ESF SURGE POWER FILTER

INSTALLATION GUIDE

Dear Installer,

To ensure you get the maximum benefit from this product, we ask that you carefully follow this installation specification. This instruction forms part of your installation record. Please read it thoroughly prior to commencing work and ensure that it is retained afterward by the equipment owner.

Prior to commencing installation, please read the '**Application Statement**' and complete the supplied checklists. Not completing the checklists may result in unpredictable performance and/or equipment damage. Eaton shall not be responsible for any issue arising as a result of the installation not being carried out according to this document.

If you are unsure about any aspect of installing this product, or require clarification of any issue, please contact your local Eaton distributor or office.

PREPARATION FOR INSTALLATION

Prior to installation, please read the following application statement then follow the checklist after to make sure you are ready to commence the job.

Application Statement:

"This Surge Protective Device (SPD) is designed to provide electrical protection to sites using a conventional, low voltage supply with a grounded neutral. For proper performance, it must be installed according to the supplied instructions, as well as any applicable local standards and laws. This unit is intended to reduce the risk of damage resulting from lightning strikes, power network transients and other associated phenomena. No product can completely eliminate risk and it is essential that connected loads also be compliant to the standards applicable to ensure proper coordination with this unit. Only suitably-qualified personnel shall install this unit."

Please contact your local Eaton distributor or office if you do not agree with the "Application Statement", otherwise please proceed to the checklist over page.

1. PRE-INSTALLATION CHECKLIST

Read the following pages carefully before commencing. If you aren't sure about anything, or have any questions, please contact Eaton or your distributor prior to commencing work. Use this checklist to determine that you are ready to commence installation.

- ☐ Supply connection is 380-440V single or 3-phase with a grounded neutral.
- ☐ Supply is TT, TN or TN C-S. The model must correspond to the service. A TT service requires a TT model. TN & TNC-S services use a TN model (but TT models may be more appropriate when remote from the M.E.N. point – contact Eaton). Unit is not suitable for an ungrounded neutral supply.
- ☐ Unit is classified as “SPD Indoor Category II” and is to be mounted against a wall or pillar in a well-ventilated position, away from direct sunlight and not exposed to rain or water spray.
- ☐ Gear-tray models are designed for installation within secure enclosures. Do not externally-mount a gear-tray model.
- ☐ Gear-tray models require adequate ventilation. Do not install within a sealed enclosure, unless heat-exchangers are used.
- ☐ Enclosure models require adequate ventilation. Do not install inside other enclosures, cabinets or cupboards.
- ☐ Mounting surface is capable of supporting the unit safely. Do not mount directly to drywall or plasterboard.
- ☐ Adequate space exists to allow the unit door to fully open without blocking pathways.
- ☐ Mounting location for geartray models is more than 150mm from any surface to the sides, top and bottom, with adequate clearance at the front for installation with the cable cover in place.
- ☐ Mounting location for enclosed models is more than 600mm above the floor and more than 300mm below the ceiling.
- ☐ Mounting location is secure. If not, suitable locks must be fitted to the unit to prevent unauthorized access. Opening the unit’s door whilst energized represents an electrical shock hazard. Contact the factory or your supplier for information.
- ☐ Suitable lifting equipment is available to support the unit during installation.
- ☐ Adequate lighting is available.
- ☐ TN models are to be located as close as possible to the main system Earth and Neutral link (M.E.N.) for point-of-entry application. Ideally, the unit should be located within 3m (cable length) of the Neutral Link, although up to 10m can be used in less critical applications. Greater lengths reduce the level of protection provided by the unit.
- ☐ Note that TT models use different wiring, with a separate “surge return earth” to the supply or local ground point. Refer to wiring diagrams for information.
- ☐ If fitted to an intermediate supply board, the board Earth should be extended to the building structure if possible to avoid electrical shock hazards. Again, Earth and Neutral connections must be kept short.
- ☐ The supply connection shall use isolation fuses in conjunction with an isolation switch. “Fuse switches” are recommended. Fuse rating is HRC-style "GL" with an interrupt rating of 25kA or greater. Do not use circuit breakers for the supply connection as protection and reliability are reduced. Circuit breakers may be used for connected loads.

