance of the Pt100. The value of the sensor is  $100\Omega @ 0^{\circ}\text{C}$  and  $+0.385\Omega/^{\circ}\text{C}$ . At  $26^{\circ}\text{C}$  ambient, the resistance of the sensor is about  $110\Omega$ .



Checking, fixing and measuring of Pt100 in bottom plenum

Checking, fixing and measuring of PT100 at PCBA

### Fig 7 Checking the temperature sensor Pt100

Where applicable, remove the screws of the controller cover as for checking and replacing of the fuse (Fig 6). Check the wire connecting terminals of the PCBA for the temperature sensor, and make sure no short-circuit or open-circuit occurs.

In most cases, loose wiring and terminating rather than open-circuit of the Pt100 sensor could trigger an error and alarm. Once fixed, those alarms will disappear when switching on the power again. If alarm still exists with Pt100 checked or replaced, and for servicing or maintenance, call authorized service engineer.

When the oven displays  $\text{Stb}$ , try first to pull down the temperature for example by adjusting the ventilator to its full opening while disable the heating, and find the cause of the over temperature. Once the cause has been eliminated, use a tip tool to reset the STB (Fig 1 ⑤), reboot the controller by powering off and on again, and the normal operation of the temperature control will resume. If warning still exists with STB checked or reset, and for servicing or maintenance, call authorized service engineer.

When the oven displays alarm  $\text{ourh}$ , cut off power and deal with the oven as 3.8 after oven temperature goes down close to ambient, then turn on power again. If alarm still exists with Pt100 checked or replaced, and for servicing or maintenance, call authorized service engineer.

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## Chapter 5 Features and specifications

### 5.1 Key features

- ✓ Delicate insulation with environment friendly rock wool and the unique design of ventilation keep the surface temperature of the equipment from being burnt even when the oven is maintained at above +200°C.
- ✓ Silent hot-air blower and the unique design of air circulation provide uniform air movement and improved temperature distribution, best stability  $\pm 0.1K$ , uniformity  $\pm 1\%$ .
- ✓ Microprocessor controlled maximum, minimum temperature and opened-door cut-off and alarm functions protect the equipment and specimen from being over-heated, and auto-restart capability after power failure keeps your test un-interrupted.
- ✓ Hair-style polished stainless steel interior and rounded-corner interior make the daily clean easy for corrosive-resistant long life operation. Adjustable shelves help you to make more space for different height.
- ✓ Applicable for drying, burning, sterilizing and aging in fields of medicals and pharmaceuticals, life science, agriculture and food industries, and electric and electronic industries.

### 5.2 Specifications (DFO)

Models		DFO-50N	DFO-70N	DFO-140N	DFO-240N
Active capacity	L	50	70	140	240
Temperature range	°C	RT+5~+260			
Temperature stability	±K	0.1~0.3			
Temperature uniformity	±%	<1.5(typical value at 200°C)			
Display resolution	°C	0.1			
Heater wattage	W	950@230V~ 950@100V~/120V~		1,500@230V~ 100V~/120V~	2,100@230V~ 1,500@100V~
Shelves (standard/max)	EA	2/3	2/4	2/5	3/7
EMC for Europe	Class B according to EN 61326-1				
EMC for USA and Canada	Class A (for operation only on networks without connected domestic areas)				
Duty cycle	Continuous				
Interior size (WDH)	mm	400×400×320	440×400×400	550×550×460	640×610×610
Overall dimensions (WDH)	mm	510×535×698	550×535×778	660×690×858	750×750×1008
Interior material	SUS 430 steel with hair-style polishing				
Housing materials	SPCC steel with powder coating				
Auxiliaries and safety functions	Temperature sensor failure cutout and alarm, independent over temperature cutout, door interlock, residual current circuit breaker, auto-restart after power failure and ATC capability				
Options	Access port, RS232/RS485, timer, temperature ramping				
Power	230V/50Hz, 6.3A			230V~/50Hz, 10A	230V~/50Hz, 15A
	100V~, 50/60Hz, 12A 120V~/60Hz, 12A			100V~/120V~ 50/60Hz, 15A	100V~/120V~ 50/60Hz, 15A

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## 5.4 Specifications (DFI)

Models		DFI-70N	DFI-240N
Active capacity	L	50	70
Temperature range	°C	RT+5~+80	
Temperature stability	±K	0.1	
Temperature uniformity	±%	<1(typical value at 80°C)	
Heater wattage	W	450	
Shelves (standard/max)	EA	2/4	3/7
EMC for Europe		Class B according to EN 61326-1	
EMC for USA and Canada		Class A (for operation only on networks without connected domestic areas)	
Duty cycle		Continuous	
Interior size (WDH)	mm	440×400×400	640×610×610
Overall dimensions (WDH)	mm	550×535×778	750×750×1008
Interior material		SUS 430 steel with hair-style polishing	
Housing materials		SPCC steel with powder coating	
Auxiliaries and safety functions		Temperature sensor failure cutout and alarm, independent over temperature cutout, door interlock, residual current circuit breaker, auto-restart after power failure and ATC capability	
Options		Access port, RS232/RS485, timer, temperature ramping	
Power		230V/50Hz, 6.3A	230V~/50Hz, 15A
		100V~, 50/60Hz, 12A 120V~/60Hz, 12A	100V~/120V~ 50/60Hz, 15A

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The operating instructions and specifications will update with technology advancement, we are no longer informing you especially!

## DG-12.8L, Ultrasonic & Ozone vegetable & fruit sterilizer

### Features:

- No Scrubbing! The Ultrasonic food washer uses principle of ultrasonic and reactive oxygen to remove 98.9% of agricultural chemicals from fruits and vegetables easily and effectively
- The ozone eliminates odors, chlorine, and other chemicals, viruses and germs. Use it on fruits, vegetables, kitchenware, baby toys, and more
- Operates using a silent vibration with no splashing over the rim. The unit sits on the counter top or fits directly in any kitchen sink
- Repeated use of the Samson Multi-Purpose Ultrasonic Washer will revive the original color of your dishes and kitchenware.



DG-12.8L



Cleaning basket



Tank Drainage outlet

### Applications:

- Vegetables and fruits-To remove 98.9% pesticides.
- Rice-Remove pesticides and disinfection.
- Meat-Remove clenbuterol.
- Fish-Sterilization and cleaning.
- Kitchen utensil cleaning: chopping board, knife, fork
- Other cleaning: jewelry, metal, watch chain, glasses, shaver, denture, baby articles.

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Model	DG-12.8L
Volume	12.8Liter
Frequency	28Khz
Power	50W
Power Supply	AC220-240V,50Hz AC100-120V,60Hz
OSO capacity	≥ 200mg/h
Ozone consume power	≤10W
Ultrasonic consume power	≤50W
Tank size(l×w×h)	330×300×145mm
Overall size(l×w×h)	415x 375 x 230mm
Unit Weight	5.5Kg
Colors	The colour as the pictures
Setting	Digital display
Drainage	Have
Cleaning basket	Have
Inner packing	415x 375 x 230mm
Carton size	500 x 310 x 410mm
Carton weight	7.5kg





**MRC Ltd**

**Hagavish 3, Holon 58393 ISRAEL**

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**E-Mail: mrc@mrclab.com**

**Web. site: www.mrclab.com**

## USER MANUAL



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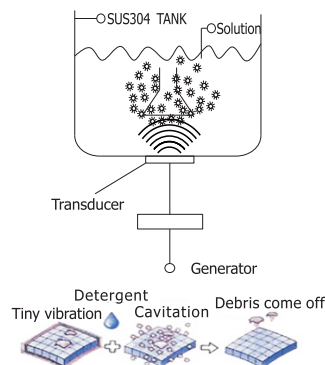
### FEATURES

- ◆ Use tap water for cleaning.
- ◆ Clear cleaning effect visible to human eyes.
- ◆ Moisture-proofed PCB for safe and durable use.
- ◆ 3 minutes auto shut off

Thank you for purchasing the ultrasonic cleaner. Please take the time to read these operating instructions before use and retaining them for future reference. Failure to follow these instructions may lead to serious personal injury and damage to property.

## ULTRASONIC CLEANING PRICIPLE

Ultrasonic cleaning is based on the cavitation effect caused by high frequency ultrasonic wave vibration signal in the fluid. Microscopic bubbles are formed, and they implode violently causing the cavitation which create an intense scrubbing action on the surface of the item being cleaned. The bubbles are small enough to penetrate microscopic crevices, cleaning them thoroughly and consistently.



Ultrasonic Cleaning Priciple

Ultrasonic cleaning is extremely effective at removing dirt and grime which would normally require tedious manual cleaning by hand. It has been used to clean a wide variety of instruments and mechanical parts such as carburetors, returning them to almost "like new" condition without damage to delicate parts.

## SAFETY PRECAUTIONS



**Keep it away from children !**

This device is not intended to use by individuals with restricted physical, sensory or metal capacities or those with lack of experience or knowledge, include children, unless they are supervised by an individual who is responsible for their safety or have received training in operating the device .

Store the unit where it is not reachable by children.Keep the package material away from children.



**To Prevent life-threatening ,please read the following very carefully .**

- 1) Do NOT use the machine at damp place .
- 2) Never immerse the machine or power cord in water or other liquid.
- 3) DO NOT touch the power plug with wet hands, especially when inserting or removing the plug.
- 4) DO NOT touch the machine if the machine has fallen into water during operation.Remove the power plug from the socket first.
- 5) DO NOT spray water or liquid over the device .
- 6) DO NOT operate the cleaner without proper grounding.
- 7) When removing the power cord from the socket ,grab the power plug not the cord.
- 8) Please protect the power cord. Do not use the machine if there is damage of the power plug or power cord.
- 9) Remove the power plug from the socket
  - if malfunction occurs
  - before cleaning the machine
  - if the device is not going to be used for a long time.
- 10) Never plugged in the machine unattended.
- 11) DO NOT disassemble the machine, except by professionals.
- 12) DO NOT operate the unit without fluid in the tank. Always ensure the fluid is no higher than the max mark.
- 13) DO NOT place the device on a soft surface, where the vents could be blocked.
- 14) Keep machine away from heat and place on a dry and level surface.
- 15) DO NOT operate the machine without filling water in tank.

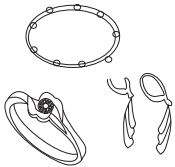
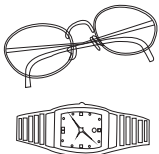

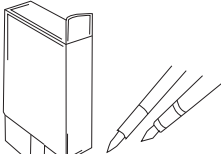
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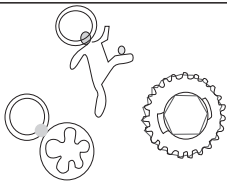

–Running dry will damage the machine.

### Caution

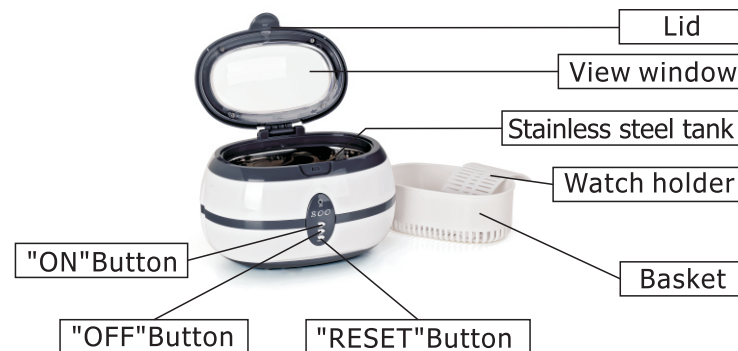
- 1) Not recommended for use with items that can be discolored, waterlogged, or damaged easily. Loose, delicate, or inlaid items may become dislodged by ultrasonic vibrations. For example: Semi-precious stones, cloth items, leather products, wood items, costume jewelry, or soft stones like pearls, opals, turquoise, coral, emeralds, etc.
- 2) Do not place mobile phones or non-waterproof watches into tank for cleaning.
- 3) Do not place glass frames or art ware that is made from tortoise shell or abalone shell.
- 4) When cleaning smaller pieces, place items into the plastic basket, then place basket into tank.

### APPLICATIONS

1. Jewelry	2. Glasses and Timepieces
	
Necklaces, rings, earrings, bracelets etc	Eyeglasses, sunglasses, watch bands
3. Personal Items	4. Stationary Items
	

Combs, shaver heads, dentures, baby items etc.	Printer-heads, inject cartridges, seals etc
5. Metal pieces	6. Dishware
	
Ancient coins, bearings, small parts etc	Forks, knives, spoons, teacup etc.

### OPERATION GUIDELINES



### OPERATION INSTRUCTIONS

- 1) Open the lid and fill the stainless steel tank with water.

**Note:** Running machine without water may damage machine!

- 2) Place items into water. The items should be completely covered by water. Do not exceed "MAX" level.
- 3) Close the lid, plug machine into power outlet. Press the "ON" button, the red indication light is on, to start 180 seconds working time. When reach the time, the light will turn off and the cleaner stop working.

**Note:** While cleaning, a buzzing sound will be heard. This means the machine is working. Do not continuous working over than 1 hour.

- 4) Press the "RESET" button to restart the machine for 3 minutes working time. Press "OFF" button to stop the machine.
- 5) When cleaning is complete, unplug the machine, open lid, and remove cleaned items. Then pour out dirty water from tank, Clean and wipe the tank.

## COMMON CLEANING METHODS

**GENNRL CLEANING**-Use only tap water. The water should immerge the items to be cleaned, but not exceed "MAX" mark.

**ENHANCED CLEANING**-When the items are very dirty, add 66 1-2 drops dish washing into water to improve the cleaning result.

### OVERSIZED ITEMS

For large items, partly clean

### ULTRA CLEANING

When items require extensive cleaning, use "IMPROVED CLEANING" procedure first, replace water and repeat "IMPROVED CLEANING" process until items completely clean.

## CARE AND MAINTENANCE

- 1) Check the joint of the power plug and cord.
- 2) DO NOT run the machine for extended time or continuously.



- 3) DO NOT impact ,hit the machine.Handle with care when move the machine.
- 4) Wipe machine housing and tank with a dry towel before storing.
- 5) Keep machine in a cool, dry place when storing.

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## STANDARD SPECIFICATIONS

Tank Size (LxWxH)mm	155x95x52
Overall Size (LxWxH)mm	200x140x125
Capacity(ml)	600
Power(W)	35
Frequency (KHz)	
Timer(Min)	3-minute Auto shut-off
Power Supply	AC100~120V, 60Hz/AC220~240V, 50Hz
N.W(KG)	0.84
G.W(KG)	1.1



## DG-600N, Mini ultrasonic watch cleaning machine digital jewelry ultrasonic



### Features:

- Use tap water for cleaning .
- Practical and classic design.
- 3 minutes automatic shut-off.
- Moisture-proofed and anti-corrosion PCB, more durable.
- Special use for promotion project.

### Applications:

- Jewelry store: Necklaces, earrings, bracelets, rings etc.
- Glasses store: Eyeglasses, lense, glasses .
- Other: denture, printer head, shaver heads, pen heads, coins, badge.

Model	DG-600N
Tank Material	Stainless steel SUS304
Frequency	40KHz
Ultrasonic Power	35W
Tank Capacity	600ml
Power Supply	AC200-240V,50Hz AC100-120V,60Hz
Tank Size	155x95x52mm
Unit Size	200x140x125mm



### DMBA210, Basic Digital Biological Microscope

The DMBA210 Digital is designed for both educational and teaching environments delivering a new higher level of optical performance.

#### Description:

The new DMBA210 Series is setting a new standard in microscope performance through improvements both in optical and mechanical features. Designed to be used in Educational Life Science, Medical as well as a variety of biological applications, this new microscope is built around Mrc's complete understanding of the daily demands placed on the standard educational microscope. Student proof features together with a new generation of EF-N Plan Achromatic objectives provide a fully corrected intermediate image for crisp and clear visual and digital results. The DMBA210 is a robust student instrument that brings professional, repeatable image quality results to all of its intended applications. The DMBA210 Digital is a Digital version of the DMBA210 that features a built-in imaging head with 3.0MP streaming live output through USB2.0 connections.

Model	DMBA210		
Observation Tubes	Ergonomic 30 degree viewing angle		
	55-75mm interpupillary distance		
	Large field of view with 18mm or 20mm options		
	Built-in Digital with 20/80 split and 3.0MP imaging sensor delivering high-resolution streaming images through a USB2.0 connection		
Eyepieces	N-WF 10x/18mm		
	N-WF 10x/20mm		
	N-WF 15x/13.3mm		
	N-WF 12.5x/16mm		
	Magnification	N.A.	W.D (mm)
	EF-N Plan 4x	0.1	6.3
	EF-N Plan 10x	0.25	4.4
	EF-N Plan 20x	0.4	4.66
	EF-N Plan 40x	0.65	0.35
	EF-N Plan 60x	0.85	0.13
	EF-N Plan 100x	1.25	0.13
	EF-N Plan Phase 10x	0.25	4.4
	EF-N Plan Phase 40x	0.65	0.35
Illumination Options	6V/30W Halogen		
	3W LED		
	Mirror		
Condenser	Abbe 1.25NA with slot for accessories and condenser lock available		
Stage	Hard Coated Mechanical Stage with 76x30mm travel range		
	Left or Right Stage drive available		
Other Options	Simple Phase Contrast 10x and 40x sliders for condenser		
	Darkfield slider for condenser		
	Simple Polarization with analyzer and polarizer		

#### Features:

Requires a USB2.0 connection • Windows XP,win7, or OSX • Intel Centrino Recommended • Mrc Images Plus 2.0 software for PC and Mac (OSX).

MRC.7.11.13

# C CENTRIFUGES Brushless, Microcentrifuge, 18/24 Places



Model	ECEN-209-18	ECEN-209-24
Max. Speed (rpm)	1,000~14,000	
Rotor (ml)	18 x 1.5/2.0ml	24 x 1.5/2.0ml
Max. RCF (g)	17,740	
Capacity (ml x pcs)	1.5/2.0x24	
Temp. Range	0°C~40°C	
Timer (min:sec)	99:59	
Weight (kg)	15	
W x D x H size (cm)	29 x 42 x 28	

Tubes not included

AC110/220V, 50/60Hz

## ECEN-209, Micro-Size High-Speed Centrifuge 18, 24 Places

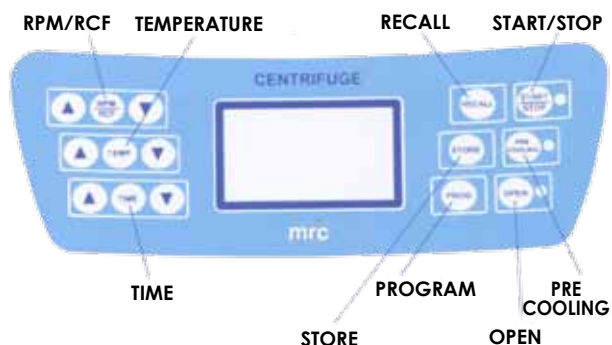
### Features:

- LCD, speed and RCF setting, and display.
- 10 memory programs for presetting parameters.
- Auto accelerating and decelerating functions.
- Auto power off for rotor imbalance, overload, breakdown indication & safety protection device.

**Rotor Included**







### ECENR-210/211/212, Micro-Size High-Speed Refrigerated Centrifuge

#### Features:

- LCD, temperature, speed and RCF setting, and display.
- 10 memory programs for presetting parameters.
- Auto accelerating and decelerating functions.
- Auto power off for rotor imbalance, overload, breakdown indication and safety protection device.



Model	ECENR-212	ECENR-210	ECENR-211
Max. Speed (rpm)	1,000~14,000		
Max. RCF (g)	17,740		
Capacity (ml x pcs)	1.5/2.0x24		
Temp. Range	0°C~40°C		
Timer (min:sec)	99:59		
Weight (kg)	60	40	45
WxDxH size (cm)	32 x 50 x 80	55 x 42 x 28	34 x 70 x 28

AC110/220V, 50/60Hz

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#### Rotor for ECEN-209-18



**REA-1518**  
1.5/2.0ml x 18pcs  
Max.14,000rpm

#### Rotor for ECENR-210/211/212



**REAC-1518**  
1.5/2.0ml x 18pcs  
Max.14,000rpm

#### Rotor for ECEN-209-24, ECENR-210/211/212



**REAC-1524**  
1.5/2.0ml x 24pcs  
Max.14,000rpm

#### Rotor for ECEN-209-18/24, ECENR-210/211/212



**REAC-0232**  
0.2ml x 32pcs  
(8 Tube PCR strip x 4)  
Max.14,000rpm

Rotor	Max. Speed (rpm)	Max. RCF (g)	Capacity (ml x pcs)	Tube size (Ø x L) mm
REA-1518	14,000	15,770	1.5/2.0x18	9.5~11x36~42
			0.5x18	7~7.9x25~34
			0.4x18	5.4~6.1x26~48
			0.2 PCRx18	5.9~6.3x20~24
REAC-1518	14,000	15,550	1.5/2.0x18	9.5~11x36~42
			0.5x18	7~7.9x25~34
			0.4x18	5.4~6.1x26~48
			0.2 PCRx18	5.9~6.3x20~24
REAC-1524	14,000	17,740	1.5/2.0x24	9.5~11x36~42
			0.5x24	7~7.9x25~34
			0.4x24	5.4~6.1x26~48
			0.2 PCRx24	5.9~6.3x20~24
REAC-0232	15,110	14,000	0.2 PCRx32	9.5~11x36~42



Laboratory Equipment Manufacturer  
www.mrclab.com



# Operation Manual for **ECEN-209**

**Digital Centrifuge, for 18 Tubes of 1.5/2ml, 14000rpm**



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**PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION**

3, Hagavish st. Israel 58817 Tel: 972 3 5595252, Fax: 972 3 5594529 [mrc@mrclab.com](mailto:mrc@mrclab.com)

**MRC.VER.01-9.11**

## I. SEPECIFICATION

SPEED (rpm)	1,000~14,000 LCDDISPLAY
MAX RCF	16,000 x g
MAX CAPACITY	1.5 / 2.0 ml x 18pcs
CONTROL	Microprocessor control .
	10 Memory Programs
SAFETY DEVICE	Auto balance
	Motor over heat protect
	Hidden auto – balance device
	Auto power off when open
	Fuse
TIMER	99min:59sec
WEIGHT (kg)	15 . 00KGS
SIZE (cm)	29 x 42 x 28 CM
POWER	AC220 V , 50Hz

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## II ROTOR AND ACCESSORY

1. Centrifugal force calculation: Use its speed and radius to calculate force as following formula.

$$RCF = (\text{rpm})^2 \times 0.00001118 \times R$$

R: radius (cm)


RCF: Relative Centrifugal Force ( x g )

2. Sterilizing and cleaning rotor:

Rotor is made of stainless steel or steel or aluminum with high density coating and highly resistant to corrosion, but not fit to alkaline and strong acid substance.

Don't heat the rotor to a high temperature (100°C) to clean or sterilize it.

3. ROTOR SEPECIFICATION

ROTOR		CAPACIATY (ml x pcs)	MAX SPEED (rpm)	RCF RCF (x g)	TUBE SIZE (mm)
REA-1518		1.5 / 2 x 18	1,000~14,000	16,000	φ 10 x 40

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4. ACCESSORIES : NOT INCLUDE, BUY SEPARATED



0.2 ml adapter

0.5 ml adapter

**NOTICE : IF ANY DECRIPTANCE FOUND FROM THE ROTOR, DO NOT USE ,  
CALL YOUR DISTRIBUTOR .**



### III INSTALLATION

1. When you take out centrifuge from carton, please check if there is any scratch, press trace and damage on knob or not. If yes please contact local dealer immediately.
2. Please install the centrifuge on a horizontal and stable table or bench. If not, it will affect anti-vibration efficiency.
3. Please use power voltage as following range, to avoid electric shock please make sure to connect ground wire to the ground terminal.

Power voltage	Acceptable voltage range
220 V	198 V ~ 242 V

4. Keep it away from dusty and moist working place.
5. Avoid the same power source with the large electric consumption machine at same time.
6. After dismantle or clean rotor, please must screw it tightly.

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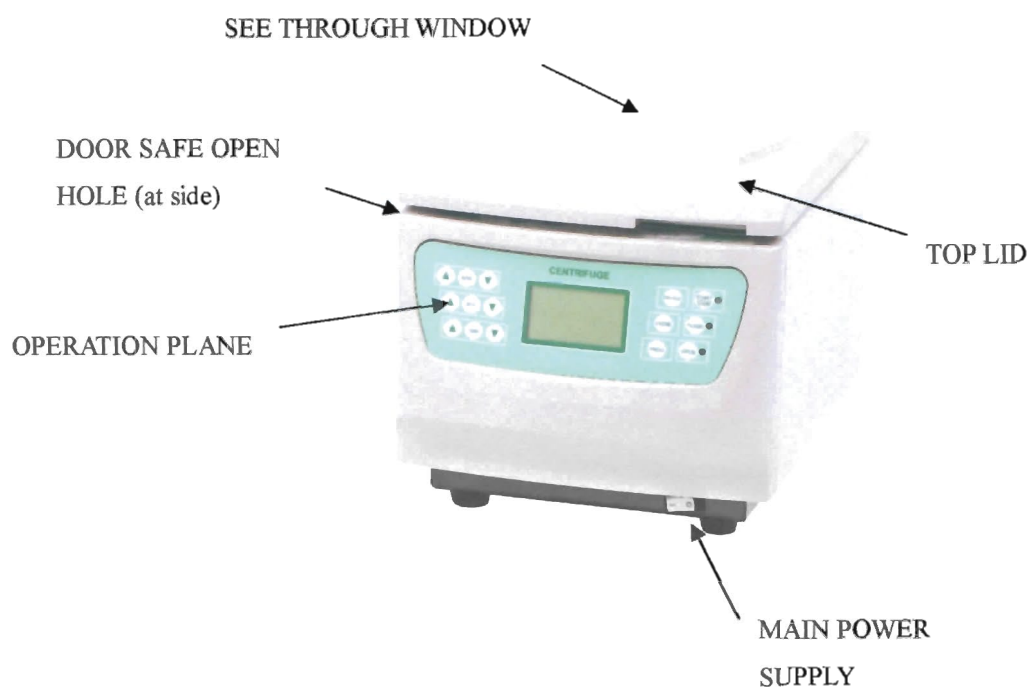
### IV OPERATION

1. Setting of Carrier
  - (1) Carrier is composed of turning ring and bucket. Four carriers should be same type and put onto rotor at one time. Different type of carriers or to use separate bucket and carrier are prohibited.
  - (2) Adapter is available for tube's diameter much smaller than carrier's, it can prevent tube broken from rotation..

#### Caution:

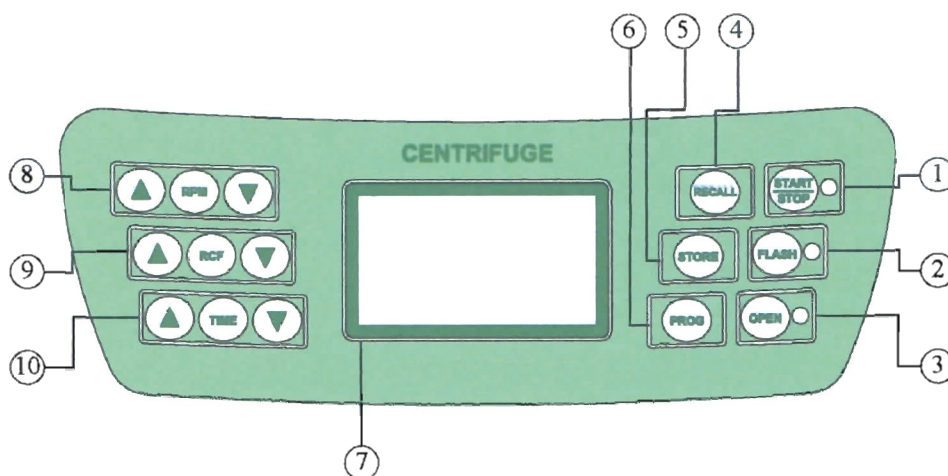
Adapter should be placed into carrier properly, if it is slanted, then tube is difficult to take out from carrier. If glass tube is broken or if rotor elapsed over one year, then rotor needs to be renewed. Damaged rotor or rotor containing broken glass will cause glass tube broken easily.

## V OUT-LINE



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OPERATION PLANE,



① START AND STOP : SWITCH ON MAIN POWER , , THIS KEY CONTROL THE START AND ALSO THE STOP. ,

② SHORT TIME ROTATION : PUSH “FLASH”KEY, MOTOR START ROTATING IMMEDIATELY. RELEASE THE “FLASH” , THE MOTOR STOP . THIS IS FOR SHORT TIME ROTATION OPERATION.

③ LID OPEN : NOTICE THE LID OPEN ONLY WITH ROTOR STOP ABSOLUTELY , THEN THIS FUNCTION WORK. THE LID CAN NOT BE OPEN WHEN ROTOR STILL ROTATION.

④ RECALL PROGRAM : RECALL THE SEATED SPEED AND RCF ALSO TIME..  
PUSH【RECALL】KEY, FIGURAL AFTER “ P” FLASH, PUSH THE 【PROG】 KEY TO SELECTE THE PROGRAM THEN PUSH RECALL KEY

⑤ MEMORY PROGRAMS : SET THE SPEED (RPM), (RCF) AND TIMER INTO THE MEMORY .

WAY OF OPERATION: SET THE SPEED AND TIMER AND PUCH THE 【STORE】 KEY. , YOU MAY SEE THE FLASH GO AFTER THE “ P”  
PUSH THE 【PROG】 KEY, TO SLECT THE PRE SET NO. ( 0~9).THEN PUSH THE STORE】 , THE PROGRAM MEMORY DONE.

⑥ SELECT THE PRE SET NO : YOU MAY CHOOSE FROM 0~9, USE TOGETHER WITH ④ 、 ⑤ OPERATION.

⑦ LCD DISPLYA : SHOW SPEED(RPM), RCF 、 TIMER , AND THE PRE SET PROGRAM NO.

⑧ SPEED SEATING : PUSH 【RPM】 , PUSH ▲▼TO SEAT THE SPEED YOU NEED. AGAIN PUSH 【RPM】 KEY TO CONFIRM.

⑨ RCF SEATING : PUSH 【RCF】 KEY , PUSH▲▼ TO SEAT THE RCF , AGAINPUSH 【RCF】 TO CONFIRM.

⑩ TIMER SEATING : PUSH 【TIME】 KEY , MIN FLASH , PUSH▲▼KEY TO SEAT.PUSH AGAIN 【TIME】 KEY SEC. FLASH, PUSH ▲▼KEY TO SEAT THE SEC. AGAIN PUSH 【TIME】 TO CONFIM .

## VI OPERATION

- (1). PLUG THE CORRECT POWER , OPEN THE ON / OFF SWITCH .
- (2). SEAT THE SPEED , OR RCF , OR TIMER SEE IF NECESSARY , EVEN YOU MAY RECALL THE MEMORY PROGRAM FROM PRE SEAT N. THE PUSH 【START/STOP】 KEY, THE CENTRIFUGE START TO RUN. 【START/STOP】 SHOW IN RED.
- (3). LCD DISPLAY SHOW WITH “ERRO” IF UNBALANCE , AND AUTO STOP, WAIT AFTER ROTOR STOP , PUSH 【OPEN】 KEY. “ ERRO” DISMISS. DOUBLECHECK WITH THE ROTOR IF ROTOR UNBALANCE USED.
- (4). WHEN THE TIME RUNING OUT, AUTO BUZZER SOUND , ROTOR STOP. LCD FLASH.
- (5). NO FUNCTION WITH 【OPEN】 KEY , THIS IS FOR SAFTY REASON. IT WORK ONLY WHEN ROTOR ALL STOP.
- (6). 【OPEN】 LIGH IN RED WHEN THE DOOR OPEN. 【START/STOP】 LIGH IN GREEN. WHICH IS NO FUNCTIN TOO WHE THE DOOR OPEN  
THERE ARE A SMALL HOLE ON THE 2 SIDE OF MACHINE. WHICH IS EMMERGIENCY OPEN HOLE OF THE DOOR. .
- (7). YOU MAY CHANGE THE SPEED AND THE TIMER WHTHIN THE ROTATION.
- (8 ).10 MEMORY PROGRAMS FOR PRE SEAT PARAMETER.
- (10). CONCERNING WITH THE SPEED SEATING , KINDLY REFERENCE WITH THE MAX SPEED FROM SORT OF ROTORS.

**NOTICE : DO NOT OVER RUN WITH THE SPEED OR OVER CARRIER IN CAPACITY WHICH MAY DAMAGE THE MOTOR OR CARUSE AN ACCIDENT.**

**NOT SUITABLE WITH FLAMMABLE ITEMS.**

**MAINTAIN:**

1. CLEAN THE ROTOR, ADAPTER , INNER TANK AFTER EVERY USE.  
NOT SUITABLE WITH TEMP. OVER 100 C.

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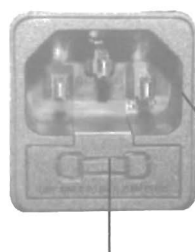


## VII ERRO INFORMATIONS

DISPLAY	STATUS	REASON/EXPLAIN	SOULT
Err-1	1. MOTOR CAN NOT RUN ON WORKING	1. Fault of the wire 2. Control system fault	1. Check the wire 2. Change the control system
	2. Speed erro	1. Hall IC (speed SENSOR fault ) 2. Fault of the wire 3. Control system fault	1. Change the new sensor 2. Check with the wire 3. Change the control system
Err-3	1. Open the door when rotation	1. Fault of the lid switch	1. Check with the lid switch, or change a new knob. 2. Check the wire.
Err-4	1. No timer seating	1. No seated function timer	1. Check the timer or re-seat again the timer.
Err-5	1. imbalance	1. No balance with the tube or carrier 2. Fault of the Unbalance switch.	1. Check carrier and basket even the tube if balance. 2. Check unbalance switch or change the new one. 3. Check the wire.
Err-7	1 Brushless motor control ALARM	1. The drive control function start	1. Push 【OPEN】 key to release it

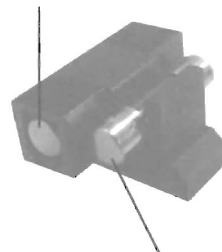
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### FUSE PREPARE



FUSE

POWER PLUG



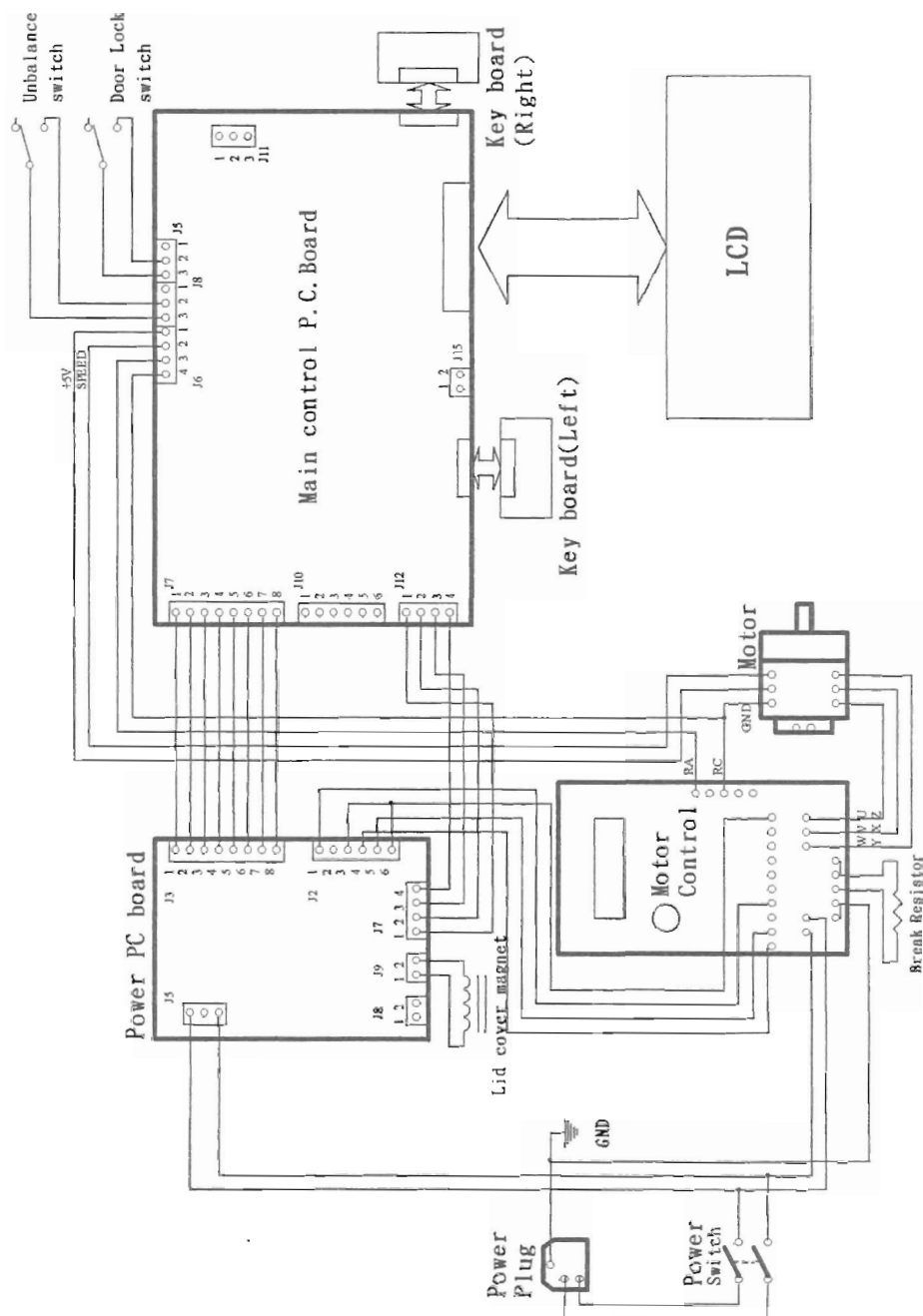
FUSE IN USE

## VIII PARTS LIST

ITEMS	Q'TY
MOTOR	1
LCD	1
KEY BOARD	2
MOTOR CONTROLL	1
RELAY	1
POWER SWITCH	1
LID COVER SWITCH	2
FUSE	2
DOOR LOCK	1
BACK HENGE	2
POWER PC BOARD	1
MAIN CONTROL PC BOARD	1
UNBALANCE SWITCH	1
BREAK RESISTOR	1

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## IX CIRCUIT DIAGRAM



### Inert Glovebox & Gas Purification Systems

The MRC high efficiency line of Inert Gloveboxes and Gas Purification Systems are designed specifically for production and large scale research applications where time management and maximum efficiency is crucial. All MRC brand Glovebox Systems are manufactured using the strictest of Quality Assurance measures and with only highest quality components including Swagelok compression fittings and valves, Edwards Vacuum Components and Allen Bradley PLC Controls.

The Glovebox design is based on a modular platform allowing customers to expand existing Gloveboxes to meet increasing working space requirements. Expansion features include additional antechambers for thru flow work processes, cold storage freezers, process vacuum ovens and furnaces and full line of accessories. The Gas Purifiers provide a < 1 ppm O<sub>2</sub> and H<sub>2</sub>O Inert Atmosphere required for a multitude of air sensitive applications.



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#### Features:

- 304 Type SS Construction
- Modular Design
- All Stainless Steel Gas Flow Piping & Fittings
- Electrical Feed-Through with Power Strip
- Gas and Vacuum Feed Through
- Foot Pedal for Manual Pressure Control
- Front Mounted Light
- MR-10 LEXAN Chemical Resistant Window
- Delrin Glove Ports
- Powder Coated Finish
- Color Touch Screen HMI
- Gas Purifier < 1 ppm O<sub>2</sub> and H<sub>2</sub>O
- Large Vacuum Chamber
- Rotary Vane Vacuum Pump
- Variable Speed 0-60 CFM Circulation System
- Automatic Regeneration
- Automatic Pressure Control
- Automatic Column Valves
- Adjustable Storage Shelves
- Locking Leveling Casters
- Power Strip.

#### Specifications:

- Modular Design
- Inside Dimensions – W1250mm x H900mm x D780mm
- Material of Construction – US type 304 Stainless Steel
- Interior Finish – Brushed
- Exterior Surface – Powder Coated Gray
- Stand – Powder Coated Gray, Leveling Feet & (asters)
- Electrical Feed Through – NW-40 Blanked
- Gas & Vacuum Feed Through – Bulkhead Fitting
- Dust Filters – .3 Micron HEPA Gas Inlet / Outlet
- Electrical Outlet – Six Position Power Strip
- Shelves – Three (3) Shelves, Height Adjustable, US type 304 Stainless Steel
- Glove Ports – Delrin– Chemical Resistant
- Gloves – Butyl – Different Sizes and Materials Available
- Window – MR-10 LEXAN 3/8" Thickness, Chemical Resistant and Inclined to Reduce Glare. Safety Glass Available
- Lighting – Front Mounted Fluorescent Lamp
- Leak Rate – < 0.05 vol%/hour (ISO 10648-2) Factory Tested
- Leak Rate – < 0.05 vol%/hour (ISO 25412) Factory Tested.

#### Control System & Operator Interface:

- Allen Bradley MicroLogix 1200 Programmable Logic Controller (PLC)
- Color Touch HMI – 6 inch Screen
- HMI – Mounted on Articulating Arm
- Data Logging – Available Per Request
- O<sub>2</sub> & H<sub>2</sub>O Display – Available Per Request
- Foot pedal for box pressure adjustment
- Electrical requirement: 230V, 50-60Hz, IOA or 115V, 50-60Hz, 20A.
- Power Consumption May Vary Depending on Accessories.



## Optional Accessories:

Oxygen Analyzers • Moisture Analyzers • Cold Storage -35C Freezers • Automatic Purge Valve • Automatic Antechamber Control • Solvent Removal Systems • Cold Wells • Dual Purifying Column • Video Microscopes • Spin Coaters • Thin Film Evaporators & Sputtering Systems • Solvent Purification Systems • Dry Vacuum Pumps • Vacuum Ovens & Furnaces • Glovebox Cooling.

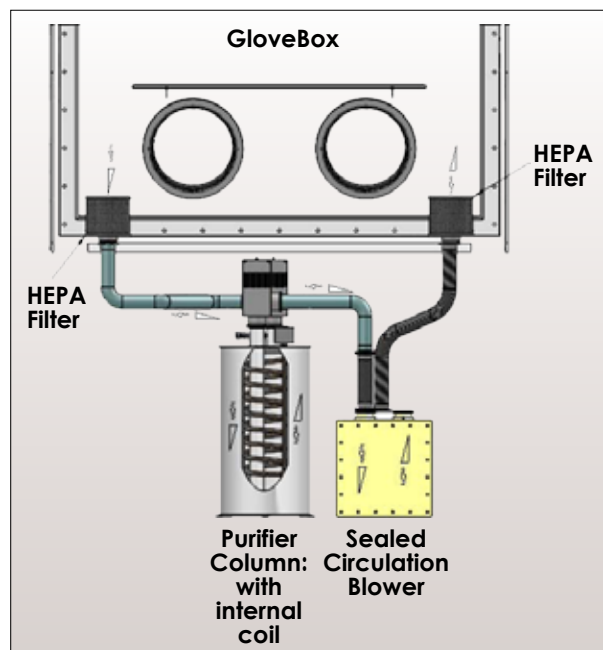


## Large Antechamber:

- Large Cylindrical Style Antechamber
- Inside Dimensions -- 390mm Diameter – 600mm Long
- Material – US type 304 stainless steel
- Interior Finish – Brushed Finish
- External Finish – Powder Coated Gray
- Doors – Exterior & Interior Vertically Pivoting, Anodized Aluminum
- Door Lock – Spindle with Gas Piston
- Sliding Tray – US type 304 stainless steel
- Pressure Gauge – Rough, Pirani Vacuum Gauge with Analog Readout available per request
- Controls – Manual, Automatic Antechamber Controls available per request.
- Leak Rate – < 0.05 vol%/hour (ISO 10648-2).



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## Circulation System:

- 0 – 60 CFM
- Variable Speed Control – PLC Controlled
- Hermetically Sealed Enclosure
- Vibration Dampened Base.

## Gas Purification System:

- Attainable Working Atmosphere – < 1PPM O<sub>2</sub> & H<sub>2</sub>O
- Working Gas – Nitrogen, Argon, Helium
- Purifier Absorption Capacity – 30 Liters O<sub>2</sub> & 1300 grams H<sub>2</sub>O
- Purifier Regeneration – Fully Automated, PLC Controlled
- Regeneration Gas: N<sub>2</sub>/H<sub>2</sub> mixture (3-7% H<sub>2</sub>) or Ar/H<sub>2</sub> mixture (3-7% H<sub>2</sub>)
- Vacuum Pump – Rotary Vane, 10CFM (12m<sup>3</sup>/h), oil mist eliminator and gas ballast oil return
- Piping – Welded US type 304 Stainless Steel
- Fittings – US type 304 Stainless Steel
- Purifier Valves – Electro Pneumatic NW-40
- Control Valves – Magnetic, Surface Mount
- Leak Rate – < 0.05 vol%/hour (ISO 10648-2).

**Gbox-Models**



## Gbox-GP-1/2, Gas purifier Systems



Gbox-GP-1



Gbox-GP-2

### Integrated Systems:

MRC Gloveboxes are designed as modular and flexible platforms that allow for the integration of second party instruments such as, Thin Film Deposition Tools, ALD, AFM, Spin Coaters, Ink Jet Printers, Hot Plates, Vacuum Ovens, Microscopes and testing equipment such as Spectroscopic Ellipsometers and Solar Simulators.

Now you can create an inert laboratory within your laboratory or clean room allowing for air free development of air sensitive materials. The modular design of the Glovebox and T-Style Antechambers enables you to create isolated atmospheres while being able to pass samples from one module to another under air free conditions.

MRC. partner with some of the world's most recognized manufacturers of ALD, Evaporation and Sputtering Tools to provide our customers with a specialized and seamlessly integrated product.

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Gbox-T  
Available in all Models





# Gbox Glovebox

## *User Manual*



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# 1 About This Manual

This document explains how to install and operate your Glovebox system and accessories. References are made in the Installation section to features in the Operational section. It is imperative that you refer to them as indicated. If you have any further questions please call our offices at 972-3-5595252

## 1.1 Firmware Revisions

This User Manual is based on a minimum PLC firmware Version 7 Revision 1. Enhancements made to this version may result in operator display screens or other operational functions that vary slightly from this manual's figures and descriptions.

## 1.2 Optional Equipment

This User Manual includes information about optional equipment that may not be installed on your system. It is presented for clarity and completeness. We have indicated which equipment is optional and which equipment is standard. In addition, a system that has been ordered with custom options may vary from what is documented in this User Manual.

There may be slight differences due to manufacturing changes.

This User Manual includes information on Dual Column systems, Automatic Antechambers, and Automatic Purge systems, all of which are optional equipment.

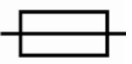


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## 1.3 Terms

The terms "box", "Glovebox", and "system" all refer to the entire standard configuration. The terms "regeneration," "regeneration cycle," and "regen" all refer to the components .or process of regenerating the system's purifier or column

## 1.4 Symbols Used

The following are symbols used in this manual and on the Glovebox itself:

	Circuit breaker
	Electrical Ground
	Electrical AC current



## 2 System Overview

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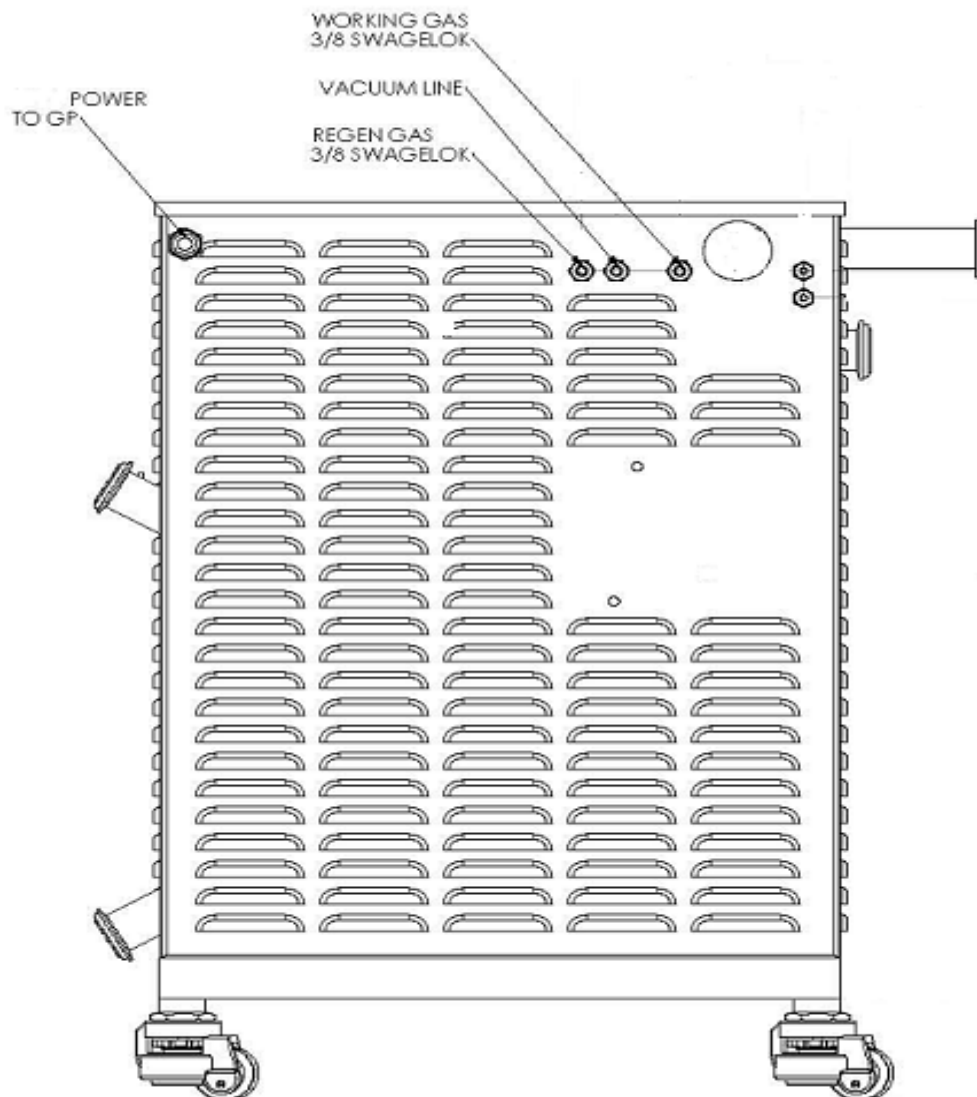
GloveBox is designed as a complete package including box, Antechamber(s), gas purification system and vacuum pump. The system is capable of removing O<sub>2</sub> and H<sub>2</sub>O to levels less than 1 ppm. O<sub>2</sub> and H<sub>2</sub>O are removed from the inert atmosphere by a combination of molecular sieve and copper catalyst. Once saturated, these materials are easily regenerated to their original state.

The GloveBox has been designed with the user in mind

- The Operator Interface comprises a color HMI (Human Machine Interface) touch screen that is mounted on a swing arm for ease of use.
- The foot pedal allows the operator hands free control of the box pressure.
- Interior and exterior doors are easy to operate.
- The controls and indicators are simple yet fully functional.

The GloveBox (Figure 1) is designed to be a completely modular system. The gas purification system is contained within a separate module that is located beneath the large Antechamber. This module has casters allowing easy movement for servicing

All service connections are located on the rear of the gas purification system and are clearly labeled.



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Figure 1 GloveBox

The vacuum pump is located on the Glovebox stand, allowing for easy access and oil change.

The Gas Purification system module has removable side panels and a top panel, allowing easy access to the Valve Assembly, Purifier Column, Valves, and Blower.

In addition you will find:

- Visual indicators on the Automatic Column valves.
- Manual override should the Automatic Column Pilot Solenoids fail.
- Circuit breakers.
- Solid State Relays.

- Easy access for replacement of valves.
- The Antechamber has a door lifting mechanism so the door lifts gently and cannot close unless pulled down by the user.
- Gloveboxes are modular in design; there are no bolts through the end panel or front window that could cause potential leaks.
- All connections are stainless steel tubing, which is either welded or connected via KF-40 clamps or compression connectors. There are no rubber hoses or hose clamps which, over time, can develop leaks or cracks.

The GloveBox control system is PLC-based and has a color HMI touch screen interface • This system monitors and controls all box functions. Extensive functionality and user features are available in the System Controller.

## 2.1 The PLC Enclosure

The PLC enclosure is located on the front of the gas purification module.

## 2.2 Exterior Controls

On the PLC enclosure, mounted on the side wall, you will find several circuit breakers and an illuminated main circuit breaker that doubles as the main power on switch.

## 2.3 Circuit Breakers

There are seven (7) circuit breakers on the side wall. The function of each breaker is indicated on a label at the side of the breaker. When they are in the tripped position, a white colored tab extends from the middle of the breaker. To reset them, press the tab back in until it locks in place. A label on the inside of the enclosure door contains specific information regarding the circuit breakers.

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Table 1 Circuit Breakers

Circuit Breaker #	Amperage 110/220 VAC	Function
1	15A/10A	Illuminated Main Power Switch
2	10A/5A	Vacuum Pump
3	6A/3A	24V Power Supply
4	5A/3A	Blower
5	4A/2A	Heater for Column 1
6	4A/2A	Heater for Column 2
7	5A/3A	Lighthouse

## 2.4 Foot Pedal

A foot pedal is provided so that the box pressure can be increased or decreased without the operator having to remove their arms from the gloves. It is a dual pedal switch. The right pedal

increases the box pressure and the left pedal decreases it. Note that the working minimum and maximum pressure settings are still being maintained by the PLC control. The foot pedal allows the user to add or remove pressure within the working minimum and maximum set points.



## 3 Installation

---

This section explains how to install a Glovebox

### 3.1 Pre-Installation Requirements

#### 3.1.1 Working Gas

The working gas requirement is Nitrogen, Argon or Helium with a suitable regulator to adjust pressure to 55-60 psi. The working gas must be connected to the gas inlet on the Glovebox either by flexible hose or hard copper plumbing to a 3/8" compression connector. Four (4) cylinders are required: three (3) for purging and one (1) for the final operation of the Glovebox.

**Note 1:** Refer to system specific installation requirements for further details. This document was supplied prior to shipping the system. Please contact your local MRC representative if you need another copy

**Note 2:** The working gas tubing must be 3/8" outside diameter for the entire distance from the regulator to the working gas connection. Any reductions in tubing diameter will result in insufficient gas flow for optimum system performance.

#### 3.1.2 Regeneration Gas

**Note:** The gas purification system has been regenerated and performance tested to < 1ppm of O<sub>2</sub> and H<sub>2</sub>O at our factory prior to shipment. It does NOT need to be regenerated prior to first use upon installation.

One cylinder of Nitrogen or Argon containing approximately 3 to 7% Hydrogen.

#### 3.1.3 Electrical

All MRC, Inc. Glovebox systems are configured to operate using the electrical power standard for the region in which the Glovebox has been ordered

**Note:** The standard 2-glove system requires 2 electrical outlets, one for the main system power and one for the power supplied to the power strip inside the Glovebox. Larger systems and those configured with other options require additional outlets.

#### 3.1.4 System Exhaust

**Note:** The Regeneration Gas, Vacuum Pump, and Purge exhausts should be handled in accordance with your facility's required specifications.

The regeneration gas exhaust is 3/8" I.D., 19/32" O.D. Tygon tubing. The Vacuum Pump exhausts are 1" OD tubing. The purge valve should also be vented, 1" Female NPT (manual purge) or KF-40mm flange (automatic purge).

**WARNING:** Proper ventilation of the exhausted gases is imperative as high levels of inert gas can cause asphyxiation.

### 3.2 Unpacking the System

All systems are packaged in specially designed shipping crates. These systems require a forklift or similar lifting device to safely remove the Glovebox and Gas Purification module from the crate. For more information, please ask your MRC, Inc. representative

**WARNING:** Glovebox systems are typically top-heavy.

All systems shipped are shipped on a special-designed pallet that includes detachable ramps to enable the Glovebox and Gas Purification module to be rolled off the pallet. Please ensure that you have sufficient personnel available to assist in the unloading process to ensure personnel safety

#### To unpack the Glovebox system

- 1 Place the Glovebox and gas purification module on a level floor in the desired location.
- 2 Remove the shrink-wrap and any other strapping that may be supporting the vacuum pump or any other accessories.
- 3 Depending on the exact system configuration purchased, there will be one or more boxes containing items such as gloves, power strips, etc. inside the large Antechamber and on the pallet. Carefully inspect all packaging materials before discarding to ensure that any small components are not misplaced.

### 3.3 Assembly

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Figure 2 Assembled Glovebox

**Note:** For double box systems, the two boxes need to be joined prior to performing the following procedure. See the next procedure, "To assemble a double box system".

### To install the Glovebox system

- 1 See Glovebox layout drawing (Figure 1).  
The Glovebox system has lockable casters on each leg to facilitate its placement. Once in place, the casters can be adjusted to lock the system in place.
- 2 Level the system by adjusting the leveling feet underneath each leg.
- 3 Place the Gas Purification module underneath the Large Antechamber.
- 4 Connect the Gas Purification module to the Glovebox. Match up the labels on the piping and components to the labels on the Glovebox and the gas purification module. e.g., "1" connects to "1", "2" connects to "2", "A" connects to "A", etc.
- 5 Lock the Purifier Cart into place by adjusting the casters.
- 6 Locate and install the shelves inside the box at your preferred height. The shelves are adjustable and can be relocated at any time. Fit the shelves into the box by sliding them through the Antechamber. It is not necessary to remove the window.
- 7 Place the power strip in the box as desired. Connect the male plug to the female outlet, which leads to the feed-through on the side of the box.
- 8 The oxygen analyzer requires that the small sampling pump be connected to the black tubing connected to the bulkhead fitting on the inside of the Antechamber wall. The batching pump should also be plugged into the electrical power strip inside the Glovebox.
- 9 Attach the purge valve to the corresponding KF-40 flange located on the top of the Glovebox. The purge valve and flange are labeled like the removed plumbing. For the auto-purge version, locate and connect the electrical and pneumatic lines.
- 10 Install the gloves. Gloves are placed inside the box through each glove port. The cuff end of the glove is stretched over the glove port until the lip fits into the last groove. Two O-rings are then stretched over each glove and placed in the outer two grooves.

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### To assemble a double box system

- 1 Remove the window from one box. See "*Removal and Replacement Procedures*" on page 71.
- 2 Press both boxes together and make them level on the inside by adjusting the leveling feet. After the boxes are level, lock the leveling feet into position.
- 3 Press both boxes apart far enough so that you can fit between them. Apply a bead of DAP latex sealant, approximately 1/8"-3/16" wide continuously around the flange of one box in the area between the inside of the box and the bolt holes.
- 4 Press the boxes together and put in the four corner bolts. After the four are in and hand tight, insert the rest of the hardware and tighten all bolts. Excess sealant will squeeze out from between the flanges.
- 5 Clean the excess sealant; it is easier to do this when the sealant is slightly dry. Clean the entire interior of the Glovebox.

- 6 Place the window on the box. See “*Removal and Replacement Procedures*” on page 71.
- 7 Install the gloves and glove O-rings. See “*Removal and Replacement Procedures*” on page 71.

### 3.4 Electrical Connections

The primary power cord has been retracted into the gas purifier module to prevent damage during shipment. Simply loosen the strain relief, pull the cord through the strain relief, and plug it into the proper wall receptacle.

The plug that is connected to the power strip is also inserted into the proper wall receptacle.

**Note:** Glove boxes are shipped with many different options. Please review each section in this User Manual that applies to the configuration of the system being installed.

### 3.5 Gas Connections

**IMPORTANT:** Make sure you have installed the proper regulator on the working gas cylinder and on the regeneration gas cylinder, connected tubing of sufficient length, and ensured that there are no leaks.

The fittings for both gases are located on the rear wall of the gas purifier module. Connect the working gas to the appropriately-labeled compression fitting and tighten it 1.25 turns from finger tight. Over tightening compression fittings can cause problems.

**Note:** If you are not familiar with compression fittings please call your MRC representative for further assistance

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Set the Working Gas pressure to 55 psi. Set the Regen Gas pressure to 7 psi. These connections are 3/8" in North America and 10mm outside North America.

### 3.6 Venting Connections

All exhaust connections should be made in accordance with your internal HVAC guidelines.

The fitting on the vacuum pump exhaust is 1" stainless steel tube stub.

The exhaust from the purifier is 3/8" ID hose.

The exhaust from the purge valve is 1" Female NPT.

**WARNING:** Proper ventilation of the exhausted gases is essential as high levels of inert gas can cause asphyxiation.

### 3.7 Commissioning the System

You are now ready to begin the commissioning the system. This section assumes that all prior sections have been completed as described.

### 3.7.1 Switching Power On

The main power ON/OFF switch is accessible from the left side of the gas purifier module on the side wall of the PLC enclosure.

Switch the power on. The main power switch light ups. All box electrical equipment is enabled with this switch. There is no other action necessary to turn power on with the possible exception of optional equipment.

The fluorescent light in the hood is controlled by its own manual switch located on the top of the light hood.

### 3.7.2 Pressure Testing the System

The Glovebox system is a leak-tight, hermetically sealed system. The entire system has been pressure and performance-tested prior to shipment. After assembly, the system must be pressure tested to ensure that all of the fittings and pipework have been connected properly.

After initial power on, the Glovebox Control screen shows the following display (Figure 3). In order to change any setting, the user must log in to the system.

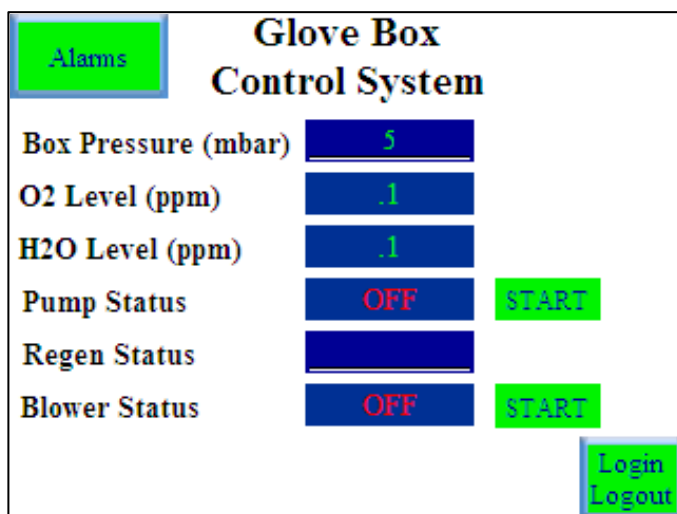


Figure 3 Glovebox Control screen

- 1 Press the **Login/Logout** button (Figure 4).



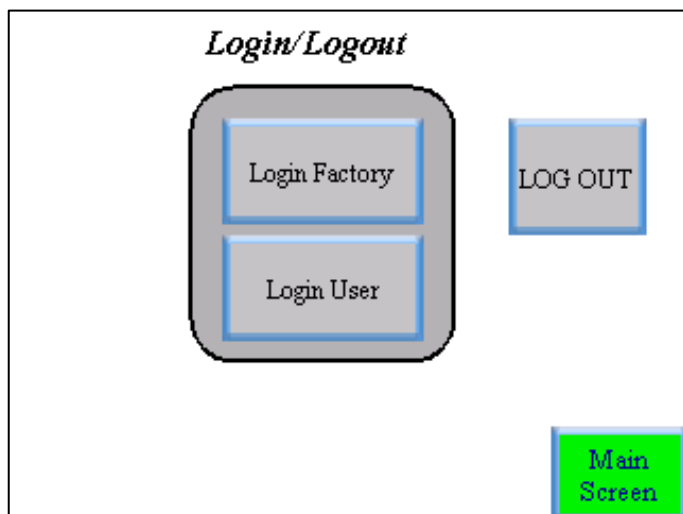


Figure 4 Login/Logout button

- 2 To Log in as a User, press the **Login User** button and then enter the code **7990**. The Login User button turns Green and flashes Accepted.
- 3 Press the **Main Screen** button to reach the Main Glovebox Control screen (Figure 5).

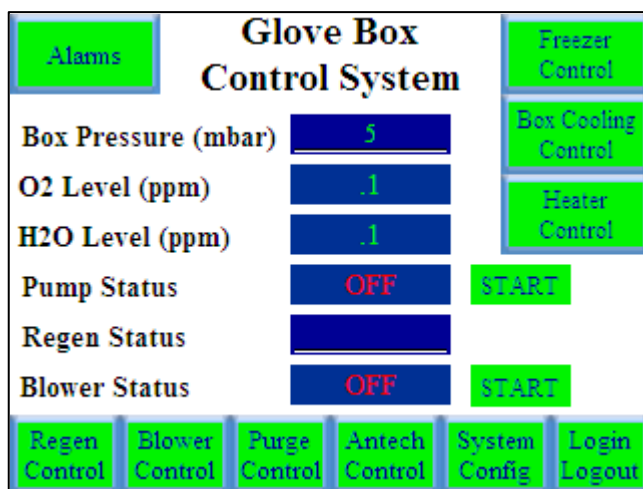


Figure 5 Main Glovebox Control screen

### 3.7.3 Adjusting the Box Pressures

The Glovebox Control system is programmed to maintain the Glovebox pressure between the minimum and maximum working pressure settings. To adjust these pressure settings:

- 1 Press the **System Config** button. The Glovebox Config Screen appears (Figure 6).

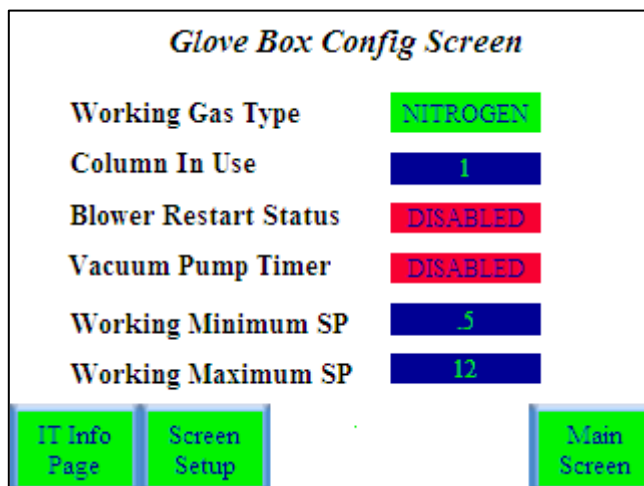


Figure 6 Glovebox Config Screen

- 2 Press the **Numeric blue display** button next to Working Maximum SP. A numerical input screen appears (Figure 7). Type in **12.0** and press the **Enter** key.
- 3 Press the **Numeric blue display** button next to Working Minimum SP. A numerical input screen appears. Type in **10.0** and Press the **Enter** key.

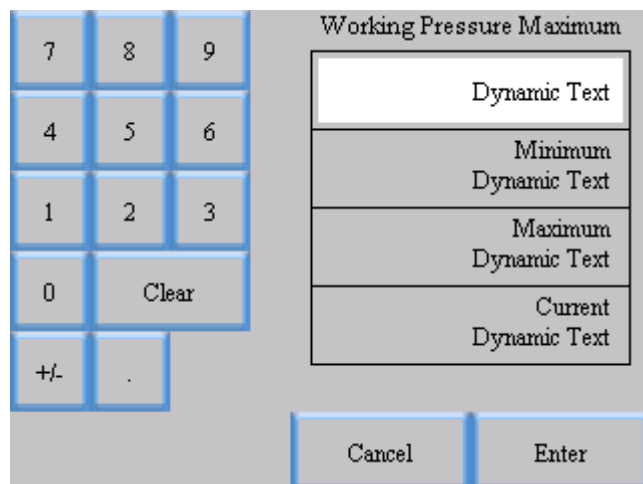


Figure 7 Numerical input screen

- 4 You will hear working gas enter the box automatically, and the pressure indicators will read 11mbar.
  - a Ensure that the inside and outside doors to the Antechambers are closed.
  - b Turn on the vacuum pump by pressing the **Start** button on the main screen.
  - c Open the evacuate valve on the Large Antechamber and allow the Antechamber to evacuate to -30.
  - d Close the evacuate valve.
  - e Repeat this process for the mini Antechamber.
- 5 Wait 10 minutes to allow the Glovebox to stabilize.

- 6 Use the appropriate foot pedal to add/remove gas to/from the Glovebox to reach a pressure of 11.0 mbar.
- 7 Using a timer, wait 25 minutes and observe the current box pressure.
  - If the pressure has not decreased more than 1 mbar in this time period, the Glovebox is leak tight.
  - If the pressure drops more than 1 mbar, check all of the connections that were made during the assembly process. Contact your MRC, Inc. representative if you require assistance in troubleshooting

### 3.7.4 Purging

The purpose of purging the system is to displace the air in the box with the inert gas of your choice. It is extremely important to displace as much of the air as possible prior to circulating the inlet gas through the purifier column. It is advisable to use at least three cylinders of gas per Glovebox module during this purging procedure and to reduce the O<sub>2</sub> and H<sub>2</sub>O levels to less than 50 ppm.

**Note:** If you have a freezer, the door should be open during purging.

The purging method is as follows:

- 1 Set the Working Maximum pressure to +10.0 mbar and the Working Minimum Pressure to +5.0 mbar See “*Adjusting the Box Pressures*” on page 19.
- 2 Open the manual purge valve located on the top left of the box. If your Glovebox system is fitted with an Auto Purge valve, refer to “*Purge Control*” on page 31.
- 3 Adjust the flow using the purge valve so that there is a steady flow of incoming gas and the box pressure is maintained at >1mbar.
- 4 Create turbulence in the box to increase the efficiency of the purge. This can be done by pressing in the gloves and waving inside the box or installing a small electric fan inside the box.
- 5 During the purge process you will need to change the working gas cylinder as it empties. You must close the purge valve before changing the cylinder.
- 6 Re-open the Purge valve after replacing the cylinder and opening the valve on the cylinder.
- 7 Purge the system with at least 3 cylinders of inert gas for a standard 2-glove system.

**Note:** If you do not have an Oxygen Analyzer, it can be assumed that after purging with three (3) cylinders (for a single 2-glove system), the Oxygen content in the box is 25 ppm or less. Close the Manual Purge valve.

- 8 Open the outlet valve of the O<sub>2</sub> analyzer, then open the inlet valve. Make sure that the batching pump has power. It should be plugged into the power strip. The power strip should be plugged into the wall outlet. Within 15 minutes, you can read the Oxygen content on the display.

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- 9 After 15 minutes if the O<sub>2</sub> level is below 50 ppm close the Purge valve and start the circulation. See “*Circulation*” below on page 22.
- 10 The O<sub>2</sub> level may increase after the blower has been turned on. If the O<sub>2</sub> level exceeds 100 ppm, stop the blower and continue to purge. Repeat steps 9 and 10 as necessary.

**WARNING:** Do not open O<sub>2</sub> analyzer valves until Glovebox has been properly purged. Exposure to high O<sub>2</sub> levels will diminish the lifetime of the O<sub>2</sub> sensor.

When shipped, the oxygen analyzer valves are closed as shown in Figure 8:

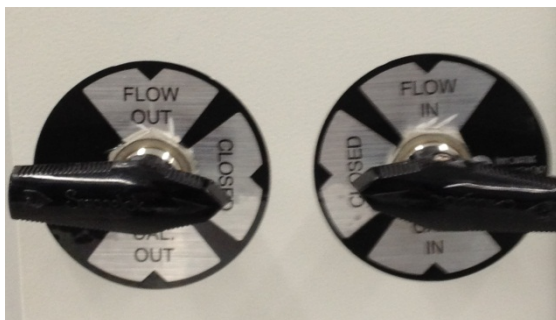


Figure 8 Oxygen analyzer valves - closed

In order to monitor the oxygen content inside the Glovebox the left Valve must be turned to the “Flow Out” Position and the Right Valve must be turned to the “Flow In” position as shown in Figure 9:

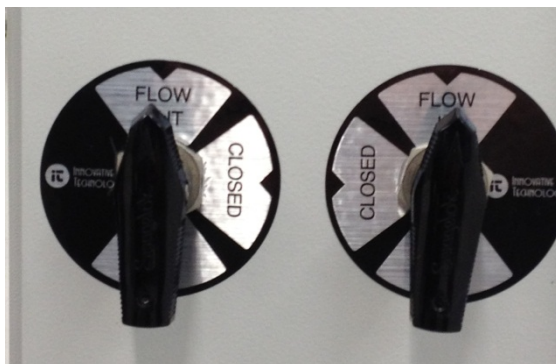


Figure 9 Oxygen analyzer valves - Flow In

**Note:** When purging is complete you may adjust the Minimum and Maximum Working pressures to attain the operating pressure that best suits your needs and comfort.

### 3.7.5 Circulation

The blower is designed to circulate the Glovebox atmosphere continuously through the purifier column. For optimum performance the blower must run constantly. Turning off the blower results in the atmosphere within the Glovebox degrading as it is not being circulated through the O<sub>2</sub> and H<sub>2</sub>O absorbing materials contained within the purifier column. O<sub>2</sub> and H<sub>2</sub>O levels inside the Glovebox will rise if the blower is switched off.

The blower can be switched on and off from the main control screen. The blower control screen can be accessed by Pressing the “Blower Control” button on the main control screen (Figure 10).

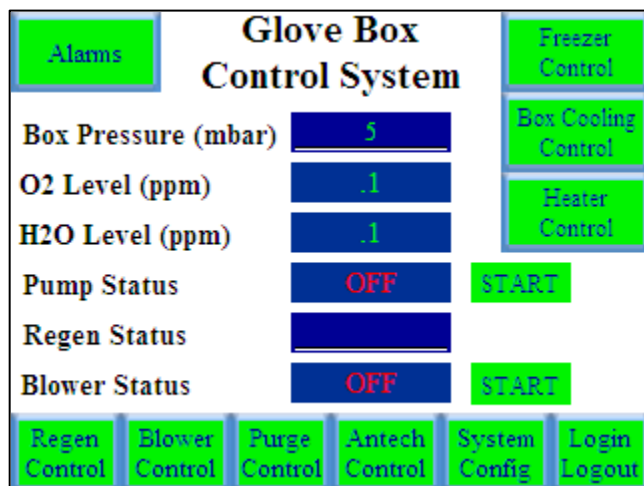


Figure 10 Glove Box Control System

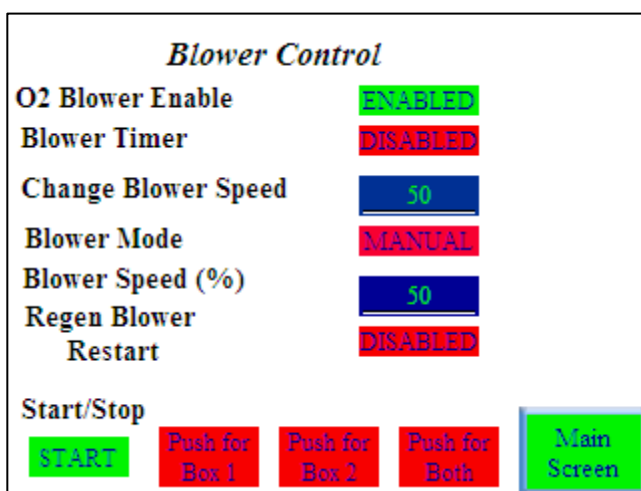


Figure 11 Blower Control screen

Starting the blower automatically opens the valves on the column and circulates the box atmosphere through the purifier column. There will be a momentary rise in oxygen because of the small amount of air trapped in the blower.

The blower provided is continuously variable; it can be set at a very low speed if you are handling sensitive crystals or during weighing. It can be set at a maximum to recover quickly from an operator error.

We suggest it be set at 50% during normal operation. Blower speed can be changed by pressing the numeric value next to the Change Blower Speed. Pressing this numeric value opens up a numeric entry screen where the desired blower speed can be entered. The value entered is a percentage. 0 means the blower is not circulating. 100% means that the blower is circulating at full speed.

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## 4 Control Panel Functions

All Glovebox functions are controlled from the touch screen (HMI – Human Machine Interface). This section describes the touchscreen and all the functions associated with it. The HMI is typically located on the side panel that has the large Antechamber attached. Custom systems may have the HMI mounted in a different location.

The HMI communicates with the Programmable Logic Controller (PLC) that is contained within the PLC enclosure on the gas purification module.

### 4.1 The Main Control Screen

The main control screen (Figure 12) is the primary source of information for the system.

This screen provides real time display of all key Glovebox operating parameters.

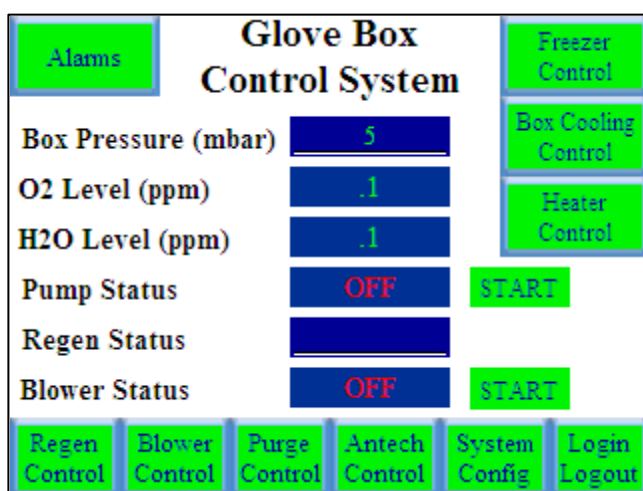


Figure 12 Glove Box Control System

4.2 Initial Power On

When the system is powered on the following screen (Figure 13) is appears:

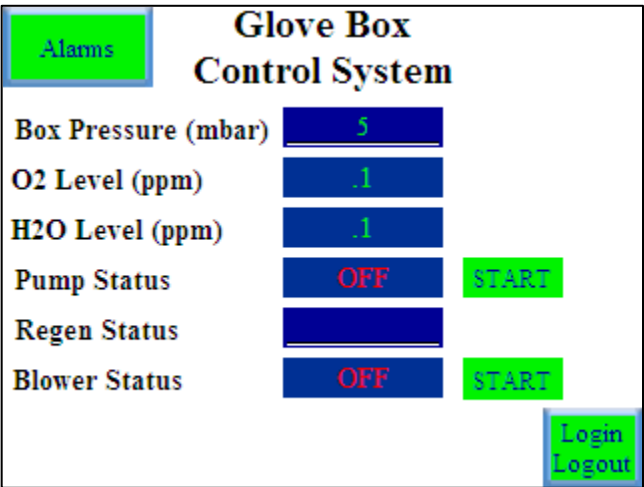


Figure 13 Glovebox powered on

This screen indicates the basic status parameters but does not allow any interaction until the user logs in to the HMI. Customers may only log in as a User.

To log in, press the **Login Logout** button. The following screen (Figure 14) appears:

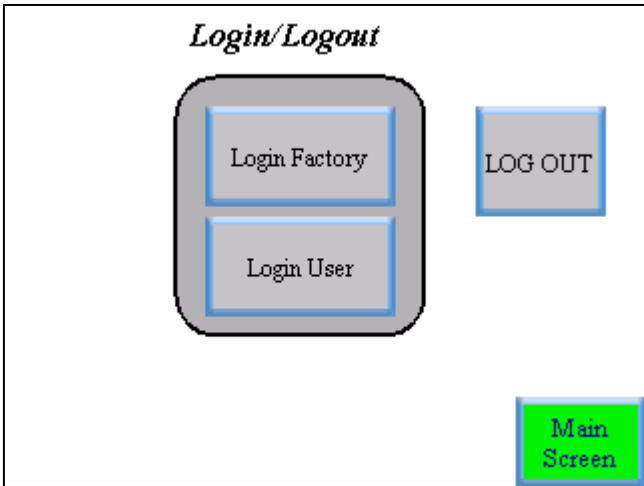


Figure 14 Login/Logout screen

To log in as User, press the gray **Login User** button. A numeric data entry screen appears. The User Login password is **7990**. After pressing the **Enter** button the Main Control Screen appears with fully functional buttons (Figure 15).

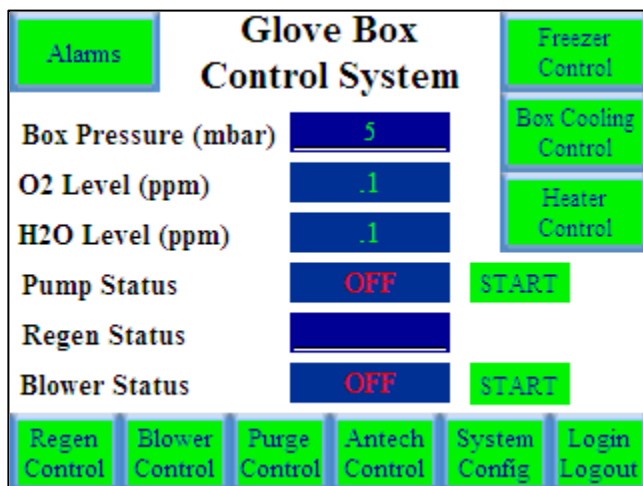


Figure 15 Glove Box Control System with fully functional buttons

**Note:** Depending on the particular configuration of your system not all buttons may be available.

<b>Box Pressure (mbar)</b>	The Main Control Screen continuously displays the current Glovebox pressure. This pressure is displayed in mbar relative to atmospheric pressure. The current pressure is displayed in the blue bar. For information on adjusting the box pressure, see “ <i>Commissioning the System</i> ” on page 17.
<b>O2 Level (ppm)</b>	If your system is equipped with an O2 Analyzer, the current real time O2 level in ppm will be displayed here.
<b>H2O Level (ppm)</b>	If your system is equipped with a H2O Analyzer, the current real time H2O level in ppm will be displayed here.
<b>Pump Status</b>	The Vacuum Pump is turned on and off by pressing the START/STOP button. The current Vacuum Pump Status is shown in the Blue Box. If the Blue Box indicates OFF then the Green button next to it will display START. Pressing the START button will turn on the vacuum pump. The pump status will now show as ON and the Red STOP button will be visible. Pressing this Red STOP button will turn off the vacuum pump. The pump also has its own on/off switch mounted on the motor. This should be in the on position at all times. The vacuum pump has three purposes in the Glovebox operation. <ul style="list-style-type: none"> <li>• Removal of excess pressure from the Glovebox</li> <li>• Evacuation of the Antechambers</li> <li>• Evacuation of the purifier column during the Regeneration cycle</li> </ul>
<b>Regen Status</b>	Indicates whether the purifier column is currently being regenerated. It displays the current stage of regeneration and the time in minutes that has elapsed in that stage. Refer to the regeneration section for further details regarding catalyst regeneration procedures.
<b>Blower</b>	The blower is a vital component in the Glovebox gas purification system because it is responsible for continuously circulating the Glovebox atmosphere through the purifier column to remove oxygen and moisture. The blower is comprised of a fan hermetically sealed inside an enclosure that is connected to the circulation pipework to create a leak-tight closed-loop. The blower is located inside the gas purification module, typically located beneath the large Antechamber. The Blower is turned on and off by Pressing the START/STOP button. The current Blower Status is shown in the Blue Box. If the Blue Box indicates OFF then the Green button next to it will display START. Pressing the START button will turn on the Blower. The Blower status will now show as ON and the Red STOP button will be visible. Pressing this Red STOP button turns off the Blower. When the BLOWER switch is activated, the PLC opens the column valves to enable circulation. The Blower Control button opens a control screen that allows further interaction with the blower settings. See “ <i>Blower Control</i> ” on page 30. <b>Note:</b> For the blower to operate correctly the system must be supplied with at least 55 psi of inert working gas pressure.

## 4.3 Control Sub-Screens

### 4.3.1 Regen Control

Pressing the “Regen Control” button brings up the following screen (Figure 16):

This screen allows the user to initiate a regeneration of the purification column.

Figure 16 Regeneration Control screen

<b>Start Button</b>	Initiates a regeneration.
<b>Are the Column Valves Closed?</b>	Prompts the user to acknowledge that the column valves are closed.
<b>Is Flow OK?</b>	Prompts the user to acknowledge that the regeneration gas is flowing.
<b>Last Regen</b>	Indicates when the last regeneration occurred.
<b>Regen Status</b>	Indicates the current step in the regeneration cycle.
<b>Step Time</b>	Indicates the elapsed time for the current step.
<b>Regen Column</b>	Indicates which column will be regenerated.
<b>Abort Button</b>	Allows the user to abort a regeneration within the first 5 minutes of starting.
<b>Regen Timers Button</b>	Accesses sub-screen below.

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#### 4.3.2 Regen Timers

The Regen timers are set in minutes. Below are the factory default settings (Figure 17). Do not change these timers without contact your MRC service provider.



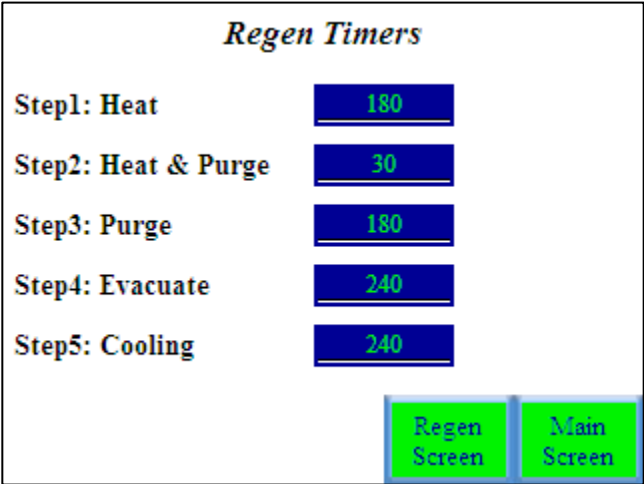


Figure 17 Regen Timers screen

Step 1: Heat	Indicates duration of Heating Cycle in minutes.
Step 2: Heat & Purge	Indicates duration of Heat & Purge Cycle in minutes.
Step 3: Purge	Indicates duration of Purge Cycle in minutes.
Step 4: Evacuate	Indicates duration of Evacuate Cycle in minutes.
Step 5: Cooling	Indicates duration of Cooling Cycle in minutes.
Regen Screen Button	Returns to the Regeneration Control screen.
Solvent Regen Button	Accesses sub-screen below (Figure 18).

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**Note 1:** All times shown are factory defaults.

**Note 2:** This feature is only available on systems fitted with a Large Capacity Regenerable Solvent Removal System.

4.3.3 Solvent Regen

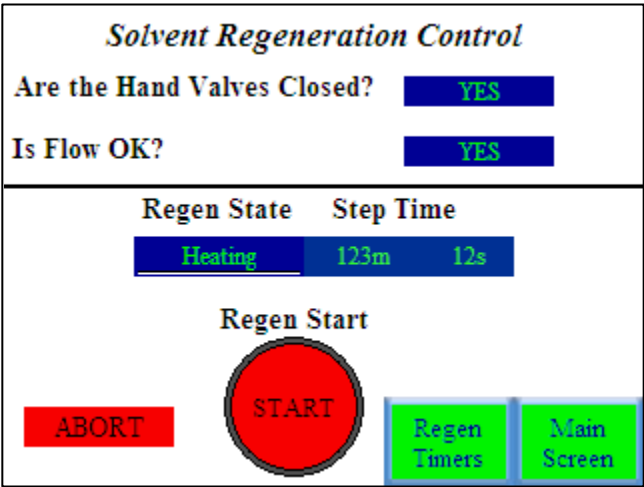


Figure 18 Solvent Regeneration Control screen

<b>Start Button</b>	Initiates a solvent regeneration.
<b>Are the Column Valves Closed?</b>	Prompts the user to CLOSE the manual isolation valves on Large Capacity Regenerable Solvent Removal Column.
<b>Is Flow OK?</b>	Prompts the user to acknowledge that the inert gas is flowing.
<b>Regen Status</b>	Indicates the current step in the regeneration cycle.
<b>Step Time</b>	Indicates the elapsed time for the current step.
<b>Abort Button</b>	Allows the user to abort a regeneration within the first 5 minutes of starting.
<b>Regen Timers Button</b>	Accesses sub-screen below (Figure 19).

