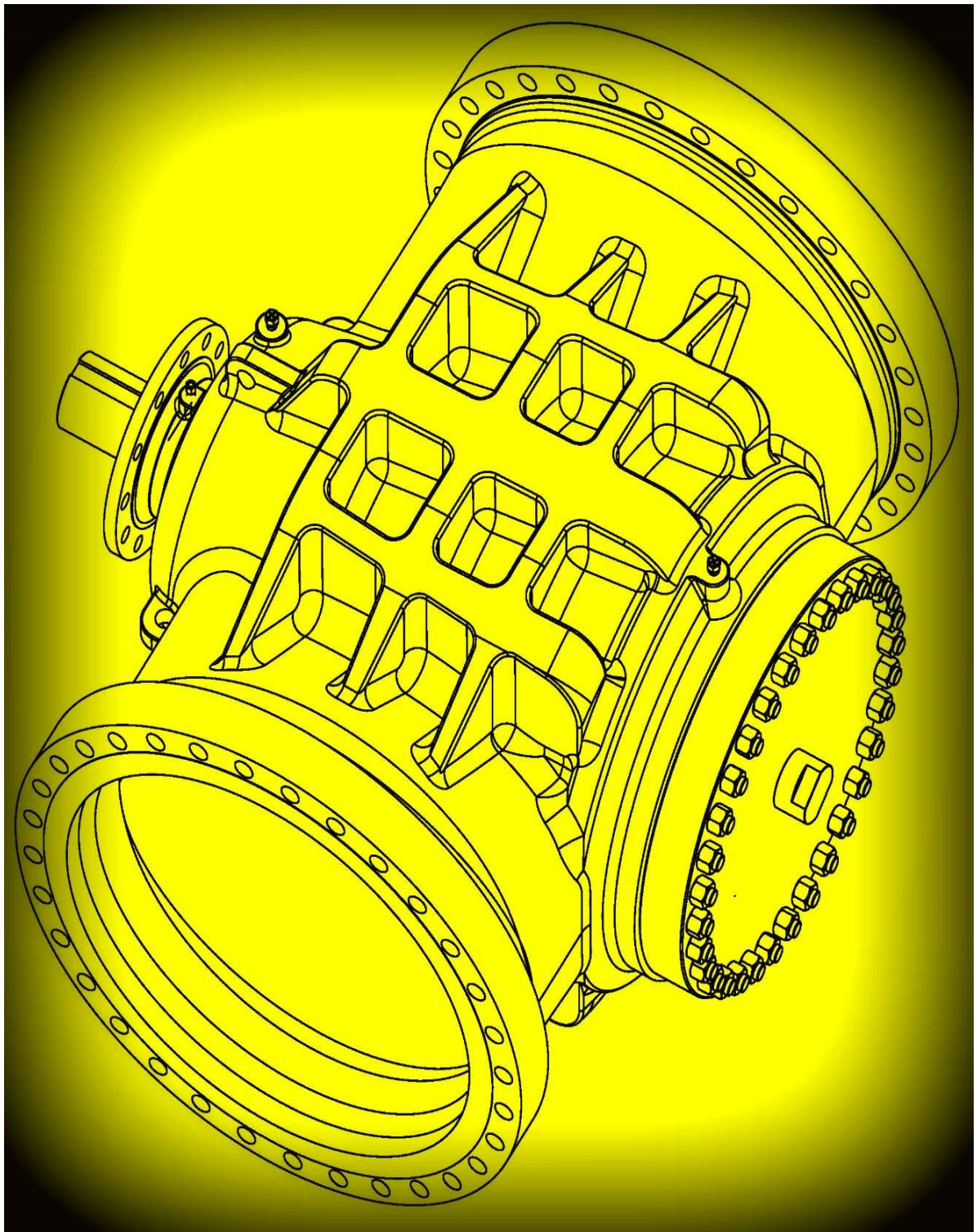


# LUBRICATED PLUG VALVES PRESSURE BALANCED TYPE

## OPERATING & MAINTENANCE MANUAL



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- 2 PRODUCT DESCRIPTION
- 3 HANDLING
- 4 STORAGE
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## 1. SCOPE

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

- operating GC lubricated pressure balance plug valves (also known as inverted lubricated plug valves);
- the maintenance of GC lubricated pressure balance plug valves;
- the safety for the operating staff.

