

B4-D

BALL VALVE STANDARD & FIRE SAFE

INSTALLATION AND ORDINARY MAINTENANCE INSTRUCTIONS

CUSTOMER:

P. ORDER:

OUR FILE:

ITEM:

REVISIONS				
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1.0 GENERAL INFORMATION

1.1 Scope

The scope of this manual is to supply the instructions about storage, installation, operating and maintenance of CAMERON ball valves type B4-D. this manuals contains the security measures defined by CAMERON VALVES & MEASUREMENTS GROVE® **and are not subject to modification.**

1.2 Technical Features

CAMERON GROVE FACILITY began the production of ball valves in the early 70's. *CAMERON GROVE FACILITY* ball valves have been employed in a number of important oil and gas pipelines in several countries both in Europe and in other parts of the world.

B4-D valves are made of three components: a central body and two side closures connected to the central body through a set of bolts.

The valve is of "Trunnion Mounted" design supported by two plates.

The sealing between body and closure is ensured by means of an O-ring made from elastomeric material in the most std. conditions. For certain special conditions, other types of sealing are provided, such as spring-energized lip-seals made from PTFE based material.

Internal sealing is ensured by two floating seats with a contact on the ball made from elastic material (O-ring) and a seal between seat and closure generally consisting in an o-ring made from elastomeric material.

The connection between stem and ball is ensured by 2-4 pins and the motion transmitted by the stem can be generated by a gear or by a manually activated lever or by an actuator (hydraulic, pneumatic, electrical or mixed power supply).

Ball, seats and stem are provided with a nickel-plating surface coating to increase the corrosion resistance of pieces (only if they are in carbon steel). Furthermore, this E.N.P. coating is treated generally at 350°C (on the ball) to increase the surface hardness (up to 1000 HV) so that the seizing possibility in case of metal contact between moving parts is reduced to the minimum.

The operation (from open to close and vice versa) occurs by rotating the valve stem by 90° and these valves should not be employed in intermediate positions (semi-open).

Operating positions are: fully open and fully closed.

B4-D CAMERON ball valves have been dimensioned to support external mechanical loads induced, for instance, by pipelines, without any leakage outwards. Moreover, they have been conceived to support a pressure wave generated by explosions.

1.3 Production Range

SIZES		ASME CLASS					
in	(mm)	150	300	400	600	900	1500
1.1/2	(40)	■	■	■	■	■	■
2	(50)	■	■	■	■	■	■
3	(80)	■	■	■	■	■	■
4	(100)	■	■	■	■	■	■

■ : standard production

1.4 Technical reference for maintenance activities

If you have entered into a technical assistance agreement for routine maintenance, when necessary contact please :


CAMERON ITALY S.r.l.
GROVE FACILITY
Via Italo Betto 11
27058 Voghera (PV), Italy
Tel.: (39) 0383-6911
Fax.: 0383-367166

2.0 OPERABILITY LIMITS

2.1 Operative Limits

All CAMERON ball valves are designed to resist to “class I” process fluids (as per Dir. 97/23/EC). Valve sealing material is chosen according to customer's particular needs. Moreover, valve construction materials yield no explosion generating reactions in the atmosphere.

Therefore:

	<p>WARNING</p> <ul style="list-style-type: none"> • DO NOT USE valves for applications (fluids) other than the project. • BEFORE installing the valves, check the ASME class on the valve name plate. Do not use the valves for line pressures higher than design pressure. • Do not use the products for other fluids than those for which they have been designed and marked.
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2.2 Liabilities

CAMERON **CANNOT BE HELD LIABLE** for any damage to persons, things or plants mainly caused by:


- defective / wrong installation;
- defective / wrong maintenance of the valves carried out by customer;
- wrong use of the valves;
- Changes / modifications/alterations carried out without CAMERON written consent.
- Employment of personnel not authorized by “CAMERON” for the activities for which authorized personnel is required by this manual;
- Employment of personnel not qualified for maintenance activities and without a minimum knowledge about protection against explosions.
- Non compliance with the instructions given in this manual as well as with safety regulations.

CAMERON reserve the right to introduce into their own products – and to any component – such changes as they deem useful or appropriate without altering the product or component essential features.

For the valves with a design qualified by the different customers, CAMERON will communicate customers the changes introduced.

2.3 Installation Sites (Applicable only in case of ATEX certification)

The classification of the sites where CAMERON products are installed is the final user's responsibility. The installation sites and the features of the fluids that these valves can transport are mentioned in the specific risk analysis for B4-D ball valves and set forth on the name plate by means of the ATEX marking string.

	<p>WARNING</p> <ul style="list-style-type: none"> • Do not use the valves in classified zones other than those applicable to ATEX marking string. • Do not use the products in the presence of flammable dusts. • Do not use the products in the event that surface temperature should exceed eighty percent of that of the fluid generating the explosive atmosphere, bearing in mind that valve surface temperature is strictly connected to that of the fluid flowing through it.
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2.4 Life Cycle


The life cycle of CAMERON std ball valves is 25 years (at least) since delivery date and under NORMAL OPERATIVE CONDITIONS.



This life cycle is applicable only if regular maintenance activities are carried out and it could be shorter on very heavy applications from the point of view of transported fluid as well as in the presence of corrosion events that have not been foreseen during the design phase and not mentioned by customer etc.

As to spare parts, CAMERON ensure their availability for 25 years since valve delivery date.

Remark: When a life cycle longer than 25 years is required, the customer should state it clearly in the request for tender or during order negotiation, as it will be considered as a project datum.

3.0 IDENTIFICATION PLATE

	<p>WARNING</p> <p><i>The indication of the product certification number issued by the notified body means that the valve meets the requirements of the applied directive (PED ATEX). If identification numbers are missing, such feature drops.</i></p>
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		CAMERON ITALY S.r.l. Grove Facility via Iliolo Bellio, 11 Voghera Italy			MADE IN ITALY LICENSE API6D-0001 ISO 14313	PED <input type="text"/>
VALVE SIZE CLASS SERIAL N° END TO END SEAT TEST Max O.P. Max O.P. MFG. DATE	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	BODY STEM CLOSURE SEAT BALL MAIN SEA. @ Max O.T. @ Min O.T. P.O.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	ESS. TEST PRESS. T. DATE with SNYS MASS DESIGN PRESS. DESIGN TEMP. ITEM TAG	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

(PED No.: 97/23/CE – ATEX 94/9/CE applicable only if required)

3.1 PED/ATEX indications for marked valves (applicable only in case of valve sold/installed in Europe)

PED certification does not cover the welds carried out on site by customer.

The equipment used should be suitable to valve maintenance and disassembly. **NO** tools shall be used that may cause sparks in hazardous atmosphere.

If the valve is provided with electrical devices, it shall be earthed to prevent any electrostatic charges.

The max. surface temperature of the valve is affected by the temperature of the fluid flowing through it. When installing the valve in potentially explosive surfaces, you should bear in mind that the max. surface temperature has to be consistent with the ignition temperature of the potentially explosive atmosphere.


Do not install the valve in such a way that its parts may be subject to a temperature higher than the valve service and design temperature. If it is supposed that such event may occur, it is necessary to take all proper measures to hold temperature within the fixed limits.

When disassembling the valves with lip-seals, it is **very** important to take notice of the direction of such lip-seals in order to enable re-assembly in the proper position, thus avoiding any problem.

4.0 ATEX MARKING STRING SPECIFICATION (applicable only in case is required the ATEX marking– refer to the quotation)

The classification of areas implemented pursuant to CEI 31-30 standard as well as to CEI 31-35 Guide points out that the valve, as it is a second degree source, generates a ZONE 2 under open environment condition.

According to the following table, the device could be certified as belonging to group II, as it has not been conceived to be used in mines, and situated in category three.

	<p>WARNING <i>In the event of valves with actuator (hydraulic, electric or pneumatic or mixed (hydraulic control and pneumatic actuation)), the certification of the latter is the actuator manufacturer's responsibility, and its marking string is set forth in the dedicated operation and maintenance manual.</i></p>
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GROUP AND CATEGORY TABLE

PROTECTION LEVEL	GÉNÉRAL		PROTECTION PERFORMANCE	OPERATING CONDITIONS
	GROUP I	GROUP II		
Very high	M1		Two independent protection systems to ensure safety even if two failures occur independently from each other.	Appliances remain fed and functioning even in the presence of explosive atmospheres.
Very high		1	Two independent protection systems to ensure safety even if two failures occur independently from each other.	Appliances are de-energized in the presence of explosive atmosphere.
High	M2		Protection suitable both to normal and to heavy duty operation.	Appliances are de-energized in the presence of explosive atmosphere.
High		2	Protection suitable to normal operation and frequent troubles as well as to applications where failures are normally taken into account.	Appliances remain fed and functioning in the zones 1,2 (G) and/or 21,22 (D).
Normal		3	Protection suitable to normal operation .	Appliances remain fed and functioning in the zones les zones 2 (G) and/or 22 (D).

For caution's sake, considering the variability of the environmental conditions where the valve will be installed as well as the classification of areas provided by customers, it has been decided to carry out the certification course required to mark it as in **category 2** i.e. to use it safely even in environments classified as **ZONE 1**. After proving its conformity, its marking string is :

CE  **II 2 G Tx**

- II** : Belonging group (Surface equipment)
- 2** : Belonging category (Equipment suitable to be installed in ZONE 1)
- G** : Potentially explosive atmosphere generated by the presence of gas or evaporation of flammable liquids
- Tx** : External equipment temperature difficult to be defined, as it is determined by the temperature of the fluid flowing through it as well as by environmental conditions.

**5.0 IDENTIFICATION OF IGNITION HAZARDS - PREVENTIVE AND PROTECTIVE MEASURES
(applicable only in case is required the ATEX marking– refer to the quotation)**

Possible ignition sources (EN 1127-1)	Compensatory measure
Hot surfaces	The surface temperature of the fitting depends strictly on the temperature of the fluid flowing through the valve. Anyhow, such temperature is complying with the specifications of Para. 8.2 EN 13463-1:2009 and therefore it is not able to ignite any potentially explosive atmosphere generated by a valve leak.
Sparks of mechanical origin	Materials are complying with the specifications of Para. 6.4.2 EN 13463-1:2009. The stem rotation speed is such as not to generate any hot surfaces due to friction.
Hot gas flames	The fluid that could flow out of the opening of a safety relief valve has no max. temperature higher than 80% of the explosive atmosphere ignition temperature.
Sparks of electrical origin	The electrical equipment (if any) is suitable to operate in a potentially explosive atmosphere.
Stray currents	The potential of the different details is equalized through metallic contact.
Static electricity	The valve is connected to the plant earth ring. Inside there is an antistatic device.
Lightning	The installation site is protected against lightning (the user's responsibility).
Electromagnetic fields	Not applicable
Ionising radiations	Not applicable
High frequency waves	Not applicable
Ultrasounds	Not applicable
Adiabatic compressions	Not applicable
Chemical reactions	Not applicable

6.0 FEATURES OF FITTINGS (applicable only in case is required the ATEX marking– refer to the quotation)

All the fittings applied to the valve should be ATEX -certificated with certification string complying with that of the actuated valve.

Fitting	Application	Marking
Actuator	Valve change-over with electric, hydraulic, pneumatic or mixed feeding (pneumatic control and hydraulic actuation)	Suitable to the hazardous zone where it will be installed
Gear	Valve manual change-over	Suitable to the hazardous zone where it will be installed
Drain / vent plug	Valve body draining activities in case of line-cleaning or of removal.	-

7.0 PRESERVATION AND STORAGE

7.1 Preservation requirements

- a) Valves are packaged and preserved to be stored up to 6 months or 24 months, depends what was agreed during the quotation stage or what in accordance with Customer's project.
- b) Should it be necessary to preserve the valves on the jobsite for a longer period before their installation, it is advisable to store them in a dry or at least covered place. In this case the integrity of package and protections is particularly necessary.
- c) Upon shipping all valves are endowed with special plugs on their ends, usually made from plastic material suitable to ensure the protection of inside parts. It is recommended not to remove them during the storage period except for a maintenance or check, if any. In such a case be careful that the same plugs are applied again.
- d) As to the preservation of motor-operated valve actuators, please follow the documentation provided by the actuator manufacturer.

7.2 Periodic maintenance during storage

During storage period the valves should be kept in their original crates preferably stored indoor or under a roof. In case of storage up to 24 months, valves must be inspected every 6 months as follows:


- a) Any kind of deterioration of the protections on the outside surfaces should be checked. In case of rust and/or paint damage, the zone concerned should be cleaned and degreased (by means of solvents).
- b) The protection should be restored according to the painting cycle employed (CAMERON).

WARNING: TO ALL THE OPERATION ON THE PRESERVATION ALWAYS REFER TO THE DEDICATED PROCEDURES PROVIDED SEPARATELY.

