Certificate of Analysis

Analytical Report: AAR49820
Eurofins Sample Number: NJ21AA5694-1
Version: 1

Accreditation No: 15773
Accredited for compliance with ISO/IEC 17025 - Testing

WILO AUSTRALIA PTY LTD
2/29 ALEXANDRA PLACE QLD 4172
QLD,
AU

Client Account Number: A00493572L0P
Eurofins Quote Number: XC8UPH19011202

Eurofins Sample Number NJ21AA5694-1

Original Received Date:	28-Apr-2021
Description:	Star-Z NOVA T, Circulator Pump
	Product Range: Star-Z NOVA Star-Z NOVA A Star-Z NOVA T
Containers Submitted:	4 Unit(s)

Analysis

 # AS/NZS 4020:2018 Compliance Testing

Refer to Attachment # 1

Method: AS/NZS 4020, Appendix A and in-house method TMP 191100 & TMP 191101
Analysis Date: 11-May-2021

Supplemental Information

Samples were tested as received. Specifications (if) reported are as provided by the client.

Accredited for compliance with ISO/IEC 17025:2017- Testing. NATA Accreditation Number 15773.

Contracted Company: Eurofins ams Laboratories (Sydney)

8, Rachael Close, Silverwater, NSW 2128 Australia
SampleReceiptAMS@eurofins.com

TGA Licence No: MI-15112007-LI-002191-11 APVMA Licence No: 6139
Questions about this report should be directed to your project manager or the general email listed above.

Reviewed and electronically signed for Data Reviewer Approval by
Sandhya Singh, Department Manager -Chemistry & Toxicology
for Eurofins ams Laboratories Pty Ltd, on 18-Oct-2021 13:15:10 UTC+11:00

1. SAMPLE INFORMATION:

Methodology: AS/NZS 4020, *Appendix A* and in-house method TMP-191100 & TMP-191101

Cross Reference No.:	Not Applicable
Interim Reporting:	Not Applicable
Batch No./ Manufacturing Date:	Information not Provided
Product Manufacturer:	WILO SE WILOPARK 1, 44263 DORTMUND, GERMANY
Sampling Organisation:	Wilo Australia Pty. Ltd.
General Composition:	Refer to Section 9
Product Use:	In-Line
Temperature Range:	(0 - 95)°C
Previous Testing:	Not Applicable
Sample selection for tests:	As provided by the Submitting Organisation

Sample storage conditions:	Prepared and controlled as per AS/NZS 4020, *Appendix A*
Extracts:	Prepared as per AS/NZS 4020, *Appendices C, D, E, F, G & H*
Testing procedure:	Initial testing is based on the recommended 'in-the-product' exposure with a scaling factor of 0.1 (1/10) applied at (95 ± 2)°C to cover a cold and hot water application up to ~95°C. Due to Metals test failing at (95 ± 2)°C, Metals test only was conducted again at 'in-the-product' exposure with a scaling factor of 0.1 (1/10) applied at (65 ± 2)°C. Due to Metals passing at an evaluated exposure of 0.01 (1/100), Taste test only was conducted at 'in-the-product' exposure with a scaling factor of 0.01 (1/100) applied at (65 ± 2)°C Refer to Section 9 for product details.
Volume retention:	~40mL

2. SUMMARY OF RESULTS:

APPENDIX	RESULTS
C - TASTE (CLAUSE 6.2)	PASSED at 'in-the-product' exposure with a scaling factor of 0.01 (1/100) applied
D – APPEARANCE (COLOUR AND TURBIDITY) (CLAUSE 6.3)	PASSED at 'in-the-product' exposure with a scaling factor of 0.1 (1/10) applied
D – APPEARANCE (ORGANIC COMPOUNDS) (CLAUSE 6.8)	PASSED at 'in-the-product' exposure with a scaling factor of 0.1 (1/10) applied
E - GROWTH OF AQUATIC MICRO-ORGANISMS (CLAUSE 6.4)	PASSED at 'total immersion' exposure
F - CYTOTOXIC ACTIVITY (CLAUSE 6.5)	PASSED at 'in-the-product' exposure with a scaling factor of 0.1 (1/10) applied
G - MUTAGENIC ACTIVITY (CLAUSE 6.6)	PASSED at 'in-the-product' exposure with a scaling factor of 0.1 (1/10) applied
H - METALS (CLAUSE 6.7)	PASSED at an evaluated 'in-the-product' exposure with a scaling factor of 0.01 (1/100) applied *

*** NOTE: Quantitative evaluation based on sample result, test scaling factor and AS/NZS 4020 test specification.**

Based on completion and evaluation of all tests on 18/10/2021, the product, Star-Z NOVA T, Circulator Pump; fully complied with the test requirements of AS/NZS 4020:2018 to cover a cold and hot water application up to ~65°C, at the recommended 'in-the-product' exposure with a scaling factor of 0.01 (1/100) applied at (65 ± 2)°C.