#### 4.3.4 Solvent Regen Timers

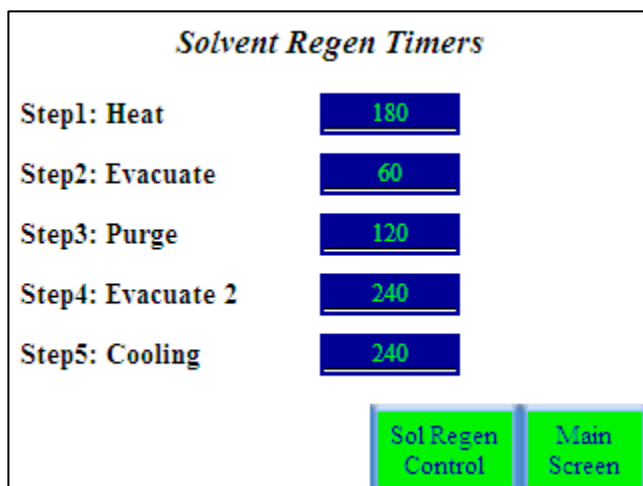


Figure 19 Solvent Regen screen

<b>Step 1: Heat</b>	Indicates duration of Heating Cycle in minutes.
<b>Step 2: Evacuate</b>	Indicates duration of Evacuate Cycle in minutes.
<b>Step 3: Purge</b>	Indicates duration of Purge Cycle in minutes.
<b>Step 4: Evacuate 2</b>	Indicates duration of Evacuate 2 Cycle in minutes.
<b>Step 5: Cooling</b>	Indicates duration of Cooling Cycle in minutes.
<b>Sol Regen Control Button</b>	Returns to the Solvent Regeneration Control screen.

**Note:** All times shown are factory defaults.

#### 4.3.5 Blower Control

Pressing the **Blower Control** button brings up the following screen (Figure 20):

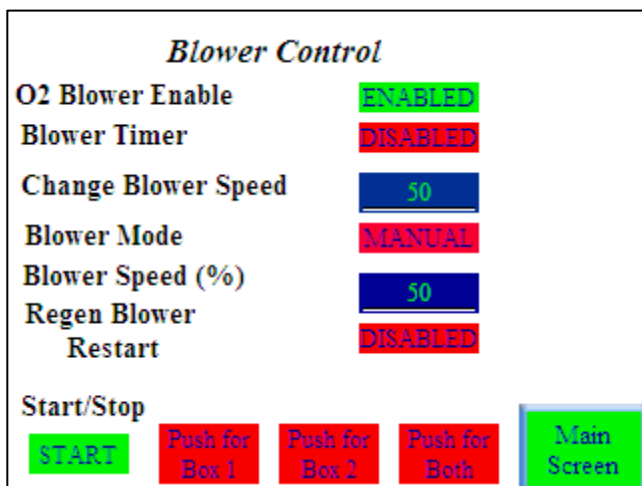


Figure 20 Blower Control screen

The blower can be turned on or off from this screen as well as from the Main Screen.

<b>O2 Blower Speed</b>	Enabling this feature automatically adjusts the blower speed based on the oxygen level within the Glovebox. If the oxygen level is above 10 ppm the blower speed increases in an attempt to scrub out the excess oxygen more quickly.
<b>Blower Timer</b>	Enabling this feature automatically returns the Blower speed to 50% after 30 minutes.
<b>Change Blower Speed</b>	Pressing this button brings up a numeric keypad that allows the blower speed to be changed between 0 and 100%.
<b>Blower Mode</b>	Displays either Automatic (AUTO) or Manual (MANUAL). This is not directly adjustable and is used in diagnostics.
<b>Blower Speed (%)</b>	Displays the current speed of the blower.
<b>Regen Blower Restart</b>	Disabled – Blower will not automatically restart after regeneration cycle is complete. Enabled – Blower automatically restarts after regeneration cycle is complete.
<b>Press for Box 1</b>	Refer to section concerning parallel-piped Glovebox systems. See “ <i>Parallel – Piped Systems</i> ” on page 55.
<b>Press for Box 2</b>	Refer to section concerning parallel-piped Glovebox systems. See “ <i>Parallel – Piped Systems</i> ” on page 55.
<b>Press for Both</b>	Refer to section concerning parallel-piped Glovebox systems. See “ <i>Parallel – Piped Systems</i> ” on page 55.

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#### 4.3.6 Purge Control

This feature only displays if your system has been factory-fitted with an Automatic Purge valve.

Pressing the **Purge Control** button brings up the following screen (Figure 21):

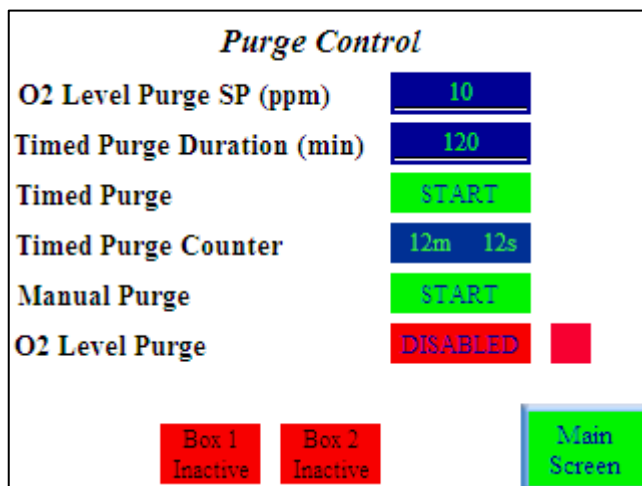


Figure 21 Purge Control screen

<b>O2 Level Purge SP (ppm)</b>	If the system is fitted with an oxygen analyzer this setting will open the automatic purge valve if the oxygen level exceeds the set value. This value can be changed by pressing the value and entering the desired value on the numeric keypad. In order to operate this feature the “O2 Level Purge” must be ENABLED.
<b>Timed Purge Duration (min)</b>	This value sets the length of time that the automatic purge valve will be open if the “Timed Purge” is started.
<b>Timed Purge</b>	Pressing START initiates the timed purge.
<b>Timed Purge Counter</b>	The counter indicates the elapsed time since the Timed Purge was started. After the time limit is reached the automatic purge valve closes.
<b>Manual Purge</b>	Pressing START will open the automatic purge valve. The purge valve will remain open until STOP is Pressed.
<b>Box 1 Active/Inactive</b>	Indicates whether Box 1 can be purged using the auto purge valve.
<b>Box 2 Active/Inactive</b>	Indicates whether Box 2 can be purged using the auto purge valve.

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#### 4.3.7 Automatic Antechamber Control

This feature is only displayed if your system has been factory-fitted with automatic Antechamber control.

Pressing the “Automatic Antechamber Control” button brings up the following screen (Figure 22):

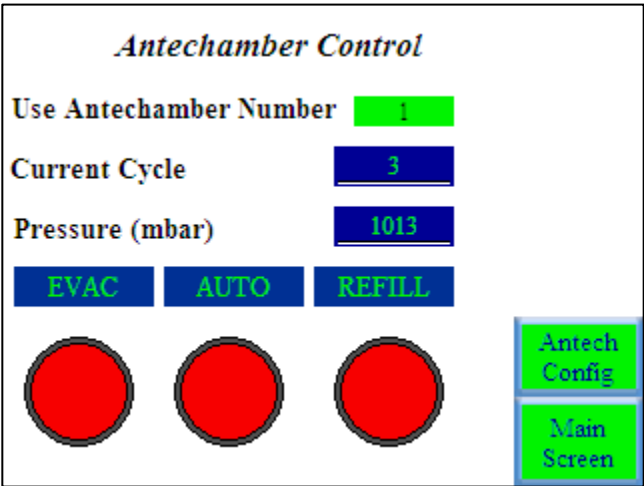


Figure 22 Antechamber Control screen

Use Antechamber Number	Allows the user to select which Antechamber to control. This is only utilized if your system is configured with multiple automatic Antechambers.
Current Cycle	Indicates how many evacuate/refill cycles have already been completed.
Pressure (mbar)	Indicates the absolute pressure within the Antechamber as measured with the digital vacuum gauge.
EVAC	Pressing this evacuates the Antechamber. Press again to stop evacuating.
REFILL	Pressing this refills the Antechamber with inert gas from the Glovebox. Press again to stop refilling.
AUTO	Pressing this causes the button to turn Green and start the evacuate/refill sequence. The individual steps associated with this are accessed and changed in the Antechamber Config screen (Figure 23).

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4.3.8 Antechamber Config

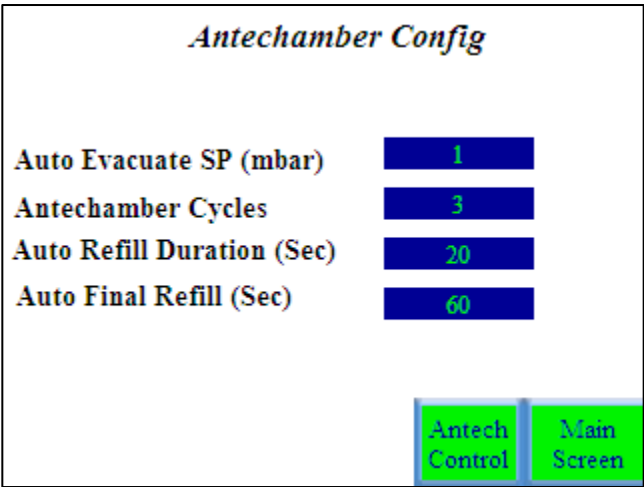


Figure 23 Antechamber Config screen



<b>Auto Evacuate SP (mbar)</b>	The set point that the Antechamber will be evacuated to.
<b>Antechamber Cycles</b>	Determines the number of evacuate/refill cycles that occur under Automatic operation.
<b>Auto Refill Duration (sec)</b>	Determines the duration of all refills except the final refill.
<b>Auto Final Refill</b>	Determines the duration of the final refill.

#### 4.3.9 System Config

Pressing the **System Config** button brings up the following screen (Figure 24):

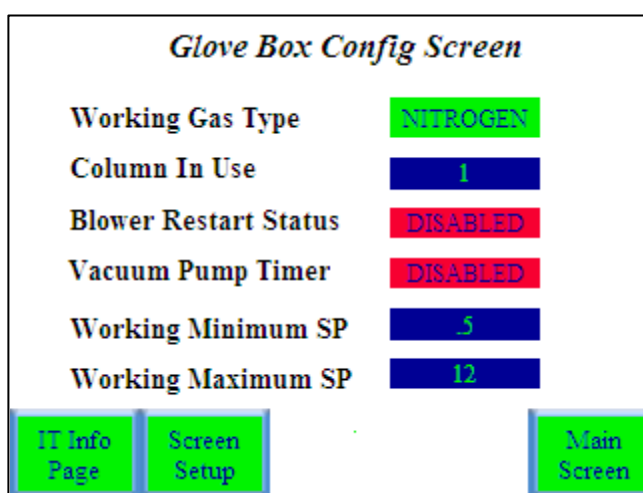


Figure 24 Glove Box Config screen

<b>Working Gas Type</b>	Allows selection of Nitrogen or Argon as working gas.
<b>Column in Use</b>	Indicates which purifier column is currently in use.
<b>Blower Restart Status</b>	When enabled, the blower will automatically restart after a power failure.
<b>Vacuum Pump Timer</b>	When enabled, the vacuum pump will automatically power down after 10 minutes. The vacuum pump will be automatically powered on as required by the system.
<b>Working Minimum SP</b>	The lower working pressure set point.
<b>Working Maximum SP</b>	The higher working pressure set point. <b>Note:</b> The PLC control system will maintain the Glovebox pressure between these Minimum and Maximum set points.
<b>IT Info Page</b>	Contains contact information for customer support.
<b>Screen Setup</b>	Allows the contrast of the HMI screen to be adjusted.

4.3.10 Alarms

Pressing the **Alarms** button brings up the following screen (Figure 25):

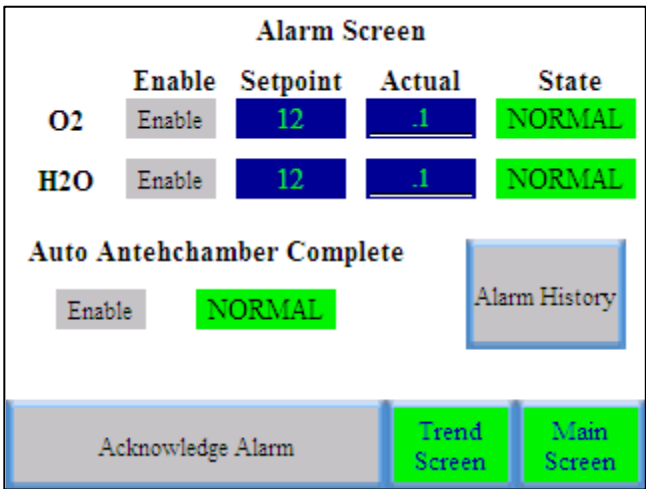


Figure 25 Alarms screen

<b>O2 Alarm</b>	Enabling this feature turns on the O2 level alarm. Set point allows the alarm to be adjusted. Actual is the real-time O2 level. State indicates whether the alarm has been triggered.
<b>H2O Alarm</b>	Enabling this feature turns on the H2O level alarm. Set point allows the alarm to be adjusted. Actual is the real-time H2O level. State indicates whether the alarm has been triggered.
<b>Auto Antechamber Complete</b>	Enabling this feature triggers a pop-up banner indicating the cycle is complete.
<b>Alarm History</b>	A log of the various alarms that have been triggered. <b>Note:</b> When an alarm is triggered a pop-up banner displays on the current screen to alert the user.
<b>Acknowledge Alarm</b>	This button must be pressed to clear any active alarms.

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Trend Screen

This button access graph (Figure 26) logs O2 and H2O levels over time.

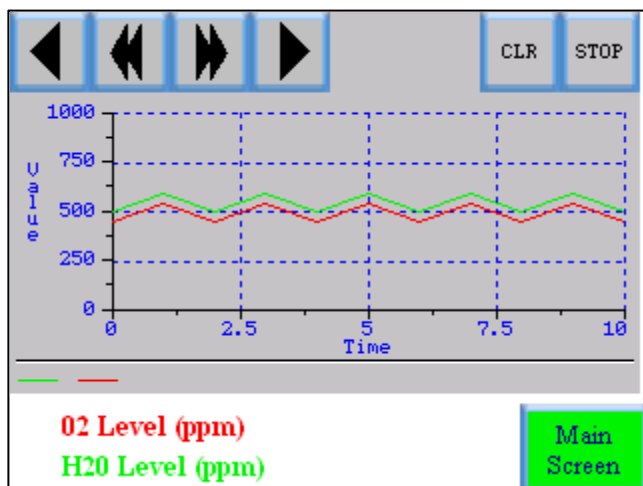


Figure 26 Trend screen

#### 4.3.11 Freezer Control

This feature only displays if your system has been factory-fitted with a freezer.

Pressing the **Freezer Control** button brings up the following screen (Figure 27):

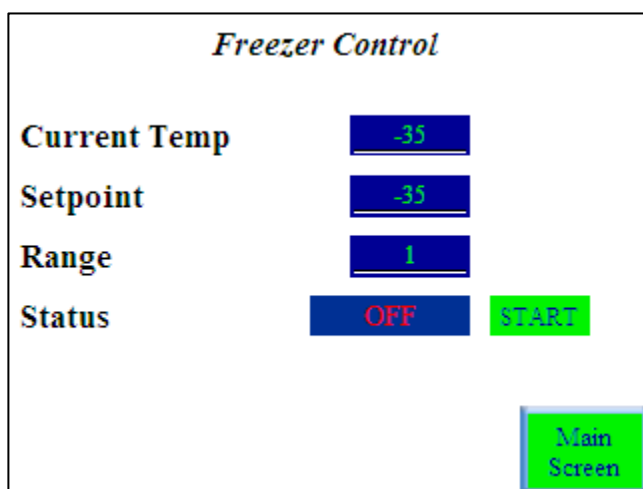


Figure 27 Freezer Control screen

<b>Current Temp</b>	Indicates the actual temperature (°C) inside the freezer.
<b>Set point</b>	Allows the temperature inside the freezer to be adjusted.
<b>Range</b>	The deviation +/- °C from the set point.
<b>Status</b>	Turns the freezer On and Off.

**Note:** If your Glovebox is equipped with a freezer do not plug in or turn on the freezer until the box has been purged with the freezer door open.

Turning the freezer on while the Glovebox contains room atmosphere will result in the condensation of moisture preventing the Glovebox from achieving optimum atmosphere conditions, i.e. preventing the system from being able to reach 1 ppm moisture content.

4.3.12 Box Cooling Control

This feature is only displayed if your system has been factory-fitted with Box Cooling.

Pressing the Box Cooling Control button brings up the following screen (Figure 28):

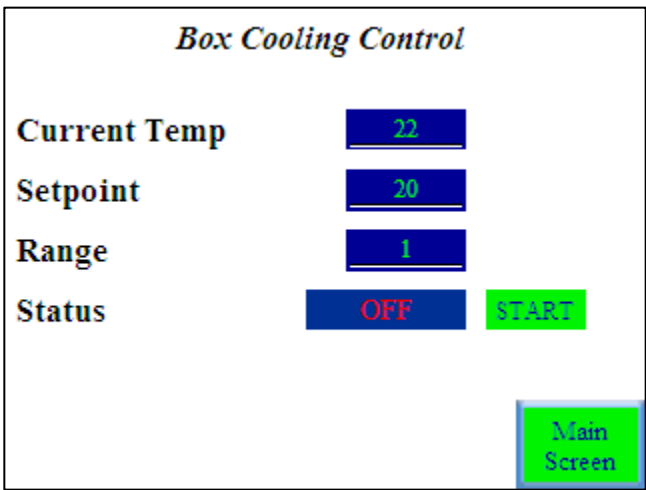


Figure 28 Box Cooling Control screen

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Current Temp	Indicates the actual temperature (°C) inside the Glovebox.
Set point	Allows the temperature inside the Glovebox to be adjusted.
Range	The deviation +/- °C from the set point.
Status	Turns the Box Cooling On and Off.

4.3.13 Heater Control

This feature only displays if your system has been factory-fitted with a heated Antechamber.

Pressing the Heater Control button brings up the following screen (Figure 29):

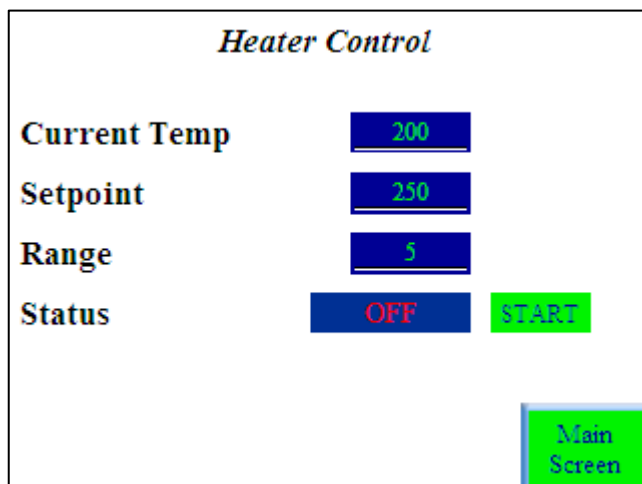


Figure 29 Heater Control screen

<b>Current Temp</b>	Indicates the actual temperature (°C) inside the heated Antechamber.
<b>Set point</b>	Allows the temperature inside the Antechamber to be adjusted.
<b>Range</b>	The deviation +/- °C from the set point.
<b>Status</b>	Turns the Heater On and Off.



## 5 System Operation

### 5.1 Adjusting the System Pressure

The Glovebox control system is programmed to maintain the Glovebox pressure between the minimum and maximum working pressure settings.

**To adjust these pressure settings**

- 1 Press the **System Config** button.

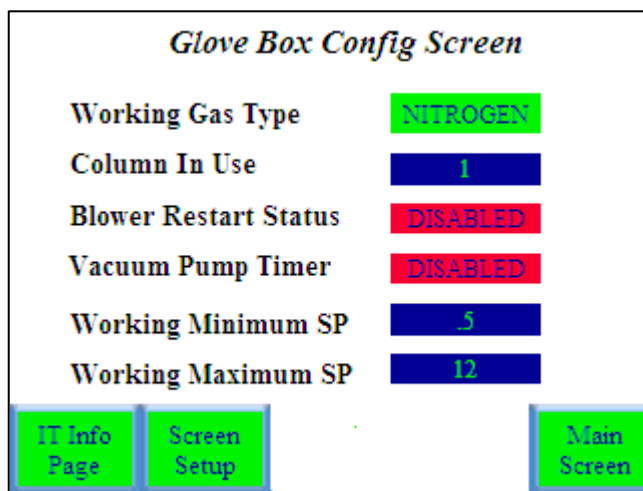


Figure 30 Glove Box Config screen

- 2 Press the Numeric blue display button next to Working Maximum SP. A Numerical Input screen appears. Type in the desired maximum pressure and Press the **Enter** key.
- 3 Press the Numeric blue display button next to Working Minimum SP. A Numerical Input screen will appear. Type in the desired minimum pressure and Press the **Enter** key.

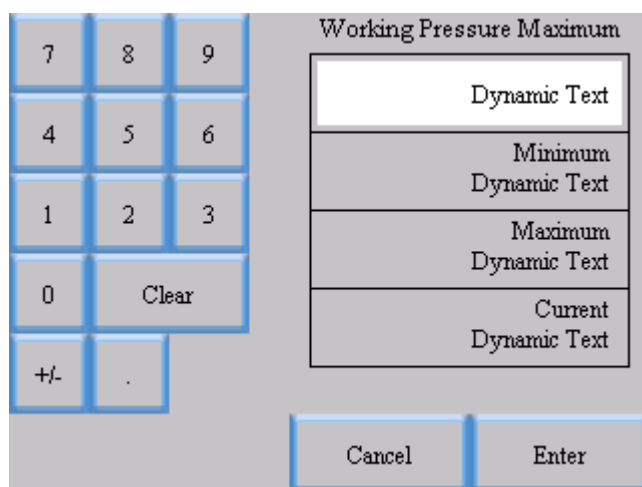


Figure 31 Numerical Input screen

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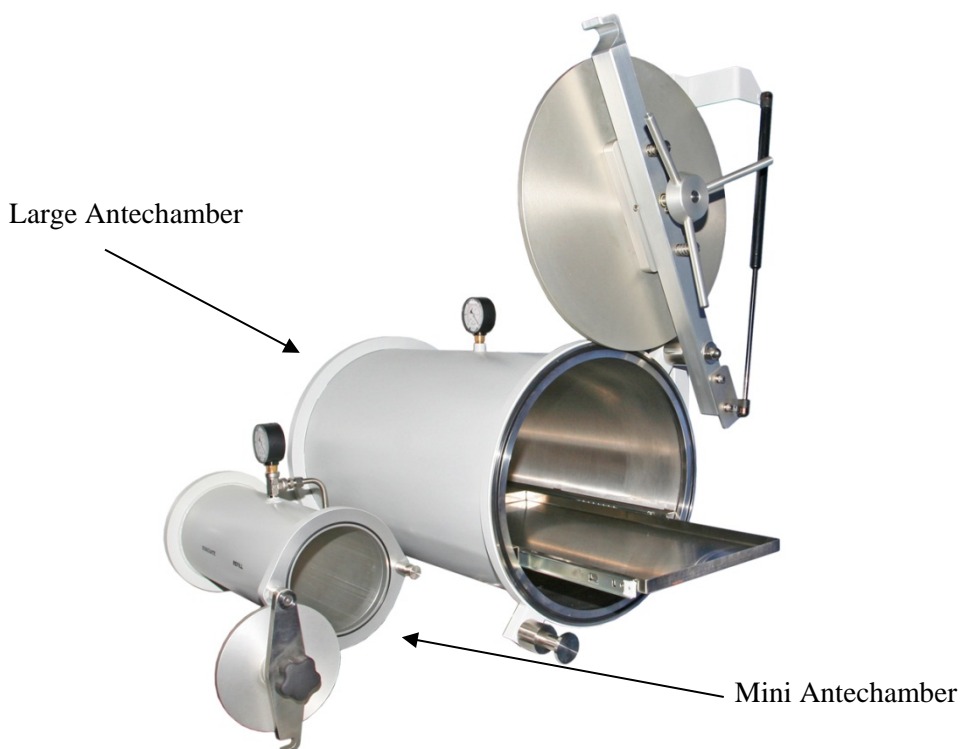
The Glovebox will automatically adjust the Glovebox pressure to be between these two limits.

## 5.2 Using the Antechambers

### 5.2.1 Manual Antechamber Control

This section describes the manual operation of the large Antechamber. Specifically, it lists the steps necessary to transfer an object into and out of the Glovebox. These steps assume that the atmosphere inside the chamber is pure and not open to the outside air.

Introducing an item into the Glovebox using the Large Antechamber



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Figure 32 Large and Mini Antechambers

- 1 Ensure that the inner door is fully closed.
- 2 Ensure that the refill valve is closed.
- 3 Open the outside door and insert the object into the Antechamber.
- 4 Close the outside door.
- 5 Open the vacuum valve to evacuate the Antechamber (-29 in. HG ).
- 6 Close the vacuum valve and open the refill valve until the pressure reads -15 in HG.
- 7 Repeat steps 5) and 6 at least three times, finally refilling to atmospheric pressure.
- 8 Close the refill valve.
- 9 Open the inner door and remove the object from the Antechamber.

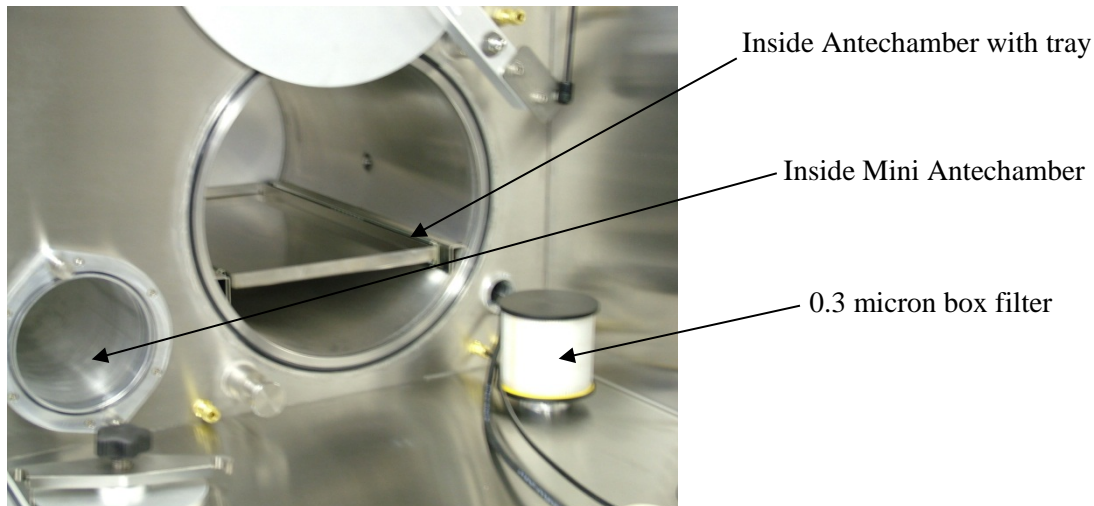


Figure 33 Inside Antechambers

### 5.3 Removing an Item from the Glovebox Using the Large Antechamber

It is extremely important that the Antechamber contains purified gas since opening the inner door will expose the box to the Antechamber. If you are not certain of the status of the Antechamber, then evacuate and refill 3 times before proceeding.

We suggest that you keep the Antechamber under vacuum. This will prompt you to refill before proceeding.

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- 1 Ensure that the outside door is fully closed.
- 2 Ensure that the refill valve is closed.
- 3 Open the inner door.
- 4 Insert the object into the Antechamber and close the inner door.
- 5 Open the outside door and remove the object.

### 5.4 Mini Antechamber

The same precautions above are true for the mini Antechamber.

This section describes the manual operation of the mini Antechamber. Specifically, it lists the steps necessary to transfer an object into and out of the Glovebox. These steps assume that the atmosphere inside the chamber is pure and not open to the outside air.

#### 5.4.1 Introducing an Item into the Glovebox Using the Mini Antechamber

- 1 Ensure that the inner door is fully closed.
- 2 Ensure that the 3-way valve for mini is closed.
- 3 Open outside door and insert the object.

- 4 Close outside door.
- 5 Turn 3-way valve to evacuate.
- 6 Evacuate to best level of vacuum (-29 hg).
- 7 Turn 3-way valve to refill.
- 8 Repeat steps 5 through 7 at least three times.
- 9 Close 3-way valve.
- 10 Open inner door and remove object from chamber.

#### 5.4.2 Removing an Item from the Glovebox Using the Mini Antechamber

- 1 Ensure that the outside door is fully closed.
- 2 Ensure that the 3-way valve for mini is closed.
- 3 Open inner door and insert the object.
- 4 Close inner door.
- 5 Open the outer door and remove the object.

Since the chambers share common vacuum and gas piping, we do not recommend using both at the same time.

#### 5.5 Automatic Antechamber Control

This feature is only displayed if your system has been factory-fitted with automatic Antechamber control.

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Pressing the “Automatic Antechamber Control” button brings up the following screen:

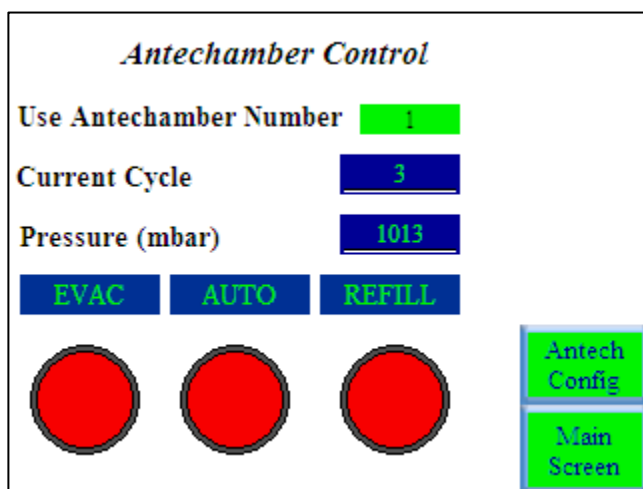


Figure 34 Antechamber Control screen

<b>Use Antechamber Number</b>	Allows the user to select which Antechamber to automatically control. Typical systems will have one large Antechamber equipped with automatic control.
<b>Current Cycle</b>	Indicates how many evacuate/refill cycles have already been completed.
<b>Pressure (mbar)</b>	Indicates the absolute pressure within the Antechamber as measured with by the digital vacuum gauge.
<b>EVAC</b>	Pressing this evacuates the Antechamber. Press again to stop evacuating.
<b>REFILL</b>	Pressing this refills the Antechamber with inert gas from the Glovebox. Press again to stop refilling.
<b>AUTO</b>	Pressing the AUTO button causes the button to turn Green and start the evacuate/refill sequence. The individual steps associated with this are accessed and changed in the 'Antechamber Config' screen.

### Antechamber Config

*Antechamber Config*

Auto Evacuate SP (mbar) **1**

Antechamber Cycles **3**

Auto Refill Duration (Sec) **20**

Auto Final Refill (Sec) **60**

**Antech Control** **Main Screen**

Figure 35 Antechamber Config screen

<b>Auto Evacuate SP (mbar)</b>	The set point that the Antechamber will be evacuated to.
<b>Antechamber Cycles</b>	Determines the number of evacuate/refill cycles that occurs under Automatic operation.
<b>Auto Refill Duration (sec)</b>	Determines the duration of all refills except the final refill.
<b>Auto Final Refill</b>	Determines the duration of the final refill.

## 5.6 Introducing an Item into the Glovebox Using the Large Antechamber

- 1 Ensure that the inner door is fully closed.
- 2 Ensure that the refill valve is closed.
- 3 Open the outside door and insert the object into the Antechamber.

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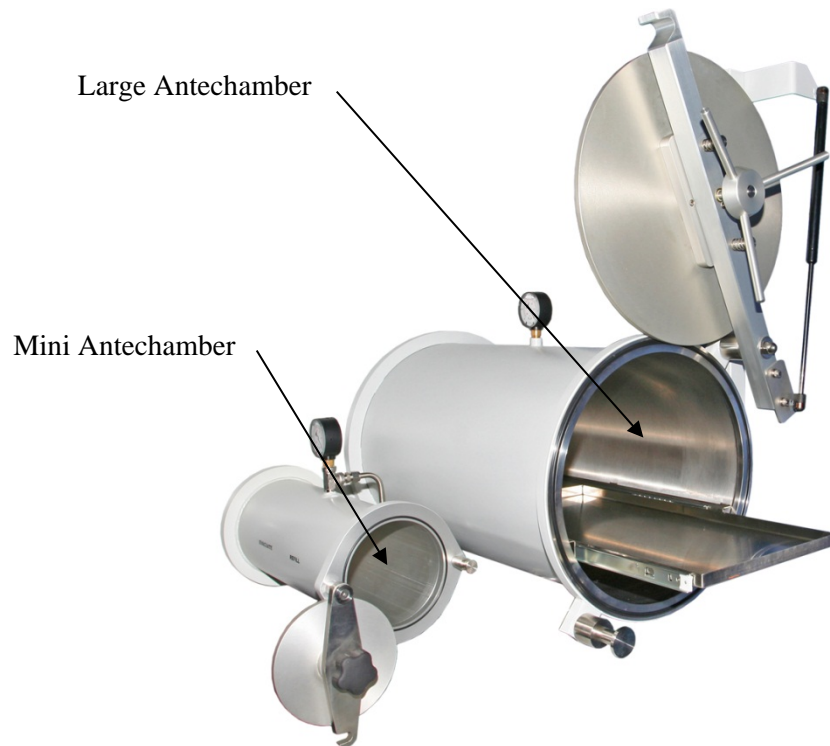


Figure 36 Inserting an object into the Antechamber

- 4 Close the outside door.
- 5 Press the Auto button.

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The system evacuates and refills as many cycles as programmed.

The system final refills.

- 6 Open the inner door and remove the object from the Antechamber

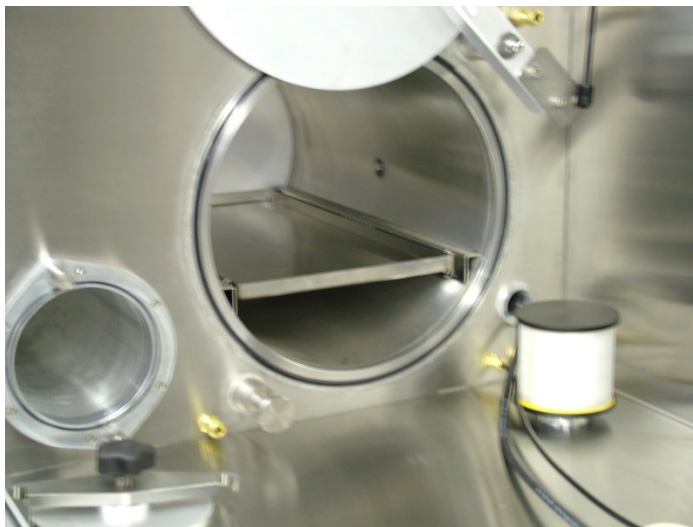


Figure 37 Removing object from Antechamber

## 5.7 Removing an Item from the Glovebox Using the Large Antechamber

It is extremely important that the Antechamber contains purified gas because opening the inner door will expose the box to the Antechamber. If you are not certain of the status of the Antechamber, then evacuate and refill 3 times before proceeding.

We suggest that you keep the Antechamber under vacuum. This will prompt you to refill before proceeding.

- 1 Ensure that the outside door is fully closed.
- 2 Ensure that the refill valve is closed.
- 3 Open the inner door.
- 4 Insert the object into the Antechamber and close the inner door.
- 5 Open the outside door and remove the object.

## 5.8 Purge Valves

Manual Purge Valve – As standard the Glovebox is fitted with a hand-operated 2-Way Ball Valve that is used to manually displace atmosphere from the Glovebox. The valve must be closed fully after purging process to prevent loss of box pressure.

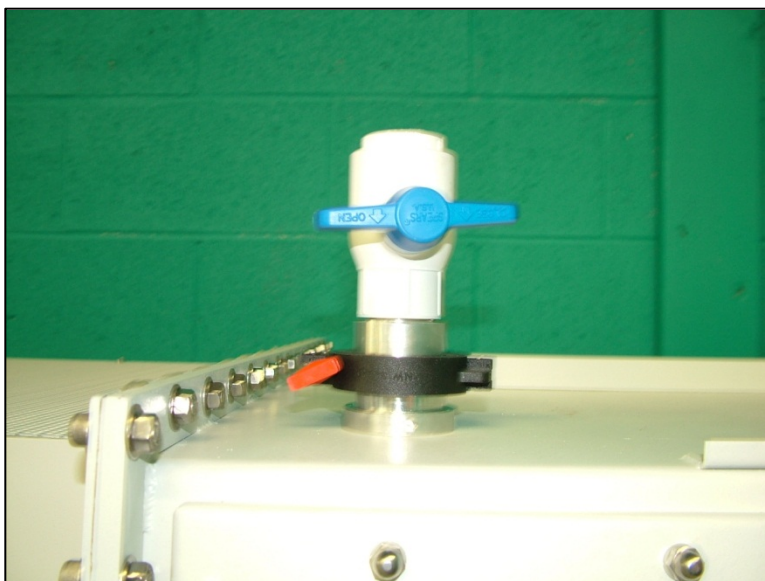


Figure 38 Hand-operated 2-Way Ball Valve

### 5.8.1 Automatic Purge Valve

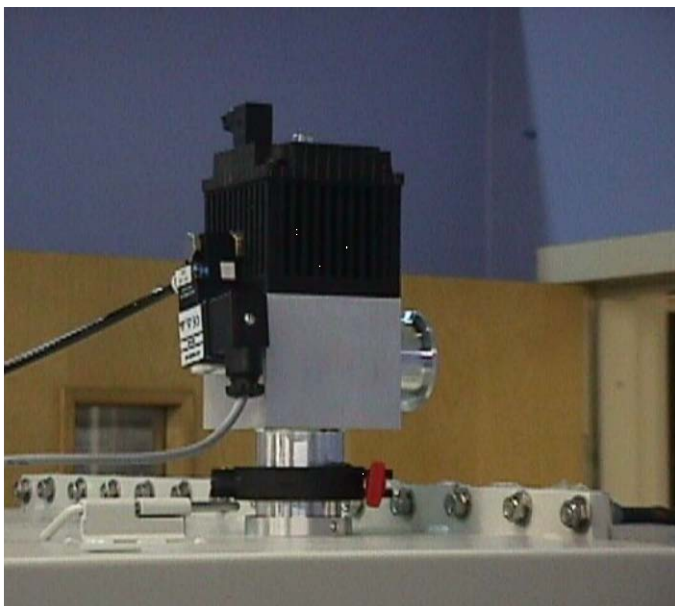


Figure 39 Automatic purge valve

This feature is only available if your system has been factory-fitted with an automatic purge valve.

Pressing the “Purge Control” button brings up the following screen (Figure 40):

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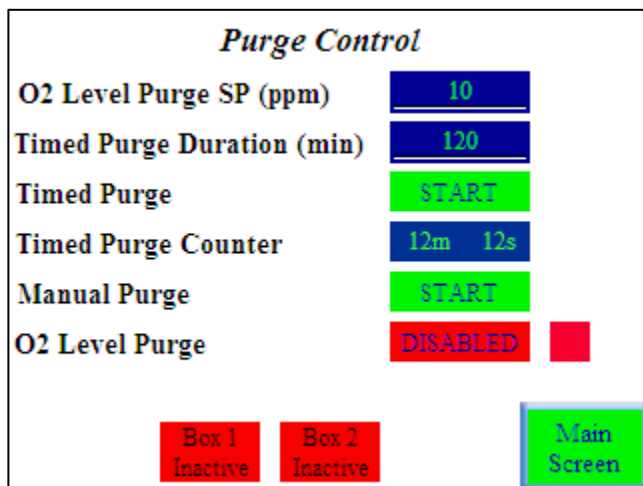


Figure 40 Purge Control screen

<b>O2 Level Purge SP (ppm)</b>	If the system is fitted with an oxygen analyzer this setting will open the automatic purge valve if the oxygen level exceeds the set value. This value can be changed by pressing the value and entering the desired value on the numeric keypad. In order to operate this feature the “O2 Level Purge” must be ENABLED.
<b>Timed Purge Duration (min)</b>	This value sets the length of time that the automatic purge valve will be open if the “Timed Purge” is started.
<b>Timed Purge</b>	Pressing START initiates the timed purge.
<b>Timed Purge Counter</b>	The counter indicates the elapsed time since the Timed Purge was started. After the time limit is reached, the automatic purge valve closes.
<b>Manual Purge</b>	Pressing START opens the automatic purge valve. The purge valve remains open until STOP is pressed.
<b>Box 1 Active/Inactive</b>	Indicates whether Box 1 can be purged using the auto purge valve.
<b>Box 2 Active/Inactive</b>	Indicates whether Box 2 can be purged using the auto purge valve.

**Note:** Initiating any purge sequence while the blower is running will switch off the blower until the purge sequence is complete. The blower will automatically restart after the purge sequence is complete.

## 5.9 Regeneration

Pressing the “Regen Control” button brings up the following screen (Figure 41):

This screen allows the user to initiate a regeneration of the purification column.

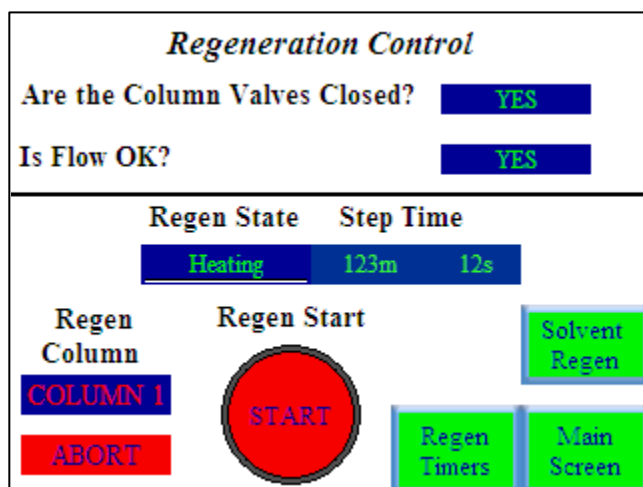


Figure 41 Regeneration Control screen

The purification column contains a mixture of copper-based catalyst to absorb oxygen and molecular sieve to absorb moisture. Over time these materials will become saturated and will no longer be able to absorb the oxygen and water. The regeneration process allows these materials to be returned to their original state thus allowing continued scrubbing of oxygen and moisture.

To maintain optimal performance it is recommended to change the purifier catalyst every three years.

**WARNING:** The final step (step 5 Cooling) of the regeneration process exposes the freshly-regenerated purifier material to the Glovebox atmosphere. The Glovebox must contain less than 100 ppm oxygen prior to starting the regeneration.

A regeneration cycle comprises five steps as shown below (Figure 42). The default times are shown and are measured in minutes.

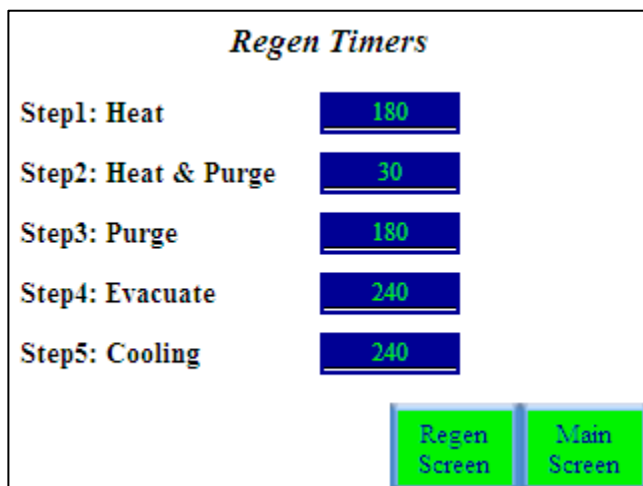


Figure 42 Regen Timers screen

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### 5.9.1 Single-Column Purification System Regeneration Procedure

- 1 Connect a cylinder of regeneration gas (forming gas) to the regen gas connection on the rear of the gas purification module. The regeneration gas must contain 3 to 7% hydrogen with the balance being nitrogen or argon. Ensure that the connections are tightened correctly. Open the regulator and set it to 7 psi.
- 2 Turn off the Blower on the Main screen. On a single column system this automatically closes the purification column valves.
- 3 Press the START button.
- 4 Press the Yes button next to "Are the Column Valves Closed?" A "click" will be heard as the solenoid valves open to allow regeneration gas to flow.  
**Note:** All column isolation valves have a yellow indicator tab. This yellow tab is not visible when the valve is closed.
- 5 Adjust needle valve on the regeneration flow meter located on the front of the gas purification module to set the flow to 25-30 scfh on the graduated scale on the flow meter.
- 6 Press **Yes** next to "Is Flow OK?". At this point the regeneration gas will stop flowing. "Step 1. Heating" begins. The Regen Status displays as Heating and the timer begins to count up. The Regeneration Status is also shown on the Main Screen.
- 7 The system automatically progresses through the regeneration steps 1 to 5. At the conclusion of the regeneration sequence the blower automatically turns back on if this feature has been



enabled in the “System Config” Screen. The blower can also be turned on using the Blower Start button.

## 5.10 Dual-Column Purification System Regeneration Procedure

Dual column purification systems allow the regeneration of one purifier column while still circulating the Glovebox atmosphere through the second column. This permits constant uptime.

Initiating a regeneration on a dual column system automatically regenerates the column that is NOT in use. The column in use can be selected from the “System Config” Screen (Figure 43).

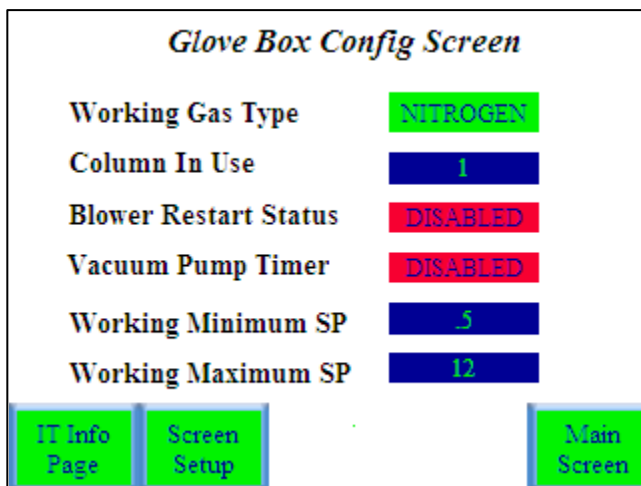


Figure 43 Glove Box Config screen

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If the “Column In Use” is shown as “1” then pressing the blue bar brings up a numeric entry keypad. To select column 2, press number **2** and then enter.

To regenerate perform steps 1, 3,4,5,6 as for the single column purification system regeneration. The blower should remain switched on during the regeneration of a dual column system,

## 5.11 Solvent Regeneration

### 5.11.1 Solvent-Column System Regeneration Procedure

**Note:** Blower does not need to be turned off.

- 1 Connect a cylinder of high purity Inert Gas (Nitrogen or Argon) to the regen gas connection on the rear of the gas purification module. The Inert gas should be 99.998 nitrogen or argon. Ensure that the connections are tightened correctly. Open the regulator and set it to 7 psi.
- 2 Open the by-pass valve (labeled A in Figure 44 below). This is located in the Gas Purifier. The top must be removed to access valve

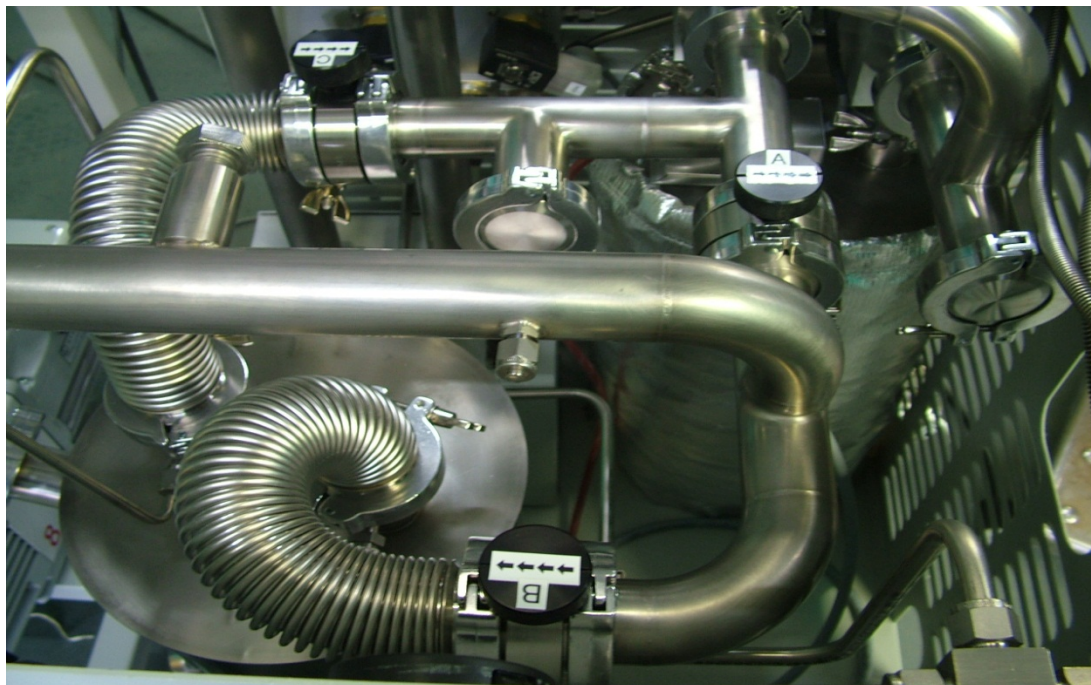


Figure 44 Gas purification module

- 3 Close the isolation valves (labeled B & C) connected to the solvent column. This is located in the Gas Purifier. The top must be removed to access valve.
- 4 From the Main Control Screen select Regen Control. Then select Solvent Regen.

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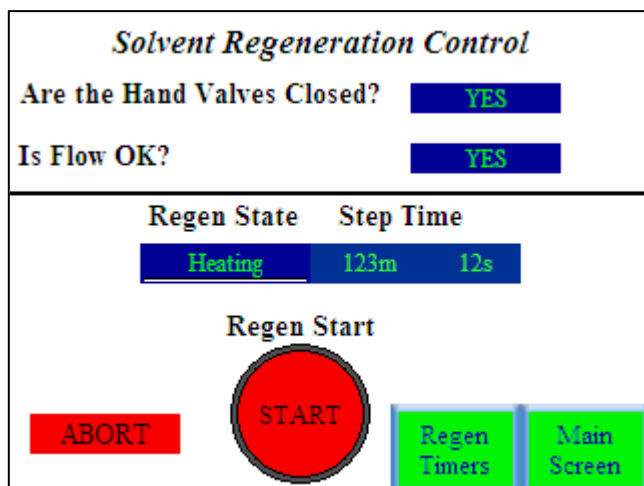


Figure 45 Solvent Regeneration Control screen

- 5 Press the START button (Figure 45).
- 6 Press the **Yes** button next to “Are the Column Valves Closed?” A “click” will be heard as the solenoid valves open to allow regeneration gas to flow.
- 7 Adjust needle valve on the regeneration flow meter located on the front of the gas purification module to set the flow to 25-30 scfh on the graduated scale on the flow meter.

- 8 Press **Yes** next to “Is Flow OK?”. At this point the regeneration gas stops flowing. Step 1. Heating begins. The Regen Status shows as Heating and the timer begin to count up. The Regeneration Status is also shown on the Main Screen.
- 9 The system automatically progresses through the regeneration steps 1 to 5.
- 10 Upon completion of the solvent regeneration, open the column isolation valves (B & C), then close the Solvent by-pass valve (A).

## 5.12 Analyzers

### 5.12.1 O2 Analyzer

When shipped, the oxygen analyzer valves are closed as shown in Figure 46 below:

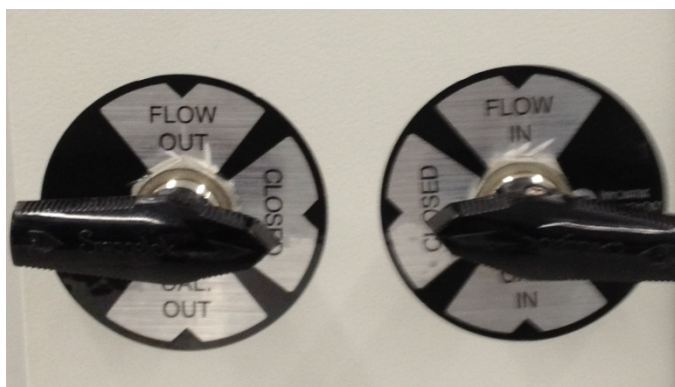


Figure 46 Oxygen analyzer valves – “Closed” position

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**WARNING:** The analyzer isolation valves should remain closed until the Glovebox has been properly purged.

In order to monitor the oxygen content inside the Glovebox, the left Valve must be turned to the “Flow Out” Position and the Right Valve must be turned to the “Flow In” position as shown in Figure 47 below:

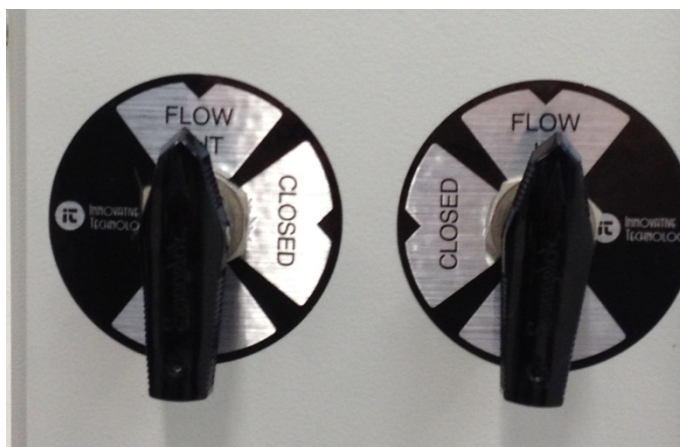


Figure 47 Oxygen analyzer valves – “Flow Out” position

The Oxygen analyzer is designed specifically for detecting trace amounts of oxygen in inert gases. The operational range of this analyzer is 0.1 to 1,000 ppm.

**Note 1:** The analyzer requires that the small batching pump inside the Glovebox be connected and powered on at all times.

**Note 1:** The analyzer is calibrated at the factory prior to shipment.

### 5.13 Moisture Analyzer

The moisture analyzer sensor is aluminum oxide ultra-high capacitance designed. It incorporates automatic temperature compensation. It is mounted in the gas stream piping.

It is shipped with a calibration certificate traceable to international standards.

The moisture content is shown on Main Screen of the Color HMI touch screen in ppm.

#### Freezer

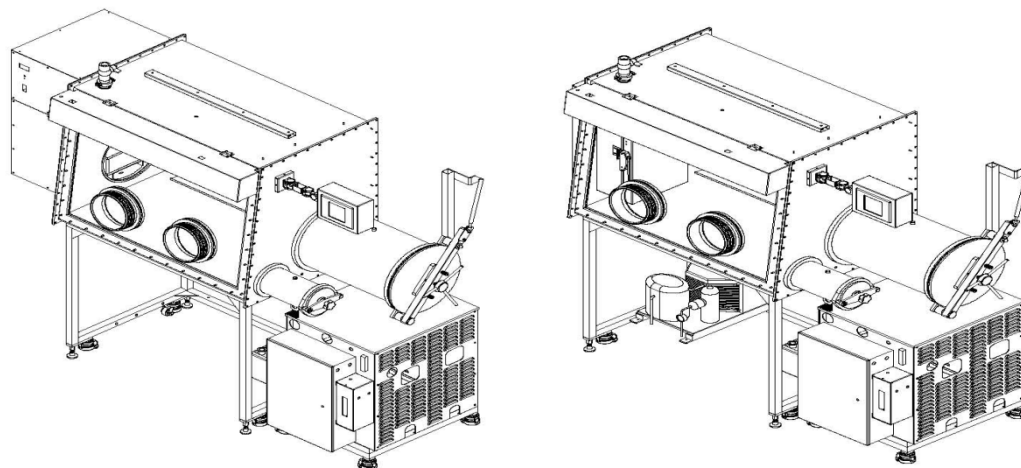


Figure 48 Moisture Analyzer

The freezer is controlled from the HMI.

Pressing the “Freezer Control” button brings up the following screen (Figure 49):

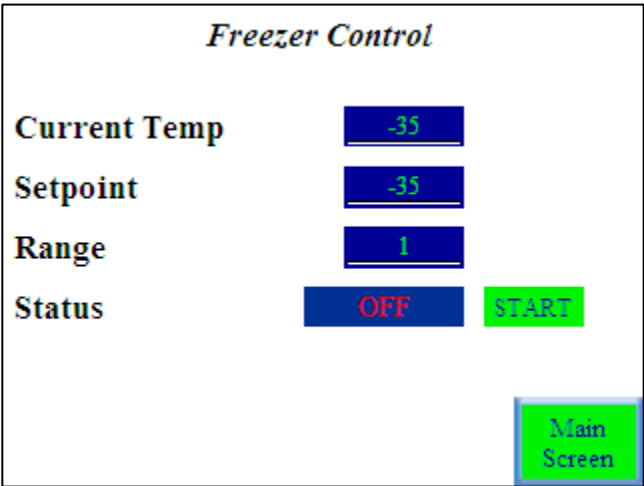


Figure 49 Freezer Control screen

<b>Current Temp</b>	Indicates the actual temperature (°C) inside the freezer.
<b>Set point</b>	Allows the temperature inside the freezer to be adjusted. Max set point is -35 c.
<b>Range</b>	The deviation +/- °C from the set point.
<b>Status</b>	Turns the freezer On and Off. By pressing the green start button or red stop button.

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**Shelves**

Cylindrical freezer has a sliding tray with 2 or 3 shelves.

Rectangle freezer has 5 removable shelves.

**5.13.1 Box Cooling Control**

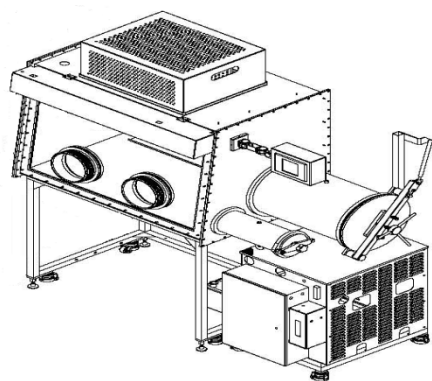


Figure 50 Box Cooling Control

This feature is only displayed if your system has been factory-fitted with Box Cooling.



Pressing the “Box Cooling Control” button brings up the following screen (Figure 51):

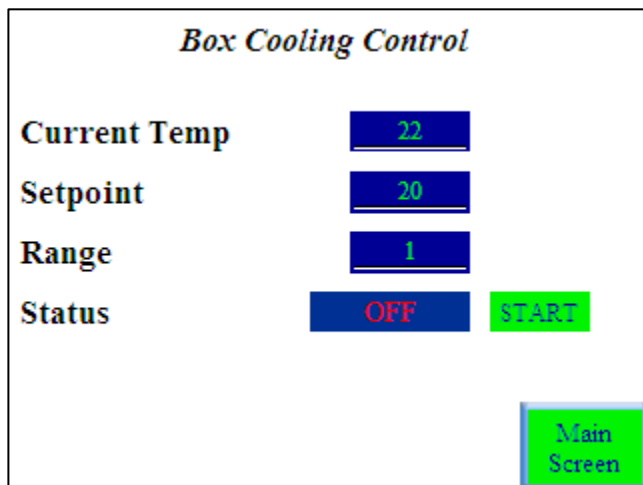


Figure 51 Box Cooking Control screen

<b>Current Temp</b>	Indicates the actual temperature (°C) inside the Glovebox.
<b>Set point</b>	Allows the temperature inside the Glovebox to be adjusted.
<b>Range</b>	The deviation +/- °C from the set point.
<b>Status</b>	Turns the Box Cooling On and Off. By pressing the green start button or red stop button.

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**Note:** Boxing will remove 10 degrees for ambient system temp.

## 5.14 Heater Control

This feature is only displayed if your system has been factory-fitted with a heated Antechamber.

Pressing the “Heater Control” button brings up the following screen (Figure 52):

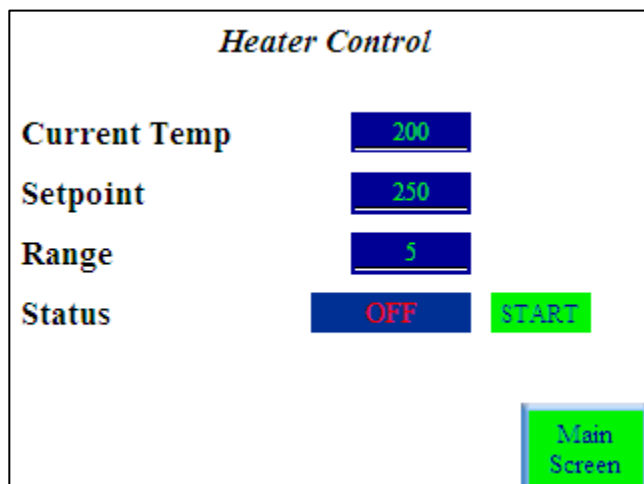


Figure 52 Heater Control screen

<b>Current Temp</b>	Indicates the actual temperature (°C) inside the heated Antechamber.
<b>Set point</b>	Allows the temperature inside the Antechamber to be adjusted up to 250 C.
<b>Range</b>	The deviation +/- °C from the set point.
<b>Status</b>	Turns the Heater On and Off. By pressing green start button or red stop button.

**WARNING:** Users can be burned if Ante chamber is not operated properly.

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#### 5.14.1 Parallel – Piped Systems

Parallel-piping offers the convenience of using a single purifier to control two separate Glovebox modules. It is intended that the primary mode of operation will be both Glovebox modules running simultaneously. In this case the atmosphere inside each Glovebox module is being circulated through the purifier column. The O<sub>2</sub> and H<sub>2</sub>O values displayed are representative of the atmosphere in both Gloveboxes as they share a common atmosphere. Each Glovebox module (1 & 2) is fitted with automatic valves on the gas inlet and outlet to allow isolation of the 2 Glovebox modules.

One Glovebox module is defined as Box 1 and the other module is Box 2.

Under the sub screen Blower Control. The system can operate 3 ways.

**Press for Box 1** – Selecting this will change the button to green to indicate that the purifier will only interact with Box 1. Pressure will only be controlled in Box1 and the displayed O<sub>2</sub> and H<sub>2</sub>O values are for Box 1 only.

**WARNING:** In this state Box 2 is completely isolated and should not be used. This mode would typically be used to enable Box 2 to be opened to air for cleaning while continuing to circulate Box 1 atmosphere through the purifier.

**Press for Box 2** – Selecting this will change the button to green to indicate that the purifier will only interact with Box 2. Pressure will only be controlled in Box 2 and the displayed O2 and H2O values are for Box 2 only.

**WARNING:** In this state Box 1 is completely isolated and should not be used. This mode would typically be used to enable Box 1 to be opened to air for cleaning while continuing to circulate Box 2 atmosphere through the purifier.

**Press for Both** – Selecting this changes the button to green to indicate that the purifier will circulate through both Box 1 AND Box 2 when the blower is started.

**Note:** For the three modes of operation described above the Blower Start button must be used to initiate circulation.

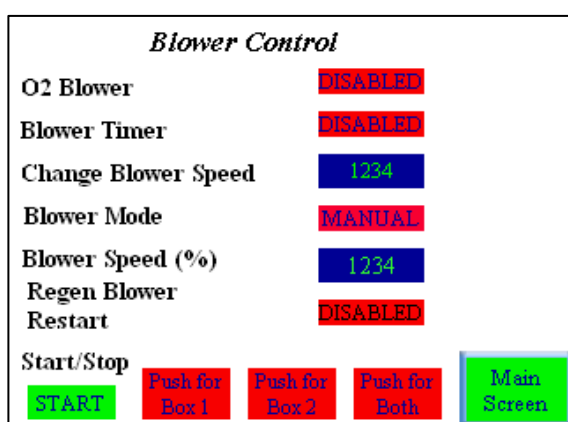


Figure 53 Blower Control screen

### Purging Parallel Piped System

The user must select which Box (1 or 2) to purge.

Manual Purge – Only open the purge valve on the selected Glovebox module (1 or 2).

See “Purge Control” on page 31 for further details.

### Auto Purge

**Press for Box 1** – Selects the module labeled Box 1 to be purged (See “Purge Control” on page 31) (Purge control – refer to Purge Control Screen in Figure 54 below) Box 1 Active button will be Green indicating that it will be purged. Box 2 will be isolated.

**Press for Box 2** – Selects the module labeled Box 2 to be purged (See “Purge Control” on page 31) (Purge control – refer to Purge Control Screen in Figure 54 below) Box 2 Active button will be Green indicating that it will be purged. Box 1 will be isolated

**Note:** Only one module should be selected to purge at a given time.

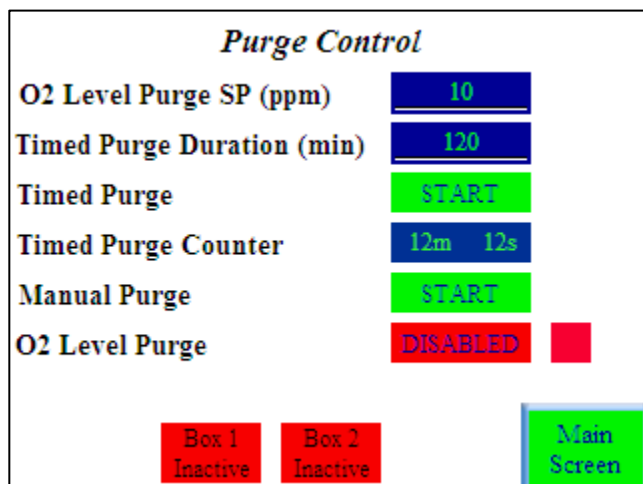


Figure 54 Purge Control screen

## 5.15 Solvent Removal Systems

Various sizes of solvent removal systems are available. These are optional extras that can absorb solvent vapors that would otherwise contaminate the purification media.

### 5.15.1 Large Capacity Solvent Removal

There are three isolation valves labeled A, B, and C. The isolation valves dictate the flow of box atmosphere, routing it directly to the purification column or through the solvent removal column prior to the purification column. There are arrows on these valves, indicating the direction of flow through them. To open them, turn the black knob counterclockwise. To close them, turn the black knob clockwise.

The evac/refill valve is located on the front of the unit. To the left of the valve is a pressure gauge that indicates the pressure inside the solvent removal column. Evacuate will open the solvent removal column directly to the vacuum pump. Refill will expose it to the box atmosphere as well as the incoming working gas supply.

### 5.15.2 Opening the Solvent Removal Column

- 1 Refill the column by turning the evac/refill valve to refill until the pressure gauge has returned to 0, and then close the valve.
- 2 Open isolation valves B and C.
- 3 Close isolation valve A. It is important that B and C be opened prior to A being closed so that flow to the blower will not be interrupted.
- 4 The flow of box atmosphere is now passing through the solvent removal column prior to passing through the purification column.

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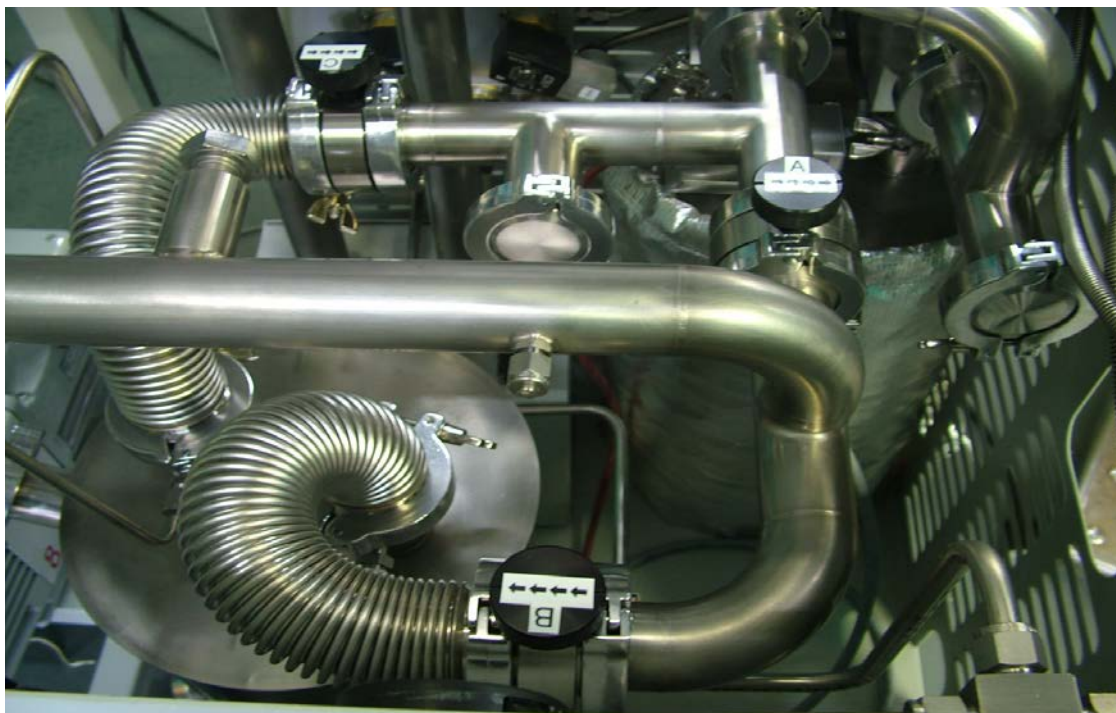


Figure 55 Solvent Removal Column - Open

### 5.15.3 Isolating the Solvent Removal Column and Removing Solvent Vapors

- 1 Open isolation valve A. This allows the system to continue to circulate through the purification column.
- 2 Close isolation valves B and C. This isolates the solvent removal column so that you can evacuate it without affecting the rest of the system. It is important to open valve A prior to closing B and C so that flow to the blower is not interrupted.
- 3 Turn evac/refill valve to evacuate.
- 4 Allow vacuum to pull on the column for at least 24 hours.
- 5 To begin circulation through the solvent removal column again, see “*Opening the Solvent Removal Column*” on page 57.

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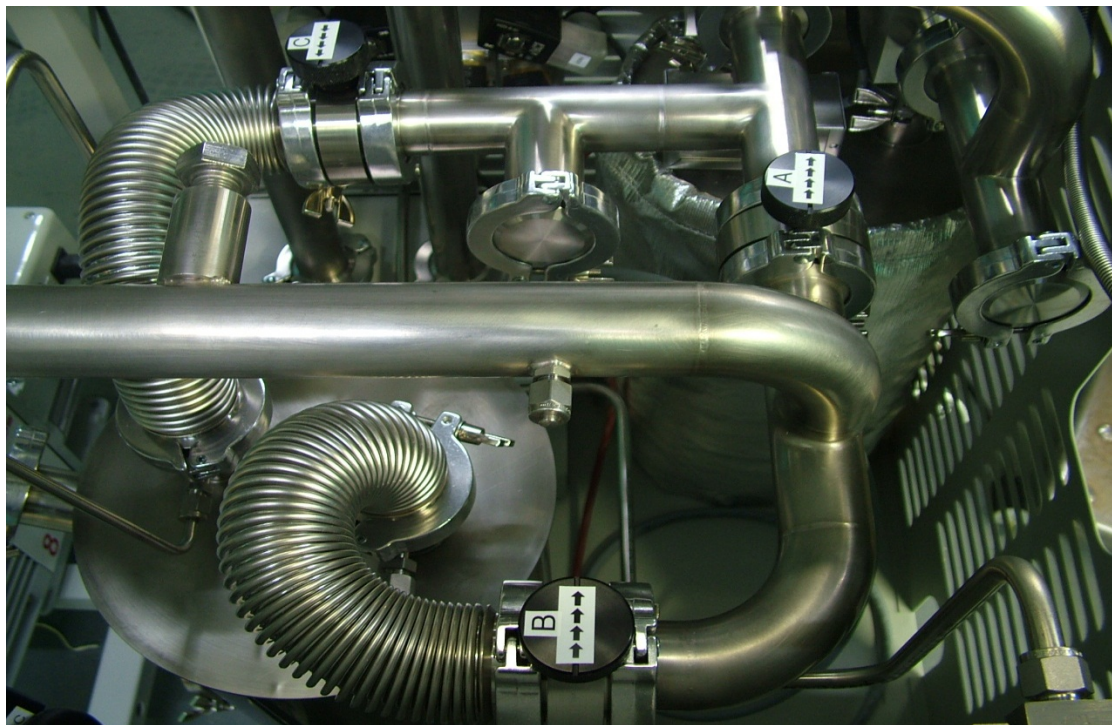


Figure 56 Solvent Removal Column – Closed

#### 5.15.4 Replacing the Carbon Charge in a Solvent Removal Column

- 1 Follow the instructions for isolating the solvent column and removing solvent vapors on page 58.
- 2 Turn the evac/refill valve to refill until the pressure in the column has returned to 0.
- 3 Close the evac/refill valve.
- 4 Place receptacle below the Empty Port to catch the old carbon charge.
- 5 Remove the Fill Port clamp and blank.
- 6 Remove the Empty Port blank and begin to collect the old carbon charge.
- 7 Replace the Empty Port clamp and blank. Make sure the centering ring is clean.
- 8 Pour new carbon charge into Fill Port. Use a funnel if necessary.
- 9 Turn evac/refill valve to evacuate and allow vacuum to pull on the column for at least 48 hours.
- 10 To begin circulation through the solvent removal column again, see “*Opening the Solvent Removal Column*” on page 57.

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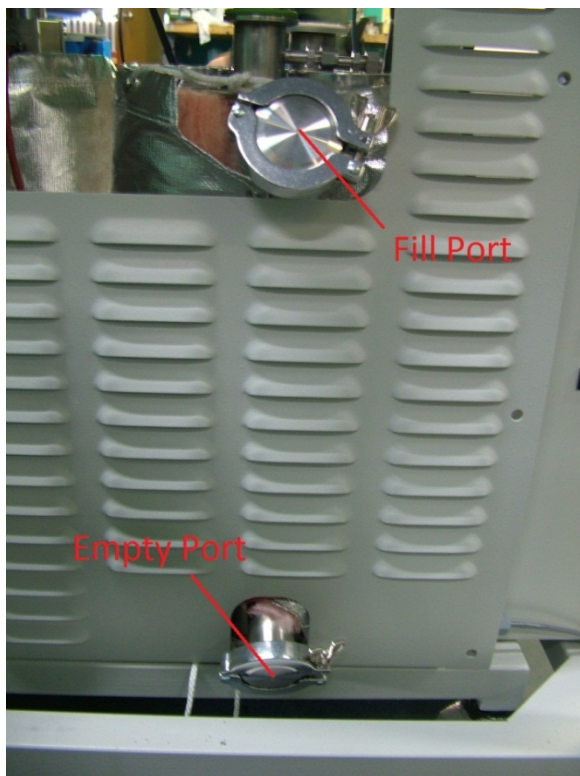


Figure 57 Fill and Empty Ports

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Figure 58 Evac/Refill Valve at Evacuate

## 5.16 Large Capacity Regenerable Solvent Removal

Operates identical as the large capacity solvent removal while having the added ability to regenerate the material with in the column.

See “*Solvent Regeneration*” on page 49 for further details.

### 5.16.1 Small Capacity Solvent Removal – External



Figure 59 Small Capacity Solvent Removal – External

This contains an activated carbon-impregnated filter element. It is located in the Glovebox circulation piping.

**WARNING:** It is fitted with an isolation valve that **MUST** remain OPEN at all times when the Glovebox is running.

#### Replacing the filter element

- 1 Turn off the blower. Power down the Glovebox using the main power switch on the gas purification module.
- 2 Close the isolation valve on the housing of the solvent removal system. See Figure 59 above.
- 3 Twist the clear base counter-clockwise to open the trap.
- 4 Replace the filter element.
- 5 Screw the clear base back into the lid.
- 6 Open the isolation valve.
- 7 Power the system on.
- 8 Purge the Glovebox until the O<sub>2</sub> level is less than 50 ppm. See “Purging” on page 21.
- 9 Turn on the blower.

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### Small Capacity Solvent Removal – Internal



Figure 60 Small Capacity Solvent Removal – Internal

This replaces the Glovebox HEPA filter on the suction side of the gas purification system. It is filled with activated carbon. It should be unscrewed before purging the Glovebox to prevent activated carbon particles being dispersed inside the Glovebox. Cartridge must be removed from Glovebox to be emptied and refilled.

## 6 Routine Maintenance

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Regular preventive maintenance will help to reduce box problems that cause down time and increase the overall performance of the system. Different environments require different maintenance intervals, but the following are the recommended minimum levels of service required.

### 6.1 Daily Tasks

- Check the gloves for wear or holes. Check that they are seated properly and that the exterior “O” rings are in place. Replace worn or defective gloves or “O” rings as soon as possible. See “*Removal and Replacement Procedures*” on page 71.
- Inspect the exterior of the system. Ensure that it is kept free from excessive dirt. Check that the piping is intact and that all gas supply and vent lines are well connected. If necessary, clean the exterior. Tighten any loose connections.
- Check that the gas supply is sufficient and the flow is adequate. If necessary, replace the gas supply and adjust the flow rate.

### 6.2 Weekly Tasks

- Check and replace, if necessary, the vacuum pump oil. This step is crucial to the life of the pump and its ability to perform to specifications. Because each pump is different, refer to the pump manual for service procedures.
- Check the ante chambers “O” rings. Replace them if they are worn.
- Check the box filters. Replace if necessary.

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### 6.3 Annual or Semi Annual Tasks

- If the purification capability of the column is not sufficient (it can no longer maintain low oxygen and moisture levels), regenerate the filter column material.
- If time between regenerations has become minimal, replace filter column material.
- Replace box filters.

### 6.4 Safety Inspections

- Inspect all box wiring for signs of wear or damage. Replace any suspect wiring found during the inspection.
- Inspect the window for signs of stress or cracks. Replace as needed.
- Never place or stack materials, tools, or documentation on any part of the Glovebox exterior surfaces except for those that are designed for such purposes. Vibration or contact with people or other objects may cause the items to fall.

Follow all of the routine maintenance tasks listed in this section.



## 7 Troubleshooting

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These are some of the most frequently-asked questions and our responses.

***Problem: There is no working gas going into the Glovebox.***

Possible causes/solutions:

- If cylinder gas, is the tank empty? If empty, replace the tank.
- Is the regulator open? If closed, open the regulator.
- Is the needle valve on the regulator open? If not, open the valve.
- What is the gas pressure? If the pressure is too high the valve won't open. Pressure on a .MRC should be 55 PSI
- Is the electrical signal getting to the gas (GA) valve? The Valve will illuminate if it is receiving the proper voltage.
- Is the Working Minimum Pressure set higher than the current pressure box pressure? The system will not call for gas unless the box pressure drops below the Working Minimum set point.

***Problem: There is no regen gas flowing.***

**Note:** Regen gas will only flow after you have confirmed that the column valves are closed. After the regen starts the gas will no longer flow until the Purge stage of the regen begins.

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Possible causes/solutions:

- If cylinder gas, is the tank empty? If empty, replace the tank.
- Is the regulator open? If closed, open the regulator.
- Is the needle valve on the regulator open? If not, open the valve.
- Are the RG and EX valves illuminated?
- Is the flow meter on the front of the purifier cart open?

***Problem: The Antechamber won't hold a vacuum.***

Possible causes/solutions:

- Clean the Antechamber door and O-rings of debris. Replace the O-rings if necessary.
- Verify the refill valve is closed.
- Verify both doors are closed.
- Verify all fittings on the chamber are tight.

***Problem: Box is leaking.***

Possible causes/solutions:

- Normally a box will not begin to leak on its own. If none of the fittings have been modified the leak is most likely in the gloves. Inspect the gloves closely for leaks. Replace gloves as required.
- Verify that all Antechambers are left under a static vacuum and are not leaking.
- Refer to pressure test section of this manual. Record the rate of leakage.

***Problem: Vacuum pump is making noise or has reduced performance.***

Possible causes/solutions:

- Change the pump oil if it looks bad.
- Verify that all fittings connected to the vacuum pump are tight.
- If there is no improvement after changing the pump oil and checking the fittings upstream from the pump, put a vacuum gauge directly on the inlet of the pump. Refer to the pump manual for obtainable vacuum. If the pump cannot obtain specified levels repair or replace the pump.

***Problem: The window is "cloudy" or scratched.***

Possible causes/solutions:

- Safety glass can be washed with alcohol. Scratches in glass are not easily repaired, especially if they are on the inside. A glass company professional might repair scratches on the outside of the glass.
- Lexan, can be washed gently with mild soap or detergent using a soft cloth. Organic solvents such as aliphatic hydrocarbons, kerosene, or naphtha may also be used. To remove light scratches try automotive wax.

***When a Service Call is Necessary***

Should a service call be necessary, the more information that can be provided about the problem, the better we will be able to respond with a quality answer in a timely fashion. If a service call is necessary or you cannot resolve one of the above issues, call your local MRC representative for help.

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## 8 System Control Electronics

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### 8.1 General Description

The Glovebox is controlled through the use of the Color HMI Touch Screen. It directs box operation through the lower PLC control box, which generally turns on or off relays to control box pressure, circulation, purifier regeneration and other functions. Each of these subsystems are described in this section.

#### 8.1.1 PLC Controller

All inputs and Output are controlled by the PLC.

#### 8.1.2 Display panel

The display panel is Color HMI Touch Screen.

### 8.2 Lower Control Box

The Lower Control Box houses the following components:

- Power Supply
- PLC
- Connections
- Solid State Relays

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#### 8.2.1 Power Supply

The power supply generates 24 volts DC from an input of 115 volts AC. It can be strapped for operation at other input voltages. The 24 VDC is for the operation of the upper control electronics, the lower PC board, and for other miscellaneous components. It can easily be removed for repair or replacement.

#### 8.2.2 Box Pressure Sensor

This section connects the tubing from the box directly to the on board pressure sensor. The sensor input is calibrated and provided to the microprocessor.

#### 8.2.3 24 Volt Low Power Relays

This section of the board is where the PLC control lines activate or deactivate the low power relays. These relays then switch on and off other relays in the system. Note that there is an LED for each relay on the PLC. When this LED is illuminated, it indicates that 24 VDC is present on the switched or output side of the relay. When trouble shooting a control problem, this is the best indication that the box electronics are functioning properly, and that perhaps the higher power relay is not working.

Table 2 Relay Functions and Connections

Connector	Function	Connection
GAS	Gas valve, opens the box to the working gas source, increases box pressure.	Valve block, GA
VAC	Vacuum valve, opens the box to the vacuum pump, reduces box pressure.	Valve block, VA
AE1	Antechamber 1 evacuate, opens the chamber to the vacuum pump.	Antechamber 1
AE2	Antechamber 2 evacuate, opens the chamber to the vacuum pump.	Antechamber 2
AR1	Antechamber 1 refill, allows the Antechamber to refill from the box.	Antechamber 1
AR2	Antechamber 2 refill, allows the Antechamber to refill from the box.	Antechamber 2
BL1	Blower, activates the column 1 valves to enable the blower speed control to turn on the blower.	Column 1 valves
BL2	Blower, activates the column 2 valves to enable the blower speed control to turn on the blower.	Column 2 valves
CO1	Cooling, vents column 1.	Valve block, CO
CX1	Column 1 flow control, used in dual column systems.	Dual column in-line pipe
CX2	Column 2 flow control, used in dual column systems.	Dual column in-line pipe
EX1	Regeneration gas exit, column 1.	Main cell block, EX
FRZ	Freezer control.	Freezer Power Crydom
HTR	Heater control.	Furnace power Crydom
HT1	Heater control, column 1.	Heater Crydom
HT2	Heater control, column 2.	Heater Crydom
PG1	Automatic purge valve control.	Purge valve
PMP	Vacuum pump control.	Vacuum pump Crydom
RG1	Regeneration gas, opens column 1 to regeneration gas.	Valve block, RG
RG2	Regeneration gas, opens column 2 to regeneration gas.	Valve block, RG
RV	Regeneration vacuum, opens column 1 to the vacuum pump.	Valve Block RV
PG2	Automatic purge valve control.	Purge Valve

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### 8.2.3.1 Solid State Relays

This section of the board is where the PLC control lines activate or deactivate the solid state relays (SSR's). These SSR's then switch on and off motors and heaters in the system.

Table 3 Solid State Relays

Solid State Relay	Function
FRZ	Turn on AC power for the freezer motor. Only used in some systems.
BXC	Turn on AC power for the box cooling motor. Only used in some systems.
HTR	Turn on AC power for the heater element. Only used in some systems.
HT2	Turn on AC power for the heater for the second column in a dual column system.
HT1	Turn on AC power for a single column system's heater.
VP	Turn on AC power for the vacuum pump.

### 8.2.4 Circuit Breakers

Table 4 Circuit Breakers

Circuit Breaker #	Amperage 110/220 VAC	Function
1	15A/10A	Illuminated Main Power Switch
2	10A/5A	Vacuum Pump
3	6A/3A	24V Power Supply
4	5A/3A	Blower
5	4A/2A	Heater for Column 1
6	4A/2A	Heater for Column 2
7	5A/3A	Lighthouse

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## 8.3 Specifications

Table 5 Specifications

Input Operating Voltage and Frequency	110-120, 200-240 V~, 50/60Hz
Operating Temperature	10-40° Celsius
Relative Humidity	Non condensing 5% to 95% RH



## 9 System Components

### 9.1 Box Flow

The general box flow is described below. When circulation is on, gas is drawn by the blower from the box, through the column, and then back into the box. When the box requires a more positive pressure, valve 'GA' opens enabling working gas to enter the circulation loop prior to the column. This allows the gas to be purified before entering the box. When the box requires less pressure, valve 'VA' opens enabling the gas from the box to be drawn out by the vacuum pump. The remaining valves are for system regeneration purposes.

