



B.F.E S.p.A.
BONNEY FORGE
VALVE LICENSEE

USER'S MANUAL

Ed. 2008 rev.1

File No.: BFC5003-2008

Rev No.: A

Depository:

CHECK VALVE OPERATION MANUAL

	File No.	BFC5003-2008
CHECK VALVE OPERATION MANUAL	REV.	A
	Page	2/11

1. General

- 1.1 Thanks for your selection of Bonney forge's check valve. As a type of pressure equipment, valve has potential hazards of pressure and creation of explosive atmosphere resulting from leakage of process fluid. For the safety purpose, user shall read this instruction to know what Bonney forge has already taken into account in our design and manufacture, and what action shall be taken by user according to essential health and safety requirements of European Directive 97/23/EC(PED) and 94/9/EC (Atex).

2. Essential health & safety requirements of PED/Atex and solution

- 2.1 What's Bonney forge design idea
- Check valve are designed as standard product, no consideration of each specific service condition since its too wide.
 - Check valve is designed to BS1868, valve has adequate strength according to ASME B16.34 pressure-temperature rating. The check valve was EC-type approved by European Notified Body.
 - Valve has different sealing materials in accordance with BS1868, which are corrosion/wear resistance to certain type of fluid.
 - Valve contains no light metal (such as Mg) and all parts are electricity conductive and connected together to prevent ignite resource.
- 2.2 Important Notice for users.
- 2.2.1 General
- 2.2.1.1 In any occurrence, first ensure personnel safety.
- 2.2.1.2 Use the valves in accordance with ASME B16.34 pressure-temperature rating.
- 2.2.1.3 Make sure that the selected valve materials are corrosion/wear resistance to the service fluid.
- 2.2.1.4 Where the service fluid is flammable/explosive, to limit the working temperature.
- 2.2.1.5 When performing Repair/maintenance operations, make sure that the valves are always depressurized, vented and drained.
- 2.2.1.6 When performing Repair/maintenance operations, always use appropriate protection e.g. protective clothing, (oxygen) masks, gloves, etc.
- 2.2.1.7 When performing Repair/maintenance operations, do not smoke, do not use any
-

	File No.	BFC5003-2008
CHECK VALVE OPERATION MANUAL	REV.	A
	Page	3/11

portable no-Ex-proof electrical device in the area and do not use open fire without a valid work permit.

2.2.1.8 Valve must periodically checked on:

- Tightness of bolted connection (body/bonnet, flange connection).
- Corrosion/wear damages (crack, pitting, thickness of the valve).

2.2.2 Specifics

Risk	Preventive Action
Accidental contact with dangerous service fluid* Due to: Gasket Blow out	1. See 2.2.1 General
	2. Immediately replace Gasket after a Blow-out (use approved/suitable materials only)
	3. Use recommended torque as in Table 11
Accidental contact with dangerous service fluid* during disassembly or maintenance operations	1. See 2.2.1 General
	2. After removal from the production line, open and close valve to guarantee depressurized cavity.
	3. Drain any remainder fluid or substances with suitable devices before disassembly.
Structural yielding of valves body with consequent risk of contact with dangerous service medium*, explosion or fire	1. See 2.2.1 General
	2. Create precautions to avoid additional forces on the valves
	3. Avoid absolutely water hammer: install precaution devices if necessary (e.g. brakes, anti shock devices, etc.)
	4. Avoid submitting excessive vibrations to the valves.
	5. Avoid quick Pressure and/or Temperature deviations.
Accidental contact with High or Low temperature parts	1. See 2.2.1 General
	2. Predispose apposite insulation on the valve.
	3. Alert by means of warning signs about risk of burns.
	4. For Cryogenic-/High Temperature service use only valves equipped with Cryogenic-/High Temp. Extension.
Fire or explosion in case of service with flammable fluids	1. See 2.2.1 General
	2. Install only Ex-proof electrical devices in the area
	3. While performing maintenance in the area, shut down all electrical devices.
Explosion in case of oxygen service	1. See 2.2.1 General
	2. Install only Ex-proof electrical devices in the area
	3. Install and use only valves completely degreased.
	4. Use valves only made with materials suitable for oxygen service (see EN 1797-1)

