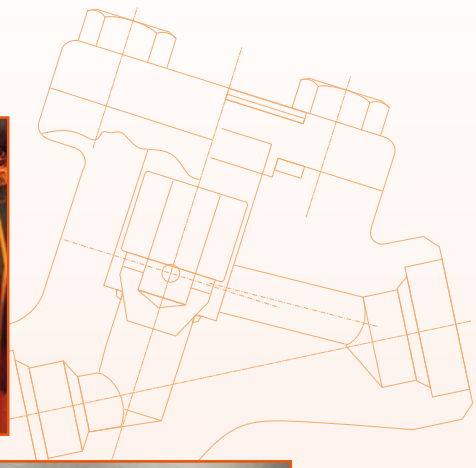
INSTALLATION, OPERATION & MAINTENANCE MANUAL

FORGED CHECK VALVES
SWING, PISTON & BALL

API602/ISO 17561/
ASME B16.34



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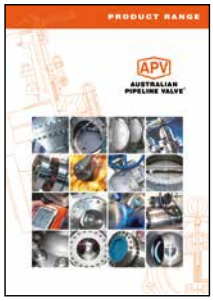

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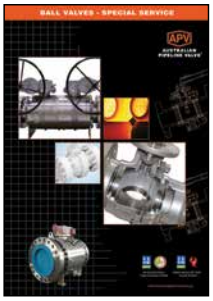

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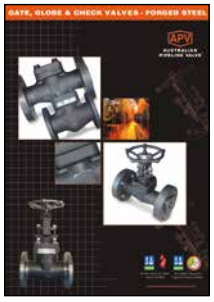

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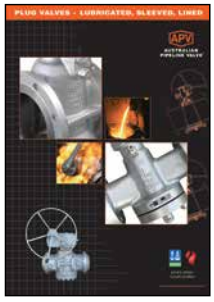

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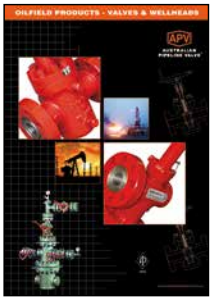

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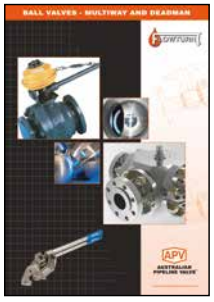

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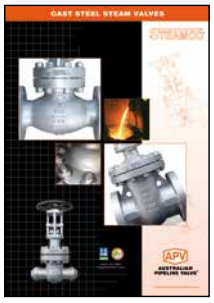

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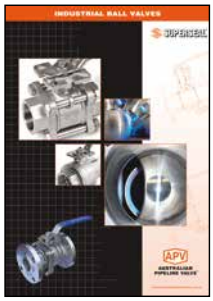

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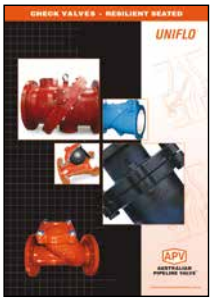

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INTRODUCTION

The majority of this information is common knowledge to experienced valve users. When properly installed in applications for which they were designed, Australian Pipeline Valve (APV) valves will give long reliable service under normal conditions. This instruction manual is only a guide for installation and operation on standard service and covers general maintenance and minor repairs. An APV approved valve reconditioner should be used for reconditioning and major repairs.

We recommend that this entire document be read prior to proceeding with any installation or repair. Australian Pipeline Valve and it's parent company take no responsibility for damage or injury to people, property or equipment. It is the sole responsibility of the user to ensure only specially trained valve repair experts perform repairs under the supervision of a qualified supervisor.

RESPONSIBILITY FOR VALVE APPLICATION

The User is responsible for ordering the correct valves. The user is responsible for ensuring APV Valves are selected and installed in conformance with the correct pressure rating and design temperature requirements. Prior to installation, the valves and nameplates should be checked for proper identification to ensure the valve is of the proper type, material and is of a suitable pressure class and temperature rating to satisfy the applications requirements of the service application.

Do not use any valve in applications where either the pressure or temperature is higher than the allowable working values. Also valves should not be used in service media if not compatible with the valve material of construction, as this will cause chemical attacks, leakage, valve failure.

RECEIVING INSPECTION AND HANDLING

Valves should be inspected upon receipt to ensure:

- Conformance with all purchase order requirements.
- Correct type, pressure class, size, body and trim materials and end connections.
- Any damage caused during shipping.

The User is advised that specifying an incorrect valve for the application may result in injuries or property damage. Selecting the correct valve type, rating, material and connections, in conformance with the particular performance requirements is important for proper application and is the sole responsibility of the user.

SAFETY INFORMATION

The following general safety information should be taken into account in addition to the specific warnings and cautions specified in this manual. They are recommended precautions that must be understood and applied during operation and maintenance of the equipment covered in this I.O.M.

Caution

To avoid injury, never attempt disassembly while there are pressures either upstream or downstream. Even when replacing gaskets, caution is necessary to avoid possible injury. Disassemble with caution in case all pressures are not relieved.

Caution

To prevent valve bending, damage, inefficient operation, or early maintenance problems, support piping on each side of the valve. Warning, certain gases and fluids could cause damage to human health, the environment or property hence the necessary safety precautions to prevent risk should be taken.

This manual provides instructions for storing, general servicing, installation and removal of check valves.

APV and it's resellers refuse any liability for damage to people, property or plant as well as loss of production and loss of income under any circumstances but especially if caused by: Incorrect installation or utilisation of the valve or if the valve installed is not fit for intended purpose. It is the sole responsibility of the user to ensure the valve type and materials are correctly specified.

DURING OPERATION TAKE INTO ACCOUNT THE FOLLOWING WARNINGS:

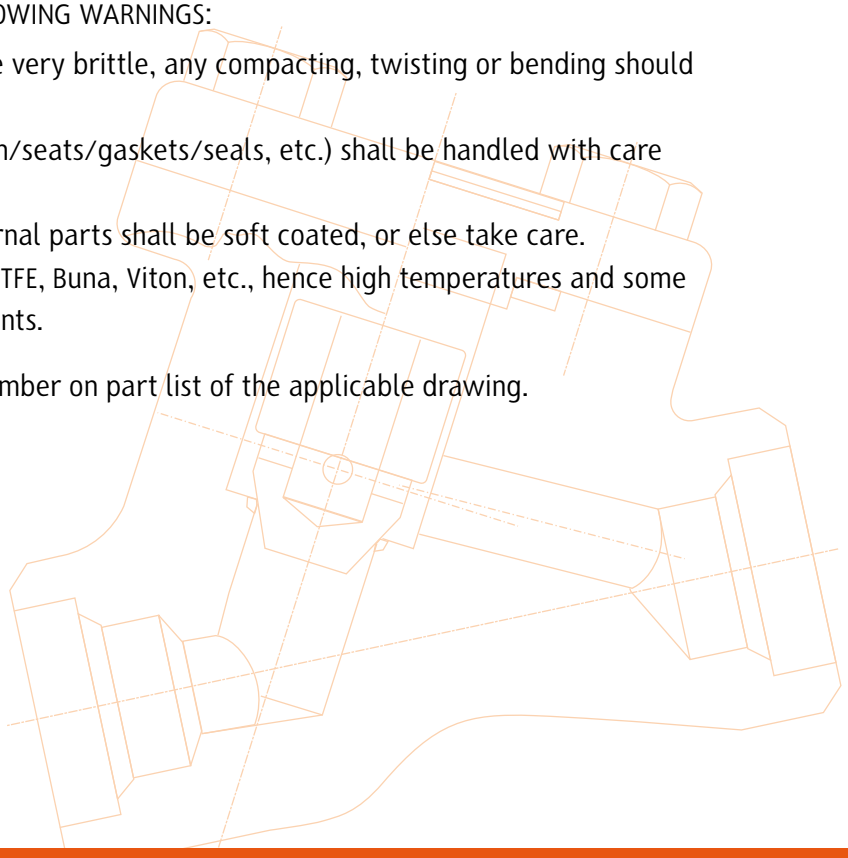
a- Graphite body gaskets (where applicable) are very brittle, any compacting, twisting or bending should be avoided.

b- The valve's internal parts (disc/stem/hinge pin/seats/gaskets/seals, etc.) shall be handled with care avoiding scratches or surface damage.

c- All tools and equipment for handling the internal parts shall be soft coated, or else take care.

