

**ITIS B.V.**

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Test certificate
202000519-C001 rev. 1

API 641 QUALIFICATION CERTIFICATE

This certificate is to certify that the valve below has passed the requirements for fugitive emission and operability according to standard: API standard 641, first edition, October 2016 "Type Testing of Quarter-turn Valves for Fugitive Emissions".

Test valve details

Manufacturer location 1 : Armature d.o.o.
Address : Koroška Cesta 55, SI/2366 Muta, Slovenia
Manufacturer location 2 : Friedrich Krombach GmbH
Address : Postfach 1130, 57202, Kreuztal, Germany
Manufacturer location 3 : Crane Ningjin Valve Co.
Address : Jing Long St. 496, 055550 Ningjin, China
Product name : Krombach® TUFSEAT™ Performance Series Metal Seated Ball Valve with Standard Trim
Nominal size : DN80
Pressure rating : Class 300
Valve Type : Ball valve
Design standard : ASME B16.34
Drawing number : 4924308006 Rev.0, Date: 22-03-2019
Serial number : 129008
Body material : A351 CF8M (1.4408)
Stem material : F51, A479 UNS S31803 (1.4462)
Body gasket material : PTFE, Graphite, 316Ti
Actuator : Pneumatic provided by Crane

Approved signatory		
 A. Floor  A. Floor 29-04-2021		

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Test certificate
202000519-C001 rev. 1

According to API 641, section 11, the specified range for covering other valves is:

Description	Tested valve	Scope
API 641 Valve group	Group A	Group A
Stem Diameter	28mm	14mm up to 56mm
Stack height	12mm	9mm up to 15mm
Stem motion	¼ turn stem	¼ turn stem
Stem Seal Material primary	PTFE, Carbon + Graphite filled, AISI 301	PTFE, Carbon + Graphite filled, AISI 301
Stem Seal Material secondary	Graphite	Graphite
Stem seal primary brand	GFD	GFD
Stem seal secondary brand	James Walker	James Walker

Disclaimer: Under no circumstances ITIS B.V. can be held responsible applying the above mentioned covering range

This certificate refers to the above mentioned test valve. This certificate does not imply assessment of the production of the valves. This certificate is only valid in conjunction with the full ITIS BV test report number 202000519-R001 rev. 1.

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Valve stem seal information



Manufacturer 1 : GFD
Stem seal description : Spring energized lip seal
Model/Type : n.a.
Manufacturer 2 : James Walker
Stem seal description : Graphite ring
Model/Type : Supagraf Premier
Included in API 622 scope : No
Stem seal material primary : PTFE, Carbon + Graphite filled, AISI 301 (1.4310)
Stem seal material secondary : Graphite
Number of rings primary seal : 1
Number of rings secondary seal : 2
Gland torque : 400Nm at start of the test
Outer stem seal dimension (OD) : 40mm
Inner stem seal dimension (Od) : 28mm
Stack Height : 12mm
Stem seal chamber depth : 28.6mm

Requirements and limits

API 641 Valve group : Group A
Ambient temperature (T_a) : 15°C to 40°C
Elevated temperature [T_e] : 260°C ±5%
Amount of operational cycles : 610 cycles
Amount of thermal cycles : 3 thermal cycles
Stem orientation : Vertical
Maximum allowable leak rate : 100 ppmv (measurement according to EPA Method 21)
Test pressure [P_a] : 41.4barg ±5%
Test pressure [P_e] : 41.4barg ±5%

Manufacturer published torque values

Running torque : 80.0Nm
Closing torque : 100.0Nm
Maximum operating pressure : 8.0barg