	File No.	BFC5003-2008
CHECK VALVE OPERATION MANUAL	REV.	A
	Page	4/11

* Dangerous service fluid as there are: Toxic-, Corrosive-, Flammable-, High- or Low temperature etc. fluid

3. Scope and Technical Parameters

3.1 Scope

The series valves are widely used in petroleum, chemical, power plant and allied industries for normal operation of pipeline system against converse movement of fluid

3.2 Technical Parameters:

Design standard: BS1868, ASME B16.34

Flange dimension: ASME B16.5

Structure length: ASME B16.10

Nominal pipeline size: 50~750 mm (2~30")

Nominal pressure: 20~420 bars (150~2500LB)

Temperature range: see Table 7

Medium: see Table 7

Body material: ASTM material, see Table 5

Trim material: API 600 trim material, see Table 6

Valve testing: API598

4. Valve Structure

Please refer to Figure 1, Table 1 to 3 for connection and main outline dimensions.

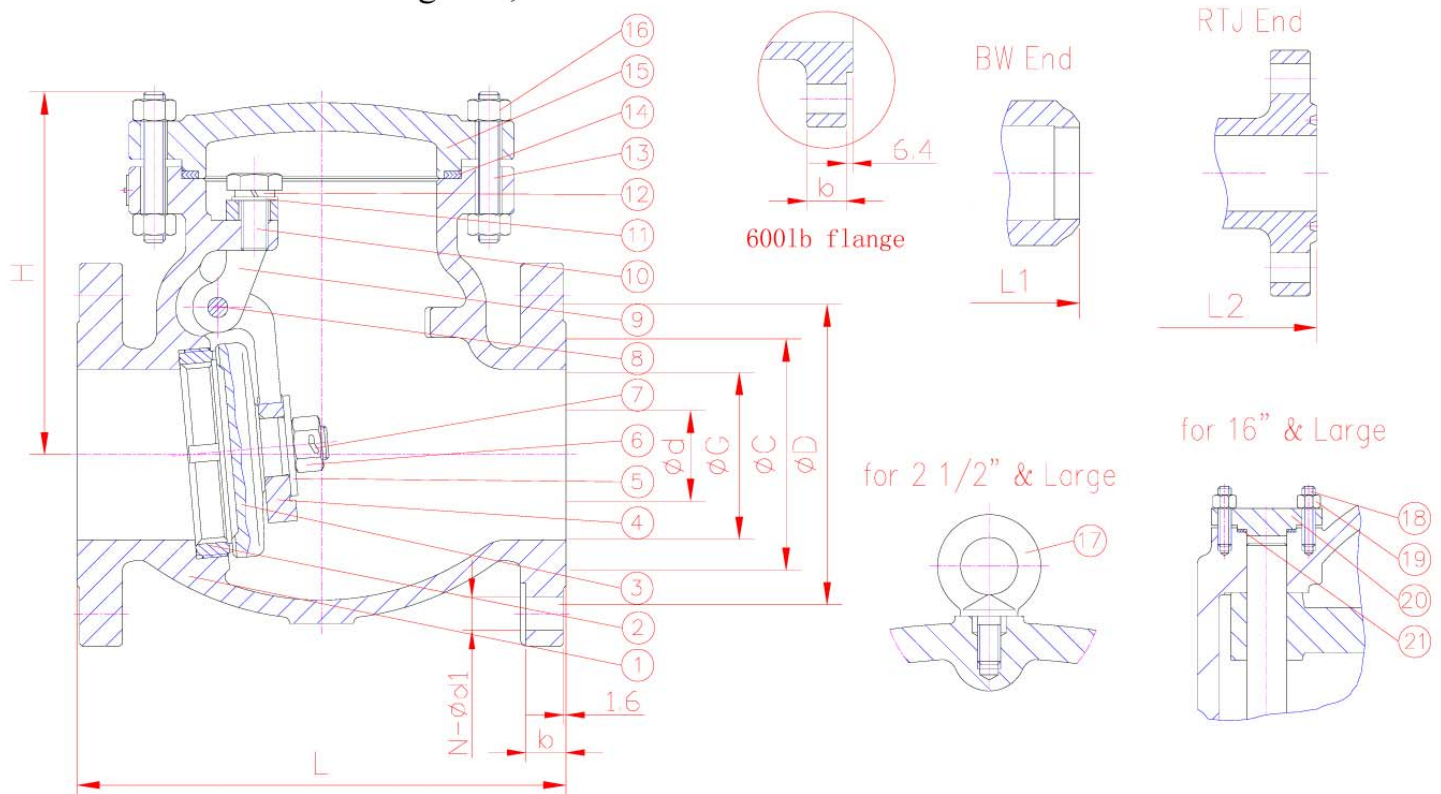


Figure1: check valve structure

	File No.	BFC5003-2008
CHECK VALVE OPERATION MANUAL	REV.	A
	Page	5/11

Table 1 DN50~400 (2~16") 20bars(150LB) check valve connection and outline dimensions

1501b CLASS

NPS inch	L inch	L1 inch	L2 inch	H mm	WT (RF) kg
2	8	8	8 1/2	160	19
2 1/2	8 1/2	8 1/2	9	167	24
3	9 1/2	9 1/2	10	180	28
4	11 1/2	11 1/2	12	217	48
5	13	13	13 1/2	285	63
6	14	14	14 1/2	315	79
8	19 1/2	19 1/2	20	365	130
