

Technical Data Sheet TI-F52 Locking Units series KFHL Certified by Lloyd's Register

For a detailed functional description refer to "Technical Information TI-F10".
Further important practical advice is given in "Operating Manual BA-F52".



Purpose-built for maritime applications, the KFHL is built on the success of the **Locking Unit KFH** and has been refined to satisfy the particular requirements.

Several design measures (choice of raw material, high level of corrosion protection, encapsulation, etc.) ensure that the equipment is able to function safely, even under the difficult conditions, e.g. on the open sea.

SITEMA has placed particular emphasis on ensuring an adequate safety margin in terms of achievable clamping forces.

The Locking Unit KFHL makes a clear distinction between "admissible load" and "holding force". The admissible load in kN denotes the maximum load that can be applied to a Locking Unit KFHL. The actual holding force is twice as high and corresponds to the safety margin required by **Lloyd's Register EMEA** for the purposes of personnel safety.

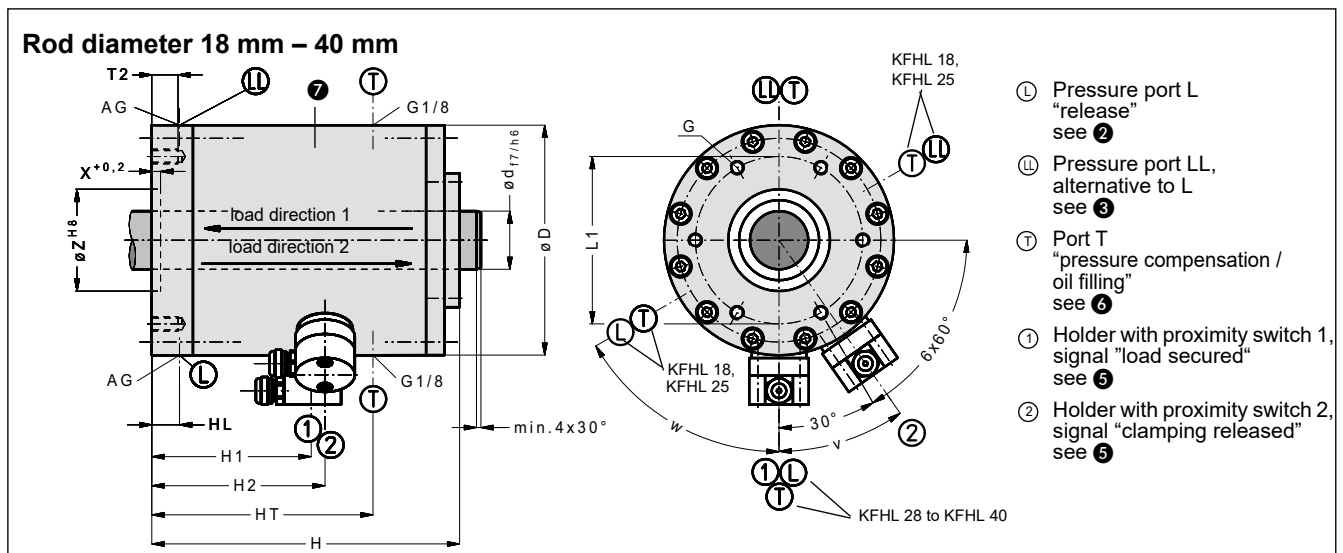


Fig. 1: Dimensions Locking Unit KFHL (CAD-files download at www.sitema.com)

Type	ID no. (order no.)	d mm	M kN	p bar	D mm	H mm	L1 mm	T2 mm	G	Z mm	X mm	AG	V cm ³	HL mm	H1 mm	H2 mm	HT mm	v °	w °	Wgt kg
KFHL 18	KFHL 018 50	18	5	70	83	130	60	12	M 6	32	4	G1/8	6	23	63	67.5	102	180°	90°	5
KFHL 25	KFHL 025 50	25	10	100	109	148	82	15	M 8	50	6	G1/8	12	21	71.5	64	118	180°	45°	10
KFHL 28	KFHL 028 50	28	17	100	129	188	96	18	M 10	60	6	G1/4	23	20	85.5	77.5	143	40°	0°	17
KFHL 32	KFHL 032 50	32																		
KFHL 36	KFHL 036 50	36	25	100	158	212	115	18	M 10	70	6	G1/4	28	19	109.5	119	161.5	35°	0°	29
KFHL 40	KFHL 040 50	40																		

