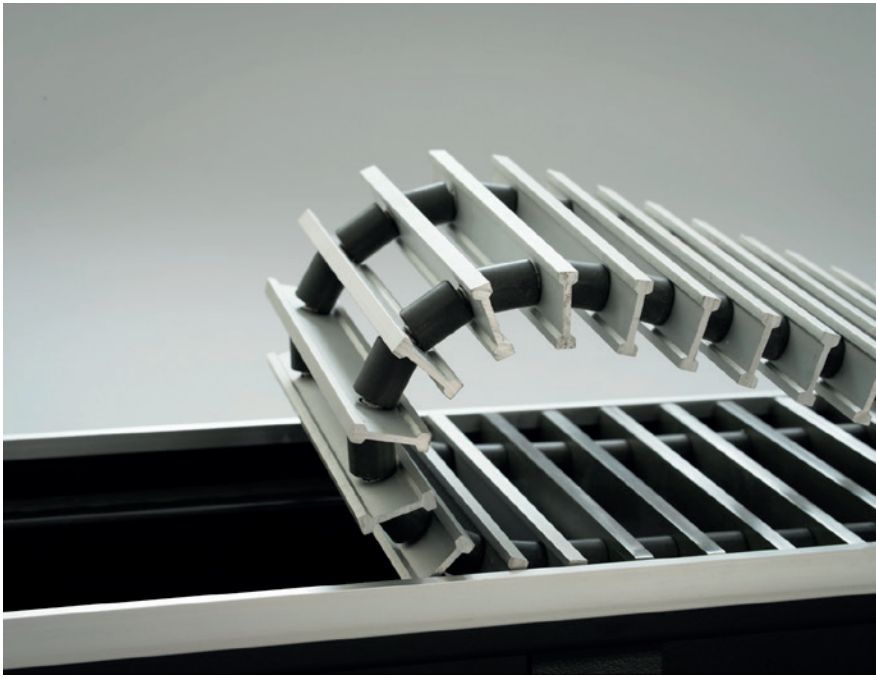


Metropolitan Cooling Trench

Installation, Operation and Maintenance Instructions

IOM 84 Issue 3

SPC

Contents

1. General

1.1 Description

This manual covers the SPC fan-assisted range of combined trench cooling and heating units. Units may also be supplied as cooling only in which case only one set of water pipes will be fitted. The units are available in two variations of height and width shown below and a variety of lengths to suit the application. Cooling and heating outputs are dependent on the size of the units, the chilled water and hot water temperatures and the fan speed. The units consist of the trench itself c/w CHW and LPHW heat exchanger, fan(s), electrical connections plus loose roll-up grille and grille trim. A stainless steel draintray is included in the base of the trench. Depending on the chilled water temperatures being used moisture may be condensed on the cooling coil in operation and this will collect in the draintray. Other accessories may be supplied depending on the details of the particular order. Power supply to the units is 230V, single phase, 50Hz which is converted to a 24V dc signal by the integral power supply to match the requirement of the EC fan(s).

The units are intended for use in internal environments and must not be used outdoors or where they are subjected to moisture. They must be installed by experienced heating contractors and electricians in compliance with all statutory regulations. Table 1 gives general details for the standard range of units, figure 1 gives an overview of the pertinent components and dimensions.

Cooler/Heater type	Fan-assisted trench
Cooling/Heating element	CHW/LPHW copper tube, aluminium fin
Fan type	Tangential
Motor type	ECDC
Power supply	230V/1Ph/50Hz
Casing	Powder coated steel
Roll-up grille	Anodised aluminium bar, plastic spacer, steel spring
Grille trim	Anodised aluminium
CHW/LPHW water connections	15mm copper
Draintray	Stainless steel
Minimum CHW temperature	2°C
Maximum LPHW temperature	90°C
Maximum working pressure	10 bar

Table 1. General specification

1.2 Receipt and Preparation

The units are wrapped and display the serial number, model reference and site reference where appropriate. Installation, operation and maintenance instructions and wiring diagrams, together with any special instructions are all supplied with the unit. On receipt check that all details are correct to the customer schedule prior to opening packaging.

