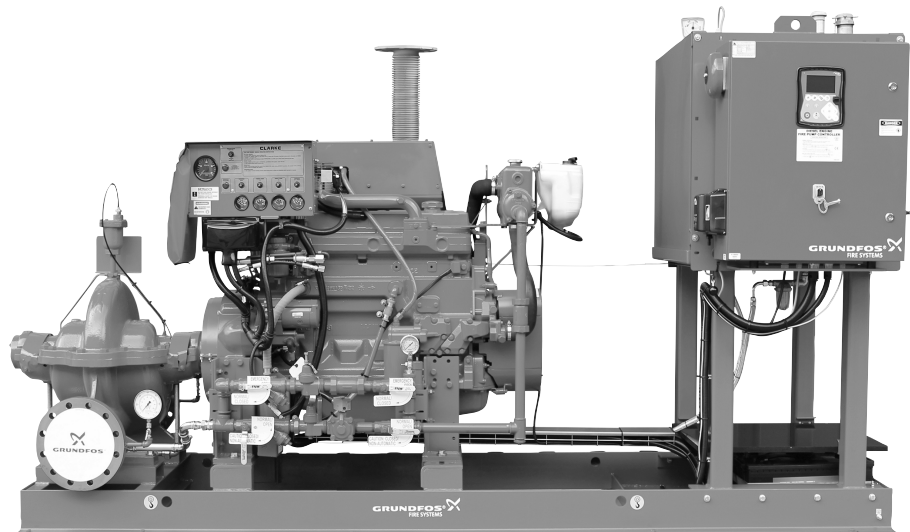


Fire HSEF FM Europe

Diesel-powered firefighting system

Installation and operating instructions



Original installation and operating instructions.

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1. General warning

Warning



Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

Warning



The use of this product requires experience with and knowledge of the product.

Persons with reduced physical, sensory or mental capabilities must not use this product, unless they are under supervision or have been instructed in the use of the product by a person responsible for their safety.

Children must not use or play with this product.

2. Symbols used in this document



Warning
If these safety instructions are not observed, it may result in personal injury.



Warning
If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or death.



Warning
The surface of the product may be so hot that it may cause burns or personal injury.



Warning
The sound pressure level is so high that hearing protection must be used.

Caution

If these safety instructions are not observed, it may result in malfunction or damage to the equipment.

Note

Notes or instructions that make the job easier and ensure safe operation.

The instructions below placed on the fire pump set must be observed and must be legible at all times:

- direction of rotation arrow
- labelling of pipe connections
- stickers with safety instructions.

3. General information

These installation and operating instructions apply to HSEF pumps approved by FM in accordance with:

- FM class 1311.

Furthermore these installation and operating instructions apply to fire pump sets in accordance with the following standard:

- NFPA 20.
- FM data sheet 3-7.

The document includes the basic information needed for operating the complete pump set and the diesel engine.

See also installation and operating instructions for the controller, engine and coupling.

3.1 Further documentation

This document is to be used together with the following documentation:

- installation and operating instructions for the controller
- installation and operating instructions for the engine
- installation and operating instructions for the coupling
- wiring diagram for the controller
- installation and operating instructions for the pressure transmitter
- service instructions for individual components
- data booklet for pump sets
- data booklet for engine.

3.2 Warranty

The warranty is according to our general terms of delivery. Liability for any damage which is a result of errors during installation, electrical connection or incorrect use is excluded. Liability for consequential damage is excluded. The start of the warranty period is to be verified.

3.2.1 Engine warranty

In order to ensure that warranty issues can be handled correctly, every engine needs to be registered at the manufacturer's website.

1. Go to <http://www.clarkefire.com/>.
2. Choose category "SERVICE, PARTS & WARRANTY".
3. Choose "Warranty".
4. Choose between two categories: either "Clarke/John Deere Online Warranty Registration" or "Other Engine Manufacturers Online Warranty Registration" depending on the manufacturer of the engine. You find the name of the manufacturer on the nameplate of the engine.
5. Fill out the form.
6. Submit the registration. When the registration is completed successfully, you will receive an acknowledgement.

