

Environmental and material tests (ENV) SECTOR

Product description:	Actuator
Tested Models:	RP
Manufacturer:	ACTUATECH S.p.A. Via San Lorenzo, 70 – 25069 Villa Carcina (BS) - Italy

Reference documents:	EN 60529:1991 + EC:1993 + A1:2000 + A2:2013 + EC:2016 + A2/EC:2019
Application:	Verification of degree of protection IP66/67/68
Remarks:	IP X8, 100 m for 60 min

Customer:	ACTUATECH S.p.A. Via San Lorenzo, 70 – 25069 Villa Carcina (BS) - Italy		
Purchase Order:	2021 – AS 000169	dated:	2021-06-01
Order Confirmation:	CO 2021-0242-00	dated:	2021-06-03

Samples receiving date:	2021-06-29			
Tests date:	from:	2021-07-08	to:	2021-07-12

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Laboratory Manager




This document does not include any attachments.

00	2021-08-02	Formal issue
Rev.	Date	Description

*Results of tests and controls reported in this document refer only to samples as tested and described.
It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.
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1. PURPOSE

Purpose of this document is to contain results of the tests, measurements and verifications performed to assess the compliance of the samples under test, as identified and described in paragraph 3, to requirements of the standards listed in paragraph 2.

2. APPLICABLE DOCUMENTS

In the following of this test report, the “applicable documents” will be indicated without date and/or edition number and/or amendments.

2.1 REFERENCE DOCUMENTS

The tests are performed in compliance with the documents listed below:

Document	Title
EN 60529:1991 + EC:1993 + A1:2000 + A2:2013 + EC:2016 + A2/EC:2019	Degree of protection provided by enclosures (IP Code)

2.2 TEST METHODS

The reference standards listed in the ch. 2.1 require the use of the following basic standards that specify *how* the tests shall be performed. The dates of publication of the following basic standards are in conformity with the reference standards requirements.

In this case the reference standard contains the test method.

2.3 TEST PROCEDURES

Document	Title
INTEK 07 02 PP 041 PRE	Intek procedure for test IP first characteristic number
INTEK 07 02 PP 043 PRE	Intek procedure for test IP second characteristic number

2.4 OTHER DOCUMENTS

None.

3. SAMPLE INFORMATION

Unless otherwise specified, the technical data stated in this paragraph are declared by the customer/manufacturer or obtained from the product technical documentation.

3.1 DESCRIPTION

Identification data of samples under test are reported in the first page of this document.



Photo of the sample (external view 1)

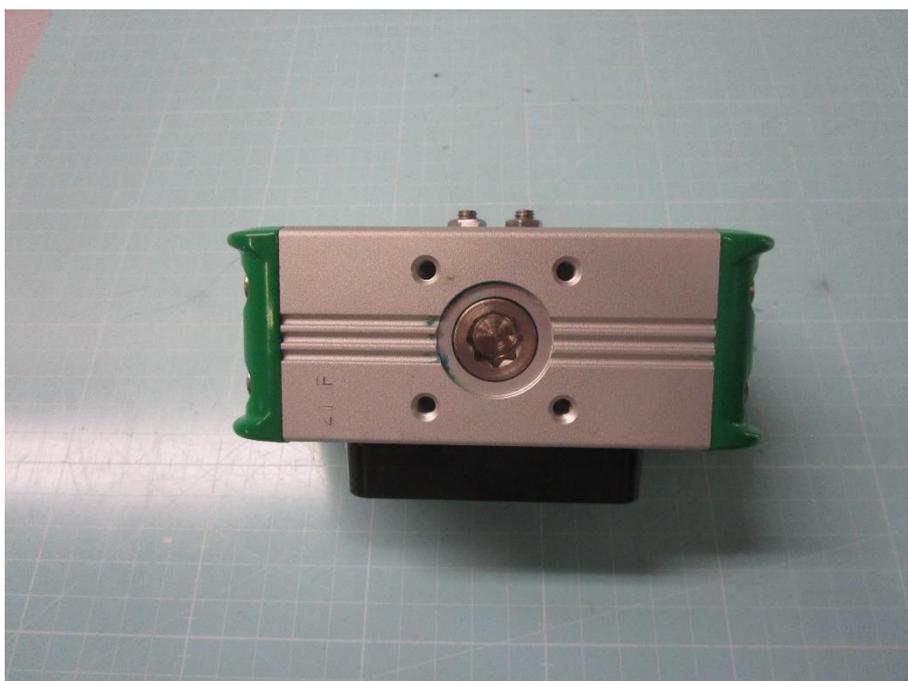


Photo of the sample (external view 2)



Photo of the sample (external view 3)



Photo of the sample (external view 4)

Note:
Marking plate was not available.

Marking plate / markings

Sample ID	Manufacturer	Model / Type	S/N or Lot No.
01 to 04	ACTUATECH S.p.A.	RP	N/A

Note: Only the tested objects are reported in this table.

3.1.1 TECHNICAL DATA

No technical data of test objects is relevant for the tests were performed and described in this document.

3.1.2 CLASSIFICATION

Based on the definition given by the applicable documents the test sample is classified as:

Category:

- 1
 2

3.1.3 ADDITIONAL INFORMATION

None.

3.2 SAMPLES / AUXILIARY EQUIPMENT ORIGIN

The test laboratory does not perform sampling.

Item	Delivered to LAB by ¹	No. of samples		Internal selection method		
		Received	Tested ²	N/A	Random	Other
Actuator	Customer	4	4	X	/	/

¹ Manufacturer / Customer / Applicant / Unknow / Other (to specify)

² See chapter 5.1 for more details related to tests performed on different samples and the test sequence.

4. TEST INFORMATION

4.1 CONDITIONS DURING THE TESTS

4.1.1 PERSONNEL

Tests performed by: **Cristiano Bellanca (Intek S.p.A) for all the tests**

4.1.2 MODIFICATIONS TO SAMPLES

Test samples were not modified during the tests.

4.1.3 ENVIRONMENTAL CONDITIONS

The laboratory environmental conditions are recorded during the tests and for each test, the ranges that the laboratory ensures are listed in the relative paragraph. These ranges are in conformity to the limits prescribed by the reference standards.

The measurement uncertainties are given with expanded uncertainty with a level of confidence of 95% (k=2)

4.1.4 CONVENTIONS

If applicable, on the right of each chapter or paragraph is written the number of the chapter or paragraph of reference Standard in the form: § number.

Throughout this report a **comma** is used as the decimal separator.