Damage should be reported to SPC immediately. It is recommended that packaging is kept in place and the units stored in a safe area until the necessary services are completed in order to avoid the possibility of site damage.

All units are guaranteed for 12 months from date of delivery.

2. Installation

2.1 Mounting general

The trench units are packed fully assembled, apart from the grille and grille trim which should be fitted after the units are fully installed. Grilles and trim are packaged separately along with any other order specific accessories.

Trench units are suitable for installation in either concrete or suspended/hollow flooring. If the units are to be mounted in a concrete screeded floor then the trench into which they are fitted must be at least wide enough to allow placement of the suspension feet which extend beyond the outer dimensions of the trench unit.

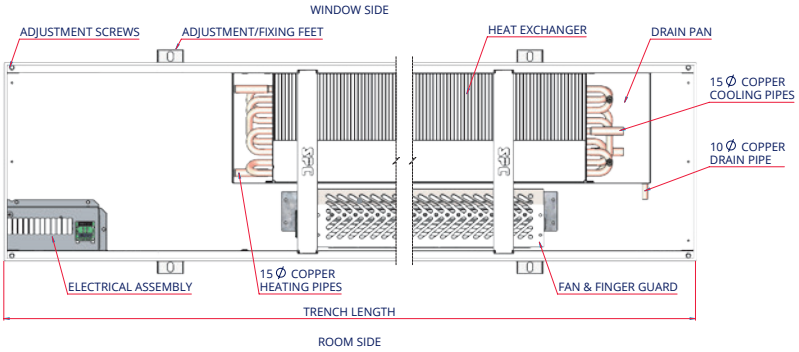
Trench units can be installed as individual elements or can form part of longer continuous runs. If part of a continuous run it is important that the complete run is laid out in the trench or suspended floor to ensure correct fitment prior to screwing down. It is important for continuous runs that the level of the top of each individual section is constant to allow the continuous grille to lay flat when fitted.

Continuous runs may include angle, corner pieces or 'dummy' sections. These should be assembled as part of the complete run and fixed in position along with the active lengths of trench heater.

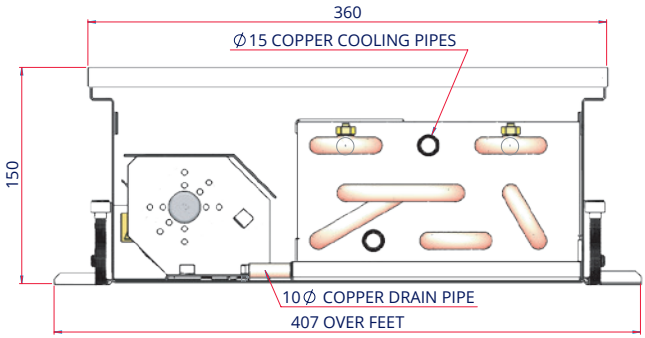
Trench units should be installed close to the window or wall that they are intended to protect, typically 50 to 500mm away. They can be installed with the heat exchanger on either the window side or the room side to suit the position of the flow and return pipework. It is, however, recommended that they be installed with the heat exchanger on the window side for maximum efficiency.

The grilles supplied for fitting to the top of the trench heaters are suitable for occasional foot traffic. Units must not be fitted where the grilles are likely to be exposed to point loads from chair legs etc., neither should they be fitted directly in front of doorways where they are subjected to excessive footfall. Not only is there a risk of damage or injury but there will be excessive build-up of debris from footwear.

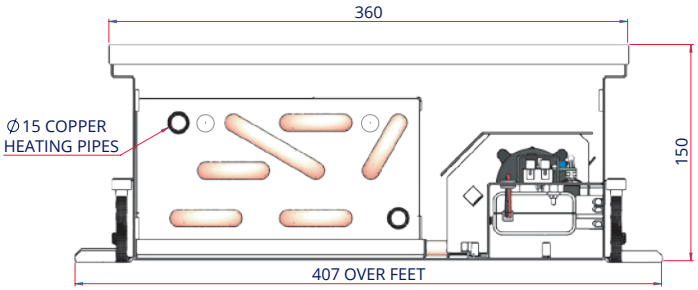
Figure 1 shows the various cross-sectional dimensions of the standard trench units. When installing in a concrete floor the minimum clearances should be observed; 20mm on either side and at both ends is recommended but this will need to be increased if pipework and/or electrical conduit is to be run alongside the trench. Note that the width at the feet not the unit width needs to be considered when sizing the trench.