In the case of valves installed but operative only after two years, CAMERON VALVES & MEASUREMENTS GROVE® recommends:

- c) Remove valve side protections.
- d) Without operating the ball, the inside surface shall be checked for the complete absence of any type of impurities, such as rust or particles, that could affect its integrity.
- e) Clean and lubricate internal parts.
- f) Then the ball shall be operated (perform a complete operation of closing and opening) and left in opening position.
- g) Valve ends should be protected again by means of the previously removed plugs.

8.0 INSTALLATION

	<p>WARNING <i>Before installing the valve on the line make sure that the line is sectioned from the process fluid and that there is no hazardous zone, this by means of an explosimeter or by consulting the technical documentation of final customer. Should there be a classified zone, it would be necessary to avoid introducing ignition sources according to the procedure set forth at Section 16.00 of this manual.</i></p>
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8.1 Operating instructions for the installation in the line

KEY-WORDS

Explosive atmosphere: mix of air and gas that, if ignited, causes an explosion.

Ignition source: event igniting the explosive atmosphere.

Classified zone: Zone where the presence of an explosive atmosphere is possible.

INFORMATION ON SAFETY

The start-up of valves and their maintenance should be strictly carried out in compliance with these procedures. Any functioning or maintenance irrespective of these procedures is a misuse of the product and voids both the warranty and the right to complaint.

When a special functioning is required, a formal written request shall be addressed to the Company in order to get their approval. Thus, product liability and warranty validity are held.

The personnel carrying out the installation shall use all the protection devices required by law and the tools provided by the employer.

The personnel charged to operate valves and/or to carry out maintenance should be properly trained, expert and prepared for the tasks assigned to them; they should also own the necessary reliability to ensure safety and best accuracy in carrying out all activities.

The personnel shall read and understand all the instructions included in this manual.

Valves should be employed for the service for which they have been built.





Transport, unpacking, lifting and connections to the different systems (electric, pneumatic, hydraulic etc.) shall be carried out by expert people and qualified personnel.

In case of any difficulty or malfunctions that cannot be solved autonomously, it is necessary to contact CAMERON.







WARNING

CAMERON DECLINE ALL LIABILITY FOR ANY DAMAGE CAUSED BY ANY ACTIVITIES IMPROPERLY CARRIED OUT AND/OR PERFORMED BY INEXPERT OR INCAUTIOUS PERSONNEL NOT COMPLYING WITH THIS MANUAL. SUCH PERSONNEL MUST BE FORMED ON THE ISSUES POINTED OUT.

SIGNS

Signal	Description
	Obligation
	Prohibition
	Danger
	Protection against explosions

Personal protection equipment to be used

PPE	Description
	Head protection device
	Protective clothing (with antistatic features)
	Gloves
	Goggles
	Protective shoes (with antistatic features)
	Hearing protectors (if the noise in the concerned zone is higher than 85 dB)

ACTIONS NOT TO BE CARRIED OUT

CAMERON valves comply with all safety regulations and requirements, but imprudence and inexperience always cause:

- danger for human safety
- danger for the user's valuables
- danger for the work quality and efficiency








Do not carry out any actions or operations when their consequences are unknown.

Do not carry out any hazardous repair attempts.

Do not remove the protections or safety devices of any kind.


Do not use the valve before the efficiency of all safety devices has been restored.

If the valve is installed in a hazardous zone from the point of view of explosions, the following prohibitions shall be observed:

PROHIBITED ACTIONS IN ZONE WITH HAZARD OF EXPLOSION	
	To carry out any actions or operations when their consequences are unknown.
	To carry out any hazardous repair attempts
	To use the valve before the efficiency of all safety devices has been restored
	To smoke or to introduce open flames into the classified zone
	To use mobile phones or personal computers within the classified zone
	To use tools unsuitable to be employed in an explosive atmosphere (not ATEX marked)
	To use in general any equipment that can produce or induce with its normal operation: laser rays or ionising radiations, high frequency waves, ultrasounds, adiabatic compressions, chemical reactions, sparks of electrical or mechanical origin.

8.2 Instructions for lifting the box containing the valve

Ball valves are packed in wooden cases in accordance with CAMERON specifications.

	<p>WARNING <i>Sometimes the valves are shipped on pallets. In this case, clearly identify the valve through its name plate, check its weight through the packing list or the relevant documents and just put it on a plane horizontal surface by using suitable handling equipment (see please Section 14.0).</i></p>
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Before handling the case, read the packing list carefully to clearly identify the valve and to check its weight. The packing list is included in the shipping documents and a further copy is contained in a metal plate fixed outside the case.

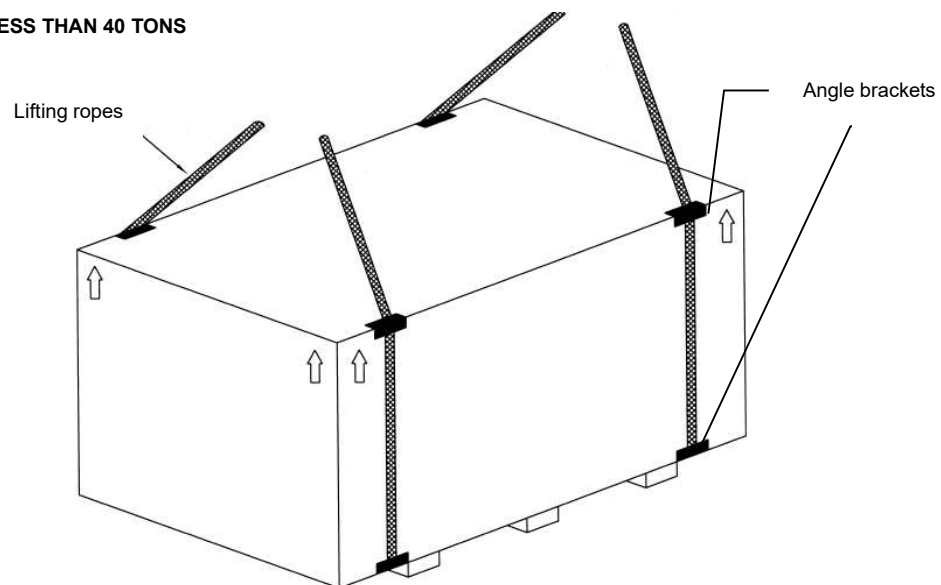
It is necessary to provide handling equipment appropriate for the total weight of the package.

The case containing the valve shall be lifted by means of ropes with suitable capacity. For the valves weighing less than 40 tons (actuator included), the cases (bonnet and bottom) shall be provided with angle brackets enabling ropes to slide.

If the weight of the case content exceeds 40 tons, 4 lifting ropes - each of them with capacity not exceeding 15 t - shall be directly applied to the lifting eyes of the valve.

The ropes shall be arranged as follows:

VALVES WEIGHING LESS THAN 40 TONS






Unload the case and put it on a plane horizontal surface. following what above listed.

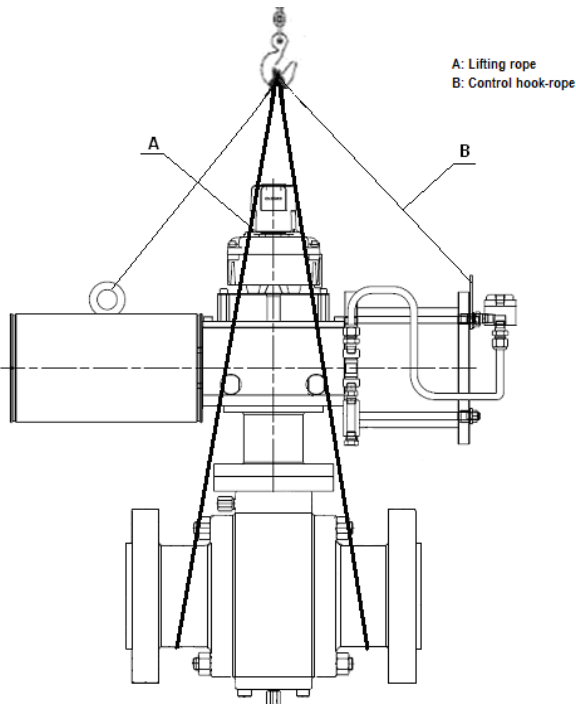
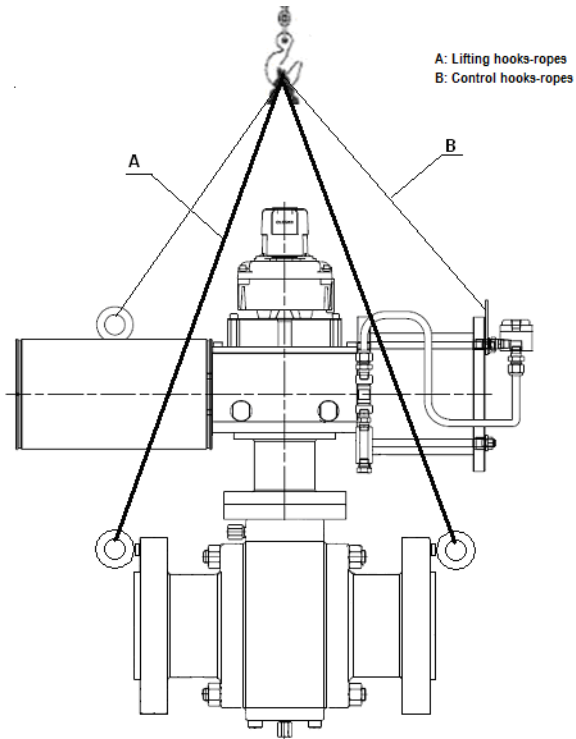
Take away the bonnet, the polyethylene sheet (provided for seaworthy packing only) and the joists nailed to the side walls.

8.3 Instructions for the proper unpacking of the valve

During unpacking pay attention not to damage the product contained.
Unpacking shall be carried out by means of suitable equipment.
It is advisable to take out the cases at final destination and only just before the definitive installation of the equipment.
Lifting activities shall be carried out pursuant to Para. 8.4.
After taking the valve out of the case, it is necessary to inspect the product for possible damages occurred during transport.
If not otherwise specified, the valve shall be kept in the fully open position during transport in order to preserve its ball and sealing surfaces.
Take temporarily the protections away to inspect the valve inside too.
Restore them upon completion of the inspection and take them definitely away **ONLY** when installing the product on the line.
If the valve is provided with the actuator already filled with process fluid (in the event of hydraulic actuator), make sure that there are no residues of oil inside the case.
For any problem, please contact the technical reference person at CAMERON ITALY S.r.l. GROVE FACILITY (see Para. 1.4).

8.4 Instructions for the proper lifting of the valve

	<p>WARNING <i>The carrying ropes / chains should be connected to the valve. In case of valves with flanged closures, apply two eyebolts to the flanges - after checking their capacity - to connect the lifting hooks to them. In case of butt welding ends or of small size valves, wind up the lifting ropes around the closures. To control the arrangement, wind up some control ropes around the actuating system so as to get the axial positioning under control.</i></p>
	<p>WARNING <i>Please refer to the procedure for the choice and use of lifting systems (Section 14.0) It is important that all handling activities are carried out by personnel trained on the issues concerning the handling of heavy loads. Check on the general plan the total weight to be handled. Check the max. load that available ropes can lift and compare it with the weights of the pieces to be lifted. Wear the Personal Protection Equipment provided for such activities (safety helmet, gloves and protection shoes). Keep away any person passing through in the handling zone.</i></p>
<p><i>Do not ABSOLUTELY use the eyes/eyebolts situated on the actuator / gear to hook on the lifting ropes. Only equalizing ropes can be connected to control load arrangement.</i></p>	
	<p>WARNING <i>Valve supports have been dimensioned to support the weight of the valve+actuator unit. IT IS ABSOLUTELY FORBIDDEN to use them to support additional external loads.</i></p>



8.5 Preservation removal

Take away the protective plastic or wooden cups and remove the anti-moisture bags of Silicagel (or any other type) from inside the valve conduit.

Valves are protected by a preserving film, for instance the anti-rust product LPS-3 or equivalent, as described in the dedicate preservation procedure.

8.6 Valve preparation

Before installation and start-up it is recommended to remove all the preservative from sealing surfaces. Due to the possible deposits of dust and residues during storage, the exposed surfaces of the valves shipped in closed position should be cleaned before installation to avoid that residual debris might damage the sealing gaskets.

The residues of preservative in excess can be removed by means of solvents such as white spirit, Stoddard solvents or other degreasers / solvents such as LPS PreSolve or A-151. The solvent can be sprayed or brushed on the preservative. Depending on the thickness and the age of the preservative, this action may last even up to 30 minutes. After getting soft, the preservative can be dried by means of a soft clean rug. This process should be repeated, if necessary, to remove all the residual preservative from surfaces.