Subject to modification without prior notice

- ① M is the admissible load the mass to be secured exerts on the Locking Unit KFHL. The holding force when delivered from factory is not less than 2 x M, but will not exceed 4 x M.
- ② The pressure p is required to release the clamping. The admissible operating pressure is 160 bar.
- ③ As supplied, pressure port LL is plugged by a plug screw. It may be used alternatively to pressure port L and is useful for filling / air-bleeding.
- ④ Hydraulic operating volume
- ⑤ Proximity switch holders are provided with standard inductive proximity switches (M8 x 1, nominal switching distance of 1.5 mm, flush mountable, NO (normally open)). The proximity switches are pressure-resistant up to 10 bar and have a cast-on cable of 5 m length.
- ⑥ Internal volume changes during switching are compensated at

- ports T.
- For use in a humid environment, the Locking Unit KFHL is to be filled or flushed with hydraulic oil for protection against corrosion. One of the ports T is used for filling and plugged or permanently connected to an oil circuit.
- The other port T needs to be connected permanently to the tank with a pressureless line. A certain back pressure caused by height differences between tank and unit is admissible (up to approx. 1 bar). Higher pressure at ports T is not allowed, as it may lead to malfunction, damage of the proximity switches or to leakage.
- ⑦ The surface of the housing parts is made of steel, the area around the wiper is made of stainless steel. The Locking Unit KFHL supplied by SITEMA is coated with oil to protect against rust on delivery, and must be professionally painted by the customer.

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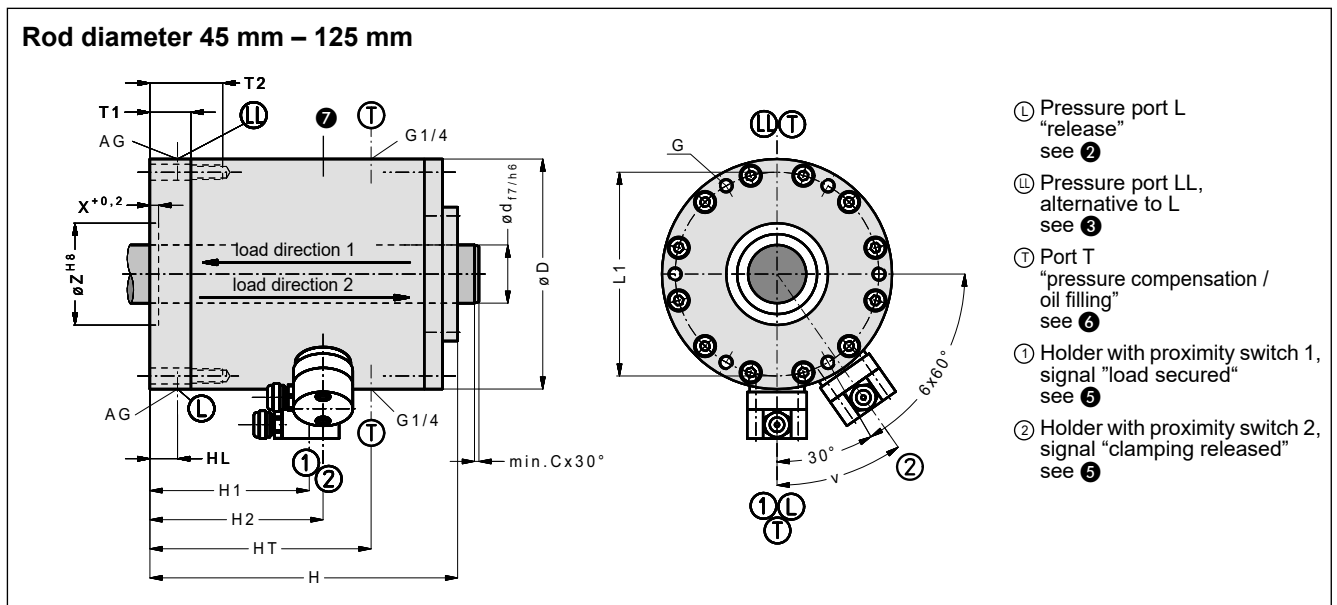


