Supply Unit SU

Original Instructions
Air Handling Units
Installation, Operations and
Maintenance Manual
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Purpose

This manual contains advice for installers and users.

General information about the range, construction and selection of ECE air handling/conditioning equipment can be obtained from our website, various sales publications, or by telephone.

Certified individual unit data concerning dimensions, weights, component specification and performance, is issued with the order acknowledgement for each unit.

Due to our policy of continuous improvement the information contained within this Manual may be altered from time to time without prior notice.
Supply Principle and Operation
Ventilation

Unidirectional ventilation unit (UVU) means a ventilation unit producing an air flow in one direction only, either from indoors to outdoors (exhaust) or from outdoors to indoors (supply), where the mechanically produced air flow is balanced by natural air supply or exhaust.

Supply air handling units incorporate many different components for makeup air, in many different areas including Health, Retail, Industrial, Distribution Centres, Warehousing, Pharmaceutical and Data Centres.

The supply air handling unit can be configured to condition air in several ways:

- Filtration
- Heating
- Cooling
- Humidify
- Dehumidify

Operation

Air filtration is always present in order to provide clean dust-free air to the building.

Direct heating, placed directly in the air stream, are direct heat exchangers and include those for gas-fired fuel-burning heaters or electric air heater batteries (EAHB).

Indirect Heating and Cooling coils use hot water or steam for heating, and chilled water for cooling. Heat pumps can be used as well. (Prime energy for heating and cooling is provided by central plant).

Humidification is often necessary in colder climates where continuous heating will make the air drier, resulting in uncomfortable air quality and increased static electricity. Various types of humidification may be used as part of our air handler and include evaporative, vaporizer, spray mist and wetted medium.

If dehumidification is required, then the cooling coil is employed to over-cool so that the dew point is reached and condensation occurs. A heater coil placed after the cooling coil re-heats the air to the desired supply temperature and humidity level. This is often used for chilled beam applications.
Checks at Design Stage
Air Inlets and Discharges

Whether ducted, or part of the Air Handling Unit, inlet and discharge connections to atmosphere such as Louvres, Cowls, Spigots, etc. should be located and dimensioned so that the flow restriction, short circulating, recirculation of vitiated air, pick up of contaminated air or nuisance discharge of exhaust air do not occur.

Ducted intakes and discharges to units should be designed and constructed to ensure that flow restriction, turbulence, pre rotation, jetting, uneven velocity profile and surface or object excitation do not occur.

Poor intake design causes uneven velocity profile across unit components resulting in moisture carryover hence flooding, design supply air conditions not being achieved, electric heater elements overheating, DX refrigerant cooling coils freezing and secondary generation of noise and vibration etc.

A.S. SCTV = Aerofoil Section Short Cord Turning Vane 50mm ctrs.
LCTV = Long Cord Turning Vanes to HEVAC – CIBSE – ASHRAE Standards
Poor discharge design causes reduction in fan pressure and volume, also turbulence generating secondary noise and vibration, which may reduce impeller, bearing, isolator and flexible connection life. Design supply conditions may also be achieved. Electric elements may overheat. DX coils may freeze.

A.S. SCTV = Aerofoil Section Short Cord Turning Vane 50mm ctrs.
D = Fan inlet eye diameter
LCTV = Long Cord Turning Vanes to HEVAC – CIBSE – ASHRAE Standards
Acoustics - Vibration

Ensure space exists for incorporating attenuation of the noise to atmosphere from outside air inlet and exhaust air discharge and on room side supply and extract ducts.

Consider noise from casing radiation, flanking and breakout.

Consider primary and secondary vibration isolation including service connections.

Services - Connections

Ensure space with clearance exists for access to, routing of, connection to and expansion and contraction of water, steam, refrigerant, gas oil supplies and line fittings. Combustion air supply, flue gas exhaust. Venting of air, isolating and draining of plant, trapping and returning steam, condensate, trapping and draining of condense from cooling coils, humidifiers and heat recovery devices to open tundish, blowing down waste to open tundish, pumping down and storing of refrigerant, power – control wiring, and components.

Commissioning & Fault Finding

Ensure plant is designed to allow installation of and access to calibration and adjustment of measuring and modulating devices for:

- Air flow direction and rate
- Medium flow direction and rate
- Resistance to airflow
- Resistance to medium flow
- Air on and off dry bulb, wet bulb and humidity
- Medium on and off pressure and temperature

Ensure space exists in and around the plant for access to, inspection of, measuring of and work on items including:

- Belt tensioning of external motors
- Jacking and levelling of steel spring vibration isolators
- Clear sight of identifying labels measuring and recording devices
- VCD blades, links and actuators, humidifier generators, sparge pipes, coil and eliminator surfaces and drain pans, electric heaters, fan and drives
- Fan speed and direction of rotation
- Motor current, resistance, continuity
- Motor nameplate
- Terminal wiring diagrams
- Wiring
Maintenance Repair and Renewal

For units with one piece coils ensure space exists of at least one unit width plus 150mm on the withdrawal side of each plant item. For units with split coils ensure at least half the width of the unit or 700mm whichever is greater.

Adjacent units can share the common space between them for access and withdrawal.

Ensure room exists for safe working platforms where units are mounted at a high level.

Ensure provision exists for steps, ladders and mezzanine etc. Where units are over 1750mm high or mounted on platforms which elevate the unit height and make access difficult.

General

Any or all of the following and their effect on the plant should be considered and the appropriate action taken:

- Conditions within surrounding areas
- External temperature and humidity
- Direct solar radiation
- Wind speed and direction
- Driven rain
- Driven snow
- Driven sand
- Sea spray, mist, fog, moisture in suspension
- Saline atmosphere
- Icing
- Unit surface temperatures and surrounding air dew point
- Gases which form acids in solution in water, such as SO₂
- Flammability
- Explosion risk
- Toxicity
- Bacteria
- Fungi
- Algae
GMEB Recommended distance to other components

In order to achieve the best possible operation of the fan inside of the Air handling Unit the following minimum distances shall be followed:

These distances should be followed in order to maintain the best operation as possible. This will allow for the minimum distances to be achieved.
GMEC Recommended distance to other components

To achieve the best possible operation of the fan inside of the Air Handling Unit the following minimum distances shall be followed:

![Diagram of fan and distances]

### Air flow measurement device

The airflow sensor is used for measuring the airflow of the plug fans. The method is based on differential pressure. The pressure is measured at a specific point in the inlet cone and the reference pressure is measured upstream of the inlet cone. The air flow sensor is supplied factory mounted in the inlet cone.

### Disposal of the product

Used product shall be disposed or recycled according to the local laws and regulations.
Checks at Order Stage
Installation, Operation and Maintenance for ECE air handling and conditioning units

**Construction**
Frame / GSS / Alu / Plastisol
Outer Skin / GSS / Plastisol
Inner Skin / GSS / Plastisol St. St.
Insulation 20mm / 50mm /

**Finish**
Location Ext / Int
Anodised All
Plastisol
GSS Self

**External System Resistance**
Depression at Unit Inlet
Positive at Fan Discharge
Pressurised Sep / Mix
Box / Plenum
DIDW - SISW
FC / BC
Ralt / Rigid
NRD’s One. Two.
Guards:
Inlet / Eyes / Disch / Drive

**Drives**
Motors Int / Ext
Duty / Idling
Pulleys / Belts / In / Out / Air Stream
Variable Speed
Spd Change Interlock with EAHB.
Inverter
DOL / SD
Elec Supply
Floor Grid

**Filters**
To Extract Heat Recovery
Grease to Kitchen Extract
Type
Efficiency by Weight
Efficiency Spot Dust
Retentivity (Act. Carbon)
BS. ASHRAE. Eurovent
Withdrawal - Side / US / DS / T / B
Fitted Manometr(s)
Magnehelic(s)
Radiant Heat from EAHB

**Inlets and Discharges**
Louvres / FAI / DTA / Std / Acoustic
Elmtrs + Drain High Velocity
Fan Discharge 45º Spigot + Mesh
Humidifying
Position / Type
Draw Through / Blow Through
Volume M³/s
Air On Cwb / Deb / Kg / Kg
Air Off Cwb / Db / Kg / Kg
Sweating Ins Frame
Dx + Const Off = Freeze
Humid Posn Adj Surfaces - Wetting
Clear Distance Downstream
Gas Heater, Condensation - Bypass
Combs’n Air Inlet - Flue Output. Posn
Load / Eff / Output
Steps / Interplaced / Face
Medium Type
Flow Return °c
Evap. Temp. °c
Pressure – Bar / Kpa
Glycol %
Outside Ambient
Cond. Temp. C
Elec Supply
EAHB Min Air Flow Speed
EAHB Balanced Across 3ph Supply
Interlock With Var Sp.Fan.
Construction
Plates / Tubes / Fins
Elements / Burner / Infill
Finish: Self / Vinyl / Et.
Free Cooling & Mechanical Top Up.
Air Entering At 90º to Coil Face.
Face Velocity Profile
Condensate Drain Provision - Height

**Plenums**
Location / Function
Diffuser / Spacer / Access
90º / Horz / Vert
To / From: Above / Below / LHS / RHS
Hinged / Lift Off.
Tool Op / Handles / Lock To One Handle
Viewport(s)
Bulkhead Light(s) Ext Switch
Floor Grids

**Inlet / Discharges**
From: Above / Below / LHS / RHS / Face
Louvre / Spigot
Stack & Cowl
90º + Scvt
Construction
Finish

**Vibration Isolators**
Int / Ext
Eff Required %
Rubber in Shear / Steel Spring
Jacking
Self-Levering
Fixed/Loose

**Flexibles**
Isolating / Fan Raft / Fan Section
Pipe Connections

**Attenuators**
Extract / Atmos / Room Side / Zone
Supply / Atmos / Room Side / Zone
To Achieve NR In / At
Unit/Duct Mounted
Straight / 90 + SCTV
Volume m³/s
Inlet / Outlet Plenum / Length
From / To / Above / Below / LHS / RHS
Finish
Breakout

**Ancillaries**
50 x 100 x 50 Full Perimeter Base
Integral Lugs
Support Legs
Support Steelwork
Side / Central Services Corridors
Pipework
Controls
Wiring
Access Platforms

**Protection**
Polystyrene Corners
Polystyrene Boards
Rewrapped after Assembly

**Site Costs**
Site Supervision Work Required
Site Assembly Required
Safety Checks I.E. Gas Heaters
Guarantee Checks
I.E. Assembly Standards, Weathering and
Site Air Leakage Standards

**Problems**
Transport: Loaded Vehicle Obstacle
Clearance / Route Load Bearing
Road Closure / Stat Permissions
Onloading / Off Loading
Crane, Fork Lift Weight / Capacity
Moving On Site: Route / Loads / Method
Building Load Bearing
Max Size / Weight per Piece for Access
Dry Storage before Erection
Basics: Level / Load Brg / Relevelling
Dev’s
Bolting Adjacent Sections Onsite
Access / Maintenance / Withdrawal Plant
Sun / Wind / Rain / Snow
Saline
Dust / Powder / Grit / Soot / Smoke / Sand
Tail Units on Plinths Side Walkway?
Are Top Access Door Catches In Reach?
Containment & Drainage of Leaks
Sloping, Differential Trapped
Condense Drains. To Open Tundish
Miswiring Motors Competent Electricia

Checks at Order Stage
Delivery
Receipt & Unpacking

Units are designed and manufactured according to ISO 9001

As part of our quality control system each unit undergoes a full pre-delivery inspection before loading.

Units are then shrink wrapped to prevent ingress of foreign bodies or water during transportation.

All units are fitted with a full perimeter bases to facilitate lifting, moving and installation.

Units should be inspected and any external damage or short delivery reported to ECE, **before unloading**.

We cannot accept responsibility for damage sustained during unloading from the delivery vehicle or on site.

Units must be off loaded, lifted and lowered using long lifting straps and timber blocks or using an “H” Frame with short lifting straps and timber blocks or a fork lift with extended forks.

Final lowering and side shifting to bring parallel faces together should be by toe jacks with timber blocks.

Internal joining bolts should never to be used to pull modules together.

Modules should never be rolled over to move across site.

Guidance notes for unloading and handling are given in the following pages.

Before commissioning all packaging materials must be removed from the units and cleared from the area.
Fan Transport inspection

Check the fan immediately after you receive it and make sure that it has not been damaged during transport. If you discover any damage, get in touch with the ECE aftersales without delay. Briefly rotate the fan impeller to see that it rotates easily. Check the information on the fan rating plate.

Faulty conditions in transporting may result in serious damage on the product.

Fan Intermediate storage

If the fan is to be switched off in between uses, the following needs to be taken into account:

- The storage environment must be dry, dust-free and not have a high level of humidity (<70%)
- Storage temperature must be in between -25°C and + 40°C
Lifting

Crane - Long lifting straps - 150mm min. width

Crane – “H Frame” Short lifting straps - 150mm min. width
Forklift

Rollers

Skates
Toe Jacks
Installation
General

Electrical wiring and controls, water, steam, gas and refrigerant piping, line fittings and controls should be installed in accordance with appropriate governing institute standard practice (I.E.E. C.I.B.S.E. etc.) and together with the electricity supply, water supply and drains should conform to the appropriate authority and all statutory regulations.

Units with drains should be mounted at a level which allows installation of cleanable drain taps at each connecting point then installation of drain pipe work falling to an open tundish.

Space should exist for the application of sealant - jointing rubbers. Tightening of internal fixings. Internal installation, attachment or insertion of isolating, indicating, recoding, modulating, activating, devices, also making and tightening of fixings at connections to air Inlet and discharge ducts.

Bases and foundations

All units must be installed on a permanent base which must be firm, level and structurally rigid. Units may be mounted on suitable steels or purpose build C.I. frames supported from the main roof structure providing this is “The use of Tico material to dampen vibration / noise is not recommended as it will cause uneven deflection due to variations in point loading within units. This will cause vertical joints to go “out of parallel” causing leakage at joints”

When foundations are uneven units will “lozenge” if the installer attempts to use the joining bolts to pull non parallel faces together causing air leakage at joins, access doors will jam and not close after opening and duct connections will not be “parallel” and will leak.

When foundations are level and perfectly flat units will be perfect cubes and will fit together squarely with good air seals, access doors will open and close correctly and duct connection are airtight.

Do not use joining bolts to pull units together in elevation or in plan.

Level Base – units perfect cubes
Thin mastic seal
Plug Fans

The fan is secured to a base by bolts in mounting holes across anti-vibration mountings. The base must be level and stable. The fan must only be mounted in a horizontal plane. Either the fan or the base is mounted on anti-vibration mountings.

