

Operating instructions for rescue equipment

LUKAS

CE

Hydraulic units

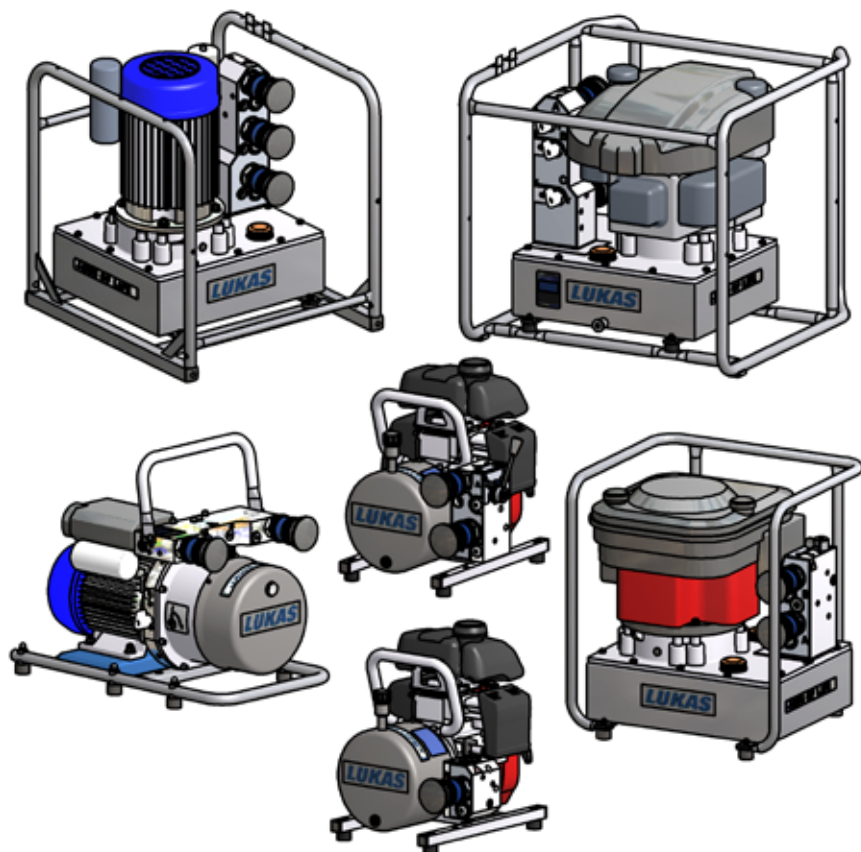
175010085 GB

Issue 12.2009

replaces 03.2009

STREAMLINE

TECHNOLOGY



(Translation of the original operating instructions)

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1. Hazard classes

We distinguish between various categories of safety instructions. The table below gives you an overview of the assignment of symbols (pictograms) and key words to the specific hazard and possible consequences.

Pictogram	Damage / injury to	Key word	Definition	Consequences
	human	DANGER!	Immediate danger	Death or major injury
		WARNING!	Potentially dangerous situation	Potential death or major injury
		CAUTION!	Less dangerous situation	Minor or slight injury
	device	CAUTION!	Danger of damage to device / environment	Damage to the equipment, damage to the environment, damage to surrounding materials
	-	REMARK	Advice for application and other important / useful information and advice	No injury / damage to persons / environment / equipment



Wear helmet with face protection



Wear safety gloves



Wear safety shoes



Proper recycling



Observe principles of environmental protection



Read and observe operating instructions

2. Product safety

LUKAS products are developed and manufactured in order to guarantee the best performance and quality when used properly.

Operator safety is the most important aspect of the product design. Moreover, the operating instructions are intended to ensure LUKAS products are used safely.

The generally applicable legal and other binding regulations pertaining to the prevention of accidents and protection of the environment apply and are to be complied with in addition to the operating instructions.

The equipment may only be operated by persons with appropriate training in the safety aspects of such equipment – otherwise, there is a danger of injury occurring.

We would like to point out to all users that they should read the operating instructions carefully before using the equipment and comply with the instructions there without restriction.

We further recommend that a qualified instructor train you in the use of the product.



WARNING / CAUTION!

The operating instructions for the hoses, the accessories and the connected hydraulic equipment must also be observed!



























Even if you have already received instructions on how to use the equipment, you should still read through the following safety instructions once again.






















WARNING / CAUTION!

Ensure that the accessories and connected equipment used are suitable for the maximum operating pressure!

	<p>Please ensure that no body parts or clothing get stuck between the visibly moving parts.</p>	<p>The department responsible is to be informed immediately of any changes (including to the operating behaviour). If necessary, the equipment is to be shut down immediately and secured!</p>	
	<p>Wear protective clothing, safety helmet with visor, safety shoes and protective gloves.</p>	<p>Inspect the equipment before and after use for visible defects or damage.</p>	
 	<p>It is prohibited to work under load if this load is lifted exclusively by hydraulic equipment. If this work is absolutely imperative, additional mechanical supports must be used.</p>	<p>Inspect all lines, hoses and screwed connections for leaks and externally visible damage. If necessary, repair immediately! Squirting hydraulic liquids can result in injuries and fires.</p>	
	<p>In the event of malfunctions, immediately shut down the equipment and secure it. The malfunction is to be repaired immediately.</p>	<p>Do not carry out any changes (additions or conversions) to the equipment without obtaining the prior approval of LUKAS.</p>	

 	<p>Comply with all the instructions regarding safety and danger on the equipment and in the operating instructions.</p>	<p>All the instructions regarding safety and danger on the equipment are to be kept complete and in a legible condition.</p>	
 	<p>Please ensure that all safety covers are present on the equipment and that they are in proper and adequate condition.</p>	<p>Any method of operation which impairs safety and/or stability of the equipment is prohibited!</p>	 
 	<p>Safety devices may never be deactivated!</p>	<p>The maximum operating pressure set on the equipment must not be changed!</p>	
	<p>Before the equipment is switched on / started up, and during its operation, it must be ensured that nobody is endangered by the operation of the equipment.</p>	<p>Comply with all specified dates or dates specified in the operating instructions pertaining to regular checks / inspections of the equipment.</p>	
 	<p>When working close to live components and cables, suitable measures must be taken to avoid current transfers or high-voltage transfers to the equipment.</p>	<p>Only original LUKAS accessories and spare parts may be used for repairs.</p> <p>When working with this equipment or when transporting it, ensure that you do not get caught up in the hose or cable loops and trip.</p>	 
 	<p>The build-up of static charge with the potential consequence of spark formation is to be avoided when handling the equipment.</p>	<p>When working with combustion engine pumps, never touch the motor and exhaust system, since there is a risk of burning.</p>	
 	<p>Motor pumps may not be used in explosion hazard areas!</p>	<p>Combustion engines must not be used in enclosed spaces, as there is a danger of poisoning and/or asphyxiation!</p>	
 	<p>If fuel for combustion engines is spilled, this fuel must be removed completely before starting the motor.</p>	<p>Filling up during operation of the combustion engine is strictly prohibited!</p>	 

 	<p>Keep combustion engines and their fuel away from ignition sources, as otherwise there is the danger of an explosion.</p>	<p>All damaged electrical components e.g. scorched cables, etc. are to be replaced immediately!</p>	 
 	<p>To avoid the danger of fire when using combustion engines, ensure sufficient ventilation and maintain a safety distance of at least 1 m (39.4 in.) to the walls and other screens.</p>	<p>Damage to electrical components may only be repaired by a qualified electrician in compliance with all applicable national and international safety guidelines and regulations.</p>	
 	<p>Please ensure that the combustion engine pumps are always placed on as flat a surface as possible in order to prevent fuel from leaking.</p>	<p>When setting up the units, it must be ensured that they are not impaired by the influences of extreme temperatures.</p>	
  	<p>The equipment is filled with hydraulic fluid. These hydraulic fluids can be harmful to your health if swallowed or if their vapours inhaled. Direct contact with the skin is to be avoided for the same reason. Please also note that hydraulic fluids can also have a negative effect on biological systems.</p>	<p>When working with or storing the equipment, ensure that the function and the safety of the equipment are not impaired by the effects of extreme external temperatures and that the equipment is not damaged in any way. Please note that the equipment can also heat up over a long period of use.</p>	
	<p>Ensure adequate lighting when you are working.</p>	<p>Before transporting the equipment, always ensure that the accessories are positioned in such a way that they cannot cause an accident.</p>	
	<p>Always keep these operating instructions within reach where the equipment is used.</p>	<p>Ensure the proper disposal of all removed parts, leftover oil, hydraulic fluid and packaging materials.</p>	 

The generally applicable, legal and other binding national and international regulations pertaining to the prevention of accidents and protection of the environment apply and are to be implemented in addition to the operating instructions!

WARNING / DANGER / CAUTION!

The equipment is to be used **exclusively** for the **purpose stated in the operating instructions (see chapter "Proper use")**. Any form of use beyond this is **not considered proper use**. The manufacturer / supplier is not liable for any damages resulting from improper use. The user bears sole responsibility for such use.

Observance of the operating instructions and compliance with the inspection and maintenance conditions are covered by the definition of proper use.



Never work when you are overtired or intoxicated!



3. Proper use

LUKAS hydraulic units are specially designed to supply LUKAS rescue equipment with hydraulic fluid so that this equipment can be used to rescue victims of road, rail or air traffic accidents as well as from buildings.

Their use for supplying pressure / fluid to rescue equipment of other manufacturers is possible, yet requires the technical inspection and approval by LUKAS in each individual case.