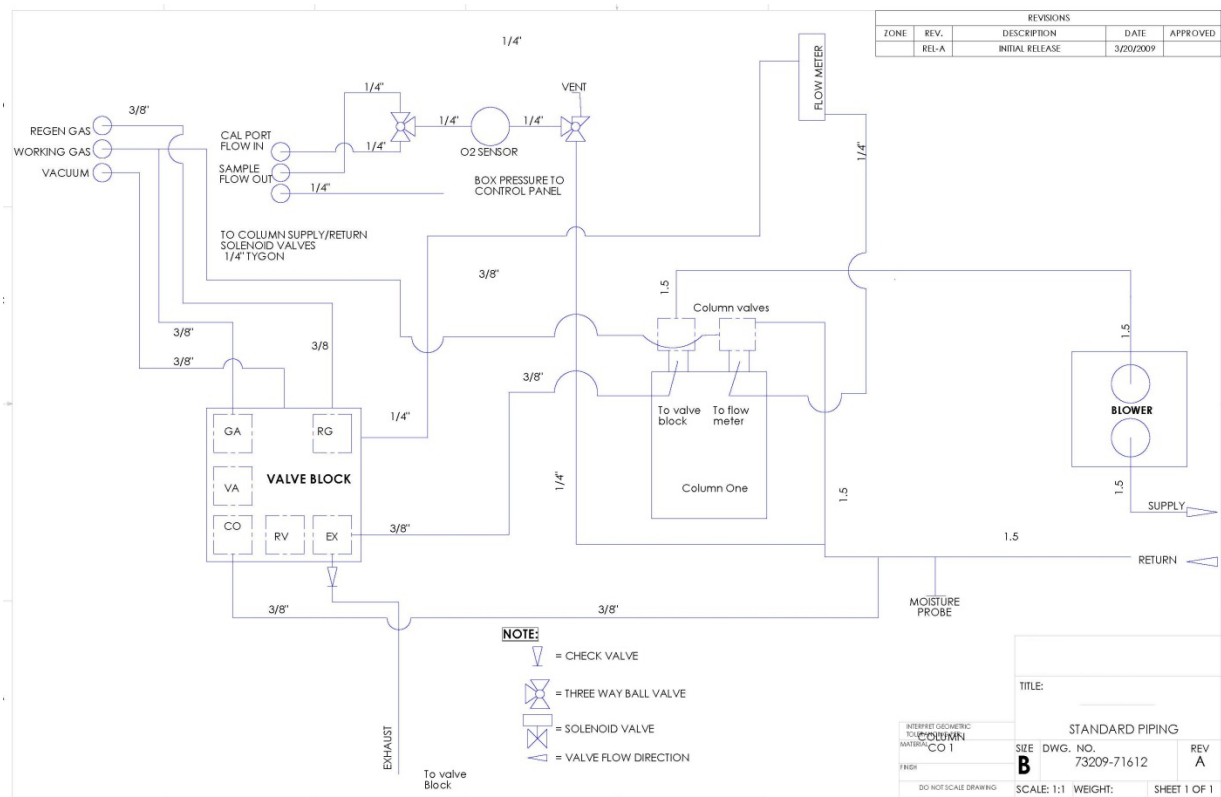


Figure 61 General Box Flow

#### 9.1.1 Piping and Valves

All piping and tubing is stainless steel unless otherwise specified. All electromagnetic valves are stainless steel with brass bases unless otherwise specified. All electro pneumatic valves are stainless steel unless otherwise specified.

#### 9.1.2 Column

The column contains the material that purifies the box gas, a heater for regeneration purposes, and a set of either manual or automatic valves that switch on or off the circulation of the box through the column. Construction is of stainless steel.

### 9.1.3 The Blower

The blower circulates the gas in the Glovebox through the column for purification. It is mounted inside an enclosure that is attached to the floor of the purifier module. The blower enclosure is connected through two pipes using two KF-40 connections.

#### 9.1.3.1 Variable Speed

The variable speed blower is fully variable from off through full speed. There is one electrical connection containing five wires. Two of the wires are for 115 VAC input power and the other two are for a 0 to 10 VDC reference voltage that controls the blower's speed. This reference voltage is provided by the PLC controller.

### 9.1.4 Vacuum Pump

The vacuum pump provides the means to reduce overall pressure levels in the main box and the Antechamber(s). It is electrically turned on via a Press button on the main control screen. In response to this user action, the PLC controller turns on a solid state relay. The relay supplies line voltage to turn on the pump. In response to a requirement to lower the box pressure, or pump down an Antechamber, the PLC will open valve, "VA", or "AE", respectively. The pump will turn on automatically if it is needed by the system.

### 9.1.5 Chambers

There are many different types of Antechambers available from MRC, Inc. However, the standard chamber is a 15" I.D. by 24" long cylinder mounted on the left or right side of the .box. In addition to this, a 6" x 15" mini Antechamber is also available on either side

## 10 Removal and Replacement Procedures

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These procedures are intended to be a guideline for removing and replacing various components of the system, for either routine maintenance or basic repair of the system. They are not intended to be exact step-by-step instructions. It is assumed that the person using these procedures is capable of performing basic mechanical and electrical tasks.

### 10.1 Blower

To replace the blower, proceed as follows.

- 1 Turn off the blower.
- 2 Turn off the system main power.
- 3 Remove the left side panel from the purifier module.
- 4 Remove the electrical connector from the blower.
- 5 Loosen and remove the two clamps that attach the piping. Cover the opening with KF-40 blanks or plastic caps to prevent excess outside air from entering the system.
- 6 Remove the blower box assembly and replace it with a new one.
- 7 If possible, purge the box piping with working gas.
- 8 Connect the piping with the clamps.
- 9 Connect the electrical connector.
- 10 Power the system on and check for leaks.

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### 10.2 Column

To replace the filter material in the purifier column you will need a vacuum cleaner, funnel, and a waste bins to collect old material.

- 1 Turn off the blower.
- 2 Turn off the system main power.
- 3 Place the waste bin under the bottom port of the column.
- 4 Remove the two KF-40 clamps and blanks from the side of the column.  
**Note:** As soon as the bottom blank is removed the filter material will begin to come out.
- 5 Drain the old material and use the vacuum to remove any remaining material.
- 6 Empty the entire contents of the purifier according to your safety regulations.
- 7 Replace the blank onto the bottom port of the column.
- 8 Use the funnel in the top port of the column and add half of the molecular sieve, all of the copper catalyst, and then the rest of the sieve.
- 9 Replace the blank to the top port of the column. Be certain that KF-40 connections are tight.
- 10 Restore the main power to the system.

- 11 Perform two regenerations of the column for optimum performance.
- 12 Resume normal system operation.

### 10.3 Filters

To replace the box filters, simply exchange them with new filters. They are installed hand tight and should be replaced the same way.

### 10.4 Gloves

Replacing a glove increases the risk of exposing the system to the outside environment. Prior to proceeding, ensure that every precaution is taken to protect the contents of the box.

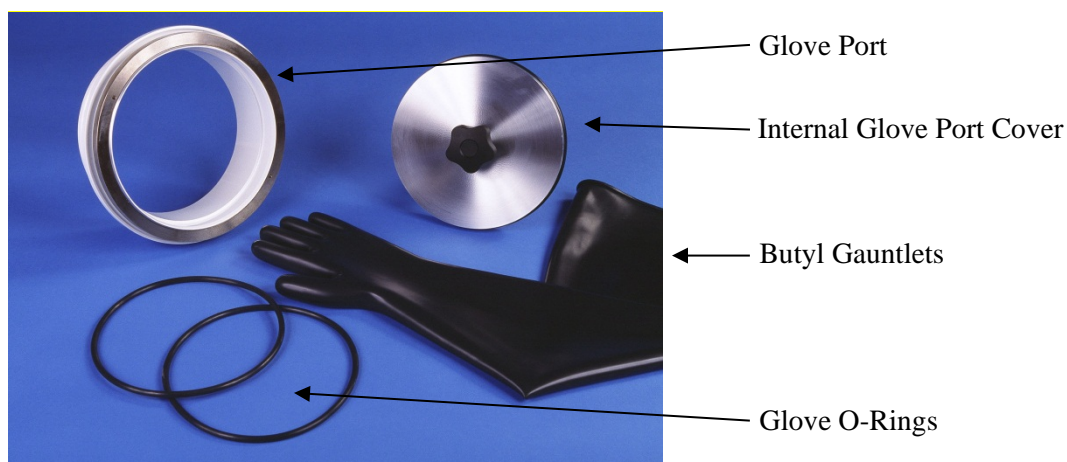


Figure 62 Gloves

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#### 10.4.1 Replacement with an Internal Glove Port Cover

An internal glove port cover is used to seal off the glove port from the inside of the Glovebox.

- 1 If the glove port cover is not inside the Glovebox, bring it in via the Antechamber.
- 2 Install and tighten the glove port cover on the port that has the glove that is to be replaced.
- 3 Remove the “O” rings that hold the glove onto the glove port.
- 4 Remove the old glove and discard it properly.
- 5 Compress the new glove as much as possible to remove excess air.
- 6 Install the new glove over the glove port.
- 7 If possible, purge the new glove by venting working gas into it via a separate gas line (this removes as much air as possible, and hence reduces the amount of air being introduced into the system).
- 8 Install the “O” rings onto the new glove port, over the new glove.
- 9 Remove the internal glove port.

#### 10.4.2 Replacement without an Internal Glove Port Cover

Without an internal glove port cover, the old glove can be used to cover the port while the new glove is installed.

- 1 Press the glove that is to be replaced into the box.
- 2 Remove the inner glove port “O” ring (that which is closest to the window).
- 3 Fold back the glove onto the outer “O” ring, taking care not to let the glove come off of the port.
- 4 Compress the new glove as much as possible to remove excess air.
- 5 Install the new glove over the glove port, over the old glove.
- 6 Install the inner “O” ring onto the glove port, over the new glove.
- 7 If possible, purge the new glove by venting working gas into it via a separate gas line. (This removes as much air as possible, and hence reduces the amount of air being introduced into the system.)
- 8 From the inside of the Glovebox, using the other glove, remove the old glove by taking it into the Glovebox.
- 9 Install the outer “O” ring onto the glove port, over the new glove.
- 10 Remove the old glove from the box via the Antechamber, and discard it properly.

#### 10.4.3 Control Box Panel

The control box consists of the circuit breakers, electronics module, power supply, and the solid-state relays. Some systems will require the white backing plate to be removed prior to removing the power supply and the solid-state relays.

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#### 10.4.4 Circuit Breakers

When replacing a circuit breaker, always use a replacement part of the same rating.

- 1 Remove system AC power from the source.
- 2 Disconnect the two fast-on type connectors using pliers. Do not remove them by pulling on the wire to which they are attached.
- 3 Depress the two tabs on the breaker body and Press out through the front door.
- 4 Install new circuit breaker in reverse order.

#### 10.4.5 Power Supply

To replace the 24 VDC power supply, proceed as follows:

- 1 Remove system AC power at the source.
- 2 Disconnect the DC power cable (right side, Blue & White with Blue wires).
- 3 Disconnect the AC power cable.
- 4 Release the clip on the bottom of the power supply. This will release it from the DIN rail.



- 5 Reinstall in reverse order.

#### 10.4.6 Solid State Relays

Mark all wiring before removal. To replace the SSRs, proceed as follows:

- 1 Remove system AC power at the source.
- 2 Disconnect the DC control wiring, right side of SSR, screws 3 & 4.
- 3 Disconnect the AC control wiring, left side of SSR, screws 1 & 2.
- 4 Remove the screws holding the SSR to the white backing panel.
- 5 Reinstall in reverse order.

#### 10.4.7 Valves

If an electrical valve should fail, it can be replaced as follows.

- 1 Remove Glovebox AC power. Do not assume that the valve is off and will stay off, because the PLC can switch a valve on due to an external event.
- 2 If the GA valve is being replaced, ensure that the gas supply is off.
- 3 If the VA valve is being replaced, ensure that the vacuum source is off.
- 4 Remove the electrical connection by loosening the center screw.
- 5 Remove the solenoid by removing the four top screws.
- 6 Replace the new solenoid in reverse order.
- 7 Turn on the gas and vacuum supply, and power on the system.
- 8 Test the new valve for operation and for leaks.

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#### 10.4.8 Vacuum Pump

To replace the vacuum pump, proceed as follows.

- 1 Remove box AC power. If the vacuum pump is powered separately from the system, ensure that the power is removed.
- 2 Disconnect the clamp from the pipe.
- 3 Disconnect the AC line cord.
- 4 Remove the bolts that secure the pump to the box frame.
- 5 Remove the old pump.
- 6 Install the new pump in reverse order.
- 7 Ensure that the new pump has the proper oil and that the oil level is correct.
- 8 Power on the system and test for proper operation.

## 10.5 Window

Replacing a window requires the box be exposed to open air, and later purged and possibly regenerated.

- 1 Stop box circulation by turning off the blower switch.
- 2 Remove all of the bolts from the window frame, and remove the frame.
- 3 Remove the window and discard properly.
- 4 Ensure that the window gasket is completely attached to the box frame and that it is free from all dirt or other material that would prevent a good seal.
- 5 Mount the new window. Ensure that the window is sitting above the window shims (clear plastic material along the bottom edge).
- 6 Position the window frame over the window and insert all corner bolts, but do not tighten them.
- 7 Insert the remaining bolts while ensuring the window is properly positioned.
- 8 Tighten all bolts.

## 10.6 System Diagrams

### 10.6.1 Front View

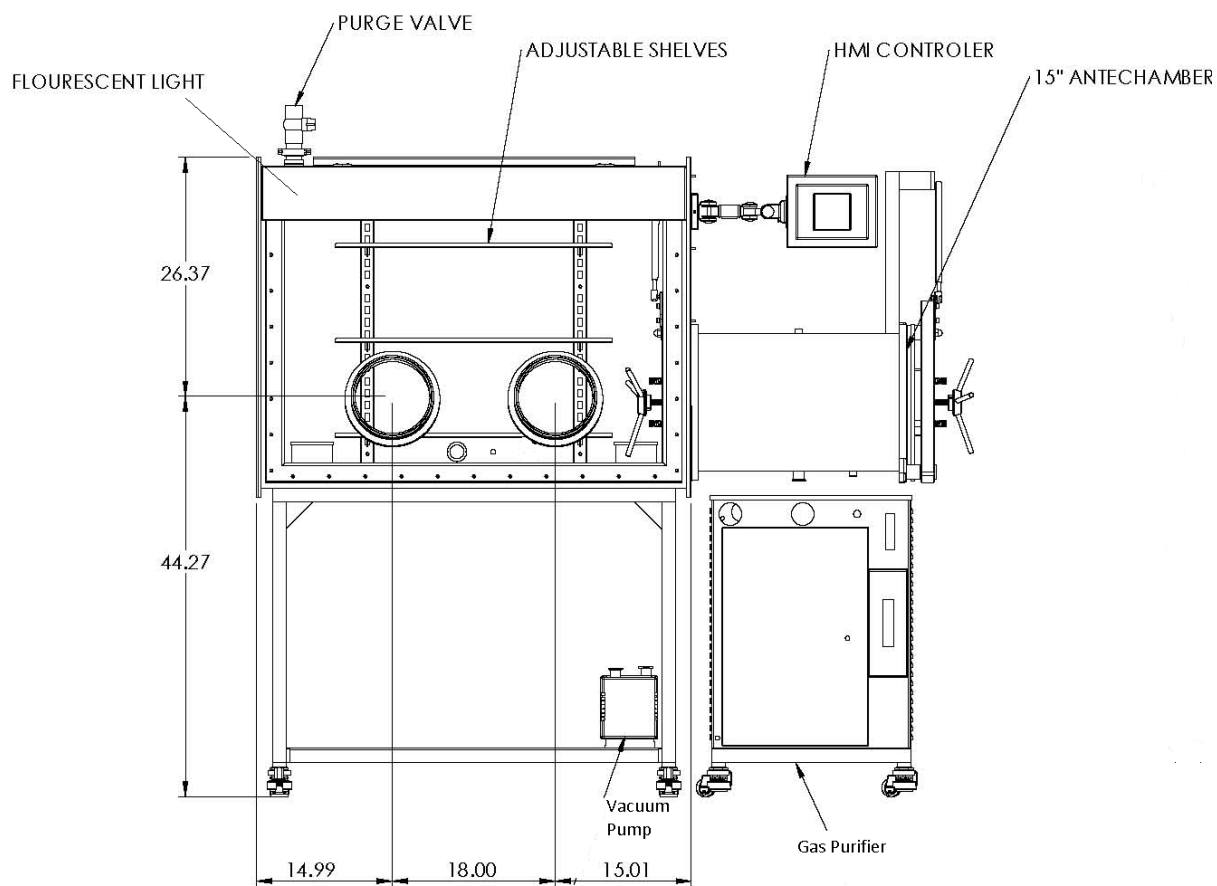
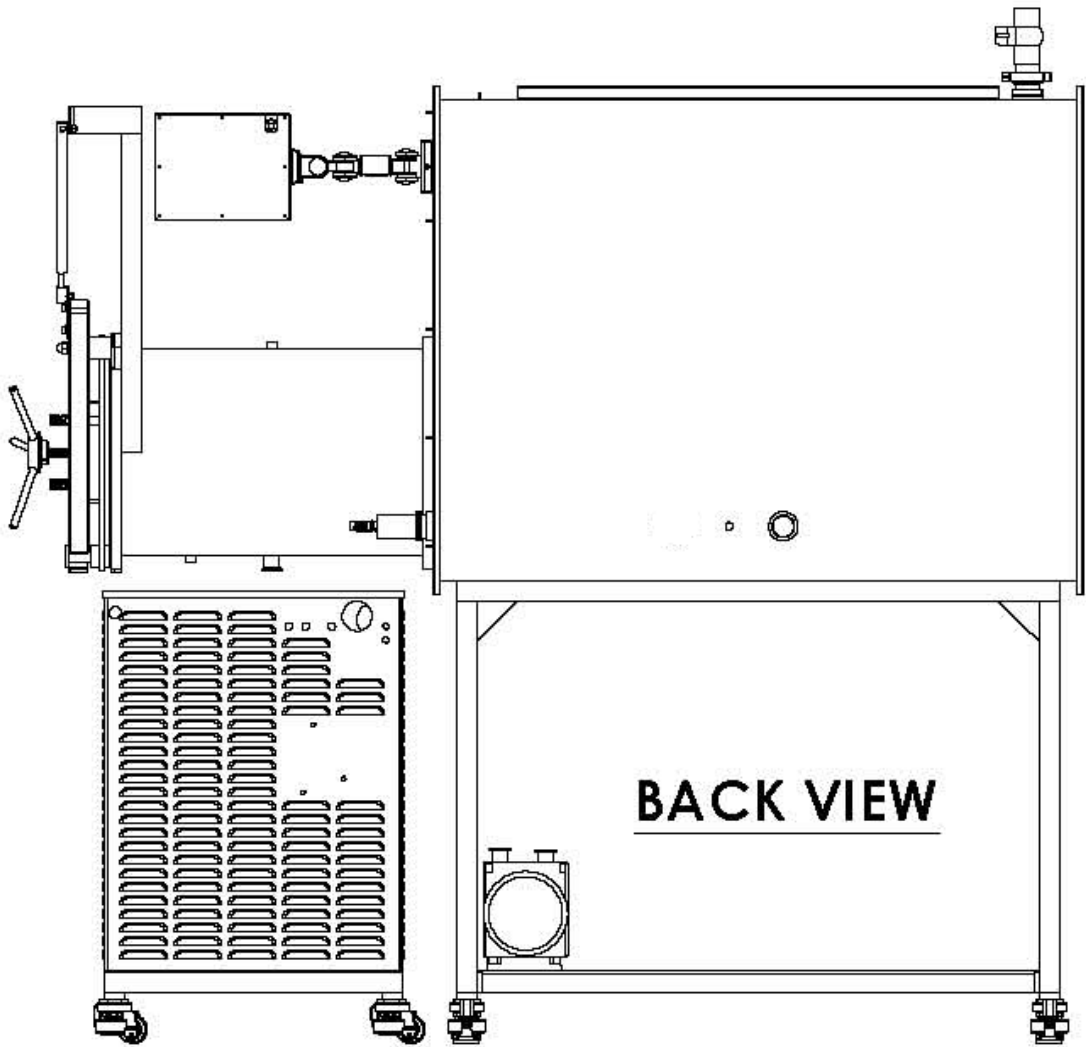


Figure 63 Front view

10.6.2 Back View



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Figure 64 Back view

### 10.6.3Gbox-2G and Gbox-4G-2500 Overall Dimensions

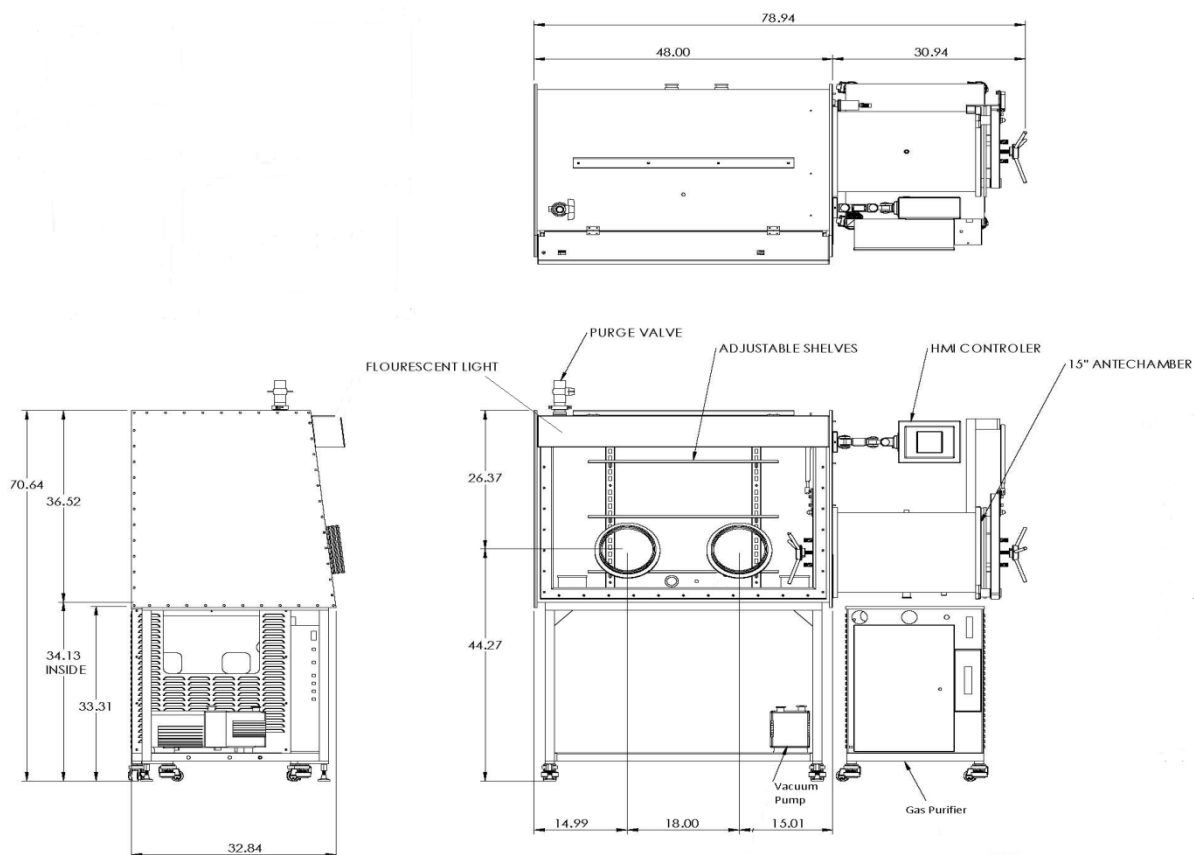


Figure 65 Gbox-2G



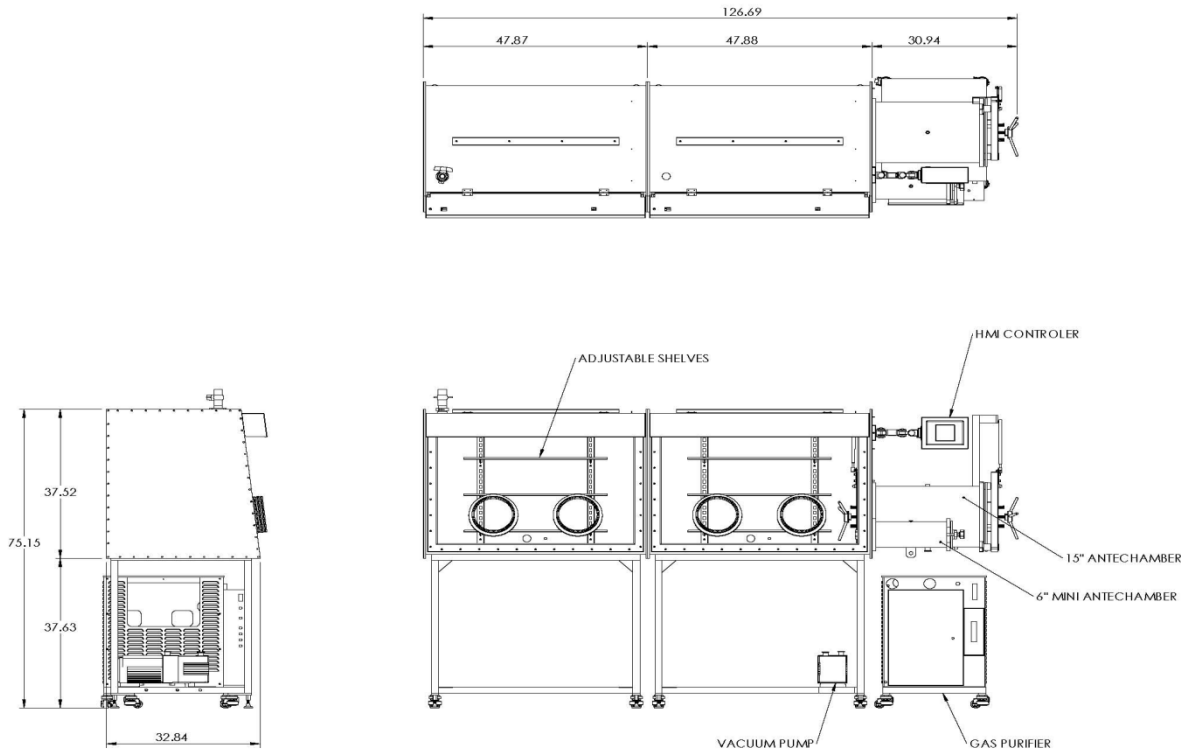


Figure 66 Gbox4G-2500

## 10.6.4Gbox-3G Overall Dimensions

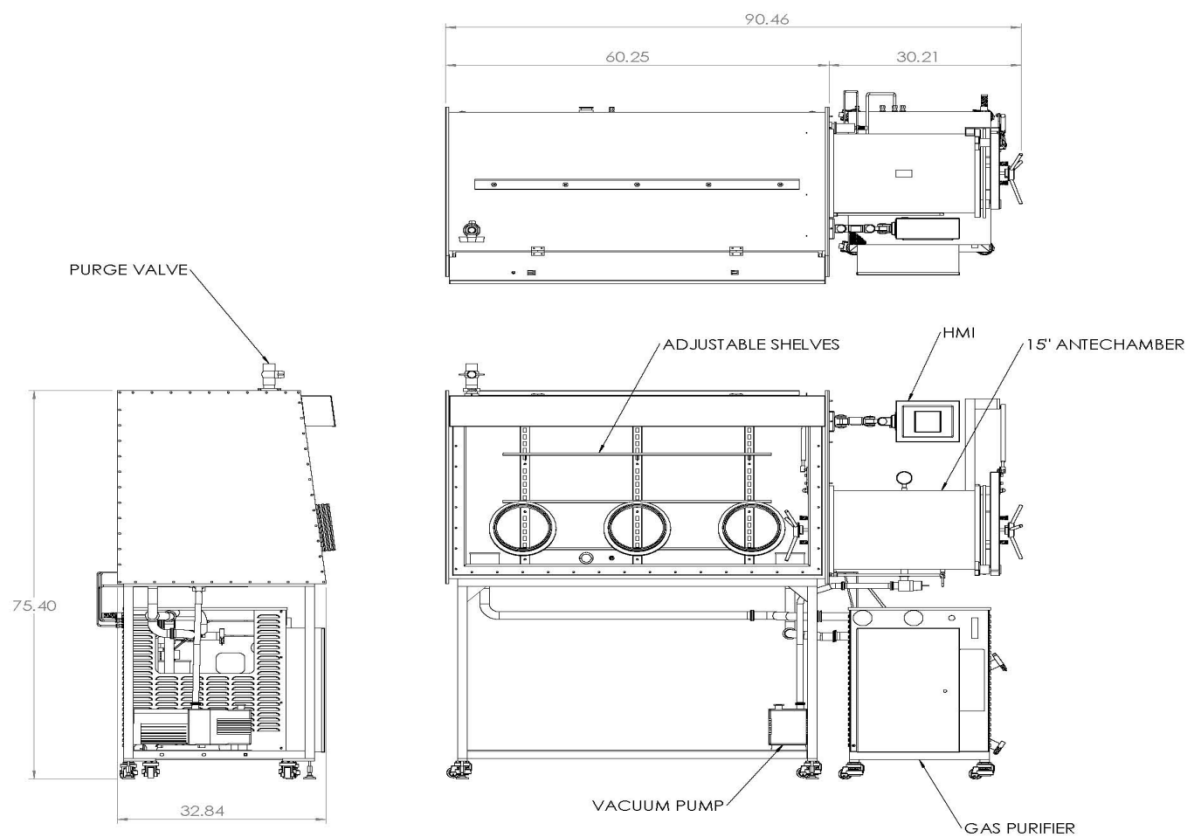


Figure 67 Gbox-3G

10.6.5Gbox-4G-1800 Overall Dimensions

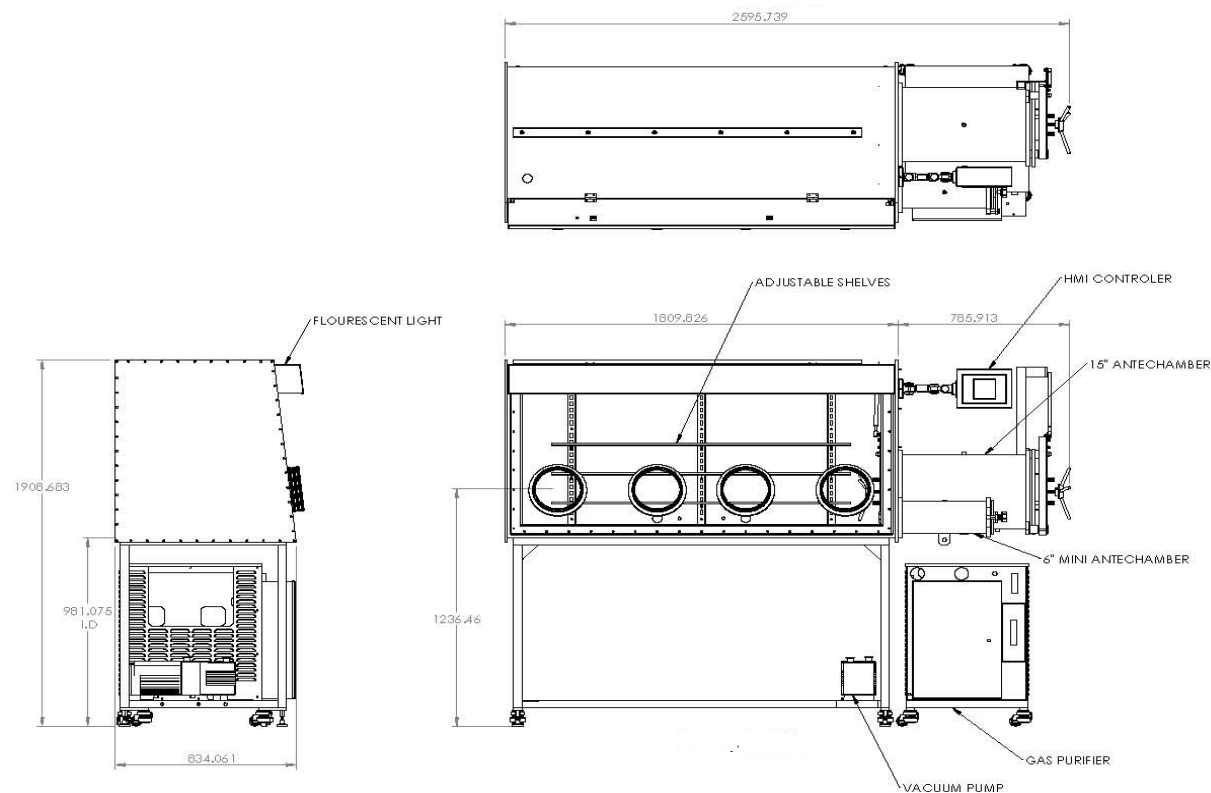


Figure 68 Gbox-4G-1800

## 10.6.6Gbox-4G-1950 Overall Dimensions

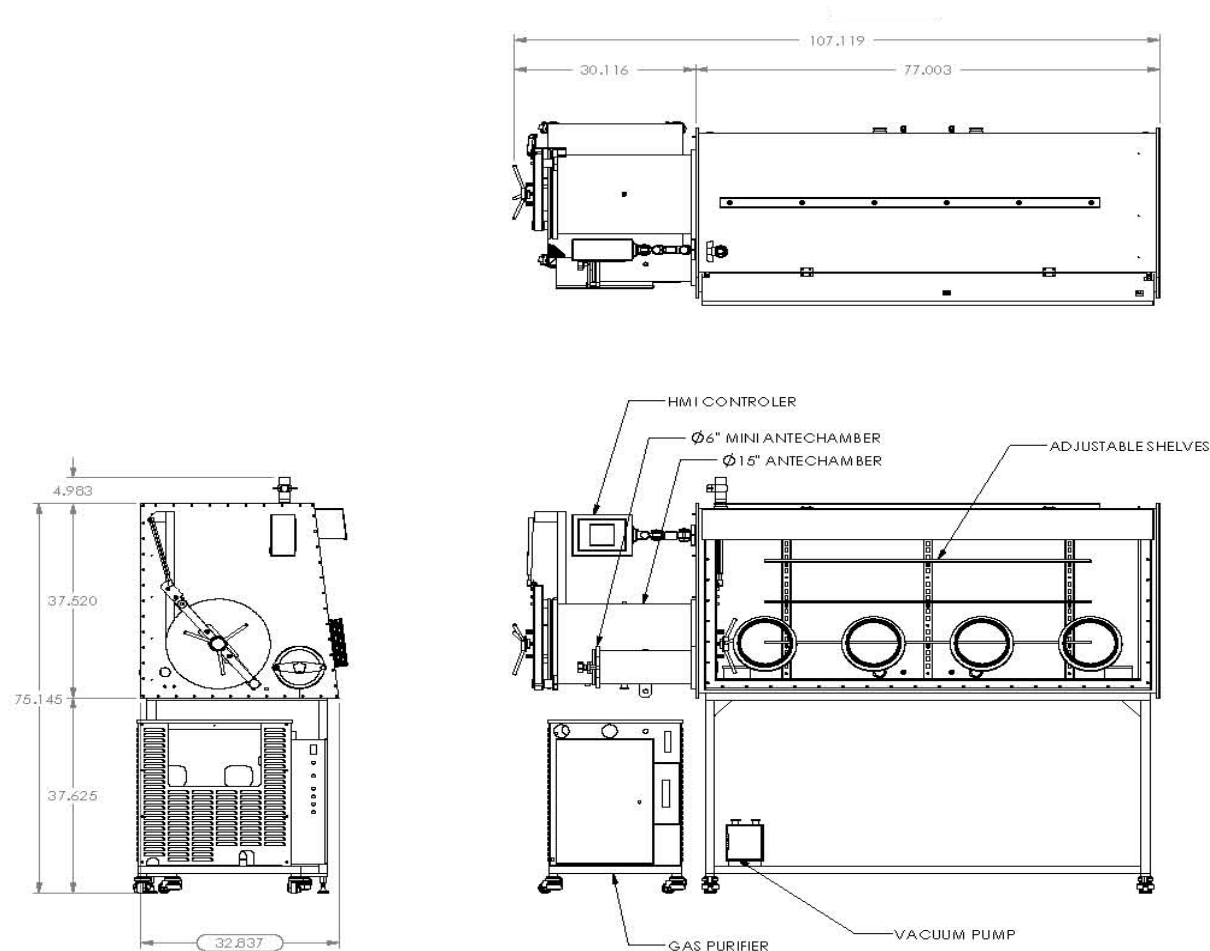


Figure 69 Gbox-4G-1950

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Laboratory Equipment Manufacturer  
www.mrclab.com



# GEM Microscope Operation Manual GEM-MINI



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**PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION**

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**MRC.VER.01-3.14**



The microscope is a great tool for separating natural from synthetic, imitation and assembled gemstone and for quality grading of both diamonds and colored stone. The Model with wide field of view, clear image and special for the jewelry store, learner and gemstone lover.

## 1. Performance parameter of Optical system and its Accessories:

### 1.1 Performance parameter of Optical system (unit: mm)

Eyepiece Objective	WF10X		
	Field range	Working distance	Magnification
1X	20	57	10
3X	6.7	61	30

1.2 With wide field of view, clear image.

1.3 With 45 degree inclines for viewing the object.

1.4 With self-lock system.

## 2. Using methods and Focusing steps:

3. 1 Turn on the “Off/On”, moving the Objective for making the magnification of 10X.

3.2 Moving up and down the Objective by focus knob to make sure the working distance in 57mm.

3.3 Moving the objective up for seeking the gemstone in a clear image.

3.4 If you need to magnify the image, just move the objective to requirement of magnification.

### 3. Performance of Lighting System

Input voltage: 110V-220V, 50-60Hz

Lighting source: LED white light sourcing, with bottom light, top light for supplying bright field, dark field and top light.

#### 3.1 Bottom light:

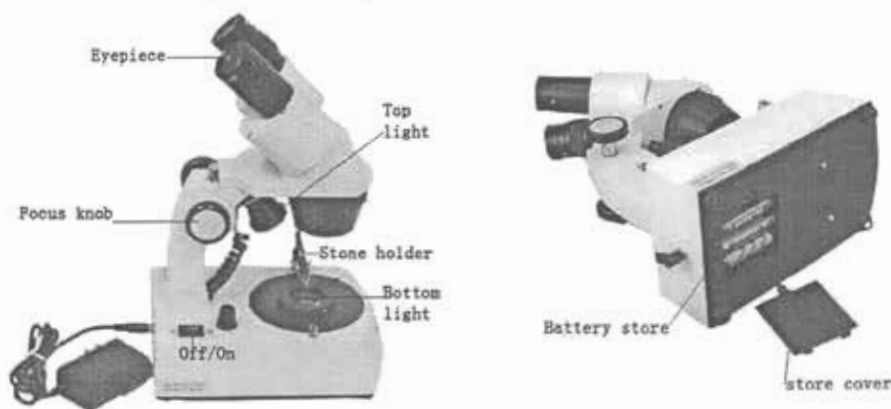
(1) Bright field: turn on the Off/On to "I-bright field(BF)", the bottom of LED on and the round of LED off. The light entering directly from bottom, low relief inclusions and curved striae are seen as dark objects against a bright background.

(2) Dark field: turn on the Off/On to "II-dark field (DF)" the round of LED on and the bottom of LED off. The light will be reflected before reaching the gemstone. The inclusions will stand out bright against a black background when using this field.

#### 3.2 Top light:

Turn on the off/on of the top light. The top light usually involves fluorescent lighting and is used to inspect the external characteristic of the gemstone, such as polishing marks, pitting and other marks that are found on the surface of gemstone.

### 4. The Introduction of product components:



# MICROSCOPES Jewellery

**HRM** *analytic* +61(0)3 9762 2034  
**ECH** *nology* Pty Ltd  
 Website NEW : www.chromanalytic.com.au Email : info@chromtech.net.au Tel: 03 9762 2034 ... in AUSTRALIA  
 Australian Distributors  
 Importers & Manufacturers  
 www.chromtech.net.au



## GEM-MINI, Fable Jewellery Microscope

- Upright minitype base 2: long-life LED light source.
- Supply 3 illumination system: bright field, dark field and top light.
- Convenient to controlled the bright field and dark field by electronic switch.
- Humanized design, both sides with gem clamp mounting hole
- Double power supply system, built-in 3x AA batteries or external DC power source.
- World-wide voltage: 100V—240V.
- Equip F19 microscope head: wide field of view, imaging clearly.
- 180° rotate objective lens, 10-30X magnifying.
- Working distance: 56mm.
- Adjustable diopter
- WF10/16mm eyepiece.

**Battery Store**



**MRC-3.14**

**GRT300****GRT300, 4-Wire Earth Ground Resistance Tester Kit**

Includes all hardware necessary to measure earth ground

**Features:**

- 4-wire, 3-wire, and 2-wire testing
- Large dual line LCD
- Autoranging
- Automatic I (current) spike check
- Automatic P (potential) spike check
- Test Hold function for easy operation
- Automatic Zero adjustment
- AC Earth Voltage
- Data Hold and Auto Power off
- Overrange and low battery indication.

Complete with test leads with alligator clips, 4 auxiliary earth bars, hard carrying case, and eight 1.5V AA batteries.



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Model	GRT300
Earth Ground Resistance ranges	2Ω/20Ω/200Ω/2000Ω
Basic Accuracy	±(2%rdg+3d)
Resolution	0.01Ω/0.1Ω/1Ω/0.01kΩ
Test Current / Frequency	<2mA / 820Hz
AC Earth Voltage / Frequency	0 to 300VAC / 40 to 500Hz
Accuracy	±(2%rdg+3d)
Power supply	Eight 1.5V 'AA' Batteries
Dimensions	250 x 190 x 110mm
Weight	1430g (batteries included)



#### HDV650 Kits all include:

VideoScope, 25mm camera probe, SD memory card, 3.7V rechargeable Li-Polymer battery, patch cable, Universal AC adapter (110-240V, four plugs), USB and AV cables, and hard carrying case.

- HDV650-10G also includes 10m fiberglass cable spool assembly
- HDV650W-10G also includes 10m fiberglass cable spool assembly and wireless transmitter
- HDV650-30G also includes 30m fiberglass cable spool assembly
- HDV650W-30G also includes 30m fiberglass cable spool assembly and wireless transmitter.

#### HDV650-Series, Plumbing VideoScope Kits

From drains to pipe runs, MRC's Plumbing Videoscope Kits reveal problems with its large, waterproof, rugged, high definition color display and a 10m or 30m snake with 25mm diameter camera head. Built-in bright lights help illuminate the problem area deep within the pipe runs. The camera probe is rugged enough to dislodge small clogs. Ideal for inspecting P-traps, 90s, drains, pipe runs, sewers, vent stacks and more. Available in a wireless kit that allows you to transmit video up to 100ft (30m) from the measurement point to your monitor.

#### Features:

- 5.7" color LCD TFT with high definition 640 x 480 VGA pixel resolution
- Mini, high-resolution, waterproof (IP57), 25mm camera head is rugged enough to dislodge small clogs
- Twelve built-in, bright LEDs illuminate the problem deep within the pipelines
- Rugged oil/chemical resistant and water/drop proof housing (IP67/2m)
- Non-slip ergonomic handles for ambidextrous use
- SD memory card included to store >15,000 images
- Video recording (up to 4 hours) with Voice annotation
- AV output for viewing images and video directly on a monitor
- Video and images can be transferred to a PC via the SD card (included) or USB output.

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Model	HDV650
<b>Camera</b>	
Minimum Focus distance	60mm
Field of View	65°
Shaft diameter	25mm
Working length	10m or 30m
<b>Borescope</b>	
LCD Color TFT Display	14.5cm size, 13.5cm viewable
Pixels	640 x 480 VGA pixel resolution
Frame Rate	30 fps frame rate (NTSC & PAL)
Operating	up to 4 hours AVI video



**280°C**



**HSD-135**  
Digital Hotplate Stirrer, 135mm

**350°C**



**HS-135**  
Ø135mm, S.S Hotplate Stirrer

**550°C**



**HSCD-7**  
Ceramic Hotplate Stirrer, 184x184mm

## HSD-135, LED Digital Magnetic Hotplate Stirrer

The magnetic stirrers of the HSD-135 is designed for a gentle to intense mixing of low viscous liquids and ideal for the digestion of organic and inorganic substances. Important aspects such as safety, convenience and cost savings have been considerably taken into account during the development of the MRC stirrers. This is reflected in various unique product advantages of our lab hot plates. The ceramic coated hot plates allow for immediate heat transfer resulting in quick heat up times and chemically resistant surface.

- LED-Display for accurate regulation of speed and temperature
- digital controlled speed and temperature
- Indicator for hot surface, even when the stirrer is shut-off
- connector for PT-1000
- integrated temperature control function
- compact construction, sealed housing (IP42)

## HS-135, BlueSpin Classic Magnetic Hotplate Stirrer

- Stainless steel and ceramic coated hotplates are optional
- Separated safety circuit. automatically stop heating when temperature over 350°C
- Motor with electronic speed control, constant speed even during changes in load
- Variable speed of motor
- High magnetic adhesion, prevent the stirrer bar escape
- Enclosed assembly with protection class IP42 and DC brushless motor guarantees long service.

## HSCD-7, BlueSpin LCD Digital 7 Inch Square Magnetic Hotplate Stirrer

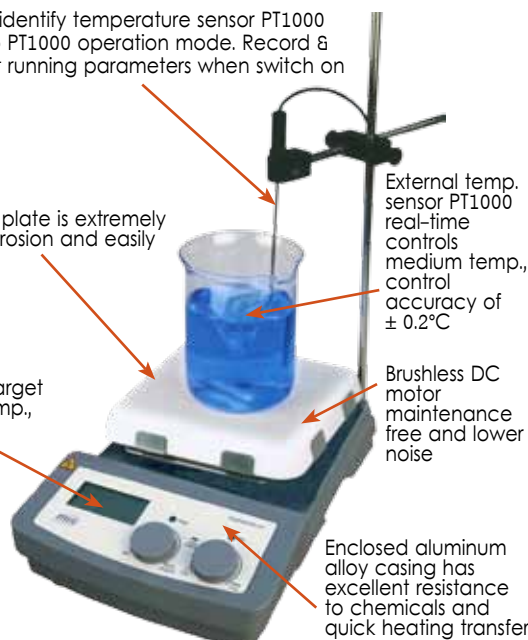
7 inch square hotplate magnetic stirrers are widely used in chemical synthesis, physical and chemical analysis, pharmaceuticals and other fields.

PID temperature technology precise controls heating process, rapidly reaches target temperature and enhances control accuracy, heating temperature up to 550°C. Our 7 inch square magnetic stirrers have glass ceramic plate extremely resistant to corrosion and easy to clean. The heating models are suitable for external temperature sensor PT1000, display and control actual medium temperature.

Automatically identify temperature sensor PT1000 and transfer to PT1000 operation mode. Record & display the last running parameters when switch on

Glass ceramic plate is extremely resistant to corrosion and easily clean

LCD displays target and actual temp., as well as set speed and actual speed can be displayed



## Specifications:

Model	HSCD-7	HS-135	HSD-135	MUSH-10
Dimension of work plate (mm)	184 x 184	Ø135	Ø135	180 x 450
Work plate material	Glass ceramic	Stainless steel	ceramic coated	Stainless steel with silicone Film
Motor type	DC brushless motor	DC brushless motor	DC motor	DC motor
Motor rating input (W)	18	18	5	12
Motor rating output (W)	10	10	3	4
Power (W)	1050	530	515	490
Voltage (VAC)	100-120/200-240	200-240	200-240	200-240
Frequency (Hz)	50/60	50/60	50/60	50/60
Stirring positions	1	1	1	10
Max. stirring quantity (H <sub>2</sub> O), L	20	20	3	0.4 (each stirring position)
Max. magnetic bar(L x Ø) (mm)	80	80	50	40
Speed range (rpm)	100-1500	0-1500	100-1500	0-1100
Speed display	LCD	Scale	LED	Scale
Speed display resolution (rpm)	±1	-	±10	-
Heating output (W)	1000	500	500	470
Heating temperature range (°C)	RT-550, increment 1	RT-340	RT-280, increment 1	RT-120
Control accuracy of work plate (°C)	±1(<100°C) ±1%(>100°C)	-	±1(<100°C) ±1%(>100°C)	-
Safety temperature (°C)	580	350	320	140
Temperature display	LCD	Scale	LED	Scale
Temperature display accuracy (°C)	±0.1	-	±1	-
External temperature sensor	PT1000	N/A	PT1000	N/A
Control accuracy with external temperature sensor PT1000 (±°C)	±0.2	-	±0.5	-
Heating warning (°C)	50°C	N/A	50°C	N/A
Remote control (RS232 interface)	Yes	N/A	N/A	N/A
Protection class according to DIN EN60529	IP21	IP21	IP42	IP42
Dimension (W x D x H) mm	215 x 360 x 112	160 x 280 x 85	150 x 260 x 80	182 x 552 x 65
Weight (kg)	5.3	2.8	1.4	3.2
Permissible ambient temp. (°C)	5-40	5-40	5-40	5-40
Permissible relative humidity	80	80%	80%	80%

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**MUSH-10, BlueSpin 10-Channel Classic Magnetic Hotplate Stirrer**

- Heating temperature up to 120°C
- High-performance multi-position magnetic stirrer with uniform temperature distribution
- Individually controlled stirring for consistency with various samples
- Electronic speed control motor provides constant speed
- DC brushless motor maintenance free and quiet running
- Stainless steel plate with silicone films, anti-slip and anti-corrosion.

120°C



### MT-723101/723102/723104, Magnetic Stands

#### Features:

- Widely used in the manufacturing industry.
- Used for clamping dial indicators, micron dial indicators and dial test indicators, etc. It can scribe on workpiece if it's attached with a scribe.
- Can be adjusted to any angle needed. It's an ideal checking device.
- This strong stand is with ON/OFF switch.



- MT-723101: Magnetic Stand with Fine Adjustment.
- MT-723102: Universal Mechanical Arm Magnetic Stand.
- MT-723104: Flexible Stem Magnetic Stand.

Model	MT-723101/723102/723104
Magnetic force	60kg/588N



### MT-723111/723112, Micrometer Stands

#### Features:

- This micrometer stands is specially designed for clamping micrometers and other measuring tools.
- MT-723111: Conventional type.
- MT-723112: Adjustable type.

MT-723112



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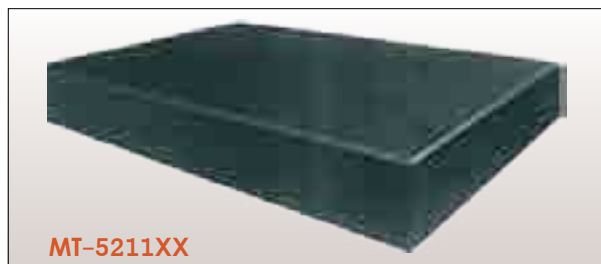


### MT-74111X, Granit Measuring Stands

#### Features:

- This granite measuring stand is specially designed for clamping dial indicators and other measuring tools.

Model	MT-741111	MT-741112	MT-741113
Measuring Range	0-100mm	0-200mm	0-250mm
Flatness	0.002mm	0.002mm	0.002mm
Size (LxWxH)mm	150x100x40	200x150x50	300x200x50



**MT-5211XX**

## MT-5211XX, Granite Inspection Surface Plate

### Features:

- With high hardness, stable function, long working life.
- Less susceptible to corrosion, non-distorted, minimal changes in dimension due to temperature changes.
- No burrs or protrusions can form on its surface. Its flatness remains high even though it has been used for a long time. It causes no damage to work pieces or instruments.

Model	MT-521101	MT-521102	MT-521103	MT-521103-1	MT-521104	MT-521104-1	MT-521104-2	MT-521105
Size (mm)	150x100x40	160x160x50	250x160x50	250x250x50	300x200x50	300x200x80	300x300x70	350x300x100
Grade 00 precision (µm)	2.5	2.5	3	3	3	3	3	3
Grade 0 precision (µm)	5	5	5.5	5.5	5.5	6	6	6

Model	MT-521106	MT-521106-1	MT-521107	MT-521107-1	MT-521108	MT-521110	MT-521110-1	MT-521110-2
Size (mm)	400x250x70	400x400x100	630x400x100	630x630x100	800x500x130	1000x630x150	1000x750x150	1000x1000x150
Grade 00 precision (µm)	3	3.5	3.5	4	4	4.5	5	5
Grade 0 precision (µm)	6	6.5	7	8	8	9	9	10

Model	MT-521116	MT-521120	MT-521116-1	MT-521120-1	MT-521125	MT-521130	MT-521140	MT-521160
Size (mm)	1600x1000x200	2000x1000x250	1600x1600x300	2000x1600x300	2500x1600x300	3000x2000x500	4000x2000x500	6000x2000x700
Grade 00 precision (µm)	6	6.5	6.5	7	8	9	11	15
Grade 0 precision (µm)	12	13	14	15	16	18	22	30



**MT-726XXX**

## MT-726XXX, Strightness Gauges

### Features:

- Used for measuring the flatness and straightness of the workpieces.
- Direct reading without using any feeler gauges.

Model	MT-726106	MT-726108	MT-726110	MT-726112	MT-726115
Measuring Range	600mm	800mm	1000mm	1200mm	1500mm
Resolution	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm

Model	MT-726006	MT-726008	MT-726010	MT-726012	MT-726015
Measuring Range	600mm	800mm	1000mm	1200mm	1500mm
Resolution	0.001mm	0.001mm	0.001mm	0.001mm	0.001mm

## MT-71120X, Computer Interfaces

### Features:

- Special connecting cable for electronic digital measuring tools, used to connect the tools with computers.
- Interface Protocol: 9600 bps, 1 start bit, 8 data bits, 1 stop bit, no parity bit.
- Tranferred with ASCII code data format . Press the Enter key to end a measured value. Transfers are done continuously and initiatively.







### MT-723101/723102/723104, Magnetic Stands

#### Features:

- Widely used in the manufacturing industry.
- Used for clamping dial indicators, micron dial indicators and dial test indicators, etc. It can scribe on workpiece if it's attached with a scriber.
- Can be adjusted to any angle needed. It's an ideal checking device.
- This strong stand is with ON/OFF switch.



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- MT-723102: Universal Mechanical Arm Magnetic Stand.
- MT-723104: Flexible Stem Magnetic Stand.

Model	MT-723101/723102/723104
Magnetic force	60kg/588N



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MT-723112



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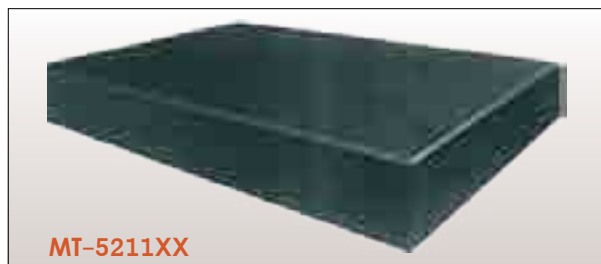
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- This granite measuring stand is specially designed for clamping dial indicators and other measuring tools.

Model	MT-741111	MT-741112	MT-741113
Measuring Range	0-100mm	0-200mm	0-250mm
Flatness	0.002mm	0.002mm	0.002mm
Size (LxWxH)mm	150x100x40	200x150x50	300x200x50





MT-5211XX

## MT-5211XX, Granite Inspection Surface Plate

### Features:

- With high hardness, stable function, long working life.
- Less susceptible to corrosion, non-distorted, minimal changes in dimension due to temperature changes.
- No burrs or protrusions can form on its surface. Its flatness remains high even though it has been used for a long time. It causes no damage to work pieces or instruments.

Model	MT-521101	MT-521102	MT-521103	MT-521103-1	MT-521104	MT-521104-1	MT-521104-2	MT-521105
Size (mm)	150x100x40	160x160x50	250x160x50	250x250x50	300x200x50	300x200x80	300x300x70	350x300x100
Grade 00 precision (μm)	2.5	2.5	3	3	3	3	3	3
Grade 0 precision (μm)	5	5	5.5	5.5	5.5	6	6	6

Model	MT-521106	MT-521106-1	MT-521107	MT-521107-1	MT-521108	MT-521110	MT-521110-1	MT-521110-2
Size (mm)	400x250x70	400x400x100	630x400x100	630x630x100	800x500x130	1000x630x150	1000x750x150	1000x1000x150
Grade 00 precision (μm)	3	3.5	3.5	4	4	4.5	5	5
Grade 0 precision (μm)	6	6.5	7	8	8	9	9	10

Model	MT-521116	MT-521120	MT-521116-1	MT-521120-1	MT-521125	MT-521130	MT-521140	MT-521160
Size (mm)	1600x1000x200	2000x1000x250	1600x1600x300	2000x1600x300	2500x1600x300	3000x2000x500	4000x2000x500	6000x2000x700
Grade 00 precision (μm)	6	6.5	6.5	7	8	9	11	15
Grade 0 precision (μm)	12	13	14	15	16	18	22	30



MT-726XXX

## MT-726XXX, Strightness Gauges

### Features:

- Used for measuring the flatness and straightness of the workpieces.
- Direct reading without using any feeler gauges.

Model	MT-726106	MT-726108	MT-726110	MT-726112	MT-726115
Measuring Range	600mm	800mm	1000mm	1200mm	1500mm
Resolution	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm

Model	MT-726006	MT-726008	MT-726010	MT-726012	MT-726015
Measuring Range	600mm	800mm	1000mm	1200mm	1500mm
Resolution	0.001mm	0.001mm	0.001mm	0.001mm	0.001mm

## MT-71120X, Computer Interfaces

### Features:

- Special connecting cable for electronic digital measuring tools, used to connect the tools with computers.
- Interface Protocol: 9600 bps, 1 start bit, 8 data bits, 1 stop bit, no parity bit.
- Tranferred with ASCII code data format . Press the Enter key to end a measured value. Transfers are done continuously and initiatively.





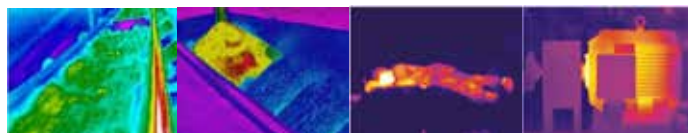
IR-CAM-EX330

## IR-CAM-EX330, Hazardous Thermal Imaging Camera

Thermal imaging camera IR-CAM-EX330 is certified intrinsically safe and specialized for oil/gas, mining industry and other hazardous (explosive) areas applications. It's the ideal device for maintenance inspections of checking refractory lining in crackers and heaters, missing or damaged pipe insulation, steam traps, motors, bearings, gearboxes, shaft misalignment, trace heating, flares, tank levels, condenser fins, heat exchangers, pumps, pipe and valve leakage, poor lubrication.

### Features:

- Heat-resistant, shock-proof housing
- Bright and clear 3.5" display to observe hot spots easily
- Voice annotation, mark information instantly
- Automatic high spot recognition, find hidden defects in time
- Voice and color alarm
- Laser pointer, assists user to locate target easily
- Rugged & compact design
- Certified by national authority testing organization.



Model	IR-CAM-EX330
<b>Detector Data</b>	
Detector type	Uncooled FPA
IR resolution	384 x 288 pixels
Pixel pitch	25µm
Spectral Range	8 ~ 14µm
FOV/Mini Focus	18°×14°/0.15m
IFOV	1.2 mrad (standard lens)
NETD/Sensitivity	<65mk@30°C
<b>Image Performance</b>	
Frequency	50/60Hz
Focus	Manual
Digital Zoom	2x
Image Display	Built-in 3.5" color LCD
<b>Measurement</b>	
Temperature range	-20°C ~ 310°C
Accuracy	±2°C or ±2% of reading
Measurement spot	4 adjustable spots
Measurement area	3 adjustable boxes, capture max./min./ avg. temperature automatically
Line Measure	Vertical/horizontal
Isotherms Analysis	Detect high/low temperature/interval
Alarm	Voice, color
Emissivity correction	Adjustable from 0.01 to 1.0
Multiple Language Menu	10 Languages (English, French, Italian, German, Spanish, Portuguese, Russian, Korean, Japanese, Simplified Chinese & Traditional Chinese)

Model	IR-CAM-EX330
<b>Image Storage</b>	
Storage type	Built-in flash card, up to 1500 images
Files format	Standard JPEG, 14-bit measurement data included
Voice comments	40s voice record, stored with per image via built-in microphone.
Laser Type	Class 2, 1mW/635nm Red
<b>Power System</b>	
Battery type	Rechargeable and explosion-proof Li-ion battery
Battery operating time	Approx 1.5 hours at room temperature
Power saving	User defined
Power operation	12V ±5%
<b>Environment Data</b>	
Operating temp. range	-20°C - +50°C
Storage temp. range	-40°C - +60°C
Humidity	≤95% non-condensing (+25°C)
Shock	30G MT210-1990
Vibration	2G MT210-1990
<b>Physical Data</b>	
Size (LxWxH) (mm)	330x95x86
Weight	650g
Tripod mounting	1/4"-20
<b>Interfaces</b>	
External DC input	Yes
Audio output	Yes
Video output	PAL / NTSC
USB	Images transfer to PC
<b>Packing Includes</b>	
Standard	Thermal imaging camera with standard IR lens, 2 Li-ion batteries, Battery charger, Adapter (only used above the mine), Video cable USB cable, Software CD, instruction, warranty card, transport case



## IRT600, Dual Laser IR Thermal Condensation Scanner

Measures Temperature and Humidity then calculates Dew Point and warns when conditions for mold growth exist.

### Features:

- Great for processes that require surface temperature control & monitoring
- Green LED changes to Yellow and then to Red as the surface temperature reading gets closer to and then equals the calculated Dew Point reading
- Dual lasers indicate ideal measuring distance where the two lasers converge to a 1" target spot
- 12:1 Distance to Target ratio
- 150 millisecond IR Temperature response time
- Switchable backlight and laser
- Max hold
- Complete with case and 9V battery.

### Specifications:

Model	IRT600
IR Temperature Range	-30 to 350°C
Basic Accuracy	±(1% of rdg + 2.7°F/1.5°C)
Air Temperature	0 to 50°C
Max resolution	0.1°C
Distance to Target	12:1
Emissivity	0.95 fixed
Humidity	20 to 80%RH
RH accuracy	±3.5%RH
Dew Point	-30 to 100°C
Dimensions	168x82x58mm
Weight	163g

### Applications:

- HVAC
- Mold Remediation
- Scientific/Educational
- Industrial Processes
- Consumer Home-owner
- Archives/Museums.



Bright LED indicator changes from green (normal, 1/3 range of Environment Temperature to Dew Point) to yellow (warning, 2/3 range which shows place will develop mildew) or red (alert, exceeds 2/3 range that shows place has mildew)

**KDS-3016, Analog 3D Shaker****Features:**

- Compact, 3D shakers with ideal shaking motion, for a maximum shaking weight of 3kg
- Compact space-saving design fits easily in the incubator and cryogenic box
- Wide range of platforms for use with a variety of vessels
- Aluminium-alloyed platform provides strong bearing capability, with non-slip mat holds vessels prevent slipping
- Continuous operation, speed range of 0-80 rpm
- Multi-voltage.



Model	KDS-3016
<b>Voltage [VAC]</b>	100-240
<b>Frequency [Hz]</b>	50/60
<b>Power [W]</b>	20
<b>Motor Type</b>	DC motor
<b>Title angle</b>	7°
<b>Max. load capacity (with platform) [kg]</b>	3
<b>Speed range [rpm]</b>	0-80
<b>Operation type</b>	Continuous
<b>Size [D×W×H mm]</b>	330×270×130
<b>Weight [kg]</b>	2.7
<b>Permissible ambient temperature [°C]</b>	5-40
<b>Permissible relative humidity</b>	80%
<b>Protection class acc. To DIN EN60529</b>	IP21

<b>Model</b>	18900027	18900040	18900155	18900028	18900025	18900038	18900039	18900026
<b>Descriptions</b>	Universal attachment with 4 bars	Lengthways roller attachment	Dish platform with non-slip mat & fixed string (8 pcs)	Fixing clip attachment	Universal attachment with 3 bars	Lengthways roller attachment	Dish attachment with non-slip mat	Fixing clip attachment
<b>Rocking Shaker</b>	•	•	•	•				
<b>3D Shaker</b>	•	•	•	•				
<b>Orbital &amp; Linear Shaker (7.5kgs)</b>	•	•	•	•				
<b>Orbital &amp; Linear Shaker (2.5kgs)</b>					•	•	•	•
<b>E series(3kgs)</b>					•	•	•	•

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<b>Model</b>	18900029	18900030	18900031	18900032	18900033	18900036	18900037
<b>Descriptions</b>	Fixing clip for flask volume 25mL, used with 18900028 & 18900026	Fixing clip for flask volume 50mL, used with 18900028 & 18900026	Fixing clip for flask volume 100mL, used with 18900028 & 18900026	Fixing clip for flask volume 200-250mL, used with 18900028 & 18900026	Fixing clip for flask volume 500mL, used with 18900028 & 18900026	Bar for 18900027 universal attachment	Bar for 18900025 universal attachment
<b>Rocking Shaker</b>	•	•	•	•	•	•	
<b>3D Shaker</b>	•	•	•	•	•	•	
<b>Orbital &amp; Linear Shaker (7.5kgs)</b>	•	•	•	•	•	•	
<b>Orbital &amp; Linear Shaker (2.5kgs)</b>	•	•	•	•	•		•
<b>E series(3kgs)</b>	•	•	•	•	•		•



## COMPACT SYSTEM OF MRC AS AN ALTERNATIVE FOR MONOBLOCKS

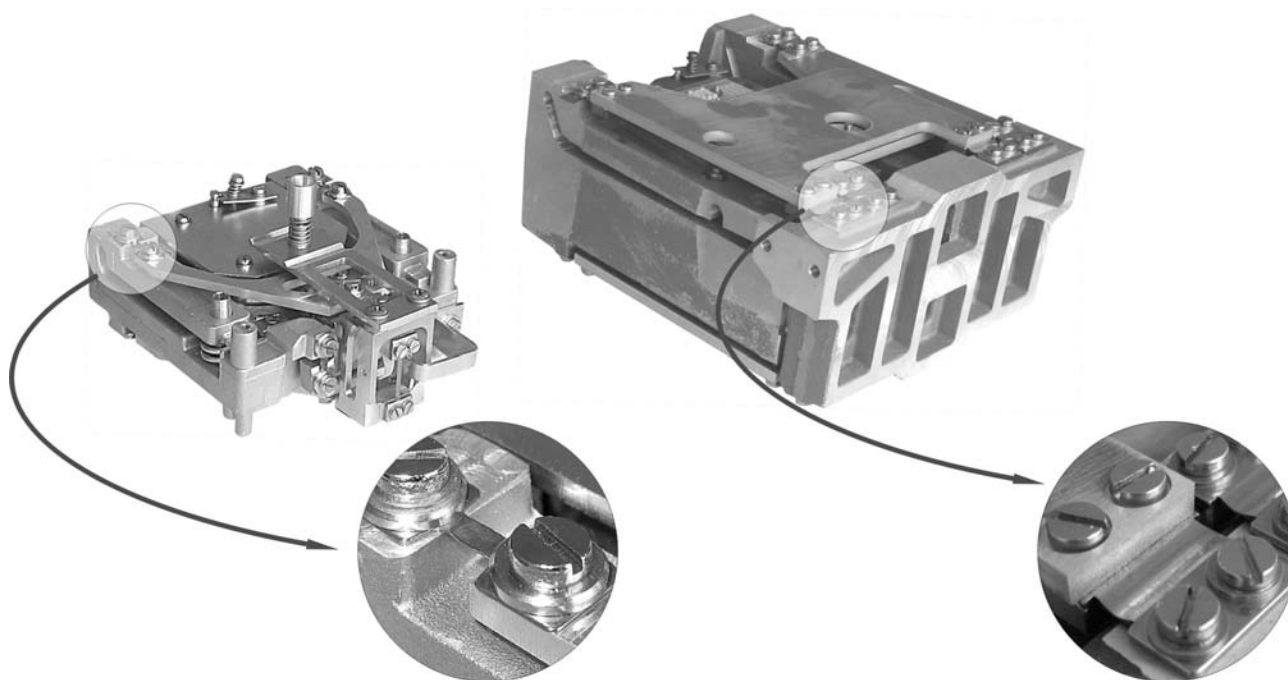
**Comparison of mechanical constructional solutions used nowadays by leading manufacturers of high resolution balances.**

Mechanical constructions of high resolution balances are divided into several types:

- a) traditional
- b) monoblock
- c) compact systems

**Traditional constructions** have been produced for over 20 years and allowed to develop kinematic pattern, which even today has remained unchanged. Currently offered constructions of balances made from, so called monoblocks, function with the same kinematic pattern. The name of the traditional construction has been adopted for balances with specific construction of bearing elements, whose functions are now served by springy elements (made of metal or bronze) so called flexures, mounted by screws to aluminium levers so called rockers.

The examples of such mechanisms manufactured at MRC are presented in the pictures.



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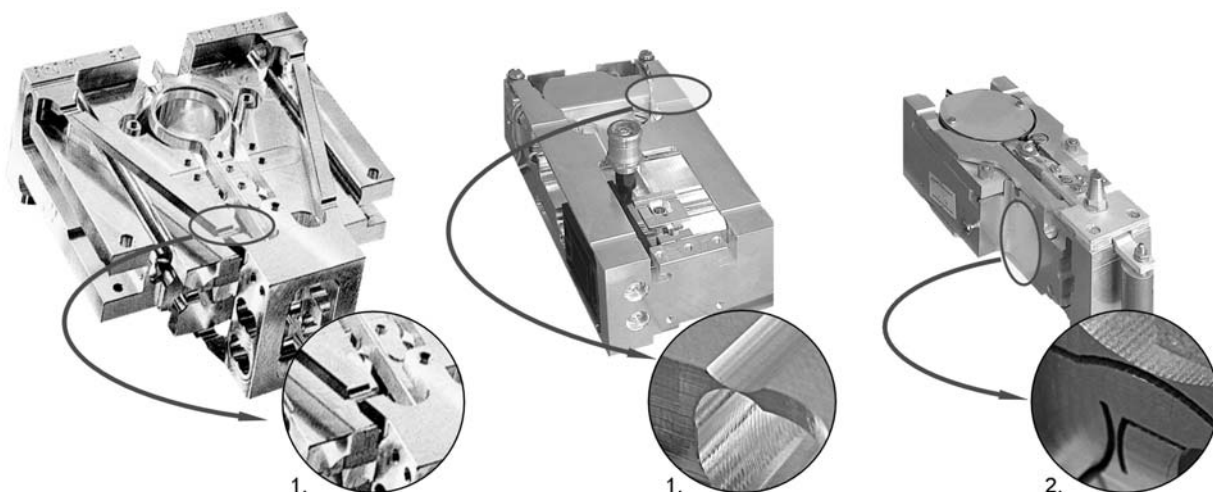
### Constructions of monoblocks

The main aim of European companies, seeking new solutions and investing significant financial resources into them, was to reduce the growing costs of workers assembling weighing elements and replace them with low-cost, faster and more efficient machines.

The first monoblocks offered in the market were characterized by significant errors (high hysteresis, temperature errors) and only after many years of research and introducing expensive, high precision machine tools it was possible to reach the resolution of 1-2 mln divisions. Even today, in professional solutions, some manufacturers are still using traditional system of flexures.

The examples of monoblock constructions sold today are presented in the pictures.





1. Example of monoblock manufactured using milling technology
2. Example of monoblock manufactured using string cutting out technology

### Constructions of compact systems

Many years of MRC's experience in producing balances with high resolutions ( max 30 mln divisions) analyzing solutions of competition and our own research and development have resulted in creating a new solution, being a compromise in the field of measuring mechanism construction –

#### **compact system.**

The first attempts of such solutions started many years ago, however only after the technology was fully developed the system could be used in most of MRC's balances.

The fundamental principle of compact system is separation of components that require precision in their manufacturing and assembling from the body unit of the mechanism, in which, only the base surfaces are significant and possible to manufacture using milling technology with NC machines.

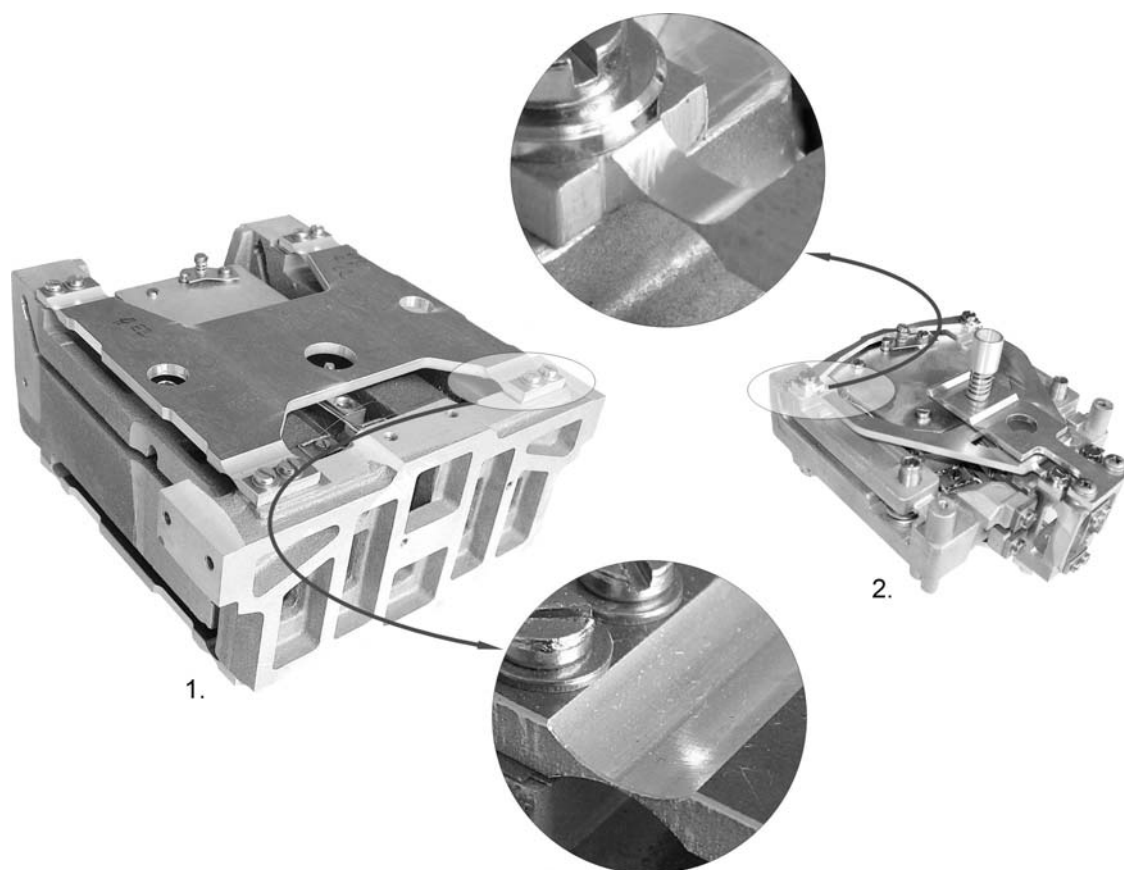
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There two elements from traditional technology used in compact system: *string* – connecting the unit of measuring lever with parallelogram and the bearing of measuring lever.

These elements have the strongest impact on indication errors such as: linearity, hysteresis, zeroing, and using special materials (stainless steel, beryllium bronze) undoubtedly improves their quality and resistance against overload.

This solution eliminates basic problems connected with quality and repeatability of elements used for manufacturing traditional weighing mechanisms, and at the same time lowers production costs and enhances the quality. Bearing the above in mind, one can make a practical comparison between the construction of a balance and other solutions used in constructions of machines for example a combustion engine used in cars.

## Examples of compact systems used in MRC's products



Example of compact system: 1 – balance series APP; balance series AS

The results achieved in MRC after the introduction of compact system with the following 185 balances: analytical balances series AS with the resolution of 3 mln divisions ( $d=0.1\text{mg}$ ), precision balances ( $d=0.1\text{mg}$ ) and precision balances series APP with 800 thousand divisions ( $d=0.01\text{g}$ ) have finally confirmed the purposefulness of the selected direction of development. The same quality as monoblocks, with lower implementation and more importantly, lower production costs, has been attained.

### Servicing of monoblocks and compact systems

Additional significant advantage of the solution currently offered by MRC is solving servicing problems. Damages caused as a result of balance overload, transport shock, or destructive activity of weighing environment, in the case of monoblock, requires replacing the whole balance as servicing means assembling a completely new mechanism.

In the version with compact system servicing is much easier than with traditional mechanism, as only a complete unit of measuring lever is replaced and the exchange is carried out without breaking the structure of weighing unit i.e. actuator and A/C converter, therefore the temperature parameters remain intact. Only non-centricity and linearity correction requires adjusting. The cost of a single lever is obviously, much lower than the cost of the complete monoblock mechanism, which is reflected in the general cost and the cost of servicing.

Another significant factor is ecology. During the production process of monoblock, especially with older solutions of monoblocks, there is much more output material processed through machining with scabs requiring utilization.

There is significantly less waste material with casting technologies which predominate in compact system.

## Comparison of functional features of different types of mechanisms

Parameter description		Assessment of Construction against traditional mechanism	
		monoblock	compact system
Statistic weighing errors (hysteresis, linearity)	Due to higher durability parameters of elastic bearing elements (flexures) for correctly assembled traditional mechanism it is possible to reach lower errors than in monoblocks	-	+/-
Temperature errors (static and dynamic)	Statistic temperature errors are fully compensated by electronic units and cannot be omitted. Dynamic errors depend on correctness of specific mechanical and electronic constructions and their size cannot be only associated with the type of traditional mechanism, monoblock or compact system.	+/-	+/-
Weighing time	Weighing time depends mostly on electronic solutions applied. For electromagnetic balances, weighing time depends, to a small degree, on the mass of weighing elements, which does not move while weighing, which results from work principle of mass determination system applied.	+/-	+/-
Resistance against transport shocks and overloads	Theoretically, better durability of flexures should favour balances with traditional mechanism extended and commonly used in all made mechanisms additional protecting elements determine the durability of the specific balance against shocks and transport.	+/-	+/-
Labour intensity of assembly	Due to quantity of parts and the necessity to mount them with high precision, assembly time of monoblock is the shortest, assembly time of traditional mechanism is the longest and assembly time of compact system is medium.	+	+/-
Labour intensity of manufacturing parts	Generally the cost of manufacturing monoblock in comparison with traditional mechanism is very high due to very high costs of operating expensive machine tools for metal processing. In compact systems in comparison with monoblocks, high precision machining is applied to a small number of elements, and the body unit of mechanism is made as aluminium casting where only insignificant part is machined.	-	+/-
Production costs of mechanism	Production cost is the sum of manufacturing costs and assembly costs. With high costs of hand-made materials, in the older countries of UE, it is justified to replace it with machine made materials. However, in the final estimate, the production of compact solution, being a compromise, which guarantees high quality of balances and with Polish wages costs is the most beneficial. It is confirmed by the prices of balances offered in the market.	+/-	+/-
Servicing	Servicing costs of mechanical elements are definitely the lowest for compact systems. Replacing rocker sets is fast, does not require special instruments and does not trigger the necessity of correcting temperature parameters. In the case of monoblocks the whole damaged monoblock needs to be replaced which is easy for the service but very expensive for the end customer.	-	+
Material wear and energy consumption (ecology)	During production process of monoblocks, especially the older versions, there are more output materials processed through machining and with newer versions there is more energy consumed for machining than in the case of shape cut out using a string.	-	+

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## Conclusions:

1. As a result of research made by within 30 years of laboratory balances (mostly electromagnetic scales), different solutions of replacing traditional, mechanical systems were found. Main reason for this modifications were to decrease production costs of scales in Europe, which were high because of increasing wages of workers. The reason for waiting long for positive effect was a problem with monoblock quality comparing to traditional solutions.
2. Scales equipped with monoblocks or compact systems are not better or worse in general than traditional systems. Scales with monoblock supposed to be cheaper in general, than traditional ones, but the actual prices do not reflect it.
3. The concept of compact system introduced by MRC is a solution, being a compromise, that limits high precision and expensive work of technicians. Price of manufacturing is lower which combined with high quality allows to compete with other producers.
4. Servicing of MRC's compact system is incomparably cheaper and faster than monoblock. It is very important for clients' costs of "after sale service".
5. Balances with very high resolutions: microbalances with  $d=1\mu\text{g}$ ;  $d=0,1\mu\text{g}$ ; or analytical balances with  $d=0,01\text{mg}$  are produced by most of manufacturers and are based on traditional systems which destroy monoblock market reputation as most precise and most stable weighing system.

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Witold Lewandowski





### MG-3003SD, SD Card Real Time Recorder, AC/DC Magnetic meter

#### Features:

- Wide range, professional magnetic measurement.
- Unit : G ( Gauss ), mT ( milli Tesla ).
- DC or AC magnetic measurement.
- DC magnetic range : 300.00 mT, 3000.0 mT.
- AC magnetic range : 150.00 mT, 1500.0 mT.
- Resolution : 0.01 mT/0.1 mT, 0.1 G/1 G.
- DC polarity : N/S ( north/south pole ).
- Sensor : Hall sensor.
- Zero adjustment.
- Separate probe, easy to make the measurement.
- Real time SD memory card Datalogger, built-in Clock & Calendar, sampling time can set from 1sec to 8hour 59min. 59sec.
- Manual datalogger is available, during execute the manual datalogger function, it can set the different location no. ( position 1 to position 99 ).
- Innovation and easy operation, computer is not need to setup extra software, after execute datalogger, just take away the SD card from the meter and plug in the SD card into the computer, it can down load the all the measured value with the time information ( year/month/date/ hour/minute/second ) to the Excel directly, then user can make the further data or graphic analysis by themselves.
- SD card capacity : 1 GB to 16 GB.
- LCD with green light backlight, easy reading.

- It can default auto power off or manual power off.
- Data hold, record max. and min. reading.
- Microcomputer circuit, high accuracy.
- Power by UM3/AA ( 1.5 V ) x 6 batteries or DC 9V adapter.
- RS232/USB PC COMPUTER interface.
- Wide applications: PCB industries, water conditioning, aquariums, beverage, fish hatcheries, food processing, photography, laboratory, paper industry, plating industry, quality control, school & college, water conditioning.

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#### General Specifications:

Model	MG-3003SD	
Circuit	Custom one-chip of microprocessor LSI circuit.	
Display	LCD size : 52 mm x 38 mm. Dot matrix LCD with backlight.	
Measurement Unit	mT    milli Tesla G       Gauss	
Measurement Range (DC function)	mT	Range 1: 300.00 mT x 0.01 mT Range 2: 3,000.0 mT x 0.1 mT
	G	Range 1: 3,000.0 G x 0.1 G Range 2: 30,000 G x 1 G
Measurement Range (AC function)	mT	Range 1: 150.00 mT x 0.01 mT Range 2: 1,500.0 mT x 0.1 mT
	G	Range 1: 1,500.0 G x 0.1 G Range 2: 15,000 G x 1 G
Accuracy ( 23± 5°C )	DC	± ( 5 % rdg. + 10 digit )
	AC	± ( 5 % rdg. + 20 digit )
Sensor	Hall sensor.	
Frequency Response	AC measurement: 50 Hz / 60 Hz	
Temp. Compensation for hall sensor	Probe head build the Temp. sensor for using the ATC (automatic Temp. compensation).	
Field Direction	Uniaxial.	
Datalogger Sampling Time Setting range	Auto	1 sec to 8 hour 59 min. 59 sec. @ Sampling time can set to 1 second, but memory data may loss.
	Manual	Push the data logger button once will save data one time. @ Set the sampling time to 0 second. @ Manual mode, can also select the 1 to 99 position ( Location ) no.
Memory Card	SD memory card. 1 GB to 16 GB.	



Model	MG-3003SD	
Advanced setting	<ul style="list-style-type: none"> <li>- SD memory card Format</li> <li>- Set clock time ( Year/Month/Date, Hour/Minute/ Second )</li> <li>- Set sampling time</li> <li>- Auto power OFF management</li> <li>- Set beep Sound ON/OFF</li> <li>- Decimal point of SD card setting</li> <li>- Unit setting</li> </ul>	
Data Hold	Freeze the display reading.	
Memory Recall	Maximum & Minimum value.	
Sampling Time of Display	Approx. 1 second.	
Data Output	RS 232/USB PC computer interface. - Connect the optional RS232 cable UPCB-02 will get the RS232 plug. - Connect the optional USB cable USB-01 will get the USB plug.	
Operating Temperature	0 to 50°C.	
Operating Humidity	Less than 85% R.H.	
Power Supply	* Alkaline or heavy duty DC 1.5 V battery ( UM3, AA ) x 6 PCs, or equivalent.	
	* DC 9V adapter input. ( AC/DC power adapter is optional ).	
Power Current	Normal operation ( w/o SD card save data and LCD Backlight is OFF ) : Approx. DC 14 mA.	
	When SD card save the data and LCD Backlight is OFF ) : Approx. DC 37 mA. * If LCD backlight on, the power consumption will increase approx. 12 mA.	
Dimension	Meter	177 x 68 x 45 mm
	Probe	198 x 25 x 19 mm
Accessories Included	* Instruction manual..... 1 PC * Magnetic Probe..... 1 PC * Hard carrying case ( CA-06 ).....1 PC	
Optional Accessories	* 1.413 mS Conductivity Standard Solution..... CD-14	
	SD memory card ( 2 GB ) AC to DC 9V adapter. USB cable, USB-01. RS232 cable, UPCB-02. Data Acquisition software, SW-U801-WIN. Excel data Acquisition software, SE-E802.	

MRC.4.14



Laboratory Equipment Manufacturer  
www.mrclab.com



# MH180 Leeb Hardness Tester

## User's Manual



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**PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION**

Hagavish st. Israel 58817 Tel: 972 3 5595252, Fax: 972 3 5594529 mrc@mrclab.com

MRC.7.14

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# 1 Overview

## 1.1 Advantages

- Wide measuring range. Based on the principle of Leeb hardness testing theory. It can measure the Leeb hardness of all metallic materials.
- Large screen LCD, showing all functions and parameters. With EL background light.
- Seven impact devices are available for special application. Automatically identify the type of impact devices.
- Test at any angle, even upside down.
- Direct display of hardness scales HRB, HRC, HV, HB, HS, HL
- Large memory could store 100 groups (Relative to average times 32~1 ) information including single measured value, mean value, impact direction, impact times, material and hardness scale etc.
- Battery information showing the rest capacity of the battery.
- User calibration function.
- Software to connect to PC via RS232 port. Micro printer support.
- Compact plastic case, suitable for use under poor working conditions
- Continuous working period of no less than 100 hours with two alkaline batteries(AA size); Auto power off to save energy.
- Outline dimensions: 150×74×32 mm
- Weight: 245g

## 1.2 Main Application & Testing Range

### 1.2.1 Main Application

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- Die cavity of molds
- Bearings and other parts
- Failure analysis of pressure vessel, steam generator and other equipment
- Heavy work piece
- The installed machinery and permanently assembled parts.
- Testing surface of a small hollow space
- Material identification in the warehouse of metallic materials
- Rapid testing in large range and multi-measuring areas for large-scale work piece

### 1.2.2 Testing Range

Testing range refer to Table 1 and Table 2 in the Appendix.



### 1.3 Technical Specifications

- Error and repeatability of displayed value see Table1-1 below.

