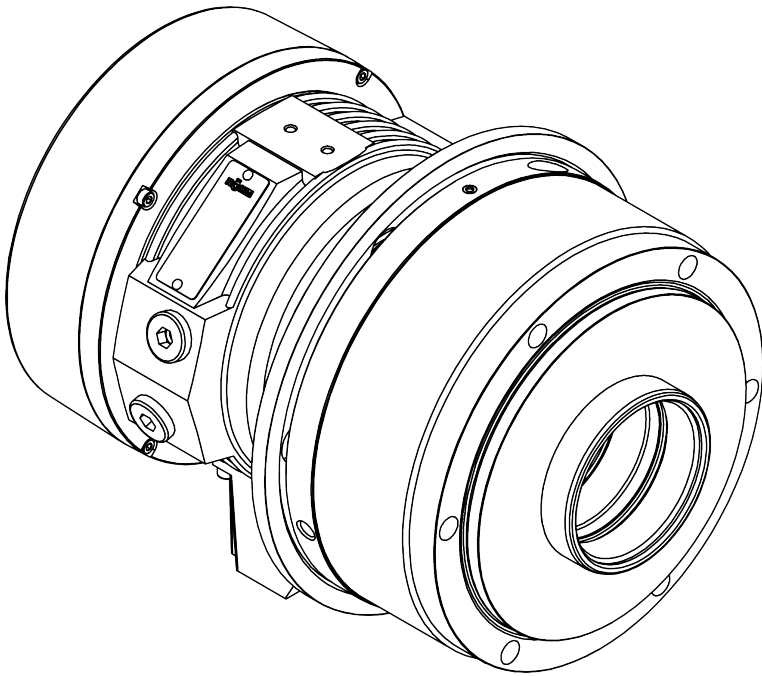


EN

Translation of the Original Operating Manual Cylinder with through-hole FORTO-HT



Store for reference

Version 1.0 • 03.05.2022

ID: XX.XXX

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1 About this operating manual

This Operating manual describes in detail the use, installation, assembly and maintenance of a cylinder with through-hole FORTO-HT. The efficiency of the cylinder with through-hole depends primarily on correct use and careful maintenance. This Operating manual serves as the leading document and is provided on delivery of the product. The personnel must have carefully read and understood the Operating manual before beginning any work. Observance of all safety instructions and instructions for use in these Operating manual is the basic prerequisite for safe work with the cylinder with through-hole. In addition to the regulations listed here, local and user-related operating instructions and professional accident prevention regulations are to be observed.

1.1 Manufacturer Details

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1.2 Copyright

This Operating manual is protected by copyright and is intended for internal purposes only.

The forwarding of the Operating manual to third parties, reproduction by any means – even in part – as well as use and/or communication of the content without the permission of RÖHM are prohibited (except for internal purposes).

Infringements will lead to claims for compensation. We reserve the right to assert further claims.

1.3 Liability and Warranty

All information and instructions in this Operating manual are given in good faith on the basis of our experience and knowledge to date. The products of RÖHM are subject to constant further development. RÖHM therefore reserves the right to make any modifications and improvements deemed useful. However, there is no obligation to extend these modifications and extensions to any previously delivered cylinders with through-hole. The cylinder with through-hole is constructed exclusively for the purpose specified under "Intended Use". Any use beyond this is deemed to be inappropriate. RÖHM is not liable for damage resulting from such use. The risk is borne solely by the operator. Product liability for consequential damage of any type is excluded for damage and operational interruptions resulting from operating errors, failure to observe this Operating manual or incorrect maintenance by unauthorised personnel.

RÖHM expressly points out that replacement and wear parts not supplied by RÖHM must be authorised by RÖHM. RÖHM does not accept liability for unauthorised replacement and wear parts. This applies to both product liability for consequential damage of all types and to liability for damage to property.

All unauthorised conversions, modifications to the cylinder with through-hole and/or changes in conditions are not permitted for safety reasons and exclude RÖHM from any liability for any damage which may result. If modifications to the cylinder with through-hole are necessary or the area of use differs from the intended use, this must be agreed with the express permission of RÖHM.

The statutory and contractually agreed terms and conditions apply.

The following damage or defects are excluded from the warranty:

- caused by the operator due to non-compliance with the written instructions of RÖHM with regard to
 - commissioning (e.g. incorrect construction and assembly work),
 - operation and
 - maintenance of the equipment (insofar as this maintenance has not been contractually taken over by RÖHM).
- caused by technical operating conditions unknown to RÖHM (e.g. chemical or electrolytic influences) and/or machine specifications.
- caused by natural wear.
- caused by force majeure.
- caused by incorrect operation of all types or by incorrect use or operation of the cylinder with through-hole. This also includes loading beyond the specified load limits (e.g. speed, pressure, force, etc.).

This also includes damage caused

- if the operator or third parties carry out modifications or repairs to the services / products without prior permission of RÖHM. Excepted from this are damage or defects which have occurred and which were demonstrably not due to these modifications or repairs.
- which occur due to use of the cylinder with through-hole under altered operating conditions (e.g. materials, tools, cutting parameters, programs, etc.), in particular without consulting and obtaining written authorisation from the seller or RÖHM.
- which are due to altered environmental conditions.

1.4 Conventions of Presentation

1.4.1 Text Display

To improve legibility and comprehension of the text, the following conventions were agreed:

Text type	Marking	Function
Operating instruction	1. 2., etc.	Marks a sequence of actions
	•	Marks an individual operating instruction
	➤	Marks an intermediate result of an operating instruction
	✓	End result of an operating instruction
List	▪	Marks elements of a list
	○	Marks comments within a list










Contains useful information or further information.

1.4.2 Display of Safety and Warning Instructions

Safety and warning instructions are marked by pictograms. The signal word and the colouring show the level of danger.

Observe the safety instructions to prevent personal injury and damage to property.

 DANGER	
	<p>Indicates an imminently dangerous situation which may lead to death or permanent personal injury if not avoided.</p> <ul style="list-style-type: none"> ➤ List of all measures which must be taken to prevent consequences.
 WARNING	
	<p>Indicates a possible danger which may lead to permanent personal injury or death if not avoided.</p> <ul style="list-style-type: none"> ➤ List of all measures which must be taken to prevent consequences.
 CAUTION	
	<p>Indicates a possible danger which may lead to minor reversible injuries if not prevented.</p> <ul style="list-style-type: none"> ➤ List of all measures which must be taken to prevent consequences.
NOTICE	
	<p>Indicates a possible danger which may lead to damage to property if not avoided.</p> <ul style="list-style-type: none"> ➤ List of all measures which must be taken to prevent consequences.

1.5 Definitions

1.5.1 Manufacturer of the machine

In this Operating manual, the manufacturer of the machine is defined as the company which builds the machine into which the cylinder with through-hole is integrated.

1.5.2 Manufacturer

In this operating manual, the manufacturer is defined as the manufacturer of other parts, assemblies or products which are contained in or attached to the cylinder with through-hole such as rotary feed-throughs, o-rings, operating materials, etc. and the manufacturer of which is not RÖHM.

1.5.3 Operator

In this Operating manual, the operator is defined as the company which uses the machine with the cylinder with through-hole to process workpieces.

1.5.4 Assembly information for holding screws

For the correct assembly it is essential to assemble the holding screws according to the information. This information is listed as standard in the following way:

Example:

6x	←	Number of holding screws
M10x90	←	Screw size
12.9	←	Strength class
83 Nm	←	Tightening torque

NOTE:

If there is no information for an item, this item is marked by “-”.

NOTE:

Holding screws are not listed in the figure keys. However, special screws such as screw plugs or venting screws are also listed in the keys.

NOTE:

The tightening torques stated must be adhered to with a tolerance of $\pm 10\%$.

1.5.5 Dial gage symbol



max. 0,005 mm

Apply a dial gage or other suitable measuring instrument for measuring of the radial and axial run-out or other test values at the indicated positions. Besides the dial gage symbol, the respective test value is specified.

1.5.6 Piston positions front and back

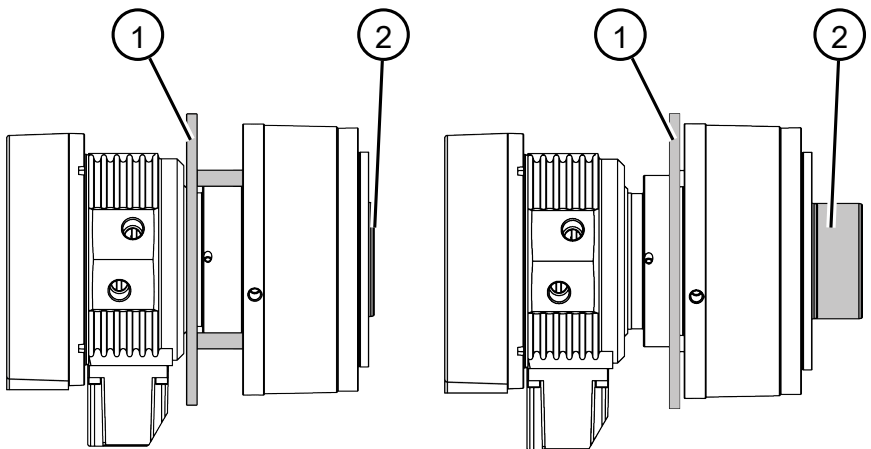
Definition of the piston positions front and back:

NOTICE:

Since the control disc is connected to the piston rod, the control disc moves analogously to the piston rod.

Piston position back/
rear end position

Piston position front/
front end position



1	Control disc
2	Piston rod

Piston position back/rear end position:

- The piston rod is fully retracted, or as far as the design of the machine allows.

Piston position front/front end position:

- The piston rod is fully extended, or as far as the design of the machine allows.

2 Safety

2.1 Intended Use

The cylinder with through-hole may only be used for the following purposes:

- To activate rotating chucks, collet chucks, mandrels with a tensioning and loosening function for workpiece clamping in a stationary machine in compliance with all the operating conditions detailed in this Operating manual.
- The workpiece can be machined on the idle or rotating cylinder with through-hole.
- Bars can be guided through the cylinder with through-hole.
- For operation in a non-explosive area.
- Only for commercial use.

2.2 Improper use

The following purposes are deemed improper use of the cylinder with through-hole:

- Use to form workpieces/materials
- Combined with a chuck or another gripping mechanism to lift and transport workpieces.
- Safety-critical applications (use not together with a chuck, but with other components, e.g. use as an actuator).
- Vertical installation of the cylinder with through-hole.
- Operation of the cylinder with through-hole outside of the operating conditions detailed in this Operating manual.
- Use in an explosive area.
- Mobile use, e.g. in vehicles.
- Private use

2.3 Obligations of the operator


2.3.1 General

Before all work on and with the cylinder with through-hole, the operator is to ensure:

- that the operating instructions are available to the responsible personnel.
- that the responsible personnel are sufficiently qualified for their work.
 - This applies in particular to assembly, maintenance and repair.

- that the responsible personnel have read and understood the operating instructions.
 - RÖHM recommends that this be documented in a suitable form.
- that the cylinder with through-hole is in perfect technical working order.
- that any damaged and defective parts are replaced immediately.

2.3.2 Rotation

 DANGER	
	<p>Danger to life by being caught on or pulled into the rotating cylinder with through-hole</p> <ul style="list-style-type: none"> ➤ Before operating the cylinder with through-hole, carry out a risk assessment/hazard assessment and implement measures derived from this for risk minimisation.

- The cylinder with through-hole must not be operated until a risk assessment of the entire machine with the cylinder with through-hole has been carried out by the manufacturer of the machine and the use of the cylinder with through-hole has been approved.
In accordance with the standard sheet VDMA 34192 (section 4.1.1), the following must be considered in particular:
 - the clamping force, actuating pressure/force and/or clamping distance sufficient to maintain safe clamping of the workpiece/tool,
 - devices for monitoring the clamping conditions, as well as
 - protection against interference in hazardous areas of rotating clamping devices and moving clamping elements.

2.3.3 Installation/replacement/conversion/change

The product described in this Operating manual is defined as an incomplete machine in accordance with the Machinery Directive 2006-42-EC and the harmonised type C standard DIN EN 1550 (ISO 16156).

If this used, defective or serviced product is to be replaced with the same new product, no further tests are required.

If not, there may be a significant modification which is to be examined.

Any modifications to a machine, whether used or new, which may impair the protection of the legal rights or assets, e.g. by performance increases, functional changes, changes in the intended use (as by changing auxiliary, operating and input materials, conversions or changes to safety technology), must first be examined in view of their safety-relevant effects. This means that in each individual case it must be determined whether new hazards

have arisen due to the modification of the (used) machine or whether an existing risk has increased. Here you can differentiate between three cases here:

- a) There is no new hazard or an increase in an existing risk so that the machine can still be regarded as safe.
- b) Although there is a new hazard or an increase in an existing risk, the existing protective measures of the machine before the modification are still sufficient so that the machine can still be regarded as safe.
- c) A new hazard or an increase in an existing risk exists and the existing protective measures are not sufficient or suitable.

Modified machines according to case 1 or 2 do not require additional protective measures. Modified machines according to case 3 must, on the other hand, be further examined by means of a risk assessment with regard to the question of whether a major modification has been made.

Here, it is to be determined whether it is possible to return the modified machine to a safe condition with simple safety devices, checking whether the simple safety device eliminates the risk or at least minimises it to a sufficient extent. If this is the case, the modification can generally be regarded as not essential.

