

Technical Data Sheet TI-F53

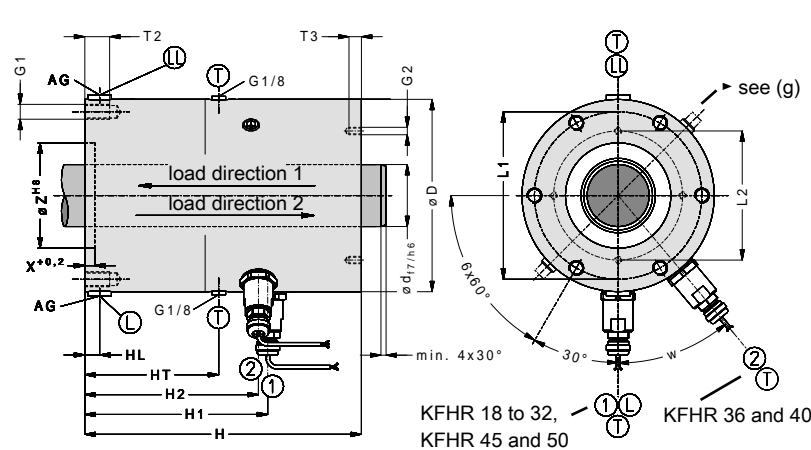
Locking Units, KFHR series

Sealed for humid conditions.

For a detailed functional description, see "Technical Information TI-F10".

Also observe the Operating Manual BA-F53.

Rod diameters 18 to 50 mm



- Ⓛ Pressure port L "release",
▶ see (b)
- Ⓛ Pressure port LL,
alternative to L,
▶ see (c)
- Ⓣ Port T "pressure compensation/
oil filling", ▶ see (f)
- ① Holder for proximity switch 1,
signal "rod clamped",
▶ see (e)
- ② Holder for proximity switch 2,
signal "clamping released",
▶ see (e)

Due to tolerances, ports 1, 2, and T can be displaced up to $\pm 5^\circ$ relative to drawn position;
as well as the threaded holes G2 to pressure ports L, LL, and ports T.

Fig. 1: Dimensions of the KFHR Locking Unit (download of CAD data from the Internet: www.sitema.com)

(a) (b)					(d)																	
Type	ID no.	d	F	p	D	H	L1	L2	T2	T3	G1	G2	Z	X	AG	V	HL	H1	H2	HT	w	Wt.
	(order no.)	mm	kN	bar	mm								mm			cm³	mm					kg
KFHR 18	KFHR 018 70	18	10	70	71	137	60	34	12	8	6x M6	4x M4	30	4	G1/8	6	29	105	98	68	45°	4
	KFHR 018 71		5	40																		
KFHR 25	KFHR 025 70	25	20	100	95	140	82	44	15	10	6x M8	4x M6	50	6	G1/8	11	19	89.5	83	62	35°	7
	KFHR 025 71		12	50																		
KFHR 28	KFHR 028 70	28	34	100	115	178	96	63	18	10	6x M10	4x M6	60	6	G1/4	18	20	118	112	94	30°	12
	KFHR 028 71		20	50																		
KFHR 32	KFHR 032 70	32	34	100	115	178	96	63	18	10	6x M10	4x M6	60	6	G1/4	18	20	118	112	94	30°	12
	KFHR 032 71		20	50																		

Subject to modification without prior notice

(a) F is the nominal minimum holding force with dry or hydraulic-oil wetted rods.

(b) Pressure p is required to release the clamping. The permissible operating pressure is 160 bar.

(c) On delivery, pressure port LL is plugged by a plug screw. It may be used as an alternative to pressure port L or is useful for air-bleeding the pressure chamber. We recommend connecting an auto-bleeder to the port which is not in use (see *Technical Information TI-Z10*).

(d) V = hydraulic operating volume

(e) The KFHR Locking Unit is fitted with inductive proximity switches: M8 x 1, nominal switching distance 1.2 mm, flush mountable, NO (normally open). The proximity switches are pressure-resistant until up to 10 bar and have a cast-on cable of 5 m length.