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Test results

Test	Mechanical cycles (total)	Temperature valve body (T)	Test pressure (P)	Tested parts	Results (ppmv)	Uncertainty leakage measurement	Date	Pass / Fail
1	0	T _a	41.4barg	Body seals	5	semi-quantitative	04-01-2021	Pass
	0			Stem seal	5			Pass
	100			Stem seal	6			Pass
	101			Stem seal	7			Pass
2	101	260°C	41.4barg	Stem seal	9	semi-quantitative	05-01-2021	Pass
	200			Stem seal	10			Pass
	201			Stem seal	12			Pass
3	201	T _a	41.4barg	Stem seal	10	semi-quantitative	05-01-2021	Pass
	300			Stem seal	13			Pass
	301			Stem seal	13			Pass
4	301	260°C	41.4barg	Stem seal	5	semi-quantitative	06-01-2021	Pass
	400			Stem seal	8			Pass
	401			Stem seal	9			Pass
5	401	T _a	41.4barg	Stem seal	8	semi-quantitative	06-01-2021	Pass
	500			Stem seal	8			Pass
	501			Stem seal	8			Pass
6	501	260°C	41.4barg	Stem seal	8	semi-quantitative	06-01-2021	Pass
	600			Stem seal	16			Pass
	601			Stem seal	17			Pass
7	601	T _a	41.4barg	Stem seal	5	semi-quantitative	07-01-2021	Pass
	610			Stem seal	5			Pass
	610			Body seal	5			Pass

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Torque measurements					
Cycle	Tested part	Results	Uncertainty	Date	Pass / Fail
First mechanical cycle	Running torque	56.2Nm	±2.9Nm	04-01-2021	Pass
Last mechanical cycle	Running torque	70.1Nm	±3.6Nm	07-01-2021	Pass

Cycling duration

Total time for the valve to perform 610 mechanical cycles (full stroke) was approximately 1.7 hours (10 seconds per cycle).

Covering range

According to section 11 of API standard 641, First Edition October 2016, type testing of quarter-turn valves for fugitive emissions, the qualification range mentioned in section 11 may be used to qualify valves of the same quarter-turn design as the test valve if the criteria from points 11.1.1 to 11.1.8 are met.

Description	Tested valve	Scope
API 641 Valve group	Group A	Group A
Stem Diameter	28mm	14mm up to 56mm
Stack height	12mm	9mm up to 15mm
Stem motion	¼ turn stem	¼ turn stem
Stem Seal Material primary	PTFE, Carbon + Graphite filled, AISI 301	PTFE, Carbon + Graphite filled, AISI 301
Stem Seal Material secondary	Graphite	Graphite
Stem seal primary brand	GFD	GFD
Stem seal secondary brand	James Walker	James Walker

Disclaimer: Under no circumstances ITIS B.V. can be held responsible applying the above mentioned covering range

Conclusion and remarks



The valve meets the requirements for Fugitive Emission and operability stated in API Standard 641, first edition, October 2016 'Type Testing of Quarter-turn Valves for Fugitive Emissions. No notable wear, deformations or damaging was detected on the sealing components during the visual inspection after the strip-down on the valve.

Reason of revision

Changing of the manufacturer location 1 from Slovakia to Slovenia.

This test report documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI). The test result(s) and conclusion(s) in this report related to the sample(s) tested as described herein and must not be used to claim product certification. This test report may not be reproduced in whole or in part, without written approval of ITIS B.V. The test meets the requirements of ISO 9001: 2015 as verified and certified by TÜV SÜD Management Service GmbH, certificate number: 12 100 43628 TMS. The test laboratory has not been responsible for the sampling stage (sample has been provided by the client). Test results stated in this report apply to the samples as received.

Applied decision rule: Measurements are reported as "Pass" – If the measurement results are within (or below) the specification limit when the measurement with its (upper) uncertainty limit is taken into account".

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Test certificate
202000519-C003 rev. 1

API 641 QUALIFICATION CERTIFICATE

This certificate is to certify that the valve below has passed the requirements for fugitive emission and operability according to standard: API standard 641, first edition, October 2016 "Type Testing of Quarter-turn Valves for Fugitive Emissions".