The replacement of components of the machine by identical components or components with identical function and identical safety level as well as the installation of protective devices which lead to an increase in the safety level of the machine and which do not enable any additional functions, are not regarded as significant modifications.

NOTICE:

However, irrespective of this, other regulations incumbent upon the employer who makes the machine available to its employees as work equipment may result in the obligation to define additional protective measures. In principle, a risk assessment must be carried out after all modifications to machinery – not only after significant modifications. This is one of the operational health and safety obligations of the user of a machine or system as work equipment. Based on the risk assessment, measures, in particular technical measures, may be necessary in order to provide the employees with safe work equipment. It must be checked whether an adaptation of the information for the safe operation of the machines, such as operating instructions, is necessary.

2.4 Qualification of Operating and Specialist Personnel

Definition of “skilled worker”

A person is designated as a skilled worker when they can assess the work assigned to them and identify possible dangers based on their specialist training, knowledge and experience. They also have knowledge of the relevant provisions. This refers only to trained specialist personnel or such personnel that the operator has found to be capable.

Definition of “trained/instructed person”

A trained/instructed person is someone who has been taught about, and if necessary trained in, the tasks assigned to them and about the possible dangers of improper conduct. They have also been taught about the necessary safety equipment and protective measures. Personnel to be taught, trained, instructed or personnel undergoing general training may only work under the constant supervision of an experienced person.

2.5 Personal protective equipment

When working on and with the cylinder with through-hole, personal protective equipment must be worn.

- Personal protective equipment must be in perfect condition when carrying out work. Defective protective equipment is to be replaced immediately.
- Observe information about personal protective equipment posted in the working area around the machine.



Wear safety goggles



Wear protective gloves



Wear safety shoes



Wear protective clothing

NOTICE:

Persons with long hair must wear a hair-net when working with the cylinder with through-hole.



Wear ear protection

NOTICE:

Ear protection must be worn if the cylinder with through-hole causes noise.

2.6 General hazards

When using the cylinder with through-hole, residual hazards exist

- during assembly and set-up work.
- during operation.
- during maintenance and service work.

These residual hazards cannot be completely eliminated considering the functional availability of the Clamping device. This is why the operating manual must be followed.

2.6.1 Skin irritation due to operating materials

Description of the hazard:

Operating materials such as hydraulic oil, compressed air, lubricants etc. can contain substances which can lead to skin irritation when touched.

Avoiding the hazard:

- Avoid contact with the operating materials
- Wear personal protective equipment when handling the operating materials
- Observe the safety data sheets of the operating materials

2.6.2 Risk of injury due to handling heavy loads

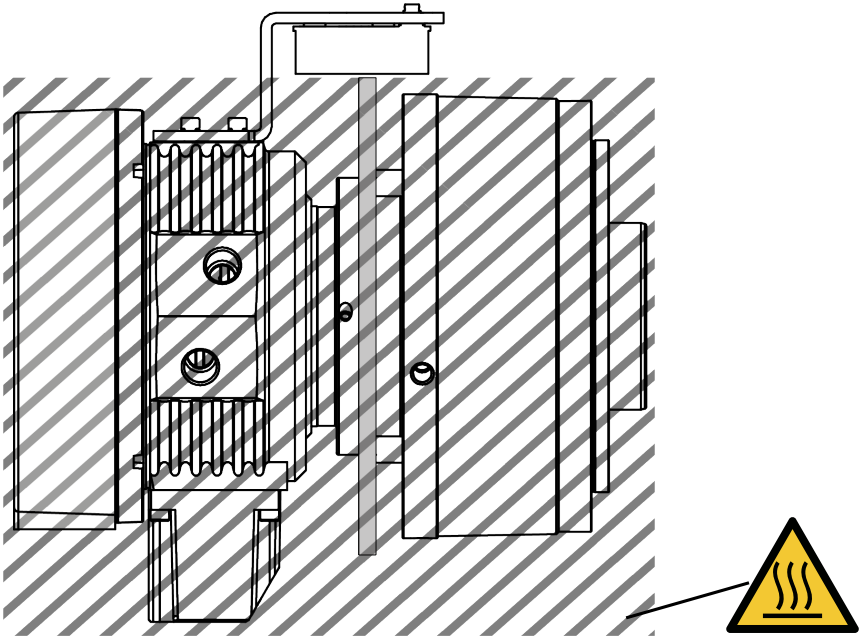
Description of the hazard:

If the cylinder with through-hole is handled manually, this can lead to the person handling it becoming overloaded or injured due to the weight of the cylinder with through-hole.

Avoiding the hazard:

Do not handle the cylinder with through-hole manually. Instead, lift it, put it down, transport it, assemble or disassemble it using suitable lifting gear.

2.6.3 Risk of burns due to hot surfaces



Hazard zone

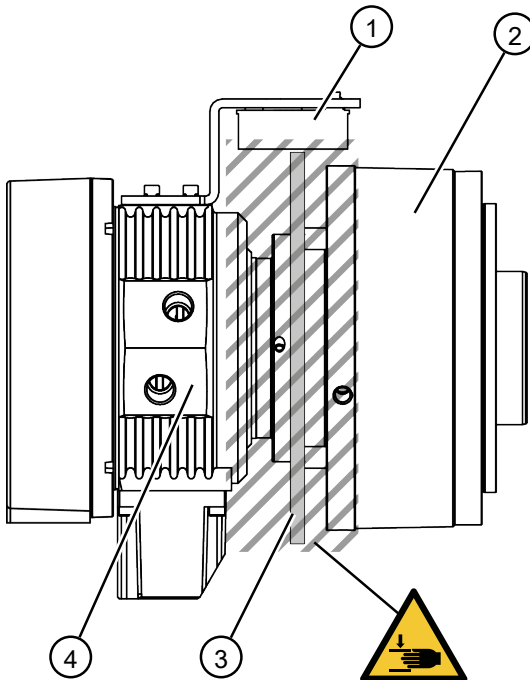
Description of the hazard:

The cylinder with through-hole may heat up during operation. There is a risk of burning in case of contact with the cylinder with through-hole.

Avoiding the hazard:

Keep away from the cylinder with through-hole immediately after it was in operation and let it cool down before carrying out any work.

2.6.4 Danger of crushing due to moving control disc



1	Position measuring system option	3	Control disc
2	Piston housing	4	Distributor housing



Hazard zone

Description of the hazard:

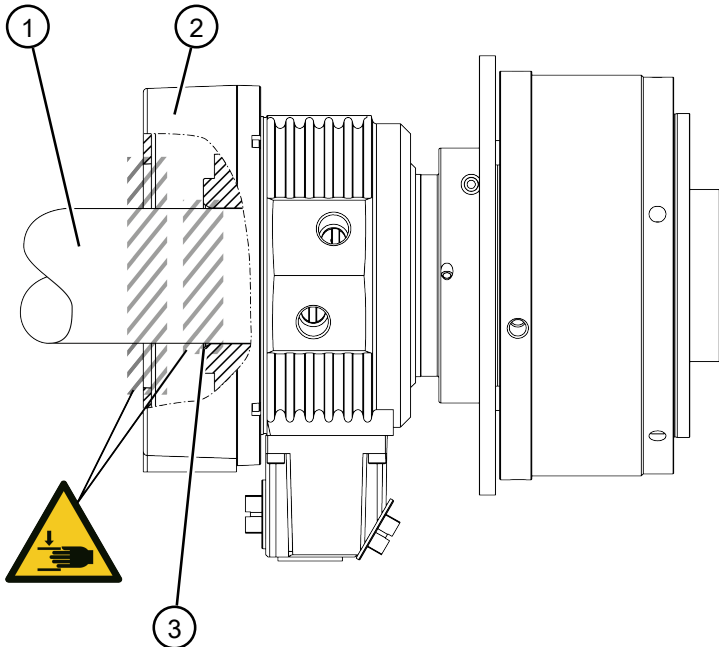
When moving the piston, the control disc also moves, giving rise to a crushing hazard between the control disc

- and the distributor housing
- and the piston housing
- and the position measuring system option or the proximity switch option

Avoiding the hazard:

Do not reach into the control disc movement range.

2.6.5 Risk of entrapment/crushing on the hollow clamping cylinder



1	Bars	3	Opening of the piston rod and/ or the material feed pipe option
2	Coolant drip pan	-	-



Hazard zone

Description of the hazard:

When bars are guided through the cylinder with through-hole, there is a risk of entrapment/crushing:

- between the bars and the opening of the coolant drip pan
- between the bars and the opening of the piston rod and/or the material feed pipe option

Avoiding the hazard:

- do not reach into the area between the bars and the opening of the coolant drip pan
- do not reach into the area between the bars and the opening of the piston rod and/or the material feed pipe

2.6.6 Risk of ejection, detachment and falling of components at the hollow clamping cylinder

Description of the hazard:

In case of failure of components of the cylinder with through-hole or non-compliance with specifications of the cylinder with through-hole (e.g. incorrect assembly, excessive speed, excessive processing force, incorrect actuating force, insufficient maintenance, wear, exceeding the service life), parts of the cylinder with through-hole can be ejected.

Avoiding the hazard:

- All information in the operating manual, assembly drawing and other applicable documents on the cylinder with through-hole must be observed.
- Carry out a risk assessment for the machine with the integrated cylinder with through-hole and implement the derived safety measures.

2.6.7 Risk of ejection, detachment and falling of workpieces

Description of the hazard:

If the operating limits of the cylinder with through-hole are not complied with (e.g. excessive speed, excessive processing force, insufficient residual clamping stroke, incorrect actuating force, insufficient maintenance, wear, exceeding the service life), failure of device components, at insufficient clamping force, workpieces held by the cylinder with through-hole can be ejected or fall.

Avoiding the hazard:

- All information in the operating manual, assembly drawing and other applicable documents on the cylinder with through-hole must be observed.
- Carry out a risk assessment for the machine with the integrated cylinder with through-hole and implement the derived safety measures.

2.7 Miscellaneous

2.7.1 Procedure in the Event of Danger and Accidents

In the event of danger and accidents, it must be ensured that first aid measures can be taken immediately.

1. Shut the machine down immediately via the Emergency-Stop button.
2. Remove the person involved from the danger zone and sit or lay the person down.
3. Call a doctor.
 - Do not make any changes to the accident site.
4. Administer first aid.
 - Stop any bleeding.
 - Cool burns.
5. Report all accidents to a superior.

2.7.2 Eyebolts for transport of hollow clamping cylinder

NOTICE:

For lifting and transport of the cylinder with through-hole, eyebolts in compliance with DIN 580 or similar load-bearing attachments must be used.

2.7.3 Modification of the hollow clamping cylinder

NOTICE:

The cylinder with through-hole may only be modified after written approval by RÖHM.

2.7.4 Dismantling the hollow clamping cylinder

NOTICE:

The cylinder with through-hole must not be disassembled other than as described in this Operating manual. Exception: After its final decommissioning, the cylinder with through-hole must be disassembled properly for disposal.

2.7.5 Collision/falling

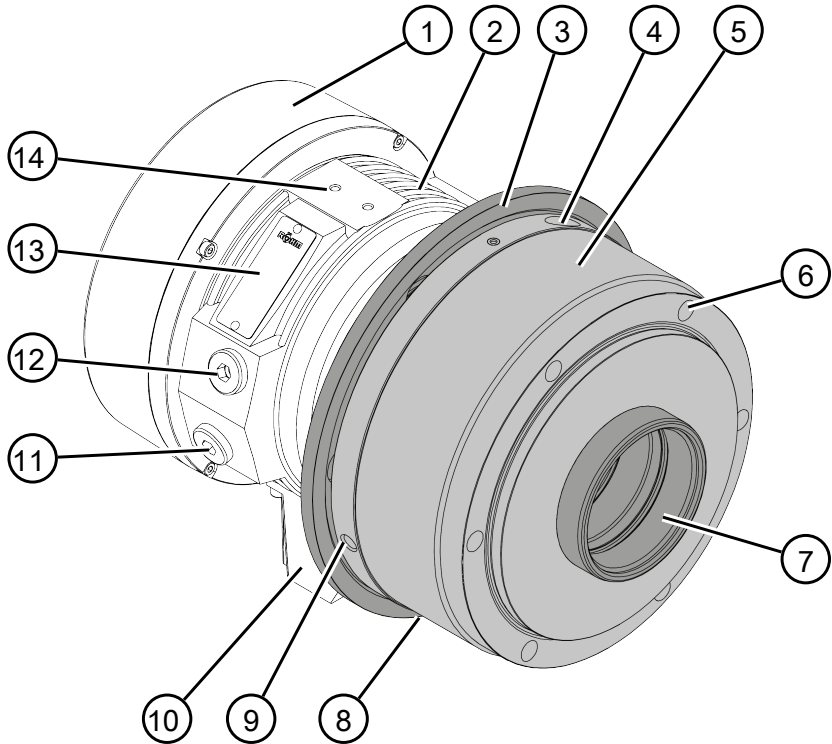
NOTICE:

After a collision between the cylinder with through-hole and other components of the machine, or after it has fallen, the cylinder with through-hole must be inspected for damage such as cracks by specialist personnel from RÖHM.