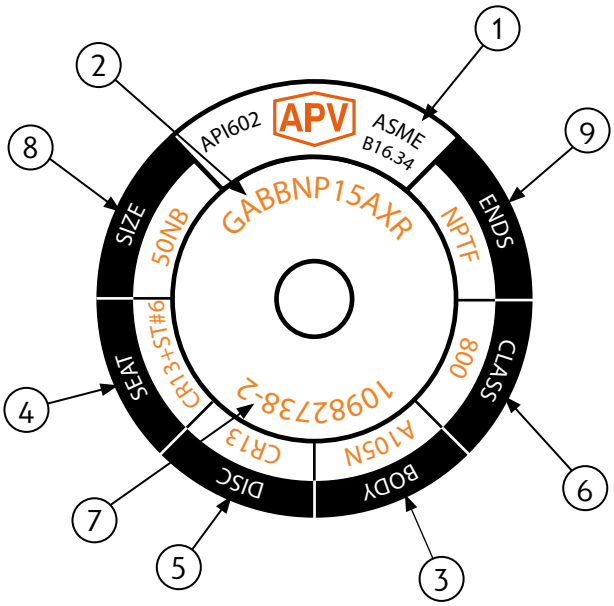
d- Valves can be fitted with gaskets or seals in PTFE, Buna, Viton, etc., hence high temperatures and some cleaning fluids may damage sealing components.

For all operations make reference to position number on part list of the applicable drawing.



VALVE IDENTIFICATION

Each APV valve is identified with a nameplate, which is placed over the handwheel and secured with the hand wheel nut on gate and globe valves, and riveted to the cover on check valves. Below is an example.



ITEM	DESCRIPTION
1	Applicable design codes
2	APV valve figure number which delineates the as-built valve type, body, trim, features, packing, NACE, etc. Refer figure number system in Appendix B
3	Shell material (e.g. body, bonnet)
4	Seat material
5	Closure member material
6	Rated pressure class
7	Serial/batch numbers
8	Nominal pipe size
9	End connections

When performing any work, ordering spare parts, or requesting technical support, please refer to this tag. The serial number, the part number and numbers on the side of the valve body are keys to proper valve identification.

1.0 INSTALLATION

Caution

Piping should be properly aligned and supported to reduce mechanical loading on the end connections.

1.1 INSTALLATION POSITIONS

Check valves are unidirectional and have the direction of flow indicated on the valve body, as per Figure 1.

FIGURE 1

Australian Pipeline Valve **piston** and **ball check valves** are recommended for use in horizontal lines with bonnet facing up. **Spring loaded** APV **ball check valves** and **y-type piston check valves** can also be used in vertical line, see Figure 2.

Check valves must be fitted in horizontal pipe runs with the cover facing vertically upward. Variance to either side of the vertical axis must not exceed five (5) degrees. Swing-check valves and spring-loaded check valve designs can be positioned in vertical pipe runs with upward flow.

Note

Check valves must not be installed in a vertical down flow pipe run or in a horizontal pipe run with the cover in the vertical down position. Always install valves in the direction indicated by the flow arrow stamped on the body.

Caution

Flow disturbances caused by the system components (e.g. pipe fittings, discharge of pumps, etc.) can lead to valve chatter, which can cause rapid wear of seats and trim and ultimately lea to valve malfunction. APV recommends that a sufficient distance be maintained between the check valve and any component that can cause flow disturbance as follows:

a) System components that create flow disturbance - examples are pumps, fittings and valves. When installing a check valve near system components, APV recommends a minimum of 10 pipe diameters of straight pipe between the upstream system components and the inlet of the check valve and a minimum of 2 pipe diameters of straight pipe between the downstream system components and the outlet of the check valve.

b) Pipe bends and transitions - examples are elbows, tees, branch connections and reducers. APV recommends a minimum of 10 pipe diameters of straight pipe between the upstream system component and the inlet of the check valve and a minimum of 4 pipe diameters of straight pipe between the downstream component and the outlet of the check valve.

Spring loaded piston check valves are recommended for reciprocating compressor service in which a history of noisy check valve operation has been experienced.

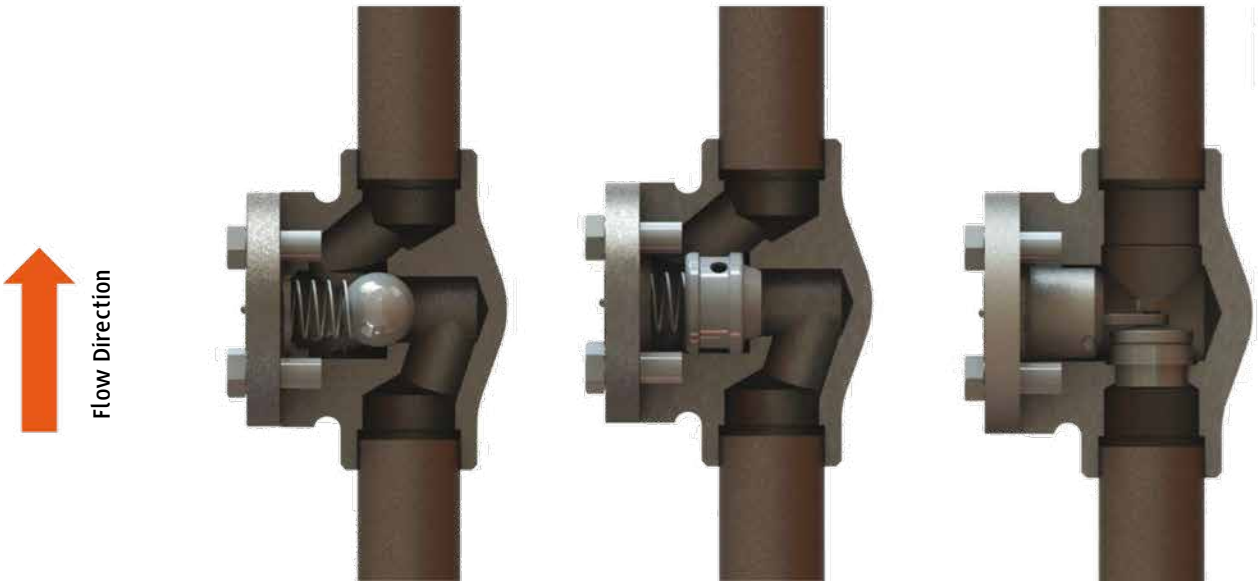
Australian Pipeline Valve swing check valves may be installed in horizontal lines or vertical lines where the direction of flow (see Figure 1) as indicated on the valve body is upwards.

FIGURE 2

CHECK VALVE POSITIONING

Horizontal Line with Flow Arrow

Maximum Rotation



Spring Loaded Ball Check

Spring Loaded Piston Check

Swing Check

Note - Only spring loaded ball check valves, spring loaded piston check valves and swing check valves may be installed in vertical runs of pipe. Flow must be upward.

1.2 PREPARATION FOR INSTALLATION

- Remove protective end caps or plugs and inspect valve ends for damage to threads, socket weld bores or flange faces.
- Thoroughly clean adjacent piping system to remove any foreign material that could cause damage to seating surfaces during valve operation.
- Verify that the space available for installation is adequate to allow the valve to be installed.

1.3 END CONNECTIONS

1.3.1 Threaded Ends

Check condition of threads on mating piping.

Apply joint compound to the male end of joint only. This will prevent compound from entering the valve flow path.

1.3.2 Flanged Ends

Check to see that mating flanges are dimensionally compatible with the flanges on the valve body and ensure sealing surfaces are free of debris.

Install the correct studs and nuts for the application and place the gasket between the flange facings.

Stud nuts should be tightened in an opposing cris-cross pattern in equal increments to ensure even gasket compression. See Appendix A, Table A.

1.3.3 Socket weld Ends

Remove all debris, grease, oil, paint, etc., from the pipe that is to be welded into the valve and from the valve end connections.

Insert the pipe into the valve end connection until it bottoms out in the socket weld bore. Withdraw the pipe 1.59mm (1/16") so that a gap remains between the pipe and the bottom of the socket weld bore to prevent cracks (ASME B1.11). Tack the pipe into the valve and complete the fillet weld.

