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Spire Metering & Chengdu Shenitech Instruments CO., LTD

2411-076NA-1



Environmental Test Report 2411-076NA-1 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 (4G) (Qty. 1)

Model Number: DN-15; Part Number: 280W-R-NV; Serial Number: 41679003

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

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ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

Document History				
Revision	Issue Date	Description of Modifications	Revised By	Approved By
N/C	1/8/2025	Initial release	N/A	T.M.

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

Client Information	
Purchase Order	Signed Quote
Quote Number	2411-076NA-1
EUT Arrival Date	12/12/2024 -- Received in good condition
Company Name	Spire Metering & Chengdu Shenitech Instruments CO., LTD
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City, State Zip	Marlborough, Massachusetts 01603, USA
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Test Program Information	
Test Personnel	Thomas Catracchia/Nick Bortnovsky -- Environmental Test Technicians
Test Title & Test Dates	IPX8 Continuous Water Immersion – December 23, 2024 IP6X Dust Tight with Pressure – December 24, 2024

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

TABLE OF CONTENTS

Introduction..... 6

Acronyms and Abbreviations 6

Equipment Under Test(s) 7

Summary of Tests Performed & Results 8

Section 1 – Test Conditions and Equipment 9

1.1 Ambient Environmental Conditions 9

1.2 Instrumentation and Equipment 9

1.3 Tolerances..... 9

Section 2 – References 10

2.1 Applicable Specifications..... 10

Section 3 – Test Logs, Test Equipment, Test Data, & Test Photographs 11

3.1 Test Log..... 11

3.2 Equipment List 12

3.3 IPX8 Continuous Water Immersion Test 13

3.3.1 IPX8 Continuous Water Immersion Test Data 14

3.3.2 IPX8 Continuous Water Immersion Test Photographs 15

3.4 IP6X Dust Tight with Pressure Test 20

3.4.1 IP6X Dust Tight with Pressure Test Data..... 21

3.4.2 IP6X Dust Tight with Pressure Test Photographs 22

Section 4 – Conclusion 27

LIST OF TABLES

Table 1 Tests Performed & Results.....8

Table 2 Tests Performed & Results.....27

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

Introduction

This report documents the results of the Environmental tests performed on the 280W-R-NV-DN15 Meter (4G) (Qty. 1), Model Number: DN-15; Part Number: 280W-R-NV; Serial Number: 41679003, 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

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

Equipment Under Test(s)

EUT		
Description		Manufacturer
280W-R-NV-DN15 Meter (4G) (Qty. 1)		Spire Metering & Chengdu Shenitech Instruments CO., LTD
Model Number	Part Number	Serial Number
DN-15	280W-R-NV	41679003

	EUT
	280W-R-NV-DN15 Meter (4G) (Qty. 1)

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

Summary of Tests Performed & Results

Table 1 Tests Performed & Results

Report Paragraph	Test Description	Specification	Results
3.3	IPX8 Continuous Water Immersion	IEC 60529	<p>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 4G meter functioned as intended, and there was no evidence of water ingress inside the unit. The 4G meter met the requirements of the specification.</p>
3.4	IP6X Dust Tight with Pressure	IEC 60529	<p>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 4G meter functioned as intended, and there was no evidence of Dust ingress inside the unit. The 4G meter met the requirements of the specification.</p>

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

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 $75 \pm 15^\circ\text{F}$, and a relative humidity of $50 \pm 30\%$.

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.

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

Section 2 – References

2.1 Applicable Specifications

Reference Specification Title	IEC 60529 Degrees of protection provided by enclosures (IP Code)
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Calibration Information	ANSI/NCSL Z540-3-2006 Calibration Laboratories and Measuring Test Equipment - General Requirements
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ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

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

3.1 Test Log

Test Log			
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 – 12/24/2024	Part Number:	280W-R-NV
Test Engineer:	T. Catracchia/N. Bortnovsky	Serial Number:	41679003

Date	Time	Description
IEC 60529 IPX8 Continuous Water Immersion		
12/23/24	2:00 PM	Started IPX8 Immersion Test. (1.2m Depth)
	2:30 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 4G meter functioned as intended, and there was no evidence of water ingress inside the unit. The 4G 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 4G meter functioned as intended, and there was no evidence of Dust ingress inside the unit. The 4G meter met the requirements of the specification.