Table 1-1

No.	Type of impact device	Hardness value of Leeb standard hardness block	Error of displayed value	Repeatability
1	D	760 $\pm$ 30HLD 530 $\pm$ 40HLD	$\pm$ 6 HLD $\pm$ 10 HLD	6 HLD 10 HLD
2	DC	760 $\pm$ 30HLDC 530 $\pm$ 40HLDC	$\pm$ 6 HLDC $\pm$ 10 HLDC	6 HLD 10 HLD
3	DL	878 $\pm$ 30HLDL 736 $\pm$ 40HLDL	$\pm$ 12 HLDL	12 HLDL
4	D+15	766 $\pm$ 30HLD+15 544 $\pm$ 40HLD+15	$\pm$ 12 HLD+15	12 HLD+15
5	G	590 $\pm$ 40HLG 500 $\pm$ 40HLG	$\pm$ 12 HLG	12 HLG
6	E	725 $\pm$ 30HLE 508 $\pm$ 40HLE	$\pm$ 12 HLE	12 HLE
7	C	822 $\pm$ 30HLC 590 $\pm$ 40HLC	$\pm$ 12 HLC	12 HLC

- Measuring range: HLD (170~960) HLD
- Measuring direction: 0~360°
- Hardness Scale: HL、HB、HRB、HRC、HRA、HV、HS
- Display: segment LCD
- Data memory: max. 100 groups (relative to impact times 32~1)
- Working power: 3V (2 AA size alkaline batteries)
- Continuous working period: about 100 hours (With backlight off)
- Communication interface: RS232

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### 1.4 Configuration

Table 1-2

	No.	Item	Quantity	Remarks
Standard Configuration	1	Main unit	1	
	2	D type impact device	1	With cable
	3	Standard test block	1	
	4	Cleaning brush (I)	1	
	5	Small support ring	1	
	6	Alkaline battery	2	AA size
	7	Manual	1	
	8	Instrument package case	1	

	9			
Optional Configuration	11	Cleaning brush (II)	1	For use with G type impact device
	12	Other type of impact devices and support rings		Refer to Table 3 and Table 4 in the appendix.
	13	DataPro software	1	
	14	Communication cable	1	
	15	Micro Printer	1	
	16	Print cable	1	

## 1.5 Working Conditions

Working temperature: 0℃~+40℃;

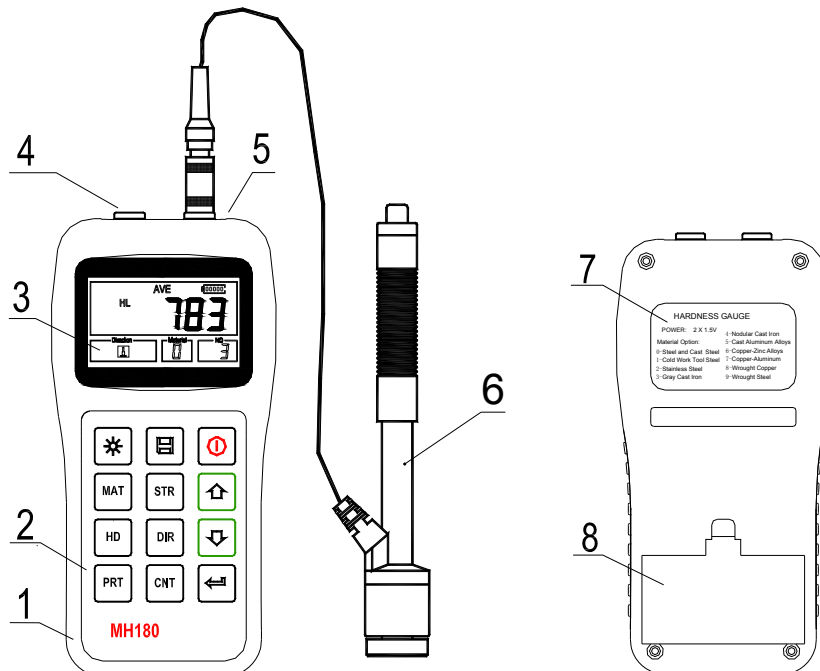
Storage temperature: -30℃~+60℃

Relative humidity: ≤90%;

The surrounding environment should avoid of vibration, strong magnetic field, corrosive medium and heavy dust.

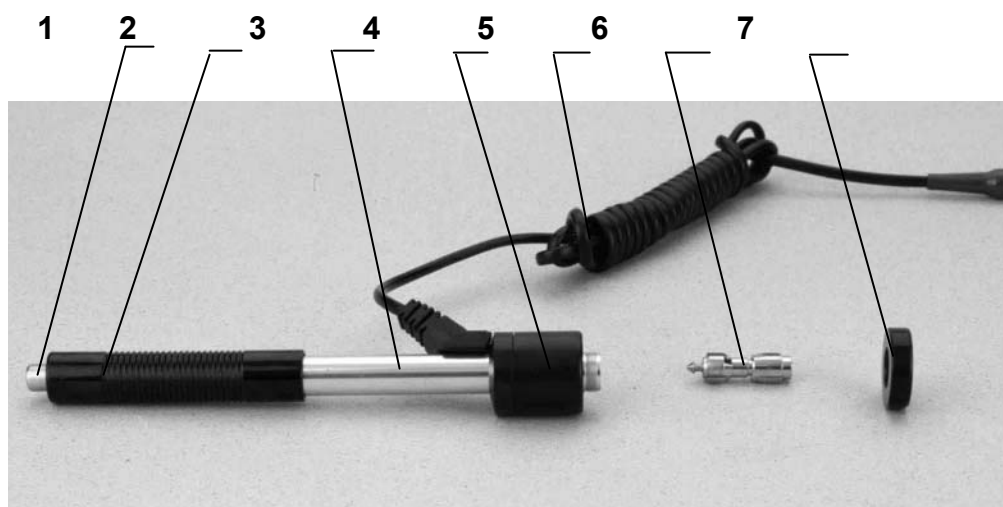
## 2 Structure Feature & Testing Principle

### 2.1 Structure Feature



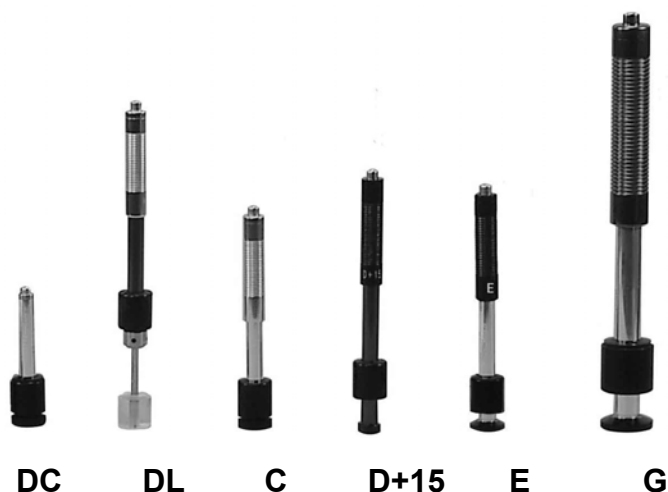
1. Main unit    2. Keypad    3. LCD display    4. Socket of RS232
5. Socket of impact device    6. Impact device    7. Label    8. Battery cover

### 2.1.1 D Type Impact Device



- 1 Release button   2 Loading tube   3 Guide tube   4 Coil unit  
5 Connection cable   6 Impact body   7 Support ring

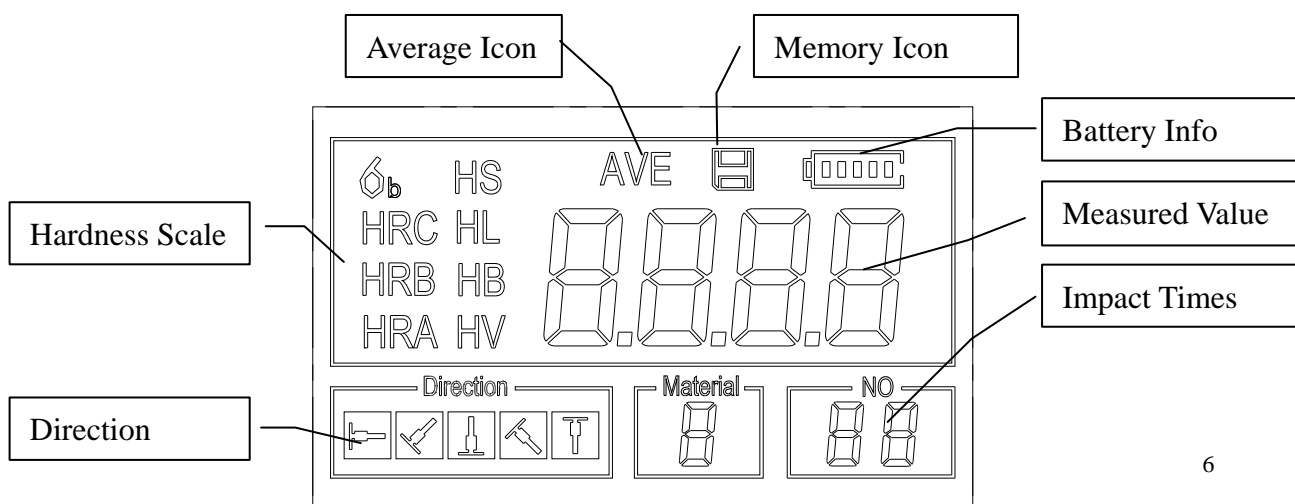
### 2.1.2 Different Types of Impact Device



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## 2.2 Main Screen

Below is the main display screen:



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Instruction of the Main Display Screen:

**Material:** The present presetting material.

**Impact direction:** The present impact direction.

**Hardness scale:** Hardness scale of the present measured value.

**Battery information:** Showing the rest capacity of the battery.

**Measured value:** Display present single time measured value (without showing average icon), or display the present mean value (with average icon prompting). “-HI-” means over conversion value or measure range. “-LO-” means lower than conversion value or measure range.





**Impact times:** Times that have been impacted.

**Average Icon:** It will appear when showing the mean value of the measured values after reaching the presetting impact times.













**Memory Icon:** It appears when operating the instrument memory.



## 2.3 Keypad Definitions

Table 2-1

	/off the EL backlig		ave or Data Delete		e instrument on/off
	l Selection		ss/Strength switch		Up
	ss Scale Selection		n change		or Down
	ta		Times set		gging or Enter

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- Press  key to store present group of measured value into memory. This operation is only valid after displaying the mean value.
- Press key  and  could display single measured value.
- Press  key could switch on of off the background light of LCD.
- Press  key to set the impact direction.
- Press  key to change the impact times in one group. The impact times item will flash when first pressing the  key, and then the impact times value will plus or minus when pressing the  or  key. Press  key finally to exit from changing the impact times process.
- Press  key to change the hardness scale.
- Press  key to change the material. Presetting hardness scale recovers to HL automatically after material presetting changed.

- Press  key to switch between hardness test and strength test. Only D and DC type of impact device has the function of strength testing. So hardness testing is the only selection if the impact device is not D or DC type.
- Press  key to print out the measured values after measurement.

## 2.4 Leeb Hardness Testing Principle

The basic principle is to use an impact body of certain weight impacts against the testing surface under certain test force, then measure the impacting velocity and the rebounding velocity of the impact body respectively when the spherically test tip is located 1mm above the testing surface.

The calculation formula is as follows:

$$HL = 1000 \times VB / VA$$

Where, HL—— Leeb hardness value



VB—— Rebounding velocity of the impact body

VA—— Impacting velocity of the impact body



## 3 Preparation



### 3.1 Instrument Preparation and Inspection

Verification of the instrument is by using standard test block. The error and repeatability of displayed value should be within the regulation of Appendix table 2. The instrument and impact device must be calibrated using a standard hardness block before use as the first time, or having not been used for a long time, or having reset the instrument system.

Press  key, meanwhile pressing down the  key to power on the system. Then the user calibration screen shows as left below.

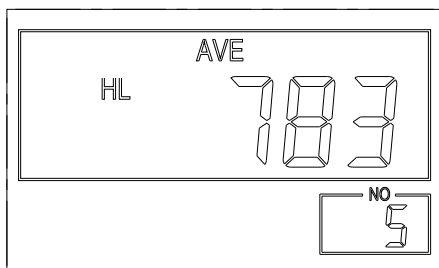
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Test for 5 points on the standard hardness block. It would display the average measured value after measuring 5 times. Press   key to change to its nominal value.

Press  key to confirm the calibration finally. Or press the  key to cancel the calibration.

Range of adjustment:  $\pm 30HL$ .

The measurement parameters, including the material setting, the hardness scale and the impact direction can't be changed during calibration.



**Note :** Use a calibrated hardness tester, test the standard test block downward vertically for 5 times, the arithmetical average value compare with the value of standard test block. If this value exceeds the standard value, could use the function of user calibration to adjust



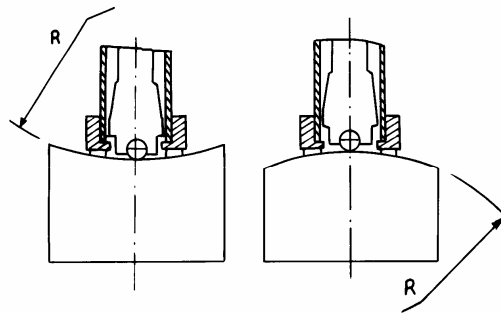
## 3.2 Impact Device Selection

Refer to Appendix Table 1 and Table 3 for selection of impact device.

## 3.3 Preparation of the Sample Surface

Preparation for sample surface should conform to the relative requirement in Appendix Table 3.

- In the preparation processing for sample surface, the hardness effect of being heated or cold processing on the surface of sample should be avoided.
- Too big roughness of the being measured surface could cause error. So, the surface of the sample to be measured must appear metallic luster, smoothing and polish, without oil stain.
- Support of test sample. Support is no necessary for heavy sample. Medium-weight parts must be set on the smoothing and stable plane. The sample must set absolutely equability and without any wobble.
- Curved surface: The best testing surface of sample is flat. When the curvature radius  $R$  of the surface to be tested is smaller than 30mm (D, DC, D+15,C, E and DL type of impact device) and smaller than 50mm (G type of impact device), the small support ring or the shaped support rings should be chosen.
- The sample should have enough thickness, minimum thickness of sample should conform to Table 3.
- For the sample with hardened layer on surface, the depth of hardened layer should conform to Table 3.




- Coupling. Light-weight sample must be firmly coupled with a heavy base plate. Both coupled surface must be flat and smooth, and there is no redundant coupling agent existing. The impact direction must be vertical to the coupled surface. When the sample is a big plate, long rod or bending piece, it can be deformed and become unstable, even though its weight and thickness is big enough, and accordingly, the test value may not be accurate. So the sample should be reinforced or supported at its back.
- Magnetism of the sample itself should be avoided.

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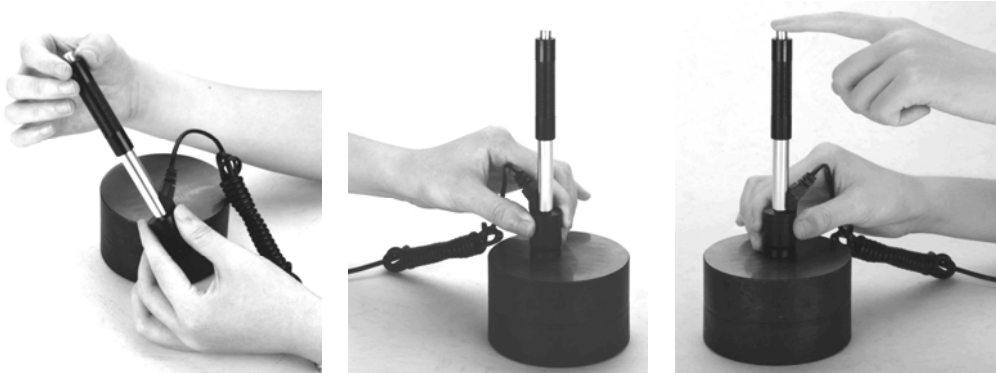
## 4 Testing Program

### 4.1 Start-Up

- Insert the plug of the impact device into the socket of impact device on the instrument.
- Press the  key, now power is on. The instrument is in working mode.

### 4.2 Loading

Pushing the loading-tube downwards until contact is felt. Then allow it to slowly return to the starting position or using other method locking the impact body.



### 4.3 Localization

Press the impact device supporting ring firmly on the surface of the sample, the impact direction should be vertical to the testing surface.

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### 4.4 Testing

- Press the release button on the upside of the impact device to test. The sample and the impact device as well as the operator are all required to be stable now. The action direction should pass the axis of the impact device.
- Each measure area of the sample usually need 3 to 5 times of testing operation. The result data dispersion should not more than mean value  $\pm 15HL$ .
- The distance between any two impact points or from the center of any impact point to the edge of testing sample should conform to the regulation of Table 4-1.
- If want accurate conversion from the Leeb hardness value to other hardness value, contrastive test is needed to get conversion relations for the special material. Use inspection qualified Leeb hardness tester and corresponding hardness tester to test at the same sample respectively. For each hardness value, each measure homogeneously 5 points of Leeb hardness value in the surrounding of more than three indentations which need conversion hardness, using Leeb hardness arithmetic average value and corresponding hardness average value as correlative value respectively, make individual hardness contrastive curve. Contrastive curve at least should include three group of correlative data.

Table 4-1

Type of Impact Device	Distance of center of the two indentations	Distance of center of the indentation to sample edge
	Not less than (mm)	Not less than (mm)
D、DC	3	5
DL	3	5
D+15	3	5
G	4	8
E	3	5
C	2	4

## 4.5 Read Measured Value

After each impact operation, the LCD will display the current measured value, impact times plus one, the buzzer would alert a long howl if the measured value is not within the valid range. When reaching the presetting impact times, the buzzer will alert a long howl. After 2 seconds, the buzzer will alert a short howl, and display the mean measured value.


## 4.6 Notification

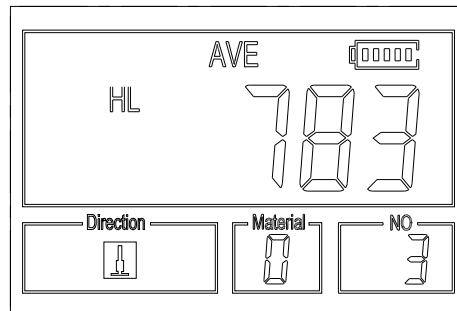
- Replacing the impact device must be done during Power off. Otherwise the main body could not identify the type of the impact device, and it may damage the circuit board of the main body.
- You could not save the current test value if the impact time is less than the presetting times value.
- Only type D and type DC of impact device have the function of strength test option. You can not change the setting to strength testing when using other types of impact device. The setting would be set to hardness testing automatically after replacing the impact device whether the setting is hardness testing or not before.
- Not all materials could convert to all hardness scale value. The hardness scale is reset to HL automatically after changing the material. So select material firstly before changing the hardness scale.


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## 5 Operation Detail


### 5.1 Power On/Off

Press  to power on the instrument. Be sure to plug in the impact device before powering on. The system would automatically detect the type of the impact device during power up, and would display this information on the screen. Users should pay attention to the probe type displayed on the screen. After pausing for several second, the screen will exit and enter the main display screen as following:



The instrument can be turned off by pressing the  key while it is working. The tool has a special memory that retains all of its settings even when the power is off.

### 5.2 Material Setting

Press  key to change the material to the one you want to preset. Hardness scale recovers to HL automatically after material presetting changed. Please select material firstly, then select hardness scale.

In hardness testing, you can select the material among the following materials: Steel and Cast Steel, Cold Work Tool Steel, Stainless Steel, Gray Cast Iron, Nodular Cast Iron, Cast Aluminium Alloys, Copper-Zinc Alloys, Copper-Aluminium Alloys, Wrought Copper and Wrought Steel. The relationship between the material number displayed on the instrument screen and the material is as follows:

Table 5-1

Material No.	Material	Material No.	Material
0	Steel and cast steel	5	Cast aluminium alloys
1	Cold work tool steel	6	Copper-Zinc alloys
2	Stainless steel	7	Copper –Aluminium alloys
3	Gray cast iron	8	Wrought copper
4	Nodular cast iron	9	Wrought steel

In strength testing, the following materials are selectable: Mild Steel, High-Carbon Steel, Cr Steel, Cr-V Steel, Cr-Ni Steel, Cr-Mo Steel, Cr-Ni-Mo Steel, Cr-Mn-Si Steel, Super Strength Steel and Stainless Steel. The relationship between the material number displayed on the instrument screen and the material is as follows:


Table 5-2

Material No	Material	Material No	Material
0	Mild steel	5	Cr-Mo steel


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1	High carbon steel	6	Cr-Ni-Mo steel
2	Cr steel	7	Cr-Mn-Si steel
3	Cr-V steel	8	Super strength steel
4	Cr-Ni steel	9	Stainless steel

### 5.3 Hardness/Strength testing

Press  key to switch between hardness testing and strength testing (6b) .


**Note: Only D and DC type of impact device has the function of strength testing. So hardness testing is the only selection if the impact device is not D or DC type.**

In hardness testing, Press  key to change the hardness scale. The supported hardness scale includes: HL, HV, HB, HRC, HS, HRB and HRA.

**Note:**





- Here only displays the valid hardness scale for the present selected impact device and material. It would not display the hardness scale which is not valid.
- Please select material firstly, then select hardness scale.
- Presetting hardness scale recovers to HL automatically after presetting material is changed.

### 5.4 Impact Direction Setting


Press the  key to move to the impact direction that you will preset.

### 5.5 Average Times Setting

You could modify average times within the range of 1 to 32 as following:




- 1) Press  key in testing state. The impact times item will begin to flash;
- 2) Press  or  key to set the average times to the number you want.
- 3) Press  key finally to exit from the operation.

### 5.6 Data logging

At most one hundred files (F00-F99, one group as one file) can be stored inside the gauge. By simply pressing the  key after a new measurement finishes-the screen showing the “AVE” icon, the measured hardness/strength group values will be saved to memory. The new saved file is appended as the last file of the memory. This function provides the user with the ability to view/delete a file/group previously saved in memory.





#### 5.6.1 Viewing stored file/Group

To view the memory data, follow the steps:

- 1) Press the  key to activate the data logging function. The memory icon will appear. It will display the current file name, the test parameter of the group data and the mean value of the group. If there is no data in the memory, it will display: <E04>, which means no memory data, and then return back.
- 2) Use the  key and the  key to select the desired file to view.






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- 3) Press the  key to see details of that group data.
- 4) Use the  key and the  key to view each single measured data in that group while viewing details.
- 5) Press the  key to return to previous screen at any time during data logging.

### 5.6.2 Deleting selected file/Group


The user may require deleting a file from the instrument memory. The procedure is outlined in the following steps.






- 1) Press the  key to activate the data logging function. The memory icon will appear. It will display the current file name, the test parameter of the group data and the mean value of the group. If there is no data in the memory, it will display: <E04>, which means no memory data, and then return back.
- 2) Use the  key and the  key to scroll to the file that will be deleted.
- 3) Press the  key on the desired file. It will automatically delete the file, and display “-DEL”.
- 4) Press the  key, at any time, to exit the data logging function and return to measurement mode.

**Note:** *Do not shut down the instrument while deleting data. It could lead to unpredicted consequence if shutting down while deleting.*


## 5.7 Print Report

At the end of the inspection process, or end of the day, the user may require the readings be printed. This function is only available with the mini-printer.


Before printing, please insert one connection plug of the print cable (Optional parts) into the socket on the up-left of the main body, and insert the other plug into the communication socket of the mini-printer. You can print out the measurement result immediately after each testing process, by easily pressing the  key. If you want to print the data stored in the instrument memory, then following is the steps:

1. Press the  key to activate the data logging function. The memory icon will appear.
2. Use the  key and the  key to select the desired file.
3. Press the  key to print the selected file. This operation will send all the data in current file to the mini printer via RS232 port and print them out.
4. Press the  key to exit the data logging functions and return to measurement mode.

## 5.8 System Reset

Press down the  key while powering on the instrument will restore factory defaults. The only time this might possibly helpful is if the parameter in the gauge was somehow corrupted.


## 5.9 EL Backlight

With the EL background light, it is convenient to work in the dark condition. Press key  to switch on or switch off the background light at any moment as you need after power on.

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
Since the EL light will consume much power, turn on it only when necessary.

## 5.10 Auto Power Off

The instrument features an auto power off function designed to conserve battery life. If the tool is idle (neither measuring nor any key operation) for 5 minutes, it will turn itself off. Before powering off, the LCD display of the instrument will continue flashing for 20 seconds. Except key , press any key could stop the twinkle of LCD screen and stop the operation of power off at the moment.

While the voltage of the battery is too low, the display will show <E00>, then power off automatically.

## 5.11 Battery Replacement

Two AA size alkaline batteries are needed as the power source. After several hours' usage of the batteries, the battery symbol on the screen will be shown as . The more of dark part indicates the more close to full. When the battery capacity runs out, the battery symbol will be shown as  and will begin to flash. When this occurs, the batteries should be replaced by a new pair.

***Pay attention to the polarity of the batteries!***

***Please take out the batteries when not working during a long period of time.***

## 5.12 Connecting to a Computer

The Instrument is equipped with a RS232 serial port. Using the accessory cable (The cable and following referred software are optional parts), the gauge has the ability to connect to a computer, or external storage device. Measurement data stored in the memory of the gauge can be transferred to the computer through the RS232 port. Detailed information of the communication software and its usage refer to the software manual.

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## 5.13 Error Code Reference

Error Code	Explanation	Error Code	Explanation
E00	Battery exhausted	E05	Can not print
E01	Value out of range	E06	
E02	Measurement not finished	E07	
E03	Data already saved	E08	
E04	No memory data	E09	

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## 6 Maintenance & Servicing

### 6.1 Impact Device Maintenance

- After the impact device has been used for 1000--2000 times, please use the nylon brush provided to clean the guide tube and impact body. When cleaning the guide tube, unscrew the support ring first, then take out the impact body, spiral the nylon brush in counter-clock direction into the bottom of guide tube and take it out for 5 times, and then install the impact body and support ring again.
- Release the impact body after use.
- Any lubricant is absolutely prohibited inside the impact device.

### 6.2 Instrument Maintenance Program

- When using standard Rockwell hardness block to testing, if all the error is bigger than 2 HRC, it may be the invalidation of impacted ball top caused by abrasion. Changing the spherical test tip or impact object should be considered.
- When the hardness tester appears some other abnormal phenomena, please do not dismantle or adjust any fixedly assembled parts. Fill in and present the warranty card to us. The warranty service can be carried on.

### 6.3 Fault Analysis & Evacuation

Fault Appearance	Fault Analysis	Handling method
Failure power on	Battery exhaustion	Replace the batteries
No measured value	Impact device cable failure	Replace the cable

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### 6.4 Notice of Transport and Storage Conditions

- Keep it away from vibration, strong magnetic field, corrosive medium, dampiness and dust. Storage in ordinary temperature.
- With original packing, transport is allowed on the third grade highway.

## APPENDIX

**Table 1**

Material	Method	Impact device					
		D/DC	D+15	C	G	E	DL
Steel and cast steel	HRC	20~68.5	19.3~67.9	20.0~69.5		22.4~70.7	20.6~68.2
	HRB	38.4~99.6			47.7~99.9		37.0~99.9
	HRA	59.1~85.8				61.7~88.0	
	HB	127~651	80~638	80~683	90~646	83~663	81~646
	HV	83~976	80~937	80~996		84~1042	80~950
	HS	32.2~99.5	33.3~99.3	31.8~102.1		35.8~102.6	30.6~96.8
Cold work tool steel	HRC	20.4~67.1	19.8~68.2	20.7~68.2		22.6~70.2	
	HV	80~898	80~935	100~941		82~1009	
Stainless steel	HRB	46.5~101.7					
	HB	85~655					
	HV	85~802					
Grey cast iron	HRC						
	HB	93~334			92~326		
	HV						
Nodular cast iron	HRC						
	HB	131~387			127~364		
	HV						
Cast aluminium alloys	HB	19~164		23~210	32~168		
	HRB	23.8~84.6		22.7~85.0	23.8~85.5		
BRASS(copper-zinc alloys)	HB	40~173					
	HRB	13.5~95.3					
BRONZE(copper-aluminium/tin alloys)	HB	60~290					
Wrought copper alloys	HB	45~315					

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**Table 2**

No.	Material	HLD	Strength $\sigma_b$ (MPa)
1	Mild steel	350~522	374~780
2	High-Carbon steel	500~710	737~1670
3	Cr steel	500~730	707~1829
4	Cr-V steel	500~750	704~1980
5	Cr-Ni steel	500~750	763~2007
6	Cr-Mo steel	500~738	721~1875
7	Cr-Ni-Mo steel	540~738	844~1933
8	Cr-Mn-Si steel	500~750	755~1993
9	Super strength steel	630~800	1180~2652
10	Stainless steel	500~710	703~1676

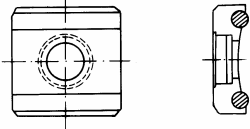
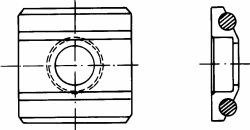
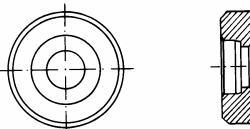
**Table 3**

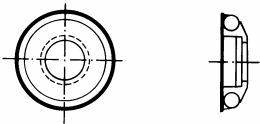
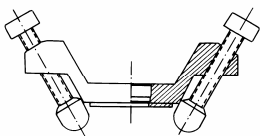
Type of impact device	DC(D)/DL	D+15	C	G	E
Impacting energy	11mJ	11mJ	2.7mJ	90mJ	11mJ
Mass of impact body	5.5g/7.2g	7.8g	3.0g	20.0g	5.5g
Test tip hardness: Dia. Test tip: Material of test tip:	1600HV 3mm Tungsten carbide	1600HV 3mm Tungsten carbide	1600HV 3mm Tungsten carbide	1600HV 5mm Tungsten carbide	5000HV 3mm synthetic diamond
Impact device diameter: Impact device length: Impact device weight:	20mm 86(147)/ 75mm 50g	20mm 162mm 80g	20mm 141mm 75g	30mm 254mm 250g	20mm 155mm 80g
Max. hardness of sample	940HV	940HV	1000HV	650HB	1200HV
Mean roughness value of sample surface Ra:	1.6 $\mu$ m	1.6 $\mu$ m	0.4 $\mu$ m	6.3 $\mu$ m	1.6 $\mu$ m
Min. weight of sample: Measure directly Need support firmly Need coupling tightly	>5kg 2~5kg 0.05~ 2kg	>5kg 2~5kg 0.05~2kg	>1.5kg 0.5~1.5kg 0.02~0.5kg	>15kg 5~15kg 0.5~5kg	>5kg 2~5kg 0.05~2kg
Min. thickness of sample Coupling tightly Min. layer thickness for	5mm	5mm	1mm	10mm	5mm



surface hardening		≥0.8mm	≥0.8mm	≥0.2mm	≥1.2mm	≥0.8mm
Size of tip indentation						
Hardness 300HV	Indentation diameter Depth of indentation	0.54mm 24 μ m	0.54mm 24 μ m	0.38mm 12 μ m	1.03mm 53 μ m	0.54mm 24 μ m
Hardness 600HV	Indentation diameter Depth of indentation 压痕深度	0.54mm 17 μ m	0.54mm 17 μ m	0.32mm 8 μ m	0.90mm 41 μ m	0.54mm 17 μ m
Hardness 800HV	Indentation diameter Depth of indentation	0.35mm 10 μ m	0.35mm 10 μ m	0.35mm 7 μ m	-- --	0.35mm 10 μ m
Available type of impact device		DC: Test hole or hollow cylindrical; DL: Test slender narrow groove or hole	D+15: Test groove or reentrant surface	C: Test small, light, thin parts and surface of hardened layer	G: Test large, thick, heavy and rough surface steel	E: Test super high hardness material

**Table 4**

No.	Type	Sketch of non-conventional Supporting ring	Remarks
1	Z10-15		For testing cylindrical outside surface R10~R15
2	Z14.5-30		For testing cylindrical outside surface R14.5~R30
3	Z25-50		For testing cylindrical outside surface R25~R50
4	HZ11-13		For testing cylindrical inside surface R11~R13
5	HZ12.5-17		For testing cylindrical inside surface R12.5~R17
6	HZ16.5-30		For testing cylindrical inside surface R16.5~R30
7	K10-15		For testing spherical outside surface SR10~SR15

8	K14.5-30		For testing spherical outside surface SR14.5~SR30
9	HK11-13		For testing spherical inside surface SR11~SR13
10	HK12.5-17		For testing spherical inside surface SR12.5~SR17
11	HK16.5-30		For testing spherical inside surface SR16.5~SR30
12	UN		For testing cylindrical outside surface, radius adjustable R10~∞



### MH180, Hardness tester

- Compact plastic case, suitable for use under poor working conditions. Test at any angle, even upside down.
- Wide measuring range. It can measure the hardness of all metallic materials. Direct display of hardness scales HRB, HRC, HV, HB, HS, HL
- Large screen (segment LCD), showing all functions and parameters. With EL background light.
- Large capacity memory could store 100 groups information.
- Datapro Software to connect with PC via RS232 port. Micro printer support
- Software calibration function.

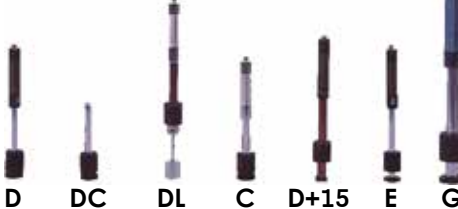
### Configuration:

	No.	Item	Quantity	Remarks
Standard Configuration	1	Main unit	1	
	2	D type impact device	1	With cable
	3	Standard test block	1	
	4	Cleaning brush (I)	1	
	5	Small support ring	1	
	6	Alkaline battery	2	AA size
	7	Manual	1	
	8	Instrument package case	1	
Optional Configuration	9	Cleaning brush (II)	1	For use with G type impact device
	10	Other type of impact devices and support rings		Refer to Table 3 and Table 4 in the appendix.
	11	DataPro s software	1	
	12	Communication cable	1	
	13	Micro Printer	1	
	14	Print cable	1	

### Main Application:

- Die cavity of molds
- Bearings and other parts
- Failure analysis of pressure vessel, steam generator and other equipment
- Heavy work piece
- The installed machinery & permanently assembled parts.
- Testing surface of a small hollow space
- Material identification in the warehouse of metallic materials
- Rapid testing in large range and multi-measuring areas for large-scale work piece.

### Testing range:



### Technical Specifications:

- Measuring range: (170-960) HLD, (17-68.5) HRC, (19-651) HB, (80-976) HV, (30-100) HS, (59-85) HRA, (13-100) HRB
- Measuring direction: 360° ↕↔↔↔
- Hardness Scale: HL, HB, HRB, HRC, HRA, HV, HS
- Display: segment LCD
- Data memory: max. 100 groups (relative to impact times 32~1)
- Working voltage: 3V (2 AA size alkaline battery)
- Continuous working period: about 100 hours (With backlight off)
- Communication interface: RS232.

### Other type of impact devices:

Material	Method	Impact device					
		D/DC	D+15	C	G	E	DL
Steel and cast steel	HRC	20 ~ 68.5	19.3 ~ 67.9	20.0 ~ 69.5		22.4 ~ 70.7	20.6 ~ 68.2
	HRB	38.4 ~ 99.6			47.7 ~ 99.9		37.0 ~ 99.9
	HRA	59.1 ~ 85.8				61.7 ~ 88.0	
	HB	127 ~ 651	80 ~ 638	80 ~ 683	90 ~ 646	83 ~ 663	81 ~ 646
	HV	83 ~ 976	80 ~ 937	80 ~ 996		84 ~ 1042	80 ~ 950
	HS	32.2 ~ 99.5	33.3 ~ 99.3	31.8 ~ 102.1		35.8 ~ 102.6	30.6 ~ 96.8
Cold work tool steel	HRC	20.4 ~ 67.1	19.8 ~ 68.2	20.7 ~ 68.2		22.6 ~ 70.2	
	HV	80 ~ 898	80 ~ 935	100 ~ 941		82 ~ 1009	
	HRB	46.5 ~ 101.7					
	HB	85 ~ 655					
	HV	85 ~ 802					
	HRC						
	HB	93 ~ 334			92 ~ 326		
	HV						
	HRC				127 ~ 364		
	HB	131 ~ 387					
	HV						
	HB	19 ~ 164		23 ~ 210	32 ~ 168		
	HRB	23.8 ~ 84.6		22.7 ~ 85.0	23.8 ~ 85.5		
	HB	40 ~ 173					
	HRB	13.5 ~ 95.3					
	HB	60 ~ 290					
	HB	45 ~ 315					
	HB						
Available type of impact device		DC: Test hole or hollow cylindrical	D+15: Test groove or reentrant surface	C: Test small, light, thin parts and surface of hardened layer	G: Test large, thick, heavy and rough surface steel	E: Test super high hardness material	DL: Test slender narrow groove or hole

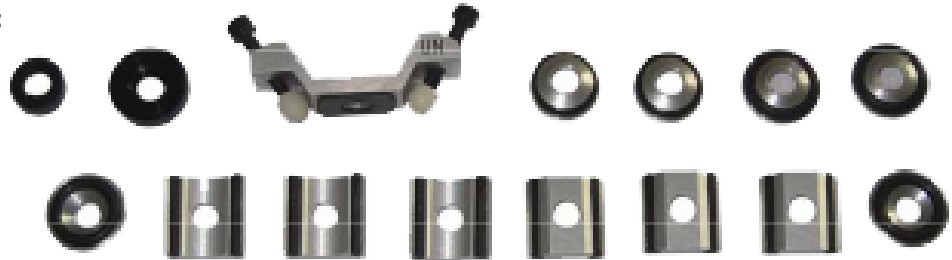
## Testing conditions:

Type of impact device	DC(D)/DL	D+15	C	G	E
Impacting energy	11mJ	11mJ	2.7mJ	90mJ	11mJ
Mass of impact body	5.5g/7.2g	7.8g	3.0g	20.0g	5.5g
Test tip hardness: Dia. Test tip: Material of test tip:	1600HV 3mm Tungsten carbide	1600HV 3mm Tungsten carbide	1600HV 3mm Tungsten carbide	1600HV 5mm Tungsten carbide	5000HV 3mm synthetic diamond
Impact device diam.: Impact device length: Impact device weight:	20mm 86(147)/75mm 50g	20mm 162mm 80g	20mm 141mm 75g	30mm 254mm 250g	20mm 155mm 80g
Max. hardness of sample	940HV	940HV	1000HV	650HB	1200HV
Mean roughness value of sample surface Ra:	1.6µm	1.6µm	0.4µm	6.3µm	1.6µm
Min. weight of sample: Measure directly Need support firmly Need coupling tightly	>5kg 2 ~ 5kg 0.05 ~ 2kg	>5kg 2 ~ 5kg 0.05 ~ 2kg	>1.5kg 0.5 ~ 1.5kg 0.02 ~ 0.5kg	>15kg 5 ~ 15kg 0.5 ~ 5kg	>5kg 2 ~ 5kg 0.05 ~ 2kg
Min. thickness of sample Coupling tightly Min. layer thickness for surface hardening	5mm ≥0.8mm	5mm ≥0.8mm	1mm ≥0.2mm	10mm ≥1.2mm	5mm ≥0.8mm

## Size of tip indentation:

Hardness 300HV	Indentation diam.	0.54mm	0.54mm	0.38mm	1.03mm	0.54mm
	Depth of indentation	24µm	24µm	12µm	53µm	24µm
Hardness 600HV	Indentation diam.	0.54mm	0.54mm	0.32mm	0.90mm	0.54mm
	Depth of indentation	17µm	17µm	8µm	41µm	17µm
Hardness 800HV	Indentation diam.	0.35mm	0.35mm	0.35mm	-	0.35mm
	Depth of indentation	10µm	10µm	7µm	-	10µm

## Support rings for Shaped Materials:



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## Other type of support rings:

No.	Type	Sketch of non-conventional Supporting ring	Remarks
1	Z10-15		For testing cylindrical outside surface R10 ~ R15
2	Z14.5-30		For testing cylindrical outside surface R14.5 ~ R30
3	Z25-50		For testing cylindrical outside surface R25 ~ R50
4	HZ11-13		For testing cylindrical inside surface R11 ~ R13
5	HZ12.5-17		For testing cylindrical inside surface R12.5 ~ R17
6	HZ16.5-30		For testing cylindrical inside surface R16.5 ~ R30
7	K10-15		For testing spherical outside surface SR10 ~ SR15
8	K14.5-30		For testing spherical outside surface SR14.5 ~ SR30
9	HK11-13		For testing spherical inside surface SR11 ~ SR13
10	HK12.5-17		For testing spherical inside surface SR12.5 ~ SR17
11	HK16.5-30		For testing spherical inside surface SR16.5 ~ SR30
12	UN		For testing cylindrical outside surface, radius adjustable R10 ~ ∞



Laboratory Equipment Manufacturer

www.mrclab.com



## Mini-ELECTRO

### Mini Gel Electrophoresis System

### Operating Manual



**PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION**

3, Hagavish st. Israel 58817 Tel: 972 3 5595252, Fax: 972 3 5594529 mrc@mrclab.com

**MRC.VER.01-6.14**



## Foreword

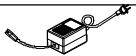






Thank you for purchasing Mini Gel Electrophoresis System.

This manual includes product introduction and operating guides etc., before using this product, be sure you fully understand its features as described in this user manual and use it properly. Also please keep the manual for future check.

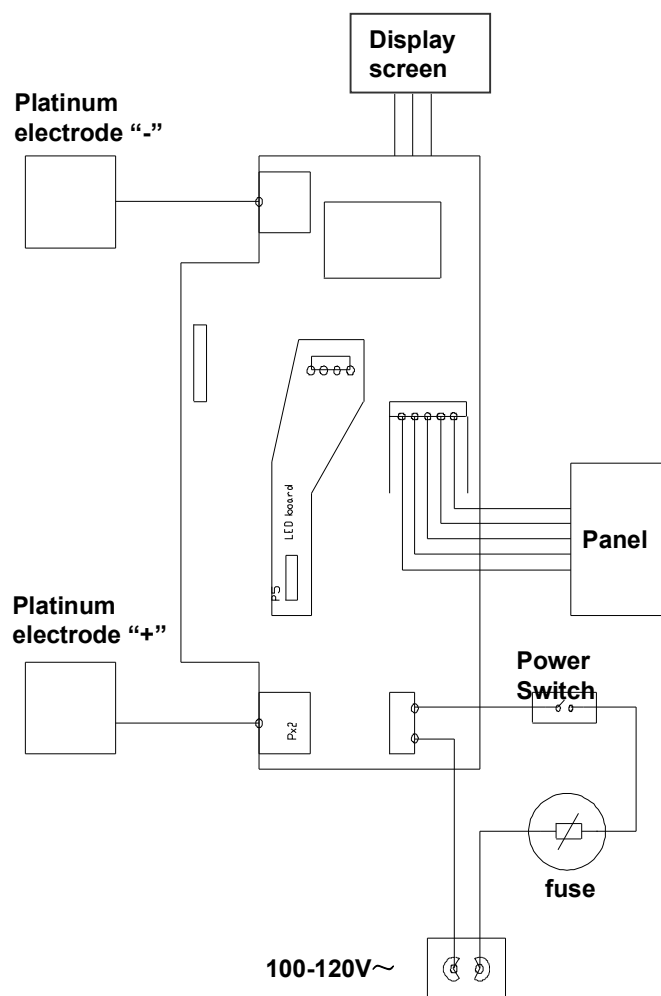
## Opening check

Please check the packing list when first open the packaging, if there's any missed or incorrect parts, please contact with distributor or manufacturer accordingly.

## Packing List (for Mini-Electro)

No.	Contents	Specs	QTY
1	Main Device	Mini-Electro	1 pc
2	AC transformer		1 pc
3	Gel maker Stand (A)		1 pc
4	Gel maker Stand (B)		1 pc
5	Gel Tray (A)		2 pcs
6	Gel Tray (B)		4 pcs
7	Combs (A)		2 pcs
8	Combs (B)		2 pcs
9	User Manual		1 pc
10	Inspect Certificate		1 pc

## Appendix 1 Wiring diagram for Mini-Electro



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## 1. Brief Introduction

This instrument has advantages in nucleic acid analyze, it's a major method in molecular biology research and basically used for nucleic acid detection and separation.

Before use, please read carefully this operating manual.

### 1.1 Standard set contents

Main device	1 pc
Power cord	1 pc
Gel maker stand (A)	1 pc
Gel maker stand (B)	1 pc
Gel Tray (A)	2 pcs
Gel Tray (B)	4 pcs
Combs (A)	2 pcs
Combs (B)	2 pcs
AC transformer *	1 pc
User Manual	1 pc
Inspect Certificate	1 pc

## 5 Maintenance



When cleaning the surface of instrument, use regular wet cloth is okay, make sure not use any corrosive cleaner and disconnect the power before cleaning



When cleaning migration tank, please separate control box first, please simply use water or neutral cleaner. There's platinum electrode at the bottom of migration tank, it's delicate, be careful not to break it by cleaning.



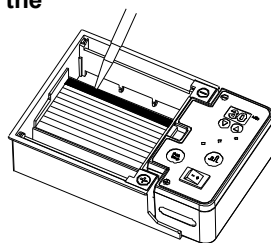
Cleaning gel maker stand, gel tray and combs with water or neutral cleaner.

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## 6 Troubleshooting

Problem	Causes	Measures
No display	Power disconnect Switch failure Controller failure	Check power supply, unplug and re-plug it Replace switch Contact distributor or manufacturer for repair
No Migration	Power switch not on No power supply	Turn on power switch Contact distributor or manufacturer for repair
Abnormal Electrophoresis Distance	Incorrect input voltage	Check mains voltage
Key function failure	Film switch failure	Contact distributor or manufacturer for repair

4.3.4 Use pipette to put the sample into the sample hole of gel



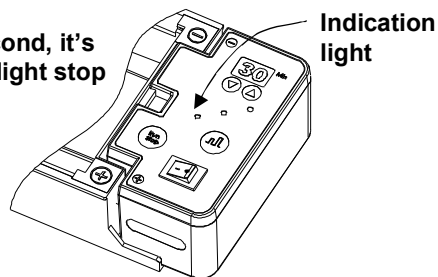
4.3.5 The display screen light after lid closed and switch turned on.

Press ▲▼ for time setting between 1min-99min, If need the instrument keep working, set "00" on time setting

Press  to select output voltage , the indication light on after chose.

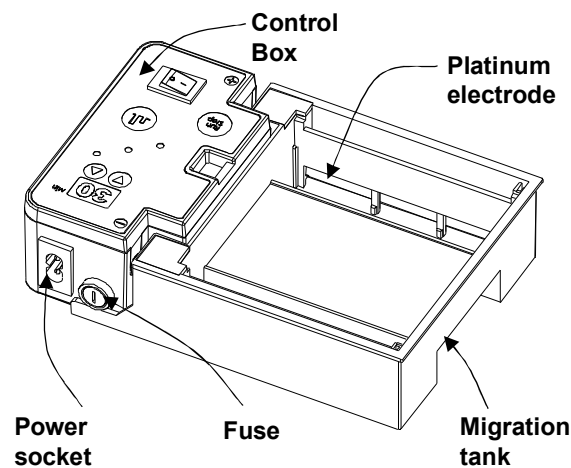
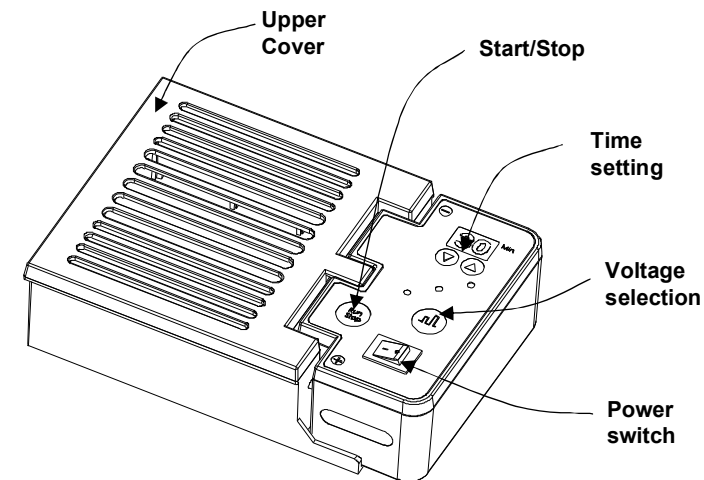
Short press Stop/Run once to start timing, simultaneously the indication light at output voltage start blinking regularly. After timing, the instrument will have beep alarm for 3 times, then display screen shows "Ed", press any key to return.

Long press Stop/Run for 1 second, it's stop operating and indication light stop blinking.



4.3.6 After operation, please turn off the power, then open the lid and take out the gel tray.

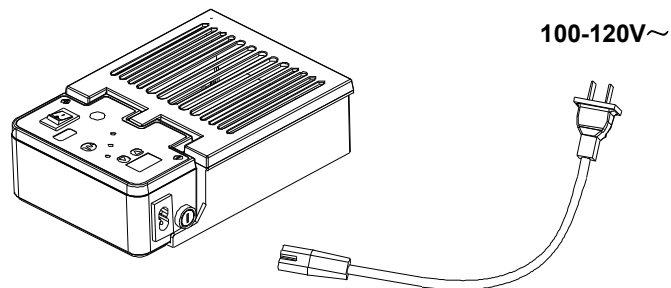
## 1.2 Components



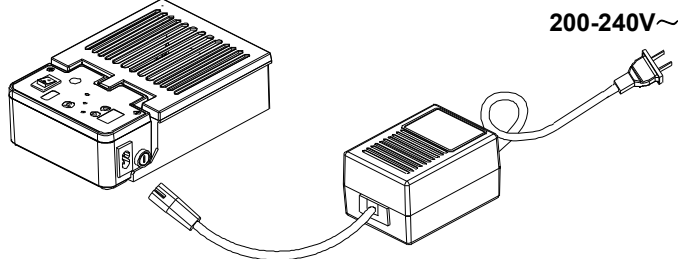
## 1.3 Installation

1.3.1 Put the electrophoresis system on a smooth surface.

1.3.2 Connect one end of power to the instrument and the other end to connect main power, the input voltage should be between AC100~120V (Photo as below)



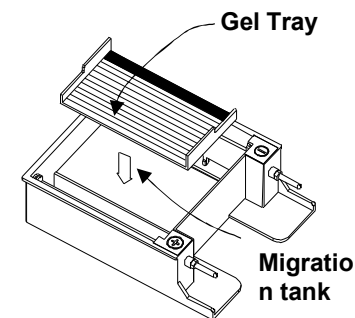
1.3.3 When the input voltage is AC220V, please use adaptor to transform, please connect both instrument and adaptor as below.



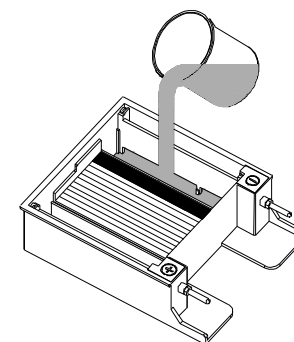
## 4.3 Electrophoresis

4.3.1 Place the prepared gel on the gel bed of the migration tank together with the tray.

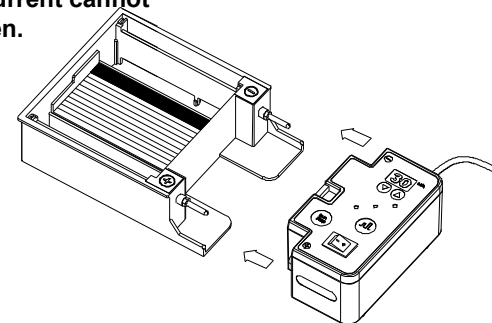
Remark: Migration may be affected if the migration tank is not placed on a level surface



4.3.2 Pour buffer solution to a level of about 3mm above the surface of the gel, 250-300ml of buffer is required.

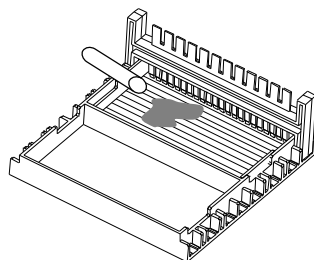


4.3.3 Connect the power supply to the migration tank and insert the electric plug into an outlet. The electric current cannot be turned on with the lid open.

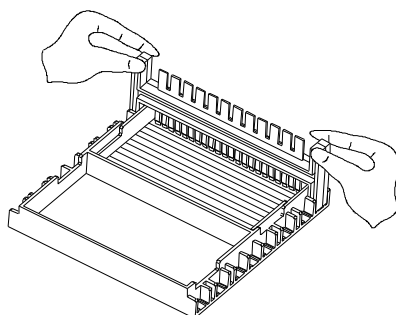




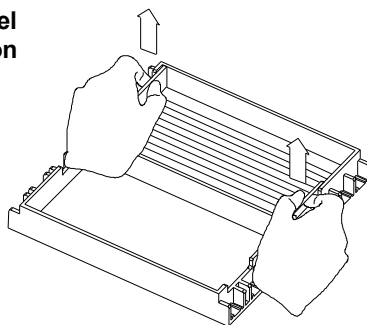
**4.2.3 Pour the gel into gel maker stand with the tray and the height should around 4mm and each tray need about 25ml gel.**



**4.2.3 Hold the two sides of comb and pull out slowly after the gel solidified. The hole of gel should be ordered and without damage.**



**4.2.4 Take out the gel tray from gel maker stand and put into migration tank**



## 2 Product Specifications

Model	Mini-Electro
Input power	Original input: AC100-120V 1A AC transformer: Input: AC220V, output: AC110V
Output voltage	DC35V , DC50V, DC100V
Timing	0 ~ 99min
Migration Tank Specs	120mm×110mm×45mm (inner dimension)
Buffer Volume	250ml-300ml
Comb Specs	3mm×1mm×22 5.6mm×1mm×12 3mm×1mm×18 5.6mm×1mm×10 (Teeth width x Teeth thickness x Teeth no.)
Gel maker Stand	110mm×60mm and 54mm×60mm (Dimension for each section)
Gel tray Specs	110mm×60mm and 54mm×60mm
Fuse	250V 2A
Overall dimension	190mm×130mm×55mm (W×D×H)
Net weight	0.45 kg (without AC transformer)



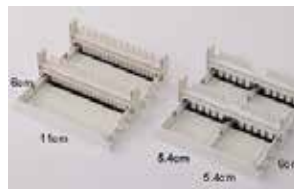
**MINI-ELECTRO**

## Accessories:

- Tooth wide (width x thickness x no.):  
 3mm x 1mm x 22  
 5.6mm x 1mm x 12  
 3mm x 1mm x 18  
 5.6mm x 1mm x 10
- Gel Dimension (WxD): 126x126mm — 1pcs
- Gel Migration Board (WxD): 110x60mm — 2pcs  
 54x60mm — 4pcs
- Transformer: AC220V (Input) / AC110V (Output) — for AC220~240V's state.



AC100~120V 50~60Hz



AC220~240V 50~60Hz

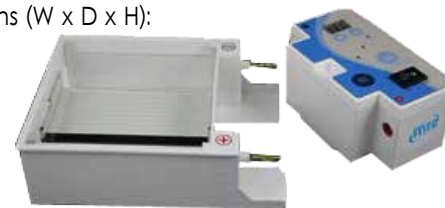
## MINI-ELECTRO, Mini Electrophoresis System

Mini-ELECTRO Mini Electrophoresis System is specifically designed for DNA and RNA electrophoresis. Voltages 35V or 50V or 100V, compact, lightweight and easy to operate are its features.

A magnetic sensor allows current to flow to the electrodes only when the lid is in place. If the lid is removed while the system is operating, current is immediately shut down. It's ideal for many applications, including Northern and Southern blotting, Cosmid library restriction analysis, Microsatellite analysis PCR fragment analysis, DNA fingerprinting and Hgh-throughput analysis.

## Features:

- Input Power: AC100~120V 50~60Hz  
 OR AC220~240V with transformer 50~60Hz
- Output Power: DC35V / DC50V / DC100V
- Construction of Bath: PC+ABS
- Overall Dimensions (W x D x H): 190x130x60mm.



## Specifications:

Model	MINI-ELECTRO
Bath Dimensions (WxDxH)	110x121x43mm
Volume of Bath	230ml
Max. Power	40W
Timer	0~99min
Overall Dimensions (WxDxH)	190x130x60mm



Laboratory Equipment Manufacturer  
www.mrclab.com



Mini centrifuge for 2xPCR plates  
**Operation Manual**  
**MINI-PLATE-1**



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**PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION**

3, Hagavish st. Israel 58817 Tel: 972 3 5595252, Fax: 972 3 5594529 mrc@mrclab.com

**MRC.VER.01-6.14**

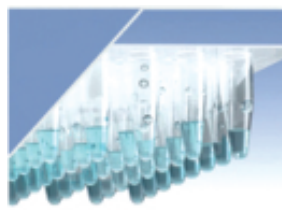
# Mini-Plate Centrifuge Manual

## Description

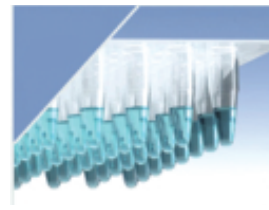
Mini-Plate Centrifuge is an unique design for the horizontal rotor (Patented)'s centrifuge in the world. The plate or tubes set into the rotor with 2pcs slope-rotor-shelf. It can quickly spin down droplets and condensation and is for use before and after thermal cycling to improve PCR yield and other tests. The Mini-Plate combines functionality, ease of use and comfort – a lot of “high” qualities to come standard in one compact micro-centrifuge

## Features

1. Unique design for the horizontal rotor (Patented)
2. It can accept these formats, including:
  - PCR standard plates with skirted, non-skirted
  - Elisa Plates
  - 8x0.2ml PCR strip tubes
  - 0.2ml PCR tubes
3. Braking time from max. speed: lower than 30sec
4. Timer can be set up to 10minutes
5. Short-spin and timing of two operations, make the tests more convenient
6. Streamline design with more quite, compact shape and transparent PC lid



Before



After

## Specification

1. Capacity: 2pcs PCR plates with skirt or without skirt / Elisa plates  
8x0.2ml PCR strip tubes / 0.2ml PCR tubes
2. Max. Speed: 2200rpm
3. G Force: 480×g
4. Timer: 0-10min
5. Dimensions: 29(W)×36(D)×14(H)cm
6. Weight: 3.6kg
7. Power: AC100-120V or AC200-240V, 50-60Hz



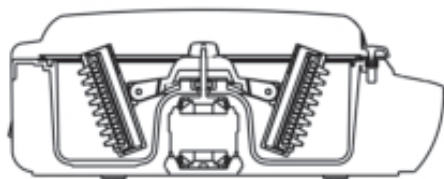
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## Operation Manual

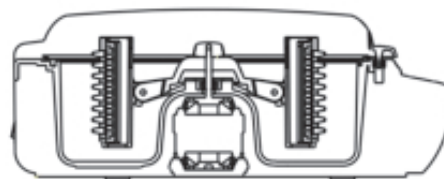
1. Time Setting Press “Set” 3 seconds. The LCD flicker, press “Set” button to increase the setting value and press “Run/Stop” button to decrease. 5seconds later, the unit will affirm the value
2. Run & Stop Press “Run/Stop” to start running, after timer is over, the unit will stop automatically
3. Short-Spin When the timer setting is 00seconds, press the “Run/Stop” button, the unit is running, unloosen the button, the unit is stopping

## Functional diagram

Before working



Working

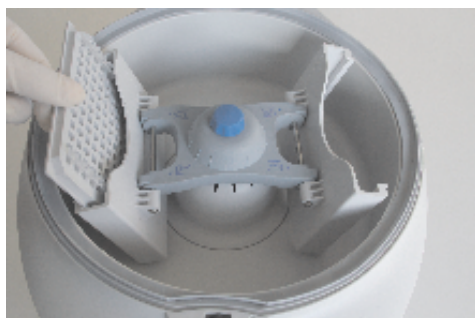




# Mini-Plate Centrifuge Manual

## How to put the plates

1. Put the PCR plate



2. Put the Elisa plate



3. Put the PCR plate with skirt and without skirt

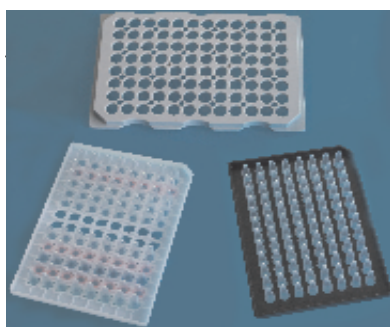


4. Put the 8x0.2ml strip or 0.2ml PCR tubes



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1. Adapter for PCR plates with skirt and without skirt



2. Adapter for 8x0.2ml strip or 0.2ml PCR tubes



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MINI-PLATE-1

### MINI-PLATE-1, Mini-Plate Centrifuge

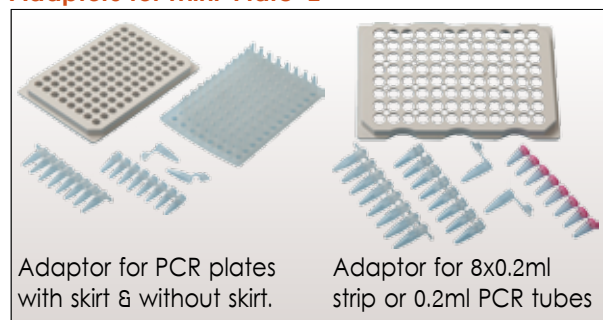
Mini-Plate-1 Centrifuge is the first one adopted an unique design for the horizontal rotor centrifuge (Patented) in the world. The plate or tubes set into the rotor with 2pcs slope-rotor-shelf. It can quickly spin down droplets and condensation and is for use before and after thermal cycling to improve PCR yield and other tests. The Mini-Plate-1 combines functionality, easily operation and comfort – a lot of “high” qualities to come standard in one compact micro-centrifuge.

#### Features:

- Unique design for the horizontal rotor (Patented)
- It can accept below formats:
  - PCR standard plates with skirted, non-skirted
  - Elisa Plates
  - 8x0.2ml PCR strip tubes
  - 0.2ml PCR tubes
- Braking time from max.speed: lower than 30sec
- Timer can be set up to 10minutes
- Short-spin and timing of two operations make the tests more convenient
- Streamline design with more compact shape and transparent PC lid.

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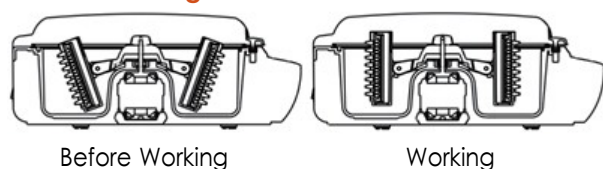
#### Adaptors for Mini-Plate-1



Adaptor for PCR plates  
with skirt & without skirt.

Adaptor for 8x0.2ml  
strip or 0.2ml PCR tubes

#### Functional Diagram



Before Working

Working

#### How to put the Plates



1. Put the PCR plate



2. Put the Elisa plate

3. Put the PCR plate  
with skirt & without skirt4. Put the 8x0.2ml strip or  
0.2ml PCR tubes

Model	Capacity	Rotor Speed	G Force	Dimensions	Weight	Power
MINI-PLATE-1	2pcs PCR plates with skirt or without skirt/Elisa plates 8x0.2ml PCR strip tubes / 0.2ml PCR tubes	2,200rpm	480 xg	290(W)x360(D)x140(H)mm	3.6kg	120V/220V, 50-60HZ



MSF 11/3

### MSF 11/3, Muffle furnaces with fiber-insulated chambers

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High accuracy laboratory electric furnaces with fiber-insulated chambers that are intended for hardening, loosening, normalising, and other thermal processing up to a temperature of 1100°C or 1300°C. The furnaces include ceramic hearth plates. To eliminate gasses or smoke that are released during thermal processing, ventilation hatches and an exhaust system may be additionally installed in the products. The furnaces are an excellent fit for scientific laboratories, educational institutions, medicine, and industry

#### Basic model:

- One-piece chamber made of fiber thermal insulation
- Heating elements embedded in vacuum formed fiber (on models up to 1100°C)
- Heating elements exposed on ceramic tubes (on models up to 1300°C)
- Microprocessor-controlled thermoregulator
- Ceramic hearth plates
- High-quality, ecological thermal insulation material
- Low electric power usage
- Short heating up/cooling down period
- High degree of accuracy
- Exterior painted with powder coating (RAL 7035).

#### Options:

- Process observation window (Φ 35mm) up to 1100°C
- Fan-assisted chimney for forced air extraction
- Supplemental ceramic bottom plates
- Buzzer
- Protection against overheating
- Data recorder
- Computer connection via RS232/RS-485/USB
- Calibration of temp. measurement system
- Table for supporting the furnace.

Model	Vol. l	T max. °C	Chambre dimen. (mm)			Overall dimen. (mm)			Power (kW)	Voltage (V)	Weight (Kg)
			Width	Length	Height	Width	Length	Height			
MSF 11/3	3	1100	125	200	115	340	470	430	1.7	230	18



MT-1101060

## MT-1101060, Universal Digital Calipers

### Features:

- Universal Digital Calipers (Updatable for different measuring tasks with all kinds of attachment).
- Can measure  $\Phi 1\text{mm}$  hole.
- Can measure inside flat groove.
- Can measure very narrow grooves.
- Can measure outside dimensions.
- Can measure the center distance between two holes.
- Can measure from edge to hole center.
- Can measure stepped sections.
- Can measure outside groove.
- Can measure inside groove.
- Can measure sectioned shafts.
- Can measure tube wall thickness.
- Broad measuring faces can easily measure the diameter of steel wire rope.



Can measure stepped sections



Can measure inside groove



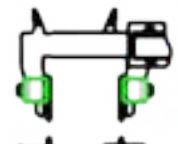
Can measure outside groove



Can measure sectioned shafts



Can measure from edge to hole center



Broad measuring faces can easily measure the diameter of steel wire rope



Can measure the center distance between two holes



Can measure tube wall thickness

### Specifications:

Model	MT-1101060
Measuring Range	0-150mm
Resolution	0.01mm

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MT-111101G

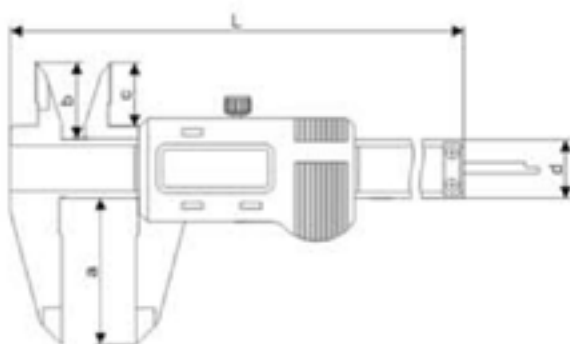
MT-111101B

## MT-111101G/B, Complete Titanium Coated Digital Calipers

### Features:

- TiAlN or TiN coating to improve greatly durability and working life.
- The internal jaws measurement accuracy can accord with DIN862.
- Zero-setting at any position.
- Inch/mm conversion.
- Data output.

Model	MT-111101G	MT-111101B
Measuring Range	0-150mm	0-150mm
Resolution	0.01mm	0.01mm
Limit Error	$\pm 0.02\text{mm}$	$\pm 0.02\text{mm}$
Color	Golden	Black
L (mm)	236	236
a (mm)	40	40
b (mm)	21	21
c (mm)	16.5	16.5
d (mm)	16	16

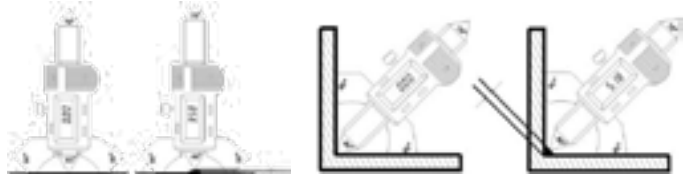




## MT-11820X, Digital Welding Gauges

### Features:

- Widely used for checking the weld of various manufacturing industries such as auto industry, shipbuilding industry, boiler industry and the like.
- Can measure the height of the weld.
- Can check the angle of the groove (The gauge has four angular templates: 60°, 70°, 80° and 90° are provided).



Model	MT-118201	MT-118202
Measuring Range	0-12.5mm	0-20mm
Resolution	0.01mm	0.01mm
Limit Error	±0.03mm	±0.03mm



## MT-3151X1, Digital Snap Gauge with Single Broad Measuring Face

### Features:

- Portable, easy to use and efficient.
- Usually used to measure dimensions of small workpieces.
- Manual power on/off.
- Inch/mm conversion at any position.
- Zero-setting at any position.
- Data output.



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Model	MT-315121	MT-315111	MT-315101
Measuring Range	0-30mm	0-30mm	0-30mm
Resolution	0.01mm	0.005mm	0.001mm
Limit Error	±0.03mm	±0.020mm	±0.009mm



## MT-3152X1, Inside/Outside Digital Snap Gauges

### Features:

- Light weight, portable and easy to operate with one single hand.
- Can measure the inside and outside dimensions and easily reach the part in narrow interspace.
- Zero-setting at any position.
- Inch/ Metric conversions.



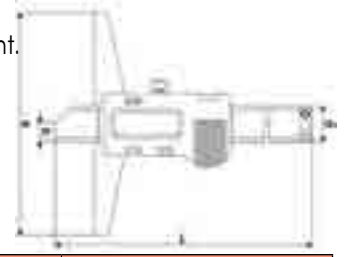
Model	MT-315221	MT-315211	MT-315201
Measuring Range	0-30mm	0-30mm	0-30mm
Resolution	0.01mm	0.005mm	0.020mm
Limit Error	±0.03mm	±0.020mm	±0.009mm



MT-12110X

**MT-12110X, Digital Depth Gauges****Features:**

- Used for depth measurement.
- Zero-setting at any position.
- Inch/mm conversion
- Data output.

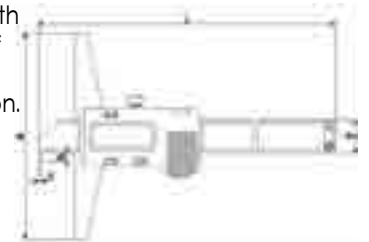


Model	MT-121101	MT-121102	MT-121103	MT-121105
Measuring Range	0-150mm	0-200mm	0-300mm	0-500mm
Vernier reading	0.01mm	0.01mm	0.01mm	0.01mm
Limit Error	±0.03mm	±0.03mm	±0.04mm	±0.05mm
L (mm)	230	280	380	580
a (mm)	100	100	100	100
b (mm)	8.5	8.5	8.5	7
c (mm)	14.5	14.5	14.5	15

MT-12310X

**MT-12310X, Digital Depth Gauges (Hook Type)****Features:**

- Used for depth measurement.
- Can measure groove width and position dimension of a groove.
- Zero-setting at any position.



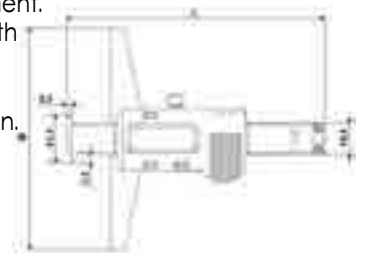
Model	MT-123101	MT-123102	MT-123103	MT-123104
Measuring Range	0-150mm	0-200mm	0-300mm	0-500mm
Resolution	0.01mm	0.01mm	0.01mm	0.01mm
Limit Error	±0.03mm	±0.03mm	±0.04mm	±0.04mm
L (mm)	230	280	380	580
a (mm)	100	100	100	100
b (mm)	5	5	5	8
c (mm)	2	2	2	3
d (mm)	14.5	14.5	14.5	15

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MT-12320X

**MT-12320X, Digital Depth Gauges (Double Hooks)****Features:**

- Used for depth measurement.
- Can measure groove width and position dimension of a groove.
- Zero-setting at any position.



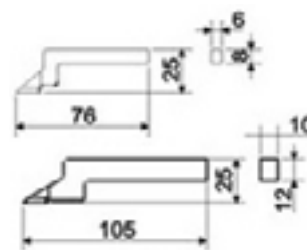
Model	MT-123201	MT-123202	MT-123203
Measuring Range	0-150mm	0-200mm	0-250mm
Resolution	0.01mm	0.01mm	0.01mm
Limit Error	±0.03mm	±0.03mm	±0.04mm
L (mm)	232.5	282.5	382.5
a (mm)	100	100	100



MT-1311XX

**MT-1311XX, Digital Height Gauges****Features:**

- Carbide-tipped scribe.
- Can easily measure height of small workpieces.
- With fine adjustment .
- The base bottom is made of hardened stainless steel.
- With data hold function and tolerance presetting functions.
- With absolute and relative measurement functions.
- With data output port.



Model	MT-131103	MT-131105	MT-131106	MT-131110
<b>Measuring Range</b>	0-300mm	0-500mm	0-600mm	0-1000mm
<b>Resolution</b>	0.01mm	0.01mm	0.01mm	0.01mm
<b>Limit Error</b>	±0.04mm	±0.05mm	±0.06mm	±0.07mm

MT-13120X

**MT-13120X, Single-Column Digital Height Gauge with Hand Wheel****Features:**

- Carbide-tipped scribe.
- Made of stainless steel, high rigid vertical column permits highly stable measurement.
- Fine-adjustment carriage to feed slider finely.

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Model	MT-131203	MT-131205	MT-131206
<b>Measuring Range</b>	0-300mm	0-500mm	0-600mm
<b>Resolution</b>	0.01mm	0.01mm	0.01mm
<b>Limit Error</b>	±0.04mm	±0.05mm	±0.06mm

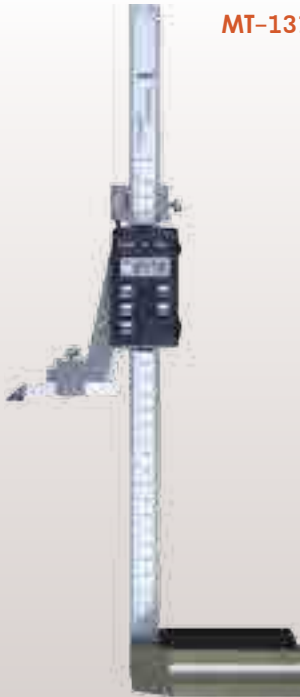
MT-13210X

**MT-13210X, Twin-Beam Digital Height Gauges****Features:**

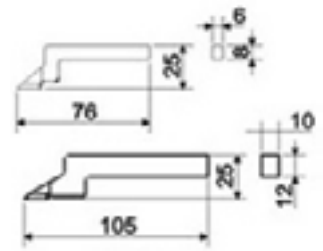
- Carbide-tipped scribe.
- With fine adjustment .
- The base bottom is made of hardened stainless steel.
- With data hold function and tolerance presetting functions.
- With absolute and relative measurement functions.
- With data output port.

Model	MT-132103	MT-132105	MT-132106
<b>Measuring Range</b>	0-300mm	0-500mm	0-600mm
<b>Resolution</b>	0.01mm	0.01mm	0.01mm
<b>Limit Error</b>	±0.04mm	±0.05mm	±0.06mm

MT-1311XX

**MT-1311XX, Digital Height Gauges****Features:**

- Carbide-tipped scribe.
- Can easily measure height of small workpieces.
- With fine adjustment .
- The base bottom is made of hardened stainless steel.
- With data hold function and tolerance presetting functions.
- With absolute and relative measurement functions.
- With data output port.



Model	MT-131103	MT-131105	MT-131106	MT-131110
<b>Measuring Range</b>	0-300mm	0-500mm	0-600mm	0-1000mm
<b>Resolution</b>	0.01mm	0.01mm	0.01mm	0.01mm
<b>Limit Error</b>	±0.04mm	±0.05mm	±0.06mm	±0.07mm

MT-13120X

**MT-13120X, Single-Column Digital Height Gauge with Hand Wheel****Features:**

- Carbide-tipped scribe.
- Made of stainless steel, high rigid vertical column permits highly stable measurement.
- Fine-adjustment carriage to feed slider finely.

230

Model	MT-131203	MT-131205	MT-131206
<b>Measuring Range</b>	0-300mm	0-500mm	0-600mm
<b>Resolution</b>	0.01mm	0.01mm	0.01mm
<b>Limit Error</b>	±0.04mm	±0.05mm	±0.06mm

MT-13210X

**MT-13210X, Twin-Beam Digital Height Gauges****Features:**

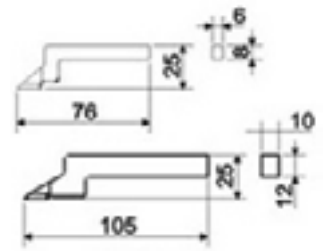
- Carbide-tipped scribe.
- With fine adjustment .
- The base bottom is made of hardened stainless steel.
- With data hold function and tolerance presetting functions.
- With absolute and relative measurement functions.
- With data output port.

Model	MT-132103	MT-132105	MT-132106
<b>Measuring Range</b>	0-300mm	0-500mm	0-600mm
<b>Resolution</b>	0.01mm	0.01mm	0.01mm
<b>Limit Error</b>	±0.04mm	±0.05mm	±0.06mm

MT-1311XX

**MT-1311XX, Digital Height Gauges****Features:**

- Carbide-tipped scribe.
- Can easily measure height of small workpieces.
- With fine adjustment .
- The base bottom is made of hardened stainless steel.
- With data hold function and tolerance presetting functions.
- With absolute and relative measurement functions.
- With data output port.



Model	MT-131103	MT-131105	MT-131106	MT-131110
<b>Measuring Range</b>	0-300mm	0-500mm	0-600mm	0-1000mm
<b>Resolution</b>	0.01mm	0.01mm	0.01mm	0.01mm
<b>Limit Error</b>	±0.04mm	±0.05mm	±0.06mm	±0.07mm

MT-13120X

**MT-13120X, Single-Column Digital Height Gauge with Hand Wheel****Features:**

- Carbide-tipped scribe.
- Made of stainless steel, high rigid vertical column permits highly stable measurement.
- Fine-adjustment carriage to feed slider finely.

231

Model	MT-131203	MT-131205	MT-131206
<b>Measuring Range</b>	0-300mm	0-500mm	0-600mm
<b>Resolution</b>	0.01mm	0.01mm	0.01mm
<b>Limit Error</b>	±0.04mm	±0.05mm	±0.06mm

MT-13210X

**MT-13210X, Twin-Beam Digital Height Gauges****Features:**

- Carbide-tipped scribe.
- With fine adjustment .
- The base bottom is made of hardened stainless steel.
- With data hold function and tolerance presetting functions.
- With absolute and relative measurement functions.
- With data output port.

Model	MT-132103	MT-132105	MT-132106
<b>Measuring Range</b>	0-300mm	0-500mm	0-600mm
<b>Resolution</b>	0.01mm	0.01mm	0.01mm
<b>Limit Error</b>	±0.04mm	±0.05mm	±0.06mm

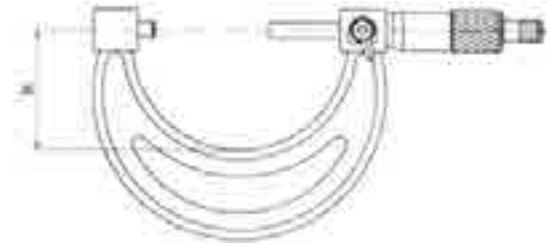
## MICROMETERS



### MT-24118X, Outside Micrometers

#### Features:

- Baked enamel frame.
- Carbide-tipped measuring faces.



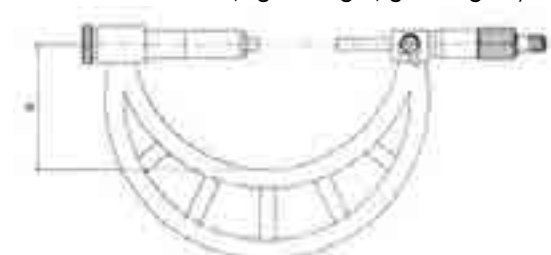
Model	MT-241181	MT-241182	MT-241183	MT-241184	MT-241185	MT-241186	MT-241187	MT-241188
Measuring Range	100-125mm	125-150mm	150-175mm	175-200mm	200-225mm	225-250mm	250-275mm	275-300mm
Reading	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm
Limit Error	±0.006mm	±0.006mm	±0.007mm	±0.007mm	±0.008mm	±0.008mm	±0.009mm	±0.009mm
H (mm)	73.5	86	98.5	111	123.5	136	148.5	161



### MT-24119X, Outside Micrometers

#### Features:

- With interchangeable standard anvils.
- Wide measuring range, high accuracy.
- Carbide-tipped measuring faces.
- Baked enamel tubular frame, light weight, good rigidity.



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Model	MT-241191	MT-241192	MT-241193	MT-241194	MT-241195	MT-241196	MT-241197
Measuring Range	300-400mm	400-500mm	500-600mm	600-700mm	700-800mm	800-900mm	900-1000mm
Reading	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm
Limit Error	±0.011mm	±0.013mm	±0.015mm	±0.016mm	±0.018mm	±0.020mm	±0.020mm
H (mm)	225	275	325	375	430	480	530



### MT-2119XX, Digital Thread Micrometers

#### Features:

- Pointed anvil & spindle are ideal for measuring the wall thickness of drills, small grooves & other hard-to-reach dimensions.
- Carbide-tipped measuring faces.

Model	MT-211901	MT-211904	MT-211907	MT-211911
Measuring Range	0-25mm	25-50mm	50-75mm	75-100mm
Reading	0.001mm	0.001mm	0.001mm	0.001mm
Limit Error	±0.004mm	±0.004mm	±0.004mm	±0.005mm

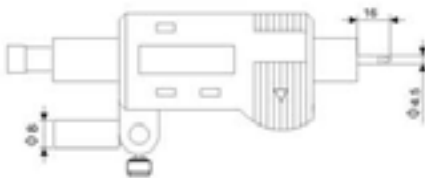
**MT-31210X/31210X-D, Digital Indicators****Features:**

- Hand/auto power off
- Preplace started position value
- Direction switch
- mm/in conversion
- Absolute and relative measurement
- Set zero at any position.

Model: With flat back	MT-312101	MT-312102	MT-312103
Model: With lug back	MT-312101D	MT-312102D	MT-312103D
<b>Measuring Range</b>	0-12.7mm	0-25.4mm	0-50.8mm
<b>Graduation</b>	0.01mm	0.01mm	0.01mm
<b>Limit Error</b>	±0.02mm	±0.02mm	±0.04mm

**MT-311XXX, Rectangle Digital Indicators**

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**Features:**

- Easy & convenient to clamp.
- Wide measuring range.
- Zero-setting at any position.
- Data output.

Model	MT-311101	MT-311102	MT-311103	MT-311104
<b>Measuring Range</b>	0-10mm	0-20mm	0-30mm	0-50mm
<b>Resolution</b>	0.01mm	0.01mm	0.01mm	0.01mm
<b>Limit Error</b>	±0.02mm	±0.03mm	±0.03mm	±0.04mm

Model	MT-311105	MT-311011	MT-311012	MT-311013
<b>Measuring Range</b>	0-100mm	0-10mm	0-25mm	0-50mm
<b>Resolution</b>	0.01mm	0.001mm	0.001mm	0.001mm
<b>Limit Error</b>	±0.05mm	±0.007mm	±0.009mm	±0.012mm



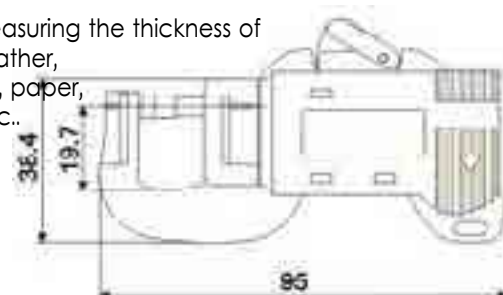
MT-315801



MT-315801, Digital Thickness Gauge (Horizontal Type)

**Features:**

- Portable, light weight, easy to operate with one single hand.
- It's fit for measuring the thickness of jewellery, leather, metal sheet, paper, film, wire, etc..



Model	MT-315801
Measuring Range	0-12mm
Resolution	0.01mm
Limit Error	±0.03mm

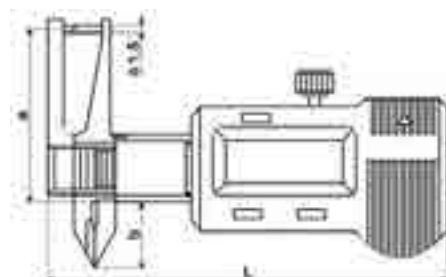
MT-31534X



MT-31534X, Mini Digital Thickness Gauges

**Features:**

- Pocket size, light weight, easy to operate with one single hand.
- For measuring small workpieces, such as jewelry, electronic components and the like.
- Zero-setting at any position.
- Inch/ Metric conversion.



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Model	MT-315340	MT-315341
Measuring Range	0-15mm	0-25mm
Resolution	0.01mm	0.01mm
Limit Error	±0.03mm	±0.03mm
L (mm)	77	87
a (mm)	33.2	33.2
b (mm)	12.5	12.5



MT-451101

MT-451101A

## MT-451101 Series, Inclinometers

### Features:

- 4×90° measurement.
- Widely used in angle measurement in auto industry, building industry and drilling machinery, etc.
- Display always reads upright, no matter which way the level is turned.
- Simple calibration requires no special fixtures.
- Versatile measuring tool, angle finder, protractor and level three in one.
- One 3V Cr2032 lithium battery.

Model	MT-451101 Series
<b>Measuring Range</b>	4×90° (0 ~ 360°)
<b>Work temperature</b>	+5°C ~ +40°C
<b>Work humidity</b>	≤85%RH
<b>Resolution</b>	0.1°
<b>Accuracy</b>	0.2°
<b>Power</b>	CR2032 3V lithium battery



MT-451101W

MT-451101WM



MT-451101V

MT-451101M

- MT-451101: Stainless steel measuring faces.
- MT-451101H: Stainless steel measuring faces with small screw thread bottom outlets holes in the bottom panel.
- MT-451101M: Stainless steel measuring faces with magnetic disks in bottom panel.
- MT-451101W: Stainless steel measuring faces with large measuring face in bottom panel.
- MT-451101WM: Stainless steel measuring faces with large and magnetic disks in the bottom panel.
- MT-451101VM: Stainless steel measuring faces with V-type measuring face in bottom panel.
- MT-451101A: Aluminum-alloy measuring faces with up and down large measuring base.
- MT-451101AM: Large Aluminum flame measuring faces with magnetic bottom panel.

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MT-451102

MT-451102M

MT-451102W

MT-451102WM

## MT-451102 Series, Bevel Boxes

### Features:

- Large LCD display for easy reading.
- Small size, light weight, easy to carry and operate.
- With magnetic disks in the bottom measuring face, it can be stuck to the workpiece to be measured.

Model	MT-451102 Series
<b>Measuring Range</b>	±180.00°
<b>Resolution</b>	0.1°
<b>Repeatability</b>	0.2°
<b>Water Proof</b>	IP54
<b>Power</b>	3V CR2032 Lithium battery
<b>Working current</b>	<100μA
<b>Dimension</b>	2"×2"×1.3"
<b>Measuring plane containing disk magnet can stick to the surface to be measured</b>	

- MT-451102: Bevel Box (Plastic frame house).
- MT-451102W: Bevel Box (Plastic frame house with bubble).
- MT-451102M: Bevel Box (Metal frame house).
- MT-451102WM: Bevel Box (Metal frame house with bubble).

## MT-461101, Digital Levels



### Features:

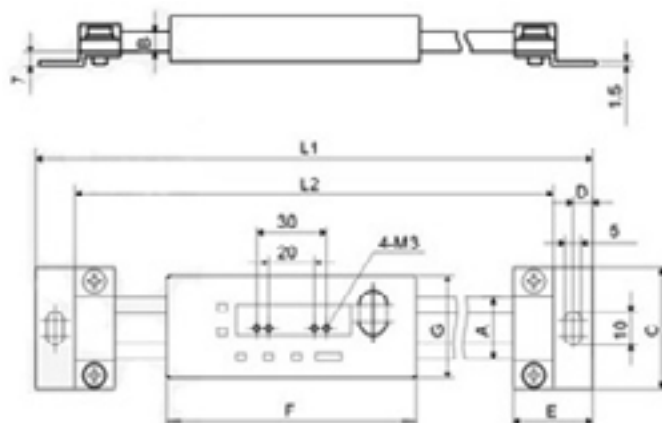
- 4×90° measurement.
- Widely used in angle measurement in auto industry, building industry and drilling machinery, etc.
- Display always reads upright, no matter which way the level is turned.
- Simple calibration requires no special fixtures.
- Versatile measuring tool, angle finder, protractor and level three in one.
- One 3V Cr2032 lithium battery.

Model	MT-461101
Measuring Range	4×90° (0 ~ 360°)
Work temperature	+5°C ~ +40°C
Work humidity	≤85%RH
Resolution	0.1°
Accuracy	0.2°
Power	CR2032 3V lithium battery

## MT-8121XX, Digital Scale Units (Horizontal Type)

### Features:

- Designed to be installed on the machines and fixtures to measure the axial movement.
- Can be connected with large LCD display unit easy reading.
- Zero-setting at any position.
- Data output.



Model	MT-812100	MT-812101	MT-812102	MT-812103	MT-812104	MT-812105	MT-812106
Measuring Range	100mm	150mm	200mm	300mm	400mm	500mm	600mm
Resolution	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm
Limit Error	±0.02mm	±0.03mm	±0.03mm	±0.04mm	±0.05mm	±0.05mm	±0.08mm

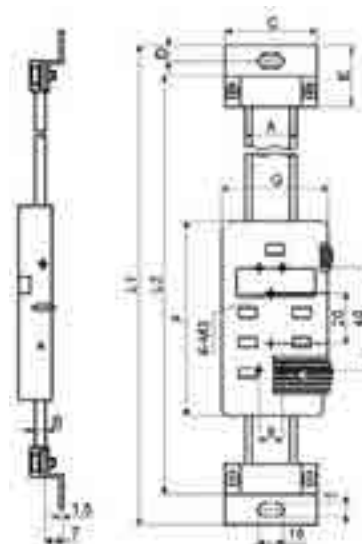
Model	MT-812107	MT-812108	MT-812109	MT-812110	MT-812112	MT-812115	MT-812120
Measuring Range	700mm	800mm	900mm	1000mm	1200mm	1500mm	2000mm
Resolution	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm
Limit Error	±0.08mm	±0.10mm	±0.10mm	±0.10mm	±0.12mm	±0.14mm	±0.20mm

## MT-8122XX, Digital Scale Units (Vertical Type)



### Features:

- Designed to be installed on the machines and fixtures to measure the axial movement.
- Can be connected with large LCD display unit easy reading.
- Zero-setting at any position.
- Data output.



