

KTR-STOP® RL

Size S and M

KTR-STOP® RL (Rotor Lock) is a hydraulic mechanism serving for locking a rotor positively by inserting a pin into a locking disk. The locking serves for preventing a rotor standing still from starting.

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KTR-STOP® RL (Rotor Lock) was designed to be used as a locking device for rotors of wind power stations. Within the scope of intended use a pin is pushed hydraulically into the bore that fits of a locking disk which prevents the rotor from rotating. This process may take place at standstill only. For any other applications please consult with KTR.

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1 Technical data

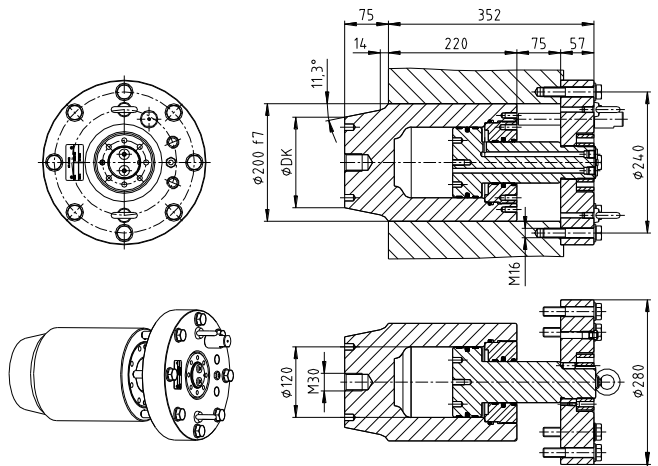


Illustration 1: Size S

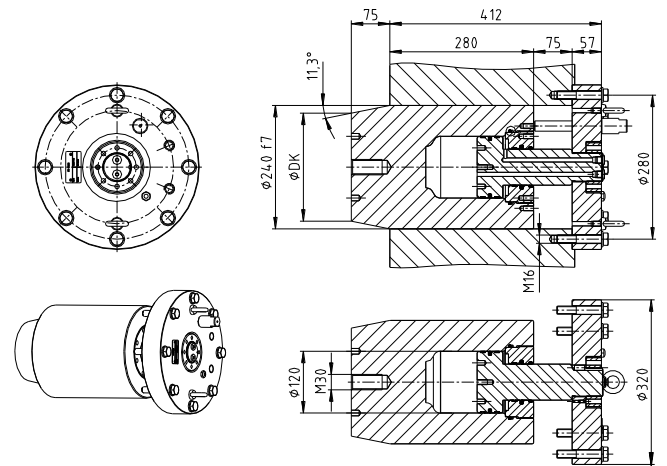


Illustration 2: Size M

Table 1: Technical data

		S	M
Approx. weight	[kg]	90	153
Max. stroke	[mm]	80	80
Max. shear force F_L	[kN]	2000	4000
Max. operating pressure	[bar]	250	250
Max. force fore stroke (F+)	[kN]	283	283
Max. force back stroke (F-)	[kN]	187	187
Piston diameter	[mm]	120	120
Piston surface fore stroke	[cm ²]	113.10	113.10
Piston surface back stroke	[cm ²]	74.61	74.61
Oil volume per 1 mm stroke	[cm ³]	11.3	11.3
Oil volume with 75 mm stroke (full stroke)	[cm ³]	848.2	848.2
Pressure port		1/4" BSP	1/4" BSP



Please note that the shear force refers to the Rotor Lock only.

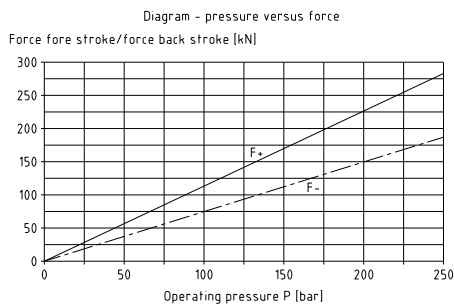
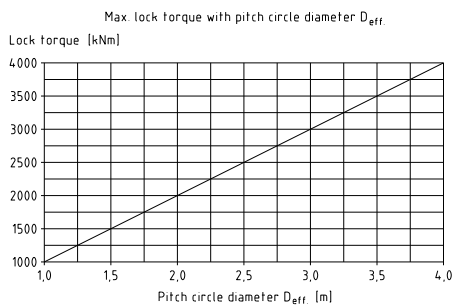


Illustration 3: Diagramme - size S

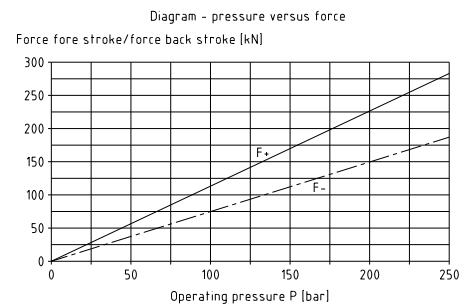
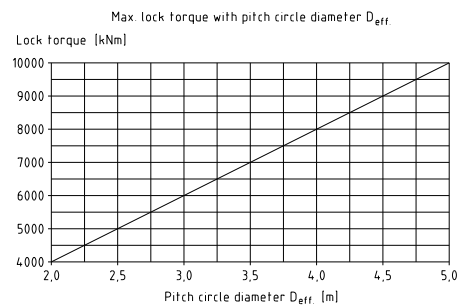


