

Operating Manual

Installation – Commissioning – Operation – Maintenance

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Introduction

This manual has been prepared to the best of our knowledge for information to our customers. It represents the result of our own practical experience.

Failure to meet the instructions given herein would void our liability!



Relevant Documents

The following documents belong to this manual:

- The order confirmation or the delivery note - *informs everybody who is involved in the use of the slide gates of the conditions of operation.*
- The drawing of the slide gate – *provides information on the outfit of the slide gate and its weight and gives additional hints on mounting, start up, operation and maintenance.*
- For slide gates the appropriate flap data sheet - *provides information on the equipment of the slide gate with drives and other accessories, as well as on the major electric and pneumatic data of the accessories.*
- The corresponding manuals and documents on the accessories supplied – *provides further advice for commissioning, operation and maintenance of the accessories supplied.*

These documents contain additional hints that must be followed essentially for mounting, commissioning, operation and maintenance.

Meaning of reference marks

	<p>Warning</p> <p>Means that death, severe or light physical injuries or substantial material damage may occur if the respective precautions are not met.</p>
	<p>Caution</p> <p>Means that material damage might occur unless the appropriate precautions are met.</p>
<p>K</p>	<p>Note</p> <p>Is an important information on the product, its handling or the relevant part of the documentation that should be taken particular care of or that includes further information.</p>

Introduction

This valve has left the manufacturer's workshop in an unobjectionable condition. To retain this condition and to ensure smooth functioning free from any hazard, it is essential to follow the hints, remarks and recommendations given in this installation, operation and maintenance manual carefully.

Qualified personnel in the meaning of this installation, operation and maintenance manual are defined as persons who are familiar with the assembly, start-up and operation of slide gates, and who dispose of qualifications in accordance with their functions.

The following instructions shall be followed:

- The contents of this installation, operation and maintenance manual.
- The corresponding safety precautions for the installation and operation of the facility where the fittings are to be installed.
- The Regulations and Guidelines on the Explosion Proofness of any equipment to be connected to the fittings with Ex-approval, or which are used with the fittings in areas of explosion hazard.
- The basic procedures on labour safety and the prevention of accidents.
- The regulations, standards and guidelines mentioned in this manual and valid in the Federal Republic of Germany. When using the fitting in other countries, the national rules applicable there shall be followed.

Should in any case the information included in this Installation, Operation and Maintenance Manual not suffice or be understandable, we shall readily be at your disposal with further information:

ENA GmbH
Spielburgweg 23
D-41844 Wegberg
Phone: +49 (0)2434 997040
Fax : +49 (0)2434 997041
E-mail : info@ena-gmbh.de
Homepage: www.ena-gmbh.de

Application

ENA slide gates are appliances for installation in piping or channel systems for industrial purposes.

By using them a medium is shut off, controlled or throttled. The slide gates provided by ENA are of customised design and manufacture. This manual is valid both for round and cornered slide gates.

Storage and Handling

- Storage in a well ventilated and dry room only.
- Protection against floor humidity by storage in a shelf or on a wooden grating.
- To be covered against dust and dirt.
- Metallic blank surfaces to be treated with a suitable anti-corrosive agent.
- Transit to the installation site in firm packing.



Warning

Improper transit may lead to personal injuries or material damage. Make sure to follow VGB 9 and VGB 9a.

Slinging possibilities for hoisting by a crane


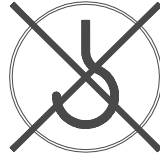
 <p>Possible slinging points or points preferred to be used.</p>	 <p>Do not use these points.</p>
<ul style="list-style-type: none"> • Bores in the flanges. • Slings around the housing by chemical fibre belts. • Slide gates of more than 500 kg weight are equipped with slinging points identified by this symbol. 	<ul style="list-style-type: none"> • Drives • Hand wheels • Valve shafts • other accessories installed

Table 1 Slinging Points



Caution

When routing the hoisting slings make sure that no accessories are squeezed or damaged!

