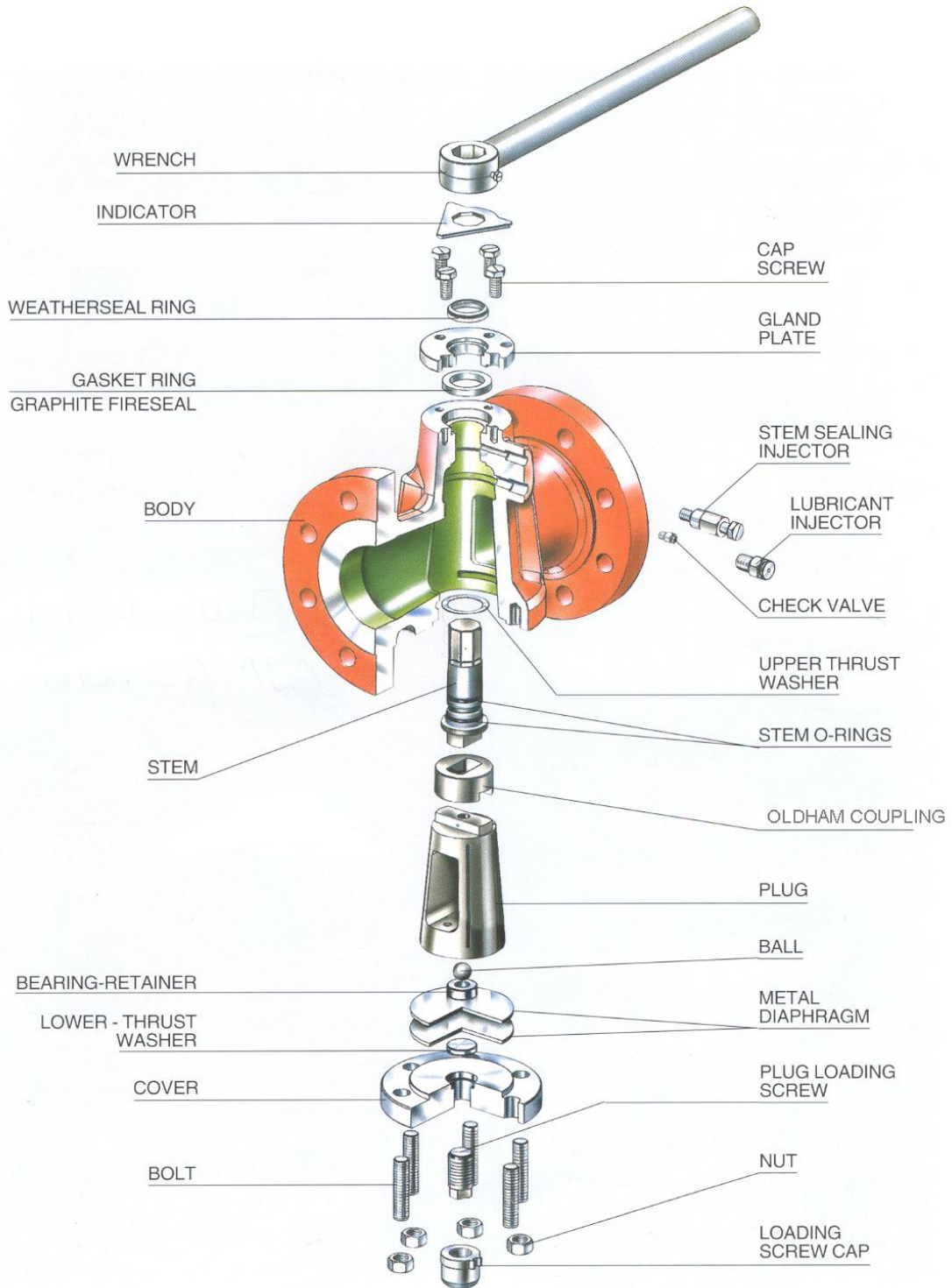


LUBRICATED PLUG VALVES PRESSURE BALANCED TYPE

OPERATING & MAINTENANCE MANUAL



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1. SCOPE

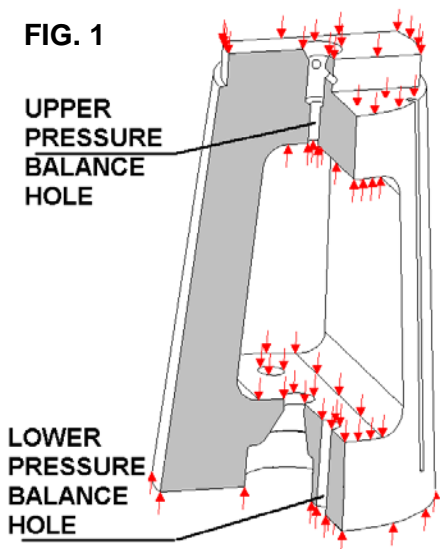
Scope of this manual is to provide to the end user all the informations for:

- operating GC plug valves;
- the maintenance of GC plug valves;
- safety for the operating staff.

2. PRODUCT DESCRIPTION

The design, based on the principles of standard taper plug valve, has been modified with the inclusion of some technical characteristics, some of them listed below, that have extended the application range of plug valves to larger sizes (up to 30") and to higher operating pressure (ANSI Class 2500 / API 10000) :

- pressure balance system (see Fig. 1) : reduction of torque values and of ordinary maintenance frequency.
- inverted plug position: stem not integral with plug but jointed to plug by means of an Oldham coupling;



Seating is metal to metal, bubble tightness is guaranteed by a film of lubricant between the mating surfaces of plug and body.

On-off service is the right application for GC plug valves.

GC plug valves are supplied comprehensive of:

- Lubricant injector fitting (Fig. 2);
- Stemsealing injector fitting (Fig. 3);
- Anti blow-out stem design starting from 1.5" (40) size ;
- Fire safe design ;
- Locking device (optional);
- Stem extension (optional).

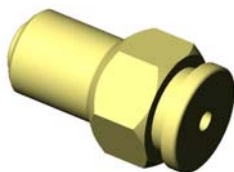


Fig. 2



Fig. 3

3. HANDLING

Lift valves using suitable lifting equipment fixing chain or sling around the body valve. Do not lift valves using gear operator, wrench , handwheel, stem extension or fittings. Use lifting lugs if available.