Illustration 4: Diagramme - size M

$$M_L = z \cdot F_L \cdot \frac{D_{eff.}}{2}$$

- F_L = Shear force [kN]
- M_L = Lock torque [kNm]
- z = Quantity of KTR-STOP® RL
- $D_{eff.}$ = Pitch circle diameter of locking disk [m]

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1 Technical data

Connection dimensions of housing

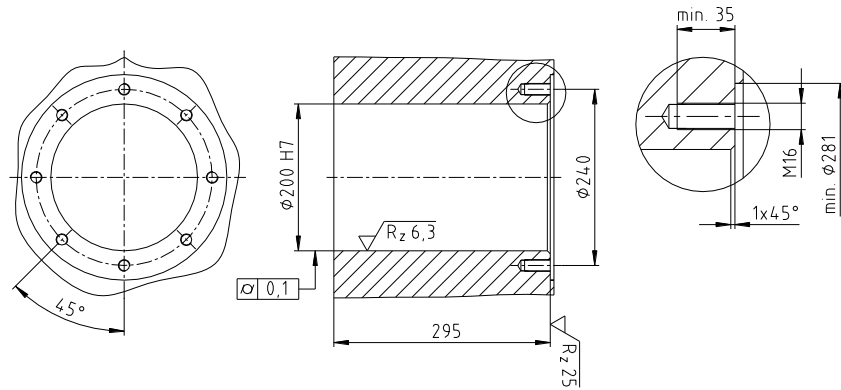


Illustration 5: Housing dimensions - size S

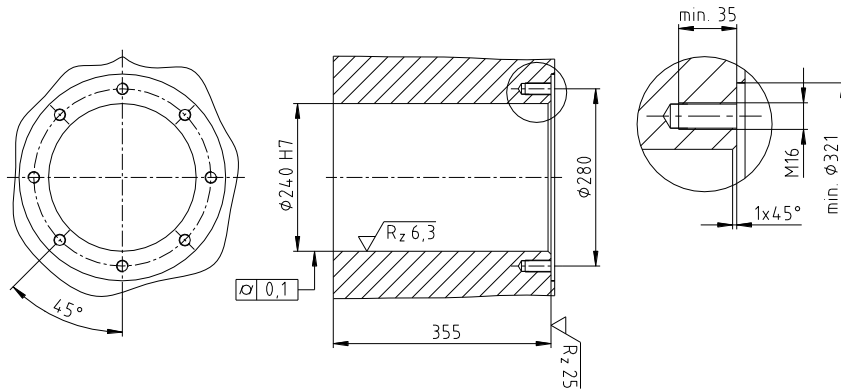


Illustration 6: Housing dimensions - size M

Connection dimensions of locking disk

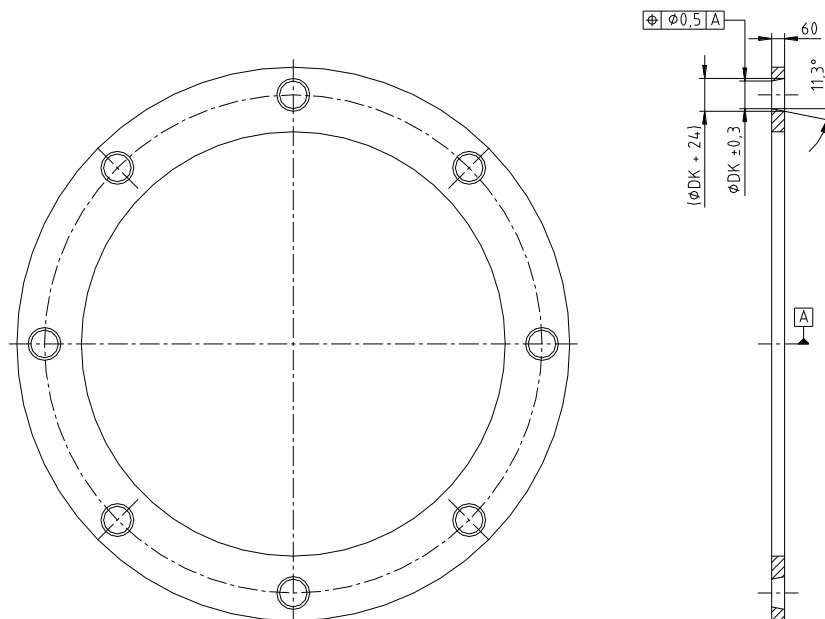


Illustration 7: Locking disk

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2 Advice

2.1 General advice

Please read through these operating/assembly instructions carefully before you start up the Rotor Lock. Please pay special attention to the safety instructions!
The operating/assembly instructions are part of your product. Please store them carefully.
The copyright for these operating/assembly instructions remains with KTR.

2.2 Safety and advice symbols



Warning of personal injury

This symbol indicates notes which may contribute to preventing bodily injuries or serious bodily injuries that may result in death.



Warning of product damages

This symbol indicates notes which may contribute to preventing material or machine damage.



General advice

This symbol indicates notes which may contribute to preventing adverse results or conditions.