4.1.5 ABBREVIATIONS

N/A = Not Applicable

N/Av = Not Available

N/D = Not Declared

N/R = Not Required (by the applicant, customer or manufacturer)

No. = Number

F = Fail

P = Pass

TR = Test Report

EUT = Equipment Under Test

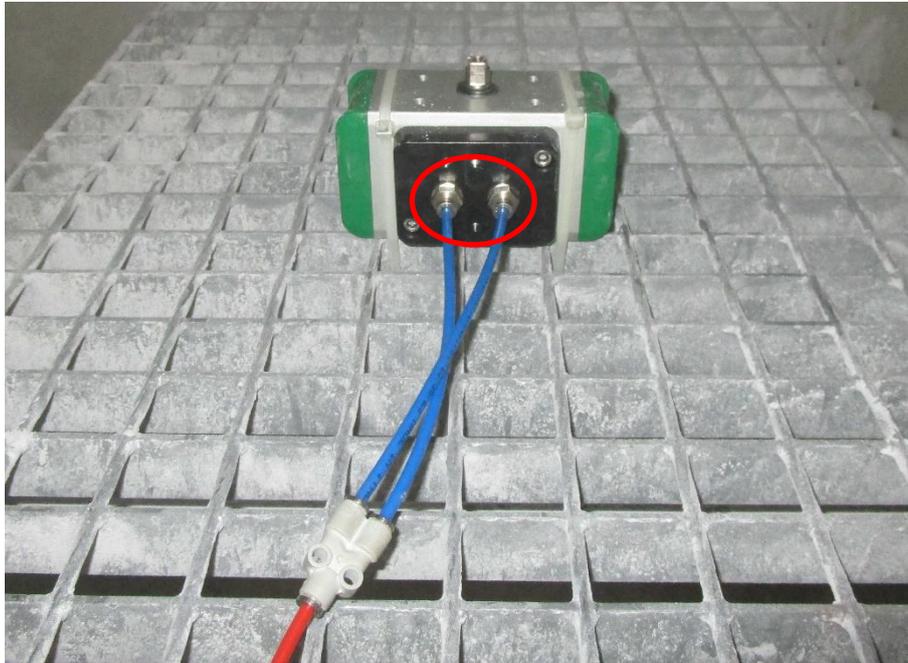
NCR = No Calibration Required

x ... y = from x to y

4.2 CONFIGURATION MODES

During the tests the sample was configured following the methods and the procedures specified in the reference documents.

For the IP6X test, the depression was applied in **these points**.



For the IPX8, IPX7 and IPX6 tests, were mounted, on the air holes, **two caps**.



4.2.1 AUXILIARY EQUIPMENT DESCRIPTION

Supporting equipment used during testing: none.

4.3 CRITERIA ADOPTED FOR COMPLIANCE EVALUATION

If applicable for compliance evaluation of the test results and considering the uncertainty values of the tests, the Laboratory adopts the following criteria:

- the reference standard specifies uncertainty for measurements:
 - measurements uncertainty permitted, or
 - instruments accuracy, or
 - application of measurements uncertainty to the measured values,
 in this case the measurement complies with the requirement if the measured value is within the limits, or with the correction due to the Laboratory uncertainty.

- the reference standard doesn't specify uncertainty for measurements or particular requirements of the instrumentation: in this case the Laboratory uses the following scheme:

	Case A	Case B	Case C	Case D
Specified upper limit Specified lower limit				
	Pass	Pass	Fail	Fail

For Case B the result is considered to comply with the requirements only if the measured result (♦) is within the limits of the standard.

5. TEST RESULTS

Ch. TR	Test (#1)	Reference	Result (+)
6.1	Verification of degree of protection IP6X	EN 60529, cl. 12, 13.4 - 13.6	PASS
6.2	Verification of degree of protection IPX8 (100 m for 60 min)	EN 60529, cl. 14.2.8 (*)	PASS
6.3	Verification of degree of protection IPX7	EN 60529, cl. 14.2.7	PASS
6.4	Verification of degree of protection IPX6	EN 60529, cl. 14.2.6	PASS

Notes:

(+) The criteria by which the results are expressed are given in the standards and/or in the Customer specification listed in paragraph 2 of this test report.

#1 See ch. 4.2 for configuration.

(*) This test is not under ACCREDIA accreditation.

5.1 SAMPLES CORRELATION / TEST SEQUENCE

The samples are sequentially subjected to the tests described in the following table.

Seq.	Test	Date (from-to)	Sample ID	Remarks
1	Verification of degree of protection IP6X	2021-07-09	04	None
2	Verification of degree of protection IPX8 (100 m for 60 min)	2021-07-08	02	None
3	Verification of degree of protection IPX7	2021-07-09	01	None
4	Verification of degree of protection IPX6	2021-07-09	03	None

5.2 TEST METHOD DEVIATIONS

Test methods described in the reference document are adopted without any deviation.

5.3 OPINIONS AND INTERPRETATIONS

None.

6. TESTS PERFORMED**6.1 VERIFICATION OF DEGREE OF PROTECTION IP6X**

The test is performed according to requirements of standards listed on chapter 2.	
Test reference:	EN 60529, clause 12, 13.4 - 13.6
Test method:	
Test procedure:	INTEK 07 02 PP 041 PRE

6.1.1 TEST PARAMETERS**Protection against access to hazardous parts**

Sample ID	04
Test probe	test wire \varnothing 1 mm
Application position	against any possible opening
Applied force	1 N \pm 10%

Acceptance criteria:

The test wire of 1,0 mm \varnothing shall not penetrate and adequate clearance shall be kept.

Protection against solid foreign access

Sample ID	04
Enclosure category	1
Extraction rate	/
Measured depression	20 mbar
Test duration	8 h

Acceptance criteria:

The protection is satisfactory if no deposit of dust is observable inside the enclosure at the end of the test.

6.1.2 ENVIRONMENTAL CONDITIONS OF THE TEST SITE

Temperature:	(23,0 \pm 5) °C
Relative humidity:	(50 \pm 25) %
Atmospheric press.:	(960 \pm 100) mbar

6.1.3 SUMMARY OF RESULTS

Sample ID	Description	Result
04	Verification of degree of protection IP6X	The test probe did not penetrate and was kept adequate clearance. At the end of the test no traces of dust were visible inside the enclosure.