Before installation and during the operation phase, valves should be dried and cleaned. It is strongly recommended to apply a further corrosion inhibitor, not affecting the sealing gaskets, for the valves that will not be commissioned at once. Carbon steel surfaces with no preservative should be protected by means of grease, heavy oil or other. Otherwise, a corrosion inhibitor in the fluid employed to carry out the hydrostatic test can be used to protect valves during service.

For the valves supplied with seat and/or stem grease fittings, after removing the preservative and after installation, a further lubrication should be carried out according to paragraph 9.2 Lubrication.

During installation the valve must be fully open.

Pay attention to safety relief valves, if any; direct the valve so that a pressure relief, if any, may not strike any persons, animals or things and may not interact with any ignition source (Chap. 16.0). It is advisable to connect the safety relief valve to the relief line towards the flare.

CAMERON GROVE FACILITY ball valves are bi-directional and can be installed with either end facing up stream. The valve should be installed in such a way as to facilitate maintenance and actuating operations. Should the valve be provided with a butt welding end, welding on the line must be performed using the proper welding procedure. After welding, clean and check the weld bead and repair as required. When installing, allow for possible deformations caused by the expansion of the line. The valve must not support the line. Avoid any strain in the valve body.

8.7 Adjustment of actuator/gearbox limit switches

Follow the adjustment instructions set forth on the actuator operation and maintenance manual.

8.8 Assembling the valve on the line

- a) Following the lifting instructions set forth at Para. 8.4, lift the valve and position it in the installation site. If on the valve there is an indication of the flow direction, during installation pay attention that the valve gets directed according to the line fluid direction.
- b) As to flanged valves (type 6B and 6BX), the installation of the gaskets between line flange and valve flange, together with the preliminary tightening of the bolts connecting both flanges, needs to be carried out workmanlike by means of appropriate torques. If the project documentation contains bolt tightening procedures, use such values; but if there are no indications, it is advisable at least to use the loads calculated according to Annex D of ISO 10423 (API6A). Thus, the risk of any leaks between the flanges when the valve gets functioning is considerably reduced.

Table D1 Recommended torques for bolted flanges (S.I.)

Diameter of studs		Pitch	Studs with $S_y = 550$ MPa Bolt stress = 275 MPa			Studs with $S_y = 720$ MPa Bolt stress = 360 MPa			Studs with $S_y = 655$ MPa Bolt stress = 327 MPa		
			Force	Torque	Torque	Force	Torque	Torque	Force	Torque	Torque
D		P	F	f=0.07	f=0.13	F	f=0.07	f=0.13	F	f=0.07	f=0.13
in	mm	mm	kN	N m	N m	kN	N m	N m	kN	N m	N m
0.500	12.70	1.954	25	36	61	33	48	80	-	-	-
0.625	15.88	2.309	40	70	118	52	92	155	-	-	-
0.750	19.05	2.540	59	122	206	78	160	270	-	-	-
0.875	22.23	2.822	82	193	328	107	253	429	-	-	-
1.000	25.40	3.175	107	288	488	141	376	639	-	-	-
1.125	28.58	3.175	140	413	706	184	540	925	-	-	-
1.250	31.75	3.175	177	569	981	232	745	1285	-	-	-
1.375	34.93	3.175	219	761	1320	286	996	1727	-	-	-
1.500	38.10	3.175	265	991	1727	346	1297	2261	-	-	-
1.625	41.28	3.175	315	1263	2211	412	1653	2894	-	-	-
1.750	44.45	3.175	369	1581	2777	484	2069	3636	-	-	-
1.875	47.63	3.175	428	1947	3433	561	2549	4493	-	-	-
2.000	50.80	3.175	492	2366	4183	644	3097	5476	-	-	-
2.250	57.15	3.175	631	3375	5997	826	4418	7851	-	-	-
2.500	63.50	3.175	788	4635	8271	1032	6068	10828	-	-	-
2.625	66.68	3.175	-	-	-	-	-	-	1040	6394	11429
2.750	69.85	3.175	-	-	-	-	-	-	1146	7354	13168
3.000	76.20	3.175	-	-	-	-	-	-	1375	9555	17156
3.250	82.55	3.175	-	-	-	-	-	-	1624	12154	21878
3.750	95.25	3.175	-	-	-	-	-	-	2185	18685	33766
3.875	98.43	3.175	-	-	-	-	-	-	2338	20620	37293
4.000	101.6	3.175	-	-	-	-	-	-	2496	22683	41057

Table D2 Recommended torques for bolted flanges (U.S.)

Diameter of studs	Pitch	Studs with S _y = 80 ksi Bolt stress = 40 ksi			Studs with S _y = 105 ksi Bolt stress = 52.5 ksi			Studs with S _y = 95 ksi Bolt stress = 47.5 ksi		
		Force F	Torque f=0.07	Torque f=0.13	Force F	Torque f=0.07	Torque f=0.13	Force F	Torque f=0.07	Torque f=0.13
in	1/in	lbf	ft lbf	ft lbf	lbf	ft lbf	ft lbf	lbf	ft lbf	ft lbf
0.500	13	5676	27	45	7450	35	59	-	-	-
0.625	11	9040	52	88	11865	68	115	-	-	-
0.750	10	13378	90	156	17559	118	200	-	-	-
0.875	9	18469	143	243	24241	188	319	-	-	-
1.000	8	24230	213	361	31802	279	474	-	-	-
1.125	8	31618	305	523	41499	401	686	-	-	-
1.250	8	39988	421	726	52484	553	953	-	-	-
1.375	8	49340	563	976	64759	739	1281	-	-	-
1.500	8	59674	733	1278	78322	962	1677	-	-	-
1.625	8	70989	934	1635	93173	1226	2146	-	-	-
1.750	8	83286	1169	2054	109313	1534	2696	-	-	-
1.875	8	96565	1440	2539	126741	1890	3332	-	-	-
2.000	8	110825	1750	3094	145458	2297	4061	-	-	-
2.250	8	142292	2496	4436	186758	3276	5822	-	-	-
2.500	8	177685	3429	6118	233212	4500	8030	-	-	-
2.625	8	-	-	-	-	-	-	233765	4716	8430
2.750	8	-	-	-	-	-	-	257694	5424	9712
3.000	8	-	-	-	-	-	-	309050	7047	12654
3.250	8	-	-	-	-	-	-	365070	8965	16136
3.750	8	-	-	-	-	-	-	491099	13782	24905
3.875	8	-	-	-	-	-	-	525521	15802	27506
4.000	8	-	-	-	-	-	-	561108	16730	30282

c) In case of welding end valves, the welding must be performed only by qualified personnel following the welding procedure (WPS, PQR) qualified by and accredited inspection institution.

8.9 Valve earthing / protection against lightning



WARNING

The final user is recommended to check the proper earthing of the pipeline and then of the valve, before this latter gets commissioned, by visually verifying that connections have been carried out workmanlike.

The valve, designed according to API standard, ensures the metallic and therefore electric continuity of its internal components thanks to the installation of an antistatic device.

Should the installation on the line not ensure the electric continuity between the valve and the line (due to painted flanged surfaces or to the use of insulating gaskets), it would be the final user's responsibility to carry out a suitable earthing in order to ensure the occurrence of potential differences.

In the ANNEX 3 of this manual there is an indication about the way of carrying out such connection.

The lightning protection of the equipment is ensured by the final user. Check that it is available and efficient.

8.10 Maintenance with valve installed after line cleaning

- a) After cleaning has been carried out it is possible that the line remains full with test fluid and, in such a case, no action is required.
If the valve shall be drained, proceed as follows:

- Make sure that there is no pressure in the valve and bring it to full open position
- Fully open the plugs and drain the valve
- Flush, grease the seats from the specific grease fittings (see diagram Par. 11.1), if any
- After each action, fully close the plugs according to CAMERON procedures.

- b) Operate the valve with a full OPENING/CLOSING operation

9.0 VALVE OPERATION AND MAINTENANCE INSTRUCTIONS

9.1 Handling instructions

- a) For a proper functioning, actuator-driven valves shall be positioned fully open or closed.
b) For a motor-driven valve, follow the instructions of the actuator manufacturer attached to our documentation. In such a case it shall be operated by means of the appropriate energy source (electric, pneumatic or hydraulic) in order to check the proper functioning of the valve-actuator unit and/or of the limit switches.
c) Do not change the actuator adjustment already carried out during the tests by CAMERON.

9.2 Lubrication

During normal operation the valve does not require any additional lubrication.

9.3 Valve operating

To open the valve, turn the stem 90° anticlockwise until it stops.

To close the valve turn the stem 90° clockwise until it stops.

The rotation can be carried out by means of a lever, a manual gear or an actuator (electric, hydraulic, pneumatic).



WARNING

Valve surface temperature is directly connected to the temperature of the process fluid flowing through the valve. The final user shall verify that such temperature does not exceed eighty percent of the ignition temperature of the dangerous substance generating an explosive atmosphere. Furthermore he shall affix the appropriate warnings so that operators may be informed should the surface temperature exceed 60°C.

The lever is fixed on the valve stem in such a way that it is parallel to the ball port, so it is possible to have a clear indication of the valve position.

When the lever is parallel to the pipeline the valve is fully open.

When the lever is perpendicular to the pipeline the valve is fully closed.

On the top of the manual gear there is a position indicator firmly secured to the valve stem with the indication of the fully open and fully closed position

If the valve is motor-actuated, read carefully the specific actuator instructions before operating the valve.

In any event - whether lever, manual gear or motor -, the end stops have been shop set-up to assure the correct 90° rotation from fully open to fully closed position, so do not change their adjustment.



WARNING

***CAMERON ball valves are of the on/off type and therefore the ball shall always be either in the fully open or fully closed position.
Standard CAMERON ball valves shall not be used as control system.***



WARNING

***To prevent that the seat-ball contact surface may be likely to stick, it is advisable to partially operate the valve (15° of the operation is sufficient) periodically, at least every 12 months.
Such partial operations increase valve reliability during the opening or closing stages of the valve.***

Valves, during their service, may accumulate water, scale, deposits and other foreign matters. These materials may damage the valve in the following ways:

- At low temperatures, ice may form inside the valve and hinder its normal functioning;
- **Foreign matters may prevent the valve from fully closing up and the ensuing throttling (flow restriction) may damage the ball or the o-rings**
- Foreign matters may get caught between the ball and the seat and damage their surfaces

A drainage schedule is the best way to prevent damages caused by foreign matters. Should it be impossible to implement a regular drainage schedule, it is recommended that drainage would be carried out in the following cases:

- Before the arrival of the cold season;
- After washing the line;
- After a hydraulic test;
- Whenever the valve does not close.

For drainage procedure see the relevant paragraph 10.1.

CAMERON ball valves have been designed and tested in such a way that they do not require the use of sealants during their normal service.







Anyway the implementation of a regular lubrication program extends the service life of the valve before carrying out maintenance actions and improves its performances.

Lubrication is recommended in the following cases:

- **Before operating the valve if the valve has been left in its position, either fully open or closed, for long periods without moving it.**
- As soon as an increase of the valve operating torque is noticed.

If the valve is provided with grease fittings, for the lubricant grease injection procedure see please Section 11.0.

10.0 VALVE REMOVAL FROM THE LINE

	<p>WARNING <i>Wear the personal protection equipment provided.</i></p>
	<p>WARNING <i>Before removing the valve from the line, make sure that there is no more pressure in the line. Be cautious when approaching the valve where line pressure is still flowing through and avoid safety relief valves, if any.</i></p>
	<p>WARNING <i>If the temperature of the fluid transported exceeds 60°C it is necessary for the valve user to signal that the valve surface temperature can cause damage or lesions to operators and, for such purpose, use the appropriate signs and/or provide fixed protections avoiding the direct contact with the surface at high temperature.</i></p>
	<p>WARNING <i>It is absolutely forbidden to use any mobile phones or personal computers and/or radio appliances in the proximity of the site where the valve is installed. As to the size of the hazardous zone, see please the paragraph "Classification of Areas according to IEC EN 60079-10".</i></p>
 	<p>WARNING <i>Before any action it is necessary to carry out the following checks:</i></p> <ul style="list-style-type: none"> • <i>Capacity of lifting ropes and visual inspection of their integrity</i> • <i>Visual inspection of the lifting hook</i> <p><i>Follow the instructions for the lifting equipment set forth at Section 14.0. If work is carried out in a classified zone, it is necessary to get appropriate reduced sparking tools. Follow the safety instructions set forth in the procedure at Section 15.0. Wear the personal protective equipment suitable to the activities to be carried out. When tightening by means of hydraulic tensioners, follow the procedure set forth at Section 16.0 of the following manual. Pay attention to the direction of vents and safety relief valves before sectioning the valve from the line.</i></p>

It is desirable that maintenance activities may be carried out by specialized personnel, prepared for the techniques and procedures applicable on the plant.
Make sure that the personnel assigned will comply with the essential safety regulations for the protection of themselves and of other persons.

