

WALK IN TEMPERATURE AND HUMIDITY CONTROL TEST CHAMBER



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Hapten now brings high quality temperature and humidity control chamber with large capacity that can meet every customer's requirement, custom designs are also available. It's flexible and user friendly technology will fulfil the requirements of building ideal chamber.

Whether be technology related applications or research based applications or agriculture based applications, test requiring temperature and humidity control are necessary. HAPTEN's walk-in type temperature and humidity control chamber allows you to perform test of large capacities, its upgraded performance gives reliability, automated operation, power efficiency and custom design in standard prices

SALIENT FEATURES:

- Customized specifications like

Temperature range	Highest adjustable temperature range can be increased according to users requirement
Refrigeration system	As per customers request lowest temperature can be made more low from -40°C
Humidity range	humidity range can be increased according to users requirement
Custom shape and size	Chamber with capacity higher than standard size can be ordered.
Shielding	Shielding to eliminate electromagnetic interference can be installed on customers request
Noise reduction specification	A noise absorbing unit can be installed to reduce noise.

- Choice of capacity for bench top, reach in, walk in models.
- Paperless recorder.-records temperature and humidity inside the chamber of each section.
- Choice of doors – single swing door or double swing door can be attached on requirement.
- RS232/RS485 interface.
- Door open and Door close alarm system.
- Inbuilt calibration system.
-
- Colour touch panel.
- Viewing window with automatic defogging.

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- Temperature and humidity controlled by microprocessor based system.

HMI+ PLC IN ONE UNIT:

- **CFC FREE REFRIGERATION UNIT**
- **Less use of electrical and mechanical components on the top and bottom of chamber**-Provides easy maintenance of chamber, increases durability because of proper air circulation; cooling systems kept at bottom of the chamber to provide proper environment for compressor.
- **Full opening door with silicone gaskets and hinged on left side**-Allows ease of complete access to the chamber and opening of door with less force; durable silicon gasket reduces temperature loss.
- **Heated viewing window**-Heated viewing window allows viewing fog generated and proper viewing of the test sample.
- **Circulation fan with variable speed-**
 - **Electrical efficiency** : Variable speed motor saves money by reducing energy bills, as it consumes less electricity than conventional motor.
 - **Cooling efficiency** : Variable speed enables gaining air conditioning efficiency or SEER.
 - **Air quality** : Variable speed motor helps clean the air efficiently. When the fan is in constant operation (indicated by the "Fan" setting on thermostat), the motor continues to slowly circulate air, allowing filters to capture more contaminants.
 - **Humidity control** : Variable speed motor combined with a Thermostat allows controlling the amount of humidity.
 - **Quieter operation** : Variable speed blower motor are significantly quieter than its single-speed counterpart.

- **Air cooled refrigerated system**-Air cooled refrigeration system offer various benefits like :
 - low fan power consumption

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- resistant to corrosion and freezing conditions
 - requires very low maintenance
 - Guaranteed long life operation
- **PCRC sheet body**-Powder coated steel body assures corrosion resistant chamber and allows working of chamber at high temperature applications.
 - **Digital output** – Target and Performance Output of the chamber operations are in digital format(digits) giving precise reading.
 - **Pre-attached data logger with data analysis software**-Primary benefits of using data loggers is to automatically collect data 24-hour basis. Graph and table format of results can be produced automatically by the data logging software.
 - **Self-calibration system**-We incorporate a self-calibration system, in each chamber, that is completely automatic to prevent errors that could result from failure to calibrate. The system continuously monitors the environment, sensing changes that could affect analysis, and re-calibrates accordingly using a built-in long-life calibrator The process takes just a few seconds, without operator intervention or additional supplies, quickly optimizing system parameters for the current conditions.
 - **Open and close updates through mobile network**-Mobile technology has the potential to make services more flexible and keep informed, information anywhere at any time from mobile device, and can set alert system to know whether or not the chamber is being used.
 - **Reliable** – Construction, performance mechanism, controls and information system integration makes the equipment reliable.
 - **Precise Control of Environmental Parameters**-The set/programmable parameters of the chamber are precise or have less deviation from original value, thus ensuring correct measurement.
 - **Micro-processor based Controller**– Microprocessor based controller enables precise control of temperature, humidity, pressure and other values. Benefits:
 - Processing speed is high