2.3 General hazard warnings



With assembly, operation and maintenance of the Rotor Lock it has to be made sure that the entire drive train is secured against accidental switch-on. You may be seriously hurt by rotating parts. Please make absolutely sure to read through and observe the following safety indications.

- All operations on and with the Rotor Lock have to be performed taking into account "safety first".
- Please make sure to switch off the power pack before you perform your work on the Rotor Lock.
- Secure the power pack against accidental switch-on, e. g. by providing warning signs at the place of switch-on or removing the fuse for current supply.
- Do not reach into the operating range of the Rotor Lock as long as it is in operation.
- Please secure the Rotor Lock against accidental operation. Please provide for the necessary protection devices.
- Please make sure that the entire hydraulic system is depressurized.

2.4 Intended use

You may only assemble, operate and maintain the Rotor Lock if you

- have carefully read through the operating/assembly instructions and understood them
- had technical training
- are authorized by your company

The Rotor Lock may only be used in accordance with the technical data (see chapter 1). Unauthorized modifications on the Rotor Lock are not admissible. We will not assume liability for any damage that may arise. In the interest of further development we reserve the right for technical modifications.

The **KTR-STOP® RL** described in here correspond to the technical status at the time of printing of these assembly/operating instructions.

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3 Storage, transport and packaging

3.1 Storage

The Rotor Lock is delivered in a preserved condition and can be stored in a closed, dry place during 12 months. With proper storage conditions its properties remain unchanged up to 12 months. If the Rotor Lock is stored over a longer period exceeding 12 months and after every transport, the corrosion protection needs to be renewed and operated over the full distance to prevent the gaskets from sticking together.



Humid storage rooms are not suitable. Please make sure that condensation is not generated. The best relative air humidity is less than 65 %. Direct contact with metallic parts or dust, respectively, must be avoided.

3.2 Transport and packaging



In order to avoid any injuries and any kind of damage please always make use of proper transport and lifting equipment.

The Rotor Lock is packed differently each depending on quantity and kind of transport. Unless otherwise contractually agreed, packaging will follow the in-house packaging specifications of KTR.

4 Assembly

The Rotor Lock is supplied in pre-assembled condition. Before assembly the Rotor Lock has to be inspected for completeness.



Please make sure that the components are not damaged when unpacking them.

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4 Assembly

4.1 Components of KTR-STOP® RL

Components of KTR-STOP® RL

Component	Quantity	Description
19	1	Fastening pin
20	8	Hexagon screw DIN EN ISO 4014 - 10.9
21	8	Disk DIN EN ISO 7089
23	1 ¹⁾	Sensor
50	1	KTR-STOP® RL (pre-assembled)

1) Optionally available

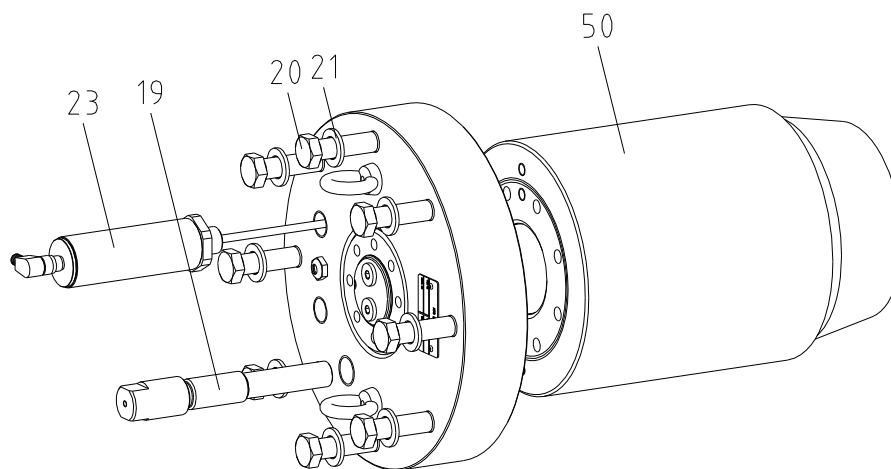


Illustration 8: Components of KTR-STOP® RL



4 Assembly

4.1 Components of KTR-STOP® RL

Components of KTR-STOP® RL

Component	Quantity	Description	Component	Quantity	Description
1	1	Piston	13	1	Back-up ring (type BU)
2	2	Guide ring (piston)	16	3	Screw plug DIN 908
3	1	Piston gasket	17	2	Eye bolt DIN 580
4	1	Locking pin	18	1	Cap screw DIN EN ISO 4762 - 10.9
5	1	Piston cover	19	1	Fastening pin
6	1	Guide ring (piston cover)	20	8	Hexagon screw DIN EN ISO 4014 - 10.9
7	1	Rod sealing ring	21	8	Disk DIN EN ISO 7089
8	1	Scraper	22	1	Air breather
9	1	Connection flange	23	1 ¹⁾	Sensor
10	1	Dowel pin			
11	1	Lock nut			
12	1	Gasket			