10.1 Drainage procedure

- a) Fully close the valve.
- b) Open the vent valve, if available, and unscrew the stem grease fitting (189).
- c) Slowly open the drain valve (39) to discharge the fluid from the body (1).



WARNING

Pay attention to open the drain valve partially and slowly as long as the pressure is being released from the body recess.



WARNING

Do not dispose of the drained fluid in the environment. Place under the drainage a container with a suitable capacity to contain the discharged fluid.



WARNING


In the event of line blow-down, carry out drainage to discharge the fluid caught in the valve body.


- d) Remove the drain valve (39) and check its integrity while the fluid, with no residual pressure, is flowing out. To facilitate such action, remove also the drain plug, if available.
- e) Re-assemble the drain valve after completing drainage.

Remarks: Drainage in the valves supplied with a blind flange will be the customer's responsibility.

10.2 Removal procedure

- a) Remove pressure from the line both upstream and downstream.
- b) Drain the valve as per Para. 10.1.
- c) Install the lifting equipment on the special lashing points.
- d) Unscrew the nuts for the connection to line flanges.
- e) Take away the valve from the line.

	<p>WARNING <i>To lift the valve, follow the instructions as per point 8.4.</i></p>
---	---

	<p>WARNING <i>The installation, removal and re-installation activities carried out by the customer should be performed correctly and according to this manual, otherwise warranty becomes void in the period and under the conditions in which it is valid.</i></p>
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The installation, removal and re-installation activities carried out by the customer should be performed correctly and according to this manual, otherwise warranty becomes void as to the period and the conditions under which it is valid.

THE ACTIVITIES AND ACTIONS MENTIONED HEREUNDER - AND/OR ANYHOW BRINGING ABOUT DISASSEMBLY OF THE VALVES AND THEIR COMPONENTS, INSPECTION, MAINTENANCE, CLEANING INSIDE THE VALVES - CARRIED OUT BY THE CUSTOMER DURING THE WARRANTY PERIOD CAUSE THE WARRANTY TO BECOME VOID: DURING THIS PERIOD ALL ABOVE MENTIONED ACTIVITIES AND ACTIONS SHOULD BE CARRIED OUT EXCLUSIVELY BY QUALIFIED PERSONNEL OR BY "CAMERON".

In any case, CAMERON decline any liability outside the warranty period.

11.0 VALVE ORDINARY MAINTENANCE AND GREASING SCHEDULE

SCENARIOS REQUIRING VALVE GREASING

A) *LEAKAGE BETWEEN STEM AND GLAND*

In the event of leakage between stem and gland, inject sealing grease through the special device.

B) *LEAKAGE BETWEEN SEAT AND BALL*

In the event of leakage between seat and ball inject (should it be possible, through the special seat grease fittings) sealant grease through the special device.

Should the valve be not provided with seat grease fittings, greasing can be carried out by placing instead the vent plug a grease fitting and then by filling the body recess with grease. Before carrying out such action, contact CAMERON GROVE technical department.

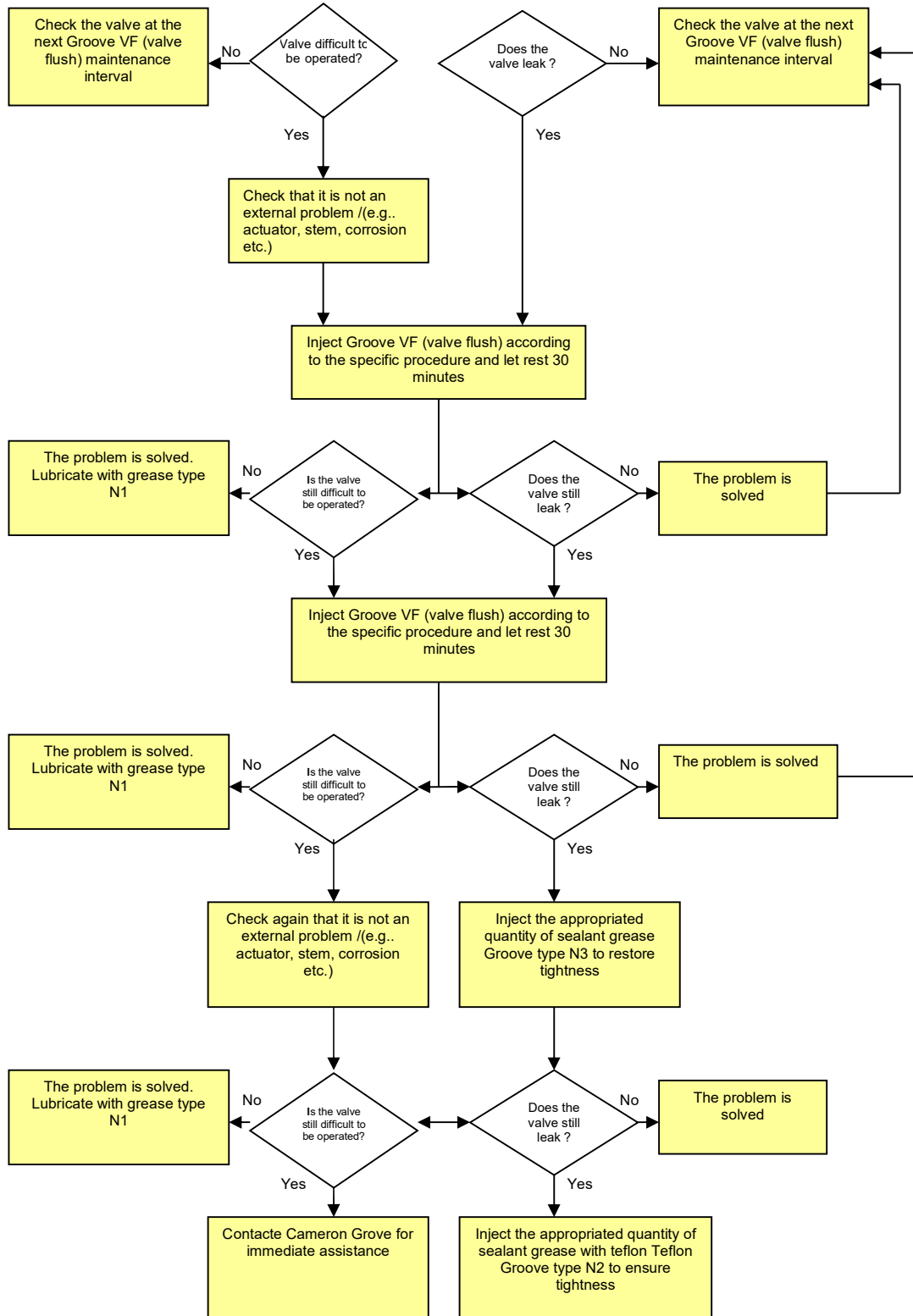


WARNING

Standard valves have always a pressure equalisation hole in the ball, between port and body recess. Should the valve be in production, the replacement of the vent plug with a grease fitting is FORBIDDEN, as there is always pressure in the middle of the body.

Make sure that the pump used for this action can give a greater pressure than that of the line.






11.1 Greasing Flow Chart



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11.2 Greasing procedure

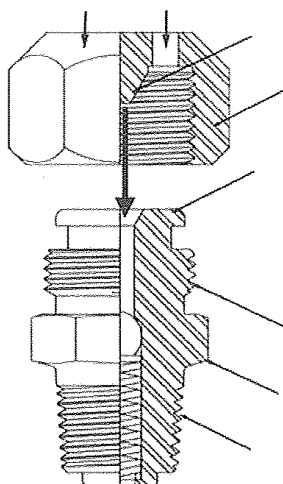
Preliminary actions

	<p>WARNING <i>Before carrying out greasing, wear the PPE: goggles, clothes, gloves, shoes and, if there are suspended loads, helmet. If the valve is subject to high pressure, wear hearing protectors (ear caps) too.</i></p>
	<p>WARNING <i>Before carrying out greasing, switch off the transport vehicle by which the valve has been reached and avoid introducing any ignition source (sparks, hot surfaces).</i></p>
	<p>WARNING <i>Do not remove grease fittings from the valve under pressure.</i></p>
	<p>WARNING <i>Be extremely cautious before opening the plugs for greasing the valve body. It is necessary to know what fluid flows through the valve to take the due cautions. In the event of toxic fluids, wear an emergency breathing apparatus and warn your own workmates on the existence of such a danger.</i></p>
	<p>WARNING <i>For grease injection use a pump with appropriate pressure with respect to line pressure (higher).</i></p>

Procedure for the connection of the lubricant pump to the greasing point

WARNING
Do not fully remove grease fittings from the valve under pressure. Only unscrew the closure plug.

VENT HOLES



METAL TO METAL GASKET

GREASE FITTING PLUG

GREASE FITTING FLANGE

PLUG CONNECTION THREAD

KEY HOOKING POINT

ASSEMBLY THREAD

Unscrew the grease fitting plug while keeping the body still by means of a key (positioned in the special hooking point)

The plug connection thread, removing the debris, if any.

Screw the pump connection to the plug connection thread.

Injection procedure

Required equipment: High-Pressure Pump
Required lubricant: Cameron Valve Flushing can be suited to valve working conditions (see please the maintenance flow chart)

1. If possible, operate the valve and determine its state. Moving the ball can help the removal of debris deposits inside it.
2. Operate the ball so that the valve reaches the fully open or closed position.
3. Identify the number of the grease injection points on the valve: there are usually two or four points. Should the valve be not provided with seat grease fittings, greasing can be carried out by placing instead the vent plug a grease fitting and then by filling the body recess with grease.
4. Check valve type, size and capacity. The total valve capacity corresponds to the minimum quantity of the grease to inject.
5. Divide valve capacity by the total number of sealant injection fittings (access ports); lubricant shall be injected through them. Remember to use the graduated scale on the handle of the hydraulic lubrication gun in order to control the quantity of the grease being injected.

VALVE LUBE SEALANT CAPACITY	
SIZE [inches]	LITERS
1.1/2	0.02
2	0.03
3	0.05
4	0.06

If the valve is underground, the capacity of the pipe used to extend the grease fittings shall be added to the amount calculated for each sealant injection fitting.

CAPACITY OF THE RISER PIPES		
Inside Diameter [inches]	OUNCES per FOOT	LITERS per METER
1/4	0.5	0.0485
3/8	1	0.0970
1/2	2	0.1941
3/4	4	0.3881

6. During injection use a low and constant pressure increment. This will contribute to ensure a consistent grease flow and distribution. A quick injection may cause damage to gaskets and a deformation of O-rings. Use a lubrication gun with manometer that can be used up to a pressure of 10000 PSI
7. During injection keep an overpressure of 1000 PSI with respect to that of the line. However, as to the O-rings used as seals, you should be constantly careful not to overpressurize them excessively and to avoid their extrusion as well as the generation of debris, which would deposit in the seat ring.
8. If it is not possible to keep the desired pressure it is likely that the injected grease has come out and got into the line without reaching the concerned area Please consider the following options:

- Try to create a false block by injecting some sealant grease (10 to 20% of valve capacity) to temporarily contain the leakage; thus you can exercise a pressure on the clogged zones. Repeat the lubrication procedure up to the exhaustion of the grease to inject.

9. A minimum lubrication time is not specified. Usually you go on as long as you can inject material through the greasing holes. Approximately, the process lasts thirty minutes but this time varies depending on valve conditions. Hereunder the grease flow inside the valve body.

Valve lubrication does not damage the valve but its gaskets. Therefore it shall be carried out only when it is strictly necessary as to pressurization time.

Remarks: The lubricant used by CAMERON is biodegradable and contains no acids, caustic substances nor solvents, which may be dangerous for the personnel or for the equipment.

10. Operate the valve approx. 10 times to move the seat ring by means of ball rotation. Any valve that cannot be fully cycled shall be partially operated as much as possible. This will help removing the residual debris, if any.

11. If necessary, go back to point 4 and repeat the process.

Grease (stem) injection procedure

Required equipment:

High-Pressure Pump

Required lubricant:

GROVE N1-N2 (see please Para. 11.1)

1. Inject the lubricant grease GROVE N1 (see please Para. 11.3) on the stem area through the stem grease fitting (189). The stem area is not subject to the line pressure because of the stem o-rings (134), therefore it is possible to use a standard pressure greasing pump. The grease fitting (189) has a 22 mm diameter.
2. It is possible to temporarily eliminate or reduce any leakage through the stem by injecting the sealant grease GROVE N2 (see please Para. 11.3). This temporary maintenance allows postponing the replacement of any worn out or damaged part till the next general maintenance.

