

Dr.-Ing. T. Bäumer

Prüflabor - Ingenieurbüro – Prüfstände

TEST Report

Fire Type Test according to DIN EN ISO 10497 Report IBB-2412

This report confirms the successful testing of a representative valve in compliance with DIN EN ISO 10497, 2010, and API 607, 7th edition.

| | | |
|---------------------|---|---|
| Manufacturer | Armature d.o.o. Koroska cesta 55 2366 Muta, SI | Friedrich Krombach GmbH Postfach 1130 57202 Kreuztal |
| | Crane Ningjin Valve Co. Jing Long St. 496 055550 Ningjin, China | Xomox Chihuahua S.A de C.V Juan Ruiz de Alarcón 313 31000 Chihuahua, Mexico |

| | |
|-------------------|--|
| Test Valve | Krombach (R) TUFSEAT TM Performance Series with Standard Temperature Trim Metal Seated Ball Valve NPS 2 Class 150 Flange end connections, Gear operated Nominal bore: 2" Pressure rating: Class 150 Body/Bonnet material: A216 WCB 1.0619 Stem material: F51 A279 UNS 531803 1.4462 Ball material: A182 F316L 1.4404 + coating Ball seal material: A182 F316L 1.4404 + coating Operation device: Gear with handwheel Drawing Number: 49 243 06 010a |
|-------------------|--|

| | |
|-----------------------------------|--|
| Date of Testing | 21 October 2020 |
| Test Report | 5 pages |
| Qualified sizes | DN 50 and below, DN 65, DN 80, DN 100 2" and below, 2 ½", 3", 4" |
| Qualified pressure ratings | Class 150, Class 300 PN 10, PN 16, PN 25, PN 40 |
| Testing location | Laboratory of Dr.-Ing. T. Bäumer GmbH, Altensenner Weg 75, D - 32052 Herford |
| Test requirements | The tests were carried out strictly in accordance with DIN EN ISO 10497, 2010, and API 607, 7th edition |
| Participants | Mr. Dr. T. Bäumer Dr.-Ing. T. Bäumer GmbH |

Test examination

The water filled valve was subjected to fire for 30 minutes at a temperature between 750 °C and 1000 °C and a pressure of e.g. 14.5 barg. After the burn period the through-seat-leakage was determined and after a cool down period the external leakage and the through-seat-leakage were measured. Then the valve was opened, and the external leakage was determined.

Instrumentation

Temperature: 4 Thermocouples, Ni Cr Ni, accuracy 1 K.

Pressure: Pressure transmitter, accuracy 0,5 %.

PC-system: AD converter board, software for measuring, Personal Computer

The measuring devices are controlled by an accredited calibration service.

Test results

Time of test start (ignition of burners): 11.10 am

Temperatures and pressure during burn period

| Time [s] | p [barg] | T _{Fire1} [°C] | T _{Fire2} [°C] | T _{Cal1} [°C] | T _{Cal2} [°C] |
|-------------|-------------|----------------------------|----------------------------|---------------------------|---------------------------|
| .0 | 14.4 | 82.9 | 66.9 | 11.4 | 10.5 |
| 30.0 | 14.3 | 648.3 | 426.6 | 32.2 | 20.4 |
| 60.0 | 14.3 | 792.4 | 762.4 | 87.7 | 57.1 |
| 90.0 | 14.4 | 816.9 | 805.4 | 153.3 | 105.1 |
| 120.0 | 14.4 | 815.3 | 781.2 | 219.4 | 157.5 |
| 150.0 | 14.4 | 836.1 | 794.4 | 282.1 | 207.1 |
| 180.0 | 14.3 | 787.4 | 799.2 | 339.2 | 257.7 |
| 210.0 | 14.4 | 836.3 | 797.0 | 390.6 | 305.3 |
| 240.0 | 14.4 | 810.8 | 781.2 | 443.3 | 354.5 |
| 270.0 | 14.4 | 779.2 | 812.1 | 491.6 | 402.7 |
| 300.0 | 14.4 | 792.0 | 789.9 | 535.1 | 447.0 |
| 330.0 | 14.4 | 814.3 | 788.4 | 573.4 | 486.7 |
| 360.0 | 14.4 | 822.7 | 779.5 | 610.8 | 523.5 |
| 390.0 | 14.4 | 827.1 | 801.7 | 643.1 | 557.0 |
| 420.0 | 14.3 | 810.8 | 703.8 | 670.6 | 588.3 |
| 450.0 | 14.5 | 851.8 | 728.0 | 696.4 | 615.1 |
| 480.0 | 14.5 | 828.8 | 712.1 | 719.7 | 638.3 |
| 510.0 | 14.4 | 876.6 | 777.8 | 738.7 | 657.8 |
| 540.0 | 14.4 | 916.2 | 790.3 | 757.8 | 675.4 |
| 570.0 | 14.5 | 897.9 | 767.4 | 775.5 | 692.1 |

| | | | | | |
|--------|------|-------|-------|-------|-------|
| 600.0 | 14.4 | 894.6 | 784.8 | 790.6 | 706.9 |
| 630.0 | 14.5 | 890.4 | 811.8 | 803.3 | 721.0 |
| 660.0 | 14.4 | 909.4 | 833.7 | 815.5 | 733.2 |
| 690.0 | 14.4 | 879.2 | 807.4 | 824.8 | 744.9 |
| 720.0 | 14.3 | 909.2 | 831.3 | 830.3 | 754.0 |
| 750.0 | 14.3 | 906.2 | 859.2 | 836.3 | 761.6 |
| 780.0 | 14.4 | 922.7 | 862.5 | 840.5 | 767.4 |
| 810.0 | 14.4 | 900.3 | 834.5 | 844.9 | 774.1 |
| 840.0 | 14.4 | 908.3 | 799.1 | 846.8 | 779.4 |
| 870.0 | 14.4 | 906.1 | 840.1 | 851.0 | 785.3 |
| 900.0 | 14.3 | 881.7 | 810.2 | 852.0 | 788.5 |
| 930.0 | 14.4 | 895.4 | 861.4 | 851.0 | 791.1 |
| 960.0 | 14.4 | 898.1 | 834.4 | 850.7 | 794.0 |
| 990.0 | 14.4 | 834.5 | 796.8 | 852.3 | 795.3 |
| 1020.0 | 14.3 | 873.0 | 809.1 | 849.7 | 793.9 |
| 1050.0 | 14.4 | 872.3 | 842.2 | 848.3 | 794.3 |
| 1080.0 | 14.4 | 857.8 | 789.2 | 847.6 | 793.5 |
| 1110.0 | 14.4 | 879.1 | 845.1 | 845.2 | 793.5 |
| 1140.0 | 14.4 | 912.3 | 879.1 | 844.9 | 795.3 |
| 1170.0 | 14.3 | 889.3 | 875.1 | 847.2 | 795.6 |
| 1200.0 | 14.4 | 869.3 | 855.8 | 846.2 | 795.5 |
| 1230.0 | 14.5 | 859.8 | 860.5 | 846.6 | 794.8 |
| 1260.0 | 14.4 | 896.2 | 876.8 | 845.0 | 794.2 |
| 1290.0 | 14.4 | 901.3 | 862.7 | 845.5 | 795.8 |
| 1320.0 | 14.5 | 894.4 | 860.9 | 847.3 | 798.8 |
| 1350.0 | 14.5 | 885.5 | 893.0 | 847.3 | 800.3 |
| 1380.0 | 14.4 | 877.3 | 826.3 | 848.8 | 800.7 |
| 1410.0 | 14.4 | 892.2 | 891.2 | 847.3 | 801.8 |
| 1440.0 | 14.5 | 886.5 | 824.9 | 849.1 | 802.3 |
| 1470.0 | 14.4 | 896.8 | 864.0 | 849.2 | 804.0 |
| 1500.0 | 14.4 | 912.8 | 884.0 | 849.7 | 805.0 |
| 1530.0 | 14.4 | 885.9 | 843.2 | 852.1 | 808.5 |
| 1560.0 | 14.4 | 878.9 | 818.0 | 853.5 | 808.0 |
| 1590.0 | 14.5 | 902.1 | 883.5 | 852.6 | 808.7 |
| 1620.0 | 14.5 | 896.3 | 908.9 | 853.2 | 807.8 |
| 1650.0 | 14.4 | 892.8 | 843.1 | 855.9 | 808.3 |
| 1680.0 | 14.4 | 891.8 | 856.3 | 855.2 | 808.8 |
| 1710.0 | 14.5 | 890.9 | 918.1 | 854.7 | 808.4 |
| 1740.0 | 14.5 | 897.3 | 876.8 | 854.4 | 808.2 |
| 1770.0 | 14.4 | 911.5 | 847.1 | 853.5 | 808.3 |
| 1800.0 | 14.5 | 766.6 | 677.3 | 860.3 | 808.1 |

Time required for valve to cool down to 100 °C: 6 min

Test valve unseated: Yes

Test valve moved to the fully open position: Yes

| | Leakage [ml/DN/min] | Allowable leakage [ml/DN/min] |
|---|------------------------|----------------------------------|
| Through-seat-leakage in burning phase: | 0,7 | 16,0 |
| External leakage in burning and cooling phase: | 0,0 | 4,0 |
| Through-seat-leakage at low pressure: | 0,0 | 1,6 |
| External leakage after unseating the valve: | 0,8 | 1,0 |

Comments on the results

The test valve is a ball valve with the pressure relief system for the valve ball tested in valve inlet. Other valves of same valve type were tested with the pressure relief system in valve outlet.