(f) The T ports compensate internal volume changes during switching. For use humid environmental conditions, the KFHR Locking Unit must be filled or flushed with hydraulic fluid to prevent corrosion. See the section *Oil filling or flushing* under *Technical Information*.

(g) The lock plates keep the clamping system open if the unit is not yet mounted. They have to be removed after mounting.

(h) The surface of the housing parts is ZnNi coated.

Technical Data Sheet TI-F53

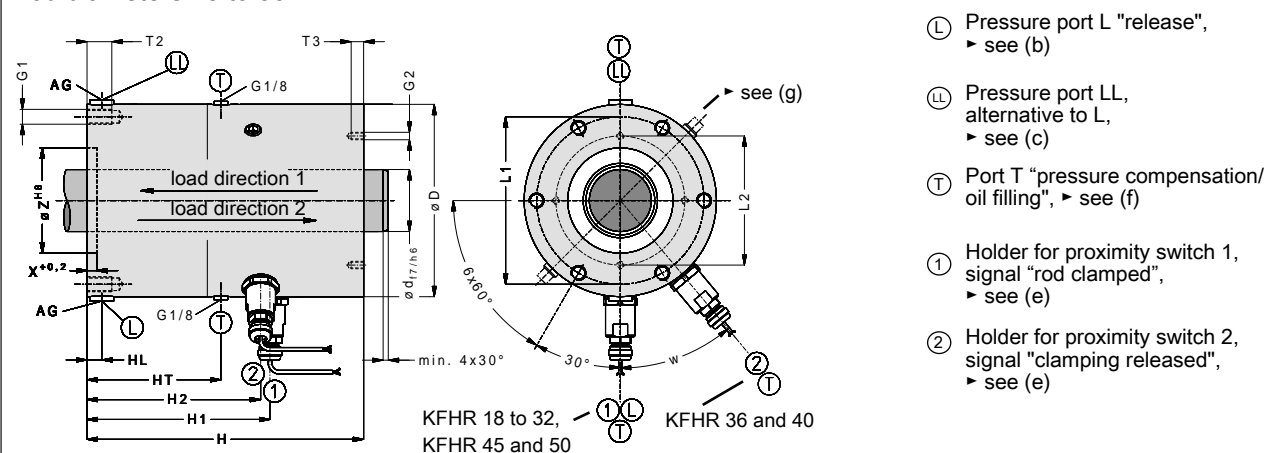
Locking Units, KFHR series

Sealed for humid conditions.

For a detailed functional description, see "Technical Information TI-F10".

Also observe the Operating Manual BA-F53.

Rod diameters 18 to 50 mm



Due to tolerances, ports 1, 2, and T can be displaced up to $\pm 5^\circ$ relative to drawn position; as well as the threaded holes G2 to pressure ports L, LL, and ports T.

- Ⓛ Pressure port L "release",
► see (b)
- ⓁⓁ Pressure port LL,
alternative to L,
► see (c)
- Ⓣ Port T "pressure compensation/
oil filling", ► see (f)
- ① Holder for proximity switch 1,
signal "rod clamped",
► see (e)
- ② Holder for proximity switch 2,
signal "clamping released",
► see (e)

Fig. 2: Dimensions of the KFHR Locking Unit (download of CAD data from the Internet: www.sitema.com)

(a) (b)											(d)																													
Type	ID no.	d	F	p	D	H	L1	L2	T2	T3	G1	G2	Z	X	AG	V	HL	H1	H2	HT	w	Wt.																		
	(order no.)	mm	kN	bar	mm								mm				cm³	mm					kg																	
KFHR 36	KFHR 036 70	36	50	100	138	200	115	80	18	14	6x M10	4x M6	70	6	G1/4	28	19	109.5	119	96	30°	20																		
	KFHR 036 71		35	55																																				
KFHR 40	KFHR 040 70	40	50	100																			155	223	135	96	20	14	6x M12	4x M6	85	8	G1/4	39	20	147.5	140	108	30°	27
	KFHR 040 71		35	55																																				
KFHR 45	KFHR 045 70	45	75	100	155	223	135	96	20	14	6x M12	4x M6	85	8	G1/4	39	20	147.5	140	108	30°	27																		
	KFHR 045 71		45	75																																				
KFHR 50	KFHR 050 70	50	75	100																			155	223	135	96	20	14	6x M12	4x M6	85	8	G1/4	39	20	147.5	140	108	30°	27
	KFHR 050 71		45	75																																				

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(a) F is the nominal minimum holding force with dry or hydraulic-oil wetted rods.

