



# TECHNICAL DATASHEET

DIN DESIGN

## KROMBACH® TUFSEAT™ Performance Series Ball Valves

TUFSEAT by KROMBACH - THE SUPERIOR MSBV

**CRANE**<sup>®</sup>

**v in** [www.cranecpe.com](http://www.cranecpe.com)

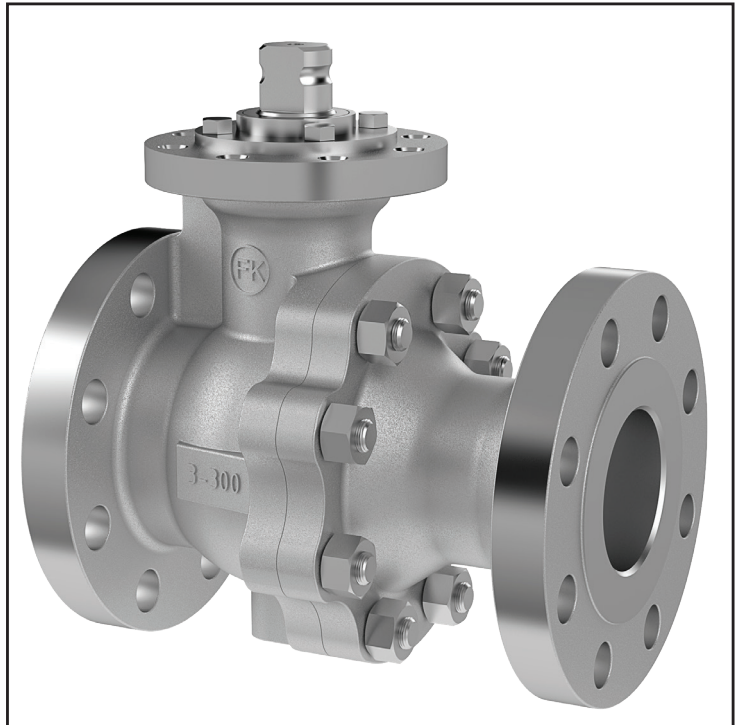
## Features and Benefits

### KROMBACH® TUFSEAT™ PERFORMANCE SERIES

The KROMBACH® TUFSEAT™ Ball Valve Performance Series combines critical safety and performance features required for demanding service applications in chemical and refining markets.

#### HIGH TEMPERATURE TRIM DESIGN

- Seat Leakage performance: ISO 5208 – Class B and ANSI/FCI 70-2 – Class VI
- Up to 800°F/ 427°C
- Up to 20% Solids
- Nickel Alloy, Chrome and Tungsten Carbide coatings on ball and seats available
- Floating Ball: KFO1156 ( DN15-DN150 / PN10, PN16, PN25, PN40)
- Trunnion: KFO 9156 (DN200-DN300 / PN10, PN16, PN25, PN40)

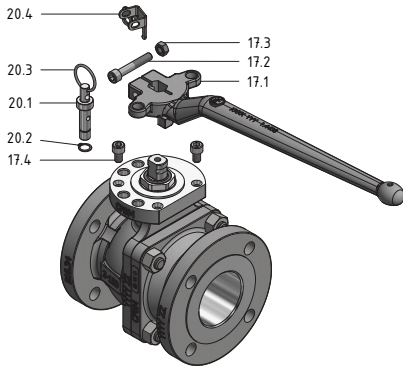


#### Product Range

Size	Class	Body Design	Face-to-Face Dimension	Body Material
DN 15-300	PN10 PN16 PN25 PN40	2-piece design Flanged Floating Ball and Trunnion Design	Long Pattern EN 558-1 Series 12 & 4	WCB / 1.0619 CF8M / 1.4408

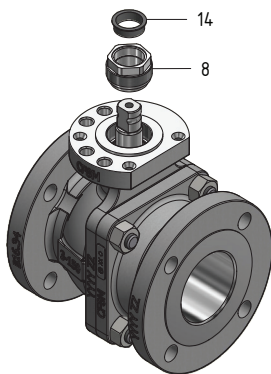
# Floating Ball Design

## Lever Design



Item	Quantity	Description	Carbon Steel		Stainless Steel	
			ASTM	DIN	ASTM	DIN
17.1	1	Hand lever	A351 CF8M	1.4408	A351 CF8M	1.4408
17.2	1	Hex socket head cap screw	316SS	A4-70	316SS	A4-70
17.3	1	Hex nut	316SS	A4	316SS	A4
17.4	2	Hex socket head cap screw	316SS	A4-70	316SS	A4-70
20.1	1	Locking pin	AISI 316	1.4401	AISI 316	1.4401
20.2	1	Retaining ring	-	1.4122	-	1.4122
20.3	1	Ring	AISI 301	1.4310	AISI 301	1.4310
20.4	1	Locking plate	316 Ti	1.4571	316 Ti	1.4571

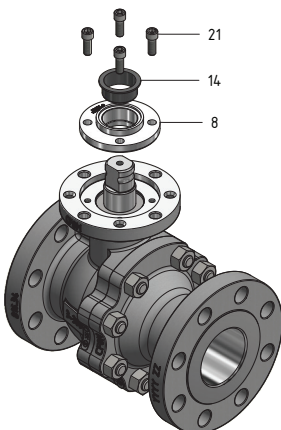
## Press Nut Design



Item	Quantity	Description	Carbon Steel		Stainless Steel	
			ASTM	DIN	ASTM	DIN
8	1	Press nut	A275 Gr. 431	1.4057	F51, A479 UNS S31803	1.4462
14	1	Guide bushing	PTFE - Carbon filled	PTFE - Carbon filled	PTFE - Carbon filled	PTFE - Carbon filled

Sizes DN15 to DN80 - PN10 & PN16 and DN15 to DN50 - PN25 & PN40.

## Packing Gland Design



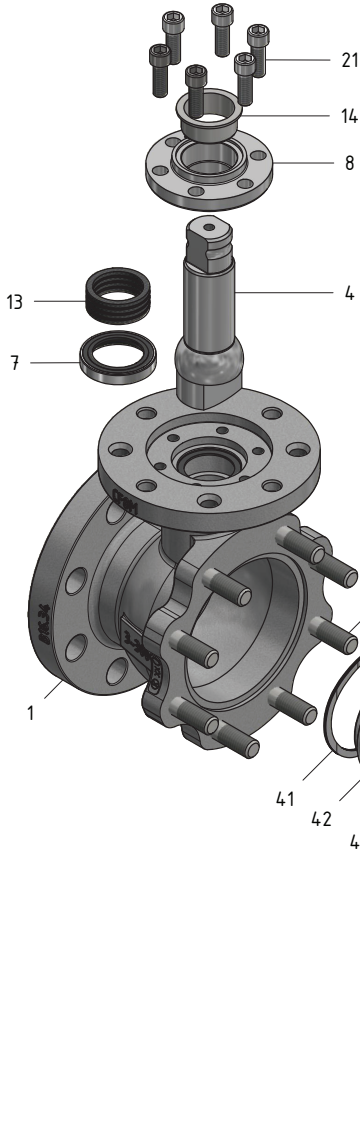
Item	Quantity	Description	Carbon Steel		Stainless Steel	
			ASTM	DIN	ASTM	DIN
8	1	Packing gland	A479 316Ti; 316SS	1.4571; 1.4401	A479 316Ti; 316SS	1.4571; 1.4401
14	1	Guide bushing	PTFE - Carbon filled	PTFE - Carbon filled	PTFE - Carbon filled	PTFE - Carbon filled
21	4	Hex socket head cap screw	A193 B8M Class 2	A4-70	A193 B8M Class 2	A4-70

