



Standalone Electric Heater Units Type TVZ

General information

About this manual

This operating and installation manual enables operating or service personnel to correctly install the standalone electric heater unit and to use it safely and efficiently.

This operating and installation manual is intended for use by fitting and installation companies, in-house technicians, technical staff, properly trained persons, and qualified electricians or air conditioning technicians.

It is essential that these individuals read and fully understand this manual before starting any work. The basic prerequisite for safe working is to comply with the safety notes and all instructions in this manual.

The local regulations for health and safety at work and the general safety regulations for the area of application of the ventilation unit also apply.

This manual must be given to the system owner when handing over the system. The system owner must include the manual with the system documentation. The manual must be kept in a place that is accessible at all times.

Illustrations in this manual are mainly for information and may differ from the actual design.

Other applicable documentation

- TROX TVZ technical documentation
- Project specific documents (if any)

TROX Technical Service

To ensure that your request is processed as quickly as possible, please keep the following information ready:

- Product name
- TROX order number
- Delivery date
- Brief description of the fault

| | |
|--------|--------------------------------------------------------|
| Online | www.troxuk.co.uk |
| Phone | +44 (0) 1842 754545 |

| | |
|---------------------------------------------------------------------|----|
| 1 <u>Unit Overview</u> | 3 |
| 2 <u>Safety</u> | 4 |
| 2.1 <u>Safety notes</u> | 4 |
| 2.2 <u>Correct use</u> | 4 |
| 2.3 <u>Safety signs</u> | 4 |
| 2.4 <u>Electric shock hazard</u> | 5 |
| 2.5 <u>Risks caused by an unsuitable installation location</u> | 5 |
| 2.6 <u>Qualified staff</u> | 5 |
| 2.7 <u>Personal protective equipment</u> | 6 |
| 3 <u>Transport and storage</u> | 6 |
| 4 <u>Installation</u> | 7 |
| 4.1 <u>General installation information</u> | 7 |
| 4.2 <u>Installing the standalone heater unit</u> | 7 |
| 4.3 <u>Connecting pressure switch</u> | 8 |
| 4.4 <u>Making electrical connections</u> | 8 |
| 5 <u>Initial commissioning</u> | 9 |
| 5.1 <u>Unit inspection</u> | 9 |
| 5.2 <u>Initial start up</u> | 9 |
| 5.3 <u>Post start up checks</u> | 10 |
| 5.4 <u>Control Strategy</u> | 10 |
| 5.5 <u>Troubleshooting</u> | 10 |
| 6 <u>Maintenance</u> | 11 |
| 6.1 <u>Maintenance</u> | 11 |
| 6.2 <u>Commissioning report/Maintenance report</u> | 12 |
| 7 <u>Replacement parts list</u> | 13 |

1 Unit overview



Heater element terminal enclosure side

This enclosure houses the heater element electrical connections, and the high temperature cut out.



Controls enclosure side

This enclosure houses the controls supplied with the unit, such as:

- Fuses
- Site mains connection terminals
- Earth stud
- Thyristor
- Pressure switch
- Transformer
- Safety relay (or contactor)

Functional description

TROX standalone electric heaters are fitted to the supply air ductwork as and where indicated on the Record Drawings usually in conjunction with a TROX TVZ VAV unit.

VAV terminal boxes control primary air to provide a variable air supply to the occupied zones of the building. For a more detailed description of the terminal boxes refer to TROX TECHNIK literature.

The standalone electric heaters unit are complete with controls including thyristor, fuses and safety interlocks.

A low differential air pressure switch is fitted. This switch will de-energize the heating element if the airflow reduces below the minimum required to operate the heater safely (by removing the heat from the element)

An automatic reset high temperature cut out (HTCO) is fitted and set to 40°C. The HTCO will de-energize the heating element if the air temperature inside the duct is too hot to operate the heater safely.

The heater is manufactured to British Standards / Codes and fully factory tested.

The integral air heater has elements designed for black heat operation consisting of nickel chrome wire in a stainless steel tube filled with magnesium oxide insulation. The heater elements are wired into the control enclosure where the earth stud and fuse(s) are supplied.