Conclusion

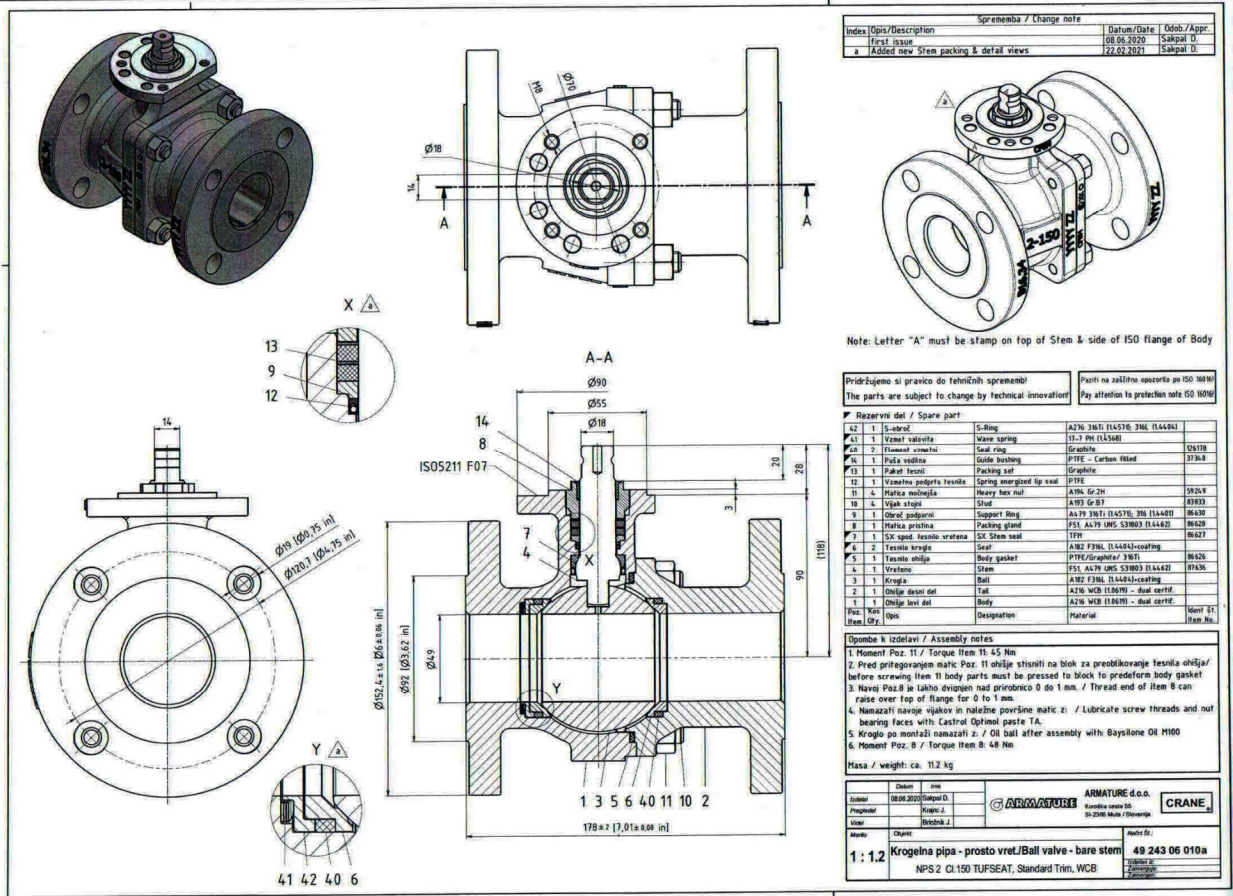
The test valve fulfilled the test requirements according to DIN EN ISO 10497, 2010, and API 607, 7th edition. Only allowable through-seat-leakages and external leakages were observed during the tests.

Herford, 21 October 2020

Dr.-Ing. T. Bäumer
GmbH



Mr. Dr. T. Bäumer
Consultant engineer



Dr.-Ing. T. Bäumer

Prüflabor - Ingenieurbüro – Prüfstände

TEST Certificate

Fire Type Test according to DIN EN ISO 10497 Report IBB-2412

This report confirms the successful testing of a representative valve in compliance with DIN EN ISO 10497, 2010, and API 607, 7th edition.

| | | |
|---------------------|---|---|
| Manufacturer | Armature d.o.o. Koroska cesta 55 2366 Muta, SI | Friedrich Krombach GmbH Postfach 1130 57202 Kreuztal |
| | Crane Ningjin Valve Co. Jing Long St. 496 055550 Ningjin, China | Xomox Chihuahua S.A de C.V Juan Ruiz de Alarcón 313 31000 Chihuahua, Mexico |

| | |
|-------------------|---|
| Test Valve | Krombach (R) TUFSEAT TM Performance Series with Standard Temperature Trim Metal Seated Ball Valve NPS 2 Class 150 Flange end connections, Gear operated Body/Bonnet material: A216 WCB 1.0619 Drawing Number: 49 243 06 010a |
|-------------------|---|

| | |
|------------------------|-----------------|
| Date of Testing | 21 October 2020 |
|------------------------|-----------------|

| | |
|------------------------|---|
| Qualified sizes | DN 50 and below, DN 65, DN 80, DN 100 2" and below, 2 ½", 3", 4" |
|------------------------|---|

| | |
|-----------------------------------|--|
| Qualified pressure ratings | Class 150, Class 300 PN 10, PN 16, PN 25, PN 40 |
|-----------------------------------|--|

| | |
|--------------------------|--|
| Test requirements | The tests were carried out strictly in accordance with DIN EN ISO 10497, 2010, and API 607, 7th edition |
|--------------------------|--|

Herford, 21 October 2020

Dr.-Ing. T. Bäumer
GmbH



Mr. Dr. T. Bäumer
Consultant engineer

Dr.-Ing. T. Bäumer

Prüflabor - Ingenieurbüro – Prüfstände

TEST Report

Fire Type Test according to DIN EN ISO 10497

Report IBB-2340

This report confirms the successful testing of a representative valve in compliance with DIN EN ISO 10497, 2010, and API 607, 7th edition.

| | | |
|---------------------|--|---|
| Manufacturer | Armature d.o.o. | Friedrich Krombach GmbH |
| | Koroska cesta 55 2366 Muta, SI | Postfach 1130 57202 Kreuztal |
| | Crane Ningjin Valve Co. | Xomox Chihuahua S.A de C.V |
| | Jing Long St. 496 055550 Ningjin, China | Juan Ruiz de Alarcón 313 31000 Chihuahua, Mexico |

| | |
|-------------------|---|
| Test Valve | Krombach (R) TUFSEAT TM Performance Series with Standard Temperature Trim Metal Seated Ball Valve NPS 3 Class 150 Flange end connections, Gear operated Nominal bore: DN 80 Pressure rating: Class 150 Body/Bonnet material: CF8M Stem material: F51 Ball material: Austenitic steel + coating Ball seal material: Austenitic steel + coating Operation device: Gear with handwheel Drawing Number: 49 243 08 002a |
|-------------------|---|

Date of Testing 20 April 2020

Test Report 5 pages

Qualified sizes DN 80, DN 100, DN 125, DN 150
3", 4", 5", 6"

Qualified pressure ratings Class 150, Class 300
PN 10, PN 16, PN 25, PN 40

Testing location Laboratory of Dr.-Ing. T. Bäumer GmbH,
Altensenner Weg 75, D - 32052 Herford

Test requirements The tests were carried out strictly in accordance with
DIN EN ISO 10497, 2010, and API 607, 7th edition

Participants Mr. Dr. T. Bäumer Dr.-Ing. T. Bäumer GmbH

Test examination

The water filled valve was subjected to fire for 30 minutes at a temperature between 750 °C and 1000 °C and a pressure of e.g. 14.5 barg. After the burn period the through-seat-leakage was determined and after a cool down period the external leakage and the through-seat-leakage were measured. Then the valve was opened, and the external leakage was determined.

Instrumentation

Temperature: 4 Thermocouples, Ni Cr Ni, accuracy 1 K.

Pressure: Pressure transmitter, accuracy 0,5 %.

PC-system: AD converter board, software for measuring, Personal Computer

The measuring devices are controlled by an accredited calibration service.

Test results

Time of test start (ignition of burners): 09.37 am

Temperatures and pressure during burn period

| Time | p | T _{Fire1} | T _{Fire2} | T _{Cal1} | T _{Cal2} |
|-------|--------|--------------------|--------------------|-------------------|-------------------|
| [s] | [barg] | [°C] | [°C] | [°C] | [°C] |
| .0 | 14.5 | 8.5 | 9.6 | 17.2 | 23.6 |
| 30.0 | 14.6 | 683.1 | 624.1 | 33.7 | 32.7 |
| 60.0 | 14.6 | 770.7 | 701.8 | 89.3 | 70.2 |
| 90.0 | 14.5 | 855.7 | 821.3 | 155.3 | 117.7 |
| 120.0 | 14.6 | 940.1 | 841.5 | 227.3 | 176.6 |
| 150.0 | 14.6 | 949.1 | 829.1 | 301.1 | 241.1 |
| 180.0 | 14.5 | 858.1 | 758.7 | 364.8 | 305.2 |
| 210.0 | 14.5 | 857.4 | 765.5 | 415.7 | 361.4 |
| 240.0 | 14.6 | 884.4 | 771.7 | 460.2 | 412.5 |
| 270.0 | 14.6 | 955.4 | 800.0 | 502.0 | 460.2 |
| 300.0 | 14.5 | 922.1 | 787.9 | 545.1 | 506.9 |
| 330.0 | 14.6 | 898.6 | 785.8 | 575.8 | 544.7 |
| 360.0 | 14.5 | 958.1 | 794.9 | 600.4 | 577.8 |
| 390.0 | 14.5 | 935.7 | 787.3 | 625.6 | 607.3 |
| 420.0 | 14.6 | 916.3 | 794.4 | 647.6 | 632.5 |
| 450.0 | 14.6 | 990.7 | 795.3 | 666.8 | 653.1 |
| 480.0 | 14.5 | 938.5 | 814.6 | 684.4 | 672.9 |
| 510.0 | 14.6 | 901.1 | 773.0 | 699.0 | 689.0 |
| 540.0 | 14.5 | 929.7 | 785.0 | 708.0 | 702.3 |
| 570.0 | 14.5 | 924.8 | 826.4 | 718.2 | 714.4 |

