

AUTHORIZED COMPANY

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ISO9001



API6D

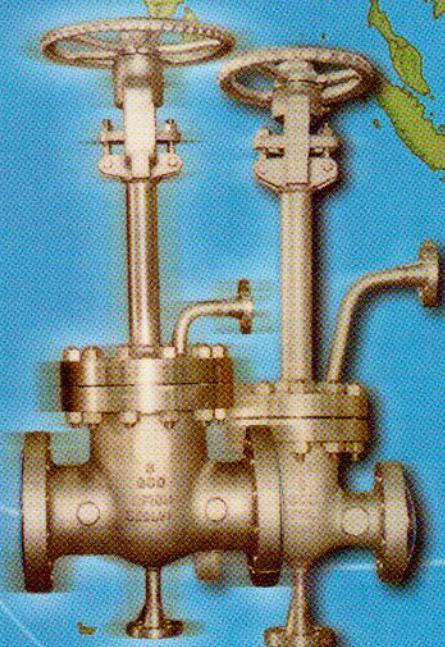


CE0035

CASTING VALVE

GATE VALVE • GLOBE VALVE • SW/CH • BALL • PLUG • VALVE

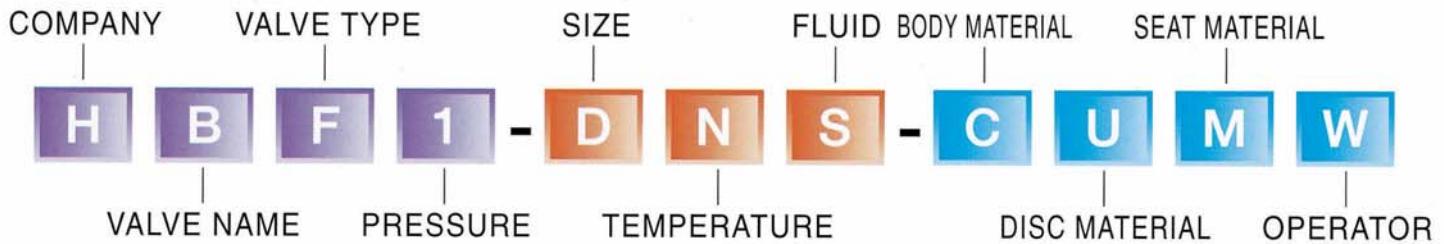
CARBON & ALLOY STEEL STAINLESS STEEL VALVE



Hawks Eng'r Co., Ltd.



Hawks Eng'r Co., Ltd.



H-COMPANY

HAWKS Co., Ltd.

B-VALVE NAME

B/Butterfly, GA/Gate,
GL/Globe, BA/Ball,
CH/Check.

F-VALVE TYPE

F/Flange, L/Lugged,
W/Wafer, B/Butt
Weld, S/Special

1-PRESSURE

1/10k(150#), 2/20k(300#),
3/30k(450#), 4/40k(600#),
6/60k(900#), 9/90k(1500#), etc...

D-SIZE

Standard -- 2"~24"
A/2", B/2.5", C/3", D/4", E/5", F/6",
G/8", H/10", J/12", K/14", L/16", M/18",
N/20", O/24", P/28", Q/32", R/36", S/40",
T/44", U/48". etc ... Others is a
marking of additionally dependable
by the buyer.

N-TEMPERATURE

1/100°C, 2/200°C, 3/300°C,
5/500°C , 7/700°C, 9/900°C
N/20 (normal temp')
Low temp is a marking of
additionally dependable by
the buyer.

S-FLUID

S/Steam, W/Water,
O/Oil, G/Gas,
B/Brine,C/Chemical

C-BODY MATERIAL

D : CARBON STEEL
E : HIGH TEMP ALLOY STEEL
F : LOW TEMP ALLOY STEEL
S : STAINLEN STEEL
Others is a marking of
additionally dependable
by the buyer.

DISC MATERIAL

S : 304, 316SS
F : A217-CA15
W : A216-WCB
Others is a marking of
additionally dependable
by the buyer.

SEAT MATERIAL

M : 304SS, 316SS
H : HF STELLITE
F : FULL STELLITE
Others is a marking of
additionally dependable
by the buyer.

W-OPERATOR

L/Hand wheel
W/Worm gear
P/Pneumatic actuator
H/Hydraulic actuator
E/Electric actuator

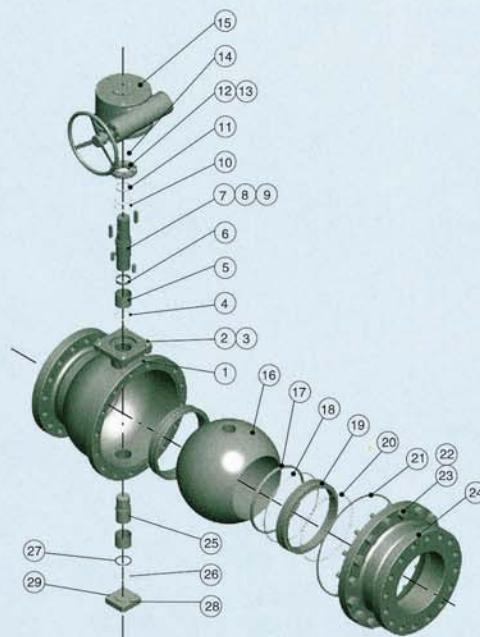


Trunnion ball valve

Application

Trunnion ball valves are suitable for use on various kinds of pipelines of Class150 ~ Class2500, PN16 ~ PN160, JIS10K ~ JIS20K to cut off or turn on the pipeline medium, of which the operation types include worm gear, manual, pneumatic or electric actuators, being in general of flange connection, and butt welding ends connection as well.

Typical drawing of trunnion ball valve and parts composition



Parts and material list

Parts No.	Parts name	Materials				
		WCB/13Cr	WCB/304	WCB/316	CF8	CF8M
1	Body	ASTM A216 WCB	ASTM A216 WCB	ASTM A216 WCB	ASTM A351 CF8	ASTM A351 CF8M
2	Nut	ASTM A194 2H	ASTM A194 2H	ASTM A194 2H	ASTM A194 2H	ASTM A194 2H
3	Bolting	ASTM A193 B7	ASTM A193 B7	ASTM A193 B7	ASTM A193 B7	ASTM A193 B7
4	O ring	Viton	Viton	Viton	Viton	Viton
5	Stem bearing	Metal backed PTFE	Metal backed PTFE	Metal backed PTFE	Metal backed PTFE	Metal backed PTFE
6	Gasket	ASTM A182 F6a	ASTM A182 F304	ASTM A182 F316	ASTM A182 F304	ASTM A182 F316
7	Stem	ASTM A182 F6a	ASTM A182 F304	ASTM A182 F316	ASTM A182 F304	ASTM A182 F316
8	Key	Carbon steel	Carbon steel	Carbon steel	Stainless steel	Stainless steel
9	Key	Carbon steel	Carbon steel	Carbon steel	Stainless steel	Stainless steel
10	O ring	Viton	Viton	Viton	Viton	Viton
11	Gasket	PTFE	PTFE	PTFE	PTFE	PTFE
12	Cover	ASTM A105	ASTM A105	ASTM A105	ASTM A182 F304	ASTM A182 F316
13	Capscrew	ASTM A193 B7	ASTM A193 B7	ASTM A193 B7	ASTM A193 B8	ASTM A193 B8M
14	O ring	Viton	Viton	Viton	Viton	Viton
15	Gear	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel
16	Ball	ASTM A182 F6a	ASTM A182 F304	ASTM A182 F316	ASTM A182 F304	ASTM A182 F316
17	Seat	Reinforced PTFE	Reinforced PTFE	Reinforced PTFE	Reinforced PTFE	Reinforced PTFE
18	O ring	Viton	Viton	Viton	Viton	Viton
19	Seat retainer	ASTM A105	ASTM A105	ASTM A105	ASTM A182 F304	ASTM A182 F316
20	Spring	SS304 or Inconel 750 SS304 or Inconel 750 SS316 or Inconel 750 SS304 or Inconel 750 SS316 or Inconel 750				
21	Gasket	Viton or PTFE or Graphite	Viton or PTFE or Graphite	Viton or PTFE or Graphite	Viton or PTFE or Graphite	Viton or PTFE or Graphite
22	Body bolting	ASTM A193 B7	ASTM A193 B7	ASTM A193 B7	ASTM A193 B8	ASTM A193 B8M
23	Body nut	ASTM A194 2H	ASTM A194 2H	ASTM A194 2H	ASTM A194 8	ASTM A194 8M
24	Closure	ASTM A216 WCB	ASTM A216 WCB	ASTM A216 WCB	ASTM A351 CF8	ASTM A351 CF8M
25	Lower trunnion	ASTM A182 F6a	ASTM A182 F304	ASTM A182 F316	ASTM A182 F304	ASTM A182 F316
26	O ring	Viton	Viton	Viton	Viton	Viton
27	Gasket	ASTM A182 F6a	ASTM A182 F304	ASTM A182 F316	ASTM A182 F304	ASTM A182 F316
28	Lower cover	ASTM A105	ASTM A105	ASTM A105	ASTM A182 F304	ASTM A182 F316
29	Capscrew	ASTM A193 B7	ASTM A193 B7	ASTM A193 B7	ASTM A193 B8	ASTM A193 B8M