Sizes DN100 to DN150 - PN10 & PN16 and DN80 to DN150 - PN25 & PN40

# Floating ball Design High Temperature Trim

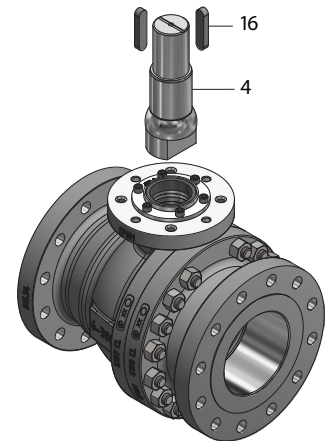
## Floating Ball Design

Item	Quantity	Description	Carbon Steel		Stainless Steel	
			ASTM	DIN	ASTM	DIN
1	1	Body	A216 WCB	1.0619	A351 CF8M	1.4408
2	1	Tail	A216 WCB	1.0619	A351 CF8M	1.4408
3	1	Ball	A182 F316L+coating	1.4404+coating	A182 F316L+coating	1.4404+coating
4	1	Stem	A276 Gr.431	1.4057	A276 Gr.431	1.4057
5	1	Body gasket	Graphite/316SS	Graphite/1.4571	Graphite/316Ti	Graphite/1.4571
6	2	Seat	A182 F316L +coating	1.4404+coating	A182 F316L +coating	1.4404+coating
7	1	S2 Stem seal	e-Carbon	e-Carbon	e-Carbon	e-Carbon
8	1	Packing gland	A479 316Ti; 316SS	1.4571; 1.4401	A479 316Ti; 316SS	1.4571; 1.4401
10*	8	Stud	A193 Gr.B7	A4-70	A193 Gr.B8M Cl.2	A4-70
11*	8	Heavy hex nut	A194 Gr.2H	A4-70	A194 Gr.8M	A4-70
13	1	Packing set	Graphite	Graphite	Graphite	Graphite
14	1	Guide bushing	A582 303 coated	1.4305 coated	A582 303 coated	1.4305 coated
21*	6	Hex socket head cap screw	A193 B8M Class 2	A4-70	A193 B8M Class 2	A4-70
40	2	Seal ring	Graphite	Graphite	Graphite	Graphite
41	1	Wave spring	A286	1.4980	A286	1.4980
42	1	S-Ring	F51, A276 UNS S31803, A276 316L, A276 316 Ti	1.4462; 1.4404; 1.4571	F51, A276 UNS S31803, A276 316L, A276 316 Ti"	1.4462; 1.4404; 1.4571



Item	Quantity	Description	Carbon Steel		Stainless Steel	
			ASTM	DIN	ASTM	DIN
16	2	Parallel key	316SS/316Ti	A4/1.4571	316ss/316Ti	A4/1.4571

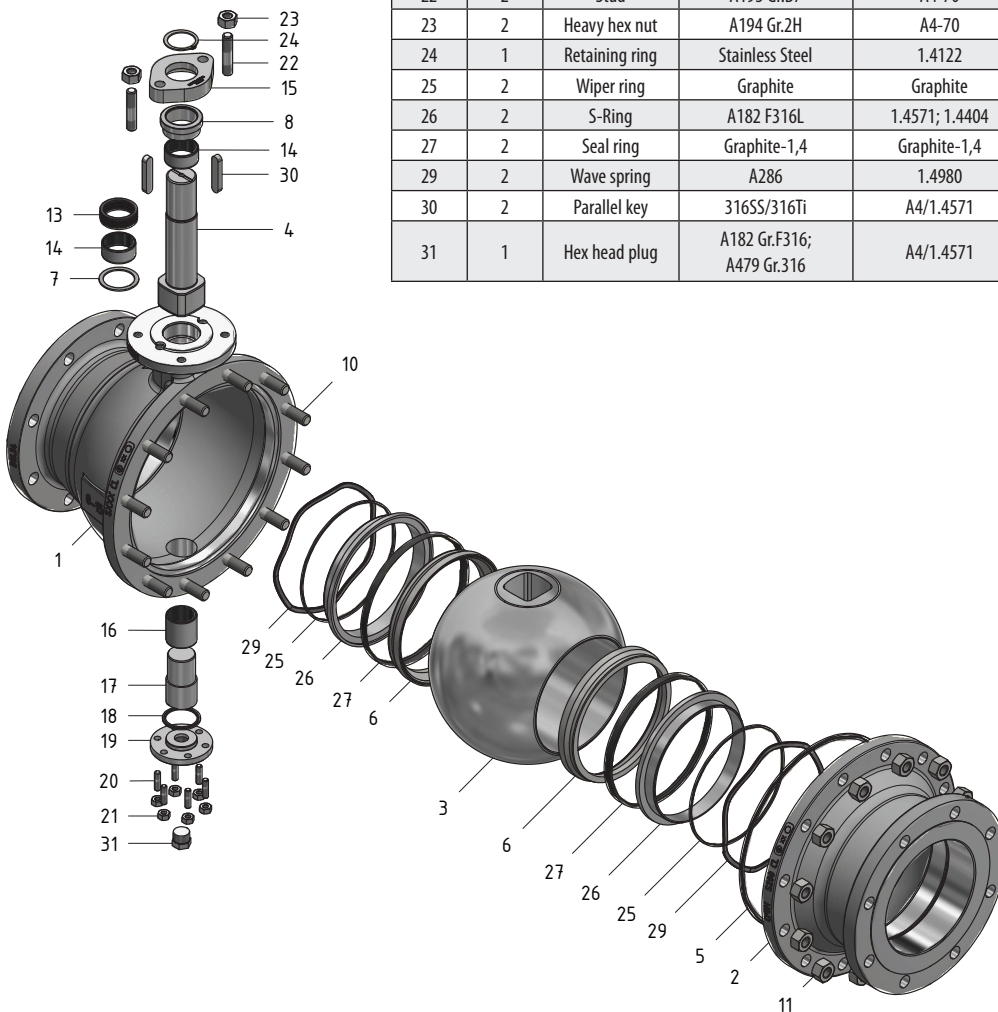
DN150 PN25 & PN 40 floating ball design with key connection item 16  
 \*Quantities may differ depending on the valve size