| | | | | | |
|--------|------|-------|-------|-------|-------|
| 600.0 | 14.6 | 863.6 | 842.3 | 723.6 | 728.0 |
| 630.0 | 14.5 | 937.1 | 812.4 | 728.8 | 738.2 |
| 660.0 | 14.5 | 887.2 | 839.9 | 729.9 | 746.5 |
| 690.0 | 14.6 | 961.1 | 805.3 | 732.9 | 756.4 |
| 720.0 | 14.6 | 903.6 | 834.3 | 740.3 | 764.3 |
| 750.0 | 14.5 | 948.6 | 793.3 | 746.8 | 767.9 |
| 780.0 | 14.5 | 905.4 | 850.5 | 750.5 | 771.8 |
| 810.0 | 14.5 | 855.9 | 820.0 | 754.1 | 779.4 |
| 840.0 | 14.5 | 918.6 | 806.8 | 756.6 | 776.0 |
| 870.0 | 14.5 | 940.4 | 848.4 | 761.8 | 779.1 |
| 900.0 | 14.5 | 987.3 | 841.4 | 765.2 | 781.1 |
| 930.0 | 14.6 | 953.0 | 845.8 | 769.8 | 788.2 |
| 960.0 | 14.5 | 964.9 | 824.3 | 772.8 | 790.9 |
| 990.0 | 14.4 | 873.7 | 836.5 | 775.3 | 794.3 |
| 1020.0 | 14.5 | 900.9 | 837.7 | 773.4 | 791.0 |
| 1050.0 | 14.6 | 855.4 | 819.9 | 773.7 | 790.5 |
| 1080.0 | 14.6 | 922.3 | 824.8 | 771.8 | 787.6 |
| 1110.0 | 14.5 | 865.9 | 819.0 | 772.4 | 789.7 |
| 1140.0 | 14.5 | 880.4 | 831.8 | 772.0 | 787.1 |
| 1170.0 | 14.5 | 929.7 | 858.3 | 768.1 | 784.4 |
| 1200.0 | 14.4 | 882.4 | 850.1 | 766.6 | 790.1 |
| 1230.0 | 14.4 | 892.5 | 807.1 | 770.5 | 791.6 |
| 1260.0 | 14.5 | 897.0 | 843.5 | 770.3 | 790.3 |
| 1290.0 | 14.5 | 803.1 | 811.7 | 772.1 | 789.3 |
| 1320.0 | 14.5 | 900.6 | 834.9 | 766.1 | 782.5 |
| 1350.0 | 14.5 | 938.1 | 829.0 | 767.7 | 782.6 |
| 1380.0 | 14.6 | 861.3 | 779.1 | 772.8 | 785.3 |
| 1410.0 | 14.5 | 888.0 | 847.7 | 772.6 | 781.0 |
| 1440.0 | 14.6 | 881.4 | 823.0 | 772.6 | 781.7 |
| 1470.0 | 14.6 | 916.7 | 812.6 | 771.4 | 780.2 |
| 1500.0 | 14.5 | 935.0 | 812.2 | 771.0 | 782.5 |
| 1530.0 | 14.5 | 861.8 | 782.3 | 774.8 | 784.3 |
| 1560.0 | 14.6 | 898.9 | 802.4 | 773.3 | 779.7 |
| 1590.0 | 14.6 | 854.1 | 858.9 | 773.0 | 782.0 |
| 1620.0 | 14.5 | 904.2 | 831.8 | 769.5 | 784.7 |
| 1650.0 | 14.5 | 879.1 | 817.9 | 768.7 | 785.9 |
| 1680.0 | 14.5 | 907.1 | 827.1 | 767.3 | 786.8 |
| 1710.0 | 14.6 | 889.6 | 859.1 | 767.6 | 786.4 |
| 1740.0 | 14.5 | 868.0 | 864.0 | 769.3 | 790.9 |
| 1770.0 | 14.5 | 897.2 | 859.0 | 769.6 | 790.7 |
| 1800.0 | 14.4 | 862.9 | 830.7 | 779.6 | 800.0 |

Time required for valve to cool down to 100 °C: 6 min

Test valve unseated: Yes

Test valve moved to the fully open position: Yes

| | Leakage [ml/DN/min] | Allowable leakage [ml/DN/min] |
|---|------------------------|----------------------------------|
| Through-seat-leakage in burning phase: | 0,1 | 16,0 |
| External leakage in burning and cooling phase: | 0,0 | 4,0 |
| Through-seat-leakage at low pressure: | 0,0 | 1,6 |
| External leakage after unseating the valve: | 0,9 | 1,0 |

Comments on the results

The test valve is a symmetric Ball Valve. Because of the symmetry the tests were carried out only for one flow direction.

Conclusion

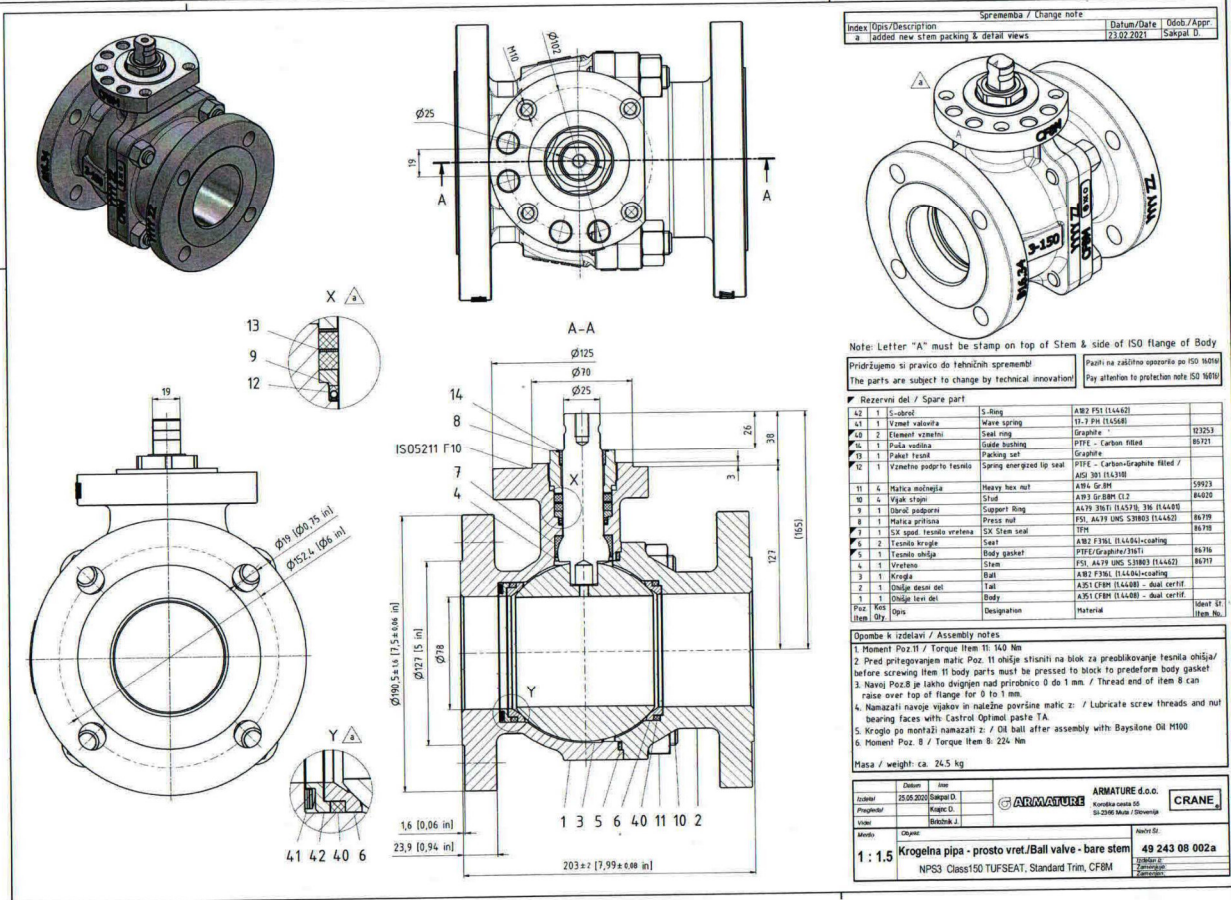
The test valve fulfilled the test requirements according to DIN EN ISO 10497, 2010, and API 607, 7th edition. Only allowable through-seat-leakages and external leakages were observed during the tests.

Herford, 20 April 2019

Dr.-Ing. T. Bäumer
GmbH



Mr. Dr. T. Bäumer
Consultant engineer



Dr.-Ing. T. Bäumer

Prüflabor - Ingenieurbüro – Prüfstände

TEST Certificate

Fire Type Test according to DIN EN ISO 10497 Report IBB-2340

This report confirms the successful testing of a representative valve in compliance with DIN EN ISO 10497, 2010, and API 607, 7th edition.

| | | |
|---------------------|---|---|
| Manufacturer | Armature d.o.o. Koroska cesta 55 2366 Muta, SI | Friedrich Krombach GmbH Postfach 1130 57202 Kreuztal |
| | Crane Ningjin Valve Co. Jing Long St. 496 055550 Ningjin, China | Xomox Chihuahua S.A de C.V Juan Ruiz de Alarcón 313 31000 Chihuahua, Mexico |

Test Valve Krombach (R) TUFSEAT TM Performance Series
with Standard Temperature Trim
Metal Seated Ball Valve NPS 3 Class 150
Flange end connections, Gear operated
Body/Bonnet material: CF8M
Drawing Number: 49 243 08 002a

Date of Testing 20 April 2020

Qualified sizes DN 80, DN 100, DN 125, DN 150
3", 4", 5", 6"

Qualified pressure ratings Class 150, Class 300
PN 10, PN 16, PN 25, PN 40

Test requirements The tests were carried out strictly in accordance with
DIN EN ISO 10497, 2010, and API 607, 7th edition

Herford, 20 April 2020

Dr.-Ing. T. Bäumer
GmbH



Mr. Dr. T. Bäumer
Consultant engineer

Dr.-Ing. T. Bäumer

Prüflabor - Ingenieurbüro – Prüfstände

TEST Report

Fire Type Test according to DIN EN ISO 10497

Report IBB-2342

This report confirms the successful testing of a representative valve in compliance with DIN EN ISO 10497, 2010, and API 607, 7th edition.

| | | |
|---------------------|---|---|
| Manufacturer | Armature d.o.o. Koroska cesta 55 2366 Muta, SI | Friedrich Krombach GmbH Postfach 1130 57202 Kreuztal |
| | Crane Ningjin Valve Co. Jing Long St. 496 055550 Ningjin, China | Xomox Chihuahua S.A de C.V Juan Ruiz de Alarcón 313 31000 Chihuahua, Mexico |

| | |
|-------------------|--|
| Test Valve | Krombach (R) TUFSEAT TM Performance Series with Standard Temperature Trim Metal Seated Ball Valve NPS 3 Class 150 Flange end connections, Gear operated Nominal bore: DN 80 Pressure rating: Class 150 Body/Bonnet material: WCB Stem material: F51 Ball material: Austenitic steel + coating Ball seal material: Austenitic steel + coating Operation device: Gear with handwheel Drawing Number: 49 243 08 014a |
|-------------------|--|

Date of Testing 20 April 2020

Test Report 5 pages

Qualified sizes DN 80, DN 100, DN 125, DN 150
3", 4", 5", 6"

Qualified pressure ratings Class 150, Class 300
PN 10, PN 16, PN 25, PN 40

Testing location Laboratory of Dr.-Ing. T. Bäumer GmbH,
Altensenner Weg 75, D - 32052 Herford

Test requirements The tests were carried out strictly in accordance with
DIN EN ISO 10497, 2010, and API 607, 7th edition

Participants Mr. Dr. T. Bäumer Dr.-Ing. T. Bäumer GmbH

Test examination

The water filled valve was subjected to fire for 30 minutes at a temperature between 750 °C and 1000 °C and a pressure of e.g. 14.5 barg. After the burn period the through-seat-leakage was determined and after a cool down period the external leakage and the through-seat-leakage were measured. Then the valve was opened, and the external leakage was determined.

