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|    | TEST REPORT RP020018 | |
| | Artificial atmospheres for aluminium pump with coating | |
| | 30/05/2018 | Page 1 of 8 |

| | | | |
|---|--|--|--|
| CUSTOMER Cliente | OBL srl, a unit of IDEX Corp Via Kennedy, 12 20090 Segrate (MI) Italia | | |
| CONTRACT Commessa | CO012418- 25/05/2018 | | |
| TEST REPORT Rapporto di Prova | RP020018 Artificial atmospheres for aluminium pump with coating | | |
| APPLICABLE STANDARDS Norme di riferimento | <ul style="list-style-type: none"> ➤ EN ISO 9227:2017 Corrosion tests in artificial atmospheres – Salt spray tests ➤ EN 60068-2-14:2009 Environmental testing – Change of temperature ➤ EN 60068-2-30:2005 Environmental testing – Damp heat, cyclic (12h + 12h cycle) | | |
| Date Data | Prepared by Redazione | Verified by Verifica Tecnica | Approved by Autorizzazione |
| 30/05/2018 | Laboratory Technician <i>Marzio Troncone</i> | Assistant Manager Eleonora Andrea Basso | General Manager <i>Michele Setaro</i> |
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| | | |
|---|---|-------------|
|    | TEST REPORT RP020018 | |
| | Artificial atmospheres for aluminium pump with coating | |
| | 30/05/2018 | Page 2 of 8 |

| INDEX | Page nr. |
|--|-----------------|
| 1. GENERAL REMARKS | 3 |
| 1.1 Customer data | 3 |
| 1.2 Identification of equipment and/or subsystem under test (EUT) | 3 |
| 1.3 Sampling | 3 |
| 2. SCOPE | 3 |
| 3. APPLICABLE DOCUMENTS | 3 |
| 3.1 Reference Standards and Documents | 3 |
| 3.2 Applicable internal procedures of Laboratory | 4 |
| 3.3 Applicability | 4 |
| 3.4 Definitions and glossary of terms | 4 |
| 4. TECHNICAL COMPETENCE | 4 |
| 5. TEST EQUIPMENT USED | 4 |
| 6. TEST PERFORMED | 5 |
| 6.1 General | 5 |
| 6.1.1 Test site | 5 |
| 6.1.2 List and description of tests | 5 |
| 6.1.3 Measurement uncertainty | 5 |
| 6.2 Corrosion tests in artificial atmospheres - Salt spray tests | 5 |
| 6.2.1 Control of pH and salt spray solution collected | 7 |
| 6.3 Thermal Shock | 7 |
| 6.4 Thermal Cycle | 8 |
| 6.5 Tests Results | 8 |

| | | |
|---|---|-------------|
|    | TEST REPORT RP020018 | |
| | Artificial atmospheres for aluminium pump with coating | |
| | 30/05/2018 | Page 3 of 8 |

1. GENERAL REMARKS

1.1 Customer data

| | |
|-----------|-------------------------------------|
| Customer: | OBL srl, a unit of IDEX Corp |
| Address: | Via Kennedy, 12 20090 Segrate MI |

1.2 Identification of equipment and/or subsystem under test (EUT)

| EUT nr | Acceptance code | Description | Receiving date |
|--------|-----------------|---------------------------------------|----------------|
| 1 | AC015118/1 | Pump in aluminium, with black coating | 25/05/2018 |



Figure 1 EUT

1.3 Sampling

All test results are related on the samples tested by the test laboratory, taken from production by the Customer. The extension of test results to the entire production is responsibility of manufacturer/importer.

2. SCOPE

Test and measurements scope is to provide to the Customer useful indications in order to evaluate EUT compliance with reference standards; the test plan has been requested by Customer.

3. APPLICABLE DOCUMENTS

3.1 Reference Standards and Documents

| | |
|-------------------------------|---|
| EN ISO 9227:2017 | Corrosion tests in artificial atmospheres |
| CEI EN 60068-2-14:2011 | Environmental testing part 2-14 – Change of temperature |
| CEI EN 60068-2-30:2005 | Environmental testing part 2-30 – Damp heat, cyclic (12h + 12h cycle) |

| | | |
|---|---|-------------|
|    | TEST REPORT RP020018 | |
| | Artificial atmospheres for aluminium pump with coating | |
| | 30/05/2018 | Page 4 of 8 |

3.2 Applicable internal procedures of Laboratory

| | |
|---------------------|--|
| PP0005 rev.5 | Prova di resistenza alla corrosione in nebbia salina |
| PP0010 rev.4 | Prove climatiche |

3.3 Applicability

Test Plan is shown in paragraph 6.1.2 of this test report.