Valves shall be lifted by trained personnel known about the dangers of injuries and death due to a falling loads. Moreover, during the a.m. operation, a particular care must be given not to damage raised face flange surfaces or butt welding ends.

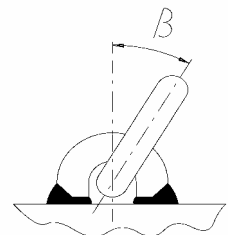
VALVES EQUIPPED WITH WELDED LIFTING LUGS : Before lifting, pay attention to the fact that the corresponding load is being transported by multileg assembly. With the existing angle inclination at the sling means there will be higher loads at the lifting point. Capacity is reduced with angle variation as shown below:

$\beta = 0^\circ$ 100% of design load

$0^\circ < \beta \leq 45^\circ$ 70% of design load

$45^\circ < \beta \leq 60^\circ$ 50% of design load

Valves are fitted with a label wired to the welded lifting lugs indicating valve weight, lifting lugs design load and safety rules here described.



Warning:

- Always check load ring for deformations and secure welds before lifting.
- Do not alter ring in any manner from its original design.
- A falling load can seriously injure or kill.

4. STORAGE

We do not envisage any particular storage instruction except for the place which shall be covered and dry and for the end protections/caps (applied in GC facility before shipping) which shall be kept on.

5. INSTALLATION

Before installing, always:

- remove protections/caps from end connections;
- remove rust inhibitor from end connections;
- check the flow passage inside the valve.