(b) Pressure p is required to release the clamping. The permissible operating pressure is 160 bar.

(c) On delivery, pressure port LL is plugged by a plug screw. It may be used as an alternative to pressure port L or is useful for air-bleeding the pressure chamber. We recommend connecting an auto-bleeder to the port which is not in use (see *Technical Information TI-Z10*).

(d) V = hydraulic operating volume

(e) The KFHR Locking Unit is fitted with inductive proximity switches: M8 x 1, nominal switching distance 1.2 mm, flush mountable, NO (normally open). The proximity switches are pressure-resistant until up to 10 bar and have a cast-on cable of 5 m length.

(f) The T ports compensate internal volume changes during switching. For use humid environmental conditions, the KFHR Locking Unit must be filled or flushed with hydraulic fluid to prevent corrosion. See the section *Oil filling or flushing* under *Technical Information*.

(g) The lock plates keep the clamping system open if the unit is not yet mounted. They have to be removed after mounting.

(h) The surface of the housing parts is ZnNi coated.

Technical Data Sheet TI-F53

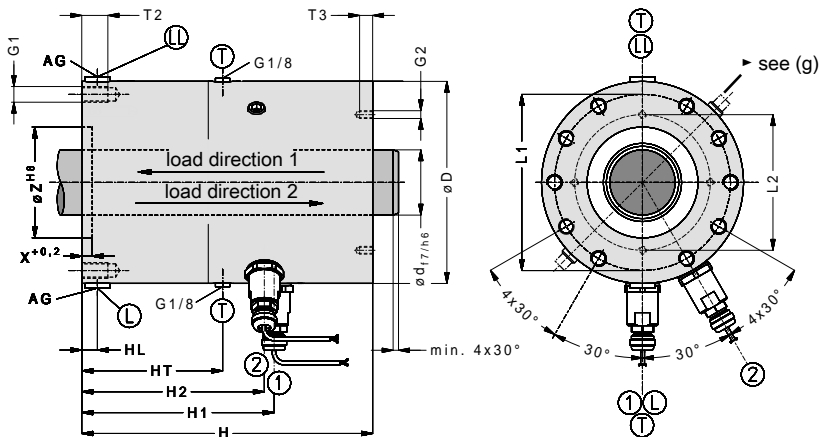
Locking Units, KFHR series

Sealed for humid conditions.

For a detailed functional description, see "Technical Information TI-F10".

Also observe the Operating Manual BA-F53.

Rod diameters 56 to 60 mm



- Ⓛ Pressure port L "release",
▶ see (b)
- ⓁⓁ Pressure port LL,
alternative to L,
▶ see (c)
- Ⓣ Port T pressure compensation/
oil filling ▶ see (f)
- ① Holder for proximity switch 1,
signal "rod clamped",
▶ see (e)
- ② Holder for proximity switch 2,
signal "clamping released",
▶ see (e)

Due to tolerances, ports 1, 2, and T can be displaced up to $\pm 5^\circ$ relative to drawn position;
as well as the threaded holes G2 to pressure ports L, LL, and port T.

Fig. 3: Dimensions of the KFHR Locking Unit (download of CAD data from the Internet: www.sitema.com)

(a) (b)											(d)											
Type	ID no.	d	F	p	D	H	L1	L2	T2	T3	G1	G2	Z	X	AG	V	HL	H1	H2	HT	Wt.	
	(order no.)	mm	kN	bar	mm								mm				cm³	mm				kg
KFHR 56	KFHR 056 70	56	100	100	180	252	160	172	20	13	10x M12	4x M6	95	10	G1/4	47	22	151.5	144	105	41	
	KFHR 056 71		70	70																		
KFHR 60	KFHR 060 70	60	100	100	180	252	160	172	20	13	10x M12	4x M6	95	10	G1/4	47	22	151.5	144	105	41	
	KFHR 060 71		70	70																		

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(c) On delivery, pressure port LL is plugged by a plug screw. It may be used as an alternative to pressure port L or is useful for air-bleeding the pressure chamber. We recommend connecting an auto-bleeder to the port which is not in use (see *Technical Information TI-Z10*).

