



QUALIFICATION TEST REPORT RBK-ILS-125 TUBING

Tested in accordance with 108-120003, Revision A

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QUALIFICATION TEST REPORT

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| PRODUCT | RBK-ILS-125, Dual Wall, Black Tubing |
| SPECIFICATION | 108-120003, Revision A |
| REPORT NUMBER | 501-120291 |
| QUALIFICATION DATE | March 28, 2024 |
| TUBING BATCH NUMBERS | RBK-ILS-125-NR1-0-50MM, LOT# 23TR4226T RBK-ILS-125-NR1-0-STK, LOT# 23TR4226T RBK-ILS-125-NR3-0-65MM, LOT# 23TR4231T RBK-ILS-125-NR3-0-STK, LOT# 23TR4231T |
| TUBING MANUFACTURING SITE | Czech Republic |
| QUALIFICATION LABORATORIES | Swindon UK and Trutnov CZ |
| LAB BOOK / TSL NUMBER REFERENCE / PROJECT NUMBER IF AVAILABLE | Project Folder Number - 2981 TuTSL Number - 240056 |

CONCLUSION

The test results in the following table show that the product meets all the requirements of 108-120003, Revision A specification.

APPROVAL

Report approved electronically via PDMLink.

RBK-ILS-125 Tubing Qualification Report



| Test | Requirement | Results | |
|--|--|--------------------------|--------------------------|
| | | NR1 | NR3 |
| Dimensions, mm ASTM D2671-21 | | | |
| Supplied Inside Diameter | 5.75 Min. | 6.56 | -- |
| | 11.00 Min. | -- | 11.31 |
| Recovered Inside Diameter | 1.25 Max. | 1.00 | -- |
| | 2.40 Max. | -- | 2.01 |
| Recovered Jacket Inside Diameter | 2.65 Max. | 2.51 | -- |
| | 4.65 Max. | -- | 4.56 |
| Recovered Total Wall | 1.15 Min. | 1.44 | -- |
| | 1.80 Min. | -- | 2.27 |
| Recovered Jacket Wall | 0.60 Min. | 0.75 | -- |
| | 0.80 Min. | -- | 0.97 |
| Longitudinal Change, % ASTM D2671-21 | 0 to -10 | -7 | -3 |
| Inner Wall Flow | Total blocking (in at least one area of the splice length) | Pass | Pass |
| Split Resistance 10 mins. ± 30 sec. @ 200 ± 5°C | | | |
| Size NR1 use a 3/16" Mandrel OD | No splitting @ 200°C | Pass | Pass |
| Size NR3 use a 3/8" Mandrel OD | | | |
| Strain Relief, N Followed by test for: | 50 Min. | Pass | Pass |
| Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥2.29 x 10 ¹¹ | ≥8.17 x 10 ¹⁰ |
| Flammability ISO 6722-1:2011 | Self-extinguishing within 30 seconds | Pass (0 seconds) | Pass (0 seconds) |

RBK-ILS-125 Tubing Qualification Report



| Test | Requirement | Results | |
|---|---|--------------------------|--------------------------|
| | | NR1 | NR3 |
| Scrape Abrasion, cycles ISO 6722-1:2011 | NR1 500 Min. NR3 5,000 Min. | > 500 -- | -- > 5000 |
| Heat Ageing Long Term 3,000 hrs. @ 125 ± 3°C Followed by tests for: | | | |
| Visual | No cracking of tubing jacket | No cracking | No cracking |
| Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥3.42 x 10 ¹¹ | ≥2.16 x 10 ¹¹ |
| Tensile Strength, MPa ISO 37:2019 | 10.0 Min. | 18.8 | 20.3 |
| Ultimate Elongation, % ISO 37:2019 | 250 Min. | 467 | 513 |
| 2% Secant Modulus, MPa ASTM D882-18 | 137 Min. | 374 | 385 |
| Volume Resistivity, Ohm-cm ASTM D2671-21 | 1.00 x 10 ¹² Min. | 4.85 x 10 ¹⁴ | 3.18 x 10 ¹⁵ |
| Thermal Indentation * ISO 6722-1:2011 | Minimum of 40% residual wall thickness | 84.51% | 91.36% |
| Copper Mirror Corrosion ASTM D2671-21 | No corrosion of the copper mirror | Pass | Pass |
| Dielectric Strength, MV/m IEC 60243-1:2013 | 16.0 Min. | 20.7 | 23.2 |
| Specific Gravity ISO 1183-1:2019 | 1.20 Max. | 1.17 | 1.16 |
| Water Absorption, % ISO 62:2008 | 0.50 Max. | 0.19 | 0.15 |