Control Strategy

Control of the heater is step-less control by thyristor responding to an external 0-10Vdc control signal.

The control strategy for the heater must allow a minimum of 10 minutes run on time to allow the heater element to safely cool at the end of the heating cycle. During this time the minimum heating cycle volume must be maintained in the duct for at least 10 minutes after the heater control signal is switched off.

Never remove the airflow whilst the heater battery is running as this will result in excessive ambient temperature inside the heater duct and may trip the high temperature cut outs.

If the HTCO trips due to an error or fault, although it will reset when the unit has cooled down, it is recommended that the cause of the error or fault is investigated and rectified, and that the HTCO is replaced before the heater is put back into service.

2 Safety

2.1 Safety notes

Symbols are used in this manual to alert readers to areas of potential hazard. Signal words express the degree of the hazard.

Comply with all safety instructions and proceed carefully to avoid accidents, injuries and damage to property.



DANGER!

Imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING!

Potentially hazardous situation which, if not avoided, may result in death or serious injury.



CAUTION!

Potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

2.2 Correct use

Standalone electric heater units are used (in conjunction with TVZ units) or the air conditioning of internal spaces such as offices.

- Ventilation
- Heating

The unit is designed for internal installation behind false ceilings or freely suspended from the structural soffit (exposed). The unit has to be properly installed by competent, qualified operatives.

Correct use also involves complying with all the information provided in this manual.

Any use that goes beyond the correct use or any different use of the unit is regarded as incorrect use.

Incorrect use



WARNING!

Danger due to incorrect use!

Incorrect use of the unit can lead to dangerous situations.

Incorrect use includes:

- Any use that is not described in this operating manual
- Operation that does not comply with the technical data
- Modifying of the unit by others, tampering with the unit
- Use, installation, operation, maintenance or repair other than described in this manual
- Having work carried out by unqualified individuals
- Use of non-genuine replacement parts or accessories, whose quality and function are not equivalent to those of the original parts
- Operation in rooms with explosive gases or gas mixtures
- Operation in rooms where the supply or extract air contains particles that are conductive, aggressive, corrosive, combustible or hazardous to health
- Operation in rooms where the humidity is permanently high (> 90 %)
- Operation outdoors
- Use for enforced ventilation
- Operation without air filters

2.3 Safety signs

The following symbols and signs are found on the unit. They apply to the very location where they are found.

Electrical voltage



Hazardous electrical voltage is present in the unit. Only skilled qualified electricians are allowed to work on parts of the unit marked with this symbol. Such work must be carried out only by skilled qualified electricians.

Controls access panel



Only skilled qualified electricians are allowed to open the controls access panel. Ensure that the electrical supply is isolated and verify that no voltage is present on any mains circuit before you open the cover to access the terminal connections.

Heating element terminal enclosure access panel



Only skilled qualified electricians are allowed to open the heating element terminal enclosure access panel. Ensure that the electrical supply is isolated and verify that no voltage is present on any mains circuit before you open the cover to access the terminal connections.

2.4 Electric shock hazard



Danger of death due to electric current!

Danger of electric shock! Do not touch any live components! Damaged insulation or parts are a life threatening hazard.

- Only a skilled qualified electrician must work on the electrical systems.
- If the insulation is damaged, disconnect the power supply immediately and have the insulation repaired.
- Isolate the power supply and verify no voltage is present using an approved voltage indicator before carrying out maintenance or cleaning.
- Ensure that live parts do not come into contact with moisture.

2.5 Risks caused by an unsuitable installation location



Risks caused by an unsuitable installation location!

Installing the unit in an unsuitable location can lead to dangerous situations.

- The unit should preferably be installed in a thermally insulated, low-leakage building.
- Frost free and dry installation location.
- Install the unit in a manner to protect the unit from being tampered with by unauthorized individuals.
- The unit must remain accessible for maintenance and cleaning.

2.6 Qualified staff

Qualification

The work described in this manual has to be carried out by individuals with the qualification, training, knowledge and experience described below:

Facility manager

Facility managers are trained individuals who understand any potential hazards related to the work under consideration, and who recognize and avoid any risks involved. Facility managers must not carry out any jobs beyond regular operation unless explicitly stated in this manual and unless the system owner has specifically agreed to them. Training to a facility manager is provided by the HVAC contractor when the system is handed over.