Fitting the Accessories

The fan should normally be connected to the air handling unit by means of flexible connection or other type of gasket to eliminate vibration transfer from fan to AHU casing. Providing necessary grounding for the accessories is within the constructor’s field of responsibility. Inlet protective screen can be fitted directly to the front frame or outside AHU to the inlet opening.

Electrical Connections

All electrical connections must be wired by authorised personnel only. The necessary electrical and safety precautions must be taken into account. If the motor is operated across a frequency converter, the connections must be made according to the instructions of the frequency converter manufacturer. The motor must be grounded.
Lifting of the GMEB fan

Sizes <071

The fan is to be lifted with three lifting chains/beams (one attached to the front plate and two to the rear end of the fan).

There are three alternative places to attach the rear lifting hooks, which are to be used depending on the fan combination. Wherever possible, use holes on the motor bracket as shown in the picture below.

In case of a built-on frequency converter, if there is no access to the hole on the motor bracket behind the frequency converter assembly bracket, one of the rear chains/beams could be attached to the hole on the frequency converter assembly bracket (up to fan size 045).
With bigger fans (or if there are no holed on the motor bracket) holes on the base frame are to be used. In this case it must be taken into account not to damage the frequency converter. Transverse beam must be used if needed.

Sizes >080:

The fan is to be lifted with four lifting chains/ beams, two attached to the front plate supports and two to the motor bracket. Lifting points are shown in the picture below.
GMEB Mounting instructions

Installation of the fan:

The fan is to be installed to a base frame using anti-vibration mountings. Alternatively the base could be mounted on anti-vibration mountings.

The base must be level and stable. The fan must only be mounted in a horizontal plane.

Built-on frequency converter:

If needed, the frequency converter can be removed to the other side of the fan with the following instructions. Otherwise please use the cable tie (delivered with the fan) to attach the motor cable to the motor bracket and mounting plate.

1. Slide off the mounting plate.

2. Put the removed upper bolts on their new places on the other side of the motor bracket. Bolts shall be loose enough to get the mounting plate slided into its place. After that attach also the earlier removed lower bolts on the other side and tighten all bolts.

3. Attach the cable tie to the motor bracket/mounting plate.
5. In case of fan size 080 frequency converter also assembled with mounting plate: Remove the frequency converter first to better access the mounting plate fixing bolts. Loosen the upper bolts and remove the lower bolts to detach the mounting plate. Reassemble in reverse order.

Fitting the GMEB accessories

The fan should normally be connected to the air handling unit by means of flexible connection or other type of a gasket to eliminate vibration transfer from fan to the AHU casing.

Providing necessary grounding for the accessories is within the constructor’s field of responsibility.

Inlet protective screen can be fitted directly to the front frame or outside AHU to the inlet opening.

Safety regulations and CE-marking

The GMPM and GMEB fan is CE-marked as a partly completed machinery and must not be put into service until the final machinery and must not be put into service until the final machinery and must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with provisions of the machinery Directive 2006/42/EC. The fan is ErP compliant. Other compliant directives are shown in the Declaration of Conformity.

GMEB Electrical connections

All electrical connections must be wired by authorised personnel only. The necessary electrical and safety precautions must be taken into account. If the motor is operated across a frequency converter, the connections must be made according to the instructions of the frequency converter manufacturer. The motor must be grounded.
Additional grounding of the motor and the built-on frequency converter

The built-on frequency converter can be additionally grounded to the air handling unit or base. Attach the grounding wire (not included in the fan delivery) securely under the lower fixing bolt of the frequency converter (marked with a grounding symbol) and to the air handling unit or base.

The additional grounding of the motor can be additionally grounded to the air handling unit, and the base. This can then be used to attach the grounding wire, which won’t be included within the fan delivery. This will be secured under the lower fixing bolt of the frequency stage.

GMEC Mounting preparations

Before mounting of the fan prepare sealing on the wall closely around the edges of the square hole. Sealing can be done by any workable method, such as sealant mass, sealing tape, rubber gasket etc. Sealing must be uniform all around. Make sure that the cable glands are pointing downwards and the air flow measurement tube is safely located i.e. not pressed between the front plate of the fan and the wall. Tighten the fan on the wall.
GMEC Mounting Instructions

Horizontal wall mounting inside the fan casing – Fan sizes 025-056

GMEC Preparing the Fan Wall

First make sure that the wall is rigid enough. There must be a circular hole and mounting screws symmetrically around the hole. Verify that the dimensions are according to the dimension table below. Make sure that the screw length is at least 30 mm from the wall surface. Install sealing around the circular hole.

First make sure that the wall is rigid enough. There must be a circular hole and mounting screws symmetrically around the hole. Verify that the dimensions are according to the dimension table below. Make sure that the screw length is at least 30 mm from the wall surface. Install sealing around the circular hole. Sealing height must be over 15 mm (25 mm in case of size 56) from the wall surface.
Mounting of the GMEC fan

Before mounting make sure that the cable glands are pointing downwards and the air flow measurement tube is safely located i.e. not pressed between the front plate of the fan and the wall. Tighten the fan on the wall.
Vertical Mounting – Fan Sizes 025-056

GMEC Mounting preparation

Preparing the mounting surface. First make sure that the surface is rigid enough. There must be a circular hole and mounting screws symmetrically around the hole. Verify that the dimensions are according to the dimension table below. Install sealing. Sealing height must be over 15 mm (25 mm in case of size 056) from the surface.

![Sealing diagram]

<table>
<thead>
<tr>
<th>Fan Size</th>
<th>$\varnothing D_1 \pm 3$</th>
<th>$\Box W_1 \pm 3$</th>
<th>$W_2 \pm 2$</th>
<th>Screws</th>
</tr>
</thead>
<tbody>
<tr>
<td>025</td>
<td>260</td>
<td>350</td>
<td>-</td>
<td>4 pcs. M8</td>
</tr>
<tr>
<td>028</td>
<td>300</td>
<td>350</td>
<td>-</td>
<td>4 pcs. M8</td>
</tr>
<tr>
<td>031</td>
<td>340</td>
<td>450</td>
<td>-</td>
<td>4 pcs. M8</td>
</tr>
<tr>
<td>035</td>
<td>380</td>
<td>450</td>
<td>-</td>
<td>4 pcs. M8</td>
</tr>
<tr>
<td>040</td>
<td>400</td>
<td>450</td>
<td>-</td>
<td>4 pcs. M8</td>
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<tr>
<td>045</td>
<td>450</td>
<td>580</td>
<td>290</td>
<td>8 pcs. M8</td>
</tr>
<tr>
<td>050</td>
<td>520</td>
<td>580</td>
<td>290</td>
<td>8 pcs. M8</td>
</tr>
<tr>
<td>056</td>
<td>570</td>
<td>710</td>
<td>355</td>
<td>8 pcs. M8</td>
</tr>
</tbody>
</table>
GMEC Mounting of the fan

Before mounting make sure that the air flow measurement tube is safely located i.e. not pressed between the front plate of the fan and the mounting surface. Tighten the fan on the place.

GMEC Grounding

Motor is grounded through the motor supply cable. If extra grounding is needed, grounding can be done with a separate cable from the fan motor to the casing of the Air Handling Unit. The motor has a grounding marking next to the grounding point.

Motor is grounded through the motor power supply cable. If extra grounding is needed, grounding can be done with a separate cable from the fan motor to the casing of the Air Handling Unit. The motor has a grounding marking next to the grounding point.
Fitting the GMEC accessories

The inlet protective screen can be fitted directly to the front plate of the fan or outside Air Handling Unit to the inlet opening.

GMEC Electrical Connections

All electrical connections must be wired by authorized personnel only. The necessary electrical and safety precautions must be taken into account. Connections must be done according to the instructions.

Installation of the GPEB fan

The fan is secured to a base by bolts in mounting holes across anti-vibration mountings. The base must be level and stable. The fan must only be mounted in a horizontal plane. Either the fan or the base is mounted on anti-vibration mountings.

Fitting the GPEB accessories

The fan should normally be connected to the air handling unit by means of flexible connection or other type of gasket to eliminate vibration transfer from fan to AHU casing.

Providing necessary grounding for the accessories is within the constructor’s field of responsibility.

Inlet protective screen can be fitted directly to the front frame or outside AHU to the inlet opening.

GPEB Safety regulations

The fan does not meet the provisions of CE labelling (i.e. it has an impeller without guard). The fan must be installed in accordance with EN 292/294.

GPEB Electrical connections

All electrical connections must be wired by authorised personnel only. The necessary electrical and safety precautions must be taken into account. If the motor is operated across a frequency converter, the connections must be made according to the instructions of the frequency manufacturer. The motor must be grounded.
SDPV-10 Po Inset Mounting (IP 44)

Connect according to the diagram. Mount the inner case to the wall with the connections pointing down. Mount cover with nut to the wall. Push dial in place at off position.

SDPV-10 Surface Mounting (IP 54)

Mount the case to the wall together with included grommets. Connect according to the diagram. Mount inner case in surface mounting case with included screws. Mount cover with nut to surface mounting case. Push dial in place at off position. When needed a 5 mm hole for condensation water is to be drilled at the bottom of the surface mounting case.

SDPV-10 Isolation and wiring

The cable connecting the device control should not exceed 4 m. For a cable length between 4 and 12 m we recommend using a shielded cable. For cable longer than 12 m use the SDPV-230 device.
SDPV-10 Wiring diagram
SDPV-10 Drawings and Dimensions
SDPV-230 Inset Mounting

Break mains voltage. Connect according to diagram. Mount the inner case to the wall with the connections pointing down. Mount cover with nut to the wall. Push dial in place at off position.

SDPV-230 Surface Mounting

Break mains voltage. Mount surface mounting case to the wall together with included grommets. Connect according to diagram. Mount inner case in surface mounting case with included screws. Mount cover with nut to surface mounting case. Push dial in place at off position. When needed a 5 mm hole for condensation water is to be drilled at the bottom of the surface mounting case.

Break the mains voltage and the mounting surface which will be cased closer to the
SDPV-230 Wiring Diagram

- L N – Power supply 230 VAC
- Vout – output 0-10 VDC / 0-20 mA / PWM
- Vmin – adjustment trimmer min speed
- Vmax – adjustment trimmer max speed
- SW switch analogue output selection: 0-10 VDC / 2: 0-20 mA / 3: PWM
SDPV-230 Drawings and Dimensions
EEID Compatibility

Our EEID speed controller is suitable for use with single phase voltage controllable motors.

EEID Inset Mounting

Break (isolate) mains voltage. Connect according to diagram. Mount Inner case to the wall with connections pointing down. Turn on the mains voltage and controller. Adjust min. speed with insulated screwdriver and turn off controller. Mount cover with nut to the wall. Push knob in place at off position.

EEID Surface Mounting

Break (isolate) mains voltage. Mount surface mounting case to the wall together with included grommets. Connect according to the diagram. Turn on mains voltage and controller. Adjust min. speed with insulated screwdriver and turn off controller. Mount cover with nut to surface mounting case. Push control dial in place at off position.

EEID Change of fuse

Break (isolate) mains voltage. Undo control dial by first turning it to the right beyond end stop and then pull towards you. Remove the nut. Remove fuse holder with a screwdriver. Change fuse. Replace components in reverse order. Use only recommended fuses (Approved, fast, with high breaking capacity).

EEID Motor protection

If motors are fitted with thermostat (tk) overheat protection it is recommended to use the EEDS range to utilise the feature.

By breaking the mains voltage, the undo control dial is done by first turning it to the right beyond and stop and then pull towards you. This will be
EEID Wiring Diagram

1 - Power supply 230 VAC, 50 Hz
2 - 230 VAC non-regulated output for connecting valve, dampers
N - Neutral
3 - Regulated output to motor
4 - Fuse holder with spare
5 - Minimum speed adjustment trimmer (pre-set to 20%)
6 - Control light
EEID Dimensions and Weights

All dimensions shown in mm

<table>
<thead>
<tr>
<th>MODEL</th>
<th>EEID1A</th>
<th>EEID2A</th>
<th>EEID4A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part</td>
<td>EA900100</td>
<td>EA900101</td>
<td>EA900102</td>
</tr>
<tr>
<td>Net Weight (g)</td>
<td>210</td>
<td>215</td>
<td>300</td>
</tr>
<tr>
<td>Gross Weight (g)</td>
<td>2.35</td>
<td>2.40</td>
<td>3.25</td>
</tr>
</tbody>
</table>
VSD2H Control Keypad

The control keypad can be used for setting the frequency converter’s parameters, reading status data, and giving control commands. It is detachable and can be operated externally being connected via a cable to the main unit. There are two accessory kits available:

**ACC/VSD2H/Hand Held Kit**

This enables the keypad to be detached from the unit and to be used as a hand held unit connected to the VSD by a 2 m cable.

**ACC/VSD2H/Door Mounting Kit**

This enables the keypad to be detached from the unit and to be mounted in the panel door connected to the VSD by a 2 m cable.

The standard test keypad features an alphanumeric display with seven indicators for run status (READY, RUN, STOP, ALARM, FAULT, FWD, REV), and three indicators for control source (I/O, KEYPAD, BUS). There are also two text lines displaying description (of menu, value or fault) and location (reference to menu and parameter) or value (numerical, textual values).

A replacement advanced commissioning keypad is available as an accessory (ACC/VSD2H GRAPHIC DISPLAY). The commissioning keypad can also be used to store the parameter settings and transport them to another drive. The top row is the drive status field, and the second row is the location field describing the position in the selection menu. The remaining three rows can be used for display of information. The commissioning keypad has extra features (help and information displays, favourites, multi-monitor of 9 selected values).
The keypad has nine buttons which are used for controlling the drive, setting parameters, and monitoring values. The buttons are the same for both types of keypad.

The keypad is the control source by default (i.e. Local) but it can be changed to remote at any time by pressing the LOC/REM button. (The control source has to be changed to Remote/Fieldbus for the NXNI or NXIP to control the drive.)

