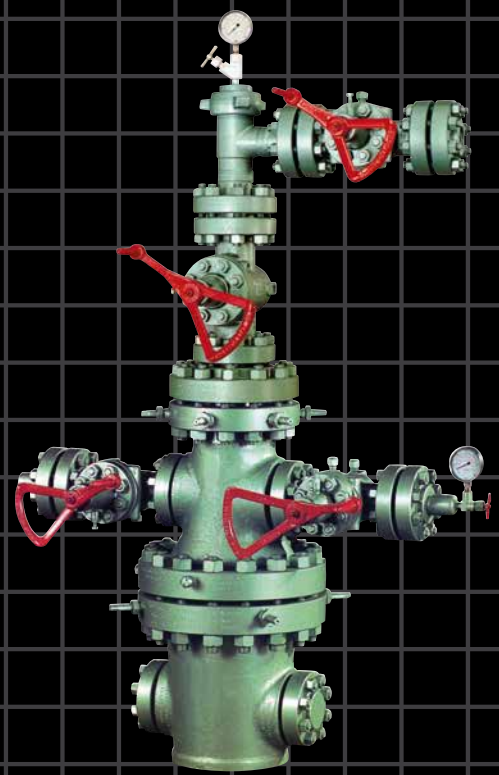
INSTALLATION, OPERATION & MAINTENANCE MANUAL

API6A SLAB GATE VALVE

M & HM STYLE



API6A

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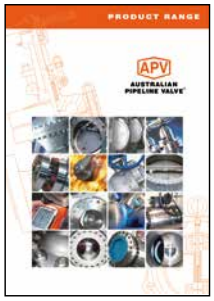

Product Brochure

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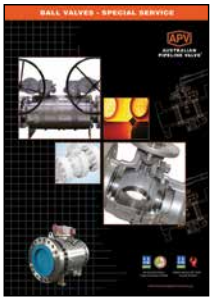
Ball Valves Floating Small Bore



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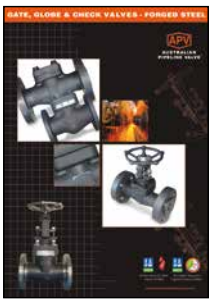

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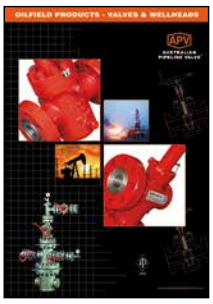

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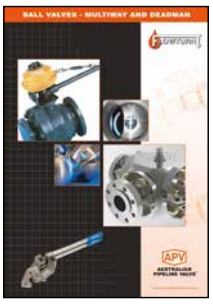
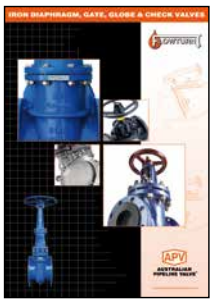


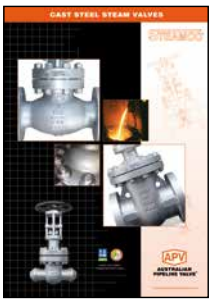
Flowturn Ball Valves Multiway & Deadman



Flowturn Gate, Globe & Check Valves

Flowturn Instrument Valves

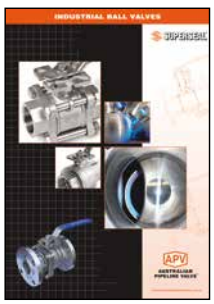
Flowturn Strainers & Sight Glasses



Steamco Steam Valves

Supercheck Wafer Check Valves

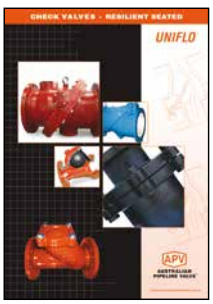
Superseal Butterfly Valves



Superseal Industrial Ball Valves

Torqturn Actuators

TwinLok Tube Fittings



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IOM Installation Operation Maintenance

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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. This instruction is only a guide for installation and operation on standard service and covers general maintenance and minor repairs. A professional APV approved valve engineering facility should be utilised for reconditioning or major repairs.

We do recommend however 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 current 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 requirements of the service application.

Do not use valves 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 and handling to end connections, hand wheel or stem.

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 required 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 in 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

Never attempt to disassemble a valve while there is pressure in the line. Ensure both upstream and downstream pressures are removed. Disassemble with caution in case all pressures are not relieved. Even when replacing stem packing, caution is necessary to avoid possible injury.

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.

- *A valve is a pressurised mechanism containing energised fluids under pressure and consequently should be handled with appropriate care.*
- *Valve surface temperature may be dangerously too hot or too cold for skin contact.*
- *Upon disassembly, attention should be paid to the possibility of releasing dangerous and or ignitable accumulated fluids.*
- *Ensure adequate ventilation is available for service.*

This manual provides instructions for storing, general servicing, installation and removal of gate 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/Graphoil packing and body gasket is very brittle, any impacting, twisting or bending should be avoided.

b- The valve's internal parts such as disc, stem, seats, seals, gaskets 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 extreme care, especially on machined mating surfaces and with soft parts.

d- Valves can be fitted with gaskets or seals in PTFE, Buna, Viton, etc., hence high temperatures will damage sealing components.

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

1.0 INSTALLATION M & HM

Where applicable, piping should be properly aligned and supported to reduce mechanical loading on the end connections.

1.1 INSTALLATION POSITIONS

Gate valves are usually bi-directional and therefore may be installed in either direction. In some cases, gate valves may be uni-directional, in which case the direction of flow will be indicated on the valve body (See section 2.0).

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 and to be operated.

Ensure sufficient clearance for the stem in the full open position may cause the valve to be inoperable. Inadequate clearance for valve may add mechanical loading to the valve ends. Sufficient clearance should be allowed for threaded valves to be 'swung' during installation.