Notes: /

6.1.4 TEST INSTRUMENTATION

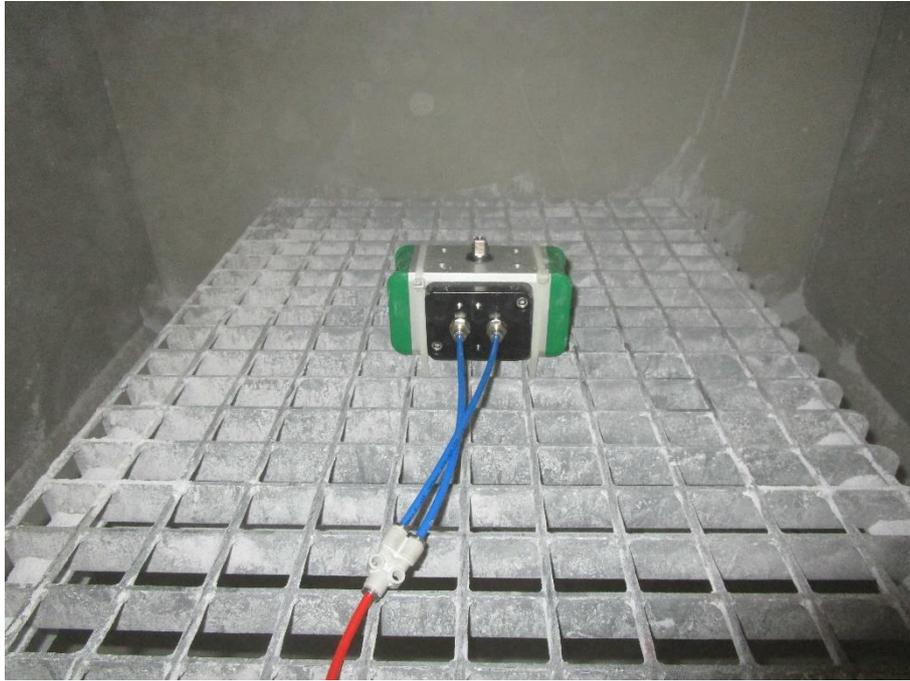
Description	Manufacturer	Model	Intek ID	Last Calibration	Calibration due
Dust chamber	ATS di Galbusera	03.01	0049 F	NCR	NCR
Talcum	L'Aprochimide	Talco HM4	0945 U	2018-03	2022-03
Volume counter	Elster	G4/6	1349 P	2021-02	2022-02
Test sieve for dust chamber	Endecotts	75 Mic.	0835 P	2021-05	2021-11
Vacuum	F.Ili Magni	-40 mbar	0956 P	2021-01	2022-01
Digital dynamometer	Sauter	FH 50	1467 P	2020-10	2021-10
IP4X test probe	ATS di Galbusera	01.12	0604 P	2021-01	2023-01
Chronometer	RS	278698	0853 P	2021-04	2022-04
Thermo/hygrometer	DeltaOhm	HD35EDL1NTVI	1048 P	2021-02	2022-02
Barometer	Fischer	/	0224 P	2019-01	2023-01

6.1.5 MEASUREMENT UNCERTAINTY

Values of expanded uncertainty are given with a level of confidence of 95 % ($k = 2$):

Measure	Uncertainty U
Force from 1 N to 50 N	2,0 %
Time	1,0 %
Pressure until -40 mbar	5,0 %