The main menu consists of 7 individual items which are browsed using up and down buttons, the submenus under these menus are then browsed by selecting OK.
Isolator Wiring Diagram

Isolator Dimensions and weights

<table>
<thead>
<tr>
<th>Amps</th>
<th>H (mm)</th>
<th>W (mm)</th>
<th>D (mm)</th>
<th>F1 (mm)</th>
<th>F2 (mm)</th>
<th>G (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60/25A</td>
<td>135</td>
<td>100</td>
<td>65</td>
<td>85</td>
<td>94.5</td>
<td>55</td>
</tr>
<tr>
<td>40/63A</td>
<td>175</td>
<td>130</td>
<td>135</td>
<td>105</td>
<td>136</td>
<td>65</td>
</tr>
</tbody>
</table>
Compatibility

This product when installed, commissioned and maintained by or under the supervision of a competent electrician in accordance with current electrical engineering codes of practice and regional laws.

It is essential that the power supply is disconnected prior to installation.

To maintain the IP rating to the product it is important to adhere to the following.

- Use only the existing mounting holes
- Use cable glands and sealing washers designed to maintain the rating.
- Tighten lid screws to 1.2Nm
- The unit designed to be mounted vertically.

Ensure that the correct section of cable and terminators are used as the table referenced above.

All works may only be carried out by skilled personnel following the local regulations, reference to the installation guide and AFTER the controller is completely isolated from the mains.
Supply Unit Fan Type & Speed Control
GMEB Fan Technical Description

The fan is used to generate a desired air volume at a given pressure rise that corresponds to the pressure losses in the duct system to which the fan is connected, and internal losses inside of the Air Handling Unit.

The plug fan is intended to be used inside of the Air Handling Unit.

**Design**

1. Front plate
2. Inlet cone
3. Impeller and hub
4. Motor
5. Base frame
6. Motor bracket
7. Front plate support (fan size 056 and bigger)
8. Vibration dampers (optional)
9. Built-on frequency converter (optional)
10. Frequency converter mounting plate (optional)
GMEB Operating conditions

The standard operation temperature range of the fan is -20°C - + 40°C.

If they are operated in conditions where the ambient temperature is higher, the rated output will as a rule have to be reduced. See the instructions of the motor manufacturer.

"The fans are designed to be used as parts of equipment. They are not ready for use as a stand-alone product and the standard version does not have protection against body contact, the appropriate protective measures are to be taken according to EN 292/294.

Only operate the fan up to the maximum permissible speed given in the information on the fan rating plate.

GMEB Motors

Both AC- and PM-motors can be used with GMPM and GMEB plug fans.

AC- motors are IEC standard IE2 or IE3 motors. The motors are equipped with a thermistor and they are designed for a frequency converter use. Admissible environmental temperature: from -15° up to +40° C.

GMEB Frequency Converters

All fans used in an Air Handling Unit in the European Union area shall be equipped with a speed controller in accordance with the Regulation 1253/2014.

GMEB Fan impeller

The impeller is made of sheet steel, welded and painted with 60 µm thick epoxy powder paint, (colour: RAL 6029, green). The impellers are dynamically balanced to ISO Standard 1940-1973 G 2.5 sizes (022-031) at the maximum speed. The vibration level of the fan is below 7.1mm/s RMS.

GMEB Fan Inlet

The design of the fan inlet is vitally important to the fan efficiency and the low level of sound generated by the fan. The inlet cones are deep-drawn in one piece and are fitted to the end panel. The inlet cone and end panel are made of galvanized sheet steel.
GMEB Motor base with base frame

The motor base is made of galvanized sheet steel or of welded sheet steel and painted with 60 μm thick epoxy powder paint (colour: RAL 7005, dark grey). The base frame is made of galvanized steel (size 022 – 071) or of steel, welded and hot-dip galvanised (size 080-140 and sizes 050-071 if motor is IEC 160).

GMEB Hub

The fan impeller is either equipped with a standard hub (separate for each motor size) or with a taper lock type hub. The standard hub is made of aluminium or welded steel. The taper lock hub (sizes 022-100) is made of cast iron and phosphatised.

GMEB Air flow sensor

The air flow sensor is used for measuring the airflow of the plug fans. The method is based on differential pressure. The pressure is measured at a specific point in the inlet cone and the reference pressure is measured upstream of the inlet cone. The air flow sensor is supplied factory mounted in the inlet cone.

GMEB Directive for machinery

The GMEB fan is not a product which is ready for use but it is designed for mounting in an air handling unit. The air handling unit manufacturer must follow all instructions according to Directive for Machinery, EMC Directive and Low Voltage Directive as well as use all necessary protective measures.

The airflow sensor that is used for the airflow of all of the plug fans. The method is based on differential pressure. The pressure of the
GMEC Technical Description

The fan is used to generate a desired air volume at a given pressure rise that corresponds to the pressure losses in the duct system, to which the fan is connected. This is achieved by means of rotating the fan impeller.

GMEC Design

1. Front frame
2. Inlet cone
3. Impeller (hub in the middle)
4. Motor
5. Base frame

GMEC Operating Conditions

Plug-in fans are designed to transport dust-free air in explosive atmosphere applications.

The standard operating temperature range of the fan is -20…+60°C. The maximum permissible ambient temperature of the motors is +40°C. If they are operated in conditions where the ambient temperature is higher, the rated output will as a rule have to be reduced.

“The fans designed to be used as parts of equipment or plant construction. They are not ready for use as a stand-alone product and the standard version does not have protection against body contact, the appropriate protective measures are to be taken according to EN 292/294.

Only operate the fan up to the maximum permissible speed given in the information on the fan rating plate.
GMEC Motors

The motors are three-phase motors to IEC-standard with degree of protection IP55 and can be equipped with thermal overload protection consisting of a thermostrip or thermistor. The motors meet the requirements of IEC-standard, VDE and DIN norms. The motors are suitable for operation across the frequency converter. The max permissible control frequency is specified on the motor rating plate. The minimum control frequency is 10 Hz.

Integral motors are 3-phase 400 VAC motors with integrated frequency converter. Degree of protection is IP 55 and allowed ambient temperature is – 10… +40°C. Max control frequency is specified on the motor plate, min control frequency is 10 Hz.

For Demand Proportional Drives.

GMEC Important information

ECE fans comply with the requirements for health and safety of the EC Machinery Directive.

All fans leave the factory after being subjective to testing.

These instructions are intended for use by professional service staff. The installation, commissioning and operation of the fans must be carried out by professional staff who are familiar with the safety regulations.

Tools and protective equipment necessary for preventing accidents from occurring while installing and operating the fan must be used/worn in accordance with the local safety regulations.

All personnel involved with the product must carefully study this operating manual and diligently comply with all orders and instructions.

ECE does not accept responsibility for any damage that can be attributed to non-observance of these instructions.
SDPV-10 Potentiometer

Features:

- Minimum (vmin) and maximum (Vmax) output setting by internal trimmer.
- IP rating flush mounting: IP44, surface mounting: IP54.
- Enclosure external: plastic ASA, RAL 9010 white-ivory
- Enclosure internal: polyamide according to IEC 60335
- Operating temperature: 0…40°C
- Supply (Vin 3-15 VDC
- Vmin 10-70 % Vin
- Vmax 30-100 % vin
- Load > 2 kΩ
- Consumption < 10 mA incl. load
SDPV-10 Description

These potentiometers are designed to control fans equipped with an EC motor or in any application where a DC control signal of 0-10VDC is required; such as demand proportional drives.

It is mounted in a splash water proof design enclosure and can be used for inset as well as for surface mounting.

The SDPV-10 is supplied with customer adjustable min and max settings pre-set from the factory for Vmin 20% and Vmax 100%.

A supply voltage between 3 and 15 VDC is required to provide an infinitely variable output signal between two internally selectable positions: Vmin and Vmax. The load may not be lower than 2 kΩ (R>2 kΩ).

SDPV-10 Range

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDPV-10</td>
<td>Potentiometer 0-10VDC</td>
<td>EA002108</td>
</tr>
</tbody>
</table>

Suitable for use directly with Inverter drives and EC Motors, for use with the IFan panel EA002108 must be used.

SDPV-10 Technical Data

- Supply (Vin) 3-15 VDC
- Vmin 10-70 % Vin Vmax 30-100 % Vin
- Load < 10 mA incl. load
- Off position
- Enclosure external: plastic ASA, RAL 9010 white-ivory
- Enclosure Internal: polymamide according to IEC 60335
- Operating temperature: 0…40°C

This potentiometer is developed to control fans equipped with an EC motor or other demand proportional drive requiring 0-10VDC input. It is mounted in a splash water proof housing and can be used for inset as well as for surface mounting. The potentiometer requires a supply between 3 VDC and 15 VDC, and it provides a stepless output signal between voltage Vmin and voltage Vmax. Vmin and Vmax are internally selectable. Position 0 is the off-position. The load cannot be lower than 2 kΩ (R>2 kΩ).
SDPV – 10 Wiring Diagram
SDPV-230 – Room Potentiometer

For demand Proportional Drives

SDPV-230 Features

- Voltage supply: 230 VAC, 50/60 Hz
- Selectable output: 0-10 V, 0-20 mA and PWM.
- Load: 0-10 V and PWM > 2kΩ / 0-20 mA < 500Ω
- Minimum (Vmin) and maximum (Vmax) output setting by internal trimmer
- IP rating flush mounting: IP44, surface mounting: IP54
- Enclosure external: plastic ASA, RAL 9010 white-ivory
- Enclosure internal: polyamide according to IEC 60335
- Operating temperature: 0…40°C.

SDPV-230 Description

This potentiometer is developed to control fans equipped with an EC motor or demand proportional drives without a 10VDC output. It is mounted in a splash water proof housing and can be used for inset as well as for surface mounting.

The potentiometer needs a supply of 230 VAC, and gives a stepless output signal of 0-10 VDC or 0-20 mA and PWM between voltage Vmin and voltage Vmax. Position 0 is the off-position. The load cannot be lower than 2 kΩ (R>2 kΩ) in 0-10 V output mode or higher than 500 Ω if 0-20 mA.

SDPV-230 Range

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDPV-230</td>
<td>Potentiometer 230VAC Out: 0-10VDC</td>
<td>EA002108</td>
</tr>
</tbody>
</table>

Suitable for use with the TEDP, TDP and Fan panel, when used directly on an Inverter and EC motor EA002107 can be used.
SDPV-230 Technical Data

- Mode 0-10 V 0-20 mA PWM
- Output 0, 1-10 V 0, 2-20 mA 0, 10-100 % PWM
- Vmin 1 – 7 VDC 2-10 mA 10-70 % PWM
- Vmax 3 – 10 VDC Vmax: 6-20 mA 30-100 % PWM
- Enclosure external: plastic, ASA, RAL 9010 white-ivory
- Enclosure internal: polyamide According to IEC 60335
- Operating temperature: 0...40°C

This potentiometer is developed to control fans equipped with an EC-motor. It is mounted in a splash water proof housing and can be used for inset as well as for surface mounting.

The potentiometer needs a supply of 230 VAC, and gives a stepless output signal of 0-10 VDC or 0-20 mA and PWM between voltage Vmin and voltage Vmax. Position 0 is the off-position. The load cannot be lower than 2 kΩ (R>2 k Ω) in 0-10 V output mode or higher than 500 Ω if 0-20 mA output is selected.
SDPV – 230 Wiring Diagram
EEID – Electronic Single Phase

Independent drive

EEID Features

- Independent control of fan speed, infinitely variable from max to min with off position.
- Supply 230 VAC, 50/60 Hz, 1 phase
- IP54 Surface IPIP44 inset ingress protection rating
- Two wire control
- JClear indication light
- Commissioning adjustable minimum speed pre-set to 20% via internal potentiometer
- Fuse 5*20mm, spare included
- RAL9010 white ivory enclosure and face. Internal polyamide.
- Mac ambient temperature: 50°C.

EEID Description

Our EEID drive is a compact wall mounted speed controller designed for single phase voltage controllable motors (230 VAC, 50-60 Hz). It varies the output voltage by using a optotriac phase angle control.

Operational status is indicated by an LED, while a hand controlled dial provides an on/off switch and the means to infinitely control fan speed.

Suitable for inset or surface or surface mounting with the splash-resistant housing provided.
EEID Range and Motor Protection

To ensure correct drive selection, please choose a drive that has an amp rating that is equal to or above the fan motor full load current (FLC).

If motors are fitted with thermostat (tK) overheat protection, we recommend the use of our EEDS controller type instead of our EEID.

### EEID Wiring Diagram

- **1**: Power supply 230 VAC, 50 Hz
- **2**: 230 VAC non-regulated output for connecting valve, dampers
- **N**: Neutral
- **3**: Regulated output to motor
- **4**: Fuse holder with spare
- **5**: Minimum speed adjustment trimmer (pre-set to 20%)
- **6**: Control light
Trend - VSD2H Variable Isolator Speed Drives

VSD2H Variable Isolator Speed Description

Variable motor speed drives suitable for HVAC applications where the speed control of motors can be applied. They convert fixed frequency and voltage from the mains supply to variable frequency and voltage enabling motors to be used with maximum efficiency resulting in significant energy savings.

The control keypad can be mounted on the front of the unit or can be remotely connected by way of a 2 m cable and mounted on a panel or used as a handheld unit.

The keypad accesses the startup wizard which facilitates the application configuration for the user (pump/fan, PID loops, multi-pump, cascade control).

VSD2H Variable Isolator Speed Features

- 380 to 480 Vac 3 phase
- Current rating range from 3 A to 310 A.
- IP21 and IP54 models available
- Optional Trend system network interfaces (NXNI or NXIP)
- Application configurable using wizard for a number pump or fan scenarios.
- Real time clock fitted with battery
- Integrated RFI filter for typical building installation
- Versatile PC tools available
- Slim, space-saving, “bookshell” design
- Varnished printed circuit boards to maximise reliability.
Physical (dimensions in mm)

3 A to 105 A units (unit size MR4 to MR7) - wall mounting

Current (A) | A  | B  | C  | D  | E  | ØF | ØG | ØH | ØI | Frame
-------------|----|----|----|----|----|----|----|----|----|-------
3 to 12      | 125| 328| 190| 100| 313| 7  | 13 | 25 | 25 | MR4   
15 to 31     | 144| 419| 214| 116| 406| 7  | 14 | 33 | 25 | MR5   
35 to 61     | 165| 557| 229| 148| 541| 9  | 15 | 40 | 33 | MR6   
72 to 135    | 197| 660| 259| 190| 645| 9  | 18 | 50 | 50 | MR7   
110 to 205   | 203| 668| 313| 217| 647| 9  | 18 | 60 | 60 | MR8   
201 to 310   | 203| 1150|365| 400|1122|9  | 10 | 59 | 58 | MR9   

S = supply cable
M = motor cable
C = control cable

Physical (continued)

140 A to 205 A units (unit size MR8) - wall mounting

Supply Unit Fan Type & Speed Control
The VSD2H range of variable speed drives provides 20 models (3 A to 310 A) for voltages from 380 to 480 Vac 3 phase with either IP21 or IP54 rating. Designed for use in the HVAC environment they enable fans and motors to regulate delivery of air and water in variable flow applications. Where flow rates may be reduced, motor energy can be significantly cut as the relationship between flow rate and power follows a cube law hence reducing flow by 20% reduces power by 50%. The drives also enable saving in installation costs: switchgear is eliminated, motor cables are reduced from 6 to 3 wires for larger drives, power factor correction capacitors are not required, size and cost of cabling and fuses is minimised (as starting current is kept within nominal value).