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

3.2 Equipment List

Equipment Log			
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 – 12/24/2024	Part Number:	280W-R-NV
Test Engineer:	T. Catracchia/N. Bortnovsky	Serial Number:	41679003

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	5CD336C5H D	UWCE
OC041	Smart Phone	Google	PIXEL 4	3567311025 00881	UWCE

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

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

3.3 IPX8 Continuous Water Immersion Test

- a) The IPX8 Continuous Water Immersion test requirements for the 280W-R-NV-DN15 Meter (4G) (Qty. 1) are specified in IEC 60529.
- b) The IPX8 Continuous Water Immersion test log for the 280W-R-NV-DN15 Meter (4G) (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 (4G) (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 (4G) (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 (4G) (Qty. 1) are located in Paragraph 3.3.2 of this document.

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

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:	41679003
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.

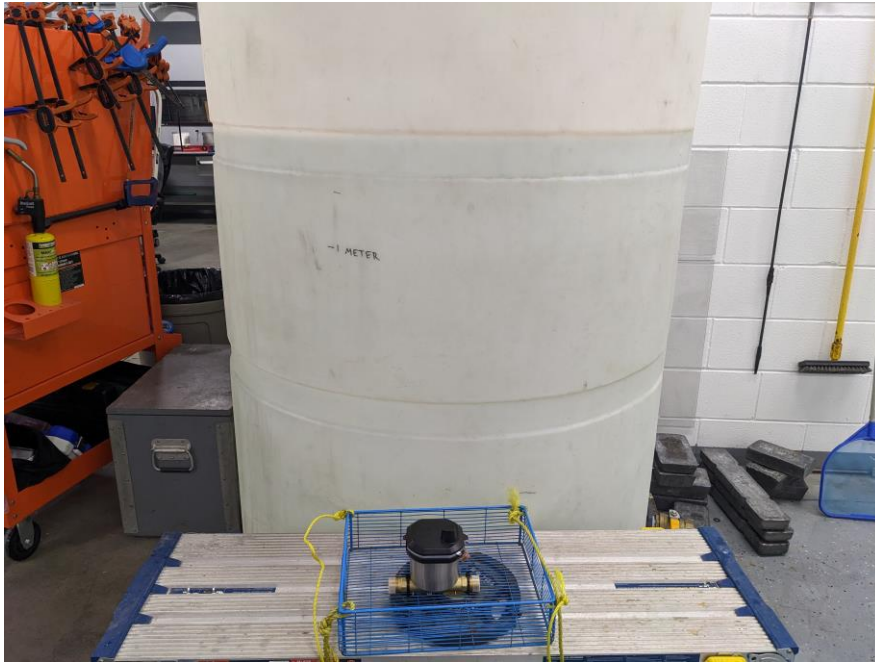
Procedure (before beginning test):

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:

- The lowest point of enclosures with a height less than 850mm is located 1,200mm below the surface of the water.
- The highest point of the enclosures with a height equal to or greater than 850mm is located 150mm below the surface of the water.
- The duration of the test is 30 minutes.
- 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.
- 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.

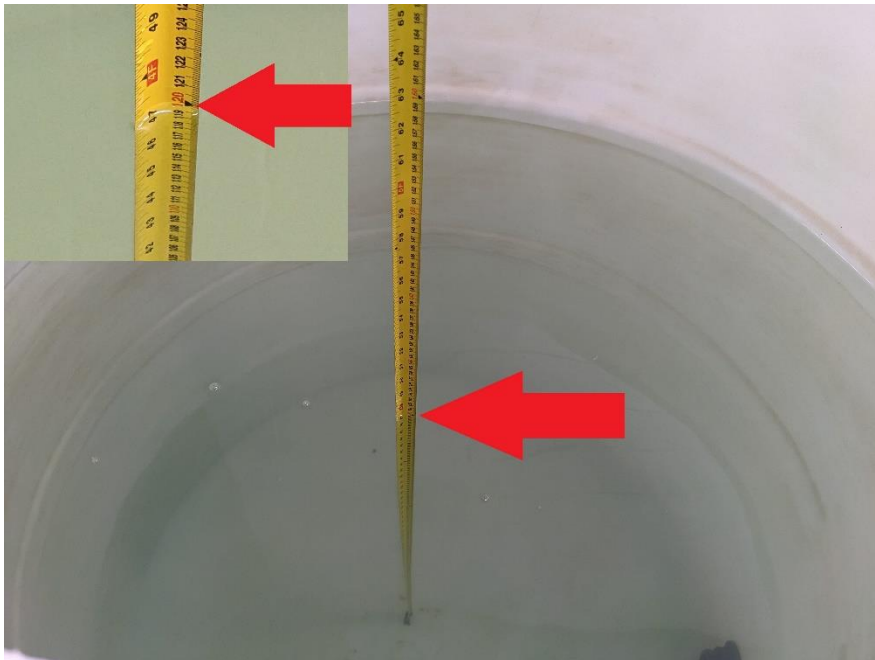
ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