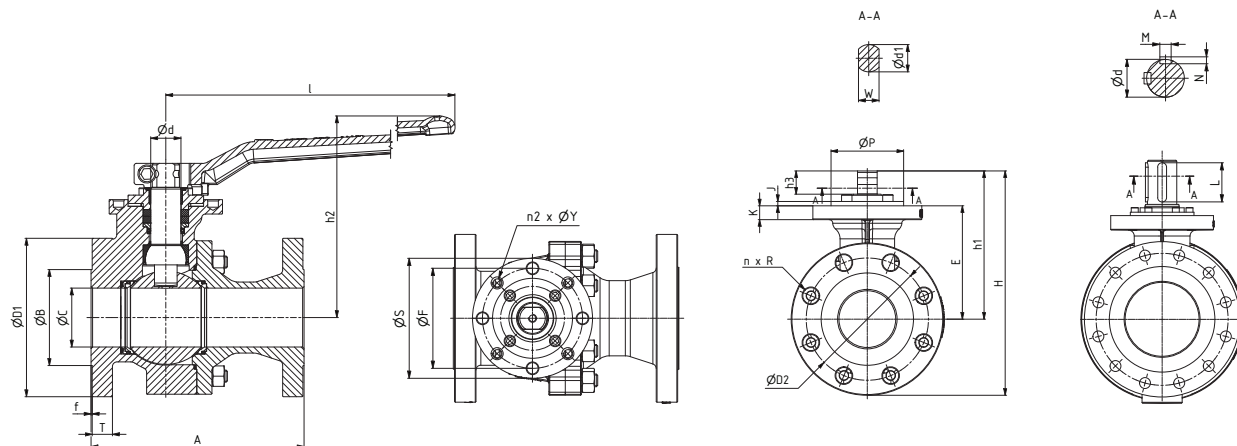
# Trunnion Design High Temperature Trim

## Trunnion Design

Item	Quantity	Description	Carbon Steel		Stainless Steel	
			ASTM	DIN	ASTM	DIN
1	1	Body	A216 WCB	1.0619	A351 CF8M	1.4408
2	1	Tail	A216 WCB	1.0619	A351 CF8M	1.4408
3	1	Ball	A351 CF8M+coating; A182 F316L+coating	1.4408+coating; 1.4404+coating	A351 CF8M+coating; A182 F316L+coating	1.4408+coating; 1.4404+coating
4	1	Stem	A276 Gr.431	1.4057	A276 Gr.431	1.4057
5	1	Body gasket	Graphite/316Ti	Graphite/1.4571	Graphite/316Ti	Graphite/1.4571
6	2	Seat	A182 F316L+coating	1.4404+coating	A182 F316L+coating	1.4404+coating
7	1	Thrust washer	Inconel 625+coating	Inconel 625+coating	Inconel 625+coating	Inconel 625+coating
8	1	Gland	A582 Gr.303	1.4305	A582 Gr.303	1.4305
10	12	Stud	A193 Gr.B7	A4-70	A193 Gr.B8M Cl.2	A4-70
11	12	Heavy hex nut	A194 Gr.2H	A4-70	A194 Gr.8M	A4-70
13	1	Packing set	Graphite	Graphite	Graphite	Graphite
14	2	Sleeve bearing	Inconel 625+coating	Inconel 625+coating	Inconel 625+coating	Inconel 625+coating
15	1	Gland flange	A516 Gr.70	1.0425	A240 316Ti; 316SS	1.4571; 1.4401
16	1	Sleeve bearing	Inconel 625+coating	Inconel 625+coating	Inconel 625+coating	Inconel 625+coating
17	1	Bottom stem	A479 316Ti; 316SS	1.4571, 1.4401	A479 316Ti; 316SS	1.4571, 1.4401
18	1	Sealing	Graphite/316Ti	Graphite/1.4571	Graphite/316Ti	Graphite/1.4571
19	1	Cover	A479 316Ti; 316	1.4571; 1.4401	A479 316Ti; 316SS	1.4571; 1.4401
20	6	Stud	A193 Gr.B7	A4-70	A193 Gr.B8M Cl.2	A4-70
21	6	Heavy hex nut	A194 Gr.2H	A4-70	A194 Gr.8M	A4-70
22	2	Stud	A193 Gr.B7	A4-70	A193 Gr.B8M Cl.2	A4-70
23	2	Heavy hex nut	A194 Gr.2H	A4-70	A194 Gr.8M	A4-70
24	1	Retaining ring	Stainless Steel	1.4122	Stainless Steel	1.4122
25	2	Wiper ring	Graphite	Graphite	Graphite	Graphite
26	2	S-Ring	A182 F316L	1.4571; 1.4404	A276 316Ti, 316L	1.4571; 1.4404
27	2	Seal ring	Graphite-1,4	Graphite-1,4	Graphite-1,4	Graphite-1,4
29	2	Wave spring	A286	1.4980	A286	1.4980
30	2	Parallel key	316SS/316Ti	A4/1.4571	316SS/316Ti	A4/1.4571
31	1	Hex head plug	A182 Gr.F316; A479 Gr.316	A4/1.4571	A182 Gr.F316; A479 Gr.316	A4/1.4571



# Floating Ball Design Dimensions and Weights PN 10 & PN 16

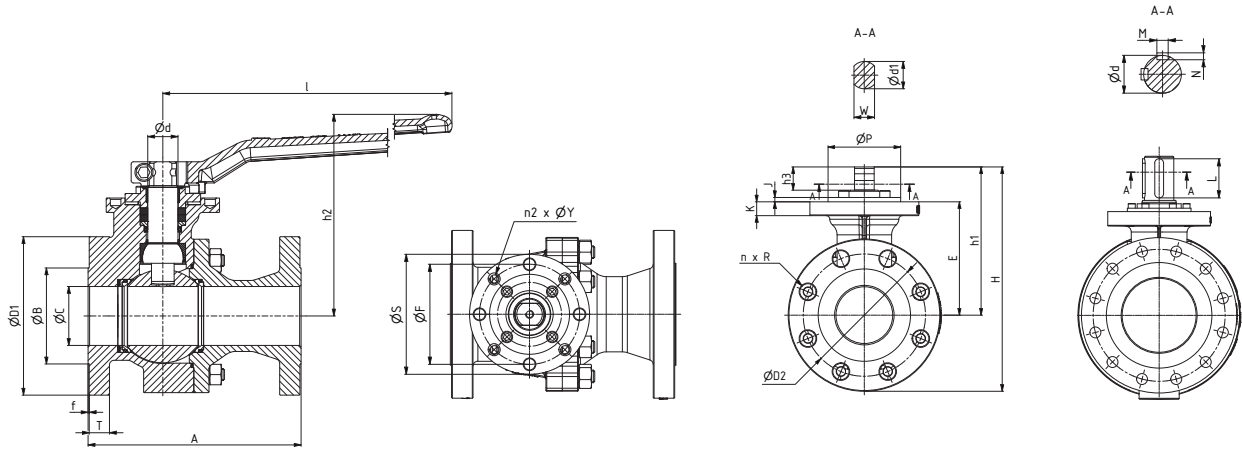


Dimensions D1, l, h2, S, E, h1 and H are for reference only.

DN	NPS	Dimensions (mm)														Weights (kg)	Weights (kg) A-long	
		A	A-long	$\phi C$	H	h1	E	$\phi D1$	$\phi D2$	n	R	$\phi B$	T	f	h2			l
15	1/2"	115	130	13	146	69	49	95	65	4	14	45	14	2	98	182	3	3
20	3/4"	120	150	19	157	75	55	105	75	4	14	58	16	2	104	182	4	4
25	1"	125	160	25	165	78	58	115	85	4	14	68	16	2	107	182	5	5
40	1 1/2"	140	200	38	226	111	83	150	110	4	18	88	16	2	151	280	10	11
50	2"	150	230	49	241	118	90	165	125	4	18	102	16	2	158	280	12	14
80	3"	180	310	78	322	165	127	200	160	8	18	138	18	2	222	448	25	27
100	4"	190	350	100	388	215	167	220	180	8	18	158	18	2	278	720	61	68
150	6"	350	480	151	433	264	212	285	240	8	22	212	20	2	-	-	109	115

DN	NPS	Dimensions (mm)														
		ISO 5211	$\phi S$	$\phi P$	$\phi F$	n2	$\phi Y$	K	J	$\phi d$	L	M	N	h3	W	$\phi d1$
15	1/2"	F05	65	35	50	4	M6	10	2	16	-	-	-	13	11	14
20	3/4"	F05	65	35	50	4	M6	11	2	16	-	-	-	13	11	14
25	1"	F05	65	35	50	4	M6	9	2	16	-	-	-	13	11	14
40	1 1/2"	F07	90	55	70	4	M8	9	3	20	-	-	-	20	14	18
50	2"	F07	90	55	70	4	M8	10	3	20	-	-	-	20	14	18
80	3"	F10	125	70	102	4	M10	21.5	3	28	-	-	-	26	19	25
100	4"	F14	175	100	140	4	M16	18	6	40	-	-	-	33.5	27	36
150	6"	F14	175	100	140	4	M16	22	6	50	-	-	-	40	36	48