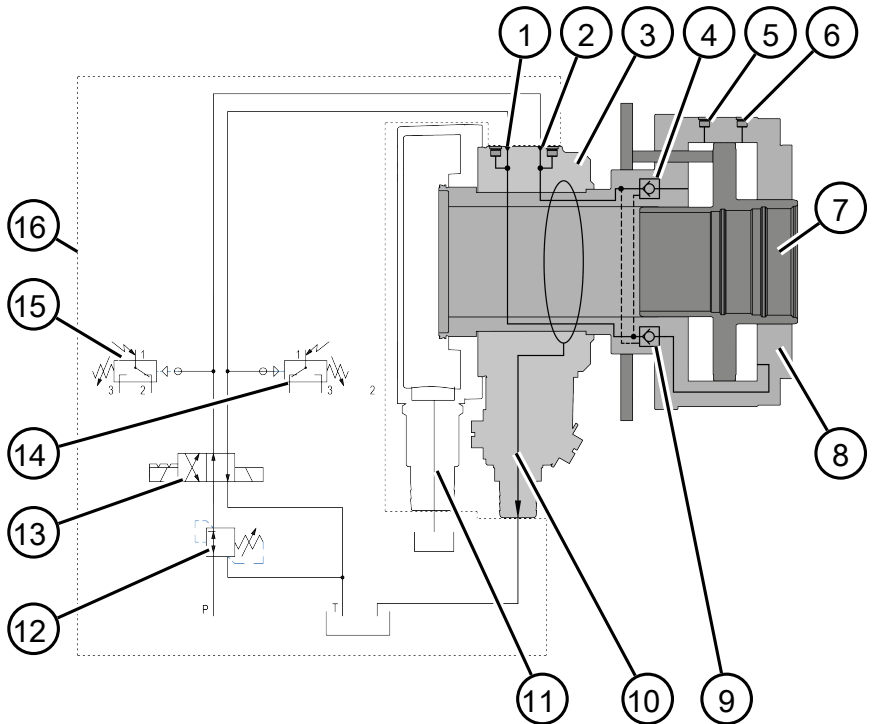
3 Product description

3.1 About this hollow clamping cylinder

Overview:



1	Coolant drip pan	8	Venting screw "A" (concealed)
2	Distributor housing	9	Transport thread (also opposite)
3	Control disc	10	Leakage oil tank
4	Venting screw "B"	11	Hydraulic connection "B" (also opposite)
5	Piston housing	12	Hydraulic connection "A" (also opposite)
6	6x through hole for holding screws	13	Name plate
7	Piston rod	14	2x thread for limit switch rail

Schematic illustration:


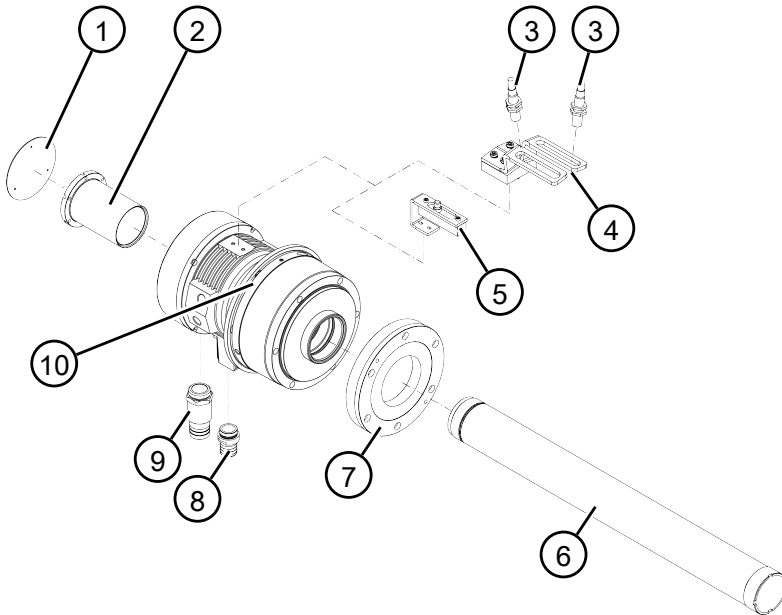
1	Hydraulic connection "B"	9	Non-return valve, controllable
2	Hydraulic connection "A"	10	Leakage oil refeed
3	Distributor housing	11	Coolant refeed
4	Non-return valve, controllable	12	Pressure reduction valve
5	Venting screw "A"	13	4/2 directional valve with notch
6	Venting screw "B"	14	Pressure switch
7	Piston rod, with through-hole	15	Pressure switch
8	Piston housing	16	Equipment to be supplied by the manufacturer of the machine. The equipment shown is an example.

Functional description:

- The cylinder with through-hole is a double-acting hydraulic cylinder with a completely hollow piston. Bars can be guided through the hollow piston to the chuck.
- By means of the standing distributor housing, pressurised hydraulic oil is fed to the rotating piston housing via the hydraulic connections “A” and “B”. If hydraulic connection “A” is pressurised, the piston rod extends; if hydraulic connection “B” is pressurised, the piston rod retracts.
- Hydraulic connections “A” and “B” are double (both-sided). In their delivered state, hydraulic connections “A” and “B” are closed with screw plugs on one side and with blanking plugs on the other side.
- The respective cylinder chambers of the cylinder with through-hole can be ventilated by means of venting screws “A” and “B”.
- In the event of a sudden failure of the fed hydraulic pressure, the non-return valves in the piston housing briefly preserve the clamping pressure in the cylinder with through-hole.
- The transfer of the hydraulic oil from the standing distributor housing to the rotating piston housing is not sealed and is thus tainted with leakage oil. The leakage oil must be fed back to the tank of the hydraulic unit via the leakage oil refeed.
- The control disc is directly linked to the piston. The end positions and/or the clamping path of the piston can be queried by means of the control disc. This can take place by means of two proximity switches or a position measuring system.
- Coolant is collected and diverted in the coolant drip pan; it then goes from the machining area of the machine into the hollow clamping cylinder via the free through-hole.

3.2 Options

The following options are available for the cylinder with through-hole:



1	Cover sheet	6	Draw tube
2	Material feed pipe	7	Cylinder flange
3	2x M12 proximity switch (not included in the scope of supply)	8	Leakage oil fitting
4	Switch carrier with limit switch rails	9	Connection piece for coolant discharge hose
5	Position measuring system with sensor holder	10	2 x 6 balancing drillings (2 levels in the piston housing)

NOTICE:

The material feed pipe, draw tube and cylinder flange options are executed on a customer-specific/machine-specific basis and are therefore shown only as examples.

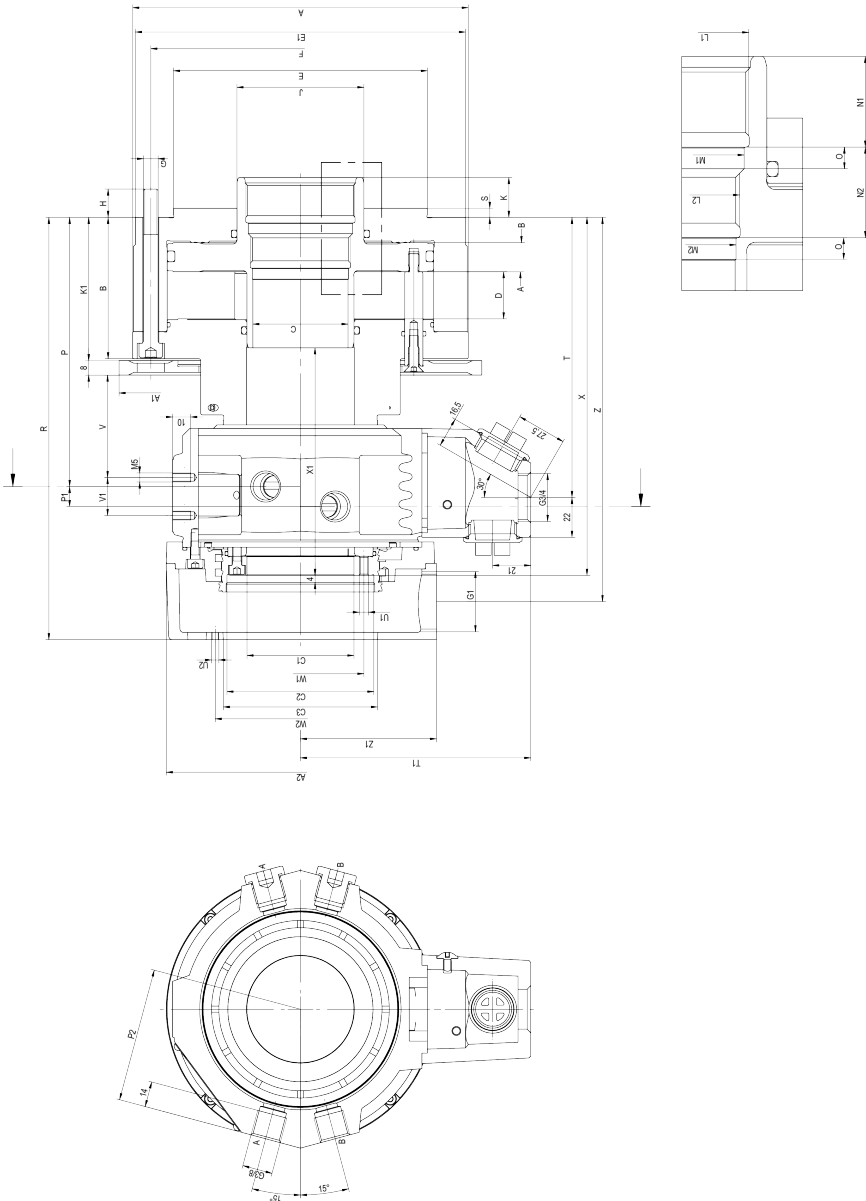
NOTICE:

The cylinder with through-hole is equipped with balancing drillings in the piston housing.

Optionally, a balancing can be carried out ex works by RÖHM. The balancing can also take place on the machine directly.

3.3 Technical data

3.3.1 Overview of construction sizes



Construction size	Unit	FORTO-HT 37/70	FORTO-HT 46/103	FORTO-HT 52/130	FORTO-HT 67/150	FORTO-HT 77/170
A	mm	145	165	185	202	215
A1	mm	170	185	205	217	237
A2	mm	148	148	148	188	188
B	mm	77	77	78	86	88
C	mm	37.5	46.5	52.5	67.5	77
C1	mm	45.2	55.2	59	74.5	85.3
C2 H8	mm	66	76	81	96	106
C3	mm	85	85	85	110	110
Stroke D	mm	26	26	26	30	30
E -0.03	mm	110	130	140	160	160
E1	mm	142	161	182	196	212
F	mm	125	147	165	180	195
G		M8	M8	M8	M10	M10
H	mm	16.6	16.6	15.6	14.6	17.6
J	mm	50	61	70	85	95
K max.	mm	24	22	22	25	25
K min.	mm	-2	-4	-4	-5	-5
K1 max.	mm	92.5	92.5	105	118	120
K1 min.	mm	66.5	66.5	79	88	90
L1		M44x1.5	M55x2	M60x1.5	M75x2	M85x2
L2		M42x1.5	M50x1.5	M55x2	M72x1.5	M80x2
M1 H9	mm	42.5	52.5	57.5	72.5	82
M2 H9	mm	40	47	52.5	69	77
N1	mm	20	25	25	25	25
N2	mm	22	25	25	28	28
O	mm	6	6	6	6	6
P	mm	138.5	138.5	148	168	169
P1	mm	11	11	12	10	12
P2	mm	68	72	74	89	94
R	mm	217	217	232	262	264
S	mm	5	5	5	8	8
T	mm	144.5	144.5	154.5	179.5	179.5

Construction size	Unit	FORTO-HT 37/70	FORTO-HT 46/103	FORTO-HT 52/130	FORTO-HT 67/150	FORTO-HT 77/170
T1	mm	122	125	127	139	146
U1		M5	M5	M5	M5	M5
U2		M4	M4	M4	M4	M4
V max.	mm	58.5	58.5	56.5	65.7	66
V1	mm	22	22	21	22	22
W1	mm	57	64	70	87	94
W2	mm	94	94	94	124	124
X	mm	187.5	187.5	197.5	222.5	224.5
X1 min.	mm	89.5	89.5	99.5	109.5	104.5
Z	mm	197	197	212	238	240
Z1	mm	75	75	75	97	97
Piston area A	cm ²	74.0	109.8	142.4	164.5	183.8
Piston area B	cm ²	70.3	103.5	131.2	152	169.6
Operating pressure min. – max.	bar	8 – 45				
Hydraulic oil operating temperature min. – max.*	°C	+40 - +70				
Effective tensile force at max. operating pressure	kN	31.6	46.5	59	68.4	76.3
Lost oil quantity at max. operating pressure	l/min	3.0	3.5	4.0	4.0	5.0
Max. permissible speed	min ⁻¹	8000	7000	6300	5500	5000
Balance quality pursuant to DIN ISO 21940-13	mm/s	G = 6.3				
Moment of inertia	kgm ²	0.015	0.024	0.044	0.07	0.092
Weight	kg	10	11.8	15.3	20.8	23.4

*) Regarding the cold start of the cylinder with through-hole, see chapter “Technical control requirements”