(d) V = hydraulic operating volume

(e) The KFHR Locking Unit is fitted with inductive proximity switches: M8 x 1, nominal switching distance 1.2 mm, flush mountable, NO (normally open). The proximity switches are pressure-resistant until up to 10 bar and have a cast-on cable of 5 m length.

(f) The T ports compensate internal volume changes during switching. For use humid environmental conditions, the KFHR Locking Unit must be filled or flushed with hydraulic fluid to prevent corrosion. See the section *Oil filling or flushing* under *Technical Information*.

(g) The lock plates keep the clamping system open if the unit is not yet mounted. They have to be removed after mounting.

(h) The surface of the housing parts is ZnNi coated.

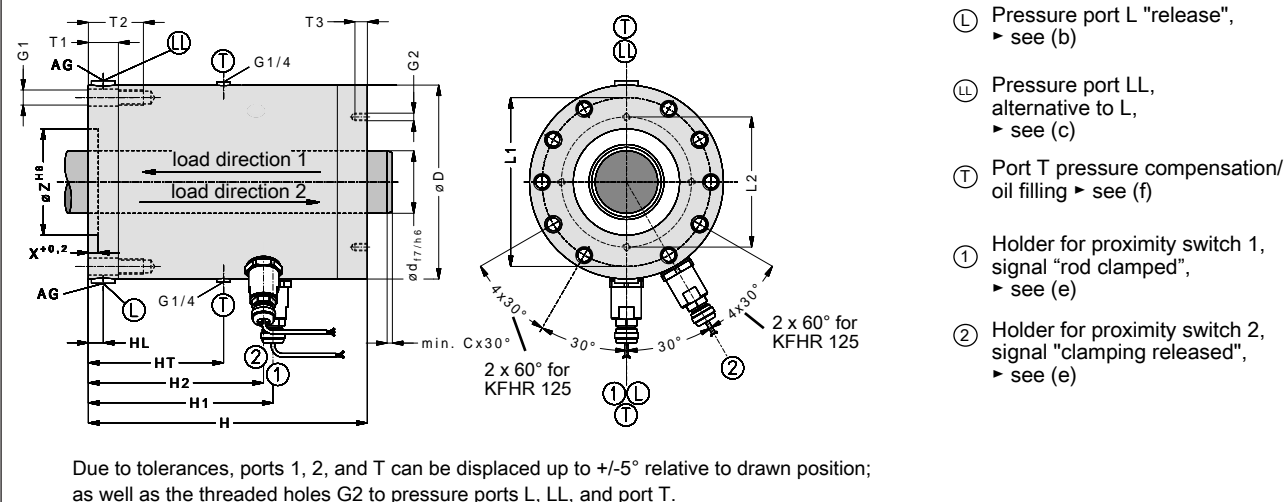
Technical Data Sheet TI-F53 Locking Units, KFHR series

Sealed for humid conditions.

For a detailed functional description, see "Technical Information TI-F10".

Also observe the Operating Manual BA-F54.

Rod diameters 70 to 140 mm


Fig. 4: Dimensions of the KFHR Locking Unit (download of CAD data from the Internet: www.sitema.com)