# Floating Ball Design Dimensions and Weights PN 25 & PN 40

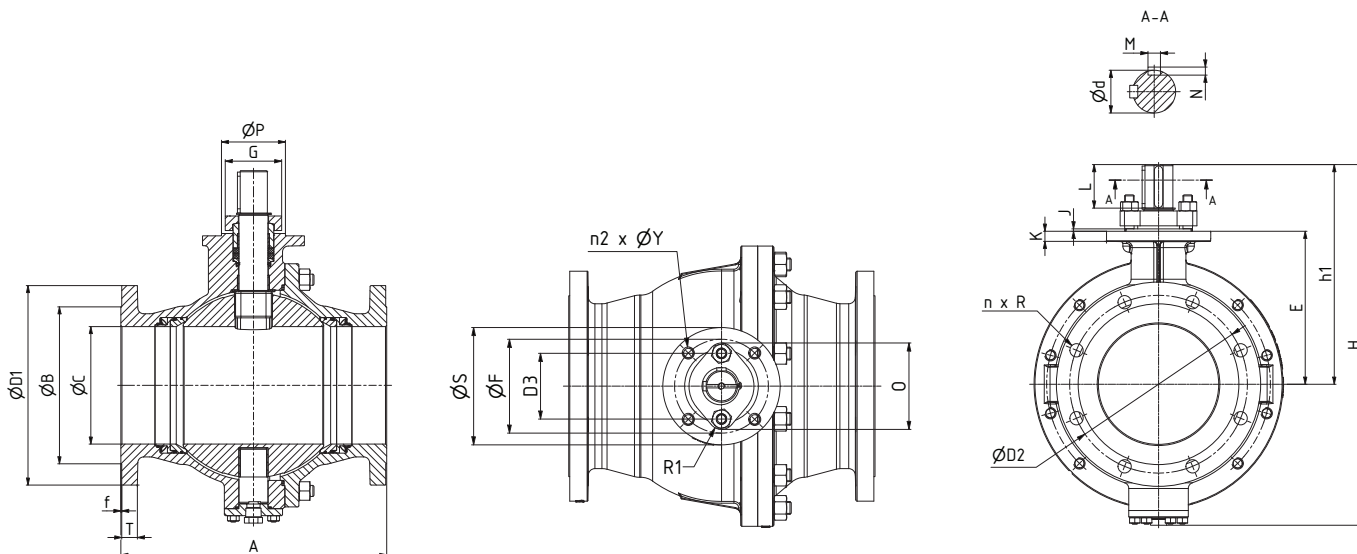


Dimensions D1, l, h2, S, E, h1 and H are for reference only.

DN	NPS	Dimensions (mm)														Weights (kg)	Weights (kg) A-long	
		A	A-long	Ø C	H	h1	E	Ø D1	Ø D2	n	R	Ø B	T	f	h2			l
15	1/2"	115	130	13	146	69	49	95	65	4	14	45	14	2	98	182	3	3
20	3/4"	120	150	19	155	75	55	105	75	4	14	58	16	2	104	182	4	4
25	1"	125	160	25	165	78	58	115	85	4	14	68	16	2	107	182	5	5
40	1 1/2"	140	200	38	225	111	83	150	110	4	18	88	16	2	151	280	10	11
50	2"	150	230	49	288	147	109	165	125	4	18	102	18	2	205	448	15	16
80	3"	180	310	78	365	204	156	200	160	8	18	138	22	2	265	720	70	73
100	4"	190	350	100	341	223	171	235	190	8	22	162	22	2	-	-	83	84
150	6"	350	480	151	496	325	212	300	250	8	26	218	26	2	-	-	243	248

DN	NPS	Dimensions (mm)														
		ISO 5211	Ø S	Ø P	Ø F	n2	Ø Y	K	J	Ø d	L	M	N	h3	W	Ø d1
15	1/2"	F05	65	35	50	4	M6	10	2	16	-	-	-	13	11	14
20	3/4"	F05	65	35	50	4	M6	11	2	16	-	-	-	13	11	14
25	1"	F05	65	35	50	4	M6	9	2	16	-	-	-	13	11	14
40	1 1/2"	F07	90	55	70	4	M8	9	3	20	-	-	-	20	14	18
50	2"	F10	125	70	102	4	M10	17	3	28	-	-	-	26	19	25
80	3"	F14	175	100	140	4	M16	19	6	40	-	-	-	33.5	27	36
100	4"	F14	175	100	140	4	M16	24	6	50	-	-	-	40	36	48
150	6"	F16	210	130	165	4	M20	29	7	70	80	18	11	-	-	-

# Trunnion Design Dimensions and Weights PN 10 & PN 16



Dimensions D1, l, S, E, h1 and H are for reference only.

## PN 10

DN	NPS	Dimensions (mm)																	Weights (kg)	Weights (kg) A-long
		A	A-long	ØC	H	h1	E	ØD1	ØD2	n	R	ØB	T	f	O	G	D3	R1		
200	8"	400	600	202	596	370	257	340	295	8	22	268	22	2	137	98	98	20	184	200
250	10"	450	730	252	677	413	300	395	350	12	22	320	24	2	137	98	98	20	291	319
300	12"	500	850	303	809	483.5	335	445	400	12	22	370	24	2	182	128	130	24	463	511

DN	NPS	Dimensions (mm)														
		ISO 5211	ØS	ØP	ØF	n2	ØY	K	J	Ød	L	M	N	h3	W	Ød1
200	8"	F14	175	100	140	4	17	17	4	50	70	14	9	-	-	-
250	10"	F14	175	100	140	4	17	22	4	50	70	14	9	-	-	-
300	12"	F16	210	130	165	4	21	22	4	50	70	14	9	-	-	-

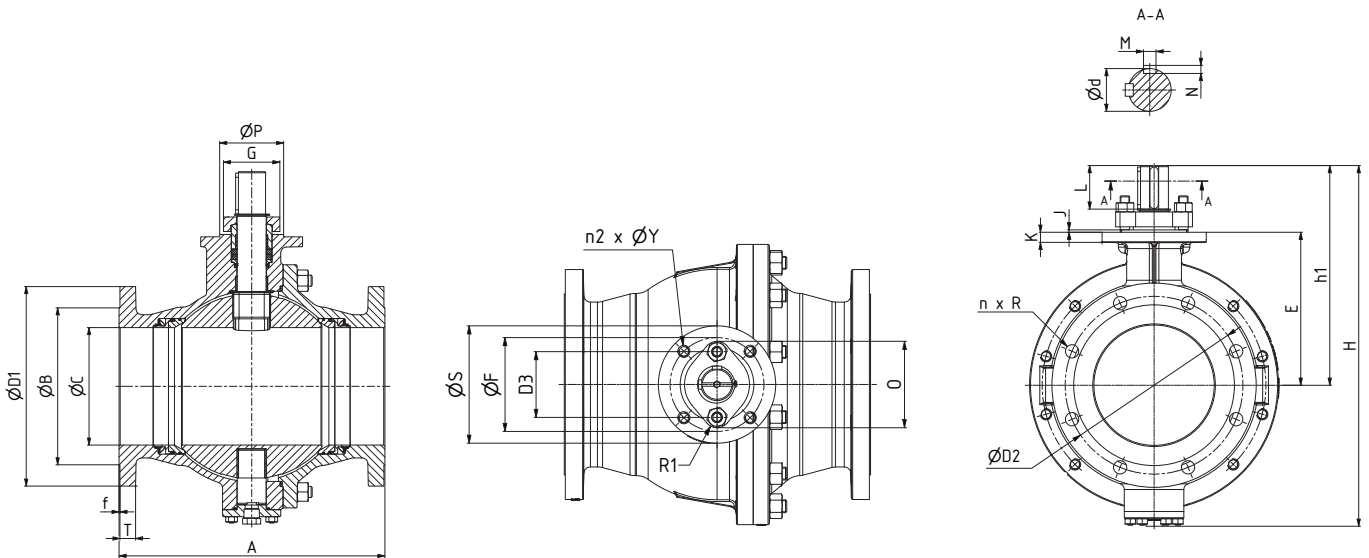
## PN 16

DN	NPS	Dimensions (mm)																	Weights (kg)	Weights (kg) A-long
		A	A-long	ØC	H	h1	E	ØD1	ØD2	n	R	ØB	T	f	O	G	D3	R1		
200	8"	400	600	202	596	370	257	340	295	8	22	268	22	2	137	98	98	20	184	200
250	10"	450	730	252	677	413	300	405	355	12	26	320	24	2	137	98	98	20	293	321
300	12"	500	850	303	809	483.5	335	460	410	12	26	378	26	2	182	128	130	24	468	517

DN	NPS	Dimensions (mm)														
		ISO 5211	ØS	ØP	ØF	n2	ØY	K	J	Ød	L	M	N	h3	W	Ød1
200	8"	F14	175	100	140	4	17	17	4	50	70	14	9	-	-	-
250	10"	F14	175	100	140	4	17	22	4	50	70	14	9	-	-	-
300	12"	F16	210	130	165	4	21	21	5	70	100	18	11	-	-	-



# Trunnion Design Dimensions and Weights PN 25 & PN 40



Dimensions D1, l, S, E, h1 and H are for reference only.