The built-in application can be configured to suit the user’s application using the start-up wizard; select either pump or fan, and enter nominal motor information. There are additional mini-wizards for setting up multi-pump control and the PID controller, and performing a resonance sweep.
Hardware

- **Unit**: The unit is housed in a slim, space saving, bookshelf style enclosure that should be mounted vertically on a wall or on the back panel of a cubicle. Enough space should be left round the unit for cooling. Most units have 4 point mounting with two keyhole slots.
- **System**: The drive consists of the main unit, the cover, and a detachable keypad unit.

**Main unit**: The main unit consists of the power unit and the control unit.

The unit will be housed in a slim, space saving, bookshelf style enclosure that should be mounted vertically on a wall or on the back of a cubicle. Enough space should be left around the unit for cooling. Most units have 4 point mounting with two keyhole slots.
The power unit provides connections for the input mains supply (L1, L2, L3) and the output supply to the motor (U, V, W).

The control unit is based around a microprocessor. The microprocessor controls the motor based on the information it receives through measurements, parameter settings, control I/O and from the control keypad. The control unit of the frequency converter consists of the control board and up to 4 additional boards connected to the slot connectors (identified by letters A, B, D, E) of the control board.

The power unit provides connections for the input mains supply (L1, L2, L3) and the output supply to the motor (U, V, W).

The control unit is based around a microprocessor. The microprocessor controls the motor based on the information it receives through measurements, parameter settings, control I/O and from the keypad. The control unit of the frequency converter consists of the control board and up to 4 additional boards connected to the slot connectors (identified by letters A, B, D, E) of the control board.
When the frequency converter is delivered from the factory, the control unit includes the standard complement of two basic boards, the basic I/O board in slot A, and the Relay Board in slot B.

Additional boards can be added to slots D and E. An NXIP or NXNI Trend network interface can only be fitted in slot D.

The basic boards terminals are shown above.

The basic I/O Board (fitted as standard) has:

2 analogue input channels, separately switchable to voltage (0(2) to 10V) or current (0(4) to 20 mA)
6 digital input channels (0 to 5 V =0, 15 to 30 V =1)
1 analogue output channel, switchable to voltage (0 to 10V) or current (4 to 20 mA).
RS485 serial bus terminal pair (for BACnet MS/TP or Modbus)
The defaults for the analogue inputs and output are indicated in the diagram below; they may be changed using the DIP switches (see below).
# Supply Unit Fan Type & Speed Control

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Signal</th>
<th>Information</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10 Vref</td>
<td>+10 Vdc Reference voltage</td>
<td>10 mA max.</td>
</tr>
<tr>
<td>2</td>
<td>A1+/</td>
<td>Analogue input 1 voltage or current</td>
<td>DIP switch 4 selects V or mA. Differential input if not connected to ground</td>
</tr>
<tr>
<td>3</td>
<td>A1−</td>
<td>Analogue input 1 common</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>A2+/</td>
<td>Analogue input voltage or current</td>
<td>DIP switch 3 selects V or mA. Differential input if not connected to ground</td>
</tr>
<tr>
<td>5</td>
<td>A2−</td>
<td>Analogue input ±2 c ommon</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>24 Vout</td>
<td>24 V auxiliary voltage output</td>
<td>±10 %, 250 mA max.</td>
</tr>
<tr>
<td>7</td>
<td>GND</td>
<td>I/O ground</td>
<td>Ground for reference and controls</td>
</tr>
<tr>
<td>8</td>
<td>D1/1</td>
<td>Digital input 1</td>
<td>Rmin = 5 kohm min. 0 to 5 V = 0', 15 to 30 V = 1'</td>
</tr>
<tr>
<td>9</td>
<td>D1/2</td>
<td>Digital input 2</td>
<td>No function</td>
</tr>
<tr>
<td>10</td>
<td>D1/3</td>
<td>Digital input 3</td>
<td>External fault</td>
</tr>
<tr>
<td>11</td>
<td>COM</td>
<td>Digital input common</td>
<td>Common for D1/1 to 8. Can be disconnected from ground by removing link</td>
</tr>
<tr>
<td>12</td>
<td>24 Vout</td>
<td>24 V auxiliary voltage output</td>
<td>as terminal 6</td>
</tr>
<tr>
<td>13</td>
<td>GND</td>
<td>I/O ground</td>
<td>as terminal 7</td>
</tr>
<tr>
<td>14</td>
<td>D1/4</td>
<td>Digital input 4</td>
<td>Rmin = 5 kohm min. 0 to 5 V = 0’, 15 to 30 V = 1’</td>
</tr>
<tr>
<td>15</td>
<td>D1/5</td>
<td>Digital input 5</td>
<td>Preset speed select B0</td>
</tr>
<tr>
<td>16</td>
<td>D1/6</td>
<td>Digital input 6</td>
<td>Preset speed select B1</td>
</tr>
<tr>
<td>17</td>
<td>COM</td>
<td>Digital input common</td>
<td>as terminal 11</td>
</tr>
<tr>
<td>18</td>
<td>AO1+</td>
<td>Analogue signal (output)</td>
<td>DIP switch 2 selects V (0 to 10V) or I (0 to 20 mA)</td>
</tr>
<tr>
<td>19</td>
<td>AO1−</td>
<td>Analogue output common</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>+24 Vdc</td>
<td>24 Vdc auxiliary input</td>
<td>+24 Vdc, 100 mA, ±10% for backup power</td>
</tr>
<tr>
<td>A</td>
<td>RS485 A (+)</td>
<td>Fieldbus communication</td>
<td>Differential receiver/transmitter; Use for BACnet MS/TP, or MODBUS RTU</td>
</tr>
<tr>
<td>B</td>
<td>RS485 A (-)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

"The control board can be powered externally by connecting an external power source to terminal 30. This voltage is sufficient for parameter setting and for keeping the control unit active. Note however that the measurements of the main circuit (e.g. DC-link voltage, Unit temperature) are not available when the mains is not connected."
The Basic Relay Board (fitted as standard) has:
- 2 changeover relay output channel
- 1 thermistor input channel

An optional system network interface can be fitted into the VSD2H drive. It is plugged into slot D, and enables the unit to be monitored and controlled from supervisors, and from the controllers. There are the IQ system current loop Lan interface. NXNI (which provides a standard four wide current loop Lan terminal set), and the Ethernet interface, nxip. See NXNI data sheet TA200826 for details. Note that the NXNI allows the unit to be monitored by all controllers, but it can only be written to by IQ3, IQ4 or IQeco controllers.
The 4 DIP switches have 3 functional positions, left, middle and right. The middle position is used for test mode. The switches are used to set the following parameters:

- Switch 1: RS485 fieldbus Terminator resistor, on or off (default off)
- Switch 2: Analogue Output 1, current or voltage (default current)
- Switch 3: Analogue Input 2, current or voltage (default current)
- Switch 4: Analogue Input 1, current or voltage (default voltage)
Quick setup

A group of the parameters most commonly used during installation and commissioning.

Monitoring

This enables parameters to be monitored only.

Parameters

This enables the parameters to be edited. First the group of parameters is selected, then the individual parameter. The actual meanings of the parameters vary with the configuration being used.

Diagnostics

This enables current and historical faults to be viewed, faults to be reset, and counters and software information to be viewed.

I/O and hardware

This selects basic I/O, any additional boards in slots D or E (an NXNI or NXIP in slot D would be shown as OPTCO), Real time clock, the drive fan, keypad settings and fieldbus (RS485 or Ethernet) parameters.

User settings

Language, application, parameter backup and restore to and from keypad.

Favourites

(advanced commissioning keypad only) This enables the user to collect a set of parameters from any of the keypad menus.

Digital Input Isolation

The digital inputs (DI1 to DI6) can be isolated from ground by removing a link on the control board as shown.
Ethernet Connection

The Ethernet connection for BACnet over IP or MODBUS TCP is situated under the cover to the left of the control keypad, and the cable is run in a channel cut in the plastic flap. A shielded RJ45 connector should be used.

RS485 Connection

The RS485 connection for BACnet over MS/TP or MODBUS RTU uses terminals A and B (A negative, B positive) in the basc I/O board terminal set. STP (Shielded twisted pair), type Belden cable 9841 or similar should be used. The terminator (see above DIP Sw 1) should only be switched on if the unit is at the end of the bus.

Real Time Clock

The VSD2H has a real time clock with timer functions. The unit comes complete with timer functions. The unit comes complete with a Real Time Clock battery installed to maintain the time during power failure.
Integrated RFI-filter

The units have integrated RFI filters, enabling them to comply with EN61800-3 category C2 (suitable for public electricity networks such as buildings).

Integrated DC Choke

The units are equipped with DC chokes to reduce harmonics (THD), enabling them to comply with EN61000-3-12.

Integrated Stress Removal

Stress removal and 360° grounding of power cables inside the unit with clamps. No need for extra glands.

External Keypad

The External Keypad can be used for setting the frequency converter’s parameters, reading status data, and giving control commands. It is detachable and can be operated externally being connected via a cable to the main unit. There are two accessory kits available.
ACC/VSD2H/Hand Held Kit

This enables the keypad to be detached from the unit and to be used as a hand held unit connected to the VSD by a 2 m cable.

ACC/VSD2H/Door Mounting Kit

This enables the keypad to be detached from the unit and to be mounted in the panel door connected to the VSD by a 2m cable.

The standard text keypad features an alphanumeric display with seven indicators for run status (READY, RUN, STOP, ALARM, FAULT, FWD, REV), and three indicators for control source (I/O, KEYPAD, BUS). There are also two text lines displaying description (of menu, value or fault) and location (reference to menu and parameter) or value (numerical, textual values).

A replacement advanced commissioning keypad is available as an accessory (ACC/VSD2H GRAPHIC DISPLAY). The commissioning keypad can also be used to store the parameter settings and transport them to another drive (ref: M6.5). The top row is the drive status field, and the second row is the location field describing the position in the selection menu. The remaining three rows can be used for display of information. The commissioning keypad has extra features (help and information displays, favourites, multi-monitor of 9 selected values).
Hardware

The keypad has nine buttons which are used for controlling the drive, setting parameters, and monitoring values. The buttons are the same for both types of keypad.

The keypad is the control source by default (i.e. Local) but it can be changed to remote at any time by pressing the LOC/REM button. (The control source has to be changed to Remote/Fieldbus for the NXNI or NXIP to control the drive.)

The main menu consists of 7 individual items which are browsed using up and down buttons, the submenus under these menus are then browsed by selecting OK.

Quick setup:
A group of the parameters most commonly used during installation and commissioning.

Monitoring: This enables parameters to be monitored only.

Parameters: This enables the parameters to be edited.

First the group of parameters is selected, then the individual parameter. The actual meanings of the parameters vary with the configuration being used.

Diagnostics: This enables current and historical faults to be viewed, faults to be reset, and counters and software information to be viewed.

I/O and hardware: This selects basic I/O, any additional boards in slots D or E (an NXNI or NXIP in slot D would be shown as OPTCO), Real time clock, the drive fan, keypad settings and fieldbus (RS485 or Ethernet) parameters.

User settings: language, application, parameter backup and restore to and from keypad.

Favourites: (Advanced commissioning keypad only) This enables the user to collect a set of parameters from any of the keypad menus.
Digital Input Isolation: The digital inputs (DI1 to DI6) can be isolated from ground by removing a link on the control board as shown.

Ethernet Connection: The Ethernet connection for BACnet over iIP or MODBUS TVP is situated under the cover to the left of the control keypad, and the cable is run in a channel cut in the plastic flap. A shielded RJ45 connector should be used.

RS485 Connection: The RS485 connection for BACnet over MS/TP or MODBUS RTU uses terminals A and B (A negative, B positive) in the basic I/O board terminal set. STP (Shielded Twisted Pair), type Belden cable 9841 or similar should be used. The terminator (see above DIP Sw 1) should only be switched on if the unit is at one end of the bus.

Real Time Clock: The VSD2H has a real time clock with timer functions. The unit comes complete with a Real Time Clock battery installed to maintain the time during power failure.

Integrated RFI-filter: The units have integrate RFI filters, enabling them to comply with EN61800-3 category C2 (suitable for public electricity networks such as buildings).

Integrated DC choke: The units are equipped with DC chokes to reduce harmonics (THD), enabling them to comply with EN61000-3-12.
**Integrated stress removal:** stress removal and 360° grounding of power cables inside the unit with clamps. No need for extra glands.

### Quick Setup

On initial power up, the startup wizard will prompt for:

- Language
- Daylight saving
- Time, day, year
- Run startup Wizard (Y/N)

If yes:

- Process (pump or fan)
- Motor Nominal Speed (range 24 to 19200 rpm)
- Motor Nominal Current (range depends on unit)

There are other mini-wizards that can be used for setting the following:

- PID: Three term control for motor or external device by way of I/O.
- Pump and Fan Cascade: Cascade control of several pumps or fans.
- Resonance Sweep: For elimination of possible resonance points in the system.

The quick setup menu, mentioned above, enables access to the parameters most commonly used during installation and commissioning including access to the start-up, PID and pump and fan Cascade wizards.

### Uninterruptible Operation and Energy Saving

**Over temperature ride-through:** Automatically adjusts switching frequency and/or speed of the motor to adapt to unusual increase in ambient. The benefit of this is uninterruptible operation.

**RTO – Ramp Time Optimizer:** When problematic areas are identified in acceleration or declaration the drive automatically expands the times needed for this to avoid mechanical stress to the system. The benefit of this is the decreased mechanical stress to the system.

**Trip free output switching:** Ensures trip free operation when an output switch (e.g. safety switch) is operated between the motor and the VSD. Truly intelligent and highly reliable function to ensure better functionality than with any other VSD. The benefit of this will be Uninterruptible operation.

**Energy Saving function (Flux Optimization):** Flux Optimization automatically minimizes energy consumption. The benefit will be a 5% increase in energy savings.