(a) (b)														(d)										
Type	ID no.	d	C	F	p	D	H	L1	L2	T1	T2	T3	G1	G2	Z	X	AG	V	HL	H1	H2	HT	Wt.	
	(order no.)	mm		kN	bar	mm									mm			cm ³	mm				kg	
KFHR 70	KFHR 070 70	70	4	150	100	225	315	195	160	26	56	16	10x M16	4x M8	110	10	G1/4	68	13	192	185	236	82	
	KFHR 070 71			80	60																			
KFHR 80	KFHR 080 70	80	4	150	100	260	393	225	175	30	65	20	10x M20	4x M10	125	10	G3/8	95	15	221	214	283	129	
	KFHR 080 71			80	60																			
KFHR 90	KFHR 090 70	90	5	250	130	350	514	300	250	40	90	20	6x M30	4x M12	230	10	G3/8	230	24	244.5	235	336	240	
	KFHR 090 71			190	100																			
KFHR 100	KFHR 100 70	100	5	250	130	430	514	370	385	50	95	30	10x M30	4x M16	170	10	G3/8	330	30	346.5	334	437	447	
	KFHR 100 71			190	100																			
KFHR 125	KFHR 125 70	125	5	330	100	350	416	300	250	40	90	20	6x M30	4x M12	230	10	G3/8	230	24	244.5	235	336	240	
KFHR 140	KFHR 140 70	140	5	600	100	430	514	370	385	50	95	30	10x M30	4x M16	170	10	G3/8	330	30	346.5	334	437	447	

Subject to modification without prior notice

(a) F is the nominal minimum holding force with dry or hydraulic-oil wetted rods.

(b) Pressure p is required to release the clamping. The permissible operating pressure is 160 bar.

(c) On delivery, pressure port LL is plugged by a plug screw. It may be used as an alternative to pressure port L or is useful for air-bleeding the pressure chamber. We recommend connecting an auto-bleeder to the port which is not in use (see *Technical Information TI-Z10*).

(d) V = hydraulic operating volume

(e) The KFHR Locking Unit is fitted with inductive proximity switches: M8 x 1, nominal switching distance 1.2 mm, flush mountable, NO (normally open). The proximity switches are pressure-resistant until up to 10 bar and have a cast-on cable of 5 m length.

(f) The T ports compensate internal volume changes during switching. For use humid environmental conditions, the KFHR Locking Unit must be filled or flushed with hydraulic fluid to prevent corrosion. See the section *Oil filling or flushing* under *Technical Information*.

(g) The surface of the housing parts is ZnNi coated.

Technical Information

1 Purpose

The KFHR Locking Unit is used as locking device for piston rods of cylinders or other clamping rods; it locks at any position. The has been designed for use in humid environmental conditions.

2 Axial play

In load direction 1, the load is held without axial play.

The load is also free from axial play in load direction 2 as long as the load does not exceed 80 % of the nominal holding force (F). If the load exceeds the 80 %, the axial play in load direction 2 is about 0.1 to 0.3 mm. Special designs may differ.

3 Operating conditions

The KFHR Locking Unit is sealed for humid conditions.

If port T is connected to a line and the unit is filled or flushed with hydraulic fluid, the unit can be operated in a humid environment. Please contact SITEMA if you have an environment with heavy contamination or extreme temperatures.

The permitted surface temperature is -20°C to +60 °C.

Viscous lubricants and grease may reduce the holding force.

4 Pressure fluid - hydraulic fluid

Use high-quality HM hydraulic fluid according to ISO 11158 (or HLP hydraulic fluid according to DIN 51524-2). Other pressure fluids may be used only in consultation with SITEMA.

5 Oil filling and oil circulation

If used in a humid environment, the KFHR Locking Unit must be filled or permanently flushed with hydraulic fluid. Changes in volume during switching are equalized via a permanently depressurized line to the tank.

To fill the unit, one of the T ports is used for filling and then plugged with a plug screw.

As an alternative, this port can also be permanently connected to an oil circuit.

The other T port needs to be connected permanently to the tank with a depressurized line.



A maximum of 1 bar back pressure, which can be caused by a difference in height between the tank and the Locking Unit, is allowed. Higher pressure on the T ports is not allowed, as this may lead to malfunctioning of the clamping system and leakages.

6 Choosing the right type

In the tables on the Technical Data Sheets you find the nominal holding force of the different types. F must be higher than the maximum axial force acting on the rod.

If it is required to hold or brake vertically moving masses or if any other dynamic impact forces occur, F must be higher than the load to be secured by an appropriate safety factor. This factor has to be defined by the user depending on the requirements, but should not be less than 1.5.

7 Requirements of the clamping rod and fastening elements

The Locking Unit will only operate correctly if the clamping rod has a suitable design.