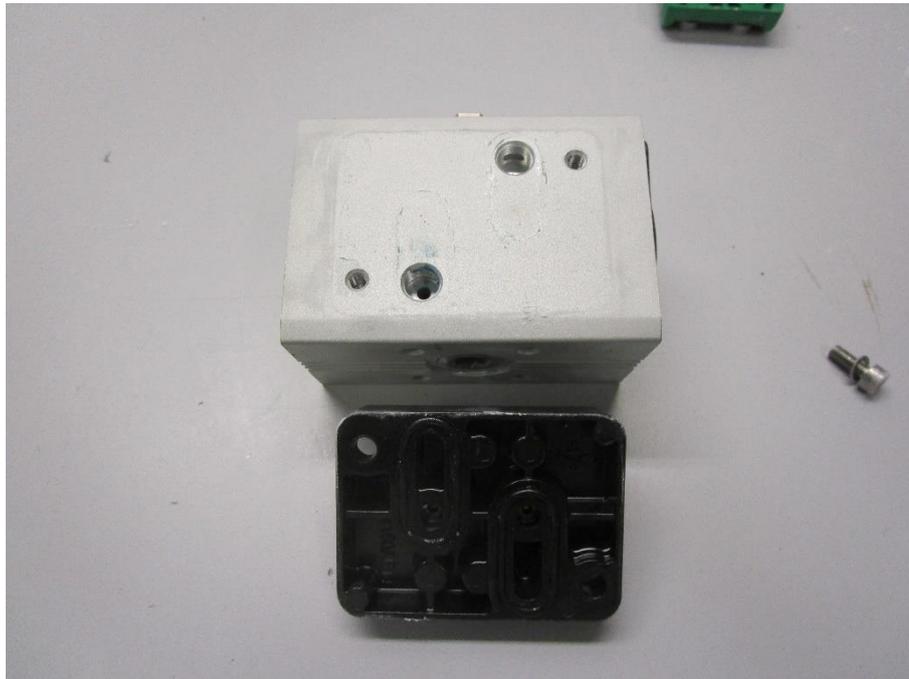
6.1.6 GRAPHS AND PHOTOGRAPHS



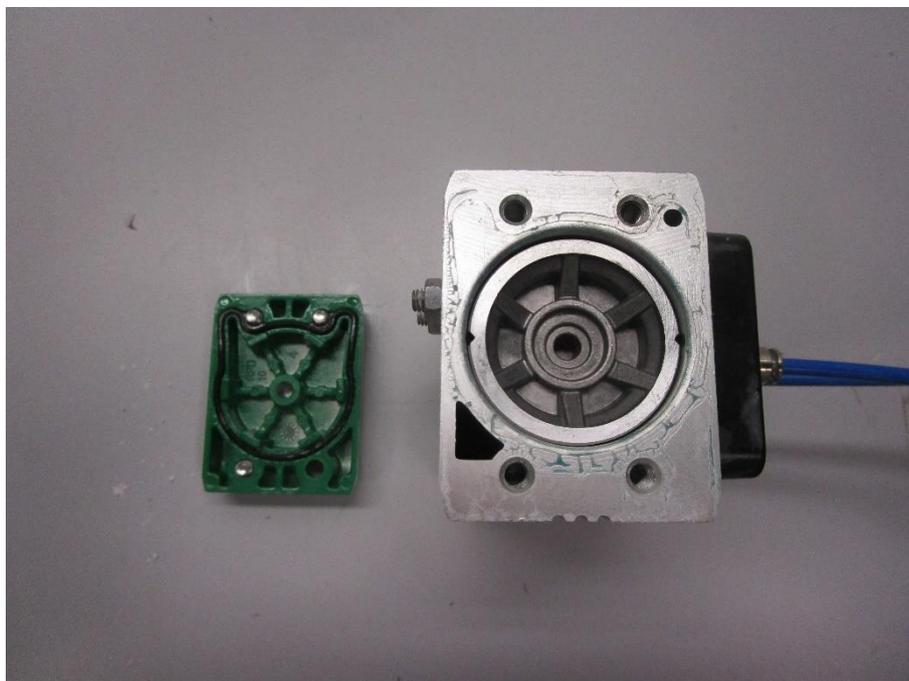
1 - Photo of test set-up



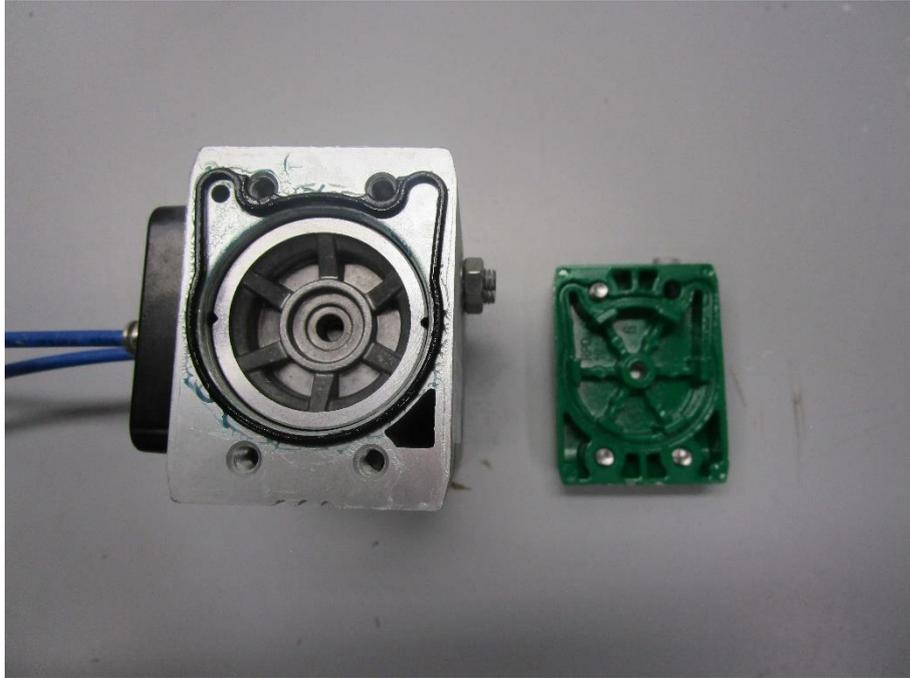
2 - Photo of test result



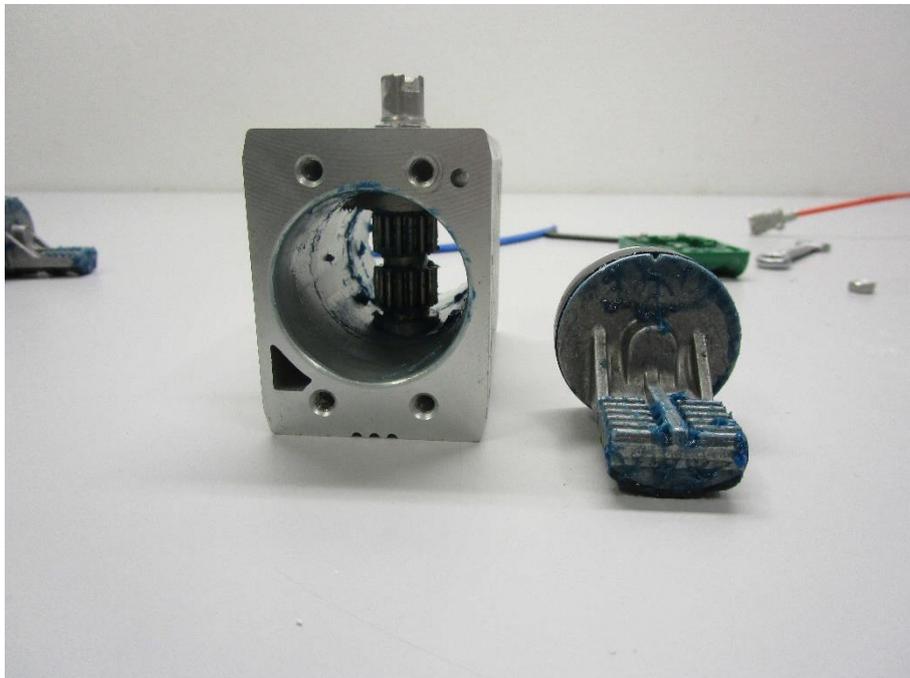
3 - Photo of test result



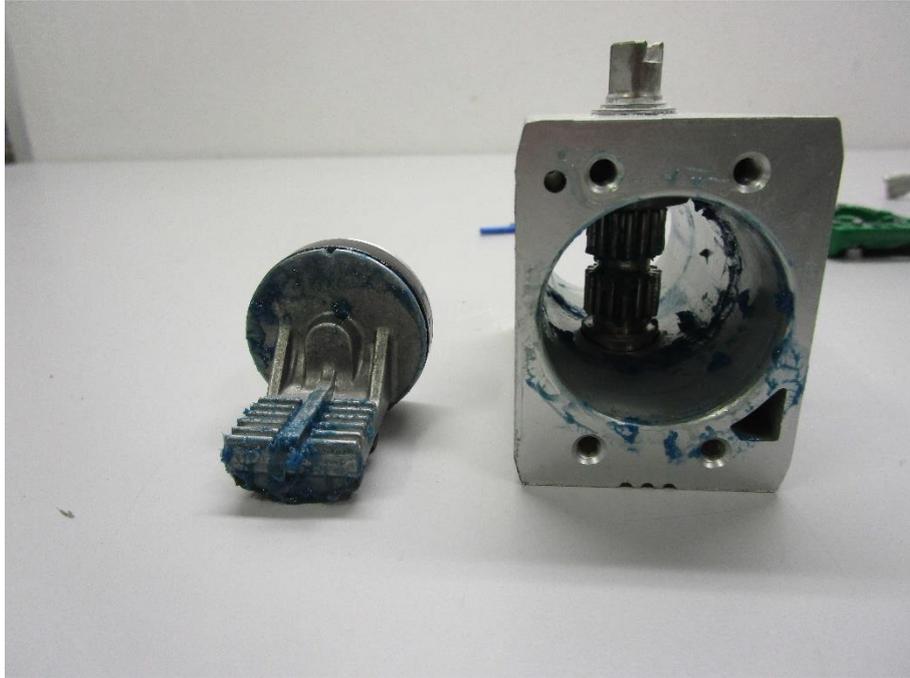
4 - Photo of test result



5 - Photo of test result



6 - Photo of test result



7 - Photo of test result

6.2 VERIFICATION OF DEGREE OF PROTECTION IPX8 – 100 m for 60 min

The test is performed according to requirements of standards listed on chapter 2.	
Test reference:	EN 60529, clause 14.2.8
Test method:	
Test procedure:	N/A

6.2.1 TEST PARAMETERS

Sample ID	02
Immersion deep	100 m
Test duration	60 min

Acceptance criteria:

In general, if any water has entered, it shall not:

- be sufficient to interfere with the correct operation of the equipment or impair safety;
- deposit on insulation parts where it could lead to tracking along the creepage distances;
- reach live parts or windings not designed to operate when wet;
- accumulate near the cable end or enter the cable if any.

If the enclosure is provided with drain-holes, it should be proved by inspection that any water which enters does not accumulate and that it drains away without doing any harm to the equipment.