Model	MT-812200	MT-812201	MT-812202	MT-812203	MT-812204	MT-812205	MT-812206
Measuring Range	100mm	150mm	200mm	300mm	400mm	500mm	600mm
Resolution	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm
Limit Error	±0.02mm	±0.03mm	±0.03mm	±0.04mm	±0.05mm	±0.05mm	±0.08mm

Model	MT-812207	MT-812208	MT-812209	MT-812210	MT-812212	MT-812215	MT-812220
Measuring Range	700mm	800mm	900mm	1000mm	1200mm	1500mm	2000mm
Resolution	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm	0.01mm
Limit Error	±0.08mm	±0.10mm	±0.10mm	±0.10mm	±0.12mm	±0.14mm	±0.20mm

**NS800, Spectrophotometer**

features with stable performance, precise measurement and powerful functions in the leading position of the same industry.

**NS800****Features:**

- Aesthetic design perfectly combined with ergonomics structure.
- 45°/0° geometrical optics structure, comply with CIE, ISO, ASTM, DIN standard.
- 3.5 inch large capacitive touch screen.
- Two standard observer perspectives, multiple light sources modes, a variety of color systems.
- The repeatability  $E^*_{ab}$  is within 0.04, the errors between each instrument is less than  $0.2E^*_{ab}$ .
- Large capacity storage, save more than 10000 data.
- PC software with powerful extension functions.
- High hardware configured with a number of innovative technologies.
- Oversized integrating sphere, more effective homogenization ray of lights and precise measurement.
- 15° oblique angle screen, in line with the human eye observation.

Model	NS800
<b>Complete spectrum reflectance curve Input L, a, b value manually</b>	
<b>Display Screen</b>	TFT 3.5inch Capacitive Touch Screen
<b>Illumination/ observation system</b>	45°/0°
<b>Integrating sphere Size</b>	Φ58mm
<b>Light Source</b>	combined LED sources
<b>Sensor</b>	Silicon photodiode array
<b>Wavelength Range</b>	400-700nm
<b>Wavelength interval</b>	10nm
<b>Reflectance range</b>	0 ~ 100%
<b>Color Space</b>	CIE LAB, XYZ, Yxy, LCh, CIE LUV
<b>Color difference Formula</b>	$\Delta E^*_{ab}$ , $\Delta E^*_{uv}$ , $\Delta E^*_{94}$ , $\Delta E^*_{cmc}(2:1)$ , $\Delta E^*_{cmc}(1:1)$ , $\Delta E^*_{OO}$
<b>Other Chromaticity Data</b>	WI(ASTM E313, CIE/ISO, AATCC, Hunter), YI(ASTM D1925, ASTM 313), TI(ASTM E313, CIE/ISO), Metamerism Index (Mt), Color Stain, Color Fastness
<b>Illuminant</b>	D65, A, C, D50, D55, D75, F2, F6, F7, F8, F10, F11, F12
<b>Measuring Aperture</b>	Φ8mm
<b>Observer</b>	2°/10°
<b>Display Data</b>	Spectral Value/Graph, Colorimetric Value, Color Difference Value/Graph, PASS/FAIL Result, Color Offset, Color Simulation
<b>Repeatability</b>	Spectral Reflectance: standard deviation within 0.1% (400-700nm: within 0.2%), Colorimetric value Standard deviation within Delta $E^*_{ab}$ 0.04
<b>Errors between each instrument</b>	Within Delta $E^*_{ab}$ 0.2
<b>Dimension (LxWxH)</b>	90x77x230mm
<b>Battery</b>	Li-ion battery, 5000 times within 8 hours
<b>Lamp Life</b>	5 years, more than 1.6 million measurements
<b>Storage</b>	1000 Standards, 10000 Samples
<b>Optional Accessory</b>	Universal test components for liquid, power, particle, Micro Printer, Powder Test Box

**Applications:**

NS800 spectrophotometer is widely used in plastic, electronic, paint, ink, textile, garment, printing and dyeing, food, medical cosmetic industries, scientific research institutes, schools & laboratories. It can measure reflectance spectrum and other color index precisely. NS800 spectrophotometer not only can help to perform color matching and color management studies, but also can control product quality management accurately. The instrument is equipped with high-end color management software which can connect PC to achieve more extension functions.

**Plastics****Paints****Printing****Automobile****Textile****Medicine**

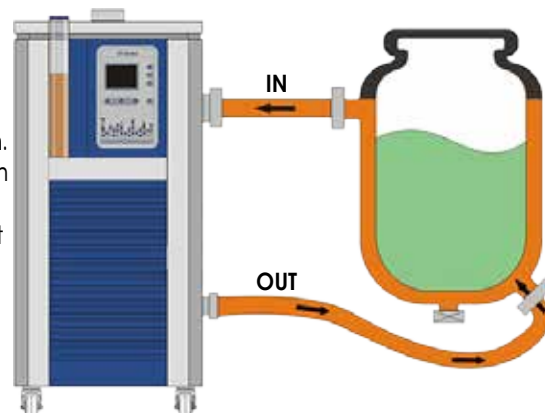




### OBHF-20/50/100, Temperature Circulators, up to 250°C

Hermetic oil cooling high temperature circulator is liquid circulating equipment which adopts electricity to heat, and provides high temperature circulating liquid. It's widely applied to heat reactors in pharmacy, chemical industry, petrochemical and other industries.

- Overtemperature alarm protection ensures safety of the unit.
- Circulating pump can output heat transfer liquid inside the equipment to heat other equipments outside.
- Electric heaters supplied by professional manufacturers ensures reliability and service life.
- The unit has vent valve which is convenient to add the liquid for the system and is prohibited opening during the work time.
- Circulating system adopts Stainless Steel which can prevent corrosion, rust & high-temperature liquid pollution.
- PID control, high temperature-controlling accuracy, easy operation.
- Coolant circulating system adopts hermetic system, so that service life of heat transfer liquid is much longer.
- The unit is easy to use, & it can work continuously.



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Model		OBHF-20	OBHF-50	OBHF-100
Highest Temperature (°C)		250		
Temperature range (°C)		Room ~ 250		
Environment Temperature(°C)		5 ~ 40		
Function of Circulating pump	Power (W)	250	250	750
	Max. flow (L/min)	30	30	75
	Max.lift (m)	25	25	15
Power of Heater (kw)		3	6	12
Ambient Humidity (%)		≤60		
Power Supply		220/50	380/50	380/50
Dimensions (mm)		645L×405W×110H	800L×700W×1200H	820L×735W×1468H



Laboratory Equipment Manufacturer  
www.mrclab.com



Integrated Thermostatic Magnetic Blenders

# Operation Manual

## OBHR-1/3/5



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**PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION**

3, Hagavish st. Israel 58817 Tel: 972 3 5595252, Fax: 972 3 5594529 mrc@mrclab.com

**MRC.VER.01-6.14**

## Content

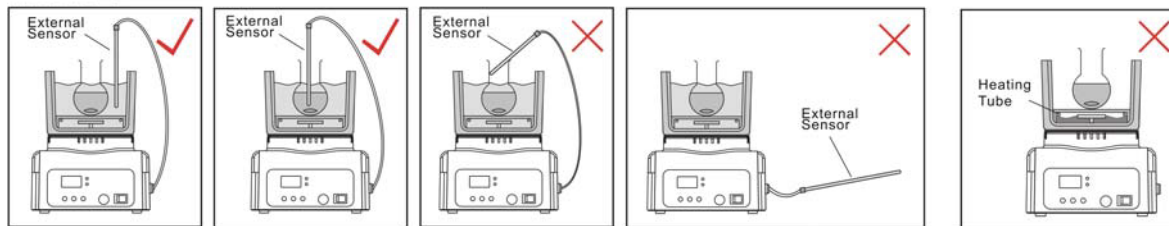
NOTE-----	1
I. Features-----	2
II. Product specifications and performance indicator-----	4
III. Use Method-----	5
IV. Circuit board function parameters-----	8
V. Guarantee and Service-----	10
VI . Analysis and troubleshooting of common failures-----	11

## Note

**NOTE:**

- This product can not be used in inflammable and explosive locations. Prohibit dry burning.
- The temperature of bath is very high, please watch out for scald when it is used.
- Cut off power when not doing experiments.
- Prohibit unattended work to avoid accidents.
- Put the container on the center of the bath.
- Please check the fuse if the indicator light doesn't work after energized or temperature display is not showed after switching on.
- When not using an external sensor, disconnect it.
- When the external sensor connection, you must ensure that the sensor probe immersed in the liquid inside, so has been heated, dangerous. Specific methods as shown below:

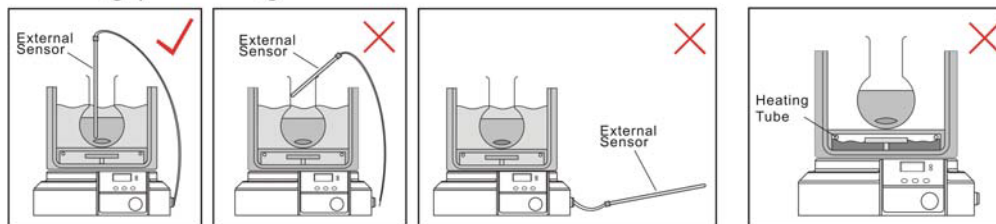
## OBHR-1



The use of external sensors

Prohibit dry burning

## OBHR-3 / OBHR-5



The use of external sensors

Prohibit dry burning

✓ Correct Operation  
 ✗ Faulty Operation



## Features

**I. Features**

1. Adopt the heater which can be used for water and oil, not only applicable for synthetic reaction of water bath, but also for high temperature synthetic reaction of oil.
2. Strong magnetic stirrer is installed under the bath, and ensure the temperature of the bath liquid even through driving the stirrer inside of the bath to stir.
3. Strong magnetic stirrer under the bath and stirrer inside the bath stir the materials at the same time, ensure the temperature of high viscosity materials even.
4. The performance of DC brushless motor is stable, can be used continuously.
5. High temperature proof magnet doesn't lose magnetism when it is used in 300°C continuously.
6. PID temperature control.
7. OBHR-1 has only external sensors, OBHR-3, OBHR-5 has a internal sensor and external sensor two functions.

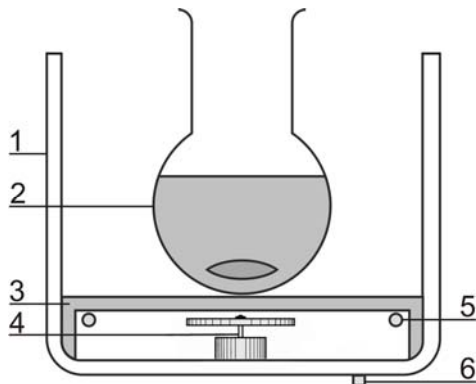
## II. Product specifications and performance indicator

Model	OBHR-1	OBHR-3	OBHR-5
Temperature range (°C)	Water: room temp+5~80    oil: room temp+5~200		
Speed (rpm)	0~2000		
Temperature stability (°C)	±1		
Bath size (mm)	Φ140×90	Φ220×110	Φ250×140
Max. flask capacity (mL)	500	3000	5000
Overall dimensions (mm)	190×190×230	280×260×230	280×260×260
Weight (kg)	4	5	6

Use method

### III. Use Method

#### 1. Pictures instructions:



- |                 |                    |
|-----------------|--------------------|
| 1. Bath         | 2. Reaction vessel |
| 3. Tray         | 4. Two stirring    |
| 5. Heating Tube | 6. Internal sensor |

- Please confirm the location of the two stages stirrers is correct before using (OBHR-3、OBHR-5) , ensure the machine work normally.

## 2. Use Method:

- ① Fix the reaction container, and add the materials into the bath according to your needed temperature.
- ② If the water bath or oil bath is used to stir, please add suitable volume water or oil according to the container's capacity (**Note:** water or oil can't be overfilled in case of damaging the machine and in danger); the liquid level should be 2/3 of the bath.
- ③ Power on and switch on the heating switch, the display show "Input type PT" for 4S, the machine enters the running state and shows the measurement temperature. After the temperature is set, the machine is in normal working condition.
- ④ Turn the potentiometer switch to open stirring function and adjust the rotary speed slowly according to your needs.
- ⑤ Temperature setting: press SET setting button, display SP and set value periodically, change the set value by increasing "▲" and reducing "▼". Press SET button to confirm and exit the setting state.

## Use method

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- ⑥ Press the reducing button for 8S time, the decimal point of the LED display begin to twinkle. And the meter enters automatic self-adjustment state. After automatic self-adjustment, a set of PID parameters are obtained which make the effects of temperature control are the best. Hereafter, the meter will control the temperature according to new PID parameters. (The first use or after replace medium, please self-tuning, make more accurate temperature control.)
- ⑦ The sensor of OBHR-3 and OBHR-5 is internal. If you need to test the temperature of reaction container, just insert the external sensor into the sensor connector; If not measuring temperature reaction container, please pull out external sensors or placed in a liquid tank, and must make the sensor immersed in the medium. The sensor of OBHR-1 is external and just put it into the sensor probe immersed in the bath tank or the reaction mass.



## IV. Circuit board function parameters

Press set button for 4S time, input password LC=3, enter into the internal parameters. And quit after pressing set button for 4S again.

Parameters indicator	Parameters name	Parameters function instruction	(Range) Factory value
Lc-	Password	"Lc=3" to view and modify the parameter values	0
P-	Proportional band	Time proportion adjustment. By reducing P, speed up heating output; by increasing P, decrease overshoot.	(1.0~Range values) 35
I-	Integral time	Integral time constant. The smaller of I value, the stronger of integral action. And can adjust control error.	(1~1000s) 200
d-	Derivative time	Derivative time constant. The bigger of D value, the strong of derivative action. And can overcome overshoot.	(0~1000s) 200

## Circuit board function parameters

T-	Control period	Heating temperature control cycle.	(1~60s) 5
AL-	Over temperature deviation alarm	When the temperature measured values > temperature value + AL ", warning lights, Buzzer chirping, disconnect the heating output.	(0~100℃) 5
Pb-	Zero adjustment	Correction (low temperature) generated when the measuring error of the sensor. Pb = actual temperature - Instrument measurements	(-50~50℃) 0
Pk-	Full adjustment	Pk = 1000 * (the actual temperature value - instrument measurements)/instrument measurements	(-999~999) 0
Et-	Timing function	Et = 0, no time function; Et = 1, the electric start timing; Et = 2, to the set point start timing.	(0~2) 0

## V. Guarantee and Service

Our company will provide maintain service free in one year after selling, if customer use it correctly. Our company will provide maintain service when the warranty period is over but charge component cost and maintenance fees.

Machine Depot ago:

- (1) Please use the unit to clean the machine, in order to avoid contamination during transportation.
- (2) Please attach documentation on the machine, the fault description.
- (3) Please machine with appropriate packaging to avoid shipping damage.

Please read the instruction carefully before using this product, follow the operation procedure strictly.

Please contact us if any quality issues occur.

Technology Consulting Tel: 972-3-5595252

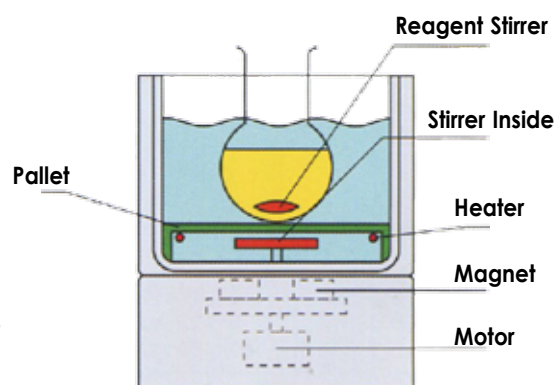
## Analysis and troubleshooting of common failures

**VI . Analysis and troubleshooting of common failures**

1.	The whole machine is out of charge;	The power supply has no power;	Check the power supply;
		The protective is fusing;	Replace the protective tube;
2.	Do not display temperature;	The power supply is not opened;	Open the power supply switch;
		The display panel line falls off;	Plug the connection line well;
		Splash water or oil on the PCB;	Blow dry it and start the machine;
3.	Display SEr	The external sensor fall	Check the external sensor, and restart the power
		No thermal bath of liquid inside (dry)	Adding an appropriate amount of liquid, and restart the power
4.	Display — — —	Sensor open or short	Replace the sensor;
5.	The temperature control is abnormal;	The temperature control circuit is bad;	Replace the temperature control circuit;
6.	Stir control disorders	Potentiometer is bad;	Replace the potentiometer;
		Switching power supply no output DC24V;	Replace the switching power supply;
		The rotation controller is bad;	Replace the controller;
		Electric power lines fall;	Plug the connection line well;

**OBHR-1/3/5, Integrated Thermostatic Magnetic Blenders**

- Can be used as water bath and also can be used as oil bath. Strong magnetic stirring is set in chamber.
- Adopt SUS 304 stainless steel heater which can be used for oil and water bath.
- Strong magnetic stirring makes the stirrings in the flume rotate synchronistically to ensure the even and precision of high viscosity solution temperature.
- The performance of high performance direct current brushless machine is stable & can be used continuously.
- High temperature magnet will not lose magnetism when continuous use in 300°C.
- PID control, digital display.
- OBHR-3 and OBHR-5 have dual sensor, temperature can be converted and displayed in flume and reaction vessel.



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Model	OBHR-1	OBHR-3	OBHR-5
Temperature range (°C)	Room temp ~ 200		
Temperature stability (°C)	±1		
Temperature display	Keypad input Digital display		
Speed-setting	Knob setting		
Speed (rpm)	0 ~ 2000		
Bath size (mm)	Φ140×90	Φ220×110	Φ250×140
Bath volume (L)	1	4	6.5
Heater wattage (W)	300	1500	1500
The max flask input (ml)	500	3000	5000
PowerSupply (V/Hz)	220/50		
Dimensions (mm)	190L×200W×190H	260L×280W×230H	260L×280W×260H



Laboratory Equipment Manufacturer  
www.mrclab.com



# Particle Size & Shape Analyzer

## Operation Manual

### Dynamic Image Analysis Measurement

# PA-2000i-IMAGE



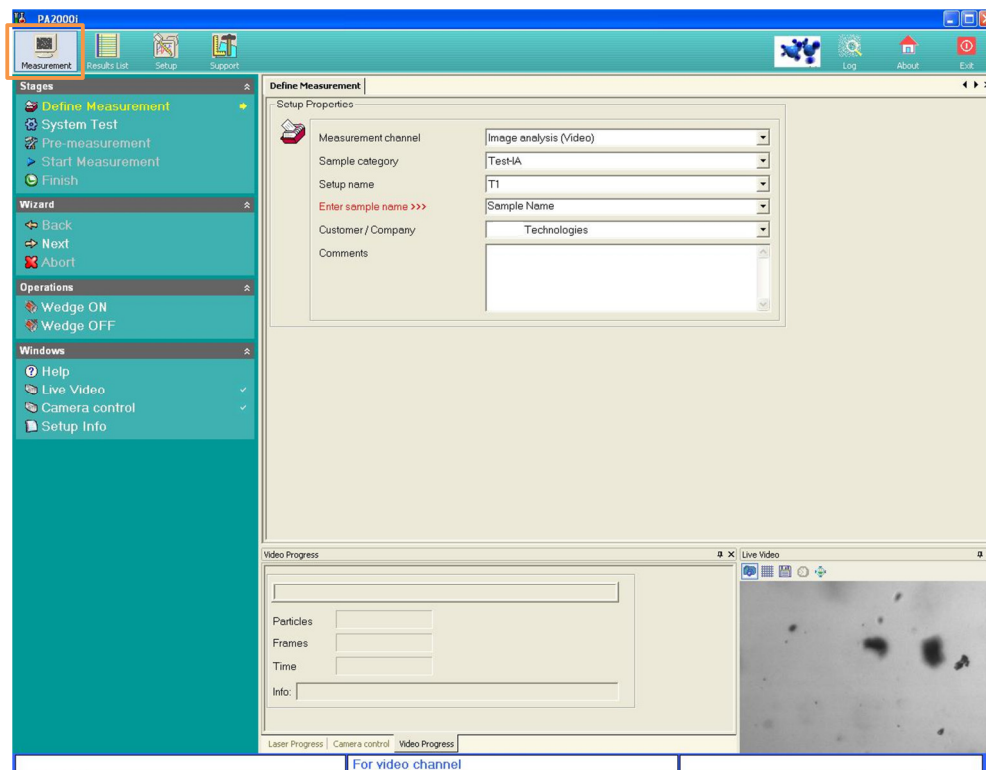
**PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION**

3, Hagavish st. Israel 58817 Tel: 972 3 5595252, Fax: 972 3 5594529 mrc@mrclab.com

**MRC.06.14**



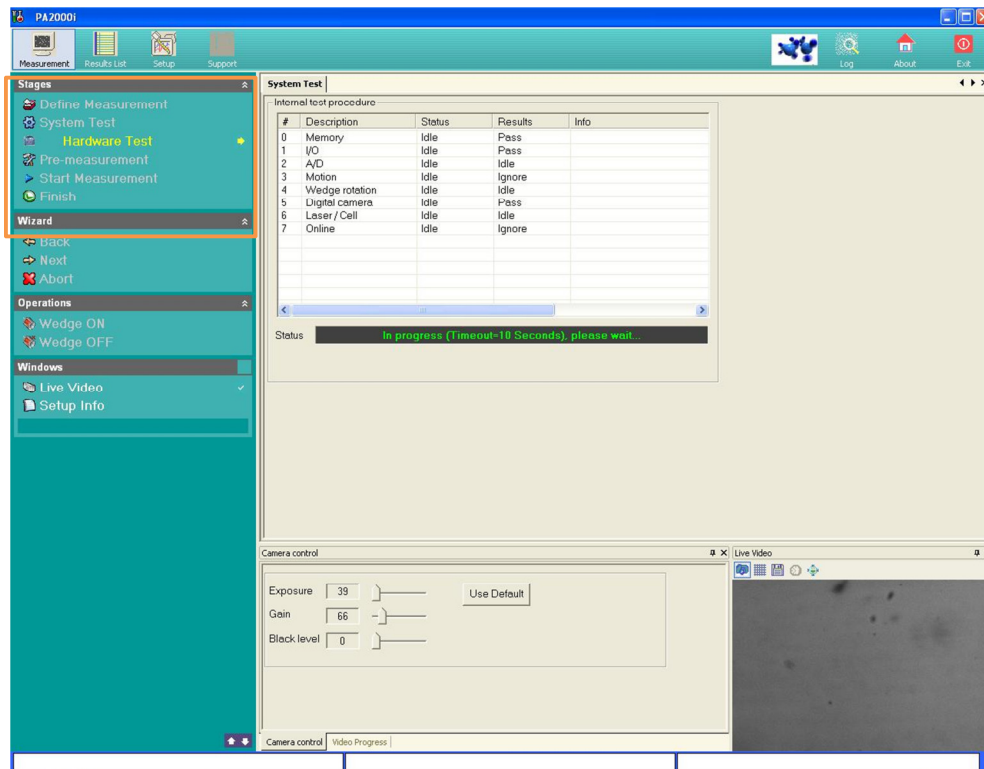
To perform a dynamic image measurement, select **Measurement** in the navigation bar to start a laser measurement. The **Define Measurement** window appears:



- Select **Image analysis (Video)** to start a dynamic image analysis measurement.
- After a **Sample category** has been selected, only the setups that are linked to this sample category can be selected under **setup name**.
- Entering a **sample name** is required to continue to the following stage.
- With **Customer or Company** the results can be linked to a customer or company.
- Entering **Comments** regarding the sample is optional.

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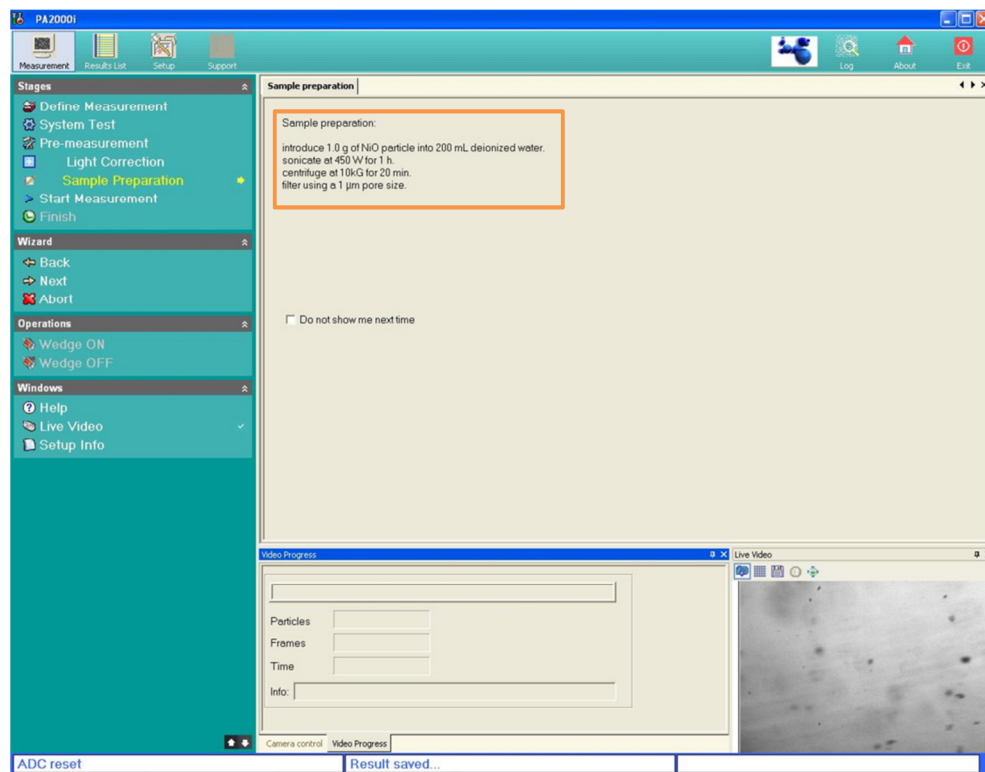
In the 'Stages' bar select **System Test**:



- The System Test is performed to ensure a proper operation of the electronics (Hardware Test) and optics of the system. If the tests pass successfully, the **Pre-measurement** stage will start automatically.
- Follow system's instructions in case that any of the tests does not pass.

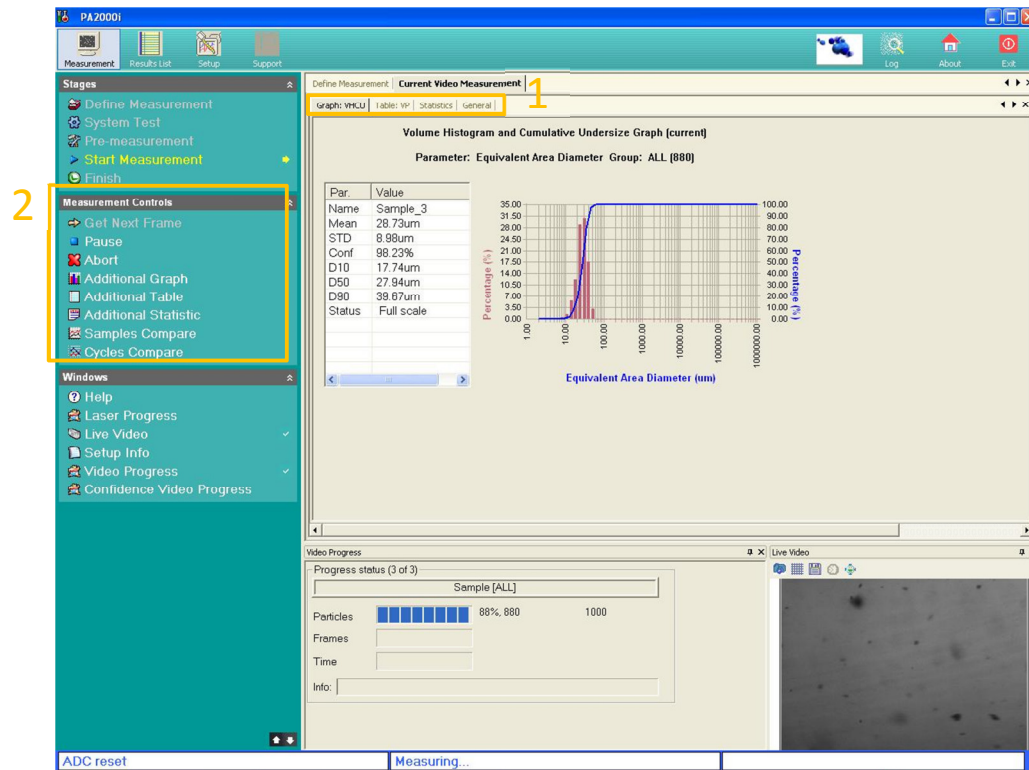
256

In the **Sample preparation** stage, the preparation instructions appear according to the setup. In case that the background image is not uniform, light correction is required (see appendix).



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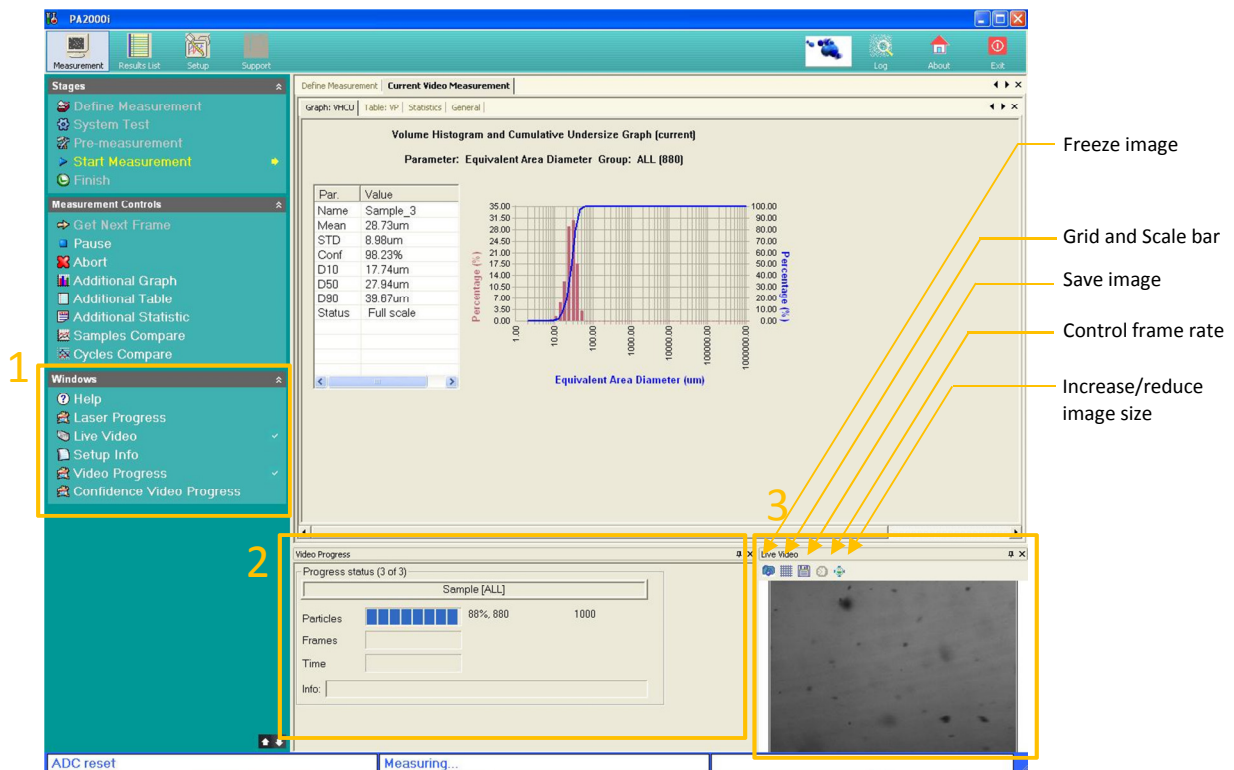
Press **Start Measurement**. During the measurement, the **Current Video Measurement** window appears:



- In the main window, the statistics of the recorded data are displayed in real-time by graphs and tables. The tabs bar above (1) enables to switch between different display-modes defined according to the setup.
- The 'Measurement controls' bar (2) enables to **Pause** or **Abort** the measurement (measured data will appear in the results list). Additional graphs, tables and statistic with more parameters can be added to the display (added to the tabs bar). The real-time measured data can be compared with previously measured data. For comparison with samples in the results list press **Samples compare** and for comparison with previous cycles in the same measurement press **cycles compare**.

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The 'Windows' bar (1) enables to display the following windows: Help, Laser Progress, Live Video, Setup Info, Video Progress and Confidence Video Progress:

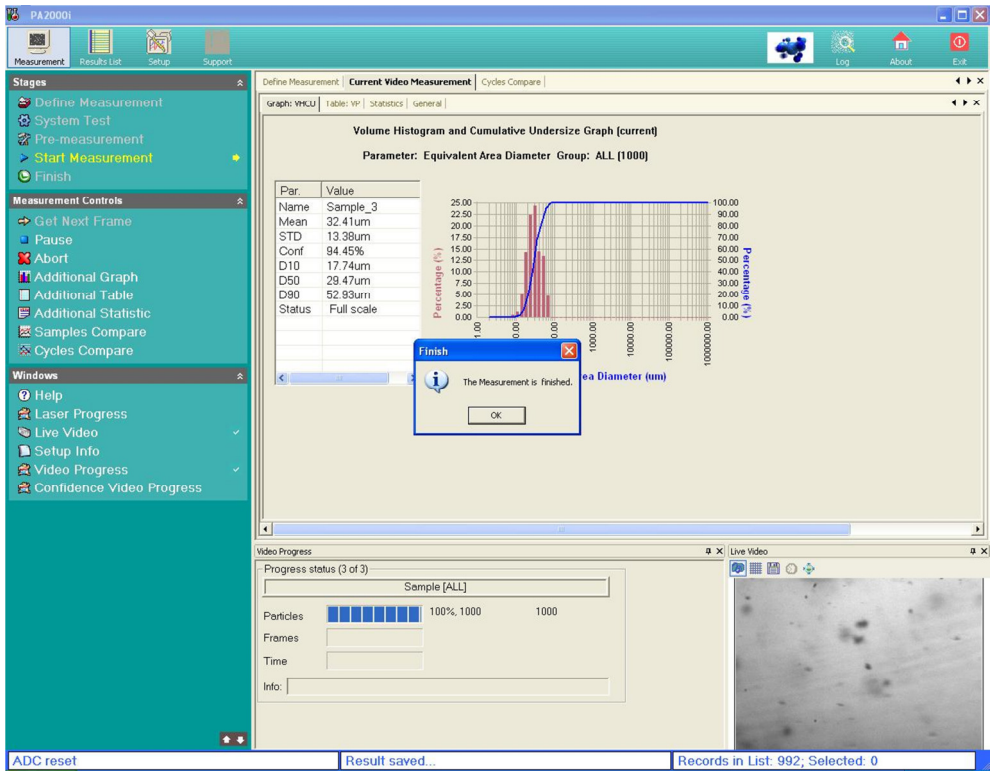


The Video Progress window (2) shows the:

- Progress status, i.e. number of measurement cycle out of total cycles defined the in setup.
- Cycle progression status according to the ending conditions defined in the setup (shown on the right of the progress bar), i.e. Particles, Frames, time and confidence.

In the Live Video window (3), images can be saved manually during the laser measurement using the listed buttons above.

When the video measurement is finished press **OK**





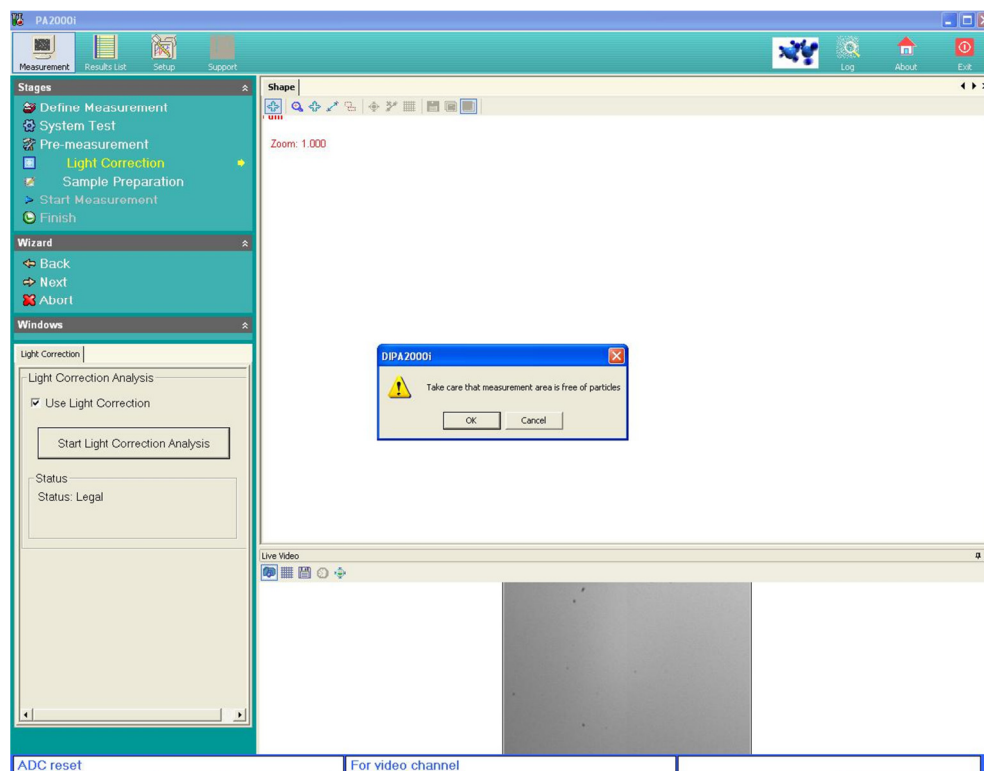
## Appendix

### Light correction

**Explanation:** The light correction analysis is used to reach light uniformity, reduction of constant electronic noises on the images and reduction of constant noises on the image (such as scratches). Using the light correction, a reference image is defined and considered as a background. Then it is subtracted from every new acquired image.

#### Activating light correction:

- Adjust the image to optimal conditions.
- Press the Start Light Correction Analysis button.
- Make sure that the measurement zone is free of particles and press **OK**.



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# Particle Size & Shape Analyzer

## Operation Manual

## Laser Measurement

# PA-2000i-LASER

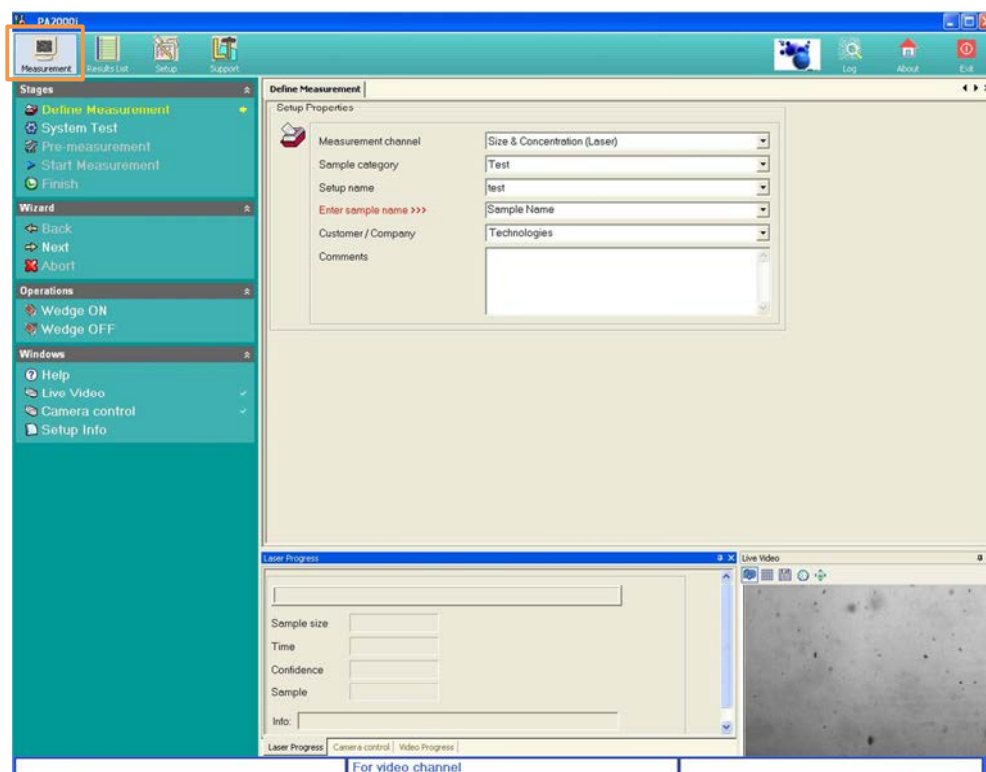


**PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION**

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**MRC.06.14**

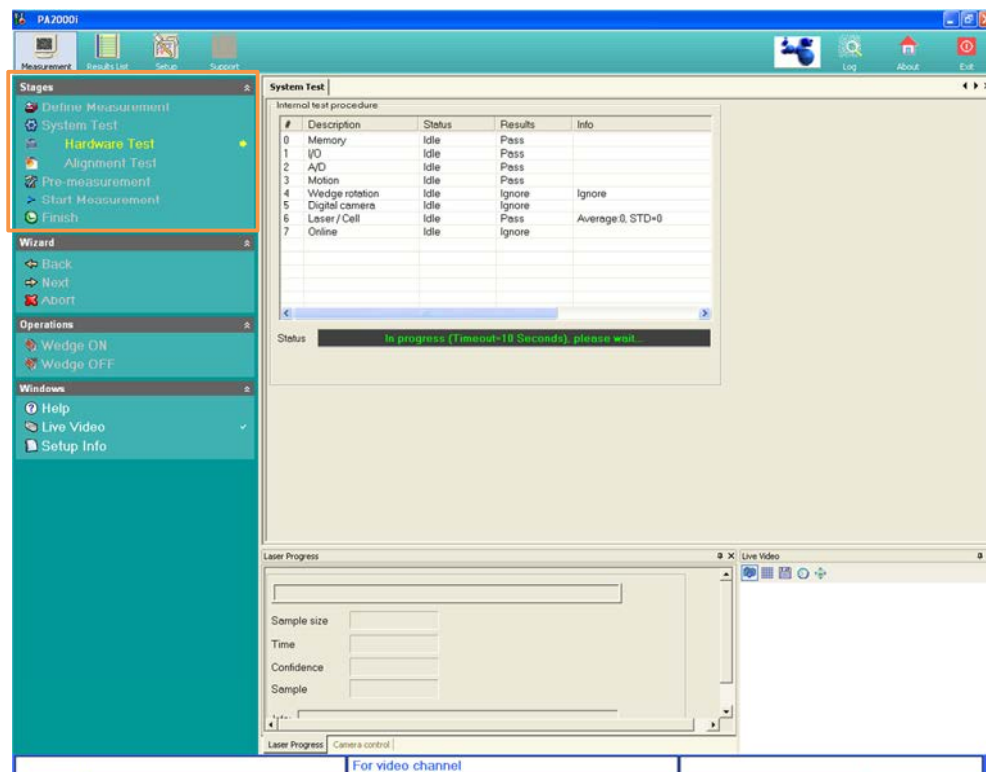
After a setup is created, select **Measurement** in the navigation bar to start a laser measurement. The **Define Measurement** window appears:



- Select **Size & concentration (Laser)** in the **Measurement channel** to start a laser measurement.
- After a **Sample category** has been selected, only the setups that are linked to this sample category can be selected under **Setup name**.
- Entering a **Sample name** is required to continue to the following stage.
- With **Customer or Company** the results can be linked to a customer or company.
- Entering **Comments** regarding the sample is optional.

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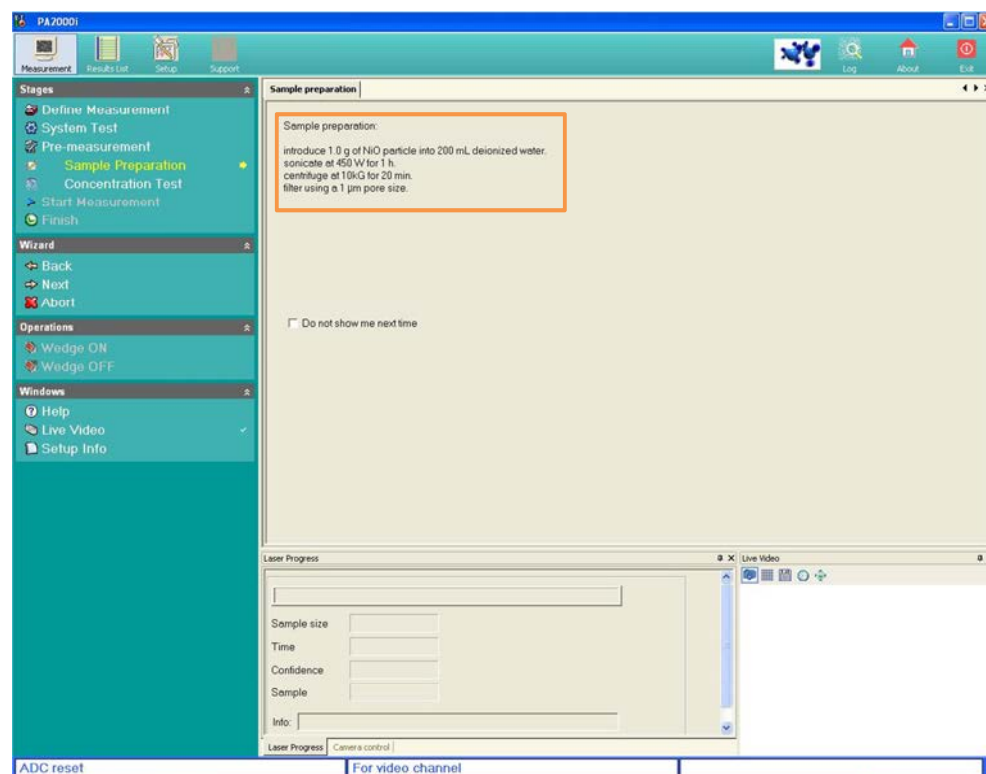
In the 'Stages' bar Select **System Test**; at this stage make sure that the measurement area does not contain particles:



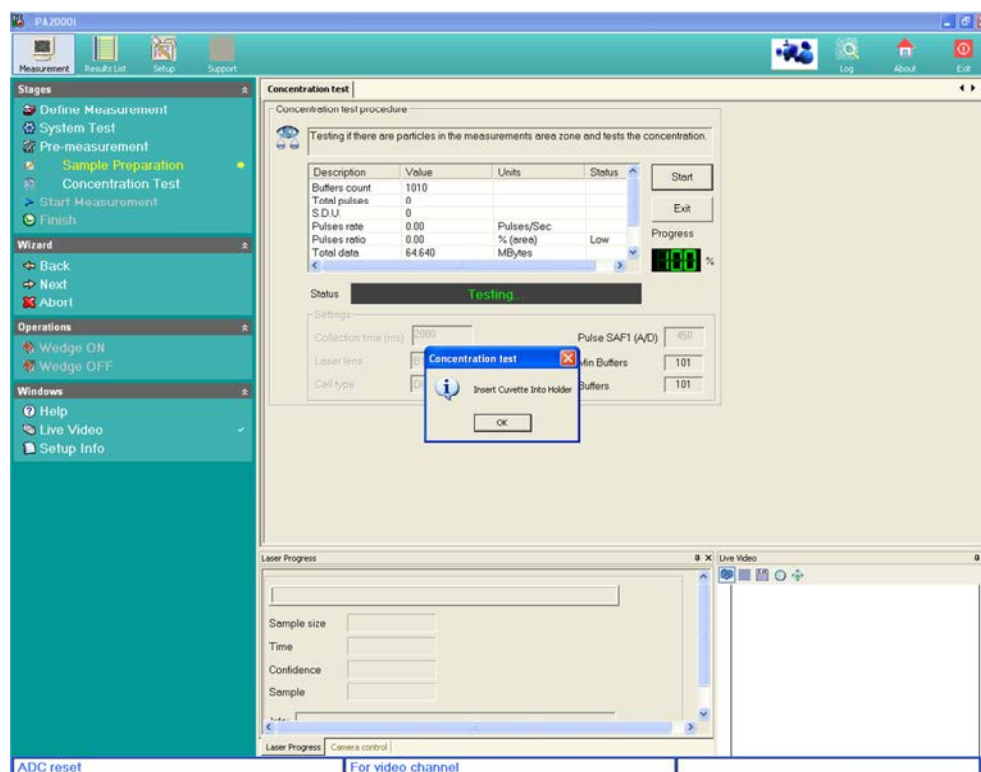
- The System Test is performed to ensure a proper operation of the electronics (Hardware Test) and optical alignment (Alignment Test). If the tests pass successfully, the **Pre-measurement** stage will start automatically.
- Follow system's instructions in case that any of the tests does not pass.

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In the **Sample preparation** stage, the preparation instructions appear according to the setup.



Continue to the **Concentration Test**, at this stage make sure to introduce the sampled particles to the measurement area:

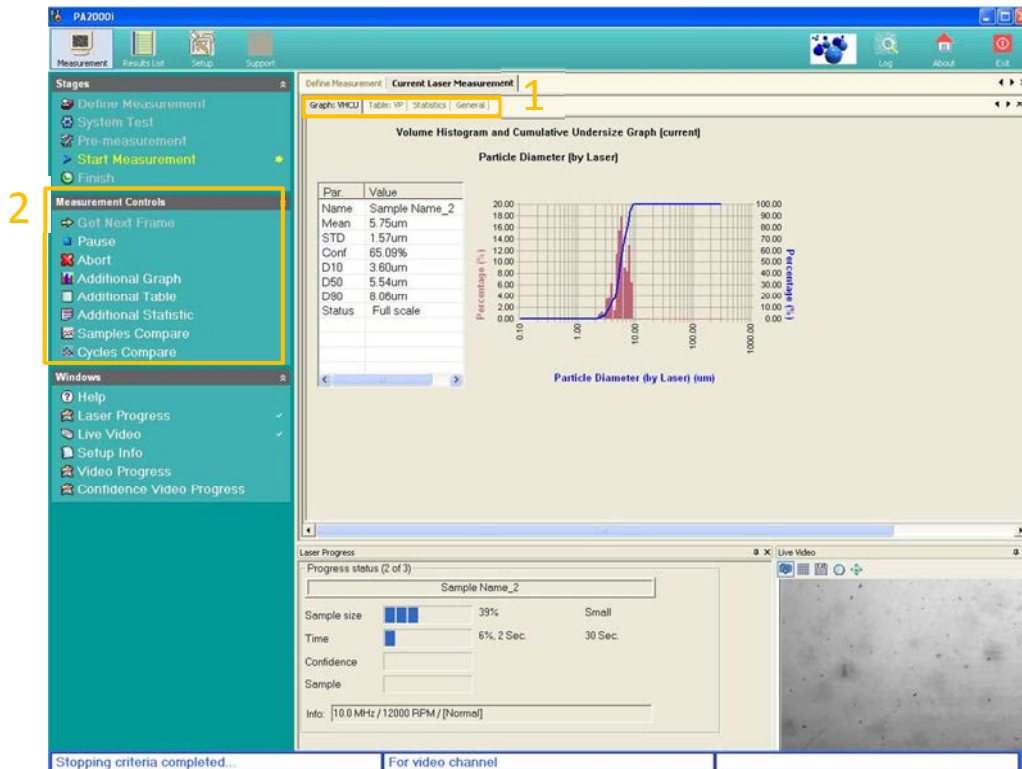


- The concentration test checks the number of recorded pulses for both regular and low concentrations. When the concentration is in the optimal range, the laser measurement starts automatically.
- If the concentration test does not pass, the concentration is outside the recommended working range. It is recommended to dilute or add particles of the sample to get the concentration in the optimal working range (however, if for some reason, the concentration cannot be changed, the concentration test can be terminated and the measurement can be started manually).

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During the measurement, the **Current Laser Measurement** window appears:

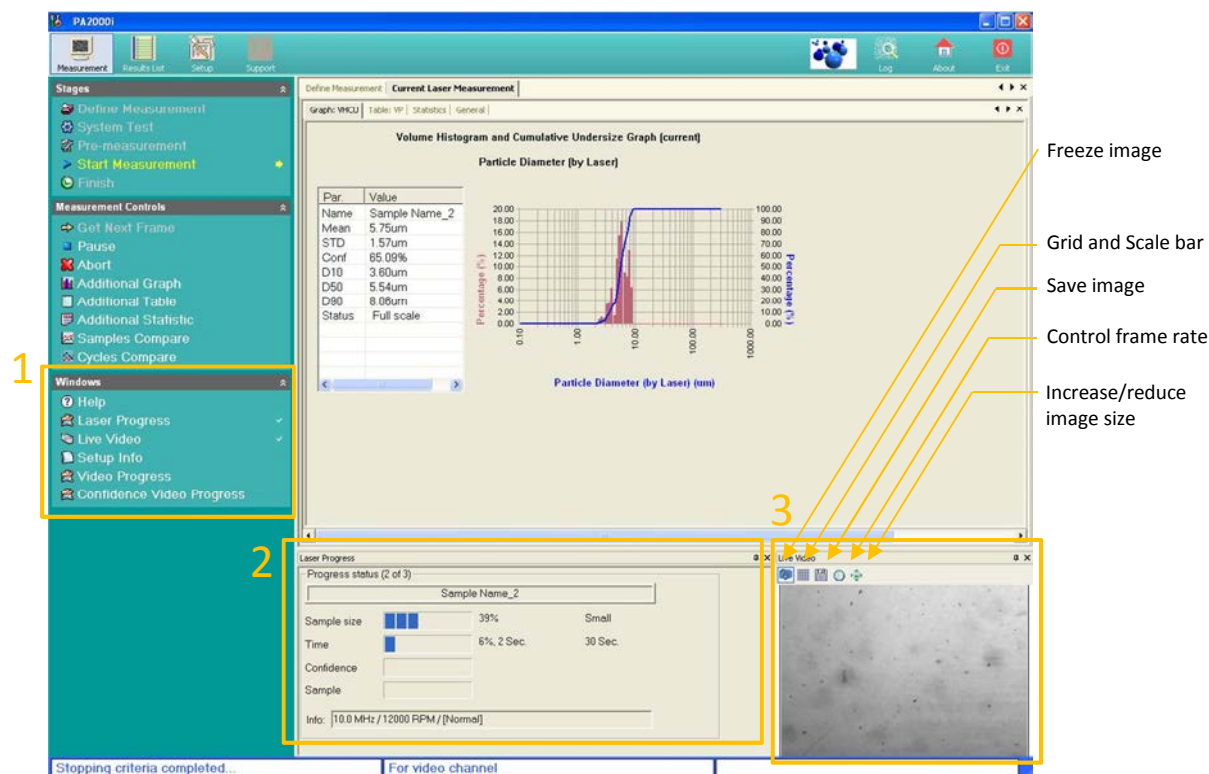


- In the main window, the statistics of the recorded data are displayed in real-time by graphs and tables. The tabs bar above (1) enables to switch between different display modes defined according to the setup.
- The 'Measurement controls' bar (2) enables to **Pause** or **Abort** the measurement. **Additional graphs, tables and statistic** with more parameters can be added to the display (added to the tabs bar). The real-time measured data can be compared with previously measured data. For comparison with samples in the results list press **Samples compare** and for comparison with previous cycles in the same measurement press **cycles compare**.

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The 'Windows' bar (1) enables to display the Laser Progress, Live Video and Setup Info:

The 'Windows' bar (1) enables to display the following windows: Help, Laser Progress, Live Video, Setup Info, **Video Progress and Confidence Video Progress (not relevant)**:



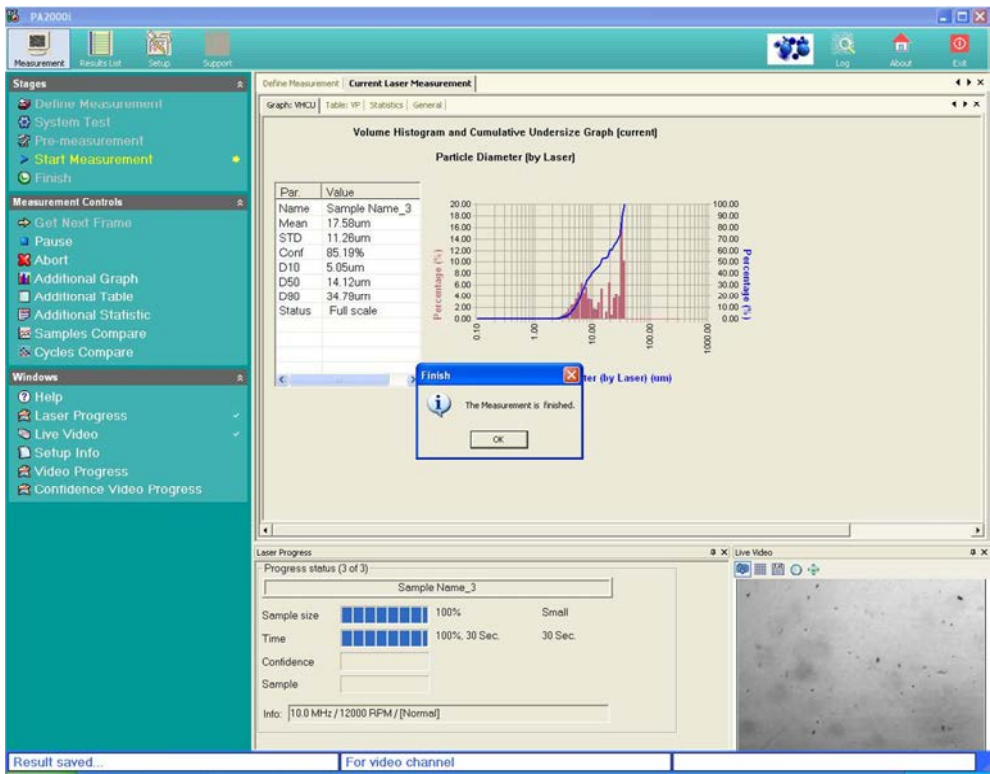
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The Laser Progress window (2) shows the:

- Progress status, i.e. current measurement cycle out of total cycles defined in the setup.
- Cycle progression status according to the ending conditions defined in the setup, i.e. sample size, time and confidence.
- The Info bar below shows the laser frequency (MHz) and circular speed (RPM).

In the Live Video window (3), images can be saved manually during the laser measurement using the listed buttons above.

When the measurement is finished press **OK**



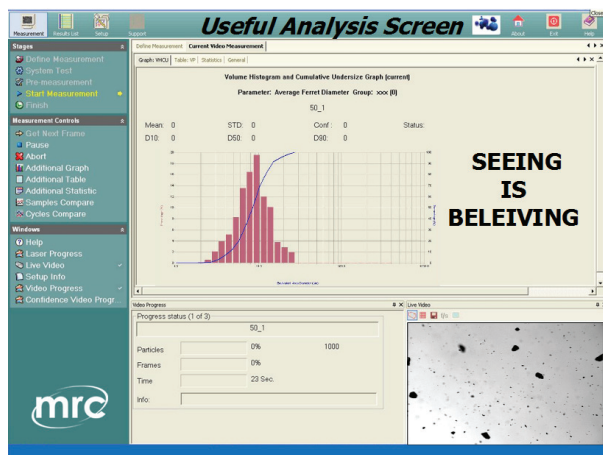
**PA2000i, Particle Size & Shape Analyzer****Video Channel – Dynamic Image Analysis**

The PA2000i Video Channel performs 2-D particles Dynamic Size and Shape Analysis in a wide size range (1 – 5,000 microns).

Acquired images are displayed and analyzed by powerful image analysis software and are automatically processed and analyzed while dozens of useful analytical parameters of the sampled particles are efficiently determined.

User friendly software provides automated and advanced Image Analysis features that assist in optimizing sample measurement.

Software algorithms enable automatic pre-programmed calculation for all of the available parameters including Ferret diameter, area, perimeter, circularity, aspect ratio and many other useful size and shape analytical parameters. This remarkable S/W can be used also in a stand-alone microscopy application, when a compatible CCD camera is mounted on an optical microscope, and the captured images are being analyzed accordingly.



Real images of the measured particles can be easily saved and printed separately or added directly into the analysis report document.

**Laser Channel – High Resolution & Accuracy**

The PA2000i Laser Channel is a straight-forward technique for determining micro-particle size distribution (0.1 – 3,600 microns), without any assumptions or sample pre-knowledge.

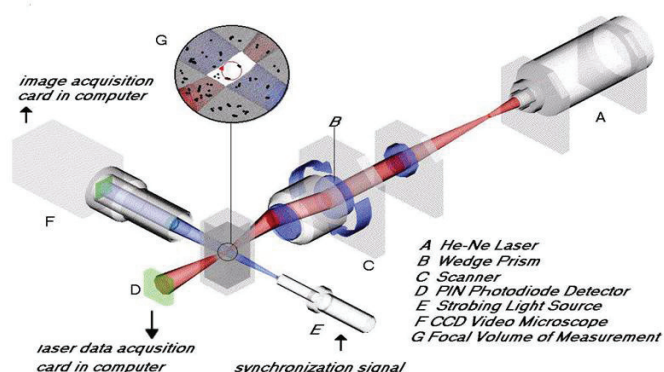
This unique analytical technique is called "Laser Obscuration Time" (LOT).

The major advantage of direct particle size measurement over other laser used techniques is its higher resolution obtained by the individual particle measurement approach that allows minor fraction detection and better measurement accuracy.

Main benefit of using the LOT is that the analysis results aren't affected by any physical or chemical property of the particle or its medium, enabling reliable results. State-Of-The-Art software analyses the obscuration time as multiple pulses algorithm complex, providing within seconds clear and accurate particles size distribution results.

**Measurement Cells:**

Magnetic Stirring, Mechanical Stirring, Liquid flow-through, Fibre flow-through, Aerosol flow-through, Micro Flow-through, Slide, Heated, Free Fall.



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**PA2000i Measuring Channels**

The PA2000i On-Line measurement offer analytical solutions for a wide variety of applications and processes in-line, in-situ, in pilot plants, in reactors or in the lab: grinding, crystallization, polymerization, homogenization, filtration, separation, drying, dispersion and so on.

**PA2000i Image Analysis software includes many procedures such as:**

- Pre-Processing Procedures
- Image Quality Filters
- Region of Interest Determination
- Out-Of-Focus Rejection
- Morphology Operations
- Grouping according to size/shape
- Re-Processing of captured images and movies
- Manual Lens Calibration for External Installations

## Specifications:

Model	PA2000i
Measured parameters	Particle Size and/or Shape
Total particle size range	0.1–5000 µm
Concentration range	Up to 10 <sup>9</sup> particles/cc (for 1µm particles)
Particle presentation phases	Liquid, dry and airborne phases
System dimensions & weight	740L x 420W x 240H (mm), 14 Kg
Laser	2mW HeNe, 632.8 nm, Silicon PIN Photodiode Detector
Laser resolution	0.33% of full scale, up to 0.2 µm
Video illumination	Synchronized strobe light, adjustable intensity & duration
Video resolution	B&W CCD camera, NTSC 640x480 pixels, PAL 768x572 pixels
Software Packages	Windows XP, MS Office, PA2000i compatible S/W package
FDA	21 CFR part 11 compliant
ISO	Compliant to numerous ISO-methods
Modular measurement cells	Liquids, emulsions, dry powders, fibers, magnetic particles, heated liquids and aerosols
Available Accessories	Automatic liquid flow controller, dry powder disperser, dry powder feeder, temperature controller, aerosol controller and compatible PC
Electricity	100–130V, 205–240V, 50/60Hz, 100VA

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## Application Examples:

Model	PA2000i
Geology	Soil, clay, sand, kaolin.
Environmental	Ocean water, tap water, waste water, dust, membrane filtration, flocculation.
Pharma & Bio-tech	Powders, suspensions, syrups, emulsions, pastes, micro-carriers, injectable solutions, collagen, microcapsules, drug powders.
Chemicals	Pesticides, dispersants, catalysts, resins, emulsions, preservatives.
Ceramics and Metals	Alumina, silica, magnetic powders, tungsten, sintered products, stainless steel, strontium, cobalt.
Energy	Coal, fuels, slurries, shale oil emulsions, fly ash.
Food Products	Emulsions, fine powders, beer, coffee, chocolate, ground products, agglomerated crystals, flour, peanut butter, corn-flakes.
Heavy Industry	Polymers, oil droplets, wear particle, chalk, fillers, toners, pulp & paper, coatings, pigments, PVC, paint.
Life Science	Bacteria, smears, yeast, inhalation toxicology, cell research, algae growth, blood analysis.





PCRSG-600

## PCRSG-600, Smart Gradient PCR, Touch Screen

Adopt the Windows CE operation system to ensure the realization of intelligent instrument, with more than 100 self-diagnostic functions. PCRSG-600 achieve the network connection independently, users can visit our official website download center to update version, which discard the complex operations and inconvenience of the traditional program updating. Through the help of remote control software, can finish the maintenance, diagnosis and data exchange of PCR machine, which greatly improve the working efficiency. PCRSG-600 support mouse and touch screen operation, support external U disk, which break the traditional push-button operation, make the programming and operation more convenient, discard the intricacy bring from viewing heavy manual. Take the lead of introducing Internet notion into the industry realm. With a new generation of information technology, Internet-based, to achieve the network extension and expansion. Take a PC as a host computer, can link up to as more as 200 PCR instruments (Smart gradient PCR thermal cycler PCRSG-600).

Through information exchange and communication in order to achieve real-time monitoring, operation and management of multiple PCRSG-600, & the printing function in any state.



### Features:

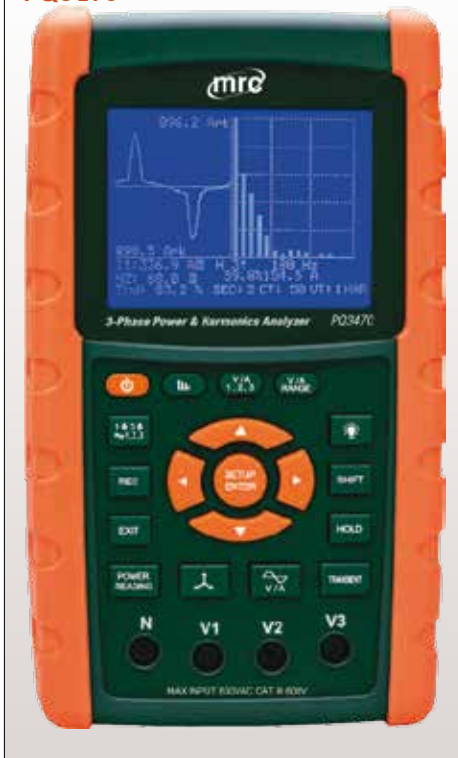
- Convenient and flexible module replacement mode.
- Sealed sample design for low temperature preservation, clean & dry.
- Two-stage hot lid pressure regulator, ensures good sealing performance.
- Gold-plated or silver-plated module, improves the efficiency of heat conduction, makes the experiment more effective.
- Large high-definition 7-inches LCD touch screen.
- Intuitive and user-friendly interface, makes programming quick and easy.
- Infinitely adjustable lid knob, suitable for various types of the tube..
- Memory function in case of power-down..
- Supporting users to set the appointment of experiments, also support the function of setting the alarm.
- Hot lid could be stopped at any angle.
- Supporting the function of selecting the pre-supposed common program.
- Hard disk and mouse can be linked, so you can operate with touch or mouse.
- Linked with PC for its multiple control.
- Can automatically read the ambient temperature and modify the error of temperature control.
- Supporting the function of TM value calculation.
- Long distance trouble judgment.
- Achieve Circulation nesting.

Model	PCRSG-600
<b>Capacity</b>	96x0.2mL(A) ,54x0.5mL(B), 96x0.2mL+77x0.5mL(C), 384well(D)
<b>Temp range</b>	0°C~99°C (Rt≤30°C)
<b>Hot lid temp.</b>	20°C~110°C
<b>Max. Heating rate</b>	≥5°C/s
<b>Environment model</b>	automatic identification, automatic correction
<b>Max. Cooling rate</b>	≥ 5°C/s
<b>Temp control</b>	block, tube (10~100μl can be used) calculated
<b>Heating / Cooling rate</b>	0.1°C/s ~ 4°C/s (Adjustable)
<b>Stored program no.</b>	2000 (The External U disk unlimited)
<b>Uniformity</b>	≤ ±0.2°C (Constant 10s)
<b>Intelligent Diagnosis</b>	108
<b>Accuracy</b>	≤ ±0.1°C
<b>Max No. of Cycle</b>	999
<b>Gradient temp range</b>	30~99°C
<b>Display</b>	7"LCD
<b>Gradient spread</b>	1~30°C
<b>Communication</b>	USB2.0, Rs232, RJ45
<b>Gradient Uniformity</b>	≤ 0.2°C (Single row)
<b>Size (mm)</b>	380mm(L)x270mm(M)x250mm(H)
<b>Voltage</b>	110V~220V
<b>Weight</b>	8.1kg





## PQ3470



Complete with 4 voltage leads with alligator clips, 8 AA batteries, SD memory card, Universal AC adaptor (100 to 240V), & case. Clamp probes sold separately



Backlit LCD displays numerical values. The data can be stored in SD memory card (included) and then transferred from meter to PC using software and data-logged readings.

## PQ3470, 3-Phase Graphical Power and Harmonics Analyzer

Saves data on an SD card in our format For easy transfer to a PC for analysis

## Features:

- Large dot-matrix, sun-readable, graphical, backlit LCD
- Full system analysis with up to 35 parameters
  - V (phase-to-phase), V (phase-to-ground)
  - A (phase-to-ground)
  - KW / KVA / KVAR / PF (phase)
  - KW / KVA / KVAR / PF (system)
  - KWH / KVAH / KVARH / PFH (system)
  - Phase angle
- Select 200A, 1200A Current Clamps or 3000A Flexible Current Probes (sold separately)
- Adjustable Current Transformer CT (1 to 600) and Potential Transformer PT (1 to 1000) ratio for high power distribution systems
- On-screen Harmonics display (1 to 50th order)
- Simultaneous display of Harmonics and Waveform
- Display of Waveform with peak values
- Analysis of Total Harmonic Distortion (THD)
- Graphic Phase diagram with 3-Phase system parameters
- 3-phase Voltage or Current Unbalanced Ratio (VUR, AUR) and unbalanced factor
- Capture Transient events (including dip, swell, and outage) with programmable threshold (%)
- Log up to 30,000 readings on a removable SD memory card in Microsoft format
- Wide sampling rate range (2 seconds to 2 hours)
- Captured measurements can be imported directly into Excel via the SD memory card
- Built-in Clock and Calendar
- Easy-to-use onscreen menu
- Easy-to-hold rugged over molded housing.

## Clamp Probes (Sold Separately):

Choose the best clamp probes to fit your application needs ranging from 200A to 3000A and flexible vs traditional jaw type.



**Model PQ34-2**  
200A Current Clamp  
Probes with 19mm jaw  
opening



**Model PQ34-12**  
1200A Current Clamp  
Probes with 50mm jaw  
opening



**Model PQ34-30**  
3000A 600mm Flexible  
Current Clamp Probes for  
wrapping around busbars

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Specifications	Range	Basic Accuracy
AC Voltage (True rms)	600.0V	±(0.5%rdg)
AC Current	3000A	±(0.5%rdg)
Active Power (MW)	9.999MW	±(1.0%rdg)
Apparent Power (MVA)	9.999MVA	±(1.0%rdg)
Reactive Power (MVAR)	9.999MVAR	±(1.0%rdg)
Power Factor	0.00 to 1.00	±0.04
Frequency Range	45Hz to 65Hz	±0.1Hz
Phase	-180° to +180.0°	±1°
Harmonics	1 to 50th	±2% (1 to 20); ±4% (21 to 31)
Crest Factor	1.00 to 99.99	±(5%)
Current Clamp input	200mV, 300mV, 500mV 1V, 2V, 3V; user-selectable	±(0.5%rdg)
Peak AC Voltage Accuracy		±(5%)
Peak AC Current Accuracy		±(5%)
Active Power Energy (MWH)	0.0kWh to 9.999MWH	±(2.0%rdg)
Apparent Power Energy (MVAH)	0.0KVAh to 9.999MVAH	±(2.0%rdg)
Reactive Power Energy (MVARH)	0.0kVARh to 9.999MVARH	±(2.0%rdg)
Datalogging	30,000 readings (2GB SD memory Card)	
Dimensions/Weight	225 x 125 x 64mm/ Meter: 1010g	



PRC30



## Applications:

- Lab and Field Calibration and Verification Operations of Sensors, Thermocouple Probes, Controllers, Panel meters & Testing tools.
- Temperature Control Process Troubleshooting
- Process devices calibration and simulation: Transducers, Transmitters, Indicators, Controllers, and Recorders
- Field test and service
- Bench research and development.



Complete with test leads, alligator clips, Thermocouple calibration cable with subminiature connector, universal calibration

cable with subminiature terminal, 100V-240V AC Universal Adaptor with 4 plugs, six 1.5V AA batteries, and hard carrying case.

## PRC30, Multifunction Process Calibrator

Precision source and measure for thermocouples (8-Types), mA, mV, and V devices

### Features:

- Palm-sized double molded housing and large dot-matrix backlit LCD
- Measures DC process signals
- High accuracy calibration function simulates precision thermocouple outputs for use in calibrating thermometers, transmitters, controllers or recorders
- Up to five user adjustable calibration presets
- Displays output in terms of millivolts or temperature based on thermocouple tables
- 24V Loop Power
- Zero adjustment, auto zero when power on and change mode
- Standard banana I/O ports and mini thermocouple inputs
- Large battery bank for extended work cycle
- External power adapter for continuous work cycle.

Model	Range	Basic Accuracy
<b>DC Source</b>		
<b>Current</b>	0 to 24mA, -25% to + 125%	$\pm(0.01\% + 1 \text{ digit})$
<b>Max. Load</b>	1000Ω @ 24mA	
<b>Voltage</b>	0 to 2000mV, 0 to 20V	$\pm(0.01\% + 1 \text{ digit})$
<b>mV/Temp</b>	-5 to 55mV	$\pm(0.01\% + 1 \text{ digit})$
<b>Type J</b>	-50 to 1000°C	$\pm(0.05\% + 1^\circ\text{C})$
<b>Type K</b>	-50 to 1370°C	$\pm(0.05\% + 1^\circ\text{C})$
<b>Type T</b>	-120 to 400°C	$\pm(0.05\% + 1^\circ\text{C})$
<b>Type E</b>	-50 to 750°C	$\pm(0.05\% + 1^\circ\text{C})$
<b>Type C, R, S</b>	0 to 1750°C	$\pm(0.05\% + 1^\circ\text{C})$
<b>Type N</b>	-50 to 1300°C	$\pm(0.05\% + 1^\circ\text{C})$
<b>DC Measure</b>		
<b>Current</b>	0 to 50mA, -25% to +230%	$\pm(0.01\% + 1 \text{ digit})$
<b>Voltage</b>	0 to 1999mV/2 to 20V	$\pm(0.01\% + 1 \text{ digit})/\text{auto range}$
<b>mV/Temp</b>	-10 to 60mV	$\pm(0.01\% + 1 \text{ digit})$
<b>Type J</b>	-50 to 1000°C	$\pm(0.05\% + 1.8^\circ\text{F or } 1^\circ\text{C})$
<b>Type K</b>	-50 to 1370°C	$\pm(0.05\% + 1.8^\circ\text{F or } 1^\circ\text{C})$
<b>Type T</b>	-120 to 400°C	$\pm(0.05\% + 1.8^\circ\text{F or } 1^\circ\text{C})$
<b>Type E</b>	-50 to 750°C	$\pm(0.05\% + 1.8^\circ\text{F or } 1^\circ\text{C})$
<b>Type C, R, S</b>	0 to 1750°C	$\pm(0.05\% + 2^\circ\text{F or } 1^\circ\text{C})$
<b>Type N</b>	-50 to 1300°C	$\pm(0.05\% + 2^\circ\text{F or } 1^\circ\text{C})$
<b>Loop Power</b>	24V	
<b>Meter Dims (LxWxH)</b>	159 x 80 x 44mm	
<b>Meter Wt</b>	236g - not including battery weight	

## Ordering Information:

**PRC30:** Multifunction Process Calibrator

**PRC30-NIST:** PRC30 with Certificate of Calibration Traceable to NIST.



PTM-9957, Temperature Controller/Monitor  
General Specifications:

Features:

- Thermocouple Temp. sensor: type K/J/T/E/R/S.
- Pt Temp. sensor: Pt 100 ohm.
- Type K range: -100 to 1300°C, °C/°F.
- Type J range: -100 to 1150°C, °C/°F.
- Type T range: -100 to 400°C, °C/°F.
- Type E range: -100 to 900°C, °C/°F.
- Type R range: 0 to 1700°C, °C/°F.
- Type S range: 0 to 1500°C, °C/°F.
- Pt 100 ohm range: -199 to 850°C, °C/°F.
- Resolution : 0.1 degree (< 1000 degree)  
1 degree (≥1000 degree)
- Control setting, Hi/Lo alarm setting.
- Control relay output, alarm relay output.
- Control Relay will make action when the reading value reach to control value.
- Alarm Relay will make action when the reading value reach to high/low alarm value.
- Hysteresis value setting for control and alarm function.
- PoMicroprocessor circuit ensures high accuracy and provides special functions and features.
- Power: 90 ACV to 264 ACV, 50/60 Hz.
- RS-232/USB computer interface.
- DIN size: 96 x 48 mm. Depth: 107 mm.
- Optional type K probe: TP-01, TP-02A, TP-03, TP-04, TP-05.
- Optional Pt 100 ohm probe: TP-100B.
- Optional USB cable, USB-01.
- Optional date acquisition software, SW-U801-WIN.

Model	PTM9957
Display	4 digits red LED, digit size : 14 mm.
Circuit	Custom chip of microprocessor LSI circuit.
Temp. Sensor type	Thermocouple Temp. sensor: Type K/J/T/E/R/S. Pt Temp. sensor : Pt 100 ohm. Sensor type can make the internal setting with default
Display units	°C/°F
Offset adjust	It can make the internal Offset setting with default.
Gain adjust	It can make the internal Gain setting with default
Sampling Time	Approx. 1 second.
Relay Output	Number: 2 relays Relay 1: Control relay. Relay 2: High/Low alarm relay. Max load: 0.5 ACA/250 ACV, 0.5 DCA/24 DCV <b>*Do not apply the relay contact load current &gt; 0.5 A, other wise the relay may be damaged permanently without warranty.</b>
Setting Function	1st layer setting procedures: CtLo (Control low limit), CtHi (Control high limit), ALLo (Alarm low limit), ALHi (Alarm high limit) Second layer setting procedures: tyPE (Sensor type), dEG (°C/°F), FILt (Digital filter), CthY (Control hysteresis set), ALHy (Alarm hysteresis set), oFSt (Offset adjustment), GAIN (Gain adjustment)
Data Output	RS 232 PC serial interface.
Operating Temp.	0 to 50°C.
Operating Humidity	Less than 80% R.H.
Power Supply	90 to 260 ACV, 50/60 Hz.
Power Consumption	Approx. 3.3 VA/AC 110V. Approx. 5.5 VA/AC 220V.
Weight	384 g
Dimension	DIN size: 96 x 48 mm, Depth: 110 mm.
Accessories Included	Instruction manual..... 1 PC Case holder with screw.....2 PCs
Optional Accessories	Type K Temp. probe: TP-01, TP-02A, TP-03, TP-04, TP-05
	Pt 100 ohm Temp. probe: TP-100B.
	* Data Acquisition software, SW-U801-WIN. * RS232 cable, UPCB-02. * USB cable, USB-01.
	* Real time SD card datalogger DL-9602SD
	* GSM controller, GSM-889. * Interface cable (cable between meter to GSM-889), GMCB-89.

Electrical Specifications:  
PT 100 ohm

Resolution	Range	Accuracy
0.1°C	-199.9 to 850.0°C	± (0.4 % + 1°C)
0.1°F	-327.0 to 999.9°F	± (0.4 % + 1.8°F)
1°F	1000 to 1562°F	± (0.4 % + 2°F)

Type K/J/T/E/R/S

Sensor Type	Resolution	Range	Accuracy
Type K	0.1°C	-50.1 to -100.0°C -50.0 to 999.9°C	± (0.4 % + 1°C) ± (0.4 % + 0.5°C)
	1°C	1000 to 1300°C	± (0.4 % + 1°C)
	0.1°F	-58.1 to -148.0°F -58.0 to 999.9°F	± (0.4 % + 1.8°F) ± (0.4 % + 1°F)
	1°F	1000 to 2372°F	± (0.4 % + 2°F)
Type J	0.1°C	-50.1 to -100.0°C -50.0 to 999.9°C	± (0.4 % + 1°C) ± (0.4 % + 0.5°C)
	1°C	1000 to 1150°C	± (0.4 % + 1°C)
	0.1°F	-58.1 to -148.0°F -58.0 to 999.9°F	± (0.4 % + 1.8°F) ± (0.4 % + 1°F)
	1°F	1000 to 2102°F	± (0.4 % + 2°F)
Type T	0.1°C	-50.1 to -100.0°C -50.0 to 400.0°C	± (0.4 % + 1°C) ± (0.4 % + 0.5°C)
	0.1°F	-58.1 to -148.0°F -58.0 to 752.0°F	± (0.4 % + 1.8°F) ± (0.4 % + 1°F)
Type E	0.1°C	-50.1 to -100.0°C -50.0 to 900.0°C	± (0.4 % + 1°C) ± (0.4 % + 0.5°C)
	0.1°F	-58.1 to -148.0°F -58.0 to 999.9°F	± (0.4 % + 1.8°F) ± (0.4 % + 1°F)
	1°F	1000 to 1652°F	± (0.4 % + 2°F)
Type R			0.5 % + 3°C)
			0.5 % + 5°F)
Type S			0.5 % + 3°C)
	1°F	32 to 2732°F	± (0.5 % + 5°F)

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**Australian Distributors**  
Importers & Manufacturers  
www.chromtech.net.au



## Qualmaster, Grains



Qualmaster

**Human quality checking is tedious, inaccurate, unrepeatable and unreliable!**



**What's in common between the QA needs of completely different low-tech factories?**



Plastic Grains  
of Kafrit Plastic



Dried Spices  
of SDA Spice



Seeds of  
Zeraim Gedera



Rice and Pulses  
Of Sugat

## Introduction:

The Qualmaster is a pioneering product designed to optimize the work of the quality control inspector when reviewing samples of grains and other raw materials like spices, granules and powders. The Qualmaster is able to measure precisely the amount of abnormal color presenting in a sample of grains like rice, wheat or lentils. It is also able to detect the amount of broken grains, and calculate the percentage of it in a sample. The Qualmaster is capable of measuring average sizes of thousands of grains per second. The Qualmaster provides accurate and repeatable values to the inspection, saving personnel time significantly. It creates a situation when two different inspections of the same material provide exactly the same results – which won't happen when the inspection is performed by different human checkers, because of different sensitivity of humans to color, and different environment lighting conditions.

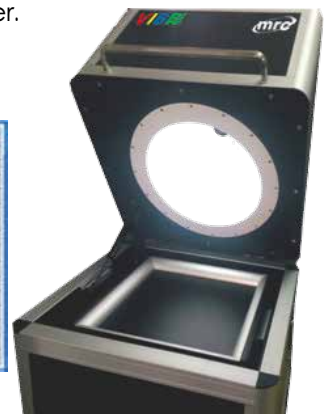
Sending images from the Qualmaster to your customers and your suppliers enables to establish a better common language, and eliminates the need to ship material samples. The returns of shipped goods for the reason of improper visual appearance are eliminated in this way. How is all that achieved? The quality control inspector puts the checked material in the device and receives the check results after a moment. The results include a statistical report featuring exceptional color, depending on the parameters defined in the system.

At the end of the examination, the system alerts whether the test passed or failed, depending on the settings defined by the user.

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## Report

	Master	Sample	Diff
Length Median	6.15	7.13	0.43
Width Median	0.36	0.15	0.48
Area Median	11.80	6.78	2.02
Particles Exp. Percent Size	16.00	7.38	
Test Color			
Med Color	100, 142, 134	104, 144, 129	0.2.5
Classification			
Color Info			
Bulk Exceptions Color			0.00
Median Diff			2.44
EMD Out			Pass
Quantity			
Exceptions Color			
Exceptions Size			
Num of all particles			28



- Expert system with two types of users
- Expert Quality Engineer configuring the Masters
- Simple employee placing and checking samples.