1) Optionally available

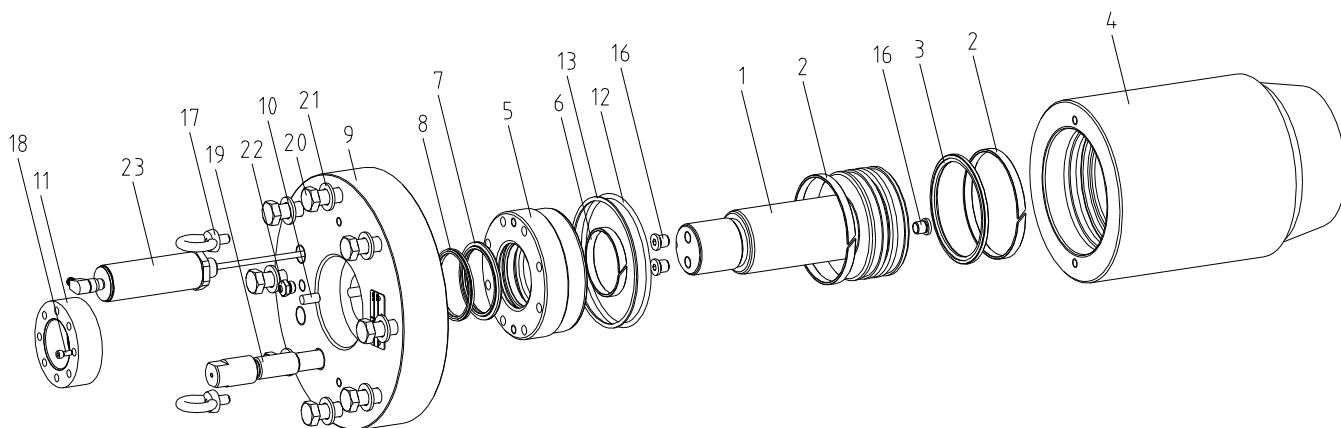


Illustration 9: Components of KTR-STOP® RL

4.2 Preparation of assembly



To ensure the full power of locking, the preparation for assembly needs to be performed carefully.

- The housing for the Rotor Lock as well as the locking disk have to be inspected for dimensional accuracy. For that purpose please investigate the connection dimensions, connection surfaces and tolerances as mentioned in the drawing (see illustrations 5 to 7).
- Please clean the locking disk and mounting surfaces.

4.3 Assembly of KTR-STOP® RL



In order to avoid any injuries please always make use of proper lifting equipment.

There are eye bolts on the face of the Rotor Lock serving to use lifting devices.



In order to avoid any damages on the Rotor Lock, never twist a rope or any other lifting tool around damageable components such as sensors, etc.

Please observe protection
note ISO 16016.

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4 Assembly

4.3 Assembly of KTR-STOP® RL



The eye bolts can be removed after assembly of the Rotor Lock. Please store them in a safe place. Avoid any kind of dirt; for that purpose you should use sealing plugs.



Before you start with the Rotor Lock assembly, please make sure that the fastening pin (component 19) has been removed (see picture 11).

- The piston (component 1) needs to be inserted into the lock bolt (component 4) as far as possible. For that purpose press the piston manually into the lock bolt or via hydraulic pressure on the pressure port "I" as far as possible. Here the pressure port "O" must neither be closed nor connected to a hydraulic system preventing a free pressure reduction on "O" (see illustration 10).

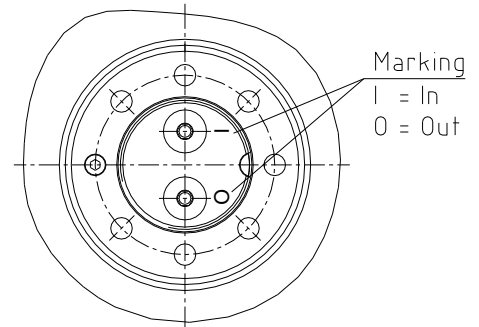


Illustration 10: Pressure ports

- Please make sure that oil may escape from the pressure connection „O“.
- Please make sure that the surface of the connection flange (component 9) is in parallel with the locking disk.
- Lubricate the bore of the housing with Molykote MoS₂.
- Insert the Rotor Lock into the bore of the housing.
- Lock the Rotor Lock by means of the hexagon screws M 16 - DIN EN ISO 4014 - 10.9 (component 20) and the disks (component 21). Hand-tighten them first.
- Tighten the hexagon screws crosswise at the tightening torque $T_A = 290 \text{ Nm}$.
- Assembly of the sensor (sensor is optionally available).



If a sensor (component 23) is used, chapter 8 needs to be observed.

- Connect the pressure oil lines to the pressure ports „I“ and „O“.



To avoid any contact between the locking disk and the Rotor Lock, a minimum distance of 5 mm needs to be observed in fully locked position (see illustration 11). In fully unlocked position the maximum distance of 15 mm needs to be observed in every case (see illustration 12).