## 2. PRODUCT DESCRIPTION

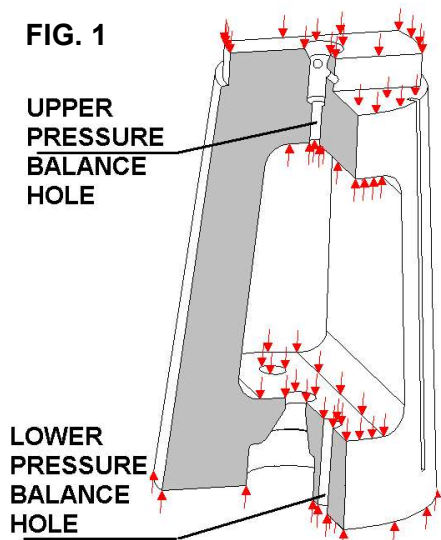
The design, based on the principles of standard taper plug valve, has been modified with:

- 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;

which have extended the application range of plug valves to larger sizes (up to 48") and to higher operating pressure (ANSI Class 2500 / API 10000 ).

The pressure balance system works with the line pressure and balancing is guaranteed by connecting equalizer holes from the line to the bottom and to the top side of the plug.

**FIG. 1**



With the above arrangement, the grease pressure is always at least equal or higher than the line pressure avoiding the possibility of plug pressure locking.

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 lubricated pressure balance plug valves.

GC lubricated pressure balance plug valves are supplied comprehensive of:

- Lubricant injector fitting (Fig. 2);
- Stem sealing injector fitting (Fig. 3);
- Anti blow-out stem design;
- Fire safe design ;
- Locking device;
- Stem extension (optional).

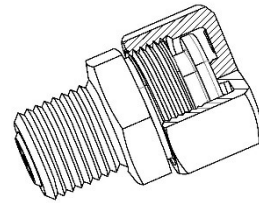


Fig. 2

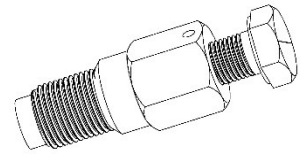


Fig. 3

## 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

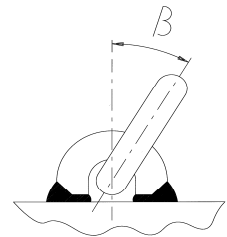
$0^\circ < \beta \leq 45^\circ$  70% of design load

$45^\circ < \beta \leq 60^\circ$  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 valve working position shall be clearly indicated in the purchase order.

**FLOW:** lubricated plug valves are bidirectional valves (as normally valve design is symmetrical) and flow shut-off is guaranteed for downstream side only.

**WARNING:** No external loads shall be applied to valves end-connections included those coming from wind, earthquake, 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**

**Worm gear operated 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.



**Climax 1034MT / G&C S19 are the recommended lubricants unless otherwise specified in GA drawings or in any other applicable document.**

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

If in doubt, contact G&C personnel.

**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 ).

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 / can).

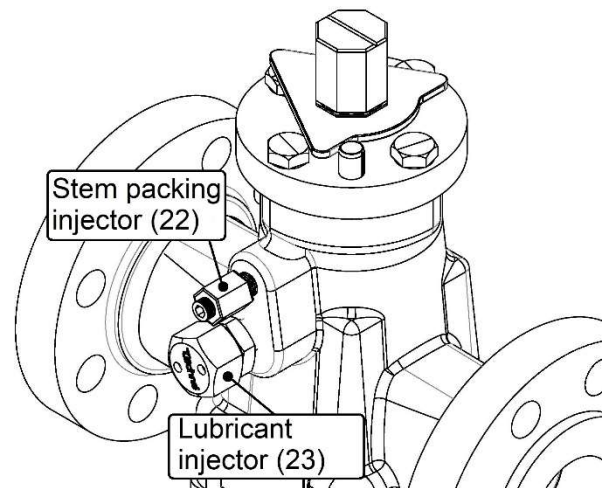


Fig. 4

**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 lubricated pressure balanced 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.

**The recommended stem mastic is CLIMAX PAC-EZ, refer to Appendix 2 for the Material Data Sheet.**

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.

