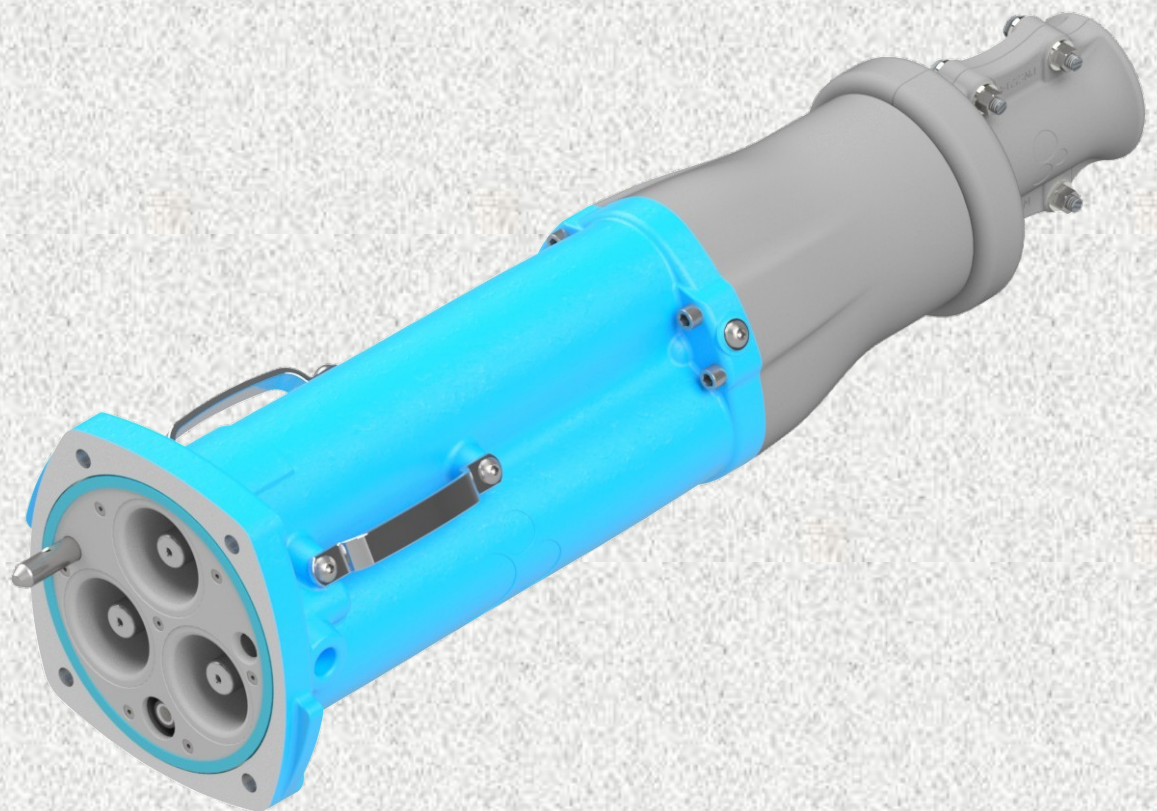




**25kV  
800 AMP Coupler and Adaptor  
Test Report**



*Pioneering the Difference.*

|              |              |              |
|--------------|--------------|--------------|
| Theory 1.9.4 | Developed by | Philip Marks |
|              | DIN          | RD_1057      |
|              | Version      | 3            |



## Test Report

**DATE ISSUED:** 18 January 2024

**DEVICE TESTED:** AusProof 25 kV 800 A Coupler

**RANGE NUMBERS:** 25BU, 25BUFO, 25KA, 25KAFO, 25KAMT, 25KAMTE, 25KAE, 25KAFO

**CLIENT'S NAME:** AusProof Pty Ltd  
6 Shona Avenue  
Gladstone  
Queensland 4680  
Australia

**CLIENT'S REFERENCE:** Email: Clinton Taylor

**TEST SPECIFICATION:** Client specification including references to AS/NZS 1300, AS/NZS 1299, C22.2 No 298, IEEE 386 and IEEE 404

**DATE OF TEST COMPLETION:** 22 November 2022

**SUMMARY OF RESULTS:** The sample device tested complied with the requirements of the above test specification.



All tests reported herein have been performed in accordance with the Laboratory's scope of accreditation, Accreditation Number: 42

Approved Signatory: K Manson

Checked By: G I Dix

International Accreditation New Zealand (IANZ) has a Mutual Recognition Arrangement (MRA) with the National Association of Testing Authorities (NATA), Australia, such that both organizations recognize accreditations by IANZ and NATA as being equivalent. Users of inspection reports / certificates are recommended to accept inspection reports / certificates in the name of either accrediting body.

PowerLab Limited, PO Box 31034 Christchurch 8444 New Zealand, 5 Sheffield Crescent Christchurch New Zealand, Info@powerlab.co.nz. This Report must not be quoted except in full.

## Testing notes

### The following personnel were present during testing:

Laboratory staff: K Manson and G I Dix

### Tests Performed

| Test number | Test                                     | Standard/Clause  | Test value   |
|-------------|--|--|--|
| 1           | Phase to phase + earth AC 50 Hz 1 minute | AS/NZS 1299<br>AS/NZS 1300<br>C22.2 No. 298<br>IEEE 386                | 52 kV for 1 minute   |
| 2           | Phase to phase + earth AC 50 Hz 4 hours  | AS/NZS 1299<br>AS/NZS 1300   | 40 kV for 4 hours  |
| 3           | Pilot to earth 50 Hz                     | AS/NZS 1300<br>AS/NZS 1299   | 1000 V for 1 minute  |
| 4           | Impulse                                  | AS/NZS 1300<br>AS/NZS 1299<br>AS/NZS 2802<br>C22.2 No. 298<br>IEEE 386 | 125 kV and 150 kV  |
| 5           | Partial Discharge                        | AS/NZS 1300<br>AS/NZS 1299<br>C22.2 No. 298                            | Inception and extinction 10% greater than 14.44 kV, Max 100 pC |
| 6           | Ingress protection                       | AS 60529   | IP68   |
| 7           | Short circuit test (phase)               | AS/NZS 1300<br>AS/NZS 1299<br>C22.2 No. 298                            | 20 kA for 1.0 s  |
| 8           | Bonding (earth) path current test        | C22.2 No. 298  | 5.01 kA for 9 s  |
| 9           | Temperature rise                         | ASNZS1300<br>ASNZS1299<br>C22.2 No. 298                                | 800 A  |

### Test Laboratory Atmospheric Conditions

Temperature 12 ( $\pm 5$ )°C.

Pressure 100 ( $\pm 5$ ) kPa

(Approximate height above local sea level is 30 m).

### Laboratory Equipment

Ferranti inverted Marx impulse generator configured with 3 stages rated at 100 kV, 0.24  $\mu$ F per stage;

Laboratory manufactured adjustable transfer, tail and front resistors;

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Laboratory manufactured impulse generator control and firing equipment;  
Haefely 600 kV peak capacitor voltage divider/chopping gap;  
Haefely 64M Impulse Peak Voltmeter;  
Manually set 25cm sphere-gap;  
Biddle balanced partial discharge detector 665700 (Zm, PDS)  
Biddle partial discharge system master calibrator 6617250  
Oscilloscope  
Heafely 2000 pF discharge free 200 kV capacitor (Ck).  
Hipotronics 150 kV 150 kVA ac dielectric test set  
Resistive voltage divider and true RMS indicator (Hipotronics KVM300)  
Fluke 287 DVM  
Tektronix TDS3034 Four Channel digitizing oscilloscope;  
11 kV/440 V short circuit transformer  
20,000/5 CT  
Laboratory constructed point on wave switch  
Inductors and Resistors  
Laboratory manufactured current viewing resistor; and  
Miscellaneous laboratory equipment including: assman hygrometer, barometer, and a mercury-in-glass thermometer.  
Agilent 34970A data acquisition system

### **Measurement Uncertainties**

Refer to the Laboratory accreditation details at [www.ianz.govt.nz](http://www.ianz.govt.nz) for information on measurement uncertainty.

### **Coupler test connection, terminations and fittings**

The sample coupler assemblies tested were terminated with Client supplied cables, potting compound and fittings

Although these are required for testing, they are not considered to be part of the sample device tested.



## Test procedures, Results

### 1. AC Voltage withstand test (phase conductors)

The specified test voltage was applied between the specified conductors and the coupler body using a Hipotronics 150 kV 150 kVA ac dielectric test set operated from the laboratory mains supply. The voltage was measured using a resistive voltage divider and true RMS indicator (Hipotronics KVM300). A stopwatch was used to monitor time of application.

52 kV rms was applied between the conductors and the coupler body for a period of 1 minute.

During the high voltage test no disruptive discharges, - flashovers or insulation punctures were noted.

The insulation resistance was greater than 1 GΩ, each phase to earth.

**Result:**

**Complies**

### 2. AC Voltage withstand test (phase conductors)

The specified test voltage was applied between the specified conductors and the coupler body using a Hipotronics 150 kV 150 kVA ac dielectric test set operated from the laboratory mains supply. The voltage was measured using a resistive voltage divider and true RMS indicator (Hipotronics KVM300). A stopwatch was used to monitor time of application.

40 kV rms was applied between the conductors and the coupler body for a period of 4 hours.

During the high voltage test no disruptive discharges, - flashovers or insulation punctures were noted.

The insulation resistance was greater than 1 GΩ, each phase to earth.

**Result:**

**Complies**

### 3. AC Voltage withstand test (pilot conductors)

The specified test voltage was applied between the specified conductors and the coupler body using a Hipotronics 150 kV 150 kVA ac dielectric test set operated from the laboratory mains supply. The voltage was measured using a resistive voltage divider and true RMS indicator (Hipotronics KVM300). A stopwatch was used to monitor time of application.

1 kV rms was applied between the pilot conductor and the coupler body for a period of 1 minute.

During the high voltage test no disruptive discharges, - flashovers or insulation punctures were noted.

**Result:**

**Complies**

### 4. Impulse test

A Ferranti impulse generator with a Haefley voltage divider and peak voltmeter was used. The wave shape was adjusted by means of interchangeable front and tail resistors to be within the allowed tolerances.

Ten impulses of each polarity were applied as specified in the Standard. Each impulse was monitored by digital comparison with a stored reference.