3.4 Definitions and glossary of terms

- EUT: Equipment Under Test
- C: In compliance with reference Standard
- NC: Not in compliance with reference Standard

4. TECHNICAL COMPETENCE

Technicians, assigned to execute the tests described in this Test Report, have been qualified as required by Quality System of Tecnolab del Lago Maggiore s.r.l.

5. TEST EQUIPMENT USED

| Tecnolab code | Description | Constructor | Model |
|----------------------|---|------------------------------|--|
| STACH012 | Conductivimeter | Xs Instruments | Cond 7 |
| STACH008 | pHmeter | Testo | 206 ph3 |
| STPRE040 | Manometer | Ferrari | 63 MMP - 1/4" BSP |
| STMAS002 | Electronic scale | Sartorius | AC210P |
| STMAS003 | Electronic scale | Sartorius | BP4100 |
| STSCA009 | Salt spray chamber | Angelantoni Industrie S.p.A. | DCTC 500 |
| STSCA005 | Climatic chamber T(-40+180°C) R.H.(5 - 98%) | Angelantoni | HYGROS 1200 |
| STSCA008 | Shock chamber (-80+220°C) | VOTSCH | VT 7012 S2 |
| STCMP055 | Calibration solutions pH4 and pH7 | Chemifarm | CHFISOPH004300 S039210415PH040617 CHFSITPH007300 S040040515PH070617 |
| STSML013 | Luxmeter | Delta Ohm | HD 2302.0 |
| STVOL018 | Graduated cylinder 50 ml cl B | n.d | n.d |
| STAUS024 | Water softener | n.d | n.d |
| ST AOT 004 | Lamps and stand | n.d | n.d |

| | | |
|--|---|-------------|
| | TEST REPORT RP020018 | |
| | Artificial atmospheres for aluminium pump with coating | |
| | 30/05/2018 | Page 5 of 8 |

6. TEST PERFORMED

6.1 General

6.1.1 Test site

Tests were performed at laboratory Tecnolab del Lago Maggiore S.r.l., Via dell'Industria 20, 28924 Verbania Fondotoce (VB) ITALY.

6.1.2 List and description of tests

| Test | Applicable Standard | Paragraph of this Test Report | EUT | Test result |
|--|------------------------|-------------------------------|-----|-------------|
| Corrosion tests in artificial atmospheres - Salt spray tests | EN ISO 9227:2017 | 6.2 | 1 | C |
| Thermal Shock | CEI EN 60068-2-14:2011 | 6.3 | 1 | C |
| Thermal Cycle | CEI EN 60068-2-30:2005 | 6.4 | 1 | C |

6.1.3 Measurement uncertainty

The measurement uncertainties stated in this document are expressed as expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $K = 2$ corresponds to a confidence level of about 95%.

6.2 Corrosion tests in artificial atmospheres - Salt spray tests

| | |
|-----------------------------|-------------------------|
| Test date: | 22/05/2018 – 29/05/2018 |
| Reference Standard: | EN ISO 9227:2017 |
| EUT: | 1 - body |
| Salt used | |
| Product Name | Sodium chloride, P.A. |
| Product Number | 47968 |
| Molecular Formula | NaCl |
| Molecular Weight | 58.44 |
| C.A.S number | 7647-14-5 |
| Iodide | < 0,1 %. |
| Copper + Zinc + Lead | < 0,005 % |
| Purity title | Min 99,7 % |
| Total impurities | Max. 0,3% |