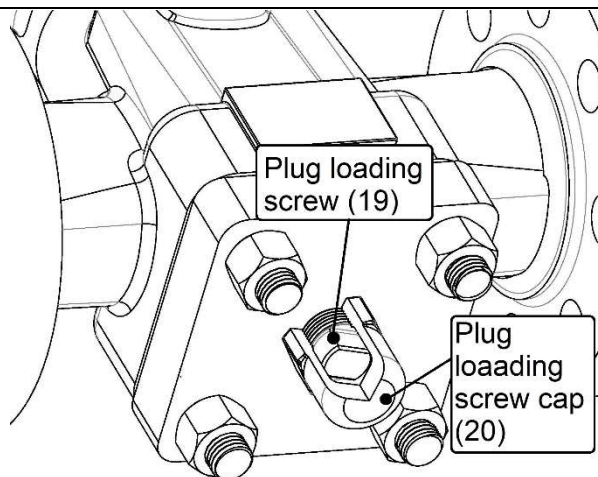


Fig. 6

**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 main line;
- plug is in open or half open position;

Refer to Appendix 1 for components identification.

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 (stem seal and lubricant injectors, check valve).

9.4.14: After cleaning the metal components with suitable degreaser, replace damaged components. If in doubt, ask!

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

Ask to GC qualified personnel for recommended torque values for cover bolting tightening.

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

**10. MARKING**

GC valves are marked in accordance with API6D (24<sup>th</sup> edition) and/or API6A (21<sup>th</sup> edition) as applicable as shown in FIG. 7 and 8 respectively, and Client's requirements (if any, with additional dedicated nameplate(s)).

**10.1 API 6D valves nameplate:**

- Size = NPS (inch);
- Cl. = ASME Pressure class;
- P1max@Tmin = Max. operating Pressure against Minimum Operating Temperature;
- P2max@Tmax = Max. operating Pressure against Maximum Operating Temperature;
- Trim = Plug / Stem material grade;
- Body = Body material grade;
- F-to-F = Face to Face (only if not specified / not in accordance with API 6D/ ASME B16.10;
- QSL = Quality Specification Level (only if required/applicable).



FIG. 7

**11.2 API 6A valves nameplate:**

- Size = NPS (inch);
- RWP = Rated Working Pressure (PSI);
- PSL = Product Specification Level;
- PR = Performance Requirement;
- TCR = Temperature Class;
- MAT = Material Designation;
- END = Size of End Connection (only if not on body) ;

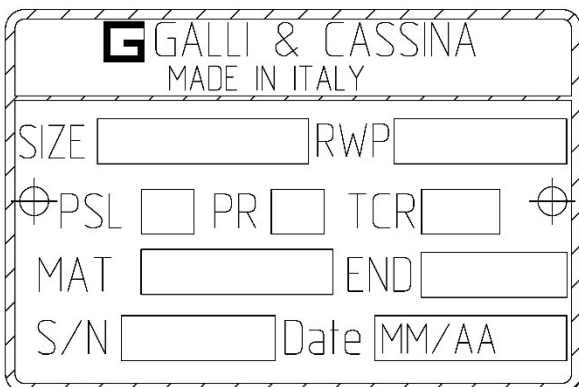


FIG. 8

**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.

**11. NOTES**

- A. Valves are designed for general purposes only, accordingly to customer valve datasheet / purchaser order. GC responsibility is limited to the verification of material suitability against operating and fluid conditions according to all the requirements when operating and fluid conditions are known.
- B. GC is not responsible for any event / damage caused by the use of a GC valve if actual operating conditions are different from those shown in the Purchase Order
- C. GC is not responsible for any event / damage caused by a wrong lubricant selection different from GC recommendations.
- D. Operate Manual valves using only wrenches and or handwheels supplied by GC. Do not introduce any part of body inside handwheel's spokes while operating.
- E. GC plug valves are not provided with protection devices against overpressure exceeding rating values indicated in the nameplate. It is end user responsibility to install proper protection devices in the lines.
- F. Greater values of flow than those of design conditions can increase wear rate: increase inspection frequency.

# APPENDIX 1

## COMPONENTS IDENTIFICATION & SPARE

- **00-PBPV-GAD01** REV00 ( Typical - Lubricated Pressure Balanced Plug Valve - lever operated );
- **00-PBPV-GAD02** REV00 ( Typical Lubricated Pressure Balanced Plug Valve - gear operated );
- **00-PBPV-GAD03** REV00 ( Typical Lubricated Pressure Balanced Plug Valve - stem extension ).