3.3.2 IPX8 Continuous Water Immersion Test Photographs



IPX8 Continuous Water Immersion

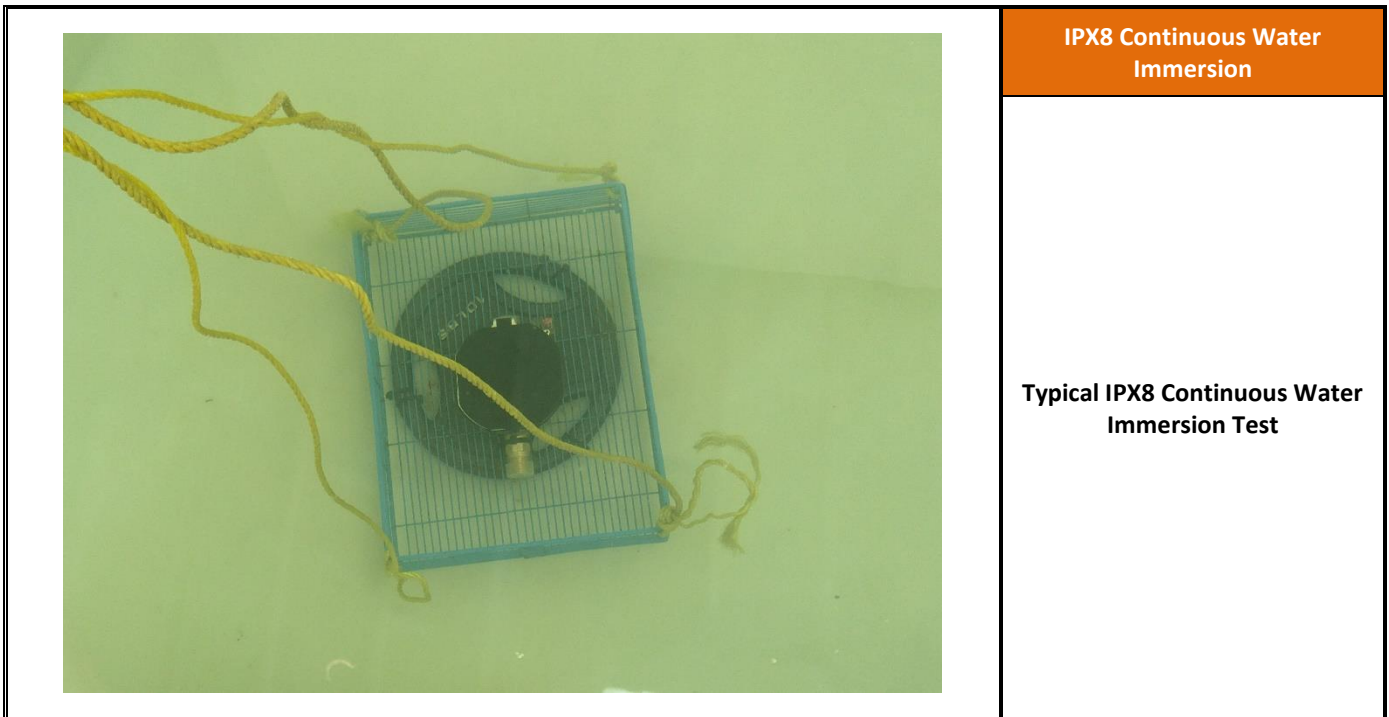
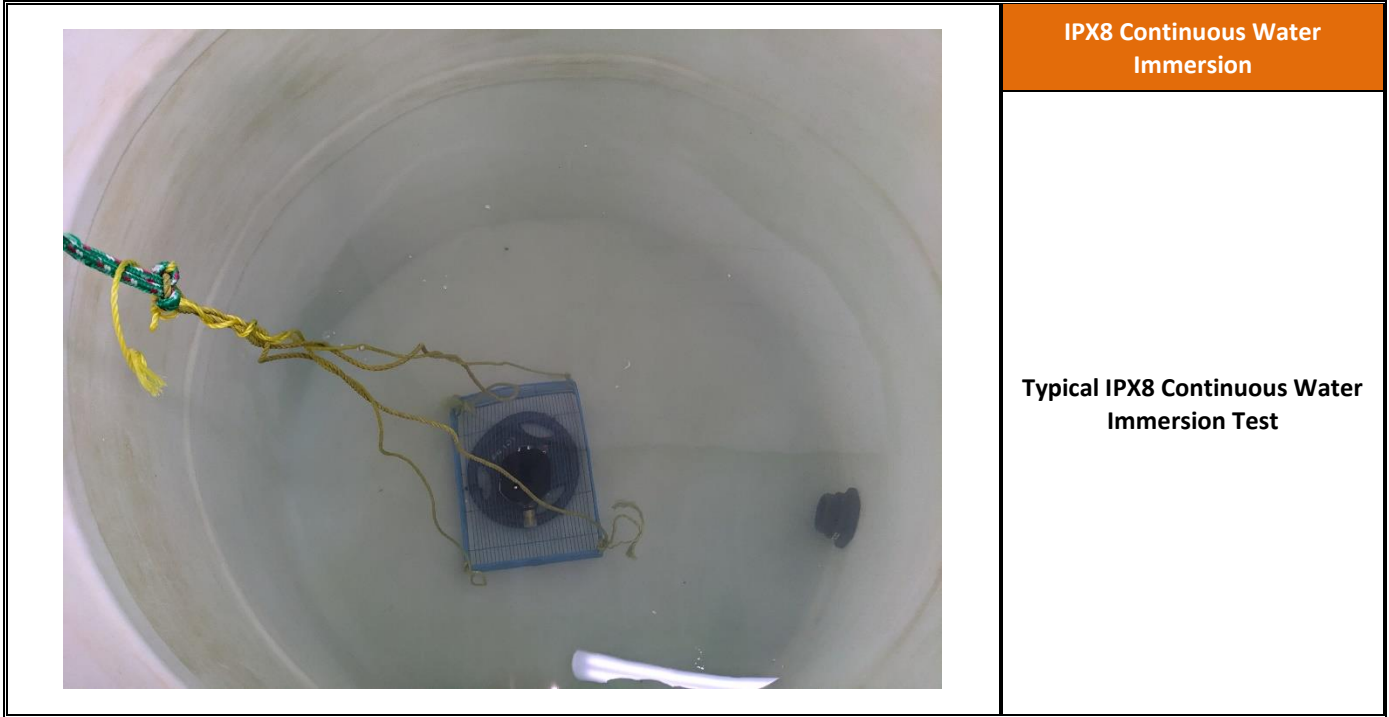
Typical IPX8 Continuous Water Immersion Test Setup



