SUFA

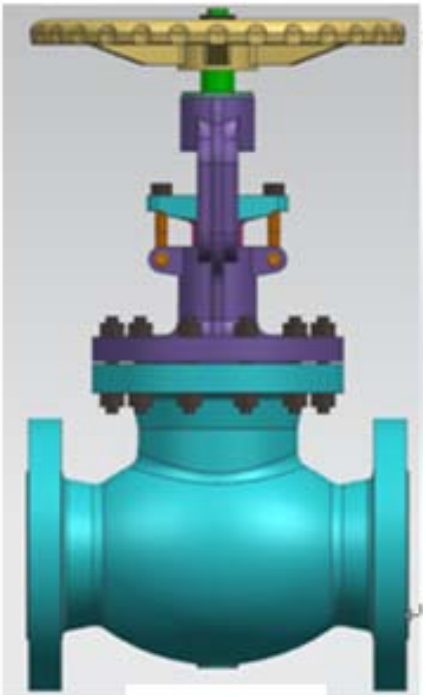
STEEL GLOBE VALVES

CLASS 150/300/600/900/1500/2500

SUFA TECHNOLOGY INDUSTRY
CO. LTD., CNNC

INTRODUCTION

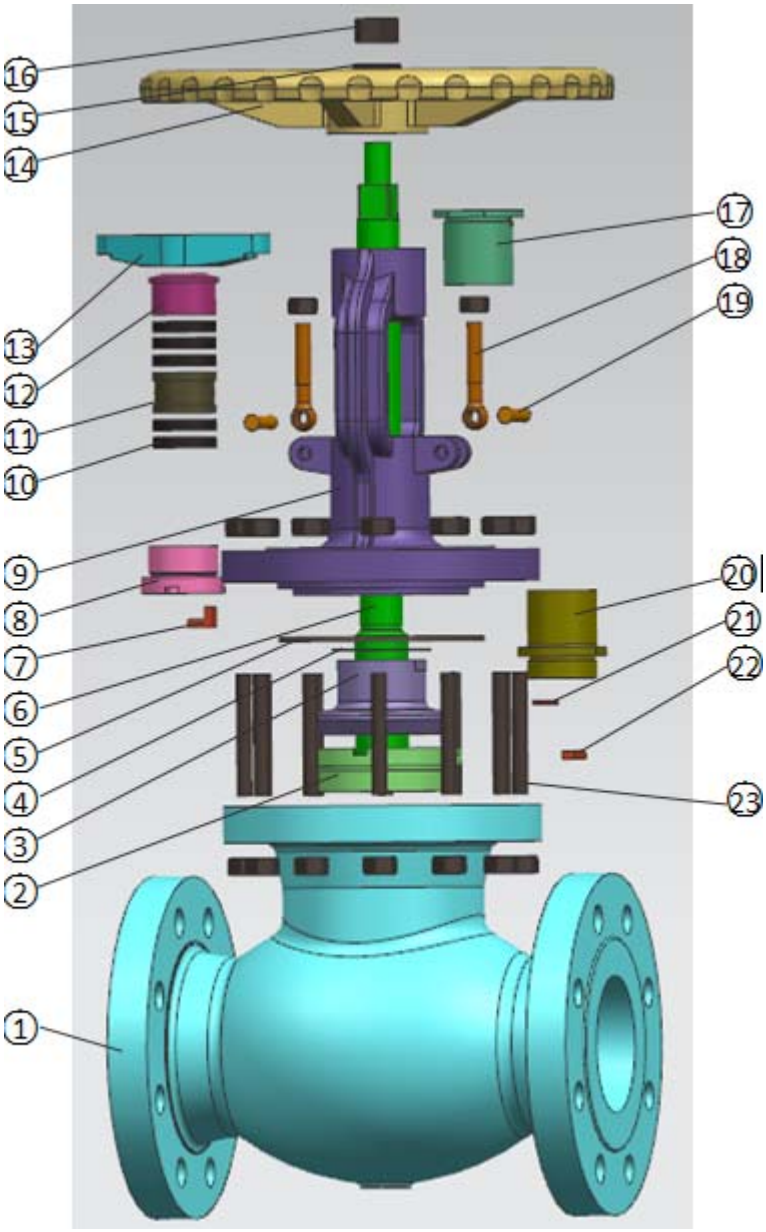
Globe valves are used where throttling or both throttling and shut off are required. They can also be used for on-off service, but because of high pressure drop, this is generally confined to applications where the valve is normally closed and pressure drop is not important when the valve is open. Globe valves are available with a complete range of manual or remote actuators.