Top view of unit with grille removed

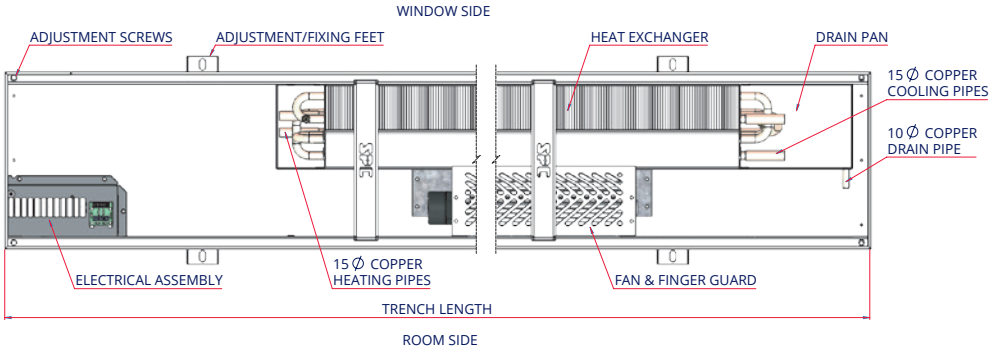


Cross section of side showing cooling pipes

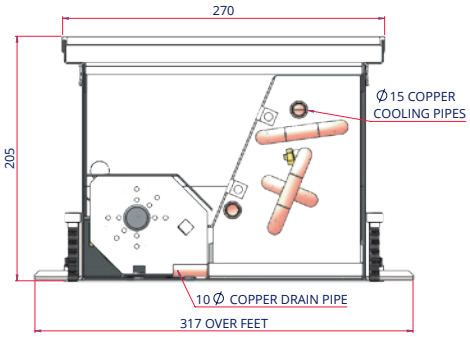


Cross section of side showing heating pipes

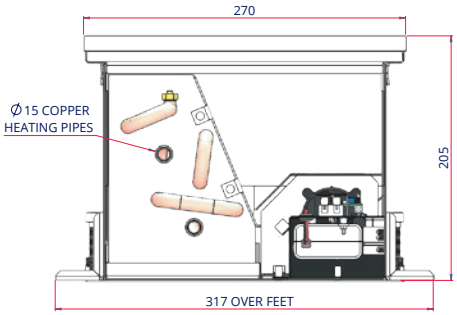
Figure 1a. General arrangement and dimensions of 360Wx150H unit



Top view of unit with grille removed



Cross section of side showing cooling pipes



Cross section of side showing heating pipes

Figure 1b. General arrangement and dimensions of 270Wx205H unit

2.1.1 Suspended/hollow floor

The finished height of the trench unit, including grille and trim, should be level with the finished floor surface +/-1mm. It is possible to adjust the finished height of the trench unit using the fixing feet which are height adjustable along with the fine adjustment screws fitted in each corner.

The trench unit should be anchored to the floor using suitable screws and anchors through the slots in the fixing feet and any further fine adjustments made to bring the finished level in line with the finished floor. It is recommended that rubber or foam pads are fitted below the fixing feet.

2.1.2 Solid/concrete floors

The hole (trench) should be cut in the floor in line with the clearances given in section 2.1. If water pipes and/or electrical conduits are to be run alongside the trench units then the size of the trench must be increased to suit.

Prior to concreting in it is important that the bracing pieces are in place and that the decorative trim and grille are removed. All holes in the sides of the trench heater must be covered during concreting using suitable tapes. A cover must be placed over the top of the trench unit to ensure that no concrete mixture can be spilled inside.

The trench unit must be anchored to the floor via the fixing feet during concreting to ensure that there can be no movement. The correct 'knockouts' must be removed and water pipes brought into the trench unit casing prior to concreting, see next section for details of pipe fittings. There are also knockouts for cable glands and the required power and control cables must be brought inside the trench before concreting.