Testing although determined by the relevant product Standard, is generally recognised for up to 5 years by the certifying body, providing the testing procedures remain the same, and the background information on all wetted parts and the product are adequately documented. Also, the results stated in the report relate to the samples of the product submitted for testing. Any changes in the material formulation and supplier/manufacturer of all wetted items, the process of manufacture, the method of application, or the surface area-to-volume ratio in the end-use, could affect the suitability of the product for use in contact with drinking water, and re-testing may be required before this actual time frame, governed by the completion and evaluation date.

3. TASTE: SAMPLES RECEIVED ON 17/06/2021

Methodology: AS/NZS 4020, *Appendix C* and in-house method TMP-191130.

Exposure: 'in-the-product'

Extraction temperature: (65 ± 2)°C **Scaling factor:** 0.01 (1/100) **Number of Panellists:** 5

No. of samples for Chlorine-free extract: 1 **No. of samples for Chlorinated extract:** 1

Description	Extract	Test Water	Taste (+ / –)	Taste Description (No. of tasters)	Test Dilution *(Taste intensity)
Test Blank	First 24h	Chlorine-free	NA	NA	NA
	Final 9-day	Chlorine-free	–	–	–
Sample	First 24h	Chlorine-free	NA	NA	NA
	Final 9-day	Chlorine-free	–	–	–
Test Blank	First 24h	Chlorinated	NA	NA	NA
	Final 9-day	Chlorinated	–	–	–
Sample	First 24h	Chlorinated	NA	NA	NA
	Final 9-day	Chlorinated	–	–	–

+ Taste detected – No taste detected NA Not applicable

AS/NZS 4020 test requirement: Minimum of 4 tasters with no discernible taste at the first 1/2 dilution.
Figure in brackets is the number of panellists detecting a taste at this dilution.

Note:
1. Tasters are given a 14-point scale to describe its intensity, with minimum of 1 as extremely weak, and maximum of >14 as extremely strong. An average of all tasters represents taste intensity.
2. First extract becomes final extract.

EVALUATION:

On the basis of these results the samples of this product referred to in this report have complied with the test requirements of AS/NZS 4020:2018, Taste; *Appendix C*.

4.A. APPEARANCE: COLOUR AND TURBIDITY

Methodology: AS/NZS 4020, *Appendix D* and in-house methods TMP-191140 and TMP-191106.

Exposure: 'in-the-product'

Extraction temperature: (95 ± 2)°C **Scaling factor:** 0.1 (1/10)

No. of samples tested: 1

	a) **TRUE COLOUR:** Hazen Units **(HU)**		b) **TURBIDITY:** Nephelometric Turbidity Units **(NTU)**	
	First 24h	Final 9-day	First 24h	Final 9-day
Sample Extract pH (24h) = 6.15	11	NA	0.27	NA
Test Blank pH (24h) = 6.13	9.8	NA	0.22	NA
FINAL RESULT	<2	NA	0.05	NA
AS/NZS 4020 Test sample requirements	**≤5**		**≤0.5**	

< = less than ≤ = less than or equal to NA Not applicable
First extract becomes final extract

For test a), test extractions were performed by Eurofins |ams. The test extracts were subsequently subcontracted to Eurofins |Environment Testing for assessment (NATA Accreditation No. 1261), Report No. 796491-W. In-house Method based on APHA 2120 B.

EVALUATION:

On the basis of these results the samples of this product referred to in this report have complied with the test requirements of AS/NZS 4020:2018, Appearance (Colour & Turbidity); *Appendix D*.

4.B. APPEARANCE: ORGANIC COMPOUNDS

Methodology: AS/NZS 4020, *Appendix D* and in-house methods TMP-191140 and TMP-191106.

