TRITIUM

Installation Manual

Veefil-RT 175-S Site Installation

TRI125.INS.018

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Version 1

Brisbane, Australia

http://www.tritium.com.au

Contents

1 Overview

1.1 Purpose of this document

The purpose of this document is to provide qualified electrical engineers and Tritium Certified installers with an outline of the steps required to install a Veefil-RT 175-S high power charging 175kW site.

This document is for both the single and dual cable variants of the Veefil-RT 175-S.

Note: The images used in this document are of the dual cable variant.

1.2 Disclaimer and warranty

This Manual sets out Tritium's understanding of best-practice methodologies and its requirements for installation of the Veefil-RT 175-S and is provided to customers pursuant to the same terms and conditions under which Tritium has supplied its products.

Tritium encourages all owners of its products to consult a qualified engineering consultancy firm to provide independent advice on the methodologies set out in this manual, and site design requirements, including in relation to applicable regulatory and statutory requirements. All site designs must be signed off on by a professional engineer.

Tritium accepts no liability for any loss caused, whether due to negligence or otherwise arising from the strict adherence to the requirements set out in this manual in contravention of local regulatory and legal requirements.

It is an express condition of Tritium's manufacturer warranty that:

- the requirements set out in this manual are adhered to (subject to local regulatory and legal requirements) when installing the Veefil-RT 175-S; and
- that the installation is conducted by a Tritium Certified technician who has completed Tritium's installation training course for the Veefil-RT 175-S.

1.3 Specifications

Unit	Specifications
LV Distribution Board	• 185kVA Output per charger • 400V/300A 50Hz, 480V/250A 60Hz, 600V/200A 60Hz • UL listed circuit breakers with optional under-voltage relay • Maximum available fault current of 18kA (current limiting fuses or current limiting circuit breakers may be required to maintain limit of 18kA) • Residual current monitoring device of time delay type (optional)
Power unit	• 1 x 185kVA double insulated safety isolation transformer • 1 x 175kW AC/DC converter with AC contactors • Integrated Communications Unit, Dual 4G SIM • 800kg
User unit	• 1 x 175kW 350A DC/DC converter (CCS/CHAdeMO) • 260kg

1.4 Installation safety considerations

- First Aid Kit
- Low Voltage Rescue Kit (LVR Kit)
- Defibrillator
- Never walk under suspended loads

- Site shall never be worked on while electrically live. Before any duty, ensure LV distribution board circuit breakers are isolated and locked out.
- Fencing and exclusion zones, authorisation from the local authorities.
- Exclusion zones when lifting hardware
- Shelter from weather (sun, wind, dust, and rain)
- Second person in the event of an accident

1.5 Acronyms and abbreviations

Acronym/abbreviation	Definition
IPU	Integrated Power Unit.
UU	User Unit
DMM	Digital multimeter
CU	Communication Unit
UV	Undervoltage
Veefil RT175-S Solution	TRI125-175 - Tritium 175kW RT175-S Veefil Solution Comprised of a single IPU and a pair of UU.

1.6 References and related documents

- TRI125.INS.016 Veefil-RT 175-S Piping and Cabling
- TRI125.CHK.008 Veefil-RT 175-SK System Installation Checklist