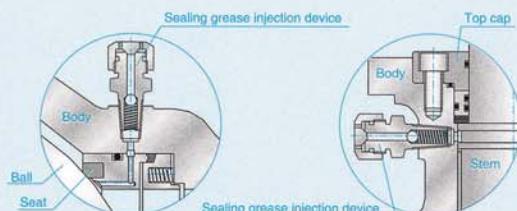
Note: The chart above only lists out some common composition of steel ball valve parts. We may provide other different parts material composition according to the customer's request or the actual valve working condition.

Trunnion ball valve

Design features of trunnion ball valve

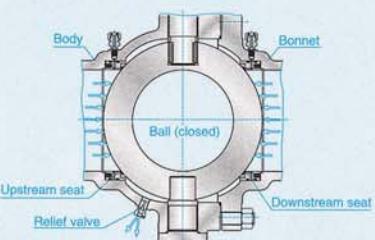
Urgent grease injection device

According to customers' requirement, the trunnion ball valves made by Hawks company are provided with devices for urgent grease injection, which are on both the stem and seat for the trunnion ball valves of DN>150mm (NPS6), and in the body cavity for the valve of DN<125mm. When the O ring of stem or the body seat ring is damaged due to accident, the medium leakage between body and stem can be prevented by injecting the sealing grease through the device.



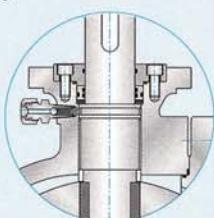
Double-block and bleed functions

In general, Hawks's trunnion ball valve features the front ball sealing design structure. Each seat of the ball valve can separately cut off the medium at both inlet and outlet of the valve to realize double-block functions. When the ball valve is closed, body cavity and two of the body ends can be blocked with each other even if both the inlet and outlet are under pressure, when the medium left in the body cavity might be bled through the relief valve.



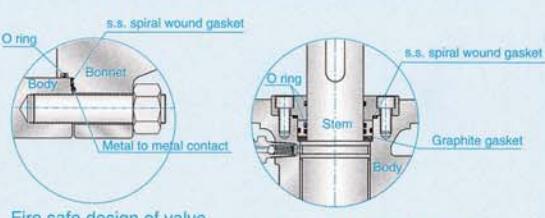
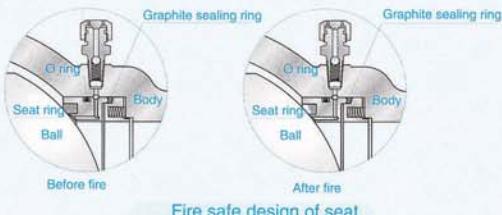
Blow-out proof stem

Blow-out proof structure is provided with for the stem, which is positioned by the up-end cap and screw, being guaranteed not to be blown-out by the medium even if at abnormal risen pressure in the cavity.



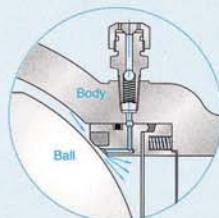
Fire safe design

With the valve heated in a fire application, the non-metal material parts such as seat sealing ring of PTFE, O ring for the stem, and sealing gasket for body and bonnet, might be damaged due to high temperature. Hawks's special design of auxiliary metal to metal or the graphite seal is provided for the trunnion ball valve to effectively prevent both internal and external leakage of the valve. As required by customers, Hawks's fire safe design for the trunnion ball valve meets the requirement of API 607, API 6Fa, BS 6755.



Self-relief in the body cavity

As the liquid medium left in the body cavity gasifies due to increased temperature, the pressure in the body cavity becomes abnormally higher, when the medium itself in the cavity would propel the seat and self-relieves the pressure to ensure the safety of valve.





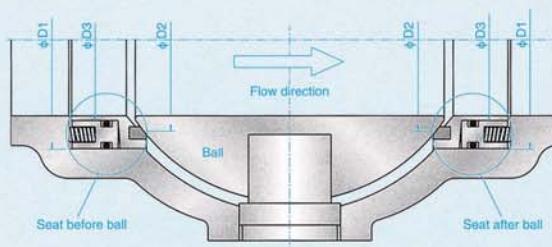
Trunnion ball valve

The Bi-sealing design structure, i.e. seat sealing in front of the ball and seat sealing behind the ball

According to some special working conditions and customers' requirement, Hawks has provided the trunnion ball valve with the Bi-sealing design structure, i.e. seat sealing in front of the ball and seat sealing behind the ball, thus the reliable sealing of the valve is ensured because the valve can perform normally even if one of the effective sealing designs becomes lost due to the abnormal condition.

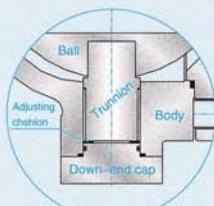
Regarding the seat in front of the ball, the piston effect formed by the area difference between D1 and D2 ,plus the pre-tightened force of a spring would cause the seat in front of the ball by the pressure difference of the medium before and after the valve to touch the ball closely to form the tightness, of which the sealing force will become bigger as the pressure difference gets higher.

Regarding the seat after the ball, the piston effect formed by the area difference between D2 and D3 ,plus the pretightened force of a spring would cause the seat behind the ball to touch the ball closely to form the tightness, of which the sealing force will become bigger as the pressure difference gets higher.



Anti-static design

The ball of the trunnion ball valve gets close contact with each other through the trunnion, adjusting cushion, and down-end cap, the passage of static electricity thus forms together with the valve , which may lead the static electricity caused by sparks generated by friction between the ball and seat during on and off performance to the ground to prevent the possible risk of fire or explosion.

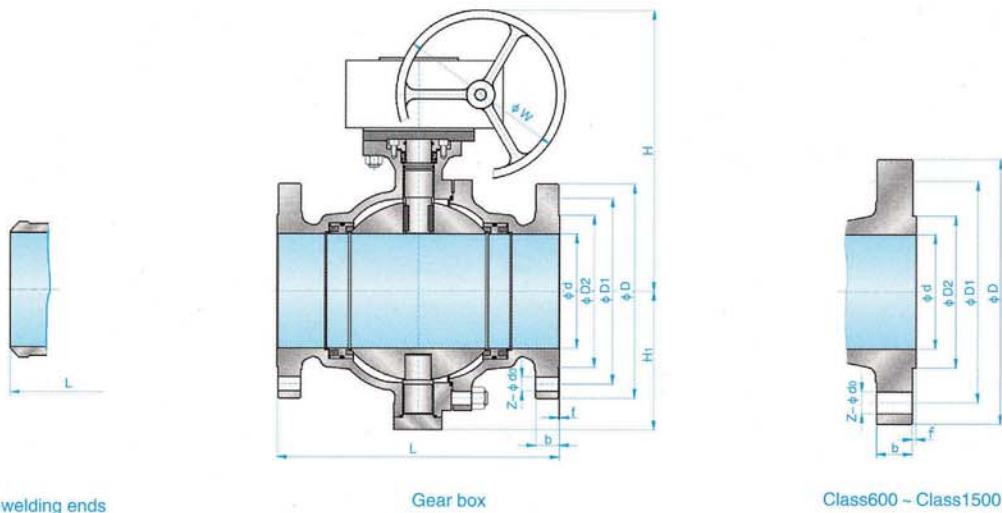


Mounting pad provided

Hawks has provided for trunnion ball valve with amounting pad for fixing the actuators, such as worm gear, pneumatic, electric, hydraulic, and pneumatic & hydraulic actuators.