1.3 END CONNECTIONS - INSTALLATION

1.3.1 Threaded Ends

Check condition of threads on mating pipe.

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

1.3.2 Flanged Ends

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

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

Stud nuts should be tightened in a an opposing criss-cross pattern in equal increments to ensure proper gasket compression.

1.3.3 Buttweld Ends

Clean the weld ends as necessary and weld into the line using an approved weld procedure. Make sure the pipe and body material given on the nameplate is compatible with the welding procedure.

1.3.4 Valve Installation by Welding

Leave valves assembled and in the lightly closed position 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.

Stem seal leakage could result in personal injury. Valve stem area is tested prior to shipping but may require extra sealant.

Personal injury may result from sudden release of any process pressure. APV recommends the use of protective clothing, gloves and eyewear when performing any installation or maintenance.

Isolate the valve from the system and relieve pressure prior to performing maintenance.

Disconnect any operating line providing air pressure, control signals or electrical power to actuators.

Check the stem sealing area for pressurised process fluids even after the valve has been removed from the line, particularly when removing packing seals, or stem bleed or grease fittings.

If a gasket seal is disturbed while removing or adjusting gasketed parts, APV recommends installing a new gasket while reassembling. A proper seal is required to ensure optimum operation.

2.0 MODEL M & HM OVERVIEW

APV API6A Gate Valves are integral body, parallel sided gate valves that are available in solid slab with a floating seat (Model FC) where the sealing force supplied by line pressure, or in expanding self energised slab (Model M & HM). Most models are bi-directional however, a preferred direction may be shown on the valve body for some models.

The Type 'M', 'HM', and 'FC' Gate Valves are proven designs that have been standard in the oil field for more than forty years. Because of APV's commitment to quality and the reliability of these standard designs, these valves can be maintained anywhere in the world, even in the most remote locations, without having to procure hard to find parts.

Available from 1 13/16" to 7 1/16" and from 2,000 psi to 15,000 psi working pressures.

2.1 FEATURES AND BENEFITS

Minimal torque: Upper and lower bearings are used to minimize operating stem torque and are isolated from well fluids to increase durability.

Bi-directional seals: The one piece, parallel sided (Model FC) slab gate seals on a floating seat. The sealing force is supplied by line pressure. The expanding type self energised slab (Model M & HM) seals on both seats.

Metal to metal stem back seat: The gate stem has a bevelled shoulder which allows for metal-to-metal sealing to the bonnet seat.

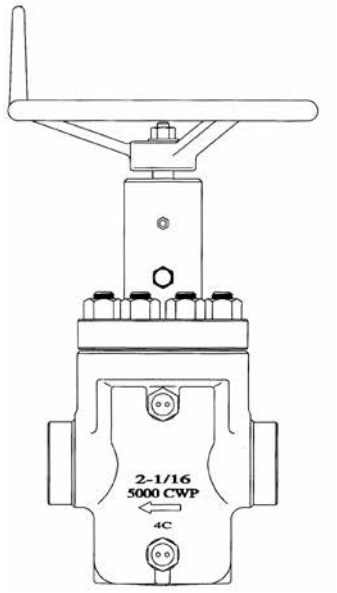
Full through conduit: The full through conduit I.D. provides smooth flow with minimal turbulence as well as providing an unobstructed passage for well intervention tools.

Replaceable gate and seats: Gate and seats are field-replaceable.

Re-energizeable Stem Packing: The stem packing can be re-energized by injection plastic sealant in between the packing stacks.

Stem packing replaceable with valve under pressure: The bonnet stem to back-seat seal allows the stem packing to be replaced with the valve under pressure.

Grease fitting: The valve body may be greased through the fitting provided in the valve bonnet.

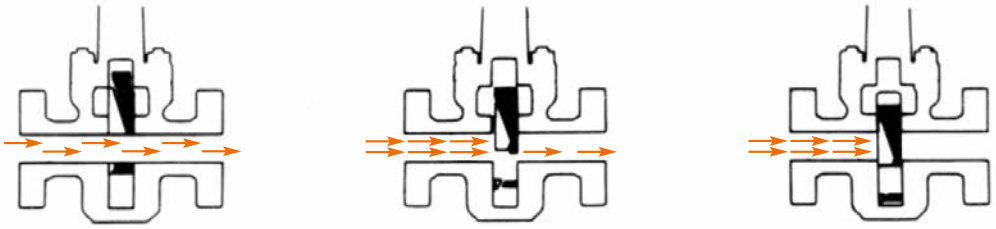


3.0 OPERATION M & HM

To close the valve: Rotate the handwheel clockwise, the gate will move downward to the bottom of the valve body, then rotate the handwheel counter-clockwise one half of a rotation to permit the gate movement under pressure. Do not “cheat”.

To open the valve: Rotate the handwheel counter-clockwise until the gate stops at the bonnet.

To close the valve: Rotate the handwheel clockwise until the gate stops at the bottom.



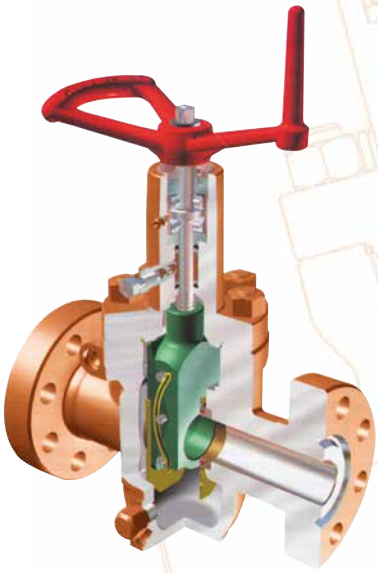
4.0 FEATURES M & HM

Full bore through-conduit: The through-conduit design of the model “M” & “HM” gives a full round bore. Destructive turbulence is eliminated.