2 Site plan

2.1 Block diagram

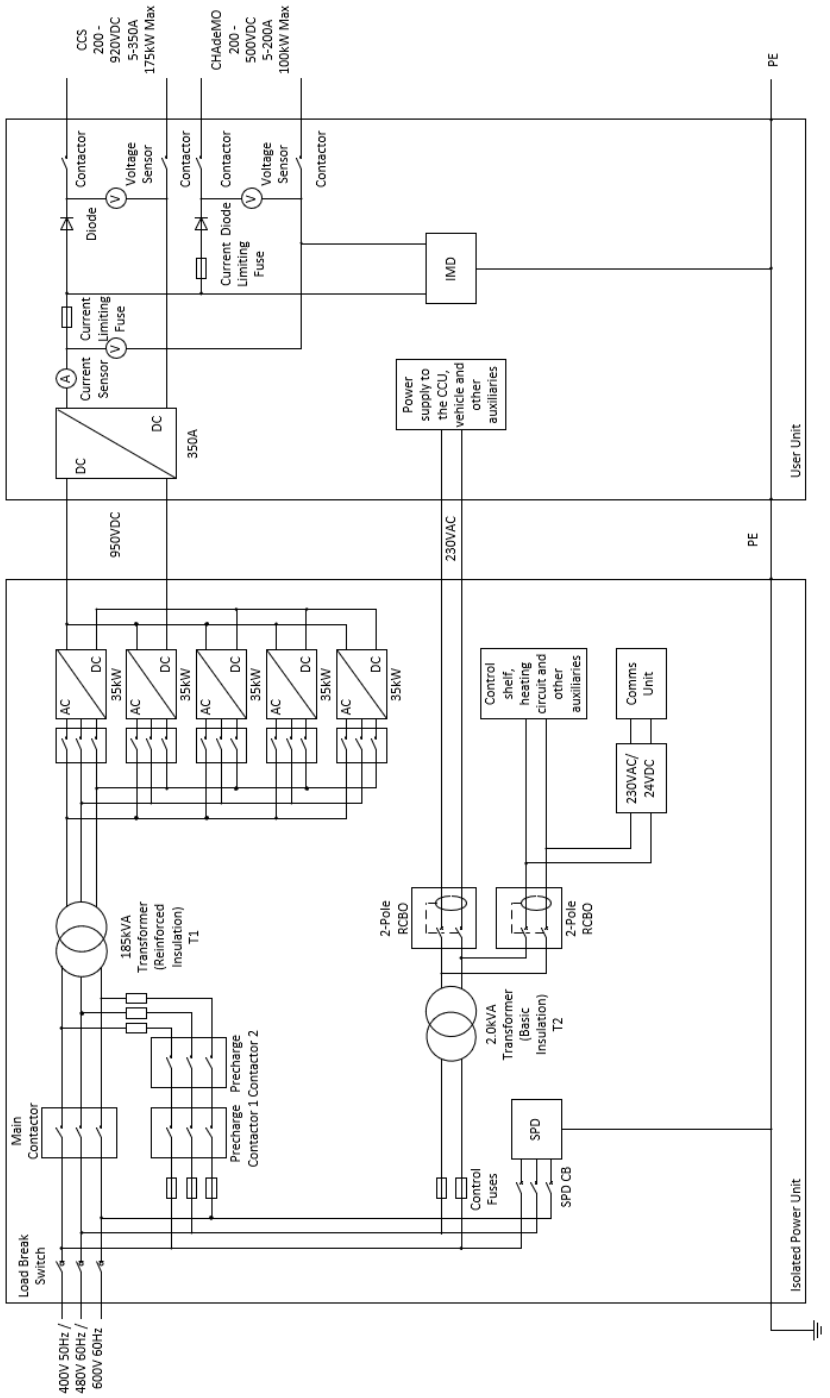

Figure 1: Single charger block diagram

2.2 Layout

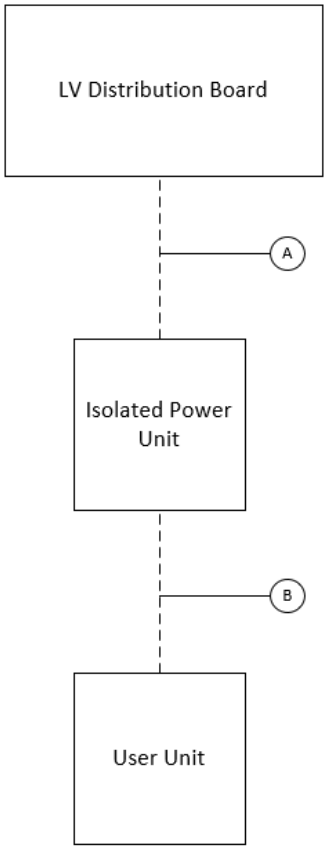

Figure 2: Site electrical layout

3 Resources

3.1 Tools and consumables

3.1.1 Tools

- Network Termination Equipment
- Electric Hydraulic Cable Lug Terminator
- 100m hook-up wire
- Rags
- Electric caulking gun
- Drill
- Torque Wrench
- Step ladder
- Table
- Chair
- General tools:
  - Spanners
  - Shifters
  - Socket Set >24mm
  - Screwdrivers
  - Side cutters
  - Allan Keys
  - Knife
  - Multi grip pliers

3.1.2 Consumables

Ensure that the appropriately sized cable termination lugs for the AC and DC installation wiring are procured, as well as the required heat-shrink to demark three phase AC cabling, high powered DC cables, and protective earth cables.

CID	Description	QTY
12942 OR 12943	RT 175-S Installation Kit (CID is region dependent). **Note:** Does not contain any DIN standard lugs	-
5542	UL Listed CABLE TIE, Yellow, 100X2.5MM, PK100	200
6234	UL Listed CABLE TIE, 94V-2, 292MM x 4.8MM BLACK, PANDUIT, PK100	1
8405	Cable Ties, Black, 450 x 8mm, Heavy Duty, 100 pack	1
9543	Nofirno cable sealant	-
9127	Cat 6A 10G Shielded Keystone SLIMLINE Jack. Toolless 180 degree IDC	2
9416	Cat 6A S/FTP LSZH 1.5m RJ45-RJ45 Network Cable: Blue	2
9565	Molex 44915 Series Number Cat6 8P8C Way Cable Mount RJ45 Modular Plug Male	2
5792	EJCC Copper Jointing Compound	125 ml
2567	Aluminium jointing compound	125 ml

3.2 Heavy equipment

- Crane – with 7m reach, 1T lift capacity
- Forklift
- Temporary weather shelter

3.3 Torques utilised during installation

Equipment	Thread code	Position	Torque (Nm)
User Unit (UU)	M5	Hatch cover	2
	M8	Ground	16
	M8 Post hex	Plastic cover	4
	M10	DC	30
	M12/16	Chassis mount	30/40
Integrated	M10	DC	30
	M10	AC, Ground	30
	M12	Chassis mount	30

4 Installation

4.1 Conduit and cabling

Important

Prior to installation of the piping and wiring, a professional review of local requirements **must** be performed to ensure that laws and regulations are adhered to. As a result, it may be required to deviate from the requirements of this documentation.

Refer to TRI125.INS.016 Veefil RT175-S Piping and Cabling.

Site electrical design must be carried out and approved by a suitably qualified professional. Prior to commissioning, the electrical installation must be signed off as safe, complete and compliant to local laws and regulations.

4.2 Upstream protection

4.2.1 Device selection

Maximum sizes for the upstream electrical protective equipment supplying the RT 175-S IPU are as described in the following table.