Assembly

The following should be checked before the beginning of assembly:

- Check according to the relevant documents (see page 4) whether the fitting is suitable with respect to the operational conditions.
- Check the fitting for smooth functioning (by manual operation).
- Check for installation dimensions and space demand.
- Determine the direction of media flow according to the following table (see page 8) or to the drawing.

**Warning**


Lock the fitting against accidental opening or closing during assembly - squeezing hazard!

All slide gates shall principally be assembled with horizontal blade, unless agreed otherwise between ENA and the purchaser. In such cases, the installation position will be as specified in the drawing.

K**Note**

The electric connectors (PG-joints) must not point upward. Install the fitting accordingly or select an angular joint for electric connection.



Direction of flow

	<p>Note</p> <p>It is essential to follow the additional notes on the corresponding drawing!</p>
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Installation

On principle, all installation parts in the piping or channel system must be in sufficient distance so that the fitting is not obstructed by opening or closing. Particular care must be taken for the installation in close vicinity to:

- pipe bends, expansion pieces or other shaped parts
- baffles
- compensators
- any parts installed in the piping such as measuring transducers.

	<p>Note</p> <p>Installation shall be centred to the pipe or channel axis, any tensioning of the fitting, e.g. by unparallel flanges, is not permitted.</p> <p>Mounting hardware like screws and gaskets, must be designed to the operational conditions of the fitting.</p>
	<p>Caution</p> <p>After assembly, any damage to the corrosion protection or surface coating of the fitting shall immediately be repaired and eliminated properly.</p>

Installation of fittings with flanged connectors and for clamping between flanges

The connecting flanges of a pipeline must be plane-parallel, they must be installed centrally to the axis. For sealing, they should be installed with a gasket or sealing strip. The screws shall be tightened uniformly and in cross-over direction, as usual for screwed connections.

Installation of fittings to be welded-in

Connected pipe ends must be plane-parallel, they must be installed centrally to the axis. The weld must be designed and laid in accordance with the housing wall thickness. Select the welding material in compliance with the operational conditions.

To avoid tension load on the fitting, try to observe a heat transfer as low and uniform as possible, if necessary by displaced welding arrangement.



Caution

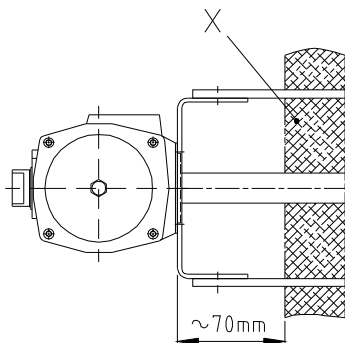
During welding take care not to damage any components in the neighbourhood by excessive heat or welding spatter.

Insulation

Slide gates for a media temperature of 100°C min. should be insulated to prevent heat from being transferred to any accessories installed. Should no insulation be provided, a baffle plate should be installed between the attached parts and the slide gate.

Any attached parts like flange bearings, connecting rods, drive units and other accessories **must not** be included in the insulation. To ensure a proper heat transfer, the insulation (X) shall be constructed in accordance with the following illustrations, making sure that a clearance of at least 70 mm is maintained to the drive console or the flange bearing console

Insulation with drive unit in direct mounting



The stuffing boxes may be included in the insulation. As this packing is a maintenance part, we recommend an easily removable collar of a diameter D of 200 mm min.

For installations after initial hot start-up we propose to use slide gates with flange connections or for clamping between flanges an insulation in this area easily removable between the flanges (see page 10).

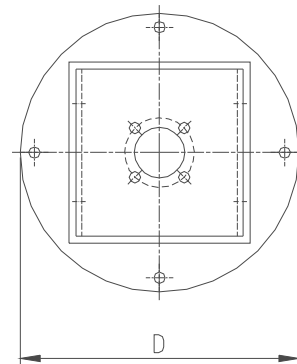


Fig. 1 Insulating Collar

Table 2 Insulation



Warning

Hot surfaces might develop on these fittings, due to the medium. Protect the surfaces after insulation against touching and identify them by the adjacent icon!