**Configurable Auto Reset function:** Auto restart function can be configured to make VSD restart automatically once fault is addressed. The benefit of this is uninterruptible operation.
VFD and Motor Control

Single Input Control: Analog signal rising edge can be used to start the device without additional start signal to a digital input. The benefit of this is cost and time savings.

Flying start: Ability to get an already spinning fan under speed control. The benefits of this will be improved performance, very important in clean room production.

Automatic torque boost function: Boosts initial voltage to start high inertia fans. The benefits of this is it avoids tripping and enables smooth starts also to high inertia loads.

High Switching Frequency: The VSD2H is capable of providing the maximum power with high switching frequency. The benefit of this is low audible noise from the motor.

Prohibit frequency: Overriding the critical frequencies to avoid resonance. Can be set with the help of resonance sweep wizard. The benefit of this will be the elimination of resonance.

Maintenance counters/alarms: The drive can be programmed to notify on upcoming maintenance for the system or the drive itself. The benefit of this will be the reliability.

Temperature-controlled fans: Fan stops operating when not needed. The benefits of this is less audible noise from the VSD itself, and also energy savings.

Advanced HVAC Control

Time based control: With the help of the real time clock and calendar functionality the drive can be programmed to perform functions based on time. The benefits of this will be cost savings and also flexibility.

Inbuilt PID Controller: Normal and Inverse Regulation, Delta P regulation with 2 standard pressure transmitters, Feed forward control, less wiring since sensor normally close to inverter. The benefit of this would be the cost saving and faster response to process closed loop.

Sleep Mode: Shutting down the motor, when no demand. The benefit of this will be energy savings.

Pressure loss compensation: For compensating e.g. wrongly placed sensor in the system. The benefit of this will be a time and cost saving. Pump Soft Fill: Feature to prevent the overpressures when filling empty pipe work. The benefit of this will be a longer lifetime of the system.

Fireoverride mode: Keeps fan/pump running in case of fire. This is a legal requirement.

Pump and Fan Cascade control with full auto-change: Controls total pumping system with several parallel pumps by equally sharing the load. Also the master pump can be included in auto-change loop. The benefits of this will be the longer lifetime of the system, also the cost savings will be a benefit.
Software

Windows based PC utility tools are available for making the use of the Trend VSD2H as easy and convenient as possible. The tools facilitate installation, commissioning and maintenance. The software is self-documenting from its integral help file. The minimum requirement for using the software is a PC and a USB to RS485 interface cable (e.g. ACC/VSD2H/USB-PC/CABLE, 3 m), to be connected to the RS4785 terminal behind the control panel.

Drive care PC tool: The drive Care tool is easy-to-use commissioning software for the control of the VSD2H. It enables the following:

- Setting up parameters with the PC
- Saving settings to the PC
- Creating commissioning documentation
- Comparing parameters settings
- Monitoring view with graphics
- Diagnostics
- Controlling the drive from the PC.

This tool also includes the ‘Loader’ tool which enables the downloading of firmware or applications.

Note that the drive configuration can be loaded from one drive into the advanced commissioning keypad (ACC/VSD2H/Graphic Display), and downloaded into another drive.
SISO – Safety Isolators/Switch-disconnectors

Switches & Sensors

Features

- Electrical range 230V-690V, 1-3 phase, 50-60Hz, 0-63A
- Enclosure IP66 Grey RAL 7035
- Mechanically interlocked with 3 x padlock to ‘off’ apertures
- Early breaker fitted to all units as standard. Three and six pole/wire versions available
- Three and six pole/wire versions available
- Two entries top and bottom 20/25A M20 40/63A M20/25
- Stainless steel facia screws
- Two earth continuity screws in each enclosure

Description

All fans and drives should have a correctly rated lockable Isolator switch instead in the power input circuit to provide full electrical isolation. This is vital for safe installation, operation and maintenance.

Many modern drives also require an early break signal so that a graceful full power off can be achieved without damage to sensitive electronics. Early break is included in all SISO Isolators. Isolators are provided with mechanically interlocked IP66 standard.
## Range

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>SISO25-3</td>
<td>Isolator 3P 25A+2EB</td>
<td>EA002000</td>
</tr>
<tr>
<td>SISO40-3</td>
<td>Isolator 3P 40A+2EB</td>
<td>EA002001</td>
</tr>
<tr>
<td>SISO63-3</td>
<td>Isolator 3P 63A+2EB</td>
<td>EA002002</td>
</tr>
<tr>
<td>SISO25-6</td>
<td>Isolator 6P+2EB 25A</td>
<td>EA002003</td>
</tr>
<tr>
<td>SISO40-6</td>
<td>Isolator 6P+2EB 40A</td>
<td>EA002004</td>
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</table>

### Attribute Table

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Unit</th>
<th>SISO25-3</th>
<th>SISO40-3</th>
<th>SISO63-3</th>
<th>SISO25-6</th>
<th>SISO40-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated thermal current</td>
<td>A</td>
<td>25</td>
<td>40</td>
<td>63</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>V</td>
<td>690</td>
<td>690</td>
<td>690</td>
<td>690</td>
<td>690</td>
</tr>
<tr>
<td>Rated impulse voltage</td>
<td>kV</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Rated operational power (3 phase AC)</td>
<td>kW</td>
<td>11.0</td>
<td>15.0</td>
<td>25.0</td>
<td>7.5</td>
<td>15.0</td>
</tr>
<tr>
<td>Rated short withstand current (3 sec)</td>
<td>A</td>
<td>500</td>
<td>800</td>
<td>1300</td>
<td>250</td>
<td>800</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminal type</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible cable</td>
<td>mm²</td>
<td>6.0</td>
<td>6.0</td>
<td>10.0</td>
<td>2.5x2</td>
<td>6.0x2</td>
</tr>
<tr>
<td>Rigid cable</td>
<td>mm²</td>
<td>10.0</td>
<td>10.0</td>
<td>25.0</td>
<td>2.5x2</td>
<td>10.0x2</td>
</tr>
<tr>
<td>Tightening torque</td>
<td>Nm</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

### Auxiliary Contacts

| Rated insulation                  | V       | 690     |
| Rated thermal current             | A       | 10      |
| Operational current               |         |         |
| 100V                               | A       | 8       |
| 220-240V                           | A       | 8       |
| 380-400V                           | A       | 3       |
| 660-690V                           | A       | 1       |
| Max. conductor size               | mm²     | 1.5     |
| Tightening torque                 | Nm      | 0.6     |
Commissioning
Plug / SISW / DIDW Fans - Motors – Drives

Access is by hinged or lift off panels. Catches are hidden quarter turn cams, tool or key operated.

Wiring to the motor(s) should be carried in flexible armoured conduit through screwed gland(s) fitted in holes(s) drilled by the installer/user. NEVER THROUGH ACCESS DOORS.

Motors may be 240/1/50 or 415/50 TEFC, flameproof, super silent, single speed, dual speed, regulative or non-regulative D.O.L. or Star Delta. DO NOT attempt to wire the motor without reference to the correct wiring diagram issued with the unit.

Starters MUST have thermal overload cut outs and single phasing prevention devices.

Belt Drives

Slacken belt tensioner, remove belts, check impeller rotates freely and fan scroll is free of obstructions.

Remove locking bolts and shipping braces, if fitted, to protect vibration isolators during transport.

Adjust jacking self-levelling steel spring vibration isolators as instructions until floating and damped.

Check rubber in shear anti-vibration mounts for condition, tightness and free operation – bounce.

Inspect all bolts on motor, fan and frame for tightness.

Test run motor for condition and correct rotation.

Replace belts and check pulleys are correctly aligned as illustrated.

Adjust the belt tension according to the table

The lowest belt tension at which slip does not occur under load gives longest belt and bearing life.
## Belt Section

<table>
<thead>
<tr>
<th>Belt Section</th>
<th>SPZ</th>
<th>SPZ</th>
<th>SPA</th>
<th>SPA</th>
<th>SPB</th>
<th>SPB</th>
<th>SPC</th>
<th>SPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small pulley diameter</td>
<td>Min</td>
<td>67</td>
<td>100</td>
<td>100</td>
<td>140</td>
<td>160</td>
<td>236</td>
<td>224</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>95</td>
<td>140</td>
<td>132</td>
<td>200</td>
<td>224</td>
<td>315</td>
<td>355</td>
</tr>
<tr>
<td>KG force for 16mm* defl'n / metre span</td>
<td>Min</td>
<td>1.0</td>
<td>1.5</td>
<td>2.0</td>
<td>2.8</td>
<td>3.5</td>
<td>5.1</td>
<td>6.1</td>
</tr>
</tbody>
</table>

With all access panels in place, components installed and the cutting system complete, connected and commissioned, check that measured full load current is less than motor nameplate full load current. Check that starter overload setting is correct and that single phasing protection is functioning. If any problems occur refer to Fault Finding Section of this manual.

The complete ductwork system should be proportioned to CIBSE - ASHRAE recommended procedure. The Volume should be measured and if outside CIBSE recommendations or specified tolerances then;

Installer / commissioning engineer should submit full commissioning data to ECE.

ECE will calculate new fan speed required to achieve design volume and recommend pulley(s) & belt(s) sizes required to achieve new fan speed.

Installer/commissioning engineer should then:
- Purchase new pulleys and belts available locally from nationwide stockists
- Change pulley(s) and belt(s) on site
- Re-measure volume
- Recheck proportion and volumes to air terminal devices

ECE site operatives are available for changing belts and pulleys on site at extra cost if required.

*Rotating standby motors generate electricity even when isolated from the mains. If the motor is being rotated by the fan do not touch the terminals even if the motor is isolated*

The most common cause of incorrect fan volume is over estimation of system resistance. Please check this before contacting ECE.

Unless specified otherwise fans are belted to give specified volume with clean filters.

Where the specification calls for design volume with dirty filters we recommend the incorporation of pressure activated constant volume control since selection of the fan(s) at final system resistance could result in considerable excess volume initially.

Excess volume can cause:
- Coil off temperature, hence room supply air temperature, hence room temperature not being achieved
- Water carryover and flooding
- Motor overload and burnout
- Increased fan noise levels
- Turbulence and excitation of duct walls resulting in noise and vibration problems
- Noise regeneration at changes of direction, volume control dampers and air terminal devices
- Reduced filter life

Gross under volume can cause coil sweating, freezing and motor burn out.
Anti-Vibration Mountings

Checking Label Positioning

The positions of the Danger & Caution labels, these labels will always be positioned on the fan section doors. Should for any reason these labels not be in position they can be obtained from ECE.

The positions of the Caution Hot Surface labels, these are positioned on electric heater batteries and gas burners where the surface on the outside of the AHU will be HOT. Should for any reason these labels not be in position they can be obtained from ECE.
Servicing Filters

Units are supplied with required filter fitted. After installation of the plant “Blow Through” ensure the system filters are replaced by the installer at commissioning as follows.

Filter Ratings – use this chart to ensure you have the correct type

**If avoidance of pattern staining on surfaces is a priority use this standard or above
## Installation, Operation and Maintenance for ECE air handling and conditioning units

<table>
<thead>
<tr>
<th>FILTER TYPE</th>
<th>ARRESTRANCE RATING</th>
<th>EFFICIENCY %</th>
<th>FILTER REFERENCE (type normally used indicated by bold boxes)</th>
<th>Pa of Normally Used Filters</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU1</td>
<td>&lt;65</td>
<td>-</td>
<td>Metal foil greases filter panels</td>
<td>100 200 50</td>
</tr>
<tr>
<td>EU2</td>
<td>&gt;65</td>
<td>&lt;80</td>
<td>50mm synthetic panel filter</td>
<td>100 200 50</td>
</tr>
<tr>
<td>EU3</td>
<td>&gt;80</td>
<td>&lt;90</td>
<td>Fan coil induction filter</td>
<td>(a) (a) 50 (a) 250 (a) 100</td>
</tr>
<tr>
<td>EU4</td>
<td>&gt;90</td>
<td>-</td>
<td>550mm Standard bag filter</td>
<td>87 287 100</td>
</tr>
<tr>
<td>EU5</td>
<td>-</td>
<td>&gt;60</td>
<td>550mm Extra bag filter</td>
<td>87 287 100</td>
</tr>
<tr>
<td>EU6</td>
<td>-</td>
<td>&gt;90</td>
<td>High efficiency panel filter</td>
<td>137 337 100</td>
</tr>
<tr>
<td>EU7</td>
<td>-</td>
<td>&gt;90</td>
<td>High efficiency panel filter</td>
<td>137 337 100</td>
</tr>
<tr>
<td>EU8</td>
<td>-</td>
<td>&gt;95</td>
<td>500mm superfine bag filter</td>
<td>287 487 100</td>
</tr>
<tr>
<td>EU9</td>
<td>-</td>
<td>&gt;95</td>
<td>300mm absolute filter</td>
<td>250 500 120</td>
</tr>
<tr>
<td>EU10</td>
<td>-</td>
<td>&gt;95</td>
<td>Mini pleat HEPA filter</td>
<td>250 500 120</td>
</tr>
<tr>
<td>EU11</td>
<td>-</td>
<td>&gt;99.97</td>
<td>Disposable terminal module</td>
<td>250 500 120</td>
</tr>
<tr>
<td>EU12</td>
<td>-</td>
<td>&gt;99.99</td>
<td>Replaceable element module</td>
<td>250 500 120</td>
</tr>
</tbody>
</table>

---

Commissioning
IOM
Installation, Operation and Maintenance for ECE air handling and conditioning units

### Retentivity

<table>
<thead>
<tr>
<th>Type</th>
<th>Retentivity (kg gas / kg carbon)</th>
<th>Constant P.d. (N/m²ins.)</th>
<th>W.G.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activated Carbon</td>
<td>0.1 – 0.4</td>
<td>112</td>
<td>0.45</td>
</tr>
</tbody>
</table>

- Remove open side access doors (unless special access).
- Thoroughly clean system.
- Install temporary filters (gauze bags etc) on inlet discharge points.
- Replace and close access doors.
- Blow out system.
- Remove contaminated temporary filters.
- Replace filters, check sealing for bypass.
- Replace doors.

- ✔ Panel filters - Check airflow direction arrows.
- ✔ Absolutes - Ensure pre-filters fitted, check sealing.
- ✔ Autorolls - Check airflow. Autorolls have two end headers, one contained the clean spool, one the dirty spool which is driven by a geared motor and chain drive, activated by a pressure differential switch with 10 seconds delay. Usually a hand inching switch, a media available light and an end of roll indicator are fitted. The 2201/50 or 415/3/50 motor has starting currents between 1/3 and 7 amps and full load current between 0.3 and 1.5 amps.
- ✔ Motor overload protection should be installed if not already fitted.