Seals without lubrication: Model “M” & “HM” gate valves do not require lubrication for positive sealing in normal operation. Lubrication can be employed as an emergency measure to help effect a temporary seal in the event the gate or seals have become damaged by foreign matter in the valve.

Two safety-capped grease fittings are provided so that the entire valve body can be filled with grease.

Repackable under pressure: APV plastic stem packing can be added to the packing box while the valve is under pressure.



Seat inserts give double seal: Seat inserts of PTFE (tetrafluoroethylene resin) give an initial PTFE-to-metal seal in addition to the metal-to-metal seal which is obtained when the gate assembly is fully expanded. All metal to metal stellite faced seating also available.

MODEL M

TRIM TYPES

Application	*H2S	**CO2	Fluid Class
General Service (A) Non Corrosive	<0.05	<7	AA
General Service (B) Slightly corrosive (Low CO2)	<0.05	7 to 30	BB
General Service (C) Moderately to highly corrosive (High CO2)	<0.05	>30	CC
Sour Service (D) Meets Nace MR-0175 H2S	<0.05	<7	DD
Sour Service (E) Slightly corrosive H2S (Low CO2)	<0.05	7 to 30	EE
Sour Service mod. (H) to highly corrosive (High CO2 + H2S)	<0.05	>30	FF
Sour Service mod. to highly corrosive and chlorides (High H2S high CO2)	<0.05	>30	HH

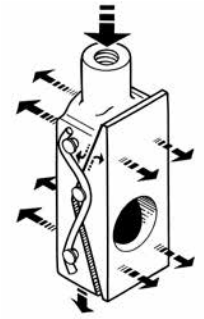
*Hydrogen sulphide partial pressure (in psi a) as defined by NACE MR - 01 - 75
**Partial pressure of carbon dioxide (in psi a).
Formula: Partial pressure (PP) = well pressure (psi) X percent of constituent in total well fluid X 1/100
Example: CO2 PP= 3000 psi X 4% x 1/100 = 120 psi*
Material must be chosen to resist CO2 weight loss corrosion.

4.1 RUGGED & DEPENDABLE PROVEN DESIGN

The APV API6A valve is designed for the primary control of high pressure gas and fluid. The valve is a through-conduit type allowing positive closure of the full bore. In both the open/close positions the expanding gate is forced into contact with the seats by the wedging force derived from the design of the gate.

The gate assembly design is a two-piece design with the stem to gate interface on the gate major segment sub-assembly. The gate assembly is bored with the port size, and milled with the “V” surface to accommodate the minor segment sub-assembly.

The gate assembly design uses the “V” to force the two segments out and into contact with the seats as shown in the illustration. The lateral travel generated with this design promotes a complete seal between the seat and gate. This feature promotes the use of this valve in all pressure ranges when a positive seal is required with no pressure assisting the closure.



CONCEPT OF EXPANDING GATE (MODEL M & HM)

(Solid Floating Gate also available type FC)

4.2 FIELD PROVEN DESIGN FEATURES

Integral cast steel body of the valve meets or exceed the API Standard 6A and NACE MR-01-75 requirements. Forged body also available.

Bonnet on the valve uses standard field service tools for valve maintenance.

External grease fitting to ensure easy access for lubrication.

Coated stems for reduced friction. High Efficiency Thrust Bearings are used to reduce torque to a minimum.

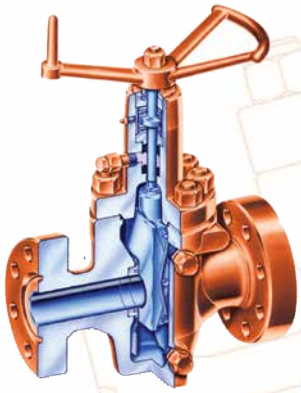
Secondary plastic packing injection port for emergency pack-off.

Auxiliary operators are easily installed.

Expanding gate assembly ensures a positive seal. The M series valve offer a dual sealing design with an elastomeric low pressure seal in addition to metal-to-metal high pressure sealing. All metal to metal stellite faced seating also available. Floating seated style with pressure energised solid slab is also available (Type FC).

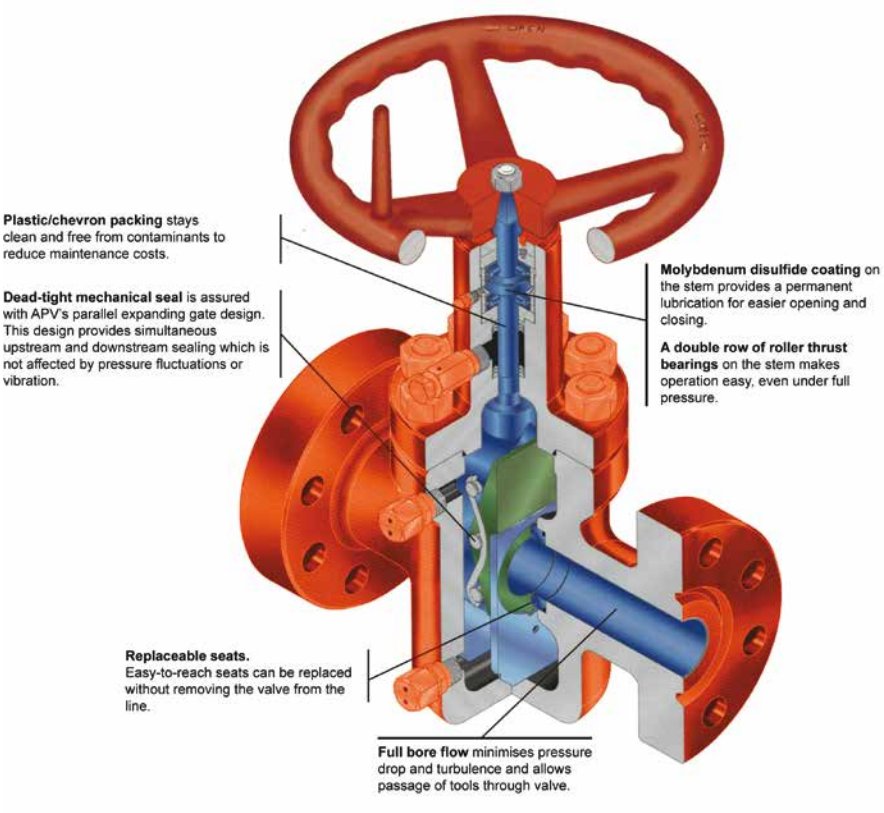
Seat design eliminates the seat from being displaced from the pocket by high pressure. The seats are field replaceable without moving the valves from the tree.