Trunnion ball valve

Main size and weight



Pressure stage	Size		Dimensions (mm)					Weight (kg)	
	DN	NPS	L		d	H	H1		
			RF	BW					
Class150 PN20	100	4	229	305	102	330	135	300	60
	125	5	356	381	127	360	165	300	80
	150	6	394	457	152	392	193	300	101
	200	8	457	521	203	492	240	300	166
	250	10	533	559	254	548	293	300	283
	300	12	610	635	305	688	340	400	463
	350	14	686	762	337	722	372	400	622
	400	16	762	838	387	722	415	400	900
	450	18	864	914	438	804	462	500	1150
	500	20	914	991	489	952	511	600	1360
	600	24	1067	1143	591	1154	601	750	2514
	650	26	1143	1245	633	1300	700	750	3200
	700	28	1245	1346	684	1550	780	750	4000
	750	30	1295	1397	735	1650	830	750	4800
	800	32	1372	1524	779	1740	870	750	5800
	900	36	1524	1727	874	1950	970	750	8000
Class300 PN50	100	4	305	305	102	340	140	300	70
	125	5	381	381	127	370	170	300	95
	150	6	403	457	152	402	192	300	128
	200	8	502	521	203	498	246	300	234
	250	10	568	559	254	655	303	400	403
	300	12	648	635	305	658	348	400	602
	350	14	762	762	337	686	378	400	803
	400	16	838	838	387	880	429	600	1273
	450	18	914	914	438	1050	518	750	1450
	500	20	991	991	489	1110	540	750	1700
	600	24	1143	1143	591	1400	650	750	3100
	650	26	1245	1245	633	1500	750	750	4500
	700	28	1346	1346	684	1600	800	750	6000
	750	30	1397	1397	735	1720	860	750	7500
	800	32	1524	1524	779	1800	900	750	9000
	900	36	1727	1727	874	2200	1020	600	12000



Trunnion ball valve

Pressure stage	Size		Dimensions (mm)							Weight (kg)	
	DN	NPS	L			d	H	H1	W		
			RF	RTJ	BW						
Class600 PN110	50	2	292	295	292	51	240	94	300	32	
	65	2½	330	333	330	64	290	115	300	47	
	80	3	356	359	356	76	340	136	300	68	
	100	4	432	435	432	102	358	152	300	106	
	125	5	508	511	508	127	400	180	300	170	
	150	6	559	562	559	152	445	209	400	241	
	200	8	660	664	660	203	498	263	400	444	
	250	10	787	791	787	254	653	312	400	668	
	300	12	838	841	838	305	665	354	500	1050	
	350	14	889	892	889	334	738	389	600	1317	
	400	16	991	994	991	385	920	440	750	1800	
	450	18	1092	1095	1092	436	1100	530	750	2400	
	500	20	1194	1200	1194	487	1200	560	750	3000	
	600	24	1397	1407	1397	538	1480	670	750	5400	
Class900 PN150	50	2	368	371	368	51	250	98	300	45	
	65	2½	419	422	419	64	300	120	300	55	
	80	3	381	384	381	76	345	140	300	94	
	100	4	457	460	457	102	415	162	300	141	
	125	5	559	562	559	127	446	188	300	230	
	150	6	610	613	610	152	477	213	400	325	
	200	8	737	740	737	203	520	270	400	580	
	250	10	838	841	838	254	628	322	400	850	
	300	12	965	968	965	305	680	360	500	1330	
	350	14	1029	1038	1029	322	750	400	600	1660	
	400	16	1130	1140	1130	373	940	460	750	2280	
Class1500 PN260	40	1½	305	305	305	38	280	100	300	44	
	50	2	368	371	368	51	320	113	300	67	
	65	2½	419	422	419	64	340	125	300	80	
	80	3	470	473	470	76	385	138	300	130	
	100	4	546	549	546	102	415	171	300	192	
	125	5	673	676	673	125	480	200	400	335	
	150	6	705	711	705	144	580	222	400	475	
	200	8	832	841	832	192	584	280	400	820	
	250	10	991	1000	991	239	650	340	500	1320	
	300	12	1130	1146	1130	287	700	370	600	2050	
Class2500 PN420	40	1½	384	387	384	38	290	105	300	72	
	50	2	451	454	451	42	320	120	300	104	
	65	2½	508	514	508	52	350	130	300	140	
	80	3	578	584	578	62	400	150	300	202	
	100	4	673	683	673	87	425	180	400	305	
	125	5	794	807	794	100	500	210	400	530	
	150	6	914	927	914	131	590	230	500	760	
	200	8	1022	1038	1022	179	610	290	500	1200	
	250	10	1270	1292	1270	223	660	350	600	2080	

Note: 1. RF indicates rased flange, RFJ means ring joint flange, and BW is butt welding ends connection.

2. Flange dimensions of the above table for valves of NPS ≤ 24 conforms to ASME B 16.5.

3. For valves of NPS ≥ 26, the flange dimensions of above table conforms to B series of ASME B16.47 and API 605. As required by customers, flange dimensions may also conform to A series of ASME B16.47 and MSS-SP-44.

Trunnion ball valve

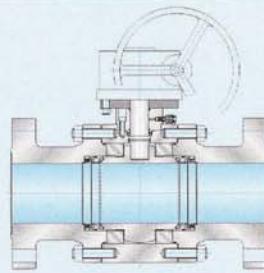
Nominal pressure	DN		50	65	80	100	125	150	200	250	300	350	400	450	500	600
PN16	L	Flange	-	-	-	-	-	394	457	533	610	686	762	864	914	1067
		BW	-	-	-	-	-	457	521	559	635	762	838	914	991	1143
	H	-	-	-	-	-	-	392	492	548	688	722	722	804	952	1154
		H1	-	-	-	-	-	193	240	293	340	372	415	462	511	601
	W	-	-	-	-	-	-	300	300	300	400	400	400	500	600	750
		Weight (kg)	-	-	-	-	-	98	160	282	455	615	889	1150	1360	2530
PN25	L	Flange	-	-	-	-	-	394	457	533	610	686	762	864	914	1067
		BW	-	-	-	-	-	457	521	559	635	762	838	914	991	1143
	H	-	-	-	-	-	-	392	492	548	688	722	722	804	952	1154
		H1	-	-	-	-	-	193	240	293	340	372	415	462	511	601
	W	-	-	-	-	-	-	300	300	300	400	400	400	500	600	750
		Weight (kg)	-	-	-	-	-	108	175	295	475	638	930	1200	1400	2580
PN40	L	Flange	-	-	-	-	-	403	502	568	648	762	838	914	991	1143
		BW	-	-	-	-	-	457	521	559	635	762	838	914	991	1143
	H	-	-	-	-	-	-	402	498	655	658	686	880	1050	1110	1400
		H1	-	-	-	-	-	192	246	303	348	378	429	518	540	650
	W	-	-	-	-	-	-	300	300	400	400	400	400	600	750	750
		Weight (kg)	-	-	-	-	-	120	228	395	598	790	1278	1440	1680	3000
PN63	L	Flange	-	-	-	305	381	403	502	568	648	762	838	-	-	-
		BW	-	-	-	305	381	457	521	559	635	762	838	-	-	-
	H	-	-	-	402	498	655	658	686	880	1050	1110	-	-	-	
		H1	-	-	192	246	303	348	378	429	518	540	-	-	-	
	W	-	-	-	300	300	400	400	400	600	750	750	-	-	-	
		Weight (kg)	-	-	-	70	99	135	248	416	612	820	1300	-	-	-
PN100	L	Flange	292	330	356	432	508	559	660	787	838	889	991	-	-	-
		BW	292	330	356	432	508	559	660	787	838	889	991	-	-	-
	H	240	290	340	358	400	445	498	653	665	738	920	-	-	-	
		H1	94	115	136	152	180	209	263	312	354	389	440	-	-	-
	W	300	300	300	300	300	300	300	400	400	500	600	-	-	-	
		Weight (kg)	36	52	72	104	162	238	448	660	1070	1335	1835	-	-	-
PN160	L	Flange	368	419	381	457	559	610	737	838	965	-	-	-	-	-
		BW	368	419	381	457	559	610	737	838	965	-	-	-	-	-
	H	250	300	345	415	446	477	520	628	680	-	-	-	-	-	
		H1	98	120	140	162	188	213	270	322	360	-	-	-	-	-
	W	300	300	300	300	300	300	400	400	500	-	-	-	-	-	
		Weight (kg)	44	56	99	148	240	338	595	878	1400	-	-	-	-	-
JIS 10K	L	-	-	-	229	356	394	457	533	610	686	762	864	914	1067	
		H	-	-	-	330	360	392	492	548	688	722	722	804	952	1154
	H1	-	-	-	135	165	193	240	293	340	372	415	462	511	601	
		W	-	-	-	300	300	300	300	300	400	400	400	500	600	750
	Weight (kg)	-	-	-	57	77	98	160	279	448	604	880	1120	1310	2480	
JIS 20K	L	-	-	-	305	381	403	502	568	648	762	838	914	991	1143	
		H	-	-	-	340	370	402	498	655	658	686	880	1050	1110	1400
	H1	-	-	-	140	170	192	246	303	348	378	429	518	540	650	
		W	-	-	-	300	300	300	300	400	400	400	600	750	750	
	Weight (kg)	-	-	-	65	91	120	220	388	580	780	1220	1400	1640	3000	