### Maximum operating conditions

<table>
<thead>
<tr>
<th>Type</th>
<th>Continuous</th>
<th>Short period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glassfibre panels</td>
<td>110°C 80% RH</td>
<td>110°C 80% RH</td>
</tr>
<tr>
<td>Soft fibre panels</td>
<td>49°C 80% RH</td>
<td>49°C 80% RH</td>
</tr>
<tr>
<td>Autoroll glassfibre</td>
<td>70°C 80% RH</td>
<td>70°C 80% RH</td>
</tr>
<tr>
<td>Bag standard</td>
<td>100°C 80% RH</td>
<td>100°C 89% RH</td>
</tr>
<tr>
<td>Bag extra fine superfine</td>
<td>100°C 100% RH</td>
<td>100°C 100% RH</td>
</tr>
<tr>
<td>Fire resistant panel (BS.2963)</td>
<td>250°C</td>
<td>500°C</td>
</tr>
<tr>
<td>Absolute corrosion resistant</td>
<td>66°C 100% RH</td>
<td>120°C</td>
</tr>
<tr>
<td>Absolute medium temperature &amp; humidity</td>
<td>70°C 80% RH</td>
<td>120°C</td>
</tr>
<tr>
<td>Absolute fire resistant &amp; self-extinguishing</td>
<td>250°C 100% RH</td>
<td>500°C</td>
</tr>
</tbody>
</table>

Always replace media with IDENTICAL media.
Install anti-frost control on Autorolls to avoid media roll-on.
Install fan run-on control with high temperature heating mediums such as steam or electricity.
Pressure switches across filters only indicate blocked filters NOT low airflow due to other reasons e.g. blocked inlets dropped fire dampers.
Install bag or absolute filters after the fan (with discharge plenum) to guarantee efficiency. Pre filters are still necessary to protect the coils. Activated carbon filters must have coarse and fine pre-filters.
Shut off VCD’s - HRD’s

Hand operated with locking quadrant
Check:
- Free action of the damper blades and arm before setting at the required angle.

Motorised (motor not normally ECE)
Remove links and check:
- Motor bolts and platform tight.
- Electrical supply and connections correct.
- Motor operates freely and in correct direction.
- Dampers move freely.
- Reconnect link(s) and adjust for required damper movement and check
- Links are not adjusted so that motor attempts to push dampers BEYOND fully open or fully closed position in as this can damage motor linkages and bearings.

Coils

General checks:
- Coils installed in correct order for psychometrics.
- Fin conditions, comb out if necessary.

Water coil checks:
- Air and water are in counter flow.
- Flow pipe work with drain cock fitted is to lowest connection.
- Return pipe work with vent is from highest connection.
- Drains at the lowest point, vents at highest point.
- Frost protection exists for low ambient airflow or shut down conditions.
Coil Connections

Ensure connections to coils are bottom inlet and top outlet, this arrangement ensures thermal siphoning aids flow. Performance will be limited if these connections are made the wrong way.

Setting Water Flow through Coils

Refer to following section for full details on coil and condensate drain connections.
Open all manual valves fully – including the bypass valve on the three port control valves diverting port.

Ensure that the three port control is set to pass 100% flow through the air handling unit coil.

With the aid of a screwdriver open the two small inbuilt valves either side of the flow indicator window on the main commissioning unit. The main commissioning unit is sited in the main return pipe (these small valves allow water to pass through the indicator window to enable flow rate to be observed.

Set the flow rate through the coil by rotating the larger valve on the main commissioning unit to restrict the water flow until the desired flow rate is indicated in the window. Once this valve has been set DO NOT adjust it again.

Move the three port control valve into the 100% bypass position.

Slowly close the secondary commissioning valve (sited on the three port control valves bypass port) at the same time observe the flow rate being indicated in the window of the main commissioning valve. Continue closing this valve until the same flow rate reading as before is obtained.

Conclude by closing the two small integral valves either side of the indicator window on the main commissioning valve.

*The system is now balanced.*

---

**Coil Condensate Drains**
Draw Through Units and Blow Through Units with negative pressure (depression at trap)

10pa difference in pressure = 1mm difference in water level
i.e. 190mm = 1900pa depression -- 235mm = 2350pa depression
Blow through units with positive pressure at trap

10pa difference in pressure = 1mm difference in water level
i.e. 190mm = 1900pa depression -- 235mm = 2350pa depression
Coil Condensate Faults

Draw Through

Inadequate trap differential resulting in condensate drain tray overflow and flooding

Not draining into an open tundish but connecting to a full pipe resulting in condensate drain tray overflow and flooding

Trap not being primed with water resulting in condensate drain tray overflow and flooding

Reverse pipe slope resulting in condensate drain tray overflow and flooding

Blocked pipe connection(s)
Partial block = some flow resulting in condensate drain tray overflow and flooding
Inadequate trap differential resulting in priming water blow-out "splutter" and air leakage

Not draining into an open tundish but connecting to a full pipe resulting in condensate drain tray overflow and flooding

Correct trap but not primed with water resulting in condensate blow-out "splutter" and air leakage

Reverse pipe slope resulting in condensate drain tray overflow and flooding

Partially or fully blocked pipe connection(s) resistance through blockage greater than P resulting in drain tray overflow and flooding.

Partial block = some flow
Draw through coils with condensate pump

Pump sump primed with water
Fan off
Coil off
No difference in water levels

Fan starts and creates depression at coil
Priming water in pipe rises \( 1 \times D \)
Priming water in sump falls
\[
\frac{1 \times D \times \text{Area of pipe}}{\text{Area of sump}}
\]
Coil is still off so no condensate is flowing

Fan still running and creating depression at coil
Coil operating, condensate flowing
Water level in pipe rises
Water level in sump also rises until HLFS operates
Pump starts

Pump runs
Water levels falls until LLFS breaks
Pump stops

\( H = \text{depression at off face of cooling coil} + \text{difference in level between HLFS operating and pipe openings} \)

10\text{pa difference is pressure} \times 1\text{mm difference in water level}
i.e. 1900\text{pa depression} – 235\text{mm} = 2350\text{pa depression}
Chilled Water Cooling and LP Hot Water Heating Coils

Bypass Circuit

Tightly closing three-way valves are required as the regulating valves. At nominal flow the pressure drop across the valves (pv100) should range from approximately the same value to about double the value of the pressure drop across the heating load branch at nominal flow.

The balancing valves are used to adjust the water volumes for the individual heating circuits.

Mixing circuit using three-way mixing valves.

Slipper valves can generally be used. The nominal size is usually chosen equal to the nominal size of the pipe. However, from the point of view of hydraulics, slipper valves one size smaller than the nominal size of the pipe are preferable.

In systems where the pressure difference between A and B exceeds approximately 0.8 mWG, it must be checked that the leakage losses of the slipper valves remain within tolerable limits. If this is not the case, seat valves are to be used.
Chilled Water Cooling Coils

Coils are normally of open header box construction (but may have split end covers supplied to order) are completely self-supporting and designed to be fitted directly between or within the sections of the air handling unit.

When split cover plates are supplied these should be removed prior to connections being made, then replaced. Great care should be taken when tightening connections to avoid damage to the coil. The space between the pipe work and cover plates should be sealed with a grommet or similar.

A correctly sized thermostatic expansion valve with external equalising connection must be fitted.

Run the liquid refrigerant line to the TEV which should be fitted to the liquid distributor, feeding the individual circuits of the evaporator coil.

An adequately sized suction line should be run from the suction head to the compressor.

The valve equalising line should be run to the suction line on the compressor side of the valve sensitive phial which should be placed on top of the suction line periphery and secured with a special slip. A suction liquid heat exchanger should be used to improve the performance of the expansion valve and utilise the complete coil surface.

If your unit is built to HTM standard each coil will come with a removable drain tray. A screw connection joins the tray to the drain line, which can be detached so the tray can be removed and washed down.

A correctly sized sloping drain line with a cleanable “U” bend water trap terminating at an open drain or tundish should be run from each drain connection.
Hot Water Heating Coils

Coils are normally of open header box construction (but may have split end covers supplied to order) are completely self-supporting and designed to be fitted directly between or within the sections of the air handling unit.

When split cover plates are supplied these should be removed prior to connections being made, then replaced. Great care should be taken when tightening connections to avoid damage to the coil. The space between the pipe work and cover plates should be sealed with a grommet or similar.

A correctly sized sloping drain line with a cleanable “U” bend water trap terminating at an open drain or tundish should be run from each drain connection.

Heater coil automatic control valves should be wired into the fan starter circuit so that valve motors close when fan is stopped. This prevents temperature build up within the unit and possible harm to motor windings, particularly important with high pressure hot water or steam coils.
Steam Coils

Coils are normally of open header box construction (but may have split end covers supplied to order) are self-supporting and designed to be fitted directly between or within the sections of the air handling unit.

When split cover plates are supplied these should be removed prior to connections being made, then replaced. The space between the pipe work and cover plates should be sealed with a grommet or similar.

Check:
- Supply is under 100 PSIG dry.
- Supply is free of air and connected to the top coil connection.
- Connecting pipe work is not supported by coil.
- Expansion allowance made for coil tubes.
- Connections are free from stress and are properly pitched and drained (to avoid water hammer).
- Condensate connections to the steam trap are the same size as the coil outlet.
- Condensate in the main is independently trapped on a coil bypass.
- The steam trap is sized on 3 times the design flow.
- Float or bucket type traps should be carefully selected to suit the steam pressures and temperatures with thermostatic air relief traps on low pressure systems and continuous venting petcocks on medium and high pressure systems.
- Multiple or banks of coils must be individually trapped to meet the demands of the varying capacities and pressures on each section.
- Selection of control valves must be based on the steam load and not the size of the steam coil supply connection.
- Automatic steam control valves are suitable where the condensate is returned to atmospheric pressure or under vacuum.
- They are not recommended on systems where pressure is maintained on the return lines.
- Steam pressure in the coil is not used for lifting condensate.
- If coil is near filter ensure fan runs on after steam supply is cut off (2 minutes).

Note:
- Over tightening connections damages coils.
- Initial rapid heat build-up causes damage to coils and associated pipe work, valve opening must be gradual.
- Check for leaks on initial start-up and after a short period of operation.
A typical piping arrangement for low pressure steam or vacuum system

A typical piping arrangement for high pressure steam system
Electric Heater Batteries

“If not properly installed and controlled EAHB’s are dangerous. They can cause serious injury or death and start fires. Ask your local electricity board fire officer and engineers department to inspect your installation before use”

Access is by the access door clamped on the side of the unit. Cable entry should be made by drilling a suitable hole in the folded angle corner posts. Screwed glands with cable holding devices should be used at all drilled holes. Do not use P.V.C. cable inside the unit.

Generally elements are intended for phase to neutral connection balanced across 415/3/50 supply e.g. 3 elements phase to neutral stage. Before connecting out of balance loads consult with your local electricity board.

All wiring must to be to I.E.E. regulations and conform to all local and national statutory requirements.

A high temperature S.P.D.T. cut out which opens at 165°C is fitted, and must be wired in line with the coil of the main EAHB contact breaker. Should this cut out operate, the cause must be ascertained before the hand reset is pushed back in, since the elements may rise to 600°C in still air causing filter damage, motor burn out and fire damper link failure etc. etc.

An airflow switch rated at the correct minimum velocity must be fitted (a filter pressure differential switch is NOT suitable).

Fan interlock with the EAHB and fan overrun (of up to 10 minutes after heater battery off depending on EAHB bank size) must be fitted together with automatic recycle to zero load on step controller.

Always ISOLATE the supply before removal of access door and REPLACE the access door before reconnection of supply.

The element tray must be earthed.
Gas Fired Heaters

Safety Notes:
- Commissioning is recommended by our operatives, in any event gas piping, flue, electricity supply and controls should comply with gas safety, gas region, local authority, fire authority and insurance company regulations.
- Do not locate in presence of chlorinated or corrosive vapours, in areas of high risk i.e. cellulose spraying, near combustible materials or where atmospheric depression i.e. an area with extract fan or system, could cause gas reverse flow into area.
- Ensure 24” minimum clearance all round this section.
- Do not obstruct or modify build in diverter.
- Except for servicing never switch off the power supply to the unit.

Internal Safety controls comprise:
- Main gas valve closure if pilot light out
- Fan on delay unit burner warm.
- Gas off on overheat.
- Fan off delay until burner cool.

External services required:
- Natural gas supply
- Combustion air supply
- Combustion gas flue
- Electricity supply for controls
- Electricity supply for motive power

Flue gas discharge:
- Flue gas leaving the top spigot at 260deg C should be vented to atmosphere using a gas board approved flue terminal via a properly sized, individual, VERTICAL, natural draught flue rising 1.8m min.
- Unavoidable horizontal runs (max 3m) should slope 65mm in 300mm and have final verticals riser of 1.5 times the horizontal run. If these conditions cannot be met then factory installed fan assistance should be considered. If condensation is possible it should be avoided by using double skinned flue with special joiner and spigot (consult your local G.A.). If condensation still occurs a non-corrosive 22mm (min) drain should be fitted.

External controls required are:
- On/off switching (time clock start/stop, thermostat controlling burner)
- Normal electrical controls (fan motor starter, contactors and overload isolators etc.)

Wiring:
- Refer to appropriate diagram supplied with unit and not the following:
- Switching must be by individual 24V controls to each unit and should incorporate a 24V thermostat, switch and time clock in series.
- Never apply higher voltages (240V supply to motor of time clock must be separate).
- Power into the control box can only be 220V l phase 50c/s.
- Single phase fan motors up to 0.5kw (0.7 h.p.) can be connected via thermal overloads direct to the box.
- Over 0.5kW single phase and all 3 phase motors must have separate electrical supplies controlled from the box via a 240V contactor relay and should be protected by thermal overloads.
Inspection prior to initial start up

Gas shut off valve closed:-
- Check all electrical functions - fan motors, room thermostat and gas control set/automatic gas safety system.
- Check correct rotation of fans.

Gas shut off valve open:-
- Carefully vent and check all gas lines for leakage by soapy water testing.
- Close gas shut off valve.