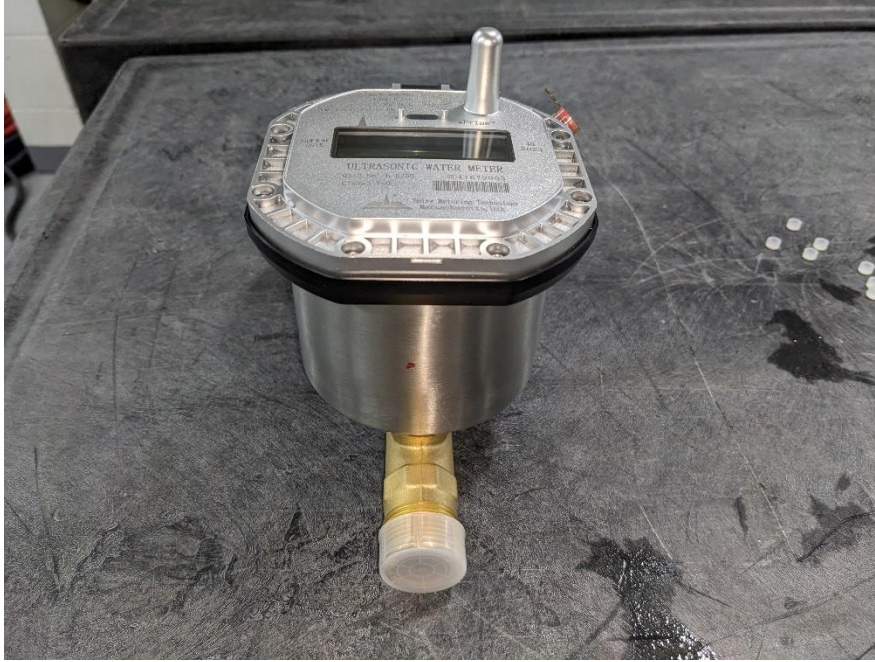
IPX8 Continuous Water Immersion

Depth Verification (1 meter)

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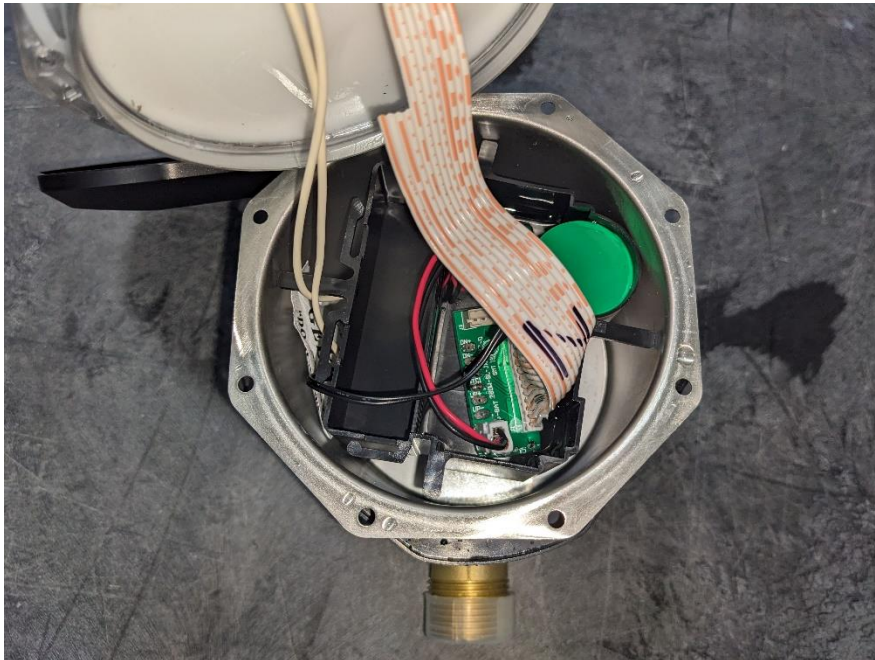


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IPX8 Continuous Water Immersion