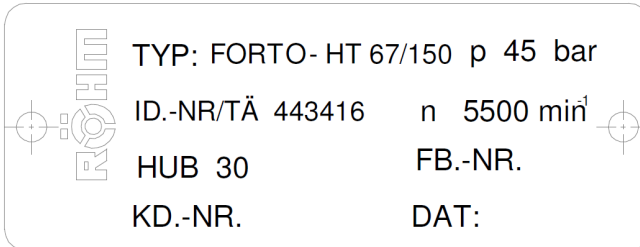
Construction size	Unit	FORTO-HT 86/200	FORTO-HT 95/225	FORTO-HT 110/250	FORTO-HT 127/325
A	mm	230	249	264	295
A1	mm	250	269	284	315
A2	mm	214	214	264	264
B	mm	96	96	96	112
C	mm	86.5	95.5	110.5	127.5
C1	mm	95.2	105.2	122	140
C2 H8	mm	121	131	151	171
C3	mm	140	140	180	180
Stroke D	mm	35	35	35	40
E -0.03	mm	180	210	210	250
E1	mm	227	244	262	290
F	mm	210	227	240	270
G		M10	M10	M10	M12
H	mm	14.6	14.6	14.6	20.6
J	mm	105	115	130	145
K max.	mm	31	31	31	44
K min.	mm	-4	-4	-4	4
K1 max.	mm	132	132	132	153
K1 min.	mm	97	97	97	113
L1		M95x2	M105x2	M120x2	M135x2
L2		M90x2	M100x2	M115x2	-
M1 H9	mm	92	102.5	117.5	132
M2 H9	mm	87	97	112	-
N1	mm	32	32	32	30
N2	mm	30	30	30	-
O	mm	6	6	6	6
P	mm	188	192	199.3	223
P1	mm	12	12	12	11
P2	mm	105	108.5	121	131.5
R	mm	289	298	310	335
S	mm	8	8	8	5
T	mm	202	205	213.5	236.5
T1	mm	149	152.5	165.5	177

Construction size	Unit	FORTO-HT 86/200	FORTO-HT 95/225	FORTO-HT 110/250	FORTO-HT 127/325
U1		M5	M5	-	-
U2		M4	M4	M4	M4
V max	mm	77	69	77	77
V1	mm	24	30	24	30
W1	mm	110	118	-	-
W2	mm	160	160	200	200
X	mm	249.5	258.7	270.5	295.5
X1 min.	mm	121.5	127.7	139.5	145.5
Z	mm	265	274	286	311
Z1	mm	109	109	134	134
Piston area A	cm ²	212.6	243.5	265.1	336.9
Piston area B	cm ²	196.9	226.2	247.4	325.7
Operating pressure min. – max.	bar	8 – 45			
Hydraulic oil operating temperature min. – max.*	°C	+40 - +70			
Effective tensile force at max. operating pressure	kN	88.6	101.7	111.3	146.5
Lost oil quantity at max. operating pressure	l/min	6.0	7.0	8.0	9.0
Max. permissible speed	min ⁻¹	4500	4000	4000	3200
Balance quality pursuant to DIN ISO 21940-13	mm/s	G = 6.3			
Moment of inertia	kgm ²	0.135	0.187	0.26	0.44
Weight	kg	29.2	37	46.3	58.1

*) Regarding the cold start of the cylinder with through-hole, see chapter “Technical control requirements”

3.3.2 Name plate

The name plate can be found on the distributor housing of the cylinder with through-hole, and it contains the following information (as example):



NOTICE:

The information on the name plate must be adhered to.

3.3.3 Media-carrying connections

Connections at the cylinder with through-hole:

Conne- ction	Size	Operating material/me- dium	Function
A	G3/8"	Hydraulic oil	The piston rod moves out
B	G3/8"	Hydraulic oil	The piston rod moves in

3.3.4 Environmental and operating conditions

The cylinder with through-hole is designed for the following environmental and operating conditions:

Environmental and operating con- ditions	Quality requirement(s)
Ambient medium	<ul style="list-style-type: none"> ▪ Air or inert gases ▪ The cylinder with through-hole must not be dipped into or immersed in liquids of any kind
Place of use	Interior
Vibration speeds	< 5 mm/s as per DIN ISO 10816-3
Relative humidity (at 40 °C)	< 100% NOTE: Use in very humid conditions leads to faster corrosion and may reduce the useful life.
Potentially explosive environment	No, not permitted

Environmental and operating conditions	Quality requirement(s)
Ambient temperature at place of use	+5 °C to +60 °C
Ambient temperature for storage	+15 °C to +70 °C
Dry and wet machining	Wet compatible with hydraulic fluid and coolant

Pollution of the machine's surroundings caused by the machine itself is permitted. However, perfect operation of the cylinder with through-hole must be checked regularly.

3.3.5 Permissible operating materials

The following operating materials are permitted:

- Hydraulic oil
 - which corresponds to the following quality requirements:
 - Hydraulic oil HLP as per DIN 51524-2 correction 1:2006-09
 - Viscosity range 32 – 46 cSt at 40 °C
 - Purity class ISO 4406: 20/18/15

Other operating materials may only be used with prior written approval from RÖHM.

3.3.6 Structural operating conditions

The following conditions must be adhered to for the proper operation of the cylinder with through-hole in a machine:

- Before using the cylinder with through-hole in a machine, it must be checked whether the machine allows the use of the cylinder with through-hole.
See also:
 - chapter "Obligations of the operator", as well as
 - chapter "Risk of ejection, detachment and falling of components at the cylinder with through-hole," as well as
 - chapter "Risk of ejection, detachment and falling of workpieces from the cylinder with through-hole.
- The rotation axis of the cylinder with through-hole must be aligned horizontally. Other spatial alignments are not permissible.
- The leakage oil tank on the distributor housing must be aligned vertically downwards.
- The coolant drip pan on the distributor housing must be aligned vertically downwards.

- The chuck can be actuated through the cylinder with through-hole with pressure or tension.
- The maximum speed of the cylinder with through-hole must not be exceeded.
- The cylinder with through-hole must be attached directly to a machine spindle or by means of the cylinder flange option.
- No force may be applied at the distributor housing. Hydraulic, leakage oil and coolant connections must be guided in flexible hoses and not in rigid pipelines.
- The supplied screws with the prescribed strength class must be used. Other screws may not be used.
- The maximum installation dimensions of the cylinder with through-hole can be found in the dimensional drawing (see chapter “Technical data”, sub-chapter “Overview of construction sizes”).
- The movement range of the control disc must be observed (danger of collision with other components, hoses, cables, etc. in the machine).
- The leakage oil hose
 - must not be bent or narrowed
 - must run with a slope to the hydraulic tank over its entire length.
 - must not be immersed in the hydraulic oil inside the hydraulic tank. As necessary, forced ventilation must be applied.
 - must be resistant against temperature and hydraulic oil.

NOTICE

The leakage oil hose should be transparent; this makes it easier to check for backlogs
- No underpressure or overpressure may emerge or exist inside the leakage oil hose.
- The end positions and/or the clamping path of the piston can be monitored by means of a clamping path monitoring device. The clamping path monitoring device can transmit corresponding signals to the machine control.
- If the workpiece to be clamped is to be clamped on a force-fit basis, this must not happen in one of the two end positions of the cylinder with through-hole. In this case, there must be a sufficiently large stroke reserve up to the corresponding end position.
- The hydraulic oil must be filtered in order to ensure the corresponding purity class (see chapter “Permissible operating materials”).

3.3.7 Technical control requirements

3.3.7.1 General technical control requirements

- The cylinder with through-hole can be clamped and released in an idle state or under rotation.
- In the event of rotation with clamping of a workpiece, either hydraulic connection “A” or “B” must be permanently pressurised with at least 8 bar (depending on which hydraulic connection is pressurised to clamp the workpiece).
NOTICE:
This also serves to preserve the bearing lubrication and/or to prevent dry runs.
- In the event of rotation over an extended period without clamping of a workpiece, a lubricating pulse of approx. 5 s at 5 bar hydraulic pressure must be applied every approx. 15 min on hydraulic connection “A” and “B” alternately.
NOTICE:
This also serves to preserve the bearing lubrication and/or to prevent dry runs.
- A cold start of the cylinder with through-hole is permitted as of an ambient temperature (machine, cylinder with through-hole and hydraulic oil) of 20 °C. Here, the cylinder with through-hole may rotate at low or medium speeds only.
- Only once the hydraulic oil has reached its operating temperature may the cylinder with through-hole be operated at maximum speed.
- If the hydraulic pressure drops or suddenly declines, the workpiece machining must be stopped immediately and the cylinder with through-hole must be decelerated to a standstill in max. 1 minute.
- In the event of a power failure of the machine and on subsequent return of power, the current switch position must not be changed.
- Depressurising the cylinder with through-hole in the case of a clamped workpiece is not permitted.

3.3.7.2 Setup mode


In the “Setup mode” machine operation type

- it may not be possible to machine a workpiece.
- rotational and linear movements of axes may not overlap.
- linear movements of axes must be limited to maximum 2 m/min.
- rotational and lifting movements are not permitted at the same time on the cylinder with through-hole.
- the speed of the cylinder with through-hole must be limited to a maximum of 10 min⁻¹.
- hydraulic pressure must be limited to maximum 10 bar.

NOTICE:

If a different hydraulic pressure is required, this is explicitly stated in the respective handling instructions.

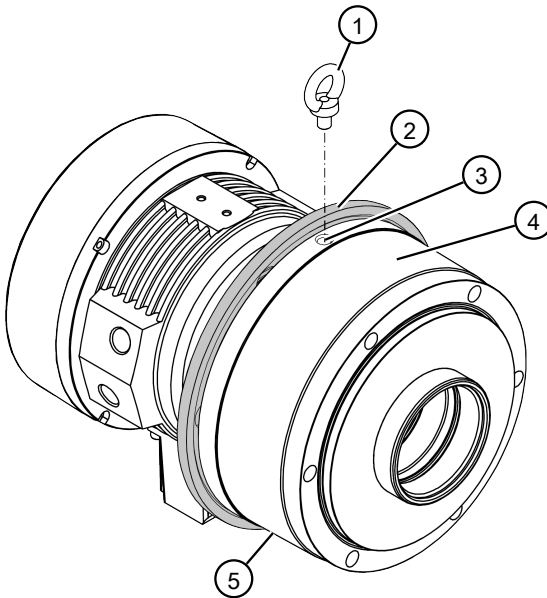
4 Transport

⚠ WARNING	
	<p>Crushing injuries in the event of unsecured transport of the cylinder with through-hole.</p> <p>Falling of the cylinder with through-hole.</p> <ul style="list-style-type: none"> ➤ Use suitable hoisting gear and slings. ➤ Wear personal protective equipment. ➤ Do not remain under suspended loads.

Pre-conditions:


- Personnel qualification: Trained/instructed person
- Wear personal protective equipment

4.1 Transport hollow clamping cylinder with eyebolt



1 M10 DIN 580 eyebolt	4 Piston housing
2 Control disc	5 M10 transport thread (concealed)
3 M10 tapped holes for transport	-

Procedure:

NOTICE	
	<p>If the piston and the control disc are in the front end position, the eyebolt cannot be screwed into the tapped holes for transport purposes.</p> <ul style="list-style-type: none"> ➤ Before transport, move the piston and the control disc into the rear end position.

1. If necessary, turn the piston housing so that one of the two tapped holes for transport purposes is at the top.
2. Fully screw the eyebolt into the tapped hole for transport
3. Attach suitable lifting gear to eyebolt.
4. Lift the Cylinder with through-hole and transport it in a manually-driven manner. The cylinder with through-hole must not wobble.

4.2 Set down hollow clamping cylinder

- Set the cylinder with through-hole down on a workbench or another surface so that the cylinder with through-hole does not lie on the control disc.
- Secure the cylinder with through-hole against tilting and rolling.

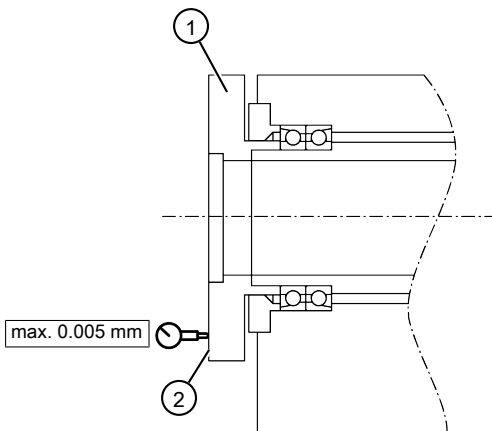
5 Assembly

Pre-conditions:

- Personnel qualification: Skilled worker
- Wear personal protective equipment
- The machine is switched off and protected against being switched on again
- Contact and centring surfaces at the machine spindle are cleaned

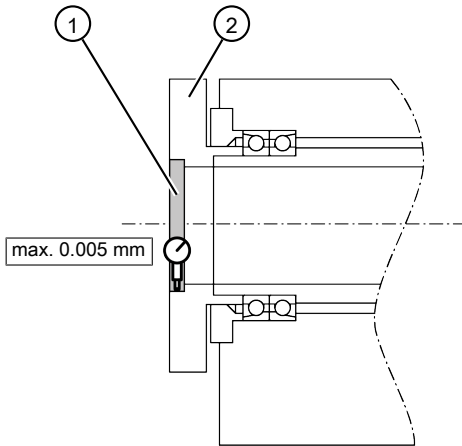
5.1 Preparing the machine

Procedure:



1	Machine spindle (example)	2	Contact surface
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- Check axial run-out at the contact surface at the machine spindle.