3.3 Receipt of product

The pump set is delivered from factory in a wooden crate or in a closed box made of wood/plywood designed for transportation with forklift or a similar vehicle.

Note

Check the pump set carefully for transport damage and missing parts on delivery. Transport and store it correctly before installation.

3.3.1 Lifting the pump set

Warning

When lifting the entire pump set, use the lifting eyes specifically marked on the base frame. Never use the lifting eyes of the individual components.

The lifting point should always be above the centre of gravity of the pump set. See fig. 1. Alternatively, a forklift suitable for the weight can be used.

Use certified and approved lifting equipment in proper condition. See the weight specification on the system nameplate located on the base frame *near the pump*.

Only transport the pump set when the cabinet door is closed and locked. Otherwise, there is a risk of jamming.

Do not stand under or near the fire pump set during lifting. When guidance needed for placing the pump set; use wires - do not touch the pump set.

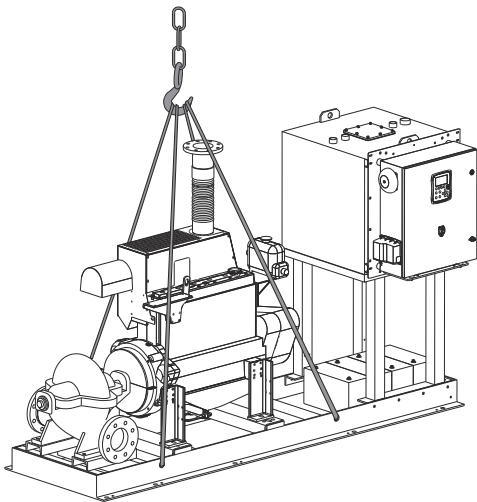


Fig. 1 Lifting the complete pump set

3.3.2 Storage

Note

Store the pump set in a frost-free place in order to avoid corrosion and damage.

3.3.3 Pump

Apply a suitable antirust agent on all machined, non-coated surfaces. If the pump is to be stored for more than six months before startup, treat the inner pump components with a suitable antirust agent.

The antirust agent must meet these requirements:

- It must not attack rubber parts.
- It must be easy to remove.
- It must be applied in accordance with the manufacturer's instructions.

In order to prevent water, dust, etc. from penetrating the pump, cover all openings appropriately until the pipes are installed. If this is not followed, it will be very expensive to dismantle the pump to remove foreign bodies after commissioning.

Turn the pump shaft by hand once a month to prevent the shaft seal from seizing up. To do this, disconnect the diesel engine from the pump.

3.3.4 Engine

See the installation and operating instructions for the engine.

3.3.5 Coupling

See the installation and operating instructions for the coupling.

3.3.6 Controller

See the installation and operating instructions for the controller.

4. Product description

4.1 Pumped liquids

The pump is suitable for pumping clean and non-aggressive fire-extinguishing water not containing additives or particles.

4.2 Applications

Grundfos HSEF pumps and Fire HSEF pump sets are designed for firefighting applications for supplying water to hose reels, fire hydrants or sprinkler systems. Do not use the pump sets for ordinary pumping of liquids or pressure boosting.

The control cabinet must not be used to supply voltage to other devices.

Warning



Only use the pumps and pump sets for the applications mentioned. Any other use is considered improper. Grundfos cannot be held responsible for damage caused by improper use. The risk is carried solely by the operator.

4.3 Pump set

The complete pump set consists of a pump, a diesel engine and a controller. A flexible coupling connects engine and pump.

All components are adapted to each other and mounted on a common base frame ready for installation. The base frame has holes for fastening lifting equipment and holes for attaching it to the floor. The pump set is delivered ready to use.

The fuel tank can be delivered separately in some options.

For installation and connection of fuel pipes, see section 6.9 *Separate fuel tank*.

The most important components of the pump set are shown in figures 2 and 3.