The applied impulse was monitored using a Tektronix digitising oscilloscope.

Wave shape was 1.0/44  $\mu$ s. Refer to Figure 1.

The test voltage was 125 kV peak.

The test was then repeated with a test voltage of 150 kV peak

During the application the 125 kV impulses no disruptive discharges, flashovers or insulation punctures were noted.

**Result (125 kV):**

**Complies**

During the application the 150 kV impulses no disruptive discharges, flashovers or insulation punctures were noted.  
Refer to Figure 1.

**Result (150 kV):**

**Complies**

### 5. Partial discharge test

The specified test voltage was applied between the conductors and the coupler body using a Hipotronics 150 kV 150 kVA ac dielectric test set operated from the laboratory

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mains supply. The voltage was measured using a resistive voltage divider and true RMS indicator (Hipotronics KVM300).

Discharge levels were measured using a Biddle balanced bridge discharge detector. The bridge was balanced according to the bridge manufacturer's instructions. The measurements system was calibrated by injecting a known discharge between the conductor and the cable sheath. The system calibration was checked at 10 pC and at 100 pC. Background discharge levels were recorded. Discharge levels were measured using an oscilloscope and the bridge meter.

Background discharge level was less than 1 pC

|            | Voltage (kV) | Discharge Level         |
|------------|--------------|-------------------------|
| Inception  | 17.1         | 500 pC after inception  |
| Extinction | 16.2         | < 2 pC after extinction |

**Result:**

**Complies**

## 6. Ingress Protection

Two sample couplers were assessed according to AS 60529 to determine compliance with IP 68.

| CI 13.3                | Ingress of Solid Objects Test (AS 60529)              |                   |                    | P       |
|------------------------|---|-------------------|--------------------|---------|
| Ingress Test Performed | Location of probe applied                             | Force applied (N) | Clearance measured | Verdict |
| Unit 1                 |   |                   |                    |         |
| IP1X                   | Enclosure Ends, Cable Rubber Entry, Bungs, Cover Cap. | 50                | No entry/damage    | P       |
| IP2X                   | Enclosure Ends, Cable Rubber Entry, Bungs, Cover Cap. | 30                | No entry/damage    | P       |
| IP3X                   | Enclosure Ends, Cable Rubber Entry, Bungs, Cover Cap. | 3                 | No entry/damage    | P       |
| IP4X                   | Enclosure Ends, Cable Rubber Entry, Bungs, Cover Cap. | 1                 | No entry/damage    | P       |
| Unit 2                 |   |                   |                    |         |
| IP1X                   | Enclosure Ends, Cable Rubber Entry, Bungs.            | 50                | No entry/damage    | P       |
| IP2X                   | Enclosure Ends, Cable Rubber Entry, Bungs.            | 30                | No entry/damage    | P       |
| IP3X                   | Enclosure Ends, Cable Rubber Entry, Bungs.            | 3                 | No entry/damage    | P       |
| IP4X                   | Enclosure Ends, Cable Rubber Entry, Bungs.            | 1                 | No entry/damage    | P       |

| CI 13.6            | Ingress of Dust Test (AS 60529) |                       |                          |                  | P       |
|--------------------|---------------------------------|-----------------------|--------------------------|------------------|---------|
| EUT identification | Degree of protection (Dust)     | Duration of test (hr) | Ambient temperature (°C) | EUT ambient (°C) | Verdict |
| Unit 1             | IP6X                            | 6.1                   | 15.1                     | 24.4             | P       |
| Unit 2             | IP6X                            | 6.1                   | 15.0                     | 20.9             | P       |

| CI 14.3            | Ingress of Water Test (AS 60529) |                               |                        |                          |                                | P       |
|--------------------|----------------------------------|-------------------------------|------------------------|--------------------------|--------------------------------|---------|
| EUT identification | Degree of protection (Water)     | Depth of EUT from surface (m) | Duration of test (min) | Ambient temperature (°C) | Water Ambient temperature (°C) | Verdict |
| Unit 1             | IPX8                             | 1.1                           | 60.0                   | 15.0                     | 17.4                           | P       |
| Unit 2             | IPX8                             | 1.1                           | 60.0                   | 15.4                     | 16.4                           | P       |



**Result****Complies****7. Short-circuit (though-fault) test**

The device was subjected to the test currents by use of a step down three phase transformer and inductors from an 11 kV supply and a phase controlled on switch and time controlled off circuit breaker:

**Test 20 kA 0.2 s**

Results: 0.234 s, 19.8 kA, n=2.0 (power factor = 0.3), 50 Hz, mean of 3 tests applied with 10 minutes between. Refer to Figure 2.

**Test 20 kA 1.0 s**

Results: 1.03 s, 19.7 kA, n=2.0 (power factor = 0.3), 50 Hz. Refer to Figure 3.

After current applications, there were no visible disturbance, pitting or burning.

**Result****Complies****8. Bonding (earth) path current test**

The earth continuity circuit was subjected to the following current waveform by use of a step down transformer and inductors from an 11kV supply and a phase controlled on switch and time controlled off circuit breaker:

**Test 5.01 kA for 9 s**

Results: 9.08 s, 5.13 kA, n=2.0, 50 Hz. Refer to Figure 4.

The earth continuity was measured on test completion.

After the current application the measured continuity was 0.0006  $\Omega$ .

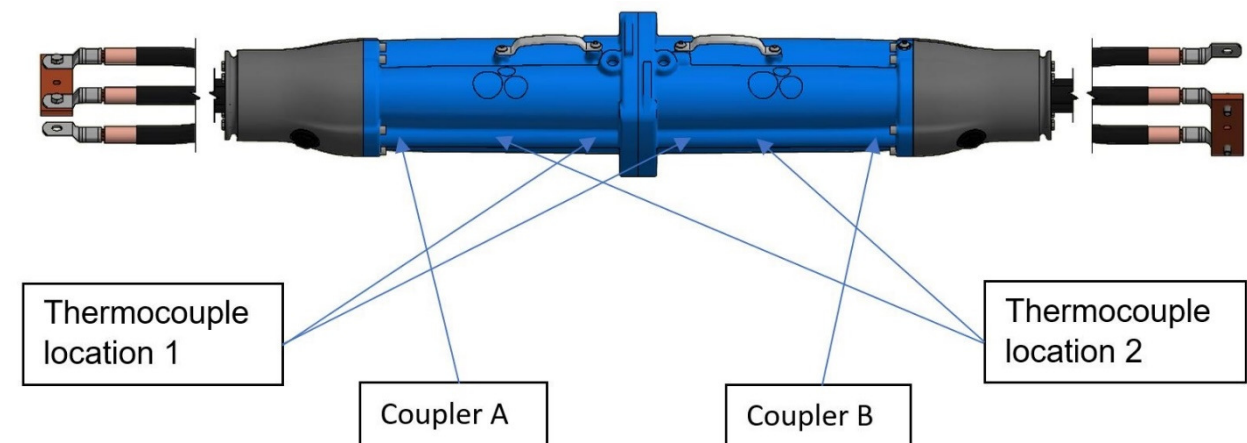
**Result****Complies**

## 9. Temperature rise

All conductors were connected in series and thermocouples were placed as required by Clause 3.3.8.4 of AS/NZS 1300.

Thermocouple locations included:

- (a) Main contact adjacent to connecting device (1)
- (b) Main contact adjacent to cable conductor (2)
- (c) Cable conductor 1 m from cable gland



| Location | Coupler | Thermocouple location | Phase ID |
|----------|---------|-----------------------|----------|
| A        | A       | 1                     | White    |
| B        | A       | 2                     | White    |
| C        | A       | 1                     | Blue     |
| D        | A       | 2                     | Blue     |
| E        | A       | 1                     | Red      |
| F        | A       | 2                     | Red      |
| G        | B       | 1                     | Blue     |
| H        | B       | 2                     | Blue     |
| I        | B       | 1                     | Red      |
| J        | B       | 2                     | Red      |
| K        | B       | 1                     | White    |
| L        | B       | 2                     | White    |

A current of 800A was passed through the test object until the temperature variation did not exceed 2 K/h.

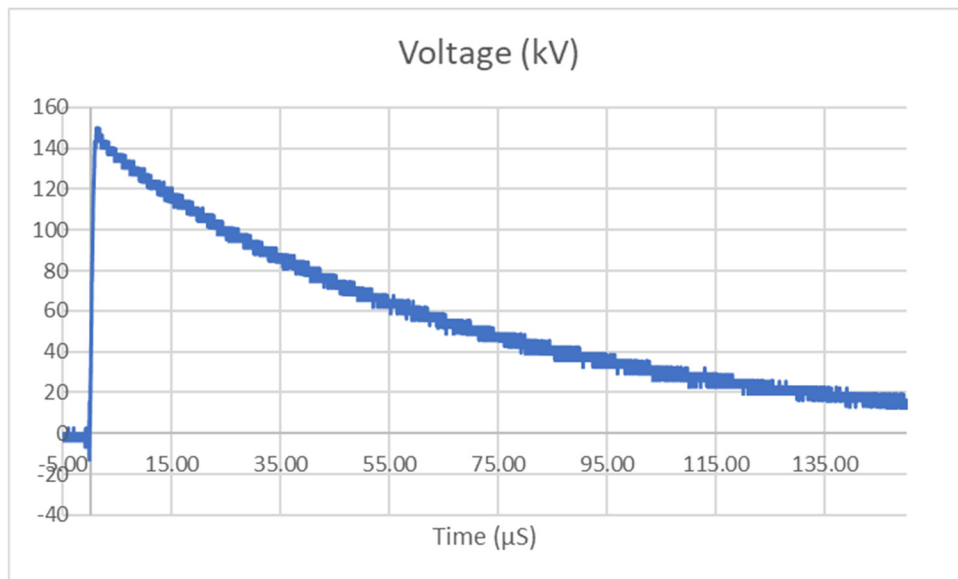
| Location              | A  | B  | C  | D  | E  | F  | G  | H  | I  | J  | K  | L  |
|-----------------------|----|----|----|----|----|----|----|----|----|----|----|----|
| Rise                  | 34 | 39 | 40 | 36 | 34 | 38 | 41 | 40 | 37 | 38 | 38 | 35 |
| Difference from cable | -2 | 3  | 4  | 0  | -2 | 2  | 5  | 4  | 1  | 2  | 2  | -1 |