Refer to Section 4.A for testing conditions (Exposure, Extraction temperature, Scaling factor & No. of Samples tested) **Extract:** 9-day

Organic Compound	Drinking Water Guideline Maximum Allowable Concentration mg/L (ppm)	Limit of Reporting mg/L (ppm)	Test Blank mg/L (ppm)	Sample Extract mg/L (ppm)	FINAL RESULT mg/L (ppm)
[1] Benzene	0.001*	0.001	<0.001	<0.001	<0.001
[1] Bromodichloromethane	0.06**	0.001	0.005	0.002	<0.001
[1] Carbon tetrachloride	0.003*	0.001	<0.001	<0.001	<0.001
[1] Chlorobenzene	0.3*	0.00001	<0.00001	<0.00001	<0.00001
[1] 1,2-dichlorobenzene	1.5*	0.001	<0.001	<0.001	<0.001
[1] 1,4-dichlorobenzene	0.04*	0.00001	<0.00001	<0.00001	<0.00001
[1] 1,2-dichloroethane	0.003*	0.00001	<0.00001	<0.00001	<0.00001
[1] 1,1-dichloroethene	0.03*	0.001	<0.001	<0.001	<0.001
[1] Cis 1,2-dichloroethene	0.06*	0.00001	<0.00001	<0.00001	<0.00001
[1] Trans 1,2-dichloroethene	0.06*	0.001	<0.001	<0.001	<0.001
[1] Dibromochloromethane	0.15**	0.001	<0.001	<0.001	<0.001
[1] Dichloromethane (methylene chloride)	0.004*	0.00002	0.00014	0.00009	<0.00002
[1] 1,4-dioxane	0.05**	0.00005	<0.00005	<0.00005	<0.00005
[1] Epichlorohydrin	0.0005*	0.0004	<0.0004	<0.0004	<0.0004
[1] Ethylbenzene	0.3*	0.001	<0.001	<0.001	<0.001
[1] Hexachlorobutadiene	0.0007*	0.00001	<0.00001	<0.00001	<0.00001
[2] N-Nitrosodimethylamine (NDMA)	0.0001*	0.00001	<0.00001	0.000013	0.00001
[1] Plasticisers di(2-ethylhexyl) (Phthalate)	0.009**	0.0005	<0.0005	<0.0005	<0.0005
[1] Benzo-(a)-pyrene (PAHs)	0.00001*	0.00001	<0.00001	<0.00001	<0.00001
[1] Styrene (Vinylbenzene)	0.03*	0.001	<0.001	<0.001	<0.001
[1] Tetrachloroethene	0.05*	0.00002	<0.00002	<0.00002	<0.00002
[1] Toluene	0.8*	0.001	<0.001	<0.001	<0.001
[1] Trichlorobenzenes	0.03*	0.00001	<0.00001	<0.00001	<0.00001
[1] Trichloroethene	0.02**	0.00001	<0.00001	<0.00001	<0.00001
[1] Vinyl chloride	0.0003*	0.00005	<0.00005	<0.00005	<0.00005
[1] Xylene	0.6*	0.003	<0.003	<0.003	<0.003

*Australian Drinking Water Guideline **NZ Drinking Water Guideline

[1] Test extractions were performed by Eurofins |ams. The test extracts were subsequently subcontracted to Eurofins | Environment Testing, NATA Accreditation No. 1261, Report No. 797416-W. In-house Method based on USEPA 522, 8260D & 8270E.

[1] (Epichlorohydrin) Test extractions were performed by Eurofins |ams. The test extracts were subsequently subcontracted to Eurofins | Eaton, ANSI-ASQ National Accreditation Board/ANAB Accreditation No. AT 1807, Report No. 938647. In-house Method based on USEPA 524.2 Modified.

[2] Test extractions were performed by Eurofins |ams. The test extracts were subsequently subcontracted to Sydney Water, NATA Accreditation No. 63, Report No. 245542. In-house Method based on USEPA 521.

EVALUATION:

On the basis of these results the samples of this product referred to in this report have complied with the test requirements of AS/NZS 4020:2018, Appearance (Organic Compounds); Appendix D.

5. GROWTH OF AQUATIC MICRO-ORGANISMS:

Methodology: AS/NZS 4020, *Appendix E* and in-house method TMP-191150.