- ☐ Fuse rating is less than or equal to the current rating of this unit.
- ☐ TT models - Earth conductor uses either a suitably-rated cable or an armoured cable shield with clamp for safety earth, and a separate, 16mm^2 or greater cable for the “Surge Return Earth”.
- ☐ TN models - Earth conductor uses either a suitably-rated cable or an armoured cable shield with clamp.
- ☐ Load phase and neutral cables are connected to unit output only. Do not bypass neutral.
- ☐ Input and output cables must be kept well apart. Minimum distance is 300mm.
- ☐ **IF INSTALLED IN A SWITCHBOARD, THE LOAD EARTH IS TO BE DIRECTLY CONNECTED TO MAIN SYSTEM EARTH, NOT THIS UNIT.**
- ☐ Ensure that you have the appropriate termination fittings (lugs, clamps etc) as well as appropriate tools for their installation. Installation of this unit requires all cables to be lugged.
- ☐ Customer is prepared for supply disconnection to allow connection of this unit. Alternatively, install the fuses and isolation switch at an appropriate time, allowing connection of this unit as required.

If everything appears OK, sign-off and proceed to the next stage. If you aren't sure about anything, or have any questions, please contact Eaton or your distributor prior to commencing work.

Completed by:		Date:	

If the preceding checklist is completed satisfactorily, you may proceed with installation. Read the following pages carefully before commencing. If you aren't sure about anything, or have any questions, please contact Eaton or your distributor prior to commencing work.

2. INSTALLATION

Proceed with installation as follows. The basic order of operations is:

- Safety isolation
- Fit unit to mounting surface
- Cable installation
- Pre-commission tests
- Commissioning
- Handover

These operations may be carried out by different groups of people, therefore it is important to complete each operation and sign-off before proceeding to the next stage. In particular, an 'approval to connect' may be required prior to commissioning or the actual commissioning may be carried out or witnessed by an energy authority representative. For these reasons, ensure that the enclosed instructions are followed correctly and that each section is signed-off.

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3. Safety Isolation

Prior to commencing installation of the unit, testing must be performed to ensure that the site is electrically safe. In the absence of a suitable procedure, follow the steps below. **Perform <u>all</u> steps even if the site is not yet connected to power.**

☐ Ensure that supply is isolated. Trace supply cables to their connection points and tag-off relevant supply breakers/fuses to prevent accidental connection using suitable 'Danger' tags.

☐ Ensure that load is isolated. Tag-off relevant load breakers/fuses to prevent accidental connection using suitable 'Danger' tags.

☐ Ensure that the supply neutral is temporarily isolated. Tag as necessary.

☐ Test all cables against site earth to ensure no voltages are present.

Completed by:		Date:	

4. Fit unit to mounting surface

Follow the instructions – either 4.1 or 4.2 depending upon enclosed or gear-tray models.

Please ensure you remove all internal shipping and packaging materials!

4.1 Enclosure models

- ☐ Note that mounting brackets may be used in 2 positions. At least one pair of brackets must be fitted in the vertical position to prevent skewing, preferably the upper pair. Determine the bracket positions before marking the mounting surface.
- ☐ Mark the surface where drilling is to take place.
- ☐ Install mounting anchors appropriate for the mounting surface. Refer to unit weight in the technical specifications (supplied with unit). For safety, one anchor should be capable of supporting this weight alone.
- ☐ Attach the mounting brackets using the short M8 fasteners supplied.
- ☐ Using a suitable lifting device or a team of persons, lift the unit into position and secure to the mounting surface. Assure that all mountings are made secure and the unit is solid.
- ☐ At this point, fit cable mounting plates or brackets as required for cable installation.

4.2 Gear-tray models

- ☐ Determine the mounting position. Unit shall be located such that it has 150mm clearance on the sides, top and bottom, and that adequate clearance exists at the front.
- ☐ Mark the surface where drilling is to take place.
- ☐ Attach the unit to the mounting surface using 4x M8 or 5/16” fasteners.
- ☐ Assure that all mountings are made secure and the unit is solid.
- ☐ At this point, fit cable mounting plates or brackets as required for cable installation.

Unit is now mounted, ready for cable installation.