Trims available for eight standard service environments. Special trims are available on request from APV to meet the most demanding environments.

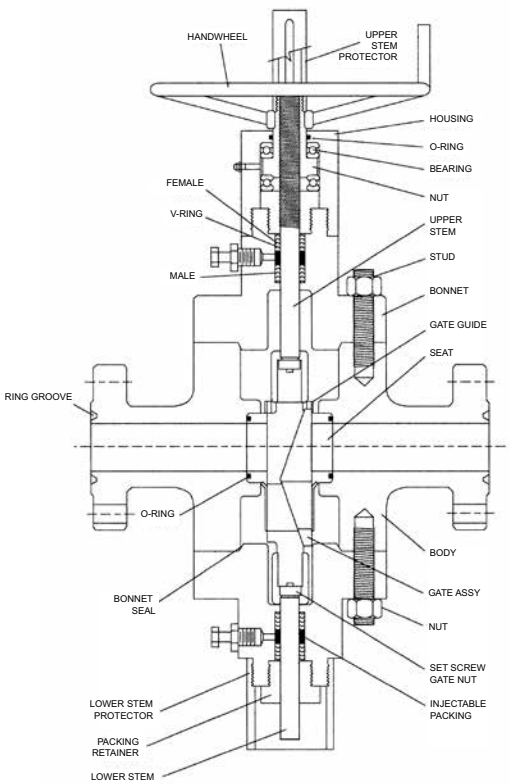


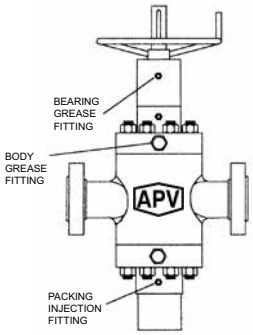
MODEL M

EXPANDING SEAL



MODEL M Working pressure: 2,000, 3,000 and 5,000 psi





MODEL HM Working pressure: 10,000, and 5,000 psi

Indicative drawing only, design will vary according to size and rating.

5.0 INSTALLATION & OPERATION M & HM

5.1 INTRODUCTION

'M' and 'HM' Style Gate Valve for working pressures 3,000 through 5,000 (Figure 1).

Manually controlled valves are standard with expanding split gate style along with non-rising stems. Fittings are supplied for body lubrication, bearing lubrication as well as restoration of stem packing. The particular wedging motion of the gate offers a positive mechanical gate seat seal on both the upstream and downstream sides of the valve; however, the valve incorporates a preferred direction of installation. The best course of flow is clearly marked by having an arrow on the valve body.

'HM' Style Gate Valve for working pressures 10,000 through 15,000 (Figure 2).

Manually controlled valves are standard with expanding split gate style along with pressure balancing stems. Fittings are supplied for body lubrication, seat lubrication, bearing lubrication as well as restoration of stem packing. The particular wedging motion of the gate offers a positive mechanical gate seat seal on both the upstream and downstream sides of the valve; however, the valve incorporates a preferred direction of installation. The best course of flow is clearly marked by having an arrow on the valve body.

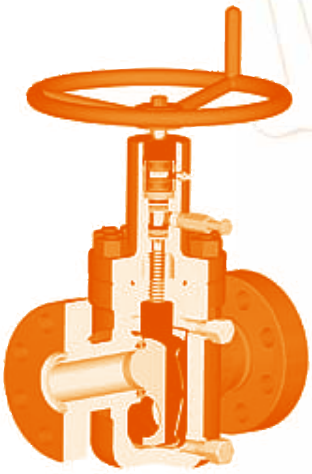


FIGURE 1 'M'

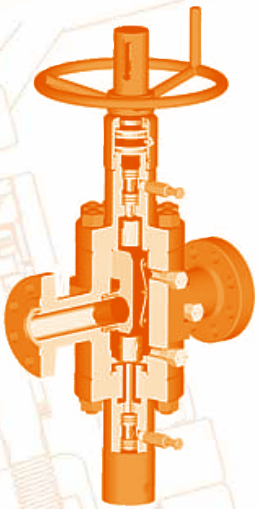


FIGURE 2 'HM'

The standard configuration for an actuated valve includes a slab gate, floating seats and a blind bonnet in place of the lower bonnet on manually operated valves. Actuator/bonnet assemblies and actuated valve assemblies also include an optional manual override device.

5.2 INSTALLATION INSTRUCTIONS

As soon as an APV gate valve has been assembled as well as tested it is thoroughly lubricated. A protective coating is put on all flange seal surfaces and threads exposed to the environment. Lubricants such as Molybdenum Disulfide, Xylan, etc., are used to coat gates, seats, stems and other internal parts before assembly. It is very important to preserve the protective coatings and lubricants before installation.

In order to avoid damage to gate and seat sealing surfaces, all valves are shipped in the open position. The valve needs to be left in the open position until installation is complete. If it is necessary to transport the valve, it must always be put into the open position.