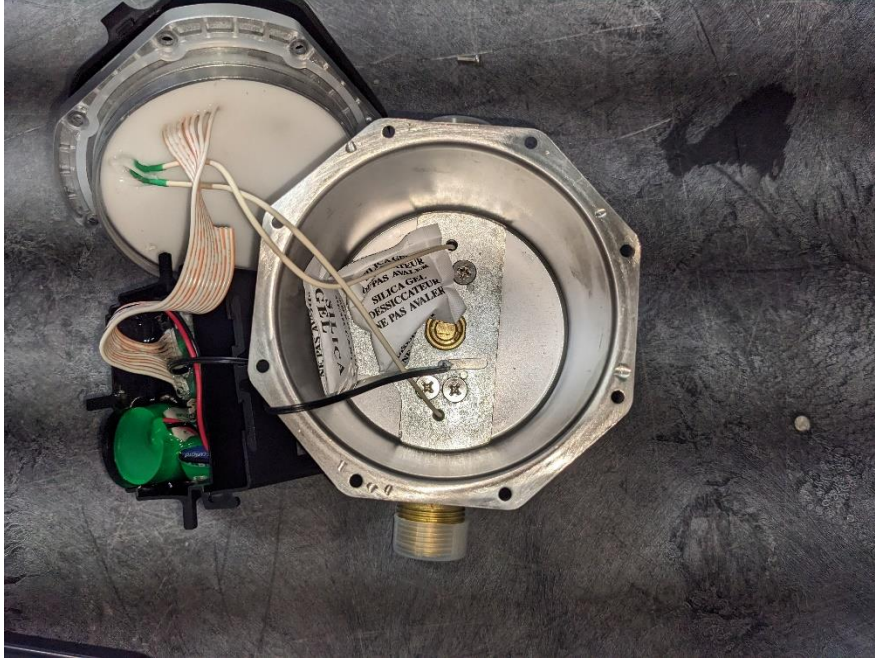
Post Test Inspection



IPX8 Continuous Water Immersion

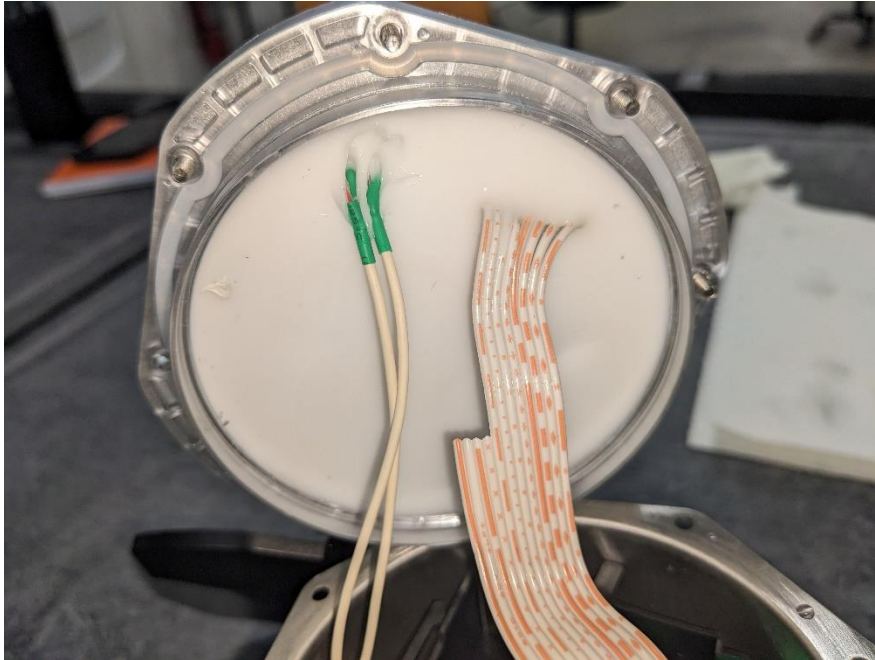
Post Test Inspection

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD



IPX8 Continuous Water Immersion

Post Test Inspection



IPX8 Continuous Water Immersion

Post Test Inspection

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IPX8 Continuous Water
Immersion

Post Test Inspection
(Functional)

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3.4 IP6X Dust Tight with Pressure Test

- a) The IP6X Dust Tight with Pressure requirement for the 280W-R-NV-DN15 Meter (4G) (Qty. 1) is specified in IEC 60529.
- b) The IP6X Dust Tight with Pressure test log for the 280W-R-NV-DN15 Meter (4G) (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 (4G) (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 (4G) (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 (4G) (Qty. 1) is located in Paragraph 3.4.2 of this document.

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

3.4.1 IP6X Dust Tight with Pressure Test Data

IP6X 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:	12/24/2024	Part Number:	280W-R-NV
Test Engineer:	T. Catracchia/N. Bortnovsky	Serial Number:	41679003
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

Procedure (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.

