Instructions for the operation of

GÄBLER-piston slide valves in gaseous oxygen pipelines

1. General:

GÄBLER-piston slide valves are shut-off valves of a high standard that are produced with the most possible care and precision. In order to keep the safety and the reliability and in order to reduce the necessary maintenance to a minimum a few but important rules must be followed.
GÄBLER piston slide valves that are intended for the use in pipelines for oxygen are free of oil and grease and are marked correspondingly on the valve body. The valves have been tested for the behaviour in adiabatic pressure shocks at the German Federal Institute for the Testing and the Research of Materials (BAM) where they have been found suitable for the use in gaseous oxygen within an operating range of max. 100 bar pressure at max. 100°C – provided the strength of the valves acc. to their nom. pressure allows that high pressure. The European Industrial Gases Association recommends using valves that have been found reliable acc. to adiabatic pressure shock tests for an operation range of 30 bar up. The minimum operation temperature for the ambient air as well as for the flowing medium is -20°C.
The metallic materials chosen for the pressure bearing parts in contact with gaseous oxygen are exempt materials according to the EIGA document for oxygen pipelines 13/20/E. They are excluded from the limitation of flow velocity up to a pressure of 20.68 MPa.

Valves that are intended for the use in pipelines in the European Community and that are falling under the validity of the Pressure Equipment Directive PED 2014/68/EU can only be installed into new pipelines if the conformity with the PED is visibly confirmed by a CE-sign in combination with the number of the Notified Body.

Oils and greases must be kept away from the valve during the operation of the valve as well as during maintenance. Further on in case of a leakage oxygen might get in contact with materials lying nearby leading to a sudden combustion. Therefore, such materials should be kept in safe distance from the valve. No oils and greases should be stocked near oxygen pipelines and valves.

1) The GÄBLER-piston slide valve has to be installed in direction of flow according to the arrows on the valve body. This direction provides a comparatively low pressure drop. Further on the direction of the pressure difference over the closed valve is important for the tightness in the valve seat.

2) If a flow in both directions is intended, spring closing valves as well as handlever-operated valves may open by themselves, if the pressure on the outlet side of the valve is higher than on the inlet side of the valve. If this might be the case (at pressure vessel shut-off valves or within circle pipelines where the medium can flow in both directions) the company H. GÄBLER ARMATUREN GMBH & Co. KG should be contacted. In these cases, a closing cylinder is recommended for the valve to support the force of the closing spring in cases of an own medium operation or an operation with auxiliary medium instead of own medium might be the solution with an double acting actuator cylinder in order to grant tightness within the valve seat.

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3) If automatically operated valves are actuated with oxygen as own medium operation, at each operation a small amount of oxygen is deaerated through the piloting solenoid valve. It has to be vented into safe areas. The minimum requirement is that this venting oxygen cannot hit combustible materials or persons working or walking next to the valve.

4) Especially the GÄBLER-piston slide valves that are shut or opened pneumatically should be arranged at a place where no direct rain, spray water or deep sea may flow into the valve leading to a corrosion of the compression spring especially for valves where stainless steel cannot be used for the spring due to tension reasons. A shelter is recommended which is including electrical equipment like solenoid valves or limit switches. Breathing wholes must not be sealed. If the valve is directly exposed to rain breathing wholes should be equipped with a small venting tube facing to the bottom to avoid water entering the valve.

5) To increase the reliability of the valve and to avoid impingement it is necessary to use suitable dirt traps in the pipeline in order to keep away abrasive particles from the piston slide valve. The filter mesh size should not exceed 70 µm. As pointed out in the EIGA doc. 13/02/E and as mentioned in point 2) oxidizable particles like rust, welding beads etc. are one of the main reasons for oxygen fires. Aside from the tightness and reliability of the valve it is important for the safety of the pipeline itself to remove all major particles.

6) To protect the GÄBLER-piston slide valve as well as the pipeline the valve should be opened and shut quickly but smoothly. The valves that are piloted pneumatically or hydraulically by own or auxiliary media should have a pressure regulator or a filter pressure reducer in order to adjust the pressure and the corresponding opening or closing speed. Manually operated valves with hand wheels are closed by turning the hand wheel clockwise; they are opened by turning it counter clockwise. If the piston is kept in a throttling position at a small degree of opening the flow velocity in the valve seat might be very high leading to a warming up of the seat sealing O-ring. This could – in the worst case in combination with combustible particles that are hitting the O-ring with high impact value – lead to an ignition of the O-Ring which in consequence would lead to a leakage in the valve seat.