POSITION: Plug valves are bidirectional valves and the stem position doesn't affect their functionality except for valves fitted with hydraulic actuators. In this case the valves working position shall be clearly indicated in the purchase order.

WARNING: No external loads shall be applied to valves end-connections included those coming from wind, hearquake, ice and snow.

WARNING: If the working temperature exceeds 70 °C, the End-user shall provide suitable protection against the possible risk of operating staff contact with hot valve surfaces.

6. PRE-COMMISSIONING

Valves installed in new plants or stored for a long time before installation, should be lubricated as described in section 8. This operation, even if not mandatory, is recommended for all valves installed in a new plant.

7. OPERATING

Geared valves are operated by means of the handwheel. To close the valve, the handwheel is turned clockwise and the position indicator, put on the top of the gear unit, is perpendicular to the direction of the flow. To open the valve, the handwheel is turned anti-clockwise and the position indicator is in the direction of the flow. The indicator on the top of the gear unit moves with the valve stem to give clear indication of the plug position.

Wrench operated valves are normally supplied in the bare shaft state and wrenches are supplied separately. The correct wrench can be identified from the dimensions of the top of the stem of the valve. It is important that only the current wrench is used to operate a valve. The operating sense of the valve is clockwise to close, and anti-clockwise to open.

Actuated valves: see Operating and maintenance manual issued by the original equipment manufacturer.

Valves should be left only in the fully open or fully closed position.

8. ROUTINE MAINTENANCE

GC valves are designed to require the minimum of maintenance. If a valve is operated infrequently or not at all, then it is good practice to exercise it occasionally by moving the plug even partially. To ensure maximum valve life and performance, GC recommend the occasional injection of plug lubricant. Periodic plug lubricant injection may be needed to keep the valve operating torque from increasing and to maintain bubble tight sealing. It is important to use only plug lubricant recommended by GC.

A wrong lubricant selection can:

- a) cause valve leakage;
- b) cause valve seizure;
- c) require valve disassembling for lubricant removing and cleaning.

WARNING: GC is not responsible for any event / damage caused by a wrong lubricant selection different from GC recommendations .

IDENTIFICATION OF INJECTORS : GC plug valves are equipped with a stem packing injector (see Fig. 3) and with a lubricant injector (see Fig. 2).

LOCATION OF LUBRICANT INJECTOR : Lubricant injector is giant button head type and is usually located on the side of the body valve (see Fig. 4).

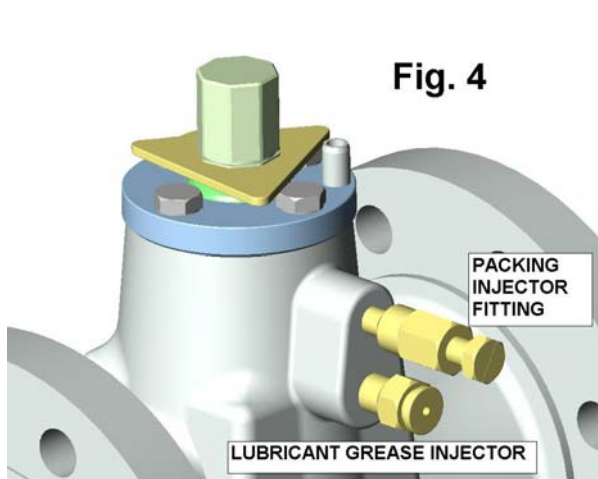


Fig. 4

When stem extension is required or if required by customer specification, lubricant injector is placed on the top of the stem.

EQUIPMENT : High pressure lubricant pump with giant button head coupler and suitable lubricant stick.

FREQUENCY OF LUBRIFICATION:

This depends on the frequency of valve operation, operating conditions and the mechanical condition of the valve. The following lubrication schedule could be an useful guide:

- after a period of 12 months with valve kept in open/closed position: annually
- 10-100 operations per week : daily
- up to 10 operation per week: weekly
- up to 10 operation per year: monthly
- less frequently : twice annually.