Instrumentation

Temperature: 4 Thermocouples, Ni Cr Ni, accuracy 1 K.

Pressure: Pressure transmitter, accuracy 0,5 %.

PC-system: AD converter board, software for measuring, Personal Computer

The measuring devices are controlled by an accredited calibration service.

Test results

Time of test start (ignition of burners): 11.40 am

Temperatures and pressure during burn period

| Time [s] | p [barg] | T _{Fire1} [°C] | T _{Fire2} [°C] | T _{Cal1} [°C] | T _{Cal2} [°C] |
|-------------|-------------|----------------------------|----------------------------|---------------------------|---------------------------|
| .0 | 14.5 | 215.7 | 267.0 | 28.8 | 31.1 |
| 30.0 | 14.5 | 552.4 | 542.8 | 49.9 | 46.5 |
| 60.0 | 14.6 | 694.1 | 639.0 | 94.2 | 77.8 |
| 90.0 | 14.4 | 844.6 | 772.4 | 153.5 | 119.5 |
| 120.0 | 14.6 | 925.3 | 782.8 | 224.6 | 174.8 |
| 150.0 | 14.6 | 933.7 | 790.8 | 299.6 | 236.9 |
| 180.0 | 14.5 | 964.8 | 801.9 | 366.7 | 301.6 |
| 210.0 | 14.5 | 958.5 | 796.6 | 429.2 | 365.5 |
| 240.0 | 14.6 | 912.2 | 806.6 | 482.9 | 424.5 |
| 270.0 | 14.6 | 913.1 | 806.0 | 527.7 | 475.7 |
| 300.0 | 14.5 | 947.2 | 783.5 | 564.6 | 520.7 |
| 330.0 | 14.6 | 983.9 | 816.9 | 597.0 | 561.6 |
| 360.0 | 14.6 | 930.2 | 797.4 | 627.8 | 599.5 |
| 390.0 | 14.5 | 942.4 | 786.7 | 654.8 | 631.5 |
| 420.0 | 14.5 | 936.0 | 782.2 | 672.3 | 654.5 |
| 450.0 | 14.6 | 985.1 | 817.4 | 687.9 | 673.9 |
| 480.0 | 14.6 | 952.2 | 817.7 | 701.5 | 691.4 |
| 510.0 | 14.7 | 891.1 | 814.4 | 713.0 | 706.2 |
| 540.0 | 14.6 | 923.0 | 806.9 | 720.4 | 719.4 |
| 570.0 | 14.6 | 943.8 | 811.5 | 727.5 | 731.5 |

| | | | | | |
|--------|------|-------|-------|-------|-------|
| 600.0 | 14.5 | 840.6 | 788.5 | 736.1 | 742.7 |
| 630.0 | 14.6 | 776.7 | 774.8 | 735.0 | 743.9 |
| 660.0 | 14.4 | 819.6 | 774.8 | 731.2 | 743.6 |
| 690.0 | 14.4 | 776.2 | 815.3 | 726.0 | 741.5 |
| 720.0 | 14.3 | 793.8 | 769.8 | 721.1 | 742.9 |
| 750.0 | 14.3 | 812.3 | 794.3 | 721.3 | 743.3 |
| 780.0 | 14.4 | 782.9 | 769.2 | 722.9 | 743.4 |
| 810.0 | 14.5 | 767.6 | 767.2 | 717.4 | 742.2 |
| 840.0 | 14.6 | 805.1 | 805.7 | 712.7 | 741.0 |
| 870.0 | 14.7 | 773.7 | 785.8 | 713.1 | 741.6 |
| 900.0 | 14.7 | 812.9 | 847.5 | 711.7 | 742.9 |
| 930.0 | 14.6 | 794.9 | 788.5 | 715.6 | 748.5 |
| 960.0 | 14.8 | 770.6 | 781.2 | 718.5 | 749.4 |
| 990.0 | 14.7 | 770.4 | 836.9 | 718.4 | 748.3 |
| 1020.0 | 14.6 | 786.8 | 800.3 | 717.9 | 751.2 |
| 1050.0 | 14.5 | 821.7 | 836.8 | 717.3 | 753.3 |
| 1080.0 | 14.5 | 834.1 | 819.4 | 716.6 | 756.3 |
| 1110.0 | 14.6 | 805.1 | 783.3 | 718.1 | 758.3 |
| 1140.0 | 14.4 | 849.3 | 792.4 | 719.8 | 755.7 |
| 1170.0 | 14.5 | 812.1 | 779.9 | 726.8 | 758.9 |
| 1200.0 | 14.7 | 769.3 | 791.0 | 730.0 | 757.4 |
| 1230.0 | 14.7 | 825.2 | 823.3 | 727.7 | 755.1 |
| 1260.0 | 14.7 | 888.4 | 811.3 | 731.9 | 758.3 |
| 1290.0 | 14.6 | 807.7 | 847.5 | 736.8 | 762.2 |
| 1320.0 | 14.6 | 839.6 | 862.0 | 735.8 | 767.1 |
| 1350.0 | 14.6 | 881.3 | 837.9 | 735.9 | 770.5 |
| 1380.0 | 14.5 | 862.2 | 868.0 | 739.2 | 773.6 |
| 1410.0 | 14.5 | 880.2 | 828.8 | 741.0 | 778.3 |
| 1440.0 | 14.6 | 871.1 | 803.0 | 743.9 | 779.7 |
| 1470.0 | 14.6 | 892.1 | 828.2 | 748.5 | 780.5 |
| 1500.0 | 14.5 | 869.1 | 838.1 | 751.3 | 779.7 |
| 1530.0 | 14.5 | 912.0 | 837.6 | 752.5 | 782.1 |
| 1560.0 | 14.6 | 833.6 | 838.8 | 754.3 | 784.9 |
| 1590.0 | 14.6 | 874.7 | 844.1 | 752.9 | 783.7 |
| 1620.0 | 14.6 | 863.0 | 833.6 | 752.1 | 784.4 |
| 1650.0 | 14.4 | 828.6 | 831.7 | 753.7 | 785.1 |
| 1680.0 | 14.4 | 859.2 | 811.7 | 749.8 | 785.6 |
| 1710.0 | 14.6 | 867.5 | 826.3 | 749.3 | 784.6 |
| 1740.0 | 14.5 | 846.0 | 800.7 | 751.1 | 785.0 |
| 1770.0 | 14.5 | 855.6 | 814.0 | 750.8 | 783.1 |
| 1800.0 | 14.4 | 839.6 | 807.5 | 751.3 | 783.7 |

Time required for valve to cool down to 100 °C: 7 min

Test valve unseated: Yes

Test valve moved to the fully open position: Yes

| | Leakage [ml/DN/min] | Allowable leakage [ml/DN/min] |
|---|------------------------|----------------------------------|
| Through-seat-leakage in burning phase: | 0,1 | 16,0 |
| External leakage in burning and cooling phase: | 0,0 | 4,0 |
| Through-seat-leakage at low pressure: | 0,0 | 1,6 |
| External leakage after unseating the valve: | 0,3 | 1,0 |

Comments on the results

The test valve is a symmetric Ball Valve. Because of the symmetry the tests were carried out only for one flow direction.

Conclusion

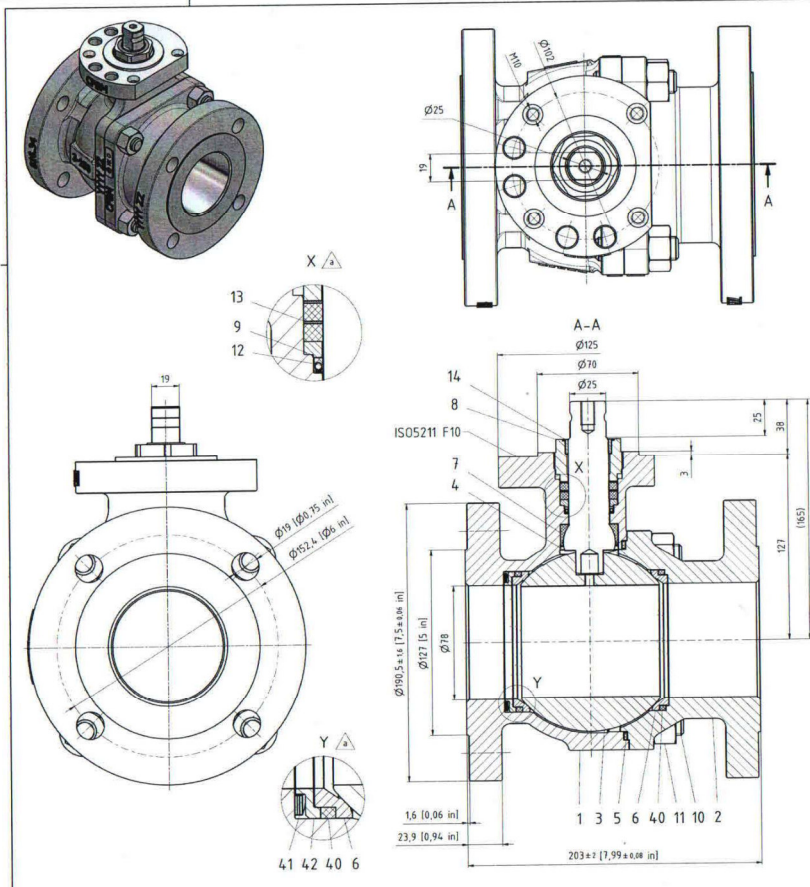
The test valve fulfilled the test requirements according to DIN EN ISO 10497, 2010, and API 607, 7th edition. Only allowable through-seat-leakages and external leakages were observed during the tests.