1.3.4 Buttweld Ends

Clean the weld ends as necessary and weld into the line using an approved weld procedure. Make sure the pipe and valve body material given on the nameplate or valve body is compatible with the welding procedure. (Refer compatibility cross reference chart at the APV website for equivalent pipe, valve & fitting grades).

1.3.5 Valve Installation by Welding

Unless the valve contains PTFE packing and/or gasket, leave valves assembled during installation, welding

and post-weld heat treatment. This will prevent the valve seat from floating or distorting during the process. After welding completion, open the valve and flush line to clean out any foreign matter.

Valves under 40mm (1.5") fitted with a PTFE or elastomer bonnet gasket must be disassembled for installation as the welding temperature can adversely affect the PTFE components. Remove the bonnet and bonnet gasket and match mark each component during disassembly for proper reassembly.

If you do not disassemble valves it will be the responsibility of the operator to ensure valves are kept cool during welding and then post-weld testing of the valve should be performed. Larger size valves over 40mm (1 1/2") NB are less likely to transmit heat to bonnet gasket during welding but still care should be taken.

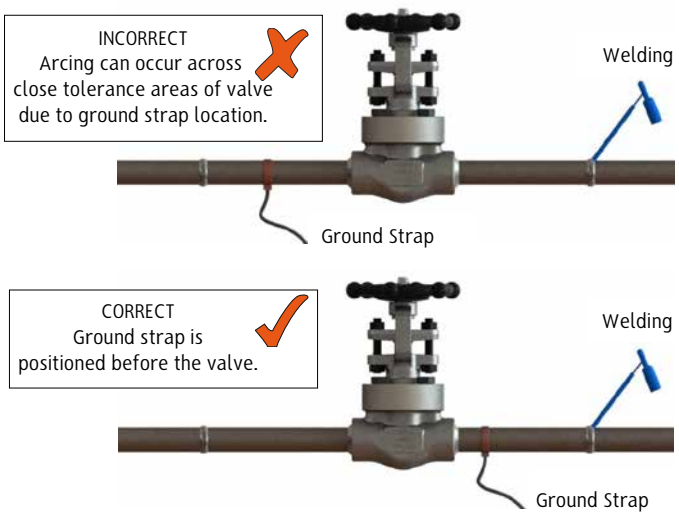
The responsibility for welding of the valves into piping systems is that of those performing the welding. Refer to ASME B31.1, B31.3 etc. Written welding procedures covering all attributes of the process and materials to be welded shall be in accordance with Section IX of the ASME Boiler and Pressure Vessel Code and any additional requirements from the applicable piping code including any possible necessary localised post weld heat treatment depending on material specifications.

APV forged globe, piston and ball check valves do not run the risk of seat loosening during welding due to the fact that they are supplied with integral Stellite body seats.

Subsequent to welding, clean and inspect the finished weld(s) and, if necessary, repair any defects using a qualified weld repair procedure. In addition, cycle the valve open-closed to check for proper operation, making sure no binding has occurred due to the weld heat.

Special trim options and body materials such as valves with PTFE packing/soft seat/ special seals/ and gaskets that have maximum temperature limits less than the valve, may require special welding and heat treatment considerations which are not included herein.

FIGURE 3



WELD SET UP

1.3.6 Post Weld Heat Treatment (PWHT)

The recommended method of PWHT is via local ceramic resistance heaters, individually monitored with thermocouples. Thermocouples are attached to the weld or welds. Properly sized ceramic heaters are wrapped around the weld area, extending approximately 6.35mm (1/4") past the weld on the valve side. Do not wrap the valve body with a heating element. See Figure 1 for details. Wrap flexible insulation around valve ends, extending approximately 12.5mm (1/2") past the valve on the valves side. It is not recommended to wrap the entire valve body with insulation. Prior to heat input close the valve completely, then open the valve approximately 1.58mm (1/16") of a turn after the handwheel slack is run out. This very slight opening will allow the trim components to expand during the thermal cycle.

Following PWHT, inspect the valve for smooth operation by cycling open and closed. If possible, perform a seat closure pressure test prior to service operation.

FIGURE 4

ITEM	DESCRIPTION
1	THERMOCOUPLE
2	VALVE
3	FIBRE INSULATION
4	CERAMIC HEATERS

POST WELD HEAT TREATMENT

1.4 POST-INSTALLATION PROCEDURES

After installation, the line should be cleaned by flushing to remove any foreign material. When caustics are to be used to flush the line, additional flushing with clean water is required. The valve should be opened and closed after installation to ensure proper operating function.

With the line pressurised, check the valve end connections, body to bonnet/cover joints and external plugs for leaks.

2.0 OPERATION

The check valve operation is automatic and requires no assistance. When the flow exerts sufficient pressure against the disc to overcome the disc's weight, the disc allows the flow to continue through the piping system. As pressure decreases, the disc lowers until it's own weight forces it to seat. This prevents the possibility of a reversal in the flow. Piston and ball check valves should not be used in applications where rusting or rust particles are present or anticipated. Swing check valves are more tolerant for applications of this nature.

Metal seated check valves (piston, ball and swing) are not zero leak devices and may "seep" in service. This type of valve should always be backed up with an isolation valve (either gate or ball valve). Check valves are designed to prevent reverse flow. Leakage rates for check valves with metal-to-metal seats are dependant on the amount of back pressure and the viscosity of the flowing medium. Soft seat check valves can offer improved leak tightness provided there is sufficient back pressure. Check valves should not be used in gas or low back pressure liquid applications if zero leakage is desired.

2.1 PISTON CHECK/BALL CHECK VALVE

A typical bolted bonnet piston check and ball check are shown in Figure 7; an exploded view is shown in Appendix B. The bodies (8) of the piston check valve and the ball check valve are of the same labyrinth design as that of the globe valve. The barrier of flow is a free moving piston (6) that is guided by the body (8) or a free moving ball (10) that is guided by the bonnet (4). The piston check and ball check also have an integral seat (7) (renewable seats also an option), against which either the piston (6) or the ball (10) seat to provide stoppage of flow. The piston (6) or ball (10) drop into the seat (7) by gravity during no-flow conditions and open by fluid pressure on the upstream side (from underneath the piston (6) or ball (10). Reversal of fluid flow forces the piston (6) or ball (10) back into the seat (7) which stops the flow.

The piston and ball check valves are designed for horizontal service; however, these valves can be equipped with an internal spring (9) which allows the valve to be used in vertical up service, as shown in Figure 2.

2.2 SWING CHECK VALVE

A typical bolted bonnet swing check valve is shown exploded view in Appendix B. The swing check valve is a straight-through flow check valve equipped with a disc (7) which rests against the seat (9) under no-flow conditions. The seat (9) is pressed into the valve body (11) and is of the removable design. A hinge

(5) supports the disc (7) from a hinge pin (8) which is set in the valve bonnet (6). The supporting hinge (5) allows the disc (7) to swing freely away from the seat (9) because of the flow pressure being exerted upon the disc's upstream side. A reversal of fluid flow exerts pressure on the downstream side of the disc (7) forcing it against the seat (9) and stopping the flow.

Caution

A check valve should not be used as a primary means of isolation for any application because a check valve may not provide a leak-tight (no through leakage). Only gate or globe valves should be used for isolation.

3.0 MAINTENANCE

No periodic maintenance is necessary unless special external accessories are fitted.

4.0 REPAIRS

Proper safety equipment and apparel should be worn when preparing to service a valve. Observe the following general warnings:

Caution

- ***A valve is a pressurised device containing energised fluids and should be handled with care.***
- ***Valve surface temperature may be dangerously too hot or too cold for skin contact.***
- ***Upon disassembling, attention should be paid to the possibility of releasing dangerous and or ignitable fluids.***
- ***Adequate ventilation should be available for service.***

4.1 REPAIR INSTRUCTIONS

Due to the relatively low replacement cost of small diameter standard carbon steel valves especially under 80 NB (3"), it is usually less expensive to replace the complete valve than to have maintenance personnel effect repairs. Generally, the only viable repairs are replacement of bonnet gasket. However, see Section 4.2 and 4.3 below for further extraordinary repairs.

Always replace the bonnet gasket whenever a valve is disassembled. Gasket seating surfaces should be scraped clean (avoid radial marks). Bonnet bolts should be tightened in a diagonal pattern at several different increasing torque settings in accordance with the recommended torque value (see table Appendix A, Table A and Figure 6).