11.3 Grease data sheets



**LUBRICANT GREASE FOR
MAINTENANCE**

Document No.	Rev.	Page	of
N1	1	30	1

DESCRIPTION

Lubricant grease based on modified calcium soap with high water and aging resistance, a strong anti-rust action and a very good behaviour at low temperatures.

The lubricating grease is composed of substances insoluble in whatever gas, liquid inside the valve. Some modified vegetal oils are often mixed with synthetic oils, special corrosion inhibiting agents and other additives to give consistency to the lubricant. These viscous and sticky lubricants will form a certain sealing and are advisable in valves new or subject to few operations. It is very important that the lubricant keeps its structure whole even when it is submitted to the stresses both of injection and of plant exercise pressures.

CHARACTERISTICS

Exercise temperature:	-50°C to +110°C
Drop point:	150°C (DIN 51 801)
Class:	2 (DIN 51 818)
Penetration after treatment:	265-295 mm/10 (DIN 51 804)
Behaviour with water:	sufficiently solid at 20°C, 50°C and 90°C (DIN 51 807) 2 (DIN 51 818)
Water content:	none
Thickening agent :	modified calcium soap

USE

To use for the maintenance of lubricated lines and sealing surfaces, from hydraulic test to installation.

Some additional grease should be injected before installation if this is carried out a long time after the final inspection test.

If the valve remains in open or closed position for a long time, it is necessary to inject some additional grease.

REVISIONS

NO.	DATE	PREP.	APPR.	DESCRIPTION
1	19.04.90	R.S.	G.B.	REVISION



**EMERGENCY SEALANT
GREASE**

Document No.	Rev.	Page	of
N2	3	31	1

DESCRIPTION

Sealant grease for ball and gate valves, suitable to all kinds of service, except oxygen service. These types of grease are heavier and more sealing and have an additional quality of PTFE particles. PTFE particles form a "bridge" in the leakage zones around gaskets. These types of grease shall be used only in emergency situations as a last alternative to the possibility of removing the valve from the pipeline.

CHARACTERISTICS

Colour:	green
Consistency:	viscous, granular plaster
Penetration ASTM MMX10:	265
Drop point: ASTM:	None
Base oil:	synthetic
Sealing agent:	TFE Fluorine-carbon
Exercise temperature:	-25°C to + 260°C
Operating pressure:	1000 Kg/cm ²
Resistance to solvents:	excellent
Resistance to water:	excellent
Resistance to acids:	excellent

USE

To use only in case of emergency, when the gasket between seat and ball/gate is damaged. During the emergency period it allows eliminating/reducing leakages due to the damage. It allows extending installation times till the first maintenance action. During valve maintenance, the sealant grease will be removed from the lines and the gaskets will be restored. The lines shall get cleaned by means of water with an addition of 3% (in weight) of OAKITE SPRAY 101. The solution shall get heated at 50°C-60°C. The valve shall be re-assembled and the greasing lines shall get filled with lubricant grease type N1.

REVISIONS

NO.	DATE	PREP.	APPR.	DESCRIPTION
3	25.10.95	R.S.	G.B.	REVISION

12.0 SITUATIONS OF FORESEEABLE FAILURE

MALFUNCTION	PROBABLE CAUSE	REMEDY
The valve does not open or close	<ol style="list-style-type: none"> 1) Actuator / operating device broken 2) Debris inside the valve. 	Check actuator functioning. Vent, drain the valve and operate
The valve is hard to operate.	<ol style="list-style-type: none"> 1) Use at a higher pressure than design pressure 2) There is ice in the operation assembly (gear or handwheel assembly). 3) There are debris/sand increasing the operation torque 	<ol style="list-style-type: none"> 1) Check the design pressure on the valve name plate. 2) Heat the parts and apply some antifreeze liquid.
Narrowing of the port.	The ball is not perfectly aligned with the seats.	Open the valve fully. Check the adjustment of actuator/gear limit switches.
Operation failed	<ol style="list-style-type: none"> 1) Locking of some details inside the valve 2) Actuator with problems 	<ol style="list-style-type: none"> 1) Ask Cameron Grove for technical assistance 2) Check actuator functioning
Leakage from the gasket body / top cover.	Gasket body / top cover damaged	Contact CAMERON for replacement.
Leakage from the stem gasket	<ol style="list-style-type: none"> 1) Sealing O-rings worn out 2) Stem damaged 	Grease the stem sealing zone with sealant grease. If the leakage does not stop, contact CAMERON for the complete replacement of gaskets or stem.
The valve does not close/open fully.	<ol style="list-style-type: none"> 1) Deposit of material inside the body. 2) Frozen water inside the body. 3) Wrong adjustment of actuator limit switch. 	<ol style="list-style-type: none"> 1) Vent and drain the valve body 2) Inject some antifreeze liquid vapour into the body.
Leakage from the grease fitting.	<ol style="list-style-type: none"> 1) Safety plug not tightened. 2) Grease fitting not properly screwed inside the NPT 3) NPT thread damaged or not properly carried out. 	<ol style="list-style-type: none"> 1) Tighten the safety plug more strongly. If the leakage does not stop, replace the grease fitting. 2) Tighten the grease fitting according to CAMERON procedure (for this action it is necessary to remove pressure from the line). If the leakage does not stop, replace the grease fitting.
The valve is not tight upstream and/or downstream.	The seats, the ball are damaged	Close the valve and lubricate the seats, if seat grease fittings are provided in the design. If the leakage does not stop or if no seat grease fittings are available, please contact CAMERON for the replacement of the parts damaged.

WARNING

In the event of a failure, before carrying out any action communicate CAMERON what happened. The personnel to be employed shall be formed on the issues concerning the hazard of explosion.

13.0 AREA CLASSIFICATION ACCORDING TO STANDARD IEC EN 60079-10

Remark. The analysis hereunder, concerning an incidental event (failure) in an open environment and with no leakage containment systems, gives a rough indication. It will be the user's responsibility to provide a more thoroughly analysis under consideration of the real environment conditions within which the product will be installed.

EVENT 1:

Loss of sealing of the valve stem.

Type of flammable substance:

Natural gas.

Type of valve:

B4-D 1.1/2"-4" ANSI 150-1500 (20 Bar-250 Bar).

Hazardous zone classification:

ZONE 2

Hazardous zone shape:

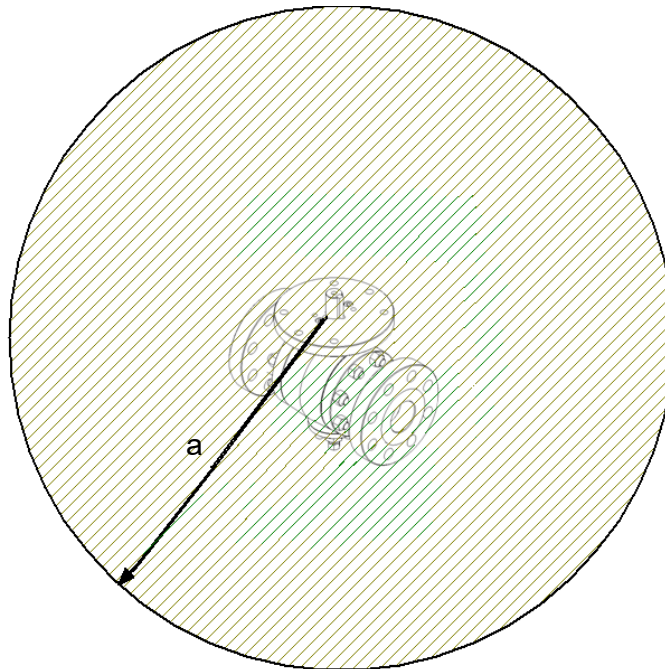
Uncertain shape. A sphere is conventionally assumed (pursuant to standard IEC EN 60079-10).

Hazardous zone size:

In the event of:

- B4-D 1.1/2"-4" ANSI 150-1500 (20 Bar-250 Bar) it will be a sphere with a radius (a) 1.5m (inferred from calculation CAL-SPE-065 by applying the directives of Guide CEI 31-35) by using, as reference diameter for the classification, the diameter of the valve (4") at the highest pressure (250 Bar).

The zone with the longest diameter is assumed as representative zone, thus being in each case in favour of safety.



ZONE 2
Radius a= 1.5m

EVENT 2:

Loss of sealing of the valve stem.

Type of flammable substance:

Crude oil (owing to the variety of types of hydrocarbons that can be present, the chemico-physical parameters of gasoline have been taken into consideration, as it has the greatest volatility of aromatic components).

Type of valve:

B4-D 1.1/2"-4" ANSI 150-1500 (20 Bar-250 Bar).

Hazardous zone classification:

ZONE 2

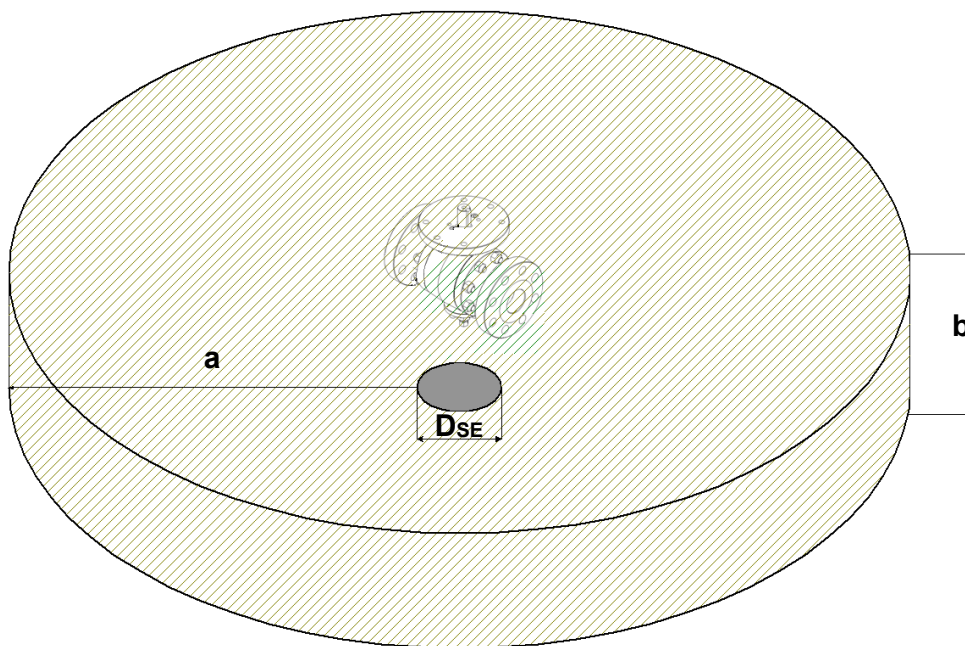
Hazardous zone and shape:

Because of the leakage, a pool of unknown shape will be generated; a circular shape is conventionally assumed (pursuant to standard IEC EN 60079-10). The vapours generated by its evaporation will constitute the hazardous atmosphere.

Hazardous zone size:

- B4-D 1.1/2"-4" ANSI 150-1500 (20 Bar-250 Bar) the pool generated by the failure will have diameter (D_{SE}) 1.5m, the hazardous zone generated by the pool will have an extent (a) 4m in addition to the pool extent and height (b) 1m above ground level (results deduced from calculation CAL-SPE-066 by applying the directives of Guide CEI 31-35). Max. valve diameter and max. applied pressure have been utilized for the classification.

As described in **EVENT 1**, for caution's sake, the hazardous zone with the longest diameter has been utilized.



ZONE 2
Extent a= 1.5m
Extent b= 4m
Extent D_{SE} = 1m

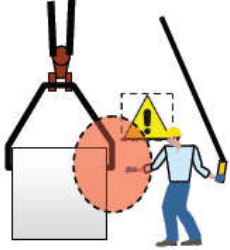
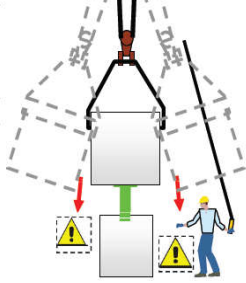

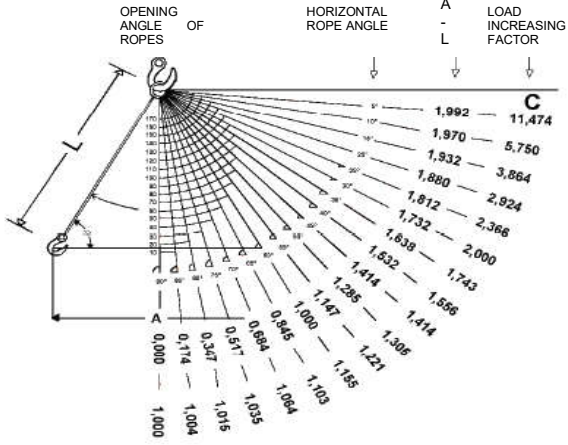
b

THE EXTENT OF THE HAZARDOUS ZONES DEDUCED FROM CALCULATIONS IS VALID ONLY FOR OPEN ENVIRONMENTS. THE WORST CASE HAS BEEN CONSIDERED AS TRACING EVENT I.E. THE LEAKAGE FROM THE VALVE WITH THE LONGEST DIAMETER, SUBMITTED TO THE MAX. OPERATING PRESSURE (CEI 31-30; 31-35).