Incubation temperature: (30 ± 1)°C

Exposure: 'total immersion'

No. of Samples: 2

Component Name	Testing Exposure	Inoculum (mL)	* MEAN DISSOLVED OXYGEN DIFFERENCE (MDOD) in mg/L
i) Front Carbon Bearing (4142339) + Pump Gasket (502468494) + Body O-Ring (502439798) + Back Flow O-ring (502439695) + Thrust Bearing (4142335) + Impeller (4195023)	2 + 2 + 2+ 2 + 2 + 1 / 1L	100	0.47
ii) Rotor Shaft (4195027) + 1/2 Packing (502439798) + Back Flow Preventer (502439695)	2 + 2 + 1 / 1L	100	<0.01
Negative Reference Control (glass plate)	~15,000mm^2 / 1L	100	0.42
Positive Reference Control (paraffin waxed glass plate)	~15,000mm^2 / 1L	100	4.24
Test Blank	Blank / 1L	100	5.68 in mg/L as mean dissolved oxygen

NA = Not applicable
***** Difference from test blank and represents mean of five readings (weeks 5, 5 ½, 6, 6 ½ & 7)
AS/NZS 4020 test sample requirements: Less than or equal to 2.4 for MDOD

EVALUATION:

On the basis of these results the samples of this product referred to in this report have complied with the test requirements of AS/NZS 4020:2018, , Growth of Aquatic Micro-organisms; *Appendix E*.

6. CYTOTOXIC ACTIVITY:

Methodology: AS/NZS 4020, *Appendix F* and in-house method TMP-191160.

Exposure: 'in-the-product'

Extraction temperature: (95 ± 2)°C **Scaling factor:** 0.1 (1/10)

Extracts: 24h, 48h & 72h **No. of samples tested:** 1

The test sample extracts from the product, as well as the test blank (test water) were used to prepare a nutrient growth medium, subsequently utilised to grow a monkey kidney cell line (VERO ATCC CCL 81).

Microscopic Examination	**Test Sample Extract** (24h, 48h and 72h)	**Test Blank** (24h, 48h and 72h)
Cell Morphology:	Satisfactory	Satisfactory
Monolayer: Confluence/Healthy Growth as ~%	100%	100%

Cytotoxicity was detected with Zinc Sulphate, used as a positive control and analysed at 0.4mM of Zinc. Water for Irrigation was included with the test blank as negative control.

AS/NZS 4020 test sample requirements: 1) Non-cytotoxic response- confluent monolayer similar to test blank.
2) Cytotoxic response- irregularly shaped cells & cell death similar to positive control 0.4mM Zinc Sulphate.

EVALUATION:

On the basis of these results the samples of this product referred to in this report have complied with the test requirements of AS/NZS 4020:2018, Cytotoxic Activity; *Appendix F*.

7. MUTAGENIC ACTIVITY:

Methodology: AS/NZS 4020, *Appendix G* and in-house method TMP-191170.
Exposure: 'in-the-product' **Extraction temperature:** (95 ± 2)°C
Scaling factor: 0.1 (1/10) **Extract:** 24h **No. of samples tested:** 1

-S9	*Salmonella typhimurium* TA98	Mean	Std Deviation	+ S9	*Salmonella typhimurium* TA98	Mean	Std Deviation
-ve c	32 38 37	36	3	-ve c	65 60 71	65	6
2,4-DNPH	127 131 140	133	7	2-AA	87 84 95	89	6
T.BLK	33 37 39	36	3	T.BLK	45 42 50	46	4
Sample	31 35 31	32	2	Sample	43 49 50	47	4

-S9	*Salmonella typhimurium* TA102	Mean	Std Deviation	+ S9	*Salmonella typhimurium* TA102	Mean	Std Deviation
-ve c	456 417 425	433	21	-ve c	652 638 690	660	27
2,4-DNPH	799 851 840	830	27	Benzo(a)pyrene	1002 697 956	885	164
T.BLK	547 539 521	536	13	T.BLK	652 645 666	654	11
Sample	522 514 568	535	29	Sample	612 560 550	574	33

+ S9 = * Metabolic Activator NA = Not applicable > = greater than
2,4-DNPH = 2, 4-dinitrophenylhydrazine 2-AA = 2-aminoanthracene -ve c = Negative Control

AS/NZS 4020 test sample requirements: (The differences in the mean number of revertants between either of the negative controls and test sample extracts should not exceed two standard deviations (for triplicate analysis)).
Positive response: If mean revertants for sample extract outside the range of spontaneous revertants for test strain.