**IMPORTANT NOTES:**

FOR ENQUIRY AND/OR ORDER OF SPARE PARTS, PLEASE PROVIDE THE FOLLOWING INFORMATION:

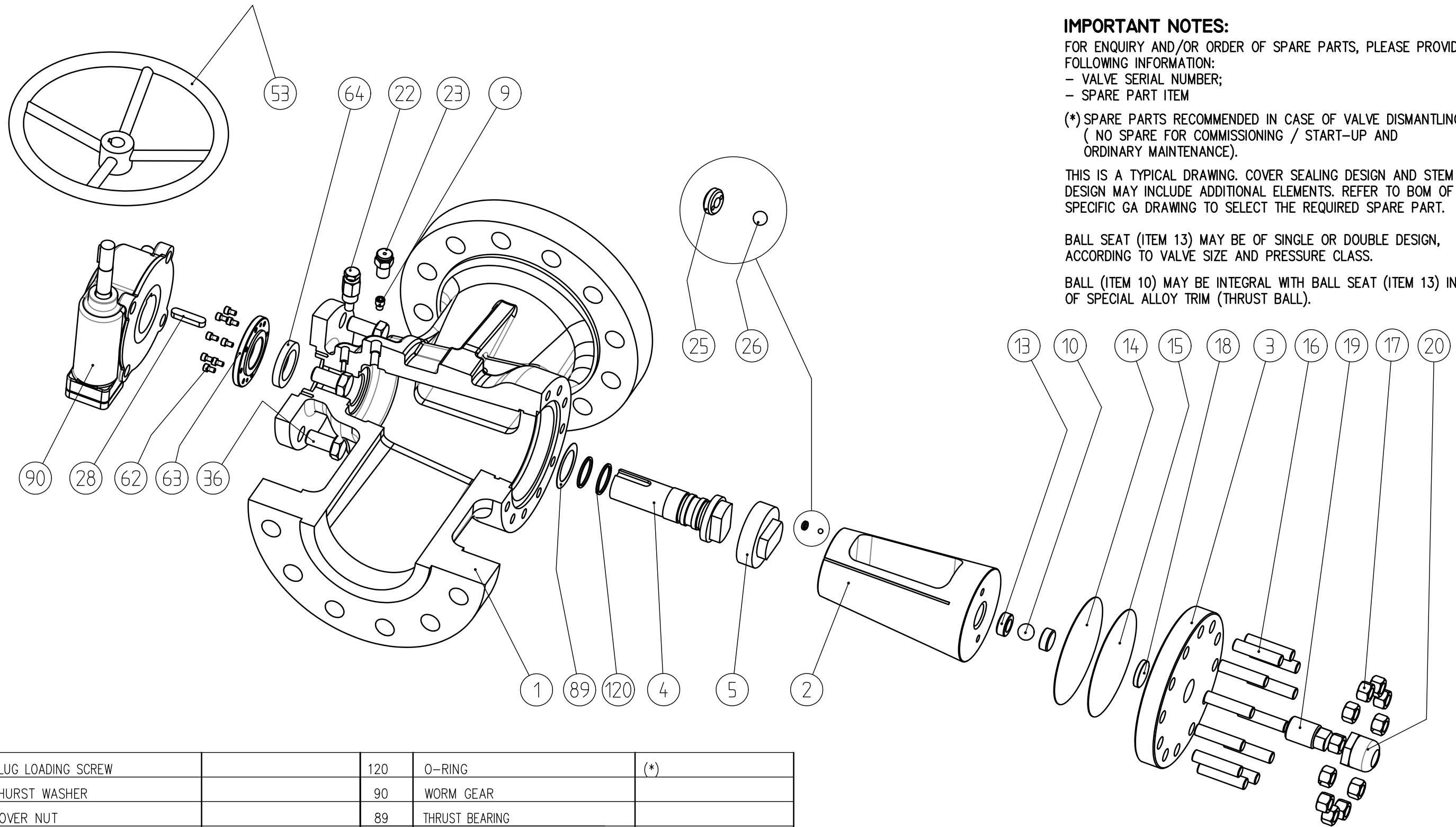
- VALVE SERIAL NUMBER;
- SPARE PART ITEM

(\* ) SPARE PARTS RECOMMENDED IN CASE OF VALVE DISMANTLING ( NO SPARE FOR COMMISSIONING / START-UP AND ORDINARY MAINTENANCE).