Trunnion ball valve

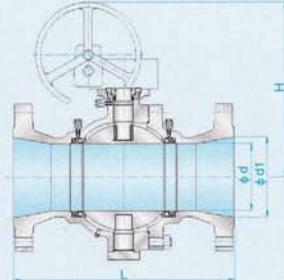
Forged steel trunnion ball valve

Hawks company manufactures in general trunnion ball valve of casted steel valve body. However, if required by customers, forged steel valve body is also available, of which the flange dimensions and face to face dimensions are the same as that of cast steel trunnion ball valve.



Ball valve with reduced bore

Except for full bore ball valves, Hawks manufactures also the ball valve with reduced bore to meet different requirement of customers, which not only lowers the cost and pricing, but also satisfies the special requirement of customers.



Size		Pressure stage												
		Class150、PN20				Class300、PN50				Class600、PN110				
DN	NPS	Dimensions (mm)												
		L	d	d1	H	L	d	d1	H	L	RF	RJ	d	d1
125	5	356	102	127	330	381	102	127	340	508	511	102	127	358
150	6	394	102	152	330	403	102	152	340	559	562	102	152	358
200	8	457	152	203	392	502	152	203	402	660	664	152	203	445
250	10	533	203	254	492	568	203	254	498	787	791	203	254	498
300	12	610	254	305	548	648	254	305	655	838	841	254	305	653
350	14	686	305	337	688	762	305	337	658	889	892	305	337	665
400	16	762	305	387	688	838	305	387	658	991	994	305	387	665
450	18	864	337	438	722	914	337	438	686	1092	1095	337	438	738
500	20	914	387	489	750	991	387	489	880	1194	1200	387	489	920
600	24	1067	489	591	952	1143	489	591	1110	1397	1407	489	591	1200
650	26	1143	538	633	1050	1245	538	633	1250	-	-	-	-	-
700	28	1245	591	684	1154	1346	591	684	1400	-	-	-	-	-
750	30	1295	633	735	1300	1397	633	735	1500	-	-	-	-	-
800	32	1372	684	779	1550	1524	684	779	1600	-	-	-	-	-
900	36	1524	779	874	1740	1727	779	874	1800	-	-	-	-	-

Size		Class900、PN150					Class1500、PN260					Class2500、PN420				
		L		d	d1	H	L		d	d1	H	L		d	d1	H
DN	NPS	RF	RJ				RF	RJ				RF	RJ			
65	2½	419	422	50	64	250	419	422	50	64	320	508	514	42	52	320
80	3	381	384	64	76	300	470	473	64	76	340	578	584	52	62	350
100	4	457	460	76	102	345	546	549	76	102	385	673	683	62	87	400
125	5	559	562	102	127	415	673	676	102	127	415	794	807	87	100	425
150	6	610	613	102	152	415	705	711	102	144	480	914	927	87	131	500
200	8	737	740	152	203	477	832	841	144	192	580	1022	1038	131	179	590
250	10	838	841	203	254	520	991	1000	192	239	584	1270	1292	179	223	610
300	12	965	968	254	305	628	1130	1146	239	287	650	1422	1445	223	265	660
350	14	1029	1038	305	322	680	-	-	-	-	-	-	-	-	-	-
400	16	1130	1140	305	373	680	-	-	-	-	-	-	-	-	-	-

Note: Flange dimensions of ball valve with reduced bore are the same as that of full bore ball valve.

ENGINEERING DATA

CONFORMANCE STANDARDS

HAWKS VALVES CONFORM TO THE FOLLOWING STANDARDS AS APPLICABLE TO CUSTOMER REQUIREMENTS.

API Spec 6D Latest Edition API Standard 598 Latest Edition API Standard 600 Latest Edition API Standard 603 Latest Edition API Standard 605 Latest Edition	: API Specification for Pipeline Valves : Valve Inspection and Test : Steel Gate Valves, Flanged and Butt-welding Ends : Class 150, Cast Corrosion-Resistant Flanged-End Gate Valves : Large-Diameter Carbon Steel Flanges
ANSI B16.5 Latest Edition ANSI B16.10 Latest Edition ANSI B16.25 Latest Edition ANSI B16.34 Latest Edition MSS Standard Practice SP-6 Latest Edition	: Steel Pipe Flanges and Flanged Fittings : Face-to-Face and End-to-End Dimensions of Ferrous Valves : Butt-welding Ends : Valves-Flanged, Threaded, And Welding End : Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings : Standard Marking System for Valves, Fittings, Flanges and Unions : Steel Pipe Line Flanges : By-Pass and Drain Connection Standard
BS 1414 Latest Edition BS 1868 Latest Edition BS 1873 Latest Edition BS 5352 Latest Edition BS 6364 Latest Edition	: Steel wedge gate valves(flange and butt-welding ends) : Steel check valves(flange and butt-welding ends) : Steel globe and globe stop and check valves(flange and butt-welding ends) : Steel wedge gate, globe and check valves(50mm & smaller) : Valve for cryogenic service
JIS B2003 Latest Edition JIS B2201 Latest Edition JIS B2203 Latest Edition JIS B2210 Latest Edition JIS B2071 Latest Edition JIS B2073 Latest Edition JIS B2074 Latest Edition JIS B2081 Latest Edition JIS B2083 Latest Edition JIS B2084 Latest Edition JPI 7S-15 Latest Edition JPI 7S-23 Latest Edition JPI 7S-24 Latest Edition JPI 7S-39 Latest Edition JPI 7S-46 Latest Edition JPI 7S-47 Latest Edition	: General Rules for Inspection of Valves : Pressure Ratings for Ferrous Material Pipe Flanges : Tolerances for Pipe Flanges : Basic Dimensions of Ferrous Material Pipe Flanges : 10kgf/cm ² Cast Steel Flanged Globe Valves : 10kgf/cm ² Cast Steel Flanged Gate Valves(Outside Screw Type) : 10kgf/cm ² Cast Steel Flanged Swing Check Valves : 20kgf/cm ² Cast Steel Flanged Globe Valves : 20kgf/cm ² Cast Steel Flanged Gate Valves(Outside Screw Type) : 20kgf/cm ² Cast Steel Flanged Swing Check Valves : Steel Pipe Flanges for The Petroleum Industry : Ring Joint Gaskets and Grooves for Petroleum Industry : Standard Marking System for valves : Valve Inspection and Test : Cast Steel Flanged Valves for the Petroleum Industry(Class 150,300) : Cast Steel Valves for the Petroleum Industry, Flanged or Butt-welding Ends (Class600 to 2500)
API ANSI ASTM ASME ASS BS JIS JPI NACE AWS	: American Petroleum Institute : American National Standards Institute : American Society for Testing and Materials : American Society of Mechanical Engineers : Manufacturers Standardization society of the Valve and Fitting Industry : British Standards Institution : Japanese Industrial Standards : Japan Petroleum Institute : National Association of corrosion Engineers : American welding Society