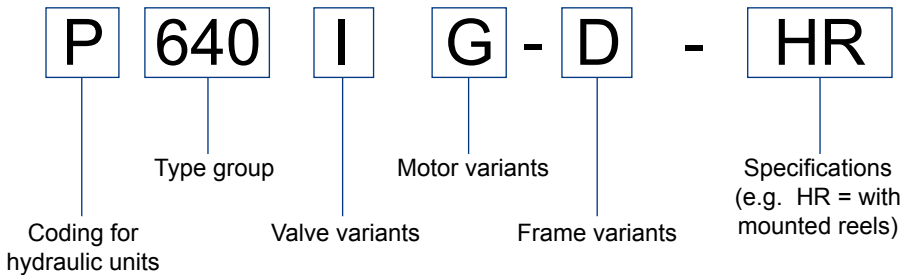
WARNING / DANGER / CAUTION!



Always observe the safety notes of these operating instructions with regard to place of installation and type of installation! The units must not be used in all atmospheres, since there could be a danger of explosion!

Spare parts and accessories for the rescue equipment can be ordered from your authorised LUKAS dealer!

4. Labelling of the units



Valve variants:

- O = Single operation
- A = Alternative operation
- I = Automatic operation (ISV valve)
- S = Simultaneous operation
- T = Triple-flow operation (TRIMO)

Motor variants:

- E = Electric motor (operation via mains supply)
- B = Electric motor (operation via battery)
- G = Gasoline / petrol engine
- D = Diesel engine

Frame variants:

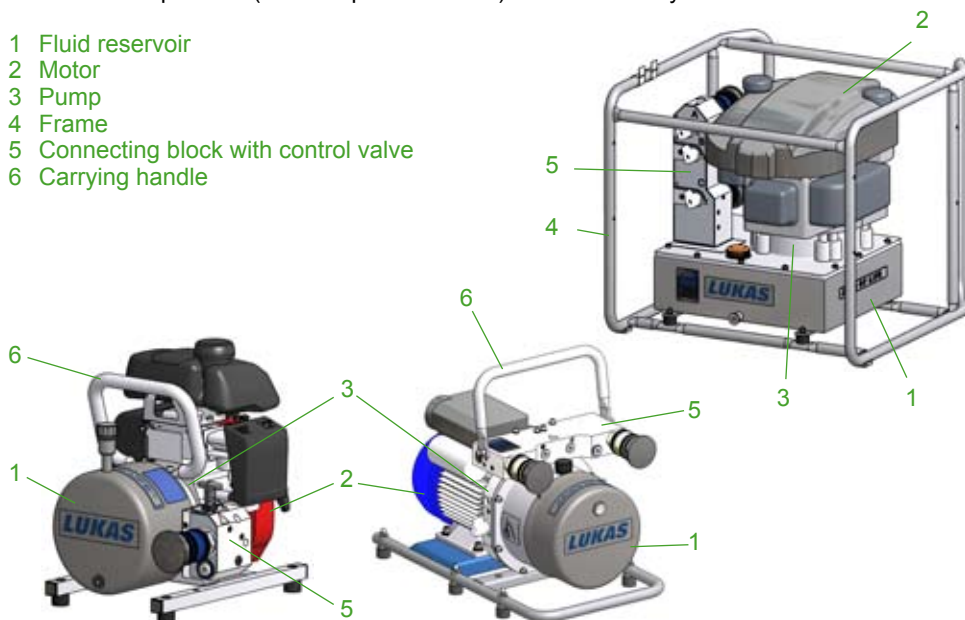
- (no entry) = Standard frame
- D = D frame
- U = U frame
- S = Frame for rescue sets
- F = F frame

5. Functional description

5.1 General information

The main components (see sample illustration) of all LUKAS hydraulic units are:

- 1 Fluid reservoir
- 2 Motor
- 3 Pump
- 4 Frame
- 5 Connecting block with control valve
- 6 Carrying handle



As a general principle on all LUKAS hydraulic units, a hydraulic pump is operated with a motor (combustion engine or electric motor) that feeds the fluid from the reservoir and builds up the pressure. The distribution of the fluid is controlled by mounted valves.

The mounted frame serves as a simple protective cage and as a mounting base for accessories that can be fitted. The hydraulic unit can also be carried by the frame or using carrying handles mounted on it.

5.2 Motor variants



WARNING / DANGER / CAUTION!

For all motor variants, also comply with the separate operating instructions of each motor manufacturer.

5.2.1 Electrical



These hydraulic units are equipped with an electric motor. The electric motor is driven by electricity from the mains supply or by electricity produced by generators. In the case of operation with generators, make sure that voltage fluctuations do not occur, as these have a direct influence on the pumping capacity and stability of the hydraulic unit.

The possible operating voltage, the current frequency and the required intensity of current can be found in the separate instructions for your unit in the chapter entitled "Technical data".

5.2.2 Gasoline / petrol

These hydraulic units are equipped with a combustion engine driven by the fuel "gasoline / petrol".

(For specific details, please consult the separate operating instructions of the engine manufacturer!)

The engines of type Briggs & Stratton have a main switch, which must be actuated for switching the aggregate on and off. The accelerator cable of these engines does not have to be readjusted and is fixed in the position „“. Nevertheless, if it is necessary in exceptional cases to switch the engine into idle running, the accelerator lever can be lifted over the adjusting plate and be switched into the position „“.

5.2.4 Diesel

These hydraulic units are equipped with a combustion engine driven by the fuel "diesel".

(For specific details, please consult the separate operating instructions of the engine manufacturer!)

5.3 Valve variants

In all cases, the valves are designed as connecting blocks. This block is firmly integrated into the hydraulic unit. Both hoses (pressure and return) are always connected to the connecting block. There are various connection blocks with different valve variants available for the different requirements of operators and the various areas of application.

REMARK:



For certain regions, the selection of the control valves is limited due to applicable standards and legal regulations.

Bear in mind that only the variants that are officially approved for your region will be deployed!



CAUTION!

When operating several pieces of rescue equipment with one unit, ensure that the usable volume of hydraulic fluid in the reservoir is greater than the maximum possible operating fluid volume of all connected rescue equipment.

As a general principle, there are two different connection blocks for each connection block variant. A block is conceived for screwing in mono-couplings directly and for screwing on hoses. On the mono-coupling variants, an adapter can be used to screw on hoses directly. On the hose connection variant, the built-in connection nipples can be replaced by quick-disconnect coupling halves.

It goes without saying that LUKAS can also provide adapter sets to connect mono-couplings to a hose connection block. These adapter sets consist of a supply and return hose with a mono-coupling fitted on one end.

5.3.1 Control valve "single operation"

This variant only enables the connection of one pressure hose and one return hose. Turning a lever / switch controls the pressure application to the pressure hose, i.e. the pressure on the pressure hose is switched on or off.

5.3.2 Control valve "alternative operation"

This valve enables the connection of two pressure hoses and two return hoses. Turning a lever / switch controls the pressure application to the pressure hoses. However, only one device can be provided with pressure at any one time.

5.3.3 Control valve "automatic operation (ISV valve)"

This valve enables the connection of two pressure hoses and two return hoses. The patented LUKAS ISV valve provides one device at each connecting block with pressure without a manual switching procedure. Changeover between the two pressure hoses is automatic. With this control valve, the first driven and pressure-operated connected device is always provided with hydraulic fluid. The second connected device, on the other hand, is automatically disconnected from fluid supply.

5.3.4 Control valve "simultaneous operation"

This valve enables the connection of two pressure hoses and two return hoses. It has two switching options, each of which controls the pressure application of the pressure hose that is marked accordingly. This means **two devices can be supplied with pressure simultaneously and independently of one another**. Without impairing the work output, it enables work with two devices simultaneously and independently of one another.

5.3.5 Control valve "triple-flow operation"

This valve enables the connection of three pressure hoses and three return hoses. It has three switching options, each of which controls the pressure application of the pressure hose that is marked accordingly. This means **three devices can be supplied with pressure simultaneously and independently of one another**. Without impairing the work output, it enables work with three devices simultaneously and independently of one another.

5.4 Pumps

Depending on the type, a single-flow, double-flow or triple-flow pump is built into LUKAS hydraulic units.

Single-flow pump  1 pump capacity

Double-flow pump  2 pump capacities

Triple-flow pump  3 pump capacities

The pumps used are always equipped with two pressure levels for each pump capacity, one low-pressure and one high-pressure level.

Low-pressure level (ND) = up to 16 MPa*

*) 1 MPa = 10 bar)

High-pressure level (HD)= up to 70 MPa*

The changeover from low pressure to high pressure is carried out automatically in the pump. The maximum pressure is limited by a pressure limiting valve.



WARNING / DANGER / CAUTION!

For reasons of safety, the pressure set on this valve **must not** be adjusted (without direct authorisation from LUKAS)!



5.5 Frames

As a general principle, all hydraulic units from the rescue equipment range come with a frame to make them easier to transport.

5.5.1 Standard frame

The standard frames vary depending on the type of hydraulic unit. They range from simple handles through to bow-type handles all the way to a frame adapted according to the unit. It therefore cannot be guaranteed that the entire unit can fit inside the exterior dimensions of the frame of standard frames.

5.5.2 D frame

As a general principle, the D frame dimensions are 500 mm x 440 mm x 480 mm.

On D frames, all parts of the unit are located within the frame.

In addition, there are mounting possibilities for connection hose reels (one double and two single hose reels).

The dimensions mean that this frame fits into in the standard fixing devices of rescue service vehicles.



5.5.3 U frame

The U frame differs from the D frame with regard to outer dimensions and shape. There are currently no mounting possibilities for hose reels on this frame.



5.5.4 Frame for rescue sets

The frame for rescue sets is specifically designed for the motor / engine and all the components included in a rescue set. In some cases, these frames have additional mounting options or special attachment parts.