THIS IS A TYPICAL DRAWING. COVER SEALING DESIGN AND STEM SEAL DESIGN MAY INCLUDE ADDITIONAL ELEMENTS. REFER TO BOM OF THE SPECIFIC GA DRAWING TO SELECT THE REQUIRED SPARE PART.

BALL SEAT (ITEM 13) MAY BE OF SINGLE OR DOUBLE DESIGN, ACCORDING TO VALVE SIZE AND PRESSURE CLASS.

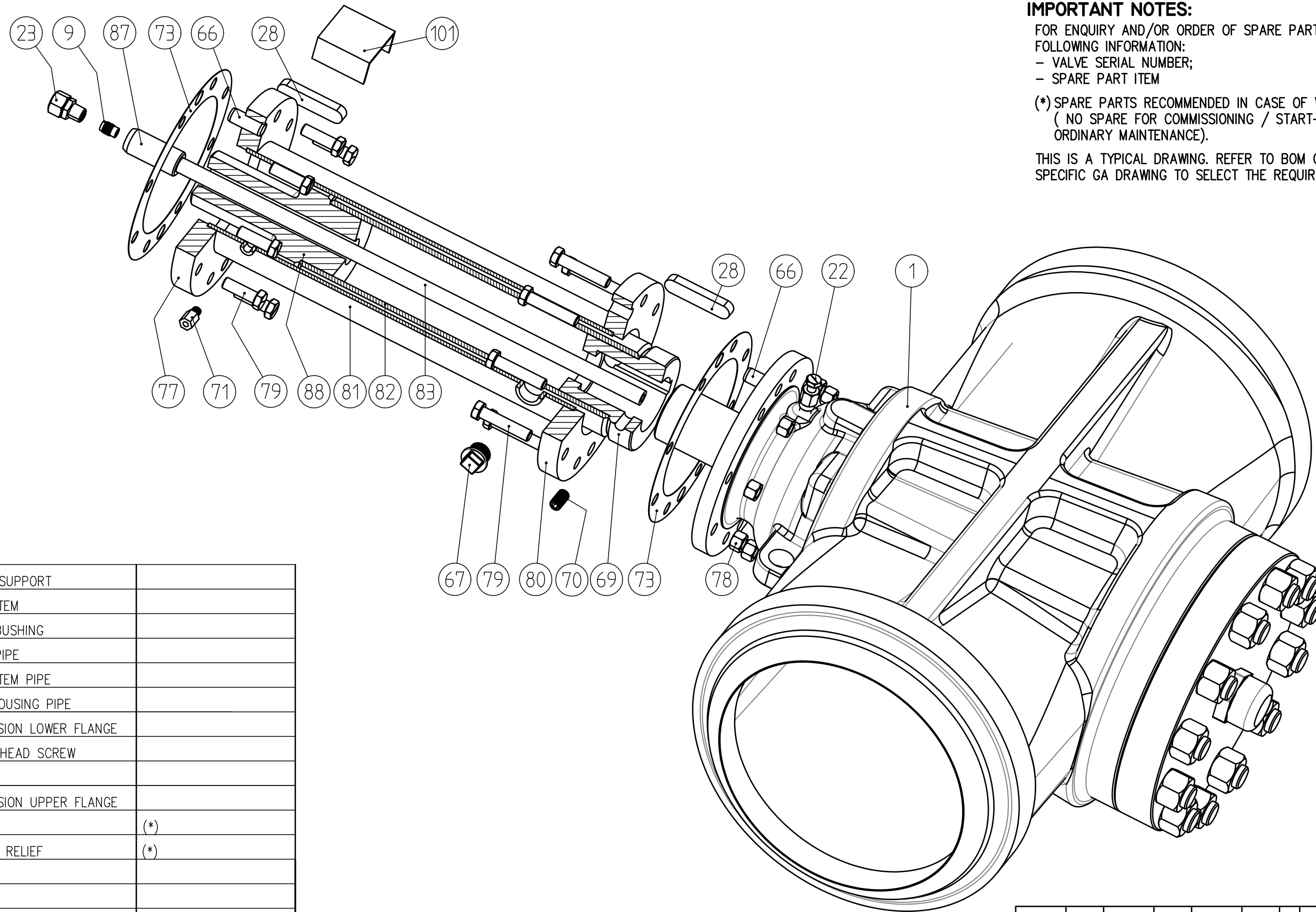
BALL (ITEM 10) MAY BE INTEGRAL WITH BALL SEAT (ITEM 13) IN CASE OF SPECIAL ALLOY TRIM (THRUST BALL).