ENGINEERING DATA

VALVE WALL THICKNESS

(API 603 ANSI B16.34)

- LIGHT WALL

NOMINAL SIZE		RATINGS											
		150#		300#		600#		900#		1500#		2500#	
		INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM
1/2	15	0.11	3.0	0.12	3.1	0.13	3.4	0.16	4.1	0.19	4.8	0.25	6.3
3/4	20	0.12	3.1	0.15	3.8	0.16	4.1	0.18	4.6	0.23	5.8	0.29	7.4
1	25	0.16	4.1	0.19	4.8	0.19	4.8	0.22	5.6	0.26	6.6	0.35	8.9
1 1/4	32	0.19	4.8	0.19	4.8	0.19	4.8	0.25	6.4	0.31	7.8	0.44	11.2
1 1/2	40	0.19	4.8	0.19	4.8	0.22	5.6	0.28	7.1	0.38	9.6	0.50	12.7
2	50	0.22	5.6	0.25	6.4	0.25	6.4	0.31	7.9	0.44	11.2	0.62	15.8
2 1/2	65	0.22	5.6	0.25	6.4	0.28	7.1	0.34	8.6	0.50	12.7	0.75	19.0
3	80	0.22	5.6	0.28	7.1	0.31	7.9	0.41	10.4	0.62	15.7	0.88	22.4
4	100	0.25	6.4	0.31	7.8	0.38	9.6	0.50	12.7	0.75	19.0	1.09	27.7
5	125	0.28	7.1	0.38	9.6	0.44	11.2	0.59	15.0	0.91	23.1	1.34	34.0
6	150	0.28	7.1	0.38	9.6	0.50	12.7	0.72	18.3	1.09	27.7	1.59	40.4
8	200	0.31	8.1	0.44	11.2	0.62	15.8	0.88	22.4	1.41	35.8	2.06	52.3
10	250	0.34	8.6	0.50	12.7	0.75	19.0	1.06	26.9	1.72	43.7	2.59	65.8
12	300	0.38	9.6	0.56	14.2	0.91	23.1	1.25	31.8	2.00	50.8	3.03	77.0
14	350	0.41	10.4	0.62	15.8	0.97	24.6	1.38	35.0	2.19	55.6	3.34	84.8
16	400	0.44	11.2	0.69	17.5	1.09	27.7	1.56	39.6	2.50	63.5	3.81	96.8
18	450	0.47	11.9	0.75	19.0	1.22	31.0	1.75	44.4	2.81	71.4	4.27	108.5
20	500	0.50	12.7	0.81	20.6	1.34	34.0	1.91	48.5	3.12	79.2	4.69	119.1
24	600	0.57	14.5	0.94	23.9	1.59	40.4	2.28	57.9	3.72	94.5	5.72	145.3

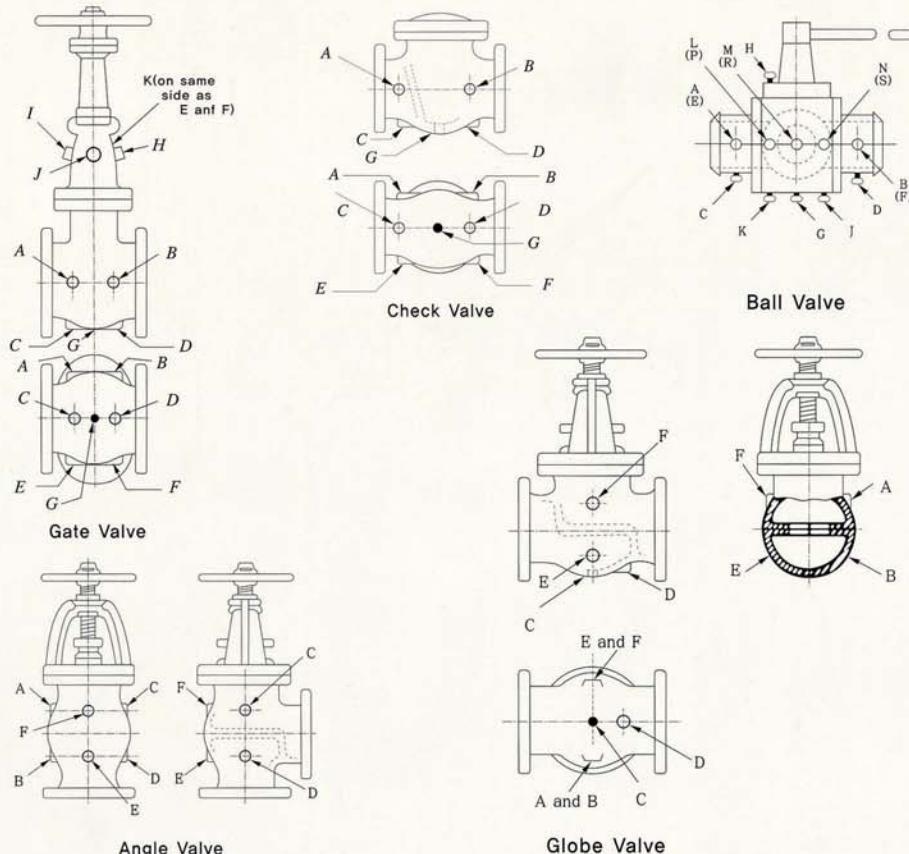
(API 600)

- HEAVY WALL

NOMINAL SIZE		RATINGS											
		150#		300#		600#		900#		1500#		2500#	
		INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM
1/2	15	-	-	-	-	-	-	-	-	-	-	-	-
3/4	20	-	-	-	-	-	-	-	-	-	-	-	-
1	25	0.25	6.4	0.25	6.4	0.31	7.9	0.50	12.7	0.50	12.7	0.59	15.0
1 1/4	32	0.25	6.4	0.25	6.4	0.34	8.6	0.56	14.2	0.56	14.2	0.69	17.5
1 1/2	40	0.25	6.4	0.31	7.9	0.37	9.4	0.59	15.0	0.59	15.0	0.75	19.1
2	50	0.34	8.6	0.38	9.7	0.44	11.2	0.75	19.1	0.75	19.1	0.88	22.4
2 1/2	65	0.38	9.7	0.44	11.2	0.47	11.9	0.88	22.4	0.88	22.4	1.00	25.4
3	80	0.41	10.4	0.47	11.9	0.50	12.7	0.75	19.1	0.94	23.9	1.19	30.2
4	100	0.44	11.2	0.50	12.7	0.63	16.0	0.84	21.3	1.13	28.7	1.41	35.8
5	125	-	-	-	-	-	-	-	-	-	-	-	-
6	150	0.47	11.9	0.63	16.0	0.75	19.1	1.03	26.2	1.50	38.1	1.91	48.5
8	200	0.50	12.7	0.69	17.5	1.00	25.4	1.25	31.8	1.88	47.8	2.44	62.0
10	250	0.56	14.2	0.75	19.1	1.13	28.7	1.44	36.6	2.25	57.2	2.66	67.6
12	300	0.63	16.0	0.81	20.6	1.25	31.8	1.66	42.2	2.63	66.8	3.41	86.6
14	350	0.66	16.8	0.88	22.4	1.38	35.1	1.81	46.0	2.75	69.9	-	-
16	400	0.69	17.5	0.94	23.9	1.50	38.1	2.06	52.3	3.13	79.5	-	-
18	450	0.72	18.3	1.00	25.4	1.63	41.4	2.25	57.2	3.50	88.9	-	-
20	500	0.75	19.1	1.06	26.9	1.75	44.5	2.50	63.5	3.88	98.6	-	-
24	600	0.81	20.6	1.19	30.2	2.00	50.8	2.88	73.2	4.50	114.3	-	-

ENGINEERING DATA

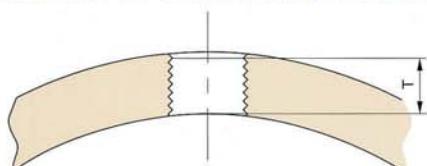
Auxiliary Connection to ANSI B16.34



GENERAL NOTE

The above sketches represent valves with symmetrical shapes. Sketches are illustrative only and do not imply design.