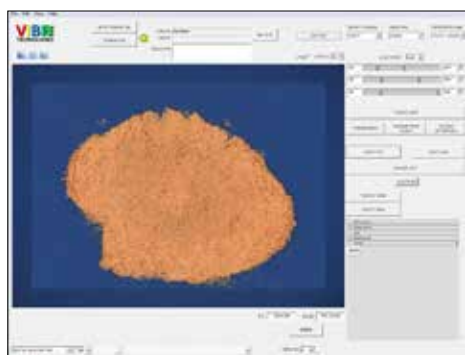
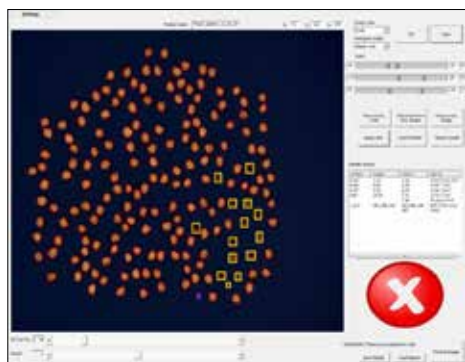
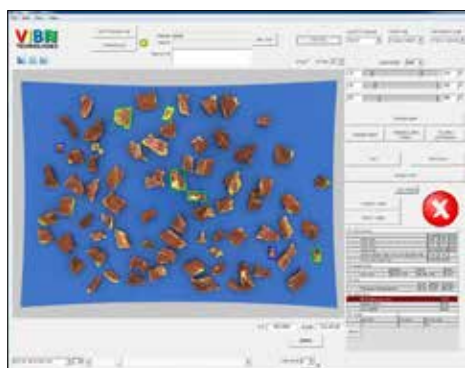
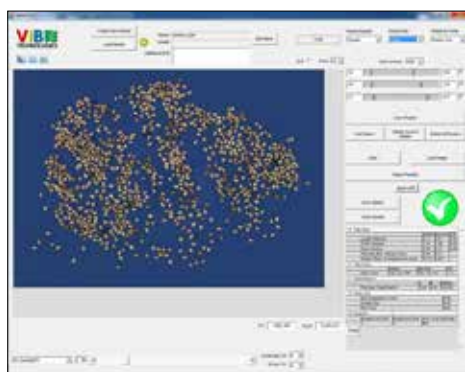
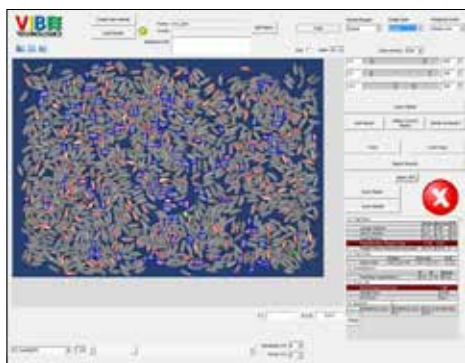


SDA Spice



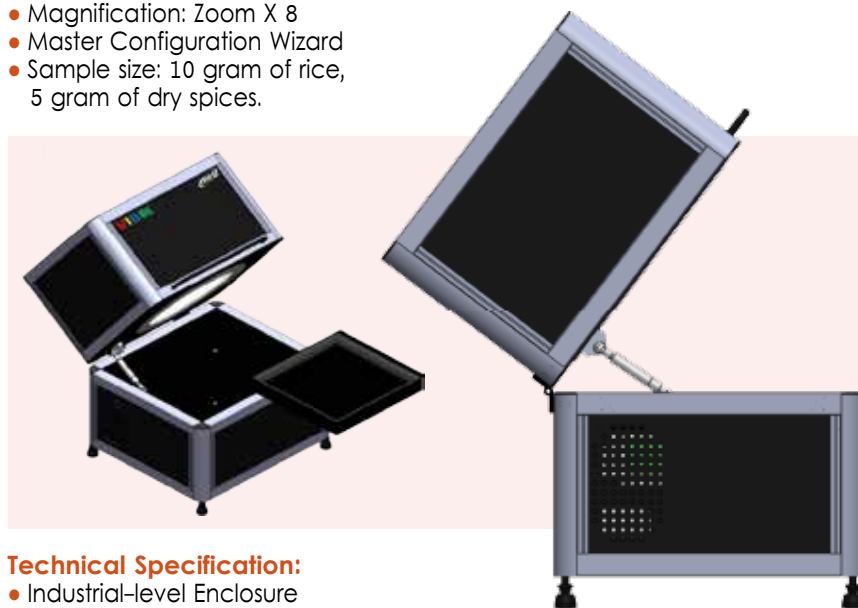
Sugat (ED&amp;F Man)

## Screen Shots:



## System Features:

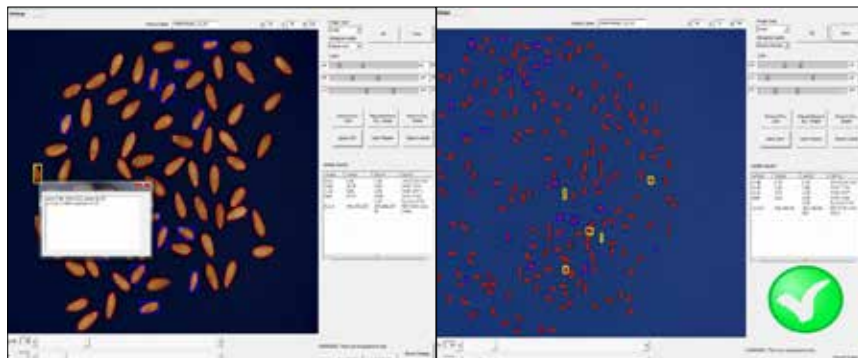
- Detection and Classification of color defects in grains, spices and other materials
- Accurate measurement of color defects percentage in the material sample
- Detection and Classification of grains of abnormal size in the sample
- Accurate percentage of broken grains or larger grains in the sample
- Saving Master and Product images
- Support for sending images and ZIP files over the Internet
- Saving text for any Master or Product
- Remote support and updates for integration with the customer's ERP system by MRC
- Classification to Product Quality Grades, 4 grades
- Defects classification by color, up to 3 defect classes
- Material mixes classification by color, up to 3 classes
- Checking hue similarity to Master
- Supports Batch Mode – averaging results of several samples check
- Sample can be tested with different masters
- Magnification: Zoom X 8
- Master Configuration Wizard
- Sample size: 10 gram of rice, 5 gram of dry spices.



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## Technical Specification:

- Industrial-level Enclosure
- 24v Leds
- PC computer, 320 GB HD, Intel Core i3 540 CPU 3.06 GHz, 4GB RAM
- Available LAN port for local network connection
- 19" monitor, mouse, keyboard
- Win7 operating system
- 5 Mega Pixel GigE industrial camera
- 170 X 120 mm inspection plate size
- Mega Pixel Lens
- MRC Qualmaster CSS Grains software
- User Interface that supports English, German, Dutch languages. Other languages possible (ask the sales representative)
- One year of full warranty under normal use conditions
- One year of full remote support
- English advanced user manuals, Basic operating instructions manual in English, German, Dutch languages. Other languages possible (ask the sales representative).



# High Speed Type Stirrer, 1000 ,750Wats

## MIXERS

**HRomalytic** +61(0)3 9762 2034  
 ECH nology Pty Ltd  
 Website : www.chromalytic.com.au E-mail : info@chromtech.net.au Tel: 03 9762 2034 ... in AUSTRALIA



RC-750

### RC-750/1000, High Speed Type Stirrer

#### Features:

- Stirring shaft is 08mm and its operational height is adjustable
- Overheated protection device and indicators
- With a digital tachometer
- With an analog ammeter.

#### Standard Accessories:

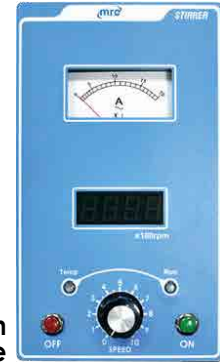
**Shaft:** Ø8x600mm

**Propeller:** No. 11 Ø50mm, Ø80mm.

**Stand base:** W400xD315xH54mm, 8kg.

**Holder Pole**

**Operation Faceplate**



Model	RC-750	RC-1000
Motor	750W	1000W
Speed (rpm)	0 ~ 5,000	0 ~ 6,000
Torque (kg-cm)	7	18
Net weight (kg)	22	25
Power	AC 110/220V, 50/60Hz	

rent samples (viscosities), volumes or propellers should affect RPM results, any over loaded operation will damage the hines possibly.

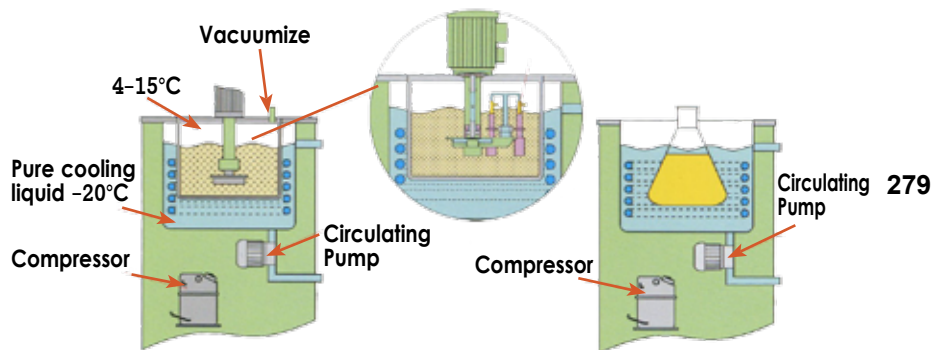




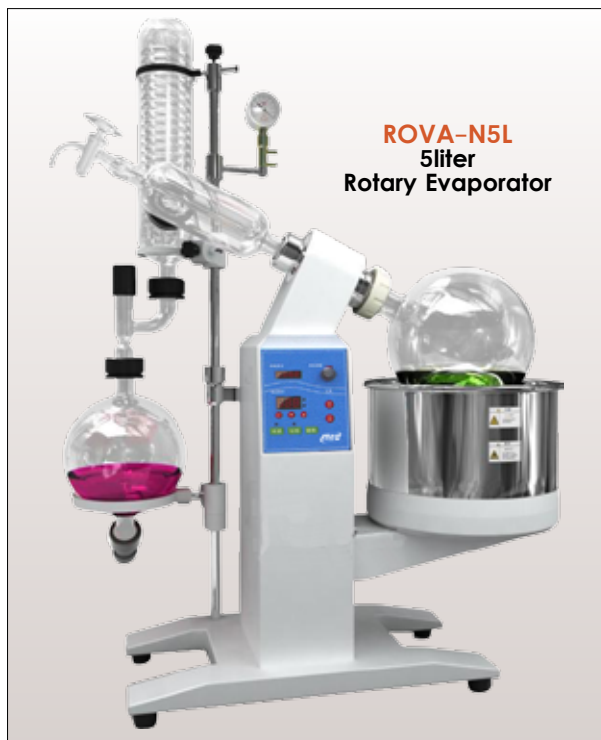
## ROVA-EZ, Low Temperature Vacuum Pump (Patent Product)

Our company has independent intellectual property right Development is based on Cooling Water Circulating Pump and Circulating Water Vacuum Pump. Use with Rotatory Evaporator to form a complete set. Suitable for low-temperature coagulation, shorten distillation time and improve the recovery

- Centralize vacuum and refrigeration, unify features of Cooling Liquid Circulating Pump and Vacuum Pump. It can draw vacuum and cool the circulating evaporator simultaneously.
- Self cooling function can ensure the water temperature in the vacuum pump around 4°C, to guarantee the best vacuum degree.
- Vacuum and cooling can work alone, simultaneously or separately.
- Cooling compressor adopts products made by Panasonic, Toshiba etc.
- vacuum pump tap of upper part placed with inserting Bijection , single valve drawing, large bleed air rate and one gauge display. After taking off the tap, the whole part can be used as a cooling water circulating pump, provide cooling source for external parts.



Model		ROVA-EZ
Temperature Range (°C)		-20°C ~ Room Temp.
Cooling Capacity (W)		310 ~ 1860
Bath Volume		20
Temperature Stability		±2
Function of Circulating Pump	Power (W)	100
	Lift (m)	5 ~ 7
	Flow (L/min)	12
Function of Vacuum Pump	Power (W)	180
	Lift (m)	10
	Flow (L/min)	80
Max.Vacuum Degre (MPa)		0.098
Number of Taps		1
Air Sucking Amount (L/min)		10
Ambient Temperature		5 ~ 25
Overall Power (W)		1200
Power Supply (V/Hz)		220/50
Dimensions (mm)		470Lx410Wx1300H







- 20 Litres, 50 Litres middle and large type of Rotary Evaporator
- SHB-E big swept volume Water Circulating Vacuum Pump
- DLSB-30/30 or DL-3000, DL-5000 of Low temperature system.

### ROVA-N5L/10L/20L/50L, Rotary Evaporators

Large capacity, large diameter rotary evaporator flask, evaporation area, the vacuum water bath, while rotating edge heating, evaporation of the solution diffusion efficiency can be used for biological, pharmaceutical, chemical, food and other small scale areas, Chinese and production. Products with recycled water multi-use vacuum pumps, diaphragm pumps, low temperature cycle (vacuum) pumps, circulating cooler, constant temperature circulator, low temperature cooling liquid circulating pump and other devices supporting component systems.

- Teflon (PTFE) and fluorine rubber dual rotating seal, patented technology to ensure high vacuum.
- The introduction of foreign advanced frequency control system, temperature control system, accurate & reliable.
- A vacuum switching valve, without affecting the system vacuum distillation of the situation & the solution can be continuously collected.
- Water bath electric lift and manual lift support, easy to use.
- PTEE discharge valve, corrosion resistance, pollution-free.



				
Model	ROVA-N5L	ROVA-N10L	ROVA-N20L	ROVA-N50L
Rotary Bottle	5L, diameter of flange opening: Φ50mm	10L, diameter of flange opening: Φ95mm	20L, diameter of flange opening: Φ95mm	50L, diameter of flange opening: Φ125mm
Collecting bottle	3	5	10	20
Speed-regulation of main machine	Digital display, variable frequency, stepless Speed-regulation			
Rotary speed of main Machine	10-140rpm	10-130rpm	10-130rpm	10-110rpm
Rotating motor (W)	phase AD induction motor, power: 40W	phase AD induction motor, power: 90W	phase AD induction motor, power: 180W	phase AD induction motor, power: 180W
Condensing tube	Vertical Type Water Refrigerating	Standing, main+auxiliary cooling and highly efficient 3 circulating cold trap		
Heating boiler	stainless water bath			
Temperature control	Digital display, temperature control, 0~99°C			
Achievable vacuum	399.9Pa (below 3mmHg)			
Evaporating capability	Water ≥2L/h Alcohol ≥4L/h	Water ≥3.2L/h Alcohol ≥6.5L/h	Water 5L/h Alcohol 11L/h	Water 9L/h Alcohol 19L/h
Elevating function	Electric elevation	Electric elevation	Electric elevation	Electric+Manual elevation
Elevating stroke	0~150mm	0~160mm	0~190mm	0~230mm
Rated power supply	220V/50Hz	220V/50Hz	380V/50Hz	380V/50Hz
Power of power supply	2.2KW	4.8KW	6.3KW	8.3KW
Dimensions (mm)	765Lx400Wx1070H	920Lx550Wx1700H	1250Lx600Wx2100H	1320Lx770Wx2340H

RPM33, Combination Contact/Laser Photo Tachometer

Quickly measure RPM, surface speed and length with one tool. Use the contact wheel for up-close readings or laser mode for safer, non-contact measurements up to 0.5m away.



Features:

- Large 5 digit backlit LCD display
- Microprocessor based with quartz crystal oscillator to maintain high accuracy
- Store/recall 10 data sets in memory with 4 parameters (measurement, max, min and average)
- Provides wide RPM (photo and contact) and Linear Surface Speed/Length (contact) measurements
- Laser guided for greater distance non-contact measurements up to 500mm
- Complete with contact wheel for rpm or linear surface speed/length, 9V battery, reflective tape and soft case.

Applications:

- Contact RPM
  - flywheels
  - conveyors
  - pumps
  - elevators
- Non-Contact RPM
  - motors
  - fans
  - gears



Contact RPM measurement



Laser Photo RPM measurement

Specifications	Photo mode	Contact mode
Range (rpm)	2 to 99,999rpm	2 to 99,999rpm
Surface Speed	-	0 to 78,720 inches/min
	-	0 to 6560 ft/min
	-	0 to 2186 yards/min
	-	0 to 2000 m/min
Length	-	3.9 to 39370 inches
	-	0.3 to 3280 feet
	-	0.1 to 1093 yards
	-	0.1 to 1000 meters
Frequency (Hz)	-	333 Hz
Accuracy	0.05% rdg +1 digit	0.05% rdg +1 digit
Sampling Time	0.5 Sec > 120rpm	
Resolution	0.1rpm (< 10,000 rpm); 1rpm (> 10,000 rpm)	
Dimensions / Weight	160 x 60 x 42 mm/151g	

Our safety containers are made of austenitic stainless steel. Typical uses include:

- Industrial production processes
- Laboratory containers at universities, research institutions and in industry
- Storage containers for safe storage of hazardous materials
- Transportation containers for transporting dangerous goods on public roads
- etc.

#### Features:

Various features of our products provide maximum safety for users working with flammable liquids. At the same time, our products ensure effective fire and environmental protection. The use of our products is explicitly recommended by the German Occupational Safety and Health Administration (section 4.15.1 of the laboratory directive, TRGS 526).



**Self-closing closures** (metering devices and taps): open during operation only.

Close automatically by spring force after usage or when containers are dropped accidentally (e.g. in emergencies). This prevents contamination and hazards due to uncontrolled spillage as well as additional fire spreading. Similarly, uncontrolled release of harmful or flammable vapors is avoided.



**Flame arrester:** Prevents ignition sparks from entering even when the container is open, therefore protecting the container and its content against explosion. Consists of a special stainless steel mesh (called Davy Filter), which protects safely from contact with sparks (e.g. due to static electricity when filling or emptying) and flames (e.g. due to fire accidents during operation). The flame arrester is easily removable (for cleaning or replacement).



**Pressure compensation:** Pressure control valves (in metering devices and screw caps) allow excess pressure in closed containers to escape automatically and thus protect against explosion (explosion-proof containers). The mechanism is activated automatically at an excess pressure of 0.3 to 0.4 bar. Excess pressure may result of chemical reactions by the substances filled, thermal influences (e.g. solar radiation, fire), frictions or mechanical hits. Once excess pressure escaped, the valve automatically closes again. Repairs and ongoing maintenance of other solutions (e.g. as fusible links) are no longer necessary.

**Grounding:** During filling or emptying of containers electric charges may occur by friction (static electricity). Sparks could lead to inflammation or explosions of containers. On the one hand MRC Safety Containers protect you through integrated flame arresters and pressure control valves. Additionally the containers are fully conductive and charges are automatically derived.

**Robust materials and construction:** The stainless steels used as well as the gaskets and all other materials are of very high quality and very durable. If used properly, the containers can be used for decades. Our products offer high robustness and extreme breaking resistance during daily operations.

**Overfill protection:** Whenever you use our safety funnels they prevent overfilling automatically. Overall these funnels take only the amount of liquids that fits into the container.

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#### Materials and chemical resistance of safety containers:

**Material:** 316 Ti (1.4571) or 304 (1.4301, for 20 litre canister). **DIN:** X6 and X5 CrNi 18-10 CrNiMoTi 17-12-2.

**Certificate:** EN 10204/3.1B. **Seals:** Polytetrafluoroethylene (PTFE).

For each product a technical datasheet can be downloaded from our website. It includes information on materials used, dimensions, weights, etc. The stainless steels used are characterised by particularly high resistance against corrosive substances. This allows for a much longer usage of stainless steel containers compared to containers made of other materials (e.g. steel or plastic). A rich chromium surface of metal oxides and hydroxides (passive layer) separates and protects the stainless steel from aggressive substances. The passive layer typically recovers itself in the event of a mechanical damage of its surface. The range of substances that can be used in our stainless steel containers includes chemical products, acids, food, alcohol, oils, etc. A selection of substances can be found in the table below ("technically pure substances", i.e. no additions). Resistance may also be given for mixed substances – since the resulting chemical reactions depend on individual conditions, a case to case evaluation need to be done by the user her-/himself.

Limitations regarding the resistance of stainless steel exist with substances which destroy the passive layer, e.g. a few chlorine, chlorine compounds or reducing acids. The company ThyssenKrupp Nirosta GmbH, supplier of stainless steels our company uses, publishes lists regarding the chemical resistance of various types of stainless steel. The German Institute for Standardization also publishes a comparable list (DIN 6601, so-called positive list). The table below shows the chemical resistance of stainless steel types used for our products against major substances (commercially available, technically pure) and is based on the two lists mentioned above. It does not apply to wastes or mixtures that have an indefinite number and concentration of admixtures and impurities. Known limitations have been added to column "Remarks".

Our conical special gaskets of our safety containers are made of polytetrafluoroethylene (PTFE). PTFE also is highly chemically resistant and subject virtually only to mechanical abrasion. The following table shows the resistance of PTFE for a variety of substances.



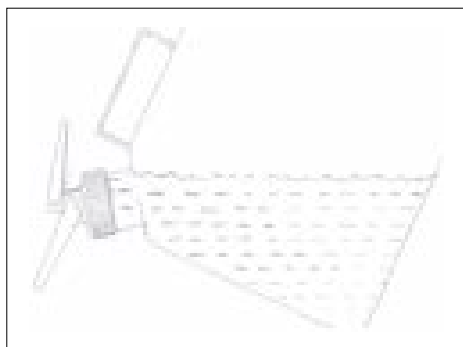
Substance	1.4571	1.4301	PTFE	Remarks
2-propanol (isopropanol)	0	0	0	
Acetone	0	0	0	
Acetonitrile	0	0	0*	* estimated
Alcohol	0	0	0	
Formic acid	0	0	0	K <10% / K >97%, T 20°C
Ammonia (ammonium hydroxide)	0	0	0	T 50°C
Ethanol	0	0	0	
Ethylalcohol	0	0	0	
Caustic potash (potassium hydroxide)	0	0	0	K < 50%
Caustic soda (sodium hydroxide, sodium hydroxide)	0	0	0	K < 25%, T 20°C
Gasoline	0	0	0	
Benzene	0	0	0	
Boric acid	0	0	0	
Butanone (methyl ethyl ketone, MEK)	0	0	0	
Chlorobenzene, anhydrous	0	0	0	
Bleaching powder, dry	0	0	0	T 20°C
Chloroform (trichloromethane), anhydrous	0	0	0	
Sulfur chloride (Dichlorodisulfane)	0	0	k.A.	
Cyclohexane	0	0	0	
Dichloroethane (ethylene chloride), anhydrous	0	0	0	
Dimethylsulfide	0	0	0*	* estimated
Vinegar	0	0	0	
Acetic acid	0	0	0	K 50%, T 20%
Ethyl acetate	0	0	0	
Ethanol	0	0	0	
Ethyl acetate	0	0	0	
Ethyl alcohol	0	0	0	
Ethyl chloride, anhydrous	0	0	k.A.	T boiling
Ethylene chloride (dichloroethane), anhydrous	0	0	0	
Ethylglycol	0	0	0	T 20°C
Ethyl ether	0	0	0	
Formaldehyde (formalin, methylaldehyd)	0	0	0	K 40%
Formalin (formaldehyde, methylaldehyd)	0	0	0	
Tannic acid (tannin)	0	0	0	K 50%
Isooctane	0	0	0	
Isopropanol (2-propanol)	0	0	0	
Potassium hydroxide (caustic potash)	0	0	0	K < 50%
Table salt (sodium chloride)	0	0	0	T 20°C, L
Carbon tetrachloride (carbon tetrachloride)	0	0	0	Without water
Methanol (methyl alcohol)	0	0	0	
Methylaldehyd (formaldehyde, formalin)	0	0	0	
Methyl alcohol (methanol)	0	0	0	
Methyl benzene (toluene)	0	0	0	
Methylene chloride, anhydrous, cooking	0	0	k.A.	
Methyl ethyl ketone, MEK (butanone)	0	0	0	
Lactic acid	0	0	0	T 20°C
n-Hexane	0	0	0	
n-Pentane	0	0	0.A.	
Sodium chloride (table salt)	0 L	0 L	0	T 20°C
Sodium hydroxide (caustic soda)	0	0	0	K < 25%, T 20°C
Caustic soda (sodium hydroxide)	0	0	0	K < 25%, T 20°C
Petroleum ether	0	0	0	
Phosphoric acid	0	0	0	K <70%, T 20°C * K <10%, T boiling
Nitric acid	0	0	0	K <66%, T 20°C * K <37%, T boiling
Sulfuric acid	1	0	0	K 7,5%, T 20°C
Tannin (tannic acid)	0	0	0	K 50%
Tetrachloromethane (carbon tetrachloride)	0	0	0	Without water
Tetrahydrofuran (THF, flashpoint <21°C)	0	0	0	T 20°C
Toluene (methyl benzene)	0	0	0	
Trichloromethane (chloroform)	0	0	0	
Alcohol (ethyl alcohol)	0	0	0	
Tartaric acid	0	0	0	K < 50%, T 20°C

0 = no restrictions, 1 = limited use, K = Concentration, T=Temperature, L = Risk of localised corrosion (pitting)  
 The data is based on existing test results - unlisted concentrations or temp. conditions do not automatically imply non-resistance!



In practice, mixtures or impure substances are often used. Small impurities may significantly affect the chemical risk profile. Since the individual operating conditions are not known to us, the testing for chemical resistance of safety containers and –funnels is the responsibility of the user and should always be ensured before using it.

## Handling instructions:



**Emptying:** When emptying containers air needs to flow into the container while liquid flows out. Our safety containers ensure both takes place. When using containers with self-closing metering device please note that the container should be tilted only as much as shown in the illustration on the left.

If the container is tilted too much (i.e. the metering device is completely below the liquid level) air can not enter the container sufficiently and liquid will flow only in erratic bursts.

For our safety containers with self-closing tap (from outside they look similar to metering de-vices), air can enter through an additional ventilation screw on the container. The tap can be below the liquid level without any problems. Therefore, safety canisters with a tap can permanently be stored horizontally, for example in safety cabinets.

**Avoid spilling:** Our safety containers are designed to offer a total volume greater than the denominated volume. This additional filling space is important to serve as expansion space for filled substances in the event of significant fluctuations in surrounding temperatures (e.g. when solvents stored outside in cold weather are transferred in a building). Do not fill the container beyond the nominal volume! The expansion space could otherwise be too small and in extreme cases liquid could escape via the pressure control valve. If safety transportation containers are used, additional hazardous goods regulations regarding filling limits might be applicable.

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**Cleaning:** If different substances should be used in the same safety container, it should be cleaned thoroughly before use. If undone, a mixture of different substances could cause uncontrolled chemical reactions. Eventually a mixture may arise, which might harm the container material. For cleaning, an in-depth rinsing is recommended. This may include a sterilisation based on an autoclave process. To ensure the material used for the gaskets of the containers (PTFE) is not affected, temperatures well above 200°C should be avoided. Generally, our products require little maintenance. Nevertheless, it is important, to check tightness and operability of the containers in appropriate intervals. E.g. the use of sticky substances could limit or impair the functioning of the gaskets or glue the flame trap. Please take care that the substances you fill do not contain hard particles. They might be shut between the gaskets of metering devices respectively taps and result in leakage. In most cases you can solve this easily. Please press the black lever and flush the device thoroughly. If available, you can also use compressed air.

**Maintenance and Repair:** Regular review of the container functions is inferred by the use of potentially explosive liquids, the audit cycle – if not mandatory – should depend from the risk potential and intensity of use. Containers may only be sent in for repair fully cleaned (inside and outside), as any residuals of flammable liquids would make welding work impossible. Contaminated safety containers / –funnels must be cleaned at the expense of the sender. If in individual cases parts are damaged, they may be sent in for repair (after cleaning). If you prefer to perform a repair yourself, you should only use our original spare parts.

To avoid impact of extraneous rust do not use steel tools when working with stainless steel material!

Safe handling, storage and transportation of hazardous goods – with MRC Safety Containers made of stainless steel



- For safe metering and handling of smaller amounts of flammable liquids at the work place
- Made of 0.6 mm strong stainless steel, gaskets of PTFE, handles of powder-coated aluminium
- Available as laboratory edition (electro-polished, optic as above) or industrial edition (unpolished, optic as product SP2 left, order number supplemented with "U").

#### 01D/02D/03D/04D/05D Series, Safety Cans for Hazardous Materials –For inplant use

- Safely protect you while working with flammable liquids and other hazardous goods in laboratories and industrial pro-duction
- Are reusable and exceptionally durable
- Are resistant to chemicals due to high-quality stainless steel and gaskets from polytetrafluoroethylene (PTFE)
- Are explosion-proof due to flame traps, pressure control valves and self-closing metering devices / taps
- Comply with the requirements of major norms (e.g. TUV, Factory Mutual (FM), etc.)
- Are recommended by occupational health and govern mental safety organizations
- Are quality products "Made in Germany".



Model	Vol. (Liters)	Discription
01D/01DU	1	with metering device 1¼"
02D/02DU	2	with metering device 1¼"
05D/05DU	5	with metering device 1¼"
01K/01KU	1	with screw cap 1¼"
02K/02KU	2	with screw cap 1¼"
05K/05KU	5	with screw cap 1¼"
SP1	1	Moistener (with soaking tray and pump 1¼")
SP2	2	Moistener (with soaking tray and pump 1¼")

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#### 05K/10K/20K Series, Safety Canisters for Hazardous Materials –For inplant use

- For safe storage, metering and handling of flamma-ble liquids
- Made of 0.8 mm strong stainless steel, gaskets of PTFE, handles also made of stainless steel
- Canister's shape maximizes the usage of limited storage space, e.g. in safety cabinets
- Canisters with self-closing taps for horizontal stor-age & decanting; with separate ventilation screw.



Model	Vol. (Liters)	Discription
05KD	5	with metering device 1½"
10KD	10	with metering device 1½"
20KDL	20	with metering device 1½" and sep. ventilation
05KK	5	with screw cap 1½"
10KK	10	with screw cap 1½"
20KK	20	with screw cap 1½"
05KZ	5	with tap 1½" and separate ventilation
10KZ	10	with tap 1½" and separate ventilation
20KZ	20	with tap 1½" and separate ventilation



#### 10K – TB4 Series, Safety Barrels for Hazardous Materials – For Inplant Use

- For safe storage of larger amounts of hazardous goods or for decanting and metering
- Made of 0.8 to 1.5 mm strong stainless steel (vol-ume dependent)
- 25L- and 50L-barrels are stackable
- Gaskets of PTFE, content level indicators of per-fluoro alkoxy copolymers (PFA)
- Also available with 100l or 200l capacity.

Model	Vol. (Liters)	Discription
10K	10	with screw cap 1½"
25K	25	with screw cap 1½"
50K	50	with screw cap 2" TPI
10Z	10	with tap ¾" and separate ventilation
25Z	25	with tap ¾" and separate ventilation
50Z	50	with tap ¾" and separate ventilation
10ZI	10	with tap ¾", separate ventilation & content level indicator
25ZI	25	with tap ¾", separate ventilation & content level indicator
50ZI	50	with tap ¾", separate ventilation & content level indicator
10D	10	with metering device 1½" and separate ventilation
10DI	10	with metering device 1½", separate ventilation & content level indicator
10S	10	Collection barrel, 2"-connection
10SI	10	Collection barrel, 2"-connection and content level indicator
WB4	4	Washing tank – for safe cleaning
TB4	4	Soaking tank – for safe moistening

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#### 01T – 25TZ Series, Safety Transportation Containers for Hazardous Materials, for Cans, Canisters, Barrels

- Special containers for the safe transport of hazardous goods on all public traffic routes
- Accredited for UN-transports according to ADR, RID, IMDG Code and ICAO-TI resp. GGVSEB and GGVSee – for all classes of hazardous goods (packaging group X)
- Made of 0.6 to 1.2 mm strong stainless steel (type dependent), gaskets of PTFE
- With flame trap and screw cap without pressure con-trol valve as a standard – also available with pressure control valve (order number supplemented with "V", e.g. 10KTV)
- Equipped with self-closing tap Z150, 25TZ may also be used in horizontal position.

Model	Vol. (Liters)	Discription
01T	1	Safety transportation can
02T	2	Safety transportation can
05T	5	Safety transportation can
05KT	5	Safety transportation canister
10KT	10	Safety transportation canister
20KTL	20	Safety transportation canister with separate ventilation
25TZ	25	Safety transportation barrel

## TK/T/TR Series, Stainless Steel Funnels, for DIN-plastic canisters, combi barrels, 2"- barrels and all Roetz safety containers

- Safety funnels are screwed on containers (continuous grounding), have an additional earth connection, an overflow protection, a flame trap and a closure head for vapour reduction
- Safety funnels type TK designed for safe and comfortable filling of DIN-plastic containers
- Safety funnels TS and T182 for combi-barrels (but-tress thread)
- Plug-in funnels inserted in Roetz safety containers without screw connection.



Model	Discription
TK50	Safety-funnel, with plastic cap (PE) DIN 50
TK50-180	Safety-funnel flat, with plastic cap (PE) DIN 50
TK51	Safety-funnel, with plastic cap (PE) DIN 51
TK51-180	Safety-funnel flat, with plastic cap (PE) DIN 51
TK61	Safety-funnel, with plastic cap (PE) DIN 61
TK61-180	Safety-funnel flat, with plastic cap (PE) DIN 61
TK71	Safety-funnel, with plastic cap (PE) DIN 71
TK71-180	Safety-funnel flat, with plastic cap (PE) DIN 71
T2	Safety-funnel with 2"-thread
T180	Safety-funnel flat, with 2"-thread
TS	Safety-funnel with 2"-buttress thread
T182	Safety-funnel flat, with 2"-buttress thread
TR1	Plug-in funnel for all safety cans
TR2	Plug-in funnel for all safety canisters
TR2V	Plug-in funnel TR2 with screw connection
TR3	Plug-in funnel for all safety barrels

## Accessories for Safety Containers



Model	For	Discription
P1	all safety cans 1l	Soaking tray with pump
P2	all safety cans 2l	Soaking tray with pump
A2	Safety barrels 10S and 10SI	Spout 2"
A15	all safety canisters & safety barrels 10l & 25l	Spout 1½"
Z34	Safety barrels	Self-closing tap ¾"
Z150	Safety canisters 05KZ, 10KZ, 20KZ, 20KDL & safety transportation barrel 25TZ	Self-closing tap 1½"
D125	all safety cans	Self-closing metering device 1¼", with ventilation
D150	Safety canisters 05KD, 10KD, 05KK, 10KK & safety barrel 10K	Self-closing metering device 1½", with ventilation
D151	10D, 10DI, 20KDL, 20KTL, 05KZ, 10KZ, 20KZ	Self-closing metering device 1½"
K125	Safety cans	Screw cap 1¼", with ventilation
K126	all safety transportation cans	Screw cap 1¼"
K150	Safety canisters and 10D, 10DI, 10K, 25K	Screw cap 1½", with ventilation
K151	10Z, 10ZI, 25Z, 25ZI	Screw cap 1½", with ventilation lever
K152	all safety transportation canisters and -barrel 25TZ	Screw cap 1½"
K200	Safety barrel 50K	Screw cap 2" TPI, with ventilation
K201	Safety barrel 50Z and 50ZI	Screw cap 2" TPI, with ventilation lever
K2	Safety barrel 10S and 10SI	Screw cap 2" Tri-Sure
FS125	all safety cans	Flame trap
FS150	all safety canisters and safety barrels 10l and 25l	Flame trap
FS200	all safety barrels 50l	Flame trap
WK	Washing tank WB4	Washing cage
LB2	Safety transportation barrel 25TZ	Bearing blocks from wood (2 pieces)



Our safety containers are made of austenitic stainless steel. Typical uses include:

- Industrial production processes
- Laboratory containers at universities, research institutions and in industry
- Storage containers for safe storage of hazardous materials
- Transportation containers for transporting dangerous goods on public roads
- etc.

#### Features:

Various features of our products provide maximum safety for users working with flammable liquids. At the same time, our products ensure effective fire and environmental protection. The use of our products is explicitly recommended by the German Occupational Safety and Health Administration (section 4.15.1 of the laboratory directive, TRGS 526).



**Self-closing closures** (metering devices and taps): open during operation only.

Close automatically by spring force after usage or when containers are dropped accidentally (e.g. in emergencies). This prevents contamination and hazards due to uncontrolled spillage as well as additional fire spreading. Similarly, uncontrolled release of harmful or flammable vapors is avoided.



**Flame arrester:** Prevents ignition sparks from entering even when the container is open, therefore protecting the container and its content against explosion. Consists of a special stainless steel mesh (called Davy Filter), which protects safely from contact with sparks (e.g. due to static electricity when filling or emptying) and flames (e.g. due to fire accidents during operation). The flame arrester is easily removable (for cleaning or replacement).



**Pressure compensation:** Pressure control valves (in metering devices and screw caps) allow excess pressure in closed containers to escape automatically and thus protect against explosion (explosion-proof containers). The mechanism is activated automatically at an excess pressure of 0.3 to 0.4 bar. Excess pressure may result of chemical reactions by the substances filled, thermal influences (e.g. solar radiation, fire), frictions or mechanical hits. Once excess pressure escaped, the valve automatically closes again. Repairs and ongoing maintenance of other solutions (e.g. as fusible links) are no longer necessary.

**Grounding:** During filling or emptying of containers electric charges may occur by friction (static electricity). Sparks could lead to inflammation or explosions of containers. On the one hand MRC Safety Containers protect you through integrated flame arresters and pressure control valves. Additionally the containers are fully conductive and charges are automatically derived.

**Robust materials and construction:** The stainless steels used as well as the gaskets and all other materials are of very high quality and very durable. If used properly, the containers can be used for decades. Our products offer high robustness and extreme breaking resistance during daily operations.

**Overfill protection:** Whenever you use our safety funnels they prevent overfilling automatically. Overall these funnels take only the amount of liquids that fits into the container.

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#### Materials and chemical resistance of safety containers:

**Material:** 316 Ti (1.4571) or 304 (1.4301, for 20 litre canister). **DIN:** X6 and X5 CrNi 18-10 CrNiMoTi 17-12-2.

**Certificate:** EN 10204/3.1B. **Seals:** Polytetrafluoroethylene (PTFE).

For each product a technical datasheet can be downloaded from our website. It includes information on materials used, dimensions, weights, etc. The stainless steels used are characterised by particularly high resistance against corrosive substances. This allows for a much longer usage of stainless steel containers compared to containers made of other materials (e.g. steel or plastic). A rich chromium surface of metal oxides and hydroxides (passive layer) separates and protects the stainless steel from aggressive substances. The passive layer typically recovers itself in the event of a mechanical damage of its surface. The range of substances that can be used in our stainless steel containers includes chemical products, acids, food, alcohol, oils, etc. A selection of substances can be found in the table below ("technically pure substances", i.e. no additions). Resistance may also be given for mixed substances – since the resulting chemical reactions depend on individual conditions, a case to case evaluation need to be done by the user her-/himself.

Limitations regarding the resistance of stainless steel exist with substances which destroy the passive layer, e.g. a few chlorine, chlorine compounds or reducing acids. The company ThyssenKrupp Nirosta GmbH, supplier of stainless steels our company uses, publishes lists regarding the chemical resistance of various types of stainless steel. The German Institute for Standardization also publishes a comparable list (DIN 6601, so-called positive list). The table below shows the chemical resistance of stainless steel types used for our products against major substances (commercially available, technically pure) and is based on the two lists mentioned above. It does not apply to wastes or mixtures that have an indefinite number and concentration of admixtures and impurities. Known limitations have been added to column "Remarks".

Our conical special gaskets of our safety containers are made of polytetrafluoroethylene (PTFE). PTFE also is highly chemically resistant and subject virtually only to mechanical abrasion. The following table shows the resistance of PTFE for a variety of substances.

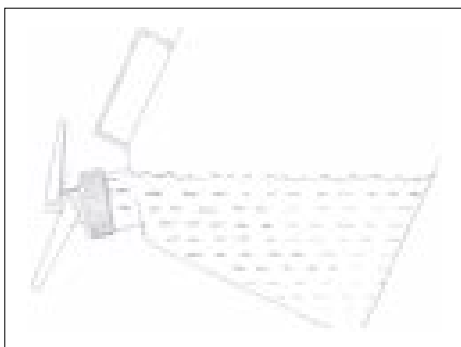


Substance	1.4571	1.4301	PTFE	Remarks
2-propanol (isopropanol)	0	0	0	
Acetone	0	0	0	
Acetonitrile	0	0	0*	* estimated
Alcohol	0	0	0	
Formic acid	0	0	0	K <10% / K >97%, T 20°C
Ammonia (ammonium hydroxide)	0	0	0	T 50°C
Ethanol	0	0	0	
Ethylalcohol	0	0	0	
Caustic potash (potassium hydroxide)	0	0	0	K < 50%
Caustic soda (sodium hydroxide, sodium hydroxide)	0	0	0	K < 25%, T 20°C
Gasoline	0	0	0	
Benzene	0	0	0	
Boric acid	0	0	0	
Butanone (methyl ethyl ketone, MEK)	0	0	0	
Chlorobenzene, anhydrous	0	0	0	
Bleaching powder, dry	0	0	0	T 20°C
Chloroform (trichloromethane), anhydrous	0	0	0	
Sulfur chloride (Dichlorodisulfane)	0	0	k.A.	
Cyclohexane	0	0	0	
Dichloroethane (ethylene chloride), anhydrous	0	0	0	
Dimethylsulfide	0	0	0*	* estimated
Vinegar	0	0	0	
Acetic acid	0	0	0	K 50%, T 20%
Ethyl acetate	0	0	0	
Ethanol	0	0	0	
Ethyl acetate	0	0	0	
Ethyl alcohol	0	0	0	
Ethyl chloride, anhydrous	0	0	k.A.	T boiling
Ethylene chloride (dichloroethane), anhydrous	0	0	0	
Ethylglycol	0	0	0	T 20°C
Ethyl ether	0	0	0	
Formaldehyde (formalin, methylaldehyd)	0	0	0	K 40%
Formalin (formaldehyde, methylaldehyd)	0	0	0	
Tannic acid (tannin)	0	0	0	K 50%
Isooctane	0	0	0	
Isopropanol (2-propanol)	0	0	0	
Potassium hydroxide (caustic potash)	0	0	0	K < 50%
Table salt (sodium chloride)	0	0	0	T 20°C, L
Carbon tetrachloride (carbon tetrachloride)	0	0	0	Without water
Methanol (methyl alcohol)	0	0	0	
Methylaldehyd (formaldehyde, formalin)	0	0	0	
Methyl alcohol (methanol)	0	0	0	
Methyl benzene (toluene)	0	0	0	
Methylene chloride, anhydrous, cooking	0	0	k.A.	
Methyl ethyl ketone, MEK (butanone)	0	0	0	
Lactic acid	0	0	0	T 20°C
n-Hexane	0	0	0	
n-Pentane	0	0	0.A.	
Sodium chloride (table salt)	0 L	0 L	0	T 20°C
Sodium hydroxide (caustic soda)	0	0	0	K < 25%, T 20°C
Caustic soda (sodium hydroxide)	0	0	0	K < 25%, T 20°C
Petroleum ether	0	0	0	
Phosphoric acid	0	0	0	K <70%, T 20°C * K <10%, T boiling
Nitric acid	0	0	0	K <66%, T 20°C * K <37%, T boiling
Sulfuric acid	1	0	0	K 7,5%, T 20°C
Tannin (tannic acid)	0	0	0	K 50%
Tetrachloromethane (carbon tetrachloride)	0	0	0	Without water
Tetrahydrofuran (THF, flashpoint <21°C)	0	0	0	T 20°C
Toluene (methyl benzene)	0	0	0	
Trichloromethane (chloroform)	0	0	0	
Alcohol (ethyl alcohol)	0	0	0	
Tartaric acid	0	0	0	K < 50%, T 20°C

0 = no restrictions, 1 = limited use, K = Concentration, T=Temperature, L = Risk of localised corrosion (pitting)  
 The data is based on existing test results - unlisted concentrations or temp. conditions do not automatically imply non-resistance!

In practise, mixtures or impure substances are often used. Small impurities may significantly affect the chemical risk profile. Since the individual operating conditions are not known to us, the testing for chemical resistance of safety containers and –funnels is the responsibility of the user and should always be ensured before using it.

### Handling instructions:



**Emptying:** When emptying containers air needs to flow into the container while liquid flows out. Our safety containers ensure both takes place. When using containers with self-closing metering device please note that the container should be tilted only as much as shown in the illustration on the left.

If the container is tilted too much (i.e. the metering device is completely below the liquid level) air can not enter the container sufficiently and liquid will flow only in erratic bursts.

For our safety containers with self-closing tap (from outside they look similar to metering de-vices), air can enter through an additional ventilation screw on the container. The tap can be below the liquid level without any problems. Therefore, safety canisters with a tap can permanently be stored horizontally, for example in safety cabinets.

**Avoid spilling:** Our safety containers are designed to offer a total volume greater than the denominated volume. This additional filling space is important to serve as expansion space for filled substances in the event of significant fluctuations in surrounding temperatures (e.g. when solvents stored outside in cold weather are transferred in a building). Do not fill the container beyond the nominal volume! The expansion space could otherwise be too small and in extreme cases liquid could escape via the pressure control valve. If safety transportation containers are used, additional hazardous goods regulations regarding filling limits might be applicable.

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**Cleaning:** If different substances should be used in the same safety container, it should be cleaned thoroughly before use. If undone, a mixture of different substances could cause uncontrolled chemical reactions. Eventually a mixture may arise, which might harm the container material. For cleaning, an in-depth rinsing is recommended. This may include a sterilisation based on an autoclave process. To ensure the material used for the gaskets of the containers (PTFE) is not affected, temperatures well above 200°C should be avoided. Generally, our products require little maintenance. Nevertheless, it is important, to check tightness and operability of the containers in appropriate intervals. E.g. the use of sticky substances could limit or impair the functioning of the gaskets or glue the flame trap. Please take care that the substances you fill do not contain hard particles. They might be shut between the gaskets of metering devices respectively taps and result in leakage. In most cases you can solve this easily. Please press the black lever and flush the device thoroughly. If available, you can also use compressed air.

**Maintenance and Repair:** Regular review of the container functions is inferred by the use of potentially explosive liquids, the audit cycle – if not mandatory – should depend from the risk potential and intensity of use. Containers may only be sent in for repair fully cleaned (inside and outside), as any residuals of flammable liquids would make welding work impossible. Contaminated safety containers / –funnels must be cleaned at the expense of the sender. If in individual cases parts are damaged, they may be sent in for repair (after cleaning). If you prefer to perform a repair yourself, you should only use our original spare parts.

To avoid impact of extraneous rust do not use steel tools when working with stainless steel material!



Seal-Plate

### Control:

The Seal-Plate Semi Automated Plate Sealer allows optimal settings for all types of plates and sealing material. Sealing time and temperature can be set using the control knob



- Sealing Temp. in 1.0°C increments
- Sealing Time in 0.1 sec increments
- Automatic Counting Function.

### Accessories:



### Simple 4 step operation:



Step.1 Pull the drawer



Step.2 Put the adapter, plate



Step.3-1 Put a sealing film



Step.3-2 Put the weighted sealing flake if the film is curly



Step.4 Press "RUN" key

### Remark:

When using the weighted sealing flake, the recommended sealing times should be increased by 1 second!

### SEAL-PLATE, Semi Automated Plate Sealer

The Seal-Plate Plate Sealer is a semi-automatic thermal sealer which is ideal for the low to medium throughput laboratory that requires uniform and consistent sealing of micro-plates. Unlike manual plate sealer, the Seal-Plate produces repeatable plate seals. With variable temperature and time settings, sealing conditions are easily optimised to guarantee consistent result, eliminating sample loss.

The Seal-Plate can be applied in product's quality control of many manufacture enterprise such as plastic film, food, medical, inspection institute, scholastic scientific research and teaching experiment. Offering complete versatility, the Seal-Plate will accept a full range of plates for PCR, assay or storage applications.



### Features:

- Format different micro well plates and heat seals
- Adjustable Sealing Temperature: 80 – 200°C
- OLED display screen, high light and no visual angle limit
- Precise temperature, timing and pressure for consistent sealing
- Automatic counting function
- Compact footprint: only 17.8cm wide.

### Security and Energy Saving Functions:

The drawer is controlled by high grad MCU, if a hand or objects blocked the drawer when it's moving, the drawer motor will automatically reverse. This feature prevents injury to the user and unit.

Special and smart design on the drawer, it's detachable from the main device. So user can maintain and clean easily the heating element.

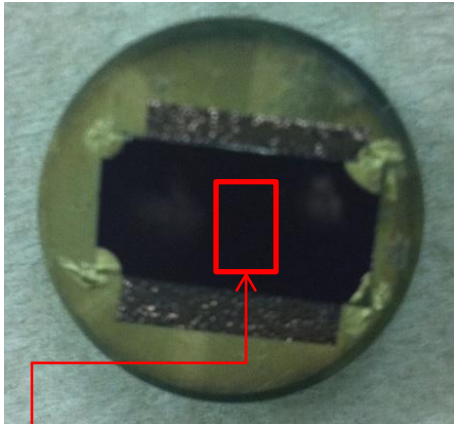
When the unit is left idle more than 60min, it automatically switches into stand-by mode during which the temperature of the heating element is reduced to 60°C to save energy. When the unit is left idle more than 120min, it switches off automatically for added safety. It switched off the display and heating.

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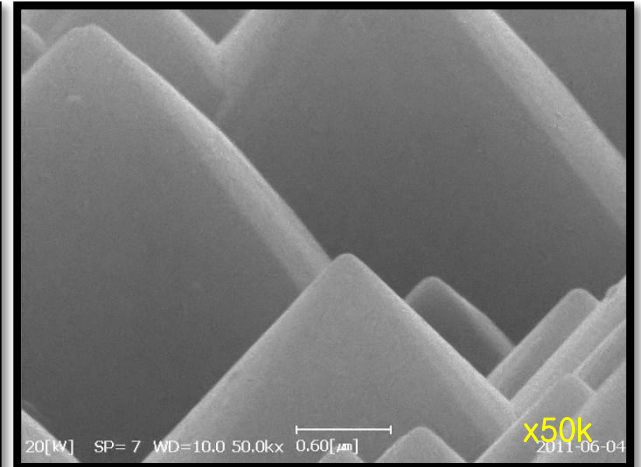
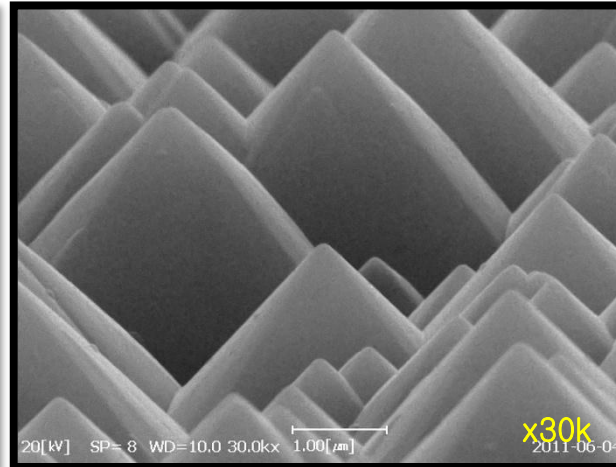
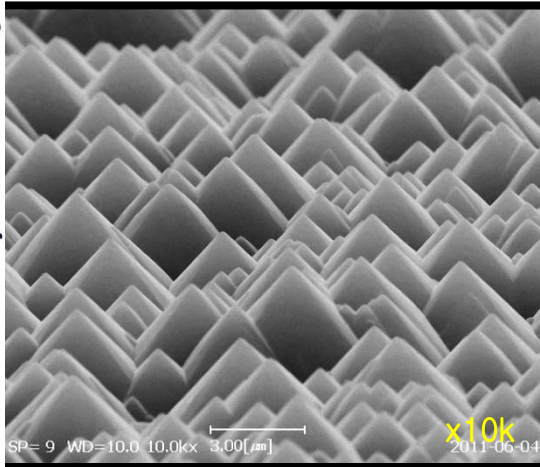
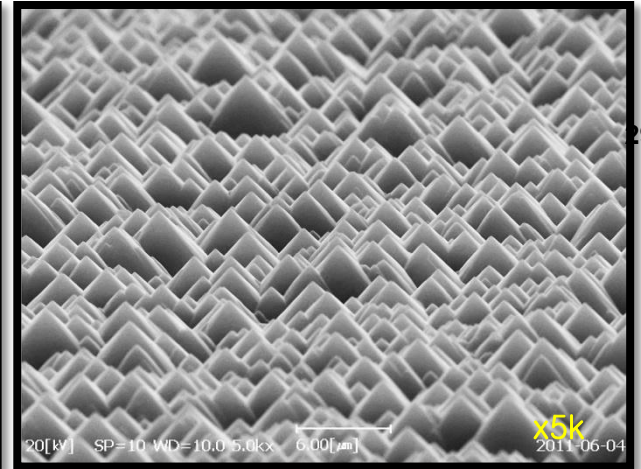
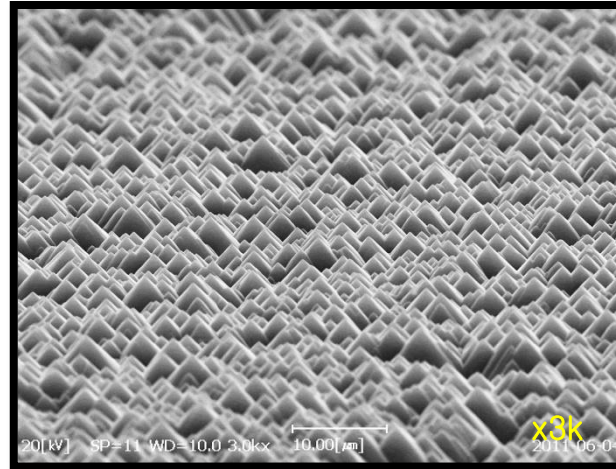
Model	SealPlate
Display	OLED
Sealing Temperature	80 – 200°C
Temp. accurate	1.0°C
Seal time	0.5s ~ 10s, increased by 0.1 sec.
Input power	300W
Dimension(D×W×H)	370mm×178mm×330mm
Weight	9.6kg
Seals plate heights	9 to 48mm high
Compatible Plate Materials	PP (Polypropylene) PS (Polystyrene) PE (Polyethylene)
Compatible Plate Types	Standard Assay Plates, Deep-Well Plates PCR Plates including skirted



# Solarcell Texture

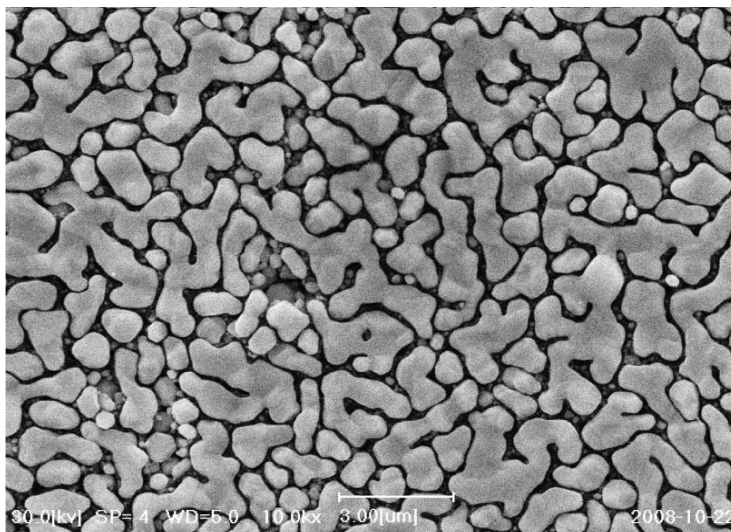


Texturing

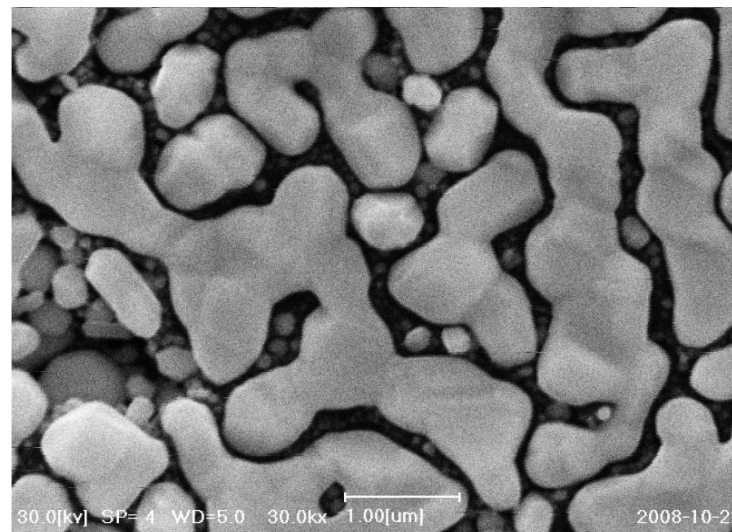




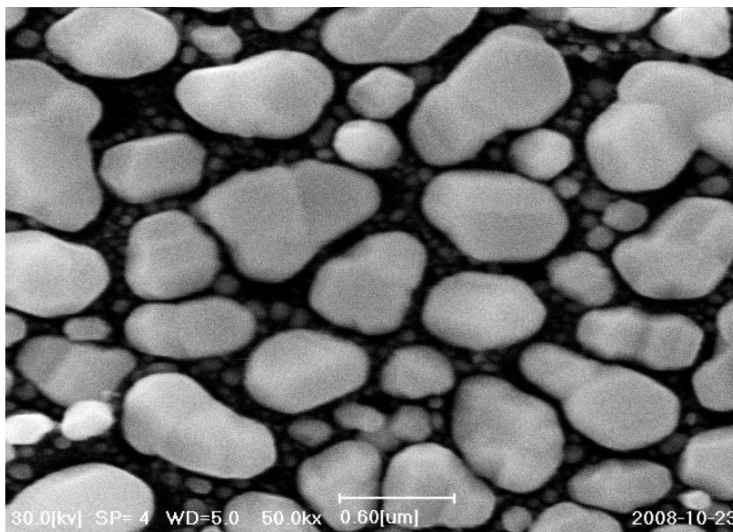
# ■ Gold Particle



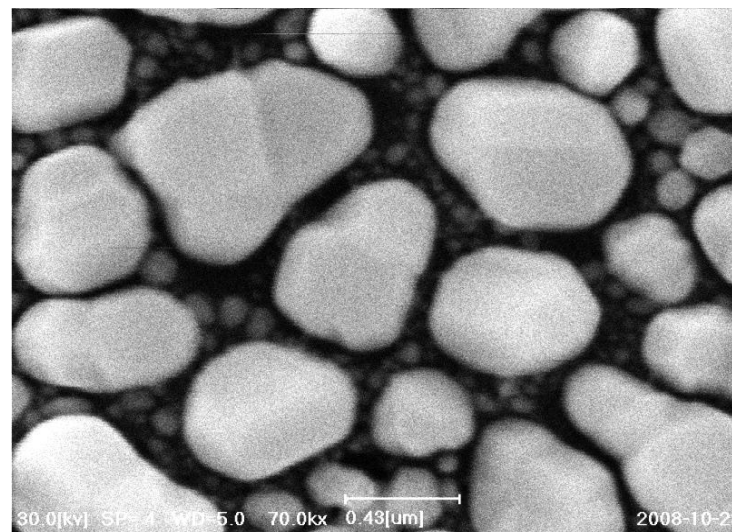
(10.0K X)



(30.0K X)



(50.0K X)

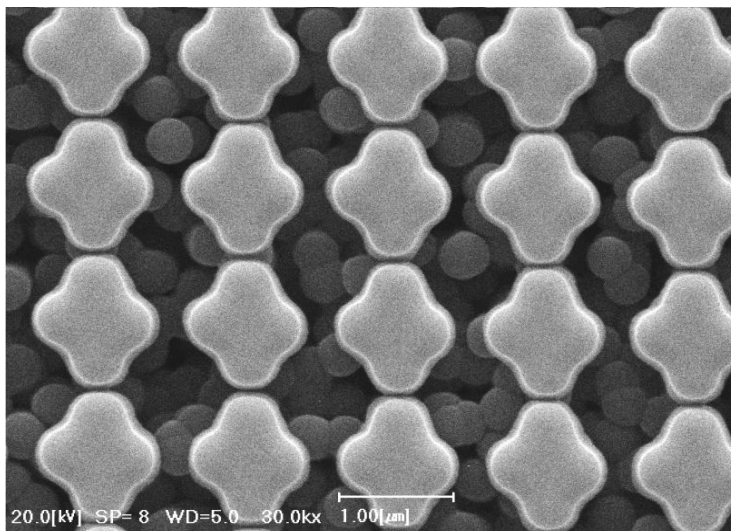


(70.0K X)

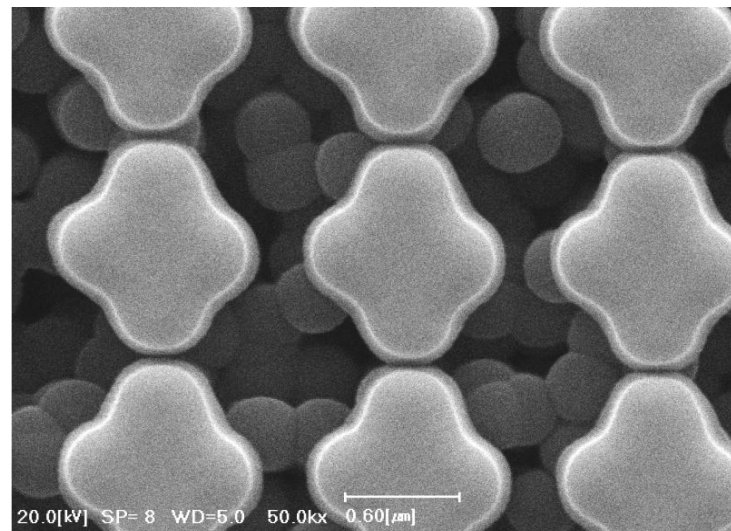


# ■ Silicon Wafer

Tilt = 0°

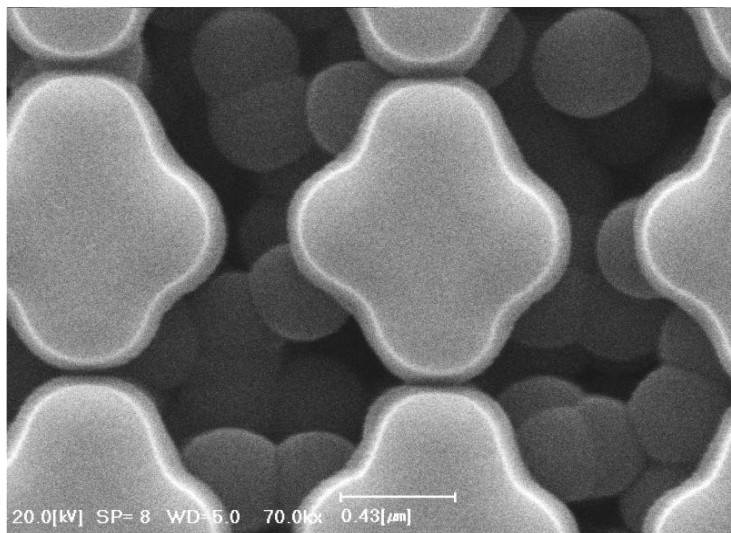


(30.0K X)

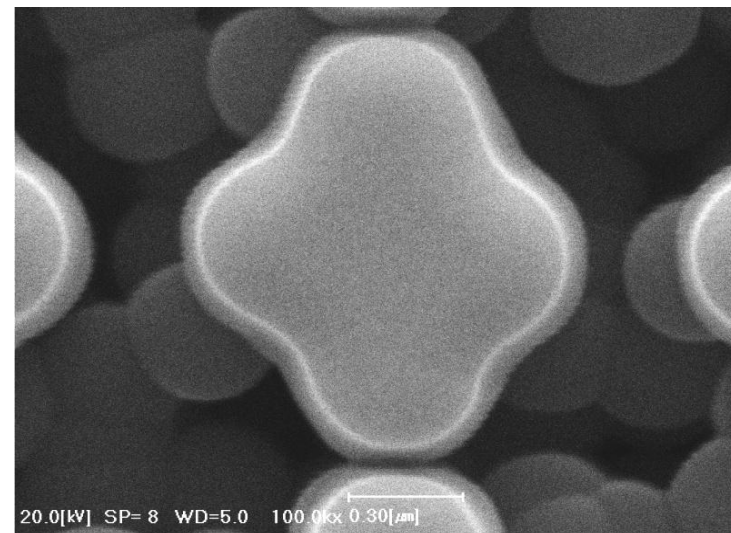


(50.0K X)

Tilt = 0°



(70.0K X)

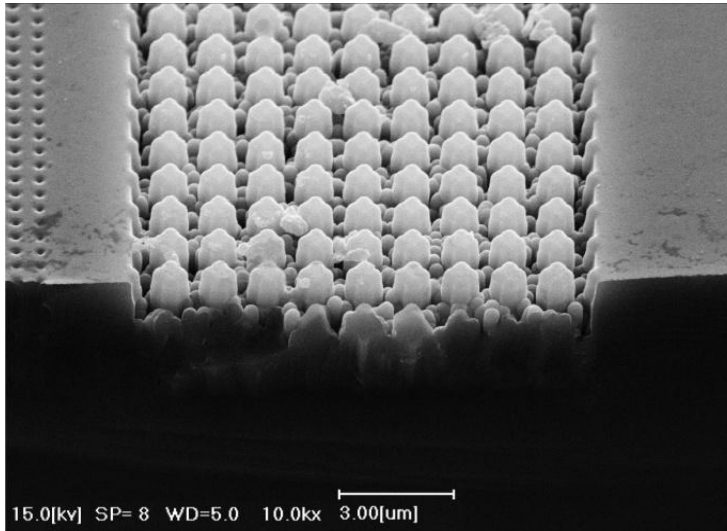


(100.0K X)

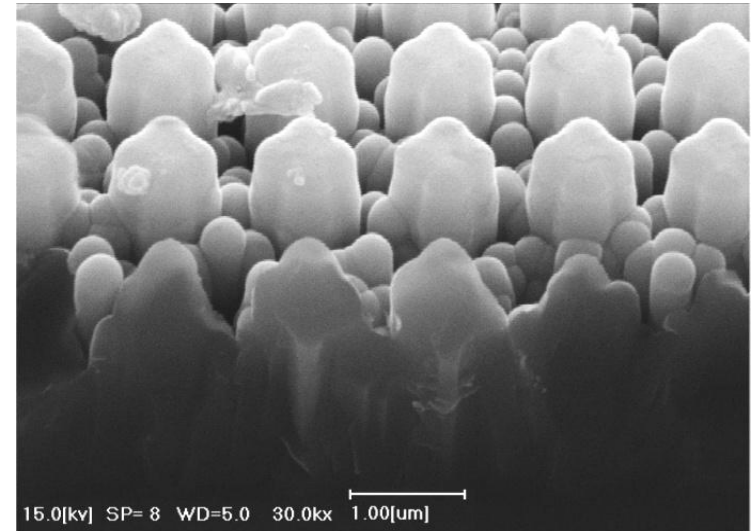
294

# ■ Silicon Wafer

Tilt = 45°

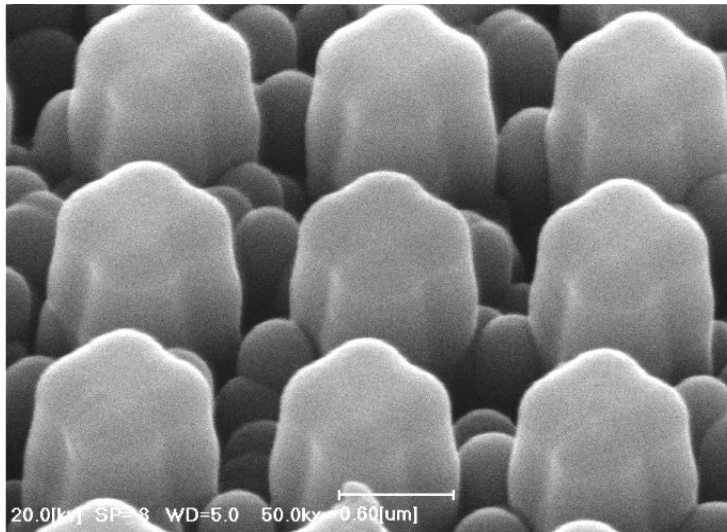


(10.0K X)

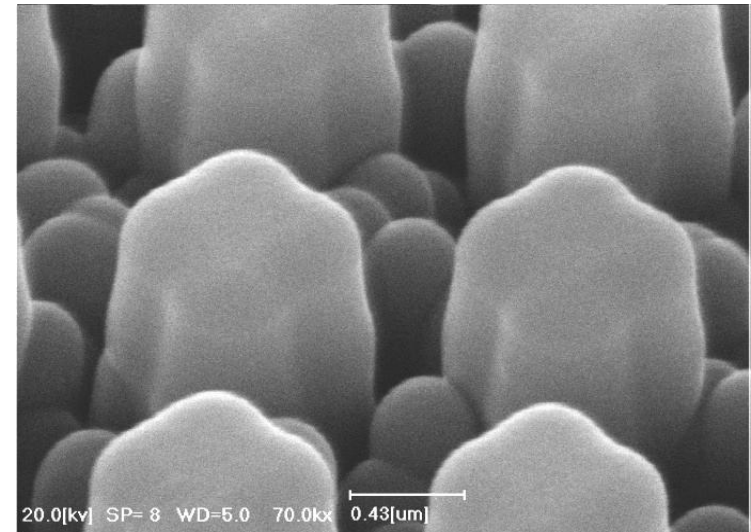


(30.0K X)

Tilt = 45°



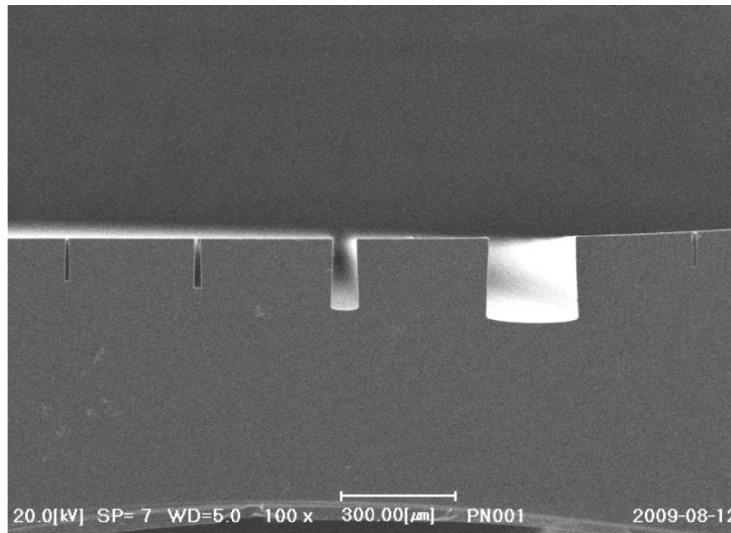
(50.0K X)



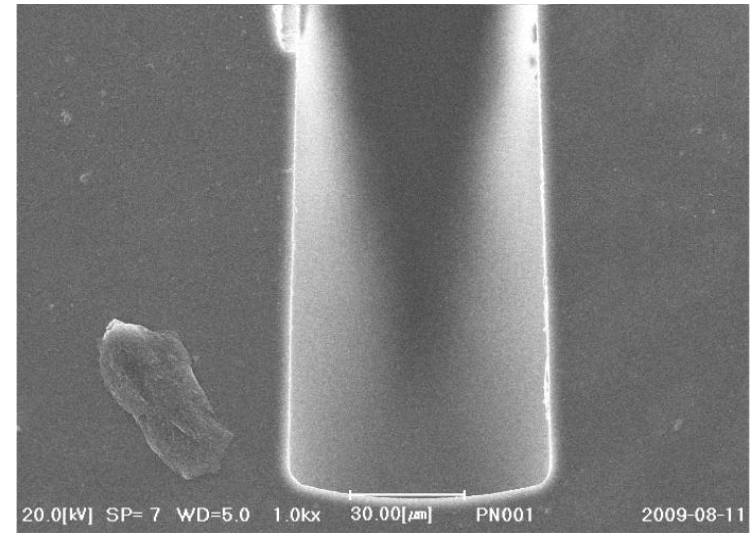
(70.0K X)



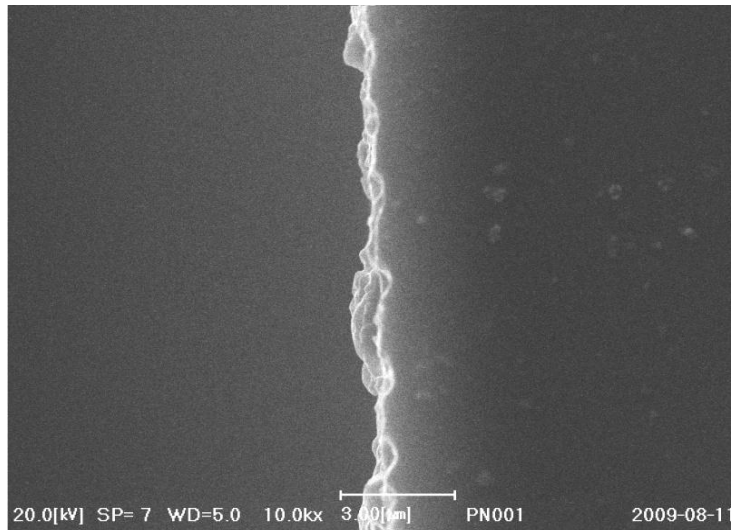
# ■ Silicon Wafer



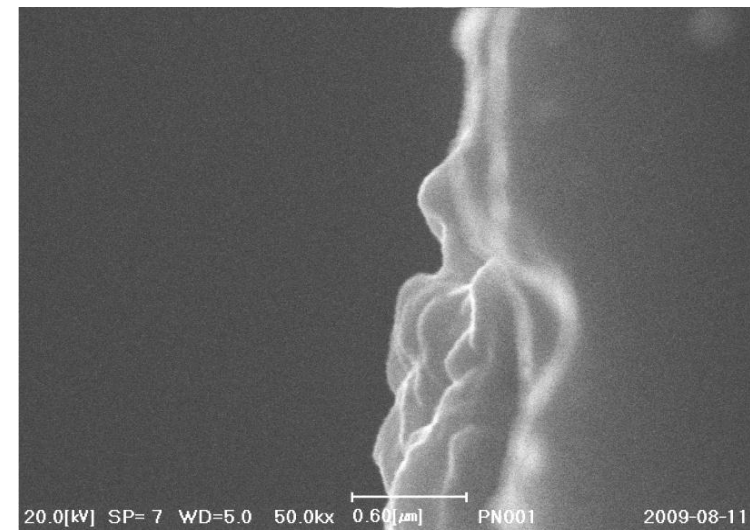
(100 X)



(1.0K X)

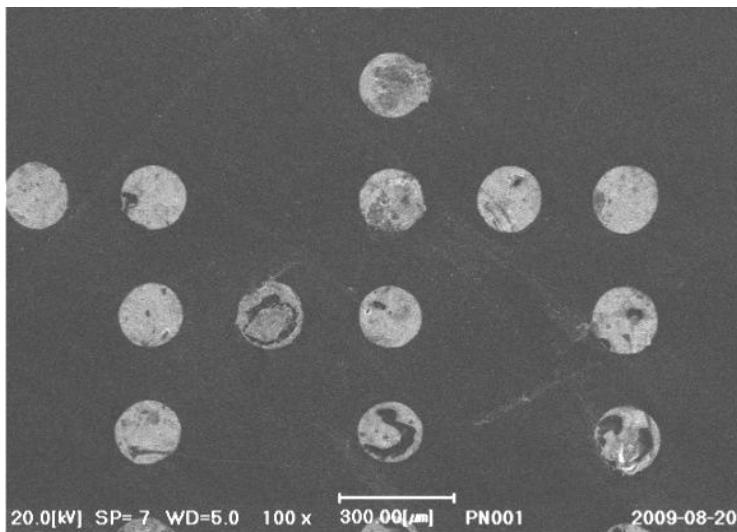


(10.0K X)

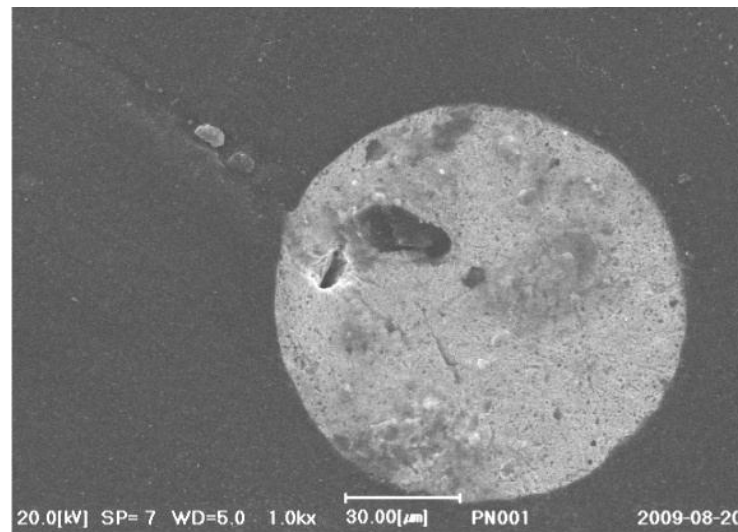


(50.0K X)

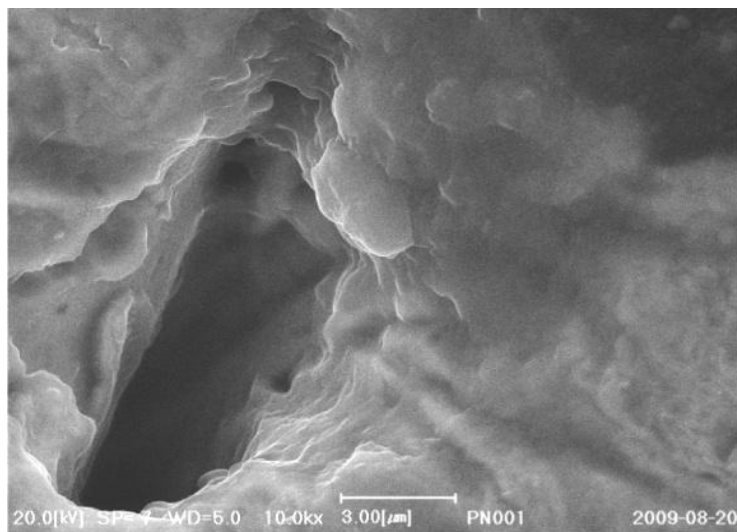
# ■ PKG (BGA)



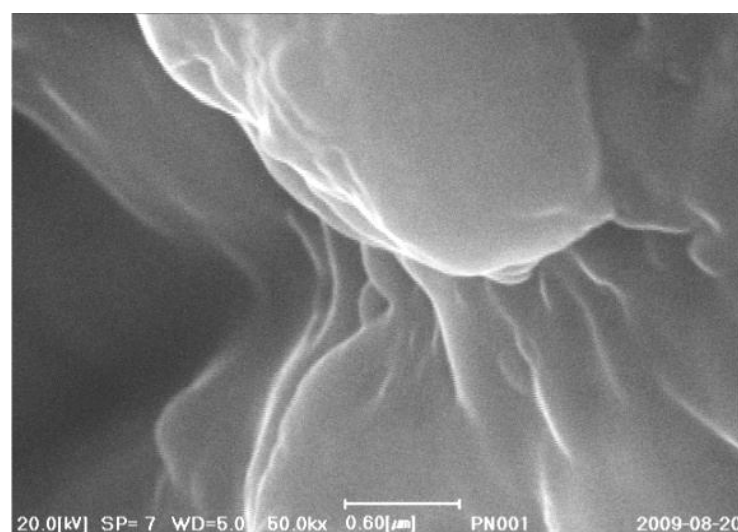
(100 X)



(1.0K X)



(10.0K X)



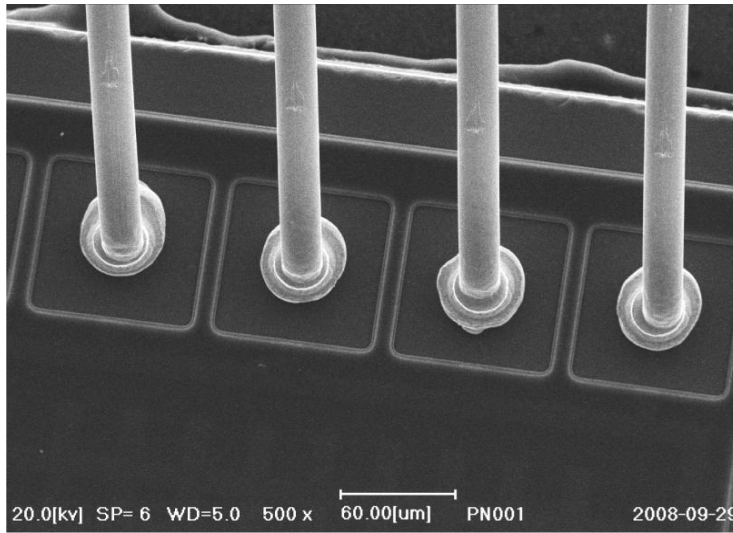
(50.0K X)

297

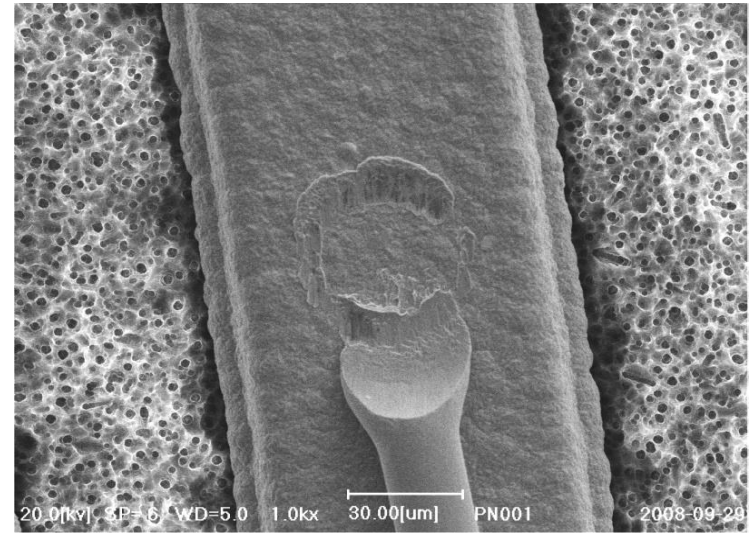


# Microfluidics Chip

ilt = 0°

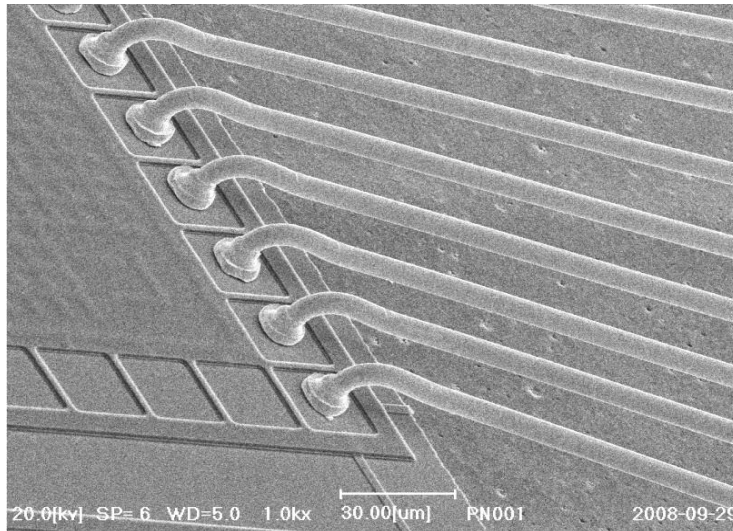


(500 X)

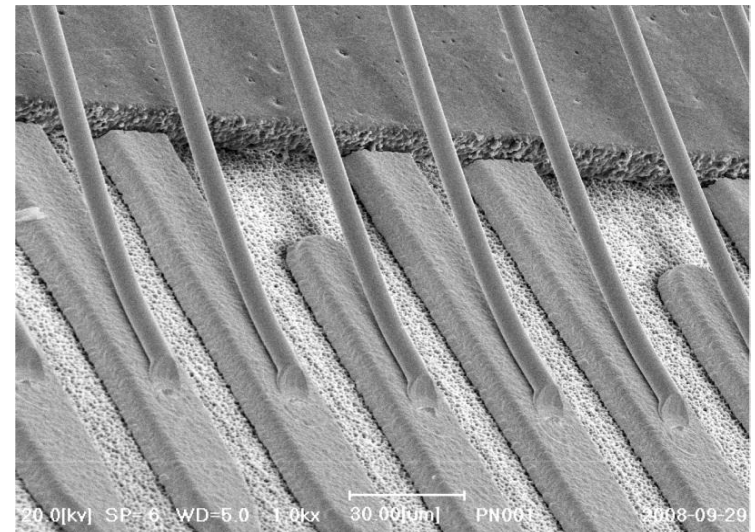


(1.0K X)

ilt = 60°



(1.0K X)

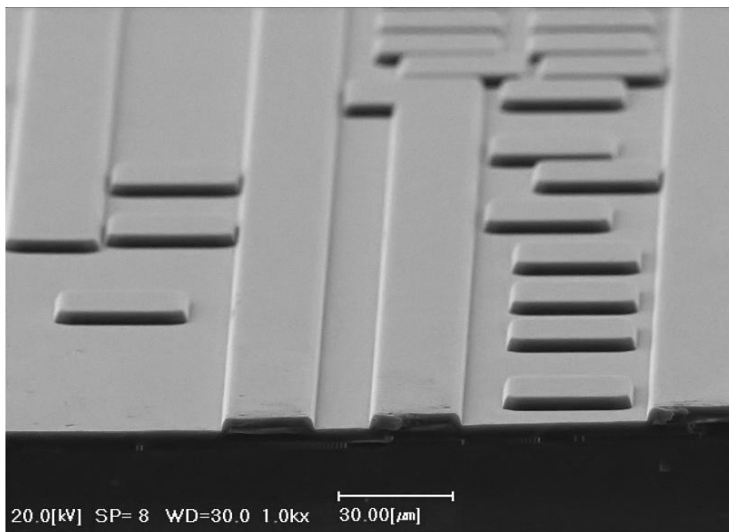


(1.0K X)

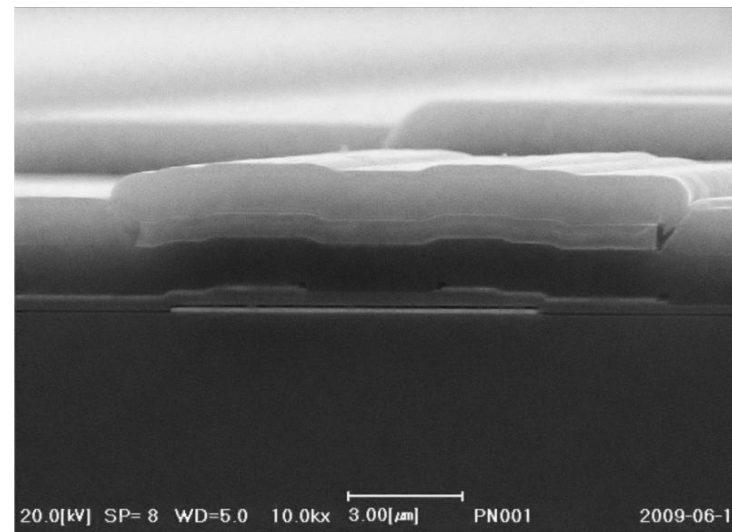
298



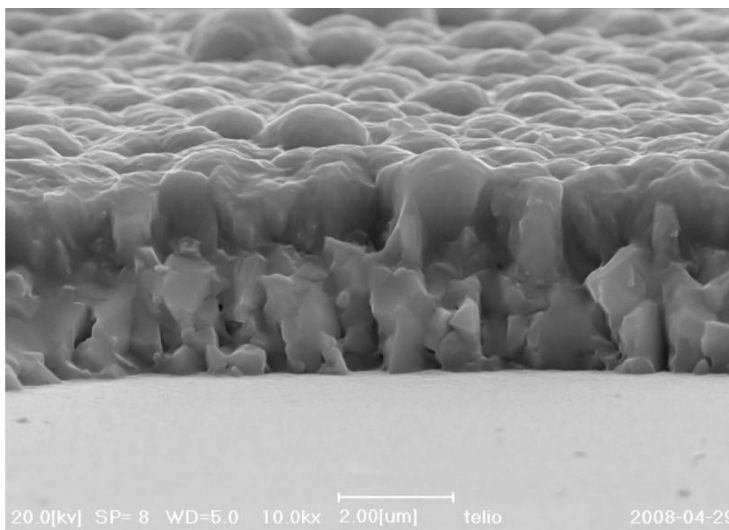
# LCD & Solar cell



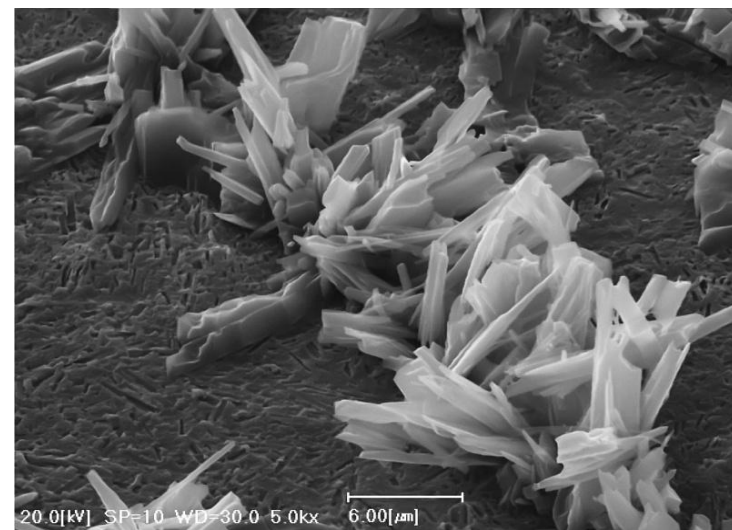
(30k X)



(10K X)