2.2 Installation process

1. Unwrap the trench heater and place it on the floor. **DO NOT REMOVE THE WOOD PIECE.**
2. Adjust the height using the screws at each end to level out the trench heater.
3. Secure the trench heater using the support feet.
4. Remove the wood piece and connect the coil using flexible hoses and/or wire the electrical components. Once complete, place the wood piece back on the trench heater.
5. Fill in the gap around the side of the trench heater and complete the flooring.
6. Remove the wood piece and fit the grille and/or trim.

2.3 Fluid piping

The cooling/heating element consists of a finned tube matrix of copper tubes expanded into continuous aluminium fins. If the unit is used for both cooling and heating then the cooling and heating tubes are interlaced within the same fin block. Flow and return connections for the cooling circuit terminate on the opposite end of the matrix to the flow and return connections for the heating circuit.

Both the cooling and heating elements terminate in 15mm plain copper pipes; one for the flow connection and one for the return connection. The units will have one of the copper connections higher than the other on both the cooling and heating circuits and, in order to optimise output, the upper of the two connections should be attached to the flow pipework and the lower to the return pipework. With the heat exchanger on the window side the chilled water connections are on the RHS and the hot water connections on the LHS as shown on the drawings above. It is important that the correct pipes are used for the cooling and heating connections as there are always considerably more tubes in the cooling circuit than the heating circuit.

The plain 15mm pipes are suitable for a number of different joining methods; the recommendation is to use compression fittings to connect to the main pipework either via hard piping or suitable flexible connectors. The pipework should be brought in from the side of the trench heater via the knock-outs supplied and angled compression fittings are often useful, knock-outs are also available in the ends of the units. If entry via other than the knock-out points is required then holes can be cut in the trench to suit.

Alternative coupling methods include push-fit connectors and brazed/soldered joints. If using push fit it is important that the end of the pipes are deburred and rounded to ensure a good seal. If plastic (PEX) pipework is used with push-fits then a special ferrule must be inserted into the plastic pipe to prevent distortion. If soldering/brazing then all surrounding surfaces must be protected from the heat.

A variety of fluid side fittings can be used in conjunction with trench units, these include: ¼ turn shut off valves, regulating valves and automatic control valves. It may be possible to incorporate these fittings in the case of the trench unit but in some instances this would not be appropriate. If a number of trench units are fitted in a single zone they would not normally be separately controlled and any automatic valves would be fitted in the common pipework system so as to simultaneously control the supply of water to all units within the single zone.

The heat exchangers in the trench units all incorporate a manual air vent which should be used during commissioning to ensure that all air is bled from the heat exchanger. This applies to both circuits of combined cooling/heating units.

2.4 Condensate removal

If the cooling circuit is supplied with chilled water at a temperature below the dewpoint of the space air then condensate may form on the surfaces of the heat exchanger. This condensate will fall into the draintray in the base of the trench unit. Higher chilled water temperature systems may be used so as to prevent the formation of condensate and in such instances it may be appropriate not to include any drainage pipework.

If condensate is expected or possible drainage should be included to run it to waste. The draintray has a 10mm pipe which should be connected to a drain hose. This drain hose can be taken outside the unit via any of the cut-outs in the casing or, alternatively, a bespoke hole can be cut. If condensate pumps are to be used then it is often appropriate to fit them to a common sump outside the trench units such that a single pump can be used to clear numerous trench units.

2.5 Wiring

The trench units require a standard 230V/50Hz mains power supply, see table below for ratings. Power wiring is via 2 core and earth to the mains terminal block which is accessible after removing the cover of the electrical box. Note, units must be earthed.

Knock-outs are provided in the sides and ends of the casing to allow cables to be taken inside the trench case. Suitable glands should be used to ensure that the cables are secured and the trench sealed.

The EC/DC fan assemblies require a 24V dc supply for their operation; this is provided by an on-board power supply and customer power wiring is restricted to 230V ac. Note that if units are wired in a 'master/slave' arrangement such that the all respond to a single thermostat etc then each individual unit will still require its own supply of power.

Additional control wiring will need to be made. This will depend on the method of control chosen for the units; it is recommended that control wiring is made using wire with a cross sectional area of 1mm2 or greater. The wiring diagram delivered with the actual unit must be used any other diagrams are only for illustration.

