2411

**Applus Keystone**
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# Spire Metering & Chengdu Shenitech Instruments CO., LTD

# 2411-076NA-2

# Environmental Test Report 2411-076NA-2 Rev. N/C

**Test Standards: IEC 60529**

**For**

## Spire Metering & Chengdu Shenitech Instruments CO., LTD

**34 St Martin Dr #13**
**Marlborough, Massachusetts 01603, USA**

**On**

## 280W-R-NV-DN15 Meter (MBus) (Qty. 1)

**Model Number: DN-15; Part Number: 280W-R-NV; Serial Number: 41679004**

**Performed By:** **Applus Keystone.**
**131 N. Columbus Inner Belt**
**New Castle, PA 16101**

**Applus Keystone. does hereby certify that all inspections and tests have been performed in accordance with the documents referenced herein with exceptions as noted in this report. The results in this report pertain to the specified equipment tested. This report shall not be reproduced, except in full, without the written authorization of Applus Keystone.**

| | | | |
|---|---|---|---|
| **Performed By:** | Thomas Catracchia/Nick Bortnovsky | **Date:** | 1/8/2025 |
| | **Thomas Catracchia/Nick Bortnovsky,** Technicians | | |
| **Prepared By:** | Tomasina Burrelli | **Date:** | 1/8/2025 |
| | **Tomasina Burrelli,** Technical Writer | | |
| **Reviewed By:** | Maria Rodgers | **Date:** | 1/8/2025 |
| | **Maria Rodgers,** Quality Manager | | |
| **Approved By:** | Robert Turner | **Date:** | 1/8/2025 |
| | **Robert Turner,** ENV Lab Manager | | |

## Document History

| Revision | Issue Date | Description of Modifications | Revised By | Approved By |
|---|---|---|---|---|
| N/C | 1/8/2025 | Initial release | N/A | T.M. |
| | | | | |
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## Client Information

| | |
|---|---|
| Purchase Order | Signed Quote |
| Quote Number | 2411-076NA-2 |
| EUT Arrival Date | 12/12/2024 -- Received in good condition |
| Company Name | Spire Metering & Chengdu Shenitech Instruments CO., LTD |
| Address | 34 St Martin Dr #13 |
| City, State Zip | Marlborough, Massachusetts 01603, USA |
| Contact Name | Yifei Yin |
| Email | yifei.yin@spiremt.com |

## Test Facility Information

| | |
|---|---|
| Test Laboratory | Applus Keystone. |
| Address | 131 Columbus Inner Belt |
| City, State, Zip Code | New Castle, PA 16101 |
| Phone | (724) 657-9940 |
| Fax | (724) 657-9920 |
| Web Site | www.keystonecompliance.com |
| Contact Name | Robert Turner |
| Title | Environmental Lab Manager |
| E-Mail Address | Bob@keystonecompliance.com |

## Test Program Information

| | |
|---|---|
| Test Personnel | **Thomas Catracchia/Nick Bortnovsky** -- Environmental Test Technicians |
| Test Title & Test Dates | IPX8 Continuous Water Immersion – **December 23, 2024**<br>IP6X Dust Tight with Pressure – **December 24, 2024** |

## TABLE OF CONTENTS



## LIST OF TABLES

**Introduction**

This report documents the results of the Environmental tests performed on the 280W-R-NV-DN15 Meter (MBus) (Qty. 1), Model Number: DN-15; Part Number: 280W-R-NV; Serial Number: 41679004, submitted by Spire Metering & Chengdu Shenitech Instruments CO., LTD

The Environmental test programs described herein were performed in accordance with the applicable requirements of IEC 60529.

Statements of compliance are made in this report without taking measurement uncertainty into account, except for when specifically requested by the customer. Where statements of compliance are made in this report, the following decision rules are applied:

Complied/Met the criteria of the specification - Results are within the limits
Non-Compliant/Did not meet the criteria of the specification - Results exceed the limits

All test data is included in Section 3 of this document.

All tests performed at Applus Keystone New Castle, PA Environmental test facility. All tests were performed using the test set-ups of the relevant standard for tests performed in laboratory conditions.

**Acronyms and Abbreviations**

**M/N** – Model Number

**P/N** – Part Number

**S/N** – Serial Number

**UUT** – Unit Under Testing

**EUT** – Equipment Under Testing

**Equipment Under Test(s)**

| EUT | | |
|---|---|---|
| Description | Manufacturer | |
| **280W-R-NV-DN15 Meter (MBus) (Qty. 1)** | **Spire Metering & Chengdu Shenitech Instruments CO., LTD** | |
| Model Number | Part Number | Serial Number |
| **DN-15** | **280W-R-NV** | **41679004** |

| EUT |
|---|
| **280W-R-NV-DN15 Meter (MBus) (Qty. 1)** |

**Summary of Tests Performed & Results**

**Table 1 Tests Performed & Results**

| Report Paragraph | Test Description | Specification | Results |
|---|---|---|---|
| 3.3 | IPX8 Continuous Water Immersion | IEC 60529 | The unit was dried off prior to inspection and disassembled. Post-test inspection revealed no visible damage, defects, or any other abnormalities resulting from the testing process. The MBus meter functioned as intended, and there was no evidence of water ingress inside the unit. The MBus meter met the requirements of the specification. |
| 3.4 | IP6X Dust Tight with Pressure | IEC 60529 | The unit was cleaned off prior to inspection and disassembled. Post-test inspection revealed no visible damage, defects, or any other abnormalities resulting from the testing process. The MBus meter functioned as intended, and there was no evidence of Dust ingress inside the unit. The MBus meter met the requirements of the specification. |

## Section 1 – Test Conditions and Equipment

### 1.1 Ambient Environmental Conditions

Unless otherwise specified herein, all tests were performed at an atmospheric pressure of 28 ±2.5 inches of mercury absolute, a temperature of 75 ±15°F, and a relative humidity of 50 ±30%.