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- Provides flexibility to alter the system by changing software.
- Compact in size.
- Operation and maintenance easier.
- Maintain precise values
- **Aesthetically designed-** Designed according to the standards and principles underlining industry's aesthetic values.
- **Corrosion Resistant interior and exteriors-**Corrosion resistant coatings like epoxy coatings are applied inside and outside the chamber to prevent against degradation due to moisture, salt spray, oxidation or exposure to a variety of environmental or industrial chemicals/ corrosive agents.
- **Energy Efficient** – Hapten chamber uses less energy to provide the same level of performance, comfort and convenience, thus making it energy conserving chamber.
- **CFC-free cooling-**The air cooled refrigerator use CFC (chlorofluorocarbon)-free refrigerants those are ozone friendly and eco-friendly.
- **Sturdy Construction-** Our chambers are built with robustness to withstand stress and strain, giving the chamber long life and ability to perform in extreme stress environments.
- **Low Maintenance-** Our systems benefit in retaining proper functionality over long period of time.
- **Light Weight:** Compact and superior materials ensure the chamber be light weight.

OPERATING PRINCIPLE:

The test condition (temperature and humidity) are controlled by air-jacket control system. Control is governed by the 32 Bit I/O system with integrated soft PLC. A web server can place test and diagnosis information in the intranet via Ethernet if desired.

The principle of the test is to determine the effects of different environmental parameters such as humidity, temperature applications tests involving micro-organisms, plants, tissues, electronic components etc. apart from various customized industrial and research applications.

The input temperature and humidity is given through Nano technology based hmi and plc, and the results are observed. By setting the temperature and humidity conditions, operation is automatically controlled.

There are 2 modes of testing:

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- Select the "Normal Mode" for frequently changing temperature and humidity conditions and flexible adjustments to rapid changes in the heat load generated by the sample.
- The "Power Saving Mode" keeps power consumption down for constant operation. Select either mode depending on testing circumstances.

CONSTRUCTION DETAILS :

Our Temperature and Humidity Control test chambers are double walled convection heated and cooled units. Outer body of our environmental chambers are constructed out of thick PCRC, pre coated corrosion resistant GI sheet duly pre-treated with primers and rust proofing and painted with long lasting stove enamel or elegantly powder coated. The inner chamber is made of heavy gauge stainless steel sheet of SS-304 grade). The gap between the walls is filled high grade mineral glass wool, which ensures maximum thermal efficiency in our chambers.

The unit is provided with single door opening (double door can be added on request). This door is provided with magnetic door closer. This door is provided with lock and key arrangement. The triple walled back of our Temperature and Humidity Control Test chambers are provided with two/Four/Six/Eight (size specific) air circulation fans for uniform maintenance of the temperature throughout the chamber.

HMI+ PLC IN ONE UNIT:



We provides better automatic controls for the chamber by integrating HMI and PLC together. This special feature is compelling alternative to traditional methods and provides a simplified, reduced cost control system architecture. It works by following operating steps:

- Sensors measure the physical quantity like temperature and convert them to electrical signal

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- The actuation device acts upon that electrical signal
- At HMI interface between operator and chamber occurs.
- The machine operates with the logic design controls controlled by software.
- This signal is sent to the chamber by logic control devices and the chamber operates.

Basic Features of HMI+PLC:

- **Processor of 1.6 GHz:** High clock speed processing PLC that enables speed up processing to the functions. With 1.6GHz processing speed, the PLC system is capable of multitasking, processing of large data volume, and high performance.
- **Audio Output Alarm:** Audio alarm alert in case of failures in any of the component controlling functions.
- **256 MB of RAM:** PLC of 256Mega Byte memory for running programs offers high memory space for installing of more programs
- **COM Port:** Com port provided for attaching RS 235/RS 485 cable.