Trench length (mm)	<1700	1700 to 2200	>2200
No. fan sets	1	2	3
Supply (V/Ph/Hz)	230/1/50	230/1/50	230/1/50
Max power draw (W)	19	38	57

Table 2. Electrical details

2.6 Control/operation

SPC fan-assisted units incorporate EC/DC fan assemblies which draw in room air and blow it across the heat exchanger prior to the cooled/warmed air being released up the side of the window or into the space.

Control of the unit's output is best achieved via control of the rotational speed of the fans. To this end the electronics built into the fan motor allow a 0-10V dc control signal to control the fan speed. At less than 1V the motors do not turn and between 1 and 10V they ramp up to their maximum speed.

The 0-10V control signal can be supplied by the central control system of the building (BMS) or can be generated and set locally inside the trench unit via the in-built potentiometers. Control possibilities include direct from the BMS and locally using thermostats and switches.

Programmable thermostats/controllers can also be used which incorporate a proportional band that automatically varies the fan speed with sensed temperature.

Waterside valves may be incorporated in the control strategy though airside control of the output is recommended.

3. Commissioning

Commissioning of fan-assisted trench units requires the following:

- Check chiller is providing a supply of chilled water
- Check boiler is providing a supply of hot water
- Check all water valves are open
- Ensure all air is vented out of the heat exchanger via vent plug provided. Both cooling and heating circuit need to be vented
- Check pipe temperatures at the heat exchanger
- Check rotation of all fans
- Check operation of any controls

4. Maintenance

Cleaning – In order to maintain the trench unit at maximum efficiency it is recommended, especially when mounted in dusty areas, that the heat exchanger should be cleaned externally using a vacuum cleaner or by directing compressed air through it and that this should be done at least once every 3 months depending on the environment. The fan and its casing can be cleaned using air or a dry cloth but must not be cleaned using water or spray as the motor incorporates electronic components. The fan guard should be cleared of any obstructions. The trench casing can be cleaned with a dry or wet cloth using mild detergent; do not allow moisture to remain within the casing. Under no circumstances should moisture be allowed in contact with the electric section of the trench during the cleaning process. Any debris can be removed from the trench unit case using a vacuum cleaner. Access to the inside of the case is achieved by removal of the roll-up grille. The grille itself can be cleaned using a dry or damp cloth and mild detergent.

Water treatment – The water flowing through the cooling/heating system should be treated with suitable inhibitor to prevent the build-up of scale and the formation of air bubbles. Any treatment used must be compatible with copper piping.

Fan bearings – The tangential fan(s) incorporate sealed for life bearing and no lubrication is required.

5. Fault finding

Below is a list of common faults and the steps required to resolve them.

Fault	Cause	Remedy
Flow and return pipes warm in cooling mode/ cold in heating mode	Chiller/boiler not working	Check chiller/boiler controls and circuit
	Pump not working	Check electricity supply to pump
	Valves not opening	Check control system
Fan(s) not running	No power	Check electricity supply to unit
	Fuse blown	Check unit fuse and any circuit breakers
	Controls	Check controls are not preventing fan(s) from operating
	Damaged fan/motor	Replace faulty fan assembly
High room temperature in cooling mode or low room temperature in heating mode	High/Low water temperatures	Check chiller/boiler controls and circuit
	Low water flowrate	Check pump and all valves in system (characterised by large temperature difference between flow and return water temperatures at heat exchanger)
	Air in system	Open manual air vents
	Controls	Check setpoint temperatures and operation of central control system to ensure fans are running at correct speed
	Fan(s) running slowly	Check controls as above and check for any obstructions to the fan movement or airflow. Check for excessive noise/vibration

Table 3. Fault finding

6. Disposal

The range of trench units are constructed from copper tube/aluminium fin heater exchangers and mild steel casings, grilles and grille trim are anodised aluminium with steel springs and plastic spacers. The heat exchanger, casing and grille assembly can all be disassembled and disposed of appropriately. The units include fan decks from mixed materials and printed circuit boards which should be disposed of separately and in line with WEEE directives. It is not recommended that the units are disposed of with domestic waste but that the components are recycled as far as possible.

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