When a hydrostatic test is conducted before installation, the valve cavity needs to be drained of test fluids and refilled using suitable lubricant. CAUTION: If hydrostatic tests that exceed the working pressure are needed, they have to be performed whilst the valve is in the open or partially open position.

5.3 OPERATING INSTRUCTIONS

APV slab gate valves have to be fully open or closed to correctly wedge the gate segments up against the seats. Once fully opened or closed, do not back off on the handwheel. The process will release the mechanical wedging action of the gate segments. The required number of turns to operate each APV valve is shown in Table 1 and Table 2.

'M' 3,000 Through 5,000 WP

Nominal Size (inches)	No. of Turns
2 1/16"	13
2 9/16"	16
3 1/8"	20
4 1/16"	25
5 1/8"	31
7 1/16"	42

TABLE 1

'HM' 10,000 Through 15,000 WP

Nominal Size (inches)	No. of Turns
1 13/16"	12
2 1/16"	14
2 9/16"	15
3 1/16"	18
4 1/16"	23

TABLE 2

6.0 MAINTENANCE M & HM

When shipped, all APV valves are fully lubricated and serviced. Once installed, well cleaned up, cementing operations, hydrofrac, acidizing, etc., can move lubricants from the body cavity. This could leave particles and fluid which is often damaging to the gate and seat sealing surfaces. It is strongly recommended to empty, vent and lubricate valves after such operations.

A routine procedure of draining the valve body is a great way to increase the efficient life of the valve. At the very least lubrication upkeep will certainly improve the life of the valve and ensure trouble free

operation. APV accredited Field Service Personnel are available to guide you through Valve Maintenance Programs.

6.1 MAINTENANCE EQUIPMENT

To facilitate the necessary valve maintenance we recommend the following equipment: Pressure releasing tool for Alemite grease fittings, Alemite grease gun, Alemite P/N 6713, with needle valve and adapter or equivalent.

Caution

When lubricating the seats, do not exceed the maximum working pressure of the valve. Once the lubricating operation has been completed, operate the valve several times allowing the grease to be distributed over the face of the seats and gate.

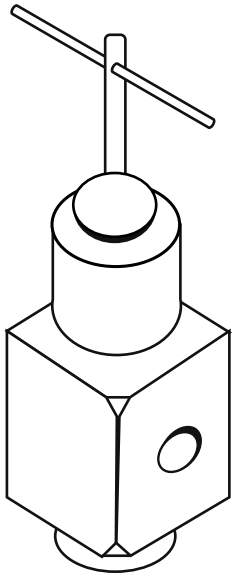


FIGURE 3
Safety Pressure Releasing Tool

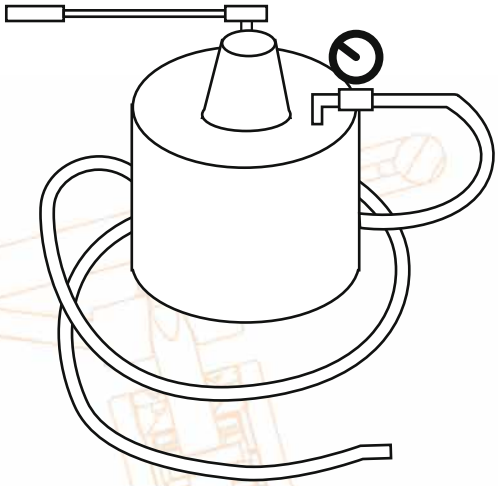


FIGURE 4
Alemite Grease Gun

6.2 IDENTIFICATION & SERVICING OF FITTINGS

In the lubrication and servicing procedures, references to fittings may be identified and located per the following figures.

Lubrication Fitting Indentification	
1	Bearing Lubrication Fitting
2	Packing Injection Fitting
3	Drain Port/Cavity Lube Port
4	Seat Sealant Injection Port

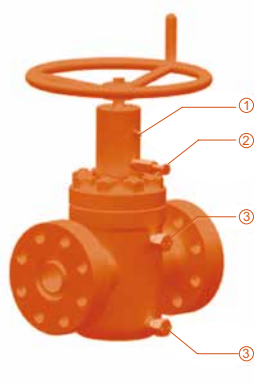


FIGURE 5
(Model M)

FIGURE 6
(Model HM)

6.3 STEM BEARING LUBRICATION

Valves are equipped with a standard 1/8" Alemite grease fitting for stem bearing lubrication. A good grade of #3 grease is recommended for this lubrication. Only a small amount of grease is required. Over lubrication will result in leakage around the stem.

Caution

APV gate valves must be removed from service to perform any work on bearings.

6.4 BODY LUBRICATION

1. Regular body lubrication can help keep valves operating freely and prolong their service life. Typically, Desco 111 (HS) is suggested. Body lubricant can be substituted using a non soluble, good grade lube, e.g. #3, #4 of #5. As a guide use one pound of grease per inch of valve bore size. This will be a sufficient amount to lubricate the valve body. The valve body doesn't need to be completely filled.

Caution

Lubricating pressure must not exceed the rated working pressure of the valve being lubricated. A pressure gauge should be used to monitor lubricating pressure.

Each valve comes with two safety ball check grease fittings attached to the body of the valve. Lubrication requires the use of a safety pressure release tool and a high pressure grease gun complete with a coupling and needle valve. The needle valve enables you to shut off flow in case the ball check in the fitting fails to reseat.

2. Operate the valve either to it's fully open or fully closed position.
3. Remove safety caps from body grease fittings and install the grease pump to one and the pressure releasing tool to the other.
4. Run the pressure release tool to bleed body pressure. Leave the stinger in this particular position.
5. Inject lubricant through the other body grease fitting.
6. Once the lubrication is complete, remove the grease pump and pressure release tool.
7. Secure the safety caps on each body grease fitting.