Herford, 20 April 2020

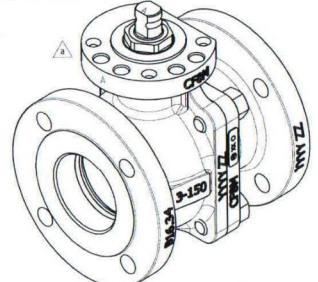
Dr.-Ing. T. Bäumer
GmbH



Mr. Dr. T. Bäumer
Consultant engineer



| Sprememba / change note | | |
|---------------------------------------|--------------|---------------|
| Index / Opis / Description | Datum / Date | Odob. / Appr. |
| a | 23.03.2021 | Lj. Kavcic II |
| added new stem packing & detail views | | |



Note: Letter "A" must be stamp on top of Stem & side of ISO flange of Body

Pridržujemo si pravico do tehničnih sprememb! / The parts are subject to change by technical innovation!

| Rezervni del / Spare part | | | |
|---------------------------|--------------------|---|---|
| 42 | 1 | S-obroč / S-ring | AW2 F33 (14442) |
| 41 | 1 | Vzmet valveta / Wave spring | 17-7 Pm (14448) |
| 43 | 2 | Člunec vratila / Seal ring | Graphite |
| 96 | 1 | Palca vodila / Guide bushing | PTFE - Carbon filled |
| 13 | 1 | Palca tesnil / Packing cut | Graphite |
| 40 | 1 | Vzmetno podprto tesnilo / Spring energized lip seal | PTFE - Carbon-Graphite filled / ASG 381 (14438) |
| 11 | 4 | Matica mornjača / Heavy hex nut | AW4 Gr 20 |
| 10 | 4 | Vrhil stipe / Stud | AW1 Gr 37 |
| 9 | 1 | Obroč podpori / Support ring | AA79 3M1 (14478), 3M (14491) |
| 8 | 1 | Matica pritiska / Press nut | F35, AA79 UMS 52083 (14442) |
| 7 | 1 | SK spod. tesnilo vratila / SK Stem seal | Item |
| 6 | 2 | Tesnilo krogle / Seat | AW2 F30L (14444)-coating |
| 5 | 1 | Tesnilo ohišja / Body gasket | PTFE(Graphite/3M1) |
| 4 | 1 | Vrvetilo / Shim | F35, AA79 UMS 52083 (14442) |
| 3 | 1 | Krogla / Ball | AW2 F30L (14444)-coating |
| 2 | 1 | Ohišje desni del / Tail | A276 WCB (12678) - dual cert. |
| 1 | 1 | Ohišje levi del / Body | A276 WCB (12678) - dual cert. |
| Poz / Pos | Opis / Description | Material | Ident št. / Item No. |

- Opombe k izdelavi / Assembly notes**
1. Moment Poz.11 / Torque Item 11: 140 Nm
 2. Pred pritrditvijo matice Poz. 11 ohišje a)lisciti na blok za preoblikovanje tesnila ohišja / before screwing Item 11 body parts must be pressed to block to predeform body gasket
 3. Navoj Poz.8 je lahko dvignjen nad prirobnico 0 do 1 mm / Thread end of item 8 can raise over top of flange for 0 to 1 mm.
 4. Namazati navoje vijakov in maledne površine matic z: / Lubricate screw threads and nut bearing faces with Castrol Optimol paste TA
 5. Kroglo po montaži namazati z: / Oil ball after assembly with: Baysilone Oil M100
 6. Moment Poz. 8 / Torque Item 8: 224 Nm

Masa / weight: ca. 24,5 kg

| | | | |
|-----------------------|---|--------------------------|--------------------|
| izšel / issue | 03.03.2020 / Krnječ J. | ARMATURARME d.o.o. | ARMATURARME d.o.o. |
| prejatelj / recipient | | Kompleksna ulica 50 | CRANE |
| vrsta / type | 01600000000000000000 | SI-2000 Mura / Slovenija | |
| skica / drawing | | | |
| 1:1.5 | Krogelna pipa - prosto vrt / Ball valve - bare stem | 49 243 08 014a | |
| | NPS3 Class150 TUFSEAT, Standard Trim, WCB | | |

Dr.-Ing. T. Bäumer

Prüflabor - Ingenieurbüro – Prüfstände

TEST Certificate

Fire Type Test according to DIN EN ISO 10497 Report IBB-2342

This report confirms the successful testing of a representative valve in compliance with DIN EN ISO 10497, 2010, and API 607, 7th edition.

| | | |
|---------------------|---|---|
| Manufacturer | Armature d.o.o. Koroska cesta 55 2366 Muta, SI | Friedrich Krombach GmbH Postfach 1130 57202 Kreuztal |
| | Crane Ningjin Valve Co. Jing Long St. 496 055550 Ningjin, China | Xomox Chihuahua S.A de C.V Juan Ruiz de Alarcón 313 31000 Chihuahua, Mexico |

Test Valve Krombach (R) TUFSEAT TM Performance Series
with Standard Temperature Trim
Metal Seated Ball Valve NPS 3 Class 150
Flange end connections, Gear operated
Body/Bonnet material: WCB
Drawing Number: 49 243 08 014a

Date of Testing 20 April 2020

Qualified sizes DN 80, DN 100, DN 125, DN 150
3", 4", 5", 6"

Qualified pressure ratings Class 150, Class 300
PN 10, PN 16, PN 25, PN 40

Test requirements The tests were carried out strictly in accordance with
DIN EN ISO 10497, 2010, and API 607, 7th edition

Herford, 20 April 2020

Dr.-Ing. T. Bäumer
GmbH



Mr. Dr. T. Bäumer
Consultant engineer

Dr.-Ing. T. Bäumer

Prüflabor - Ingenieurbüro – Prüfstände

TEST Report

Fire Type Test according to DIN EN ISO 10497

Report IBB-2388

This report confirms the successful testing of a representative valve in compliance with DIN EN ISO 10497, 2010, and API 607, 7th edition.

| | | |
|---------------------|--|--|
| Manufacturer | Armature d.o.o. Koroska cesta 55 2366 Muta, SI | Friedrich Krombach GmbH Postfach 1130 57202 Kreuztal |
|---------------------|--|--|

| | |
|---|---|
| Crane Ningjin Valve Co. Jing Long St. 496 055550 Ningjin, China | Xomox Chihuahua S.A de C.V Juan Ruiz de Alarcón 313 31000 Chihuahua, Mexico |
|---|---|

| | |
|-------------------|---|
| Test Valve | Krombach (R) TUFSEAT TM Performance Series with Standard Temperature Trim Metal Seated Ball Valve NPS 8 Class 150 Flange end connections, Gear operated Nominal bore: 8" Pressure rating: Class 150 Body/Bonnet material: A216 WCB 1.0619 Stem material: F51 A479 1.4462 Ball material: A351 CF8M 1.4408 Ball seal material: 316L 1.4404 + coating Operation device: Gear with handwheel Drawing Number: 49 243 12 010 |
|-------------------|---|

| | |
|------------------------|-------------------|
| Date of Testing | 08 September 2020 |
|------------------------|-------------------|

| | |
|--------------------|---------|
| Test Report | 5 pages |
|--------------------|---------|

| | |
|------------------------|----------------------------------|
| Qualified sizes | DN 200 and above 8" and above |
|------------------------|----------------------------------|

| | |
|-----------------------------------|--|
| Qualified pressure ratings | Class 150, Class 300 PN 10, PN 16, PN 25, PN 40 |
|-----------------------------------|--|

| | |
|-------------------------|---|
| Testing location | Laboratory of Dr.-Ing. T. Bäumer GmbH, Altensenner Weg 75, D - 32052 Herford |
|-------------------------|---|

| | |
|--------------------------|--|
| Test requirements | The tests were carried out strictly in accordance with DIN EN ISO 10497, 2010, and API 607, 7th edition |
|--------------------------|--|

| | |
|---------------------|---|
| Participants | Mr. Dr. T. Bäumer Dr.-Ing. T. Bäumer GmbH |
|---------------------|---|

Test examination

The water filled valve was subjected to fire for 30 minutes at a temperature between 750 °C and 1000 °C and a pressure of e.g. 14.5 barg. After the burn period the through-seat-leakage was determined and after a cool down period the external leakage and the through-seat-leakage were measured. Then the valve was opened, and the external leakage was determined.

Instrumentation

Temperature: 5 Thermocouples, Ni Cr Ni, accuracy 1 K.

Pressure: Pressure transmitter, accuracy 0,5 %.

PC-system: AD converter board, software for measuring, Personal Computer

The measuring devices are controlled by an accredited calibration service.

Test results

Time of test start (ignition of burners): 11.25 am

Temperatures and pressure during burn period

| Time | p | T _{Fire1} | T _{Fire2} | T _{Cal1} | T _{Cal2} | T _{Cal3} |
|-------|--------|--------------------|--------------------|-------------------|-------------------|-------------------|
| [s] | [barg] | [°C] | [°C] | [°C] | [°C] | [°C] |
| .0 | 14.5 | 20.5 | 22.0 | 25.1 | 37.6 | 23.3 |
| 30.0 | 14.5 | 697.0 | 483.2 | 42.1 | 43.6 | 34.8 |
| 60.0 | 14.6 | 836.1 | 771.8 | 116.2 | 76.4 | 89.5 |
| 90.0 | 14.5 | 836.0 | 802.3 | 201.5 | 122.4 | 160.0 |
| 120.0 | 14.4 | 852.3 | 811.5 | 281.5 | 177.8 | 223.3 |
| 150.0 | 14.6 | 820.5 | 770.9 | 350.3 | 234.8 | 286.6 |
| 180.0 | 14.6 | 844.7 | 706.9 | 410.6 | 289.5 | 340.2 |
| 210.0 | 14.5 | 867.1 | 764.7 | 467.0 | 343.3 | 388.4 |
| 240.0 | 14.5 | 839.0 | 808.7 | 517.8 | 397.4 | 434.7 |
| 270.0 | 14.3 | 817.1 | 794.5 | 559.2 | 445.9 | 474.8 |
| 300.0 | 14.4 | 872.6 | 789.8 | 595.5 | 492.2 | 509.9 |
| 330.0 | 14.6 | 892.7 | 774.0 | 630.4 | 537.0 | 544.8 |
| 360.0 | 14.5 | 865.9 | 827.0 | 657.5 | 576.0 | 576.6 |
| 390.0 | 14.5 | 855.9 | 789.4 | 681.7 | 606.8 | 601.9 |
| 420.0 | 14.6 | 849.1 | 776.6 | 707.8 | 635.7 | 623.1 |
| 450.0 | 14.4 | 860.3 | 775.6 | 724.6 | 659.3 | 642.9 |
| 480.0 | 14.6 | 855.0 | 832.6 | 736.3 | 677.4 | 658.9 |
| 510.0 | 14.5 | 863.7 | 826.9 | 754.8 | 694.9 | 673.8 |
| 540.0 | 14.6 | 903.7 | 785.1 | 770.2 | 711.0 | 687.2 |
| 570.0 | 14.5 | 858.1 | 792.2 | 789.1 | 727.7 | 696.0 |
| 600.0 | 14.6 | 850.9 | 879.4 | 792.2 | 737.9 | 707.6 |