- **USB Ports:** A USB port provided for transferring data through communication between HMI and PLC. Various peripherals can be connected via USB hub.



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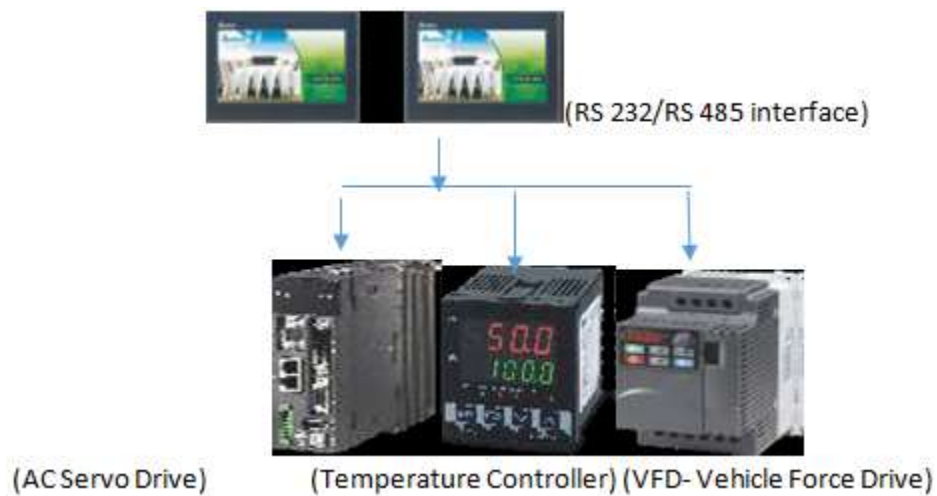


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- **Coloured Touch Panel:** We provide coloured touch panel screen available in 2 sizes -7 inches and 10inches, displaying all the control features, digital clock, sensor layouts, data and values, graphics and pictures, navigations etc.
- **RS232 or RS485 Interface:** Serial interface provided to get connectivity with internet, mobile and other data transmission. Single device to device interface and a communication bus that is used to form simple networks of multiple devices are available through RS485 interface. RS485 interface supports transmission speed of 2400, 4800, 9600, 19200, 38400 bits per second.

Through Ethernet communication module, AC Drives, temperature controller and other industrial automation products can be connected quickly.



- **Touch Screen Size of 7 Inches and 10 Inches:** HMI screen available in 2 sizes- 7inches and 10inches, as per user's requirement. Screen displays the control features, images, data values and other programs.
- **Expandable Memory with a SD Card:** SD card plugged in appropriate slot for more memory requirement that will be read and used as part of device; for long storage requirements SD card may be added and store data with expanded memory.

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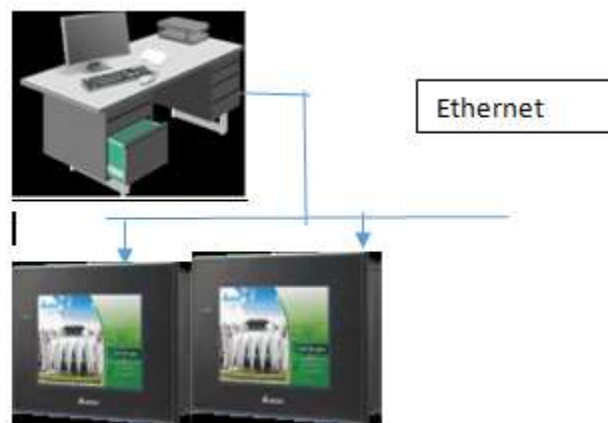
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- **High Resolution Brilliant TFT Displays, 64k Colours:** HMI screen displays 64000 different colours with good resolution, allowing large number of distinguished colours, easy to establish and work with. It shows entire new 2D drawing technique, the screen resolution enhanced for more realistic images and more colourful and vivid displays.