Start-up

A functional check is performed on all slide gates in the workshop, during which any mechanical stops and limit switches, if existing, are also adjusted. This adjustment shall be checked after installation and before starting-up!

For starting-up of the overall system, all fittings shall principally be open, in order to avoid damage by pressure impact.

A summary of activities to be performed is found in Table 6 Summary of works for starting up on page 20.

Before first start-up

The following checks shall be performed prior to the first start-up:

- Installation Inspection
- Inspection of all supply lines
- Inspection of the adjustment of mechanical stops, travel switches and limit switches
- Functional checkout of fittings

Hot start-up

The following checks shall be performed after first hot start-up:

- Functional checkout of slide gate
- Inspection of supply lines
- Inspection of stuffing boxes for correct tightening torque and sealing.

Slide gates with flange connection and for clamping between flanges

After the first hot start-up, it is necessary to re-tighten the screwed joints and to check the flange connection for leakage. Therefore, the insulation shall be constructed adequately in this area.

Slide gates to be welded-in

After the first hot start-up check the weld for tightness and repair, if necessary.



Warning

Escaping medium may cause personal injury and material damage.

Maintenance

The various hardware options are described hereunder. The corresponding drawing gives information whether the components concerned are integrated in the fitting or mounted to the fitting, and which materials are used.



Warning

For any maintenance activities, make sure to prevent the fitting against external, automatic or accidental actuation!

In Table 7 Summary of maintenance activities on page 21 you find a listing of all maintenance activities required.

Stuffing boxes (Option)

The shaft is sealed by a stuffing box packing applied in various versions.

Construction

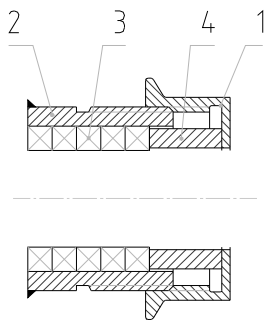


Fig. 2 Type SDK

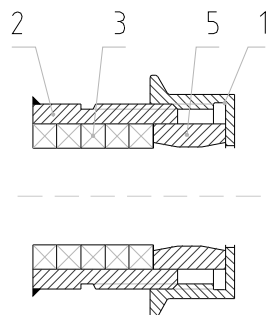


Fig. 3 Type SGK

Item	Description	Wear Part
1	Bearing cap	
2	Bearing holder	
3	Packing	V
4	Pressure ring	
Item	Description	Wear Part
1	Bearing cap	
2	Bearing holder	
3	Packing	V
5	Slide bearing	V

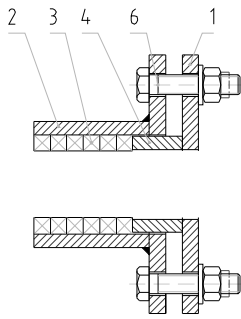


Fig. 4 Type SDB

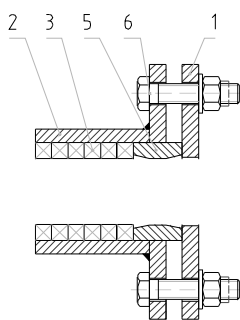


Fig. 5 Type SGB

Item	Description	Wear Part
1	Gland flange	
2	Bearing holder	
3	Packing	V
4	Pressure ring	
6	Mounting bolts	
Item	Description	Wear Part
1	Gland flange	
2	Bearing holder	
3	Packing	V
5	Slide bearing	V
6	Mounting bolts	

Table 3 Stuffing box setup

Stuffing box with inhibitor gas connection (option)

This type of shaft seal is used for critical media because it ensures absolute tightness even after many hours of operation. The bearing housing is provided with a pipe joint **A** through which the inhibitor gas is routed into the packing compartment. The louver ring **B** mounted closely underneath distributes the inhibitor gas in both directions, thus preventing passage of harmful gases.