### 1.2 Instrumentation and Equipment

Measuring and test equipment, utilized in the performance of these tests, was calibrated in accordance with ANSI/NCSL Z540-3-2006, by Applus Keystone. or a commercial facility, utilizing reference standards (or interim standards) whose calibrations have been certified as being traceable to the National Institute of Standards & Technology (NIST). All reference standards utilized in the above calibration system are supported by certificates, reports, or data sheets attesting to the date, accuracy, and conditions under which the results furnished were obtained. All subordinate standards, measuring and test equipment are supported by like data, when such information is essential to achieve the accuracy control required by the procedure.

Applus Keystone. attests that the commercial sources providing calibration services on the above referenced equipment, other than the NIST Standards are in fact capable of performing the required services to the satisfaction of Applus Keystone. Quality Assurance. Certifications of all calibrations performed are retained on file in the Applus Keystone. Quality Assurance Department, and are available for inspection upon request by customer representatives.

The test equipment utilized during this test program is listed on individual Test Equipment Sheets located in Section 3 of this document.

### 1.3 Tolerances

All test conditions were maintained within all applicable specified tolerances.

## Section 2 – References

### 2.1 Applicable Specifications

| | |
|---|---|
| Reference Specification Title | **IEC 60529**<br>**Degrees of protection provided by enclosures (IP Code)** |
| Calibration Information | **ANSI/NCSL Z540-3-2006**<br>**Calibration Laboratories and Measuring Test Equipment - General Requirements** |

## Section 3 – Test Logs, Test Equipment, Test Data, & Test Photographs

### 3.1 Test Log

| Test Log | | | |
|---|---|---|---|
| EUT: | 280W-R-NV-DN15 Meter (MBus) (Qty. 1) | Job Number: | 2411-076NA |
| Customer: | Spire Metering & Chengdu Shenitech Instruments CO | Model Number: | DN-15 |
| Date: | 12/23/2024 – 12/24/2024 | Part Number: | 280W-R-NV |
| Test Engineer: | T. Catracchia/N. Bortnovsky | Serial Number: | 41679004 |

| Date | Time | Description |
|---|---|---|
| **IEC 60529 IPX8 Continuous Water Immersion** | | |
| 12/23/24 | 2:35 PM | Started IPX8 Immersion Test. (1.2m Depth) |
| | 3:05 PM | Ended IPX8 Immersion Test. |
| | | The unit was dried off prior to inspection and disassembled. Post-test inspection revealed no visible damage, defects, or any other abnormalities resulting from the testing process. The MBus meter functioned as intended, and there was no evidence of water ingress inside the unit. The MBus meter met the requirements of the specification. |
| **IEC 60529 IP6X Dust Tight with Pressure** | | |
| 12/24/2024 | 9:15 AM | Started the IP6X Dust Tight with Pressure. |
| | 5:15 PM | Ended the IP6X Dust Tight with Pressure. |
| | | The unit was cleaned off prior to inspection and disassembled. Post-test inspection revealed no visible damage, defects, or any other abnormalities resulting from the testing process. The MBus meter functioned as intended, and there was no evidence of Dust ingress inside the unit. The MBus meter met the requirements of the specification. |

### 3.2 Equipment List

| Equipment Log | | | |
|---|---|---|---|
| EUT: | 280W-R-NV-DN15 Meter (MBus) (Qty. 1) | Job Number: | 2411-076NA |
| Customer: | Spire Metering & Chengdu Shenitech Instruments CO | Model Number: | DN-15 |
| Date: | 12/23/2024 – 12/24/2024 | Part Number: | 280W-R-NV |
| Test Engineer: | T. Catracchia/N. Bortnovsky | Serial Number: | 41679004 |

| Test Equipment | | | | | |
|---|---|---|---|---|---|
| Asset No. | Description | Manufacturer | Model | Serial No. | Cal. Due |
| NC016 | Dust Chamber | Keystone Compliance | None | None | UWCE |
| NG024 | Talcum Powder | ED&D | DTC-810 | DTC-825 | IPU |
| NG198 | Tape Measure | Starrett | KTX1-26ME-N | 21085829 | 3/27/2025 |
| NG276 | Stopwatch | Control Company | 1051;94460-28 | 230285870 | 4/24/2025 |
| NI004 | Dust Controller | Keystone Compliance | None | None | UWCE |
| NM097 | Temperature/Humidity Meter | Traceable | 4096 98766-84 | 240013750 | 1/4/2026 |
| NT032 | Immersion Tank | Custom Roto Mold | CRMI-500OTT | None | UWCE |
| OA127 | Laptop | Hewlett-Packard | 15-eg3045cl | 5CD336C5HD | UWCE |
| OC041 | Smart Phone | Google | PIXEL 4 | 356731102500881 | UWCE |