Test valve details

Manufacturer location 1 : Armature d.o.o.
Address : Koroška Cesta 55, SI/2366 Muta, Slovenia
Manufacturer location 2 : Friedrich Krombach GmbH
Address : Postfach 1130, 57202, Kreuztal, Germany
Manufacturer location 3 : Crane Ningjin Valve Co.
Address : Jing Long St. 496, 055550 Ningjin, China
Product name : Krombach® TUFSEAT™ Performance Series Metal Seated Ball Valve with Standard Trim
Nominal size : DN150
Pressure rating : Class 300
Valve Type : Ball valve
Design standard : ASME B16.34
Drawing number : 4924312025a Rev. 0, Date: 14-10-2020
Serial number : 133892
Body material : A216 WCB (1.0619)
Stem material : A182 F51 (1.4462)
Body gasket material : Spiral Wound, 316Ti Windings, ½ PTFE ½ Graphite filler, EPTFE tape overlay
Actuator : Pneumatic provided by Crane

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Test certificate
202000519-C003 rev. 1

According to API 641, section 11, the specified range for covering other valves is:

Description	Tested valve	Scope
API 641 Valve group	Group A	Group A
Stem Diameter	50mm	25mm up to 75mm
Stack height	18mm	13.5mm up to 16.75mm
Stem motion	¼ turn stem	¼ turn stem
Stem Seal Material primary	PFTE Carbon, Graphite filled AISI 301	PFTE Carbon, Graphite filled AISI 301
Stem Seal Material secondary	Graphite	Graphite
Stem Seal Material third	Graphite	Graphite
Stem primary seal brand	GFD	GFD
Stem secondary seal brand	Klinger Kempchen	Klinger Kempchen
Stem third seal brand	James Walker	James Walker

Disclaimer: Under no circumstances ITIS B.V. can be held responsible applying the above mentioned covering range

This certificate refers to the above mentioned test valve. This certificate does not imply assessment of the production of the valves. This certificate is only valid in conjunction with the full ITIS BV test report number 202000519-R003 rev. 1.

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Valve stem seal information

Manufacturer 1 : GFD
Stem seal description : Spring energized lip seal
Model/Type : n.a.
Manufacturer 2 : James Walker
Stem seal description : Graphite ring
Model/Type : Supagraf Premier
Manufacturer 3 : Klinger Kempchen
Stem seal description : Graphite ring
Model/Type : Rivatherm Super 2E2
Included in API 622 scope : No
Stem seal material primary : PTFE, Carbon + Graphite filled, AISI 301 (1.4310)
Stem seal material secondary : Graphite
Stem seal material third : Graphite
Number of rings primary seal : 1
Number of rings secondary seal : 2
Number of third seal : 2
Gland torque : 20Nm at start of the test
Outer stem seal dimension (OD) : 50mm
Inner stem seal dimension (Od) : 70mm
Stack Height : 18mm
Stem seal chamber depth : 35.5mm

Requirements and limits

API 641 Valve group : Group A
Ambient temperature (T_a) : 15°C to 40°C
Elevated temperature [T_e] : 260°C ±5%
Amount of operational cycles : 610 cycles
Amount of thermal cycles : 3 thermal cycles
Stem orientation : Vertical
Maximum allowable leak rate : 100 ppmv (measurement according to EPA Method 21)
Test pressure [P_a] : 41.4barg ±5%
Test pressure [P_e] : 41.4barg ±5%

Manufacturer published torque values

Running torque : 650.0Nm
Closing torque : 650.0Nm
Maximum operating pressure : 8.0barg