LUBRICANT INJECTION : This operation can be done with valve under pressure. If possible, but it's not essential, valve should be in fully open position and manoeuvred in order to spread better the lubricant between plug and seating areas. The following step procedure shall be followed:

- a) Check that the giant button head of the fitting on the valve is clean from dirty / paint.
- b) Make sure that pump is fitted with the recommended lubricant
- c) Connect the pump coupler to the fitting (see Fig.5)
- d) Start to inject lubricant (4 ÷ 6 ksi / 28 ÷ 41 MPa)
- e) Disconnect the lubricant pump

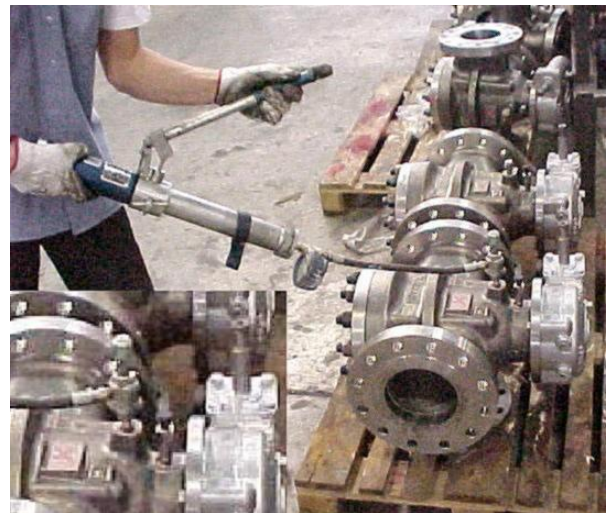


FIG. 5

9. NON-ROUTINE MAINTENANCE

9.1 STEM MASTIC INJECTION

GC plug valves usually do not require further mastic injection after workshop assembling.

In the event of leakage to atmosphere, it is necessary to determinate exactly where the leakage is occurring.

If the leakage is around the stem (i.e. up the side of the stem) it can be stopped by injecting stem sealing compound at the stem sealing injector.

LOCATION OF STEM PACKING INJECTOR : The stem packing injector is placed on the side of the body valve in correspondence of stem (see Fig. 4)

INJECTION OF MASTIC: The stem sealing compound injector has a stud bolt (or a grub screw) in the centre which can be removed. A pellet of stem sealing

compound is placed in the injector and the stud bolt (or the grub screw) reinserted and screwed in until greatly increased backpressure is apparent. This process may be repeated if necessary.

9.2 LEAKAGE THROUGH LUBRICANT FITTING

If a leakage occurs through the lubricant fitting, it can be stopped with an injection of lubricant if the ball of the check valve is not seated. Otherwise remove the pressure and tight the check valve (replace it if damaged).

9.3 PLUG ADJUSTING

If a plug valve leaks across the seats even after:
 a) injection of sufficient lubricant into the valve and valve is still very easy to operate,
 b) after checking that the plug is in the correct closed position (if gear or actuator operated valve),
 then the plug is probably out of adjustment (not in close contact enough with the body seat) and needs to be adjusted into the tapered body seat.

NOTE : Damaged metal seats can also produce these symptoms.

If a plug valve is very hard to operate, even after injection of sufficient lubricant, then the plug could have been pushed too far into the tapered body seat and needs adjusting out a little.

PROCEDURE FOR PLUG ADJUSTING: This operation can be carried out with the valve under pressure.

First identify the lock nut or cap (see fig. 6) that protects the plug loading screw.

It is always located in the centre of the valve cover. Remove the nut / cap by unscrewing it.

To adjust the plug into the body seat, use a proper wrench to tighten the plug loading screw until it becomes significantly harder to turn. It should take no more than a quarter of turn to tighten the plug loading screw, unless the plug loading screw has already been slackened off.