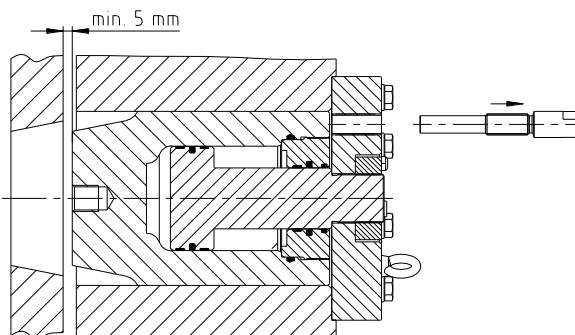


Illustration 11

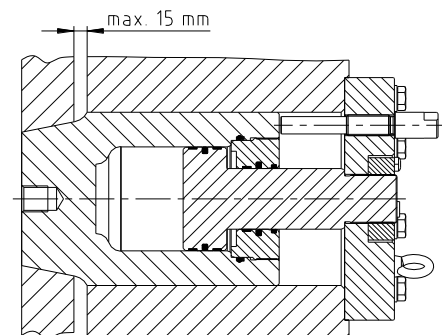


Illustration 12



4 Assembly

4.4 Start-up of KTR-STOP® RL



Before start-up and after each operation on the Rotor Lock the hydraulic system has to be generally vented and filled up or re-filled with fluid. Repeat venting the Rotor Lock several times a year, since any air in the hydraulic system may have an influence on the operativeness of the Rotor Lock.



Please make sure that there is sufficient liquid in the hydraulic system during and after the venting process (recommendation of liquid, see chapter 4.6).

- Activating the pressure ports reciprocally several times allows you to vent the hydraulic system of the Rotor Lock.



The hydraulic system must never be operated at a higher pressure than the figures mentioned in the type plate of the Rotor Lock or table 1. If any figures or types/sizes are changed, please consult with KTR.



To prevent serious injuries of your hand, never keep your fingers between locking disk and locking pin while locking the Rotor Lock. Before every maintenance operation make sure that the Rotor Lock is fully secured against activating.

4.5 Locking of KTR-STOP® RL



To prevent injuries and any kind of damage on the Rotor Lock or, as an example, your wind power stations etc., the mechanical locking device of the Rotor Lock has to be mounted before the maintenance or service operations are started with.

- Screw the fastening pin (component 19) into the connection flange (component 9) against a stop (see illustration 13).

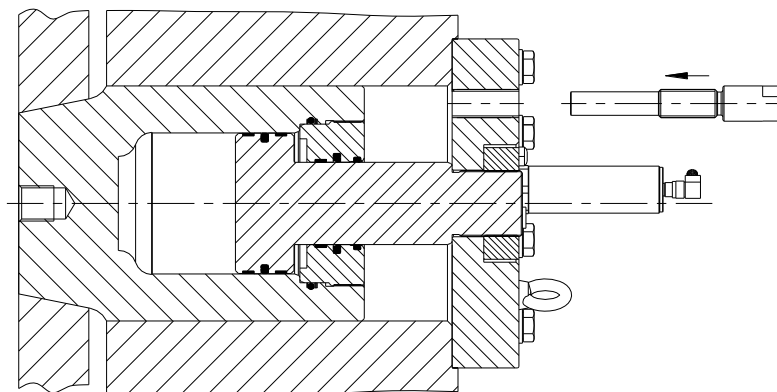


Illustration 13: Locking the KTR-STOP® RL

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4 Assembly

4.6 Recommendation of fluids to be used



You may only use mineral hydraulic fluids meeting the demands of DIN 51524. KTR recommends those fluids corresponding to DIN 51524-3.

KTR recommends the following fluids (other manufacturers may be selected):

Manufacturer	Standard		Special	
	- 20 °C to + 40 °C (- 4 °F to 104 °F)	+ 10 °C to + 60 °C (+ 50 °F to + 140 °F)	- 30 °C to + 20 °C (- 22 °F to 68 °F)	+ 30 °C to + 70 °C (+ 86 °F to + 158 °F)
<i>Mineral oil</i>				
Castrol	Hyspin HVI 32	Hyspin HVI 46	-	Hyspin HVI 68
Shell	Tellus TX32	Tellus TX46	Tellus Artic	Tellus TX68
Mobil	DTE 13M	DTE 15M	-	DTE 16M
Hydro Texaco	Rando HDZ32	Rando HDZ46	Rando Ashless 8401	Rando HDZ68
Valvoline	Ultramax HVLP32	Ultramax HVLP46	-	Ultramax HVLP68



The permissible operating temperatures of Rotor Lock components from - 20 °C to + 60 °C (- 4 °F to + 140 °F) have to be observed. For deviating operating temperatures please consult with KTR.

Viscosity

We would recommend a viscosity range from 20 to 220 mm²/s (cSt) of the hydraulic fluid with operating temperature. The viscosity during starting should not exceed 500 mm²/s and the viscosity during operation should not fall below 12 mm²/s.

Filtration

When filling and re-filling the hydraulic system and replacing the hydraulic fluid, the oil needs to be filtered. For that purpose use an offline filter or a respective fill unit. In addition we would recommend to use an inline filter.



The service life of the Rotor Lock system is extended depending on the level of purity of the oil.

The KTR hydraulic systems are provided with a 10-µm inline filter as a standard.

In order to ensure the reliability of the system, only those oils originating from the following purity classes are permitted:

- ISO 4406, class 18/16/13

Maintenance operations on the hydraulic system

In order to ensure a smooth operation of the overall system, the maintenance operations on the hydraulic system (inspection of level and degree of dirt, replacing the hydraulic fluid or filter elements, etc.) have to be performed as per the manufacturer's operating instructions.