4.2 DISASSEMBLY & GASKET REPLACEMENT

Before disassembling:

1. Check that the line is in a complete shut down phase, then remove the valve from pipeline.
2. Pre-order all necessary spare parts and joining gaskets.
3. Put identification markings on valve body, disc and bonnet. This helps to avoid mismatching of parts at the time of re-assembly.
4. If the bolts and nuts are too tight, apply deep penetrating oil and then unscrew.

Disassembly:

1. Disassemble all cover bolts and nuts.
2. Gently break the seal with a lever, gradually lifting the bonnet flange at intervals 360° around the bonnet.
3. Clean gasket surface areas, replace gasket and refit bonnet as detailed in 4.1 above.
4. 'Pressure seal' valves use a proprietary gasket.

4.3 VALVE INTERNALS DISASSEMBLY INSPECTION AND REPAIR

1. Check that the (where applicable) hinge, nut and pin are in good condition and firmly connected. Replace damaged parts as necessary.
2. For ***swing check valves***, lift and remove the disc hinge assembly. Movement should be free and not hindered by any malfunction of the hinge pin. Where disc travel is not sufficiently smooth, remove plugs or blind flanges and then remove hinge pin. Check surface for seizure or scraping marks. If marks are deeper than 1.5mm (1/16"), re-machine hinge pin and reassemble hinge pin and re-assemble. If defect depth is greater than 1.5mm (1/16"), a new hinge pin is necessary. When reassembling hinge pin, it is recommended that the disc be removed by loosening the nut. For ***piston check*** or ***ball check valves***, if there is a spring ensure it is functioning properly and is sufficiently energised. The spring should hold the disc/ball tightly against the seat no matter what position the valve is in.
3. When leakage is due to deterioration of seal surfaces caused by corrosion, erosion or foreign substances, it must be determined whether the disc or seal seat are the cause. Where special soft seat inserts are supplied, consult APV.

a) Deterioration of disc surfaces:
Swing check valves: - Disassemble disc by removing nut and washer. (Ball/Piston check valves have a free floating disc). Repair surface by grinding and relapping using a fine grade abrasive paste.

b) Deterioration of seat seal surfaces:
When seal surfaces are damaged and defects are confined to a small area but are not deeper than 0.4mm the seal surface can be relapped. For smaller sizes the recommended method is to use a cast iron strap with an outside diameter matching the valve's raceway. If the seat surfaces cannot be relapped an APV approved repairer will decide if the surface has to be reground/re-machined or replaced. When defects are deeper than 0.4mm and found on the entire surface, re-metallising or a new seat is required. For threaded-in seats it is recommended that an anti seizure compound be used when installing the replacement seat to make threading it in the body easier.

Caution

Always be sure that the valve is de-pressurised and isolated prior to performing any maintenance work. Remove any dangerous fluids from valve before commencing maintenance.

Caution

Check valves do not require lapping fixtures as the bore of the valve body serves as a guide. On ball check valves the rolling action of the ball retains seating surfaces in good condition until ball size or ball guide is worn and replacement parts are needed.

Caution

After lapping, it is recommended that the surface of the seat and disc be checked for proper contact using the marking blue. Coat the seats with marking blue, and tightly screw the disc into the seats. Unscrew the disc, and examine to make sure there is continuous contact between the sealing surfaces of the disc and body seat.

Typical Forged Bolted Piston Check Valve Exploded View

1. Seat
The seat ensures a stable shut off. The seat is precision ground for optional seating.

2. Cover Gasket
The cover gasket creates a leak-proof seal between the bonnet and the body.

3. Piston
Piston is machined to the tightest tolerances to ensure trouble free shut off and cycling.

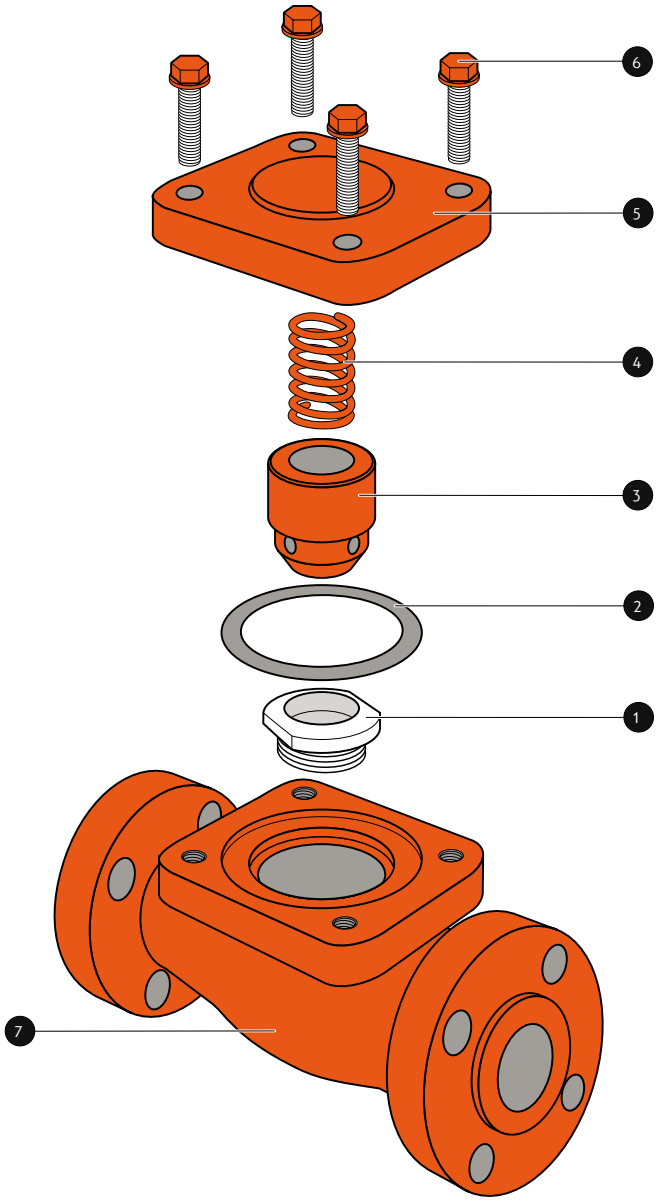
4. Spring
The spring is precision made and loaded for precise pressures.

5. Cover
The cover allows access to internal components.

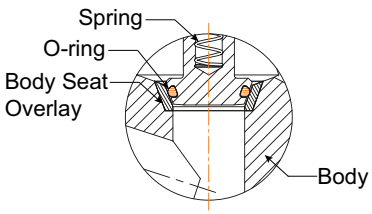
6. Cover Studs
The cover studs secure the bonnet to the body.

7. Body
Forged steel bodies provide low resistance flow and optimum strength and performance.

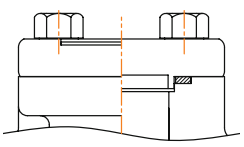
FIGURE 5



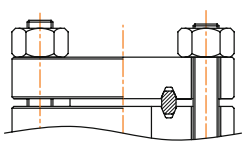
Sample only refer to as built drawing as there are numerous styles and designs also vary depending on size & class.