● INDUSTRY STANDARDS	
Pressure/Temperature Ratings	ASME B16.34
Basic Design	BS 1873/API 623
Face-to-Face/End- to- End	ASME B16.10
Flange Dimensions	ASME B16.5
Butt-Welding End	ASME B16.25
Socket Welding End	ASME B16.11
Threaded End	ASME B1.20.1
Testing	API 598

MAJOR FEATURE

BOLTED BONNET CAST STEEL T-TYPE GLOBE VALVES



● PRODUCT RANGE	
CLASS 150	2”-20”
CLASS 300	2”-20”
CLASS 600	2”-20”

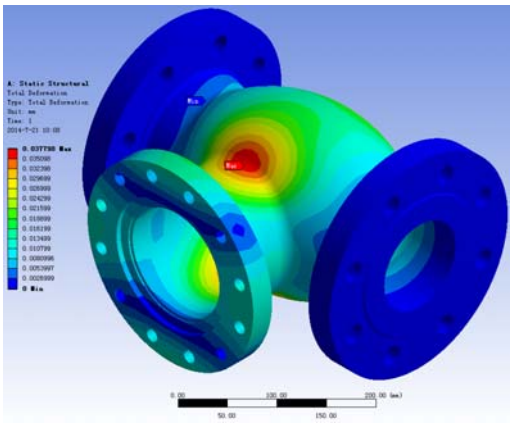
● DESIGN STANDARDS
BS 1873/API 623
ASME B16.34

● DESIGN FEATURES
Bolted Bonnet
Spiral Stem/ Rising Stem
Rising Handwheel

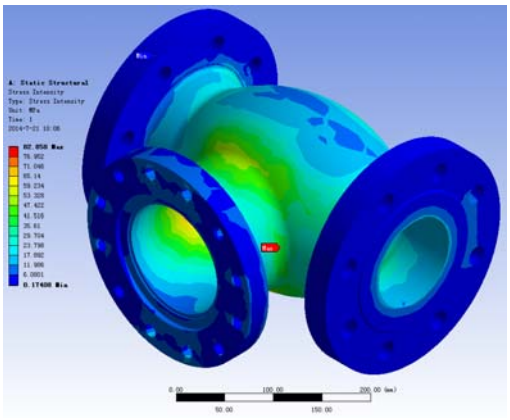
NO.	Name	N0.	Name	NO.	Name
1	Body	9	Bonnet	17	Stem Nut
2	Seat Ring	10	Packing	18	Gland Eyebolts/Nuts
3	Disc	11	Lantern	19	Pins
4	Retaining Washer	12	Gland	20	Disc Nut
5	Gasket	13	Gland Flange	21	Thrust Plate
6	Stem	14	Handwheel	22	Tabs
7	Tabs	15	Washer	23	Bolts/Nuts
8	Back Seat	16	Handwheel nut		

FINITE ELEMENT ANALYSIS

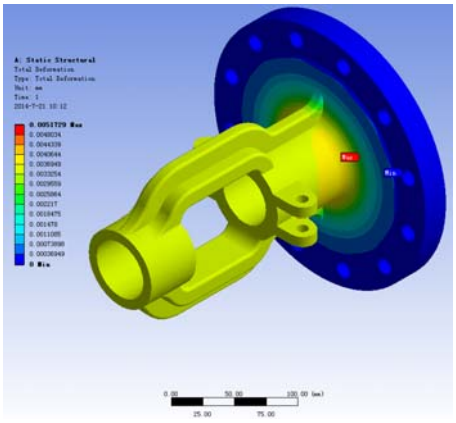
Analyze stress and strain of body and bonnet, observe the position and value of the maximum stress and strain, in order to get the most appropriate design.