**UWCE:** Used with Calibrated Equipment
**REF:** Reference Only
**IPU:** Inspect Prior to Use

**3.3** IPX8 Continuous Water Immersion **Test**

a) The IPX8 Continuous Water Immersion test requirements for the 280W-R-NV-DN15 Meter (MBus) (Qty. 1) are specified in IEC 60529.

b) The IPX8 Continuous Water Immersion test log for the 280W-R-NV-DN15 Meter (MBus) (Qty. 1) is located in Paragraph 3.1 of this document.

c) The IPX8 Continuous Water Immersion test equipment used to test the 280W-R-NV-DN15 Meter (MBus) (Qty. 1) is located in Paragraph 3.2 of this document.

d) All recorded test data for the IPX8 Continuous Water Immersion test on the 280W-R-NV-DN15 Meter (MBus) (Qty. 1) is located in Paragraph 3.3.1 of this document.

e) The IPX8 Continuous Water Immersion test photographs for the 280W-R-NV-DN15 Meter (MBus) (Qty. 1) are located in Paragraph 3.3.2 of this document.

### 3.3.1 IPX8 Continuous Water Immersion Test Data

| Water Jet Data Sheet | | | |
|---|---|---|---|
| EUT: | **280W-R-NV-DN15 Meter (4G) (Qty. 1)** | Job Number: | **2411-076NA** |
| Customer: | **Spire Metering & Chengdu Shenitech Instruments CO** | Model Number: | **DN-15** |
| Date: | **12/23/2024** | Part Number: | **280W-R-NV** |
| Test Engineer: | **T. Catracchia/N. Bortnovsky** | Serial Number: | **41679004** |
| Test Specifications | | | |
| Test Spec: | **IEC 60529** | Para./Sec.: | **IPX8 Continuous Water Immersion** |

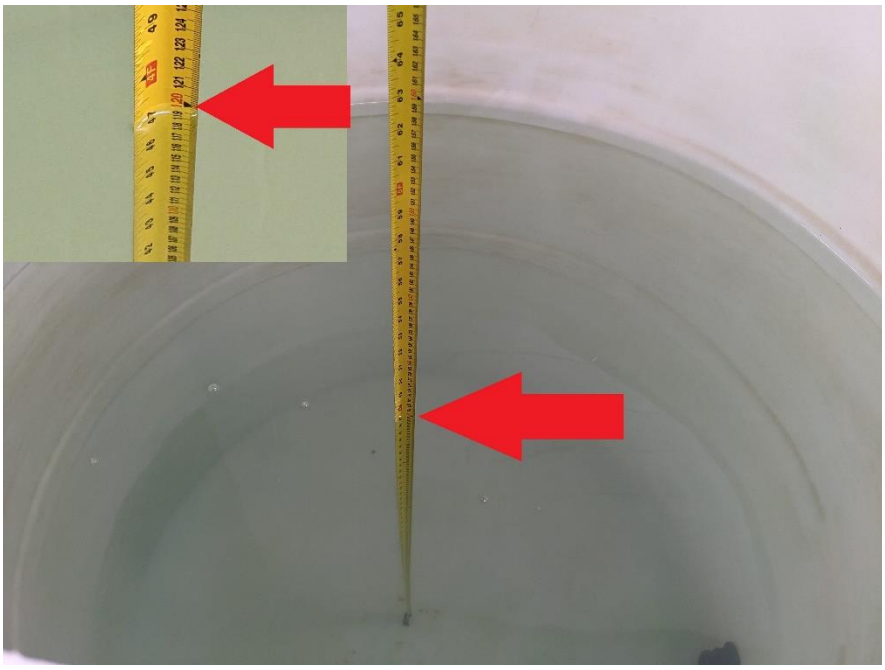
**Test Data**

| Second Char. numeral | Degree of protection | |
|---|---|---|
| | Brief description | Definition |
| **8** | **Protected against the effects of temporary immersion in water** | **Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of pressure and time.** |

| ocedure (before beginning test): |
|---|
| The test is made by completely immersing the enclosure in water in its service position as specified by the manufacturer so that the following conditions are satisfied:<br>a. The lowest point of enclosures with a height less than 850mm is located 1,000mm below the surface of the water.<br>b. The highest point of the enclosures with a height equal to or greater than 850mm is located 150mm below the surface of the water.<br>c. The duration of the test is 30 minutes.<br>d. The water temperature should not differ by more than 5 K from the temperature of the specimen under test However, a modified requirement may be specified in the relevant product standard if the tests are to be made when the equipment is energized and/or its parts in motion.<br>e. Unless there is a relevant product standard, the test conditions are subject to agreement between manufacturer and user, but they shall be more severe than those prescribed in 14.2.7 and they shall take account of the condition that the enclosure will be continuously immersed in actual use. |