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Test results

Test	Mechanical cycles (total)	Temperature valve body (T)	Test pressure (P)	Tested parts	Results (ppmv)	Uncertainty leakage measurement	Date	Pass / Fail
1	0	T _a	41.4barg	Body seals	5	semi-quantitative	10-02-2021	Pass
	0			Stem seal	5			Pass
	100			Stem seal	5			Pass
	101			Stem seal	5			Pass
2	101	260°C	41.4barg	Stem seal	51	semi-quantitative	10-02-2021	Pass
	200			Stem seal	43			Pass
	201			Stem seal	45			Pass
3	201	T _a	41.4barg	Stem seal	5	semi-quantitative	11-02-2021	Pass
	300			Stem seal	5			Pass
	301			Stem seal	5			Pass
4	301	260°C	41.4barg	Stem seal	8	semi-quantitative	11-02-2021	Pass
	400			Stem seal	15			Pass
	401			Stem seal	15			Pass
5	401	T _a	41.4barg	Stem seal	5	semi-quantitative	12-02-2021	Pass
	500			Stem seal	5			Pass
	501			Stem seal	5			Pass
6	501	260°C	41.4barg	Stem seal	10	semi-quantitative	12-02-2021	Pass
	600			Stem seal	15			Pass
	601			Stem seal	15			Pass
7	601	T _a	41.4barg	Stem seal	5	semi-quantitative	15-02-2021	Pass
	610			Stem seal	5			Pass
	610			Body seals	5			Pass

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Torque measurements					
Cycle	Tested part	Results	Uncertainty	Date	Pass / Fail
First mechanical cycle	Running torque	6.8barg	±0.08bar	10-02-2021	Pass
Last mechanical cycle	Running torque	6.0barg	±0.08bar	15-02-2021	Pass

Cycling duration

Total time for the valve to perform 610 mechanical cycles (full stroke) was approximately 1.7 hours (10 seconds per cycle).

Covering range

According to section 11 of API standard 641, First Edition October 2016, type testing of quarter-turn valves for fugitive emissions, the qualification range mentioned in section 11 may be used to qualify valves of the same quarter-turn design as the test valve if the criteria from points 11.1.1 to 11.1.8 are met.

Description	Tested valve	Scope
API 641 Valve group	Group A	Group A
Stem Diameter	50mm	25mm up to 75mm
Stack height	18mm	13.5mm up to 16.75mm
Stem motion	¼ turn stem	¼ turn stem
Stem Seal Material primary	PTFE Carbon, Graphite filled AISI 301	PTFE Carbon, Graphite filled AISI 301
Stem Seal Material secondary	Graphite	Graphite
Stem Seal Material third	Graphite	Graphite
Stem primary seal brand	GFD	GFD
Stem secondary seal brand	Klinger Kempchen	Klinger Kempchen
Stem third seal brand	James Walker	James Walker

Disclaimer: Under no circumstances ITIS B.V. can be held responsible applying the above mentioned covering range

Conclusion and remarks



The valve meets the requirements for Fugitive Emission and operability stated in API Standard 641, first edition, October 2016 'Type Testing of Quarter-turn Valves for Fugitive Emissions. No notable wear, deformations or damaging was detected on the sealing components during the visual inspection after the strip-down on the valve.

Reason of revision

Changing of the manufacturer location 1 from Slovakia to Slovenia.

This test report documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI). The test result(s) and conclusion(s) in this report related to the sample(s) tested as described herein and must not be used to claim product certification. This test report may not be reproduced in whole or in part, without written approval of ITIS B.V. The test meets the requirements of ISO 9001: 2015 as verified and certified by TÜV SÜD Management Service GmbH, certificate number: 12 100 43628 TMS. The test laboratory has not been responsible for the sampling stage (sample has been provided by the client). Test results stated in this report apply to the samples as received.

Applied decision rule: Measurements are reported as "Pass" – If the measurement results are within (or below) the specification limit when the measurement with its (upper) uncertainty limit is taken into account".

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Test certificate
202000519-C005 rev. 1

API 641 QUALIFICATION CERTIFICATE

This certificate is to certify that the valve below has passed the requirements for fugitive emission and operability according to standard: API standard 641, first edition, October 2016 "Type Testing of Quarter-turn Valves for Fugitive Emissions".