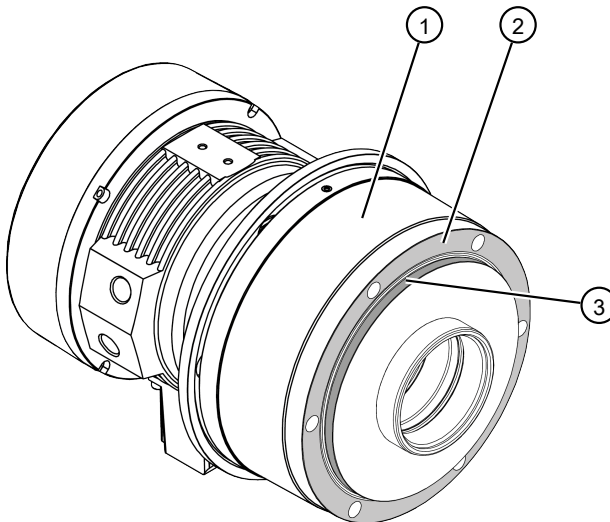


1	Centring surface	2	Machine spindle (example)
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- Check concentricity at the centring surface at the machine spindle.

5.2 Mounting the hollow clamping cylinder at the machine spindle

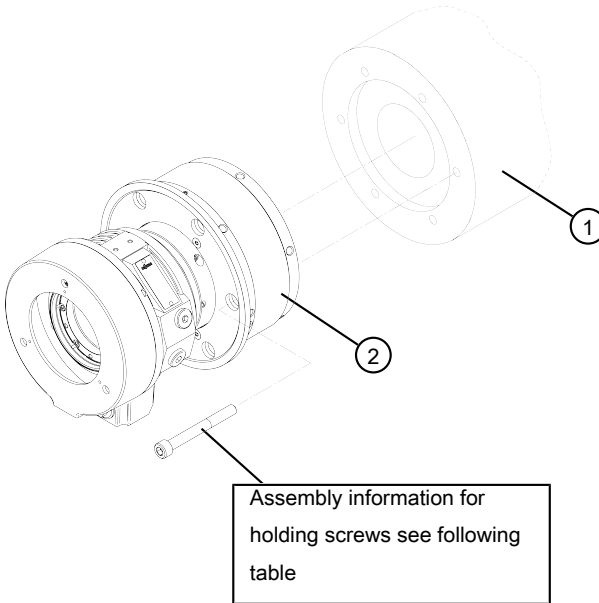
Pre-conditions:



1	Piston housing	3	Centring surface
2	Contact surface	-	-

- Clean the contact and centring surfaces.

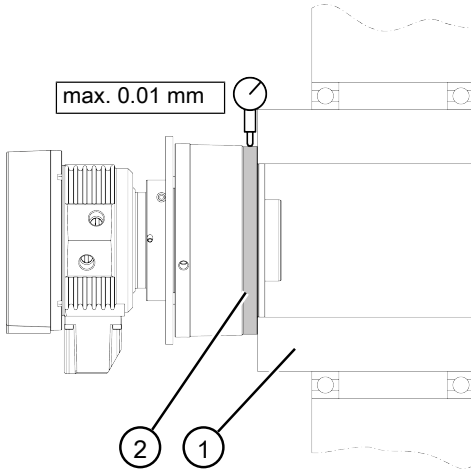
Procedure:



1	Machine spindle (example)	2	cylinder with through-hole
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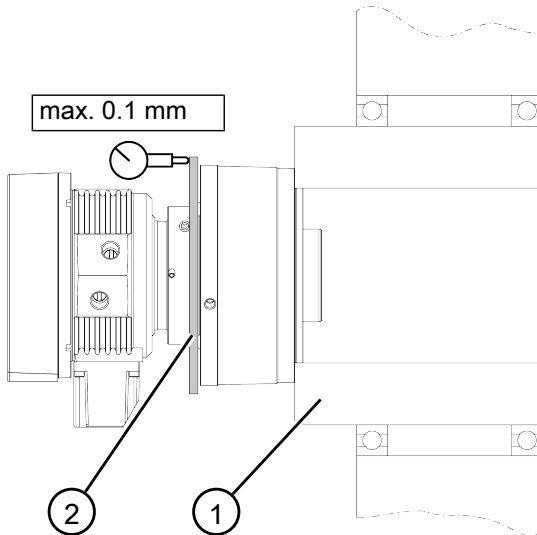
Assembly information for holding screws								
FORTO-HT 37	FORTO-HT 46	FORTO-HT 52	FORTO-HT 67	FORTO-HT 77	FORTO-HT 86	FORTO-HT 95	FORTO-HT 110	FORTO-HT 127
6x								
M8x85			M10x90	M10x95	M10x100		M12x120	
12.9								
42.2 Nm			83 Nm				144 Nm	

1. Apply Cylinder with through-hole to machine spindle.
2. Attach the Cylinder with through-hole with holding screws at the machine spindle.
 NOTICE:
 Crosswise tighten the holding screws.
 NOTICE:
 The holding screws must be inserted and tightened with the stated tightening torque.



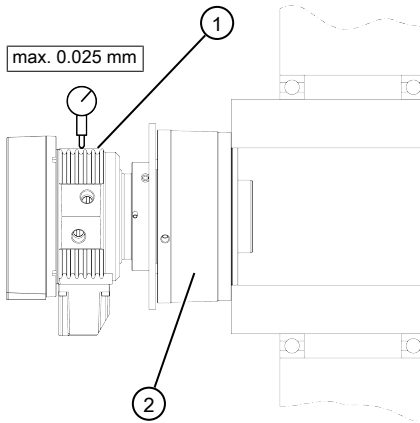
1	Machine spindle (example)	2	Check collar
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3. Check concentricity at the check collar.



1	Machine spindle (example)	2	Control disc
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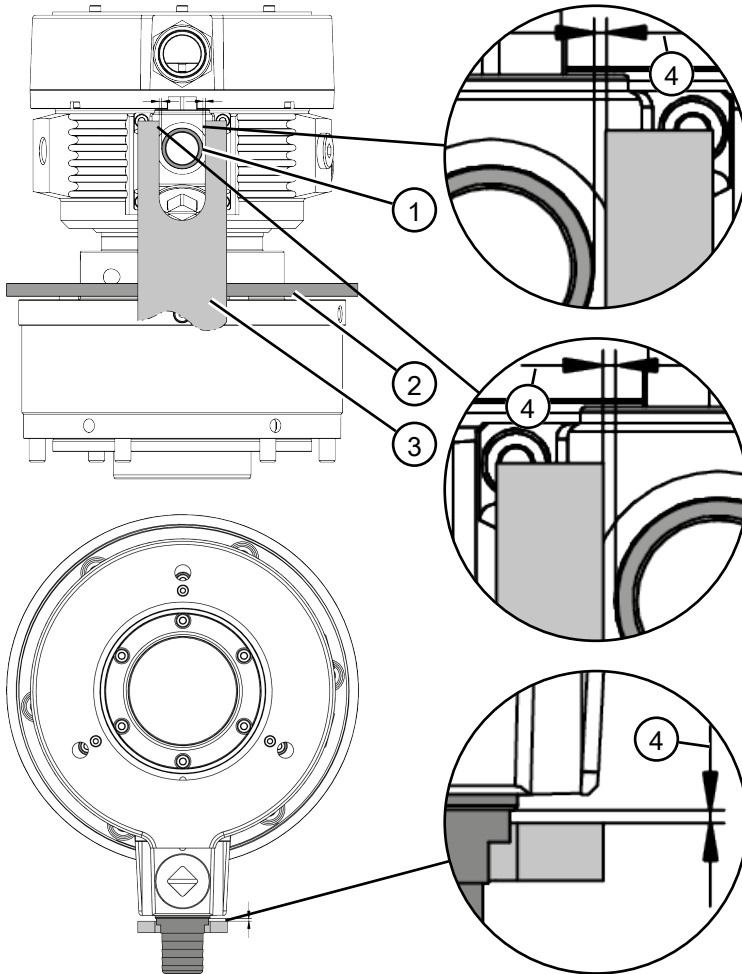
4. Checking axial run-out on the control disc.



1	Flat surface on distributor housing	2	Piston housing
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5. Place dial gauge on distributor housing. The standing distributor housing must not wobble during the rotation of the piston housing.

5.3 Assembling the protection against torsion



1	Leakage oil fitting	3	Protection against torsion (example)
2	Control disc	4	Distance

NOTICE:

- The distributor housing must be secured against turning in both rotational directions. To this end, protection against torsion must be provided for on the machine. The protection against torsion is not included in the scope of supply.

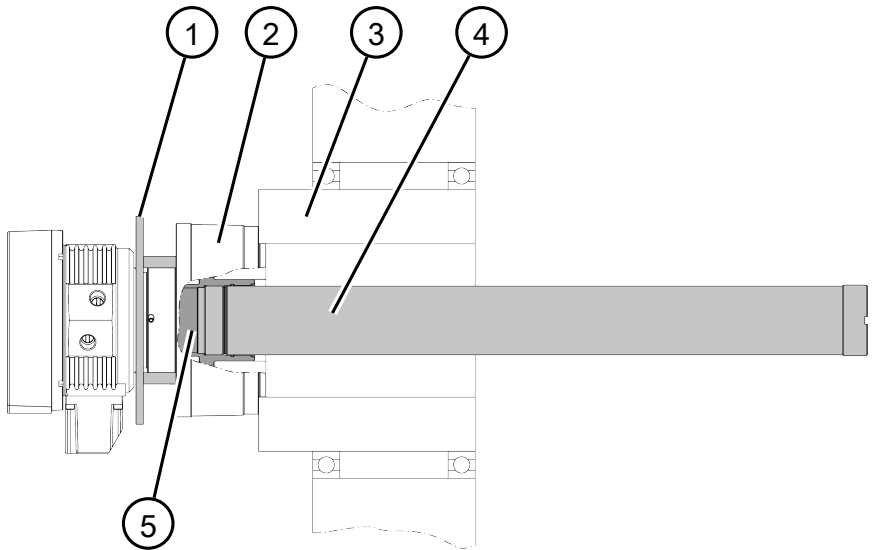
- The protection against torsion must be designed for a torque of 20 Nm.
- The protection against torsion must not exercise pressure on the cylinder with through-hole and must have a distance of approximately 2 mm to the leakage oil tank and/or the leakage oil fitting in all directions.
- The protection against torsion can be produced in the form of a fork; this facilitates assembly/disassembly of the cylinder with through-hole and the protection against torsion.
- The protection against torsion must be designed and assembled so that no collision with the control disc takes place. Observe control disc movement range.

5.4 Assembling options on the hollow clamping cylinder

5.4.1 Assembling draw tube option

NOTICE:

To assemble the draw tube option, the cylinder with through-hole must be assembled in the machine and filled with hydraulic oil and ventilated.



1	Control disc	4	Draw tube
2	Piston housing	5	Piston
3	Machine spindle (example)	-	-

Procedure:

1. Move piston into rear end position. To this end, pressurise hydraulic connection "B".
2. Insert draw tube completely (with support discs, depending on the design) into the machine spindle.
3. Screw draw tube into the piston of the cylinder with through-hole. Tightening torque 80 Nm.

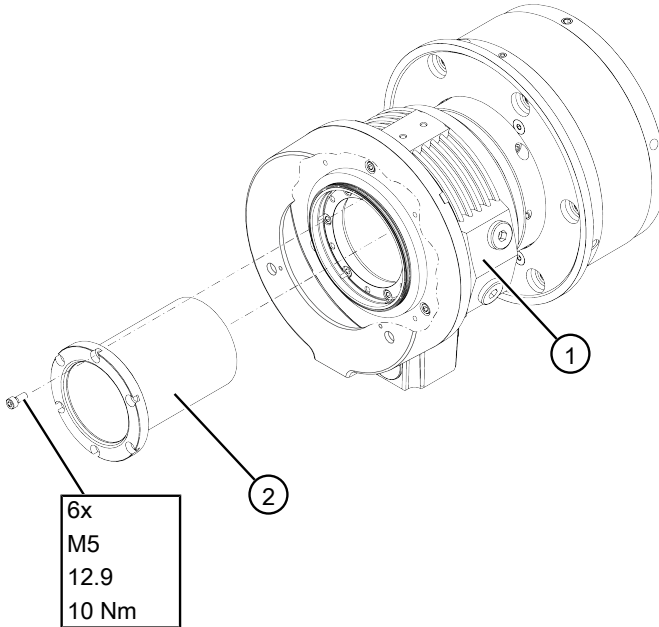
NOTICE:

Use special key for screwing in.

NOTICE:

The special key is not included in the scope of supply of the cylinder with through-hole or the draw tube and must be ordered separately.

5.4.2 Assembling material feed pipe option



1	Distributor housing	2	Material feed pipe
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Procedure:

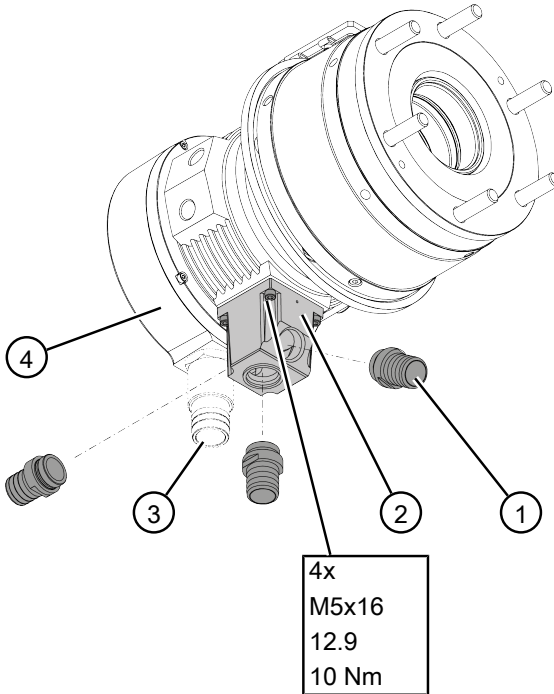
1. Insert material feed pipe into distributor housing.
2. Fix the material feed pipe to the distributor housing with the holding screws.