Initial start up
- Switch on main switch
- Supply air discharge(s) open
- Room thermostat “off” lowest setting
- Time switch at “on” period
- Turn on main gas
- The unit will now start
- Refer to user manual supplied with gas heater unit for details start up procedure.
Electronic Steam Humidifiers

Humidifiers supplied for use with ECE units are electrode boilers which operate at atmospheric pressure and utilise standard water supplies provided the local regulations regarding connection of this type of equipment are observed. If local regulations call for the use of a break tank to feed the unit, the speed at which the humidifier cylinder fills will be determined by the head pressure available. The size of tank, its height and the size of its connecting pipe work must be chosen carefully to ensure the unit always receives an adequate water supply. A built in flow regulator compensates for pressure fluctuations.

Water - drain connections
- Standard unit inlets are supplied with 15mm brass compression fittings.
- Drains are brass couplings of 1.5” BSP male thread and 1.25” BSP female thread sizes.

Power Supply
- Connect using conduit entry glands through appropriate knockouts in casing.
- Wiring should comply with the relevant local regulations using appropriately sized circuit breakers.

Control connection
- When step control or modulation is required, the boiler, services and controls are mounted in a cabinet which may be fixed to the side of the air conditioning unit or to an adjacent vertical surface BELOW the sparge pipe level.
- When on-off switching only is required the boiler and its services may be mounted inside the air conditioning unit with the control panel remote.

Start up
- Close electrical panel
- Turn on water supply to humidifier
- Close circuit breaker feeding power supply to humidifier
- Put run/drain switch into the “RUN” position
- Put on/off switch into the “ON” position
- Humidifier will now operate to the demands of the control circuit.

Operation of typical electronic steam humidifier
Operation of typical electronic steam humidifier
GMEC Commissioning

Safety checking

- Check that the impeller rotates freely.
- Make sure that there are no foreign objects in the fan or in the Air Handling Unit.
- Also check that there is no unusual noise in the fan or motor.
- Check that the installation work has been carried out in accordance with the relevant regulations.
- Cables and air flow measurement tubes must be attached so that they do not touch the impeller.
- All necessary protective devices must be installed.
- The fan may only be commissioned after all proper procedures have been followed and all necessary inspections have been carried out.

Test run

Briefly switch on the power supply to the motor to check whether the fan impeller rotates in the correct direction. If the impeller is rotating in the correct direction, the fan may be switched on.

Check that no abnormal mechanical sound and no surging occur.

GPEB Commissioning

Rotate the shaft and check that the impeller can move freely. Make sure that there are no foreign objects in the fan or in the ducting. Also check that there is no unusual noise in the fan. Check that the installation work has been carried out in accordance with the relevant regulations.

All necessary protective devices must be installed.

The fan may only be commissioned after all proper procedures have been followed and all necessary inspections have been carried out.

Test Run

Briefly switch on the power supply to the motor to check whether the fan impeller rotates in the correct direction. If the impeller is rotating in the correct direction, the fan may be switched on. Check that no abnormal mechanical sound and no surging occurs.
GMEB Commissioning

Safety Checking

- Rotate the shaft and check that the impeller can move freely.
- Make sure that there are no longer foreign objects in the fan or in the ducting.
- Also check that there is no unusual noise in the fan.
- Check that the installation work has been carried out in accordance with the relevant regulations.
- All necessary protective devices must be installed.
- The fan may only be commissioned after all proper procedures have been followed and all necessary inspections have been carried out.

Test Run

Briefly switch on the power supply to the motor to check whether the fan impeller rotates in the correct direction. If the impeller is rotating in the correct direction, the fan may be switched on. Check that no abnormal mechanical sound and no surging occurs.
Maintenance
Plug Fan Air flow measurement device

The airflow sensor is used for measuring the airflow of the plug fans. The method is based on differential pressure. The pressure is measured at a specific point in the inlet cone and the reference pressure is measured upstream of the inlet cone. The air flow sensor is supplied factory mounted in the inlet cone.

**Disposal of the product**

Used product shall be disposed or recycled according to the local laws and regulations.

**Before Maintenance**

Switch off the power supply to the fan at the safety switch and wait until the impeller is fully stopped.

"There is a risk of electric shock on PM-motors if the impeller is rotating. Ensure that the impeller is surely still before and during the maintenance work.

**Inspection**

The fan is to be inspected at least once a year.

**Checking the motor bearings**

The motors are meant to be operated in dry or humid air at a normal ambient temperature. The motor bearings have to be lubricated in accordance with the instructions that accompany the motor. Bearings are to be replaced in accordance with the motor manufacturers instructions.

**Impeller**

The maximum permissible vibration level measured from the motor bearing is 4.5mm/s RMS. The impeller can be cleaned by using a vacuum cleaner, compressed air or by brushing. If the impeller is coated with greasy dirt it can be washed with a detergent or a solvent.

The cleaning is to be done at least once a year Badly tarnished impeller will result in lower efficiency of the fan and increases energy consumption.
Replacing the motor and impeller

The fan has to be disconnected and taken out from the unit before the motor can be replaced.

1. Dismantle the front plate supports (fan size 056 and bigger) and the front plate and inlet cone (front plate and inlet cone are permanently riveted to each other).
2. Release the impeller from the motor shaft by loosening the clamp screw and removing the end bolt and washer.

3. If needed, use an extraction tool to pull the impeller off the motor shaft. There is a groove in the impeller hub for the extraction tool. With bigger sizes it is recommended to support the impeller. Size of the extraction tool needed depends on the impeller size. Please follow the general instructions of the extraction tool carefully.

4. Dismantle the old motor from the motor bracket.
5. Mount a new motor to the motor bracket, do not tighten the fixing bolts.
6. Clean the motor shaft and the impeller hub hole. Use of lubrication is recommended.
7. Mount the impeller on the motor shaft.
8. Mark the needed overlap to the inlet cone, see the below illustration and table.

9. Mount the front plate and inlet cone (permanently riveted to each other).

10. Mount the front plate supports (fan size 056 and upwards).

11. Align the impeller and check that the gap between the impeller and the inlet cone is as equal as possible around the impeller. Also check that the overlap is correct.

12. Tighten the motor fixing bolts, reassemble and tighten the end bolt and washer, tighten the clamp screw.

“Before installing and starting the fan, make sure that there is no mechanical contact between the impeller and the inlet cone.

Final inspection

Check that:

- The impeller is mounted for the correct direction of rotation.
- All screws and nuts have been tightened.
- No foreign objects have been left in the fan or in the ducting.
SDPV-10 Maintenance

In normal conditions our controllers are maintenance-free. If external surfaces requires light cleaning, please use a dry or slightly damp cloth. If heavy cleaning is needed, then we recommend the use of a non-aggressive cleaning product. Particular attention should be paid to ensure that no fluids enter the controller to the mains electrical supply when it is completely dry.

SDPV-230 Maintenance

In normal conditions our controllers are maintenance-free. If external surfaces requires light cleaning, please use a dry or slightly damp cloth. If heavy cleaning is needed, then we recommend the use of a non-aggressive cleaning product. Particular attention should be paid to ensure that no fluids enter the controller. Only reconnect the controller to the mains electrical supply when it is completely dry.
## Maintenance Schedule

<table>
<thead>
<tr>
<th>Item</th>
<th>Interval (in months)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>SISW / DIDW Fans:</strong></td>
<td></td>
</tr>
<tr>
<td>Fan impeller cleaning</td>
<td></td>
</tr>
<tr>
<td>Fan motor – cooling vents clear, bearings check</td>
<td></td>
</tr>
<tr>
<td>Fan vee-belt drive, wear, tension, alignment</td>
<td></td>
</tr>
<tr>
<td><strong>Plug Fans:</strong></td>
<td></td>
</tr>
<tr>
<td>Check and lubricate the motor</td>
<td></td>
</tr>
<tr>
<td>Clean the impeller using a vacuum cleaner, compressed air or by brushing. Greasy dirt can be washed with detergent or a solvent</td>
<td></td>
</tr>
<tr>
<td><strong>Filters:</strong></td>
<td></td>
</tr>
<tr>
<td>Filter panels check, clean or renew as necessary</td>
<td>✓</td>
</tr>
<tr>
<td>Filter bag check, clean or renew as necessary:</td>
<td></td>
</tr>
<tr>
<td>➢ Standard</td>
<td></td>
</tr>
<tr>
<td>➢ Fine</td>
<td></td>
</tr>
<tr>
<td>➢ Extra fine</td>
<td></td>
</tr>
<tr>
<td>Filter absolute and activated carbon check, clean or renew as necessary</td>
<td>✓</td>
</tr>
<tr>
<td>Filter autoroll check, clean or renew as necessary</td>
<td>✓</td>
</tr>
<tr>
<td>Filter condition indicator and autoroll controls – operation</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Coils:</strong></td>
<td></td>
</tr>
<tr>
<td>Coils venting</td>
<td>✓</td>
</tr>
<tr>
<td>Coils surfaces, connecting piping</td>
<td></td>
</tr>
<tr>
<td><strong>Electric Air Heater Battery:</strong></td>
<td></td>
</tr>
<tr>
<td>EAHBs continuity, earthing, HT cut out</td>
<td></td>
</tr>
<tr>
<td>Wiring, flow switch, fan overrun, controls</td>
<td></td>
</tr>
<tr>
<td><strong>Dampers:</strong></td>
<td></td>
</tr>
<tr>
<td>Bearings, links, free movement</td>
<td></td>
</tr>
<tr>
<td>Motors, bearings, free movement</td>
<td></td>
</tr>
</tbody>
</table>
## Gas Burners

| All points | ✓ |

## Humidifiers:

| Humidifier cylinder electrodes | ✓ |
| Humidifier controls, wiring, piping | ✓ |

## General Maintenance:

| Metal, paint, sealing strips, sealant, fixings | ✓ |
| Insulation, A/Vs, flex, connections, fixings | ✓ |
| Wiring, controls, earth continuity | ✓ |

* indicates a one-off activity

This Schedule is not intended to be exclusive, inclusive or mandatory. Different conditions of use may dictate shorter or longer periods and or more intensive action.
SISW / DIDW - Fan Bearings

Spider Arm Bearing

Sealed ball races mounted in rubber, pre-greased and self-aligning for service free use under normal duties.

Units in the ECE range fitted with spider arm bearings
Plummer Block Bearing

Sealed ball races, mounted in cast iron supports, self-aligning and pre-greased with grease points.

Units in the ECE range fitted with Pillow Block bearings
Replacing the filters (for HTM specification units)

All filters are fitted to universal filter frames. The filters are fixed using C70 clips. To replace a filter:

- Unclip the fastening pins and pivot them in their base

- Once all the clips are loosened the filter will start to come out from the top. Pull the filter out and check neoprene tape for damage, replacing as required
- Push the new filter into the frame, making sure the pleats are all vertical and the filter seals against the neoprene tape

- Re-fasten the C70 pins
Motor Bearings

Self-aligning self-oiling and spring loaded ball lubricators, use light machine oil.

Pressure grease fittings and relief plugs, wipe down fitting, remove pressure plug (if fitted) and hardened grease. Add grease till NEW grease is expelled, run motor for 10 minutes, stop motor, clean and replace plus.

The bearing should be repacked with Shell Alvania 2, BP Energygrease 2 or Esso Beacon 2, leaving room for expansion (These greases are suitable for temperatures between -30 C and + 110C).

If a rumble, knock or scrape is heard the motor should be replaced or examined and repaired by an electric motor repair specialist.

NEVER subject the shaft to hard blows, as this may cause damage to the bearings resulting in noisy running and reduce list.

Motors without Grease Points

Remove belts, run motor and apply the tip of a screwdriver to motor body (not shaft!) and the handle to your ear. A purring sound should be heard. If a squeaking noise is heard the bearing is dry and should be cleaned and flushed, out with a mixture of Tuoline and methylated alcohol (or, in an emergency, white spirit, never petroleum or paraffin).

Motor Overheating

Check for overheating, ascertain cause and rectify.

Washable Filters

Wash in mild detergent, rinse and squeeze dry.

Autoroll Filters

Check oil level in gearbox, lightly oil chain drive, lubricate drive motor, oil end of roll indicator arm.

Activated Carbon (Constantly Monitored)

When gas absorption drops below limiting level remove, replace with spare set and sent laden set for reactivation of discard.

Activated Carbon (disposable non-monitored)

After 1 month usage remove test element or one cell (install new cell) and send for analysis and prediction of remaining life. Replace filters completely within predicted period.
Electric Heater Batteries

Particularly check condition of wiring and insulation, plus surrounding paintwork/metalwork for signs of overheating.

Dampers - Motors

Lightly oil damper and motor bearings and link swivels – except nylon bearings.

Coils - General

Check finned surfaces every six months for build-up of dirt or lint. If required wash down with mild detergent solution and soft brush and blow out any solids between fins with compressed air line. Take care not to disturb the fin surfaces or probe the coils with metal scraper as damage may cause leaks.

At six monthly intervals ensure that the condensate drain lines are unobstructed and functioning.