## PN 25

DN	NPS	Dimensions (mm)																Weights (kg)	Weights (kg) A-long	
		A	A-long	ØC	H	h1	E	ØD1	ØD2	n	R	ØB	T	f	O	G	D3			R1
200	8"	400	600	202	609	372	256	360	310	12	26	278	28	2	178	102	130	24	293	313
250	10"	450	730	252	716	441	290	425	370	12	30	335	30	2	178	102	130	24	447	486
300	12"	500	850	303	824	497	335	485	430	16	30	395	32	2	188	112	140	24	684	751

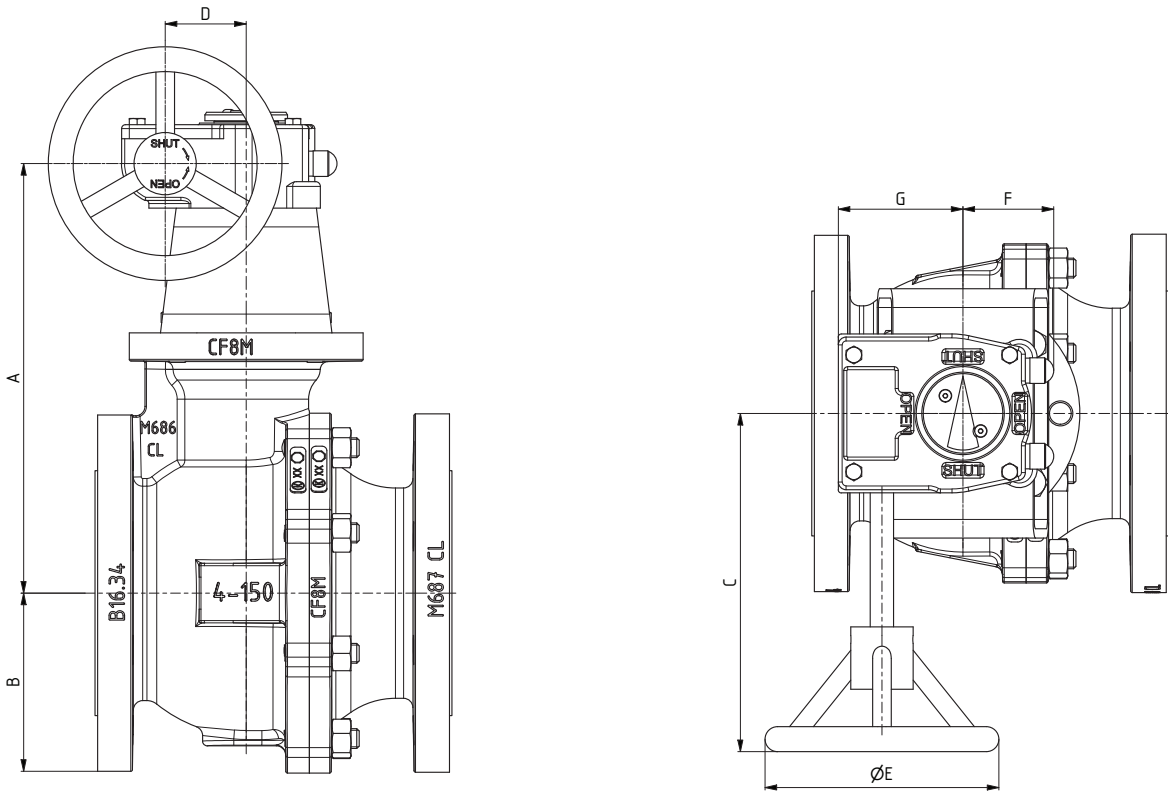
DN	NPS	Dimensions (mm)															h3	W	Ød1
		ISO 5211	ØS	ØP	ØF	n2	ØY	K	J	Ød	L	M	N						
200	8"	F16	210	130	165	4	21	21	5	70	70	18	11	-	-	-			
250	10"	F25	300	200	254	8	17	18	5	70	100	18	11	-	-	-			
300	12"	F25	300	200	254	8	17	30	5	80	110	20	12	-	-	-			

## PN 40

DN	NPS	Dimensions (mm)																Weights (kg)	Weights (kg) A-long	
		A	A-long	ØC	H	h1	E	ØD1	ØD2	n	R	ØB	T	f	O	G	D3			R1
200	8"	400	600	202	609	372	256	375	320	12	30	285	32	2	178	102	130	24	299	320
250	10"	450	730	252	716	441	290	450	385	12	33	345	36	2	178	102	130	24	462	501
300	12"	500	850	303	824	497	335	515	450	16	33	410	40	2	188	112	140	24	706	770

DN	NPS	Dimensions (mm)															h3	W	Ød1
		ISO 5211	ØS	ØP	ØF	n2	ØY	K	J	Ød	L	M	N						
200	8"	F16	210	130	165	4	21	21	5	70	70	18	11	-	-	-			
250	10"	F25	300	200	254	8	17	18	5	70	100	18	11	-	-	-			
300	12"	F25	300	200	254	8	17	30	5	80	110	20	12	-	-	-			

# High Temperature Design with Gears PN 10 & PN 16

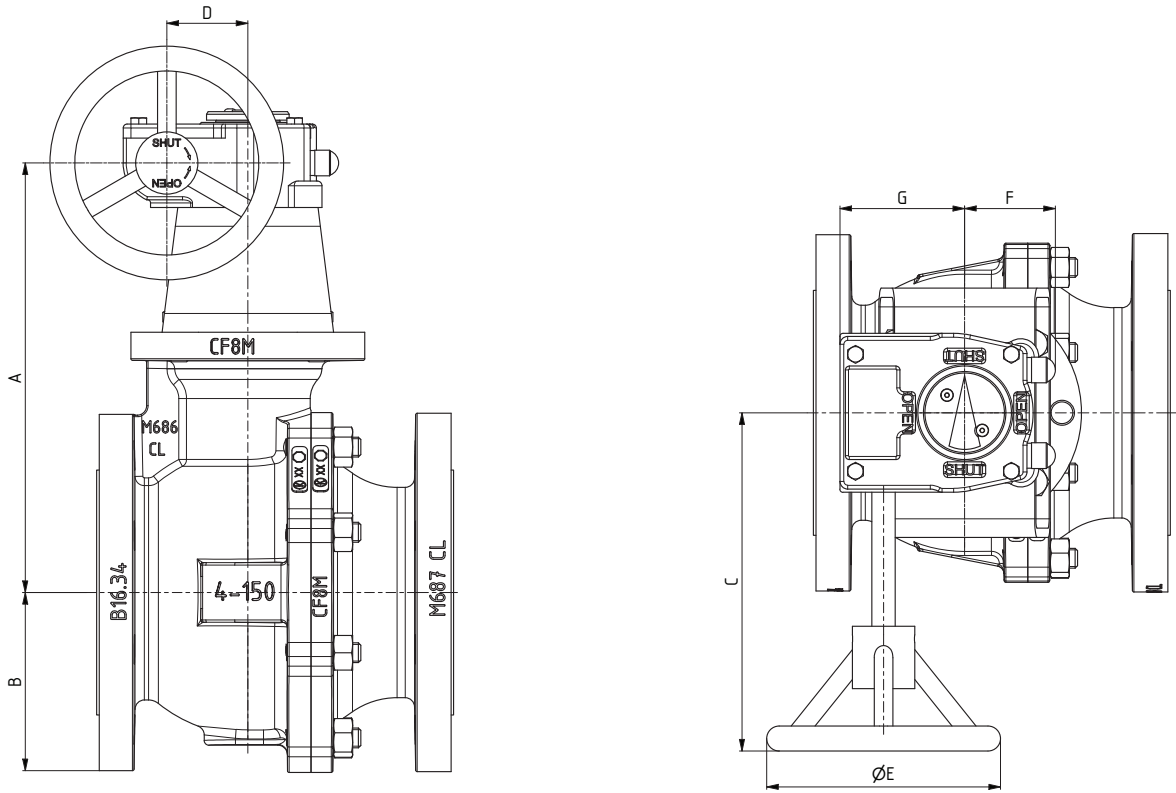


*Gear dimensions are for reference only.*

DN	NPS	Dimensions (mm)						
		A	B	C	D	ØE	F	G
100	4"	288	123	249	71	150	85	105
150	6"	334	169	270	86	300	103	126
200	8"	459	237	270	86	300	103	126
250	10"	502	265	270	86	300	103	126
300	12"	589	327	318	53	350	109	150