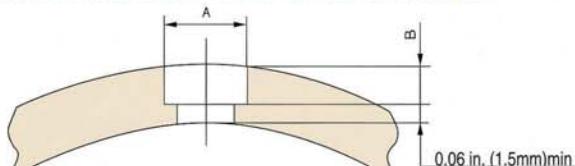
METHOD OF DESIGNATING LOCATION OF AUXILIARY CONNECTIONS WHEN SPECIFIED



Conn Size NPS	3/8	1/2	3/4	1	1 1/4	1 1/2	2
Length of Thread, T.[Note(1)]	0.41	0.53	0.55	0.68	0.71	0.72	0.76
in	11	14	14	18	18	19	20

NOTE :

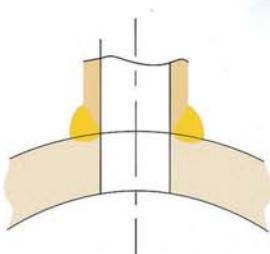
(1) In no case shall the effective length, T, be less than shown in table above. These lengths are equal to the effective thread lengths of American National External Pipe Threads (Ans1821).



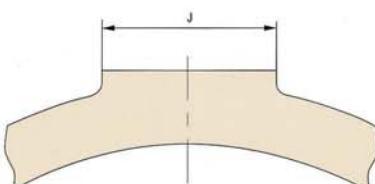
Conn. Size, NPS	3/8	1/2	3/4	1	1 1/4	1 1/2	2
Min. Dia of Socket, A in	0.690	0.855	1.065	1.330	1.675	1.915	2.406
mm	17.5	22	27	34	43	49	61

Conn. Size, NPS	3/8	1/2	3/4	1	1 1/4	1 1/2	2
Min. Dia of Socket, B in	0.19	0.19	0.25	0.25	0.25	0.25	0.31
mm	5	5	6.5	6.5	6.5	6.5	8

THREAD LENGTH FOR AUXILIARY CONNECTIONS



SOCKET WELDING FOR AUXILIARY CONNECTIONS



Conn Size NPS	3/8	1/2	3/4	1	1 1/4	1 1/2	2
Length of Thread, T.[Note(1)]	0.41	0.53	0.55	0.68	0.71	0.72	0.76
in	11	14	14	18	18	19	20

BUTTWELDING FOR AUXILIARY CONNECTIONS

BOSSES FOR AUXILIARY CONNECTIONS

ENGINEERING DATA

JIS-ASTM Material Comparison List

UNS DESIGNATION	GRADE	BAR		CASTING		FORGING	
		JIS	ASTM	JIS	ASTM	JIS	ASTM
		G 4303	A276	G 5121	A 351	G 3214	A 182
AUSTENITIC STEELS							
S20910	22Cr-12Ni5Mn-2Mo-Cb-V-N-0.04C			XM-19		CG6MMN	
S21800	17Cr-8.5Mo-8Mn-4Si-N-0.08C			—		CF102MnN	
S21904	20Cr-6.5Ni-9Mn-N-0.08C			XM-11			F XM-11
S24000	18Cr-3Ni-13Mn-N-0.06C			XM-29			
S24100	18Cr-1.5Ni-13Mn-N-0.1C			XM-28			
JIS	17Cr-7Ni-0.1C			SUS 301			
S30200	18Cr-8Ni-0.1C	SUS 302	302	SCS 12	(A743 CF-20)		(A473 302)
JIS	18Cr-8Ni-0.06C	SUS 304		SCS 13		SUS F 304	
S30400	18Cr-8Ni-0.06C	SUS 304	304	SCS 13A	CF8, 8A	SUS F 304	F304
JIS	18Cr-9Ni-Lo, C	SUS 304L		SCS 19		SUS F 304L	
S30403	18Cr-9Ni-Lo, C	SUS 304L	304L	SC519A	CF3, 3A	SUS F 304L	F304L
S30409	18Cr-8Ni-0.07C		(A479 304H)		CF10	SUS F 304H	F304H
S30430	18Cr-9Ni-3.5Cu-0.06C	SUS XM7	XM-7				
S30451	18Cr-8Ni-0.15Mn-0.06C	SUS 304N1	304N				F304N
S30452	18Cr-8Ni-0.25Mn-0.06C	SUS 304N2	XM-21				
S30453	18Cr-9Ni-0.15Mn-0Lo, C	SUS 304LN	304LN				F304LN
—	18Cr-13Ni-0.06C	SUS 305J1					
S30600	18Cr-15Ni-4Si-0.009C						F46
S30800	20Cr-11Ni-0.06C		308		(A743 CG12)		(A473 308)
S30815	20Cr-10Ni-1.5Si-N-Ce-0.08C		—				F45
S30880	21Cr-10Ni-2Mn-Si-0.06C		ER308				
S30900	22Cr-12Ni-0.1C		309	SCS 17	CH20		(A473 309)
S30908	22Cr-12Ni-0.06C	SUS 309S	309S		CH8		(A473 309S)
S30909	22Cr-12Ni-0.07C				CH10		(A336 F 309H)
S30940	22Cr-12Ni-Cb-0.06C		309Cb				
S31000	25Cr-20Ni-0.1C		310	SCS 18	CK20	SUS F 310	F310
S31008	25Cr-20Ni-0.06C	SUS 310S	310S				(A473 310S)
S31040	25Cr-20Ni-Cb-0.06C		310Cb				
S31254	20Cr-18Ni-6.5Mo-N-Cu-0.01C		—		CK3MCuN		F44
S31400	25Cr-20Ni-2Si-0.15C		314				(A473 314)
JIS	18Cr-12Ni-2.5Mo-0.06C	SUS 316		SCS 14		SUS F 316	
S31600	18Cr-12Ni-2.5Mo-0.06C	SUS 316	316	SCS 14A	CF8M	SUS F 316	F316
JIS	18Cr-12Ni-2.5Mo-Lo, C	SUS 316L		SCS 16		SUS F 316L	
S31603	18Cr-12Ni-2.5Mo-Lo, C	SUS 316L	316L	SCS 16A	CF3M, 3MA	SUS F 316L	F316L
S31609	18Cr-12Ni-2.5Mo-0.07C		(A479 316H)		CF10M	SUS F 316H	F316H
S31635	18Cr-12Ni-2.5Mo-Ti-0.06C		316Ti				
S31640	18Cr-13Ni-2Mo-Cb-0.06C		316Cb	SCS 22	CF10MC		
S31651	18Cr-12Ni-2.5Mo-0.15N-0.06C	SUS 316N	316N				F316N
S31653	18Cr-12Ni-2.5Mo-0.15N-Lo, C	SUS 316LN	316LN		(A743 CF-3MN)		F316LN
S31654	18Cr-12Ni-2.5Mo-0.2N-Lo, C		—		(A-743 CF-3MN)		
JIS	18Cr-12Ni-2Mo-2Cu-0.06C	SUS 316J1		BCS 15			
JIS	18Cr-12Ni-2Mo-2Cu-Lo, C	SUS 316J1L		SCS 20			
S31700	18Cr-12Ni-3.5Mo-0.06C	SUS 317	317		CG8M		F317
S31703	18Cr-12Ni-3.5Mo-Lo, C	SUS 317L					F317L
S31725	18Cr-16Ni-5Mo-Lo, C	SUS 317L	—				
S32100	18Cr-9Ni-Ti-0.06C	SUS 321	321			SUS F 321	F321
S32109	18Cr-9Ni-Ti-0.07C		(A479 321H)			SUS F 321H	F321H
S33100	8Cr-20Ni-1Si-Mn-0.15C						F10
S34700	18Cr-9Ni-Cb-0.06C	SUS 347	347	SCS 21	CF8C	SUS F 347	F347
S34709	18Cr-9Ni-Cb-0.07C		(A479 347H)			SUS F 347H	F347H
S34800	18Cr-9Ni-Cb-0.06C		318				F348
JIS	18Cr-13Ni-4Si-0.06C	SUS XM15J1					
—	20Cr-24Ni-3Mo-2Cu-3Si-0.05C				(A743 CN-7MS)		
—	20Cr-29Ni-2.5Mo-3.5Cu-0.05C			SCS 23	CN7M		
—	20Cr-33Ni-Mn-Si-Cb-0.01C				CT15C		
—	21Cr-24Ni-5Mo-Lo, C				(A743 CN-3M)		
—	25Cr-20Ni-0.3C				HK30		
—	25Cr-20Ni-0.4C				HK40		
FERRITIC-AUSTENITIC STEELS							
S31100	25Cr-6Ni-0.04C			XM-26			
S31200	25Cr-6Ni-2Mo-N-Lo, C						F50
S31803	23Cr-6Ni-3Mo-N-Lo, C		—	SCS10			F51
—	25Cr-5Ni-2Mo-3Cu-0.02C				CD4MCu		
S32900	25Cr-4.5Ni-2Mo-0.06C	SUS 329J1		SCS11			