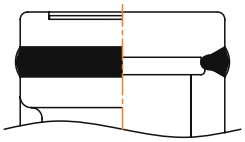
Elastomer Seat Insert Option (Piston Check Valves)



Bolted Cover (Spiral Wound Type)



Bolted Cover (Ring Type Joint)



Welded Cover (Full Penetration Welding)

APPENDIX A

INDICATIVE BONNET BOLTING (BOLTED BONNET) TORQUE NM

TABLE A

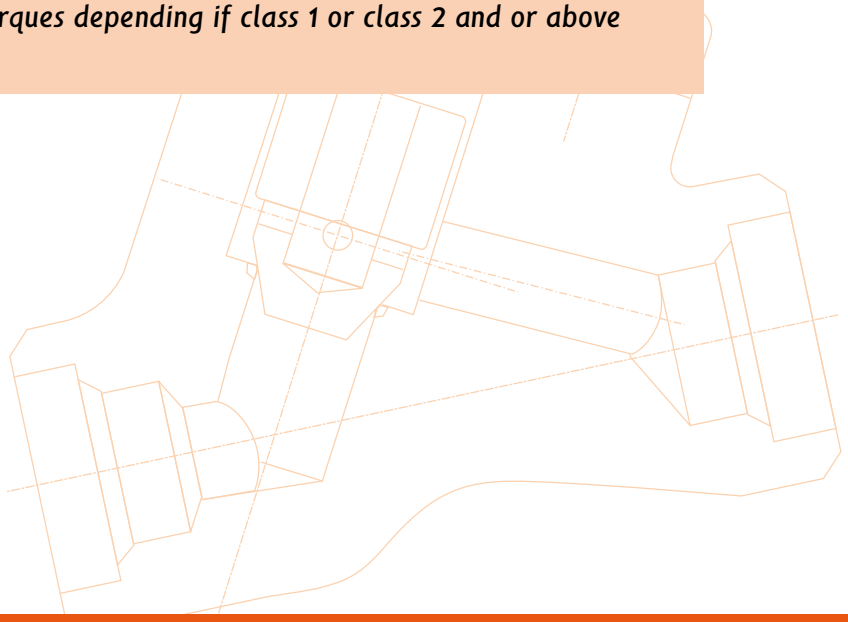
Stud Size UNC	Stud Size Metric	Maximum Body-Bonnet Bolt Torque			
		All bolt materials with min. yield stress @ room temp. > 60ksi (>400MPa) Example B7		All bolt materials with min. yield strength @ room temp. ≤ 60ksi (≤400MPa) Example B8/B8M Class 1 (10)	
		Ft-Lb	N-m	Ft-Lb	N-m
3/8 UNC	M10	20	30	11	16
1/2 UNC	M12	50	70	27	37
9/16 UNC	M14	70	95	38	50
5/8 UNC	M16	100	140	50	70
3/4 UNC	M20	170	230	90	125
7/8 UNC	M22	270	370	145	200
1 UNC	M24	400	550	215	300

Note:

(1) Different body gaskets may require slightly different torques.
(2) Torque tolerance ±10%.
(3) For temperatures above 750°F (400°C) use 75% of the torque values. In high temperature services, there is a possibility of creep in the bonnet studs. Regular checking of the bonnet - studs for tightness, would help prevent leakage through the bonnet gasket.
(4) Above torque values are with the bolts lubricated.
(5) Values above are based on 30,000 psi (206.85 Mpa) bolting stress and lubricated with heavy graphite and oil mixture or a copper based anti-seize grease.
(6) Do not exceed by more than 25% of values stated when emergency torquing is required.
(7) All bolts shall be torqued in the pattern as shown in Figure 6 on next page to ensure uniform gasket loading.
(8) Optimum torque can vary depending on type of body gasket but do not increase torque more than 10% above those shown.
(9) Consult us for other bolt material.
(10 Most B8M and B8 bolts class 2 can be tightened to a higher torque.

Note

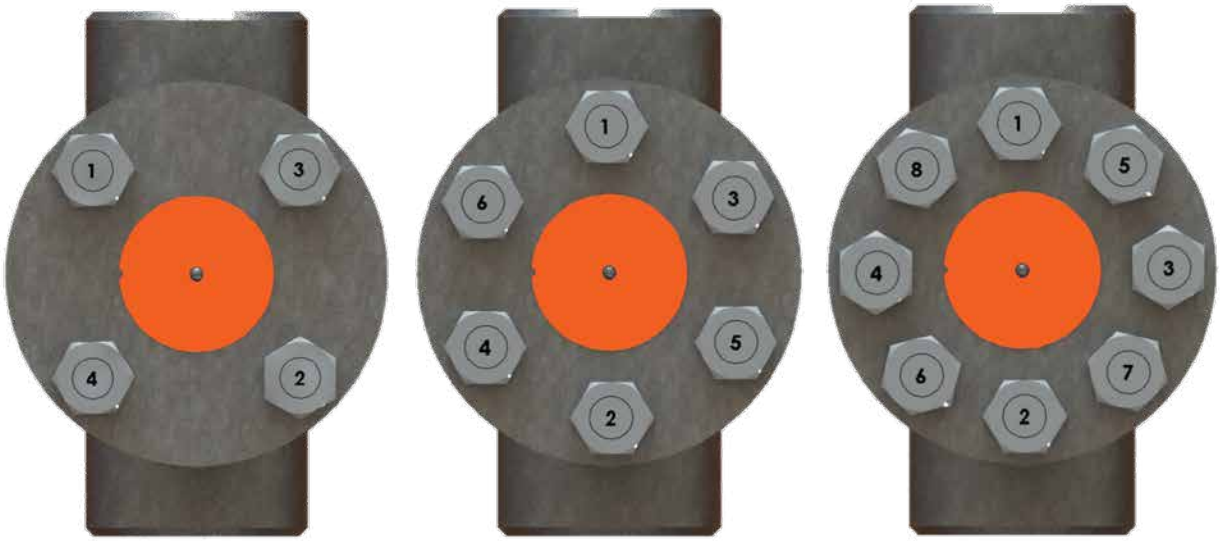
For 'pressure seal' bonnet consult APV for torques (where bolting is applicable). Bolt tensions shown must be decreased by 25% when other or no lubrication used. Non lubricated bolts can have an efficiency of less than 50% the torque of values stated. Indicative torques are shown only, different body gasket systems, different sizes & classes, etc., will have different torque requirements. Furthermore, other stud grades can have much lower torques depending if class 1 or class 2 and or above variables.



APPENDIX A - CONT.

BOLT TIGHTENING SEQUENCE EXAMPLE

FIGURE 6



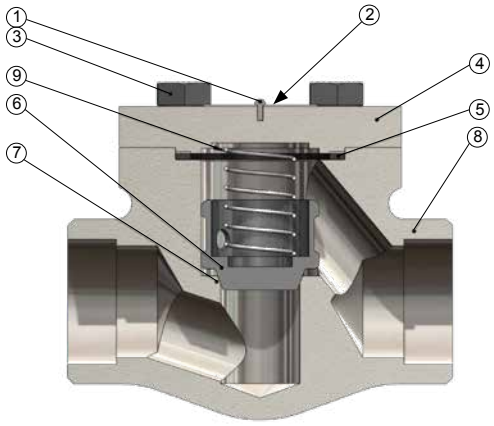
APPENDIX B

EXPLODED BILL OF MATERIALS (EXAMPLES)

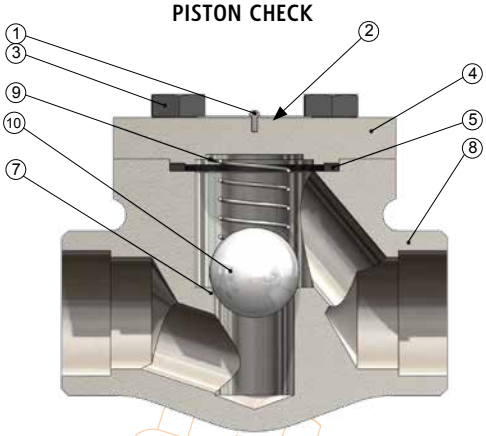
FIGURE 7

ITEM	DESCRIPTION
1	RIVET
2	NAME PLATE
3	BOLTS
4	BONNET
5	GASKET
6	PISTON
7	INTEGRAL SEAT
8	BODY
9	SPRING*
10	BALL

* The spring will be supplied on request

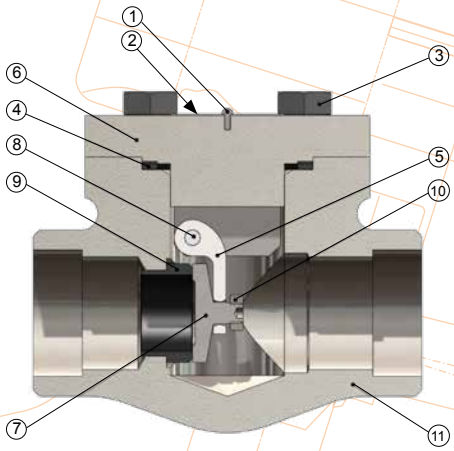


PISTON CHECK



BALL CHECK

ITEM	DESCRIPTION
1	RIVET
2	NAME PLATE
3	B/B BOLTS
4	B/B GASKET
5	HINGE
6	BONNET
7	DISC
8	HINGE PIN
9	SEAT
10	DISC NUT
11	BODY