Completed by:		Date:	

Figure 1. Single-phase models

EARTHING NOTES:
1. TT models use separate earth returns for safety and surge return paths. The 2 cables are terminated at the main system earth in most cases
.
2. For TT installations remote from the system earth, the "Surge Return Earth" may be connected to a local earthing rod or structural earth. The safety earth remains connected to the system earth, according to the wiring rules.

3. For all units, if the load is directly connected to the output of the filter, the load's safety earth may be connected to the filter as shown. If the filter is feeding a distribution panel, the load earth must come from the distribution panel.

Figure 1A
TN model wiring

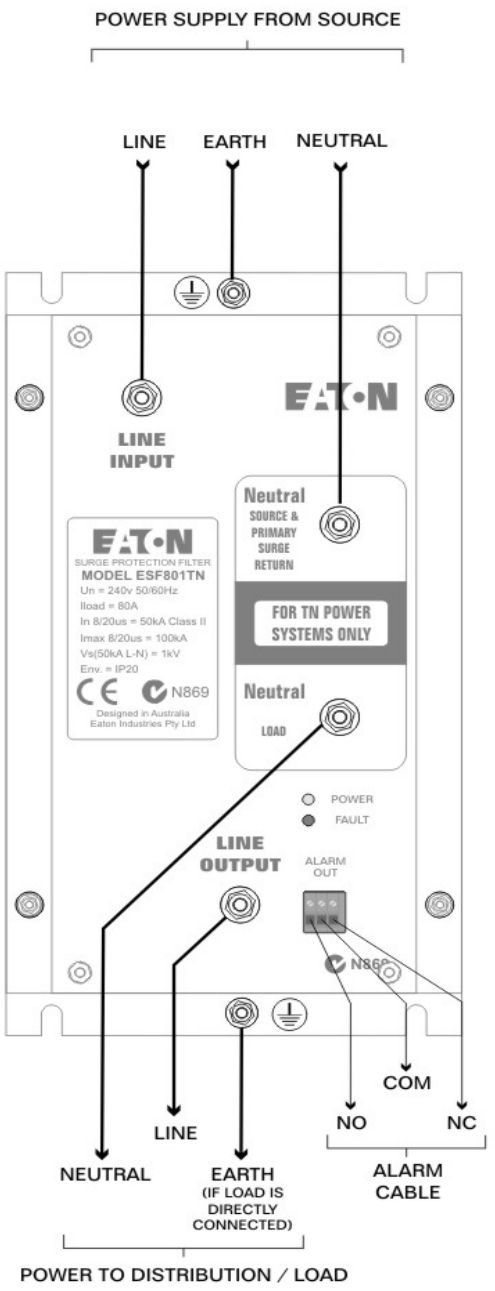


Figure 1B
TT model wiring

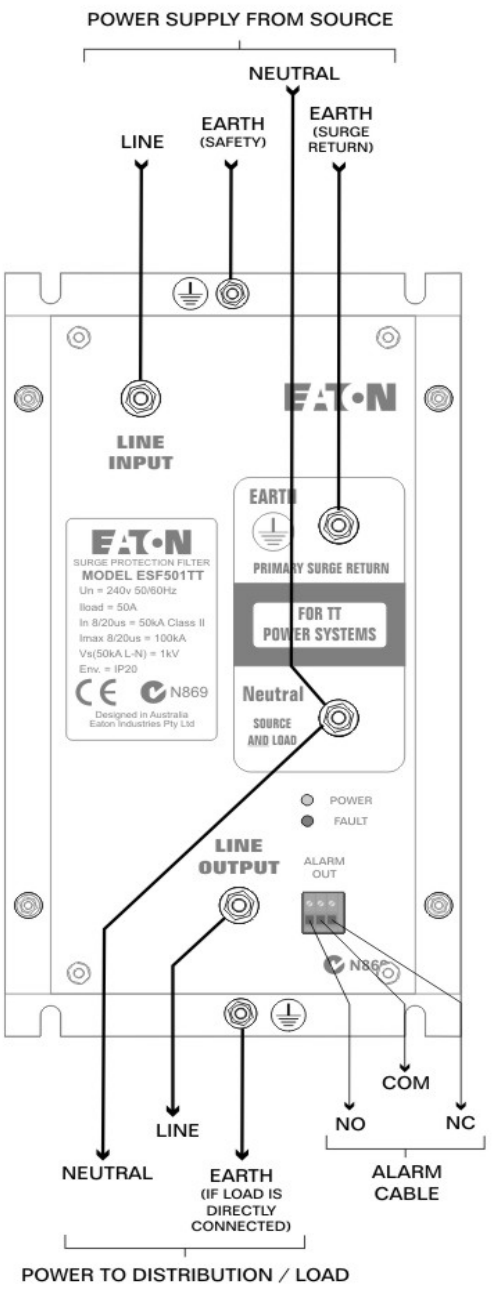


Figure 2. 3-phase TN models

EARTHING NOTES:

If the load is directly connected to the output of the filter, the load's safety earth may be connected to the filter as shown. If the filter is feeding a distribution panel, the load earth must come from the distribution panel.

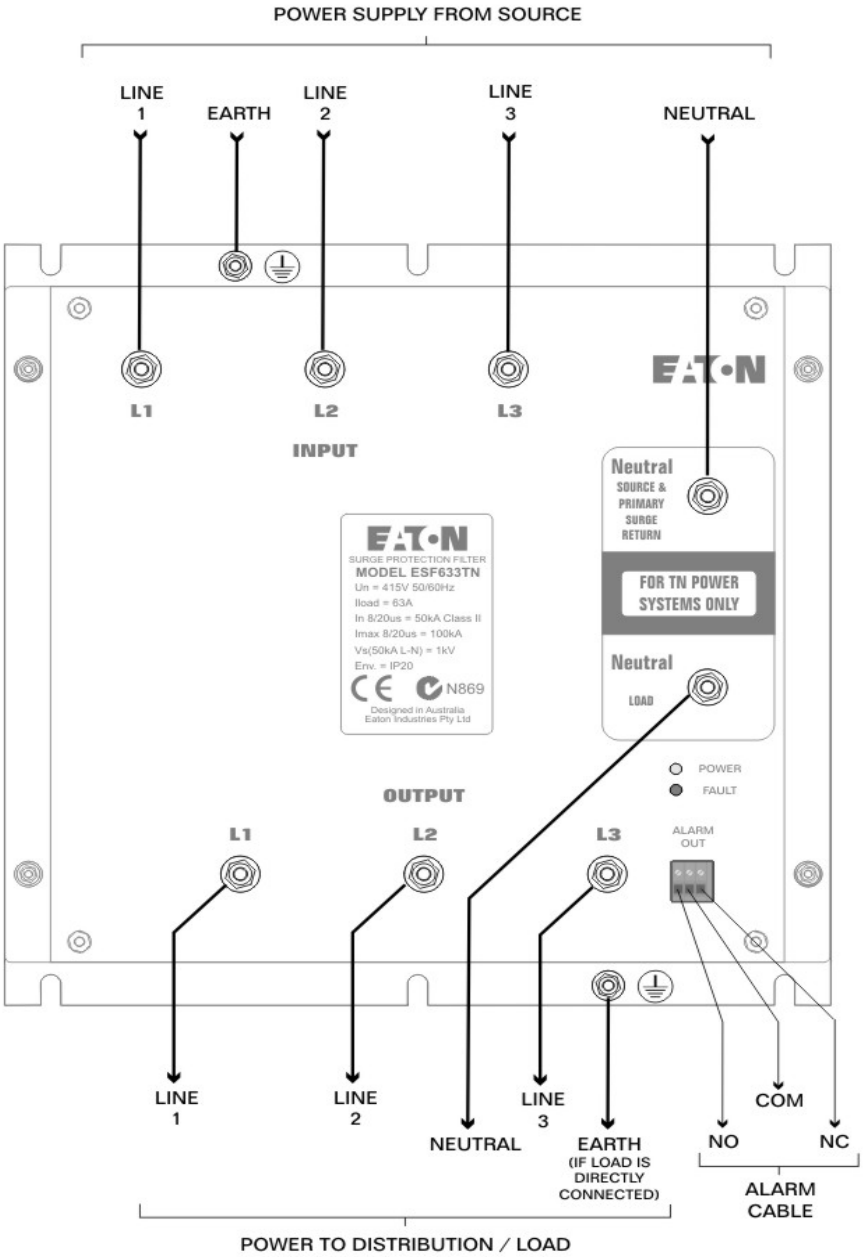
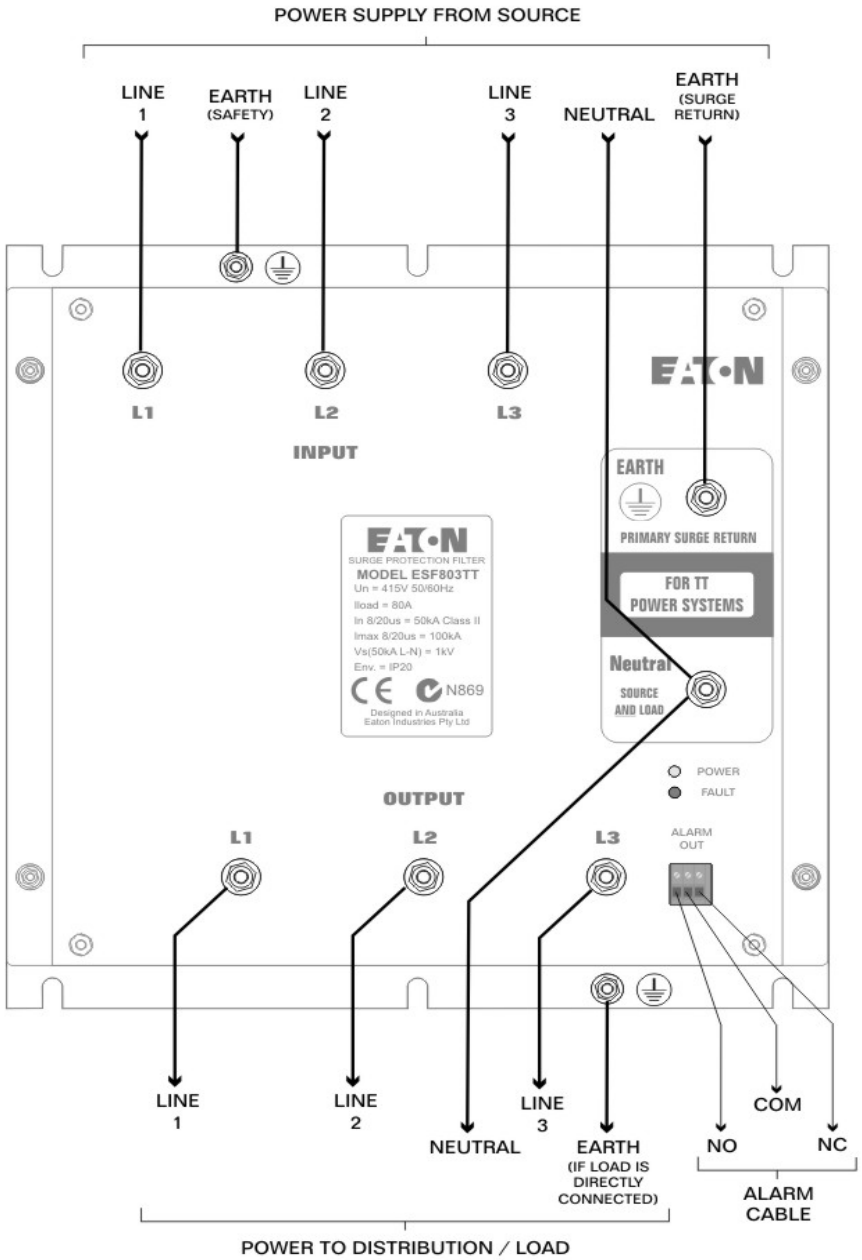


Figure 3. 3-phase TT models

EARTHING NOTES:
1. TT models use separate earth returns for safety and surge return paths. The 2 cables are terminated at the main system earth in most cases
.
2. For installations remote from the system earth, the "Surge Return Earth" may be connected to a local earthing rod or structural earth. The safety earth remains connected to the system earth, according to the wiring rules.

3. If the load is directly connected to the output of the filter, the load's safety earth may be connected to the filter as shown. If the filter is feeding a distribution panel, the load earth must come from the distribution panel.