For the position of the inhibitor gas connection, refer to the corresponding drawing!

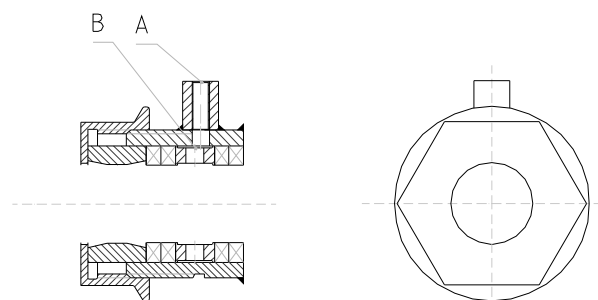


Fig. 6 Type SDKS & SGKS

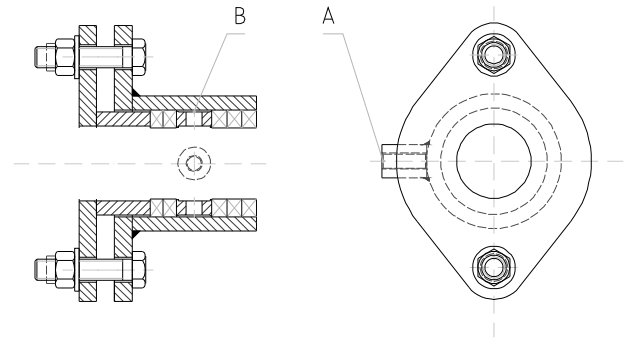


Fig. 7 Type SBDS & SBGS

Shaft dia.	16	22	32	40	50	60	70	80	90	100
Inhibitor gas connector	G 1/8"	G 1/4"								
Sleeve DIN 2986										
Volume flow	0.1 to 0.5 m ³ /h									
Inhibitor gas pressure	Medium pressure + 10 mbar									

Table 4 Stuffing boxes with inhibitor gas connections

	<p>Warning</p> <p>As the inhibitor gas also escapes to the open atmosphere through the stuffing box, only non-toxic and/or non-explosive gas shall be used, for instance air or nitrogen.</p>
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Maintenance

The stuffing box shall be inspected for leakages, at regular intervals. If leakages occur, the bearing cap (Type SKG –SKD) or the mounting bolts of the gland flange (Type SBG – SBD) shall be tightened for a torque according to the list on page 14.

	<p>Caution</p> <p>Excessive tightening torque may cause too high a momentum on the valve shaft and lead to sluggish movement and seizing.</p>
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Replacement of packing

- If existing, remove any accessories such as drive units, flanges and/or pillow blocks, adjustment levers and actuator vanes.
- Unmount bearing caps and/or gland valves and pull off from the shaft.

- Remove any residues of old packing.
- Clean the packing chamber and shaft, the surfaces must be metallic bright and free from scores.
- When using yard ware, cut the packing at 45° according to the shaft diameter (d) and the packing section (s) for a length (L).

$$L = (d+s) \times \pi + s$$

Equation 1 packing cutting – L – d – s mass in mm

- Insert 4 rings max, cut faces displaced to each other by 90°. Now these are pressed-in using a mounting sleeve. The remaining rings are added and also pressed-in.
- Insert the slide bearing, pressure ring or louver ring according to the construction set-up.
- Replace the bearing cap or louver flange and tighten for the torque indicated on page 14 Tightening Torques – making sure that twisting or canting takes place. During tightening of the stuffing box, the shaft should be actuated several times, to verify the adjusting forces needed.

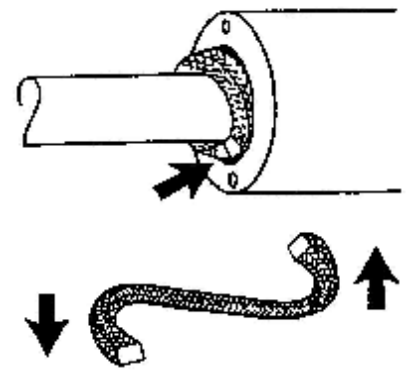


Fig. 8 Packing

Tightening Torques

The area pressure during tightening the stuffing box packing should correspond to about twice the medium pressure, have not less than 20 N/mm².