(For specific information, please contact your authorised LUKAS dealer or LUKAS directly.)

5.5.5 F frames

The F frame is currently the largest frame in the LUKAS range. This frame is deployed if the size of the motor and mounted parts makes other frame variants too small. The special shape of this frame enables mounting of connection hose reels (one double and two single hose reels).

This frame is mainly used for combustion engine units with triple-flow control valves (TRIMO units).



5.6 Connection to the rescue equipment

Connection with the rescue equipment is via extension hose pairs or hose reels. These are available in various lengths, coloured bend protections and with various connection options.

The individual hoses of a hose pair are to be differentiated by colour to prevent confusion of the pressure and return hoses.

(For specific details, please consult the LUKAS range of accessories or contact your LUKAS dealer).

5.7 Connection options

The connections for the hydraulic hoses are always on the valve block.

In the standard range, only mono-couplings or alternatively direct connections, or quick-disconnect couplings or alternatively direct connections are envisaged. Depending on the coupling variant, an autonomous connecting block is fitted on the unit.

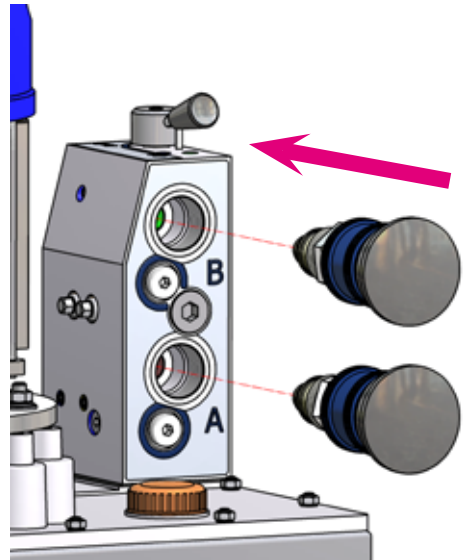
In order to be able to use the direct connection as an alternative possible connection, an adapter or connection nipple (male) must be fitted in the connecting block beforehand.

(Fitting the adapter, see chapter "Assembly of coupling systems")

6. Assembly of coupling systems

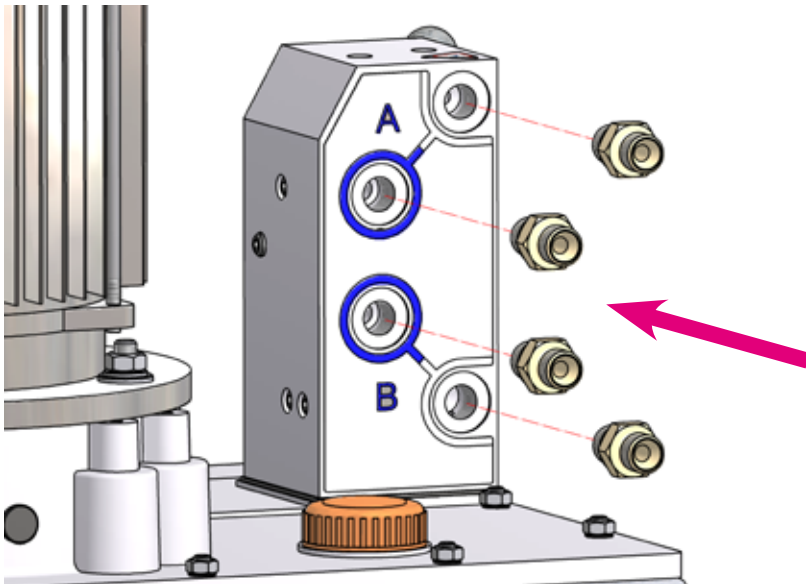
6.1 Mono-couplings

Only female mono-coupling halves are mounted on the connecting block of the hydraulic unit. The female coupling is screwed into the valve block with a tightening torque of $M_A = 40 \text{ Nm}$.



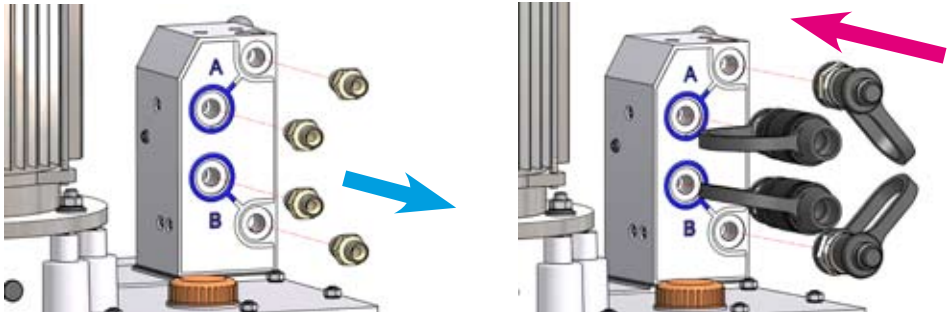
6.2 Direct connection

On the connecting block of the hydraulic unit, the connection nipple (male) is screwed into the valve block with a tightening torque of $M_A = 40 \text{ Nm}$. Subsequently, suitable locking elements (e.g. locking ball with nut) must be screwed onto the connection nipples or the hoses must be connected immediately.



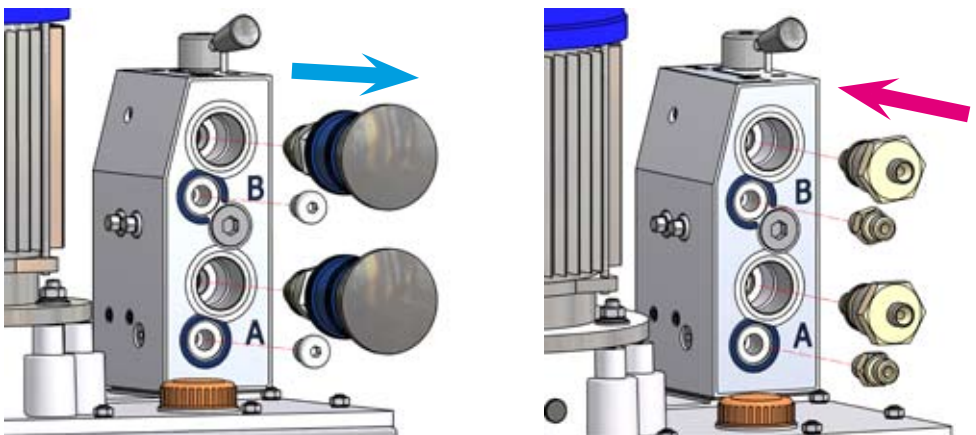
6.3 Quick-disconnect couplings

On the connecting block of the hydraulic unit, the connection nipples are replaced by quick-disconnect couplings to enable connection of hoses equipped with this coupling system. First of all, remove the connection nipples and then screw in the quick-disconnect couplings. The return hose connection (marked in blue) must always be equipped with a female quick-disconnect coupling. Both the female quick-disconnect couplings and the male quick-disconnect couplings are screwed into the valve block with a tightening torque of $M_A = 40 \text{ Nm}$. To conclude, quick-disconnect couplings must be sealed with matching dust protection caps.



6.4 Adapter for direct connection to mono-coupling valve block

Connection nipples and adapters must be mounted on the connecting block of the hydraulic unit so that the hoses can be screwed onto them directly. To achieve this, first of all remove the mono-couplings and locking screws of the return connections, then screw in the connection nipples and adapters. The connection nipples and adapters are screwed into the valve block with a tightening torque of $M_A = 40 \text{ Nm}$. To conclude, suitable locking elements (e.g. locking ball with nut) must be screwed onto the connection nipples or the hoses must be connected immediately.



7. Connection of the hoses



CAUTION!

When connecting the hose assemblies, always ensure that the connection components are not soiled; clean beforehand if necessary!



REMARK:

Before you want to connect hoses to and disconnect hoses from the hydraulic unit as well as to couple and uncouple hoses with quick-disconnect couplings, ensure that the actuating valves of the pump unit have been set at static pressure or that the unit has been switched off or, in the case of electric pumps, has been disconnected from the mains!



REMARK:

The devices can be equipped with different coupling systems. They usually only differ with regard to the article number and not the designation.

It goes without saying that the coupling systems can also be re-equipped at a later time.

The coupling system for the factory status of the equipment can be found in the separate instructions for your unit in the chapter entitled "Technical data".



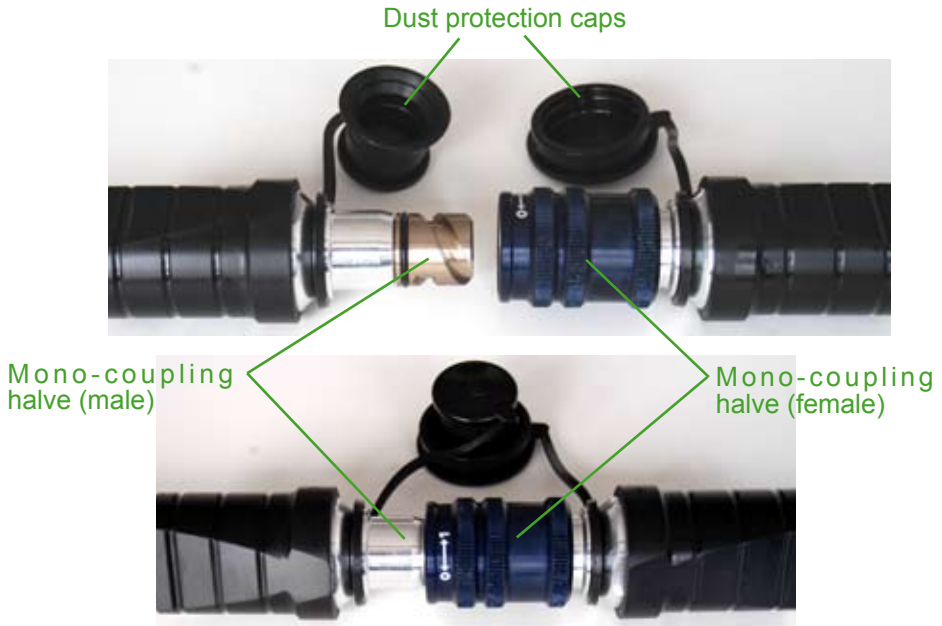
WARNING / DANGER / CAUTION!