(Values are degrees Kelvin)

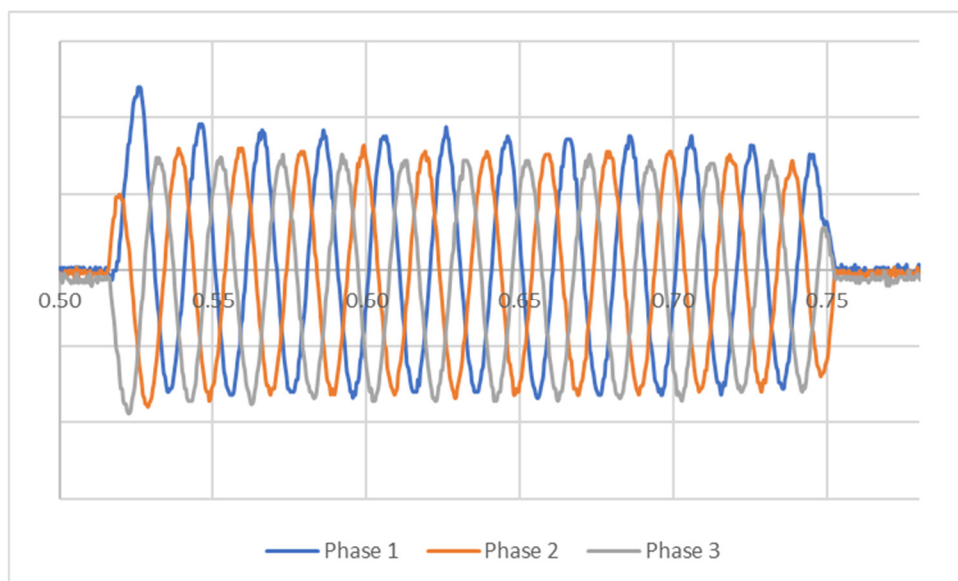
**Result**

**Complies**

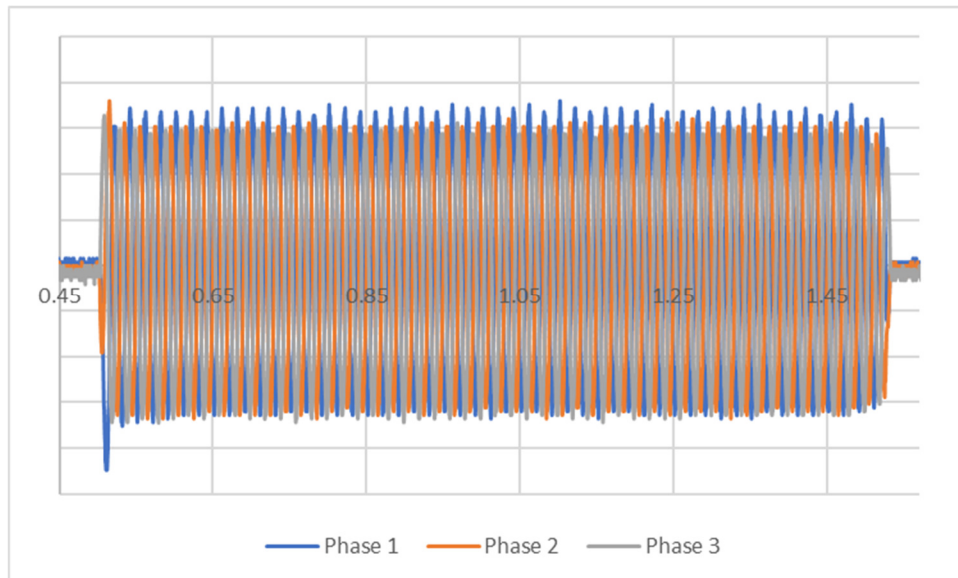
## Oscillograms



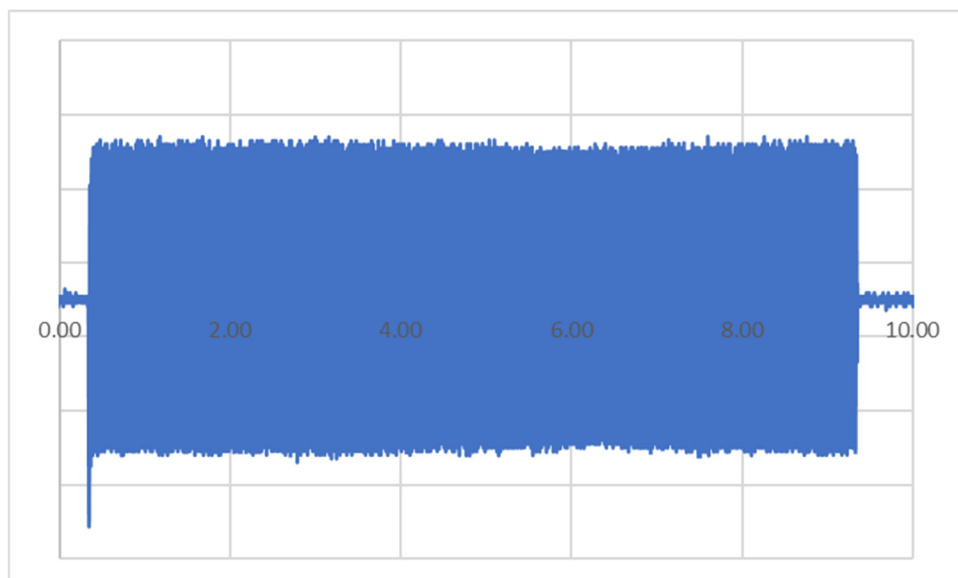
**Figure 1. Last 150 kV impulse**



**Figure 2. 20 kA for 0.2 s short circuit test number 3**



**Figure 3. 20 kA for 1 s short circuit test**



**Figure 4. 5 kA for 9 s short circuit test**



## Pictures:



Picture 1 General view of coupler