A facility manager's tasks include cleaning the unit, performing functional tests and regular checks, and carrying out maintenance and adjustment work.

HVAC technician

HVAC technicians are individuals who have sufficient professional or technical training in the field they are working in to enable them to carry out their assigned duties at the level of responsibility allocated to them and in compliance with the relevant guidelines, safety regulations and instructions. HVAC technicians are individuals who have in-depth knowledge and skills related to HVAC systems; they are also responsible for the professional completion of the work under consideration.

HVAC technicians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on HVAC systems, understand any potential hazards related to the work under consideration, and recognize and avoid any risks involved.

Network administrator

Network administrators design, install, configure and maintain the IT infrastructure in companies or organizations.

Skilled qualified electrician

Skilled qualified electricians are individuals who have sufficient professional or technical training, knowledge, experience and qualifications to relevant local wiring regulations to enable them to work on electrical systems, understand any potential hazards related to the work under consideration, and recognize and avoid any risks involved.

Any work has to be carried out by individuals who can be expected to carry out their assigned duties reliably. Individuals whose reaction time is delayed due to alcohol, drugs or other medication must not carry out any work.

2.7 Personal protective equipment

Personal protective equipment is equipment that protects the user against health or safety risks at work.

Personal protective equipment must be worn for various types of work; the protective equipment required is listed in this manual together with the description of each type of work.

Description of personal protective equipment

Industrial safety helmet



Industrial safety helmets protect the head from falling objects, suspended loads, and the effects of striking the head against stationary objects.

Protective gloves



Protective gloves protect hands from friction, abrasions, punctures, deep cuts, and direct contact with hot surfaces.

Safety shoes



Safety shoes protect the feet from crushing, falling parts and prevent slipping on a slippery floor.

3 Transport and storage

Checking delivered goods

Check delivered items immediately after arrival for transport damage and completeness.

If there is any visible damage, proceed as follows:

- Either do not accept the delivered items, or accept them with reservations.
- Note down the damage on the shipping documents or on the shipping company's delivery note.
- Immediately file a complaint with the shipping company and vendor.



File a complaint as soon as you detect any damage. Claims for compensation can be filed only within the complaint period.

Transport

Hazardous electrical voltage that is present in the ventilation unit. Only skilled qualified electricians are allowed to work on parts of the ventilation unit marked with this symbol. Such work must be carried out only by skilled qualified electricians or the technical service.



CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts may cause cuts or grazes.

- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.
- If possible, take the unit in its transport packaging up to the installation location.
- Use only lifting and transport gear designed for the required load.
- Always secure the load against tipping and falling.
- Do not move bulky items just by yourself. Get help to prevent injuries and damage.

Storage

Please note:

- Store the unit only in its original packaging
- Protect the unit from the effects of weather
- Protect the unit from humidity, dust and contamination
- Storage temperature: -10 °C to 50 °C.
- Relative humidity: 95 % max., no condensation

Packaging

Properly dispose of packaging material.

4 Installation

4.1 General installation information

Before installation

Before you install the unit, take suitable precautions to protect openings from contamination during installation.

If this is not possible, at least cover the unit or take other precautions to protect it from contamination. In this case you have to ensure that the unit cannot be started.

Ensure that all components are clean before you install them. If necessary, clean them thoroughly. If you have to interrupt the installation procedure, protect all openings from the ingress of dust or moisture.

Installation information

- Install the ventilation unit preferably in a thermally insulated, low-leakage building.
- Frost free and dry installation location.
- Installation and connections to be performed by others; fixing, connection and sealing material to be provided by others
- Install the unit only on structural elements that can carry the load of the unit.
- Use only certified fixing systems.
- The unit and controls must remain completely accessible for maintenance.

Installation

The unit is to be duct mounted.

Ensure the weight of the unit and accessories are correctly matched to the supports (if any).

Suspension components for installing the unit are not included in the supply package, but (if required) have to be selected by others and fit for the project specific installation.

4.2 Installing the standalone heater unit

Personnel:

- HVAC technician

Remove all packaging from the inlet and outlet connections. Only remove packaging just before connecting the adjacent ductwork.