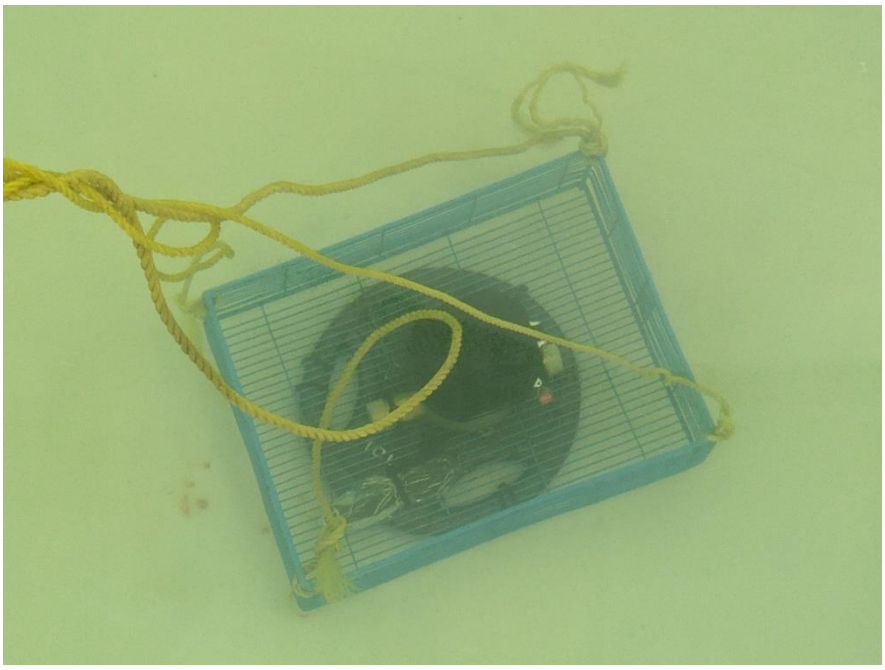
### 3.3.2 IPX8 Continuous Water Immersion Test Photographs


| IPX8 Continuous Water Immersion |
| --- |
| Typical IPX8 Continuous Water Immersion Test Setup |



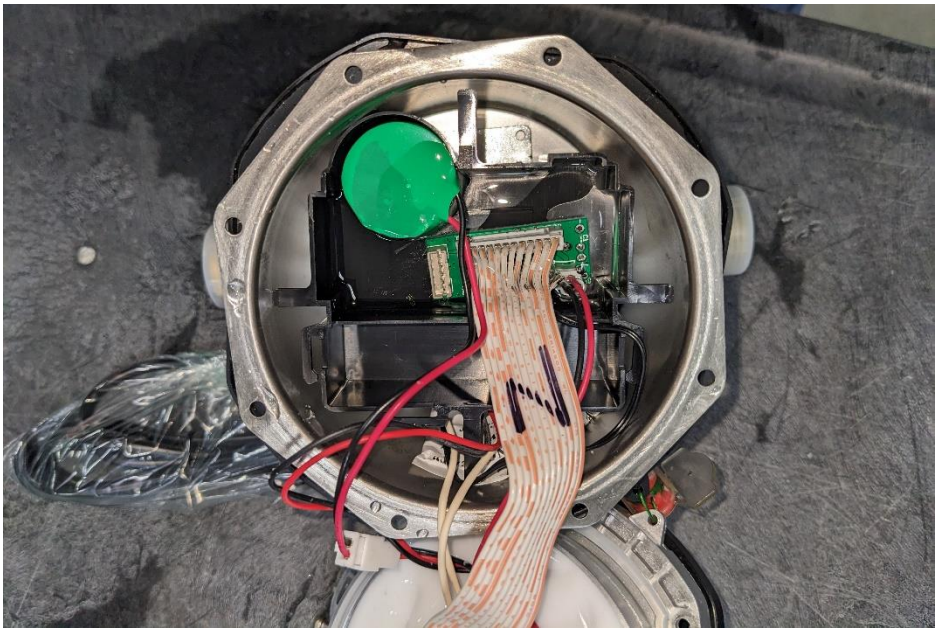
| IPX8 Continuous Water Immersion |
| --- |
| Depth Verification (1 meter) |

| IPX8 Continuous Water Immersion |
| --- |
| Typical IPX8 Continuous Water Immersion Test |

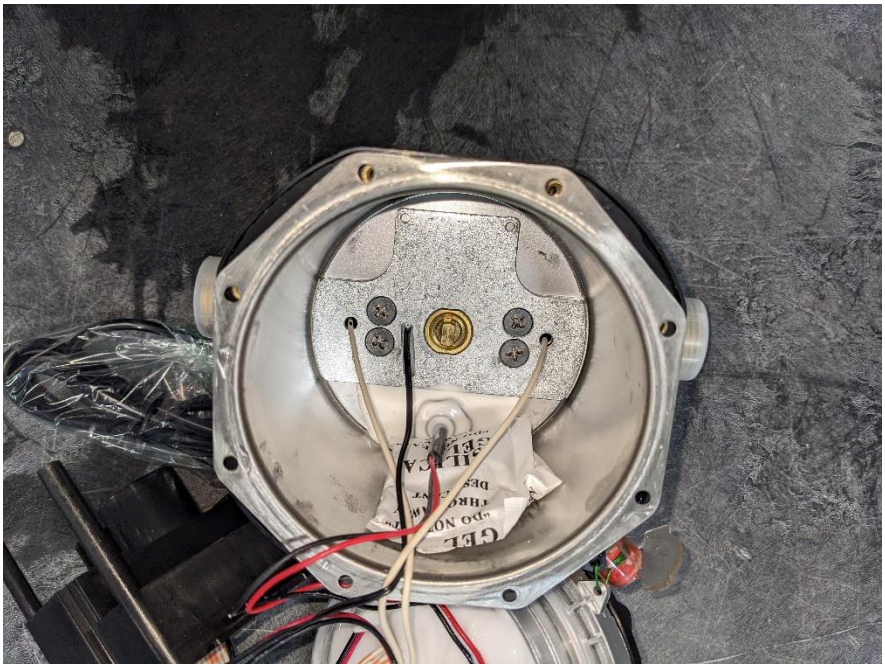


| IPX8 Continuous Water Immersion |
| --- |
| Typical IPX8 Continuous Water Immersion Test |