6.2.2 ENVIRONMENTAL CONDITIONS OF THE TEST SITE

Temperature:	(23,0 ± 5) °C
Relative humidity:	(50 ± 25) %
Atmospheric press.:	(960 ± 100) mbar

6.2.3 SUMMARY OF RESULTS

Sample ID	Description	Result
02	Verification of degree of protection IPX8 (100 m for 60 min)	At the end of the test no traces of water were visible inside the enclosure.

Notes: /

6.2.4 TEST INSTRUMENTATION

Description	Manufacturer	Model	Intek ID	Last Calibration	Calibration due
Tank for diving	Climat	500 l	0694 N	NCR	NCR
Manometer 16,0 bar	Climat	16 Bar	0848 P	2020-08	2021-08
Chronometer	RS	278698	0853 P	2021-04	2022-04
Thermo/hygrometer	DeltaOhm	HD35EDL1NTVI	1047 P	2021-02	2022-02
Barometer	Fischer	/	0224 P	2019-01	2023-01

6.2.5 MEASUREMENT UNCERTAINTY

Values of expanded uncertainty are given with a level of confidence of 95 % ($k = 2$):

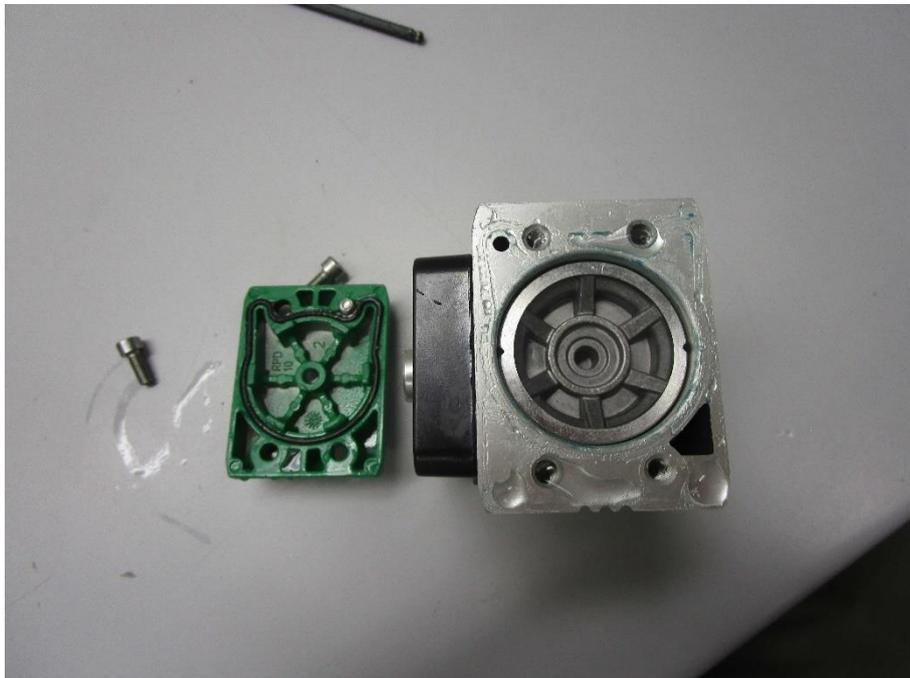
Measure	Uncertainty U
Immersion deep fox IPX8	1,0 %
Time	1,0 %