EVALUATION:

On the basis of these results the samples of this product referred to in this report have complied with the test requirements of AS/NZS 4020:2018, Mutagenic Activity; *Appendix G*.

8.I. METALS: INITIAL TESTING ON SAMPLES RECEIVED ON 28/04/2021

Methodology: AS/NZS 4020, *Appendix H* and in-house methods TMP-191180 and TMP-191230.

Exposure: 'in-the-product' **Extraction temperature:** (95 ± 2)°C **Scaling factor:** 0.1 (1/10)

Extracts: 24h & 9-day **No. of samples for I:** 1 **No. of samples for II:** 1

Element	AS/NZS 4020: Maximum Allowable Concentration mg/L (ppm)	Limit of Reporting mg/L (ppm)	Test Blank mg/L (ppm)	Sample Extract I mg/L (ppm)	Sample Extract II mg/L (ppm)	FINAL RESULT I mg/L (ppm)	FINAL RESULT II mg/L (ppm)
Aluminium[1] (Al)	0.2	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Antimony[1] (Sb)	0.003	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic[1] (As)	0.01	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium[1] (Ba)	0.7	0.001	0.024	<0.001	0.022	<0.001	<0.001
Boron[1] (B)	1.4	0.05	0.12	0.15	0.11	0.15	<0.05
Cadmium[1] (Cd)	0.002	0.0002	<0.0002	<0.0002	0.0002	<0.0002	0.0002
Chromium[1] (Cr)	0.05	0.001	0.077	0.003	0.11	<0.001	0.033
Copper[1] (Cu)	2	0.001	0.034	<0.001	0.045	<0.001	0.011
Iron[1] (Fe)	0.3	0.05	0.90	<0.05	1.0	<0.05	0.10
Lead[1] (Pb) a) First 24h: b) Final 9-day:	0.01	0.001	a) 0.06 b) <0.001	a) <0.001 b) 0.18	a) 0.078 b) 0.13	a) <0.001 b) 0.18	a) 0.018 b) 0.13
Manganese[1] (Mn)	0.1	0.005	<0.005	<0.005	0.007	<0.005	0.007
Mercury[1] (Hg)	0.001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum[1] (Mo)	0.05	0.002	0.010	<0.001	0.006	<0.001	0.006
Nickel[1] (Ni)	0.02	0.001	0.005	<0.001	0.006	<0.001	0.006
Selenium[1] (Se)	0.01	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silver[1] (Ag)	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001

< = less than mg/L = milligram per litre [1] = ICPMS – In-house Method Code: LTM-MET 3040 First extract becomes final extract.
NA = Not applicable
Test extractions were performed by Eurofins |ams. The test extracts were subsequently subcontracted to Eurofins |Environment Testing for assessment (NATA Accreditation No. 1261), Report Nos. 796491-W & 799029-W. In-house Method based on US EPA Method 3010A & US EPA Method 6020B.

EVALUATION: On the basis of these results the samples of this product referred to in this report have not complied with the test requirements of AS/NZS 4020:2018, Metals; *Appendix H*.

8.II. METALS: INITIAL TESTING ON SAMPLES RECEIVED ON 17/06/2021

Methodology: AS/NZS 4020, *Appendix H* and in-house methods TMP-191180 and TMP-191230.

Exposure: 'in-the-product' **Extraction temperature:** (65 ± 2)°C **Scaling factor:** 0.1 (1/10)

Extracts: 9-day **No. of samples for I:** 1 **No. of samples for II:** 1

Element	AS/NZS 4020: Maximum Allowable Concentration mg/L (ppm)	Limit of Reporting mg/L (ppm)	Test Blank mg/L (ppm)	Sample Extract I mg/L (ppm)	Sample Extract II mg/L (ppm)	FINAL RESULT I mg/L (ppm)	FINAL RESULT II mg/L (ppm)
Lead[1] (Pb)	0.01	0.001	<0.001	0.045	0.048	0.045	0.048

< = less than mg/L = milligram per litre [1] = ICPMS – In-house Method Code: LTM-MET 3040
First extract becomes final extract. NA = Not applicable