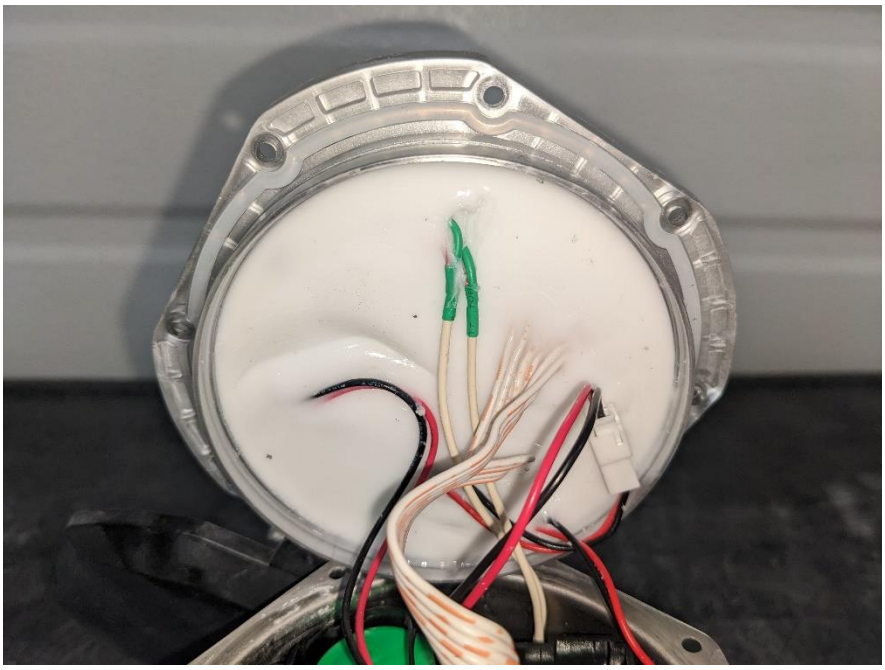
| IPX8 Continuous Water Immersion |
| --- |
| Post Test Inspection |



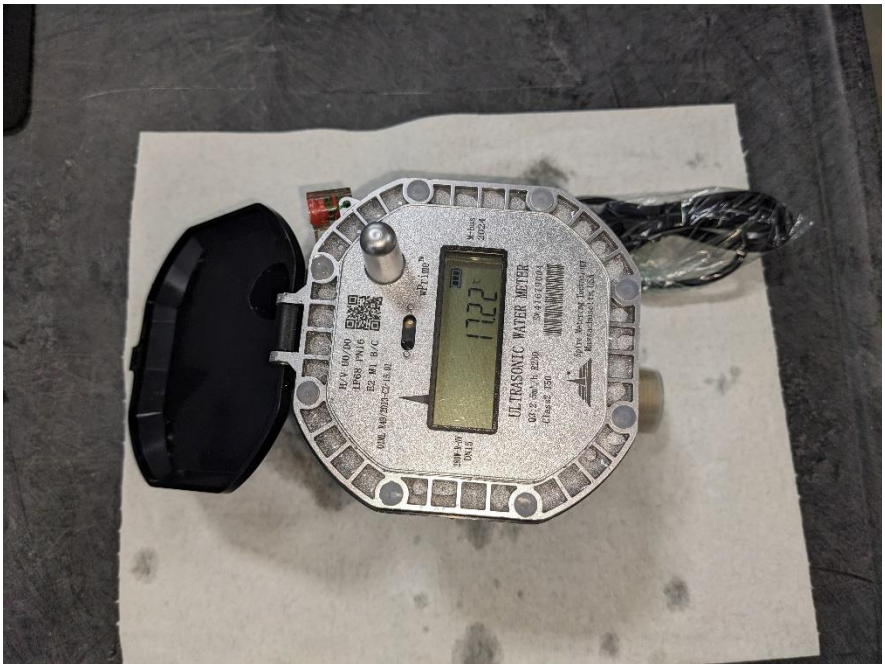
| IPX8 Continuous Water Immersion |
| --- |
| Post Test Inspection |



| IPX8 Continuous Water Immersion |
| --- |
| Post Test Inspection |



| IPX8 Continuous Water Immersion |
| --- |
| Post Test Inspection |

| | |
|---|---|
|  | **IPX8 Continuous Water Immersion**<br><br>**Post Test Inspection (Functional)** |

### 3.4 IP6X Dust Tight with Pressure Test

a) The IP6X Dust Tight with Pressure requirement for the 280W-R-NV-DN15 Meter (MBus) (Qty. 1) is specified in IEC 60529.

b) The IP6X Dust Tight with Pressure test log for the 280W-R-NV-DN15 Meter (MBus) (Qty. 1) is located in Paragraph 3.1 of this document.

c) The IP6X Dust Tight with Pressure test equipment used to test the 280W-R-NV-DN15 Meter (MBus) (Qty. 1) is located in Paragraph 3.2 of this document.

d) All recorded test data for the IP6X Dust Tight with Pressure test on the 280W-R-NV-DN15 Meter (MBus) (Qty. 1) is located in Paragraph 3.4.1 of this document.

e) The IP6X Dust Tight with Pressure test photograph for the 280W-R-NV-DN15 Meter (MBus) (Qty. 1) is located in Paragraph 3.4.2 of this document.