| | | | | | | |
|--------|------|-------|-------|-------|-------|-------|
| 630.0 | 14.6 | 830.4 | 873.8 | 800.5 | 744.4 | 719.3 |
| 660.0 | 14.5 | 824.3 | 861.9 | 807.6 | 749.8 | 729.8 |
| 690.0 | 14.5 | 823.8 | 860.1 | 807.8 | 753.4 | 733.9 |
| 720.0 | 14.6 | 832.0 | 822.9 | 812.7 | 756.8 | 740.7 |
| 750.0 | 14.6 | 851.0 | 765.4 | 811.2 | 759.1 | 739.5 |
| 780.0 | 14.4 | 828.1 | 816.7 | 817.5 | 762.4 | 739.9 |
| 810.0 | 14.3 | 842.9 | 766.0 | 818.6 | 763.4 | 741.1 |
| 840.0 | 14.4 | 827.1 | 791.8 | 821.0 | 765.9 | 743.1 |
| 870.0 | 14.6 | 819.4 | 813.3 | 820.9 | 766.1 | 746.3 |
| 900.0 | 14.5 | 804.5 | 789.4 | 824.6 | 767.7 | 749.7 |
| 930.0 | 14.6 | 820.7 | 777.8 | 820.5 | 767.2 | 750.7 |
| 960.0 | 14.5 | 806.8 | 767.2 | 822.6 | 766.0 | 749.9 |
| 990.0 | 14.5 | 778.2 | 784.8 | 819.3 | 763.3 | 750.4 |
| 1020.0 | 14.5 | 775.9 | 849.4 | 813.5 | 759.7 | 746.4 |
| 1050.0 | 14.6 | 772.7 | 832.5 | 806.8 | 755.5 | 747.3 |
| 1080.0 | 14.4 | 791.0 | 800.1 | 798.6 | 752.2 | 748.9 |
| 1110.0 | 14.3 | 810.9 | 781.5 | 799.5 | 752.1 | 745.8 |
| 1140.0 | 14.6 | 766.6 | 764.8 | 800.5 | 753.5 | 744.4 |
| 1170.0 | 14.6 | 773.4 | 778.9 | 797.2 | 751.3 | 744.9 |
| 1200.0 | 14.5 | 763.3 | 771.2 | 795.1 | 749.5 | 745.7 |
| 1230.0 | 14.6 | 775.3 | 758.8 | 790.0 | 746.8 | 743.4 |
| 1260.0 | 14.4 | 819.9 | 766.8 | 788.4 | 748.1 | 737.9 |
| 1290.0 | 14.6 | 802.3 | 787.1 | 797.2 | 752.7 | 735.0 |
| 1320.0 | 14.7 | 756.8 | 806.3 | 800.7 | 754.9 | 737.0 |
| 1350.0 | 14.6 | 768.0 | 806.1 | 795.8 | 753.8 | 741.5 |
| 1380.0 | 14.4 | 773.4 | 794.2 | 791.1 | 752.3 | 743.0 |
| 1410.0 | 14.4 | 786.6 | 773.3 | 786.1 | 750.1 | 742.0 |
| 1440.0 | 14.5 | 771.0 | 796.5 | 780.3 | 747.5 | 742.5 |
| 1470.0 | 14.5 | 779.3 | 754.4 | 775.9 | 745.7 | 743.4 |
| 1500.0 | 14.6 | 782.2 | 789.8 | 778.7 | 747.0 | 743.2 |
| 1530.0 | 14.6 | 764.6 | 802.1 | 771.7 | 745.0 | 740.7 |
| 1560.0 | 14.5 | 792.6 | 781.9 | 769.3 | 743.2 | 746.5 |
| 1590.0 | 14.6 | 777.2 | 773.7 | 764.5 | 741.7 | 745.8 |
| 1620.0 | 14.6 | 788.5 | 789.0 | 765.5 | 742.8 | 748.4 |
| 1650.0 | 14.5 | 779.1 | 772.8 | 763.8 | 740.9 | 745.1 |
| 1680.0 | 14.5 | 788.8 | 776.7 | 763.6 | 739.7 | 742.4 |
| 1710.0 | 14.6 | 759.3 | 755.2 | 759.7 | 739.1 | 739.8 |
| 1740.0 | 14.6 | 772.3 | 769.7 | 762.9 | 739.4 | 737.6 |
| 1770.0 | 14.6 | 768.3 | 790.4 | 763.7 | 739.5 | 734.2 |
| 1800.0 | 14.5 | 764.2 | 774.2 | 769.6 | 741.4 | 742.3 |

Time required for valve to cool down to 100 °C: 9 min

Test valve unseated: Yes

Test valve moved to the fully open position: Yes

| | Leakage [ml/DN/min] | Allowable leakage [ml/DN/min] |
|---|------------------------|----------------------------------|
| Through-seat-leakage in burning phase: | 1,5 | 16,0 |
| External leakage in burning and cooling phase: | 0,0 | 4,0 |
| Through-seat-leakage at low pressure: | 0,0 | 1,6 |
| External leakage after unseating the valve: | 0,1 | 1,0 |

Comments on the results

The test valve is a symmetric Ball Valve. Because of the symmetry the tests were carried out only for one flow direction.

Conclusion

The test valve fulfilled the test requirements according to DIN EN ISO 10497, 2010, and API 607, 7th edition. Only allowable through-seat-leakages and external leakages were observed during the tests.

Herford, 08 September 2020

Dr.-Ing. T. Bäumer
GmbH



Mr. Dr. T. Bäumer
Consultant engineer

Index / Opis / Description

| Index / Opis / Description | Sprememba / Change note | Datum / Date | Oslob / Appr |
|----------------------------|-------------------------|---------------------------|--|
| 31 | Vijak zagnani | Hex head plug | ARM2 Gr F304 AL79 Gr 316 |
| 30 | Mozak | Parallel key | 136ss/316I (AA/14578) |
| 23 | Vzmetil valonita | Wave spring | 11.7 Ph (14580) |
| 22 | Podmetec | Wiper ring | Graphite |
| 21 | Vzmetno podprto tesilo | Spring energized lip seal | PTFE Carbon-Graphite Filled / AISI 301 (14390) |
| 20 | Štrobac | G-ring | A276 316Ti (14578), 316 (14404) |
| 19 | Podmetec | Wiper ring | Graphite |
| 18 | Vakuobak | Retaining ring | Stainless Steel (14322) |
| 17 | Matka močnjaja | Heavy hex nut | A194 Gr 2H |
| 16 | Vijak stopi | Stud | ARM3 GR87 |
| 15 | Matka močnjaja | Heavy hex nut | A194 Gr 2H |
| 14 | Vijak stopi | Stud | ARM3 GR87 |
| 13 | Podprta pod. čepa | Cover | A192 (10460) |
| 12 | Tesnilo | Sealing | PTFE/Graphite/316Ti |
| 11 | Čep podporni | Bottom stem | A197 316Ti (14578), 316 (14404) |
| 10 | Polja teženja | Sleeve bearing | 316 (14404) |
| 9 | Priravnica prirube | Gland flange | Steel, AISI |
| 8 | Polja teženja | Sleeve bearing | 316 (14404) |
| 7 | Podprta tesnilo | Spring energized lip seal | PTFE Carbon-Graphite Filled / AISI 301 (14390) |
| 6 | Matka močnjaja | Heavy hex nut | A194 Gr 2H |
| 5 | Vijak stopi | Stud | ARM3 GR87 |
| 4 | Obroč podporni | Support Ring | A197 316Ti (14578), 316 (14404) |
| 3 | Polja prirube | Gland | Stainless Steel |
| 2 | Spodnje tesnilo vrtena | Stem seal | PTFE/ADMILE |
| 1 | Tesnilo ohišja | Seal | 316 (14404)+coating |
| 1 | Tesnilo ohišja | Body gasket | PTFE/Graphite/316Ti |
| 1 | Vrateno | Stem | F51, AL79 UNS 53803 (14422) |
| 1 | Krogla | Ball | A351 CF8M (14408), 316 (14404)+coating |
| 1 | Ohišje desni del | Ball | A276 WCB (10490) - dual certif. |
| 1 | Ohišje levi del | Body | A276 WCB (10490) - dual certif. |
| 1 | Opis | Designation | Material |

Opomba k izdelavi / Assembly notes

- Moment Poz. 11 / Torque Item 11: 240 Nm
- Pred priloževanjem matice Poz. 11 ohišje strisniti na blok za preoblikovanje tesnila ohišja / Before screwing Item 11 body parts must be pressed to block to predefine body gasket
- Poz. 23 priložiti z momentom cca. 45 Nm na višino h / Pos. 23 tighten with Torque cca. 45 Nm to height h.
- Namazati navoje vijakov in naležne površine matic z / Lubricate screw threads and nut bearing faces with: Castrol Optimol paste TA.
- Kroglo po montaži namazati z / Oil ball after assembly with Baysilone Oil H100
- Moment Poz. 21 / Torque Item 21: 20 Nm
- Masa / weight: ca. 170,2 kg

Note: Letter "A" must be stamp on top of Stem & side of ISO flange of Body

Dr.-Ing. T. Bäumer

Prüflabor - Ingenieurbüro – Prüfstände

TEST Certificate

Fire Type Test according to DIN EN ISO 10497 Report IBB-2388

This report confirms the successful testing of a representative valve in compliance with DIN EN ISO 10497, 2010, and API 607, 7th edition.

| | | |
|---------------------|---|---|
| Manufacturer | Armature d.o.o. Koroska cesta 55 2366 Muta, SI | Friedrich Krombach GmbH Postfach 1130 57202 Kreuztal |
| | Crane Ningjin Valve Co. Jing Long St. 496 055550 Ningjin, China | Xomox Chihuahua S.A de C.V Juan Ruiz de Alarcón 313 31000 Chihuahua, Mexico |