10	24 1/2	24 1/2	25	445	200
12	27 1/2	27 1/2	28	510	300
14	31	31	31 1/2	532	451
16	34	34	34 1/2	583	556

Table 1 (Cont'd)

inch	L	d	G	C	D	b	N-d1
2	203	51	92	120.5	152	15.9	4-19
2 1/2	216	64	105	139.5	178	17.6	4-19
3	241	76	127	152.5	190	19.1	4-19
4	292	102	157	190.5	229	23.9	8-19
5	330	127	186	216	254	23.9	8-22
6	356	152	216	241.5	279	25.4	8-22
8	495	203	270	298.5	343	28.5	8-22
10	622	254	324	362	406	30.3	12-25
12	699	305	381	432	483	31.8	12-25
14	787	337	413	476	533	35.1	12-29
16	864	387	470	539.5	597	36.6	16-29

Table 2: DN50~300 (2~12") 50bars(300LB) check valve connection and outline dimensions

3001b CLASS

NPS inch	L inch	L1 inch	L2 inch	H mm	WT (RF) kg
2	10 1/2	10 1/2	11 1/8	195	31
2 1/2	11 1/2	11 1/2	12 1/8	210	39

	File No.	BFC5003-2008
CHECK VALVE OPERATION MANUAL	REV.	A
	Page	6/11

3	12 1/2	12 1/2	13 1/8	225	45
4	14	14	14 5/8	270	68
5	15 3/4	15 3/4	16 3/8	310	90
6	17 1/2	17 1/2	18 1/8	330	136
8	21	21	21 5/8	395	220
10	24 1/2	24 1/2	25 1/8	465	315
12	28	28	28 5/8	482	449

Table 2 (Cont'd)

inch	L	d	G	C	D	b	N-d1
2	267	51	92	127	165	22.4	8-19
2 1/2	292	64	105	149.5	190	25.4	8-22
3	318	76	127	168	210	28.5	8-22
4	356	102	157	200	254	31.8	8-22
5	400	127	186	235	279	35.1	8-22
6	445	152	216	270	318	36.6	12-22
8	533	203	270	330	381	41.2	12-25
10	622	254	324	387.5	444	47.8	16-29
12	711	305	381	451	521	50.8	22-25