### 3.4.1 IP6X Dust Tight with Pressure Test Data

| IP6X Data Sheet | | | |
|---|---|---|---|
| EUT: | **280W-R-NV-DN15 Meter (MBus) (Qty. 1)** | Job Number: | **2411-076NA** |
| Customer: | **Spire Metering & Chengdu Shenitech Instruments CO** | Model Number: | **DN-15** |
| Date: | **12/24/2024** | Part Number: | **280W-R-NV** |
| Test Engineer: | **T. Catracchia/N. Bortnovsky** | Serial Number: | **41679004** |
| Test Specifications | | | |
| Test Spec: | **IEC 60529** | Para./Sec.: | **Dust Tight with Pressure** |

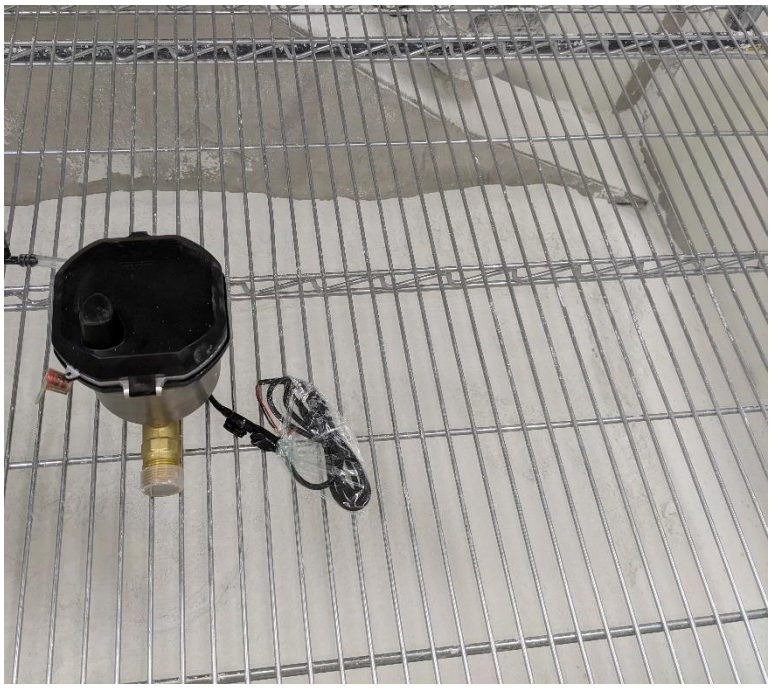
**Test Data**

| First Char. numeral | Degree of protection | |
|---|---|---|
| | Brief description | Definition |
| **6** | **Dust-tight** | **No ingress of dust** |

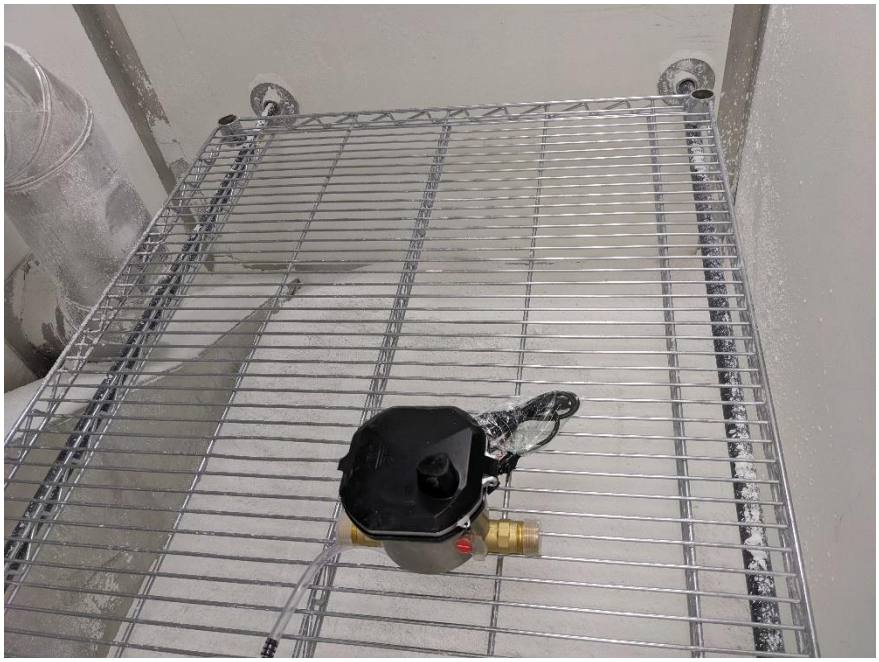
**ocedure (before beginning test):**

Determine Atmospheric conditions prior to testing. Temperature range: 15°C to 35°C
Relative humidity:25 % to 75 % Air pressure: 86 kPa to 106 kPa. Maintain the talcum powder in suspension in a test chamber. The talcum powder used shall be able to pass through a square-meshed sieve the nominal wire diameter of which is 50µm and the nominal width of a gap between wires 75µm. The amount of talcum powder to be used is 2 kg per cubic meter of the test chamber volume. It shall not have been used for more than 20 tests. The object of the test is to draw into the enclosure, by means of depression, a volume of air 80 times the volume of the sample enclosure tested without exceeding the extraction rate of 60 volumes per hour. In no event shall the depression exceed 2 kPa (20 mbar) on the manometer.