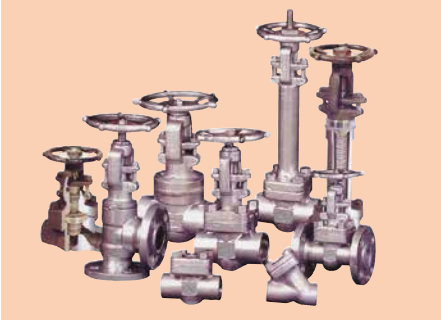


SWING CHECK

Typical example only refer to as-built drawing

APPENDIX C

Part Number System



A	B	C	D	E	F	F	G	H	-	I	J	K
Type	Type	Connection	Class	Body Material	Trim	Trim Modifier	Nace	Bore	Dash	Special	Bonnet Gasket	Stem Packing

(EXAMPLE) GLBBSW80ADR-5 : GLOBE VALVE, BOLTED BONNET, SOCKET WELDED, 800LBS, A105N, MONEL TRIM, NON NACE, STANDARD BORE, RING GASKET

A - TYPE

GA	GATE SOLID WEDGE
GF	GATE FLEX WEDGE
GP	GATE PARALLEL SLIDE
GL	GLOBE
GS	GLOBE SDNR (STOP CHECK)
GY	Y-TYPE GLOBE (IN LINE)
YS	Y-TYPE GLOBE SDNR
GN	NEEDLE POINT GLOBE
PC	PISTON (LIFT) CHECK
BC	BALL CHECK
HC	BALL HEAD PISTON (LIFT) CHECK
SC	SWING CHECK
AG	RIGHT ANGLE GLOBE
AY	RIGHT ANGLE GLOBE Y-TYPE
ZZ	SPECIAL

B - BONNET

BB	BOLTED BONNET
WB	WELDED BONNET
PS	PRESSURE SEAL BONNET
BL	BONNETLESS
SP	SPECIAL

BELLOWS SEAL/CRYOGENIC/ EXTENDED BONNET
See Section I

C - CONNECTION

NP	NPT THREADED
NS	NPT x SW
BS	BSP THREADED
SW	SOCKET WELDING
BW	BUTT WELDING
RF	RAISED FACE FLANGE
FF	FLAT FACE FLANGE
UD	UNDRILLED FLANGE
RJ	RING JOINT FLANGE
RU	UNMACHINED FLANGE
ZZ	SPECIAL DRILLING RF/FF

D - CLASS

15	ASME 150LBS
30	ASME 300LBS
60	ASME 600LBS
80	ASME 800LBS
90	ASME 900LBS
150	ASME 1500LBS
250	ASME 2500LBS
450	ASME 4500LBS
99	SPECIAL

E - BODY

A	ASTM A105N
B	ASTM A105
C	ASTM A182-F5
D	ASTM A182-F9
E	ASTM A182-F11
F	ASTM A182-F22
G	ASTM A182-F304
H	ASTM A182-F304L
J	ASTM A182-F316
K	ASTM A182-F316L
L	ASTM A350-LF2
M	ASTM A182-F304/F304L*
N	ASTM A182-F316/316L*
P	ASTM A182-F321
Q	ASTM A182 F51
R	ASTM A182 F55
S	ASTM A182 F53
T	ASTM A350-LF3
Z	SPECIAL

**Dual Certified*

F - TRIM CODES

		BODY SEAT SURFACE	DISC SURFACE	STEM	BACK SEAT
TRIM CODE(1)	B	Bronze	Bronze	Bronze	Bronze
	C	AL-Bronze	AL-Bronze	AL-Bronze	AL-Bronze
	D	Monel(1)	Monel(1)	Monel	Monel
	E	F51(1)	F51(1)	F51	F51
	G	F55(1)	F55(1)	F55	F55
	H	Hastelloy B(1)	Hastelloy B(1)	Hastelloy B	Hastelloy B
	L	F316(1)(6)	F316(1)(6)	F316(6)	F316(6)
	M	F316L(1)	F316L(1)	F316L	F316L
	N	Alloy 20(1)	Alloy 20(1)	Alloy 20	Alloy 20
	P	F304(1)	F304(1)	F304	F304
	Q	F304L(1)	F304L(1)	F304L	F304L
	R	Alloy 625(1)	Alloy 625(1)	Alloy 625	Alloy 625
	V	F53(1)	F53(1)	F53	F53
	W	F347(1)	F347(1)	F347	F347
	Blank	F6a/F6/410	F6a/F6/410	F6a/F6/410	F6a/F6/410
	Z	Special(1)	Special(1)	Special	Special
MODIFIER	EN	ENP	ENP	(2)	(2) (3)
	GE(5)	Stellite #6	Stellite #12	17-4 PH	Stellite #6
	I	-	-	17-4 PH	-
	M	-	-	Monel	-
	T	+PTFE Seat	-	-	-
	U	Stellite	Stellite	(2)	(2) (3)
	X	(4)	(4)	(4)	(4)
	XU	Stellite	(2)	(2)	(2) (3)
	Z	-	-	Special	-

(1) Add modifier below if applicable. (2) As per trim code above. (3) Or Integral as per body.
(4) API trim code# only. (5) Geothermal trim. (6) Can be dual certified 316/316L.

G - NACE

Blank	=	NON NACE
N	=	NACE

H - BORE

R	=	STANDARD BORE
F	=	FULL BORE
Z	=	SPECIAL BORE

- - DASH

-	=	SPECIAL SUFFIX

I - SPECIAL

BL	=	BELLOWS SEALED
CR	=	CRYOGENIC
EX	=	EXTENDED BONNET
LP	=	LONG PATTERN
SP	=	C/W SPRING
PT	=	PTFE SEAT
ZZ	=	OTHER SPECIAL

J - BONNET GASKET

Blank Standard: SS Spiral + GRP (BB), Pressure Seal Ring (PSB).
N/A- (WB)

1	SS Spiral + PTFE
2	S31803 Spiral
3	PTFE
4	SS Spiral + PTFE + GRP
5	Ring
9	Special

K - STEM PACKING

Blank Standard: Graphite.
N/A- (Check Valves)

L	Graphite + PTFE
T	PTFE
F	Fugitive Emission GRP
P	Fugitive Emission PTFE
Z	Special

APPENDIX D

EXPLODED B.O.M. SWING CHECK

BILL OF MATERIALS

NO.	PART NAME	MATERIAL	NOTES
1	BODY	ASTM A105N	PHOSPHATED
2	SEAT	ASTM A276 410+ST#6	(1) (2)
3	DISC	ASTM A276 420+ST#6	(1) (2)
4	DISC NUT	ASTM A193 B8	-
5	HINGE	ASTM A351 CF8	-
6	PIN	ASTM A276 410	-
7	GASKET	SS316+FLEXIBLE GRAPHITE	-
8	BONNET	ASTM A105N	PHOSPHATED
9	BOLT	ASTM A194 B7M	PHOSPHATED
10	NAME PLATE	316SS	-

(1) STELLITE: MINIMUM THICKNESS 10MM, STELLITE HARDNESS 36 ~ 45 HRC (331 ~ 427 HB)
(2) SEAT & DISC MINIMUM SMOOTHNESS Ra. 4 ~ 6 µm