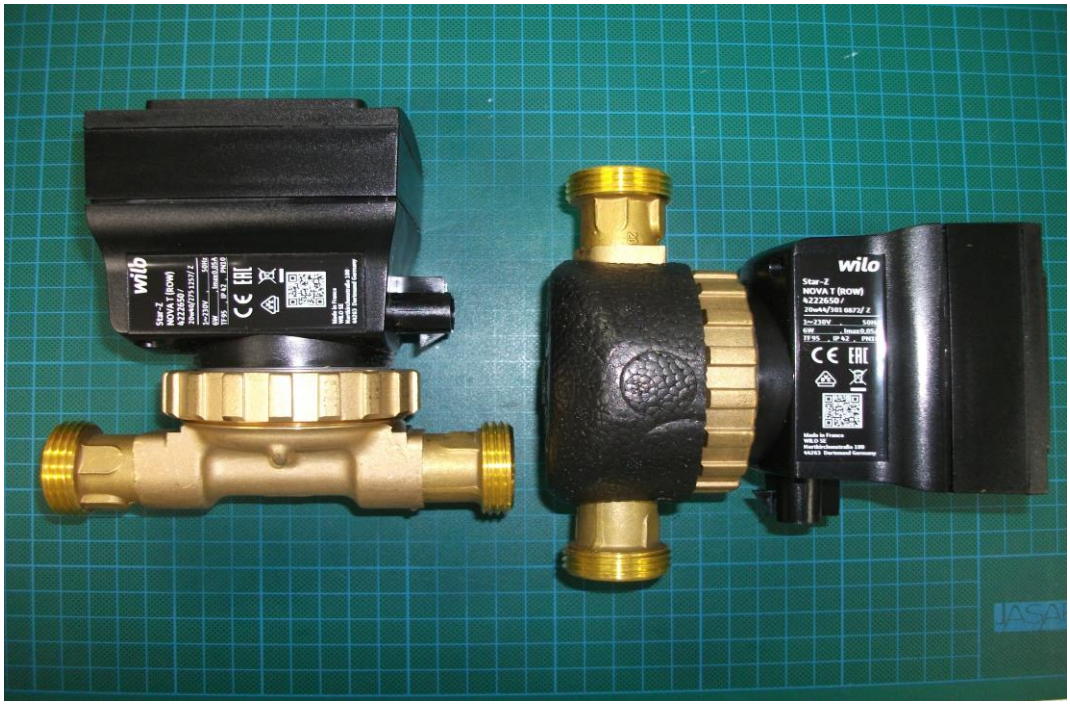
Test extractions were performed by Eurofins |ams. The test extracts were subsequently subcontracted to Eurofins |Environment Testing for assessment (NATA Accreditation No. 1261), Report No. 814995-W. In-house Method based on US EPA Method 3010A & US EPA Method 6020B.

Evaluated Lead result = (Highest Sample result x 10) x Maximum scaling factor in AS/NZS 4020
= (0.048 x 10) x 0.01
= 0.0048