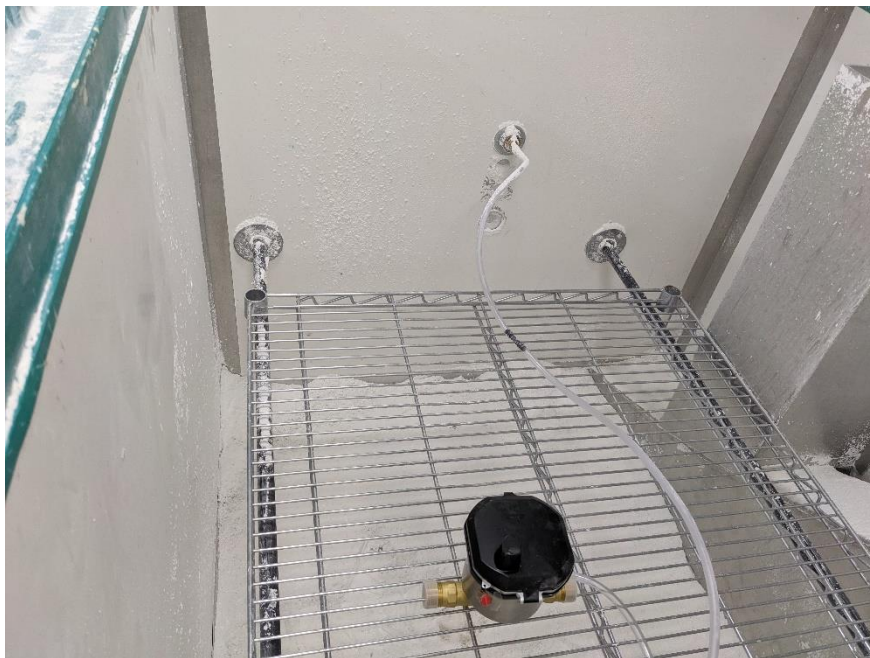
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3.4.2 IP6X Dust Tight with Pressure Test Photographs



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

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD



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

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IP6X Dust Tight with Pressure