RBK-ILS-125 Tubing Qualification Report



| Test | Requirement | Results | |
|---|------------------------------|--------------------------|--------------------------|
| | | NR1 | NR3 |
| Sequential Test Results | | | |
| Insulation Resistance Test, Ohms | 2.00 x 10 ⁸ Min. | ≥7.10 x 10 ¹⁰ | ≥4.20 x 10 ¹⁰ |
| Cold Impact 4 hrs. @ -40 ± 2°C ISO 6722-1:2011 Followed by tests for: | | | |
| Visual | No cracking of tubing jacket | No cracking | No cracking |
| Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥1.37 x 10 ¹¹ | ≥1.30 x 10 ¹¹ |
| Accelerated Heat Ageing 168 ± 2 hrs. @ 130 ± 5°C Followed by tests for: | | | |
| Visual | No cracking of tubing jacket | No cracking | No cracking |
| Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥4.00 x 10 ¹¹ | ≥1.32 x 10 ¹¹ |
| Thermal Shock 1 hr. ± 5 mins. @ 130 ± 5°C/30 ± 2 mins. @ 0 to 5°C (5 cycles) Followed by tests for: | | | |
| Visual | No cracking of tubing jacket | No cracking | No cracking |
| Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥3.01 x 10 ¹¹ | ≥3.18 x 10 ¹⁰ |
| Temperature Humidity Cycling Followed by test for: | | | |
| Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥1.74 x 10 ¹⁰ | ≥5.80 x 10 ⁹ |
| Mechanical Vibration IEC 60068-2-6 Followed by test for: | | | |
| Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥4.20 x 10 ⁹ | ≥3.60 x 10 ⁹ |

RBK-ILS-125 Tubing Qualification Report



| Test | Requirement | Results | |
|---|------------------------------------|--------------------------|--------------------------|
| | | NR1 | NR3 |
| Sequential Test Results | | | |
| Flex Test (Ambient) Followed by test for: | | | |
| Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥4.00 x 10 ¹¹ | ≥3.95 x 10 ¹¹ |
| Voltage Withstand | No breakdown at 1kV after 1 minute | No Breakdown | No Breakdown |
| Fluid Compatibility 30 ± 2 mins. @ 23 ± 2°C Followed by tests for: | | | |
| Diesel Fuel Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥4.00 x 10 ¹¹ | ≥3.37 x 10 ¹¹ |
| Brake Fluid DOT 4 Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥3.47 x 10 ¹¹ | ≥2.85 x 10 ¹⁰ |
| Engine Cleaner GUNK Degreaser Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥4.00 x 10 ¹¹ | ≥4.30 x 10 ¹⁰ |
| Petrol (without oxygen compounds), ISO 1817 Liquid C Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥2.89 x 10 ¹¹ | ≥1.12 x 10 ¹¹ |
| Screen Wash (50% Isopropanol / 50% Distilled Water by vol) Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥6.71 x 10 ¹⁰ | ≥1.63 x 10 ¹¹ |
| Carwash Detergent (1% Teepol / 99% Distilled Water by vol) Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥1.18 x 10 ¹¹ | ≥4.00 x 10 ¹¹ |
| Battery Acid Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥3.77 x 10 ¹⁰ | ≥4.00 x 10 ¹¹ |
| Engine Coolant (50% Ethylene Glycol / 50% Distilled Water by vol) Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥1.28 x 10 ¹¹ | ≥1.41 x 10 ¹⁰ |

RBK-ILS-125 Tubing Qualification Report



| Test | Requirement | Results | |
|---|-----------------------------|--------------------------|--------------------------|
| | | NR1 | NR3 |
| Sequential Test Results | | | |
| Fluid Compatibility 30 ± 2 mins. @ 100 ± 3°C Followed by tests for: | | | |
| ISO 1817 Oil No.1 (IRM 901) Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥4.00 x 10 ¹¹ | ≥4.00 x 10 ¹¹ |
| Automatic Transmission Fluid Dextron VI Insulation Resistance, Ohms | 2.00 x 10 ⁸ Min. | ≥4.00 x 10 ¹¹ | ≥4.00 x 10 ¹¹ |