Before connecting equipment, make sure that **all the components used** are suitable for the **maximum operating pressure of the hydraulic unit!** In cases of doubt, you **must consult LUKAS directly** before connecting the equipment!

7.1 Coupling the mono-couplings

The hydraulic hoses are connected without the risk of confusion via mono-coupling halves (male and female) to the hydraulic pump.



Before coupling, remove dust protection caps, then connect male and female, and turn the locking sleeve of the female to direction "1" until the locking sleeve locks into place. The connection is now in place and secure. Decouple by turning the locking sleeve to direction "0".

The equipment can also be coupled under pressure provided the connected equipment is not activated.



REMARK:

At low ambient temperatures and if you are using extension hoses / hose reels, we **recommend** connecting the coupling halves at **static pressure**, as otherwise coupling can require the application of a great deal of force.

To protect against dust, the accompanying dust protection caps must be replaced.



WARNING / DANGER / CAUTION!

The mono-couplings must **not** be **screwed off** the hoses and / or the hoses must not be **swapped!**



7.2 Coupling the quick-disconnect couplings

The equipment is connected to the hydraulic pump via quick-disconnect coupling halves (male and female).



Before coupling, remove the dust protection caps, then pull back and hold the locking sleeve of the female coupling (position X). Connect the nipple and female coupling and let go of the locking sleeve. To conclude, turn the locking sleeve into position Y. The connection is now in place and secure. Uncouple in reverse order.



CAUTION!

Always couple the return hose first and then the supply hose!
On disconnecting, you should always disconnect the supply line first and then the return pipe!



REMARK:

Coupling of the devices is only possible when the hoses are **depressurised**.

To protect against dust, the accompanying dust protection caps must be replaced.



WARNING / DANGER / CAUTION!

Some quick-disconnect couplings have special functions. Therefore it is **not** permitted to **screw** them **off** the hoses or to **swap** them!



7.3 Direct connection



REMARK:

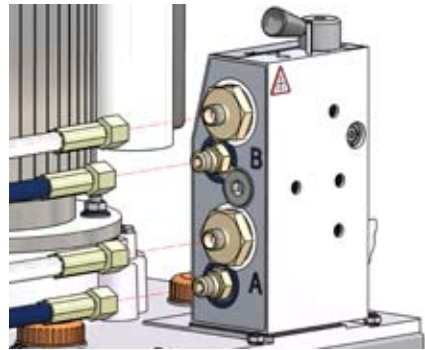
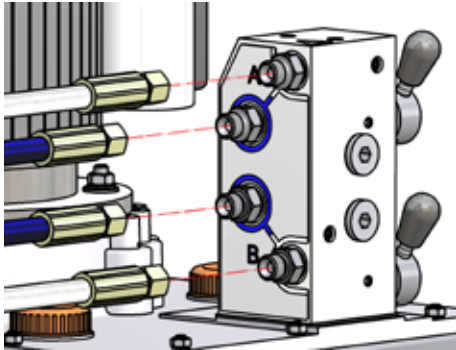
In order to be able to mount the hoses directly onto the connecting block, adapters or connection nipples have to be screwed into the valve block beforehand.

The hydraulic hoses are screw-connected to the connecting block of the hydraulic unit. Screw-in sleeves or adapters are mounted in the valve block. The hoses are secured directly onto these screw-in sleeves or adapters by means of union nuts. To do so, you must first remove the dust protection caps or locking screws and the steel balls underneath, then fit the corresponding hydraulic hose and use the union nut of the hose to screw it firmly to the screw-in sleeve or adapter. Please observe the torque of 35 Nm.



CAUTION!

Always connect the return hose first and then the supply hose!

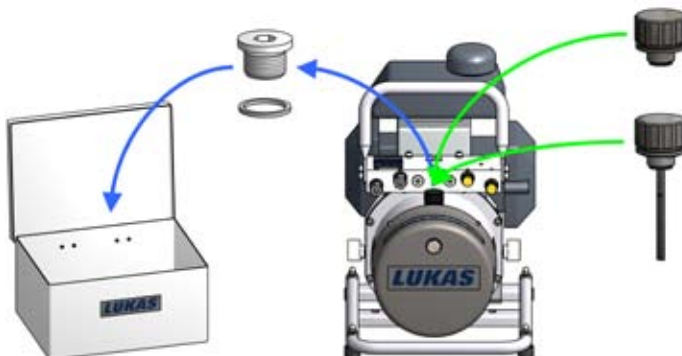


8. Set-up and start-up



CAUTION!

Before commissioning the 620, the locking screw of the hydraulic fluid reservoir must be replaced by the supplied filling screw with venting function. The locking screw only serves the purpose of securing the hydraulic reservoir during transportation and is to be stored in line with accepted principles.



8.1 Set-up



WARNING / DANGER / CAUTION!

Combustion engine units and most electrical units must not be used in a potentially explosive situation (danger of the formation of sparks). Units with combustion engines must not be used in enclosed spaces, as there is a danger of poisoning and/or asphyxiation!

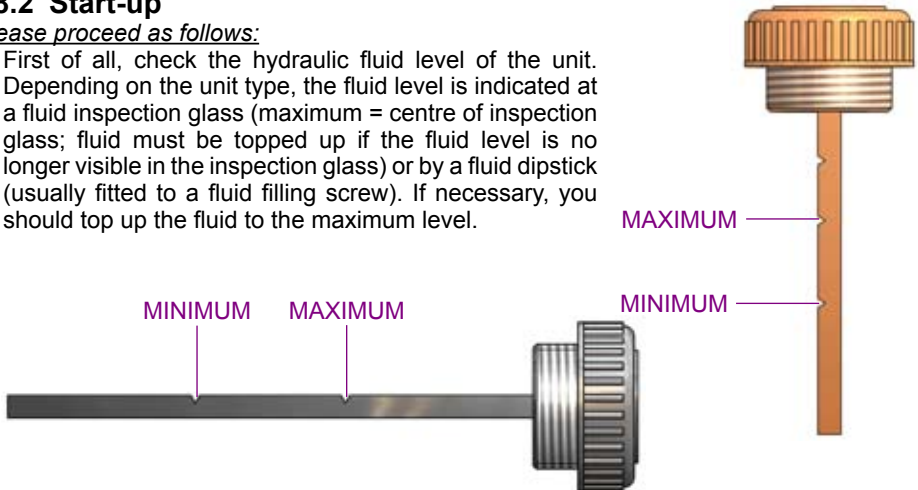
The unit is to be set up in a suitable location (safe location / flat surface / sufficient distance from vehicles, loads, sources of ignition, etc.).

LUKAS units work perfectly at an angle of up to 30°. However, in order to guarantee maximum safety and fluid withdrawal, they should be operated in as horizontal a position as possible.

8.2 Start-up

Please proceed as follows:

1. First of all, check the hydraulic fluid level of the unit.
Depending on the unit type, the fluid level is indicated at a fluid inspection glass (maximum = centre of inspection glass; fluid must be topped up if the fluid level is no longer visible in the inspection glass) or by a fluid dipstick (usually fitted to a fluid filling screw). If necessary, you should top up the fluid to the maximum level.



2. Now connect the mains plug of the hydraulic units with electric motor to the power supply (exception: units for accumulator operation).
3. Then vent the hydraulic unit. Set all levers of the distributor valve to circulation at static pressure (see chapter "Valve variants"). The actual venting is carried out in the units in a different manner, depending on the drive motor:
 - a) *Gasoline / petrol engine:*
 - Remove plug connector from the spark plug.
 - Slowly turn the starter rope several times.
For a motor with electric starter, activate the starter several times.
 - Then replace the plug connector.
 - b) *Diesel engine:*
 - Slowly turn the starter rope several times in such a way that the engine does not start.
 - c) *Electric motor (power and accumulator operation):*
 - Turn the motor on and after nearly 10 seconds off again, do this a few times.
(Before switching back on, the motor must be at a standstill!)

This procedure means that the pump can slowly extract and be well vented. The hydraulic fluid reservoir is equipped with automatic venting, which means no further venting measures are required.

4. Check the level of the fluid in the reservoir once more. If necessary, top up the fluid.
5. To conclude, you can now connect the extension hoses and/or hose reels (unless already connected to the unit) and/or couple the rescue equipment.

9. Operation



CAUTION!

As a general principle, **before starting up the motor**, the hydraulic unit is to be switched to **circulation at static pressure** (i.e. the outlet valves are to be opened, for example). Only in this way is it possible to start the unit without a hydraulic load.

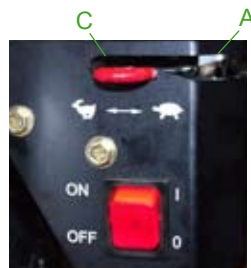
9.1 Starting the motors

9.1.1 Gasoline / petrol and diesel engines

Before starting the combustion engines, check that the fuel tank is full and that the engine oil level is within the permitted tolerances. If necessary, top up the relevant fluid.