Fig. 2: Dimensions Locking Unit KFHL (CAD-files download at www.sitema.com)

Type	ID no. (order no.)	d mm	C mm	M kN	p bar	D mm	H mm	L1 mm	T1 mm	T2 mm	G	Z mm	X mm	AG	V cm ³	HL mm	H1 mm	H2 mm	HT mm	v °	Wgt kg
KFHL 45	KFHL 045 50	45	4	37	100	175	256	150	28	52	M 12	85	8	G1/4	43	14	117	110	186	40°	40
KFHL 50	KFHL 050 50	50																			
KFHL 56	KFHL 056 50	56	4	50	100	200	287	172	25	50	M 12	95	10	G1/4	62	12,5	115.5	106.5	195.5	40°	57
KFHL 60	KFHL 060 50	60																			
KFHL 70	KFHL 070 50	70	4	75	100	225	315	195	26	56	M 16	110	10	G1/4	86	13	133	124	184	30°	85
KFHL 80	KFHL 080 50	80																			
KFHL 90	KFHL 090 50	90	5	125	130	260	416	228	30	65	M 20	125	10	G3/8	100	15	220.5	214	294	30°	128
KFHL 100	KFHL 100 50	100																			
KFHL 125	KFHL 125 50	125	5	165	100	350	422	300	40	90	M 30	230	10	G3/8	220	26	244.5	235	335	30°	270

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For use in a humid environment, the Locking Unit KFHL is to be filled or flushed with hydraulic oil for protection against corrosion. One of the ports T is used for filling and plugged or permanently connected to an oil circuit.

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⑦ The surface of the housing parts is made of steel, the area around the wiper is made of stainless steel. The Locking Unit KFHL supplied by SITEMA is coated with oil to protect against rust on delivery, and must be professionally painted by the customer.

Purpose

The Locking Unit KFHL is used as an infinitely variable lock on piston rods for cylinders or other clamping rods. The Locking Unit KFHL absorbs axial forces in both load directions.

Axial play

The admissible load (M) is held free from axial play in load direction 1 and 2.

Operating conditions

The Locking Unit KFHL is designed for difficult, especially **humid environmental conditions**.

To prevent dirt and humidity from penetrating, the Locking Unit KFHL needs to be filled with hydraulic oil (HLP) according to DIN 51524-2 and remain filled completely at all times during operation.

It is particularly important not to apply grease to the rod surface.

The permitted surface temperature is -20°C to $+60^{\circ}\text{C}$.

Required risk assessment

It must be ensured that the dimensions and arrangement of a Locking Unit KFHL used in safety-relevant applications meet the requirements of the risk evaluation EN ISO 12100:2010 and also comply with any further standards and regulations applicable for the intended use. The Locking Unit KFHL alone principally cannot form a complete safety solution. It is however suitable to be part of such a solution. Furthermore, all attachments and fixations have to be dimensioned correspondingly. This is generally the duty of the system manufacturer and the user.

Type Approval by Lloyd's Register

The SITEMA Locking Unit KFHL has been tested and approved by **Lloyd's Register**.

For further details to this Type Approval Certificate please see page 5.

According to Lloyd's regulations, in addition to the type approval certificate all individual units have to be certified by an Lloyd's official in our factory.

Choosing the right type

The tables (see pages 1 and 2) show the admissible load M of the various types. The value of M must be higher than the maximum axial force acting on the rod. The holding force of the Locking Unit KFHL is not less than $2 \times M$ according to the requirements of the Safety Authorities.