The system has to be scavenged or vented after each replacement of the hydraulic fluid.



Adverse reactions may be generated by mixing different fluids or fluids of various manufacturers.



Please contact the manufacturer of mineral oils if you intend to replace the hydraulic fluid.

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4 Assembly

4.7 Disassembly of KTR-STOP® RL



Please make sure that the entire hydraulic system is depressurized.



Parts released or falling down may cause injury to persons or damage on the machine. Secure the components before disassembly.



If a sensor is used (component 23) it has to be removed before the Rotor Lock is disassembled.

- Disconnect the pressure oil line from the Rotor Lock.
- Remove the 8 hexagon screws (component 20) with the disks (component 21) serving for fastening the Rotor Lock in the housing.
- Now you can take off the Rotor Lock.

5 Spares inventory, customer service addresses

A basic requirement to ensure the operational readiness of the Rotor Lock is a stock of the most important spare parts on site.

Contact addresses of the KTR partners for spare parts and orders can be obtained from the KTR homepage at www.ktr.com.



KTR does not assume any liability or warranty for the use of spare parts and accessories which are not provided by KTR and for the damages which may incur as a result.

6 Disposal

In respect of environmental protection we would ask you to dispose of the products on termination of their service life in accordance with the legal regulations and standards that apply, respectively.

- **Metal or brake pads, respectively**
Any metal components have to be cleaned and disposed of by scrap metal.
- **Gaskets/O-rings**
Gaskets and O-rings can be disposed of by residual waste.
- **Sensors**
Electric components have to be treated as electric waste.
- **Hydraulic oil**
Hydraulic oils have to be collected in suitable tanks and disposed of by a waste disposal company.

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7 Maintenance of KTR-STOP® RL/replacement of single parts



KTR does not assume any liability or warranty for the maintenance respectively replacement of single parts by the customer and the resulting damages.



To ensure the full power of locking, both disassembly and assembly have to be performed at the highest level of purity.

- Disassemble the Rotor Lock, please observe chapter 4.7 *Disassembly of the KTR-STOP® RL*.
- Remove the cap screw (component 18) and unscrew the lock nut (component 11) by means of a sickle spanner.
- Pull off the connection flange (component 9) and the cylindrical pin (component 10) from the piston (component 1).
- Unscrew the piston cover (component 5) by means of a sickle spanner and remove it from the piston.
- Remove the piston (component 1) from the lock bolt (component 4).



When removing the piston cover and the piston please make sure that the respective keyways are not damaged.

- Take the guide rings, piston gasket, columnar sealing ring, scraper, gasket and back-up ring (components 2, 3, 6, 7, 8, 12 and 13) out of the piston and piston cover as well as the lock bolt.
- The components have to be cleaned from dirt, grease and corrosion protection. The components can easily be cleaned by means of solvents. Afterwards dry the components.



Please observe the manufacturer's instructions regarding the use of solvents.

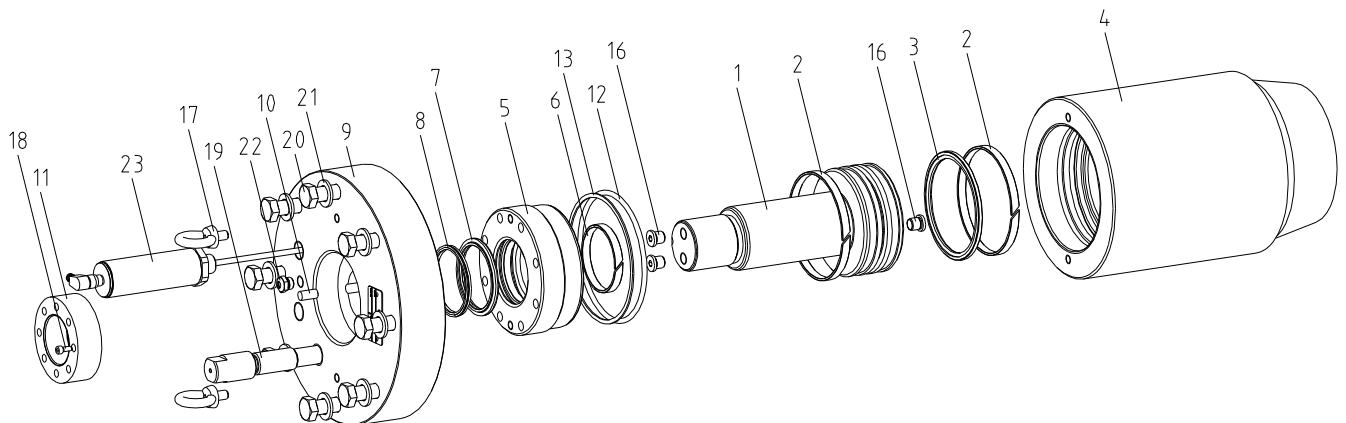


Illustration 14: Components of KTR-STOP® RL

- Mount the piston gasket (component 3) and the guide rings (component 2) onto the piston.



To facilitate the assembly the piston gasket (component 3) can be heated to 80 °C. For mounting the piston gasket a special assembly tool is required. Please consult with KTR for any other applications.