6.2.6 GRAPHS AND PHOTOGRAPHS

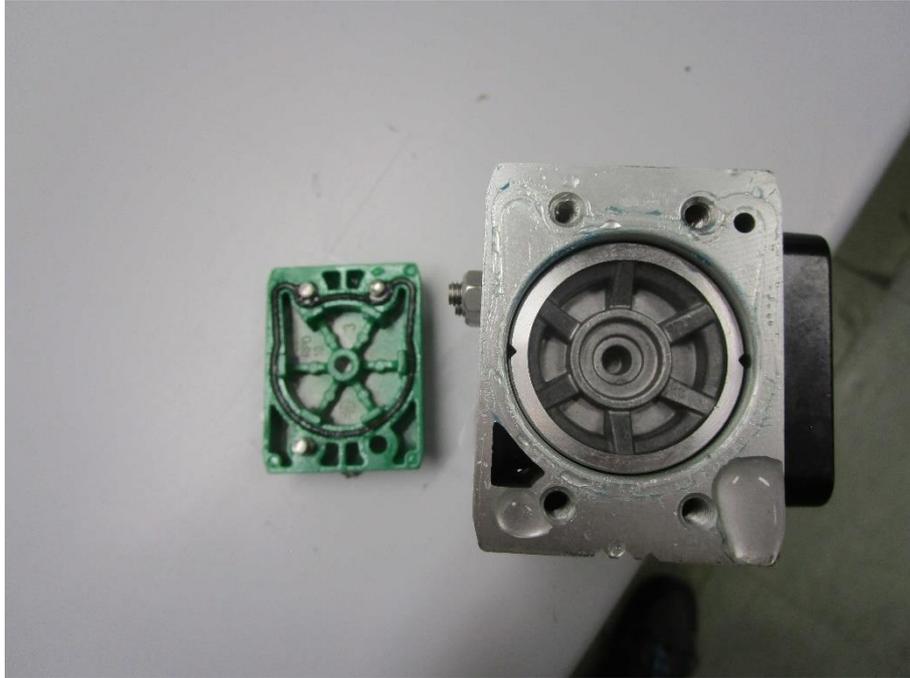
8 - Photo of test set-up



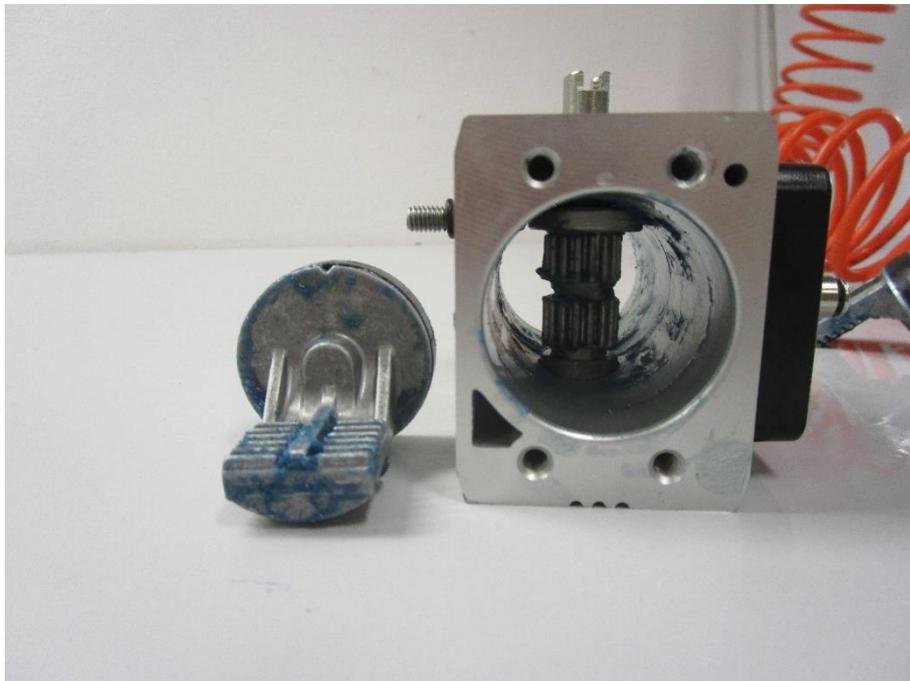
9 - Photo of test result



10 - Photo of test result



11 - Photo of test result



12 - Photo of test result



13 - Photo of test result

6.3 VERIFICATION OF DEGREE OF PROTECTION IPX7

The test is performed according to requirements of standards listed on chapter 2.	
Test reference:	EN 60529, clause 14.2.7
Test method:	
Test procedure:	INTEK 07 02 PP 043 PRE

6.3.1 TEST PARAMETERS

Sample ID	01
Lowest point from water surface	1000 mm
Test duration	30 min

Acceptance criteria:

In general, if any water has entered, it shall not:

- be sufficient to interfere with the correct operation of the equipment or impair safety;
- deposit on insulation parts where it could lead to tracking along the creepage distances;
- reach live parts or windings not designed to operate when wet;
- accumulate near the cable end or enter the cable if any.

If the enclosure is provided with drain-holes, it should be proved by inspection that any water which enters does not accumulate and that it drains away without doing any harm to the equipment.

6.3.2 ENVIRONMENTAL CONDITIONS OF THE TEST SITE

Temperature:	(23,0 ± 5) °C
Relative humidity:	(50 ± 25) %
Atmospheric press.:	(960 ± 100) mbar

6.3.3 SUMMARY OF RESULTS

Sample ID	Description	Result
01	Verification of degree of protection IPX7	At the end of the test no traces of water were visible inside the enclosure.

Notes: /

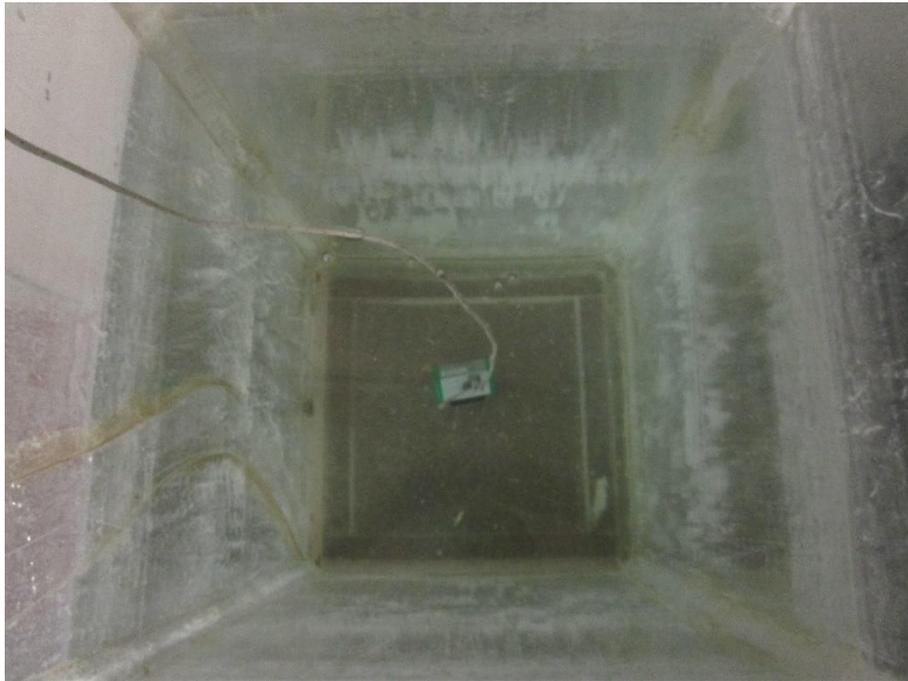
6.3.4 TEST INSTRUMENTATION

Description	Manufacturer	Model	Intek ID	Last Calibration	Calibration due
Tank for immersion test	Intek	/	0087 N	NCR	NCR
Chronometer	RS	278698	0853 P	2021-04	2022-04
Measuring tape	BMI Radius	20 m	0695 P	2018-01	2022-01
Thermo/hygrometer	DeltaOhm	HD35EDL1NTVI	1047 P	2021-02	2022-02
Barometer	Fischer	/	0224 P	2019-01	2023-01

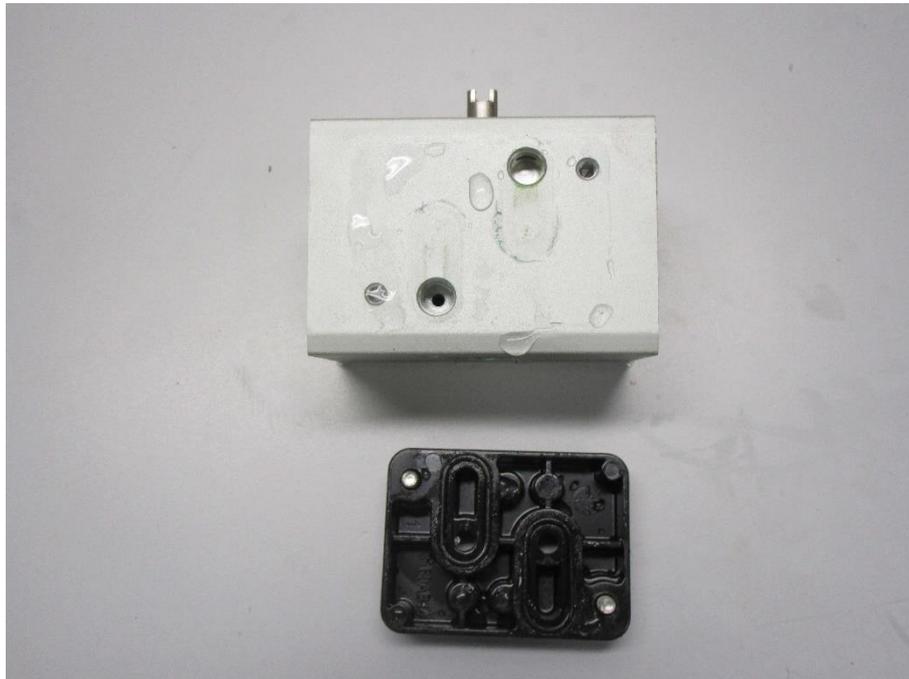
6.3.5 MEASUREMENT UNCERTAINTY

Values of expanded uncertainty are given with a level of confidence of 95 % ($k = 2$):