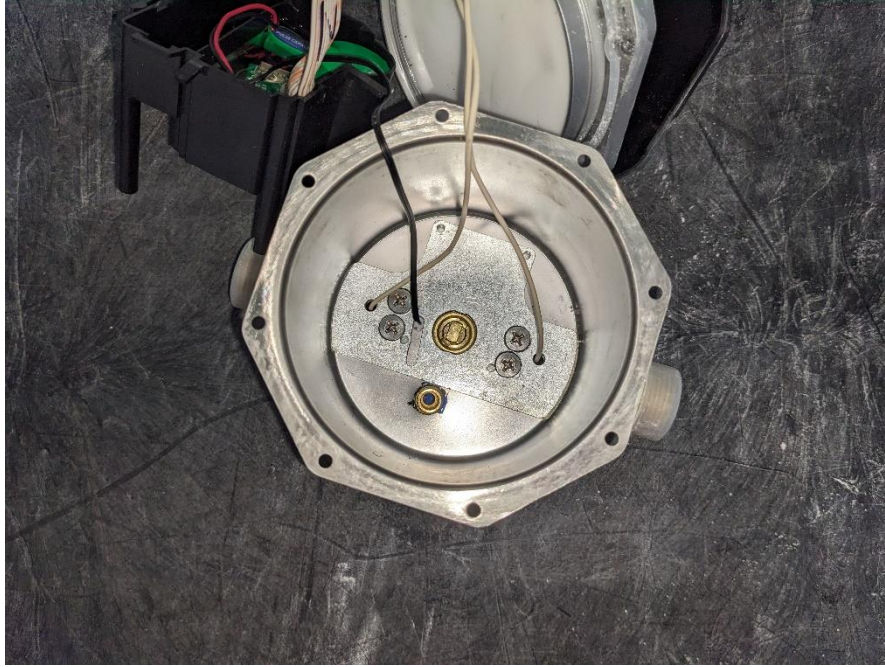
Post Test Inspection



IP6X Dust Tight with Pressure

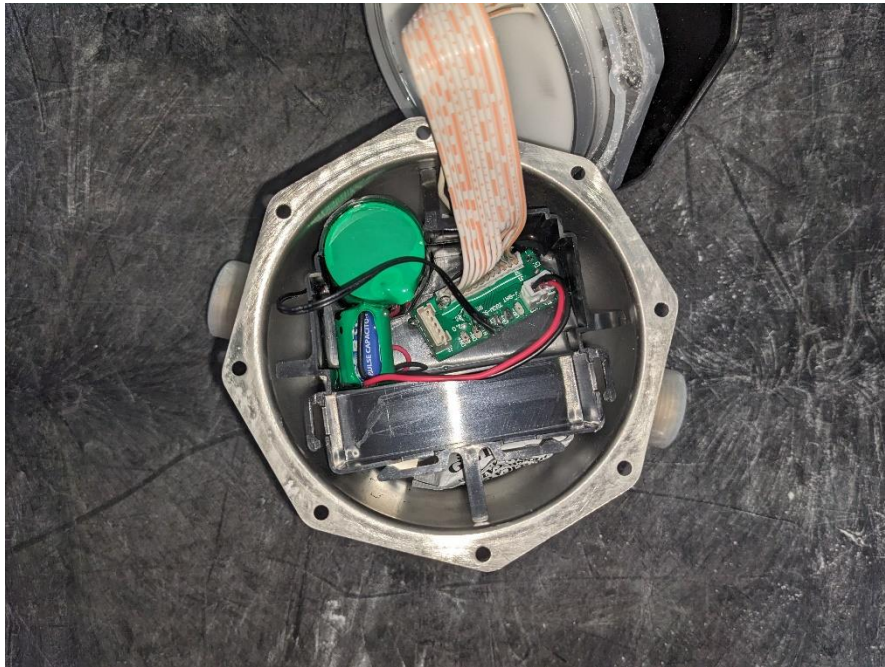
Post Test Inspection

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD



IP6X Dust Tight with Pressure

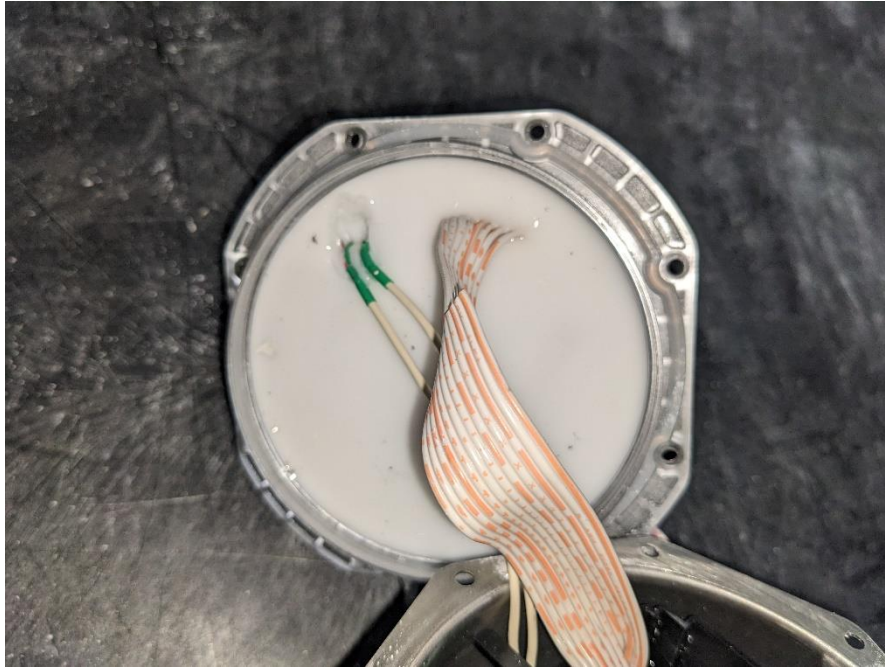
Post Test Inspection



IP6X Dust Tight with Pressure

Post Test Inspection

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD



IP6X Dust Tight with Pressure

Post Test Inspection

ENVIRONMENTAL TEST REPORT FOR SPIRE METERING & CHENGDU SHENITECH INSTRUMENTS CO., LTD

Section 4 – Conclusion

- a) The 280W-R-NV-DN15 Meter (4G) (Qty. 1), Model Number: DN-15; Part Number: 280W-R-NV; Serial Number: 41679003, 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 4G meter functioned as intended, and there was no evidence of water ingress inside the unit. The 4G 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 4G meter functioned as intended, and there was no evidence of Dust ingress inside the unit. The 4G meter met the requirements of the specification.

- b) The 280W-R-NV-DN15 Meter (4G) (Qty. 1) was returned to Spire Metering & Chengdu Shenitech Instruments CO., LTD after completion of the Environmental Test.