ENGINEERING DATA

SPECIAL ALLOY STEEL

TAPE OF STEEL	GRADE	BAR		CASTING		FORGING	
		JIS	ASTM	JIS	ASTM	JIS	ASTM
Carpenter 20	Cr-Ni-Fe-Mo-Cu-Cb						
Alloy 20Cb-3	35Ni-20Cr-2.5Mo-39Fe-35Cu-Cb-0.05C		B 473 NO8020				B 462 NO8020
CN7M, SCS 23	29Ni-20Cr-2.5Mo-45Fe-35Cu-0.05C			G 5121 SCS 23	A 351 CN7N		
CN-7MS	24Ni-19Cr-2.5Mo-49Fe-2Cu-3Si-0.05C				A 743 CM-7MS		
Carpenter 20 Mod	Ni-Fe-Cr-Mo						
Alloy 20 Mod	26Ni-22Cr-5Mo-47Fe-Ti-0.03C		B 621 NO8320				B 621 NO8320
CN-3M	25Ni-21Cr-5Mo-49Fe-Lo, C				A 743 CM-3M		
Nickel	Ni						
Alloy 200	99Ni-0.1C	H 4562 NNCB	B 160 NO2200				B 160 NO2200
Alloy 201	99Ni-0.01C	H 4562 NLCB	B 160 NO2201				B 160 NO2201
CZ-100	97Ni-0.8C				A 494 CZ-100		
Duranickel 301	95Ni-4.5A1-Ti-0.2C	H 4562 NDB					
Monei	Ni-Cu						
Alloy 400	69Ni-31Cu-0.2C(Si<0.5) (S<-0.024)	H4553 NCuB	B 164 NO4400				B 164 NO4400
Alloy 405	69Ni-31Cu-0.2C(Si<0.5) (S:0.025-0.06)		B 164 NO4405				B 164 NO4405
M-35-1	70Ni-30Cu-0.25C(Si<1.25)				A 494 M-351		
M-35-2	70Ni-30Cu-0.25C(Si<2.00)				A 494 M-35-2		
N-30H	67Ni-31Cu-3Si-0.2C				A 494 M-30H		
M-25S	66Ni-30Cu-4Si-0.15C				A 494 M-25S		
M-30C	66Ni-30Cu-1.5Si-2Cb-0.2C				A 494 M-30C		
Inconel	Ni-Cr-Fa(Ni-Cr-Mo-Cb)						
Alloy 600	77Ni-15Cr-8Fe-0.1C	G 4901 NCF 600	B 166 NO6600				B 564 NO6600
CY 40	77Ni-15Cr-(8Fe)-0.3C				A 494 CY-40		
Alloy 625	65Ni-22Cr-9Mo-4Cb-0.08C		B 446 NO6625				B 564 NO6625
CW-6MC	65Ni-22Cr-9Mo-4Cb-0.04C				A 494 CW-6MC		
Inconel 601	61Ni-23Cr-14Mo-1.5A1-0.08C	G 4901 NCF 601					
Inconel 690	62Ni-23Cr-9Fe-0.03C	B166 NO6690					
Inconel X-750	73Ni-16Cr-7Fe-1Cb-2.5Ti-A1-0.06C	G 4901 NCF 750	B 637 NO7750				B 637 NO7750
Inconel 751	73Ni-16Cr-7Fe-1Ni-2.5Ti-A1-0.08C	G 4901 NCF 751					
CYSnBIM	76Ni-13Cr-3Mo-4Bi-4Sn-0.03C				A 494 CY5SnSim		
Incoloy	Ni-Fe-Cr(Ni-Fe-Cr-Mo-Cu)						
Alloy 800	33Ni-21Cr-46Fe-A1-Ti-0.08C	G 4901 NCF 800	B 408 NO8800				B 564 NO8800
Alloy 800H	33Ni-21Cr-46Fe-A1-Ti-0.075C	G 4901 NCF 800H	B 406 NO8810				B 564 NO8810
Alloy 825	42Ni-22Cr-3Mo-30Fe-2Cu-1Ti-0.03C	G 4901 NCF 825	B 425 NO8825				B 425 NO8825
Hastelloy B	Ni-Mo						
Alloy B	67Ni-28Mo-5Fe-V-0.03C		B 335 N10001				B 335 N10001
A-12MV	67Ni-28Mo-5Fe-V-0.1C				A 494 N-12MV		
Alloy B-2	72Ni-28Mo-0.01C		B 335 N10665				B 335 N10665
N-7M	68Ni-32Mo-0.05C				A 494 N-7M		
Hastelloy C	Ni-Mo-Cr						
Alloy C-276	58Ni-16Cr-16Mo-6Fe-4W-0.005C		B 574 N10276				B 335 N10276
CW-12MW	58Ni-16Cr-16Mo-6Fe-4W-V-0.01C				A 494 CW-12MW		
Alloy C-4	68Ni-16Cr-16Mo-0.008C		B 574 NO6455				B 574 NO6455
CW-2M	68Ni-16Cr-16Mo-0.01C				A 494 CW-2M		
Alloy C-22	58Ni-21Cr-14Mo-4Fe-3W-0.008C		B 574 NO6022				B 574 NO6022
CW-6M	62Ni-19Cr-19Mo-0.05C				A 494 CW-6M		
Hastelloy G	Ni-Cr-Fe-Mo-Cu						
Alloy G	46Ni-22Cr-6.5Mo-20Fe-.5Mn-2Cu-0.03C		B 581 NO6007				B 581 NO6007
Alloy G-2	50Ni-25Cr-6Mo-17Fe-1Cu-1Ti-Lo, C		B 581 NO6975				B 581 NO6975
Alloy G-30	44Ni-30Cr-5Mo-15Fe-2Cu-1Cb-3W-Lo, C		B 581 NO6030				B 581 NO6030
Alloy G-3	49Ni-22Cr-7Mo-20Fe-2Cu-0.008C		B 581 NO6985				B 581 NO6985
Hastelloy N	Ni-Mo-Cr-Fe						
Alloy N	76Ni-7Cr-17Mo-0.06C		B 573 N10003				B 573 N10003
Hastelloy X	Ni-Cr-Mo-Fe						
Alloy X	48Ni-22Cr-9Mo-19Fe-1.5Co-W-0.1C		B 572 NO6002				B 572 NO6002
Js 700	Ni-Fe-Cr-9Mo-Cb						
Alloy 700	25Ni-21Cr-4.5Mo-49Fe-Cb-0.02C		B 581 NO8700				B 672 NO8700
CN-3M	25Ni-21Cr-5Mo-49Fe-Lo, C				A 743 CN-3M		
904L	Ni-Fe-Cr-Mo-Cu-Lo, C						
Alloy 904L	26Ni-21Cr-4.5Mo-47Fe-1.5Cu-0.01C		B 649 NO8904				B 649 NO8904
RA-330	Ni-Fe-Cr-Si						
Alloy 330	36Ni-19Cr-44Mo-1Si-0.06C		B 511 NO8330				B 511 NO8330
Nimonic 80A	Ni-Cr						
Nimonic 80A	76Ni-20Cr-2Ti-1.5A1-0.08C	G 4901 NCF 80A	B 637 NO7080				B 637 NO7080
IN-102	Ni-Cr-Fe-Cb-Mo-W						
IN-102	68Ni-15Cr-3Mo-7Fe-3Cb-3W-A1-Ti-Mg-B-Zr-0.06C		B 518 NO6102				
Affcorr	Ni-Cr-Mo-W						
ffcorr	55Ni-31Cr-10.5Mo-2.5W-Cb-0.1C		B 756 NO6110				B 564 NO6110
RA-333	Ni-Cr-Mo-Co-W-Fa-Si						
Alloy 333	46Ni-26Cr-3Mo-19Fe-3Co-3W-0.08C		B 719 NO6333				
AL-6X	Cr-Ni-Mo-Fe						
AL-6X	25Ni-21Cr-6.5Mo-47Fe-Lo, C		B 691 NO8366				
CN-3M	25Ni-21Cr-5Mo-49Fe-Lo, C						
AL-6XN	25Ni-21Cr-6.5Mo-47Fe-0.2N-o, C		B 691 NO8367				B 462 NO8357