Measure	Uncertainty U
Immersion deep fox IPX7	20 mm
Time	1,0 %

6.3.6 GRAPHS AND PHOTOGRAPHS

14 - Photo of test set-up



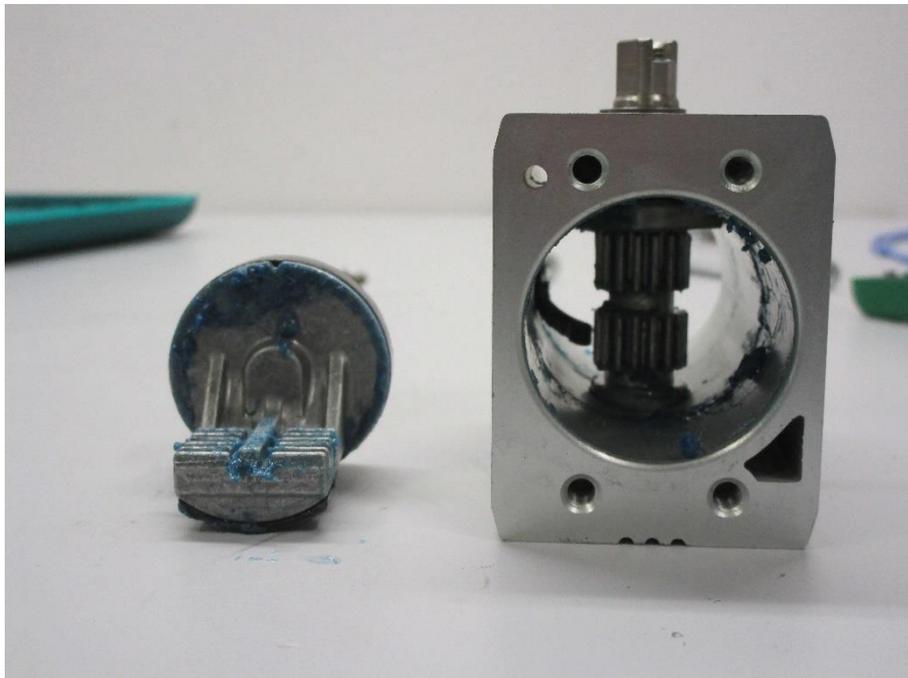
15 - Photo of test result



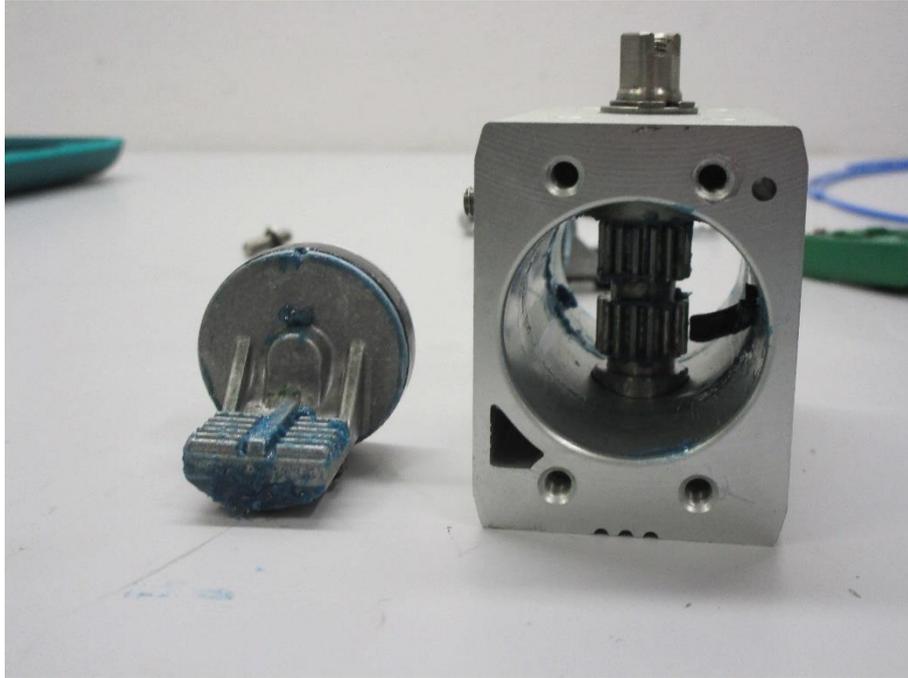
16 - Photo of test result



17 - Photo of test result



18 - Photo of test result



19 - Photo of test result

6.4 VERIFICATION OF DEGREE OF PROTECTION IPX6

The test is performed according to requirements of standards listed on chapter 2.	
Test reference:	EN 60529, clause 14.2.6
Test method:	
Test procedure:	INTEK 07 02 PP 043 PRE

6.4.1 TEST PARAMETERS

Sample ID	03
Delivery rate	100 l/min
Test duration	3 min
Distance from nozzle to the sample	between 2500 and 3000 mm

Acceptance criteria:

In general, if any water has entered, it shall not:

- be sufficient to interfere with the correct operation of the equipment or impair safety;
- deposit on insulation parts where it could lead to tracking along the creepage distances;
- reach live parts or windings not designed to operate when wet;
- accumulate near the cable end or enter the cable if any.

If the enclosure is provided with drain-holes, it should be proved by inspection that any water which enters does not accumulate and that it drains away without doing any harm to the equipment.

6.4.2 ENVIRONMENTAL CONDITIONS OF THE TEST SITE

Temperature:	(23,0 ± 5) °C
Relative humidity:	(50 ± 25) %
Atmospheric press.:	(960 ± 100) mbar

6.4.3 SUMMARY OF RESULTS

Sample ID	Description	Result
03	Verification of degree of protection IPX6	At the end of the test no traces of water were visible inside the enclosure.

Notes: /

6.4.4 TEST INSTRUMENTATION

Description	Manufacturer	Model	Intek ID	Last Calibration	Calibration due
Water jet hose nozzle Ø 12,5 mm	ATS di Galbusera	03.23	0027 P	2020-06	2022-06
Water flowmeter 130 l/min	CVC	D7	0025 P	2020-11	2022-05
Target	Nuova Fusap	120 mm	0961 L	NCR	NCR
Chronometer	RS	278698	0853 P	2021-04	2022-04
Measuring tape	BMI Radius	20 m	0695 P	2018-01	2022-01
Thermo/hygrometer	DeltaOhm	HD35EDL1NTVI	1047 P	2021-02	2022-02
Barometer	Fischer	/	0224 P	2019-01	2023-01

6.4.5 MEASUREMENT UNCERTAINTY

Values of expanded uncertainty are given with a level of confidence of 95 % ($k = 2$):