Flange bearing and/or plummer block (Option)

Construction

Flange bearings and/or plummer blocks are mounted to appropriate consoles on the fitting. They are used in two-hole or four-hole mountings, depending on the mechanical load. All bearing houses are provided with a tapered lubrication nipple H1. To be able to control the thermal expansion of the flap shaft, the stationary and movable bearings are mounted to the slide gate. Stationary bearings are marked by **FP** in the slide gate description.

Maintenance

At 2000 operation hour intervals, the bearings shall be relubricated; on this occasion, make sure to inspect also the firm seating of the bearing housing and the stationary bearing function, respectively.



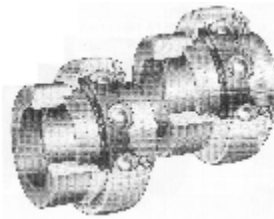
Type of bearing	Bearing temperatures in °C							Together	Consist. NLGI - Classe									
	-50	0	+50	+100	+150	+200	+250											
UCF & UCFL	-30		+120					A	2	OKS 402								
PCJ & PCJT	-30		+150					B	2	OKS 404	Isoflex Topas L152							
RCJ...FA125	-20		+250					C	2	OKS 4220	Barrierta L55/2							
Composition	A Lithium soap			B Complex lithium soap				C PTFE / perfluoropolyether oil										
Grease volume for relubrication (g)																		
Shaft diameter	15	20	25	30	35	40	45	50	55	60	65	70	75	80	90	100		
Volume	2,0	2,5	3,0	4,5	5,5	7	7,5	8	10	10,5	14	14	14,5	15,5	20,5	26		

Table 5 Recommended lubricants

Use flange bearings as stationary FP

Two different bearing inserts are mounted:

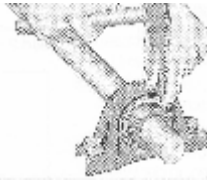


- Bearing insert with threaded pins for retaining.
- Bearing insert with eccentric ring for retaining.

The movable bearings are not retained and therefore are supplied without any eccentric ring or threaded pins.

Replacing the bearings

Bearing housing with eccentric ring	Bearing housing with threaded pins
Remove any accessories like drives, actuators and actuator tabs, remove old bearing housing.	
Shift and align the housing unit on the shaft, during adjustment make sure to follow pre-tension information in the drawing.	Shift and align the housing unit on the shaft, during adjustment make sure to follow the pre-tension information in the drawing.
Tighten the screws of the housing on the console (follow tightening torque M_A).	Tighten the screws of the housing on the console (follow tightening torque M_A).
Shift the eccentric clamping ring to the starting crank of the inner bearing race and tension it manually.	Tighten treaded pins using a hollow hexagon wrench, follow tightening torques M_G (Table 10 Tightening torques for threaded pins), secure by thread protection paste, e.g. OKS90.

<p>Fix the eccentric clamping ring by mandrel and hammer and retain by threaded pin.</p>		<p><i>Illustrated is the assembly of a plumber block housing. The flange bearing housing shall be installed accordingly.</i></p>
<p>Re-mount the accessories according to the drawing, check the fitting for proper functioning.</p>		

Limit Switches (Option)

Limit switches are to signal the end positions or any intermediate position . They are mounted either on the slide gate shaft or directly on the drive unit. For information about limit switches mounted on the drive unit please refer to the corresponding drive unit documentation.

Maintenance


In intervals of 500 operation hours, check for the electric connections and proper functioning.