*Gear size is based on clear, clean liquid fluid at maximum differential pressure.*

## High Temperature Design with Gears PN 25 & PN 40



*Gear dimensions are for reference only.*

DN	NPS	Dimensions (mm)						
		A	B	C	D	ØE	F	G
80	3"	277	100	249	71	150	86	105
100	4"	293	122	265	86	250	103	126
150	6"	468	172	318	53	350	109	150
200	8"	510	237	318	53	350	109	150
250	10"	543	275	378	130	250	127	180
300	12"	598	327	400	140	350	133	195

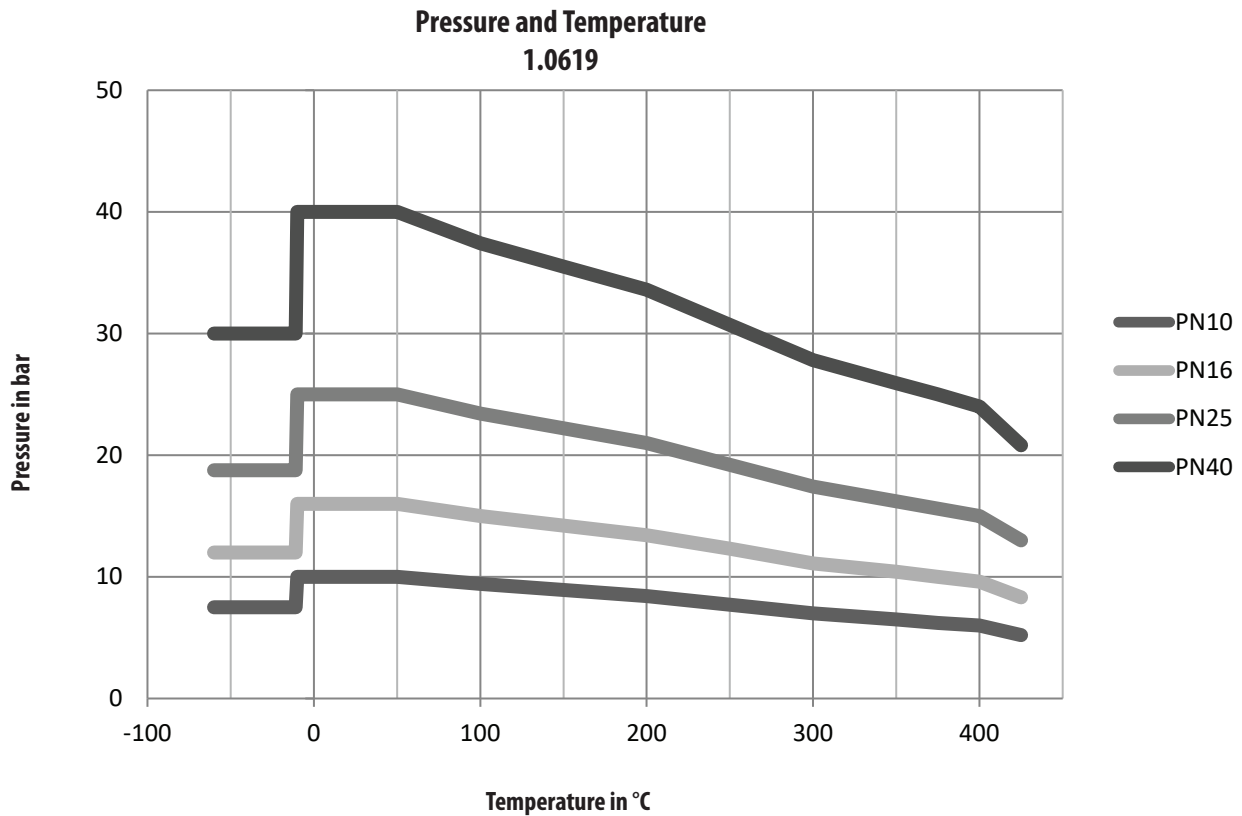
*Gear size is based on clear, clean liquid fluid at maximum differential pressure.*

# Pressure/Temperature Ratings for Carbon Steel

Temperature	Max working pressure PN 10	Max working pressure PN 16	Max working pressure PN 25	Max working pressure PN 40
	1.0619*			
°C	bar			
-60**	7.5	12.0	18.8	30.0
-10	10.0	16.0	25.0	40.0
50	10.0	16.0	25.0	40.0
100	9.4	15.0	23.4	37.4
150	8.9	14.2	22.2	35.5
200	8.4	13.4	21.0	33.6
250	7.7	12.3	19.2	30.7
300	7.0	11.1	17.4	27.8
350	6.5	10.4	16.2	25.9
375	6.2	10.0	15.6	25.0
400	6.0	9.6	15.0	24.0
425	5.2	8.3	13.0	20.8

\* according EN12516-1 - Material Group 3E0

\*\* Values in accordance to AD2000-W10 - Stress category II

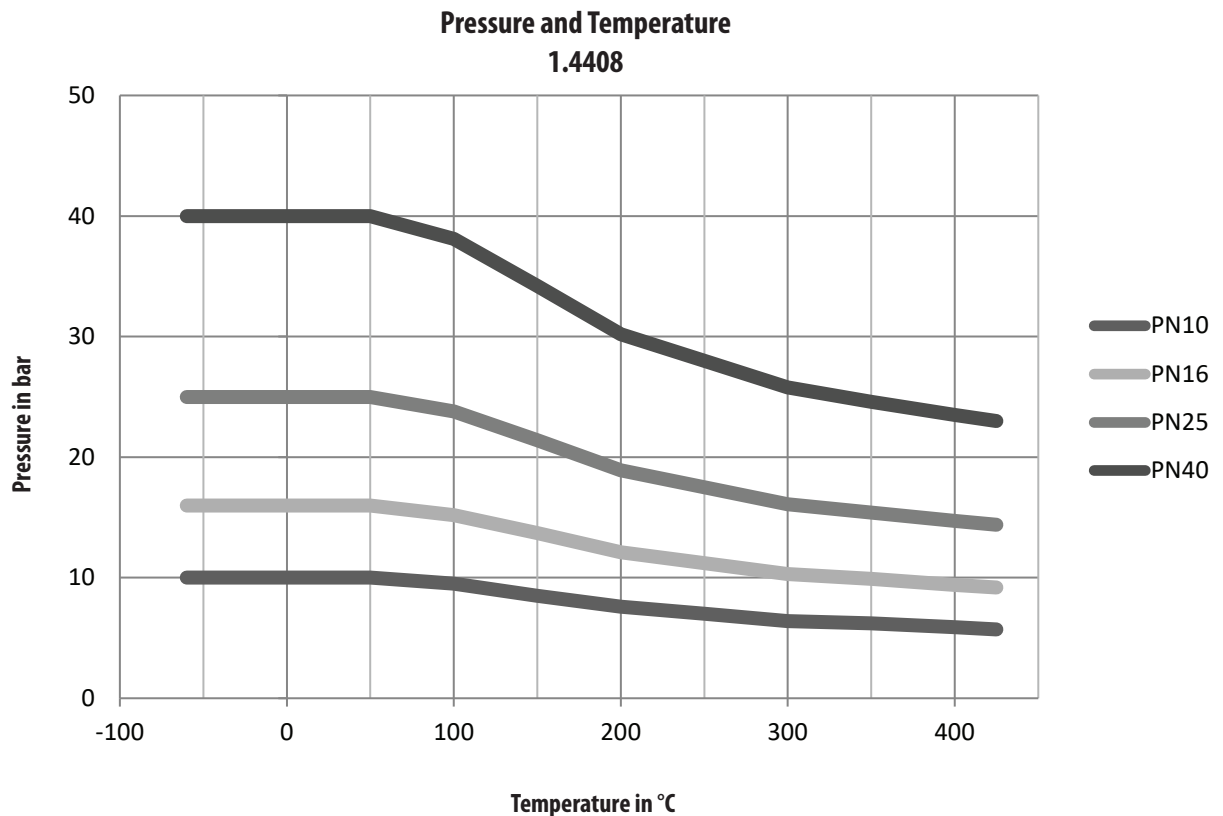


## Pressure/Temperature Ratings for Stainless Steel

Temperature	Max working pressure PN 10	Max working pressure PN 16	Max working pressure PN 25	Max working pressure PN 40
	1.4408 *			
°C	bar			
-60**	10.0	16.0	25.0	40.0
-10	10.0	16.0	25.0	40.0
50	10.0	16.0	25.0	40.0
100	9.5	15.2	23.8	38.1
150	8.5	13.7	21.4	34.2
200	7.6	12.1	18.9	30.2
250	7.0	11.2	17.5	28.0
300	6.4	10.3	16.1	25.8
350	6.2	9.9	15.4	24.6
400	5.9	9.4	14.7	23.5
425	5.7	9.2	14.4	23.0