14.0 SAFETY PROCEDURE: CHECK AND CONTROL OF LIFTING DEVICES AND ACCESSORIES

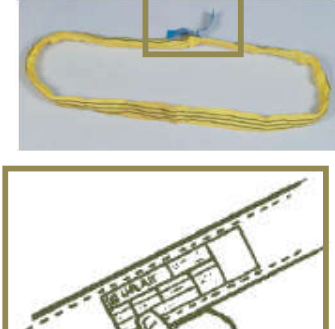
The requirements hereunder are applicable both for handling the valve unit (either manual or actuated) and for handling internal components during assembly and disassembly activities in the event of an extraordinary maintenance.

14.1 RULES TO BE ALWAYS OBSERVED

	<ul style="list-style-type: none"> • Forbid the access to the handling zone. • Check that the valve assembly is in a well balanced position (to take into consideration the centroid of the load) and apply chains, belts or ropes to the lifting points positioned on the body. • Check for the absence of obstacles in the motion path. • Avoid positioning your hands or other parts of the body in proximity of the contact area between valve unit and lifting equipment. 																																																																																															
	<ul style="list-style-type: none"> • Do not make the load fluctuate and check for the absence of other persons on the opposite side of the moving valve unit. • Check that the hook is perfectly centred on the valve centroid (usually at the valve centre) in order to prevent any load fluctuations upon lifting. • Carry out a first minimum lifting (the distance of the load from the bearing plane is a minimum one and the possibility of simultaneous uncontrolled movements is a remote one) in order to check that the load is well balanced and the connections with lifting systems quite steady. 																																																																																															
	<ul style="list-style-type: none"> • Adopt a safe working position, so as to have the possibility of avoiding the load, should it follow unexpected paths. • Make sure to have a visual contact with the operator and with the personnel present in the surrounding area. 																																																																																															
 <table border="1"> <thead> <tr> <th>OPENING ANGLE OF ROPES</th> <th>HORIZONTAL ROPE ANGLE</th> <th>A - L</th> <th>LOAD INCREASING FACTOR</th> <th>C</th> </tr> </thead> <tbody> <tr><td>0.000</td><td>0.000</td><td>1.000</td><td>1.000</td><td>1.000</td></tr> <tr><td>0.114</td><td>0.114</td><td>1.004</td><td>1.004</td><td>1.004</td></tr> <tr><td>0.227</td><td>0.227</td><td>1.015</td><td>1.015</td><td>1.015</td></tr> <tr><td>0.341</td><td>0.341</td><td>1.035</td><td>1.035</td><td>1.035</td></tr> <tr><td>0.454</td><td>0.454</td><td>1.064</td><td>1.064</td><td>1.064</td></tr> <tr><td>0.567</td><td>0.567</td><td>1.103</td><td>1.103</td><td>1.103</td></tr> <tr><td>0.680</td><td>0.680</td><td>1.155</td><td>1.155</td><td>1.155</td></tr> <tr><td>0.793</td><td>0.793</td><td>1.221</td><td>1.221</td><td>1.221</td></tr> <tr><td>0.906</td><td>0.906</td><td>1.305</td><td>1.305</td><td>1.305</td></tr> <tr><td>1.019</td><td>1.019</td><td>1.414</td><td>1.414</td><td>1.414</td></tr> <tr><td>1.132</td><td>1.132</td><td>1.556</td><td>1.556</td><td>1.556</td></tr> <tr><td>1.245</td><td>1.245</td><td>1.743</td><td>1.743</td><td>1.743</td></tr> <tr><td>1.358</td><td>1.358</td><td>2.000</td><td>2.000</td><td>2.000</td></tr> <tr><td>1.471</td><td>1.471</td><td>2.366</td><td>2.366</td><td>2.366</td></tr> <tr><td>1.584</td><td>1.584</td><td>2.924</td><td>2.924</td><td>2.924</td></tr> <tr><td>1.697</td><td>1.697</td><td>3.864</td><td>3.864</td><td>3.864</td></tr> <tr><td>1.810</td><td>1.810</td><td>5.750</td><td>5.750</td><td>5.750</td></tr> <tr><td>1.923</td><td>1.923</td><td>11.474</td><td>11.474</td><td>11.474</td></tr> </tbody> </table>	OPENING ANGLE OF ROPES	HORIZONTAL ROPE ANGLE	A - L	LOAD INCREASING FACTOR	C	0.000	0.000	1.000	1.000	1.000	0.114	0.114	1.004	1.004	1.004	0.227	0.227	1.015	1.015	1.015	0.341	0.341	1.035	1.035	1.035	0.454	0.454	1.064	1.064	1.064	0.567	0.567	1.103	1.103	1.103	0.680	0.680	1.155	1.155	1.155	0.793	0.793	1.221	1.221	1.221	0.906	0.906	1.305	1.305	1.305	1.019	1.019	1.414	1.414	1.414	1.132	1.132	1.556	1.556	1.556	1.245	1.245	1.743	1.743	1.743	1.358	1.358	2.000	2.000	2.000	1.471	1.471	2.366	2.366	2.366	1.584	1.584	2.924	2.924	2.924	1.697	1.697	3.864	3.864	3.864	1.810	1.810	5.750	5.750	5.750	1.923	1.923	11.474	11.474	11.474	<ul style="list-style-type: none"> • Ropes shall not be used beyond their capacity and therefore bear in mind that the real stress to which they are submitted during lifting is increased according to a "C" factor depending on the angle at the top of the slinging system. • Do not use lifting accessories with divergence on the top exceeding 120°; beyond such limit, capacity varies considerably following small variations of the angle or of the general conditions of use. • When choker slings are used, they should always be used in pairs. Wind up the rope twice around the load before pulling. Make sure that the rope is well tightened around the load.
OPENING ANGLE OF ROPES	HORIZONTAL ROPE ANGLE	A - L	LOAD INCREASING FACTOR	C																																																																																												
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14.2 CHECK AND PROPER USE OF LIFTING BANDS AND SLINGS

14.2.1 Marking

	<p>Slings shall bring the following marks:</p> <ul style="list-style-type: none"> • Manufacturer identification, capacity and construction material • CE mark on a tear-proof label sewn inside one of the two eyes or on the path cover
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14.2.2 Checks and usage limits

Detected Anomaly	Inspection Way	Usage Limits	Remedy
Cuts, even of small sizes	Visual inspection	Do not use the equipment	Replace the equipment
Deformation or signs of deterioration (burns, fusion or carbonization, illegible label)	Visual inspection	Do not use the equipment	Replace the equipment
Web loosening or stiffening	Visual inspection	Do not use the equipment	Replace the equipment
Tear of the external cover of endless round slings	Visual inspection	Do not use the equipment	Replace the equipment
Check that slings are not older than 5 years; if so, replace them.			

14.2.3 Typical damage of bands and slings

Damage caused by acid



Damage caused by heat



Damage caused by abrasion



Cuts on surfaces



Cuts



Web damaged



Pits




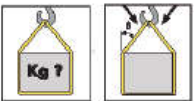
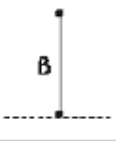
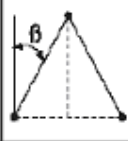
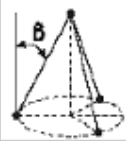
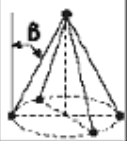
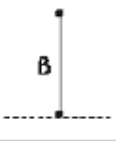
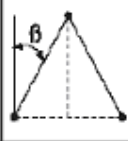
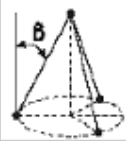
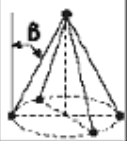
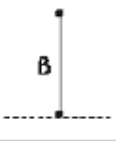
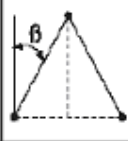
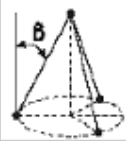
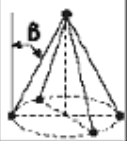



Fraying



Illegible label

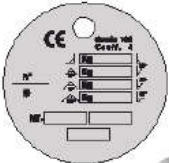


14.2.4 Hints for proper use

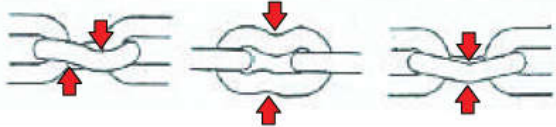
	<ul style="list-style-type: none"> Never use even partially damaged slings, check their integrity every time before using them. 										
	<ul style="list-style-type: none"> Check capacity depending on the load to be lifted as well as on the inclination method and angle of the sling system used. Always mind the load centroid. <table border="1" data-bbox="537 541 1247 737"> <tr> <td style="background-color: #FFD700;">Working angles</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #FFD700;">% loss depending on angle beta</td> <td>-0 %</td> <td>-30 %</td> <td>-30 %</td> <td>-47,5 %</td> </tr> </table>	Working angles					% loss depending on angle beta	-0 %	-30 %	-30 %	-47,5 %
Working angles											
% loss depending on angle beta	-0 %	-30 %	-30 %	-47,5 %							
	<ul style="list-style-type: none"> Avoid contact with sharp and abrasive surfaces: in this case use appropriate protections or edge protectors. Check that the band eye or the endless sling does not get hooked up in surfaces that can damage it. Never crush the slings under the load nor try to slip them off from it if it rests on the band. Do not drag the sling on the ground during transport. Check that the eye length is at least 4 times the diameter of the pin or of the hook on which it works, so that the eye internal angle does not exceed 20°. 										
	<ul style="list-style-type: none"> Never shorten the slings with knots, as their capacity decreases. 										
	<ul style="list-style-type: none"> Keep slings clean, protect them against the contact with acids and wash them by mean of cold water, then hang them to dry. In case of use for loads soiled with chemical substances, check compatibility. 										

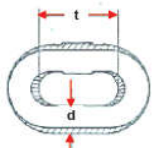
14.3 CHECK AND PROPER USE OF CHAINS AND SUB ASSEMBLY

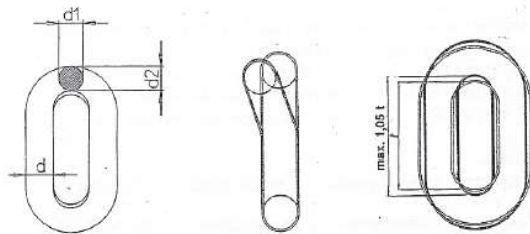
14.3.1 Marking

	<p>Chains shall bring the following marks:</p> <ul style="list-style-type: none"> Manufacturer identification and capacity CE mark on a metallic plate
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14.3.2 Checks and usage limits

Detected Anomaly	Inspection Way	Usage Limits	Remedy
Deformations	Visual inspection	No remarkable deformations shall be present	Replace the equipment
			

Detected Anomaly	Inspection Way	Usage Limits	Remedy
Fissures, cracks	Visual inspection	None shall be present	Replace the equipment
Wear (quarterly check)	Measurement with the caliper 	Wear limit for ring diameter $d = -10\%$ Elongation limit for chain link $t = +5\%$	Replace the equipment



Pitch increase caused by wear


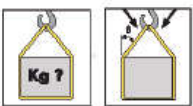

Deformation justifying the replacement/removal of a chain

Pitch increase caused by elongation (overload)

$$d_m = (d_1 + d_2)/2$$

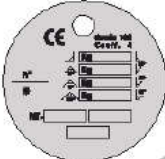
$$d_{m \min} = 0.9 * d$$

14.3.3 Hints for proper use

	<ul style="list-style-type: none"> BEFORE ANY USAGE, visually check that there are no deformations or wear signs. In case of doubt, have the chain checked by competent personnel.
	<ul style="list-style-type: none"> The capacities indicated consider the symmetrical lifting of the load in normal environment conditions. When a load gets slinged by passing the chain under it and then hooking up the chain by means of the hook, chain capacity decreases by 20%. When asymmetric loads are handled, lifting shall be carried out only by specialized personnel able of determining the correct chain dimensioning. Be very careful about sharp edges, as chain capacity decreases considerably. In this case too, the actions shall be carried out by specialized personnel.
	<ul style="list-style-type: none"> Do not submit chains to acids or caustic solutions.