- Insert the gasket (component 12) and the back-up ring (component 13) in the lock bolt. For that purpose the gasket may be heart-shaped (see illustration 15).



7 Maintenance of KTR-STOP® RL/replacement of single parts

- Insert the guide ring (component 6), the rod sealing ring (component 7) and the scraper (component 8) into the piston cover. For that purpose the rod sealing ring and the scraper may be heart-shaped (see illustration 15).



The rod sealing ring (component 7) and scraper (component 8) have to be installed in the right direction (see illustration 16).



With a reassembly basically new piston gaskets, guide rings, gaskets, back-up rings and scrapers have to be used, since their operativeness is no longer ensured due to wear and damages.

- Grease the gaskets, the scraper and the guide rings with hydraulic oil (see illustration 16).



Oils and greases containing molybdenum disulphite or zinc sulphite additives must not be used.

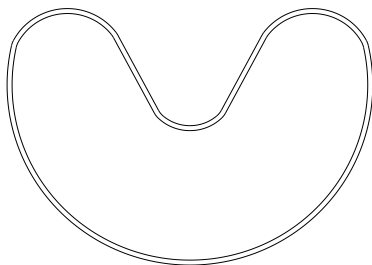


Illustration 15: Assembly of gaskets, scrapers etc.

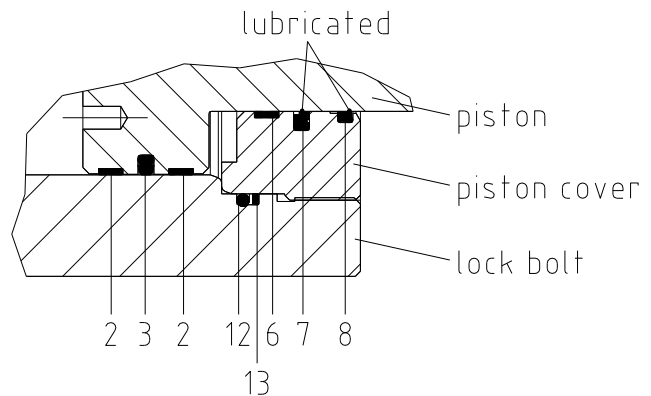


Illustration 16



Inspect the surfaces of the pistons and the holes of the locking pin to make sure that they are neither scratched nor damaged. Such kind of damages may cause earlier wear on the piston gaskets, guide rings, O-rings, back-up rings and scrapers and generate leakages.

- Lightly oil the piston and the bore of the lock bolt.
- Insert the piston (component 1) into the bore of the lock bolt (component 4) and press it against a stop.
- Push the piston cover (component 5) onto the piston and screw the piston cover into the lock bolt by means of a sickle spanner.
- Fit the connection flange (component 9) onto the piston and align the two keyways to each other.
- Batter the cylindrical pin (component 10) into the keyway against a stop.
- Screw the locking nut (component 11) into the connection flange against a stop by means of a sickle spanner, afterwards turn back slightly.
- Align one bore from the locking nut to the tapping of the connection flange.
- Fasten the lock nut by means of the cap screw (component 18).
- Repeat chapters 4.2 to 4.6.



8 Accessories - Sensor

8.1 Technical data

Operation of sensor

There are two micro switches in the housing of the sensor. By fully locking or unlocking the Rotor Lock the sensor needle activates the switches in two different positions. In this way the electronic signal Rotor Lock "In" or Rotor Lock "Out" is transmitted.

Technical data:

Operating temperature	-40 °C to +85 °C
Max. voltage	30 V DC/AC
Switching current	1 to 100 mA
Switching tolerance	± 0.4 mm
Max. stroke	85 mm
Protection class	IP 65 (mounted)
Width across flats	41 mm
Max. tightening torque G 1/2"	20 Nm
Max. tightening torque M12	hand-tight
Length of cable	5 m, 10 m or 15 m
Material of cable	PUR
Dimension of cable	5 * 0.34 mm ²

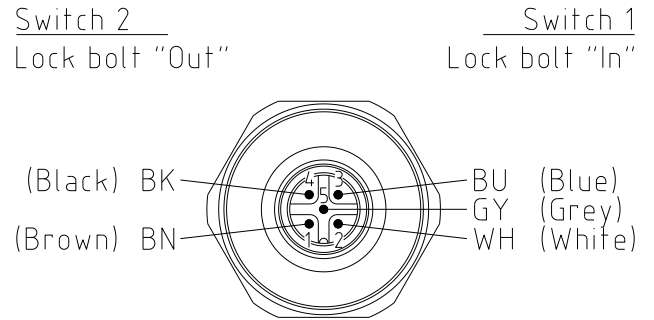


Illustration 17: Plug-in connection

Positions of switching:

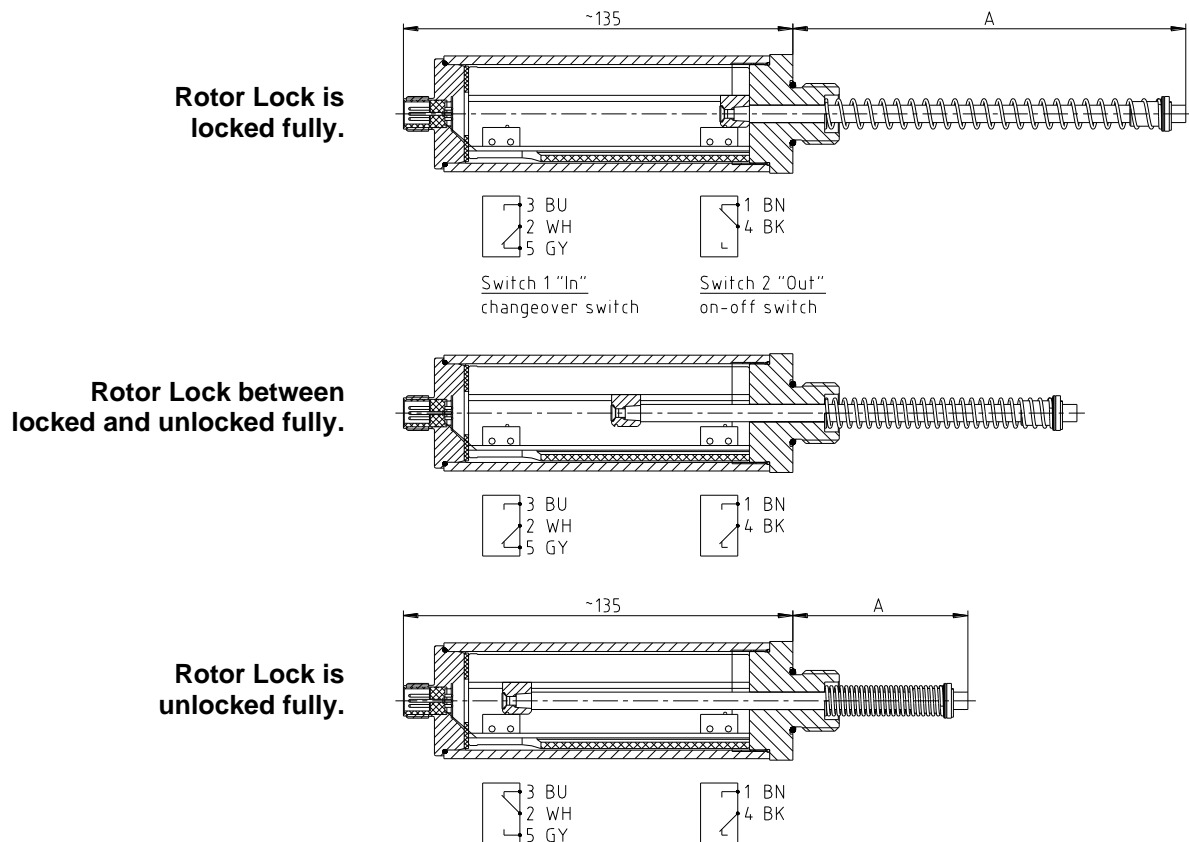


Illustration 18: Positions of switching

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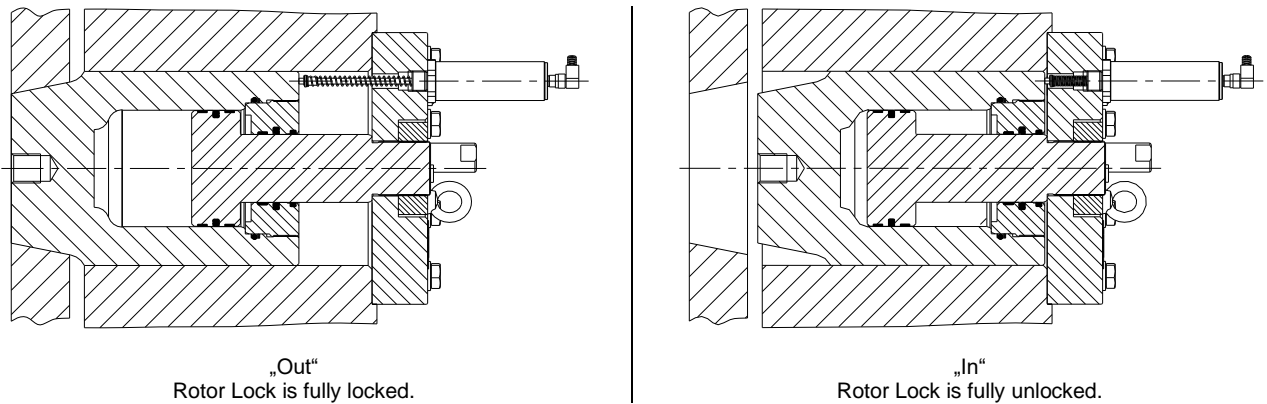
**8 Accessories - Sensor****8.1 Technical data**

Illustration 19

8.2 Assembly / start-up

- Remove the sealing plug from the Rotor Lock.
- Hand-tighten the sensor in the Rotor Lock for the time being.
- Tighten the sensor at the tightening torque $T_A = 20 \text{ Nm}$.
- Provide for the electric connection according to the plug-in connection (see illustration 17).



The sensor measures the position of the lock bolt. The sensor indicates the signal Rotor Lock In or Out approximately 5 mm before the final position has been reached.



With damages like, for example, faulty cables, bad connections, etc. the signals for the position Rotor Lock In or Out disappear.