ENGINEERING DATA

Chemical & Physical Properties

CASTING MATERIALS

CHEMICAL PROPERTIES

	Carbon Steel	CA-15	High Temp.	High Temp.	HIGH	TEMP	304-S.S.	316-S.S.	HASTEL LOY-B	HASTEL LOY-C	304-L.S.S.	316L-S.S.	Low Temp	NICKEL	INCONEL	MONEL	A-20
ASTM Std	A-216	A-217	A-217	A-217	A-217	A-217	A-351	A-351	A-494	A-494	A-351	A-351	A-352	A-494	A-494	A-494	A-351
Grade	WCB	CA-48	WC6	WC9	C-5	C-12	CF8	CF8M	N-12M-1	CW-12M-1	CF3	CF3M	LCB	CZ-100	CY-40	M-35	CN-7M
C% Max.	0.30	0.15	0.20	0.18	0.20	0.20	0.08	0.08	0.12	0.12	0.03	0.03	0.30	1.0	0.4	0.35	0.07
Min%	1.00 MAX.	1.00	0.05-0.08	0.40-0.70	0.40-0.70	0.35-0.65	1.50	1.50	1.00	1.0	1.50	1.50	1.00	1.5	1.5	1.5	1.5
P% Max.	0.04	0.040	0.04	0.04	0.040	0.040	0.04	0.04	0.040	0.040	0.04	0.04	0.05	0.03	0.03	0.03	0.04
S% Max.	0.045	0.040	0.045	0.045	0.045	0.045	0.04	0.04	0.030	0.030	0.04	0.04	0.06	0.03	0.03	0.03	0.04
Ni%	0.50	1.00	-	-	-	-	8.00	9.00	Balance	Balance	8.00-12.0	9.00-13.0	-	95.0 Min	Balance	Balance	27.5-30.5
Cr%	0.40	11.5-14.0	1.00-1.50	2.00-2.75	4.0-6.50	8.00-10.00	18.0-21.0	18.0-21.0	1.00	15.7-17.5	17.0-21.0	17.0-21.0	-	-	14-17.0	-	19.22
Mo%	0.25	-	0.45-0.65	0.90-1.20	0.45-0.65	0.90-1.20	-	2.00-3.00	26.0-30.0	16-18.0	-	2.00-3.00	-	-	-	-	2-3
Cu	0.0	-	-	-	-	-	-	-	0	-	-	-	-	1.25	-	26-33	3.4
Si	0.30	1.50	0.60	0.60	0.75	1.00	2.00	2.00	1.00	1.0	2.0	1.50	0.60	2.0	3.0	1.25	1.5
Fe	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	11.0	3.5	-
V	-	-	-	-	-	-	-	-	0.20-0.60	0.2-0.4	-	-	-	-	-	-	-

PHYSICAL PROPERTIES

Tensile Strength Min. Kis Mpa	70 485	90-115 621-493	70 485	70 621-793	90-115 621-793	70 485	70 185	76 525	70 485	70 485	65 450	72 495	50 345	70 485	65 450	62 425
Yield point Min. Kis Mpa	30 205	65 448	40 275	40 275	60 414	60 414	28 195	30 205	40 275	30 205	30 205	35 240	40 275	18 125	28 195	25 170
Elongation in 2 inch (50mm) %Min	22	18	20	20	18	18	35	30	6	35	30	20	40	10.0	30.0	25.0
Reduction of Area % min	35	30	35	35	35	35	-	-	-	-	-	35	-	-	-	-

WROUGHT MATERIALS

CHEMICAL PROPERTIES

	11-13% Cr	Ductile	Carbon Steel	B-8F	321-S.S	304L-S.S	316L-S.S	304-L-S.S	316L-S.S	Hard Facing	Bolts	Nuts
ASTM Std	A-182	A-439	ASTM	A-320	A-182	A-182	A-182	A-182	A-182	KLS	A-193	A194
Grade	F6a	D2C	A-105	B-8F	F-321	F-304	F-316	F-304L	F-316L	HF-6R	B7	2H
C% Max.	0.15	0.29	0.22-0.35	0.15	0.08	0.08	0.08	0.035	0.035	11.05	0.38-0.48	0.40
Si% Max.	1.00	100.3.00	0.35	1.00	1.00	1.00	1.00	1.00	1.00	1.11	0.15-0.35	-
Min% Max.	1.00	1.80-2.40	0.60-1.05	2.00	2.00	2.00	2.00	2.00	2.00	-	0.75-1.00	-
P% Max.	0.04	0.08	0.04	0.20	0.030	0.04	0.04	0.040	0.040	-	0.04	0.04
S% Max.	0.03	-	0.05	0.150-0.350	0.030	0.03	0.03	0.030	0.030	-	0.04	0.05
Ni%	0.05	21.0-24.0	-	8.00-10.00	9.00-12.00	8.0-11.0	10.0-14.0	8.00-13.00	10.00-15.00	-	-	-
Cr%	11.5-14.5	0.05	-	17.00-19.00	17.00Min	18.0-20.0	16.0-18.0	18.00-20.00	16.00-18.00	28.3	0.80-1.10	-
Mo%	-	-	-	-	-	-	2.00-3.00	-	2.00-3.00	-	0.15-0.25	-
Ti%	-	-	-	-	C%×5-0.60	-	-	-	-	-	-	-
Fi%	Bal	-	-	-	-	-	-	-	-	0.30	Bal	Bal
W%	-	-	-	-	-	-	-	-	-	4.20	-	-
Co%	-	-	-	-	-	-	-	-	-	Bal	-	-

PHYSICAL PROPERTIES

Tensile Strength Min. Kis Mpa	85 586	58 400	70 483	75 517	75 517	75 517	75 517	70 483	70 483	- -	125 862	175 -
Yield point Min. Kis Mpa	55 379	28 193	35 248	30 207	30 207	30 207	30 207	25 172	25 172	- -	105 724	-
Elongation in 2 inch (50mm) %Min	18	20	22	35	45	30	30	30	30	-	16	-
Reduction of Area % min	35	45	30	50	50	50	50	50	50	-	50	-

Memo