After adjusting the plug loading screw, refit the lock nut or protector cap but do not over tighten it.

To adjust a seized or hard to turn plug out of the body seat, slacken off the plug loading screw by a quarter turn then inject lubricant into the valve : this should turn the plug out sufficiently to make it operate smoothly.

WARNING: Do not over tighten the plug loading screw as this might jam the plug into the body seat.

WARNING: Do not remove the plug loading screw from the valve cover.

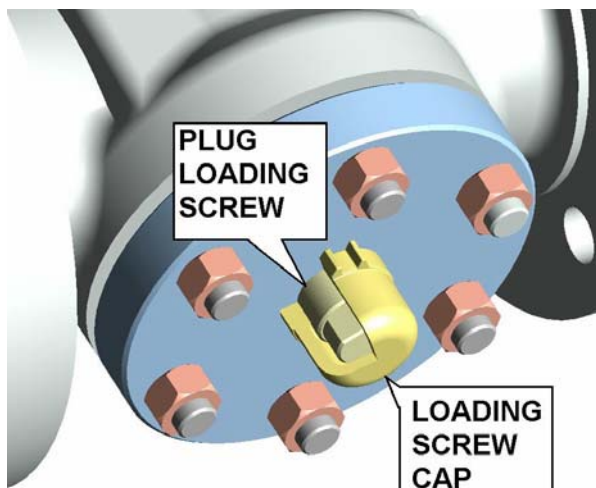


Fig. 6

9.4 ASSEMBLING / DISASSEMBLING PROCEDURE

WARNING: Only authorized personnel by GC can disassemble a GC valve : nevertheless GC is not responsible for any event/damage caused and valve guarantee expires as well. The following procedure must be read carefully before disassembling a GC plug valve.

WARNING: Before removing the valve, make sure that:

- there is no pressure in the line;
- valve is in open or half open position.

For valve components identification, see the coversheet
 9.4.1: Remove valve operator (wrench / gear / actuator) unscrewing its relative cap screw.

9.4.2: Remove stem key (if any).

9.4.3: Remove the cap screws connecting the gland plate to the body valve and the gland plate itself.

9.4.4: If valve is not supplied with stem extension, go directly to point 9.4.8.

9.4.5: Remove the extension pipe (the external one) unscrewing the cap-screws of extension flange/body junction.

9.4.6: Remove the stem extension out of the valve stem after unscrewing out the stop grub screw.

9.4.7: Disconnect the lubricant extension pipe from valve stem.

9.4.8: Remove cover nuts.

9.4.9: Remove cover and lower thrust washer (the plug loading screw can be left screwed in the cover).

9.4.10: Remove metal diaphragms (replace them if damaged), bearing retainer and ball.

9.4.11: Remove the plug.

9.4.12: Remove the Oldham coupling and the stem. In case of plain stem valve, remove also the stem O-ring (replace it if damaged), the graphite ring (always to be replaced) and the upper thrust washer.

9.4.13: Remove valve fittings (stemseal and lubricant injectors, check valve).

9.4.14: After cleaning the metal components with suitable degreaser, check if components have been damaged.

Assembly the valve following the instructions from 9.4.14 up to 9.4.1.

Bolts & cap screws can be lubricated with industrial grease, plugs with lubricant recommended by GC only.

10. MARKING

GC valves are marked in accordance with API 6D – ISO14313 (or API 6A) and PO requirements as indicated in the following figures 7a and 7b:

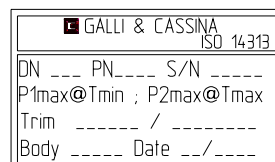


FIG 7a (API 6D)

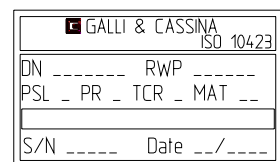


FIG 7b (API 6A)

CAUTION: Any maintenance operation shall not be carry out with valve under pressure if not otherwise specified in this manual or authorized by GC qualified personnel.