Picture 2 Coupler in dust test

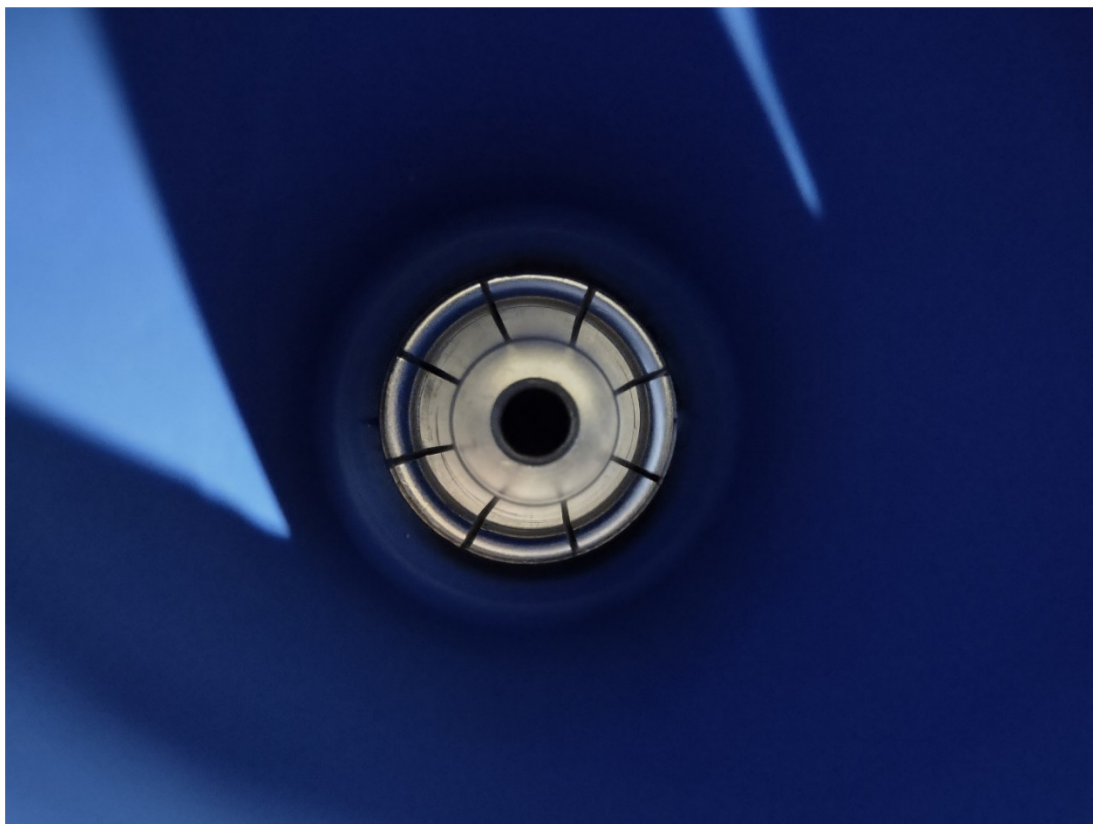


Picture 3 Coupler in 1 m water





Picture 4 Contacts after short circuit test



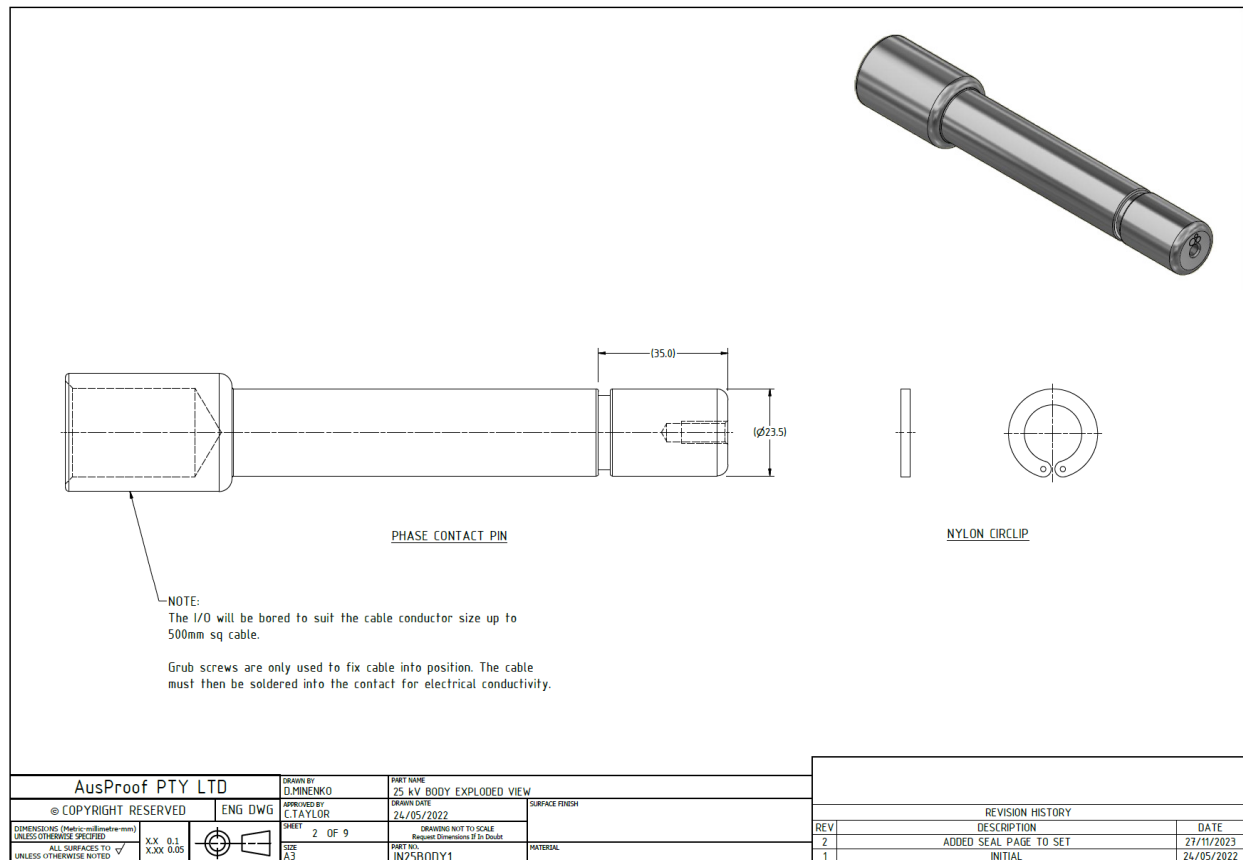
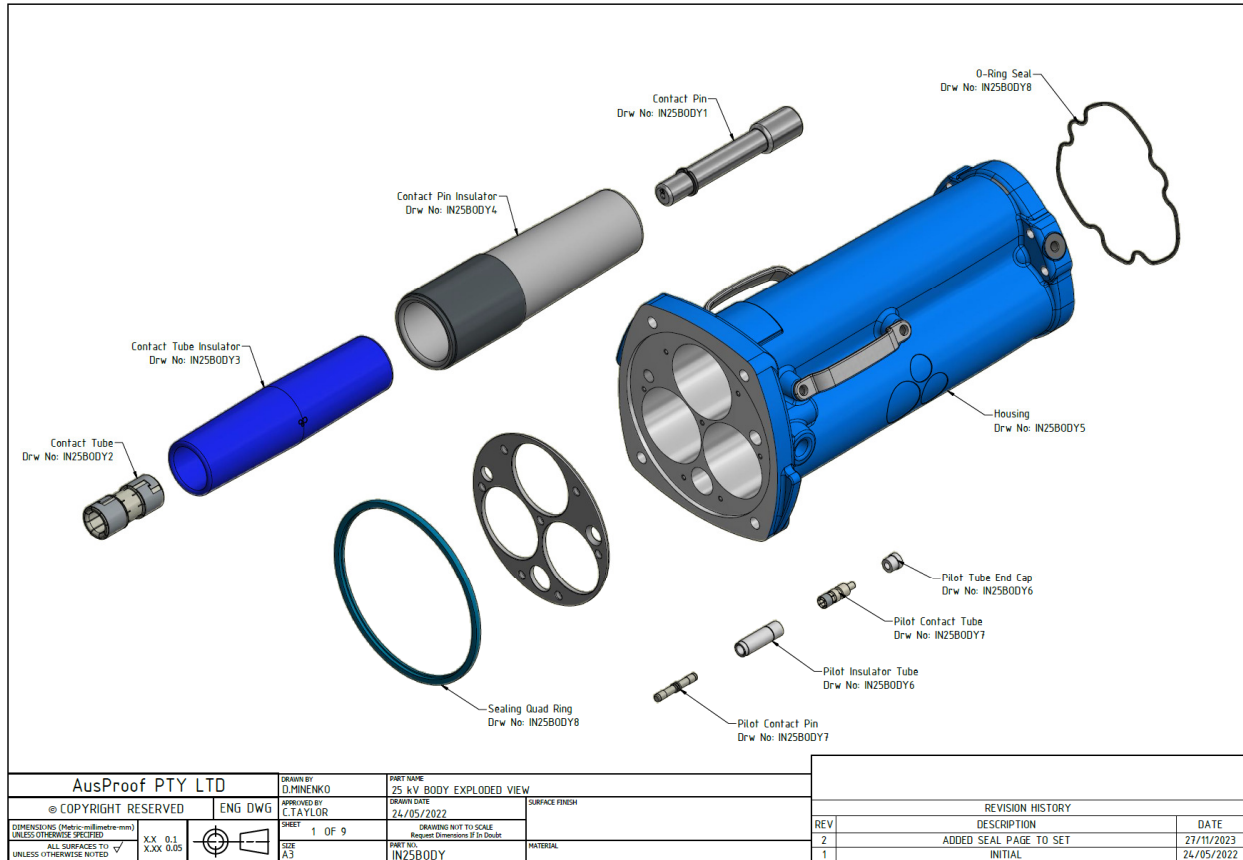
Picture 5 Contacts after short circuit test

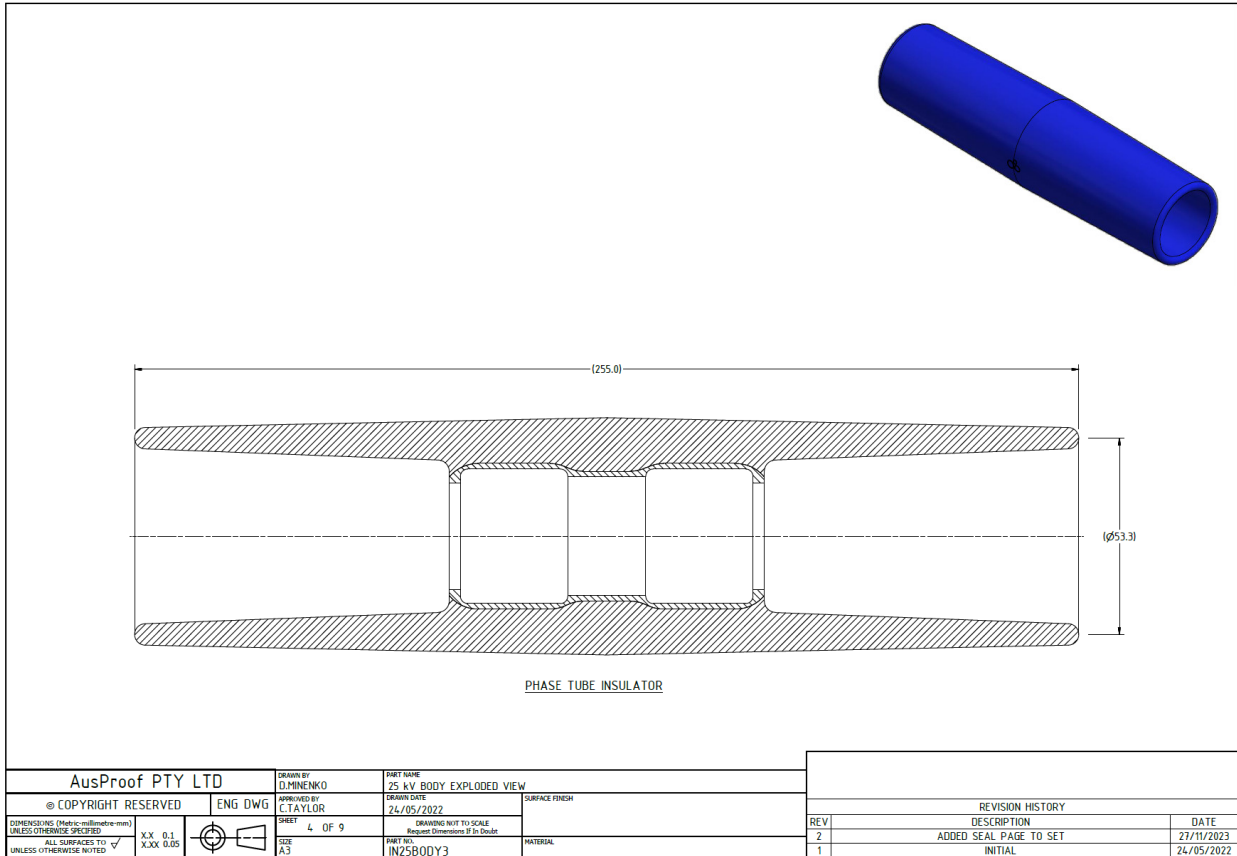
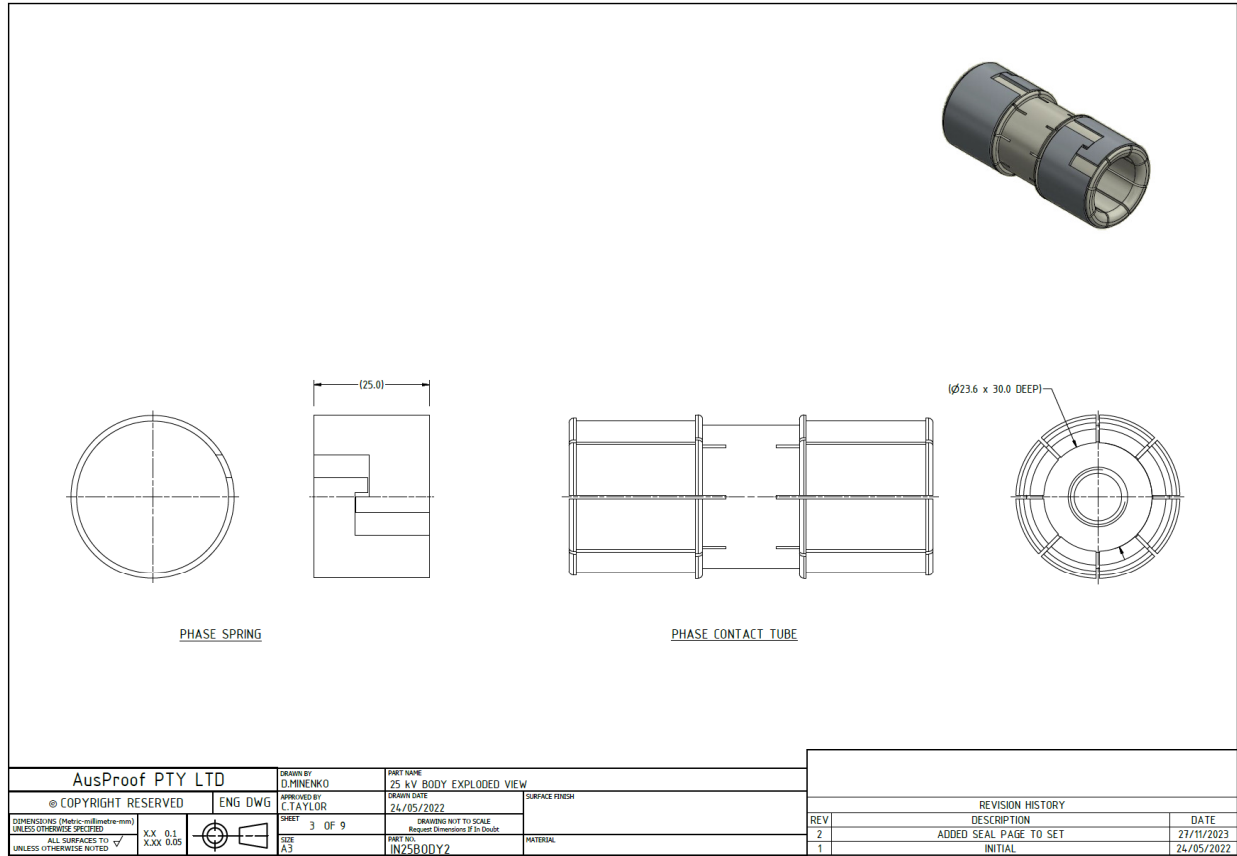
## Drawings:

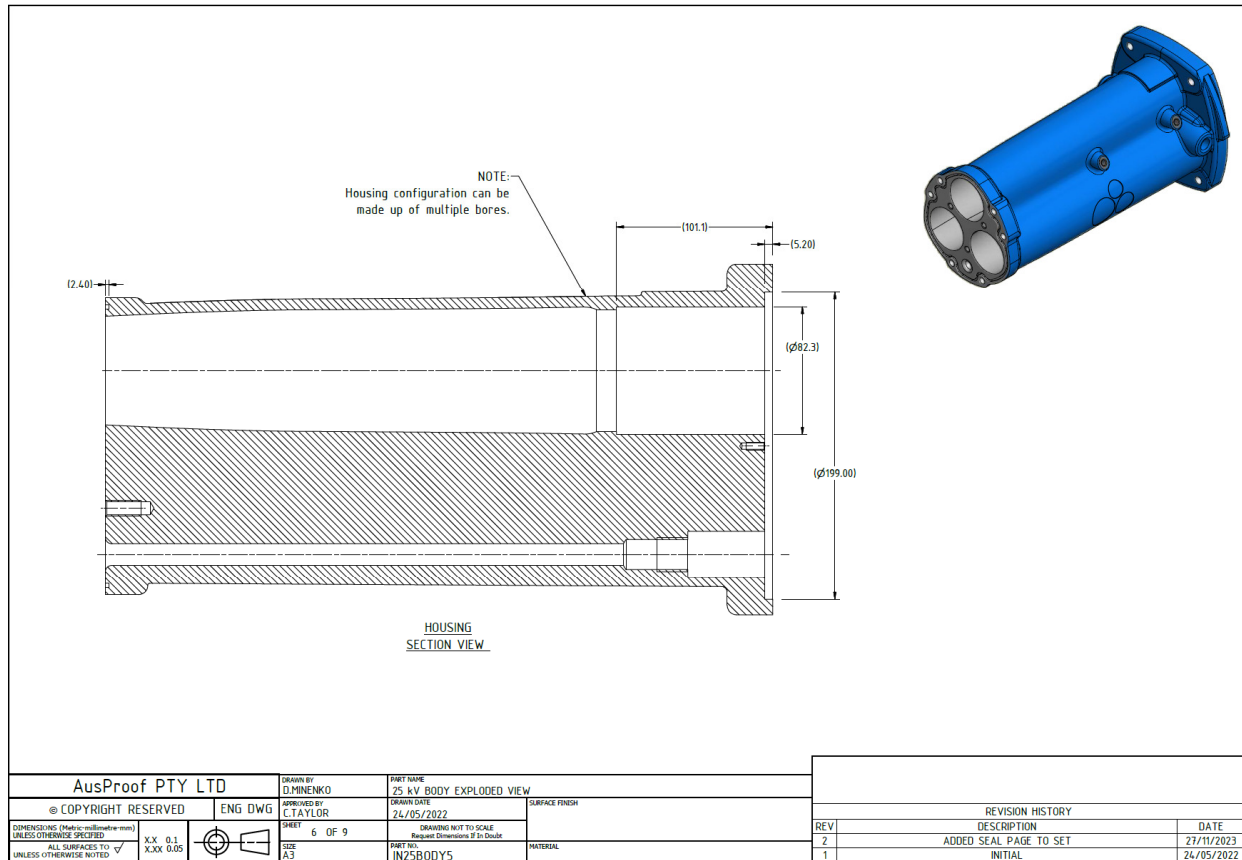
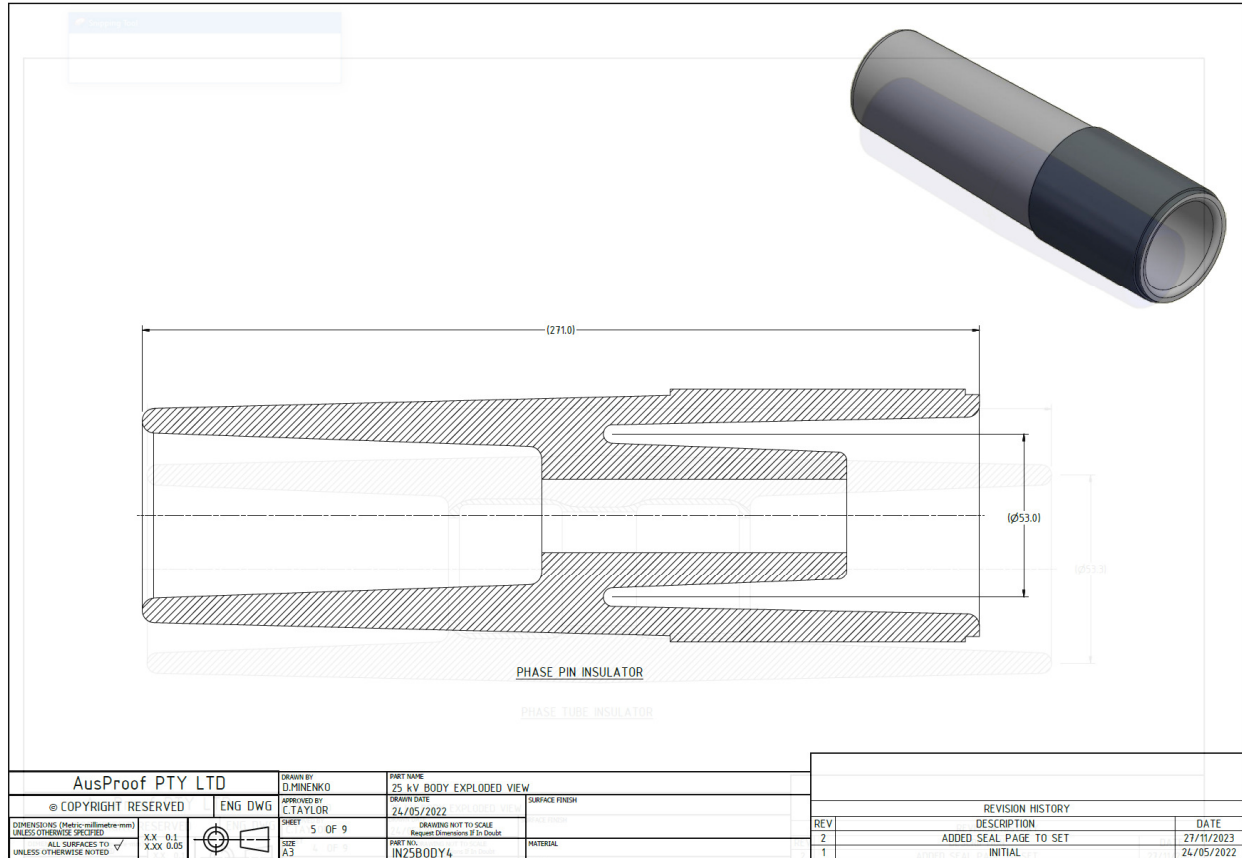
List of drawings:

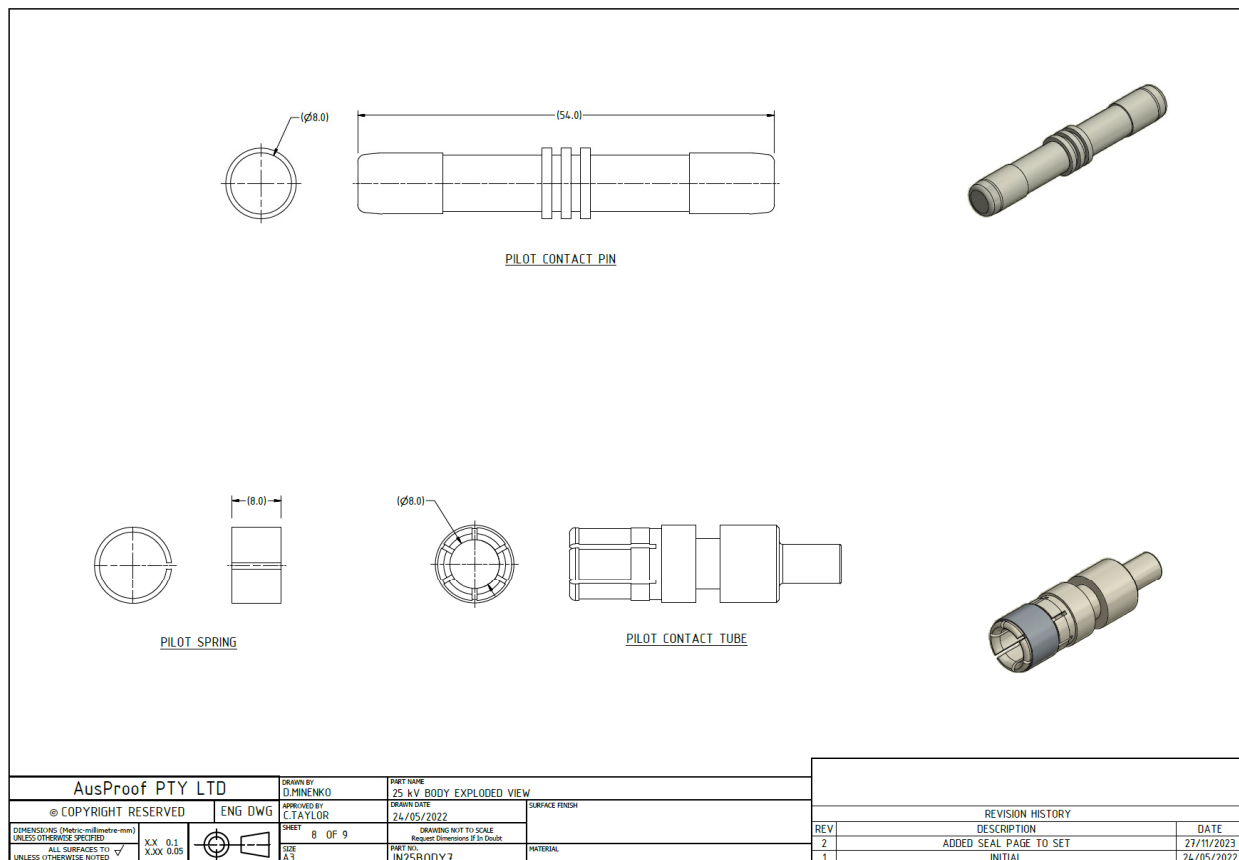
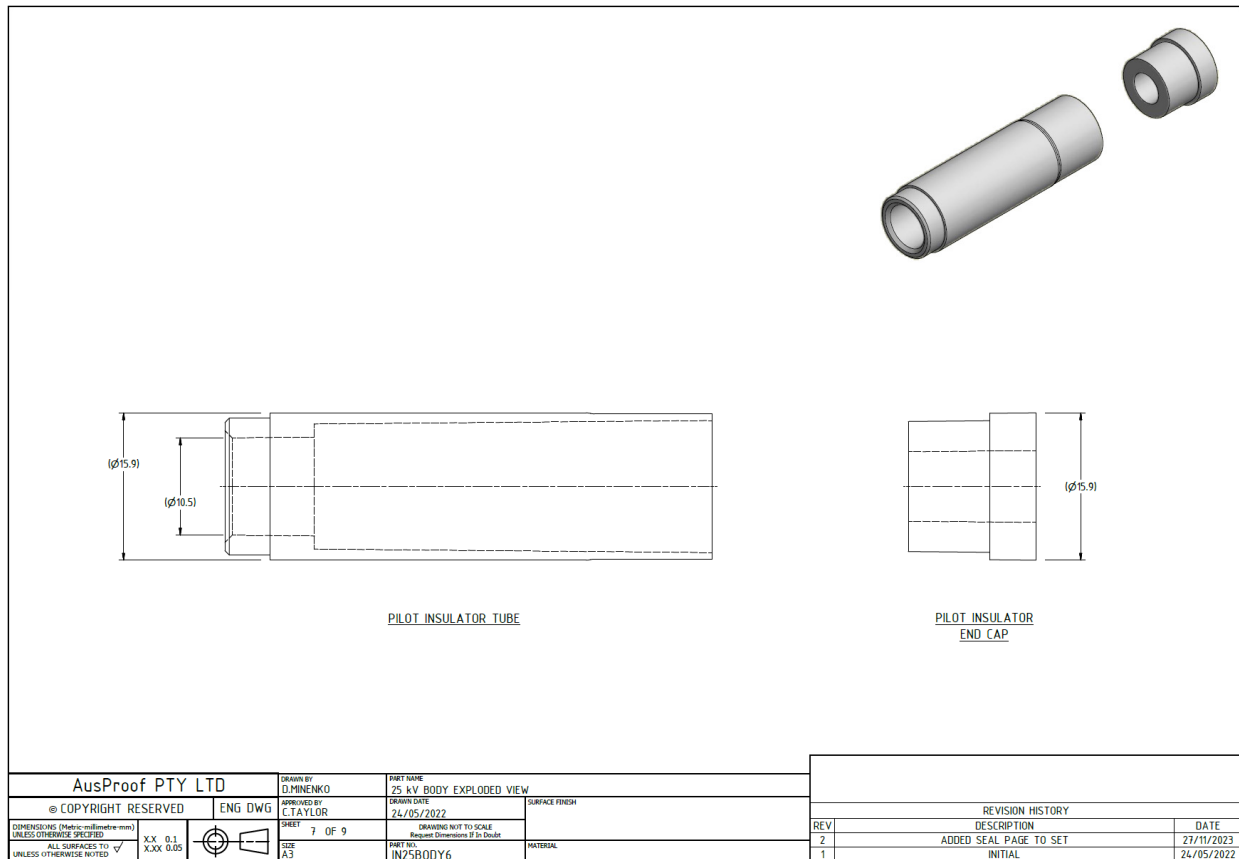
| No | Drawing No.   | Title   | Revision | Date       |
|----|---------------|---|----------|------------|
| 1  | IN25BODY      | Cable coupler & components                    | 2        | 27/11/2023 |
| 2  | IN25BODY1     | Phase contact pin                             | 2        | 27/11/2023 |
| 3  | IN25BODY2     | Phase contact tube                            | 2        | 27/11/2023 |
| 4  | IN25BODY3     | Phase Tube insulator                          | 2        | 27/11/2023 |
| 5  | IN25BODY4     | Phase Pin insulator                           | 2        | 27/11/2023 |
| 6  | IN25BODY5     | Housing                                       | 2        | 27/11/2023 |
| 7  | IN25BODY6     | Pilot Insulator tube                          | 2        | 27/11/2023 |
| 8  | IN25BODY7     | Pilot Pin/Tube                                | 2        | 27/11/2023 |
| 9  | IN25BODY8     | Sealing quad ring/O-ring seal                 | 2        | 27/11/2023 |
| 10 | IN25COVER     | End covers & components                       | 1        | 27/11/2023 |
| 11 | IN25COVER1    | Cast pro cover                                | 1        | 27/11/2023 |
| 12 | IN25COVER2    | Insulated end cover                           | 1        | 27/11/2023 |
| 13 | IN25COVER3    | Universal End Cover Cast Box                  | 1        | 27/11/2023 |
| 14 | IN25COVER4    | Sealing quad ring/O-Ring Seal                 | 1        | 27/11/2023 |
| 15 | IN25COVER5    | End cover plug                                | 1        | 27/11/2023 |
| 16 | IN25GLANDKA   | KA Glands & components                        | 1        | 27/11/2023 |
| 17 | IN25GLANDKA1  | KA Small/KA Large                             | 1        | 27/11/2023 |
| 18 | IN25GLANDKA2  | KA OCS Comp ring/KA OCL Comp ring             | 1        | 27/11/2023 |
| 19 | IN25GLANDKA3  | KA OCS Pressure ring/KA OCL Pressure ring     | 1        | 27/11/2023 |
| 20 | IN25GLANDKA4  | Filler bung/O-ring                            | 1        | 27/11/2023 |
| 21 | IN25GLANDKAN  | KAN Glands & components                       | 1        | 27/11/2023 |
| 22 | IN25GLANDKAN1 | KAN Small Housing/KAN Large Housing           | 1        | 27/11/2023 |
| 23 | IN25GLANDKAN2 | KAN Small Comp washer/KAN Large Comp washer   | 1        | 27/11/2023 |
| 24 | IN25GLANDKAN3 | KAN OCS Comp ring/KAN OCL Comp ring           | 1        | 27/11/2023 |
| 25 | IN25GLANDKAN4 | KAN Small ss comp ring/KAN Large ss comp ring | 1        | 27/11/2023 |
| 26 | IN25GLANDKAN5 | Filler bung/O-ring                            | 1        | 27/11/2023 |