\* according EN1092-1 Material Group 14E0

\*\* Values in accordance to AD2000-W10 - Stress category I



# Maximum Allowable Stem Torques

## Maximum Allowable Stem Torque PN 10 & PN 16

DN	NPS	MAST [Nm]						
		Stem Material						
		A276 Gr431 1.4057	A182 F51 1.4462	A564 Gr630 1.4542	A453 Gr660 1.4980	A276 Gr316Ti 1.4571	A276 Gr316 L 1.4404	A286 GrXM-19 1.3964
<b>Floating Ball Design</b>								
15	1/2"	108	84	107	122	66	53	88
20	3/4"	108	84	107	122	66	53	88
25	1"	108	84	107	122	66	53	88
40	1 1/2"	276	214	275	311	157	111	225
50	2"	276	214	275	311	157	111	225
80	3"	792	614	787	891	406	286	644
100	4"	2177	1687	2164	2449	1187	837	1769
150	6"	4355	3375	4327	4899	2667	1983	3538
<b>Trunion Design</b>								
200	8"	7609	5681	6531	7609	3094	2181	5073
250	10"	7609	5681	6531	7609	3094	2181	5073
300	12"	14736	11003	12649	14736	5993	4224	9824

## Maximum Allowable Stem Torque PN 25 & PN 40

DN	NPS	MAST [Nm]						
		Stem Material						
		A276 Gr431 1.4057	A182 F51 1.4462	A564 Gr630 1.4542	A453 Gr660 1.4980	A276 Gr316Ti 1.4571	A276 Gr316 L 1.4404	A286 GrXM-19 1.3964
<b>Floating Ball Design</b>								
15	1/2"	108	84	107	122	66	53	88
20	3/4"	108	84	107	122	66	53	88
25	1"	108	84	107	122	66	53	88
40	1 1/2"	276	214	275	311	157	111	225
50	2"	792	614	787	891	406	286	644
80	3"	2177	1687	2164	2449	1187	837	1769
100	4"	4355	3375	4327	4899	2667	1983	3538
150	6"	13707	11003	12649	13707	5993	4224	9824
<b>Trunion Design</b>								
200	8"	11776	11003	11776	11776	5993	4224	9824
250	10"	14736	11003	12649	14736	5993	4224	9824
300	12"	25272	19997	22988	25272	10891	7678	17855

# Kv / Cv Values

## Kv / Cv Values Class PN 10 - PN 40

DN	NPS	Opening Angle															
		90°		80°		70°		60°		50°		40°		30°		20°	
		Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv
<b>Floating Ball Design</b>																	
15	1/2"	26	30	22	26	17	20	10	12	7	8	4	5	3	3	2	2
20	3/4"	48	56	41	48	31	36	18	21	12	14	8	9	5	6	3	3
25	1"	82	95	71	82	52	60	31	36	21	24	13	15	8	9	5	6
40	1 1/2"	225	261	194	225	144	167	86	100	56	65	36	42	23	27	14	16
50	2"	424	492	365	423	271	314	161	187	106	123	68	79	42	49	25	29
80	3"	1125	1305	968	1123	720	835	428	496	281	326	180	209	113	131	68	79
100	4"	1903	2207	1637	1899	1218	1413	723	839	476	552	304	353	190	220	114	132
150	6"	4801	5569	4129	4790	3073	3565	1824	2116	1200	1392	768	891	480	557	288	334
<b>Trunion Design</b>																	
200	8"	8737	10135	7514	8716	5592	6487	3320	3851	2184	2533	1398	1622	874	1014	524	608
250	10"	14186	16456	12200	14152	9079	10532	5391	6254	3547	4115	2270	2633	1419	1646	851	987
300	12"	20933	24282	18002	20882	13397	15541	7955	9228	5233	6070	3349	3885	2093	2428	1256	1457

# Operating Torques

## Operating Torques PN 10

DN	NPS	Torque [Nm]						
		BTO	RUN	ETO		BTC	RUN	ETC
<b>Floating Ball Design</b>								
15	1/2"	10	9	9		10	9	9
20	3/4"	11	9	10		11	9	10
25	1"	11	10	10		11	10	10
40	1 1/2"	24	18	19		21	18	20
50	2"	34	22	25		27	22	28
80	3"	97	54	59		65	54	73
100	4"	217	122	130		143	122	161
150	6"	598	300	333		367	300	434
<b>Trunion Design</b>								
200	8"	465	270	296		325	270	320
250	10"	661	372	418		460	372	446
300	12"	1202	670	746		820	670	817

## Operating Torques PN 16

DN	NPS	Torque [Nm]						
		BTO	RUN	ETO		BTC	RUN	ETC
<b>Floating Ball Design</b>								
15	1/2"	10	9	9		10	9	9
20	3/4"	11	9	10		11	9	10
25	1"	13	10	10		11	10	11
40	1 1/2"	28	18	19		21	18	22
50	2"	44	24	26		29	24	33
80	3"	132	60	65		71	60	90
100	4"	291	135	143		157	135	198
150	6"	844	343	376		414	343	557
<b>Trunion Design</b>								
200	8"	601	304	330		363	304	384
250	10"	865	422	468		515	422	541
300	12"	1585	768	843		928	768	1003

## Operating Torques PN 25

DN	NPS	Torque [Nm]						
		BTO	RUN	ETO		BTC	RUN	ETC
<b>Floating Ball Design</b>								
15	1/2"	11	9	9		10	9	9
20	3/4"	12	9	10		11	9	10
25	1"	15	10	11		12	10	12
40	1 1/2"	36	20	21		23	20	26
50	2"	77	43	45		50	43	56
80	3"	235	115	120		132	115	162
100	4"	451	199	207		228	199	298
150	6"	1372	550	583		641	550	884
<b>Trunion Design</b>								
200	8"	970	502	528		580	502	655
250	10"	1361	651	697		767	651	881
300	12"	2239	1010	1085		1194	1010	1401

## Operating Torques PN 40

DN	NPS	Torque [Nm]						
		BTO	RUN	ETO		BTC	RUN	ETC
<b>Floating Ball Design</b>								
15	1/2"	12	9	10		11	9	10
20	3/4"	15	10	10		11	10	12
25	1"	19	11	11		13	11	14
40	1 1/2"	48	22	23		25	22	32
50	2"	102	48	50		55	48	69
80	3"	323	133	137		151	133	207
100	4"	638	235	243		267	235	394
150	6"	1998	666	699		769	666	1201
<b>Trunion Design</b>								
200	8"	1333	606	631		694	606	850
250	10"	1908	799	845		930	799	1168
300	12"	3196	1268	1343		1477	1268	1893

The torques shown in the chart are for reference only (clean clear lubricating liquid, actuation safety factor = 1.0). For application-specific torques, please consult the factory.