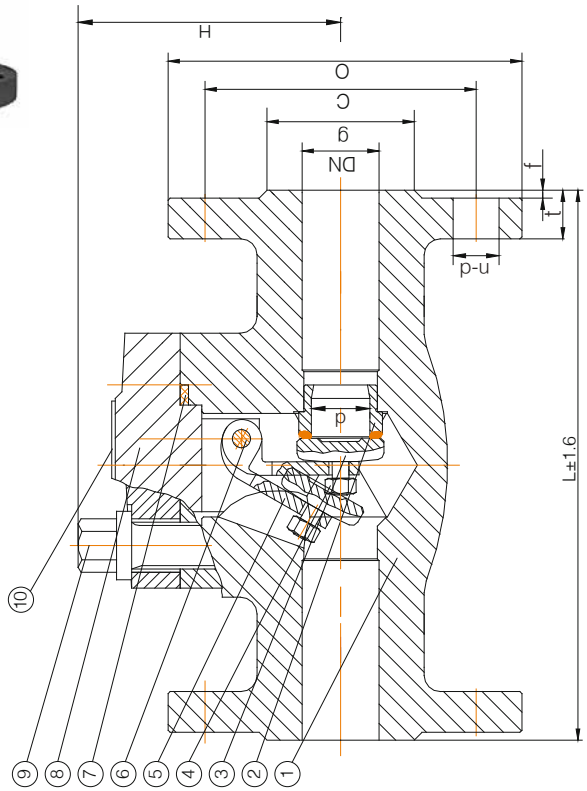
		TEST PRESSURE	
RATING	CL 600	SHELL HYDRO	SEAT HYDRO
DESIGN & MFG.	API602/ISO 15761, ASME B16.34	15.3 Mpa 2225 Psi	11.4 Mpa 1650 Psi
PRESS-TEMP RATING	ASME B16.34	SEAT AIR	BACKSEAT
FACE TO FACE DIM.	API602/ISO 15761/ANSI B16.10	Mpa Psi	Mpa Psi
END CONNECTION	RFSF Ra 3.2 ~ 6.3 µm	B16.34 BODY TEMPERATURE	
END DIMENSION	ANSI B16.5	-29 TO 425 °C, -20 TO 800 °F	
TEST & INSPECTION	API 598/ISO 5208	MEDIUM	Water, Oil, Gas
MARKING	MSS SP-25		
OTHER REQ.	PHOSPHATING PHO-WFGGC		
PORT SIZE	STANDARD BORE		
TRIM	API #5		
NOTES	NACE MR-01-75 & MR-01-03 (ISO 15156)		
OTHER			

Swing Check Valve, Bolted Cover, Model SCBBRF60AUNR
NPS 1/2"~2" (DN15~DN50) Class 600, RF, SB, A105N, Trim API #5, Nace

ORDER Nº/ DWG Nº	782	APPROVED	B.T.
REV.	00	CHECKED	S.Q.
		DRAWN	C.C.

Australian Pipeline Valve

APV DWG FRM 782



DIMENSIONS (MM) & WEIGHT (KG)

Inch	DN	L	d	O	C	g	n-Ø	t	f	H	Weight
1/2"	15	165	10.5	95	66.7	35.0	4-15	15.0	6.4	61	4.0
3/4"	20	191	13.5	118	82.5	43.0	4-19	16.0	6.4	78	5.8
1"	25	216	17.0	124	88.9	51.0	4-19	18.0	6.4	84	9.5
1 1/2"	40	241	29.0	156	114.3	73.0	4-22	23.0	6.4	120	15.6
2"	50	292	36.5	165	127.0	92.0	8-19	26.0	6.4	133	24.5

Dimensions in millimeters

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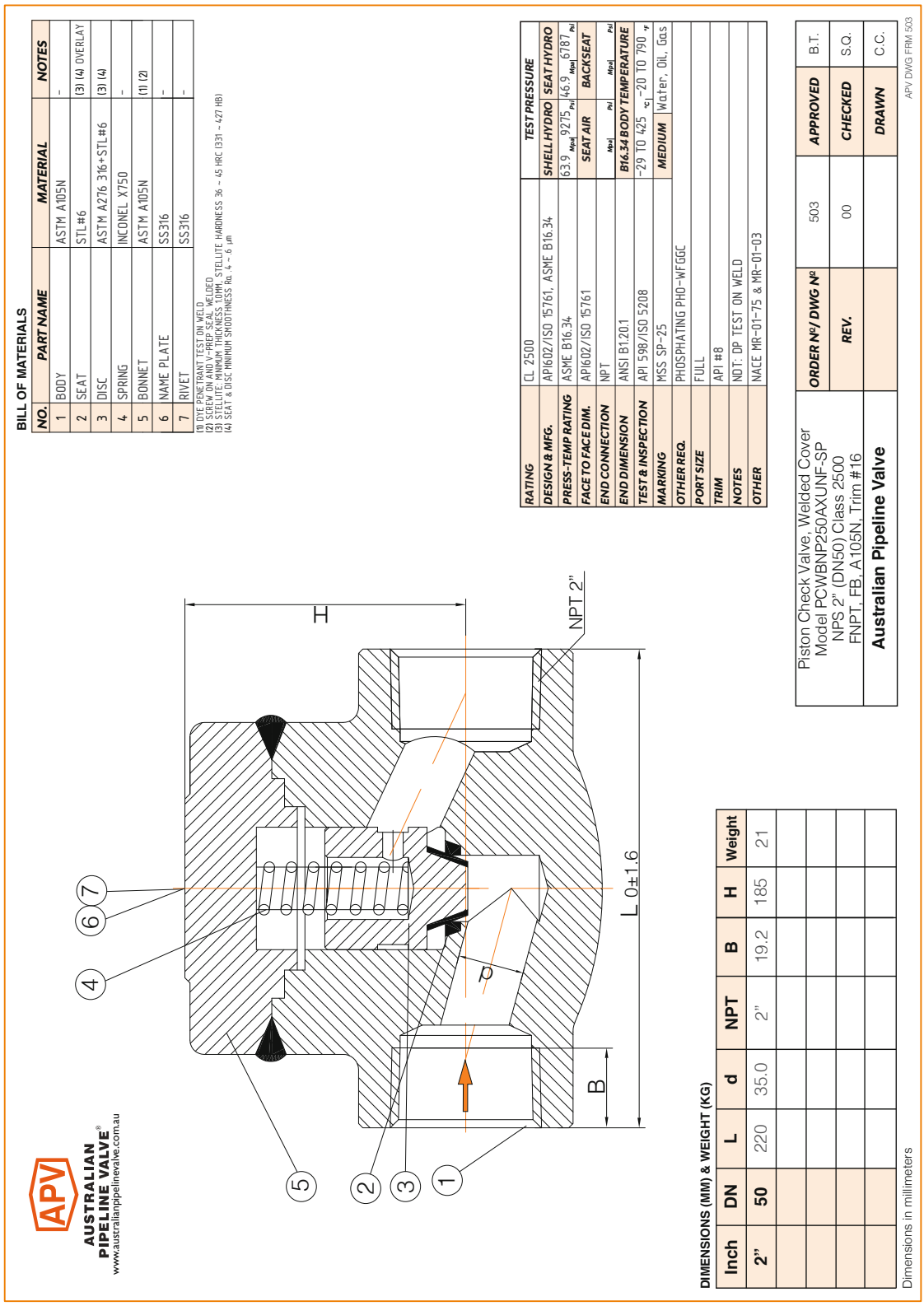
Example only, refer to as-built drawing.

APPENDIX D - CONT.

EXPLODED B.O.M. WELDED BONNET - NOT REPAIRABLE



Example only, refer to as-built drawing.

APPENDIX D - CONT.

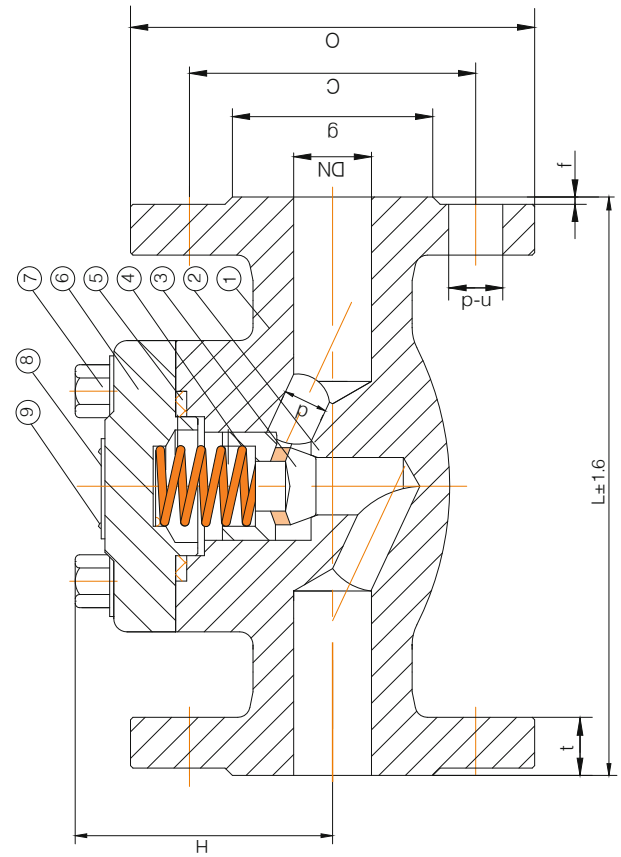
EXPLODED B.O.M. PISTON CHECK

BILL OF MATERIALS

NO.	PART NAME	MATERIAL	NOTES
1	BODY	ASTM A182 F304/L	(1)
2	SEAT	ASTM A182 F304/L	(2) INTEGRAL
3	DISC	ASTM A276 304	(2)
4	SPRING	INCONEL X750	-
5	GASKET (ENCAPSULATED)	SS304+PTFE	SPIRAL WOUND
6	BONNET	ASTM A182 F304/L	(1)
7	BOLT	ASTM A193 B8	-
8	NAME PLATE	SS304	-
9	RIVET	BRASS	-