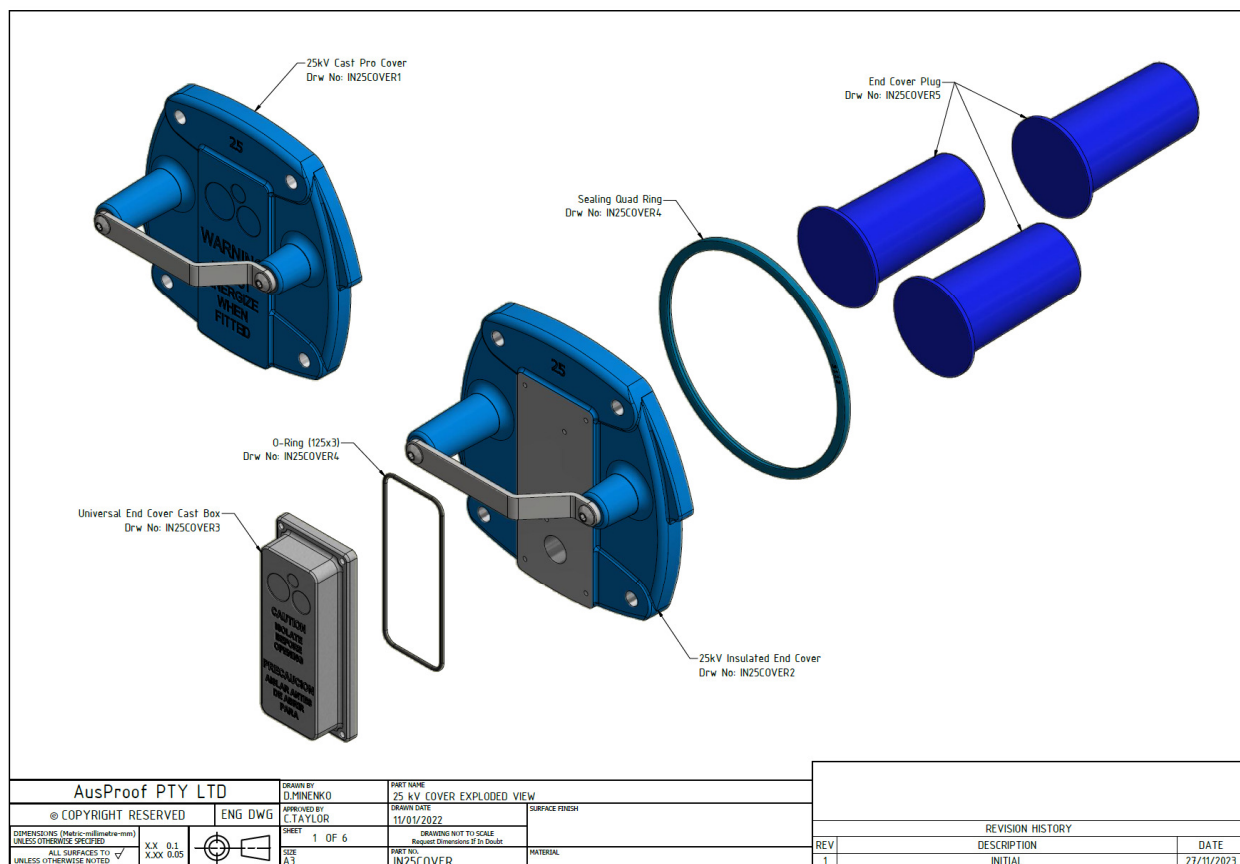
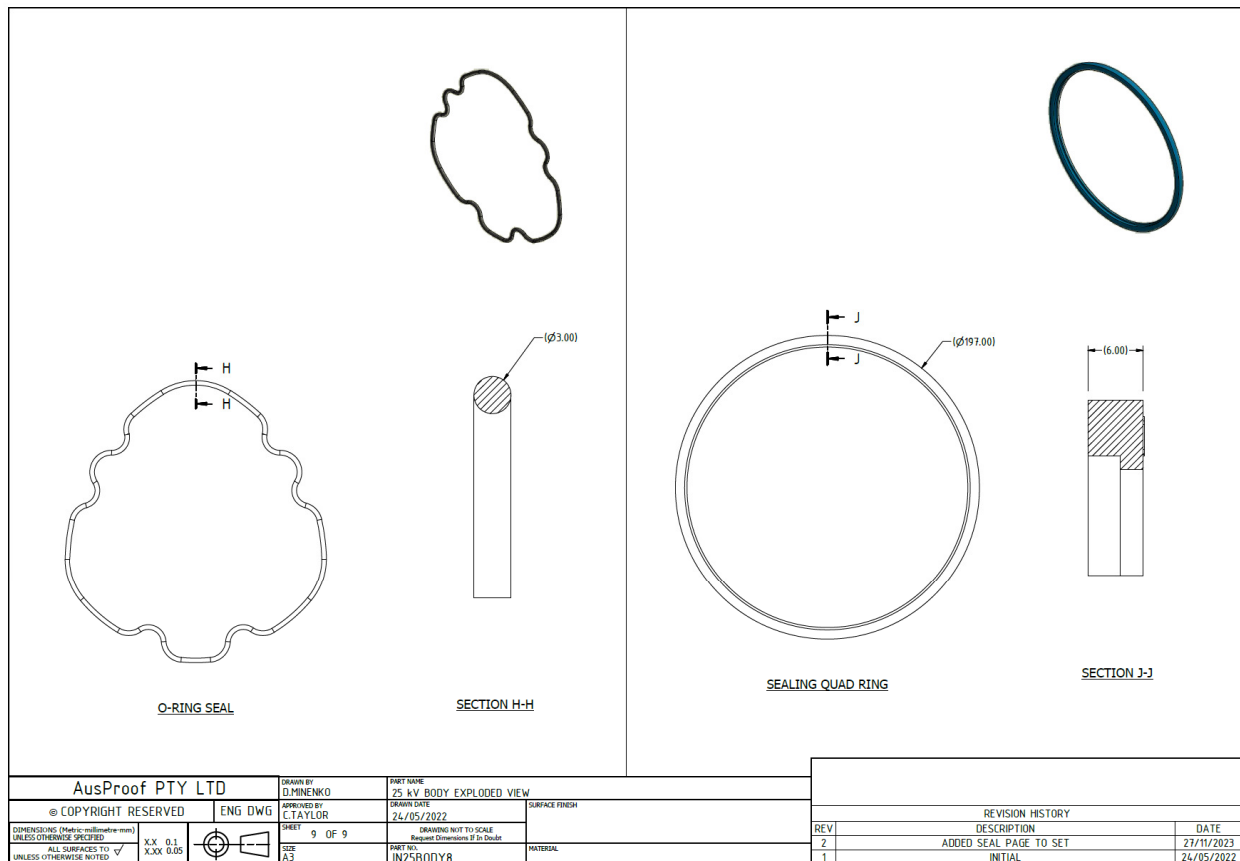


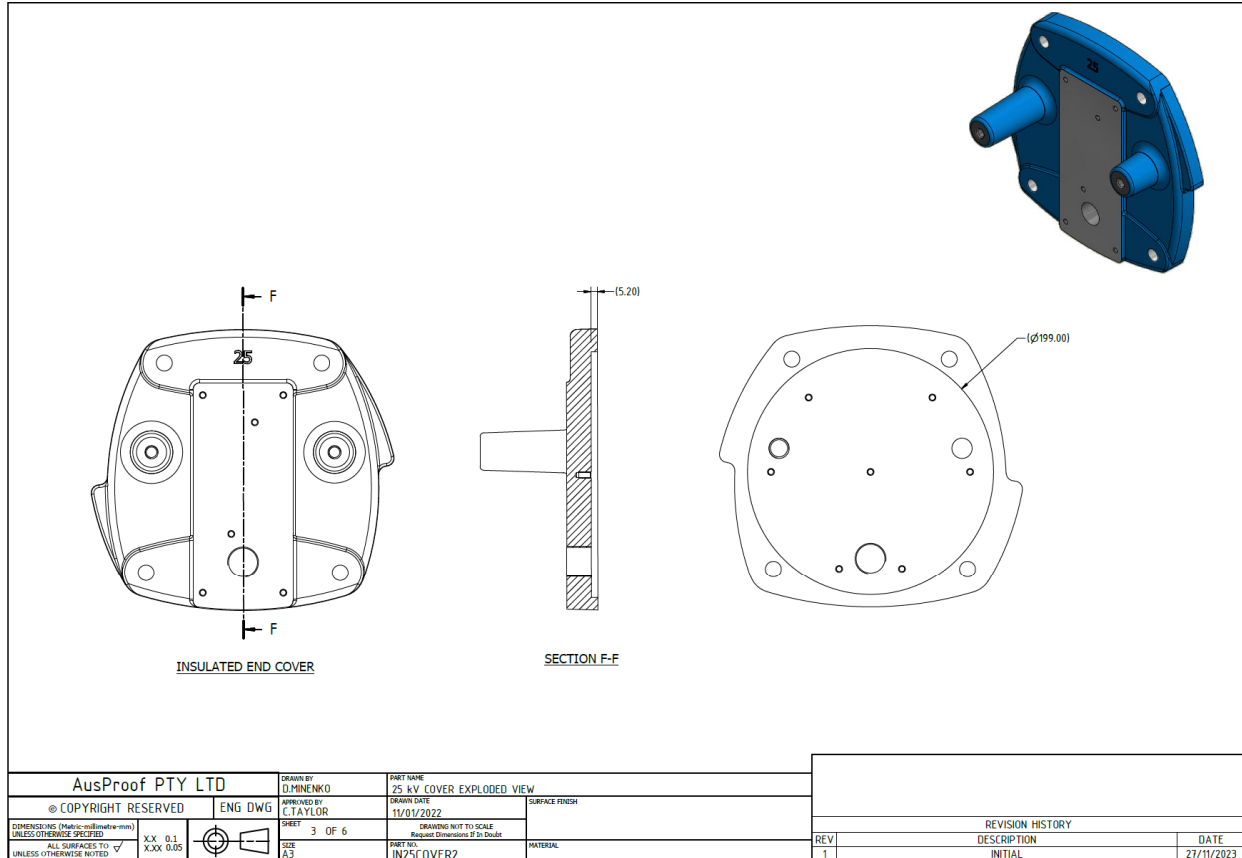
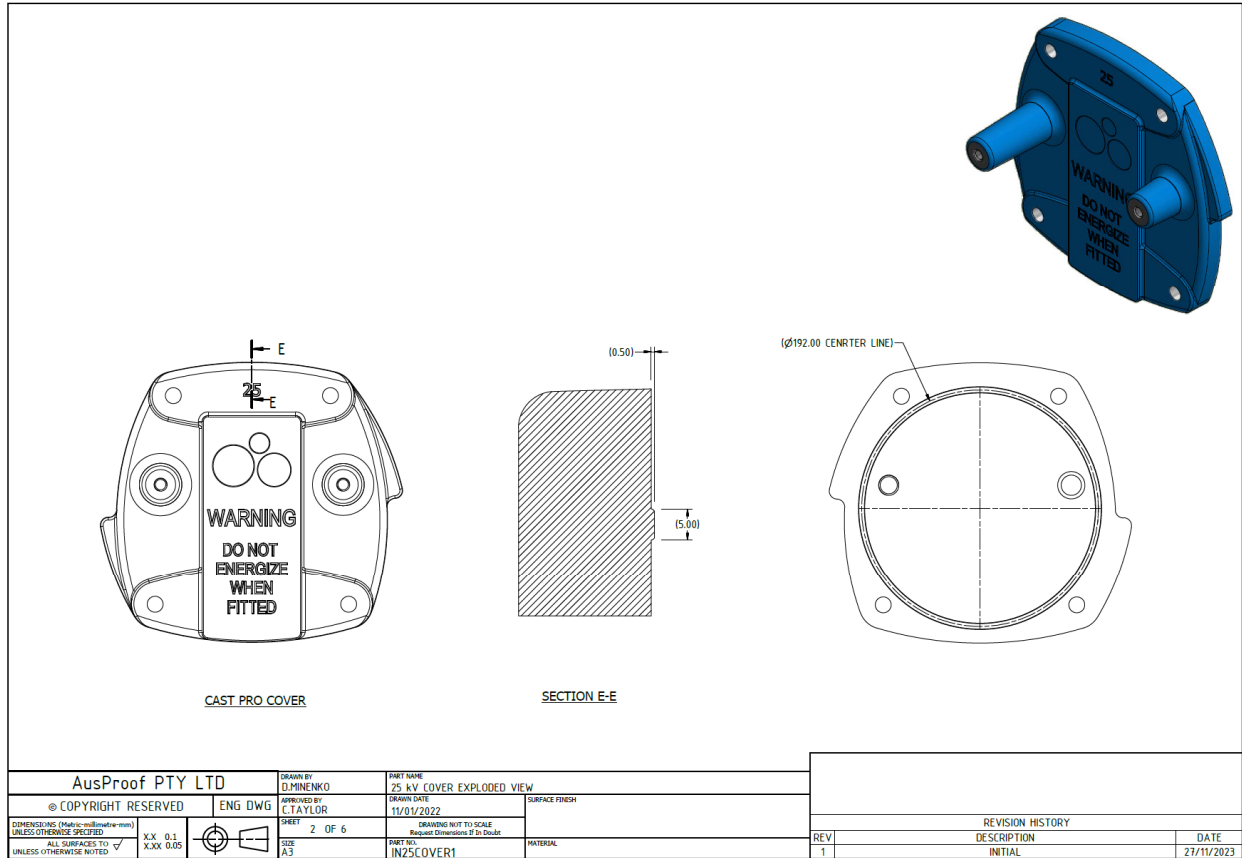