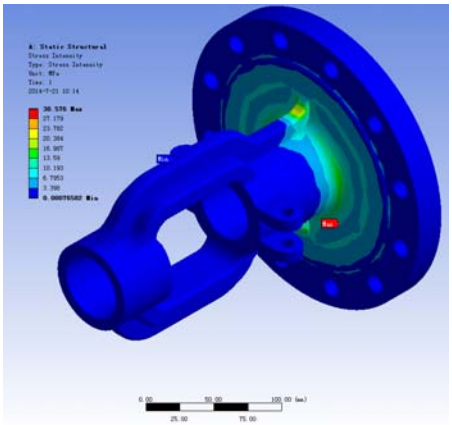
Body stress analysis



Body strain analysis

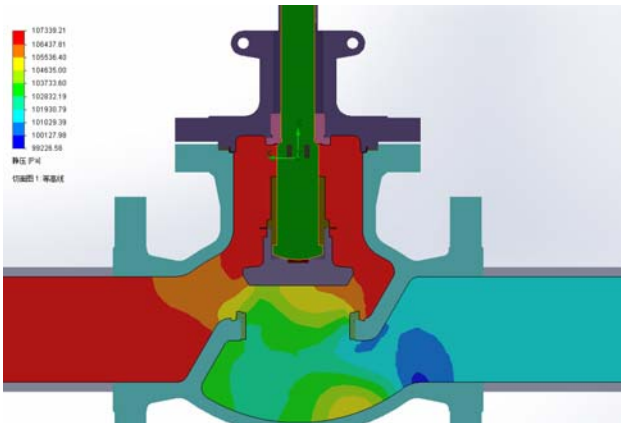


Bonnet stress analysis



Bonnet strain analysis

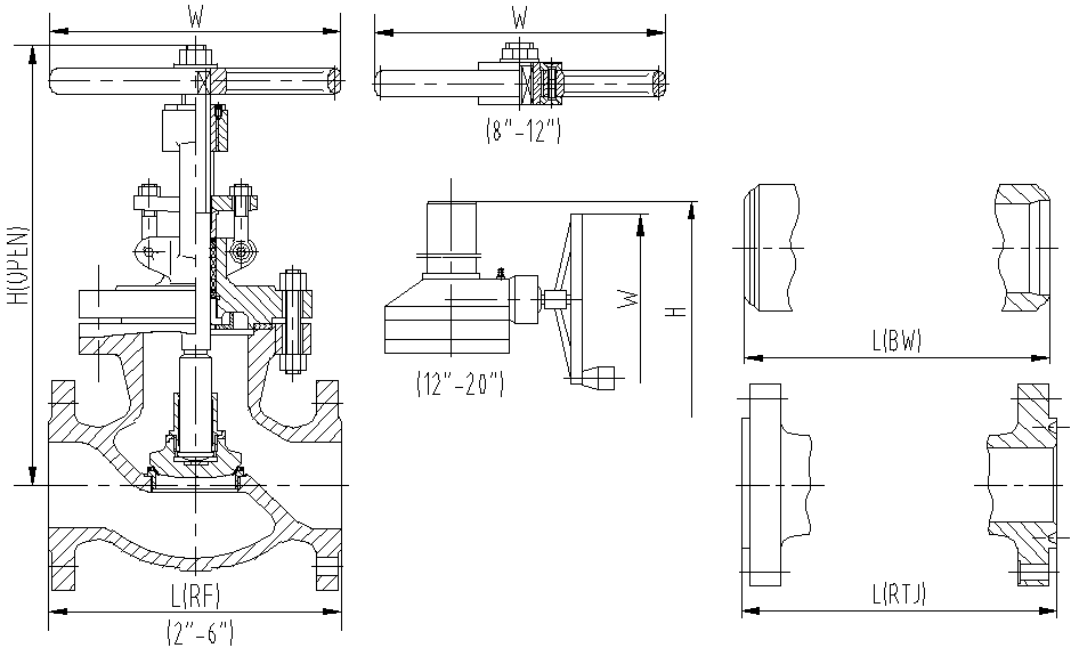
Flow analysis is to get the valve's flow resistance coefficient an C.V values, which is to achieve the purpose of optimizing the valve design.