NOTICE:

Crosswise tighten the holding screws.

The holding screws must be inserted and tightened with the stated tightening torque.

5.4.3 Assembling leakage oil fitting option



1	Leakage oil fitting	3	Connection piece for coolant discharge hose
2	Leakage oil tank	4	Coolant drip pan

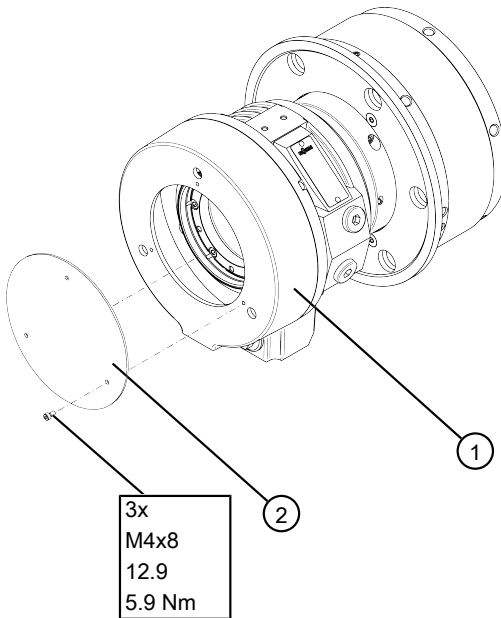
NOTICE:

- The leakage oil fitting can be mounted on the leakage oil tank in one of the three positions as shown in the illustration.
- If the connection piece is additionally assembled for the coolant discharge hose, the leakage oil fitting cannot be guided horizontally backwards.
- If the leakage oil is to be discharged to the side, the leakage oil tank can be loosened and turned 90° left or right and then reassembled.
- If the leakage oil fitting is to be assembled diagonally downwards, the protection against torsion must not collide with the leakage oil fitting or the leakage oil hose.

Procedure:

1. Screw the leakage oil fitting onto the leakage oil tank in the desired position.
 NOTICE:
 The leakage oil fitting must be tightened with a tightening torque of 40 Nm.
2. Close non-required openings on the leakage oil fitting with screw plugs.

5.4.4 Assembling cover sheet option



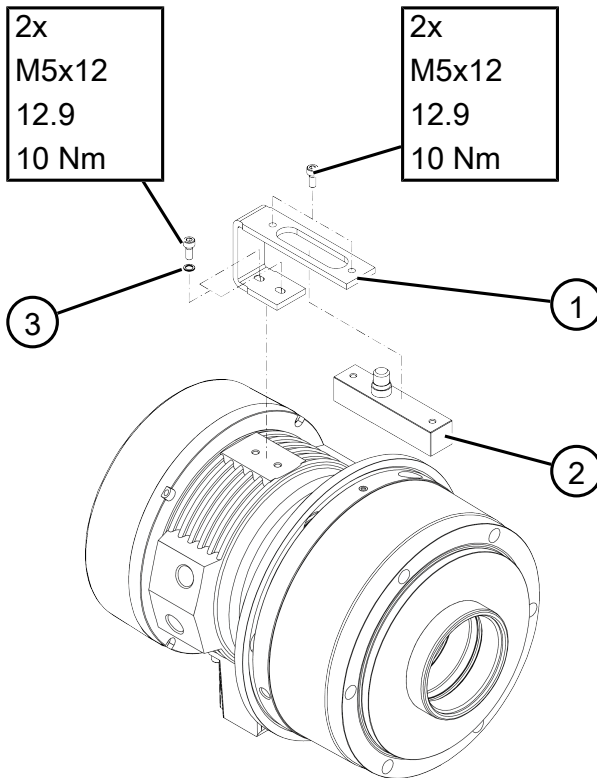
1	Coolant drip pan	2	Cover sheet
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Procedure:

- Assemble the cover sheet on the coolant drip pan with the holding screws.

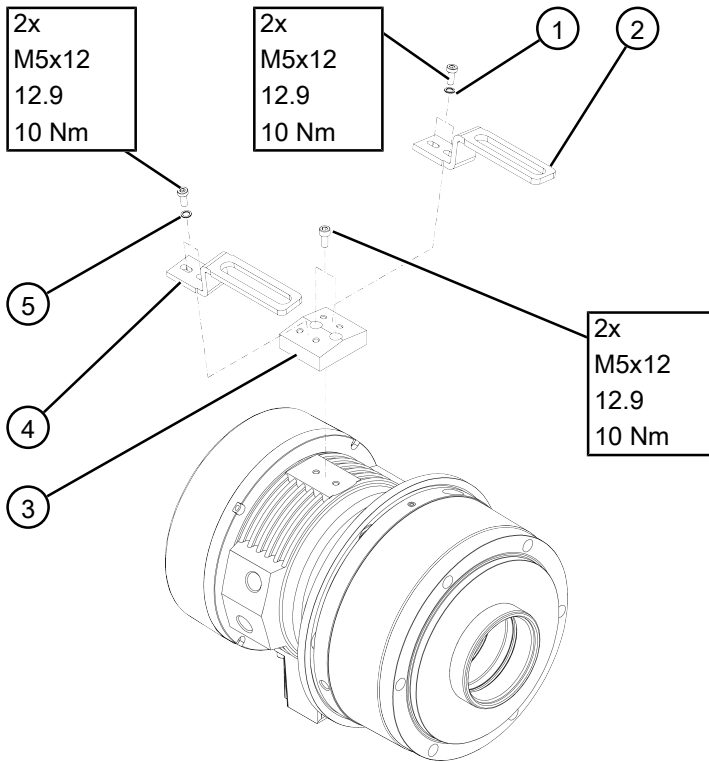
5.4.5 Mounting the position measuring system/proximity switch option

Position measuring system attachment

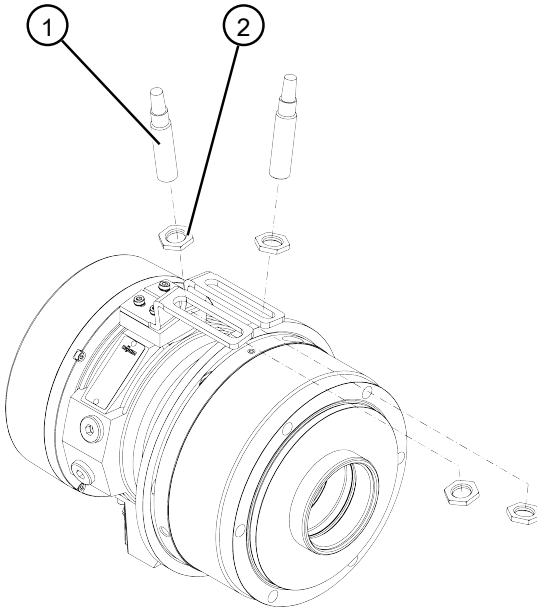


1	Sensor holder	3	2x locking washer
2	Position measuring system	-	-

Proximity switch attachment



1	2x locking washer	4	Limit switch rail
2	Limit switch rail	5	2x locking washer
3	Switch carrier	-	-



1	2x M12 proximity switch	2	4x M12 nut
---	-------------------------	---	------------

NOTICE:

- The clamping path of the cylinder with through-hole can be monitored either with two proximity switches or a position measuring system.
- To attach and adjust the proximity switches or the position measuring system, follow their operating manuals.
- The cables of the proximity switches or the position measuring system must be installed in such a way that they cannot be placed under tension.
- The cables of the proximity switches or the position measuring system must be installed in such a way that they cannot be caught or crushed by moving parts such as the control disc.

NOTICE:

Cables for the proximity switches or the position measuring system are not included in the scope of supply and must be obtained by the manufacturer of the machine or the operator of the machine.

Procedure:

1. Depending on the option, attach sensor holder with position measuring system or switch carrier with limit switch rails and proximity switches with holding screws and locking washers to the cylinder with through-hole.

NOTICE:

The holding screws must be inserted and tightened with the stated tightening torque.

2. Adjust proximity switches or position measuring system.

NOTICE:

See the operating manuals of the proximity switches or the position measuring system.

NOTICE:

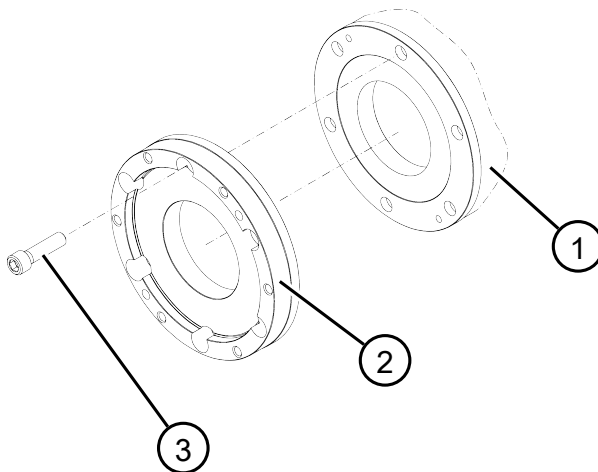
See also chapter “Configuring clamping path monitoring”.

5.4.6 Assembling cylinder flange option

Pre-conditions:

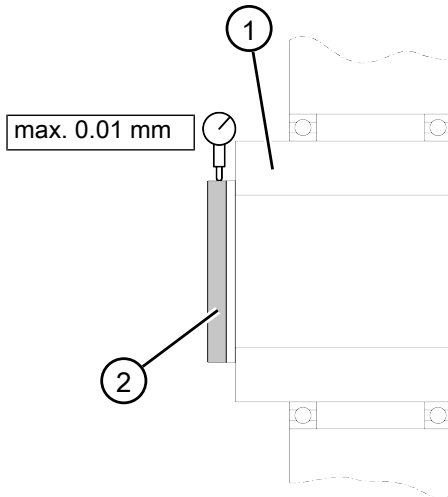
- Contact and centring surfaces at the machine spindle are cleaned
- Contact and centring surfaces at the cylinder flange are cleaned
- Concentricity error and axial run-out error at the machine spindle each max. 0.005 mm

Procedure:



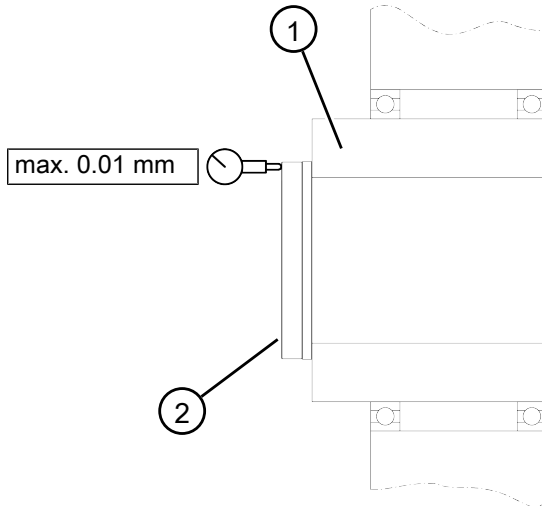
1	Machine spindle (example)	3	Holding screw (example)
2	Cylinder flange (example)	-	-

1. Fix the cylinder flange to the machine spindle with the holding screws.
 NOTICE:
 Crosswise tighten the holding screws.
 NOTICE:
 The cylinder flange is produced on a customer-specific/machine-specific basis. See the respective dimensional drawing for dimensions and screws to be used.



1	Machine spindle (example)	2	Check collar on cylinder flange
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2. Check concentricity at the check collar.



1	Machine spindle (example)	2	Contact surface on cylinder flange
---	---------------------------	---	------------------------------------

3. Check axial run-out at the contact surface.
4. Assemble cylinder with through-hole on the cylinder flange.
 NOTICE:
 For the procedure, see chapter “Mounting the cylinder with through-hole at the machine spindle”.

5.4.7 Balancing the hollow clamping cylinder option

Pre-conditions:

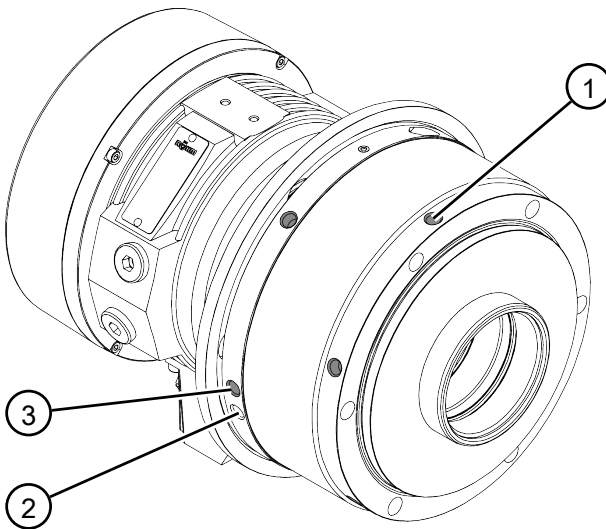
- Personnel qualification: Skilled worker
- Wear personal protective equipment
- Cylinder with through-hole is assembled in the machine and connected
- Hydraulic oil at operating temperature
- Cylinder with through-hole at operating temperature
- Balancing drillings are present on the cylinder with through-hole.