6.5 STEM PACKING

1. Plastic packing may be injected into the valve stem packing box through the stem packing fitting located in the valve bonnet in order to stop or prevent leakage that may occur around the stem or packing gland.

Use caution if this procedure is being done while the valve is in service and under pressure. Stem packing is supplied in easy-to-use stick form and is available for all service conditions. A socket with a speed or ratchet wrench is recommended for this operation.

2. Run the hex head stinger all the way into the stem packing fitting and then back out when you are sure that the ball check has seated. Ball check leakage can be detected through the small hole in the side of the fitting prior to completely removing the stinger.
3. Remove the stinger and insert one stick of packing.
4. Reinstall the stinger to inject the packing.
5. Repeat if necessary, inserting only as much packing as is required to stop any leakage.

Excessive packing pressure will cause the stem to bind, making operation of the valve difficult.

6.6 VENTING AND DRAINING

1. Regular draining of valve bodies will help to increase valve life and minimise damage to the valve due to build up of foreign matter. Such accumulation can prevent the valve from fully closing which may lead to damage to the seat and gate segment sealing surfaces.
2. Position the valve in a fully open or fully closed position.
3. Remove one of the body grease fitting safety caps and install a pressure release tool.
4. Screw the stinger of the pressure release tool into the fitting to bleed body pressure and allow the valve to vent or drain.
5. After venting or draining, back the stinger out from the pressure release tool to reseat the ball check.
6. In the event the initial draining is not sufficient, repeat the procedure.
7. After draining is finished, the valve needs to be be lubricated (Section 6.4).

6.7 REGULAR PREVENTATIVE MAINTENANCE

Regular routine draining and body lubrication is the most effective way to reduce issues caused by foreign matter in the valve body. If a routine procedure cannot be implemented, valves should be drained at the following times:

- Following a well arrival and clean up.
- Following any cementing or fracturing procedure.
- Whenever the valve becomes difficult to operate or will not fully open or close by the required number of handwheel turns. Operate the hex head stinger all the way into the stem packing fitting and then back out when you are certain that the ball check has seated. Ball check leakage is usually detected through the small hole in the side of the fitting before completion.

7.0 TROUBLESHOOTING M & HM

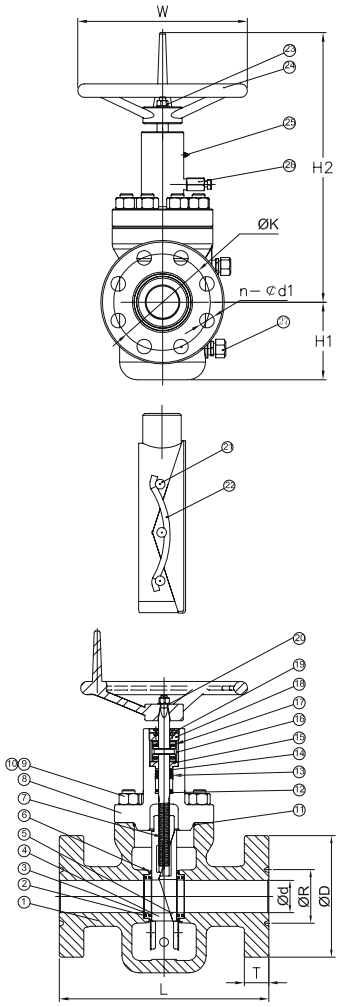
TROUBLE	PROBABLE CAUSE	REMEDY
Will not open or close	Restriction in body cavity	Work handwheel back and forth. If ice is suspected, see procedure below
Hard to operate	Insufficient lubricant	See lubrication procedure
	Accumulation of mud, sand or other foreign matter in valve body	See draining and lubrication procedure
	Stem thread damage	Repair or replace
	Gate spring broken or off	Repair or replace
	Pressure in body greater than upstream or downstream pressure	See venting procedure
Restricted bore in valve	Gate not properly aligned with the bore of seats	Stroke valve fully several cycles from full open to full closed position
Erratic Operation	Bearing needs to be lubricated	Lubricate bearings
	Bearings are broken	Replace bearings
	Stem threads damaged	Back up from hard operating spot before continuing in one direction. Replace at first opportunity
	Gate spring broken or off	Repair or replace
Leaking bonnet flange	Loose bonnet connection	Isolate from pressure, bleed down cavity and tighten bonnet bolting
	Damaged bonnet seal ring	Replace seal ring
Leaking around stem	Packing and/or stem damaged	Inject with plastic
		Replace packing or stem
Will not seal downstream	Worn or damaged gate and seats	Inject grease in body. Replace seat at first opportunity
Grease fitting leaking	Safety cap not tight	Tighten safety cap or replace fitting when practical.

APPENDIX 1

MODEL 'M' PARTS LIST

ITEM	PART NAME	MATERIAL	QUANTITY	REMARK
1	Body	ZG30CrMo(A487 4C,60K)	1	
2	Seat	410+HF	2	QPQ Nitriding
3	Seat Insert	RPTFE	4	
4	Gate Body	410+HF	1	QPQ Nitriding
5	Gate Segment	410+HF	1	QPQ Nitriding
6	Gate Guide	Stainless Steel	2	
7	Stem	410+HF/17-4PH+HF	1	QPQ Nitriding
8	Bonnet	30CrMo(AISI4130,60K)	1	
9	Stud	ASTM A193 B7M	8	Zinc plated
10	Nut	ASTM A194 2HM	8	Zinc plated
11	Bonnet Ring	316SS	1	
12	Packing	RPTFE	1	
13	Packing	RPTFE	3	
14	Packing	RPTFE	1	
15	Packing Gland	Low Alloy Steel	1	Zinc plated
16	Bearing Bushing	Carbon Steel	1	Zinc plated
17	Bearing	SS316	2	metal to metal
18	Bearing Nut	Carbon Steel	1	Zinc plated
19	Bearing Lock Nut	Carbon Steel	1	Zinc plated
20	Washer	Carbon Steel	1	Zinc plated
21	Pin	Stainless Steel	6	QPQ Nitriding
22	Spring	X-750	2	
23	Nut	ASTM A194 2HM	1	Zinc plated
24	Handwheel	Ductile Iron	1	
25	Grease Fitting	Stainless Steel	1	
26	Packing Injection	Stainless Steel	1	
27	Grease Injection	Stainless Steel	2	

Indicative only, parts will vary depending on sizes & ratings. Refer to as-built drawings.
Refer page 12 & 16 for 'HM' design.