Design and attachment of the rod

The Locking Unit KFHL will operate correctly only if the rod has a suitable surface:

- ISO tolerance field f7 or h6
- induction hardened min. HRC 56, surface hardening depth:
 - \varnothing up to 30 mm: min. 1 mm
 - \varnothing over 30 mm: min. 1.5 mm
- surface roughness: $R_z = 1$ to $4 \mu\text{m}$ (R_a 0.15 - $0.3 \mu\text{m}$)
- protection against corrosion, e.g. hard chromium plating: $20 \pm 10 \mu\text{m}$, 800 – 1 000 HV
- lead-in chamfer, rounded:
 - \varnothing 18 mm up to \varnothing 80 mm: min. $4 \times 30^{\circ}$
 - \varnothing over 80 mm up to \varnothing 180 mm: min. $5 \times 30^{\circ}$
 - \varnothing over 180 mm up to \varnothing 380 mm: min. $7 \times 30^{\circ}$

Often, the following standard rods fulfill the above mentioned requirements and can then be used:

- piston rods (ISO tolerance field f7), hard chrome plated
- rods for linear ball bearings (ISO tolerance field h6)

The rod must not be lubricated with grease.

The actual holding force of the Locking Unit KFHL is higher than the **admissible load (M)** indicated in the data sheets and drawings but will not be higher than four times this value. Therefore, all **fixation elements** carrying the load (rod, its attachment, etc.) have to be dimensioned for at least **$4 \times M$** .

Please note that at dynamic loads (e.g. when braking), the full holding force ($4 \times M$) can occur.

In case of overload, the rod will slip. This does normally not cause any damage to the rod or the clamping unit.

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

Pressure fluid

Hydraulic oil (HLP) in accordance with DIN 51524-2:2006 must be used as pressure fluid. Please consult SITEMA before using any other fluids.

Control

In most applications, an actuation as suggested in the drawing below is used.

During every operational cycle, the 3/2-way valve is actuated electrically and releases the Locking Unit KFHL. In all other operational conditions including power failure, emergency stop etc., the Locking Unit KFHL engages and holds the rod or brakes the load. Likewise, the load is secured when the pressure line breaks.

To prevent possible problems, the rod shall not be driven unless proximity switch 2 indicates the signal "clamping released".

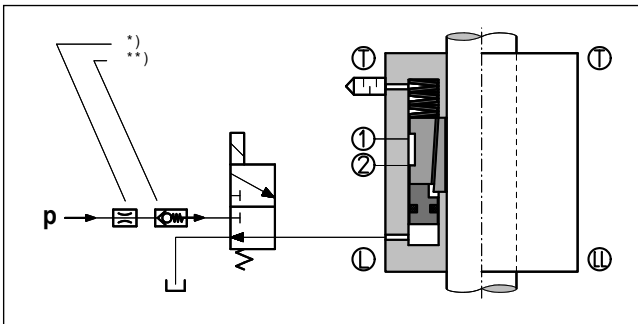


Fig. 3: Schematic diagram of hydraulic circuit

- * In case impact noises due to excess pressure are audible when pressurizing the Locking Unit KFHL, these can be suppressed by means of a flow control valve in the p-line.
- ** In case the pressure is not sufficiently constant (e.g. pressure drop at the beginning of a downward stroke), we recommend a check valve in the p-connection of the valve.

⚠ WARNING!

Risk due to slowed discharge of pressure medium!
 Slowed discharge of the pressure medium may cause a dangerous situation. The clamping then only locks with a time delay.

- ☛ Make sure that the discharge of the pressure medium from pressure port L is **not** impaired by any additional components.
- ☛ Route all connection lines without any kinks.
- ☛ If there is any danger of kinking, take appropriate precautions (protective tube, thicker hose, etc.).

If a particular quick response time of the Locking Unit KFHL is required, the following preconditions must be met:

- short line distances
- fast valve response times
- appropriate control
- large valve and line cross-sections

Monitoring by proximity switches

Proximity switch 1 "load secured" signals the secure state and is used to authorize entrance to the danger zone.

Proximity switch 2 "clamping released" is used to activate the movement of the drive in the load direction.