Flow analysis

DIMENSIONS AND WEIGHTS

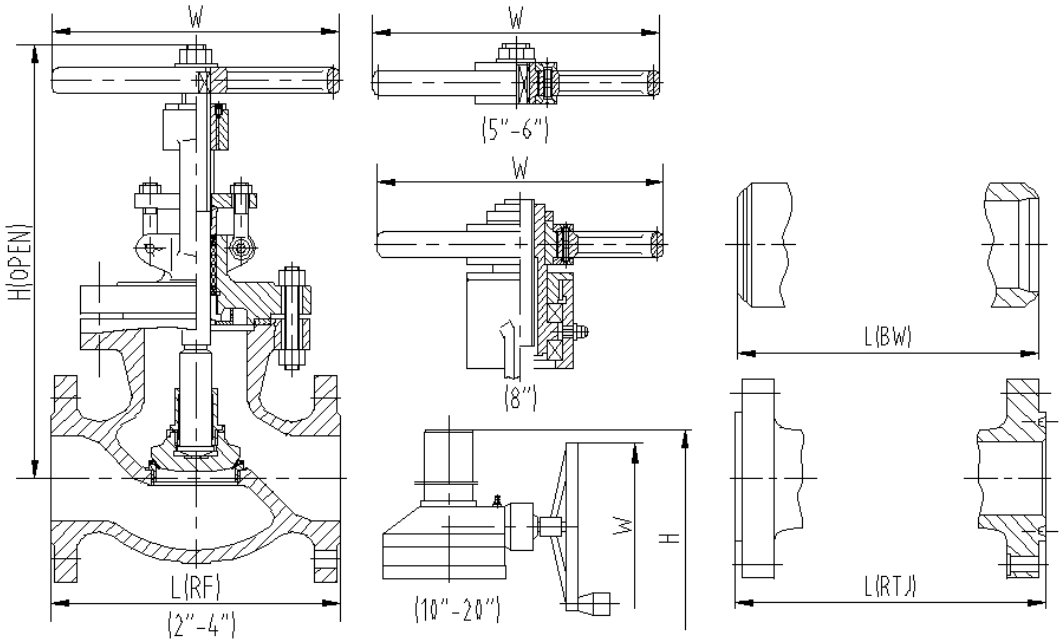
BOLTED BONNET CAST STEEL T-TYPE GLOBE VALVES—CLASS 150



NPS	In	2	2-1/2	3	4	5	6	8	10	12	14	16	18	20
DN	mm	50	65	80	100	125	150	200	250	300	350	400	450	500
L(RF/BW)	mm	203	216	241	292	356	406	495	622	698	787	914	978	978
L(RTJ)	mm	216	229	254	305	369	419	508	635	711	800	927	991	991
H(OPEN)	mm	341	372	391	457	500	534	616	721	949	988	1193	1275	1295
W	mm	200	250	250	300	350	350	400	450	560	610	710	710	710
WT(RF/RTJ)	Kg	18.5	26.9	35.3	51.1	71	91.5	142	216	348	770	984	1346	1386
WT(BW)	Kg	14.6	20.9	28.4	40.6	58.5	76.2	139	183	298	671	836	1144	1180
Torque	N.m	21	36	58	91	135	187	351	661	870	1232	2033	2580	2602
C.V		60	84	100	185	215	440	810	1260	1890	2441	3234	4308	5164