APPENDIX 2

API6A MATERIAL SERVICE CATEGORIES & RATING LEVELS

Overview Standards

Australian Pipeline Valve (APV) standards comply with technical specification API-6A. The description for APV valves consist of a general description, working pressure, temperature rating, material class rating, product specification level (PSL) and performance requirement (PR). These ratings are defined in the following API-6A tables.

To comply with API-6A, APV offers:

Pressure ratings in psi: 2000, 3000, 5000, 10,000 & 15,000. Temperature ratings: L, P, R, S, T, U, V, X & Y.
Material class: AA, BB, CC, DD, EE, FF & HH.
Product specification level: 1, 2, 3 & 4 (PSL 1, 2, 3, 4)
Performance requirement: 1 & 2.

RECOMMENDED MINIMUM PSL FOR PRIMARY PARTS

NACE	No	Yes	Yes	Yes	No	Yes
High H2S Concentrate	No	No	Yes	No	No	Yes
Close Proximity*	No	No	No	Yes	Yes	Yes
Rated Working Pressure, PSI						
	PSL	PSL	PSL	PSL	PSL	PSL
5,000	1	1	2	2	1	3
10,000	2	2	3	3	3	4
15,000 and up	3	3	4	4	4	4

*See paragraph A5 of API-6A 17a. Ed.

PR1 is standard
PR2 also available (increased cycle times on test required)

API MATERIAL REQUIREMENTS

	MINIMUM MATERIAL REQUIREMENTS	
MATERIAL CLASS	**BODY, BONNET & FLANGE**	**PRESSURE CONTROLLING PARTS**
AA - General Service	Carbon or low allow steel	Carbon or low allow steel
BB - General Service	Carbon or low allow steel	Stainless Steel
CC - General Service	Stainless Steel	Stainless Steel
DD - Sour Service[a]	Carbon or low allow steel[b]	Carbon or low allow steel[b]
EE - Sour Service[a]	Carbon or low allow steel[b]	Stainless Steel[b]
FF - Sour Service[a]	Stainless Steel[b]	Stainless Steel[b]
HH - Sour Service[a]	CRAs[bcd]	CRAs[bcd]

As per API6A (ISO 10423) 2013:
[a] As defined by ISO 15156 (all parts) (NACE MR0175) (See API6A)
[b] In compliance with ISO 15156 (all parts) (NACE MR0175) (see API6A)
[c] CRA required on retained fluid-wetted surfaces only; CRA cladding of low-alloy or stainless steel is permitted (See API6A)
[d] CRA as defined in API6A; ISO 15156 (all parts) (NACE MR0175; see API6A) definition of CRA does not apply.

API TEMPERATURE REQUIREMENTS

TEMPERATURE CLASSIFICATION	OPERATING RANGE					
	F°			C°		
	MIN.		MAX.	MIN.		MAX.
K	-75	to	180	-60	to	82
L	-50	to	180	-46	to	82
N	-50	to	140	-46	to	60
P	-20	to	180	-29	to	82
R*	Room Temperature*					
S	0	to	140	-18	to	60
T	0	to	180	-18	to	82
U	0	to	250	-18	to	121
V	35	to	250	2	to	121
X*	0	to	350	-18	to	177
Y*	0	to	650	-18	to	343

* No longer referenced in API6A/ISO 10423-2013

API PRESSURE/TEMPERATURE RATINGS (Y)*

	TEMPERATURE IN ºF								
	0 to 250	300	350	400	450	500	550	600	650
Rated Working Pressure PSI	2000	1955	1905	1860	1810	1735	1635	1540	1430
	3000	2930	2860	2785	2715	2605	2455	2310	2145
	5000	4880	4765	4645	4525	4340	4090	3850	3575

* Based on 'Y' Temp. Due to elastomers, Gate Valves & Chokes are temp 'T' as standard hence consult seperate chart.

PSL (PRODUCT SPECIFICATION LEVEL) MATERIAL REQUIREMENTS

PSL Material Control is found in API Specification 6A, Specification for Wellhead and Christmas Tree Equipment Section 400

PSL (PRODUCT SPECIFICATION LEVEL) QUALITY CONTROL

PSL Material Control is found in API Specification 6A, Specification for Wellhead and Christmas Tree Equipment Section 400

PSL (PERFORMANCE REQUIREMENTS) LEVELS

There are two Performance Requirement Levels, PR1 and PR2. The latter represents more rigorous performance requirements. See API Specification 6A, Section 300 and Section 900.
Section 905 covers valves (905.3 - Flowline Valves, 9.5.5 - Actuated Valves).