Test valve details

Manufacturer location 1 : Armature d.o.o.
Address : Koroška Cesta 55, SI/2366 Muta, Slovenia
Manufacturer location 2 : Friedrich Krombach GmbH
Address : Postfach 1130, 57202, Kreuztal, Germany
Manufacturer location 3 : Crane Ningjin Valve Co.
Address : Jing Long St. 496, 055550 Ningjin, China
Product name : Krombach® TUFSEAT™ Performance Series Metal Seated Ball Valve with Standard Trim
Nominal size : DN200
Pressure rating : Class 300
Valve Type : Ball valve
Design standard : ASME B16.34
Drawing number : 4924312014a Rev. 0, Date: 01-06-2020
Serial number : 130784
Body material : A216 WCB (1.0619)
Stem material : A182 F51 (1.4462)
Body gasket material : Spiral Wound, 316Ti Windings, ½ PTFE ½ Graphite filler, EPTFE tape overlay
Actuator : Pneumatic provided by Crane

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Test certificate
202000519-C005 rev. 1

According to API 641, section 11, the specified range for covering other valves is:

Description	Tested valve	Scope
API 641 Valve group	Group A	Group A
Stem Diameter	70mm	35mm up to 140mm
Stack height	24mm	18mm up to 30mm
Stem motion	¼ turn stem	¼ turn stem
Stem Seal Material primary	PFTE Carbon, Graphite filled AISI 301	PFTE Carbon, Graphite filled AISI 301
Stem Seal Material secondary	Graphite	Graphite
Stem Seal Material third	Graphite	Graphite
Stem primary seal brand	GFD	GFD
Stem secondary seal brand	Klinger Kempchen	Klinger Kempchen
Stem third seal brand	James Walker	James Walker

Disclaimer: Under no circumstances ITIS B.V. can be held responsible applying the above mentioned covering range

This certificate refers to the above mentioned test valve. This certificate does not imply assessment of the production of the valves. This certificate is only valid in conjunction with the full ITIS BV test report number 202000519-R005 rev. 1.

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Valve stem seal information


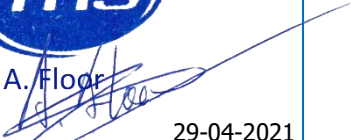
Manufacturer 1 : GFD
Stem seal description : Spring energized lip seal
Model/Type : n.a.
Manufacturer 2 : James Walker
Stem seal description : Graphite ring
Model/Type : Supagraf Premier
Manufacturer 3 : Klinger Kempchen
Stem seal description : Graphite ring
Model/Type : Rivatherm Super 2E2
Included in API 622 scope : No
Stem seal material primary : PTFE, Carbon + Graphite filled, AISI 301 (1.4310)
Stem seal material secondary : Graphite
Stem seal material third : Graphite
Number of rings primary seal : 1
Number of rings secondary seal : 2
Number of third seal : 2
Gland torque : 450Nm at start of the test
Outer stem seal dimension (OD) : 90mm
Inner stem seal dimension (Od) : 70mm
Stack Height : 24mm
Stem seal chamber depth : 38.0mm

Requirements and limits

API 641 Valve group : Group A
Ambient temperature (T_a) : 15°C to 40°C
Elevated temperature [T_e] : 260°C ±5%
Amount of operational cycles : 610 cycles
Amount of thermal cycles : 3 thermal cycles
Stem orientation : Vertical
Maximum allowable leak rate : 100 ppmv (measurement according to EPA Method 21)
Test pressure [P_a] : 41.4barg ±5%
Test pressure [P_e] : 41.4barg ±5%

Manufacturer published torque values

Running torque : 760.0Nm
Closing torque : 760.0Nm
Maximum operating pressure : 8.0barg

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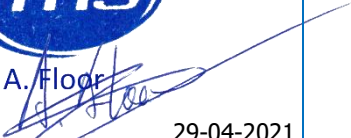