Table 3: DN50~300 (2~12") 100bars(600LB) check valve connection and outline dimensions

6001b CLASS					
NPS inch	L inch	L1 inch	L2 inch	H mm	WT (RF) kg
2	11 1/2	11 1/2	11 5/8	180	32
2 1/2	13	13	13 1/8	197	42
3	14	14	14 1/8	285	60
4	17	17	17 1/8	325	110
5	20	20	20 1/8	343	161
6	22	22	22 1/8	376	221
8	26	26	26 1/8	532	346
10	31	31	31 1/8	583	628
12	33	33	33 1/8	608	796

Table 3 (Cont'd)

inch	L	d	G	C	D	b	N-d1
2	292	51	92	127	165	25.4	8-19
2 1/2	330	64	105	149.5	190	28.5	8-22
3	356	76	127	168	210	31.8	8-22

	File No.	BFC5003-2008
CHECK VALVE OPERATION MANUAL	REV.	A
	Page	7/11

4	432	102	157	216	273	38.1	8-25
5	508	127	186	266.5	330	44.5	8-29
6	559	152	216	292	356	47.8	12-29
8	660	200	270	349	419	55.7	12-32
10	787	248	324	432	508	63.5	16-35
12	838	298	381	489	559	66.6	20-35

5. Main Parts and Material

The user or the pipeline system designer must select valve body material and the class according to the working temperature, working pressure, the type of fluid and standard temperature-pressure rating as specified in ASME B16.34. The manufacturer takes only the responsibilities for use the order material and the valve class, no responsibility for incoherence of user selected material and valve class with the working condition.

Table5 Valve main parts and material

No Parts Name	Materials								
1 Body	ASTM A216-WCB	ASTM A352-LCB	ASTM A352-LCC	ASTM A217-WC6	ASTM A217-WC9	ASTM A351 CF8	ASTM A351 CF8M	ASTM A351 CF3	ASTM A351 CF3M
15 Bonnet	ASTM A216-WCB	ASTM A352-LCB	ASTM A352-LCC	ASTM A217-WC6	ASTM A217-WC9	ASTM A351 CF8	ASTM A351 CF8M	ASTM A351 CF3	ASTM A351 CF3M
4 Arm	ASTM A216-WCB	ASTM A352-LCB	ASTM A352-LCC	ASTM A217-WC6	ASTM A217-WC9	ASTM A351 CF8			
14 Gasket	150~600LB, STAINLESS STEEL WINDING GASKET					900~1500LB, METAL GASKET			
13 Bolt	ASTM A193 B7	ASTM A320 L7M	ASTM A320 L7M	ASTM A193 B16	ASTM A193 B16	ASTM A193 B8			
16 Nut	ASTM A194 2H	ASTM A320 7M	ASTM A320 7M	ASTM A194 4	ASTM A194 4	ASTM A194 8			

Table6; Common used trim material

API 600 Trim No.	Seat ring	Disc sealing	Stem	Back seat	Lantern ring
1	ER410	ER410	ASTM A182 F6a	ASTM A182 F6a	ASTM A182 F6a
2	304	304	ASTM A182 F304	ASTM A182 F304	ASTM A182 F304
5	STL	STL	ASTM A182 F6a	ASTM A182 F6a	ASTM A182 F6a
8	STL	ER410	ASTM A182 F6a	ASTM A182 F6a	ASTM A182 F6a
9	Monel	Monel	Monel	Monel	Monel
10	316	316	ASTM A182 F316	ASTM A182 F316	ASTM A182 F316
12	STL	316	ASTM A182 F316	ASTM A182 F316	ASTM A182 F316