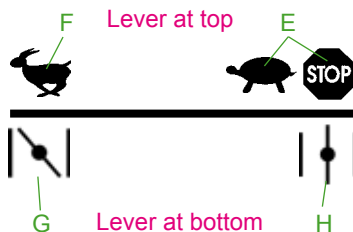
Flow chart for starting Briggs & Stratton motors, unit type 640:

1. Open gasoline / petrol tap and switch the main switch to position '1' (ON).
2. Move the lever from switch position A to switch position C, if not fixed in position C.
3. Pull the starter rope or activate the E starter



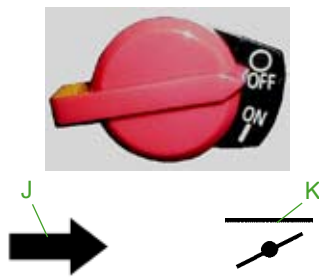
Flow chart for starting Intek motors, unit type 640:

1. Open gasoline / petrol tap
2. Move top lever from switching position E to switching position F
3. Move bottom lever (choke) from switching position G to switching position H
4. Pull the starter rope or activate the E starter
5. When the motor is running, switch bottom lever back to switching position G.



Flow chart for starting Honda motors, unit type 620:

1. Open gasoline / petrol tap
2. Switch the ON/OFF switch to ON.
3. Move lever from switching position J to switching position K (choke)
4. Pull starter rope
5. When the motor is running, switch lever back to switching position J



Please consult the separate operating instructions of the motor manufacturer for the precise procedure for starting the combustion engine!

An electric starter is available from the LUKAS range of accessories for some units.
 (For specific details, please consult the LUKAS range of accessories or contact your LUKAS dealer).

On these units, after checking the fluid levels, proceed as follows:

1. Switch to "START ENGINE"
2. Turn the ignition key clockwise.

Charge the accumulator of the electric starter:

1. Switch to "CHARGE BATTERY"
2. Connect the supplied charger to the mounted socket.

10.1.2 Electric motors

Before starting the electric motors, check that all electrical connections and cables are in proper order. First of all, connect the power cable (for motors with power supply) to the supply socket.

The motor is started by turning the ON/OFF switch to the **ON** position.



CAUTION!

Electric motors need a brief, very high starting current. When using a generator, you should therefore check to see that it can also supply the relevant current strength.

The current supply has to be fused with min. 25 A (triple-flow operation min. 30 A)

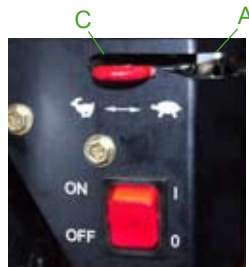
9.2 Stopping the motors

9.2.1 Gasoline / petrol and diesel engines

The gasoline / petrol and diesel engines stop automatically when the fuel tank is empty. Should they stop moving beforehand, the following procedure is required:

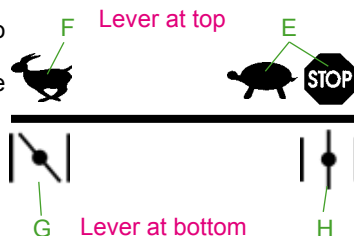
Flow chart for stopping Briggs & Stratton motors, unit type 640:

1. Switch the main switch to position '0' (OFF).
 (The throttle lever has not to be switched back to position A!)
2. When the engine has come to a standstill, close the fuel tap.



Flow chart for stopping Intek motors, unit type 640:

1. Move the top lever from switching position F to switching position E
2. When the engine has come to a standstill, close the fuel tap.



Flow chart for stopping Honda motors, unit type 620:

1. Set the ON / OFF switch to the OFF position.
2. When the engine has come to a standstill, close the fuel tap.



Please consult the separate operating instructions of the motor manufacturer for the precise procedure for stopping combustion engines!



WARNING / CAUTION!

Never touch the hot motor / engine parts: this could result in severe burns!

9.2.2 Electric motors

The movements of the electric motors are stopped by changing the ON/OFF switch to the OFF position. This also stops the pumping output of the connected hydraulic pump.

9.3 Controlling the valves



WARNING / DANGER / CAUTION!

For valves which can be connected to several rescue devices, you must ensure all **unnecessary** connections are **closed** with steel fasteners (supplied with the valve blocks).



CAUTION!

As a general principle, **before starting up the motor**, the hydraulic unit is to be switched to **circulation at static pressure** (i.e. the outlet valves are to be opened, for example). Only in this way is it possible to start the unit without a hydraulic load.

9.3.1 Control valve "single operation"

A lever is fitted on this valve. The pressure application of the pressure hose is controlled by turning a lever.

There are 2 switching stages:

- 0 = circulation at static pressure (no pressure supplied to the hydraulic hose)
- 1 = pressure supply to the pressure hose

9.3.2 Control valve "alternative operation"

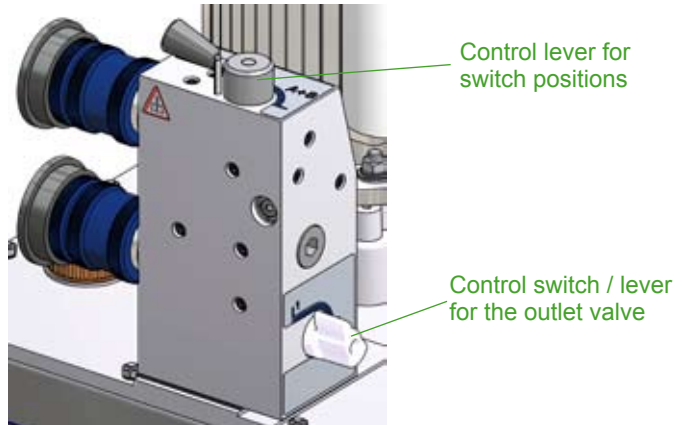
A lever is fitted on this valve. The pressure application of the pressure hoses is controlled by turning a lever.

There are 3 switching stages:

- A = pressure supply to the pressure hose 1
- B = pressure supply to the pressure hose 2
- C = pressure relief of both pressure hoses 1 and 2

9.3.3 Control valve "automatic operation (ISV valve)"

There is no direct control option for this valve, since the pressure application is controlled automatically. Nonetheless, the unit also has 2 levers or switches. The top lever controls whether or not one device (switching position "A") or two devices (switching position "A + B") should be operated. The side switch is to control the outlet valve, which means that in switch position "0" the unit is switched to circulation at static pressure.



Special feature for the operation of control valves "automatic operation (ISV valve)":

Case 1: Two hose pairs and two rescue devices connected:

As a rule, two hose pairs are connected to the valve. Changeover between the two connected rescue devices is automatic.

Switch the control lever for switch positions to position "A+B".

To supply the connected rescue equipment with hydraulic fluid, the control lever for the outlet valve must be switched to position "1". To return the valve to circulation at static pressure, the control lever for the outlet valve must be switched to position "0".

Case 2: One hose pair and one rescue device are connected (at connection A):

If only one hose pair is connected at the valve, the following instructions are important:

1. The valve connections where no hoses are connected, must be sealed by means of special locking screws, for example, in such a way that no hydraulic fluid can escape on pressure application.
2. The control lever for switch positions must be in position "A".
3. The hydraulic fluid supply of the connected rescue equipment and switching to circulation at static pressure take place by switching the control lever for the outlet valve. ("1" = fluid supply; "0" = circulation at static pressure)



REMARK:

Single-device operation is only possible at connection A.

Case 3: Two hose pairs and one rescue device are connected (at connection A):

If two hose pairs are connected and there is only one rescue device at the hose pair of connection "A", the following instructions are important:

1. The control lever for switch positions must be in position "A".
2. The hydraulic fluid supply of the connected rescue equipment and switching to circulation at static pressure take place by switching the control lever for the outlet valve. ("1" = fluid supply; "0" = circulation at static pressure)

Case 4: Two hose pairs (with quick-disconnect couplings) and one rescue device are connected (at connection B):

If two hose pairs are connected and a rescue device is only connected at the hose pair of connection "B", the device works neither in switch position "A" nor in switch position "A+B". The second hose pair at connection A without a connected rescue device indicates to the valve that a device is connected at connection A that has to be supplied with maximum operating pressure. This switches off connection B, which is no longer supplied with hydraulic fluid.

To exclude this possibility, you should either connect a second rescue device or join the supply and return hoses of the connection that is not used (short-circuiting).

Case 5: Two hose pairs (with mono-couplings) and one rescue device connected (at connection B):

If two hose pairs are connected and a rescue device is only connected at the hose pair of connection "B", the device only works in switch position "A+B". This is made possible by the female mono-coupling halve, which enables an internal fluid circulation when not connected.

9.3.4 Control valve "simultaneous operation"

Two levers are fitted on this valve. Each lever is assigned to one pressure port. The pressure application of the relevant pressure hose is controlled by turning the relevant lever.

There are 2 switching stages for each lever:

- 0 = circulation at static pressure (no pressure supplied to the hydraulic hose)
- 1 = pressure supply to the pressure hose

9.3.5 Control valve "triple-flow operation"

Three levers are fitted on this valve. Each lever is assigned to one pressure port. The pressure application of the relevant pressure hose is controlled by turning the relevant lever.

There are 2 switching stages for each lever:

- 0 = circulation at static pressure (no pressure supplied to the hydraulic hose)
- 1 = pressure supply to the pressure hose

10. Dismantling the equipment / deactivation following operation

Once work has been completed, all connected equipment is to be reset to its base position before the unit is shut down. You can now stop the motor of the unit / switch it off and, if using an electric motor (without accumulator), disconnect it from the mains supply.

Mono-couplings:

If the connected hose assemblies have to be dismantled during shut-down, decouple as described in chapter "Coupling the mono-couplings". Ensure that you replace the dust protection caps onto the mono-coupling halves.