5. Cable installation

Note: Surge filters require special treatment regarding installation practices, if optimal protection with safety is desired. Internal cabling should follow the rules below:

Note for TN models only:

- The TN models use the supply neutral as the main surge return path. For this reason, it should not be under-sized and should be the same size as, or larger than the phase conductor size. Composite cables usually use under-sized neutral conductors and are unsuitable for primary connections to SPDs.

Notes for TT models only:

- The TT models use a separate “Surge Return earth”, as well as the normal safety earth. The purpose of the “Surge Return Earth” is to provide a separate earth path for surges, preventing their conduction into other equipment.
- The “Surge Return Earth” should be sized the same as the phase conductors, or larger.
- The “Surge Return Earth” should be connected to the earth block in the supply SWB i.e. at the same point as the normal safety earth.
- If remote from the SWB, a local ground rod or system should be employed and connected to the “Surge Return Earth” only. In this case, the normal safety earthing conductor should still be connected at the supply point.

Ensure that the correct wiring diagram is followed for each model. Refer to the diagrams on the preceding pages:

- Single-phase TN model – Figure 1a
- Single-phase TT model – Figure 1b
- 3-phase TN model – Figure 2
- 3-phase TT model – Figure 3

If you have any questions, please contact Eaton or your distributor prior to commencing work.

☐ Open door.

☐ Carefully unplug the door earth cable from lug on door.

☐ Remove door.

☐ Attach the supplied cable glands to the enclosure. Tighten using appropriate tools.

☐ Determine the cable length necessary for installation and, leaving an extra 100mm, cut off any surplus cable.

☐ Feed the cable(s) through the gland to the required depth and tighten gland.

To prevent slippage during termination, place a strong cable tie around the cable, immediately above and below the cable gland. Remember to remove before commissioning.

☐ Strip the cable sheath and form the individual wires roughly into position.

☐ With reference to the wire lugs to be applied to the cable, cut each cable to the correct length.

☐ In the case of an armoured/shielded input cable, cut the armour/shield back and use a clamp.

If using armoured/shielded cable with an earth clamp, provide a suitable length of 16-25mm^2 cable to link the earth clamp with the geartray earth stud. Keep length as short as possible (<300mm). Earth stud torque is 10Nm.

- ☐ In the case of an armoured/shielded output cable, trim the armour/shield flush with the cable sheath. Heatshrink insulation over for a neat joint.
- ☐ Except for directly-connected loads, the load circuit earth must not be connected to this unit. Refer to the installation checklist.
- ☐ Fit wire lugs, using an appropriate tool. Ensure crimps are solid with no broken wires.
- ☐ Connect the earth wire from input cable to the earth stud on the geartray. Bolt torque is 15Nm.
- ☐ (TT models only) connect the "Surge Return Earth" cable to the terminal marked; "**EARTH Primary surge return**". Bolt torque is 15Nm.
- ☐ Connect **input** phase and neutral wires to positions as marked. Use the correct-size spanner to prevent the bolt heads from turning. Ensure adequate clearance from other terminals. Use a suitable torque-indicating wrench to tighten the securing nuts. Bolt torque is 15Nm.
- ☐ Connect **output** phase and neutral wires to positions as marked. Use the correct-size spanner to prevent the bolt heads from turning. Ensure adequate clearance from other terminals. Use a suitable torque-indicating wrench to tighten the securing nuts. Bolt torque is 15Nm.
- ☐ If external alarm wiring is required, fit the 16mm cable gland, removing the blanking plug first.
- ☐ Connect alarm cable (must be double-insulated) through the 16mm cable gland.
- ☐ Using self-adhesive cable tie holders, secure alarm cable to cabinet, leaving a small amount of slack for movement.
- ☐ Strip alarm wires to required length and fit ferrules as required. Note that alarm connections are shown in the 'normal' operating position and will be reversed when the unit is not powered.
- ☐ Ensure all cables ties are fitted, tightened and trimmed.

This completes cable installation ready for pre-commission testing. Please sign-off before proceeding to the next stage.