Adjustment

<h1 style="color: red;">K</h1>	<p>Note</p> <p>The limit switches are pre-adjusted in the factory. It is essential that this adjustment is checked and re-adjusted, if necessary. The threaded pin (3) shall be secured by retaining paste like e.g. OKS90 (www.oks-germany.de)!</p>
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Man holes and inspection openings (option)

For maintenance and cleaning purposes, slide gates can be provided with inspection openings. For more detailed information, please refer to the respective drawing.

	<p>Warning</p> <p>Man holes or inspection openings must not be opened unless it is ensured that the slide gate is secured against automatic or accidental movement.</p> <p>Any medium still remaining in the fitting may cause severe physical injuries or personal damages! Prior to opening make sure to neutralise the medium, e.g. by flushing the line with fresh air.</p>
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When closing the opening, check and/or replace the gasket.¹

Manual levers and drive units (option)

For actuating the slide gates, drive units of various makes and types are used. Which drive is mounted to the slide gate, please refer to the relevant drawing and the proper documents; see the notes on page 4,

¹ Gasket can be ordered from ENA as a wear part assembly.

Drive units

Drive units are to actuate the slide gates automatically. Various types are in use:

- Electric drives
- Pneumatic drives
- Hydraulic drives
- Mechanical drives with manual adjustment.

For the design of the drive unit please refer to the enclosed documentation; also refer to the notes on page 4.



Warning

For all kinds of work like assembly, start-up and maintenance, make sure to follow the relevant documentation mentioned in the Annex.

Direct mounting

Directly mounted drive units are attached directly on the slide gate shaft or connected with the shaft via a coupling or an adapter.

K

Notre

The recommended mounting position for the drive units of slide gates is the CLOSED limit position.

Exception: For drive units with the safety position of the spring load OPEN, the recommended mounting position is the OPEN limit position!

- Check the connecting dimensions of the shaft or the adapter and the drive console.
- Move the slide gate and the drive unit into the same limit position manually; refer to the note above.
- Place the drive unit on the shaft and insert the drive screws with lock washers according to DIN 127.
- Tighten the screws firmly, according to tightening torques according to Table 14 Tightening torques for drive unit fastening screws, on page 29.
- Adjust the mechanical end position limits and travel switches according to the drive unit documentation as included in the Annex.
- Connect the electrical, pneumatical and hydraulic lines according to the drive unit documentation concerned in the Annex.



Warning

The electrical, pneumatical and hydraulic connections must be made only by properly trained and qualified personnel. Make sure to follow the relevant national regulations.

Start-up of drive units

**Caution**

Prior to the first start-up, make sure to compare the connection data with the name plate of the drive unit or the corresponding slide gate data sheet.

The drive units are pre-adjusted in the manufacturer's works, check any mechanical limit stop positions and travel switches before first start-up, re-adjust as necessary.

Maintenance of drive units

Verify the supply lines for proper seating and freedom of leakages at approx. 1000 operating hours intervals.

Check the travel switches at 1000 operating hours intervals for proper function and correct switching points.

**Warning**

Make sure to follow the maintenance instructions of the drive unit as described in the Annex

Safety Precautions according to EN DIN 292 – 1/2

Slide gates are system components intended for installation in a machine or system. From this installation results to the systems engineer or systems operator, under certain conditions, to follow the machine guidelines by providing the slide gates or the system with the safety precautions as specified hereunder.

For any queries arising to the application of EN DIN 292 – 1/2 you should contact ENA GmbH – Tel. +49 (0)2434 997040 – e-mail info@ena-gmbh.de .

Isolating protection means

Any moving adjusting levers and connecting rods may cause a squeezing hazard to the operators and maintenance personnel. However, also high surface temperatures may be the reason for hazard to personal injury. As the spatial arrangement of the slide gates on in the system determines whether a potential of hazard is caused by the slide gate, the systems engineer or systems operator shall determine whether the corresponding parts should be safeguarded by a protective grid. DIN EN 294 and DIN EN 563 will give you binding information whether this is the case.