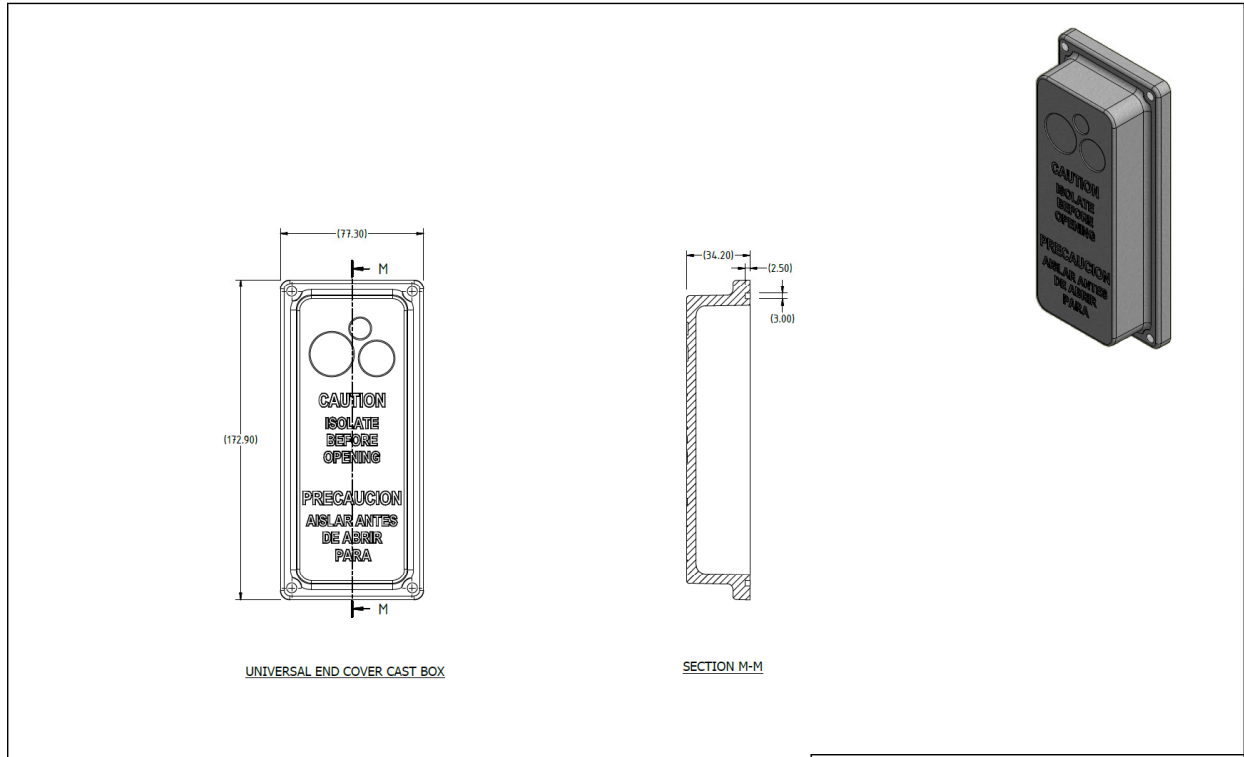




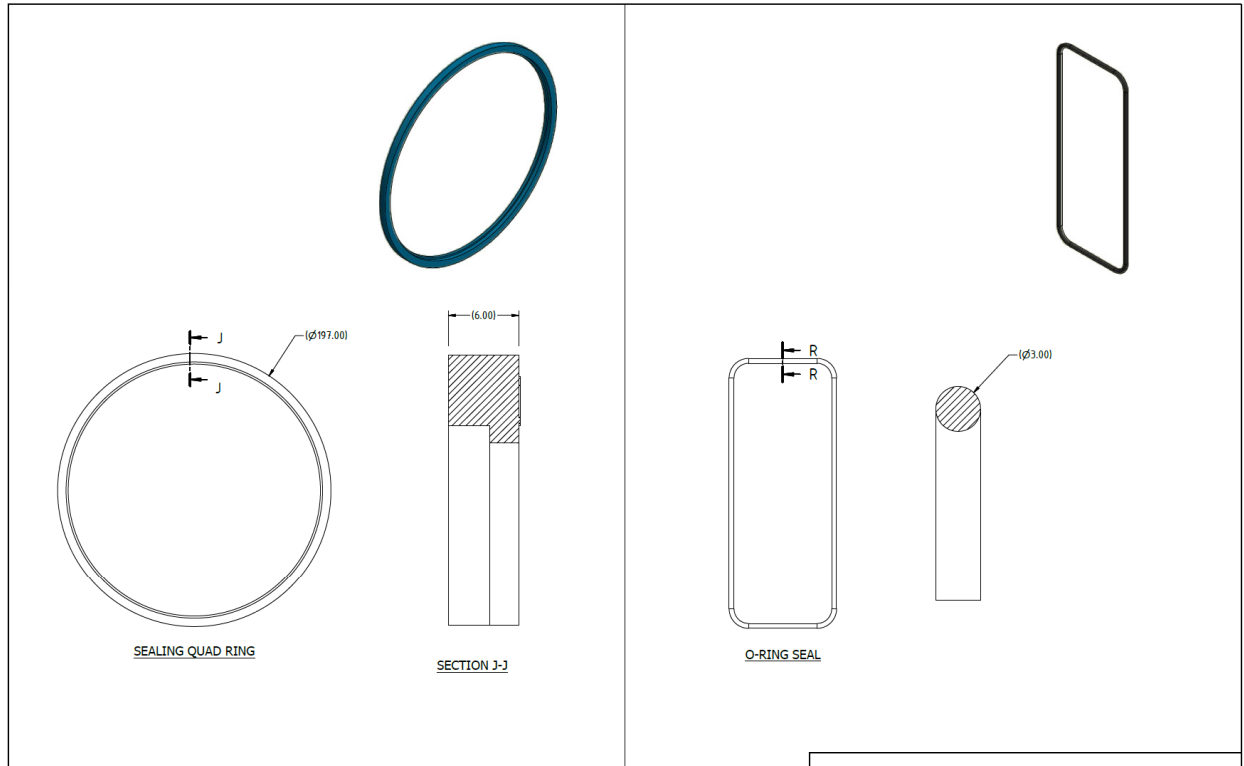








|   |  |                         |  |                        |                    |
|---|--|-------------------------|--|------------------------|--------------------|
| AusProof PTY LTD  |  | DRAWN BY<br>D.MINENKO   | SHEET NAME<br>25 kV COVER EXPLODED VIEW                |                        |                    |
| © COPYRIGHT RESERVED  |  | APPROVED BY<br>C.TAYLOR | DRAWN DATE<br>11/01/2022                               | SURFACE FINISH         |                    |
| DIMENSIONS (Metric-millimetre-mm)<br>UNLESS OTHERWISE SPECIFIED |  | SHEET<br>4 OF 6         | DRAWING NOT TO SCALE<br>Request Dimensions if in Doubt | REVISION HISTORY       |                    |
| ALL SURFACES TO<br>UNLESS OTHERWISE NOTED                       |  | SIZE<br>A3              | PART NO.<br>INZ5COVER3                                 | REV<br>1               | DATE<br>27/11/2023 |
|   |  |                         |  | DESCRIPTION<br>INITIAL |                    |



|   |  |                         |  |                        |                    |
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| AusProof PTY LTD  |  | DRAWN BY<br>D.MINENKO   | SHEET NAME<br>25 kV COVER EXPLODED VIEW                |                        |                    |
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| DIMENSIONS (Metric-millimetre-mm)<br>UNLESS OTHERWISE SPECIFIED |  | SHEET<br>5 OF 6         | DRAWING NOT TO SCALE<br>Request Dimensions if in Doubt | REVISION HISTORY       |                    |
| ALL SURFACES TO<br>UNLESS OTHERWISE NOTED                       |  | SIZE<br>A3              | PART NO.<br>INZ5COVER4                                 | REV<br>1               | DATE<br>27/11/2023 |
|   |  |                         |  | DESCRIPTION<br>INITIAL |                    |