Procedure:

NOTICE:

- The balancing drillings are not closed. Exception: The cylinder with through-hole was already previously balanced by RÖHM. In this case, one or several balancing drillings are already closed.

- Balancing drillings already used and/or closed by Röhm may no longer be opened.
- Suitable screw plugs or threaded pins and balancing weights must be obtained by the manufacturer or the operator.
- The two tapped holes for transport purposes must not be used to balance the cylinder with through-hole, only the balancing drillings intended for this purpose.
- Carry out the balancing in a machine operating mode intended for it by the manufacturer of the machine.
- The max. permitted speed of the cylinder with through-hole must not be exceeded.



1	Balancing drillings (level 1)	3	Balancing drillings (level 2)
2	Transport thread (also opposite)	-	-

Balancing drillings (number, thread size and tightening torque)								
FORTO -HT 37	FORTO -HT 46	FORTO -HT 52	FORTO -HT 67	FORTO -HT 77	FORTO -HT 86	FORTO -HT 95	FORTO -HT 110	FORTO -HT 127
6x M8 (8 mm deep)			6x M10 (8 mm deep)					
24.6 Nm			48 Nm					

NOTICE:

Tighten screw plugs or threaded pins with the tightening torque indicated.

NOTICE:

Secure screw plugs or threaded pins with screw locking.

5.5 Connect media-carrying connections

5.5.1 Connecting hydraulic hoses

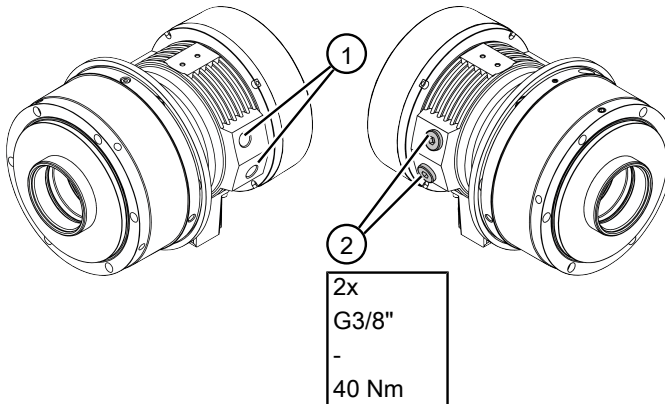
NOTICE:

- In the delivered state of the cylinder with through-hole, hydraulic connections “A” and “B” are closed with screw plugs on one side and with blanking plugs on the opposite side.
- Do not remove screw plugs or blanking plugs at the cylinder with through-hole before the hydraulic hoses are connected.
- If hydraulic connection “A” is pressurised, the piston rod extends; if hydraulic connection “B” is pressurised, the piston rod retracts.

Pre-conditions:

- Hydraulic hoses and screw fittings are free from dirt. If necessary, rinse the hydraulic hoses and screw fittings through with hydraulic oil.
- Only screw fittings with cylindrical threads may be used. Conical threads are not permitted.

Procedure:



1	Sealing plugs	2	Screw plugs
---	---------------	---	-------------

1. Remove the sealing plugs and keep them for later use.
2. If necessary, unscrew screw plugs and screws them back in again on the other side.

NOTICE:

The screw plugs must be inserted and tightened with the stated tightening torque.

3. Screw in hydraulic hoses.

5.5.2 Connecting the leakage oil hose

NOTICE:

For specifications on installing and connecting the leakage oil hose, see chapter “Structural operating conditions”.



6 Commissioning

6.1 Filling the hollow clamping cylinder with hydraulic oil and venting out the air

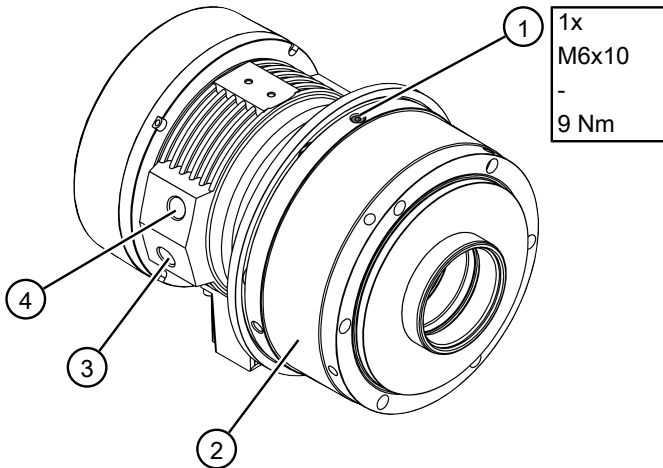
Pre-conditions:

- Personnel qualification: Skilled worker
- Wear personal protective equipment
- Cylinder with through-hole is assembled in the machine and connected
- Machine in “Setup mode” machine operation type
- Hydraulic oil at operating temperature
- Hydraulic pressure set to 5 bar

Procedure:

⚠ WARNING	
	<p>Danger of crushing in the movement range of the control disc between the control disc, the piston housing and the distributor housing during ventilation.</p> <ul style="list-style-type: none"> ➤ Do not reach into the control disc movement range during ventilation.
⚠ WARNING	
	<p>Danger of slipping and skin irritations due to leaking hydraulic oil.</p> <ul style="list-style-type: none"> ➤ Wear personal protective equipment. ➤ Collect any leaking hydraulic oil.

Ventilating hydraulic connection "A"



1	Venting screw "A"	3	Hydraulic connection "B" (also opposite)
2	Piston housing	4	Hydraulic connection "A" (also opposite)

NOTICE:

Illustration without machine spindle, options and hydraulic lines

1. Turn the piston housing so that venting screw "A" is at the top.
2. Undo venting screw "A" by one or two turns.

NOTICE:

The venting screw must not be loosened by more than two turns or unscrewed completely.

3. Pressurise hydraulic connection "A".
 - At first, hydraulic oil mixed with air bubbles leaks out from the loosened venting screw.
4. Once hydraulic oil is leaking out without air bubbles, tighten venting screw "A".

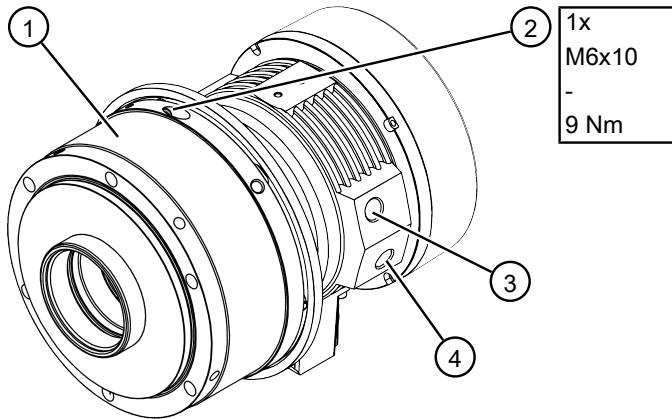
NOTICE:

The venting screw must be tightened with the stated tightening torque.

NOTICE:

Collect any leaking hydraulic oil.

Ventilating hydraulic connection “B”



1	Piston housing	3	Hydraulic connection “A” (also opposite)
2	Venting screw “B”	4	Hydraulic connection “B” (also opposite)

NOTICE:

Illustration without machine spindle, options and hydraulic lines

1. Turn the piston housing so that venting screw “B” is at the top.
2. Undo venting screw “B” by one or two turns.

NOTICE:

The venting screw must not be loosened by more than two turns or unscrewed completely.

3. Pressurise hydraulic connection “B”.
 - At first, hydraulic oil mixed with air bubbles leaks out from the loosened venting screw.
4. Once hydraulic oil is leaking out without air bubbles, tighten venting screw “B”.

NOTICE:
The venting screw must be tightened with the stated tightening torque.

NOTICE:
Collect any leaking hydraulic oil.
5. Carry out a visual inspection. Check that all venting screws are tight.

Cleaning the hollow clamping cylinder


- After the ventilation, clean the cylinder with through-hole externally.

6.2 Carrying out a functional test


Pre-conditions:

- Personnel qualification: Skilled worker
- Wear personal protective equipment
- Machine in “Setup mode” machine operation type
- Hydraulic oil at operating temperature
- Hydraulic pressure set to 8 bar
- Chuck is connected to the cylinder with through-hole and/or the draw tube option
- No workpiece clamped

Procedure:

⚠ WARNING	
	<p>Danger of crushing in the movement range of the control disc between the control disc, the piston housing and the distributor housing during functional testing.</p> <p>➤ Do not reach into the control disc movement range during functional testing.</p>

1. Approach the front and rear end position 5 to 10x with the piston.
NOTICE:
The cylinder with through-hole must not rotate.
2. Check the cylinder with through-hole for correct connection of hydraulic lines “A” and “B”.
3. Check hydraulic lines, leakage oil hose, coolant discharge hose and cables. These must not be placed under tension.
4. Check the protection against torsion.

⚠ WARNING	
	<p>Dry runs of the cylinder with through-hole can cause a cold shut of the distributor housing and the piston housing. As a consequence of this, the hydraulic hoses can tear and hydraulic oil under high pressure can spray around. Risk of injury</p> <p>➤ During the rotation of the cylinder with through-hole, either hydraulic connection “A” or hydraulic connection “B” must be permanently pressurised.</p>

5. Make the cylinder with through-hole rotate with 5 min⁻¹.
NOTICE:
During the rotation, either hydraulic connection “A” or hydraulic connection “B” must be permanently pressurised.
6. Set the machine to “Production mode”.
7. Increase hydraulic pressure to max. 45 bar.
8. Approach the front and rear end position 5 to 10x with the piston.
NOTICE:
The cylinder with through-hole must not rotate.
9. Gradually increase the rotation up to the maximum speed of the cylinder with through-hole.
10. Switch to the "Setup mode" machine operating mode.
11. Carry out a visual inspection. Check Cylinder with through-hole for leaks.

6.3 **Configuring clamping path monitoring**



NOTICE:

- When the cylinder with through-hole is assembled for the first time or repeatedly, the clamping path monitoring must always be configured.
- If changes are made to the chuck, the clamping diameter or the clamping type (internal clamping or external clamping), the clamping path monitoring must also be readjusted.
- RÖHM recommends a linear position measuring system to monitor the complete piston stroke. If using proximity switches, RÖHM recommends at least querying the open position and the clamping position. The clamping path monitoring should be set in such a way that no signal is produced when clamping without a workpiece.
- The control disc has a width of 8 mm. The proximity switch should be chosen so that it can safely detect the control disc. The proximity switches can be adjusted using the slot on the limit switch rail.

Pre-conditions:

- Personnel qualification: Skilled worker
- Wear personal protective equipment
- Machine in “Setup mode” machine operation type
- Hydraulic pressure set to 10 bar

Procedure:

 WARNING	
	<p>Danger of crushing in the movement range of the control disc between the control disc, the piston housing and the distributor housing during configuration of the clamping path monitoring.</p> <p>➤ Do not reach into the control disc movement range during configuration of the clamping path monitoring.</p>

NOTICE:

The following approach is recommended by RÖHM.

1. Approach rear end position (open position).
2. Set the corresponding proximity switch according to the operating manual of the manufacturer of the proximity switch.

NOTICE:

Proceed accordingly with the position measuring system option.

3. Clamp workpiece in the chuck (corresponds to the clamping position).
4. Set the corresponding proximity switch according to the operating manual of the manufacturer of the proximity switch.

NOTICE:

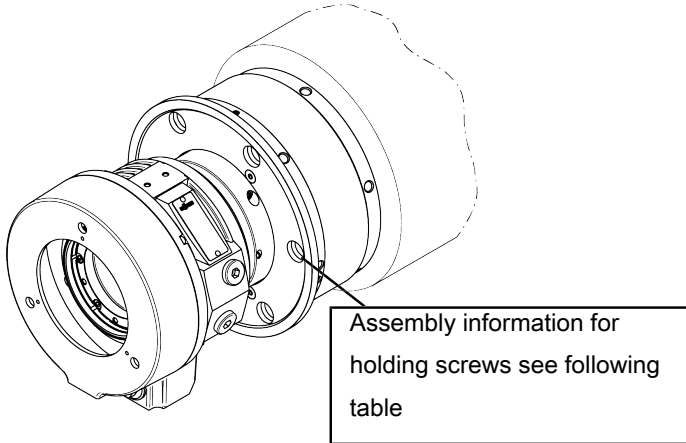
Proceed accordingly with the position measuring system option.

6.4 Tightening holding screws

Pre-conditions:

- Personnel qualification: Trained/instructed person
- Wear personal protective equipment
- The machine is switched off and protected against being switched on again

Procedure:



Assembly information for holding screws								
FORTO -HT 37	FORTO -HT 46	FORTO -HT 52	FORTO -HT 67	FORTO -HT 77	FORTO -HT 86	FORTO -HT 95	FORTO -HT 110	FORTO -HT 127
6x								
M8x85			M10x90	M10x95	M10x100			M12x120
12.9								
42.2 Nm			83 Nm				144 Nm	

- After an operating time of 80 h at the cylinder with through-hole, tighten the holding screws once.

NOTICE:



The holding screws must be inserted and tightened with the stated tightening torque.