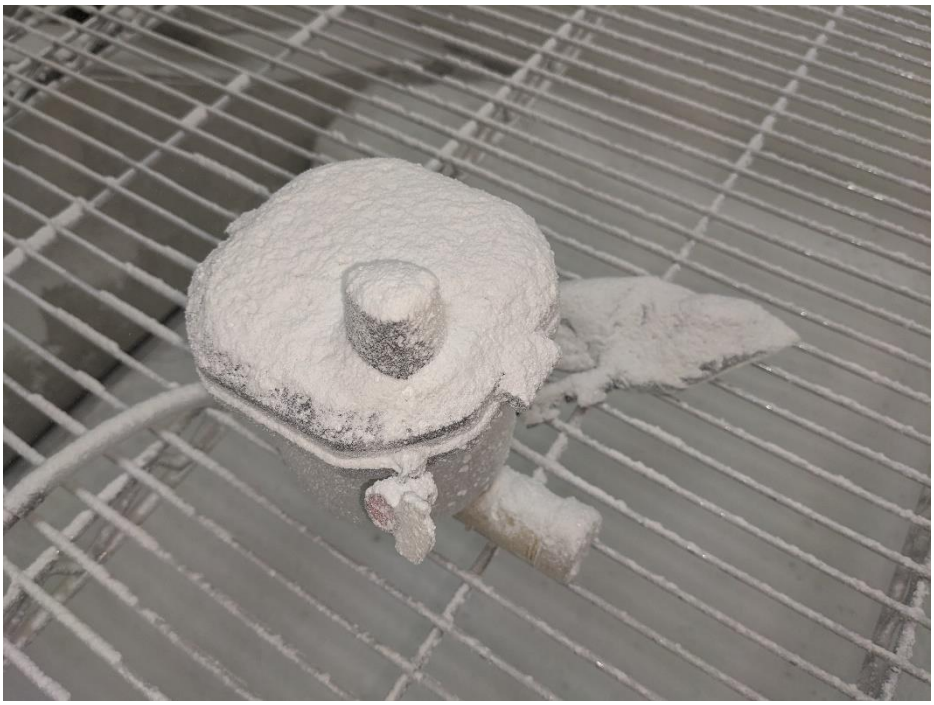
### 3.4.2 IP6X Dust Tight with Pressure Test Photographs



| IP6X Dust Tight with Pressure |
| --- |
| Typical IP6X Dust Tight with Pressure Test Setup |



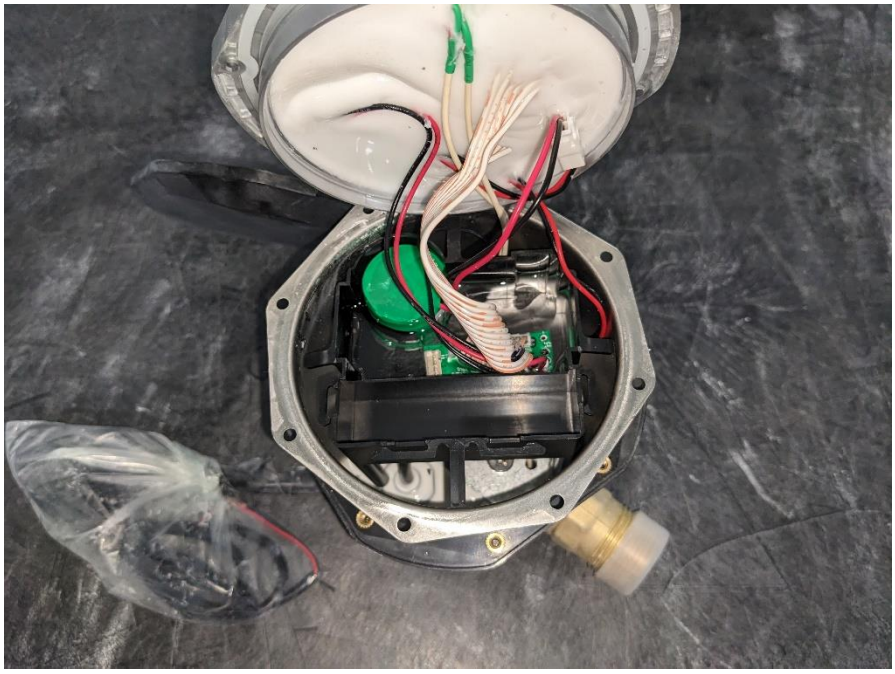
| IP6X Dust Tight with Pressure |
| --- |
| Typical IP6X Dust Tight with Pressure Test Setup |