Note: Torque calculation pressure: 2 MPa

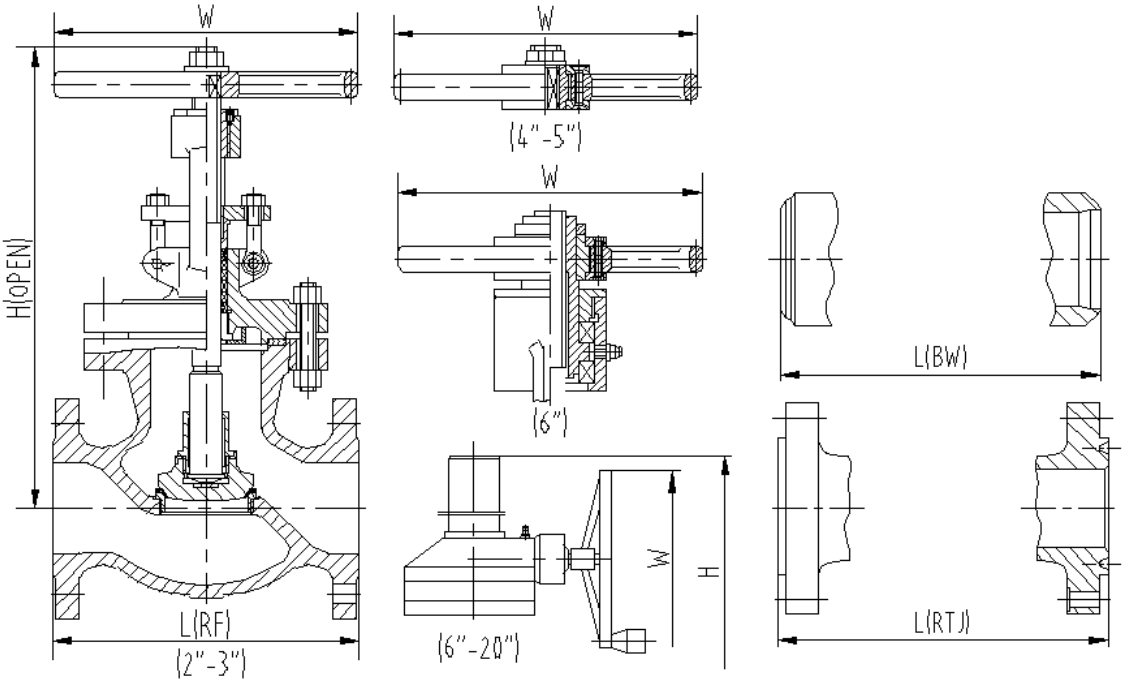
BOLTED BONNET CAST STEEL T-TYPE GLOBE VALVES—CLASS 300



NPS	In	2	2-1/2	3	4	5	6	8	10	12	14	16	18	20
DN	mm	50	65	80	100	125	150	200	250	300	350	400	450	500
L(RF/BW)	mm	267	292	318	356	400	444	559	622	711	838	864	978	1016
L(RTJ)	mm	283	308	334	372	416	460	575	638	727	854	880	994	1035
H(OPEN)	mm	378	422	443	537	627	687	899	930	1100	1241	1393	1666	1666
W	mm	200	250	250	300	400	450	560	458	610	610	810	1000	1000
WT(RF/RTJ)	Kg	23.6	35.7	47.1	73.6	110	145	257	440	802	869	1193	1959	1993
WT(BW)	Kg	17.9	29.4	35.8	55.8	88	116	213	380	716	764	1049	1724	1755
Torque	N.m	46	78	128	219	412	643	963	1752	2631	3521	5783	10201	10317
C.V		60	84	100	185	215	440	810	1260	1890	2441	3234	4183	4926