Before connecting ductwork check for any debris and remove if necessary.

The unit can be installed in the false ceiling or the false floor of the building using the mounting support points on the unit casing. When using other supporting methods please refer to our Technical Department for approval.

All duct connections should be well sealed against air leakage.

Adequate access must be provided to the controls enclosure on the side of the box.

Ensure adjacent duct work has suitable size access panel or similar arrangement for cleaning and maintenance of the heater element and HTCO probe.

Allow minimum of 200mm clearance for the removal of the controls enclosure lid and heater enclosure lid.



Ensure the unit is installed with the correct orientation, according to the TOP DIRECTION label on the side.



Ensure the unit is installed with the correct direction of airflow, as indicated by the label on the base of the unit.

4.3 Connecting pressure switch

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Safety shoes
- Protective gloves

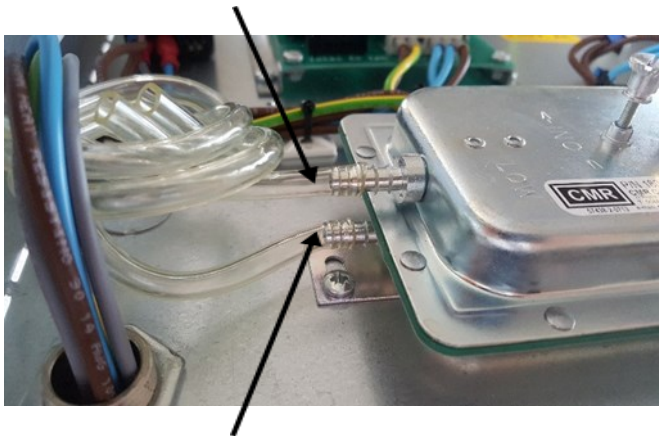
CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts may cause cuts or grazes.

- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

Negative pressure connection



Positive pressure connection

The pressure switch is intended to connect into the flow grid connecting tubes on a VAV Flow grid.

- Cut the VAV flow grid tubes and insert 'T' pieces to join the tubes together again.
- Then connect 4.2mm internal diameter tube to the 'T' pieces and the other end to the pressure switch. Use reducers if the VAV flow grid pipes are not the correct size.
- Make sure that the positive pressure flow grid tube is connected to the positive pressure connection of the pressure switch and the negative pressure flow grid tube is connected to the negative pressure connection of the pressure switch.
- Secure the pipes when installed to ensure it is not possible for the pipes to become "kinked".
- Always observe the minimum bending radii of the tubing used, typically 60mm.

DANGER!

It is not recommended to leave one side of the differential pressure switch open to atmospheric pressure and rely on the downstream external static pressure to operate the switch because this does not "prove" airflow is sufficient.

4.4 Making electrical connections

DANGER!

Electric shock hazard! Electrical equipment carries a dangerous electrical voltage!

- Only skilled qualified electricians are allowed to work on the electrical system and to connect the unit to the mains.
- Isolate the unit from the mains (all phases) and secure the unit against inadvertently being energized on again.
- Verify that no voltage is present using an approved voltage indicator.
- Carry out assembly or connection jobs only as long as no voltage is present.

Notes on the electrical installation

Any cables must be designed for the supply voltage for which they will be used. The length and cross section as well as any contact resistance may increase voltage losses. The power rating of each unit must also be considered. A skilled qualified electrician has to select the correct cable types and sizes. This job must only be carried out by specialist electrical companies.

- Electrical connection must comply with any applicable regulations and follow the code of good practice.
- The connection data can be found on the wiring diagrams.
- Protect any connections from physical damage.
- Secure cables entering the electrical enclosures with suitable cable glands.
- If any maintenance jobs have to be carried out, the unit first has to be de-energised and safely isolated (all phases). No voltage must be present.

Personnel:

- Skilled qualified electrician

⚠ DANGER!

Danger of electric shock! Do not touch any live components! Electrical equipment carries a dangerous electrical voltage.

- Only skilled qualified electricians are allowed to work on the electrical system.
- Isolate the power supply before working on any electrical equipment.