19	PLUG LOADING SCREW		120	O-RING	(*)
18	THRUST WASHER		90	WORM GEAR	
17	COVER NUT		89	THRUST BEARING	
16	COVER STUD		64	GRAPHITE RING	NON-REUSABLE/(*)
15	METAL DIAPHRAGM	NON-REUSABLE/(*)	63	GLAND	
14	METAL DIAPHRAGM	NON-REUSABLE/(*)	62	SOCKET HEAD SCREW	
13	BALL SEAT	(SEE NOTES SECTION)	53	HANDWHEEL	
10	BALL	(SEE NOTES SECTION)	36	SCREW	
9	CHECK VALVE	(*)	28	KEY	
5	EQUALIZER RING		26	BALL (PRESS. BAL. SYSTEM)	
4	STEM		25	RETAINER (PRESS. BAL. SYSTEM)	
3	COVER		23	LUBRICANT INJECTOR	(*)
2	PLUG		22	STEM PACKING INJECTOR	(*)
1	BODY		20	PLUG LOADING SCREW CAP	
<b>ITEM</b>	<b>DENOMINATION</b>	<b>NOTES</b>	<b>ITEM</b>	<b>DENOMINATION</b>	<b>NOTES</b>

D.P.	20/06/19	G.G.	20/06/19	V.V.	20/06/19	00	FIRST ISSUE
DISEGNATO	DATA	CONTROLLATO	DATA	APPROVATO	DATA	REV.	DESCRIZIONE
N° COMMESSA	POSIZIONE	QUANTITA'	DATA	FIRMA	N° DISTINTA BASE		
<b>CAD DRAWING AO</b>		DENOMINAZIONE LUBRICATED PLUG VALVE		SCALA		COMPONENTE COMPONENTS AND SPARES	
GALLI & CASSINA S.P.A. SILANO (AV)		TOLLERANZE GENERALI DI LAVORAZIONE: QUOTE LINEE COMPRESSE A 10° QUOTE LINEE COMPRESSE TR A 90° ±0.05 QUOTE LINEE COMPRESSE TR 90° ±0.1 ANGOLI TOLLERANZE GENERALI DI LAVORAZIONE: APPROSSIMAZIONE DI QUOTAZIONE CON R = 1 D. QUOTAZIONE DA 1 a 40° ANGOLI TOLLERANZE GENERALI DI LAVORAZIONE		NUMERO DELLO 63 / ( 32 / 16 / 08 )		PESO kg N° DISEGNO 00-PBPV-GAD01	
La Galli & Cassina S.P.A. si riserva a termini di legge la proprietà del presente disegno con divieto di riproduzione o comunicazione a terzi senza sua autorizzazione.							





**IMPORTANT NOTES:**


FOR ENQUIRY AND/OR ORDER OF SPARE PARTS, PLEASE PROVIDE THE FOLLOWING INFORMATION:

- VALVE SERIAL NUMBER;
- SPARE PART ITEM

(\*) SPARE PARTS RECOMMENDED IN CASE OF VALVE DISMANTLING ( NO SPARE FOR COMMISSIONING / START-UP AND ORDINARY MAINTENANCE).

THIS IS A TYPICAL DRAWING. REFER TO BOM OF THE SPECIFIC GA DRAWING TO SELECT THE REQUIRED SPARE PART.

101	NAMEPLATE SUPPORT	
88	EXTENDED STEM	
87	LUBRICANT BUSHING	
83	LUBRICANT PIPE	
82	EXTENDED STEM PIPE	
81	EXTENDED HOUSING PIPE	
80	STEM EXTENSION LOWER FLANGE	
79	HEXAGONAL HEAD SCREW	
78	NUT	
77	STEM EXTENSION UPPER FLANGE	
73	GASKET	(*)
71	BREATHER / RELIEF	(*)
70	STOP PLUG	
69	BUSHING	
67	DRAIN PLUG	
66	GUIDE PIN	
28	KEY	
23	LUBRICANT INJECTOR	(*)
22	STEM PACKING INJECTOR	(*)
9	CHECK VALVE	(*)
1	BODY	
<b>ITEM</b>	<b>DENOMINATION</b>	<b>NOTES</b>