Electrical Network	RT175-S Maximum Demand	Recommended Size	Maximum Size [2)]
600 VAC 3ph, 60Hz	200 A	250 A [1)]	250 A
480 VAC 3ph, 60Hz	250 A	320 A [1)]	320 A
400 VAC 3ph, 50Hz	300 A	320 A	350 A

[1)] Recommended sizes for North American markets are selected according to NEC article 625, accounting for the 125% rule.

[2)] The over current protection device rating must not exceed these values in order to maintain primary protection for the LV transformer within the IPU.

Important

Available short-circuit fault current for the RT175-S must not exceed 18 kA. This means that a current limiting fuse or circuit breaker may be required in locations where site fault current availability exceeds this value.

4.2.1 Optional under-voltage relay

The IPU includes pre-wired terminals to allow the optional use of an under-voltage device at the upstream supply breaker. The pre-wired terminals supply a normally closed 230VAC signal to allow upstream isolation in the event of a RT175-S safety loop trip (for example, tilt switch, cabinet door switch).

The use of an upstream under-voltage trip is optional, as the IPU locally isolates via the input contactor in each of these events.

4.3 Earthworks

Ensure that earthworks and trenching is completed with respect to installation personnel safety and applicable local and national legislation.

Ensure that all trenches are adequately roped off or barricaded to prevent accidental access and take care with respect to trenching locations and timing to allow appropriate access to equipment as required.

4.4 HPC equipment storage recommendations and conditions

Ensure that equipment is stored properly on site to ensure that it is protected from the weather and not exposed to the rain. Packaging may be damaged when wet.

When storing equipment:

- Stack and protect boxes inside a fenced off area of the site.
- Protect from weather conditions; store in a dry place or cover with a waterproof tarpaulin.
- Storage temperature -20 to 45 ºC.
- Ensure that only packing crates of similar sizes are stacked.
- Ensure a maximum height of two crates.
- Cabinets must be closed when leaving the site.

Figure 3: Maximum stacking height of similar sized boxes.

4.5 High power electrical connections

It is critical that the high-power electrical connections are done correctly to ensure safe, compliant, and warranted performance of the charging equipment.

SAFETY WARNING!

Only trained and competent electricians are authorised to perform this work.

- Ensure that the upstream power feeds are off and locked out throughout the work.
- The charging equipment must not be energised at any time during the installation. To ensure personnel and equipment safety, power will be applied for the first time during the commissioning phase.
- Ensure that the cables used meet the minimum requirements specified by Tritium.
- Ensure that the lugs are compatible with fine strand cable, and that the crimping die is correct for both the wire type and lug type.
- Double check lug, cable, and crimp die compatibility.

Figure 4: F type die from Klauke

- A small amount of **copper** jointing compound must be applied to the contact patch of all lug to copper busbar connections. This inhibits corrosion at the joint to maintain a good connection for the life of the charging system.
- Use a flat washer in contact with the top of the lug and a spring washer on top of the flat washer for all bolted lug connections.
- Torque all connections to the specified amount and mark the torque with a paint pen immediately.
- Clearly label all cables. Relabel when a cable is shortened, if required.
- Mark all cables with colour coded heat shrink.
- Do not cover the entire lug with heat shrink; leave one crimp mark showing so that the correct crimping tool stamp is shown.

4.6 Integrated power unit installation

4.6.1 Access and clearance

To maintain accessibility and serviceability of the unit via the cabinet doors, the front and rear of the IPU should be spaced at least 1m from any walls. This also aids in ventilation of the units.

If the IPU cabinets are required to be serviceable to the point where the primary IPU transformer may be removed in future, make allowancefor enough spacing between the rear of the unit to fit the length of a forklift and associated lifting tines, with additional appropriate manoeuvring space.

4.6.2 Foundation - precast preparation

Foundation design and preparation is the responsibility of the customer. Device footprints are provided by Tritium for hole drilling and conduit/cable location guidance.

For a full-scale drawing of Figure 5 and Figure 6, see the following documents respectively:

- TRI125-284_Foundation Template
- TRI125-285_Cable Entry Diagram.

Note: A mounting stencil may be supplied by tritium at customer request. All lengths in the below figures are specified in millimeters.