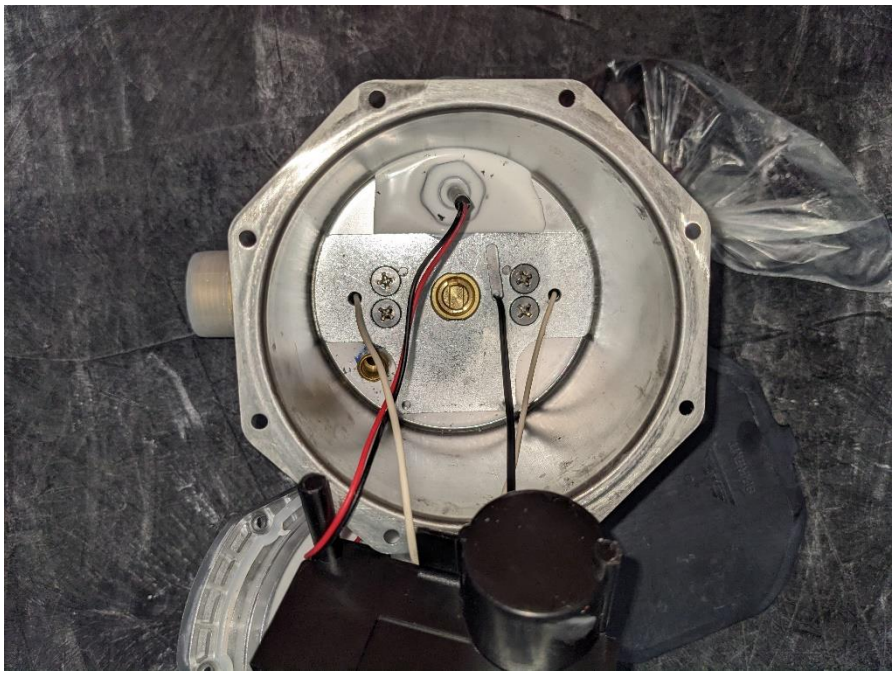


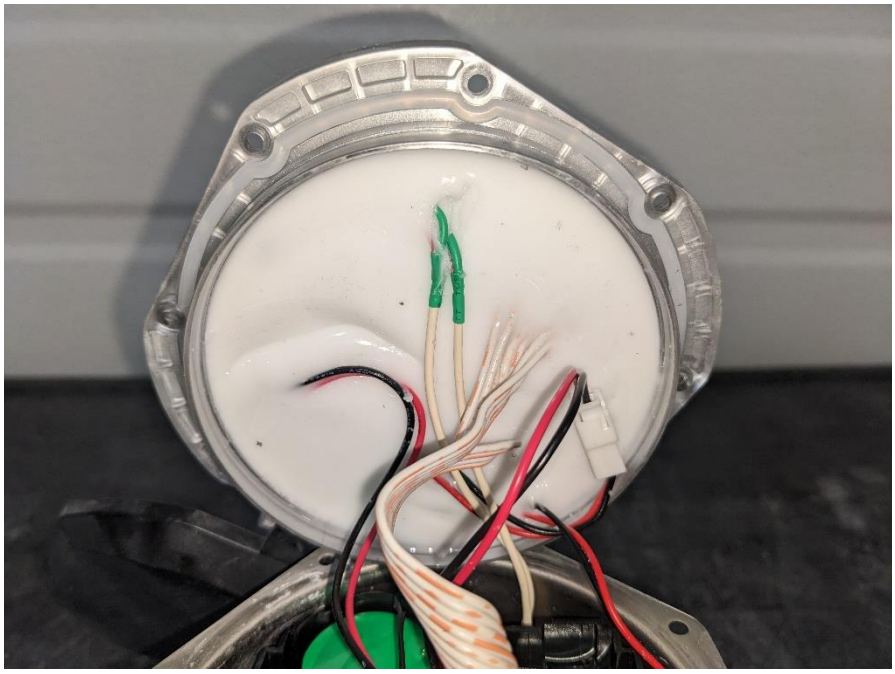
| IP6X Dust Tight with Pressure |
| --- |
| Typical Post IP6X Dust Tight with Pressure Test |

| IP6X Dust Tight with Pressure |
| --- |
| Typical Post IP6X Dust Tight with Pressure Test |

| | |
|---|---|
|  | **IP6X Dust Tight with Pressure**<br><br>**Post Test Inspection** |

| | |
|---|---|
|  | **IP6X Dust Tight with Pressure**<br><br>**Post Test Inspection** |

| | |
|---|---|
|  | **IP6X Dust Tight with Pressure**<br><br>**Post Test Inspection** |

| | |
|---|---|
|  | **IP6X Dust Tight with Pressure**<br><br>**Post Test Inspection** |

| | |
|---|---|
|  | **IP6X Dust Tight with Pressure**<br><br>**Post Test Inspection (Functional)** |

**Section 4 – Conclusion**

a) The 280W-R-NV-DN15 Meter (MBus) (Qty. 1), Model Number: DN-15; Part Number: 280W-R-NV; Serial Number: 41679004, was subjected to the following Environmental Tests in accordance with IEC 60529 and the specifications as shown in Table 2:

**Table 2 Tests Performed & Results**

| Test Description | Specification | Results |
|---|---|---|
| **IPX8 Continuous Water Immersion** | **IEC 60529** | **The unit was dried off prior to inspection and disassembled. Post-test inspection revealed no visible damage, defects, or any other abnormalities resulting from the testing process. The MBus meter functioned as intended, and there was no evidence of water ingress inside the unit. The MBus meter met the requirements of the specification.** |
| **IP6X Dust Tight with Pressure** | **IEC 60529** | **The unit was cleaned off prior to inspection and disassembled. Post-test inspection revealed no visible damage, defects, or any other abnormalities resulting from the testing process. The MBus meter functioned as intended, and there was no evidence of Dust ingress inside the unit. The MBus meter met the requirements of the specification.** |

b) The 280W-R-NV-DN15 Meter (MBus) (Qty. 1) was returned to Spire Metering & Chengdu Shenitech Instruments CO., LTD after completion of the Environmental Test.