- **Software Supports All Six IEC 61131 Programming Languages:** Software supports all the six programming languages under international standard IEC 61131: Function Block Diagram, Ladder Diagram, Structured Text, Sequential Function Chart, Instruction List, and Continuous Function Chart.
- **E-remote Control Software:** E-remote enables viewing the monitor and same screen shown on HMI at the production site, and control the manufacturing process via Ethernet.



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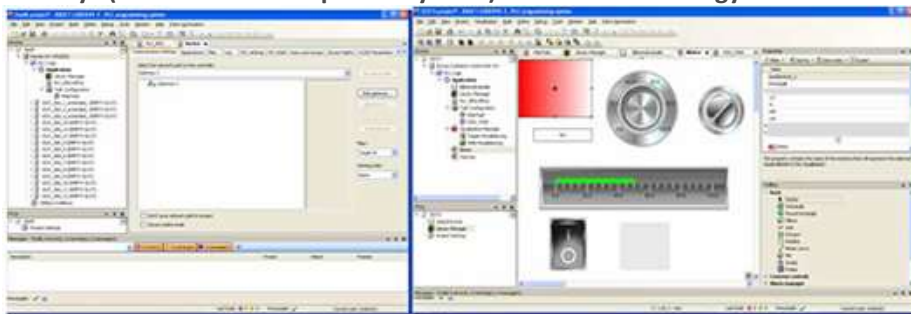


- **A set of Trouble Shooting Tools:** 3 troubleshooting tools provided with in the software
- Simulation- Imitation of a situation as real situation
- Debugging- Finding and reducing number of defects.
- Online changes- Like change of IP address can be made online. Manual to operate the programs on request.

- **Increased Numbers of On - Board I/O peripherals (10-50):** Maximum number of 50 I/O peripherals provided on request, to attach input and output devices to the HMI and PLC. Increased number of input and output peripherals allows adding of devices like printers, recorders, etc., as per the need.

- **Data Logging and Free Programming Software:** Attached data logger with input program software provided. Through data logging software, HMI and PLC collect data through sensors, analyze the data and save and output the results of the collection and analysis. Examples of the types of information a data logging system can collect include temperatures, sound frequencies, vibrations, times, light intensities, electrical currents, pressure and changes in states of matter.

CoDeSys (Controller Development System) software technology



Software Screen Shot

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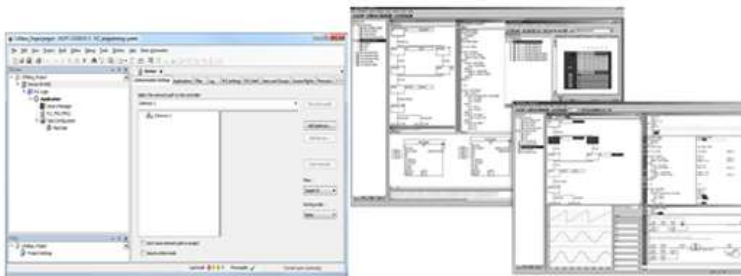


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Heating:

Indirect heating system is provided in our units, comprising of air heaters made of high grade Kanthal A-1 wires of suitable wattage. The warm air is evenly distributed throughout the chamber through efficient motor fans ensuring very good temperature sensitivity.

Cooling:

An energy efficient cooling unit is installed in our photo stability test chambers to enable studies at lower room temperatures. We use high end CFC free compressors of Copeland / Kirloskar / Tecumseh / Bitzer / Danfoss make, conforming to latest international standards and guidelines.

DETAILED DESCRIPTION ALONG WITH SALIENT FEATURES ARE AS UNDER FOR REFRIGERATION MACHINE :

CONDENSING UNIT

AIR-COOLED CONDENSOR

Air-cooled condenser is internally grooved finned copper tubes used for high heat transfer area, which not only reduce power consumption, but also bring down the condensation faster. This unit is designed. & verdigris & reduces the resistance, saves energy consumption and ensure good heat exchange.