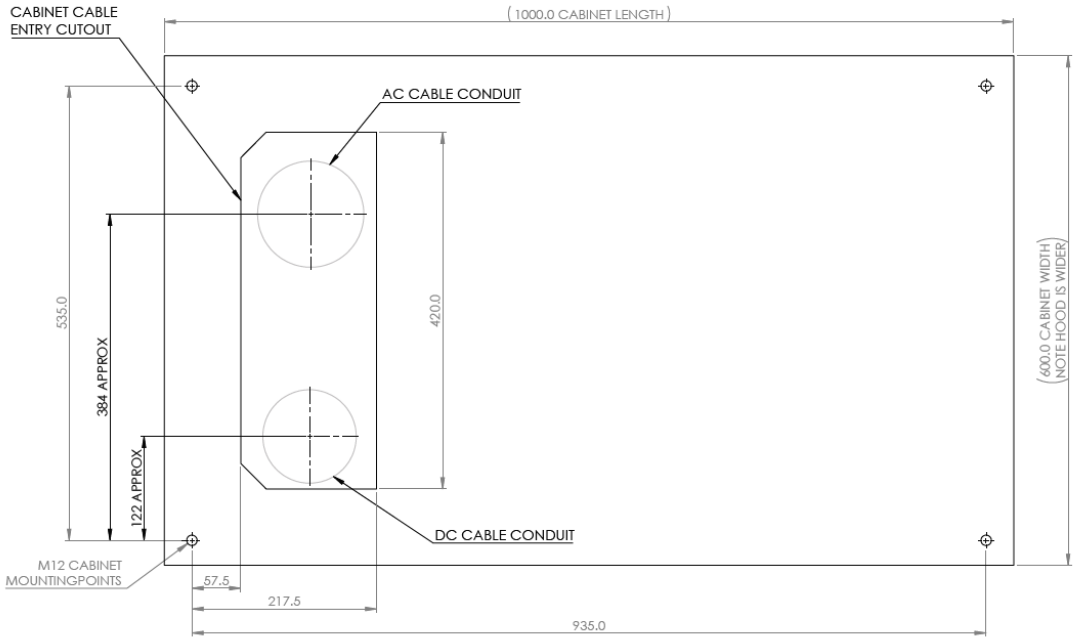

Figure 5: IPU Foundation Template

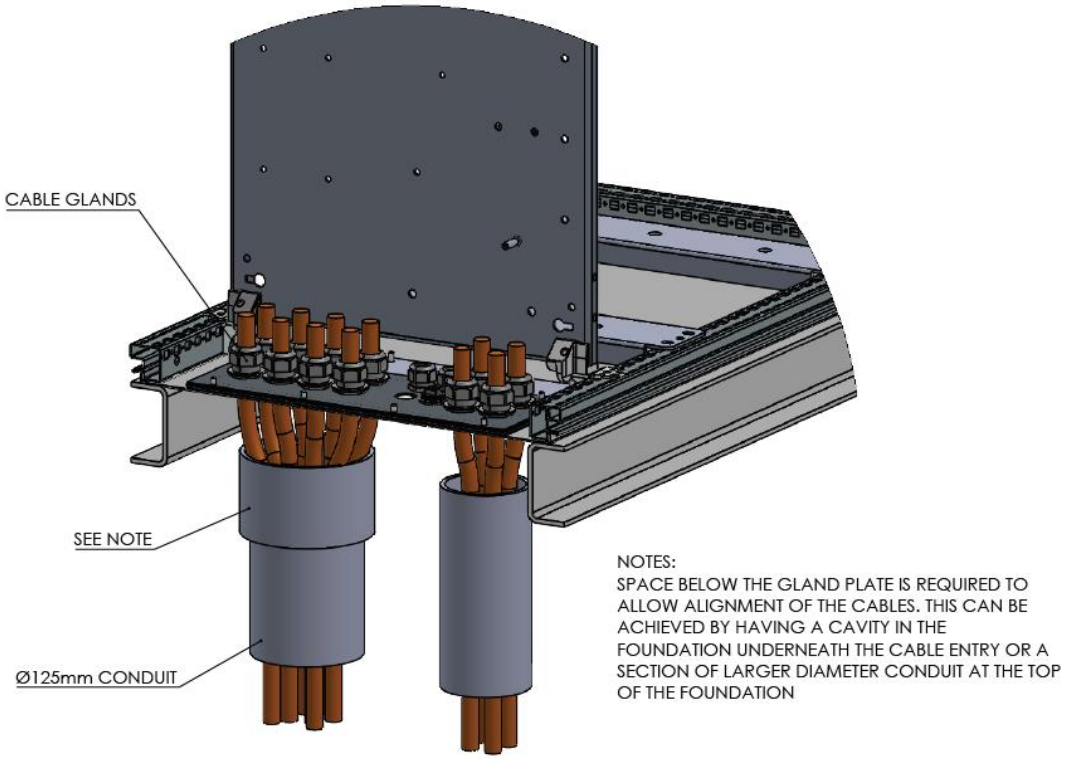

Figure 6: IPU Cable Entry Diagram

After the foundation is prepared:

1. Ensure that all cables are pulled and labelled correctly according to the cabling plan.
   Note: For more information, see TRI125.INS.016 Veefil-RT 175-S Piping and Cabling.
2. Cut the mounting rods down to 50mm above the foundation ground.
3. Deburr, then straighten threads.
4. Clean the slab of dust and debris.
5. Apply anti-seize to rods and temporarily fasten with an M12 Nut and flat washer.

4.6.3 Unbox and install the IPU

1. Locate the IPU box that is specially marked and contains the set of lifting eyes and straps.
2. Remove the top and side cardboard panels.
3. Open the lifting kit and attach the M12 load-rated lifting eyes (1.2 Tonne), lifting slings, and protective pads to the four lifting points located in each corner on top of the cabinet.
4. Use a torque wrench to tighten the lifting eyes.
   Note: Use recommended torque settings when fastening lifting eyes; the settings are written on the parts.

Figure 7: View of lifting slings attached to the unit

5. Carefully crane the IPU into place, bolt the IPU down, then detach the crane.
   Important: Ensure that the IPU is properly secured by the bolts before you detach the crane.

4.6.4 Terminate the IPU unit DC link

Important

Prior to installation of the piping and wiring, a professional review of local requirements must be performed to ensure that laws and regulations are adhered to. As a result, it may be necessary to deviate from the cable lug sizes (and corresponding cable sizes) referenced in this section.

1. Identify the DC output cables for the rectifier pack of the power unit.
   Note: These are contained within conduit B as shown in *TRI125.INS.016 Veefil-RT 175-S Piping and Cabling****Error! Reference source not found.***.
2. Measure, cut, and crimp with M10 cable lugs to the DC mounting points.