(1) DUAL CERTIFIED 304 & 304L
(2) SEAT & DISC MINIMUM SMOOTHNESS Ra. 4 ~ 6 µm

		TEST PRESSURE	
RATING	CL 300	SHELL HYDRO	SEAT HYDRO
DESIGN & MFG.	API602 /ISO15761, ASME B16.34	7.6 Mpa 1100 psi	5.5 Mpa 800 psi
PRESS-TEMP RATING	ASME B16.34	SEAT AIR	BACKSEAT
FACE TO FACE DIM.	API602 /ISO15761	Mpa psi	Mpa psi
END CONNECTION	RFSF 3.2 ~ 6.3 Ra.	B16.34 BODY TEMPERATURE	
END DIMENSION	ANSI B16.5	ASME B16.34 -29~ASME B16.34	
TEST & INSPECTION	API 598/ISO 5208	MEDIUM	Water, Oil, Gas
MARKING & PAINT	MSS SP-25, PICKLED & PASSIVATED		
OTHER REQ.			
PORT SIZE	STANDARD BORE		
TRIM	API #2		
NOTES	INTEGRAL FLANGES		
OTHER			



ORDER Nº/ DWG Nº	1072	APPROVED	B.T.
REV.	00	CHECKED	S.Q.
		DRAWN	C.C.

Piston Check Valve, Bolted Cover,
Model PCBBRF30MPR-SP1
NPS 1/2" ~2" (DN15~DN50) Class 300
RF, SB, A182 F304L, Trim API #2

Australian Pipeline Valve

APV DWG FRM 1072

DIMENSIONS (MM) & WEIGHT (KG)

Inch	DN	L	d	O	C	g	n-d	t	f	H	Weight
1/2"	15	152.5	10.5	95	66.5	35.0	4-16	15.0	1.6	61	4.0
3/4"	20	178	13.5	117	82.5	43.0	4-19	16.0	1.6	78	4.8
1"	25	203	17.0	124	89.0	51.0	4-19	18.0	1.6	84	8.8
1 1/2"	40	229	29.0	156	114.5	73.0	4-22	21.0	1.6	120	13.7
2"	50	267	36.5	165	127.0	92.0	8-19	23.0	1.6	133	17.8

Dimensions in millimeters

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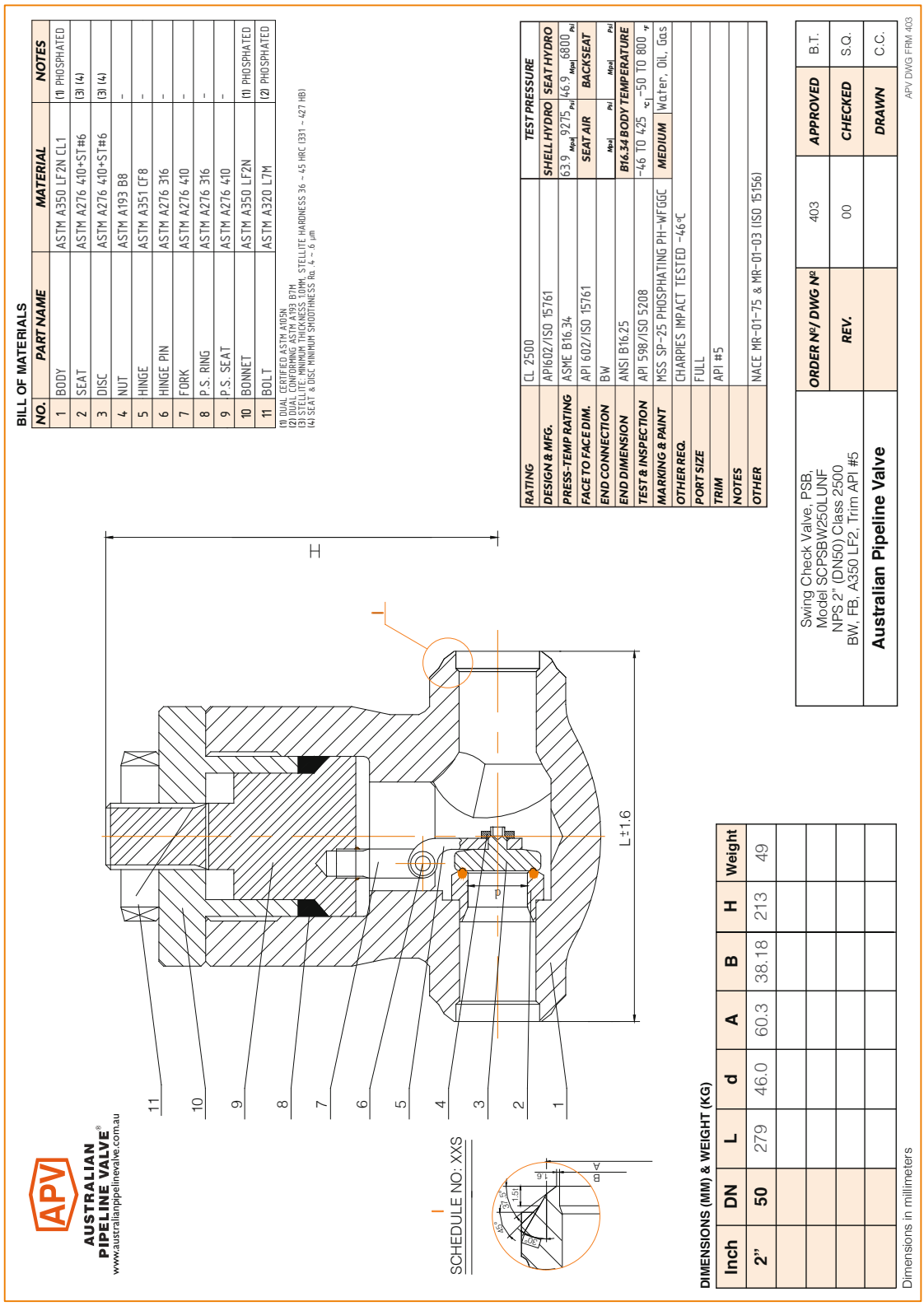
Example only, refer to as-built drawing.

APPENDIX D - CONT.

EXPLODED B.O.M. PRESSURE SEAL BONNET



Example only, refer to as-built drawing.

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1. **LIMITED WARRANTY:** Subject to the limitations expressed herein, Seller warrants that products manufactured by Seller shall be free from defects in design, material and workmanship under normal use for a period of one (1) year from installation but in no case shall the warranty period extend longer than eighteen months from the date of sale. This warranty is void for any damage caused by misuse, abuse, neglect, acts of God, or improper installation. For the purpose of this section, "Normal Use" means in strict accordance with the installation, operation and maintenance manual. The warranty for all other products is provided by the original equipment manufacturer.

2. **REMEDIES:** Seller shall repair or replace, at its option, any non-conforming or otherwise defective product, upon receipt of notice from Buyer during the Manufacturer's warranty period at no additional charge. SELLER HEREBY DISCLAIMS ALL OTHER EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS OR FITNESS FOR A PARTICULAR PURPOSE.

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6. **EXCUSED PERFORMANCE:** Seller will make a good faith effort to complete delivery of the products as indicated by Seller in writing, but Seller assumes no responsibility or liability and will accept no back-charge for loss or damage due to delay or inability to deliver, caused by acts of God, war, labor difficulties, accidents, inability to obtain materials, delays of carriers, contractors or suppliers or any other causes of any kind whatever beyond the control of Seller. Under no circumstances shall Seller be liable for any special, consequential, incidental, or indirect damages, losses, or expense (whether or not based on negligence) arising directly or indirectly from delays or failure to give notice of delay.

NOTES

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