Test Valve Krombach (R) TUFSEAT TM Performance Series
with Standard Temperature Trim
Metal Seated Ball Valve NPS 8 Class 150
Flange end connections, Gear operated
Body/Bonnet material: A216 WCB 1.0619
Drawing Number: 49 243 12 010

Date of Testing 08 September 2020

Qualified sizes DN 200 and above
8" and above

Qualified pressure ratings Class 150, Class 300
PN 10, PN 16, PN 25, PN 40

Test requirements The tests were carried out strictly in accordance with
DIN EN ISO 10497, 2010, and API 607, 7th edition

Herford, 08 September 2020

Dr.-Ing. T. Bäumer
GmbH



Mr. Dr. T. Bäumer
Consultant engineer

Dr.-Ing. T. Bäumer

Prüflabor - Ingenieurbüro – Prüfstände

TEST Report

Fire Type Test according to DIN EN ISO 10497 Report IBB-2390

This report confirms the successful testing of a representative valve in compliance with DIN EN ISO 10497, 2010, and API 607, 7th edition.

| | | |
|---------------------|---|---|
| Manufacturer | Armature d.o.o. Koroska cesta 55 2366 Muta, SI | Friedrich Krombach GmbH Postfach 1130 57202 Kreuztal |
| | Crane Ningjin Valve Co. Jing Long St. 496 055550 Ningjin, China | Xomox Chihuahua S.A de C.V Juan Ruiz de Alarcón 313 31000 Chihuahua, Mexico |

| | |
|-------------------|---|
| Test Valve | Krombach (R) TUFSEAT TM Performance Series with Standard Temperature Trim Metal Seated Ball Valve NPS 8 Class 150 Flange end connections, Gear operated Nominal bore: 8" Pressure rating: Class 150 Body/Bonnet material: A351 CF8M 1.4408 Stem material: F51 A479 1.4462 Ball material: A351 CF8M 1.4408 Ball seal material: 316L 1.4404 + coating Operation device: Gear with handwheel Drawing Number: 49 243 12 002b |
|-------------------|---|

Date of Testing 09 September 2020

Test Report 5 pages

Qualified sizes DN 200 and above
8" and above

Qualified pressure ratings Class 150, Class 300
PN 10, PN 16, PN 25, PN 40

Testing location Laboratory of Dr.-Ing. T. Bäumer GmbH,
Altensenner Weg 75, D - 32052 Herford

Test requirements The tests were carried out strictly in accordance with
DIN EN ISO 10497, 2010, and API 607, 7th edition

Participants Mr. Dr. T. Bäumer Dr.-Ing. T. Bäumer GmbH

Test examination

The water filled valve was subjected to fire for 30 minutes at a temperature between 750 °C and 1000 °C and a pressure of e.g. 14.5 barg. After the burn period the through-seat-leakage was determined and after a cool down period the external leakage and the through-seat-leakage were measured. Then the valve was opened, and the external leakage was determined.

Instrumentation

Temperature: 5 Thermocouples, Ni Cr Ni, accuracy 1 K.

Pressure: Pressure transmitter, accuracy 0,5 %.

PC-system: AD converter board, software for measuring, Personal Computer

The measuring devices are controlled by an accredited calibration service.

Test results

Time of test start (ignition of burners): 08.40 am

Temperatures and pressure during burn period

| Time [s] | p [barg] | T _{Fire1} [°C] | T _{Fire2} [°C] | T _{Cal1} [°C] | T _{Cal2} [°C] | T _{Cal3} [°C] |
|-------------|-------------|----------------------------|----------------------------|---------------------------|---------------------------|---------------------------|
| .0 | 14.3 | 17.9 | 19.1 | 18.9 | 17.9 | 17.3 |
| 30.0 | 14.4 | 641.8 | 534.0 | 35.9 | 27.9 | 30.8 |
| 60.0 | 14.5 | 784.5 | 747.5 | 108.0 | 75.6 | 89.6 |
| 90.0 | 14.3 | 785.2 | 774.8 | 194.1 | 134.8 | 162.7 |
| 120.0 | 14.4 | 787.0 | 787.9 | 274.7 | 197.3 | 232.6 |
| 150.0 | 14.4 | 797.4 | 779.4 | 347.6 | 252.8 | 298.1 |
| 180.0 | 14.3 | 832.2 | 788.1 | 412.6 | 313.8 | 355.8 |
| 210.0 | 14.5 | 878.4 | 833.2 | 471.7 | 376.5 | 408.4 |
| 240.0 | 14.3 | 899.2 | 857.5 | 526.7 | 441.5 | 456.1 |
| 270.0 | 14.5 | 901.4 | 925.3 | 575.2 | 502.1 | 499.0 |
| 300.0 | 14.5 | 904.3 | 908.5 | 616.0 | 556.6 | 535.9 |
| 330.0 | 14.4 | 865.6 | 819.2 | 654.7 | 604.3 | 568.4 |
| 360.0 | 14.3 | 828.1 | 774.8 | 681.5 | 642.4 | 594.6 |
| 390.0 | 14.4 | 870.6 | 834.9 | 708.4 | 673.1 | 619.3 |
| 420.0 | 14.4 | 888.2 | 901.4 | 728.0 | 702.8 | 639.2 |
| 450.0 | 14.3 | 877.3 | 829.4 | 750.2 | 728.3 | 657.6 |
| 480.0 | 14.5 | 890.6 | 914.1 | 768.2 | 749.4 | 674.1 |
| 510.0 | 14.6 | 880.2 | 841.4 | 784.1 | 766.9 | 689.3 |
| 540.0 | 14.6 | 867.1 | 836.9 | 798.7 | 782.3 | 701.9 |
| 570.0 | 14.5 | 865.1 | 847.5 | 812.1 | 795.7 | 714.3 |

| | | | | | | |
|--------|------|-------|-------|-------|-------|-------|
| 600.0 | 14.5 | 871.2 | 881.4 | 824.3 | 805.3 | 724.5 |
| 630.0 | 14.3 | 871.1 | 849.5 | 832.1 | 814.3 | 733.0 |
| 660.0 | 14.3 | 883.0 | 881.2 | 835.6 | 819.8 | 739.9 |
| 690.0 | 14.4 | 844.6 | 809.9 | 848.3 | 826.4 | 748.9 |
| 720.0 | 14.4 | 869.1 | 861.9 | 848.8 | 831.4 | 754.1 |
| 750.0 | 14.3 | 851.4 | 824.2 | 852.0 | 835.5 | 758.6 |
| 780.0 | 14.3 | 839.1 | 813.8 | 858.5 | 834.1 | 765.3 |
| 810.0 | 14.4 | 836.8 | 826.9 | 858.6 | 833.6 | 768.0 |
| 840.0 | 14.3 | 809.3 | 765.0 | 864.9 | 834.0 | 773.6 |
| 870.0 | 14.4 | 825.1 | 830.0 | 851.6 | 829.4 | 772.3 |
| 900.0 | 14.3 | 800.7 | 777.8 | 854.7 | 825.1 | 777.3 |
| 930.0 | 14.3 | 808.8 | 796.0 | 853.1 | 821.5 | 778.8 |
| 960.0 | 14.2 | 797.9 | 781.3 | 848.8 | 818.9 | 777.6 |
| 990.0 | 14.4 | 762.5 | 779.1 | 845.5 | 816.3 | 777.9 |
| 1020.0 | 14.5 | 783.2 | 787.8 | 835.8 | 811.6 | 775.9 |
| 1050.0 | 14.5 | 786.8 | 835.5 | 827.5 | 805.9 | 774.0 |
| 1080.0 | 14.6 | 759.3 | 788.9 | 823.3 | 800.7 | 773.9 |
| 1110.0 | 14.7 | 788.4 | 874.6 | 809.4 | 795.8 | 768.0 |
| 1140.0 | 14.7 | 796.1 | 874.2 | 808.0 | 792.8 | 767.2 |
| 1170.0 | 14.5 | 792.9 | 857.0 | 806.1 | 790.6 | 766.0 |
| 1200.0 | 14.3 | 780.5 | 757.8 | 809.8 | 789.2 | 767.7 |
| 1230.0 | 14.4 | 777.6 | 827.4 | 800.9 | 785.1 | 764.0 |
| 1260.0 | 14.4 | 798.6 | 919.3 | 793.8 | 782.2 | 759.6 |
| 1290.0 | 14.3 | 825.0 | 860.3 | 798.5 | 781.2 | 760.1 |
| 1320.0 | 14.4 | 794.1 | 826.8 | 800.5 | 781.6 | 760.1 |
| 1350.0 | 14.3 | 792.3 | 803.1 | 805.4 | 782.2 | 762.0 |
| 1380.0 | 14.4 | 782.1 | 852.5 | 803.5 | 781.6 | 760.4 |
| 1410.0 | 14.4 | 762.3 | 750.1 | 804.8 | 782.4 | 761.5 |
| 1440.0 | 14.5 | 800.1 | 881.7 | 796.5 | 781.3 | 758.1 |
| 1470.0 | 14.5 | 788.7 | 785.6 | 806.1 | 783.2 | 760.8 |
| 1500.0 | 14.6 | 782.8 | 808.4 | 804.1 | 785.0 | 759.1 |
| 1530.0 | 14.6 | 784.1 | 787.8 | 808.6 | 785.1 | 760.1 |
| 1560.0 | 14.5 | 763.4 | 796.5 | 808.8 | 785.3 | 759.2 |
| 1590.0 | 14.5 | 810.8 | 854.1 | 808.6 | 787.0 | 757.7 |
| 1620.0 | 14.3 | 805.9 | 843.7 | 809.8 | 788.7 | 758.3 |
| 1650.0 | 14.3 | 790.6 | 759.3 | 819.2 | 793.2 | 761.9 |
| 1680.0 | 14.4 | 791.3 | 797.3 | 817.9 | 795.1 | 760.4 |
| 1710.0 | 14.4 | 828.7 | 837.0 | 819.7 | 796.7 | 761.3 |
| 1740.0 | 14.3 | 817.8 | 833.6 | 819.3 | 798.2 | 760.8 |
| 1770.0 | 14.3 | 787.0 | 773.9 | 823.8 | 799.9 | 762.8 |
| 1800.0 | 14.4 | 774.6 | 770.4 | 824.1 | 801.4 | 762.2 |

Time required for valve to cool down to 100 °C: 9 min

Test valve unseated: Yes

Test valve moved to the fully open position: Yes

| | Leakage [ml/DN/min] | Allowable leakage [ml/DN/min] |
|---|------------------------|----------------------------------|
| Through-seat-leakage in burning phase: | 1,6 | 16,0 |
| External leakage in burning and cooling phase: | 0,0 | 4,0 |
| Through-seat-leakage at low pressure: | 0,0 | 1,6 |
| External leakage after unseating the valve: | 0,5 | 1,0 |

Comments on the results

The test valve is a symmetric Ball Valve. Because of the symmetry the tests were carried out only for one flow direction.