Take off the controls enclosure lid; to do so, loosen and remove the M5 pozi screws from the front of the enclosure, then remove the lid.

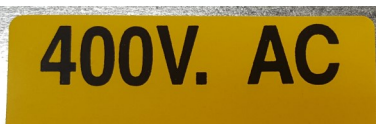


Connect the unit according to the wiring diagram.

- Refer to TROX wiring diagram within controls enclosure on each unit (as shown above).
- Use sheathed cable, ensuring the cable is suitably secured and supported (e.g. cable gland). A Ø20mm hole is provided for mains electrical entry to the controls enclosure.
- The unit voltage rating will be specified on the rating label inside the controls enclosure, either:



230Vac, 1ph, 50-60Hz
or



400Vac, 3ph, 50-60Hz

Making electrical connections professionally:

- Check and ensure that the actual supply voltage is as indicated by the unit rating label fixed inside the controls enclosure.
- Ensure that the unit has been correctly earthed.
- Check that the controls enclosure lid is installed and securely fastened.
- The unit and controls must remain completely accessible for maintenance.

- Communications, network and BMS wiring should be separated from power, controls and signal wiring.
- If the units have been stored for more than 3 months, all electrical terminals should be checked and insulation resistance checks must be carried out.
- Check the insulation resistance of the heating elements is greater than 1MΩ.
- All wiring must comply with local wiring regulations. The factory made internal wiring complies with BS 7671: IET Wiring Regulations

5 Initial commissioning

Personnel:

- Skilled qualified electrician

5.1 Unit inspection

Before initial commissioning:

- Remove protective film, if any.
- Ensure that the unit is clean, and clean if necessary.
- Check and ensure that the actual supply voltage is in accordance with the unit electrical rating label.
- Ensure that the unit has been correctly earthed.

⚠ CAUTION!

- The unit must not be energised until all initial commissioning checks have been completed satisfactorily.
- Rectification works to correct incomplete initial commissioning checks should be carried out by skilled, qualified operatives.

5.2 Initial start up

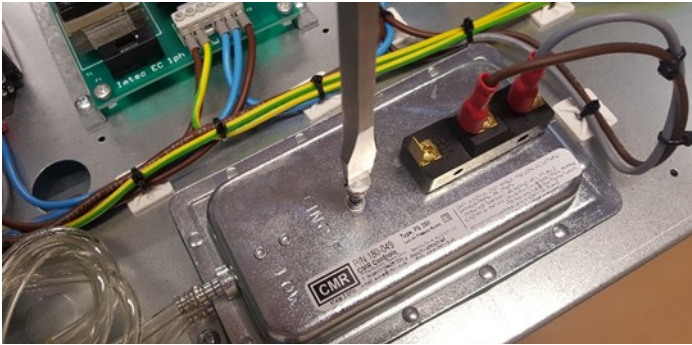
⚠ CAUTION!

Once all unit inspection checks have been completed and any issues identified are rectified, the unit must have the minimum airflow flowing before it can be energized.

Commissioning

Pressure switch set-up procedure

1. With the air volume at the Minimum heating volume (specified on the wiring diagram enclosed with the unit), switch on the power supply.
2. Using a No.7 slotted screwdriver, set up the pressure switch by turning the screw CW until the heater safety relay (or contactor) is de-energized.



3. Slowly turn the screw back CCW until the heater Relay or Contactor energizes again.

WARNING!

In order to operate the heater safely, it is the responsibility of the Commissioning Engineer to verify that the Pressure switch is only activated at or above the safe Minimum Airflow.

5.3 Post start up checks

Check the thyristor is working. There should be an LED indication to show the output power according to:

For 1-phase heaters,

CONTROL & LOAD LEDs indicate as follows:

Green LED - Control input (0-10VDC)

0 V, flashing 0.5s ON, & OFF

>0 V, fully ON

24V on, 230V off, intermittent flashing

Yellow LED - Load ON

For 3-phase heaters,

Red LED flashes depending on the power output.

OFF = load OFF

ON = load ON

Flashing = partially ON (proportional to control signal)



5.4 Control Strategy

The control strategy for the heater must allow a minimum of 10 minutes run on time to allow the heater element to safely cool at the end of the heating cycle. During this time the minimum heating cycle volume must be maintained in the duct for at least 10 minutes after the heater control signal is switched off.