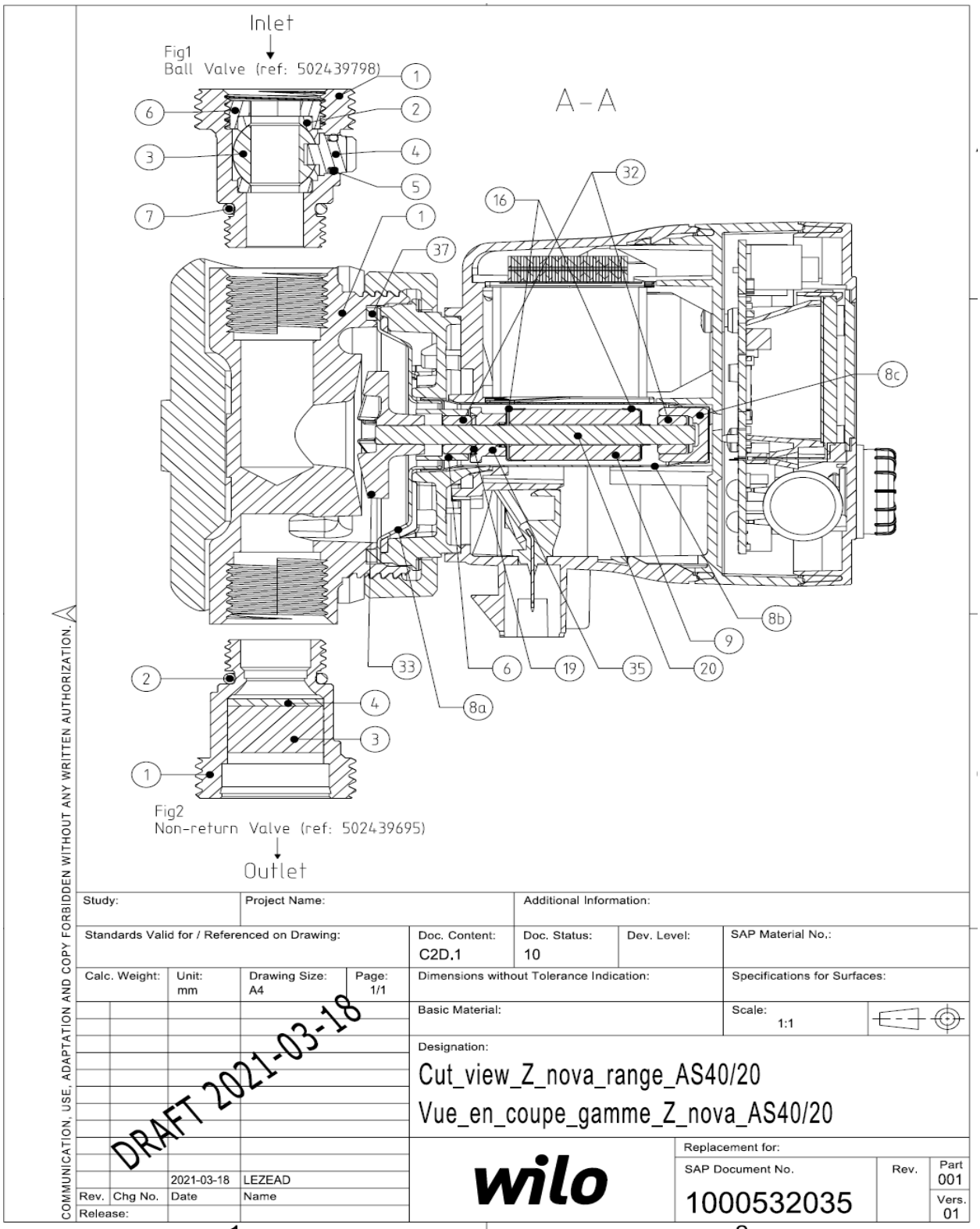
EVALUATION:

The results have not complied at the testing exposure but on final calculation of evaluated exposure, the samples of this product referred to in this report have complied with the test requirements of AS/NZS 4020:2018, Metals; *Appendix H*, at an evaluated 'in the-product' exposure with a scaling factor of 0.01 (1/100) applied.

9.I. PHOTOS OF TEST SAMPLE:



9.II. BILL OF MATERIAL (BOM) PRODUCT:



9.III. METALLURGICAL TEST REPORT:

UNIVERSAL SCIENTIFIC LABORATORY PTY LTD
ABN 76 093 281 764
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ANALYSIS REPORT

ORIGIN: AMS LABORATORIES P/L
DESCRIPTION: Pump Housing (#4123695).
ORDER NO: 7860
ALLOY CODE BRASS
COLOUR CODE
REPORT NO: 21/1646
REPORT DATE 24 /06/21
LOG BOOK NO: 210244
HEAT NO:

Sample No.
UNITS W/W %

	Cu	Sn	Pb	Fe	Ni	Mn	Al	Zn	Si	Sb	As	Cd	Bi
#6	58.4	.18	1.8	.25	.09	<.01	.01	Rem.	.02	.01	<.01	<.005	<.01
SPECIFICATION LIMITS													
MAX:													
MIN:													
ANALYTICAL TECHNIQUE(S)													
Method	M21	M100	M100	M100	M100	M100	M100	M100	M100	M100	M100	M100	M100
MU	.2												

MU= Measurement Uncertainty

REMARKS:
WIL NJ21AA5694-1

Checked
SS 09/07/2021

This analysis was performed at: 12, 65 Marigold St., Revesby

To the best knowledge of the company the results on this report are correct. however no legal responsibility will be accepted for or arising from their use. Samples were tested as received unless stated otherwise. The report shall not be reproduced unless in full. Measurement uncertainty data are available on request.

NATA
WORLD RECOGNISED ACCREDITATION

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NATA accredited laboratory No. 492
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WILLIAM TING
AUTHORISING OFFICER