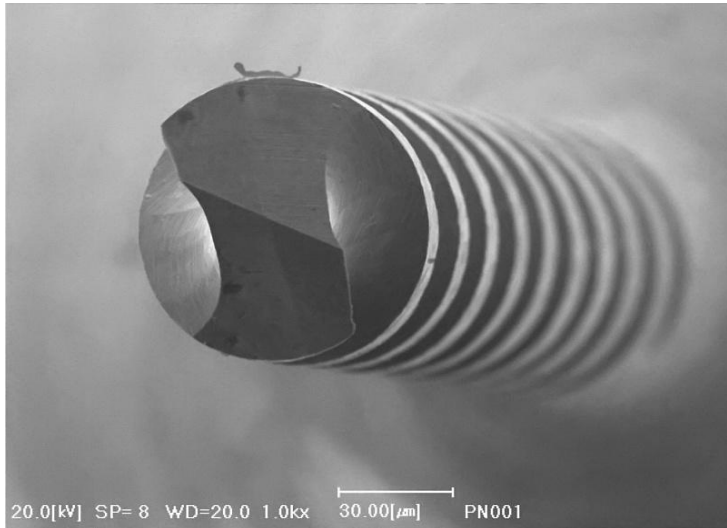
(10.0K X)



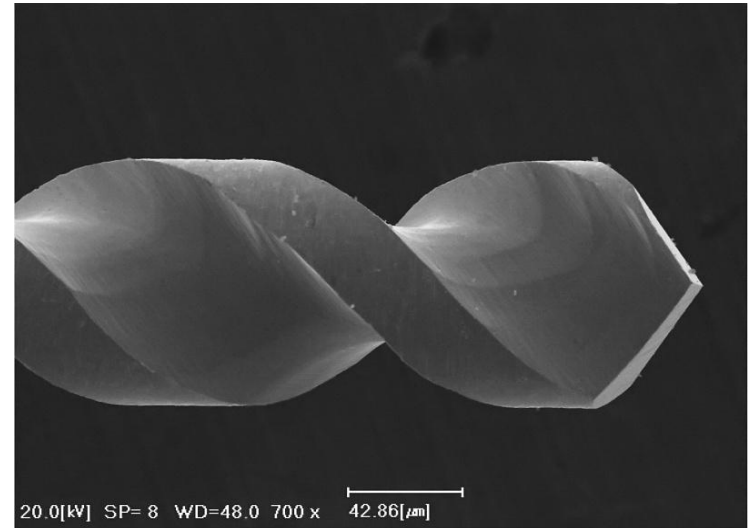
(5K X)

299

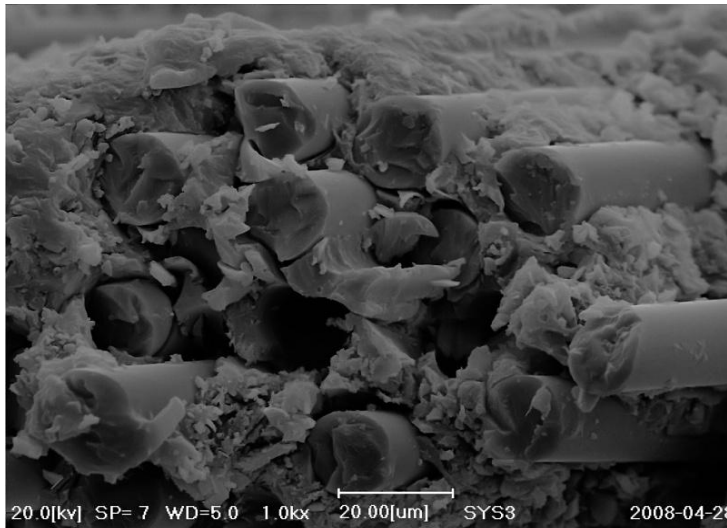
# Micro Drill & Ceramic



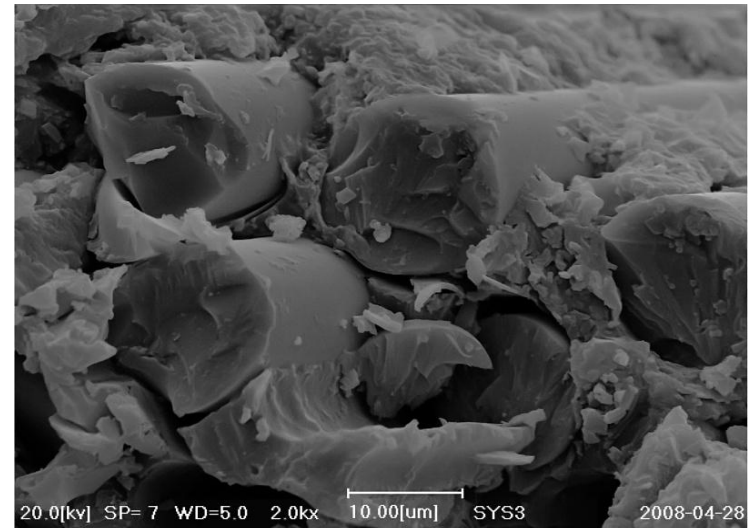
(1k X)



(700X)



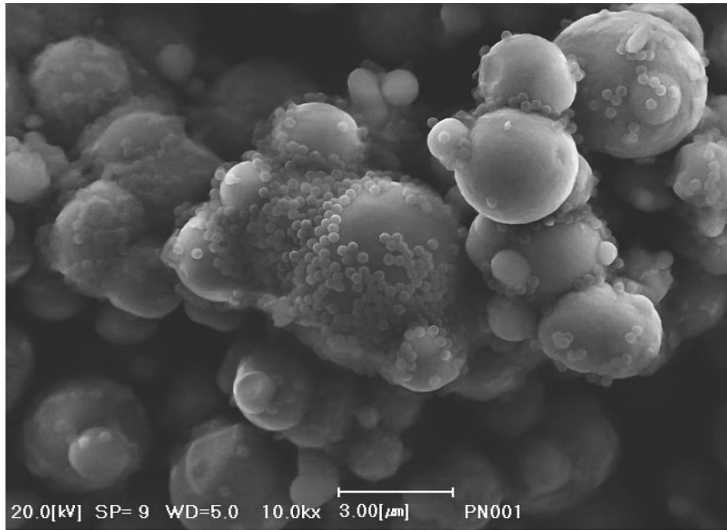
(1K X)



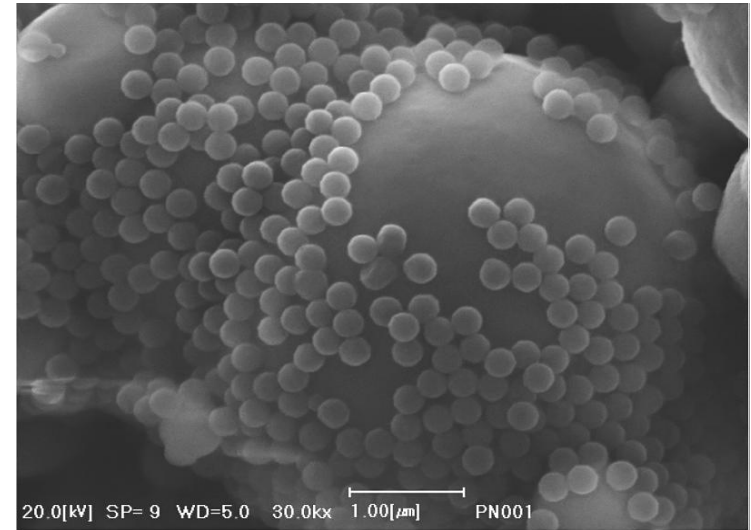
(2k X)

300

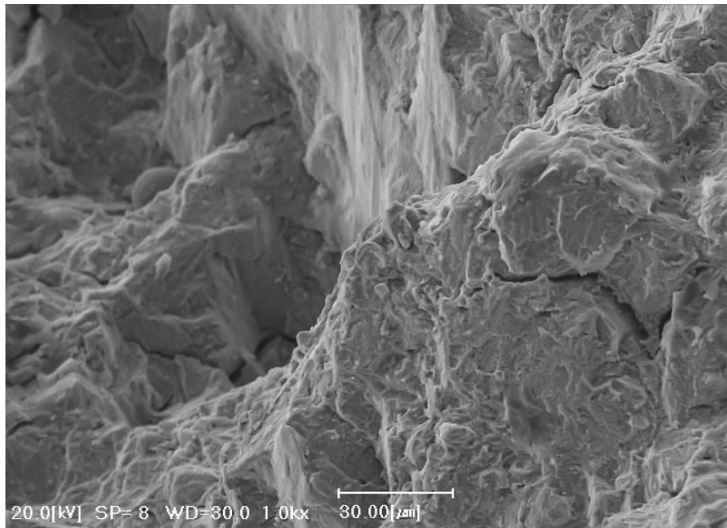
# ■ Tungsten Metal



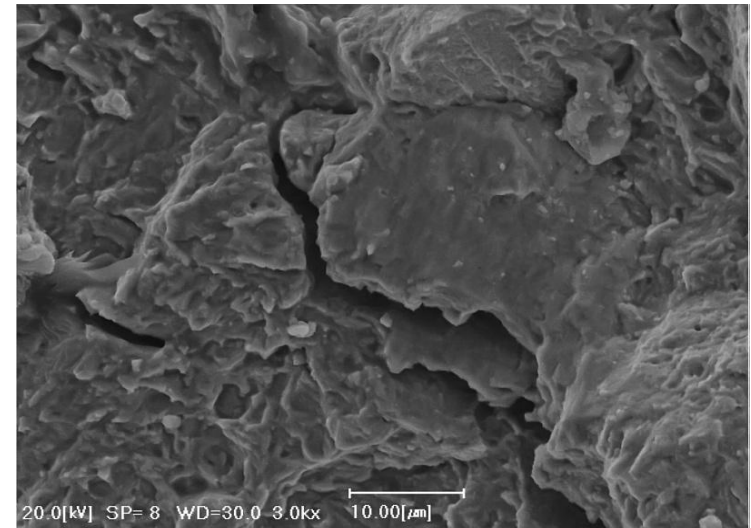
(1.0K X)



(5.0K X)



(10.0K X)

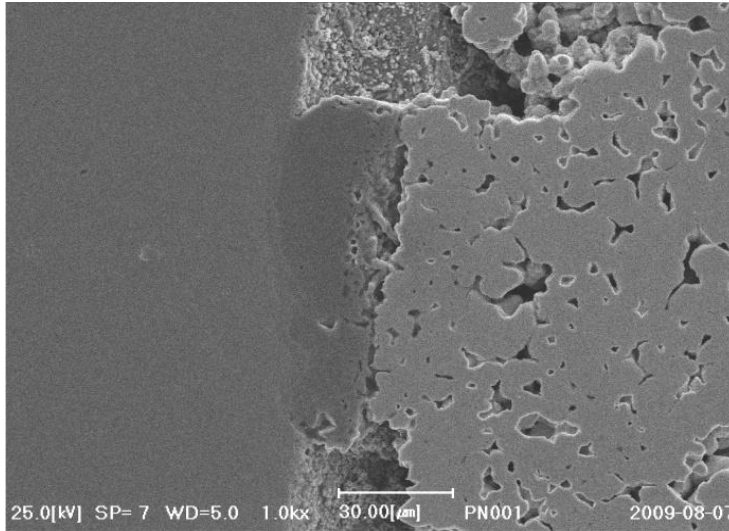


(50.0K X)

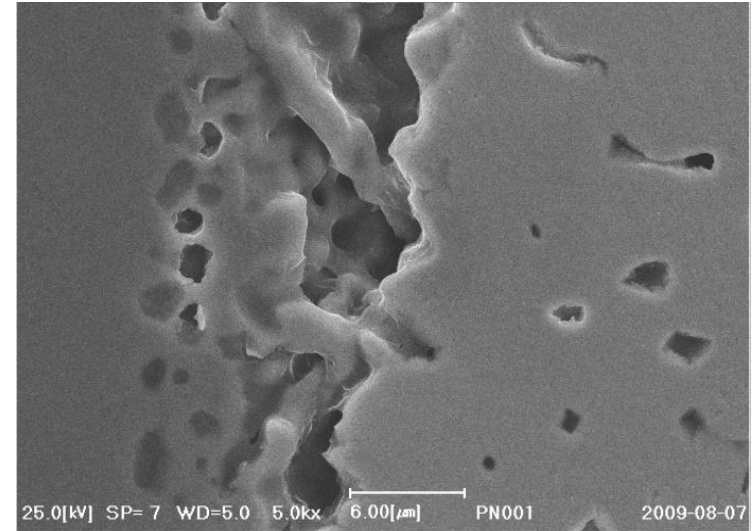
301



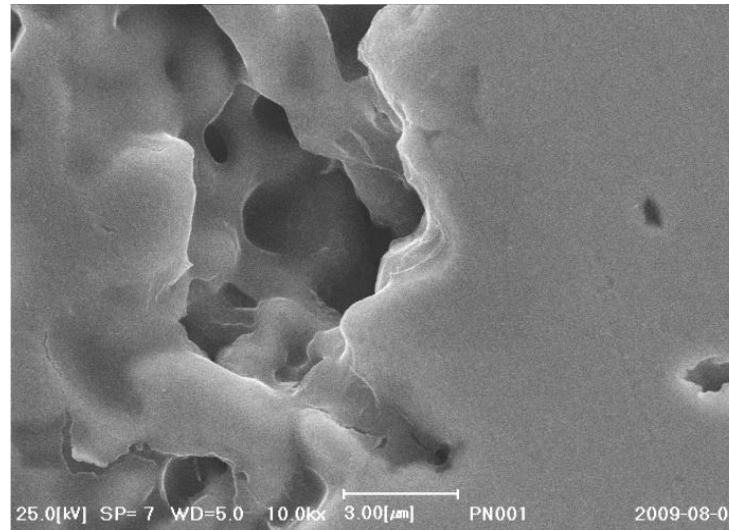
# ■ Tungsten Metal



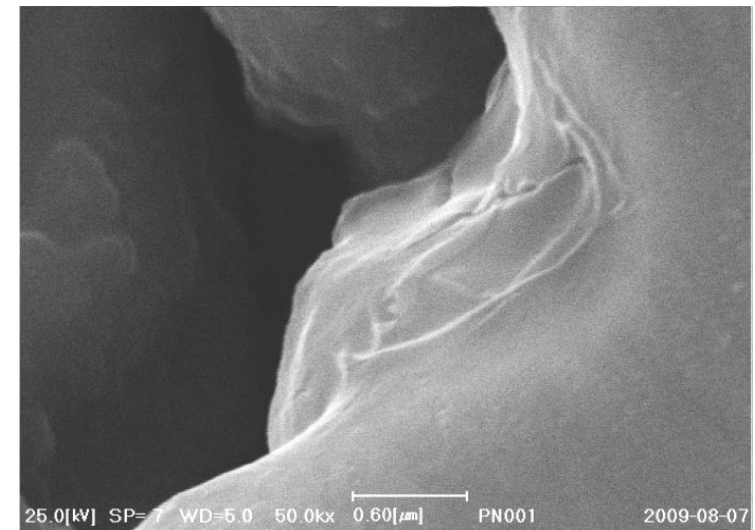
(1.0K X)



(5.0K X)



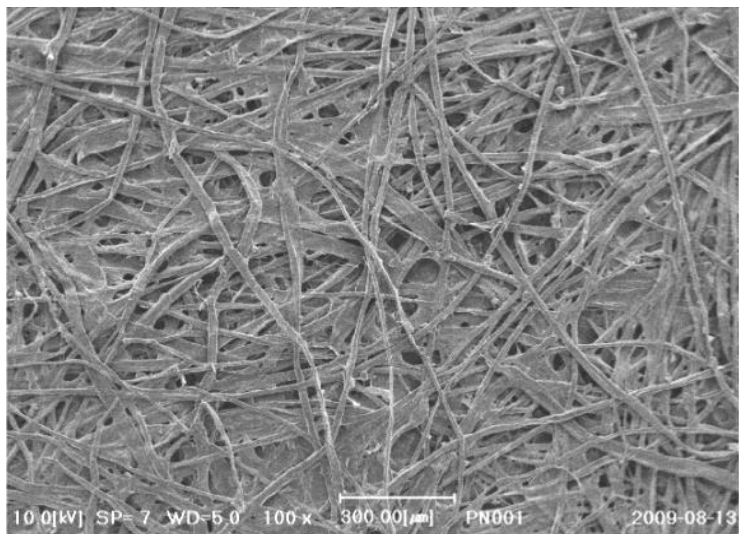
(10.0K X)



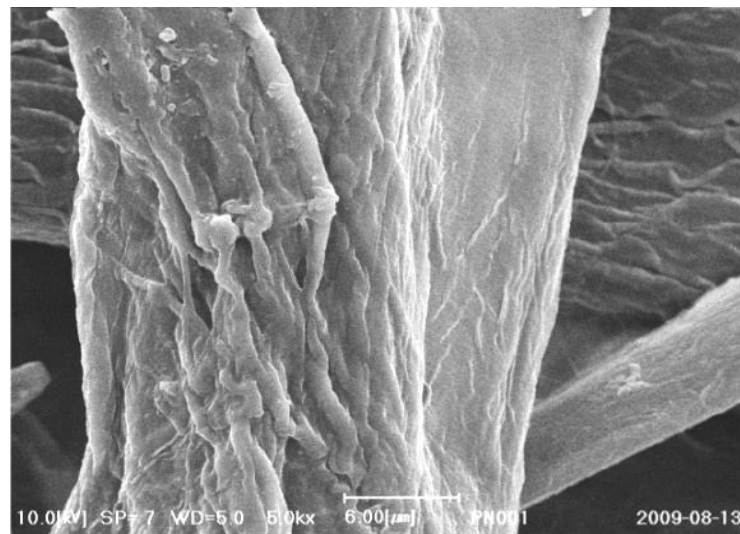
(50.0K X)

302

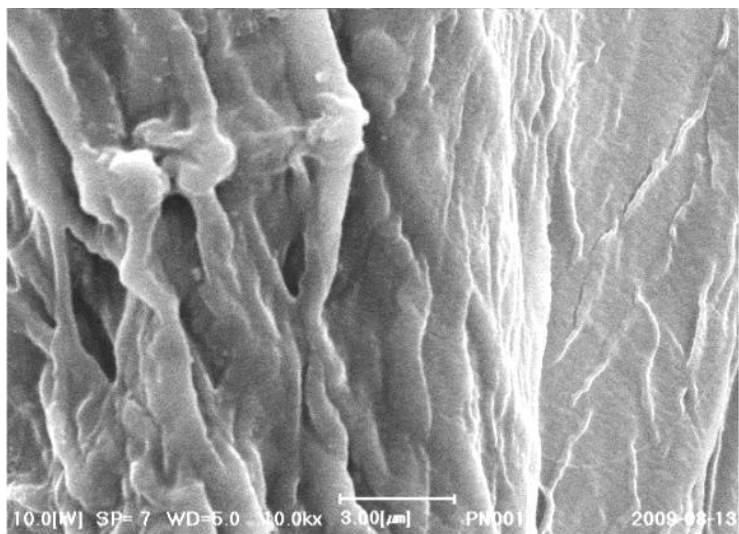
# ■ Korean Paper



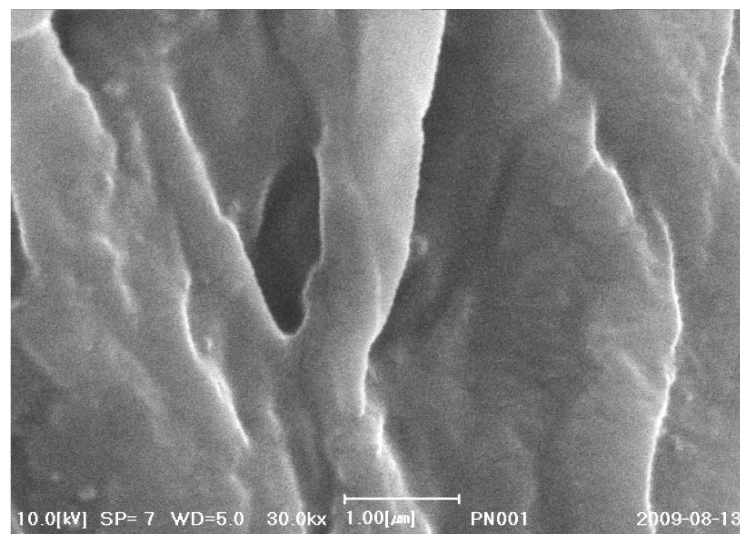
(100 X)



(5.0K X)



(10.0K X)

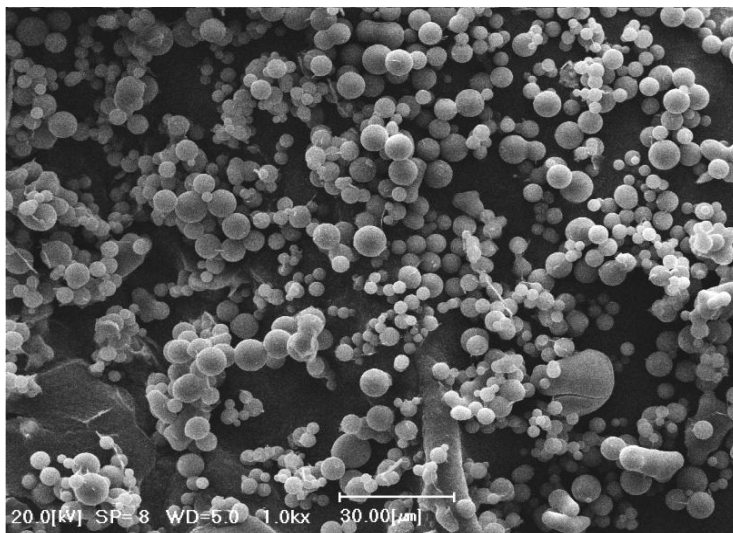


(30.0K X)

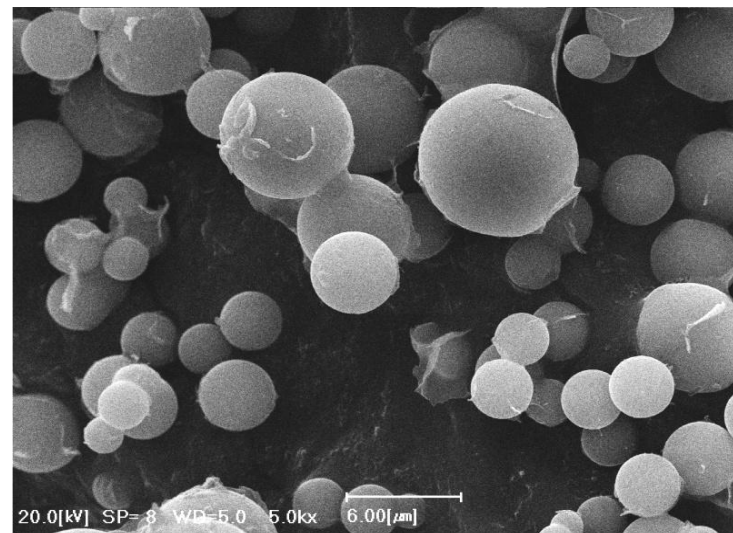
303



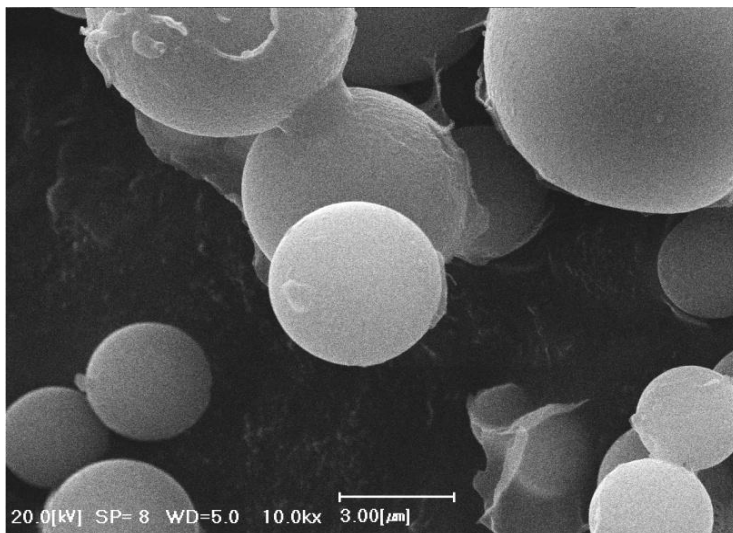
# Powder



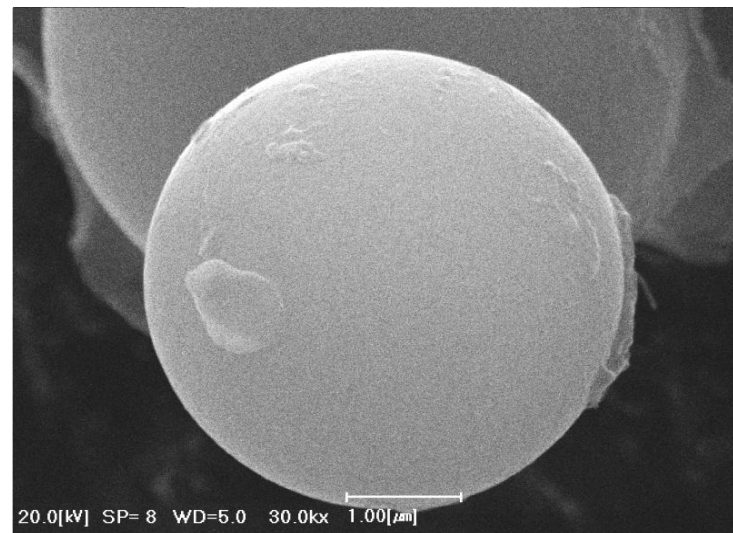
(1.0K X)



(5.0K X)



(10.0K X)

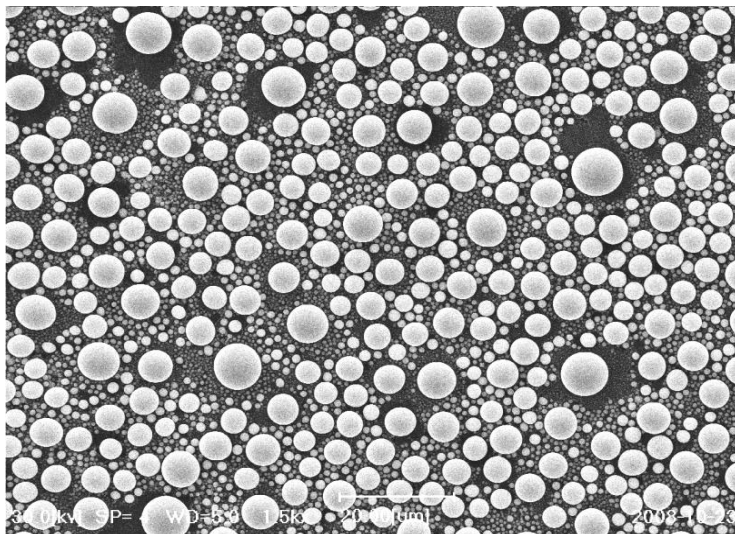


(30.0K X)

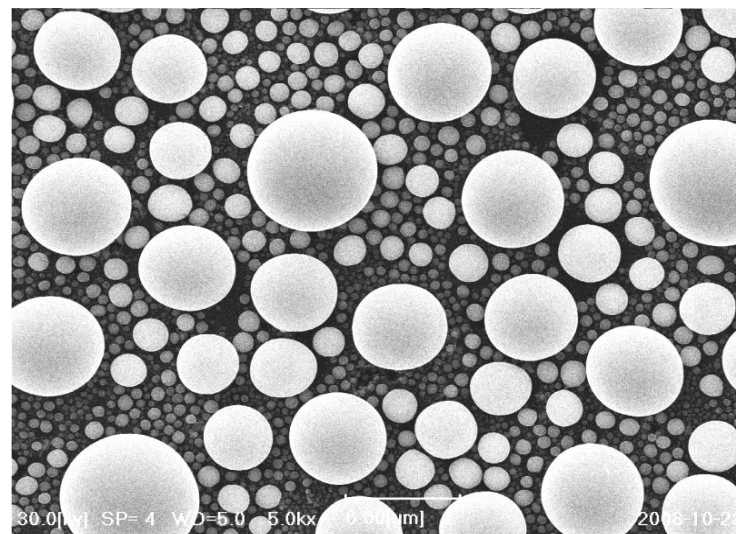
304



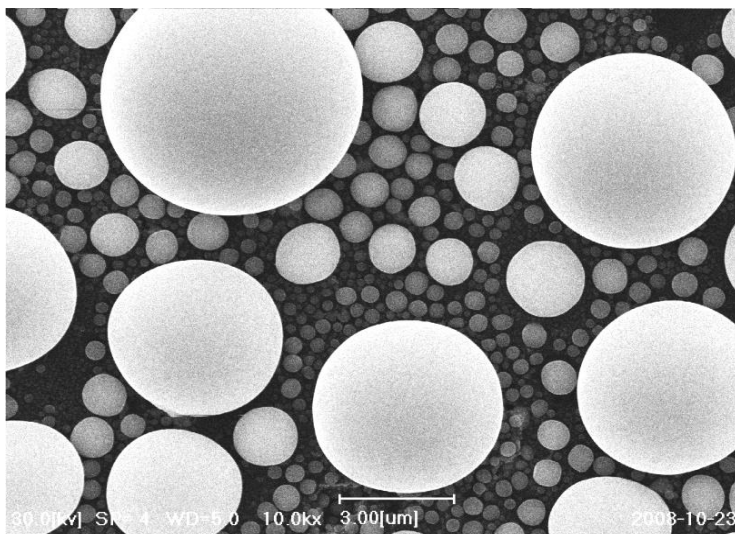
# ■ Tin ball



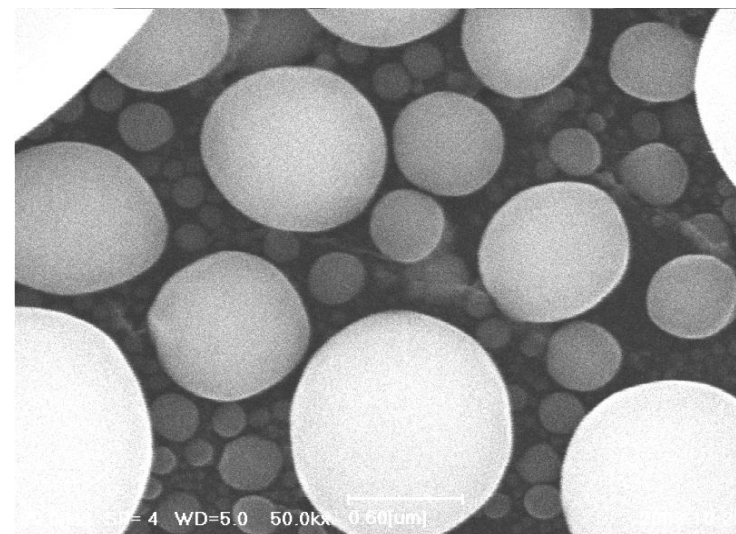
(1.5K X)



(5.0K X)



(10.0K X)



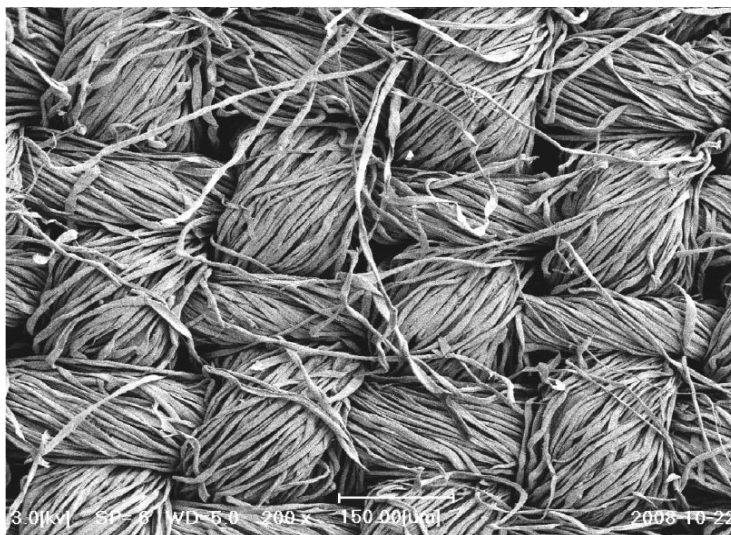
(50.0K X)

305



# ■ Cotton & Wool

Cotton



(200 X)



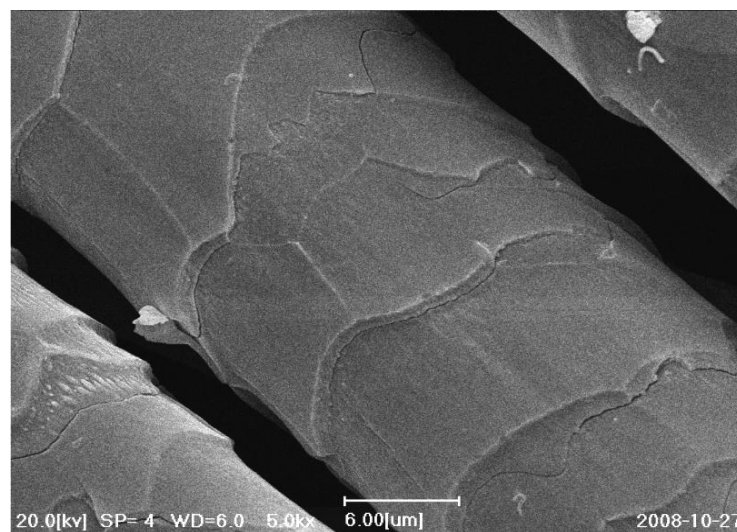
(1.0K X)

306

Wool



(300 X)

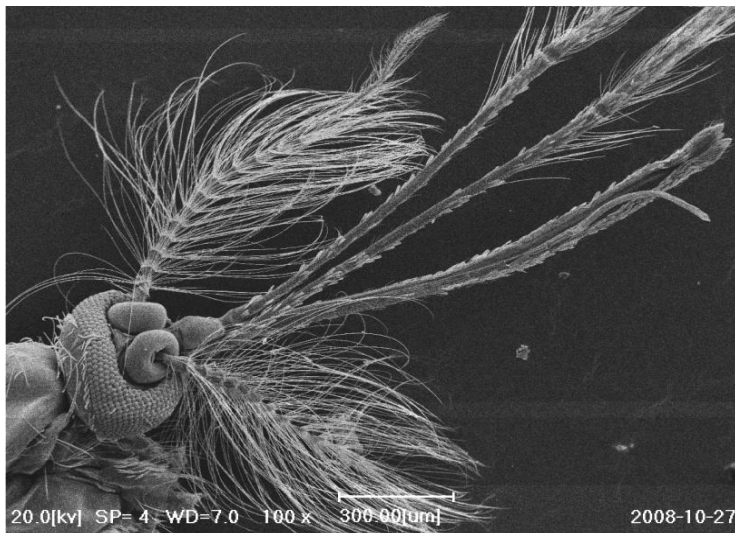


(5.0K X)

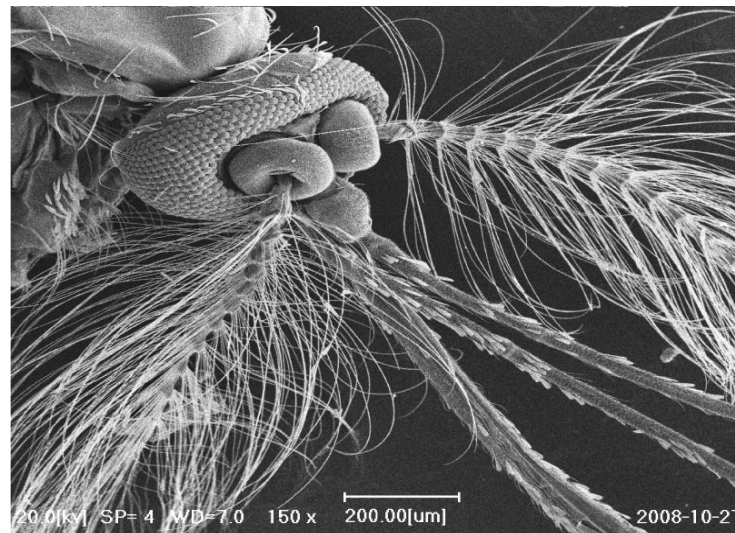


# ■ Mosquito & Rice

Mosquito



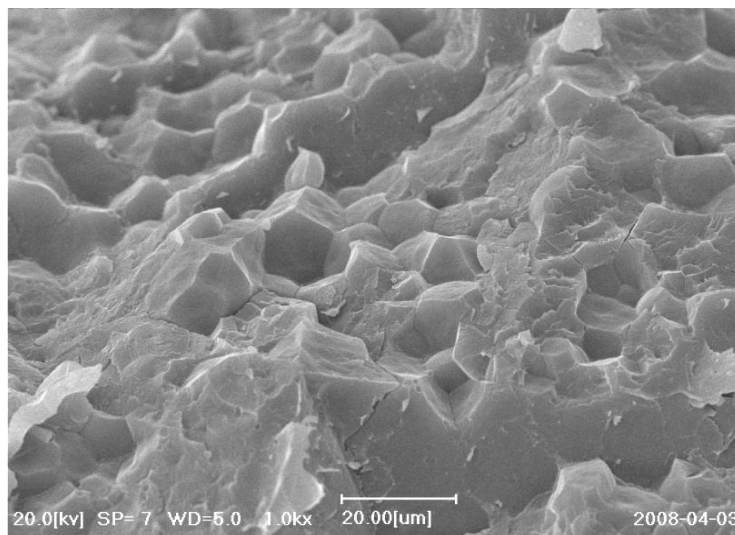
(100 X)



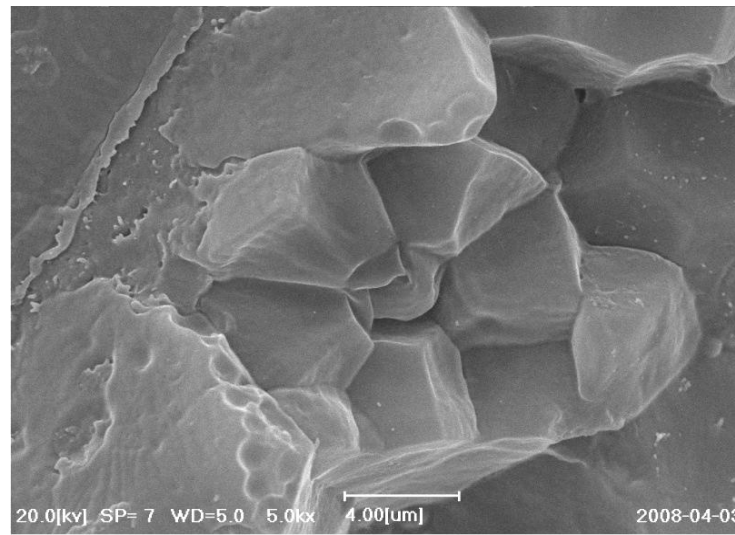
(150 X)

307

Rice



(1.0K X)



(5.0K X)

## SEM-20/30, TableTop



SEM-20

### Navigation to Nanoworld With SEM

How do you keep the forefront from competition in researching nanometer small world. MRC provides convenient Table-top SEM to industry and school which makes it possible having high resolution Image precisely and quickly. By adopting SEM, It is possible to observe nano-world and obtain high quality images without paying excessive expenses.

### High Quality Images with Economical Price

SEM help customer to obtain urn and nm quality images within a few minutes. The size of SEM enhances space efficiency in the laboratory. SEM is the best reasonable instrument which help science teacher to give visual explanation to the students. SEM is also more affordable to small and medium industry company. MRC promises precise nano-world measurement using SEM.

### The Wise SEM for Your Application

#### Material Analysis

SEM helps to grasp material characteristiathrough providing precise images. SEM makes it possible to analyze deep submicron or nanometer structure. Alteration of material caused by pressure, heat can be detectable using SEM. High depth of field and dear image from SEM would be the best solution to find defects and changes of various materials.

#### Pharmaceutical Chemistry

The structure and size of material in pharmaceutical chemistry keep diminishing to reach nanometer in researching area. SEM can be utilized to view nanometer samples precisely and eventually help researcher to get exact output what is needed.

#### Quality Control

Tiny defects can be found exactly through having high quality Images with SEM. Deep submicron cracks that is hard to find using optical microscope can be detectable using SEM. Inspection with SEM may find out problems in manufacturing process and hence quality of product can be upgraded into higher level.

#### Educational Purpose

SEM leads students into the nano-world of science that has not been viewed practically in school. Now, numeral application such as cells, insect, pollen, metal texture, forensic evidence would be applicable with SEM. This instrument may derive students' curiosity of nano-world which help to discover a talent of students.

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## Specifications:

Model	SEM-20
Magnification Range	x 20 ~ x 80.000
Effective Magnification	x 40.000
Resolution	7nm (at 20kv SE Image)
Accelerating Voltage	1KV ~ 20KV (1/3/5/10/15/20KV)
Electron Gun	Tungsten Flarment (W)
Detector	SE Detector default, BSE/EDS optional
Stage	X: 35mm (Motorized), Y: 35mm (Motorized), R: 360°, Z: 0 ~ 60mm
Sample Size	45mm (H), 70mm (Diameter)
Image Mode (Mod)	RED(320x240), TV(640x480), Slow(800x600),
	Phfo(1280x960, 2560x1920, 5120x3840)
Frame Rate	RED (Max. 30 frarres/sec), TV (Max. 10 frames/sec), Slow(Max. 2 frams/sec)
Vacuum System	Turbo Molecular Pump
Auto Functions	Start,Focus,Filament,Brightness/contrast
OS	Windows 7
Operation	Key Board/Mouse
Dimension	400(W) x 600(L)x 550(H)mm, 90kg

309

Model	SEM-30
Magnification Range	x 20 ~ x 100.000
Effective Magnification	x 50.000
Resolution	5nm (at 30kv SE Image)
Accelerating Voltage	1KV ~ 30KV (1/3/5/10/15/20/30KV)
Electron Gun	Tungsten Flarment (W)
Detector	SE Detector (optional: BSE/EDS)
Stage	X: 35mm (Motorized), Y: 35mm (Motorized), T: 0 ~ 45° (Motorized) R: 360°, Z: 0 ~ 60mm
Sample Size	45mm (H), 70mm (Diameter)
Image Mode (Mod)	RED(320x240), TV(640x480), Slow(800x600),
	Phfo(1280x960, 2560x1920, 5120x3840)
Frame Rate	RED (Max. 30 frarres/sec), TV (Max. 10 frames/sec), Slow(Max. 2 frams/sec)
Vacuum System	Turbo Molecular Pump
Auto Functions	Start,Focus,Filament,Brightness/contrast
OS	Windows 7
Operation	Key Board/Mouse
Dimension	400(W) x 600(L)x 550(H)mm, 90kg

## Automatic Stage

1. Automation of X,Y,T axis Stage.

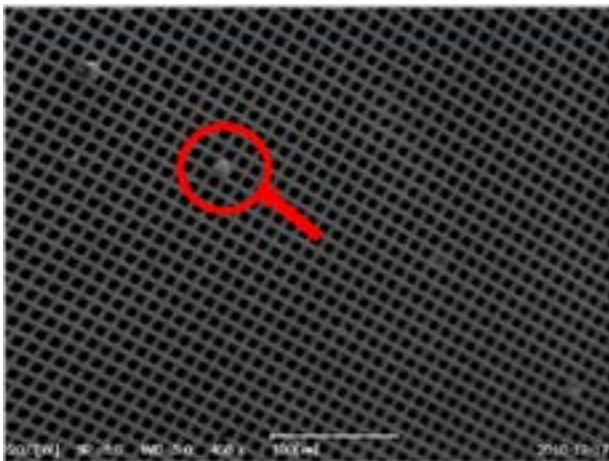


1.

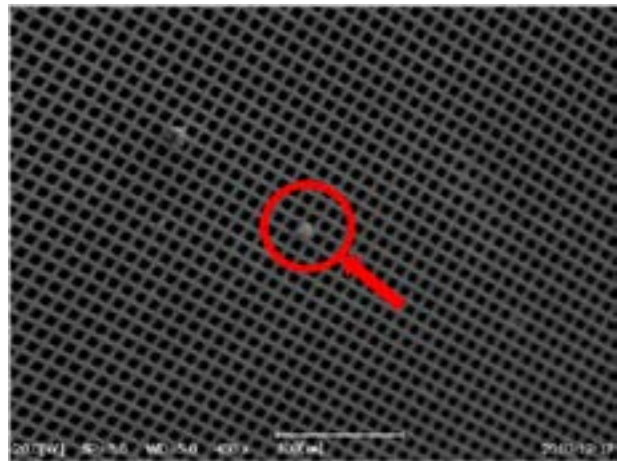


2.

2. Click & Move function.



1.



2.

3. Free magnification zooming function by mouse wheel.

4. Image focusing by mouse wheel.

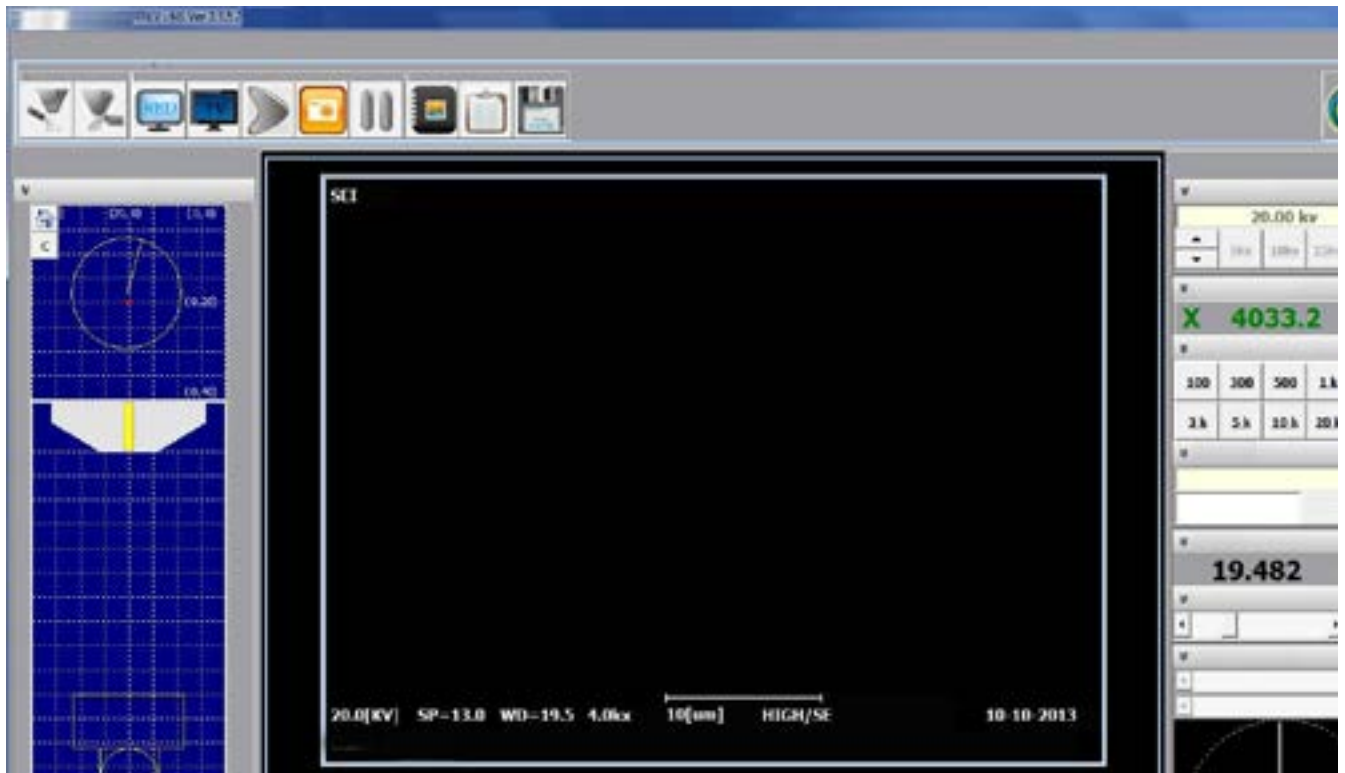
310

## Compare time-saving by Auto Stage

Items	Time for Sample Analysis (10 point basis)
<b>Manual Stage</b>	<ul style="list-style-type: none"> <li>• <b>Time of 1 Point Analysis : 10 minutes</b> <ul style="list-style-type: none"> <li>- Vacuum : 3 minutes</li> <li>- Finding Sample : 3 minutes</li> <li>- Alignment &amp; setting : 1 minute</li> <li>- Focusing : 30 seconds</li> <li>- Brightness and Contrast settings : 20 seconds</li> <li>- Image data acquisition : 30 seconds</li> </ul> </li> <li>• <b>Time of 10 Points Analysis : about 48 minutes</b></li> </ul>
<b>Auto Stage (SEM-30, SEM-20)</b>	<ul style="list-style-type: none"> <li>• <b>Time of 1 Point Analysis : 8 minutes</b> <ul style="list-style-type: none"> <li>- Vacuum : 5 minutes</li> <li>- Finding Sample : 30 seconds</li> <li>- Alignment &amp; setting : 1 minute</li> <li>- Focusing : 30 seconds</li> <li>- Brightness and Contrast settings : 20 seconds</li> <li>- Image data acquisition : 30 seconds</li> </ul> </li> <li>• <b>Time of 10 Points Analysis : about 25 minutes</b></li> </ul>

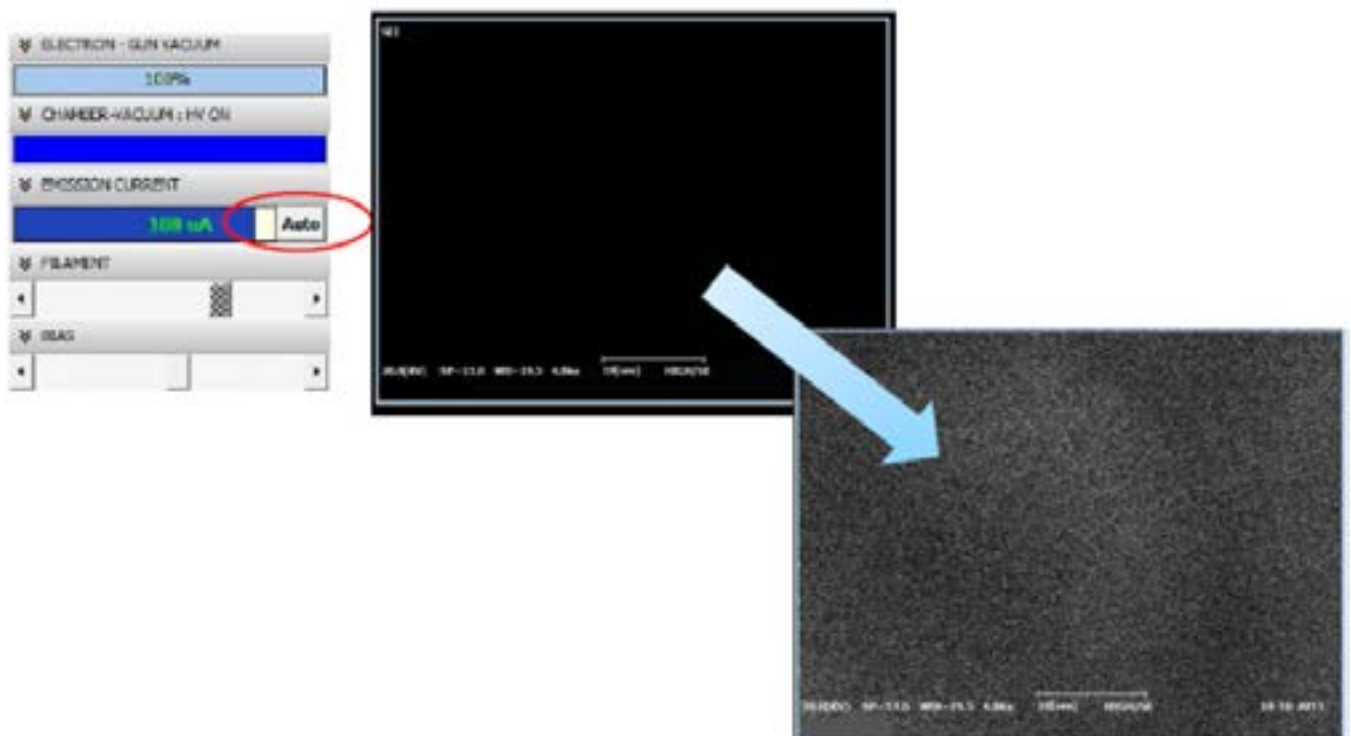
# MICROSCOPES Scanning Electron

## Nanostation GUI Display

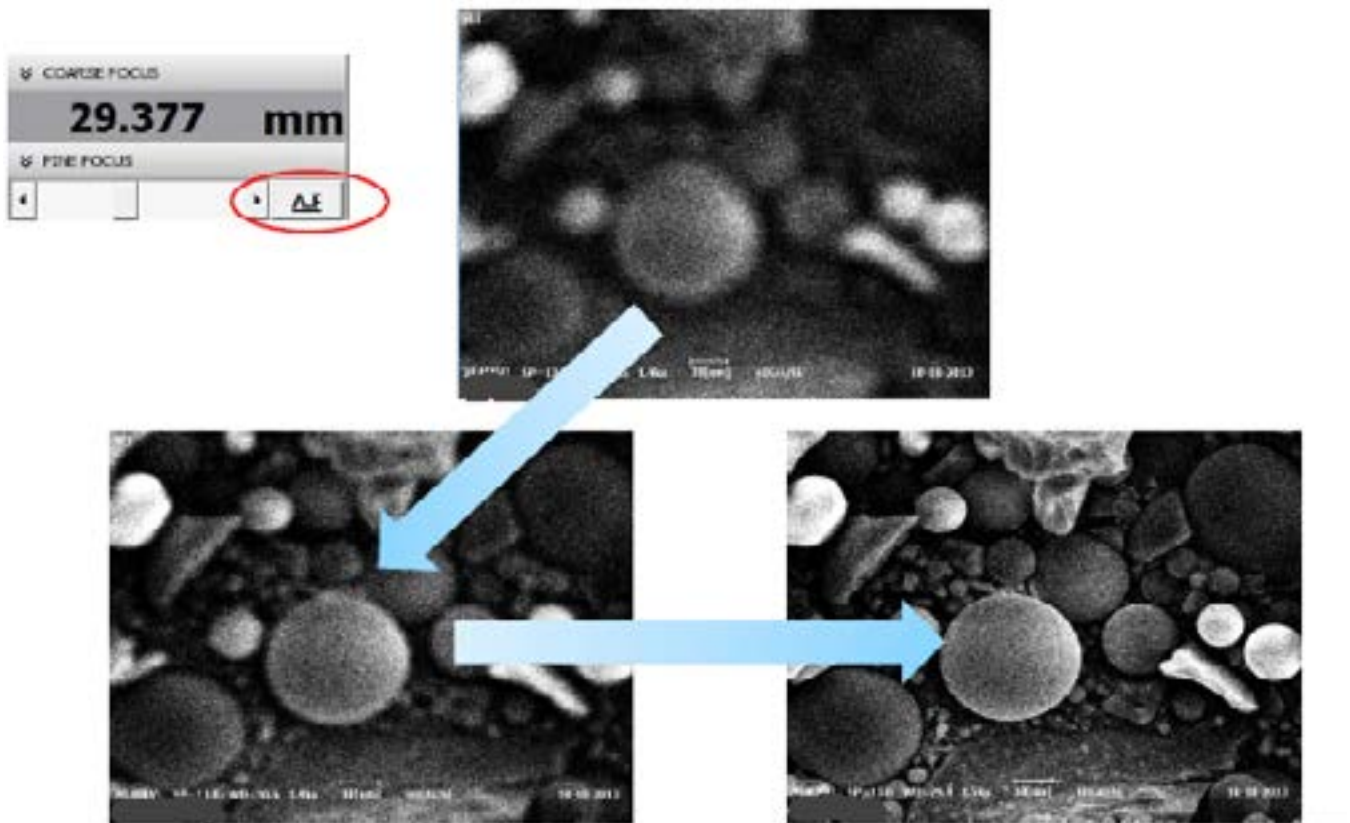


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## Automatic Function: Auto Filament

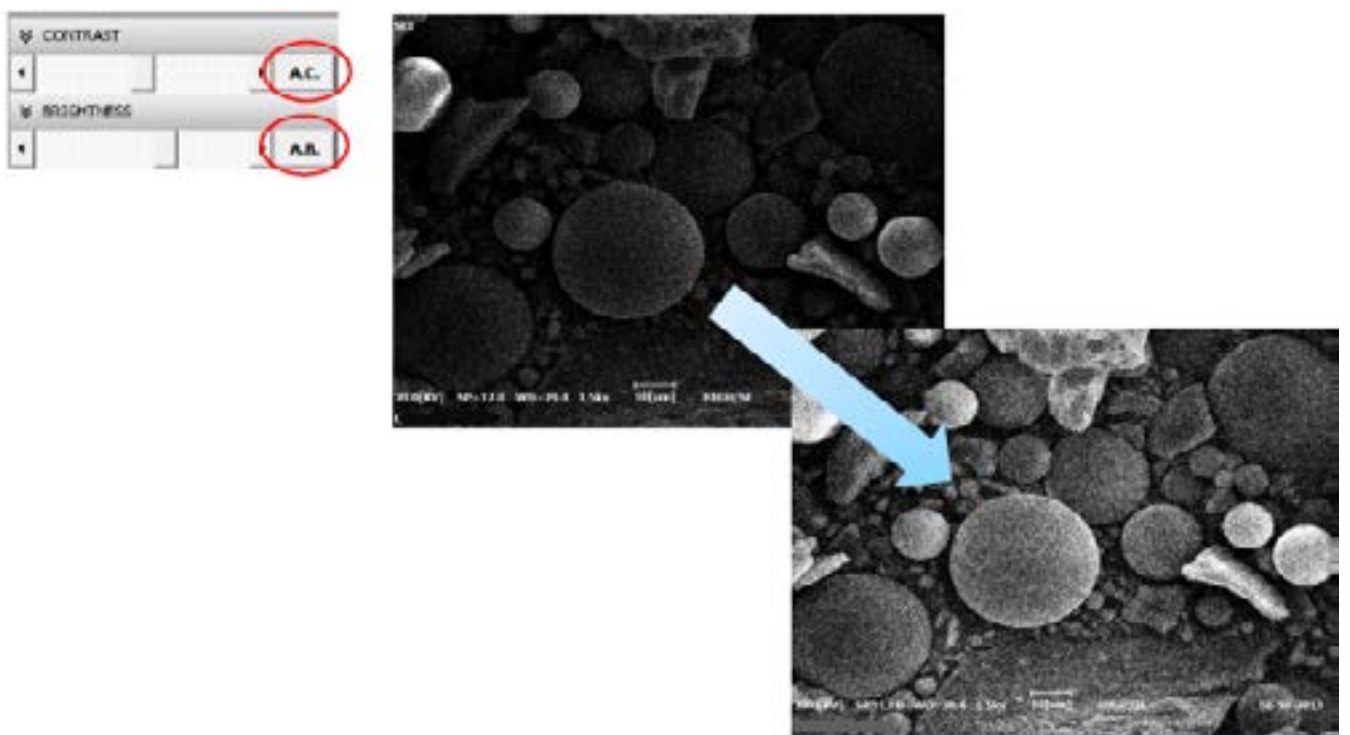


## Automatic Function: Auto Focus



312

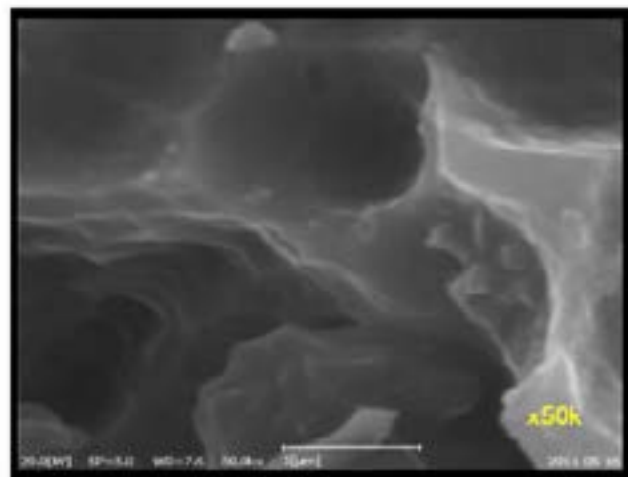
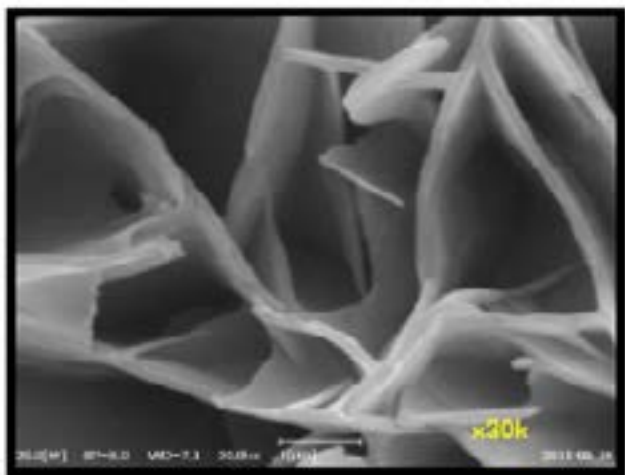
## Automatic Function: Auto Contrast/Brightness





## Clean Images:

- Maximum magnification x300,000 (Effective x100,000)



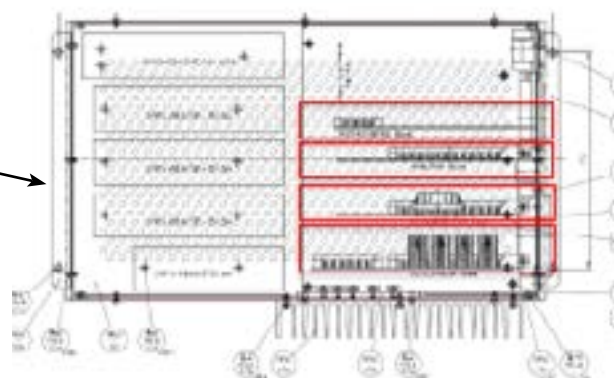
- Accurate focus by the fast frame on RED mode.
- Secure a large amount of beam with a short distance.
- The high brightness image is obtained by digital FPGA.

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## Easy Maintenance by Modular Boards/Parts



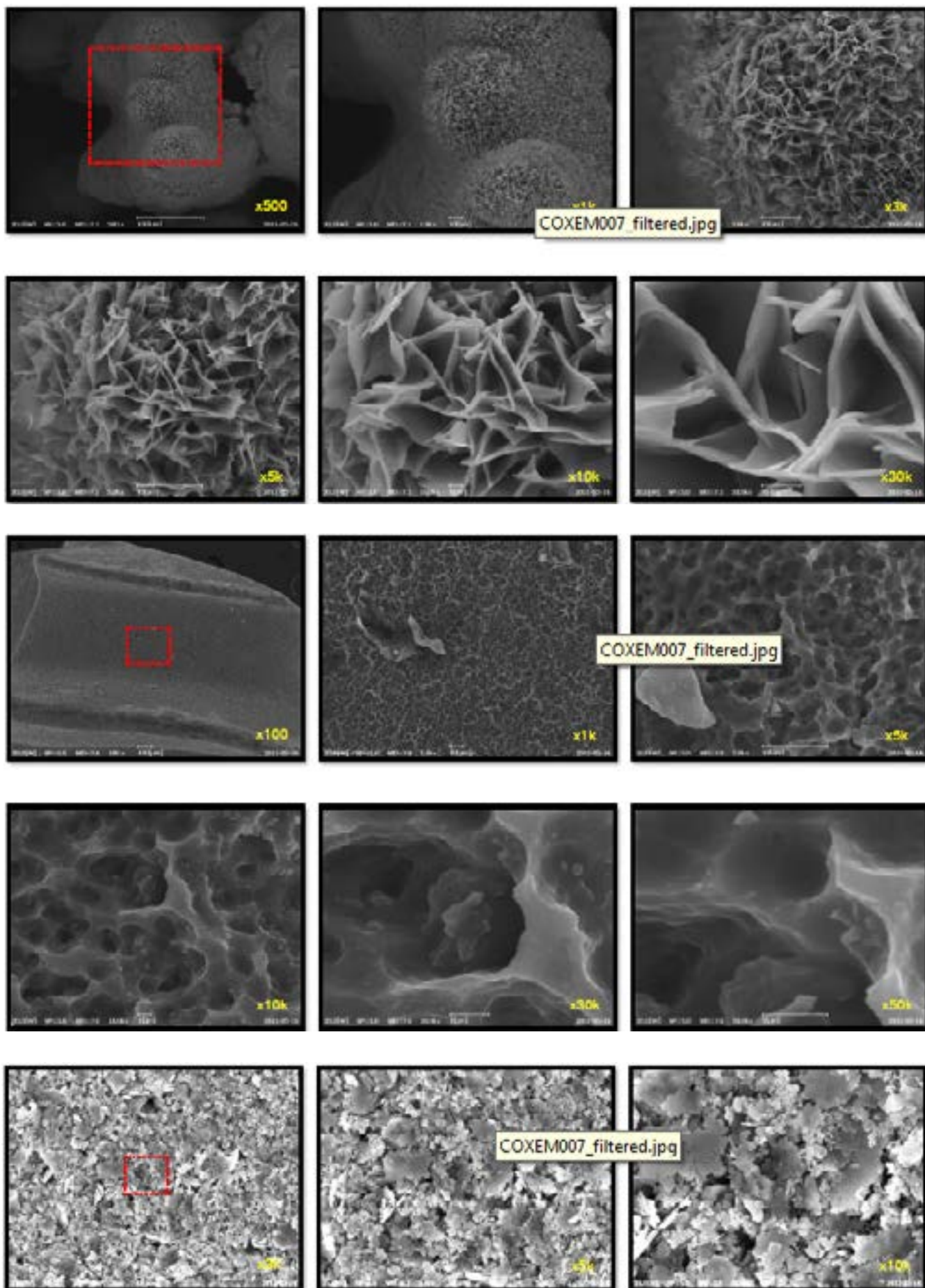
Established by modular parts/boards





## Images from Metal Oxides:

Images from SEM



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SL355



### SL355, Personal Noise Dosimeter

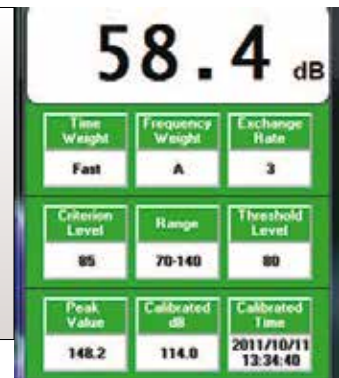
Low cost, lightweight, and easy to use For measuring total sound exposure over an 8-hour period

#### Features:

- Perform OSHA and IEC Noise accumulation surveys
- One user-defined measurement setup
- Adjustable Criterion Level, Exchange Rate, and Threshold
- Applications include Personal accumulated noise exposure measurement, Workplace noise assessment, OSHA and other regulatory agency compliances
- Measures frequency weighted noise exposure and peak sound level simultaneously
- Datalogs up to 12,000 readings when used as a sound level meter with sampling times between 1sec and 1hr
- In sound level mode, meter displays sound level, time-averaged sound level (Leq), peak, and sound exposure level (SEL)
- Optional 94/114dB calibrator to perform "before" and "after" calibration checks per ANSI standards
- Stores up to 20 dosimeter surveys.  
Data includes Start/Stop Time, %Dose, %Dose projected for an 8 hour period, and peak level when used in the Dosimeter mode
- USB interface with Windows® XP/Vista/7 compatible software to control setup and retrieve stored events or analyze real time measurements
- Includes belt clip, clip-on 0.5" microphone with 2.6ft (0.8m) cable, 3 AAA batteries, mini screwdriver, software, USB cable, and carrying case.



Includes 0.5" microphone with clip, secure front cover, convenient belt clip, and software



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Model	SL355
<b>Standards</b>	IEC61252, ANSI S1.25(1992) for dose and sound exposure meters IEC 60651-1979 Type 2 for sound level meters ANSI S1.4-1983 Type S (1) for sound level meters
<b>Ranges</b>	60 - 130 dB / 70 to 140dB (A/C Weighting) 60 to 130dB / 93 to 133dB (C or Z (Linear) Peak) 70 to 140dB / 103 to 143dB (C or Z (Linear) Peak)
<b>Digital Display</b>	LCD 0.01-9999%
<b>Criterion Level</b>	80, 84, 85, or 90dB
<b>Exchange Rate</b>	3, 4, 5 or 6 dB
<b>Threshold Level</b>	70 to 90 (1dB steps)
<b>High Level Detector/Peak Flag</b>	115dB, 130dB and 140dB
<b>Response Rate</b>	Fast or Slow
<b>Measurement Duration</b>	5, 10, 15, or 30 minutes 1, 2, 4, 8, 12, or 24 hours
<b>Microphone</b>	1/2 inch electret condenser with 31" cable
<b>Battery Life</b>	>35 hrs
<b>Event Storage</b>	20 surveys
<b>USB Interface</b>	yes
<b>Real time clock/calendar</b>	yes
<b>Dimensions/Weight</b>	97 x 51 x 35mm, 120g, incl.batteries

## SL-4035SD, SD card real time data recorder, Integrating Sound Level Meter

**Features:**

- Measurement Range : 30 dB to 130 dB.
- Measurement Item : SPL, Leq.
- Resolution : 0.1 dB
- Measurement Frequency Range : 31.5 Hz to 8 KHz
- Frequency Weighting : A and C
- Time Weighting : Fast and Slow
- Data Hold : Freeze the display reading
- Memory Recall : Maximum & Minimum value
- Memory Card : SD memory card, 1 GB to 16 GB
- Advanced setting:
  1. Set clock time (Year/Month/Date,Hour/Minute/Second)
  2. Decimal point of SD card setting
  3. Auto power OFF management
  4. Set beep Sound ON / OFF
  5. Set sampling time
  6. SD memory card format
- Leq Preset measurement time up to 24 hours
- Microphone type: 1/2 inch electric condenser microphone.

Model	SL-4035SD
Frequency	Accuracy (23 ± 5°C)
31.5 Hz	± 3.5 dB
63 Hz	± 2.5 dB
125 Hz	± 2.0 dB
250 Hz	± 1.9 dB
500 Hz	± 1.9 dB
1 KHz	± 1.4 dB
2 KHz	± 2.6 dB
4 KHz	± 3.6 dB
8 KHz	± 5.6 dB



### Smart-SteriMAX, Infrared Loop Sterilizer, using IR-HotSpot Technology



#### High-Speed Annealing and Sterilizing the Smart Way

Are you looking for a fast, efficient and flameless product to anneal or sterilize your inoculation loops and delicate micro instruments? Then our electrical SteriMax smart should be your first choice – ideally suited for use in any type of lab, anaerobic work environment and Laminar Flow Cabinet.

#### Smart Infrared Light – Instantly Ready to Work

Specifically focused infrared light generates an IR-HotSpot in which your inoculation loop is sterilized at temperatures from 750 to 1000°C after only 5 to 10 seconds. The SteriMax smart just needs to be plugged in and will be immediately ready to use, without any unnecessary warm-up period.

Our highly sophisticated annealing tube is based on many years of experience. It is made of special quartz glass. The tube is closed at one end preventing any risk of contamination with pathogens.

The annealing tube can be slid out in a matter of seconds for easy cleaning.

#### Smart Operation – Touchless Working

SteriMax smart allows you to fully focus on your core task. Hardly any attention is needed for inserting your inoculation loop into the annealing tube – which is easily accessible from the front of the flat glass panel. Touchless IR-Sensor technology starts each sterilization process automatically. Adjustable timers signal both the completion of sterilization and cooling via the display and an audible signal. After that your inoculation loop is ready for use. Both timers can be adjusted and recalled individually & up to the second for two users by gently touching the panel.

#### Smart Use of Power – Minimum Heat Dissipation

'Thermocontrol' is the key element for an efficient use of power. It allows for quick but smooth softstart of the infrared light, a short heating period and the re-use of residual heat for the next sterilization process, which will be respectively shorter. Whenever you pause, your energy consumption and heat dissipation will pause as well.

#### Smart Design – Outstanding Features

SteriMax smart comes in an elegant stainless steel housing with a touch safety glass control panel designed for extreme laboratory environments with many unique features:

- Instantly ready to work without any unnecessary warm-up
- Auto-Start through touchless IR-Sensor technology
- Touch operation
- Adjustable sterilization & cool-down timers for two users
- Annealing tube made of special quartz glass
- Very simple cleaning of the device and annealing tube.

#### The range

- Infrared light technology and quartz glass annealing tube
- Replacement quartz glass annealing tube
- Inoculation loop holder with inoculation loop  $\Phi$  3 mm
- Holding device for 3 MRC inoculation loop holders.



**Touch operation**  
ON / OFF – user  
selection



**Touch-Timer**  
sterilization time



**Touch-Timer**  
cooling down  
reminder for loops



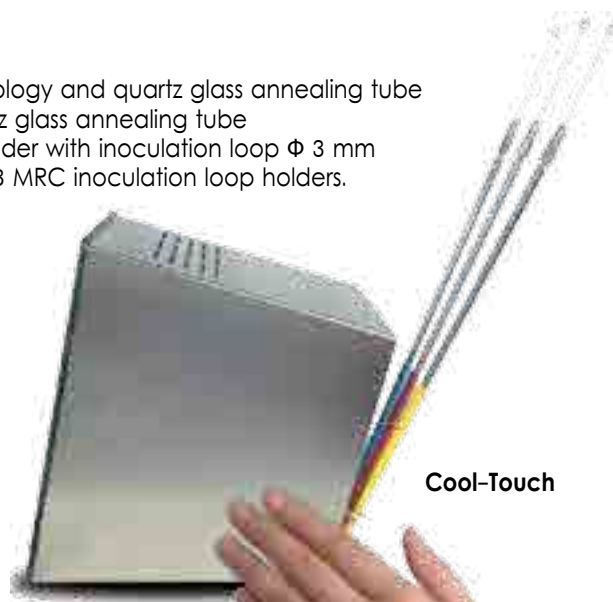
**Touchless IR-Sensor**  
for an automatic  
start of the  
sterilization process



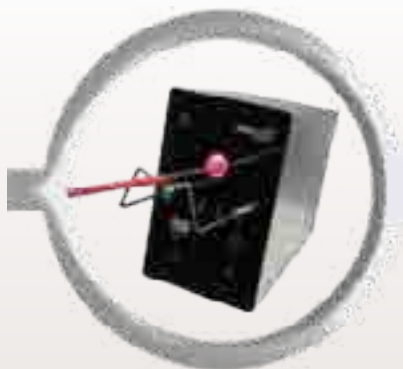
**Thermocontrol**  
with residual heat  
display



**Annealing tube**  
removable in a  
matter of seconds



## Accessories:



**Magnetic instrument support**  
stainless steel



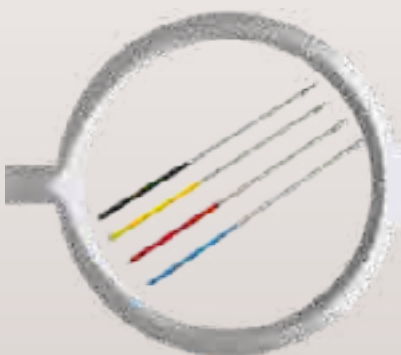
**Tray, 3 places**  
stainless steel, for right or left side



**Quartz glass annealing tube**



**Inoculation loops**  
special stainless steel, wire  $\Phi$  0.6mm  
 $\Phi$  1/3/5 mm



**Inoculation loop holder**  
stainless steel, with sleeve nut, for  
inoculation loops  
wire  $\Phi$ 0.6-1mm, length 215/245mm



**Tray, mobile**  
stainless steel, 5 places

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Model	SMART-SteriMAX
<b>Technical Data</b>	
<b>IR-Sensor</b>	sensor range 8-stage adjustable
<b>Touch operation</b>	ON/OFF, selection for 2 users sterilization timer 5 – 10 s inoculation loop cooling timer 0 – 25 s with audible signal (disengageable)
<b>Thermocontrol</b>	dynamic sterilization timer
<b>Annealing tube</b>	<b>Sterilization temperature</b>
<b>Quartz glass</b>	750 °C – 1000 °C (1382 °F – 1832 °F)
<b>Safety features</b>	
<b>Residual heat display</b>	indicates a hot annealing tube
<b>Automatic unit switch off</b>	15, 30 or 60 min.
<b>Temperature monitor</b>	thermal circuit breaker
<b>Electrical</b>	
<b>Power supply</b>	220 – 240 V or 112 – 128 V, 50/60 Hz
<b>Power consumption</b>	approx. 600 W / short time (5 – 10 s)
<b>Protection class</b>	IP 20
<b>Heat source</b>	IR halogen spot light
<b>Mechanical</b>	
<b>Quartz glass annealing tube</b>	outer- $\Phi$ 19 mm, inner- $\Phi$ 16 mm, length 112 mm
<b>Casing</b>	heat resistant glass / stainless steel, UV and solvent resistant
<b>Measurements (w x h x d)</b>	110 x 170 x 180 mm
<b>Weight</b>	approx. 1800 g



# MICROSCOPES Stages



## SMZ-168XY/SMZ-XY, Microscope Stage

- Measuring Travel: 50x50mm
- Glass Stage Size: 96x96mm
- Measuring Heads & Resolution: 0.001mm.

### Options:

#### Lower cost micrometer: MT-212002

- Measuring Range: 0-50mm
- Resolution: 0.001mm
- Limit Error:  $\pm 0.005$ mm.

Option: With Stereo Microscope.



**MRC-3.14**

SP-9201, Environment Meter

General Specifications:

Display	8 mm LCD display
Measurement	Air velocity/Temp. * Humidity/Temp. * Light * Barometer * CFM, CMM * Dew point * Wet bulb * Wind chill * Heat index * Altitude * Pt 1000 ohm Temp. (optional)
Operating Humidity	Max. 80% RH.
Operating Temperature	0 to 50°C (32 to 122°F)
Over Input Display	Indication of "- - - -"
Power Supply	CR 2032 DC 3V battery
Power Consumption	Approx. DC 5 mA
Weight	160g (battery included)
Dimension	HWD 120 x 45 x 20 mm (4.7 x 1.8 x 1.2 inch).
Standard Accessory	Instruction Manual
Optional Accessories	Pt 1000 ohm Temp. probe, TP-1000

Air velocity		
Unit	Range	Resolution Accuracy
ft/min	80 to 3937 ft/min	1 ft/min
m/s	0.4 to 20.0 m/s	0.1 m/s
km/h	1.4 to 72.0 km/h	0.1 km/h
MPH	0.9 to 44.7 mile/h	0.1 MPH
knots	0.8 to 38.8 knots	0.1 knots
Temp.	0 to 50°C	0.1°C
	32 to 122°F	0.1°F

Remark: ft/min: feet per minute    MPH: miles per hour  
m/s: meters per second    Knots: nautical miles per hour  
km/h: kilometers per hour

Humidity/Temp.		
Unit	Range	Resolution Accuracy
% RH	10 to 95 %RH	0.1 %RH =>70% RH: ± ( 4 %rdg +1.2 %RH)
Temp.	0 to 50°C 32 to 122°F	0.1°C 0.1°F ± 2.5°F

Light * auto range		
Unit	Range	Resolution Accuracy
Lux	0 to 2,200 Lux 1,800 to 20,000 Lux	1 Lux 10 Lux ± 5% rdg ± 8 dgt
Ft-cd	0 to 204.0 Fc 170 to 1,860 Fc	0.1 Ft-cd 1 Ft-cd

Remark : Ft-cd : feet candle

Barometric pressure ( Barometer )		
Unit	Range	Resolution Accuracy
hPa	10.0 to 999.9 1000 to 1100	0.1 hpa 1 hpa ± 1.5 hPa ± 2 hPa
mmHg	7.5 to 825.0	0.1 mmHg ± 1.2 mmHg
inHg	0.29 to 32.48	0.01 inHg ± 0.05 inHg

Pt 1000 ohm Thermometer (optional probe)		
Unit	Range	Resolution Accuracy
°C	-10.0 to 100.0°C	0.1°C ± 1.2°C
°F	14.0 to 212.0°F	0.1°F ± 2.5°F

Air flow		
Unit	Range	Resolution
CMM	0.024 to 36000	0.001/0.01/0.1/1
CFM	0.847 to 1271300	0.001/0.01/0.1/1/10 (X10)/100 (X100)

Dew point Temp.		
Unit	Range	Resolution Remark
°C	-25.3 to 49.0°C	0.1°C * Calculate from the humidity/Temp. value
°F	-13.5 to 120.0°F	0.1°F

Wet bulb Temp.		
Unit	Range	Resolution Remark
°C	-5.4 to 49.0°C	0.1°C * Calculate from the humidity/Temp. value
°F	22.2 to 120°F	0.1°F

Heat index		
Unit	Range	Resolution Accuracy
°C	-5.4 to 49.0°C	0.1°C ± 2.0°C
°F	22.2 to 120°F	0.1°F ± 3.6°F

Effects of the heat index (shade values)

Celsius	Fahrenheit	Notes
27-32°C	80-90°F	Caution: Fatigue is possible with prolonged exposure and activity. Continuing activity could result in heat cramps
32- 41°C	90- 105°F	Extreme caution: Heat cramps, and heat exhaustion are possible. Continuing activity could result in heat stroke
41- 54°C	105- 130°F	Danger: Heat cramps, and heat exhaustion are likely ; heat stroke is probable with continued activity
over 54°C	over 130°F	Extreme danger : Heat stroke is imminent

Note: Exposure to full sunshine can increase heat index values by up to 8°C ( 14°F).

Wind chill

Unit	Range	Resolution	Accuracy
°C	-0.4 to 44.2°C	0.1°C	± 2.0°C
°F	15.0 to 112.0°F	0.1°F	± 3.6°F

Altitude

Unit	Range	Resolution	Accuracy
m	-2000 to 9000 m	1 m	± 15 m
ft	-6000 to 30000 ft	1 ft	± 50 ft



- Features:**
- 11 in 1 professional environment instruments: 1. Air velocity/Temp., 2. Humidity/Temp., 3. Light 4. Barometer, 5. CFM, CMM, 6. Dew point, 7. Wet bulb, 8. Wind chill, 9. Heat index, 10. Altitude, 11. Pt 1000 ohm Temp. (optional).
  - Tiny bone shape with lightweight and small size case design are suitable for handling with one hand.
  - Wristlet design provides extra protection to the instrument especially for user one hand operation.
  - Low-friction ball bearing mounted wheel design provides high accuracy at high and low air velocity.
  - Exclusive photo diode and color correction filter light sensor, spectrum meets C.I.E. photopic.
  - High precision humidity sensor with fast response time.
  - Build in baro sensor for the atmosphere value and altitude measurement precisely.
  - Optional Pt 1000 ohm Temp. probe for the precision Temp. measurement.
  - Built- in microprocessor circuit assures excellent performance & accuracy.
  - Concise and compact buttons or rangement, easy operation.
  - Memorize the maximum and minimum value with recall.
  - °C/°F detection by pressing button on the front panel.
  - Hold function to freeze the current reading value.

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## SRA-301/2/4/8, SRD-301/2/4/8, SD Manual/Automatic Multi Functional Mixers

## SRD-Series



## Features:

- Brushless DC motor (BLDCM). With a high output power, low vibration and low noise design.
- With a stable performance - fast reaction, and with an overheat - over-voltage and current-overload protection devices.
- Through the feedback design to maintain the stirring speed and torque while the machine is working.
- Rotation direction can be changed by manual operation while the machine is stop or working.
- With a protection hood outside the chuck. Any improper open of the hood will stop the machine working automatically.
- When the hood of the chuck is opened, the rotor inside the motor will be locked up to forbid rotating, the stirring shaft can be loosen or fastened up in the chuck by single hand without tools.
- Stirring shaft can be moved up and down for fastening in a proper position. One smaller chuck and thinner stirring shaft are also available for optional purchasing.
- The machine body can do an orbit-like movement. It helps to set up the machine at a special angle for getting a more perfect stirring effect.



SRA-Series

## SRA-301/2/4/8 (Manual series):

- Displaying only speed during the rotation. Different speed sets can be used with a variety of different viscosity and capacity.

## SRD-301/2/4/8 (Automatic serie):

- Displaying both the speed and torque during the rotation. A variety of speed & torque settings can be with different viscosity & capacity usage.
- With a timer function for doing timer pre-sets of the automatic start and stop running.
- Available for doing timer pre-set of the period between the clockwise and reversal rotation.

Manual Model	SRA-301	SRA-302	SRA-304	SRA-308
Automatic Model	SRD-301	SRD-302	SRD-304	SRD-308
Motor	DC80W			
Speed (rpm)	0 ~ 3,000	0 ~ 1,500	0 ~ 750	0 ~ 375
Torgue (Kg)	2.5	5	10	20
Time Setting	99 : 59 (SRD)			
Body Size (WxDxHmm)	107x179x150			
Stand Base Size (WxDxHmm)	400x315x54			
Body net Weight (Kg)	3			
Power	AC 110V/220V, 50/60HZ			

## TECLAB



## TECLAB, Oxygen-Sensor With Glass Fiber Optics

### Configuration:

- Opto-chemical O<sub>2</sub> - sensor system
- Windows software and USB or 7" SAMSUNG GALAXY tablet and batteries
- Glass fiber 0,4mm up to 3m with sensor Pre — calibrated, exchangeable cables.

### Performance:

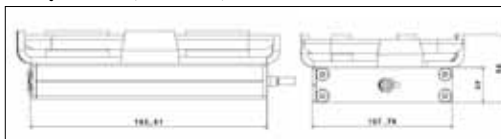
- Measurement range 0 — 10mg/l
- Accuracy  $\pm 0.05\text{mg/l}$  or  $\pm 1\%$  of measured value
- Resolution  $< 0.002\text{mg/l}$
- Min. response time 1sec in gas; up to 30sec in harsh media
- Calibrated in liquid media at 200 / 25° / 30°C with 0%, 5%, 10% and 21% of dissolved oxygen.

### Package:

- Easy-to-use software package for Windows or Android
- Self — diagnosis for easy failure detection
- Pre — calibrated sensor for plug&play of exchangeable fiber cables
- Intuitive navigation, password protected
- Optional portable configuration with tablet and battery mode.

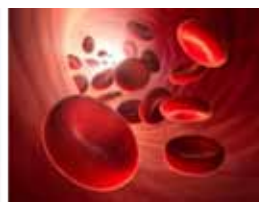
### Applications:

- Invasive testing of modified atmosphere packaging (MAP)
- Headspace — measurement in injections, bottles, tanks
- O<sub>2</sub> - determination in vivo / invitro in injections, vials, cells
- Micro - bioreactors
- Tissue Engineering
- Sensor for very small volume.



### Lead User:

- Pharmaceutical & Food labs
- Biotechnological institutes
- Industrial processes
- Cellular tissue analysis.





TEPS-V6

**TEPS-V6, Portable clip-on digital immersion circulator**

MRC immersion heaters and water baths with a precise temperature controlled environment, to produce consistently perfect results Ideal for sous vide and other demanding applications.

MRC immersion circulator is a space saving clip on heater/stirrer unit. It can be easily fitted to a standard stainless or polycarbonate gastronorm square tank or round (minimum depth 18cms) and maximum volume of approximately 60 Liters.

For large tanks and pots there are several immersion heaters with higher wattage and immersion lengths. Precise temperature achieved by PID high precision controller, accuracy and repeatability are guaranteed. Actual temperature is clearly displayed to 0.1°C. Temperature settings are retained in memory even after 'power off'.

Temperatures can be easily and rapidly set with the push button, wipe clean control panel. Easy clamping method, safety protection for low water level and optional sturdy handle for easy carrying.

The case is constructed from high quality stainless steel.

If the water drops below the recommended minimum level or the unit is inadvertently switched.

**Applications:**

- Laboratory water baths
- Calibration baths
- Sous vide.