Clean heavy soiling caused during use of the hydraulic unit before storage.

Quick-disconnect couplings:

If the connected hose assemblies have to be dismantled during shut-down, decouple as described in chapter "Coupling the quick-disconnect couplings". Ensure that you replace the dust protection caps onto the mono-coupling halves.

Clean heavy soiling caused during use of the hydraulic unit before storage.

Direct connection:

This connection should only be unscrewed when it is absolutely necessary, e. g. when you have a longer storage time, when decommissioning, for maintenance tasks, etc.

If the connected hose assemblies have to be dismantled during shut-down, first of all disconnect the pressure hose and then the return hose. Ensure that you replace the dust protection caps onto the screw-in sleeves and onto the hoses. Clean heavy soiling caused during use of the hydraulic unit before storage.



CAUTION!

Depending on the size and the weight of the hydraulic unit, it should be transported to the storage site by one person or several people.

If the equipment is to be stored for a longer period of time, the exterior is to be cleaned completely and the mechanical moving parts are to be lubricated. If storing a unit with combustion engine, you should also remove the fuel from the fuel tank.

Avoid storing the hydraulic units in a damp environment.

Please observe the regulations in the chapter entitled "Safety regulations for hoses".

11. Maintenance and service

The hydraulic units are subject to very high mechanical loads. A visual inspection is therefore to be carried out after every use: however, at least one visual inspection is to be carried out every six months.

This reveals wear and tear in good time; punctual replacement of these wearing parts prevents damage to the equipment. Also check regularly that all the securing screws are tightened (if applicable, comply with prescribed tightening torques)

Every 3 years or when there might be doubts regarding the safety or reliability of the unit, an additional function check is to be carried out (in this connection, comply with the applicable national and international regulations with regard to the maintenance intervals of rescue equipment). In the Federal Republic of Germany, regular safety inspections according to the regulations of the Gesetzliche Unfallversicherung (GUV; 'statutory accident insurance') are mandatory.



CAUTION!

Clean off any dirt before checking the equipment!



WARNING / DANGER / CAUTION!

In order to carry out maintenance and repair work, tools appropriate for the job and personal protection equipment obligatory (including protective covers).



LUKAS offers a suitable test kit for the function test of the hydraulic units.

(For specific details, please consult the LUKAS range of accessories or contact your LUKAS dealer).

11.1 Recommended testing periods

11.1.1 Visual inspection

A visual inspection must be made after each use / latest once a year.

11.1.2 Function test

Operating time per day	Function test
up to 1 hour	once per year
up to 8 hours	once per 3 months
up to 24 hours	once per month

Beyond these testing periods, a function test should be accomplished, if the aggregate makes suspicious noises, or there is a reasonable suspicion of an internal damage of the aggregate.

If the noises or suspicious factors named above should occur several times during one month or the hydraulic unit does not reach the nominal pressure (75% of the maximum pressure) during the functional test, you will have to contact the LUKAS customer service immediately. You will find the contact information in the chapter 'Troubleshooting'.

11.2 Hydraulic units with combustion engine

Visual inspection

Hydraulic units

- Check that all hydraulic connections are tightened,
- General tightness, no leakage (the hot oils do not have any influence on the function)
- Is there any damage apparent on the motor, valve blocks or on the casing?
- Existence and stability of carrying frame
- Are type plate, all activation plates, signs, identification marks and warning labels are present and legible?
- Are all covers (e.g. protective roof, exhaust cover) present and undamaged?
- Are all liquid levels within the specified tolerances?
- Are the starters in proper working order and undamaged?
- Couplings must be easy to couple
- Dust protection caps must be available
- All necessary accessories (such as spark plugs, plug socket and fuel canister must be present.

Hoses (see also "Safety regulations for hydraulic hoses")

- Visual check for visible damage
- Check for leaks.

Function test

- No suspicious noises.
- Test for maximum load.

(Recommendation: use the LUKAS test kit, including testing instructions, for the function test).

11.3 Hydraulic units with electric motor

Visual inspection

Hydraulic units

- Check that all hydraulic connections are tightened
- General tightness, no leakage (the hot oils do not have any influence on the function)
- Is there any damage apparent on the motor, valve blocks or on the casing?
- Existence and stability of carrying frame
- Are the type plate, all activation plates, signs, identification marks and warning labels present and legible?
- Are all covers (e.g. protective roof, fan cover) present and undamaged?
- Are all liquid levels within the specified tolerances?
- ON/OFF switch in proper working order, undamaged
- Couplings must be easy to couple
- Dust protection caps must be available
- All electrical attachments (such as cables and plugs) must be present and undamaged

Hoses (see also "Safety regulations for hydraulic hoses")

- Visual check for visible damage
- Check for leaks

Function test

- No suspicious noises
- Test for maximum load

(Recommendation: use the LUKAS test kit, including testing instructions, for the function test).

12. Repairs

12.1 General information

Servicing may only be carried out by the manufacturer or personnel trained by the manufacturer and by authorised LUKAS dealers.

Only LUKAS spare parts may be used to replace all components (see spare parts list) since special tools, assembly instructions, safety aspects, inspections might have to comply with (see also chapter "Maintenance and service").

During assembly, ensure the complete cleanliness of all components, since dirt can damage the rescue equipment!



WARNING / DANGER / CAUTION!

Protective clothing must be worn when repairs are being carried out, since parts of the units can also be pressurised in an idle state.



REMARK:

Please always return the guarantee registration card to LUKAS Hydraulik GmbH. Only then are you entitled to the extended guarantee.



REMARK:

Before you use couplings from a different company, you must contact LUKAS or an authorised dealer.



CAUTION!

Since LUKAS hydraulic units are designed for top performance, only those components in the spare parts lists of the relevant unit may be replaced.

Further components in the unit may only be replaced if:

- You have participated in appropriate LUKAS service training,
- You have the explicit permission of the LUKAS customer service (on request, check for granting permission. Check is necessary in each individual case!)



REMARK:

Do not carry out any repairs without the relevant LUKAS spare parts list, since this contains the necessary torques for screws and / or important additional information.



CAUTION!

Attention must be paid to ensuring that no fuel can escape from units with combustion engines during repair work!

12.2 Preventive service

12.2.1 Care regulations

The exterior of the equipment is to be cleaned from time to time in order to protect it from external corrosion. Oil is to be applied to the metallic surfaces.

12.2.2 Function and load test

If there is any doubt regarding the safety or reliability of the equipment, a function and load test must also be performed.

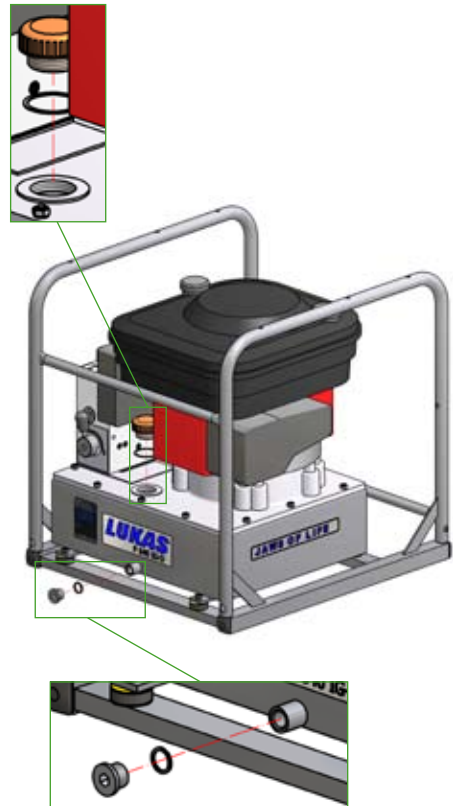
LUKAS offers appropriate test equipment.

12.2.3 Replacing the hydraulic fluid

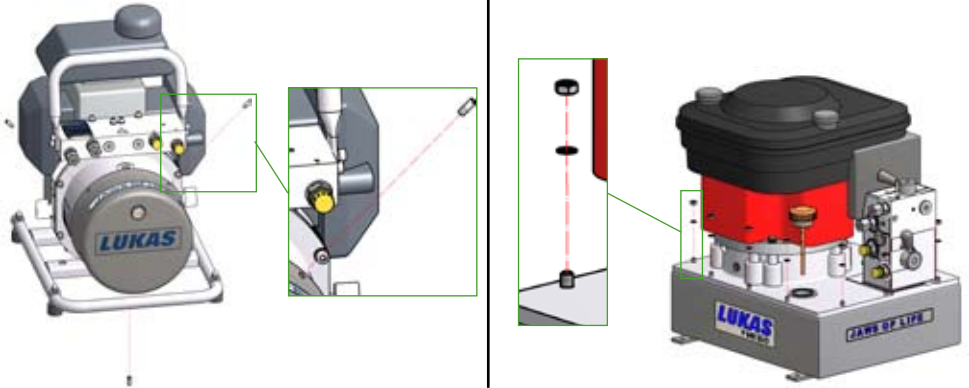
- After approx. 200 deployments, but after three years at the latest, replace the hydraulic fluid
- The fluid should be replaced when it is warmed up.
- The motor must be switched off!
- The old hydraulic fluid must be disposed of properly.