Note: Torque calculation pressure: 5 MPa

BOLTED BONNET CAST STEEL T-TYPE GLOBE VALVES—CLASS 600



NPS	In	2	2-1/2	3	4	5	6	8	10	12	14	16	18	20
DN	mm	50	65	80	100	125	150	200	250	300	350	400	450	500
L(RF/BW)	mm	292	330	356	432	508	559	660	787	838	889	991	1092	1194
L(RTJ)	mm	295	333	359	435	511	562	663	790	841	892	994	1095	1200
H(OPEN)	mm	433	459	532	612	711	901	954	1149	1340	1520	1700	1850	2000
W	mm	250	250	350	400	400	560	458	610	810	1000	1200	1200	1200
WT(RF/RTJ)	Kg	35.4	47	69.3	115	184	266	477	979	1179	1605	2031	2460	2890
WT(BW)	Kg	29.2	37.9	57.1	90	141	227	406	862	1040	1410	1788	2165	2545
Torque	N.m	102	162	273	484	842	1123	2285	3877	8139	11301	14494	20422	20934
C.V		58	84	100	185	335	440	780	1200	1810	2250	2934	3781	4396

Note: Torque calculation pressure: 10 MPa

SPECIAL SERVICE

◆NACE Valves

SUFA NACE valves are applicable to the oil exploration and natural gas where contain hydrocarbon medium, such as H2 and H2S. The NACE valves can prevent materials crack including sulfide stress cracking (SSC), stress corrosion cracking (SCC) and hydrogen induced cracking (HIC), which are caused by H2S, since a long time under acidic conditions.

The quality control of SUFA NACE valves:

1. Material and heat treatment are in strict accordance with NACE MR0175 standard requirements, without using material which is untested proved.
2. Strengthen heat treatment quality control of materials, with particular emphasis on the hardness control of the weldment's base and heat-affected zone, ensuring the hardness of the base and the heat-affected zone are similar, and the welding parts should be annealing to reduce the sensitivity of the SSC.
3. The hardness of the base material, weld and heat-affected zone should be less than or equal 22HRC(after heat treatment to eliminate stress).

Valve Parts	ASTM Specification	NACE Hardness	API 600 Hardness
Body/Bonnet	A216 WCB	≤HRC 22 (234HB)	---
Disc	A216 WCB+13Crdeposit**		≥250HB*
Seat Rings	A105+13Crdeposit**		≥250HB*
Stem	A276 410		≥200HB
Gland			---
Back seat			≥250HB
Bonnet Bolts	A193 B7M	≤HRC 22	---
Bonnet Nuts	A194 2HM	≤HRC 22	---

* Hardness differential of 50 HB is required between the seats.

** Double Tempered

SPECIAL SERVICE

◆Hydrogenation Valves

SUFA Hydrogenation valves are applicable to the hydrotreater where include oil, hydrogen, sulfide, and their mixture or other conditions. They can protect the valves' reliability from harsh conditions, which include Metallic materials' variability caused by hydrogen ions and H2S stress corrosion cracking under the room temperature (SSC), Hydrogen ions to the inside and outside of the metal decarbonization， rapid and uniform corrosion caused by H2S, Stress corrosion cracking is accelerated by hydrogen and chloridion together under the high temperature(HIC).

The quality control of SUFA Hydrogenation valves:

1. Using reasonable structure design, the maximum to avoid stress concentration and stress corrosion generation in the harshconditions.
2. Material and heat treatment are in strict accordance with hydrogenation standard requirements, without using material which is untested proved.
3. Carbon steel and alloy steel use the electric furnace + VOD or furnace + AOD smelting method. And strictly control the material's chemical composition and mechanical properties, such as the content of sulfur, phosphorus and other harmful impurities elements, grain size, non-metallic entrainment and other indicators.
4. Body and bonnet of SUFA hydrogenation valves not only apply RT or UT inspection, but also apply the whole surface MT or PT.
5. In addition to routine factory tests, and increase low pressure gas seals test, micro-leakage test, and high-pressure gas strength test according to user requirements.