RBK-ILS-125 Tubing Qualification Report



| Key Equipment Used (Swindon) | | | |
|------------------------------|---------------------------------------|--|-------------------------|
| Equipment Name | Equipment Model (Serial Number) | Calibration No. | Calibration Expire Date |
| RBK Processor | MKIV (16G0133) | N/A | 08/08/2024 |
| Insulation Resistance Tester | Chauvin Arnoux (199849 XKH) | F21577A | 13/12/2024 |
| Insulation Resistance Tester | Norma Unilap (56927 AA) | F4017A | 13/07/2024 |
| Tensometer | Testometric A350T (350-8179) | T=DDNB2401 T=DDNB2402 T=DDNB2403 | 24/05/2024 |
| Oven 02 | Memmert UN110 plus (3418.3301) | N/A | N/A |
| Oven 09 | Memmert UN110 plus (3418.3299) | N/A | N/A |
| Oven 10 | Memmert UN110 plus (3418.3300) | N/A | N/A |
| Oven 11 | Memmert UN110 plus (3418.3298) | N/A | N/A |
| Oven 12 | Memmert UN110 plus (3419.1050) | N/A | N/A |
| Oven 13 | Memmert UN110 plus (89/04/113) | N/A | N/A |
| Oven AT08 | Gallenkamp (1188-0025A) | N/A | N/A |
| Oven AT30 | Gallenkamp (091404) | N/A | N/A |
| Oven AT33 | Gallenkamp (2306D) | N/A | N/A |
| Data Logger | Graphtec Midi Logger GL220 (RW LOG06) | 145521/AC | 04/06/2024 |
| Abrasion Rig | Merlin (WSCR2) - Made in House | Calibrated before use | N/A |
| Scales | (K22247) | 108686 | 05/12/2024 |
| Stop Clock | RS (ASC06) | F18116A | 10/08/2024 |
| Stop Clock | RS (ASC05) | F18117A | 10/08/2024 |
| Digital Thermometer | RS Pro (03002908) | F17333A | 13/06/2024 |
| Digital Thermometer | RS Pro (73002570) | F17334A | 13/07/2024 |

RBK-ILS-125 Tubing Qualification Report



| Key Equipment Used (Swindon) | | | |
|------------------------------|---|-----------------|-------------------------|
| Equipment Name | Equipment Model (Serial No.) | Calibration No. | Calibration Expire Date |
| Air Cooled Vibrator | V875-440LPT750C (1005218-1 2641-000010-1) | N/A | N/A |
| Accelerometer | B&K Type 4533-b (31529) | CDK2303180 | 28/04/2024 |
| HV Cage | HV11 (6TE1051) | N/A | 27/08/2024 |
| Environmental Chamber | Weiss Technik WK-1200/70/5/v (58226074390010) | N/A | 22/08/2024 |
| Cold Impact Rig | Made In House | N/A | N/A |
| Freezer | WCF01 | N/A | N/A |
| Digital Caliper | (A15092968) | F18120A | 10/08/2024 |

RBK-ILS-125 Tubing Qualification Report



| Key Equipment Used (Trutnov) | | | |
|------------------------------|------------------------------|-----------------|-------------------------|
| Equipment Name | Equipment Model (Serial No.) | Calibration No. | Calibration Expire Date |
| Microscope | MicroVu, SOL 161 | M5848 | 11/2024 |
| Caliper | Digital | QL M5672 | 09/2024 |
| Ruler | 300 x 30 x 1 mm | M5725 | 10/2025 |
| Stopwatch | TM 44 | E0097 | 10/2025 |
| Stopwatch | TM 44 | E4910 | 02/2026 |
| Stopwatch | TM 44 | E4906 | 04/2024 |
| Stopwatch | Fisherbrand | E4900 | 04/2024 |
| Thermocouple | FLUKE 52 II + FLUKE 80PK-25 | E4884 | 10/2024 |
| Tensile Machine #1 | Instron 3345 | M5869 | 08/2024 |
| High Resistance Meter | Keysight B2987A | E4991 | 06/2025 |
| Glass Thermometer | 0 - 360°C | E4941 | 11/2025 |
| Analytical Scale | Ohaus AX224 | M5801 | 04/2024 |
| Dielectric Tester | Hypotronic, 7100-2D149-5B | E4929 | 09/2024 |
| Temperature Sensor #7 | MAC -- 00-80-A3-B1-87-8A | E4870 | 11/2024 |
| Temperature Sensor #12 | MAC -- 00-80-A3-B1-88-A8 | E4881 | 09/2024 |