API6A TRIM TYPES

TRIM CODE	API SPEC, 6A RETAINED FLUID RATING	TRIM TYPE
T-21	AA	**STANDARD TRIM** For essentially non corrosive liquids or gases. Typical are crude and reined oils, natural or refined gases and processed hydrocarbons. Typical uses are wellheads, manifolds flowlines, and other similar installations requiring a through conduit valve. The temperature limitations are 0º to 250ºF (-17.7ºC to 121ºC).
T-22	BB	**STAINLESS TRIM** For substantially the same service as T-21 but where the corrosion resistance of 13% Chrome Stainless Steel internal parts are desirable. Also usable for mildly corrosive fluids and gases where limited corrosion of the internal body surfaces can be tolerated. The temperature limitations are 0º to 250ºF (-17ºC to 121ºC). Recommended when partial pressure of CO2 is greater than 7.3.
T-23	CC	**FULL STAINLESS STEEL TRIM** For any liquid or gaseous product for which the resistance of the 13% Chrome Stainless is adequate. Also used where the resistance of Stainless Steel is desirable from the standpoint of product purity. The temperature limitations are 0º to 250ºF (-17.7ºC to 121ºC). Recommended when partial pressure of CO2 is greater than 30.
T-24 S-24	DD EE	**SOUR GAS & OIL** Primarily for sour gas and oil where resistance to Hydrogen Sulfide embrittlement is required. Also suitable for other chemicals, products or hydrocarbons when H2S is present. May be used when CO2 is present in smaller amount then H2S. The temperature limitations are 0º to 250ºF (-17.7ºC to 121ºC).
T-26	FF	**STAINLESS SOUR GAS AND OIL TRIM** Primarily for sour gas and oil when the CO2 exceeds the H2S content. It is intended to provide resistance to the metal loss type of corrosion usually associated with CO2, plus resistance to Hydrogen Sulphide embrittlement. The temperature limitations are 0º to 250ºF (-17.7ºC to 121ºC).
T-27		**WATERFLOW (UNINHIBITED)** Primarily for use in untreated or uninhibited brackish saline water typically associated with oilfield waterflood projects and/or disposal wells in which the internal plastic coating of the body surfaces provides resistance to salt water corrosion. The internal parts are also resistant to Sulfide embrittlement and corrosion. The temperature limitation are 0º to 250ºF (-17.7ºC to 121ºC).
T-36	AA	**LOW TEMPERATURE – STANDARD TRIM – GENERAL OILFIELD** For essentially non-corrosive liquids or gases. Typical examples are crude and refined oils, natural or refined gases and processed hydrocarbons. Typical uses are wellheads, manifolds, flowlines and other similar installations requiring a through conduit valve. The temperature limitations are -50º to 180ºF. (-45ºC to 82ºC).
T-37 S-37	DD EE	**LOW TEMPERATURE – SOUR GAS AND OIL** Primarily for sour gas and oil where resistance to Hydrogen Sulphide embrittlement is required. Also suitable for other chemicals, products or hydrocarbons where H2S is present. May be used when CO2 is present in smaller amounts than H2S. The temperature liitations are -50ºC to 180º F (-45ºC to 82ºC).

SPECIAL TRIMS AND TEMPERATURE RANGES AVAILABLE UPON REQUEST.

VALVE TRIM CHART FOR API6A GATE & CHOKE VALVES

API6A TEMPERATURE CLASS P: SERVICE -20°F TO 180°F (-29°C TO 82°C)

SERVICE	TRIM	API MATERIAL CLASS	PRESSURE RATING PSI	MATERIALS				
				BODY & BONNET	BONNET SEAL	GATE & SEGMENT	SEAT	STEM
General Oilfield Gas, Oil	T21	AA	2,000 3,000 5,000	Carbon or Low Allow Steel	CS	4130 w/QPQ	4130 w/TFE[2]	4130 w/MDC[5]
General Moderately Corrosive CO^2	T22	BB	2,000 3,000 5,000	Carbon or Low Allow Steel	SS	410	410	17-4PH w/MDC[5]
General Moderately Corrosive CO^2	T23	CC	2,000 3,000 5,000	API 60K CA6NM Stainless Steel	SS	410	410 w/TFE[2]	17-4PH w/MDC[5]
Sour (H_2S) Service NACE[4] MR01-75	T24	DD	2,000 3,000 5,000	API 60K Alloy Steel	SS	4130 or 17-4PH Nitrided	4130 w/TFE[2]	17-4PH w/MDC[5]
Sour (H_2S) Service NACE[4] MR01-75	S24	EE	2,000 3,000 5,000	API 60K Alloy Steel	SS	4130 or 17-4PH Nitrided	410 w/TFE[2]	17-4PH w/MDC[5]
Corrosive (CO^2) & Sour (H_2S) NACE[4] MR01-75	T26	FF	2,000 3,000 5,000	API 60K CA6NM Stainless Steel	SS	17-4PH	17-4PH w/TFE[2]	17-4PH w/MDC[5]
Waterflood	T27	EE	2,000 3,000 5,000	API 60K Alloy Steel w/Plastic Coat	SS	17-4PH	17-4PH w/TFE[2]	17-4PH w/MDC[5]
API 6A TEMPERATURE CLASS L: SERVICE -50ºF TO 180ºF (-46ºC TO 82ºC)								
General Oilfield Gas, Oil	T36	AA	2,000 3,000 5,000	API 60K Alloy Steel	CS	4130	4130 w/TFE[2]	17-4PH w/MDC[5]
Sour (H^2S) Service NACE[4] MR01-75	T37	DD	2,000 3,000 5,000	API 60K Alloy Steel	SS	4130	4130 w/TFE[2]	17-4PH w/MDC[5]
Sour (H_2S) Service NACE[4] MR01-75	S37	EE	2,000 3,000 5,000	API 60K Alloy Steel	SS	17-4PH	4130 w/TFE[2]	17-4PH w/MDC[5]

1	QPQ	NITRIDE
2	TFE	TEFLON
3	HF6	STELLITE #6
4	CHARPY	V NOTCH IMPACT TEST
5	MDC	MOLYBDENUM DISULFIDE COATING

This list is provided as a guide only. Australian Pipeline Valve reserves the right to provide alternatw materials without prior notice.

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