D.P.	20/06/19	G.G.	20/06/19	M.M.	20/06/19	00	FIRST ISSUE
DISSEGNA	DATA	CONTROLLATO	DATA	APPROVATO	DATA	REV.	DESCRIZIONE
N° COMMESSA	POSIZIONE	QUANTITA'	DATA	FIRMA	N° DISTINTA BASE		
 <b>GALLI &amp; CASSINA S.P.A.</b> SILDANO (MI)		<b>CAD DRAWING A0</b> <small>TOLLERANZE GENERALI DI LAVORAZIONE:            QUOTE LINEE COMPRESIVE A 18° ANGOLI            QUOTE LINEE COMPRESIVE A 90° ANGOLI            TOLLERANZE GENERALI DI LAVORAZIONE:            APPORTARE IL DISEGNO            GLI SPICCHI NON QUOTATI            CON R = 1            Ø SPICCHI DA 1 x 40°            ANGOLI            TOLLERANZE GENERALI DI LAVORAZIONE:</small>		SCALA NUMERELLE	DENOMINAZIONE <b>LUBRICATED PLUG VALVE</b> <b>PRESSURE BALANCED TYPE</b> COMPONENTE <b>COMPONENTS AND SPARES</b>		
63 ( 32 / 16 / 08 )		PESO kg		N° DISEGNO <b>00-PBPV-GAD03</b>			





# APPENDIX 2

## RECOMMENDED STEM MASTIC

# APPENDIX 3

## TROUBLE SHOOTING GUIDE

<b>Problem</b>	<b>Probable Cause</b>	<b>Solution</b>
<b>Hard to Cycle</b>	i. Lack of lubricant.	Inject lubricant.
	ii. Dried out lubricant.	Flush with valve cleaner. Consult GALLI & CASSINA or Lubricant manufacturer for recommended valve cleaner.
	iii. Cold ambient temperature	Inject lubricant
	iii. Damaged valve operator.	Check operator manufacturer's manual.
	iv. Plug forced too far into body.	Reset plug.
<b>Does not cycle full open or closed</b>	i. Operator end of stroke stops are incorrectly set.	Adjust the operator end of stroke stops.
	ii. Debris.	Flush the piping.
<b>Leakage across the seats</b>	i. Lack of lubricant.	Inject lubricant.
	ii. Incorrect lubricant.	Consult GALLI & CASSINA with service details.
	iii. Plug set incorrectly.	Adjust plug loading screw.
	iv. Damaged seats.	Rotate plug 180°.
<b>Leakage through stem</b>	i. Leaking stem seal / Possible damage to stem seal	1. Inject lubricant. This will not repair the leakage but it will probably reduce / stop the leakage
		2. Leakage can be stopped by injection of mastic compound through the stem packing injection fitting (see section 9.1).  This will not repair damaged stem seals, but it will probably stop the leakage temporarily. Repeat if valve is cycled and/or if stem leaking occurs again.  Replace stem seals once valve is removed from service.    Fluid may be dangerous to human health. Thereof adequate protections shall be provided and personnel trained / informed on the risk.
		3. Remove from service.  Disassemble and inspect for root cause of problem.
<b>Cover leakage</b>	i. Cover loose.	Close the valve and tighten the cover bolting. If this does not stop the leak, proceed to ii.
	ii. Possible damage to cover seal(/s)	Remove from service. Disassemble and inspect for cause of problem.

<b>Leakage through lubricant fitting</b>	i. Internal fitting obturator(/ball) is not seated .	Inject lubricant to reseal the obturator(/ball) of the check valve and/or of the lubricant injector fitting.
	ii. Lubricant injector and/or check valve loose.	Isolate and depressurize valve, remove lubricant injector and tight the check valve fitting (do not over torque).  Tighten the lubricant injector. If this does not stop the leak proceed to iii.
	iii Damaged lubricant injector fitting and/or internal check valve.	Isolate and depressurize valve. Cycle valve open. Remove and replace lubricant injector and check valve fittings.    Lubricant grease in the lubricant chamber could be under pressure. Thereof adequate barriers to protect from grease / check valve expulsion at high velocity shall be provided and personnel trained / informed on the risk. Contact GC personnel.
<b>Leakage through valve body</b>	i. Possible body defect or internal corrosion/erosion	Replace valve.  Disassemble and inspect for cause of problem.



**IF IN DOUBT, CONTACT GC PERSONNEL**