**Easy Clamping Method**

**TEPS-4SPL**  
Longer immersion heater for deep and large containers  
250 Watt power



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Front

Longer immersion heater for deep and large containers

Model	TEPS-V6
Display/resolution	Digital LED/0.1°C
Temp. range	Ambient + 5°C – 95°C
Temp. setting	Push button
Stability	±0.1°C
Display/resolution	Digital LED/1 min. increments
Dimensions (mm)	Stirrer case: W122 x D153 x H200 (includes handle) Guard: W122 x D132 x H148 Allow 90mm at rear of unit for mains cable/ventilation
Electrical supply	230V
Power consumption	1kW (Optional: 2000, 2600, 3000 watt)





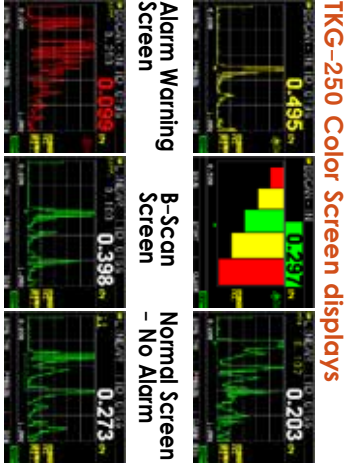
- Common Applications:**
- Boiler Tubes
  - Pressure Vessels
  - Storage Tanks
  - Ship Hulls
  - Containers
  - Home Oil Tanks
  - Pipes
  - Steam Lines
  - Compressors
  - Shafts
  - Bridge Pins
  - Bond Inspection.

**Ergonomic and Intuitive:**

Some of the key advantages of the TKG Series include its intuitive interface, easy-to-read display, and various alarm modes. These innovations make it easier to use the device's advanced functions, such as the user-configurable Fast Minimum/Maximum threshold settings, which, combined with unique Vibration feedback alerts and various Visual alarms, help reduce the likelihood of missing critical thickness parameters, even by new users.

**Clear and Bright Display:**

Readable in bright sunlight, the on-screen data displays filename, ID number, thickness measurement, minimum threshold, gain, rectify and range settings, and the three menu items on the bottom of the screen correspond to the F1 – F2 – F3 buttons. The battery % level is always visible on screen, and the TKG gauges provide an extended battery life from two AA batteries. (See chart on back page for model-specific features and functions)



Model	TKG-100	TKG-150	TKG-250
Gain – Variable adjustment	-	Low, Standard, High	In 1dB steps from 20-90dB or Automatic Gain Control (AGC) for waveform
B-Scan – (Non-Encoc			
Echo-to-Echo	-		TKG-150 and TKG-250 models do not affect base material thickness value)
Differential Mode	-		Displays the difference from the actual thickness measurement and a user entered reference value
Velocity Mode	-		Displays acoustic sound speed to measure thicknesses of unknown materials
Datalogger	-		Stores 50,000 readings (expandable to 100,000) and 5,000 waveforms; file names up to 20 charac-ters long; and the included ExTech XPorter software extracts .csv data files that can be opened for viewing in MS Excel, Notepad, or Wordpad. TKG250 also has file compare and grid review features.
Range	-	-	Adjustment of manual range control or auto zoom tracking to center echoes independent of selected range
Rectification Modes	-	-	RF, Half Wave Positive, Half Wave Negative and Full Wave Rectification
Live Waveform (A-Scan)	-	-	Full adjustments for gain in 1dB step or AGC, main bang blank, blank after first received echo, range including zoom auto tracking to center echoes independent of material and rectification.
Battery Life	Up to 50 hrs (20hrs w/backlighting)	Up to 50 hrs (20hrs w/backlighting)	8 to 14hrs (depends on operating conditions)

**TKG-100/150/250, Ultrasonic Thickness Gauges**

The TKG Series of ultrasonic thickness gauges are compact, rugged devices that use ultrasonic technology to perform non-destructive thickness measurements on a variety of engineered materials. The most common application is to detect corrosion and buildup in steel structures in which only one side is accessible to take inspection measurements Designed and made in the USA, TKG gauges are often used to inspect steam lines, boiler tubes, storage tanks, and pressure vessels. These gauges are also used to inspect marine systems, heavy equipment, aircraft sections, and bridge structures.

**Rugged and Versatile:**

Designed for use in harsh conditions, TKG gauges are made of an impact-resistant material. All three models are IP54-rated for dust and water resistance and are ideal for quality control applications beyond metals, including castings, plastics, composites, fiberglass, ceramics, and glass. The TKG-150 and TKG-250 models have added versatility with Vibration Alerts, an Echo-to-Echo measurement mode that ignores paint and coatings, and Automatic Datalogging.

- Common Features:**
- Wide measurement range: 5MHz probe: 0.040" to 20" of steel 10MHz probe: 0.020" to 20" of steel (optional)
  - Sunlight readable dot-matrix display with backlight
  - Multiple transducer options for high temperature and difficult to measure materials
  - Fast minimum feature to capture minimum thicknesses
  - On screen display of 8 languages
  - Splash-proof (IP54), high impact, compact housing.
- Model TKG-100/150 Additional Feature:**
- Sun light readable.

- Model TKG-150 Additional Features:**
- Echo to Echo option to reduce coating errors
  - 100K internal datalogger with export to Excel
  - B-scan (Visual cross section of test piece)
  - Vibrate on alarm.
- Model TKG-250 Additional Features:**
- Color LCD display shows red, yellow and green visual alarm indication
  - Live Waveform (A-scan for thickness verification)
  - File compare feature as a real time corrosion monitor
  - Dynamic change of waveform color on alarm
  - Grid review of saved readings
  - Echo to Echo option to ignore coatings
  - 100K internal datalogger with export to Excel
  - B-scan (Visual cross section of test piece)
  - Vibration alarm indication.



Thickness Range (in Steel)	5kHz probe: 1.0 to 508mm; 10MHz probe: 0.50 to 508mm
Languages	English/French/Spanish/Italian/Czech/German/Portuguese/Slovak/Finnish/Hungarian
Hold Mode	Holds display to retain last thickness reading with reverse video display
Freeze Mode	Freezes display (ideal for high temperature readings)
Fast Min/Max Mode	Displays Min or Max and actual thickness value at 20 measurements/sec
Units	Inches/Millimeters/Microseconds
Alarms	Audible beeping, illuminee flashing display and keypad; and vibration feedback (only on the TKG-150/TKG-250 models)
Illuminating Keypad	F1 = Red, F2 = Yellow, F3 = Green for easy, go/no-go testing

All models include 2oz bottle of couplant, 2 AA batteries, Transducer (5MHz, 0.375" diameter ) with potted cable, and hard case. TKG-150 and TKG-250 also include protective hoister, USB cable, and XPorter software.



Additional Functions:



TM40

## TM40, Corkscrew Stem Thermometer

101mm stainless steel probe with a T-shaped design provides easy grip to twist the screw tip into any solid or semi-solid materials to take temperature measurements.

### Features:

- Measures temperature from -50 to 150°C
- Basic accuracy of  $\pm 1^\circ\text{C}$  with  $0.1^\circ/1^\circ$  resolution
- Rugged 101mm stainless steel probe
- General water resistant design
- Auto power off conserves battery life
- Dimensions: 160x107x30mm, Weight: 91g
- Complete with SR44 (G13) button battery and protective sheath for probe storage.



### Applications:

- Agriculture (soil)
- Laboratories
- Frozen samples
- Liquid solutions.



TM55

## TM55, Pocket Fold-Up Food Thermometer

Splash-proof (IP65) with folding 2.4" stainless steel probe is NSF certified for measuring liquids, pastes, and semi-solid food.

### Features:

- Measures from -40 to 250°C with 61mm stainless steel probe (NSF certified)
- Fast response time at < 5 seconds in moving liquid
- Large LCD display with  $0.1^\circ$  resolution
- Basic accuracy:  $\pm 1^\circ\text{F}/0.5^\circ\text{C}$
- Auto power off (with disable) after 1 hour or when probe is placed in stored position
- Probe can be positioned from  $0^\circ$  (storage) to  $180^\circ$  angle
- Ultrasonically welded housing (waterproof IP65 rated) with anti-microbial additive
- Built-in magnetized strip attaches to refrigerator
- Dishwasher safe (top rack)
- Dimensions: 116 x 38 x 20mm; Weight: 41.2g
- Complete with CR2032 battery.

### Applications:

- Food Industry
- Frozen and semi-solid samples
- Liquid solutions
- Agriculture (soil)
- Laboratories.



Adjustable folding probe from  $0^\circ$  to  $180^\circ$  angle



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- Frozen and semi-solid samples
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- Agriculture (soil)
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**Adjustable folding probe  
from  $0^\circ$  to  $180^\circ$  angle**



## UM200



## UM200, High Resolution Micro-Ohm Meter

Precision meter provides resolution down to  $1\mu\Omega$ .  
Using 4-wire Kelvin clip test leads

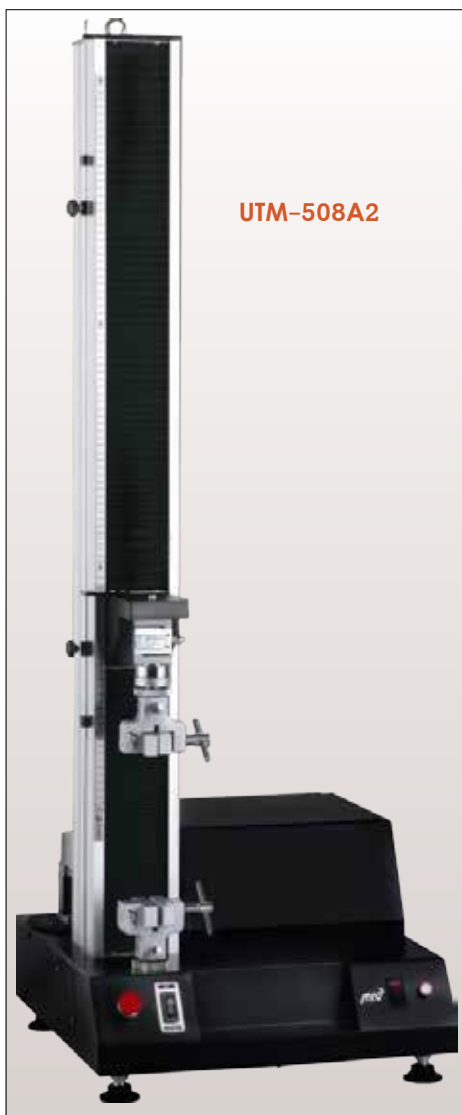
## Features:

- 6 ranges with 3 sub-ranges in each current range
- Measurement of resistive and inductive materials
- Auto or Manual ranging
- High resolution to  $1\mu$
- 5-Digit backlit LCD
- Built-in comparator for Hi/Lo resistance testing with 20 sets of prestored values
- Store/Recall up to 3000 measurements
- 10A maximum test current
- Cable length measurement (feet or meters)
- PC interface
- Complete with 4-wire cables with Kelvin clip connectors, rechargeable Li-Polymer battery, AC adapter/charger, software and USB cable, and soft carrying case.



Meter includes accessories all packaged in a convenient soft pouch case

	Range	Resolution	Current	Accuracy (%rdg)
Resistance	60m	$1\mu$	10A	$\pm(0.25\% + 25\mu\Omega)$
	600m	$10\mu$	1A	$\pm(0.25\% + 250\mu\Omega)$
	6	$100\mu$	100mA	$\pm(0.25\% + 2.5m\Omega)$
	60	1m	10mA	$\pm(0.25\% + 25m\Omega)$
	600	10m	1mA	$\pm(0.25\% + 250m\Omega)$
	6k	100m	100 $\mu$ A	$\pm(0.75\% + 3\Omega)$
Power	Rechargeable Li-Polymer Battery			
Dimensions/Weight	257 x 155 x 57mm/1160g			



UTM-508A2

**UTM-508A2/513A2, Material Testing Machines**

Single column machine on volume & operation all have good configuration, suitable for below 5KN small section material to proceed with tests, this machine can use in environment with limit space.

With exclusive test software, tensile, compression, bending and multi-function tests can be done. Software is easy to operate & also with multinational languages, various metric and imperial units selection, instant diagram showing and offer complete test analysis data that user can analyze various materials after tests.

**Standard:**

ISO 7500-1 , ASTM E4 , ASTM D-76, DIN5122 , JIS B7721/B7733 , EN 1002-2, BS1610,GB T228.

**Industry:**

Rubber, Plastic, Paper, Textile, Tape, Electron, Package, Architecture.

**Features:**

- The seal plates are treated by anode hardening, and the ball screws are equipped with dust -proof cover to extend its lifetime and precision.
- Hardware protection Up/down limit, emergency stop button.
- Servo-motor driven, precise decelerators and ball screws is used to reduce the noisy, loss of transmission.
- Load Cell comply with ASTM-E4 standard which accuracy is limited within 1.0% and adopt bridge circuit to sense the load force and export data. Load cell also includes memory lock to memorize various parameters. Machine can detects the parameter automatically when switching different load cells.
- With external I/O junction to expand functions Inching control.
- Various grips & extensometers are available.



UTM-513A2

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**Optional Accessories:**

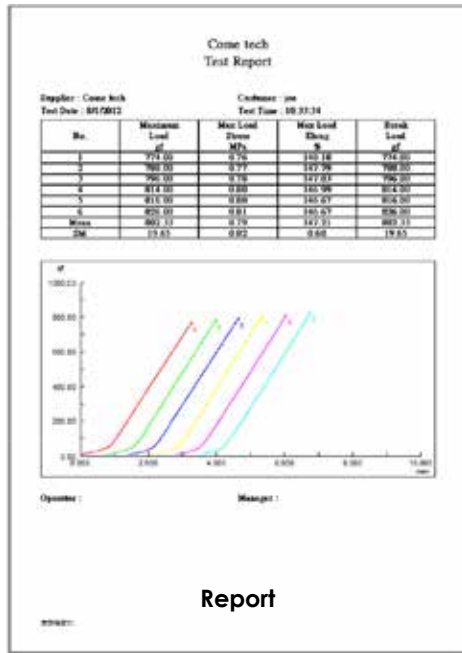
Each test will require different test grip and accessories for application industry in plastic, metal, biomedical, composites, elastomer, components, automotive, aerospace, textiles...

- Tensile grip
- Compression grip
- Flexure fixture
- Peel/tear fixture
- Film COF test fixture
- Load cell
- Extensometer.



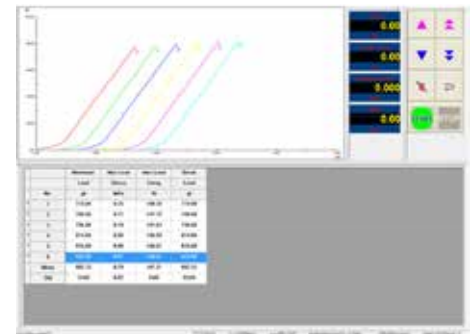


# MATERIAL TESTING 5kN, Tensile Testing Machine



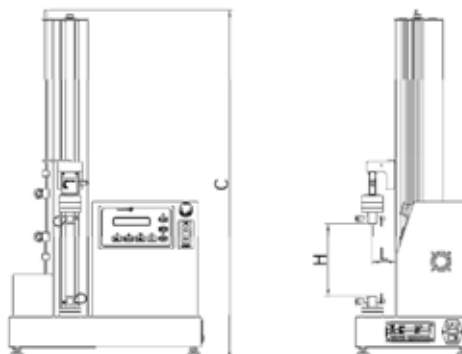
## Software:

- Data sampling rate: Max. 60 Hz.
- Full-computerized control to run the test or Jog button control
- Compatible with Window XP, Vista, WIN. 7 or WIN. 8 system, but the memory requires 512 MB.
- Software has Chinese & English version.
- USB interface for bidirectional transmission
- Multi-curves display and real-time plot
- Various units of measurement are available
- Flexible form to manage database.
- Free to name the data file.
- Testing screen is selective to display data, graph or for both at the same time.
- Data processing: file saving, setting loading, report printing and data comparing.
- Graph display: strain v.s. elongation, strain v.s. time and so on.
- Tensile test, compression test, bending test, peel test, adhesive test...
- Deformation of machine is revised automatically to ensure test data closing to the precise value.
- Software protection: Overload, over displacement protection.



Software interface

## Machine dimensions:



Model	Width x Depth x Height A x B x C (mm)	Crosshead travel H (mm)	Front opening space L (mm)
UTM-508A2	500x530x1450	800	80
UTM-513A2	500x530x1000	400	80

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Model	UTM-508A2	UTM-513A2
Max. Capacity	5 KN	
Force resolution	1/20000	
Test stroke	800 mm (w/o grip)	400 mm (w/o grip)
Stroke resolution	0.0001 mm	
Speed	1~1000 mm/min	1~1000 mm/min
Test space	Φ140 mm	
Speed range	0.1 ~ 1000 mm/min can self-setting (By PC digital setting)	
Speed precision	0.1 ~ 10 mm/min ± 2%    10 ~ 1000 mm/min ±1%	
PC-port	USB	
Data sample rate	Faster 100 Hz	
Hardware safety protection	Up/down limit, emergency stop button	
Motor type	Servo motor	
Stiffness Slop	284 kgf/mm	
Feature	* Load cell includes memory lock to memorize various parameters. When switching different load cells, it will automatically change parameter and no need for other setting. * With inching up/down button, easy to operate	
Power Supply	Single phase 200 ~ 240 VAC 5 A	
Dimension / Weight	50x53x145cm / 80kg	50x53x100cm / 65kg

## UVA-60, UV LED Curing System



### Why MRC?

- Good reputation for supplying high quality LED UV
- Series of UV products, from UV spot type to area curing type. Good for environment products.
- Inspection and feedback system (UV test devices), ensured the product's quality.

### Controller Specifications:

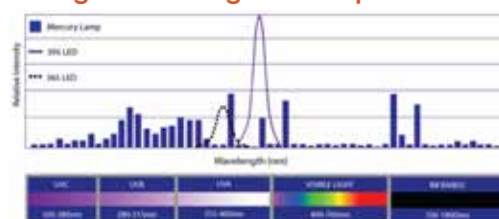
Drive Mode	Manual, Auto, Step, Pulse
Operate Port	Foot pedal/RS232
Cooling Method	Fan cooling
Power Setting range	0-100%
Input Power	100-240VAC
Power consumption	<450W
Ambient Temp.	Working: +5 ~ +40°C Storage: -15 ~ +65°C
Ambient humidity	20 ~ 85%
Irradiator	One controller irradiator

### Irradiator Specifications:

Model	UVA-60
Valid emitting window	60x60mm
Wavelength	365nm
Light Intensity	2000mw/cm <sup>2</sup>
Recommend working distance	≤2mm
Dimensions(LxWxH)	120 x 112 x 165mm
Weight	appr. 1Kg
Power consumption	<450W
Connect cable	Optional 2m to 10m
Cooling method	Fan-cooling
Ambient temp. / Humidity range	0 to 35°C, 85% max
Storage temp. / Humidity range	-10 to 60°C, 85% max.

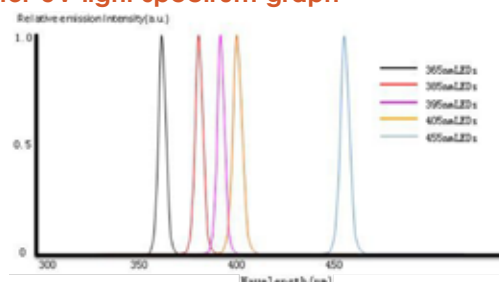
### Characteristics 1: LED Irradiator single wavelength UV output

High power LED single wavelength UV light source is a specially designed product with high efficiency. It can eliminate the needless light irradiation, especially the infrared ray. It is the ideal light source for high precision and heat-sensitive workpieces.



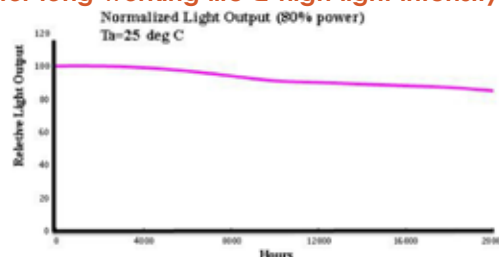
### Characteristics 2: LED irradiator UV light spectrum graph

Normal irradiator wavelengths: 365, 385, 390~420nm, 455nm, 465nm etc, others can be customized.



### Characteristics 3: LED irradiator long working life & high light intensity

Light intensity keeps almost the same level during the 20,000 hours working life. Inner temperature control system can guarantee the constant light intensity, no need daily checking. (Default power 60%).

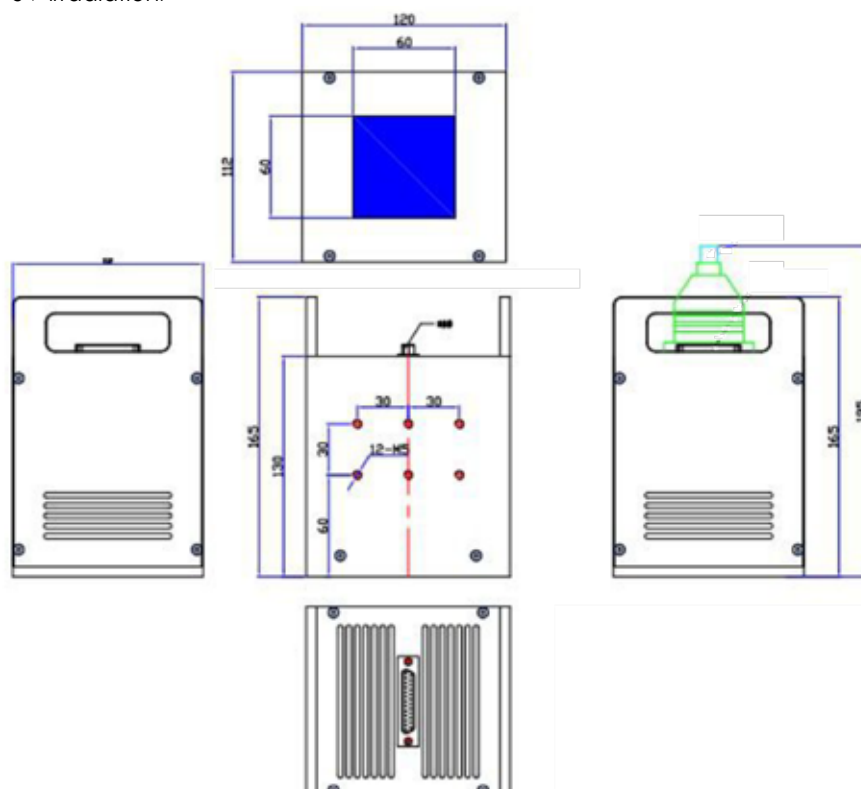


### Characteristics 4: LED irradiator contains no destructive heat light

Very low heat emission light source. The output light contains no heat, minimize the heat effect. Surface temperature changes very little during the irradiation.

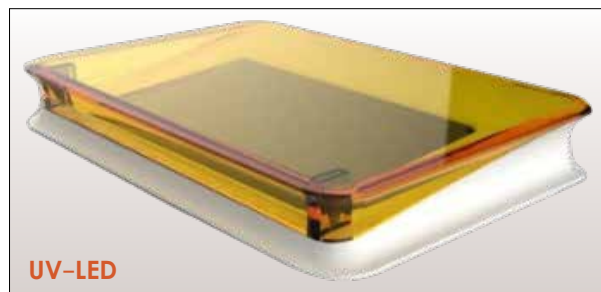
### Characteristics 5: Application Area

Medical treatment, disinfecting • UV glue curing, UV ink drying • Optoelectrical area, LCD, PCB exposure • Special UV industry • Large area UV irradiation.



## UV-LED, Concept-Image Originated from the Books

Books are embedded With an abundance of knowledge. The UV-LED (DNA transilluminator) contains the DNA messages. KnowLedge is acquired by opening the book. While the DNA message is extracted by flipping open UV-LED.



The idea is derived from the book's non-bound, dented side, which offers users the ease with flipping open the upper cover.



The three-dimensional wedge shaped structure can enhance the upper cover's strength, thus providing a higher level of durability during the course of flipping open the upper cover on a frequent basis.

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## Features:

- Smart power-saving function
  - Automatic power shut-off option at 5 minutes.



- Goodbye, Power Brick.



- Gel cutting knife
  - cut out the target from the gel for further experiment.



- Ergonomic fusion-Patented 4° ergonomic viewing angle ("Golden Angle").



- Blue light source good for 30,000 hours.
- No risk of UV damage for high quality work experience.



- Optimized for use with the nucleic acid and protein fluorescent dyes.

## Specifications:

Model	UV-LED
Unit Dimensions (WxLxH)	295x215x42mm
Gel Viewing Dimensions (WxLxH)	200x120mm
Emission Maxima (nm)	470nm
Weight	1.3KG
Filter Type	Amber Filter



**Environments Prone to Airborne Particulates:**

- Diesel vehicle transportation & service depots
- Power generation (fossil fuel burning)
- Traffic-related emissions
- Charcoal-based heating/cooking
- Cement manufacturing, mining, & stone crushing
- Metallurgy processes (melting, pouring, torch-cutting)
- Agroindustrial (flour milling & agricultural field burning).



**VPC300, Video Particle Counter with built-in Camera**

Particle Counter with unique built-in camera for capturing videos & photos that are stored onto internal memory or a micro SD card. The VPC300 can measure up to 6 channels of particle sizes plus Air Temperature and Relative Humidity. Use the included software to generate reports with videos, photos, and data points.

**Features:**

- Simultaneously measure and display 6 channels of particle sizes (down to 0.3  $\mu\text{m}$ ), Air Temperature, Humidity, Dew Point and Wet Bulb
- 2.8" TFT Color LCD display
- Built-in 320x240-pixel camera takes videos (3GP) and photo images (JPEG) and records them in internal 74MB memory
- Store 5000 records (date, time, counts, humidity, temperature, sample volumes, and location label) and 20 minutes of video
- Selectable sample time, count data, and programmable delay
- Max, Min, DIF, AVG record, Date/time setup controls
- Auto Power Off
- Language selection: English, French, German, Spanish
- Meter is NIST calibrated
- Tripod mount for continuous recording
- Mini-USB port connection
- Micro SD card slot in battery compartment (memory card not included; max size 8GB)
- Complete with NIST-traceable calibration certificate, Universal AC Adapter/Charger with multiple plugs, USB cable, PC software, tripod, filter, 7.4V NiMH battery and hard case.

**Specifications:**

Model	VPC300
Channel of Particle Sizes	0.3, 0.5, 1.0, 2.5, 5.0, 10 $\mu\text{m}$
Flow Rate	0.1ft <sup>3</sup> (2.83L/min) controlled by internal pump
Count Modes	Cumulative, Differential, Concentration
Counting Efficiency	50% @ 0.3 $\mu\text{m}$ ; 100% for particles>0.45
Coincidence Loss	5% @ 2,000,000 particles per ft <sup>3</sup>
Air Temperature	-25 to 60°C, Accuracy: $\pm 1^\circ\text{C}$
Relative Humidity	0 to 100%RH; Accuracy: $\pm 3\%$ RH (40% to 60%RH)
Dew Point/ Wet Bulb	0 to 50°C
Dimensions/Weight	240 x 75 x 57mm/ 570g



Laboratory Equipment Manufacturer  
www.mrclab.com



# Operation Manual

# WBL-118

## Refrigerated Bath & Circulator



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**PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION**

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**MRC.VER.01-10.13**



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## Preface

In order to make the equipment fully functional and ensure safety of the equipment, property, specimens and the operator, read this manual carefully and completely. When you have any question that cannot be explained by this manual, consult your local MRC distributors or supporting technicians at MRC. It is our pleasure to provide services for you.

### General safety notes

The equipment is designed for operation with non-flammable heat transfer liquids only!

No silicone oil is allowed for use with this series of the equipment. The internal silicone rubber parts may swell when in contact with silicone oil resulting in leakage of the liquid! For engineering change related to the use of silicone oil or other liquid, consult MRC engineer!

The equipment is intended for heating, cooling, conditioning of specimen and/or applications system by immersion in or external circulating of the liquids. This leads to potential hazards of high or low temperatures, fire, and the general hazards related to the application of electrical energy.

The operator is largely protected through the application of the appropriate standard specifications.

Further hazard sources may arise from the type of material being treated, e.g. mixing, dissolving, reacting and resultant excessive energy, liquid spillage resulting from immersion or removal of the specimen, and by the fracture or rollover of the container and reaction with the heat transfer liquid.

It is not possible to cover all possibilities; they remain largely within the responsibility and the judgment of the operator!

The equipment must only be used as intended and described in these Operating Instructions. This includes operation by suitably trained qualified personnel.

The maximum temperature deviation both in normal condition and in electro-magnetic interference field according to IEC 61326-1 is  $\pm 0.2$  °C.

### Classes of the EMC standard IEC 61326-1

Class A: Equipment for operation only on networks without connected domestic areas;

Class B: Equipment for operation on networks with connected domestic areas.

### Valid for Europe

The equipment is designed in accordance with EMC requirements of EN 61326-1 Class B. Class B equipment is suitable for operation on networks with connected domestic areas.

### Valid for USA

Instructions for Class A digital devices as follows:

"This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC (Federal Communication Commission) Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio

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frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.”

“This device complies with Part 15 of the FCC (Federal Communication Commission) Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.”

### Valid for Canada

“This Class A digital apparatus complies with Canadian ICES-003” (ICES=Interference Causing Equipment Standards).

«Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada».



Caution, Class A equipment must not be operated on power networks with connected domestic areas!

### Important symbols

For your safety, pay attention to these important symbols as follows, during moving, installing operating and maintenance. The equipment is designed for safe operation because of your attention!



Warning, possibility of electric shock!

Inappropriate operation may cause hazard of electric shock and result in serious personal injury or death!



Caution, hot surface or area!

Accidental touching or approaching may cause burn hazard!



Caution, important note, and always refer to operating instructions (this document) for detailed information!

The equipment must be operated by well trained qualified personnel only!

Wrong operation may cause personal injury, damage and/or mal-function of the equipment!

## Chapter 1 Safety instructions

### 1.1 Normal operating environment

The equipment is designed for safe operation under ambient conditions as follows:

- indoor use;
- altitude up to 2,000 m;
- temperature 5 °C to 40 °C;
- maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C;
- mains supply voltage fluctuations up to  $\pm 10$  % of the nominal voltage;
- transient overvoltage up to the levels of overvoltage category II;
- temporary overvoltages occurring on the mains supply;
- Pollution degree 2 or less of the intended environment;



Excessive high or low temperature and/or humidity will significantly degrade electric safety of the equipment!

Note the effect of the altitude on the boiling points of the heat transfer liquids!

Note the effect of the ambient temperature on the minimum operating temperature and cooling capacity of the equipment connected for optional cooling!

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### 1.2 Safety warning



When heating, cooling and conditioning with specimen or application system which is intrinsically explosive, flammable or toxic or, which liberates hazardous substances as result of reacting, dissolving or mixing under operating temperature range for normal use, safety acts and regulations for the particular chemicals and experimental laboratory shall be observed!

Not applicable for specimen or application system which develops tremendous energy as result of reacting, dissolving or mixing under operating temperature range for normal use!



The dielectric strength of the equipment may be degraded if after transport or storage in humid conditions. The equipment shall be powered as for normal use and conditioned at its maximum operating temperature, whichever is smaller, for at least 1h before commissioned for normal use. Warning, hazard of electric shock during the dry-out!

### 1.3 Caution



Caution, Risk of burn hazard!

Do not touch or approach parts or area with high temperature, for example, bath cover and the heat transfer liquid when maintained at operating temperature over 60°C!

	Pull the temperature of the heat transfer liquid as close as possible to the ambient before attempting to shut down the equipment, except when operations as such are prohibited for the specimen or the application system! Warning, Hazards of burn and possible electric shock resultant from unattended hot temperature or condensing and degraded dielectric strength!
	The minimum distance away from the ventilating holes at the back or sides of the equipment to the wall, furniture or other installations shall be 300mm! The inlets of fresh air and outlets of exhausting air of the immersion controller shall be kept clear of any obstacles, so that no close-loop of the air circulating may develop.
	Keep the equipment away from hot-air emitting source, direct sunshine, strong magnetic field and electric sparks! Neither contamination of high concentration dust or corrosive gas, nor strong airflow surrounds!
	Voltage, frequency and current for power supply must meet the requirements as designated on the nameplate! Use power socket matching the power plug of the equipment. Hot line (L) and neutral line (N) for single phase equipment must not be reversed! For possible wet location conditions, where cycle of evaporating and condensing, overflowing or spillage may occur and for protection against hazard of possible electric shock, use power socket with appropriate IP protection and additional residual current circuit breaker (RCD) with rated breaking capacity!
	Socket for power supply must be equipped with protective ground (PE) to prevent against hazard of possible electric shock!
	Connect the power from behind the equipment. Plug in and remove the cable by directly holding the plug. No dragging of cable in any part. Protect the cable from being damaged by contacting with the hot surface of the equipment or mouse etc!
	Caution, Hazard of overflowing or low level! Never attempt to initiate the equipment if no heat transfer liquid is filled or filling volume is lower than the minimum level as specified; Never move the equipment if the bath tank is fully filled with the heat transfer liquid; The liquid level may change with the heating and cooling of the equipment, and with the immersion or removal of the specimen! Disconnect the application system from the equipment only after proper draining of the heat transfer liquid, especially when the application system is charged to maximum volume by additional filling of the liquid!



**Class I/NFL** Caution, Risk of fire!

The equipment is designed for operation with non-flammable heat transfer liquids only! Water and mixture of water and glycol are the most popular non-flammable heat transfer liquids appropriate for the equipment.

No silicone oil is allowed for use with this series of the equipment. The internal silicone rubber parts may swell when in contact with silicone oil resulting in leakage of the liquid!

For engineering change related to the use of silicone oil or other liquid, consult your local MRC distributor or MRC technician! The use of inappropriate liquid may adversely affect the performance and safety of the equipment!



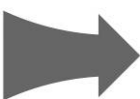
The circulation of the heat transfer liquid is important for performance and safety! The kinematic viscosity, immersion and distribution of the specimen and, flow resistance of the application system and the circulating tubing significantly influence the circulation of the liquid!

The first time commissioned for use or when exchange of the heat transfer liquid and, immediately after startup of the circulating pump, check if any liquid leakage exists in the external circulating tubing and fittings, if head pressure of the pump and flow of the heat transfer liquid are in their rated range and, if the liquid level is in its range for safe operation!

Mixing and use of heat transfer liquids with different physical and/or chemical properties may adversely affect the performance and safety of the equipment! The liquid shall be completely drained and removed before attempting to charge the other. When necessary, consult MRC or supplier of the liquid for particular application!

Never touch or attempt to handle the heat transfer liquid with temperature higher than +60°C! Caution, burn hazard!

No draining of the heat transfer liquid with potential of chemical or biological hazard! Collect and identify the heat transfer liquid for future use! Consult MRC or manufacturer of the liquid for proper disposal!



Install an extraction system over the bath opening, if the operating of the equipment could lead to liberation of hazardous air or gas mixture, for example the evaporation of the heat transfer liquid! The rating of the fume hood shall be at least the maximum possible exhausting temperature! If necessary for safety, additional temperature limiting and warning devices, condensate accumulator shall be installed for the extraction system!

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Caution: Note the following when connecting the equipment to an external application system:

1. The external circulating pipe, including flexible tubing and hose, shall be connected only after the equipment and application system are well seated and installed. The length and distribution path shall be as short as possible and be so arranged that no kink and other mechanical stress develops during normal use which otherwise may result in thermal and/or liquid hazards!
2. Flexible hoses, fittings and couplings are important for the safe operation of the equipment; Use only hoses, fittings and couplings provided with the equipment or recommended by MRC!
3. The ratings of pressure and temperature for the hoses, fittings and the jacket, container or heat exchanger of the application system, their chemical resistance to the heat transfer liquid shall meet requirements of the operating temperature and/or pressure range of the heat transfer liquid to be delivered by the equipment!
4. Thermal insulation for hoses, fittings, couplings and the application system is important for performance and safety! The materials of the insulation shall meet the requirements of the maximum operating temperature range!
5. If no external circulating is necessary, use hoses, fittings and couplings to short-circuit the liquid connections as for an external application!

Keep the cables and wiring protected by conduit and/or hose and well secured; keep them clearly away from direct contact with any exposed heated parts of the equipment and application system !



Caution: Risk of frozen hazard!

When water is employed as heat transfer liquid, and when intended for standstill for long period and when experiencing low ambient is possible, run the equipment at operating temperature close to ambient for at least 1hr. Empty the bath containing water, and remove the water completely. Disconnect the equipment and remove the mains plug from power source.



Do not disassemble or exchange assembly parts and electric circuits by unauthorized personnel! Hazard of possible electric shock! In case of repairing, contact authorized local MRC distributor or MRC personnel.

Always remove the mains plug from the socket before cleaning, moving, maintenance



The first time powering up after repairing or standstill for long period, or at designated intervals under normal use, check the functionality of the following parts or components:

Hydraulic tightness and fastening of flexible tubing for circulating, status of insulation, at three months intervals; Aging, resistance to chemical stress from the heat transfer liquid and its temperature and pressure of flexible hose, at six months intervals;

Cutoff capability of the safety temperature limiter (STB).

## Chapter 2 Installing and operating

### 2.1 Installing

#### 2.1.1 Unpacking

Unpack the equipment and sort the accessories respectively and carefully. The packing carton, pallet, packing buffering stuffs etc, are designed for one shipment only. For future shipment, prepare the packing materials as well as the way of packing as received.

Check the equipment and accessories for potential transport damages. If there is any damage visible on the equipment, a claim must be filled in writing with the freight forwarder; a notification to the freight forwarder is obligatory so that the shipment can be examined. Inform MRC for any missing accessories and servicing or repairing.

Accessories lists

Part Number	Qty	Descriptions	Remarks
DSGE1802	1	Operating instructions	This document
ERSG0110	1	Fuse (250V~, 10A)	
BJGW0002	1	External circulating kit	Assembled
SZGJ0105	1	Flow adaptor L silicone	Assembled
SZGJ0115	1	Bypassing U tube silicone	Assembled
BJGW0105	1	Bath cover assembly	



Do not disassemble or exchange assembly parts and electric circuits by unauthorized personnel! Hazard of electric shock!  
In case of damaged shipment and dent, deformation or distortion of the enclosure, contact authorized local MRC distributor or MRC personnel.

### 2.1.2 Installing

Install the equipment on a rigid, nonflammable surface and well-ventilated place. The bench should be 600~800mm high for ease of operation. Keep enough space between wall and back, sides of the equipment for better ventilation. If the equipment is installed on an unstable surface or floor, abnormal noise may be generated.

The voltage, frequency and current of the power supply must be rated at least the same as those designated on the name plate of the equipment. The switch board is recommended to be on the back right side of the equipment and equipped with outlet matching the power plug of the equipment with protective ground (PE).

For possible wet location conditions, where cycle of evaporating and condensing, overflowing or spillage may occur and for protection against hazard of possible electric shock, use power socket with appropriate IP protection and additional residual current circuit breaker (RCD) with rated breaking capacity!



The minimum distance away from the ventilating holes at the back or sides of the equipment to the wall, furniture or other installations shall be 300mm! The inlets of fresh air and outlets of exhausting air of the immersion controller shall be kept clear of any obstacles, so that no close-loop of the air circulating may develop.



Keep the equipment away from hot-air emitting source, direct sunshine, strong magnetic field and electric sparks!  
Neither contamination of high concentration dust or corrosive gas, nor strong airflow surrounds!



Voltage, frequency and current for power supply must meet the requirements as designated on the nameplate! Use power socket matching the power plug of the equipment. Hot line (L) and neutral line (N) for single phase equipment must not be reversed!



Socket for power supply must be equipped with protective ground (PE) to prevent against hazard of possible electric shock.

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### 2.1.3 Connecting to an application system where necessary

The external circulating pipe, including flexible tubing and hose, shall be connected only after the equipment and application system are well seated and installed. The length and distribution path shall be as short as possible and be so arranged that no kink and other mechanical stress develops during normal use which otherwise may result in thermal and/or liquid hazards!

Flexible hoses, fittings and couplings are important for the safe operation of the equipment; Use only hoses, fittings and couplings provided with the equipment or recommended by MRC!

The ratings of pressure and temperature for the hoses, fittings and the jacket, container or heat exchanger of the application system, their chemical resistance to the heat transfer liquid shall meet requirements of the operating temperature and/or pressure range of the heat transfer liquid to be delivered by the equipment!

Thermal insulation for hoses, fittings, couplings and the application system is important for performance and safety! The materials of the insulation shall meet the requirements of the maximum operating temperature range!

Keep the cables and wiring protected by conduit and/or hose and well secured; keep them clearly away from direct contact with any exposed heated parts of the equipment and application system!



## 2.2 Descriptions

### 2.2.1 Front view (Fig 1)



**Fig 1 Front view**

- ① The immersion controller
- ② Exhausting openings
- ③ Fresh air inlets

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### 2.2.2 Back view (Fig 2)



**Fig 2 Back view**

- ① Power cable (15A max)
- ② IEC plug
- ③ Bypassing tubing
- ④ Exhausting openings
- ⑤ Liquid connection (outlet)
- ⑥ Liquid connection (return)
- ⑦ Drain device

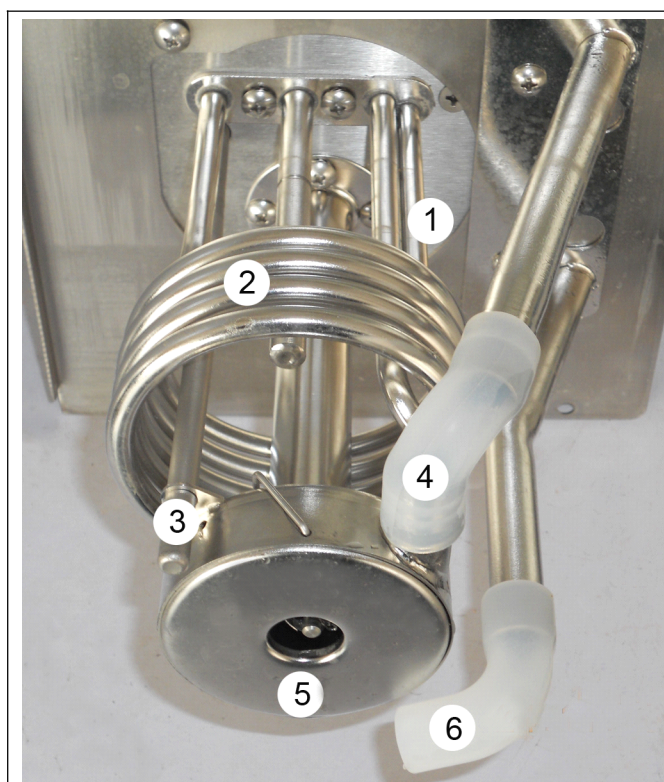
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The inlets of fresh air and outlets of exhausting air of the equipment shall be kept clear of any obstacles, so that no close-loop of the air circulating may develop.

If no external circulating is necessary, use hoses, fittings and couplings to short-circuit the liquid connections as for an external application system!

The equipment is not applicable for specimen or application system which develops tremendous energy as result of reacting, dissolving or mixing under operating temperature range for normal use!

### 2.2.3 The immersion controller (Fig 3)



**Fig 3 The immersion controller**

- ① Independent safety temperature limiter (STB)
- ② Heater coil
- ③ Temperature sensor Pt100
- ④ Pump outlet with connection to the external circulating kit
- ⑤ Pump inlet
- ⑥ External circulating return with flow adaptor

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The connection to the pump outlet and external circulating kit shall be hydraulically tight! Loose connection may result in hazard of liquid spray!

The pump inlet shall be clear of any obstacles! The minimum distance for the pump inlet to the bath bottom shall be 20mm. Sometimes a piece of paper mark from the specimen, gauze or collection of dirt may block the flow of the pump and circulation, resulting in degradation of performance and overheating!

The flow rate and direction at the external circulating return may also influence the performance and safety of the equipment! Reduced flow may produce an uneven circulating of the liquid and temperature distribution, while strong circulating may lead to overflow or splash of the liquid! Flow adaptor or limiter may be used for proper adjustment of the flow rate and direction.

The independent safety temperature limiter (STB) is important for safety. The STB is incorporated for

protection against hazard of run-dry while heating is in progress. The STB resets automatically once temperature resumes to below designated limit value if gentle and slow triggering happens. However the reset of the STB is not possible if sudden and rapid temperature rising occurs while continuous heating without any liquid.

For regular check of the STB for safety, refer to 4.2 for detailed procedures.



The first time powering up after repairing or standstill for long period, or at 6 months intervals under normal use, check the functionality of the following parts or components:

Cutout capability of the safety temperature limiter (STB)!

## 2.2.4 Put into operation

Use non-flammable heat transfer liquid only!

If an application system is connected, additional liquid may be necessary for appropriate level once initiated.

### **Class I/NFL** Caution, Risk of fire!

The equipment is designed for operation with non-flammable heat transfer liquids only! Water and mixture of water and glycol are the most popular non-flammable heat transfer liquids appropriate for the equipment.

No silicone oil is allowed for use with this series of the equipment. The internal silicone rubber parts may swell when in contact with silicone oil resulting in leakage of the liquid!

For engineering change related to the use of silicone oil or other liquid, consult your local MRC distributor or MRC technician! The use of inappropriate liquid may adversely affect the performance and safety of the equipment!



### Caution, Hazard of overflowing or low level!

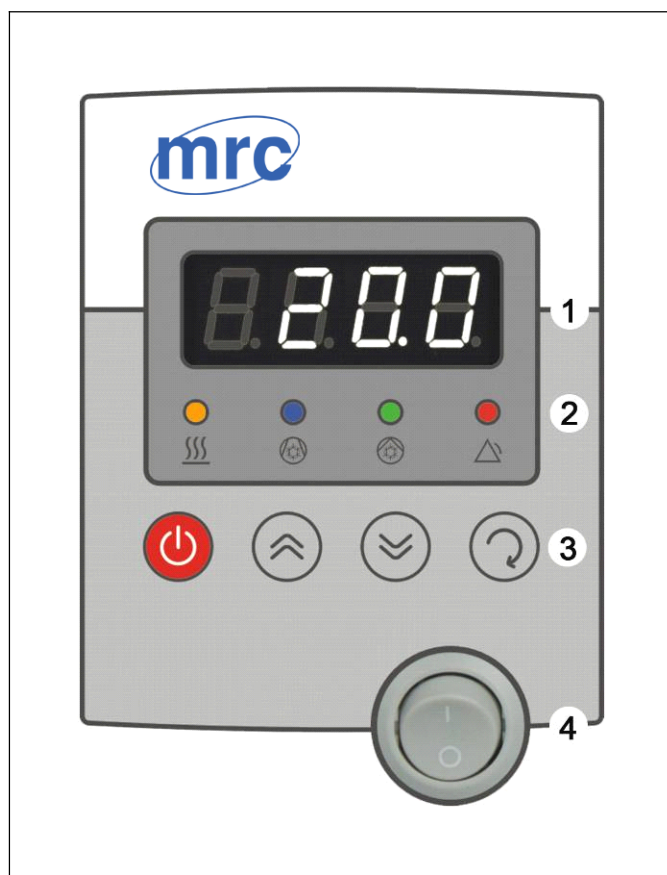
Never attempt to initiate the equipment if no heat transfer liquid is filled or filling volume is lower than the minimum level as specified; Never move the equipment if the bath tank is fully filled with the heat transfer liquid; The liquid level may change with the heating and cooling of the equipment!

Disconnect the application system from the equipment only after proper draining of the heat transfer liquid, especially when the application system is charged to maximum volume by additional filling of the liquid! The liquid level will change significantly with the immersion or removal of the specimen!

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## Chapter 3 Controller descriptions and operation

### 3.1 Controller panel (Fig 4)



**Fig 4 Controller panel**

- ① Temperature and working parameter display
- ② Status display
- ③ Key
- ④ Power switch

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#### 3.1.1 Display for temperature and working parameters

Normally it displays the bath temperature once switched on and initiated or *OFF* when standstill.

Other possible symbols include: *SEt*, *HL*, *LL*, *COOL*, *AUTO*, *ALC*, *defL*, *ESc*, *Stb*. Related definitions are as follows:

*SEt*: Setting of working temperature, must be 5°C higher than low limit *LL* and 5°C lower than the high limit *HL*. The temperature setting beyond the scope will not be accepted.

*HL*: This parameter is an absolute value and used for reminding only. When temperature in the bath is higher than the set value, *HL* is displayed. The controller will trigger a beeping alarm and disable the heating. While the actual temperature is higher than the *HL* setting, the *HL* may be set to a


higher value by pressing  so that *HL* beeping can be cleared. If the actual temperature is recovered to lower than the *HL* setting, the *HL* alarm will disappear automatically with seconds of


delay, or may be cleared immediately by pressing . The heating is possible only if the *HL* is cleared.

*LL*: This parameter is an absolute value and used for reminding only. When temperature in the bath is



lower than the set value,  $L_L$  is displayed. The controller will trigger a beeping alarm. While the actual temperature is lower than the  $L_L$  setting, the  $L_L$  may be set to a lower value by

pressing  so that  $L_L$  beeping can be cleared. If the actual temperature is recovered to higher than the  $L_L$  setting, the  $L_L$  alarm will disappear automatically with seconds of delay, or may

be cleared immediately by pressing .

$Comp$ : Control parameter for compressor, and select among  $Auto$ ,  $on$  and  $off$ , which means as follows:

$Auto$ : Compressor works automatically as controlled by the difference between set and actual temperatures;

$on$ : Compressor works continuously;


$off$ : Compressor is disabled.

$Auto$ : Select between  $off$  and  $on$ , which means manually starting and automatically starting.

$ATC$ : Absolute temperature calibration (ATC), when the temperature displayed differs from the temperature measured by a standard thermometer, ATC is used to calibrate the display.



$def$ : Return to the factory default setting. It may be used when system halts or any other abnormal situation occurs.



$Esc$ : Exit the  $Set$  menu.



$STB$ : The independent safety temperature limiter (STB) is triggered, resulting from localized overheating or low level. Once  $STB$  alarm is triggered,  LED flashes for warning and both the heating and circulating pump are disabled. The warning and protection against heating and circulating are locked even if the level is recovered. The automatic resetting is possible only when the temperature in the bath is lower than a designated safe limit.


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### 3.1.2 Working status indicating

 Heater: Press  for more than 2 seconds to initiate the circulating pump. Orange LED will be steadily lit with full power heating; When LED flashes, the heating power is automatically adjusted to meet actual need. LED flashing frequency keeps constant when temperature is stabilized.

 Circulating pump: Press  for more than 2 seconds to initiate the circulating pump with LED on, after which the heating operation is possible.

 Circulating pump: Press  for more than 2 seconds to initiate the circulating pump with LED on, after which the heating operation is possible.

 Alarm: for hot-gas bypassing or alarm. For this series of products, alarm only. Red LED is on, when there is beeping and warning for safety or error is triggered.

The warning or error of the sensor may be accompanied by the following:

*Err1*: Warning of temperature sensor short-circuit.

*Err2*: Warning of temperature sensor open-circuit.

*Overh*: Warning of the bath temperature far beyond *Ht*.

### 3.1.3 The key functions and navigate the menu (Fig 4)

There're 4 keys as follows. The function and their operation are summarized and listed in the table:



KEY	NO	FUNCTION	OPERATION	REMARKS
	1	Initiate or terminate pump circulating	Press and hold the key for more than 2 seconds.	Temperature regulating is possible only if the circulating pump is initiated.
	2	Set the working temperature	Press the button for less than 1 second.	After showing <i>SEt</i> , press  to enter, change the digits by pressing  , accept the setting by pressing .
	3	Set the working parameters	Press and hold the key for more than 2 seconds.	<p>a) <i>HL</i> is first displayed, press  for <i>LE</i>, <i>COOL</i>, <i>Auto</i>, <i>REc</i> and <i>dEFt</i>, use <i>ESC</i> for exit;</p> <p>b) Press  to enter for change of a definite setting of the working parameter, for example <i>HL</i>.</p> <p>Change the digits or setting by pressing  , accept the setting by pressing , or confirmed and exit automatically in 4 seconds.</p>
	4	Move between settings or increase the value	Press the key shortly	
	5	Move between settings or decrease the value	Press the key shortly	

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### 3.2 Set the working parameters

1) Set the working temperature







Refer to No.2 in the table.

2) Set high temperature limit value

Press for more than 2 seconds until *HL* is displayed. Press to enter *HL* setting. Original

$H\bar{L}$  value is displayed, and press   to get the desired value. Press  to confirm and exit the set up screen or exit automatically in 4 seconds.

### 3) Set low temperature limit value

Press  for more than 2 seconds until  $H\bar{L}$  is displayed. Scroll the menu by  until screen displays  $L\bar{L}$ . Press  to enter  $L\bar{L}$  setting. Original  $L\bar{L}$  value is displayed, press   to get the desired value. Press  to confirm and exit the set up screen or exit automatically in 4 seconds.

## 3.3 Constant temperature control


### 1) Connect the power by inserting the power plug, or engage the circuit breaker on the switch board.

Turn on power switch and the controller runs self-check to display:  $8888$ , LED on, software version number  $u1.98$ ,  $RoFF$  ( $RoN$  will show up if  $R_{uto}$  is set to  $RoN$ ) settings for  $H\bar{L}$ ,  $L\bar{L}$ . Refer to 3.5 for procedures about  $RoN$  and  $RoFF$  setting. The software version number may change with technique updates.

### 2) Check and/or set the working temperature, refer to No.2 in the table.

3) If the equipment is in the standby state, press  for more than 2 seconds, the circulating pump will start to operate and the heater is on if the setting is higher than the actual temperature.

4) When the temperature in the bath is lower than the set value, heating LED is on and the equipment is in operation and start to heat. When the set temperature and actual temperature are quite different, heating LED will be steadily lit with full power heating and the temperature will go up with full speed. As the temperature approaches the set point, the LED flashes as desired and the controller decreases the power for the heater. With the actual temperature equals to the set temperature, the controller keeps the temperature by constant power output.

5) To terminate the temperature control, press  for more than 2 seconds. The circulating pump and heater are stopped. The LEDs go off, and the display shows  $oFF$ .



Connect the power from behind the equipment. Plug in and remove the cable by directly holding the plug. No dragging of cable in any part. Protect the cable from being damaged by contacting with the hot surface of the equipment or mouse etc!

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Caution, Hazard of overflowing or low level!

Never attempt to initiate the equipment if no heat transfer liquid is filled or filling volume is lower than the minimum level as specified; Never move the equipment if the bath tank is fully filled with the heat transfer liquid; The liquid level may change with the heating and cooling of the equipment!

Disconnect the application system from the equipment only after proper draining of the heat transfer liquid, especially when the application system is charged to maximum volume by additional filling of the liquid! The liquid level will change significantly with the immersion or removal of the specimen!

**Class I/NFL** Caution, Risk of fire!

The equipment is designed for operation with non-flammable heat transfer liquids only! Water and mixture of water and glycol are the most popular non-flammable heat transfer liquids appropriate for the equipment.

No silicone oil is allowed for use with this series of the equipment. The internal silicone rubber parts may swell when in contact with silicone oil resulting in leakage of the liquid!

For engineering change related to the use of silicone oil or other liquid, consult your local MRC distributor or MRC technician! The use of inappropriate liquid may adversely affect the performance and safety of the equipment!

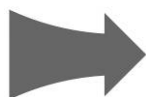


The circulation of the heat transfer liquid is important for performance and safety! The kinematic viscosity, immersion and distribution of the specimen and, flow resistance of the application system and the circulating tubing significantly influence the circulation of the liquid!

The first time commissioned for use or when exchange of the heat transfer liquid and, immediately after startup of the circulating pump, check if any liquid leakage exists in the external circulating tubing and fittings, if head pressure of the pump and flow of the heat transfer liquid are in their rated range and, if the liquid level is in its range for safe operation!

Mixing and use of heat transfer liquids with different physical and/or chemical properties may adversely affect the performance and safety of the equipment! The liquid shall be completely drained and removed before attempting to charge the other. When necessary, consult MRC or supplier of the liquid for particular application!

Never touch or attempt to handle the heat transfer liquid with temperature higher than +60°C! Caution, burn hazard!



Install an extraction system over the bath opening, if the operating of the equipment could lead to liberation of hazardous air or gas mixture, for example the evaporation of the heat transfer liquid! The rating of the fume hood shall be at least the maximum possible exhausting temperature! If necessary for safety, additional temperature limiting and warning devices, condensate accumulator shall be installed for the extraction system!

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### 3.4 Absolute temperature calibration (ATC)

- 1) If the temperature display is away from the actual temperature as measured by standard



thermometer, the display temperature needs to be calibrated by this function.






- 2) Set the bath at temperature of 40.0°C for calibration. Wait until temperature is stabilized. Read the temperature of the standard thermometer.


- 3) Press  for more than 2 seconds until screen displays *HL*. Scroll the menu by  until screen displays *ALC*. Press  to enter. Original value will show up, then press  to modify the value as available from the standard thermometer. Press  to confirm and exit the set up screen or exit automatically in 4 seconds.




The temperature in the bath must be kept in constant and the standard thermometer be kept in the bath center for at least 30 minutes, before performing calibration. During heating up or cooling down, the temperature distribution is not even and the readings both from thermometer and the controller are not typical thus not appropriate for calibration.

### 3.5 Auto setting for *RoN* and *RoFF*

- Press  for more than 2 seconds until screen displays *HL*. Scroll the menu by  until *Auto* is displayed, then press  to enter. Use   to select between *RoN* and *RoFF*.

For automatic power-on function, use *RoN*, and press  to confirm and exit the setting. In this case, the equipment will automatically resumes to the status before power being interrupted.





If the mode is set to *RoFF*, press  for more than 2 seconds to start the equipment where necessary.



*Auto* mode setting is designed to protect the equipment from power failure and make it efficient, uninterrupted operation. You are recommended to set *RoN* mode if operating for more than 24 hours is desired.

### 3.6 Set default parameters

- 1) It may be used to recover data and functional parameters when system halts or any other abnormal situation occurs.

- 2) Press  for more than 2 seconds until screen display *HL*. Scroll the menu by  until *dEFL* is displayed, then press  for more than 2 seconds until *dEFL* flashes. Press 


again for less than 1 second to accept the default setting until *donE* is displayed and it exits automatically.



Accidental power failure or interference, the abnormal situation will happen such as the equipment may not be able to achieve normal temperature controlling, alarm may not be cleared or abnormal temperature displays etc. Try *dEFL* command first to recover default settings.

### 3.7 Terminate operating



- 1) Press  for more than 2 seconds. The circulating pump and the heater stop simultaneously.
- 2) Disconnect the power by turning off the power switch, removing the power plug, or disengaging the residual current circuit breaker (RCD).



Pull the temperature of the heat transfer liquid as close as possible to the ambient before attempting to shut down the equipment, except when operations as such are prohibited for the specimen or the application system! Warning, Hazards of burn and possible electric shock resultant from unattended hot temperature, condensing and degraded dielectric strength!



Caution: Risk of frozen hazard!

When water is employed as heat transfer liquid, and when intended for standstill for long period and when experiencing low ambient is possible, run the equipment at operating temperature close to ambient for at least 1hr. Drain the bath containing water, and remove the water completely. Disconnect the equipment and remove the mains plug from power source.

No draining of the heat transfer liquid with potential of chemical or biological hazard! Collect and identify the heat transfer liquid for future use! Consult MRC or manufacturer of the liquid for proper disposal!

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## Chapter 4 Maintenance

### 4.1 Regular maintenance

- 1) Clean the bath interior and exterior of the equipment periodically to keep the equipment clean;
- 2) Check for hydraulic tightness and fastening of the connections for flexible hoses, fittings and couplings;
- 3) Check fixing screws periodically, and if any loose, fix it.




Remove the plug from power line before cleaning. Use soft dry tissue to clean the bath interior and avoid any splashing or washing!

If any water or other materials fall into the equipment containing electric and/or electronic parts and components, disconnect the power immediately. Power on only after water is completely evaporated or removed.

### 4.2 Regular check of the STB

Regular check of the STB is required for safe operation. Intervals of six months for normal use, or the first time powering up after repairing or standstill for long period, are recommended for regular check of the functionality. Check the STB as follows:

- 1) Set the temperature at 10°C above the ambient and/or the liquid, so that it keeps heating,  LED is continuously on;
- 2) Initiate the temperature control as for normal use, i.e. the pump is circulating and heating is in full capacity;
- 3) Drain the bath so that the heater and the STB are exposed to the air completely. Make sure no liquid spraying out from the circulating return, dripping from the drain device on the bench or floor;
- 4) The liquid evaporates immediately from hot surface of the heating coil. Keep running dry for a couple of seconds until the *SAFE* warning is displayed. Caution, Never run dry for more than 90s!
- 5) Close the drain device, and fill the tank with water. The STB resets automatically once temperature resumes to below designated limit value.



Caution, Risk of burn hazard and liquid spillage!

Do not touch hot surface of the heating coil! Keep away from dripping hot liquid or evaporating hot steam! Use protective gloves or glasses if necessary!

Never run dry for more than 90s! Overheating of the coil may damage the heater or degrade its insulation strength!



The first time powering up after repairing or standstill for long period, or at 6 months intervals under normal use, check the functionality of the following parts or components:

Cutout capability of the safety temperature limiter (STB)!

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### 4.3 Checking and replacing the fuse (Fig 5)

With the mains plug connected and power switch in “on” position and if no LED and digits display, check the fuse first. If any doubt that checking and replacing fuse is necessary, use a fuse with the same size and capacity as rated and do as follows:

- 1) Make sure the mains plug has been removed;
- 2) Unloosen the two screws on the top and 4 screws at the back of the controller as shown in Fig 5. Remove the cove plate and check or replace the fuse;
- 3) Replace the cover and fasten the six screws.



Do not disassemble or exchange assembly parts and electric circuits! Hazard of possible electric shock!

Except for replacing the fuse, there is no other part necessary for customer to disassemble or repair. If repairing is desired, contact with authorized engineer.

Always remove the mains plug from the power socket when performing checking or replacing the fuse, and never use any fuse different from the original one. Secure the fuse once checked or replaced. For servicing or maintenance, call authorized service engineer.



**Fig 5 Checking and replacing the fuse**

- ① Main fuse (10A)  
② Terminal for Pt100

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#### 4.4 Clear error, warning and alarm

When the equipment displays *E-01*, *E-02*, check the connections of the Pt100 where necessary.

*E-01* and *E-02* are indications for short-circuit and open-circuit of the temperature sensor PT100.

For inspection, remove the screws for the controller cover as for checking and replacing of the fuse (Fig 5). Check the wire connecting terminals of the PCBA for the temperature sensor, and make sure no short-circuit or open-circuit occurs. If necessary, a multimeter may be used for the resistance of the Pt100. The value of the sensor is  $100\Omega@0^{\circ}\text{C}$  and  $+0.385\Omega/^{\circ}\text{C}$ . At  $26^{\circ}\text{C}$  ambient, the resistance of the sensor is about  $110\Omega$ .

In most cases, loose wiring and terminating rather than open-circuit of the Pt100 sensor could trigger an error and alarm. Once fixed, those alarms will disappear when switching on the power again. If alarm still exists with Pt100 checked or replaced, and for servicing or maintenance, call authorized service engineer.

When the equipment displays *Stb*, try first to pull down the temperature of the heater or the heat transfer liquid and find the cause of the over temperature. The STB resets automatically once temperature resumes to below designated limit value. Reboot the controller by powering off and on again, and the normal operation of the temperature control will resume. If warning still exists with STB checked or reset, and for servicing or maintenance, call authorized service engineer.

When the equipment displays alarm *ourh*, cut off power and deal with the equipment as 3.6 after bath temperature goes down close to ambient, then turn on power again. If alarm still exists with Pt100 checked or replaced, and for servicing or maintenance, call authorized service engineer.

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## Chapter 5 Features and Specifications

### 5.1 Key features

- ✓ SMT assembled and microprocessor-based precise dynamic temperature control with temperature stability up to  $\pm 0.02^{\circ}\text{C}$ ;
- ✓ Independent immersion controller head, DIY for precise temperature system with different bath capacity and style;
- ✓ Immersion bath and external circulator in one unit, helps you to save money and make more space;
- ✓ Absolute temperature calibration (ATC) for accurate temperature control and AUTO-restart after power failure for continuous uninterrupted operation;
- ✓ Designed to be distributed in Europe, North America, Japan, Australia and India.

### 5.2 Specifications

Models		WBL-118
Temperature range	$^{\circ}\text{C}$	-28~+95
Pump flow rate max	L/min	12
Pump pressure max	mbar	300
Stability	$^{\circ}\text{C}$	$\pm 0.05 \sim 0.1$
Setting resolution	$^{\circ}\text{C}$	0.1
Display resolution	$^{\circ}\text{C}$	0.1
Heater wattage	W	1500
Cooling Capacity@20 $^{\circ}\text{C BT/RT}$	W	300
ACC temperature	$^{\circ}\text{C}$	40
Bath material		TIG welded, SUS 304
House materials		SPCC steel with powder coating
Liquid connections		Nipple, 1/2", 12/7mm (od)
Safety class DIN 12876		Class I/NFL, non-flammable heat transfer liquid, No silicone oil Optional Class II/FL, Class III/FL
EMC for Europe		Class B according to EN 61326-1
EMC for USA and Canada		Class A, for operation only on networks without connected domestic areas
Duty cycle		Continuous
Bath size	mm	170W x 350D x 160H
Bath opening	mm	166W x 175D
Overall dimensions	mm	260W x 510D x 607H
Immersion depth	mm	160
Automation and safety		ATC, Temperature sensor failure cutoff and alarm, high-temperature cutoff and low temperature alarm, blocked pump motor, auto-restart after power failure and run-dry protection
Power supply		230V~, 50/60Hz; 120V~, 60Hz; 100V~, 50/60Hz

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WBL-118



## WBL-Series, Digital Refrigerated Bath &amp; Circulator

Model	WBL-118
Temperature range	-28°C~90°C
Temp. stability	±0.05~0.1°C
Display resolution	0.1°C
Volume	5L
Heater wattage	1500W
Cooling capacity 20/20°C <sup>a)</sup>	300W
ACC Working temperature <sup>b)</sup>	1600°C
Pressure pump	Pressure: 200Mbar, Flowrate: 15L/min
Refrigerant	R134a
Liquid	Class I/NFL
Bath materials	Wwided bath with stainless steel
Housing materials	SPCC steel with powder coating
Interior size	W170xD190xH160
Bath opening	W170xD180
Outside dimensions	W235xD505xH610
Duty cycle	Continuous
Auxiliaries	ATC, temperature sensor failure cutoff and alarm, high-temperature cutoff and low temperature alarm, block pump motor, auto-restart after power failure and run-dry protection
Power	220-230V, 50/60Hz; 120V,60Hz; 100V,50/60Hz

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## WBLD-Series, Refrigeration Capacity Recyclable Coolers



WBLD-Series

**Features:**

It is particularly suitable for measuring chemical, biological and physical experiment in low temperature, it is used for grouping instrument of pharmaceutical health, foodstuff, chemistry and university or academic institution, including reaction vessel rapid cooling, low temperature moulds, frozen processing fixture and low testing machine cooling.

- Chemistry, biological area: atomic absorption ICP, ICP-MS, NMR, CCD, biological fermentor, Chemical reactor, synthetic tank and so on.
- Material area: SEM TEM X ray scattering, X fluorescence, magnetron sputtering vacuum coating machine laser.
- With low noise and high reliability, Internationally famous fully closed compressor ensure long-term work.
- Circulating pump is domestic high performance or high pressure vane pump imported with original

packaging, pressure vane pump can be adjusted, high quality.

- Closed circulating system can avoid refrigerating medium evaporation and pollution, save energy.
- Circulating system is equipped with filter apparatus, clean refrigerating medium avoids instrument lin clogging
- Use environment friendly refrigerating and medium not having component of chlorofluorocarbon, Be suite for international environment refrigerating standards.
- Design in a new style, little volume, beautiful profile.
- With built-in liquid-level monitor, liquid-level inside the bath can be checked visually.
- Circulating system is equipped with pressure gauge, displays circulating system pressure.
- Many different models can meet the customers' different requirements.
- Panels on both sides can be removed easily, convenient to maintain and clean.

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Glass Reaction Kettle



Rotary Evaporator



Biological Fermentation Tank



Atomic Absorption



ICP



Nuclear Magnetic Resonance



# CHILLERS

## Recyclable Coolers

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Model	WBLD-1000	WBLD-1000G	WBLD-2000	WBLD-2000G	WBLD-3000	WBLD-3000G	WBLD-6000	WBLD-6000G
Temp. range (°C)	-10 ~ 25							
Temp. stability (°C)	±2							
power supply (V/Hz)	220V/50Hz						380V/50Hz	
Cooling capacity(W)	1000@15°C		2000@15°C		3000@15°C		6000@15°C	
Refrigeranting Madium	R134a							
Pump Flow (L/min)	30	≥7	30	≥7	30	≥16	40	≥16
Pump Pressure (Bar)	1	1-10	1	1-10	1	1-10	1.4	1-10
Dimensions L×W×H(mm)	675×426×695		675×456×775		740×490×830		1020×635×1030	

Model		WBLD-3-300	WBLD-3-700	WBLD-3-1000	WBLD-3-2500
Temp. range (°C)		-30 ~ 25			
Temp. stability (°C)		±2			
power supply (V/Hz)		220V/50Hz			380V/50Hz
Cooling capacity(W)	0°C	1240	1750	2820	7500
	-10°C	780	1070	1810	4600
	-20°C	300	700	1000	2500
	-30°C	-30	300	520	1040
Refrigeranting Medium		R410a			R404a
Pump Flow (L/Min)		30	30	30	30
Pump Pressure (Bar)		1	1	1	1.4
Dimensions (L×W×H) (mm)		675×426×695	675×456×775	740×490×830	1020×635×1030

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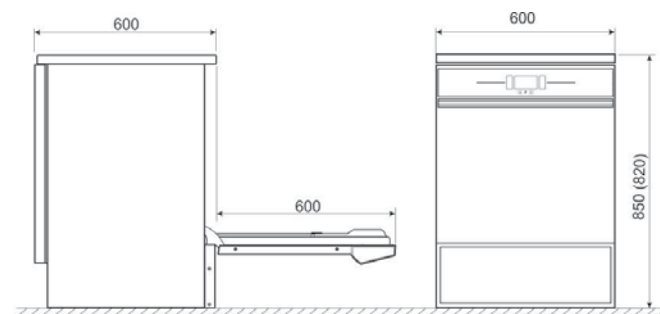




WG-0160

**WG-0160, The Easy washer of the market**

MRC has created a multipurpose washer for professional use able to wash up to 85°C (thermal disinfection) and dose liquid detergent and neutralizer by peristaltic pumps. This washer represents a perfect choice to wash and disinfect all kinds of instruments used in small laboratories, universities, schools, specialized clinics, tattoo studios, veterinary clinics, and more.



Model	WG-0160
Chamber washing volume	150L
Washing levels	2
Detergent dosing pumps	1 or 2
Washing chamber stainless steel	AISI 304
Integrated water softener	☺
Washing temp. up to °85C (Thermal disinfection)	☺
Demineralised water rinse for professional washing	☺

**Top quality materials for professional use**

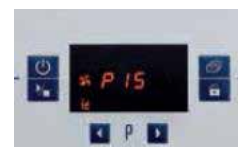
Chamber & external paneling made in high grade AISI 304 stainless steel.

**Automatic liquid dosing**

Up 2 dosing peristaltic pumps for liquid dosing. Liquid dosing increases the washing performance.

**Easy to use**

LCD display with led indicators for an easy communication. Friendly control of machine features.



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#### Features:

- The system requires no special installation, connect the system to your tap water supply, plug in the system and install the pack-it's ready to used.
- Easy to maintain and operate:
  - A unique and easy-to-install prefiltration pack unit
  - Self-maintenance of the reverse osmosis membrane.
- Save space, the tank is built-in the system.
- The system recirculates water when the system is not in use in order to maintain water quality.
- The graphic display clearly indicates all system parameters. From water quality to knowing when it is time to change the purification pack, you'll see at a glance what is need.
- For ease-of use, the main purification technologies are contained in an innovative all-in-one pack that mean you can change it in just a couple of minutes.
- Data storage and RS 232/USB communication port.

#### WPF-90D, Deionized Water System, Tap Water Inlet

##### Detail Advantages:

- Super-large LCD display, display the system running state and various parameters intuitively.
- Automatic micro-computer system, multi-menu operating, animation mode display.
- Fault automatically detect, automatic diagnosis.
- Water quality over standard alarm, no water alarm, consumables end alarm function.
- Consumables residual life shows, inform the user to replace consumables timely.
- 3 road on-line water quality monitoring, monitor the inlet, RO and Ultra pure water's quality timely.
- Built-in system disinfection procedure, realize the disinfection of ultra pure water's tube.
- Embedded sterilization program to achieve full pipeline disinfection.
- Unique design of consumables, easy for replacement.
- Built-in 20 liters water tank to save place, external tank is available demands.
- RS232 interface could record water quality automatically by attaching to external device. The traceability is ensured.
- Molding process, high-strength plastic shell, beautiful appearance.
- RO membrane of DOW, stable operation and high desalinization rate.
- Dow's nuclear-grade resin.
- 0.2µm polyether alternative compound filter terminal disinfection filter.
- Fast-plug pipeline, hygienic and quick.
- Pipeline with NSF authorization to assure high quality ultra-pure water.



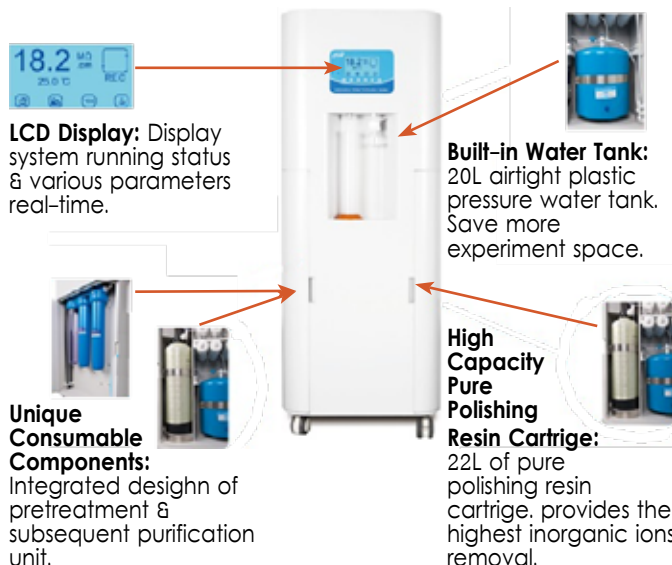
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# WATER-PURIFICATION Laboratory Water Purification Systems

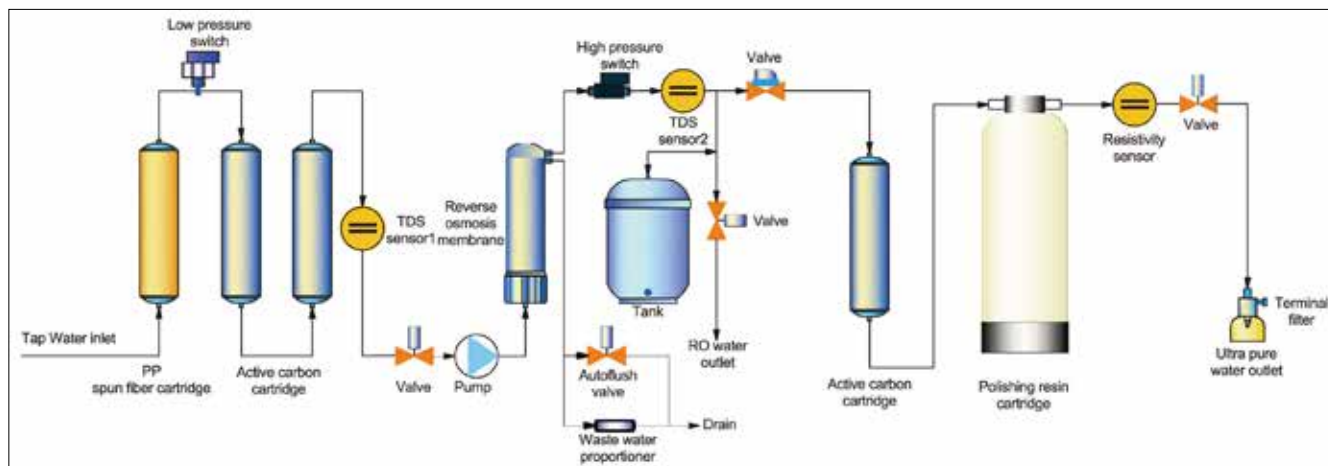
## Application:

Biochemical analyser inlet, ultra water purification system inlet. Microbiological media preparation water, fine chemical, chemical & biochemical reagent configuration. Buffer a configuration, photographic flush, ion chromatography, etc

**Feed water:** Potable tap water:  
TDS<200ppm, 5-40°C,  
1.0 ~ 3.5Kg/cm2.



## Flow schematic:



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Model	WPF-90D
Flow rate of DI water	90 liters/hour
Flow rate of RO water	≥1.5liters/min
Resistivity of DI water	>10 MΩ/cm
Conductivity of RO wate	< 0.05 x Source Water Conductivity
Granular(>0.2μm)	<1/ml
Microbe	<1cfu/ml
Feed water requirements	tap water, temperature: 5-45°C, pressure: 1.0-4.0Kg/cm2
Dimension / Weight	L x W x H: 570×600×1500mm / Weight: about 60Kg
<b>Working conditions</b>	
Environmental temp.	5°C ~ 35°C
Relative humidity	20% ~ 80%
Electrical Requirements	AC110-220V,50/60Hz; 240W



WPF-RO-45

### WPF-RO-45, RO water system (Floor-stand, tap water inlet)

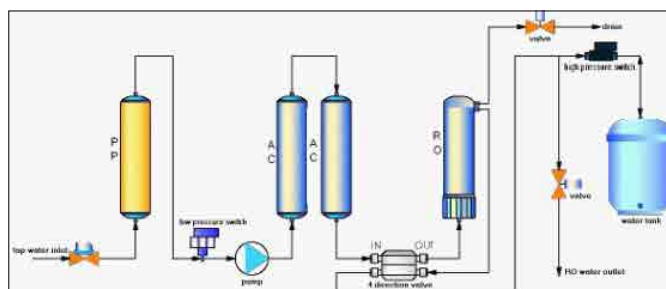
#### Application:

Feed water for ultrapure water system, glass washing, agricultural experiment, aquaculture, animal drinking water, thermostatic horizontal wet equipment, humidifier used water and autoclave etc.

#### Feed water

#### Flow schematic:

- LV.1 20' spun fiber filter
- LV.2 20' granular active carbon filter
- LV.3 20' active carbon block filter
- LV.4 300GPD RO membrane
- LV.5 10' accutive active carbon filter.



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#### Performance Characteristics:

- Micro-computer control
- Large LED display, have the acousto-optic alarm function
- Built-in RO membrane antiscaling timing automatic flush procedures
- Various specifications storage tanks can be selected to meet different needs
- Stainless steel chassis, eliminate corrosion and rust, ensure the body's clean, composite GLP norms
- Floor-stand design, bottom sets activities, make installation and moving more convenient
- All lines have NSF approval, new fast insert connector, replace and maintain the filter column conveniently
- RO membrane, manufactured by DOW or CSM, to assure RO membrane's long time and high quality of pure water.

#### Standard configuration:

Host (1 set of filter cartridge) + 40 litres storage tank + Installation package.

#### Remarks:

- Feed water: TDS200ppm, 25°C, 50psi and 15% recyclable.
- GPD = gallon/day, 1gallon = 3.8liter.
- The quality of feed water will influence the quality of pure water and filter life.

PF: Pretreatment filter; AC: Active carbon; RO: Reverse osmosis.

Model	WPF-RO-45
Flow rate (25°C)	45 litres/hour*
Instant flow rate	>1.5litres/min (need pressure storage tank)
RO water TDS (ppm)	5-10 (salt rejection ≥95%)*
Inorganic ion	>95%
Organic rejection	>99% (Molecular weight>100)
Particulates	>99%
Microbe	>99%
Bacteria	<1CFU/ml (0.2µm PES terminal)
Granular (>0.2µm)	<1/ml (0.2µm PES terminal filter)
Outlet	1 piece: RO water
Water quality monitoring	LCD resistivity + TDS test pen
Dimension	LXWXH: 65X47X110cm
Weight	About 70Kg
Power	100-250V, 50-60Hz/120W
Working condotions	
Environmental temp.	5°C ~ 35°C
Relative humidity	20% ~ 80%



**Features:**

- High-quality stainless steel is used for enclosures which are anti-corrosive and durable. The compact structure is simple and space-saving.
- The boxes are protected with fluoride-free foam thermal cover featuring good insulation effect. The internal bladders are of fluorine-free bacterial inhibitory type. They are both energy-saving and environment-friendly.
- High-quality and high-efficient fluorine-free R134a compressors are adopted. Major parts and components have passed relevant safety certifications. The product are stable in quality and have long service life.
- The ice-making process is fully computer controlled, using imported computer chips to make control reliable and operation steady.
- The use of imported technologies and accessories makes noise low, operation smooth and reliable. Cooling holes and blower fans are deployed on top of ice makers to ensure that the motor of reducer can operate reliably even under harsh conditions at high temperature.
- The patented technology of line of chip ice-making chamber separated from the evaporator which is adopted attributes to the high cooling efficiency and large ice-making capacity.
- The screw extrusion hob-style ice-making type makes a compact structure, realizing automatic separation of ice from water. The optimal design of skate blade makes the shape of ice small and practical.
- The unique float-type water tank water inflow system ensures that there is no residual water, no ice clearance process and no water wasted, making them water and energy efficient.
- They have ice full display, water deficiency display, in operation display and malfunction warning display, etc. for shutdown protection. They will stop automatically in case of ice full or water deficiency and start automatically when ice is not full or water supply is resumed. They have automatic reminiscence function.
- The ice made is small chipped ice taking the shape of amorphous fine granular flakes, which can infiltrate into narrow space, featuring fast cooling speed, good ice bathing effect.
- There are power switch and function indicators deployed at the front with detailed instructions. They are easily perceived and available. The various safety performance indicators have passed electrical tests and therefore are safe and reliable.
- Long-term performance tests and commissioning of the machines will be performed before they leave the factory, thereby ensuring excellent performance of the product.







XBC-25/50/80

**XBC-25/50/80, Vertical Flake Ice Maker Series****Features:**

Luxurious appearance and compact design,  
Fully automatically computer controlled convenient for use.  
Automatic detection and protection in case of operation, water deficiency  
ice full and malfunction,  
Highly efficient fluoride-free compressor energy efficient and environment-  
friendly  
Cylindrical bullet ice with elegant  
appearance.

**Applications:**

Pubs, KTV and dancing halls, gyms, cold drinks  
shops milk tea shops, cafes convenience  
stores, restaurants and other F&B and  
entertainment venues.



Model	XBC-25	XBC-50	XBC-80
Ice making capacity	25kg/24h	50kg/24h	80kg/24h
Ice storage capacity	7kg	14kg	25kg
Ice shape	Cylindrical		
Powe/Voltage	240w/220v	380w/220v	580w/220v
Product Dimension	398x542x682mm	400x510x825mm	500x612x900mm



XBC-25/50/80

**XBC-150/200/300/500/1000, Split-Type Ice Maker Series****Features:**

Split-type structure, large ice bin, large ice storage capacity and strong  
applicability  
Fully automatically computer controlled, convenient for use.  
Automatic detection and protection in case of operation, water deficiency,  
ice full and malfunction. Highly efficient fluoride-free compressor, energy  
efficient and environment-friendly.  
Square ice cubes with beautiful shape.

**Applications:**

Pubs, KTV and dancing halls, gyms,  
cold drinks shops milk tea shops, cafes,  
convenience stores, restaurants and  
other F&B and entertainment venues.



Model	XBC-150	XBC-200	XBC-300	XBC-500	XBC-1000
Ice making capacity	150kg/24h	200kg/24h	300kg/24h	500kg/24h	1000kg/24h
Ice storage capacity	105kg	145kg	210kg	280kg	470kg
Ice shape	Square				
Powe/Voltage	800w/220v	860w/220v	1150w/220v	1650w/220v	3800w/380v
Product Dimension	560x870x1580mm	560x870x1780mm	760x860x1530mm	760x860x2050mm	1220x950x2030mm

AN340

**AN340, CMM/CFM Anemometer/ Psychrometer Datalogger**

Telescoping probe with 18mm diameter vane sensor easily fits into air vents and can extend length of probe to 1m long.

Measures Air Velocity/Volume, Temperature, Humidity, Wet Bulb, and Dew Point. User can store up to 12,000 readings for data analysis.

**Common Features:**

- Telescoping 18mm diameter vane sensor extends from 0.3m up to 1m.
- Measures Air Velocity, Air Flow, Air Temperature, Humidity, Dew Point and Wet Bulb
- Manually store/recall up to 99 readings
- Automatically datalog up to 12000 readings with 12/24 hour time and date stamp
- Select data sampling rate from 1s to 4hr: 59 min: 59s
- Min/Max/Avg readings
- Data hold and Auto power off with disable
- Built-in PC Interface
- Complete with external mini vane probe, Windows® compatible software, USB cable, 6 AAA batteries, and hard carrying case.

**Applications:**

- HVAC with small ducts and vents
- Manufacturing
- Engineering
- Appliance Testing
- Research and Design.



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	Range	Basic Accuracy
m/s	0.5 to 20m/s	±3%
ft/min	100 to 3940ft/min	±3%
Temperature	-20 to 60°C	0.6°C
Humidity	0.1 to 99.9%RH	±3%RH
Wet Bulb	-20 to 60°C	
Dew Point	-20 to 60°C	
CFM/CMM	0 to 99999	
Dimensions/Weight	169x78.3x44.4mm / 210g	

### 3 Warnings



To avoid electrical shock, do not use this product with wet hands.



When operating, do not put your finger or any other objects into the migration tank.

Do not detach the control box with migration tank while in energized state. Attempting to do so can cause damage.



Please read carefully this instruction manual before operation to avoid any personal injury. Only the trained one could be qualified in operating this product.



To protect your warranty and avoid potential electrical shock, do not attempt to open or repair the product, please contact distributor or manufacturer for repair.



Put the product in a place which has low humidity and low dust, also please keep it away from water, direct sunshine / strong light, corrosive gas, high magnetic field, heater, fire and other heat source, make sure good ventilation.



Power switch located on control box, press "I" turn on, press "O" turn off.



Turn off after operation, when this product is not in use, detach the power supply and cover it with soft cloth or plastic paper to avoid dust.

### 4. Operating guide

#### 4.1 Key Functions

Stop/Run----Short press one to run and long press 1 second to stop



-----Select output voltage .

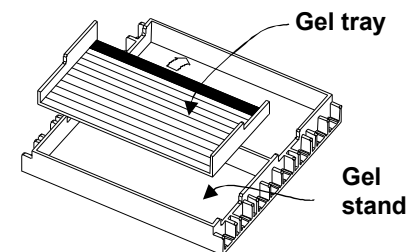


-----Time setting, when time set at "0", display "∞"

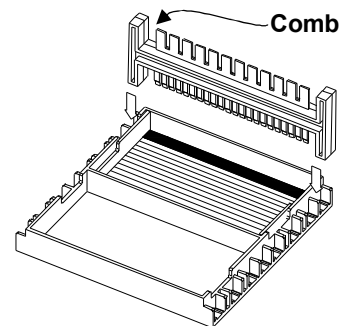
#### 4.2 Gel Preparation

4.2.1 Place the gel maker stand on a level surface, put the gel tray into the gel stand and the maximum is to have two gel tray simultaneously

Note: If the gel tray is not placed level, the thickness of the gel will not be uniform and migration may be affected.



4.2.2 Fix the comb into the gel maker stand as per photo on the right



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