NOTICE:

The tightening of the holding screws must be documented in the table “Test record” at the end of this Operating manual in the chapter “Appendix”.

7 Operation

7.1 Production mode

 DANGER	
	<p>Danger to life by being caught on or pulled into the rotating cylinder with through-hole.</p> <ul style="list-style-type: none"> ➤ Before operating the cylinder with through-hole, carry out a risk assessment/hazard assessment and implement measures derived from this for risk minimisation.

Information on operating the cylinder with through-hole:

- The workpieces must be machined in production mode.
- The clamping cycle must be determined by the manufacturer of the machine or the operator of the machine.
- Production mode of the machine must be supervised.

Pre-conditions:

Personnel qualification: Trained/instructed person

8 Cleaning

Information for cleaning:

- It is preferable to use rags, cloths, fine brushes or brooms for cleaning.
- Alternatively, compressed air can be used for cleaning. In this case, a minimum distance of 30 cm must be maintained, with a maximum pressure of 6 bar. The compressed air jet must not be directed immediately onto jaw guides, guide gaps, vulcanisation gaps or air sensing outlet openings.
- Do not use high-pressure cleaners, solvents, cleaning agents or chemicals for cleaning.

Cleaning task	Interval (hours of operation or after incident)
Clean the cylinder with through-hole	120 h or 1x weekly, more often if necessary
Clean coolant drip pan and check for backlogs	120 h or at least 1x weekly
Check leakage oil tank for backlogs	120 h or at least 1x weekly

Pre-conditions:

- Personnel qualification: Trained/instructed person
- Wear personal protective equipment
- The machine is switched off and protected against being switched on again
- All hydraulic connections are depressurised
- No workpiece or bars in the chuck or cylinder with through-hole
- The machine and cylinder with through-hole have cooled down

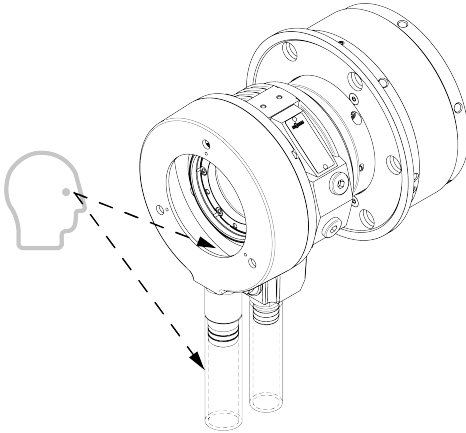
8.1 Cleaning the hollow clamping cylinder

Procedure:

1. Clean the cylinder with through-hole externally.
2. Clean options if required.
 NOTICE:
 Clean the options according to the operating manuals of the manufacturers of the options.

8.2 Cleaning the coolant drip pan and checking for backlogs

Procedure:



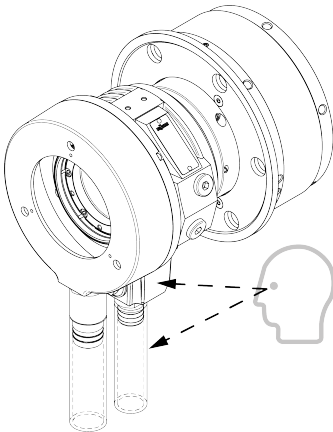
NOTICE:

If necessary, first remove the cover sheet option.

1. Clean the coolant drip pan internally; remove chips especially.
2. Check coolant drip pan and coolant discharge hose for backlogs. Remove the backlogs if necessary.

8.3 Check leakage oil tank for backlogs

Procedure:



- Check leakage oil tank and leakage oil hose for backlogs. Remove the backlogs if necessary.

9 Maintenance

Maintenance work on the cylinder with through-hole	Interval (hours of operation or after incident)
Checking the cylinder with through-hole for deformations, signs of wear, corrosion, leaks and loose parts (screws, components, plugs, options)	2500 h or at least 1x per half-year
Check the non-return valves (constant pressure)	5,000 h or at least 1x per year

Maintenance work on the options	Interval (hours of operation or after incident)
Checking options	For the interval and scope of the maintenance work, see the operating manuals of the respective manufacturer of the options

9.1 Checking the hollow clamping cylinder

Pre-conditions:

- Personnel qualification: Trained/instructed person
- Wear personal protective equipment
- The machine is switched off and protected against being switched on again
- The machine and cylinder with through-hole have cooled down

Procedure:

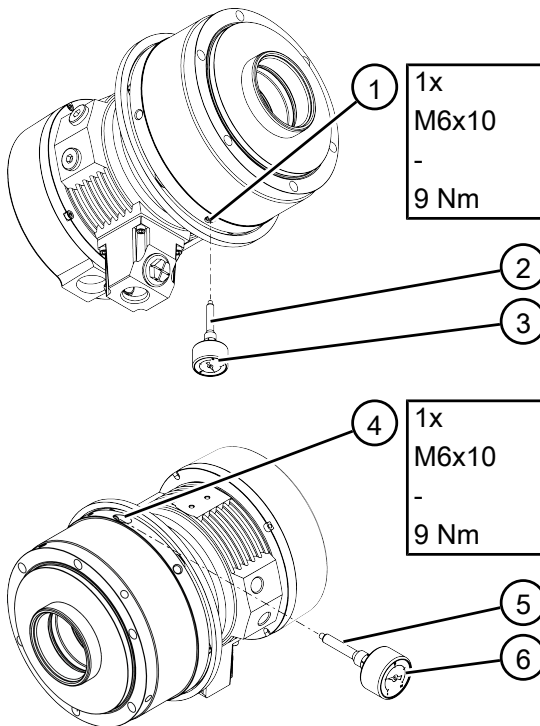
- Check the Cylinder with through-hole for deformations, signs of wear, corrosion, leaks and loose parts (screws, components, plugs, options).

9.2 Checking the non-return valves

Pre-conditions:

- Personnel qualification: Skilled worker
- Wear personal protective equipment
- Machine in “Setup mode” machine operation type
- Cylinder with through-hole at operating temperature
- Hydraulic oil at operating temperature
- No workpiece or bars in the chuck or cylinder with through-hole
- Cylinder with through-hole is depressurised

Procedure:



1	Venting screw “A”	4	Venting screw “B”
2	Adapter	5	Adapter
3	Pressure gauge	6	Pressure gauge

⚠ WARNING



Danger of crushing in the movement range of the control disc between the control disc, the piston housing and the distributor housing during the inspection of the non-return valves.

- Do not reach into the control disc movement range during the inspection of the non-return valves.

1. Unscrew venting screw “A” and “B” and screw in a pressure gauge with adapter in each case.
NOTICE:
Screw pressure gauge with adapter with approx. 5 – 6 Nm tightening torque into the piston housing.
 2. Depressurise hydraulic connection “B”.
 3. Pressurise hydraulic connection “A” at 45 bar.
 4. Read pressure gauge “A” and note displayed pressure.
 5. Depressurise hydraulic connection “A”.
 6. After a waiting time of one minute, read the pressure again.
 - **Pressure loss less than 30%:**
The non-return valve functions flawlessly if the pressure loss after a waiting time of one minute is no more than 30%.
 - **Pressure loss more than 30%:**
If the pressure loss is more than 30%, a ventilation according to chapter "Commissioning" must be carried out.
 - **Pressure loss after ventilation and re-check of the non-return valve more than 30%:**
If the pressure loss is still more than 30% when re-checking the non-return valve, the non-return valve or a seal is defective and must be replaced.
 7. Repeat process with hydraulic connection “B”.
 8. Depressurise hydraulic connections “A” and “B”.
 9. Remove both pressure gauges with adapter and screw venting screws “A” and “B” back in again.
NOTICE:
The venting screws must be inserted and tightened with the stated tightening torque.
- NOTICE:
- Defective non-return valves and seals must be replaced by specialist personnel of RÖHM without fail.

- Alternatively, the cylinder with through-hole can be sent to RÖHM in order to replace the non-return valves.

10 Storage

Pre-conditions:

- Personnel qualification: Trained/instructed person
- Wear personal protective equipment
- Cylinder with through-hole has been removed from the machine
- Hydraulic oil emptied
- Cylinder with through-hole is clean

Procedure:

- Close hydraulic connections and leakage oil connection.
- Secure cylinder with through-hole against tilting and rolling.
- Do not store cylinder with through-hole on the control disc.
- Apply preservative to the outer surfaces of the cylinder with through-hole.
- The cylinder with through-hole must be stored in a dry and protected place in accordance with the storage temperature (see Environmental and Operating Conditions).

NOTICE:

The cylinder with through-hole may only be stored for a maximum duration of one year. If the cylinder with through-hole is stored for longer than one year, a general overhaul must be carried out before its next use.

11 Troubleshooting

NOTICE:

- Troubleshooting must be carried out by a skilled worker or specialist personnel of RÖHM.

12 Decommissioning and disassembly

Pre-conditions:

- Personnel qualification: Skilled worker
- Wear personal protective equipment
- Piston rod of the cylinder with through-hole is in rear end position
- No workpiece or bars in the chuck or cylinder with through-hole
- The machine is switched off and protected against being switched on again
- Cylinder with through-hole is depressurised
- The machine and cylinder with through-hole have cooled down
- Cylinder with through-hole is clean

Procedure:

1. Remove options/attachments.
NOTICE:
Remove options and attachments according to the operating manual of the manufacturers of the options and attachments.
2. Separate chuck from the cylinder with through-hole and/or from the draw tube.
NOTICE:
If necessary, use special key to unscrew the draw tube.
3. Disassemble the protection against torsion.
4. Disconnect the hydraulic lines at hydraulic connections “A” and “B”.
NOTICE:
Collect any leaking hydraulic oil.
5. Separate coolant discharge hose from the coolant drip pan.
NOTICE:
Collect any leaking coolant.
6. Disconnect the leakage oil line from the leakage oil fitting.
NOTICE:
Collect any leaking oil.
 - The cylinder with through-hole is only connected to the machine via the machine spindle.
7. Unscrew venting screw “A” and “B”.
8. Turn piston housing so that the opening of venting screw “A” points downwards.
NOTICE:
Collect any leaking hydraulic oil.

9. Screw venting screw “A” back in.
10. Repeat process with venting screw “B”.
11. Close the open hydraulic connections “A” and “B” with screw plugs or blanking plugs.
12. Turn piston housing so that tapped holes for transport purposes point upwards.
13. Fully screw the eyebolt into tapped hole for transport
14. Attach lifting gear (load-bearing equipment) to eyebolt and tighten.
15. Unscrew 6x holding screws on the piston housing and remove the cylinder with through-hole from the machine spindle.
NOTICE:
Keep the holding screws for reuse.
16. Remove Cylinder with through-hole from the machine.

13 Disposal

Pre-conditions:

- Personnel qualification: Skilled worker
- Wear personal protective equipment
- Cylinder with through-hole has been removed from the machine
- Cylinder with through-hole is clean

Procedure:

- Dismantle the Cylinder with through-hole into its respective individual parts properly and completely for disposal.
- Improper dismantling, e.g. by sawing or separation with saws, abrasive cutters, plasma cutters, welding torches or similar tools is prohibited.
- During dismantling, any leaking operating materials must be collected.
- Metals, plastics, rubber and operating materials etc. must be disposed of according to the applicable local regulations.
- The balancing weights optionally contained in the cylinder with through-hole must be disposed of according to the applicable local regulations.
NOTICE:
Balancing weights used by RÖHM can contain steel, lead or wolfram.

14 Appendix

14.1 Test record

Activity	Interval	Date	Signature
Tighten holding screws; for procedure, see chapter "Tightening holding screws"	Once after an operating time of 80 h		

14.2 Declaration of Incorporation



driven by technology

Translation of the original Declaration Of Incorporation Of Partly Completed Machinery

According to the European Machinery Directive 2006/42/EC, Annex II Part 1 B

Hereby the RöhM GmbH
Heinrich-RöhM-Str. 50
D-89567 Sontheim/Brenz
Germany

declares for the following partly completed machinery

Manufacturer Brand: Hydraulic actuating cylinder with trough-hole
FORTO-HT
Model Type: size 37/70 + 46/103 + 52/130 + 67/150 + 77/170 + 86/200 + 95/225 + 110/250 + 127/325
Year: from 2022

That, as far as possible by the delivery, the following basic standards of the directive mentioned above (coverage see appendix) - inclusively the at the moment of declaration valid changes - were observed and applied:

EN ISO 4413 Hydraulic fluid power - General rules and safety requirements for systems and their components

that the special technical documents according to Annex II Part B of the directive mentioned above were produced and will be given to the single nations department on substantiated demand:

on paper or as data file via eMail

that this partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of this Directive.

Person, established in the Community and authorized to compile the relevant technical documentation:

Name: Holger Mack Address: RöhM GmbH
Dept. KOB
Heinrich-RöhM-Str.50
89567 Sontheim / GERMANY

issue place: Sontheim
issue date: 17/05/2022

Details in the company of the signing person: Head of Design Department Sontheim
Name Details of the signing person: Andreas Grassel

Signature: i. V.

Appendix: Complied requirements of Annex I of Directive 2006/42/EC. The numbers refer to the sections of the Annex:

1.1.2., 1.1.3., 1.1.5., 1.2.6., 1.3.2., 1.3.4., 1.3.9., 1.5.3., 1.5.4., 1.5.8., 1.5.9., 1.6.3., 1.7.2., 1.7.3., 1.7.4.

15 Notes