Procedure:

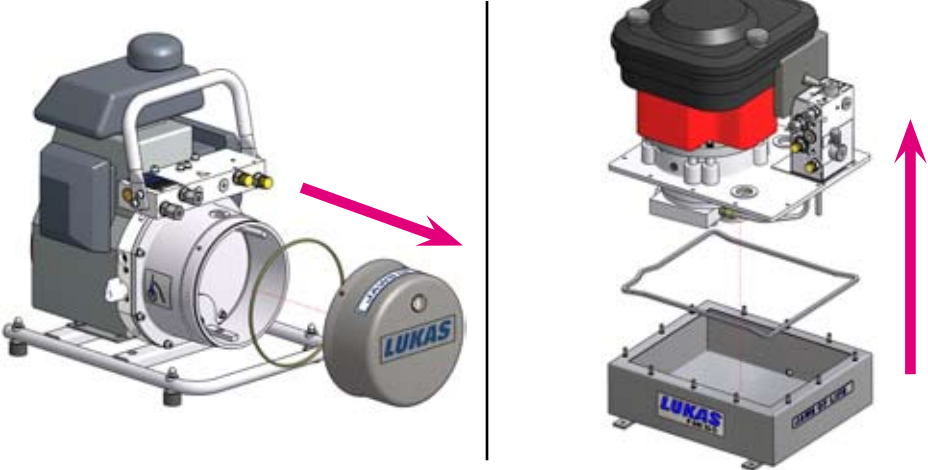
1. Place the collection basin underneath the drain plug of the unit.
2. Undo the venting and drain plug of the unit and let the fluid flow into the collection basin.
This enables easy cleaning of the hydraulic unit.



3. The fastening screws of the hydraulic fluid reservoir must then be loosened.



4. Remove the reservoir and the seal below it.



5. Free the entire reservoir of dirt using a smooth cloth.
6. When fitting the reservoir, replace the reservoir seal and tighten the fastening screws (tightening torque, see spare parts list or separate instructions for your unit in the chapter entitled "Technical data").
7. Also replace the seal ring of the drain plug and fit it as specified in the spare parts list.
8. Add the new hydraulic fluid to the reservoir through the filling plug.
9. Finally, the unit must be vented as described in the chapter entitled "Start-up"

12.3 Repairs

When carrying out permitted repairs, please observe the relevant spare parts lists with the remarks and drawings they contain.

Should there be any uncertainties regarding the repairs, please contact your authorised LUKAS dealer or LUKAS Customer Service.

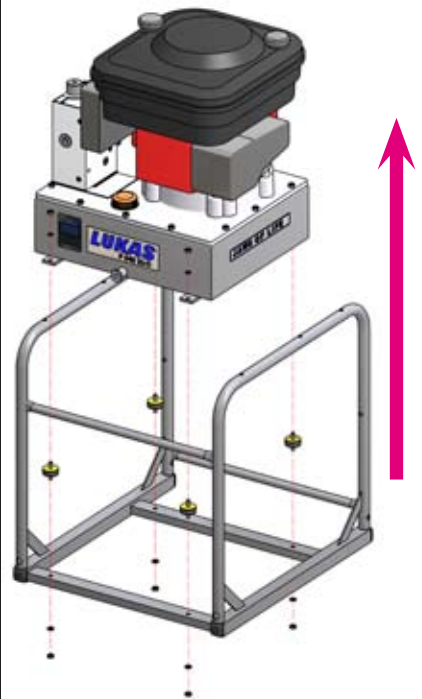


CAUTION!

Valve blocks and motors / engines may only be replaced by qualified personnel (e.g. equipment supervisor) taking account of all applicable standards, regulations and laws.

12.3.1 Replacing the handle / frame

Replace the handles or frame if they are severely deformed or broken. To replace the frame, undo the fastening screws of the handle or frame and replace it with a new one. Tighten the fastening screws. Please consult the appropriate spare parts lists for any torques and additional assembly instructions.



12.3.2 Mono-couplings

The mono-couplings on the connection hoses on the equipment must be replaced in the event of:

- external damage
- the locking device not working
- hydraulic fluid continually leaking in a coupled/uncoupled state.



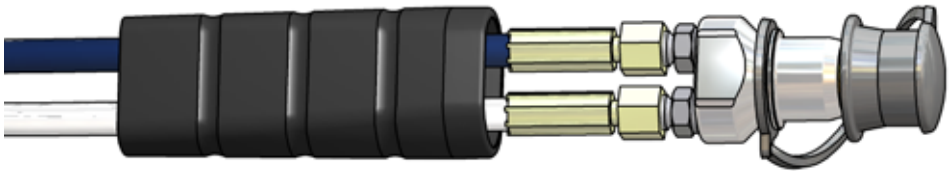
WARNING / DANGER / CAUTION!

Never repair couplings: they are to be replaced by original LUKAS parts!

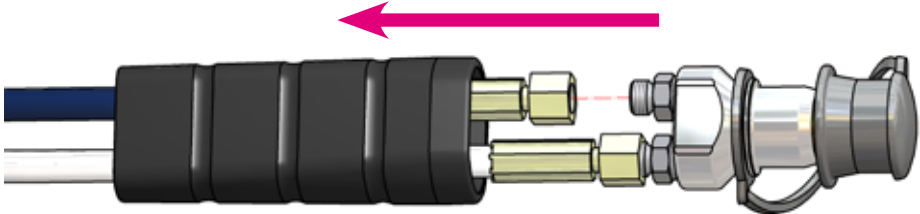


Procedure when mounted on hoses:

1. Remove the cover from the couplings.



2. Loosen the union nuts of the hose assembly and remove the coupling.



3. Position the new coupling and tighten the union nuts of the hose assemblies with a torque of $M_A = 40 \text{ Nm}$ and push the cover of the couplings back on.



CAUTION!

As the case may be, make sure that port 'T' or 'T1' of the unit is always connected to port 'T' of the mono-coupling.

Procedure when mounted into the valve block:

1. Remove the coupling from the valve block.
2. Position the new coupling and tighten it with a torque of $M_A = 40 \text{ Nm}$.

12.3.3 Quick-disconnect couplings

The quick-disconnect couplings must be replaced in the event of:

- external damage
- the locking device not working
- hydraulic fluid continually leaking in a coupled/uncoupled state.



WARNING / DANGER / CAUTION!

Never repair couplings: they are to be replaced by original LUKAS parts!

Procedure when mounted on hoses:

1. Loosen the union nut of the hose assembly and remove the coupling.
2. Position the new coupling and tighten the union nut of the hose assemblies with a torque of $M_A = 35 \text{ Nm}$.

Procedure when mounted into the valve block:

1. Remove the coupling from the valve block.
2. Position the new coupling and tighten it with a torque of $M_A = 40 \text{ Nm}$.

12.3.4 Direct connection

The screw-in sleeves must be replaced in the event of:

- external damage
- hydraulic fluid continually leaking in connected / unconnected state.

Procedure:

1. Remove the screw-in sleeve from the valve block.
2. Position the new screw-in sleeve and tighten it with a torque of $M_A = 40 \text{ Nm}$.

12.3.5 Replacing hoses

Replace hoses if they are leaky or defective, and if they are older than 10 years. To replace the hoses, undo the union nuts of the hose connections, remove the hose to be replaced and replace it with a new hose. Tighten the union nut during the assembly with a torque of $M_A = 40 \text{ Nm}$.



REMARK when using mono-couplings:

If you want to replace the hoses, you have to dismantle the mono-couplings (if mounted).



CAUTION (with mono-coupling-system)!

As the case may be, make sure that port 'T' or 'T1' of the unit is always connected to port 'T' of the mono-coupling.



CAUTION with (quick-disconnect-system)!

As the case may be, make sure that reservoir port 'T' or 'T1' of the unit is always equipped with a female quick-disconnect coupling.

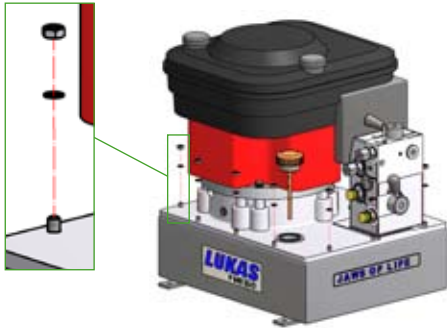
On the other hand, the supply ports must be equipped with a male quick-disconnect coupling.

12.3.6 Replacing the valve blocks

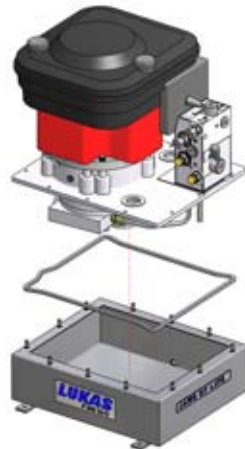
Replace the valve blocks if they are leaky or defective and direct repair of the valve block by a dealer or LUKAS is no longer possible. The valve block may only be replaced when the hydraulic unit is switched off. Electric motors must be disconnected from the power supply.

Replacing the valve blocks of the 640 units:

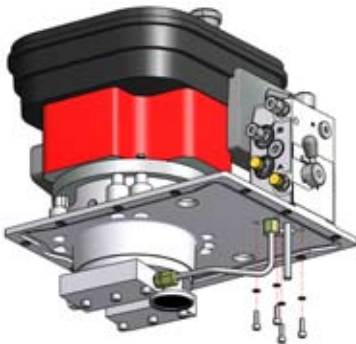
1. Disconnect all hoses from the valve block.



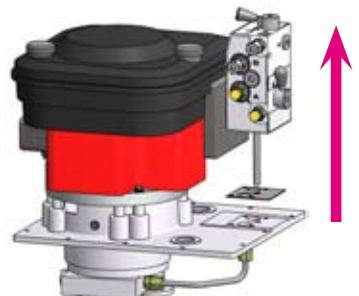
2. Loosen the fastening screws of the hydraulic fluid reservoir and remove the fluid filler caps.



3. Remove the hydraulic fluid reservoir.
Please ensure that the hydraulic fluid does not become contaminated, or replace the hydraulic fluid.