Requirement	Diameter	Value
ISO tolerance zone	all	f7 or h6
Induction hardened	all	min. HRC 56
Surface hardening depth	ø to 30 mm	min. 1 mm
	ø over 30 mm	min. 1.5 mm
Surface roughness	all	Rz = 1 to 4 µm (Ra 0.15 to 0.3 µm)
Protection from corrosion	all	e.g. hard chromium plating: 20 ± 10 µm 800 - 1000 HV
Lead-in chamfer rounded	ø 18 to 80 mm	min. 4 x 30°
	ø over 80 to 180 mm	min. 5 x 30°
	ø over 180 to 380 mm	min. 7 x 30°

Table 5: Clamping rod requirements

The rod must not be greased or lubricated.

Manufacturers of piston rods for cylinders or rods for linear ball bearings usually offer suitable clamping rods.

The actual holding force of the Locking Unit is higher than the nominal holding force F indicated in the data sheets and dimensional drawings. But it will not be higher than twice this value.

Therefore, all fastening elements carrying the load (rod, its attachment, etc.) have to be dimensioned for at least 2 x F. This maximum force can occur when braking a moving load.

In case of overload, the rod slips, normally causing no damage to rod and Locking Unit.



Generally, the basic rod material needs to have sufficient strength. In the case of compression-loaded rods, the buckling resistance must be observed.

8 Important information for mounting the KFHR types 18 to 60

The KFHR types 18 to 60 are blocked in their released position to allow quick mounting. They can be slid over the rod directly, it is not necessary to connect a temporary pressure supply.

IMPORTANT: The lock plates have to be removed after mounting. For more information see the Operating Manual of the unit.

9 Actuation

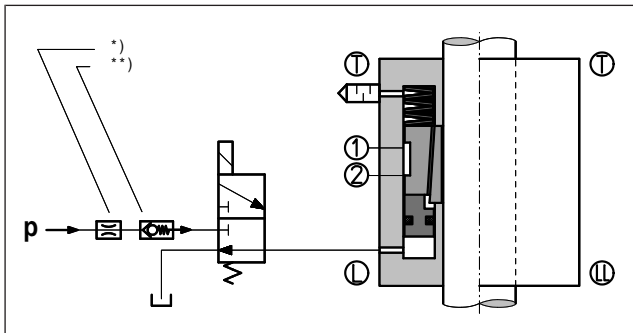


Fig. 5: Schematic circuit diagram

*	If impact noises are audible when pressurizing the unit, these can be suppressed by installing a throttle in the p-line.
**	If the pressure is not sufficiently constant (e.g. pressure drop at the beginning of a downward stroke), we recommend a check valve in the pressure connection.

In most cases it is recommended to implement the actuation as shown in the figure above.

During every operational cycle, the 3/2-way valve is actuated electrically which releases the clamping.

In any other operational condition, as well as in cases of power failure, the locking unit engages, holds the rod and/or brakes the load. Likewise, the load is secured when the supply line breaks.

To prevent problems, a movement of the rod should only be permitted if proximity switch 2 signals "clamping released".

For a quick response time, the following preconditions must be met:

- quick controller
- short line distances
- quick valve response times
- large valve and line cross-sections

10 Safety of machinery - risk assessment

It must be ensured that the dimensions and arrangement of Locking Units used in safety-relevant applications meet the requirements of *EN ISO 12100:2010 Safety of machinery - General principles for design - Risk assessment and risk reduction* and also comply with any further standards and regulations applicable for the specific intended use. The Locking Unit alone principally cannot be a complete safety solution. It is however suitable to be part of such a solution. Furthermore, all attachments and connections have to be dimensioned correspondingly. This is generally the duty of the machinery manufacturer and of the operator.

11 Regular performance tests

A performance test of the Locking Unit must be carried out at regular intervals. Regular checking is the only way to ensure that it will operate safely in the long run.

Please see the Operating manual for further details.

12 Maintenance

Maintenance is limited to the regular performance tests. Should the Locking Unit cease to comply with the required characteristics, the safety for working with the machine or system may no longer be given. In this case the Locking Unit must be immediately and professionally repaired by SITEMA.

To ensure the function as safety-related component, any repair or refurbishing must be carried out by SITEMA. SITEMA cannot take any responsibility for repairs by another party.