| | |
|------------------------------------|--|
| Test parameters: | <p>Corrosion rate: $70 \pm 11,9 \text{ g/m}^2$ Room temperature: $35 \pm 2 \text{ }^\circ\text{C}$ NaCl concentration: 15 % * Range pH: 6,5 -7,2</p> <p>The salt spray must be collected in two containers of 80 cm² of horizontal collecting surface (10 cm in diameter), the amount of collected solution should be between 1 and 2 ml/hour. Control pH and sprayed solution collected: See Paragraph 6.2.1</p> <p><u>Duration of treatment:</u> 168 hours of exposure to salt spray</p> |
| Criterion of acceptability: | <p>Each sample before being subjected to visual inspection must be thoroughly rinsed using distilled water and subsequently dried. The condition of the samples is detected by recording the presence of corrosion points, detachment of the coatings and any damage.</p> |
| Test set-up: | <p>The samples are washed with distilled water and placed in saline fog at an angle of 20° from the vertical or hanging by inert warp. See Figure 2 for the set-up test.</p> |
| Results: | See Paragraph 6.2.2 |
| Corrosion rate: | 84 g/m ² for 48 h |

* In accordance with the Client's request, the test was performed under more intense conditions than required by the reference standard EN ISO 9227:2017 : the concentration of sodium chloride solution used for saline fog has been increased from the 5% defined by the reference standard up to 15%.



Figure 2 - Test set up

6.2.1 Control of pH and salt spray solution collected

| Test conditions (Average) | |
|--------------------------------------|------|
| Room Temperature (°C) | 34,8 |
| Water Conductivity (µS/cm) | 6,8 |
| Initial Solution Concentration (g/l) | 150 |
| Initial Solution pH | 6,94 |
| ml/h collected | 1.1 |
| Collected solution pH | 6,92 |
| Collected solution Temperature (°C) | 25 |

6.3 Thermal Shock

| | |
|--------------------------|---|
| Test date: | 22.05.2018 – 24.05.2018 |
| EUT: | 1 - base |
| Test description: | Severity: <ul style="list-style-type: none"> • Tmax: + 80°C • Tmin: - 20°C • Dwell time: 15 min • Cycles: 96 EUT Supplied /Functioning : NO |
| Test set-up: | EUT is disposed in the volumetric center of the chamber. Fixing method and supports: Test set-up is shown in Figure 3 |



Figure 3 - Test set up

6.4 Thermal Cycle

| | |
|--------------------------|---|
| Test date: | 22.05.2018 –24.05.2018 |
| EUT: | 1 - lid |
| Test description: | Severity: <ul style="list-style-type: none"> • T: +50°C • Tmin: -5°C • Relative umidity: 95% • Dwell time: 12 hours • Cycles: 2 EUT Supplied /Functioning : NO |
| Test set-up: | EUT is disposed in the volumetric center of the chamber. Fixing method and supports: Test set-up is shown in Figure 4 |

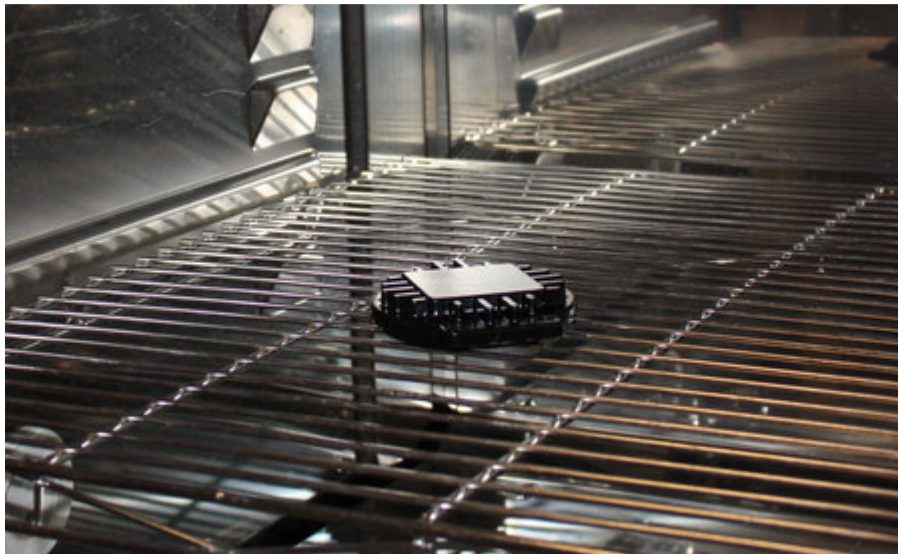


Figure 4 - Test set up

6.5 Tests Results

No one of the samples shows any spot of detachment of the coating.