14.4 CHECK AND PROPER USE OF ROPES


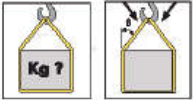

14.4.1 Marking

	<p>Ropes shall bring the following marks:</p> <ul style="list-style-type: none"> • Manufacturer identification and capacity • CE mark on a metallic plate
---	---

14.4.2 Checks and usage limits


Detected Anomaly	Inspection Way	Usage Limits	Remedy
Permanent deformations folding, kinking, bulges or core breakout	Visual inspection	None shall be present	Replace the equipment
Corrosion signs, thread colour variations due to overheating or weld spatter	Visual inspection	None shall be present	Replace the equipment
Loosening of strands even when the rope becomes taut; cut or crushed sleeves	Visual inspection	None shall be present	Replace the equipment
<p>Broken wires As a rule, when there are 5-6 broken wires concentrated in a length equal to 6 times the rope diameter, replacement is to be carried out. Due to the difficulty of counting the exact number and to the hazards connected with lifting, it is advisable to replace the sling as soon as two or at most three broken wires are found in the same strand. Particularly check the rope in proximity of the connection (sleeves or sockets), where breaks are the most frequent, and bend the rope in order to found broken wires, if any.</p>	Visual inspection	5-6 broken wires concentrated in a length equal to 6 times the rope diameter	Replace the equipment
Wear (quarterly check)	Measurement with the caliper	Rope diameter decrease by approx. 10% due to wear and/or wire crushes	Replace the equipment

14.4.3 Hints for proper use

	<ul style="list-style-type: none"> • Before using the wire rope tie rod, inspect visually the conditions of the accessories and the integrity of the stud; make sure that the load does not exceed the capacity shown on the name plate situated on the sub assembly or on the sleeve of the wire rope tie rod. • Check that the sizes of tie rod suspension accessory (usually a sub assembly) are such as to enable certain mobility on the crane hook without any forcing or jamming.
	<ul style="list-style-type: none"> • The capacity is determined by the max. load to be lifted and by the axial effort to which the rope is submitted. Really, with the same load applied, the axial effort increases the more the rope axis shifts from the vertical. For each type of tie rod the manufacturer shall indicate the capacity under consideration of an outer angle of 45° (90° at the tie rod top) and of 60° (120° at the tie rod top). • Never use the wire rope tie rod with an inner angle exceeding 120°. • Approximately, the pin diameter shall be at least 3-4 times the rope diameter so that the rope may preserve its features; under this value the rope deteriorates quickly and the wire rope tie rod capacity get halved.
	<ul style="list-style-type: none"> • When the rope is to work in contact with sharp edges, protect it by means of appropriate edge protectors so that it does not spoil quickly; moreover, avoid bending the wire rope tie rod in proximity of sleeves or splices and avoid shortening the wire rope tie rod with knots. • Never leave the load hanging from the sling; the lifting and lowering of the load shall be completed as quickly as possible and the load shall be put down without crushing the rope, which, if so, could get damaged. Even more so, do not take away the rope crushed under the load by pulling it at one end. • For a correct usage, avoid hooking up the load on the hook tip, capacity decreases considerably and, before lifting the load, make sure that legs are free from kinking.

14.5 CHECK AND PROPER USE OF HOOKS

14.5.1 Marking

	<p>Hooks shall bring the following marks</p> <ul style="list-style-type: none"> • Manufacturer identification and capacity • CE mark.
---	---

14.5.2 Checks and usage limits

Detected Anomaly	Inspection Way	Usage Limits	Remedy
Deformations: widening of the depth of throat opening, elongation, deformations, scoring, breaks.	Visual inspection	None shall be present	Replace the equipment
Particular signs of corrosion due to overheating or weld spatter	Visual inspection	None shall be present	Replace the equipment
Missing locking key	Visual inspection	It cannot be used	Replace the equipment
Wear (quarterly check)	Measurement with the caliper	Deformations or reduced thickness in whatever point > 10%, elongation > 5%	Replace the equipment

14.5.3 Hints for proper use

	<ul style="list-style-type: none"> • The hook preserves its nominal capacity when the resultant of applied forces is aligned to the hook axis (1). • Never submit the hook to side efforts or buckling (2, 3, 4). Do not turn the swivel hook under load. • Hooks shall be replaced as soon as wear signs, deformations or reduced thickness in whatever point exceeding 10% are detected. Never try to repair a hook. • Pay attention that the hook may not be affected by any weld spatter which could affect its integrity. • The locking key ensures that the tie rod connected to the hook, during lifting, does not come out of its recess. It is not at all dimensioned to support any loads. • Before any lifting make sure that the hook and the locking device are in good state, that locking devices are not bent or damaged, that the recall spring of the locking device pushes this latter against the hook and thus closes its opening.
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14.6 CHECK AND PROPER USE OF SHACKLES, EYEBOLTS AND CLAMPS

14.6.1 Checks and usage limits for eyebolts

Detected Anomaly	Inspection Way	Usage Limits	Remedy
Deformations: elongation, path deformation, scoring, thread breaks.	Visual inspection	None shall be present	Replace the equipment
Signs of corrosion due to overheating or weld spatter	Visual inspection	None shall be present	Replace the equipment
Wear (quarterly check)	Measurement with the caliper	Deformations or reduced thickness in whatever point > 10%, elongation > 5%	Replace the equipment

14.6.2 Hints for the proper use of eyebolts

- Before usage check thread wholeness and make sure that threaded parts are clean.
- Screw tightly the eyebolt till it fully adheres to the surface of the detail on which it gets assembled.
- Never try to adapt the eyebolt by cutting or restoring its thread.
- When the eyebolt is submitted to side efforts a capacity reduction occurs as follows:

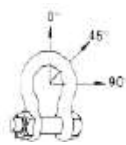
	Angle with respect to the vertical	Capacity
	0°	100%
	45°	70%

14.6.3 Checks and usage limits for shackles

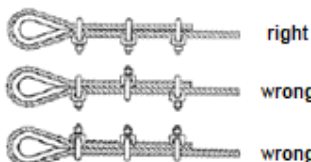
Detected Anomaly	Inspection Way	Usage Limits	Remedy
Deformations: elongation, path deformation, scoring, thread breaks.	Visual inspection	None shall be present	Replace the equipment
Signs of corrosion due to overheating or weld spatter	Visual inspection	None shall be present	Replace the equipment
Wear (quarterly check)	Measurement with the caliper	Deformations or reduced thickness in whatever point > 10%, elongation > 5%	Replace the equipment

14.6.4 Hints for the proper use of shackles

- Never submit the shackle to unbalanced pulls, which could make it turn and therefore damage it; always check shackle efficiency before each lifting.
- Make sure that the pin is well screwed against the bracket by using the whole thread.
- To avoid load unbalances, the clearance of the pin could be reduced by shimming it on both sides by means of appropriate spacers, never weld.
- Never weld on a shackle; never use a bolt or something other than the original pin.
- When the shackle is submitted to side efforts a capacity reduction occurs as follows:

	Angle with respect to the vertical	Capacity
	0°	100%
	45°	70%
	90°	50%

14.6.2 Hints for the proper use of clamps

	<ul style="list-style-type: none"> ▪ Position the clamps as shown in the figure as otherwise the liftable load of the connection decreases even by 60% with respect to the rope load. ▪ It is recommended to mount a number of clamps not inferior to that shown in the table
---	---

Rope diameter		Sizes							Weight (kg)	Minimum number of clamps	Tightening torque Nm
		A (mm)	E (mm)	H (mm)	I (mm)	L (mm)	R (mm)	S (mm)			
1/8 (inch)	3-4 (mm)	M4	12	18	9	20	7	10	0.009	3	1.25
3/16	5	M5	13	24	13	24	10	15	0.020	3	2.46
1/4	6	M6	15	27	15	28	11	16	0.033	3	4.24
5/16	7-8	M6	19	31	17	34	12	18	0.040	5	4.24
3/8	9-10	M8	22	37	20	42	13	21	0.079	5	10.20
7/16	11	M8	22	41	22	44	14	24	0.079	5	10.20
1/2	12-13	M10	33	44	25	55	15	26	0.130	5	20.11
9/16	14	M10	33	47	27	57	18	27	0.145	5	20.11
5/8	15-16	M10	33	51	29	63	20	28	0.175	5	20.11
11/16	17-18	M12	44	56	34	75	21	32	0.260	5	34.43
3/4	19-20	M12	44	62	34	75	22	33	0.290	5	34.43
7/8	21-22	M12	52	65	39	85	25	35	0.340	7	34.43
1	23-26	M14	50	72	42	95	27	40	0.490	7	54.77
11/8	27-30	M14	50	78	47	110	33	43	0.620	8	54.77
11/4	31-34	M16	55	88	53	120	37	48	0.840	8	85.14
11/2	35-40	M16	60	98	59	140	40	54	1.120	8	85.14

15.0 SAFETY PROCEDURE FOR THE USE OF HYDRAULIC TENSIONERS

USE OF HYDRAULIC WRENCHES AND TENSIONERS

The main precautions the operator shall adopt are the following:

- wear all the personal protection equipment provided
- never carry out any tampering whatever on the equipment
- never use the electric pump, if available, in the presence of explosive atmospheres or moist environment! If an electric pump is used, make sure that it is “earthed” and that its electric cable is an appropriate (construction cable is required) and whole one. Operators shall be aware of electrical hazards!
- check that feeding pressure does not exceed the plate data of the equipment and of the relevant feedline (breaks with projection of metallic parts might occur); should values not be correct, carry out the necessary adjustments on available pressure regulators
- check, through visual inspection, the wholeness and the proper connection of pneumatic plant pipes to the corresponding compressed air feeding line fittings (whole and properly connected quick couplings) Inspect in order to identify possible cracks, wear signs Take the damaged equipment out of service and communicate this to your superior.
- check, through visual inspection, the wholeness and the proper connection of piping and high pressure fittings; immediately communicate any malfunction to your superior and take the equipment out of service. Inspect in order to identify possible cracks, wear signs Take the damaged equipment out of service and communicate this to your superior.
- test the proper no-load functioning of the equipment and the tightness of the relating ducts
- lay piping in such a way as not to hinder transit ways and working area Damages to pipes may arise from mechanical, thermal as well as chemical stress and may cause the release of hydraulic fluid under pressure, thus causing lesions
- in order to avoid the possibility of objects dropping from high lying zones, the equipment and its reaction arm shall be steadily fixed/lashed and, if necessary, additionally held by safety cable (for devices Enerpac type or similar)

DURING USE:

- never pressurize connectors (pipes with quick couplings, if any) when they are disconnected
- keep hands and fingers far from the points with crushing hazard: they are near the reaction point (lever) and in narrow spaces between key and possible bulks
- the equipment is provided to be used by only one operator (in the event of more operators, the operator controlling the actuation system shall see directly all the operators and check whether they are in a safety position before pressurizing)
- set the reaction and properly house the torque wrench! an improper use (set-up reaction and/or improper grip-positioning) may bring about tensions that can damage the equipment or the pin/nut sensible to breaking the commonest cause of breaking is the non-orthogonal grip between key

section and nut, with the resulting twisting arrow. always operate according to the manual (for the devices Enerpac type or similar)

- caution: high hydraulic pressure use suitable and perfectly whole tools, pipes, fittings as well as the necessary PPE. Pay attention to possible leakage of hydraulic liquid; in such a case immediately communicate the malfunctioning to your superior and take the equipment out of service Never exceed the max. operating pressure indicated
- wear safety goggles and eyeshade! Eye protection is necessary when working with or near the hydraulic pressure system
- carry out the work in conditions of suitable stability
- avoid long and continuous shifts not to expose workers to noise hazards and vibrations of upper limbs
- immediately communicate any malfunctioning detected

SPECIFIC STANDARDS FOR HYDRAULIC TENSIONERS

In order to ensure safety while assembling the different components of the feeding circuit and relevant tensioner as well as to avoid the possibility of using any components with different and not coordinated characteristics of nominal pressure, each component belonging to the same class of pressure is identified by means of a specific colour according to the following principles:

COLOUR	MAX. OPERATING PRESSURE	MIN. HP PIPE BEND RADIUS
Green	1000 bar	95 mm
Blue	1500 bar	130 mm
Red	2500 bar	200 mm

- check the proper operating pressure for the specific tightening activity according to the operation and maintenance manual of the equipment and according to the instructions received by your superior
- operating pressure shall never exceed the plate pressure of the equipment (always inspect visually by means of the special gauge)
- never pressurize connectors (pipes with quick couplings) when they are disconnected
- check that there is no pressure in the circuit before connecting or disconnecting quick couplings (always inspect visually by means of the special gauge).
- position danger warnings in proximity of the working area (EQUIPMENT UNDER PRESSURE! DANGER)
- make sure that no unauthorized personnel may approach the working area (mark out and/or inhibit the access by means of a red-white barrier chain)
- during the pressurizing and the pressure releasing phases the personnel assigned shall keep away from tensioners and assume a safe position; particularly during all tensioning phases it is forbidden to be on the tie rod axial path (in the event of a break there is the hazard of high speed ejection of parts)

- upon reaching the operating pressure, near the tensioner only after shutting off the hydraulic pump delivery and waiting pressure stabilisation and, anyhow, only for the time strictly necessary to tighten the nut always assume a safe position (keep away as much as possible from the tensioner and never assume a position within the axial path of the tie rod)
- never leave a tensioner under pressure unattended and release pressure during work breaks
- immediately release pressure if any unauthorized personnel get near the working area and if any personnel assume not safe positions as described above
- keep your hands and fingers away from the points with squeezing hazard during the phases of nut positioning and tightening.