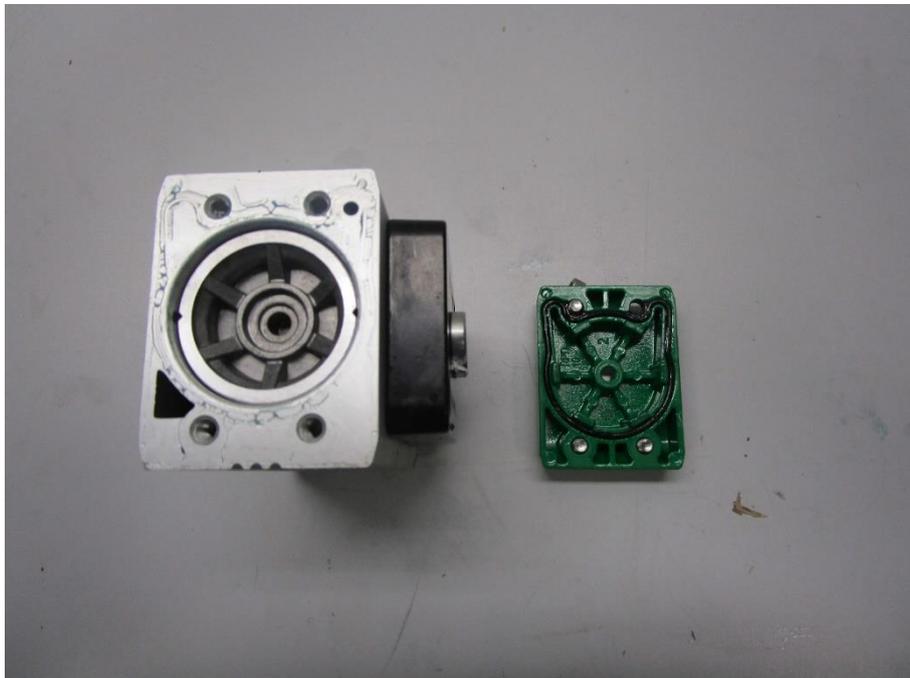
Measure	Uncertainty U
Water flow	4,5 %
Linear dimension > 20 mm	0,5 %
Time	1,0 %

6.4.6 GRAPHS AND PHOTOGRAPHS

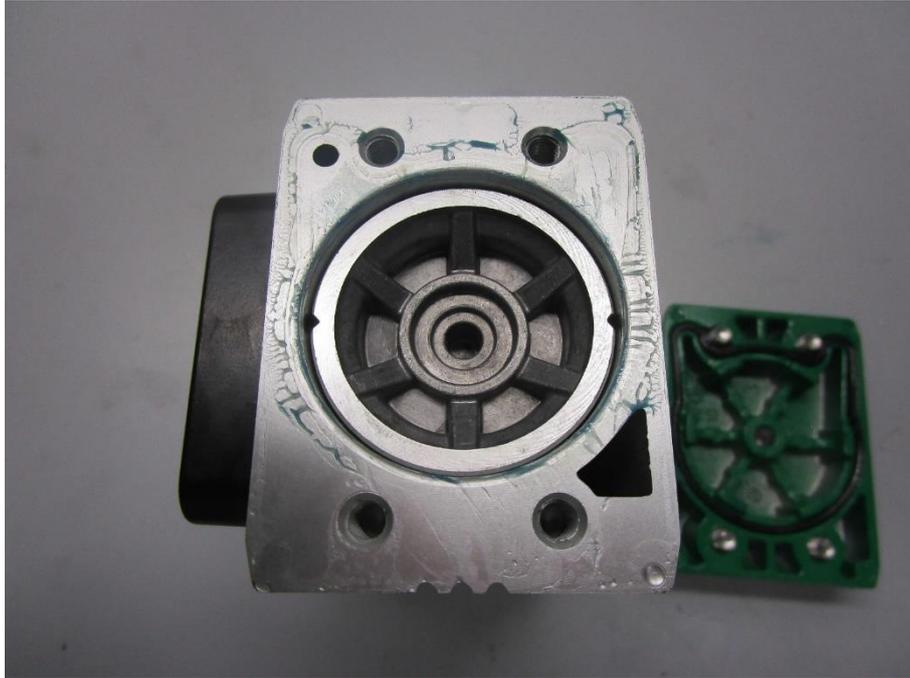
20 - Photo of test set-up



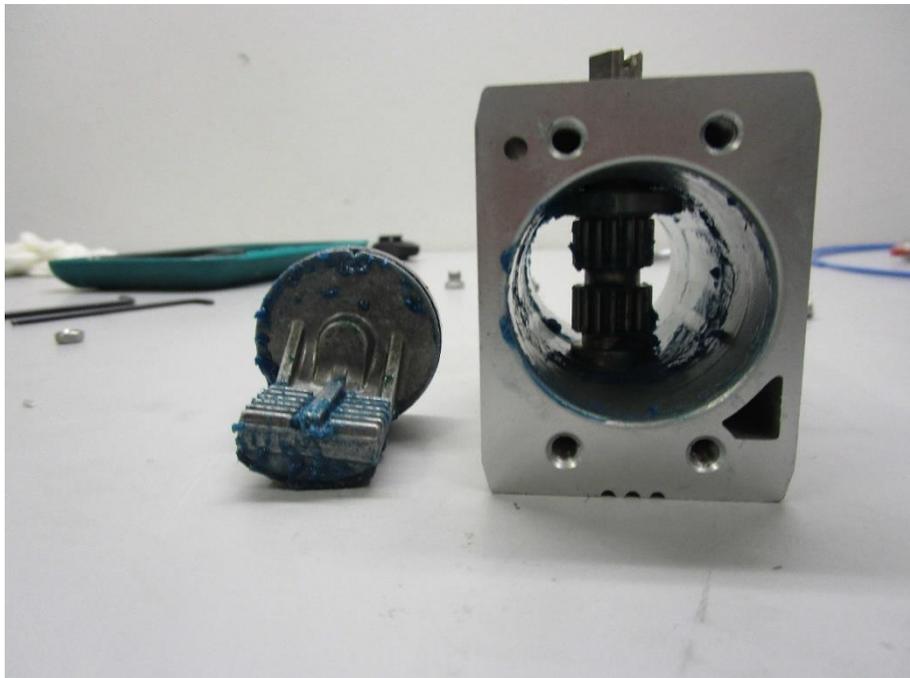
21 - Photo of test result



22 - Photo of test result



23 - Photo of test result



24 - Photo of test result



25 - Photo of test result

7. TEST INSTRUMENTATION

The Laboratory guarantees that all the test instruments and accessories are within the valid calibration period and satisfy all requirements of standard ISO/IEC 17025:2017.

7.1 INSTRUMENTATION ACCURACY

If reference standard doesn't specify otherwise, accuracy of used instruments is in accordance with the limits listed in the IEC operational document - IEC EE OD-5014 ed. 1.0 "Instrument Accuracy Limit".

8. DOCUMENTATION

List of documentation supplied to the laboratory: no document was necessary to acquire for the execution of the tests.

9. ANNEXES LIST

None.

End of test report.