The selection recommendation table of SUFA hydrogenation valve body material

Medium	Temperature	Body Material
Oil	≤260℃	ASTM A105、ASTM A216 WCB
	261-350℃	ASTM A105、ASTM A216 WCB
		ASTM A182 F321 or F347、ASTM A351 CF8C
H_2	≤260℃	ASTM A105、ASTM A216 WCB
H_2+H_2S	≤200℃	ASTM A105、ASTM A216 WCB
	201-280℃	ASTM A182 F11、ASTM A217 WC6
	281-350℃	ASTM A182 F22、ASTM A217 WC9
	≥351℃	ASTM A182 F321 or F347、ASTM A351 CF8C
Oil+H_2+H_2S	≤200℃	ASTM A105、ASTM A216 WCB
	201-280℃	ASTM A182 F11、ASTM A217 WC6
	281-350℃	ASTM A182 F22、ASTM A217 WC9
	≥351℃	ASTM A182 F321 or F347、ASTM A351 CF8C

TESTING AND INSPECTION

◆ TESTING

General valve， NACE Valves and Hydrogenation Valves testing are according to the API598.However, Hydrogenation Valves testing time is two times of the requirements, and full (100%) valves must be done high pressure seal testing with liquid and gas seal testing with 0.6MPa. Hydrogenation valves' micro leak testing is according to requirements of the ISO 15848.The testing of various valve are as follows.

Test Description	Valve Type		
	General valve	NACE Valves	Hydrogenation Valves
shell	√	√	√
backseat	√	√	√
low-pressure closure	optional	optional	√
high-pressure closure	√	√	√
Micro leak testing	—	—	√

NOTE：

1. The high-pressure closure includes seat ring and disc seal, body and bonnet flange seal, and stem packing seal.

2. When the purchaser specifies an “optional” test, the test shall be performed in addition to the required tests.

3. When there are clear requirements for the testing items in the order, the testing must be carried out with requirements of the order.

◆ INSPECTION

The inspections of SUFA various types of valves are in accordance with ASME and other related code requirements. According to the different operating conditions and quality controls, the inspection items of the bearing pressure components (including stem) are shown in the following table.

Inspection Items	Valve Type			Normative References
	General valve	NACE Valves	Hydrogenation Valves	
Visual inspection	√	√	√	MSS SP-55
Dimensions	√	√	√	Design Requirements
Hardness control	a	√	√	NACE MR0175
Chemical composition	√	√	√	Relevant Material specifications of ASTM
mechanical properties	√	√	√	Relevant Material specifications of ASTM
Forging ultrasonic testing	b	b	√	ASTM A388
Casting ray testing	c	c	√	ASME B16.34
Surface magnetic particle and penetrant testing	—	—	d	MT:ASTM A275, ASTM E709；PT：ASTM E165
Surfacing sealing surface penetrant testing	√	√	√	ASME BPVC Ⅷ
Butt end beveling ray testing and surface penetration testing	√	√	√	ASME B16.34
others	—	—	e	

Note:

1. When there are clear requirements for the inspection items in the order , the inspection must be carried out with requirements of the order.

a—The bearing pressure components of General valve' hardness reference requirements of the ASTM code.

b—General valves and NACE valves, which pressure rating is CLASS≥900, the forgings do the ultrasonic testing, however hydrogenation valves are all done in all pressure ratings.

c—General valves and NACE valves, which pressure rating is CLASS≥900, the Castings do ray testing, however hydrogenation valves are all done in all pressure ratings.

d—The outer surface and the inner surface which can be reached of the carbon steel and alloy steel bearing pressure components shall be magnetic particle testing everyone, and penetrant testing for stainless steel. Of course, penetrant testing can take the place of magnetic particle testing for carbon steel and alloy steel.

e—The hydrogenation valves also need to inspect the content of harmful elements(such as S and P),grain size, metallurgical structure and so on.