CAUTION!

Never switch off the unit whilst the heater battery is running as this will result in excessive ambient temperature inside the heater duct and may trip the high temperature cut outs.

CAUTION!

If the HTCO trips due to an error or fault, although it will reset when the unit has cooled down, it is recommended that the cause of the error or fault is investigated and rectified, and that the HTCO is replaced before the heater is put back into service.

5.5 Troubleshooting

If for any reason the thyristor does not start the heating cycle, check the following:

- Check the 0-10Vdc control signal is being applied correctly to the thyristor.
- Check that the airflow is greater than the minimum airflow specified for the unit, and that the airflow is sufficient to operate the pressure switch.
- Check that the HTCO (inside the heater terminal enclosure) is set at 40C and has not tripped. The correct setting is shown below:



- Check the unit fuses have not ruptured.

6 Maintenance

6.1 Maintenance

Ensure all components are re-installed in the correct orientation and to the same unit with fixings securely tightened.

DANGER!

Electric shock hazard! Electrical equipment carries a dangerous electrical voltage!

- Only skilled qualified electricians are allowed to work on the electrical system and to connect the unit to the mains.
- Isolate the unit from the mains (all phases) and secure the unit against inadvertently being energized again.
- Verify that no voltage is present using an approved voltage indicator.
- Carry out assembly or connection jobs only as long as no voltage is present.

CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts may cause cuts or grazes.

- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

WARNING!

- The heating elements inside the duct can reach temperatures exceeding 300°C. **Do not touch the elements.**
- If maintenance of the elements is required, allow a minimum of 10 minutes cooling time to allow the elements to cool down to a safe temperature.

The units are virtually maintenance free with no moving parts and no lubrication required.

During initial operation of the system it is recommended that a three month inspection period is used increasing to a six/twelve months after eighteen months use.

Any components removed from the unit during inspection and maintenance should be stored away securely, at low level.

6.2 Commissioning report/Maintenance report

| | | |
|------------------------------------------------|----------------------------------------------|--------------|
| Building: | Floor: | Unit: |
| Commissioning: <input type="checkbox"/> | Maintenance: <input type="checkbox"/> | Date: |

Maintenance measures

| Item to be checked | Measures | Interval [months] | | | Done | |
|--------------------------------------------|---------------------------------------------------------------------------------------------|-------------------|---|----|--------------------------|--------------------------|
| | | 3 | 6 | 12 | Yes | No |
| Checking heater element(s) | Remove dust and perform insulation resistance test between terminal and stainless sheath. | X ¹⁾ | X | | <input type="checkbox"/> | <input type="checkbox"/> |
| Checking high temperature cut out operates | Adjust set point to ambient temperature to check heater de-energizes and reset to 40°C | | X | | <input type="checkbox"/> | <input type="checkbox"/> |
| Checking the pressure switch operates | Checking that the minimum airflow is present, and when not present the heater de-energizes. | | X | | <input type="checkbox"/> | <input type="checkbox"/> |

1) initial inspection period. After 12 month running period, inspection interval could increase to 6 month cycle depending on reported findings

| | |
|----------------------------------------|--|
| Comment: | |
| | |
| | |
| | |
| | |
| | |
| Next maintenance scheduled for: | |
| Signature: (Technician) | |
| Company: (Stamp) | |

7 Replacement parts list

i **Ordering replacement parts**

You can identify order-specific components of the unit either by a code on the component itself or by the reference number detailed on the label or TROX technical schedule.

| Name | Replacement part no. |
|--------------------------------------------|----------------------|
| Heating elements | Refer to TROX |
| High temperature cut out | 113898T |
| Pressure switch | 008894T |
| Transformer | 117210T |
| Relay | 088313T |
| Contactora (3-phase only) | 088388T |
| Thyristor (1-phase) – Carlo Gavazzi | 123230T |
| Thyristor (3-phase) | 088408T |
| Thyristor (1-phase) – Obsolete Imtec EC3/1 | 088316T |
| Thyristor (1-phase) – Obsolete Imtec EC6/1 | 088317T |