Conclusion

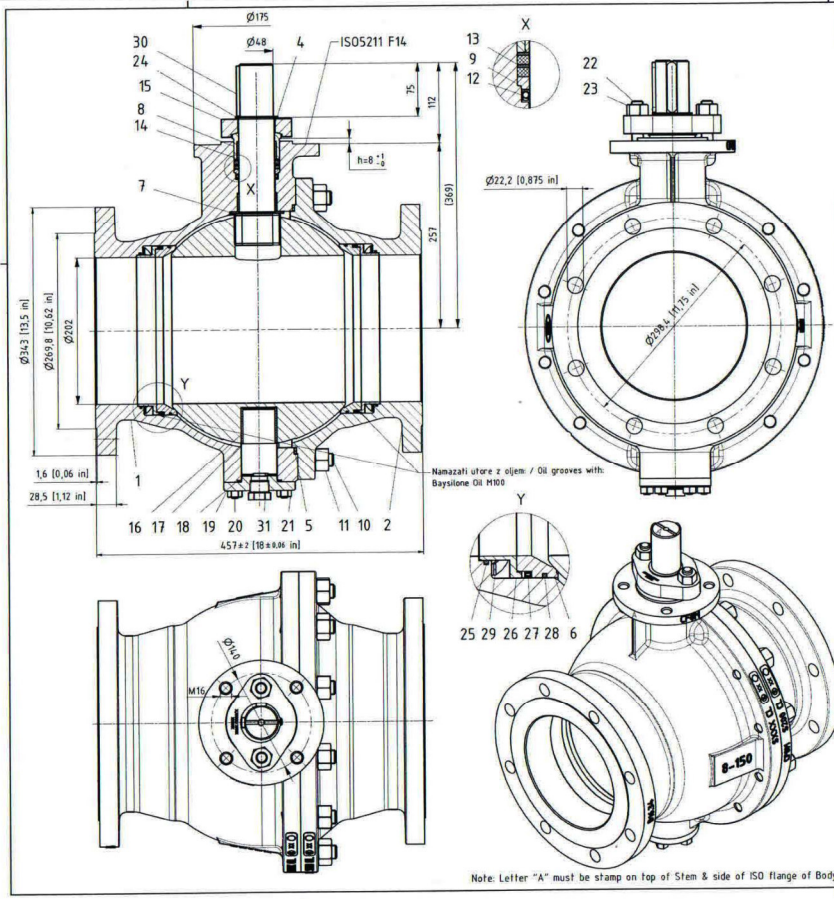
The test valve fulfilled the test requirements according to DIN EN ISO 10497, 2010, and API 607, 7th edition. Only allowable through-seat-leakages and external leakages were observed during the tests.

Herford, 09 September 2020

Dr.-Ing. T. Bäumer
GmbH



Mr. Dr. T. Bäumer
Consultant engineer



Sprememba / Change note

| Index / Opis / Description | 1 Datum / Date | 2 Osob. / Appr. |
|------------------------------------|----------------|-----------------|
| 3 New packing & detail views added | 03.02.2021 | Sakpal, U. |

Priloge / Priloženo: s pravico do tehničnih sprememb! / The parts are subject to change by technical innovations!

Pažiti na zaščitno opozorilo po ISO 9000 / Pay attention to protection note ISO 9000

Rezerva del / Spare part

| 31 | 1 | Vijak zaporni | Hex head plug | AW2 Gr 316, ALP9 Gr 316 | |
|----------|----|-------------------------|---------------------------|--|----------|
| 30 | 2 | Možnik | Parallel key | 316ss 316Ti (14L14378) | |
| 29 | 2 | Vijec valovita | Wave spring | 11-2 Pos (14480) | |
| 28 | 2 | Posnemalica | Wiper ring | Graphite | |
| 27 | 2 | Vzmetno podprto tesnilo | Spring energized lip seal | PTFE / Carbon-Graphite Filled / AISI 301 (14420) | 127527 |
| 26 | 2 | S-obroč | S-Ring | AZ16 316Ti (14517), 316L (14464) | |
| 25 | 2 | Posnemalica | Wiper ring | Graphite | |
| 24 | 1 | Uključnik | Retaining ring | Stainless Steel (14420) | |
| 23 | 1 | Matica močnejša | Heavy Hex nut | AW6 Gr 316 | |
| 22 | 2 | Vijak stopi | Stud | AW3 Gr 316L (12) | |
| 21 | 4 | Matica močnejša | Heavy Hex nut | AW3 Gr 316L (12) | |
| 20 | 4 | Vijak stopi | Stud | AW3 Gr 316L (12) | |
| 19 | 1 | Pokrov pod. čepa | Cover | ALP9 316Ti (14517), 316L (14489) | |
| 18 | 1 | Tesnilo | Sealing | PTFE/Graphite/316Ti | 86125 |
| 17 | 1 | Čep podporni | Bottom stem | ALP9 316Ti (14517), 316L (14489) | 87041 |
| 16 | 1 | Paša lažna | Sleeve bearing | 316L (14484) | |
| 15 | 1 | Prilobica prirobe | Gland flange | ALP9 316Ti (14517), 316L (14489) | |
| 14 | 2 | Paša lažna | Sleeve bearing | 316L (14484) | |
| 13 | 1 | Paket tesnil | Packing set | PTFE / Carbon-Graphite Filled / AISI 301 (14420) | 86870 |
| 12 | 1 | Vzmetno podprto tesnilo | Spring energized lip seal | PTFE / Carbon-Graphite Filled / AISI 301 (14420) | 86870 |
| 11 | 12 | Matica močnejša | Heavy hex nut | AW6 Gr 316 | 85645 |
| 10 | 12 | Vijak stopi | Stud | AW2 Gr 316L (12) | 86422 |
| 9 | 1 | Obroč podporen | Support Ring | ALP9 316Ti (14517), 316L (14489) | 87044 |
| 8 | 1 | Paša prirobe | Gland | Stainless Steel | 821521 |
| 7 | 1 | Spodnje tesnilo vretena | Stem seal | PTFE/316L | |
| 6 | 1 | Čep | Seat | 316L (14484)-coating | |
| 5 | 1 | Tesnilo ohišja | Body gasket | PTFE/Graphite/316Ti | 86856 |
| 4 | 1 | Vreteno | Stem | PS5, ALP9 UNS 31683 (14463) | |
| 3 | 1 | Krogla | Ball | AISI CF8M (14488), 316L (14484)-coating | |
| 2 | 1 | Ohišje desni del | Ball | AISI CF8M (14488) - dual certif. | 87054 |
| 1 | 1 | Ohišje levi del | Body | AISI CF8M (14488) - dual certif. | 87055 |
| Poz. 8/9 | | Tip | Designation | Material | Item No. |

Oporočila k izdelavi / Assembly notes

1. Moment Poz. 11 / Torque Item 11: 240 Nm
2. Pred prilagajanjem matic: Poz. 11 ohišja vstavliti na blok za presiliko vretena tesnila ohišja / before screwing item 11 body parts must be pressed to block to preform body gasket
3. Poz. 23 pritegati z momentom cca. 45 Nm na višino h / Pos. 23 tighten with Torque cca. 45 Nm to height h
4. Namazati navoje vijakov in maticne površine matic z: / Lubricate screw threads and nut bearing faces with Castrol Optimol paste TA
5. Kroglo po montaži namazati z: / Oil ball after assembly with Baysilone Oil M100
6. Moment Poz. 21 / Torque Item 21: 28 Nm

Masa / weight: ca. 170.2 kg

| | | | |
|------------|---------------------|---------------------------|-----------------|
| izdelatelj | 11.11.2019/KRpic.J. | ARMATURE d.o.o. | ARMATURE d.o.o. |
| prejeto | | Krovelna cesta 50 | CRANE |
| skupaj | | SI-2008 Marja / Slovenija | |

1:3 Krogelna pipa 2-delna / Ball valve 2-piece
NPS8 Class150 TUFSEAT, Standard Trim, CF8M

Arhiv št.: 49 243 12 002b

Note: Letter "A" must be stamp on top of Stem & side of ISO flange of Body

Dr.-Ing. T. Bäumer

Prüflabor - Ingenieurbüro – Prüfstände

TEST Certificate

Fire Type Test according to DIN EN ISO 10497 Report IBB-2390

This report confirms the successful testing of a representative valve in compliance with DIN EN ISO 10497, 2010, and API 607, 7th edition.

| | | |
|---------------------|---|---|
| Manufacturer | Armature d.o.o. Koroska cesta 55 2366 Muta, SI | Friedrich Krombach GmbH Postfach 1130 57202 Kreuztal |
| | Crane Ningjin Valve Co. Jing Long St. 496 055550 Ningjin, China | Xomox Chihuahua S.A de C.V Juan Ruiz de Alarcón 313 31000 Chihuahua, Mexico |

| | |
|-------------------|--|
| Test Valve | Krombach (R) TUFSEAT TM Performance Series with Standard Temperature Trim Metal Seated Ball Valve NPS 8 Class 150 Flange end connections, Gear operated Body/Bonnet material: A351 CF8M 1.4408 Drawing Number: 49 243 12 002b |
|-------------------|--|

| | |
|------------------------|-------------------|
| Date of Testing | 09 September 2020 |
|------------------------|-------------------|

| | |
|------------------------|----------------------------------|
| Qualified sizes | DN 200 and above 8" and above |
|------------------------|----------------------------------|

| | |
|-----------------------------------|--|
| Qualified pressure ratings | Class 150, Class 300 PN 10, PN 16, PN 25, PN 40 |
|-----------------------------------|--|

| | |
|--------------------------|--|
| Test requirements | The tests were carried out strictly in accordance with DIN EN ISO 10497, 2010, and API 607, 7th edition |
|--------------------------|--|

Herford, 09 September 2020

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