For automatic detection of failures both signals are compared. In case both switches indicate the same state - apart from minor overlapping periods - there is a defect present.

Proposal for the logic integration of the Locking Unit KFHL in the machine control system

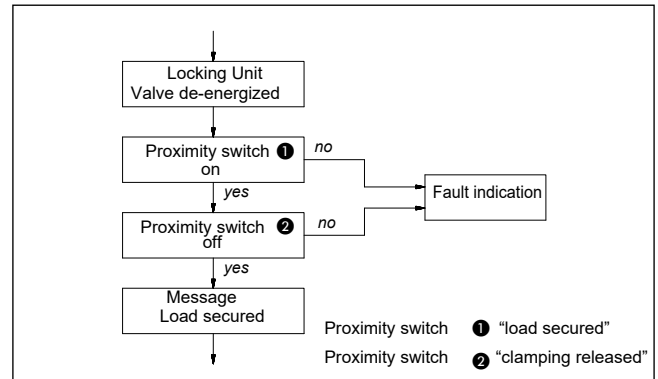


Fig. 4: Secure load

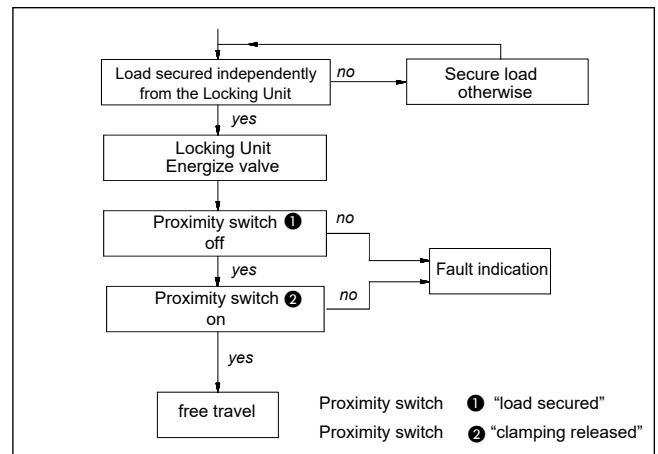


Fig. 5: Release load

Regular performance tests

The Locking Unit KFHL must be functionally checked at regular intervals. Regular checking is the only way to ensure that the Locking Unit KFHL will operate safely in the long run.

Please see the *operating manual* for further details.

Maintenance

The maintenance is limited to the regular performance tests.

Should the Locking Units KFHL 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 Units KFHL must be immediately and professionally repaired by SITEMA.

The Locking Units KFHL are safety components. Any repair or refurbishing must be carried out by SITEMA. SITEMA cannot take any responsibility for repairs by another party.



Lloyd's Register

Type Approval Certificate Extension

This is to certify that Certificate No. 09/20026 for the undernoted products is extended and renumbered as shown.

This certificate is issued to:

PRODUCER	SITEMA GmbH & Co. KG G.-Braun-Straße 13 76187 Karlsruhe Germany
DESCRIPTION	Locking Device
TYPE	KFHL
APPLICATION	As locking unit (locking by springs / hydraulic releasing) for hydraulic cylinders in marine systems classed with Lloyd's Register.
STANDARD	Lloyd's Register Rules and Regulations for the Classification of Ships, 2014
RATINGS	Shaft diameter: 18 mm to 125 mm Admissible load: 5 kN to 165 kN

"This Certificate is not valid for equipment, the design, ratings or operating parameters of which have been varied from the specimen tested. The manufacturer should notify Lloyd's Register EMEA of any modification or changes to the equipment in order to obtain a valid certificate."

The attached Design Appraisal Document No. ENS 24048-09, Issue 1 dated 06.01.2015 and its supplementary Type Approval Terms and Conditions form part of this Certificate.

All other details remain as the previous Certificate No. 09/20026 to which this extension should be attached.

Certificate No.	09/20026 (E1)
Issue Date	06 January 2015
Expiry Date	22 July 2019
Sheet	1 of 1


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 Hamburg Technical Support Office
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