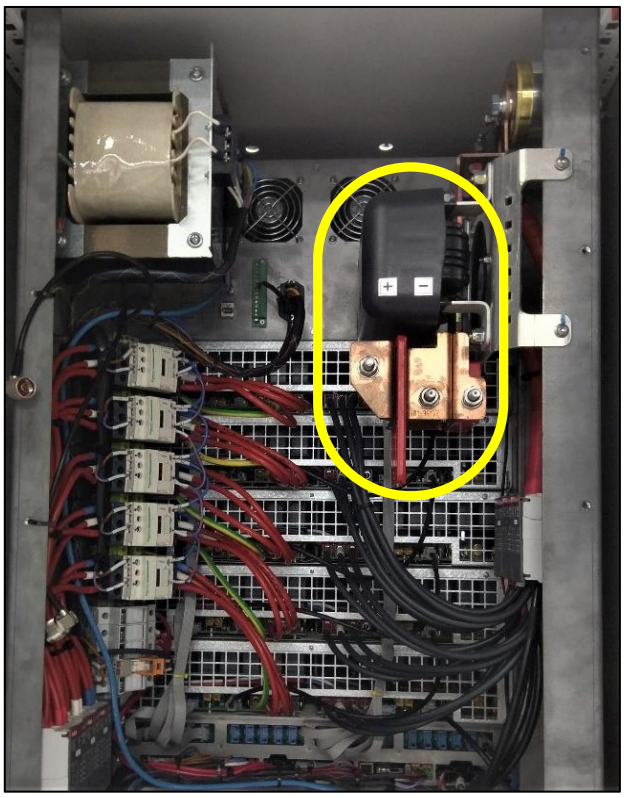

Figure 8: IPU DC Output Terminals

3. Measure, cut, and terminate the UU Earth with an M10 cable lug to the second terminal of the IPU earth bar.

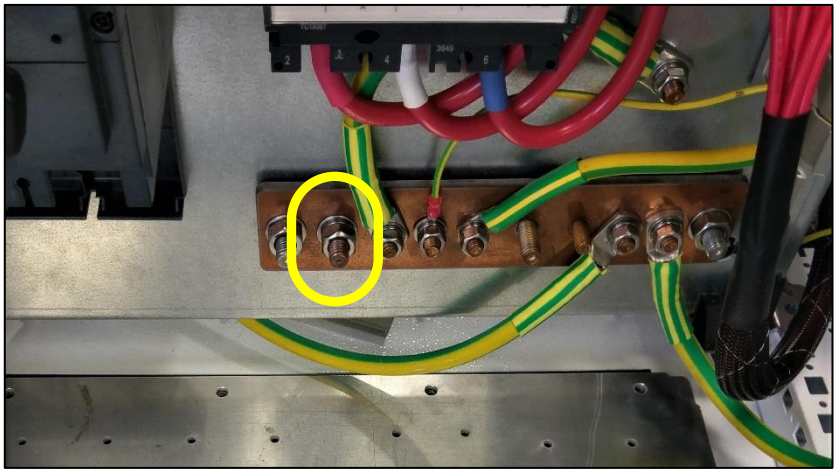

Figure 9: IPU Earth Terminals, UU Connection Point

4.6.5 Terminate the IPU AC link

1. Identify the AC input cables.
   Note: These are contained within conduit A as shown in *TRI125.INS.016 Veefil-RT 175-S Piping and Cabling****Error! Reference source not found.***.
2. Measure, cut, and crimp with M10 cable lugs to mounting points L1, L2, L3 on load break switch Q0, located on the bottom-left of the main gear tray.

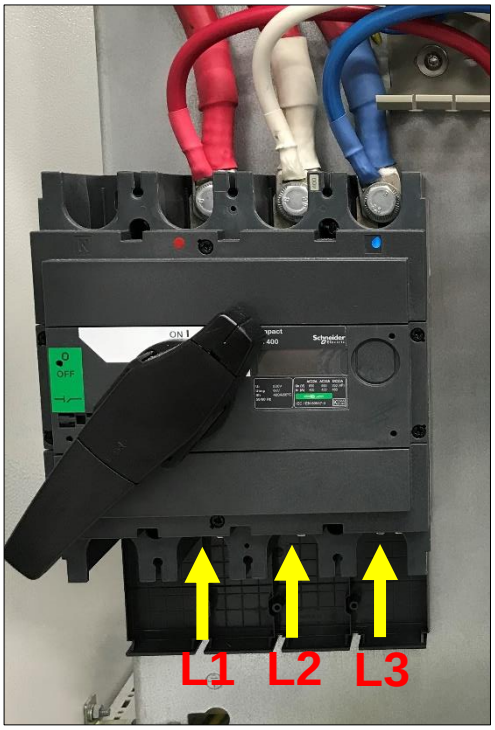

Figure 10: IPU 3phase AC Input isolation switch (Q0)

3. Measure, cut, and crimp the protective Earth with an M10 cable lug to mounting point GNDAC1 on the bottom of the gear tray.