COMPRESSOR:

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- **HERMETIC COMPRESSOR:** Single stage Reciprocating Compressor. Give the High Efficiency compared to sealed compressors, Less Power Consumption , Accessible for repairing, low noise level, Less Vibrations, Wide Voltage Range, Designed for Extremely High Ambient ,Full warranty etc
- **COOLING SYSTEM:** The compressor is mounted perfectly to ensure recommended level of sound and vibration.

REFRIGERATION CONTROL

- **Low and High Pressure switch of RANCO/Danfoss :** Which ensures the compressor and refrigeration system when low pressure will occurs it trip off the compressor. This is the only operator friendly switch can easily reset.
- **Hand Shut off Valve :** Is the only Condensing Unit, which is equipped with it. This valve is used for pump down the total gas in to the condenser & receiver in the faulty condition.
- **Liquid Dryer of Danfoss make :** Which is equipped in the liquid line for ministration of moisture in the liquid. It will collect all the moisture in side the refrigeration line as well as gas.
- **Moisture Indicator of Danfoss make :** The sight glass area in the Moisture Indicator shows at a glance the condition of the refrigerant system. The moisture indicator element changes colour and indicate if the system is safely dry, or dangerously wet.

- **Solenoid Valve of Castle make :** In most refrigeration applications, in order to automatically control the flow of fluids in a system, it is necessary to be able to start or stop the flow in the refrigerant circuit. An electrically operated solenoid valve is usually used for this purpose. Its basic function is the same as a manually operated shutoff valve, but it can be positioned in remote locations, and may be conveniently controlled by simple electrical switches.
- **Oil Separator of Stainless Steel 304 :** The oil separator intercepts the oil mixed with compressed gas and returns it into the crankcase of the compressor, thus assuring an efficient lubrication of its moving parts. Also, it improves the overall efficiency in the system.

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- **Suction Accumulator** : Maximum Efficiency of the relief device (expansion valve) because it is supplied with sub cooled Liquid.
- **Liquid Receiver** : As per ASME Section VIII Division I for storage of refrigerant.
- **Humidity Range**: 10% to 95%RH (Humidity Applicable as per the Temperature Humidity Graph Attached)

Humidification (WATER TANK AND AEROSOL SYSTEM):

A low-pressure droplet free vapour boiler using direct vaporization system is used. Water Reservoir is provided at the side of the chamber with a 10 x 8mm PU tube quick connector and water level is automatically controlled through a water-in solenoid valve. The wick tank water level is automatically maintained through a water solenoid valve and an electrical float switch. The de-mineralized water or single distilled water supply to the humidity inlet having a resistance measurement of approximately 50,000 – 200,000 Ohm/cm is provided with the unit.

Aerosol Generator and Monitor is a multi-function aerosol instrument comprised of an atomizer aerosol generator. As an aerosol generator can be used to generate a mono disperse aerosol by atomization. The output aerosol concentration is continuously monitored by control facility to provide a stable aerosol output with a known particle size and a known aerosol concentration from 10nm to1000nm. Water Reservoir is provided at the side of the chamber with a 10 x 8mm PU tube quick connector and water level is automatically controlled through a water-in solenoid valve. The wick tank water level is automatically maintained through a water solenoid valve and an electrical float switch. The de-mineralized water or single distilled water supply to the humidity inlet having a resistance measurement of approximately 50,000 – 200,000 Ohm/cm is provided with the unit.

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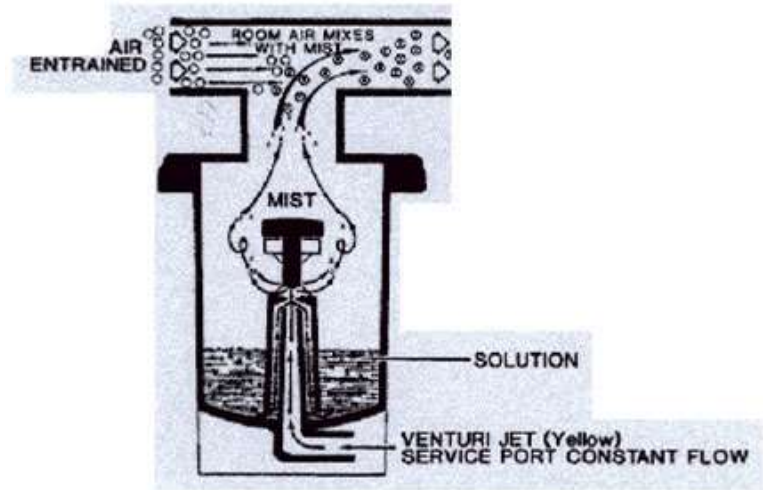