Table7 body material suitable for fluid and temperature range

	ASTM A216- WCB	ASTM A352- LCB	ASTM A352-LCC	ASTM A217-WC6	ASTM A217-WC9	ASTM A351- CF8	ASTM A351- CF8M	ASTM A351- CF3	ASTM A351 -CF3M
RECOMMEND TEMPERATURE LIMITS	-29~427	-46~343	-46~343	-29~593	-29~593	-29~537	-29~537	-29~427	-29~454
APPLICATION	STEAM,WATER, OIL VAPOUR,GAS and GENERAL SERVICE	LOW TEMPERATURE SERVICE STEAM,WATER,OIL VAPOUR,GAS		HIGH TEMPERATURE SERVICE STEAM,WATER,OIL VAPOUR,GAS		HIGH and LOW TEMPERATURE SERVICE CORROSION RESISTANCE			

Note: where the process fluid is flammable/explosive, it must limit the working temperature of the pipeline system.

	File No.	BFC5003-2008
CHECK VALVE OPERATION MANUAL	REV.	A
	Page	8/11

6. Working Principle and Structure Description

6.1 Working principle

This series is sole direction check valve, when fluid flows at normal direction, the disc opens to fluid pressure; when fluid flows converse, the disc closes to the gravity and converse fluid pressure and cut off the bore.

6.2 Structure description

6.2.1 Flange end or butt welding end may be selected as to purchaser optimum.

6.2.2 Class 150LB valves use a reinforced flexible graphite gasket while 300 to 600LB valves use stainless steel graphite winding gasket and 900 to 1500LB valves use loop metal gasket.

6.2.3 The 5⁰ bevel seal is used for the valve and the seal material is applied to API 600 or to the customer requirements.

7. Valve Transportation

Valves are heavy and metal products, care shall be taken to avoid physical injury during transportation. Before transportation, cord and lift device and transportation tool shall be ready, valve package inspected and broken package repaired. Packaging shall conform to specification requirements.

Valve shall be handled with care, no damage the flange end or butt welding end.

The paint, nameplate and flange sealing surface shall be protected during transportation, no drag valve on the ground especially with the end sealing surface contacted the ground.

Don't unpack when the valve is not ready for installation at the construction field. The valve shall be placed at a safety location against whether.

8. Valve Storage

8.1 Valve shall be stored in air and dry room with bore blanked and flange sealing surface protected.

8.2 Long-time-stored valve shall be re-inspected prior to use. Close attention shall be paid against sealing damage when removal of dirties for the cleanness of sealing surface. Of necessary, valve shall be pressure tested once more.

9. Valve Installation

9.1 Carefully check valve identification against valve specifications before installation. The fluid flow direction in pipeline must be consistent with the arrow direction indicated on the body.

	File No.	BFC5003-2008
CHECK VALVE OPERATION MANUAL	REV.	A
	Page	9/11

- 9.2 If there is pressure pulse/surge source, the check valve shall be installed far away from the source.
- 9.3 Check the inside of bore and the sealing surface before installation, any attached dirty shall be removed with clean soft cloth.
- 9.4 For valve with flange end, user shall select proper bolt, gasket according to the working temperature, working pressure and fluid, equally fasten the bolts and nuts. Bolt shall be with full thread and 8UN serial thread shall be used for bolt over 1 inch in diameter.
- 9.5 For valve with butt-welding end, user shall perform welding and post welding heat treatment using qualified WPS and welder in accordance with the requirements of ASME B31.3.

10. Valve Operation and Maintenance

- 10.1 The online valve shall not be knocked, walked on or used as weight support.
- 10.2 Usually check valves have no heat insulation structure, never touch the surface of valves to prevent burn when the valve has a high/low surface temperature.
- 10.3 The thickness of body and bonnet must be checked to ensure safety operation at an interval of three months. Where the thickness is less than value in Table10, the valve must be scrapped.
- 10.4 After put into service, valve shall be checked and maintained periodically especially for the condition of sealing surfaces and worn, and the corrosion of body. In case of such situation, valve shall be repaired or replaced. It is suggested that inspection and maintenance of valve shall be perform every three months provided the fluid is water or oil, every month or to local law provided the fluid is strong corrosive
- 10.5 After reparation, valve shall be re-assembled using recommended torque as listed in Table 8. After reassembly, valve shall be pressure tested.