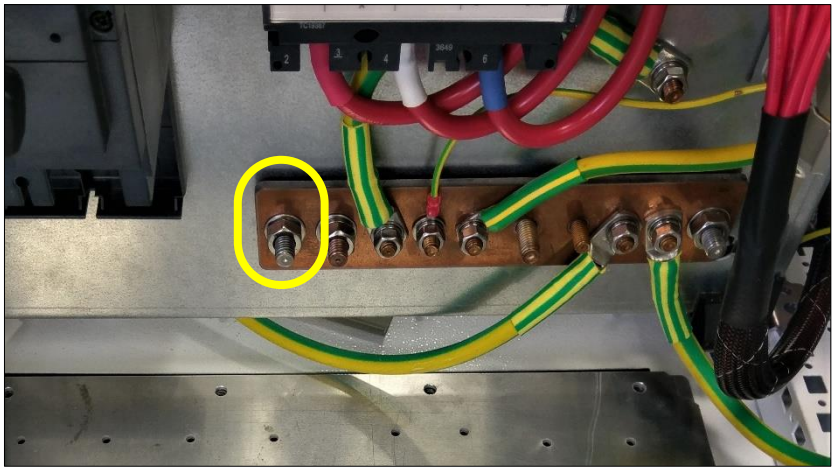

Figure 11: IPU Earth Terminals, Earthing Electrode Connection Point

4.6.6 Terminate Earthing electrodes

Important

- For EMC compliance, it is important that a local Earthing electrode is used to bond the chassis of the IPU directly to ground. This may be in the form of an earth stake, or if available, can be bonded to pre-existing buried earth structures.
- Prior to installation of the unit, a professional review of local lightning protection requirements must be performed to ensure that laws and regulations are adhered to. As a result, it may be necessary to install additional earthing electrodes for outdoor installations.

Terminate the bandeizen/earth electrodes to the IPU earth busbar as shown in section *4.6.5 Terminate the integrated power unit DC link*. If metal foundation plates are used, terminate to each IPU chassis or earth busbar.

4.6.7 Terminate low power and data cables

All low power field wiring (excluding communications) to the user unit is to be terminated into terminal block X1 (Figure 12).

Note: IMI earth reference field wiring terminal is not depicted in in the following image.

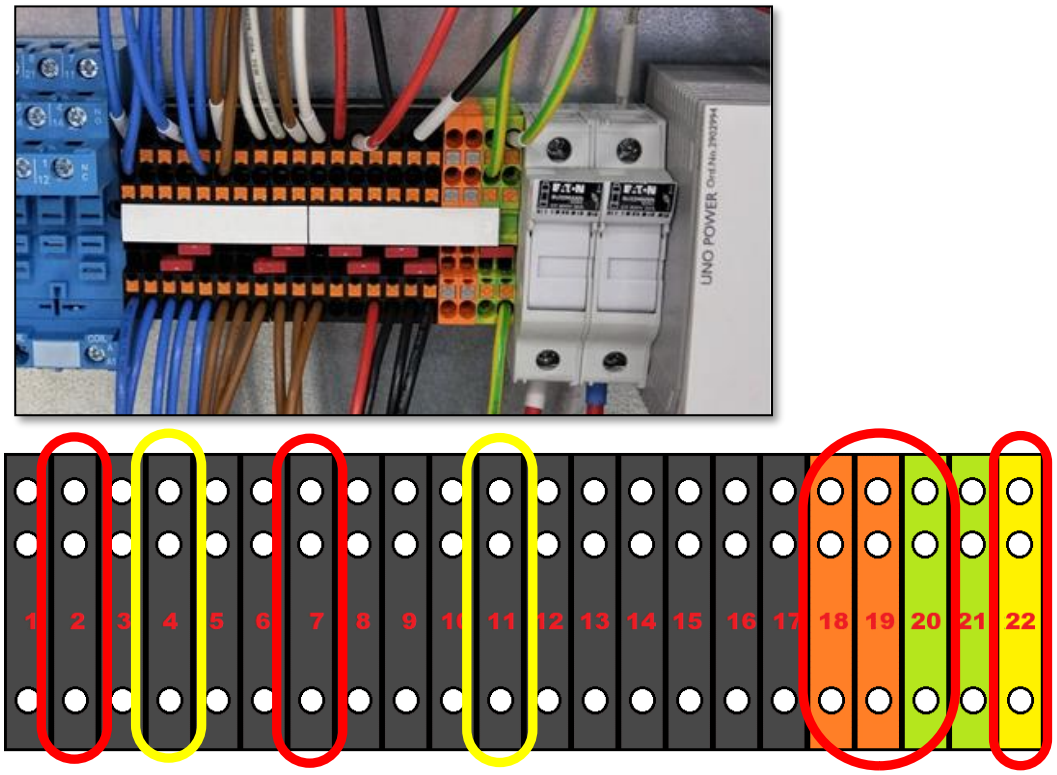

Figure 12: IPU Terminal Block X1 – Red highlights showing customer field wiring. Yellow highlights show optional wiring.

1. Strip, bootlace (only if stranded wire, skip bootlace if solid core), and insert the wires into the field wiring terminals as follows:

Terminal	Wire
2	• User Unit 230 VAC Neutral
7	• User Unit 230 VAC Line
18	• User Unit 24V Safety Loop
19	• User Unit 24V Safety Loop
22	• IMI Earth reference (from supply) • IMI Earth reference (to user unit)
11	• (optional) upstream breaker shunt output, 230 VAC Line
4	• (optional) upstream breaker shunt output 230, VAC Neutral

2. Locate the Ethernet cable from the control shelf and use the tool-less jack from the installation kit to terminate the Cat6A cable.
   Note: Use colour code A for all Cat connections.
3. Cover the Ethernet jack in heat shrink and secure to the frame of the IPU.
4. Connect a 1m patch lead from the Ethernet jack to the control shelf.
   Note: Alternatively, terminate the cable directly with a male connector and insert this into the control shelf.