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- **Dehumidification:** Refrigeration based de-humidification system is used. The desired level of lower humidity will be achieved by maintaining the precise dew point temperature.
- **Humidity Sensitivity:** Humidity is controlled by mean of an electronic humidity controller cum indicator with an accuracy of $\pm 2.5\%$
- **Temperature Control:** The temperature inside our temperature and humidity control test chambers is controlled through Nano technology based HMI & PLC controller.
- **Temperature Range:** Temperature range of our standard Chamber is -40°C to $+80^{\circ}\text{C}$. However we have the capacity to modify the same to suit the individual specialized requirements of our customers.
- **Temperature Sensitivity:** Temperature inside our Temperature and Humidity Control test chambers are controlled with a sensitivity of $\pm 0.3^{\circ}\text{C}$ or better.
- **Illumination:** Our Temperature and Humidity Control test chambers are provided with door operated illumination system comprising of fluorescent lights, beside two panels of diffused fluorescent light panel located at the either side of the chamber to enable the user to conduct the photo periodic tests and experiments.
- **Insulation:** The gap of 75 mm between the outer and the inner wall is filled with special grade glass wool to prevent thermal losses.

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- **Mineral Glass Wool Insulation:** Glass mineral wool is one of the most environmentally friendly, stable and sustainable insulates available. Glass wool is incombustible by nature. Euro class classification is A. It does not propagate flames and toxic smokes. Thanks to a dense entanglement of materials with a low conduction and trapping a great amount of air, glass wool is an excellent thermal insulation. The thickest it is, the best thermal resistance it has, thus reducing heat losses in our equipment's for better sensitivity and economical operations. And its impact on the environment in manufacture, use and disposal is minimal.
- **Air Circulation:** Triple walled back of unit is fitted with two air circulation fans for maintaining temperature uniformly throughout the chamber

Features of Coaxial Circulation Fan:

- Vacuum impregnated stator winding with dr. back varnish under red bectol
- Non-hygroscopic.
- Best IR value
- Bright bar (EN - 8 class) shaft.
- Bush bearing of branded companies.
- Surge comparison testing in fans and pumps eliminates into turn short circulating of the stator.
- Pressure die-casted-rotor manufactured with zero error.
- Boats of high accuracy

Port Hole :Port holes with silicon enclosure is provided at back side of the chamber (50mm dia). Through the port hole you can input sensors, wires and other test equipment. Silicone foam plugs have excellent temperature and humidity resistance and offer very good thermal insulation Generally a single port hole is given but more numbers ca be increased according to customers request.

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TECHNICAL SPECIFICATIONS:

MODEL	HB-WTHC01	HB-WTHC02	HB-WTHC03
Test Space Dimension (W X D X H)(mm)	1790 x 2100 x 2305	2740 x 2100 x 2305	3790 x 2100 x 2305
Chamber Volume	4200 Ltr.	8100 Ltr.	12500 Ltr.
Temperature Range	-40° C to +80° C		
Temperature Controller	HMI+PLC		
Temperature Fluctuation	±0.3°C		
Temperature Uniformity	±0.75°C		
Temperature Sensor	PT-100		
Ramp up rate	1°C/min		
Temperature pull down rate	0.33°C/min		
Humidity	10 - 95% RH		
Humidity Deviation	±3%RH		
Humidity uniformity	±5%RH		
Port hole (single)	50 mm dia (more port holes can be attached on request)		
Door	Hinged on left/Right with gasket		
Display	LCD		
Power Requirements	220/230V, 50/60Hz		

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