4. Loosen the union nut on the piping of the valve block and the fastening screws of the valve block.

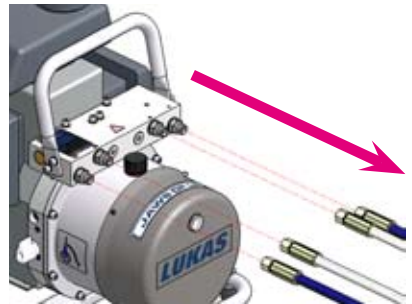


5. Remove this and the seal underneath it.
6. Remove the connection nipple for the piping and the return pipe from the valve block.

7. Clean the fastening point and the connection nipple for the piping using a non-fibrous cloth.
8. Screw the connection nipple for the piping and the return pipe into the valve block and tighten.
9. Apply seal using sealant.
10. Place a new seal on the fastening point and bolt the the new valve block to the unit once again.
Please consult the spare parts lists for the necessary torques. If no torques are specified, the screws are to be tightened in such a way that no leakage and overload of the screwed connections can occur.
11. Reassemble the hydraulic fluid reservoir. (If necessary, replace the reservoir seal).
Please consult the spare parts lists for the necessary torques.
12. Vent the unit once the repairs are complete.

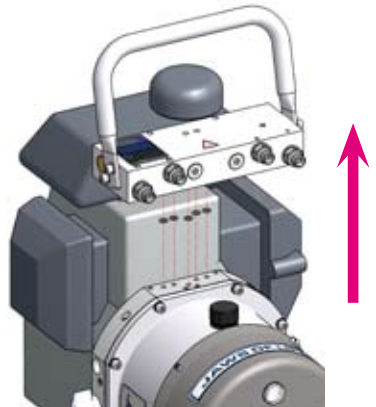
Replacing the valve blocks of the 620 units:

1. Disconnect all hoses from the valve block.



2. Loosen the fastening screw of the valve block.
CAUTION! Do not loosen the fastening screw of the connection flange!

3. Remove the valve block.
4. Position the new O-rings at the correct points of the connection flange.
Observe the relevant spare parts list.



5. Position the new valve block on the connection flange, making sure you do not move or damage the O-rings.
6. Now screw on the fastening screws of the valve block and tighten.
Please consult the spare parts lists for the necessary torques.
7. Vent the unit once the repairs are complete.

12.3.7 Replacing the engines / motors

Replace the engines / motors if they are defective and direct repair of the valve block by a dealer or the manufacturer is no longer possible. The engine / motor may only be replaced with the hydraulic motor switched off. Electric motors must be disconnected from the power supply.

Engines / motors may only be replaced as a complete component. Empty the fuel tanks of combustion engines beforehand and make sure that no engine oil escapes when you are removing the engine.

Procedure for replacing the engine / motor:

1. Loosen the fastening screws of the engine / motor.
Observe the relevant spare parts list.



2. Pull the engine / motor off. Please ensure that you do not damage the engine / motor shaft mount.
3. Equip the shaft of the new engine / motor with an appropriate adjusting key (provided it is not already in place).
4. Grease the shaft of the new engine / motor and push the shaft of the new engine / motor into the engine / motor shaft mount.

Ensure that the adjusting key of the engine / motor shaft is inserted into the correct guide of the engine / motor shaft mount.

5. Assemble the engine / motor using fastening screws and tighten.

Please consult the spare parts list for the necessary torques.

6. For combustion engine pumps, top up the necessary liquid levels (e.g. engine oil, fuel). For electric motor pumps, connect the necessary electrical cables.



7. Perform a function test with the hydraulic unit (as described in the chapter entitled "Maintenance and service").

(Recommendation: use the LUKAS test kit, including testing instructions, for the function test).

12.3.8 Labels

All damaged and/or illegible labels (safety notices, type plate, etc.) must be renewed.

Procedure:

1. Remove damaged and/or illegible labels.
2. Clean the surfaces using acetone.
3. Attach new labels.

Make sure that the labels are attached in the right position. If you are no longer sure about this, contact your authorised LUKAS dealer or LUKAS directly.

13. Troubleshooting

In the case of defects which directly affect the motor / engine, please consult the separate operating instructions of the motor / engine manufacturer.

Trouble	Cause	Solution
Electric motor does not start following activation of the switch	Power cable not connected	Connect power cable correctly
	Battery flat	Charge battery
	Electric motor defective or overloaded due to another defect in the unit	Shut down immediately and have repaired by authorised dealer, motor / engine manufacturer or directly by LUKAS
Combustion engine will not start	Fuel tank empty	Top up fuel
	Electric starter battery flat	Charge electric starter battery
	Fuel tap not open	Open the fuel tap
	Starting switch is not at "ON"	Set starting switch to "ON"
	Lever not set to choke	Set lever to choke
	Combustion engine defective or overloaded due to another defect in the unit	Have repaired by authorised dealer, motor / engine manufacturer or directly by LUKAS
	Too low ambient temperature	For the solution, consult the separate operating instructions of the motor / engine manufacturer.
The motor / engine is running, but the connected rescue equipment is not moving / moving very slowly upon activation of the valve.	Hose assembly not connected properly or is damaged	Inspect the connection of the hose assembly and, if necessary, reconnect
	Valve in the connecting block not switched for pressure application in the supply line.	Switch valve in the connecting block for pressure application in the supply line.
	Connecting block defective	Replace connecting block
		Have repaired by authorised dealer or directly by LUKAS
	Defective pump unit	Have repaired by authorised dealer or directly by LUKAS
Mono-coupling (female) defective	Replace mono-coupling (female)	

Trouble	Cause	Solution
The connected rescue equipment does not move on activation of the valve, or moves only very slowly or unevenly.	Air in the hydraulic supply	Vent the hydraulic system
	Pressure relief on the unit is still active (circulation at static pressure)	Check the switching positions of the valve lever(s) and, if necessary, reset (as far as the final position)
		For the ISV valve: Have repaired by authorised dealer or directly by LUKAS
	Connecting block defective	Replace connecting block
	Defective pump unit	Have repaired by authorised dealer or directly by LUKAS
Replace mono-coupling (female) defective		
Connected rescue device does not reach its final position	Insufficient fluid in the hydraulic reservoir	Top up hydraulic fluid to the maximum filling level Caution! Before topping up the rescue equipment, return to the base position!
	Usable hydraulic fluid volume of the unit is insufficient	Use a different rescue device with a usable quantity below the maximum usable quantity of the unit
Connected rescue device does not reach its specific performance data	Maximum permitted operating pressure of the pump is not reached	Have the pressure limiting valve reset or repaired by authorised dealer or directly by LUKAS
	Pump or connecting block defective	Have repaired by authorised dealer or directly by LUKAS

Trouble	Cause	Solution
Fluid leaks from the hydraulic fluid reservoir (especially from the filler screw)	Return of the hydraulic fluid from the rescue device exceeds the reservoir's maximum quantity when filled.	Reduce the level in the hydraulic fluid reservoir to the mark on the dipstick or inspection glass
	Defective seal	Have repaired by authorised dealer or directly by LUKAS
Leaking fluid between engine and flange bearing	Radial shaft seal on the drive shaft is defective	Have repaired by authorised dealer or directly by LUKAS
Hydraulic fluid milky and cloudy	Water / condensation in the system	Immediately replace hydraulic fluid
<u>With mono-coupling-system:</u> hose assembly cannot be coupled	Pressure too high (e.g. caused by excessive ambient temperature)	Switch valve block to circulation at static pressure
		For the ISV valve: Have repaired by authorised dealer or directly by LUKAS
	Coupling defective	Coupling needs to be replaced immediately
<u>With mono-coupling-system:</u> It is frequently not possible to couple hose assemblies	Hydraulic fluid not adapted to the application situation	Hydraulic fluid must be replaced (see chapter "Recommended hydraulic fluids")
	Coupling defective	Coupling needs to be replaced immediately
<u>With quick-disconnect coupling system:</u> hose assembly cannot be coupled	Pressurised	Switch valve block to circulation at static pressure
		For the ISV valve: Have repaired by authorised dealer or directly by LUKAS
	Coupling defective	Coupling needs to be replaced immediately
<u>With mono-coupling-system:</u> Leak in the couplings	Coupling defective	Coupling needs to be replaced immediately

Trouble	Cause	Solution
<u>With quick-disconnect coupling system:</u> Leak in the coupling (male)	Safety valve reacted	After pressure release, there is no more leakage.
	Coupling (male) defective	Coupling (male) needs to be replaced immediately
<u>With quick-disconnect coupling system:</u> Leak in the coupling (female)	Female coupling defective	Female coupling needs to be replaced immediately
Hydraulic fluid leak on the hoses or the connections	Leak, possible damage	Replace hoses
Damage on the surface of the hydraulic hoses	Mechanical damage or contact with aggressive agents	Replace hoses

If it is not possible to rectify the malfunctions, inform an authorised LUKAS dealer or the LUKAS Customer Service department immediately!

The address for the LUKAS Customer Service department is:

LUKAS Hydraulik GmbH

Weinstraße 39, D-91058 Erlangen
Postfach 2560, D-91013 Erlangen

Tel.: (+49) 09131 / 698 - 348

Fax.: (+49) 09131 / 698 - 353



REMARK:

Before shipping units of the type P620x, the locking screw for transport protection must be bolted onto the unit once again. (Reverse order as shown in the chapter "Set-up and start-up").

14. Notes



WARNING / DANGER / CAUTION!
Before connecting equipment, make sure that all the **components used** are suitable for the **maximum operating pressure of the hydraulic unit!** In cases of doubt, you **must consult** LUKAS directly before connecting the equipment!



Please dispose all packaging materials and dismantled parts properly.

LUKAS Hydraulik GmbH

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