Figure 13: Cat6A tool-less, Example Ethernet Terminations

4.7 User unit installation

4.7.1 Foundation preparation

Note: If the user unit is to be located a distance greater than 100m from the IPU, optical fibre is required for communication in place of Cat6a.

Foundation design and preparation is the responsibility of the customer. Device footprints are provided by tritium for hole drilling and conduit / cable location guidance. For further details, please refer to *TRI125.INS.001 Veefil-RT175-S User Unit Installation Manual.*

Note: A mounting stencil may be supplied by tritium at customer request.

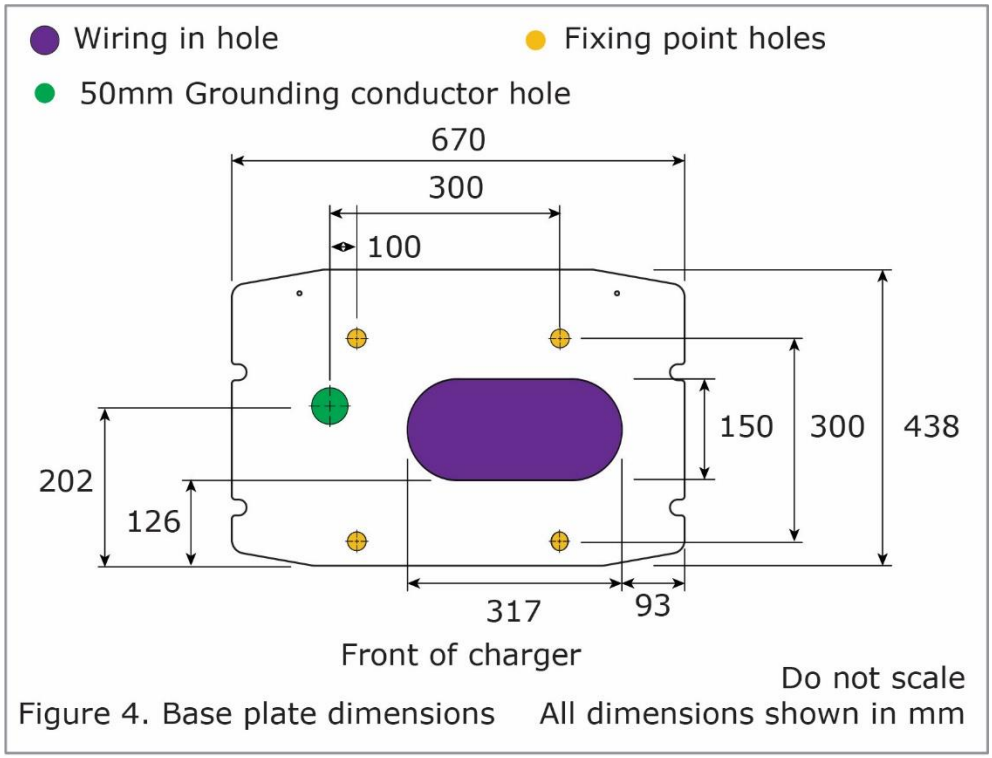

Figure 14: User Unit Baseplate Dimensions

1. Ensure that all cables are pulled and labelled correctly.
2. Ensure that conduits are cut to 70mm from the foundation ground.
3. Cut the M16 mounting rods down to 50mm from the foundation ground.
   Note: Do not use less than M12.
4. Clean the foundation of any debris.
5. Inspect the mounting rods to ensure they are straight, and the threads are clean.

Figure 15: Completed User Unit Foundation Preparation

4.7.2 Unboxing and craning

1. Remove the lid and walls from the shipping box.
   Note: For more information, see *TRI125.INS.019 Veefil-RT 175-S User Unit Installation Manual.*

Figure 16: User unit lifting points (indicative)

2. Attach lifting straps to the crane.
3. Slowly lift the user unit until clear of the ground.

Quality reminder
Be careful as the unit may swing. A second operator may be required to control the user unit lift.

4. Lower the unit to the ground in a vertical position, using the crane to keep tension.
5. Remove the protective plastic wrapping from the lower portion of the user unit
6. Remove the screws that hold the front lower panel.
7. Remove the front lower panel and store in a safe location to prevent damaged or scratching.

8. Remove the timber base plate.
9. Use the crane to lift the User Unit in place over the foundation.
10. Feed the cables through the hole in the foundation plate.
11. Align the rods from the foundation through the mounting holes in the base, and then lower into place.
12. Ensure that the plastic grommets are inserted into the foundation plate.
13. Apply anti-seize compound to the mounting rods.
14. Use M16 nuts and flat washers to fasten the User Unit to the foundation, then torque to 40Nm (or 30Nm for M12).
15. Stow cables beneath the User Unit for protection until ready for cable termination (see Figure 17)

Figure 17: Mounted User Unit, and User Unit Cable Storage (Images indicative only)

4.7.3 Terminate Earthing electrode

Important

- For EMC compliance, it is important that a local earthing electrode is used to bond the chassis of the user unit directly to ground. This may be in the form of an earth stake, or if available, can be bonded to pre-existing buried earth structures.
- Prior to installation of the unit, a professional review of local lightning protection requirements must be performed to ensure that laws and regulations are adhered to. As a result, it may be necessary to install additional earthing electrodes for outdoor installations.