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Test results

Test	Mechanical cycles (total)	Temperature valve body (T)	Test pressure (P)	Tested parts	Results (ppmv)	Uncertainty leakage measurement	Date	Pass / Fail
1	0	T _a	41.4barg	Body seals	5	semi-quantitative	02-03-2021	Pass
	0			Stem seal	5			Pass
	100			Stem seal	5			Pass
	101			Stem seal	5			Pass
2	101	260°C	41.4barg	Stem seal	5	semi-quantitative	03-03-2021	Pass
	200			Stem seal	5			Pass
	201			Stem seal	5			Pass
3	201	T _a	41.4barg	Stem seal	5	semi-quantitative	03-03-2021	Pass
	300			Stem seal	5			Pass
	301			Stem seal	5			Pass
4	301	260°C	41.4barg	Stem seal	5	semi-quantitative	04-03-2021	Pass
	400			Stem seal	6			Pass
	401			Stem seal	7			Pass
5	401	T _a	41.4barg	Stem seal	5	semi-quantitative	04-03-2021	Pass
	500			Stem seal	6			Pass
	501			Stem seal	6			Pass
6	501	260°C	41.4barg	Stem seal	5	semi-quantitative	05-03-2021	Pass
	600			Stem seal	8			Pass
	601			Stem seal	9			Pass
7	601	T _a	41.4barg	Stem seal	5	semi-quantitative	05-03-2021	Pass
	610			Stem seal	5			Pass
	610			Body seals	5			Pass

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Torque measurements					
Cycle	Tested part	Results	Uncertainty	Date	Pass / Fail
First mechanical cycle	Running torque	5.5barg	±0.08bar	01-03-2021	Pass
Last mechanical cycle	Running torque	6.5barg	±0.08bar	05-03-2021	Pass

Cycling duration

Total time for the valve to perform 610 mechanical cycles (full stroke) was approximately 6.1 hours (36 seconds per cycle).

Covering range

According to section 11 of API standard 641, First Edition October 2016, type testing of quarter-turn valves for fugitive emissions, the qualification range mentioned in section 11 may be used to qualify valves of the same quarter-turn design as the test valve if the criteria from points 11.1.1 to 11.1.8 are met.

Description	Tested valve	Scope
API 641 Valve group	Group A	Group A
Stem Diameter	70mm	35mm up to 140mm
Stack height	24mm	18mm up to 30mm
Stem motion	¼ turn stem	¼ turn stem
Stem Seal Material primary	PTFE Carbon, Graphite filled AISI 301	PTFE Carbon, Graphite filled AISI 301
Stem Seal Material secondary	Graphite	Graphite
Stem Seal Material third	Graphite	Graphite
Stem primary seal brand	GFD	GFD
Stem secondary seal brand	Klinger Kempchen	Klinger Kempchen
Stem third seal brand	James Walker	James Walker

Disclaimer: Under no circumstances ITIS B.V. can be held responsible applying the above mentioned covering range

Conclusion and remarks


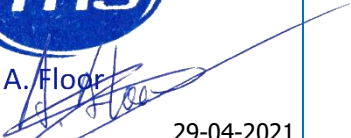
The valve meets the requirements for Fugitive Emission and operability stated in API Standard 641, first edition, October 2016 'Type Testing of Quarter-turn Valves for Fugitive Emissions. No notable wear, deformations or damaging was detected on the sealing components during the visual inspection after the strip-down on the valve.

Reason of revision

Changing of the manufacturer location 1 from Slovakia to Slovenia.

This test report documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI). The test result(s) and conclusion(s) in this report related to the sample(s) tested as described herein and must not be used to claim product certification. This test report may not be reproduced in whole or in part, without written approval of ITIS B.V. The test meets the requirements of ISO 9001: 2015 as verified and certified by TÜV SÜD Management Service GmbH, certificate number: 12 100 43628 TMS. The test laboratory has not been responsible for the sampling stage (sample has been provided by the client). Test results stated in this report apply to the samples as received.

Applied decision rule: Measurements are reported as "Pass" – If the measurement results are within (or below) the specification limit when the measurement with its (upper) uncertainty limit is taken into account".

Approved signatory	
 A. Floor  A. Floor	29-04-2021