Provision for safe access

Flap vales are system components subject to maintenance. To ensure safe operation, platforms or walkways should be provided. If these walkways give access to a hazardous area (for isolating means see the chapter above), the access should be safeguarded.

If stationary facilities are not feasible, it will be possible to use portable working platforms.

For slide gates with a rating of greater than 1000 or 0.8 m² of free space, a man hole for inspections inside the piping or duct system should be provided. This man hole should be located as closely as possible to the slide gate.

Provision for power cut-off and power reduction

Facilities shall be provided for maintenance activities, by which any individual power source can be separated. For components connected via plug-and-socket connections, it would be sufficient to disconnect the plug and socket. Residual or stored energy that might still exist after separation – *a hazard that must be considered particularly for pneumatic and hydraulic components* – must be carried away without any risk.

Tables

Summary of works for start-up				
Component	Intervals after		Activities performed	Note
	Assembly	Hot start-up		
Surface protection	X		Repair damages	Page 8
Screwed flange joint		X	Tighten fastening screws and check for tightness	Page 10
Welded flange joint		X	Check for tightness	Page 8
Stuffing box		X	Check for tightness	Page 11
Flange bearing or plunger block		X	Check stationary bearing function	Page 15
		X	Check for fastening	
Limit switches	X		Check for adjustment	Page 17
	X		Secure threaded pin by retainer paste	Page 17
Man holes		X	Check for tightness	Page 17
Drive unit	X	X	Check for mechanical limit stop position and travel switches	Page 18
	X	X	Functional checkout	
General	X	X	Check for supply lines	
	X	X	Functional checkout of slide gate	

Table 6 Summary of works for starting up

Summary of Maintenance Activities							
Component	Interval					Activities to be performed	Note
	Daily	Annually	500 op. hrs.	1000 op. hrs.	2000 op. hrs.		
Slide gate general		X				Functional checkout	
Stuffing box					X	Re-tighten stuffing box packing	Page 11
					X	Check stuffing box for tightness	
Flanged bearing or plummer block					X	Lubricate bearing	Page 15
					X	Check stationary bearing for functioning	Page 15
					X	Check for fastening	
Limit switches			X			Check for fastening	Page 17
				X		Check for (switch point) function	Page 17
				X		Check for electric connections	
Man holes and inspection openings				X		Check for tightness	Page 17
Manual lever	X					Check for clamping action	Page 17
Drive units			X			Check for fastening	Page 18
				X		Check for functioning	
				X		Check supply lines for connection	Page 18
				X		Check for travel shutdown	

Table 7 Summary of maintenance activities

SW	M_G	SW	M_G
2,5	3,6 Nm	5	26 Nm
3	6 Nm	6	42 Nm
4	14 Nm		

Table 8 Tightening torques for threaded pins

Size	M_A	Size	M_A
M6	10 Nm	M14	115 Nm
M8	25 Nm	M16	180 Nm
M10	41 Nm	M18	245 Nm
M12	72 Nm	M20	345 Nm

Table 9 Tightening torques for screws with metric threads, strength class 8.8

Size	M_A	Size	M_A
M8x1	27 Nm	M14x1,5	150 Nm
M10x1,25	52 Nm	M16x1,5	225 Nm
M12x1,25	95 Nm	M18x1,5	325 Nm
M12x1,5	90 Nm		

Table 10 Tightening torques for screws with metric fine threads, strength class 8.8

Size	M_A	Size	M_A
M6	3,5 Nm	M16	135 Nm
M8	16 Nm	M20	280 Nm
M10	32 Nm	M24	455 Nm
M12	56 Nm	M30	1050 Nm

Table 11 Tightening torques for screws of stainless and acid-resistant steel A2/A4, strength class 70

Size	M_A	Size	M_A
M6	10 Nm	M16	220 Nm
M8	25 Nm	M20	420 Nm
M10	50 Nm	M30	1500 Nm
M12	86 Nm	M36	2500 Nm

Table 12 Tightening torques for drive mounting screws