Terminate the local earth electrode to the body of the user unit on the same stud as the protective Earth cable (Figure 18: User Unit Earth Stud Location).

4.7.4 Terminate Protective Earth cable

1. Identify the large protective Earth cable from the marked cables.
2. Measure and cut to required length to terminate to stud located in *Figure 178*.

Figure 18: User Unit Earth Stud Location

3. Terminate M8 lug to cable.
4. Apply green/yellow heat shrink to cable.
5. Apply aluminium jointing compound to the contact area.
6. Use an M8 spring washer and nut to fasten the cable to the earthing stud.
7. Tighten to 16Nm and apply a torque mark.

4.7.5 Terminate DC input cables

1. Identify and individually feed each DC power cable through its respective gland then measure, cut, and terminate with an M10 lug.
   Note: Depending on site design, there may be up to two DC+ and two DC- cables. To maintain device IP rating, ensure that unused holes are appropriately sealed.
2. Apply copper jointing compound to the mating surfaces.
3. Use an M10 spring washer and nut to fasten the cable to the stud.
4. Tighten to 30 Nm and apply torque marks.

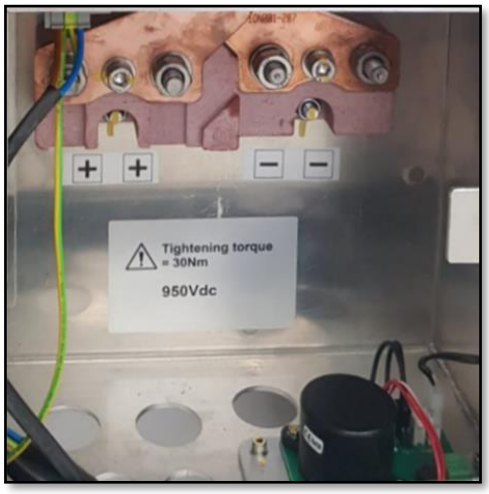

Figure 19: User Unit DC Termination Point

4.7.6 Terminate safety loop cable

1. Feed the safety loop cable through the gland.
   Note: If a 3-core cable is supplied only 2 cores are required, the third (earth) conductor should be taped and stowed.
2. Strip and apply bootlaces to the cable if stranded, no bootlace if solid core.
3. Insert the cable into the green connector on the tilt sensor PCB, the polarity of this connection does not matter.
   Note: This is the PCB located on the bottom-right of Figure 19.

4.7.7 Terminate single phase cable

1. Feed the single-phase cable through the gland.
   Note: When terminating the 3-core cable, do not terminate the Earth to common chassis Earth terminal. This core will be used for the IMI reference point.
2. Strip and apply bootlaces to the cable if stranded, no bootlace if solid core.
3. Insert the cable into the designated field wiring terminals to the top-left of the connection box.
   Note: For internal wiring, brown denotes 230VAC line and blue denotes 230VAC neutral.
4. Close the hatch and tighten all cover screws to 2Nm.

4.7.8 Terminate Ethernet cable

1. Unscrew the Ethernet IP connector from the HMI screen.
2. Slide housings mating half over the Ethernet cable coming from the conduit.
   Note: Ensure that the housing does not slide all the way back into the conduit.
3. Terminate the Ethernet cable into the Cat6A tool-less jack from the installation kit using Mode A.
   Note: Ensure that you connect shield to equipment ground on both the IPU and UU ends.

Figure 20: Cat6A tool-less.

4. Slide the housing cover back up over the jack as shown in *Figure 21.*

Figure 21: Terminated Ethernet jack.

5. Remove and discard Female to Female inline connector from housing.
6. Connect Ethernet cable from the HMI and close the housing.
   Note: Make sure that the housing is tightened in the middle and at the two end nuts to ensure a waterproof seal.

5 Site installation handover

Complete *TRI125.CHK.008 Veefil-RT 175-S System Installation Checklist* and attach photos of the installation.

5.1 Pre-checks

1. Check strain relief on power cables.
2. Check earths are attached on removable panels and doors.
3. Check if there is any remaining liquid or dust and clean the site.

5.2 Polarity, cross-wire and bolted short test

5.2.1 DC link test

1. Use a DMM and a long piece of wire to perform a continuity test between each of the items in the following table:

User Unit	Power Unit	Pass Criteria
Earth	DC +	NC
	DC -	NC
	Earth	Connected
DC +	DC +	Connected
	DC -	NC
	Earth	NC
DC -	DC +	NC
	DC -	Connected
	Earth	NC

5.2.2 AC link test

1. Use a DMM and a long piece of wire to perform a continuity test between each of the items in the following table:

Power Unit (Isolation Switch)	Upstream Supply	Pass Criteria
Earth	L1	NC
	L2	NC
	L3	NC
	Earth	Connected
L1	L1	Connected
	L2	NC
	L3	NC
	Earth	NC
L2	L1	NC
	L2	Connected
	L3	NC
	Earth	NC
L3	L1	NC
	L2	NC
	L3	Connected
	Earth	NC

5.2.3 Waste management, tidy up and report

1. Finalise any waste pick up, cleaning operations, and tidy up the site.
2. Send the full report to Tritium and all other parties involved via *TRI125.CHK.008 Veefil-RT 175-S System Installation Checklist* and the pictures to support the signed checklist.

6 Revision record

Revision	Date	Change
1	4 March 2020	Document creation (J Pierce, S Taylor)