7) To check the function and the reliability of the GÄBLER-piston slide valve the piston should be operated regularly, at least once a month. By moving the piston, the smoothness of the seals is improved thus extending the life of the sealing rings as well as the tightness of the valve towards the atmosphere and within the valve seat.

8) After long periods of not operating the valves, the seals might have settled down in the liners a bit and the valve needs a small increase in operation force. On the ground the FKM seal elements are quite elastic this process is reversible by moving the piston with operation pressure several times so that it can be secured that the valve shuts tight again.

9) It is only allowed to operate the automatically operated valves with the right power supply which is shown in the data sheet as well as it is marked on the solenoid and on the limit switches.

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10) If the valve is auxiliary medium operated the GÄBLER piston slide valve itself must be equipped with an additional actuation cylinder to separate the flowing medium within the pipeline and the auxiliary medium in case of a leakage. The actuator cylinder is not suitable for an operation with oxygen if not explicitly confirmed. In this case FKM seals would be used instead of the standard NBR seals for the actuator cylinder. Nonetheless the parts of the actuator cylinder are degreased.

11) The auxiliary medium pressure is limited to 10 bar(g). The auxiliary medium pressure should be equipped with a shut-off feature, e.g. a GÄBLER GKS 200.

12) Automatically operated valves must not be operated while they are locked mechanically. The activator bolt or the split stem nut of an optional additional manual operation with hand wheel must be unlocked and in idle mode, at valves with hand lever the locking pin must be pulled out completely before the valve is operated pneumatically.
If pressure is applied to operate the valve automatically with pneumatic force while the manual emergency operation is still locked the valve will get seriously damaged. Please look at the additional instruction manual for the additional emergency operation.

13) If a valve that has been purchased and supplied by the manufacturer for a certain medium like oxygen and if it is intended for the use within another medium the manufacturer has to be contacted for assistance whether the materials are suitable, approved and allowed for the intended flowing medium.

14) The operation range of pressure and temperature as well as the nominal bore, the nom. pressure, the direction of flow, the sign of the manufacturer is marked on the valve body either as cast-on figures or as hard stamped letters and figures. The marking could be placed on the valve body itself and on the rim of the flanges.

15) Valves are only allowed to be operated within the range of pressure and temperature which is marked on the valve itself and which is named in the data sheet.

16) Maintenance and repair work must be carried out using original GÄBLER spare parts through the manufacturer himself or through authorized maintenance companies or through skilled and trained staff of the end-user in a clean workshop designed and prepared for the repair of oxygen valves.

17) Especially for automatic valves with an emergency manual operation with hand lever it must be taken care that during the operation of the valve nobody is in the angular freedom of the hand lever or in the stroke of the position indication trolley in order to avoid becoming jammed or getting struck.

If the instructions mentioned above are followed the GÄBLER-piston slide valve has almost no considerable abrasive effects for the sealing elements and guarantees a long life of operation, which has been proved in a huge number of cases of use in plants all over the world.

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The engineering of the valve and its parts in respect of strength, suitability of materials, function and reliability has been performed according to established construction norms and rules. It is manufactured using established and reliable components.

The Gäbler Piston Slide Valve is state of the art and has proved reliable since more than sixty years. The valves can be classified technically tight.
Provided the medium is almost free of particles and crystallising content, provided the valve is installed according to the above installation instructions with media and ambient conditions in accordance with the requirements and if the valve is operated regularly at least once a month for checking purposes the GÄBLER Piston Slide Valve is a very reliable valve which is almost free of wear and which can be classified permanently tight in the sense of DIN EN 161.

H. Gäbler Armaturen GmbH & Co. KG is running a quality assurance system acc. DIN EN ISO 9001 (:2015) since many years. Customer complaints are analysed in order to improve the product quality and safety. The achieved quality is result of the quality management system and is therefore repeatable.

The valve has been engineered under the provisions of the DIN EN ISO 13849-2:2008-12 with respect to fundamental safety principles acc. table B1, using approved and well-tried safety principles acc. table B2.
Based on the result of long-term multiple stroke tests, the analysis acc. EN 13849, the internal investigation of customer complaints and the evaluation of the success of improvement actions provided the valve has been installed and used in line with the installation and operation instructions the valve has got the following reliability and life expectation:

b_{10D} = 1.000.000 strokes.

The duration of use for that quantity of operations is

T_M = 10 years.

After that quantity of operations or after duration of ten years in operation the valve must be maintained with the exchange of worn-off parts.

For low demand applications as safety shut-off devices, own-medium-operated, spring-closed Gaebler Piston Slide Valves are SIL2-rated acc. ISO 61508, provided a suitable piloting solenoid valve is used.

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