BTO = Break to open  
 RUN = Running  
 ETO = End to open

BTC = Break to close  
 RUN = Running  
 ETC = End to close



# Torques for Packing Gland Nut, Body Joint and Cover

## Packing gland nut torques PN 10 & PN 16

DN	NPS	Thread Size	Standard Trim	High Temperature Trim
			[Nm]	[Nm]
<b>Floating Ball Design</b>				
15	1/2"	M30x1	116	116
20	3/4"	M30x1	116	116
25	1"	M30x1	116	116
40	1 1/2"	M36x1,5	224	224
50	2"	M36x1,5	224	224
80	3"	M48x1,5	490	389
100	4"	M12x1.75	29	20
150	6"	M12x1.75	26	18
<b>Trunion Design</b>				
200	8"	M16x2	140	97
250	10"	M16x2	140	97
300	12"	M24x3	329	330

## Packing gland nut torques PN 25 & PN 40

DN	NPS	Thread Size	Standard Trim	High Temperature Trim
			[Nm]	[Nm]
<b>Floating Ball Design</b>				
15	1/2"	M30x1	116	116
20	3/4"	M30x1	116	116
25	1"	M30x1	116	116
40	1 1/2"	M36x1,5	224	224
50	2"	M48x1,5	490	389
80	3"	M12x1.75	29	20
100	4"	M12x1.75	26	18
150	6"	M12x1.75	41	41
<b>Trunion Design</b>				
200	8"	M24x3	329	330
250	10"	M24x3	329	330
300	12"	M24x3	374	374

## Body joint torques PN 10 & PN 16

DN	NPS	Thread Size	[Nm]
<b>Floating Ball Design</b>			
15	1/2"	M10	30
20	3/4"	M10	30
25	1"	M10	30
40	1 1/2"	M12	50
50	2"	M12	50
80	3"	M16	120
100	4"	M12	50
150	6"	M16	120
<b>Trunion Design</b>			
200	8"	M20	230
250	10"	M20	230
300	12"	M22	318

## Body joint torques PN 25 & PN 40

DN	NPS	Thread Size	[Nm]
<b>Floating Ball Design</b>			
15	1/2"	M10	30
20	3/4"	M10	30
25	1"	M10	30
40	1 1/2"	M12	50
50	2"	M12	50
80	3"	M14	77
100	4"	M16	120
150	6"	M20	230
<b>Trunion Design</b>			
200	8"	M20	230
250	10"	M22	318
300	12"	M24	405

## Cover torques PN 10 & PN 16

DN	NPS	Thread Size	[Nm]
<b>Floating Ball Design</b>			
15-150	1/2"-6"	-	-
<b>Trunion Design</b>			
200	8"	M10x1.5	28
250	10"	M10x1.5	28
300	12"	M10x1.5	28

## Cover torques PN 25 & PN 40

DN	NPS	Thread Size	[Nm]
<b>Floating Ball Design</b>			
15-150	1/2"-6"	-	-
<b>Trunion Design</b>			
200	8"	M10x1.5	28
250	10"	M10x1.5	28
300	12"	M10x1.5	28

# Product Coding

PRODUCT LINE				DESIGN						
Valve	General Design	Bonnet	Valve Type	Size	Pressure Class	Seat Type	Sealing System	Bore Size	End Connection	Face to Face
KFO	1	1	76	G	C	B	1	1	A	3

## PRODUCT LINE

Valve	
Standard Flange Ball Valve	KFO

General Design	
Cast split body, floating	1
Forged split body, floating	5
Forged split body, trunnion mounted	7
Cast split body, trunnion mounted	9

Bonnet	
Standard	1
Bonnet extension	2

Valve Type	
Performance Series (425°C/800°F)	56
Performance Series (260°C/500°F)	76

## DESIGN

Nominal Pipe Size	
DN 10	A
DN 15	B
DN 20	C
DN 25	D
DN 40	F
DN 50	G
DN 80	I
DN 100	J
DN 150	L
DN 200	M
DN 250	N
DN 300	O

Pressure Class	
PN 10	B
PN 16	C
PN 25	E
PN 40	F

Seat Type	
Double Seat/ Bi-Directional	B

Standard Sealing System	
Standard Sealing System	1

Seat Type	
Full Port	1

Connection	
Flanged - EN 1092-1 Form B1	D
Flanged - EN 1092-1 Form B2	E
Flanged - EN 1092-1 Form C	I
Flanged - EN 1092-1 Form D	J
Flanged - EN 1092-1 Form C & D	K
Flanged - EN 1092-1 Form E	L
Flanged - EN 1092-1 Form F	M
Flanged - EN 1092-1 Form E & F	N

Face to Face	
EN558 series 27 (Short)	3
EN558 series 1 (Long)	5

# Product Coding

MATERIAL						OTHER			OPERATION	OPTIONS
Body Material	Stem Material	Stem Seal	Ball Base Material	Seat Base Material	Coating System	Maximum Temperature	Jacket	Drain/ Purge Ports	Operator	Options
B	H	2	F	F	2	B	0	0	F	0

## MATERIAL

Body Material	
1.0619 (GP240GH)	A
1.4408 (GX5CrNiMo19-11-2)	B
1.4469 (GX2CrNiMoN26-7-4)	C
1.7357 (G17CrMo5-5)	G
2.4816 (NiCr15Fe)	J
2.4660 (NiCr20CuMo)	K
1.4859 (GX10NiCrNb 32-20)	L
2.4365 (GNIcu30Nb)	M
1.4409 (GX2CrNiMoN19-11-2)	N
1.4417 (GX2CrNiMoN25-7-3)	R
2.4602 (NiCr21Mo14W)	T
Other	X

Stem Material	
1.4542 (X5CrNiCuNb16-4)	A
1.4021 (X20Cr13)	B
1.4571 (X6CrNiMoTi17-12-2)	C
1.4462 (X2CrNiMoN22-5-3)	D
1.4980 (X6NiCrTiMoVB25-15-2)	E
1.3964 (X2CrNiMnMoNNb21-16-5-3)	F
1.4057 (X17CrNi16-2)	H
1.4404 (X2CrNiMo17-12-2)	I
Other	X

Stem Seal (Packing)	
Standard Graphite	1
Fugitive Emission Packing (ISO15484/API-641)	2

Ball Base Material	
1.4571 (X6CrNiMoTi17-12-2)	C
1.4462 (X2CrNiMoN22-5-3)	D
1.4980 (X6NiCrTiMoVB25-15-2)	E
1.4404 (X2CrNiMo17-12-2)	F
Other	X

Seat Base Material	
1.4571 (X6CrNiMoTi17-12-2)	C
1.4462 (X2CrNiMoN22-5-3)	D
1.4980 (X6NiCrTiMoVB25-15-2)	E
1.4404 (X2CrNiMo17-12-2)	F
Other	X

Coating System		
H3	Ball: M3 Nickel/Chrome (NiCr) Seat: M3 Nickel/Chrome (NiCr)	2
H4	Ball: M6 Nickel/Chrome/Tungsten Carbide (NiCr-WC) Seat: M3 Nickel/Chrome (NiCr)	3
H5	Ball: M4 Cobalt based (Stellite SF20) Seat: M4 Cobalt based (Stellite SF20)	4
H6	Ball: M11 Chromium Carbide/Nickel/Chromium (Cr3C2-NiCr) Seat: M11 Chromium Carbide/Nickel/Chromium (Cr3C2-NiCr)	5
H10	Ball: M12 Tungsten Carbide Seat: M12 Tungsten Carbide	6
H11	Ball: M2 Hard Chromium (Cr) Seat: M2 Hard Chromium (Cr)	7

## OTHER

Maximum Temperature	
260°C / 500°F	B
425°C / 800°F	C

Heating Jacket	
None	0

Drain/Purge Ports	
None	0

## OPERATION

Operator	
Bare Stem	F
Lever - Locking	L
Gear (manual)	G
Actuated (pneumatic, hydraulic, electric)	A
Mounting kit w/o Operator	M
Extended Lever	J
Stem Extension	H
Stem Extension with Locking Lever	O
Stem Extension with Gear	P
Stem Extension with Actuator	R
Other	X

## OPTIONS

Options	
None	0
NACE MR 0103 or 0175	1
Special	X

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