AFTER USE:

- deactivate the equipment and release pressure from it and from its piping
- disconnect the feeding pipes and check for the wholeness of them and of the equipment as a whole
- be extremely careful not to damage the equipment during handling, particularly in the zone of fittings and quick couplings
- store the components, pump, HP/LP pipes, tensioners in a safe area in order to ensure that they cannot be accidentally damaged (mechanical, chemical, thermal stresses)
- in the event of maintenance actions, make sure to have released the pressure inside the equipment as well as in the relating feeding piping, and strictly follow the manufacturer's instructions in the instruction manual
- never carry out any tampering whatever on the equipment.

16.0 SAFETY PROCEDURE: ACTION INSIDE EXPLOSION HAZARD ZONES

During actions in classified zones it is necessary to avoid introducing the following effective ignition sources.

Possible ignition sources (EN 1127-1)	Compensatory measure
Hot surfaces	It is forbidden to use open flames within classified zones
Sparks of mechanical origin	It is forbidden to use spark producing tools. If manual, they shall be bronze tools.
Hot gas flames	Pay attention to the location of safety relief valve vents during maintenance activities so that you do not enter their action radius. The location of safety relief valves is signalled by means of a specific symbol.
Sparks of electrical origin	It is forbidden to use electrical appliances in not ATEX-certified hazardous zones.
Stray currents	Electrical appliances (limit switches assembled on the connection) are suitable to operate in a potentially explosive atmosphere.
Static electricity	It is necessary to wear anti-static clothes and shoes.
Lightning	The installation site is protected against lightning (the user's responsibility).
Electromagnetic fields	It is forbidden to use any mobile phones within a classified zone.
Ionising radiations	It is forbidden to use gamma or X rays.
High frequency waves	It is forbidden to use any mobile phones within a classified zone
Ultrasounds	The appliances used shall be suitable to the classified area.
Adiabatic compressions	It is forbidden to use appliances that can produce adiabatic compressions.
Chemical reactions	It is forbidden to use any substances that could create an exothermal reaction when in contact with a potentially explosive atmosphere.

The extent of the hazardous zone, calculated for open environments under consideration of the worst case as tracing event, is set forth at Section 14 of this manual.

Appliances to be used

Appliances should be suitable to be used in a classified atmosphere.
As to manual tools (wrenches etc.), they should be made from reduced sparking material (bronze).

Substances to be used

It is necessary to use substances that cannot create exothermal reactions when in contact with a potentially explosive atmosphere.

Personal protection equipment to be used

It is necessary to use personal protection equipment of anti-static type so as to transmit no discharge to metallic surfaces.

17.0 ENVIRONMENTAL IMPACT OF THE PRODUCT

All valve metallic parts can be recycled, while soft parts (elastomers, plastic materials etc.) shall be disposed of as hazardous wastes separately from household waste.

At the end of its operating life a valve shall be disassembled and the recyclability of its parts shall be assessed depending on the type of fluid with which it has entered into contact. If nothing can be recycled, pieces shall be disposed of as hazardous wastes.

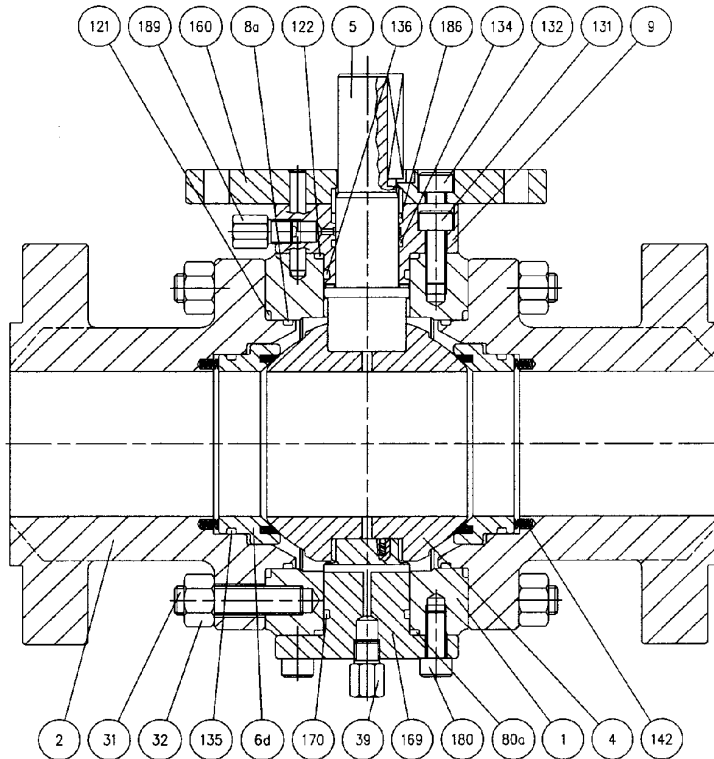
The valve is tested to ensure its tightness towards the outside. The product flowing through it can come out only in the event of a failure (remote event). The possible hazardous zone that could be generated is analysed at section 13.0 with reference to an open environment. It will be up the user's responsibility to provide a more thoroughly analysis under consideration of the real environment conditions within which the product will be installed.

The valve assembler can, through the data set forth in this manual, carry out the calculation of the extent of the hazardous zone depending on environment/installation conditions other than those considered at the previous sections.

Through a continuous development of the product and through a continuous improvement of sealing systems we are working in order to attain zero leakage towards the outside during the whole valve operating life.

This result can be attained more easily by carrying out the ordinary maintenance as shown in this manual.

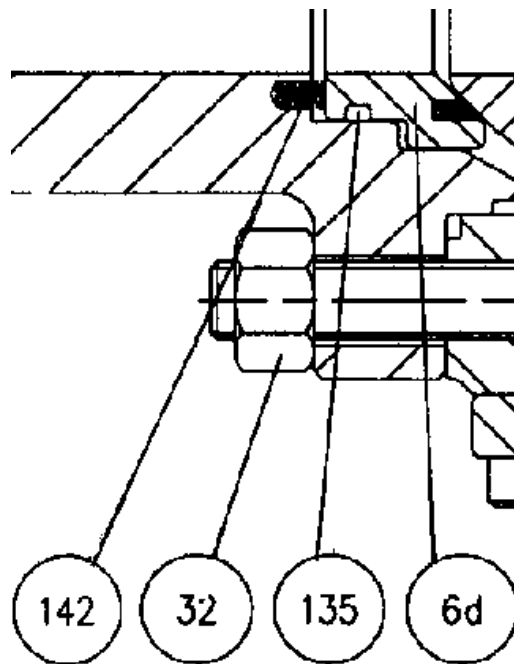
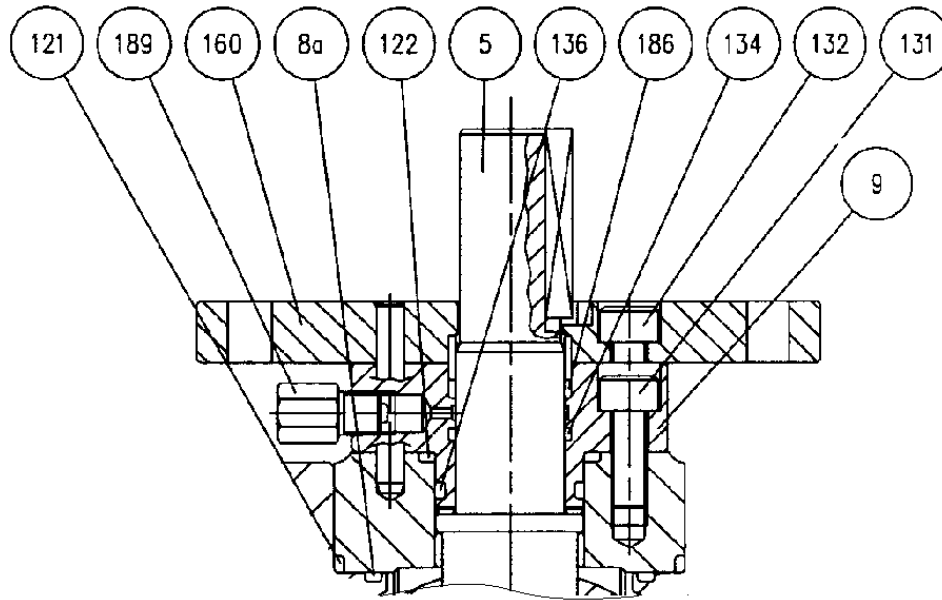
ANNEX NO. 1 – B4-D Valve Unit –



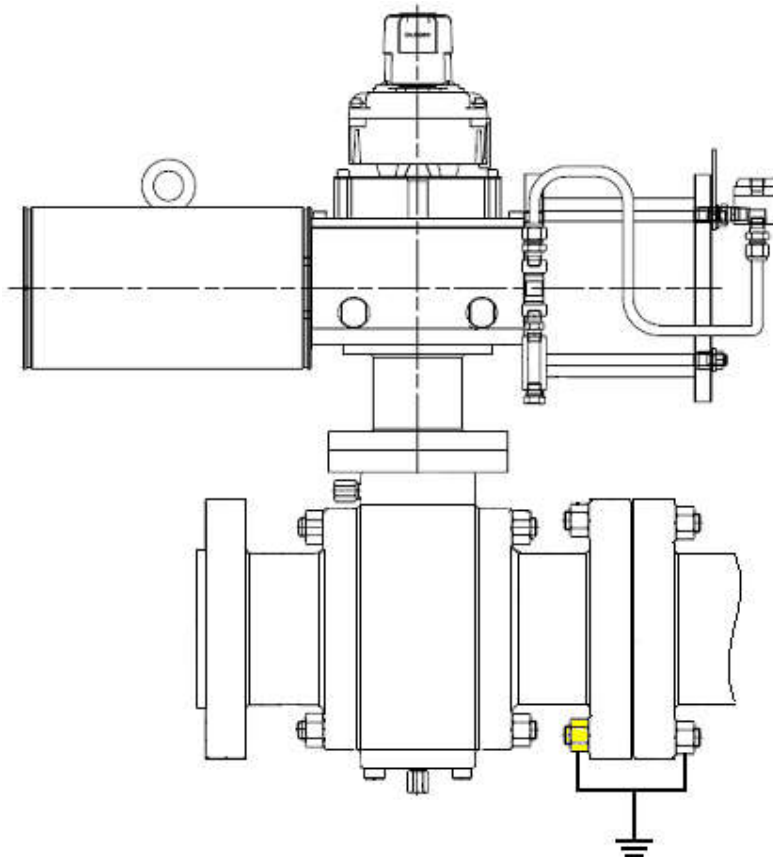
No.	PART NAME
1	BODY
2	CLOSURE
4	BALL
5	STEM
6d	OUTER SEAT
8a	CLOSURE O-RING
9	TOP COVER
31	BODY STUD
32	BODY STUD NUT
39	DRAIN VALVE
80a	LOWER TRUNNION F.S. SEALS
95	BODY CAPSCREW
121	CLOSURE F.S. SEALS
122	TOP COVER F.S. SEALS
131	TOP COVER CAPSCREW
132	ADAPTER PLATE CAPSCREW
134	STEM O-RING
135	SEAT O-RING
136	TOP COVER O-RING
142	SEAT SPRING
160	ADAPETR PLATE
165	BEARING HOUSING
169	LOWER TRUNNION
170	LOWER TRUNNION O-RING
180	LOWER TRUNNION CAPSCREW
186	STEM F.S. SEAL
189	STEM GREASE FITTING
544	STOP COLLAR

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ANNEX NO. 2 – Crucial Areas –



ANNEX NO. 3 – Identification of the Earthing Plate –



Should the surfaces of the flanges be painted and not ensure a direct metallic contact, it would be necessary to restore it by means of a cable and to check that the whole system is at the same potential and earthed.

The earthing of the system is the final installer's responsibility.