Completed by:		Date:	

6. PRE-COMMISSIONING TESTS

Prior to commissioning of the unit, testing must be performed to ensure that the unit is safe to commission. Follow the steps below. **Perform <u>all</u> steps even if the site is not yet connected to power.**

- ☐ Inspect wiring, checking that insulation is undamaged and wire locations correspond to the correct diagram.
- ☐ Ensure that all fasteners are tightened by tugging gently on cables.
- ☐ Replace the cable cover, fitting the 4 nylon screws finger-tight only.
- ☐ Ensure that the load is isolated. Tag-off relevant load breakers/fuses to prevent load energisation during commissioning.
- ☐ Replace door.
- ☐ Reconnect the door earth cable.
- ☐ Close door and lock.
- ☐ Restore neutral connections at the switchboards if necessary.

This completes pre-commission testing. Please sign-off and proceed to the next stage.

Completed by:		Date:	

7. COMMISSIONING

Verify that all prior check-boxes in this document are ticked and that each section is signed-off. If not, return this document to the relevant persons, asking them to complete the relevant section(s) of the form. **Do not proceed with the commissioning process begin until ALL previous details have been checked and signed-off.** Failure to observe this warning may result in unsatisfactory performance, personal injury and potential damage to equipment.

- ☐ Obtain approval for commissioning from the relevant persons or authority. In some areas, a representative from the energy authority must inspect and approve the installation prior to commissioning. Check your local laws.
- ☐ Double-check that load circuits are isolated.
- ☐ Measure the supply voltage with a meter to ensure that it is present at the correct voltage, especially if a generator or temporary supply is to be used for commissioning. Operation at out-of-tolerance voltages may cause faulty operation or damage the unit.
- ☐ If testing with a generator supply, ensure that the generator neutral line is earthed at the point of connection to the building. Do not rely upon a temporary generator earth.
- ☐ Reset circuit breakers/fuses on supply switchboard and remove danger tag.
- ☐ Operate the master switch, if applicable. **Power should now be applied to the unit.**
- ☐ After a short period (<5 seconds), there should be a blue indicator visible through the window on the door panel.

Be aware of any sources of heat, burning smells or unusual noises. It is normal for this type of unit to emit a faint buzzing sound from the filter components inside the unit. If any problems arise, shut down the supply immediately, isolate and inspect. If in doubt, contact Eaton for information before proceeding.

NOTE! If a red indicator is visible on the front panel, this indicates a fault condition. Contact Eaton or your distributor for information.

- ☐ Proceed to commission the load. Remove any tags fitted and operate the applicable load breakers on the load switchboard.
- ☐ Following the recommended practices, start-up the load equipment and ensure it operates correctly. If possible, operate the load equipment in all possible conditions, continuing the period of testing until correct operation has been determined.

After load equipment is turned on, be aware of any sources of heat, burning smells or unusual noises. It is normal for the unit to emit a faint buzzing sound from the filter unit, which may become louder or softer, depending on the applied load. If any problems arise, shut down the supply immediately, isolate and inspect. If in doubt, contact Eaton for information before proceeding.

- ☐ Shut down load equipment and isolate load breakers (if it is not desired to leave equipment operating afterward).

This completes commissioning. Please sign-off and proceed to the next section.

Completed by:		Date:	

8. HANDOVER

- ☐ Take 2 copies of this entire document.
- ☐ One copy is to be mailed or faxed back to the factory or your distributor. This copy, when received, will activate your warranty. Please ensure that it is done immediately.
- ☐ One copy is to be retained by the installer for future reference.
- ☐ This document (original) is to be handed to the site manager or works supervisor for inclusion into site quality records.

Eaton would like to thank you for correctly installing and commissioning this unit. Customer satisfaction is very important to us and your high standard of work and attention to detail is as much a part of this unit's effectiveness as our design. We would like to hear from you if you have any suggestions or complaints regarding our products. Please contact your supplier to discuss the matter.

Finalised by:		Date:	

Warranty

Eaton Industries warrants the ESF series against faulty materials and workmanship for a period of 5 years from the date of installation on the condition that installation has been correctly carried out with respect to these installation instructions. Eaton Industries reserves the right to inspect the installation to it's own satisfaction in regards to any claim made against this warranty, or to appoint an independent person or persons to do the same. Due to the unpredictable nature of lightning and power surges, no guarantee of performance is made in this respect and no responsibility shall be taken for damages or loss resulting from, or attributed to, the installation and/or use of this equipment.

INSTALLATION NOTES

Signature : _____ Date : _____