DX Cooling Coils

During winter the refrigerant should be pumped over into the liquid receiver and the isolating valve shut. Enough gas should be left in the system to keep a positive pressure in it. Before restarting, the plant should be checked for refrigerant leaks.
Fault Finding
## Centrifugal Fans

<table>
<thead>
<tr>
<th>Fault</th>
<th>Check</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NO AIR FLOW</strong></td>
<td></td>
</tr>
<tr>
<td>▶ Fan motor stationery</td>
<td>✓ Motor connected</td>
</tr>
<tr>
<td>▶ No current to motor</td>
<td>✓ Wiring or isolator (on?)</td>
</tr>
<tr>
<td></td>
<td>✓ Fuses intact</td>
</tr>
<tr>
<td></td>
<td>✓ Wiring to starter (on?)</td>
</tr>
<tr>
<td></td>
<td>✓ Starter wired properly</td>
</tr>
<tr>
<td></td>
<td>✓ Overloads holding in and correct size</td>
</tr>
<tr>
<td></td>
<td>✓ Wiring to time clock at “on phase”</td>
</tr>
<tr>
<td></td>
<td>✓ Wiring to panel/mains (on?)</td>
</tr>
<tr>
<td></td>
<td>✓ Other control circuits holding fan(s) off (eg. gas fired heater warm up)</td>
</tr>
<tr>
<td>▶ Fan motor running</td>
<td>✓ Jammed impeller</td>
</tr>
<tr>
<td>▶ Current to motor</td>
<td>✓ Seized fan/motor bearings</td>
</tr>
<tr>
<td></td>
<td>✓ Drive belts too tight</td>
</tr>
<tr>
<td></td>
<td>✓ Motor windings/wiring faulty</td>
</tr>
<tr>
<td></td>
<td>✓ Motor wrongly connected</td>
</tr>
<tr>
<td></td>
<td>✓ Wrong voltage</td>
</tr>
<tr>
<td><strong>NO AIR FLOW</strong></td>
<td></td>
</tr>
<tr>
<td>▶ Fan motor running</td>
<td>✓ Jammed impeller</td>
</tr>
<tr>
<td>▶ Fan stationery</td>
<td>✓ Drive belts loose or missing</td>
</tr>
<tr>
<td></td>
<td>✓ Impeller loose or missing</td>
</tr>
<tr>
<td><strong>NO AIR FLOW</strong></td>
<td></td>
</tr>
<tr>
<td>▶ Fan running</td>
<td>✓ Louvres blocked</td>
</tr>
<tr>
<td></td>
<td>✓ VCD’s closed</td>
</tr>
<tr>
<td></td>
<td>✓ Filters blocked</td>
</tr>
<tr>
<td></td>
<td>✓ Cooling coil frozen solid</td>
</tr>
<tr>
<td></td>
<td>✓ Duct blocked</td>
</tr>
<tr>
<td></td>
<td>✓ Fire damper link failed</td>
</tr>
<tr>
<td></td>
<td>✓ Grilles closed</td>
</tr>
<tr>
<td><strong>LOW AIR FLOW</strong></td>
<td>Check as for no air flow plus:-</td>
</tr>
<tr>
<td></td>
<td>✓ Fan rotation incorrect</td>
</tr>
<tr>
<td></td>
<td>✓ Filters back to front</td>
</tr>
<tr>
<td></td>
<td>✓ Media wrong</td>
</tr>
<tr>
<td></td>
<td>✓ Drive belts slack or greasy</td>
</tr>
<tr>
<td></td>
<td>✓ Pulley ratios wrong</td>
</tr>
<tr>
<td></td>
<td>✓ Duct resistance exceeds design</td>
</tr>
<tr>
<td></td>
<td>✓ Duct leaking on pressure side</td>
</tr>
<tr>
<td></td>
<td>✓ Access doors off</td>
</tr>
<tr>
<td></td>
<td>✓ Duct joint not sealed</td>
</tr>
<tr>
<td><strong>HIGH AIR FLOW</strong></td>
<td>✓ Low initial clean filter resistance</td>
</tr>
<tr>
<td></td>
<td>✓ Filter missing</td>
</tr>
<tr>
<td></td>
<td>✓ Duct incomplete or leaking</td>
</tr>
<tr>
<td></td>
<td>✓ Pulley ratios wrong</td>
</tr>
<tr>
<td></td>
<td>✓ Backward bladed impeller installed as forward</td>
</tr>
<tr>
<td></td>
<td>✓ System resistance over estimated</td>
</tr>
<tr>
<td><strong>MOTOR CURRENT EXCEEDS NAMEPLATE F.L.C.</strong></td>
<td>Check as for no airflow, low air flow, high air flow</td>
</tr>
</tbody>
</table>
Electric Heaters

<table>
<thead>
<tr>
<th>Fault</th>
<th>Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO HEAT</td>
<td>✓ All controls, protective devices and interlocks as described in “Commissioning” section are installed</td>
</tr>
<tr>
<td></td>
<td>✓ Thermostat setting too low</td>
</tr>
<tr>
<td></td>
<td>✓ Time clock at “on” phase</td>
</tr>
<tr>
<td></td>
<td>✓ Filters clean</td>
</tr>
<tr>
<td></td>
<td>✓ Airflow adequate</td>
</tr>
<tr>
<td></td>
<td>✓ Isolator connected</td>
</tr>
<tr>
<td></td>
<td>✓ Mains switch on</td>
</tr>
<tr>
<td></td>
<td>✓ Power from mains</td>
</tr>
<tr>
<td></td>
<td>✓ All wiring connected</td>
</tr>
<tr>
<td></td>
<td>✓ High temperature cut out button in</td>
</tr>
<tr>
<td></td>
<td>✓ Continuity across H.T. cut out terminals</td>
</tr>
<tr>
<td></td>
<td>✓ Airflow switch making and breaking</td>
</tr>
<tr>
<td></td>
<td>✓ Voltage to airflow switch terminals</td>
</tr>
<tr>
<td></td>
<td>✓ Contactor coil functioning properly</td>
</tr>
<tr>
<td></td>
<td>✓ Fuses not blown</td>
</tr>
<tr>
<td></td>
<td>✓ Step controller functioning properly</td>
</tr>
<tr>
<td></td>
<td>✓ Fan - EAHB interlock functioning properly</td>
</tr>
</tbody>
</table>

If low airflow refer to “Low Airflow” centrifugal fan section.

**If the high temperature cut out has operated do not run system until reason for “cut out” has been found.**

LOW HEAT

<table>
<thead>
<tr>
<th>Fault</th>
<th>Check</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>✓ Wrong elements supplied</td>
</tr>
<tr>
<td></td>
<td>✓ Element failure (open circuit or down to earth)</td>
</tr>
<tr>
<td></td>
<td>✓ Elements disconnected</td>
</tr>
<tr>
<td></td>
<td>✓ Elements incorrectly wired</td>
</tr>
<tr>
<td></td>
<td>✓ Wrong voltage</td>
</tr>
<tr>
<td></td>
<td>✓ Thermostat too low</td>
</tr>
<tr>
<td></td>
<td>✓ Step controller sticking/faulty</td>
</tr>
<tr>
<td></td>
<td>✓ Wiring fault</td>
</tr>
<tr>
<td></td>
<td>✓ Other controller equipment fault</td>
</tr>
</tbody>
</table>

Cooling Coils

<table>
<thead>
<tr>
<th>Fault</th>
<th>Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO COOLING</td>
<td>✓ Thermostat setting too high/faulty</td>
</tr>
<tr>
<td></td>
<td>✓ Time clock at “on” phase</td>
</tr>
<tr>
<td></td>
<td>✓ Motor not connected</td>
</tr>
<tr>
<td></td>
<td>✓ Overloads tripped</td>
</tr>
<tr>
<td></td>
<td>✓ (continue checks as for airflow in “fans”)</td>
</tr>
<tr>
<td>NO COOLING</td>
<td>✓ Correct setting</td>
</tr>
<tr>
<td></td>
<td>✓ Faulty condenser</td>
</tr>
<tr>
<td></td>
<td>✓ Heat rejection faulty</td>
</tr>
<tr>
<td></td>
<td>✓ Fans and pumps stopped</td>
</tr>
<tr>
<td></td>
<td>✓ Condenser blocked</td>
</tr>
<tr>
<td>LOW OR NO COOLING</td>
<td>✓ Suction pressure/evaporating temperature too low</td>
</tr>
<tr>
<td></td>
<td>✓ Coil freezing up</td>
</tr>
<tr>
<td></td>
<td>✓ Condenser too large for evaporator</td>
</tr>
<tr>
<td></td>
<td>✓ Low air flow</td>
</tr>
<tr>
<td></td>
<td>✓ Uneven air flow</td>
</tr>
<tr>
<td></td>
<td>✓ Low entering air temperature</td>
</tr>
<tr>
<td></td>
<td>✓ Humidistat(s) calling for dehumidification</td>
</tr>
<tr>
<td>Condition</td>
<td>Causes</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>NO COOLING</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓ Low compressor capacity control installed and functioning</td>
</tr>
<tr>
<td></td>
<td>✓ Thermostatic valves closed</td>
</tr>
<tr>
<td></td>
<td>✓ Thermostat failure</td>
</tr>
<tr>
<td></td>
<td>✓ Circulating pump failure</td>
</tr>
<tr>
<td></td>
<td>✓ Chilled water isolating valve closed</td>
</tr>
<tr>
<td></td>
<td>✓ Water in system</td>
</tr>
<tr>
<td></td>
<td>✓ LP cutout functioning</td>
</tr>
<tr>
<td></td>
<td>✓ Expansion valve freezing</td>
</tr>
<tr>
<td><strong>LOW COOLING</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓ Low load (unloader) compressor capacity control functioning</td>
</tr>
<tr>
<td></td>
<td>✓ Step controller functioning</td>
</tr>
<tr>
<td></td>
<td>✓ Other modulating controls functioning</td>
</tr>
<tr>
<td></td>
<td>✓ Fridge plant cycles</td>
</tr>
<tr>
<td><strong>HIGH RH</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓ Humidistat or dewpoint stat too high / faulty</td>
</tr>
<tr>
<td></td>
<td>✓ No cooling</td>
</tr>
<tr>
<td></td>
<td>✓ Coil fault (see above)</td>
</tr>
<tr>
<td></td>
<td>✓ Entering air temperature too high</td>
</tr>
<tr>
<td></td>
<td>✓ Insufficient cooling capacity (maybe start up, pull down time)</td>
</tr>
<tr>
<td></td>
<td>✓ Excessive fresh air or airflow</td>
</tr>
<tr>
<td></td>
<td>✓ Excessive moisture gain</td>
</tr>
<tr>
<td></td>
<td>✓ Moisture carryover</td>
</tr>
<tr>
<td><strong>LOW RH</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓ Stat too low / faulty</td>
</tr>
<tr>
<td></td>
<td>✓ Coolant too cold</td>
</tr>
<tr>
<td></td>
<td>✓ Refrigerant plant capacity too high</td>
</tr>
<tr>
<td></td>
<td>✓ Inadequate controls</td>
</tr>
<tr>
<td></td>
<td>✓ Insufficient air flow</td>
</tr>
<tr>
<td><strong>COIL SWEATING</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓ Blocked filters</td>
</tr>
<tr>
<td></td>
<td>✓ Blocked coil face</td>
</tr>
<tr>
<td></td>
<td>✓ Air on dewpoint condition higher than design</td>
</tr>
<tr>
<td></td>
<td>✓ Chilled water flow temperature or DX evaporating temperature lower</td>
</tr>
<tr>
<td></td>
<td>than design</td>
</tr>
<tr>
<td><strong>MOISTURE CARRY OVER FROM FINS</strong></td>
<td>Check as for “coil sweating”</td>
</tr>
<tr>
<td><strong>MOISTURE CARRY OVER FROM DRAIN TRAY</strong></td>
<td>High volume</td>
</tr>
<tr>
<td></td>
<td>✓ Uneven face velocity</td>
</tr>
<tr>
<td></td>
<td>✓ Eliminators omitted in error</td>
</tr>
<tr>
<td></td>
<td>✓ Horizontal</td>
</tr>
<tr>
<td></td>
<td>✓ Undamaged</td>
</tr>
<tr>
<td></td>
<td>✓ Drain tray outlet to U-trap not clocked</td>
</tr>
<tr>
<td></td>
<td>✓ Primed adequate differential U-trap drain</td>
</tr>
<tr>
<td></td>
<td>✓ Adequately sized correctly pitched condense line dropping into open</td>
</tr>
<tr>
<td></td>
<td>✓ Upstream restricted airflow causing depression at coil greater than</td>
</tr>
<tr>
<td></td>
<td>✓ U bend differential</td>
</tr>
<tr>
<td></td>
<td>✓ Cover plates leaking air on bolt on coils</td>
</tr>
</tbody>
</table>
### Heating Coils

#### Fault Finding

<table>
<thead>
<tr>
<th>Fault</th>
<th>Check</th>
</tr>
</thead>
</table>
| NO HEAT     | ✓ Thermostat too low/faulty  
✗ Time clock at “on” phase/faulty  
✗ Pump failure  
✗ Boiler plant off  
✗ Automatic valve closed due to thermostat  
✗ Valve transformer failure  
✗ Isolating valves closed  
✗ Airlock  |
| LOW HEAT    | ✓ Check flow and return temperature - if low check boiler plant and controls  
✗ Check flow rate – if low check:  
✓ Regulating valves open  
✗ Insufficient pump head  
✗ Piping sizing wrong  
✗ Blockage in coil or high coil resistance (check temperature change across coil and equal tube temperatures).  
✓ Warm up time adequate  |

### Refrigeration

#### Fault Finding

<table>
<thead>
<tr>
<th>Fault</th>
<th>Check</th>
</tr>
</thead>
</table>
| HEAD PRESSURE TOO HIGH   | ✓ Refrigerant overcharge - vent excess charge  
✓ Air in system - leak test, repair leak, evacuate and recharge  
✓ Dirty Condenser - clean  
✓ Malfunction of condenser fan (air cooled) - check head pressure speed control if fitted  
✓ Restricted water flow - check flow rate and adjust  
✓ Water on temperature too high - cooling tower operation  
✓ Blockage in discharge pipe work - check and replace damaged section(s) evacuate and recharge  
✓ High air temperature entering condenser (air cooled) spill over between adjacent condenser, fit baffle or re-site condensers  |
| LOW HEAD PRESSURE        | ✓ Refrigerant under charge - leak test, add refrigerant if necessary  
✓ Over condensing - Fan speed too high (air cooled), water flow too high (water cooled)  
✓ Faulty valves  
✓ Low external ambient - pre heat air to cooled condenser  
✓ Low back pressure  |
| HIGH BACK PRESSURE       | ✓ Air flow too high – adjust belt drive as necessary  
✓ Room temperature or air on too high – adjust thermostat  
✓ Faulty expansion valve  
✓ Also see – “Head pressure too high” above  |
| LOW BACK PRESSURE        | ✓ Air flow too low – adjust belt drive as  
✓ Filters dirty  
✓ Shortage of refrigerant – leak test add refrigerant as necessary  
✓ Faulty valves  
✓ Blockage in pipe check and replace damaged section(s) evaluate and recharge  |
| SUCTION LINE SWEATING BACK TO COMPRESSOR | Expansion valve open too wide |
# Fan Drive Belts

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>PROBLEMS CAUSED</th>
<th>PROBABLE CAUSES</th>
<th>REMEDY</th>
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</thead>
<tbody>
<tr>
<td>Loose cover &amp; seal</td>
<td>Weathering or ozone attack</td>
<td>Overloading or overloaded</td>
<td>Lubricate properly</td>
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<tr>
<td>Weathering or ozone attack</td>
<td>Overloading or overloaded</td>
<td>Overloading or overloaded</td>
<td>Clean pulleys &amp; belt(s)</td>
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<td>Overloading or overloaded</td>
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<td>Replace belt(s)</td>
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<td>Install properly</td>
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<td>Check for belt length</td>
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<td>Remove obstruction</td>
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<td>Tension properly</td>
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<td>Redesign drive</td>
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<td>Use only new belts</td>
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<td>Use single source</td>
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