Table8: Recommended torque for flange connection bolting

Thread size	Torque (N.M)	Thread size	Torque (N.M)
1/2-13UNC	50~60	1-1/4 -8UN	850~1000
9/16-12 UNC	70~80	1-3/8-8 UN	1100~1300
5/8-11 UNC	100~130	1-1/2-8 UN	1400~1800

	File No.	BFC5003-2008
CHECK VALVE OPERATION MANUAL	REV.	A
	Page	10/11

3/4-10 UNC	160~210	1-5/8-8 UN	1800~2200
7/8-9 UNC	280~330	1-3/4-8 UN	2200~2600
1-8 UNC	420~500	1-7/8-8 UN	2800~3300
1-1/8-8 UN	500~600	2-8 UN	3500~4200

- 10.6 When performing Repair/maintenance operations, user shall use valve gasket, bolt and nut of the same size and material as the original one. Valve gasket may be ordered as spare parts for maintenance and replacement. It is forbidden to open the bonnet or replace the bolt or nut when the valve contains pressure. After replacement of gasket, bolt and nut, valve shall be pressure tested prior to reuse.
- 10.7 User may repair the valve-sealing surface providing a successful closure test is performed and the sealing is ok.
- 10.8 Generally valve trim prefers replacement to reparation. It is better to use provided part as replacement. If part produced by valve manufacturer is not available due to emergency, user shall produce the part to Bonney forge's technical documentation . Bonney forge takes no responsibility for loss caused out of part produced from outsourcing.
- 10.9 It is not recommended for reparation of valve pressure-containing part by user. If the pressure-containing part is used for a long time and consequently defection occurs and affect safety use, user shall replace the valve with a new one.
- 10.10 Welding repair on valve online is forbidden.

11. Potential Failure and Troubleshooting

Failure	Cause	Troubleshooting
Leakage between sealing surfaces	1. Dirties between sealing surfaces 2. Sealing surfaces damaged	1. Clean sealing surface 2. Repair the sealing surfaces
Operation failure	1. Arm device in a wrong position. 2. The wear of arm, disc and pin connection. 3. Arm deformation or rupture	Cut off the fluid and dismount the valve, repair the valve or replace part
Leakage between bonnet flanges	1. Bonnet bolts loose 2. Bonnet gasket failure	1. Proper tighten bonnet nuts 2. Replace bonnet gasket
Body and bonnet broken and leaked	1. Water hammer 2. Fatigue 3. Freezing broken	1. Replace valve that exceeds guarantee period or is found with early fatigue defection 2. Drain away water in winter when valve is not used

	File No.	BFC5003-2008
CHECK VALVE OPERATION MANUAL	REV.	A
	Page	11/11

12. Quality Warrant

- 12.1 Bonney forge warrants its valves to the original purchaser for a period of 18 months from and after the date of delivery to the original customer, against defects in material and workmanship under proper and normal use and service and not caused of resulting from improper application or usage, improper installations, improper maintenance and repairs, modifications or alterations.
- 12.2 Purchaser shall give notice to Bonney forge upon finding of any defect or assuming defect, Bonney forge has privilege to check the facts of the defect.
- 12.3 Bonney forge sole obligation under this warranty shall be limited to the follows:
—repair of the material or,
—replacement of the parts and materials or,
—refund the purchase price or collect the defected products from the original purchaser.
- 12.4 Bonney forge is not responsible to claims caused from unexpected natural disaster such as earthquake, typhoon of any kind arising out of the defect.
- 12.5 The scope and limitation of warranty can be changed through the agreement between Bonney forge and purchaser.

13. Servicing

- 1.1 Where contractually specified, Bonney forge may provide field installation and adjustment.
- 13.2 Bonney forge will trace the quality of sold valve and provide service to customer requirements.
-