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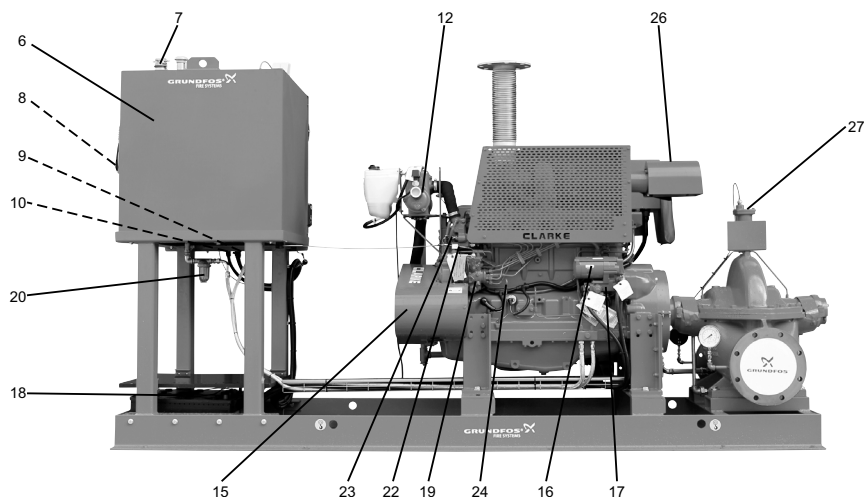


Fig. 2 Example of a diesel-powered Fire HSEF pump set, right view

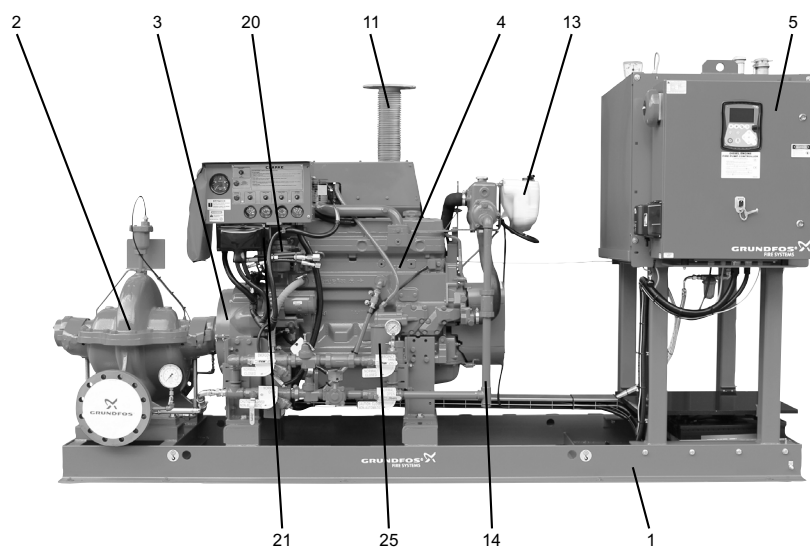


Fig. 3 Example of a diesel-powered Fire HSEF pump set, left view

Pos.	Component
1	Base frame
2	Pump
3	Coupling with coupling guard
4	Engine, complete
5	Controller
6	Fuel tank
7	Tank cap
8	Manual filling pump
9	Fuel valve (hidden)
10	Drain screw on fuel tank (hidden)
11	Exhaust pipe
12	Heat exchanger
13	Equalisation tank
14	Cooling circuit

Pos.	Component
15	Generator with V-belt and cover
16	Starter
17	Starter relay
18	Starter batteries
19	Diesel injection pump
20	Fuel filter
21	Fuel delivery pump
22	Speed setting
23	Stop lever
24	Oil dipstick
25	Oil filter
26	Air filter
27	Automatic air relief valve

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4.4 Pump

The pump is a non-self-priming, single-stage Grundfos HSEF standard pump with volute casing. It has a radial suction port and a radial discharge port with ANSI B 16.5 compliant flanges. For technical data see page 24 chapter 15.3.1 *Permissible flange forces and flange torques*.

The impeller diameter can be reduced to customise the pump performance to a certain duty point. This means that the actual impeller diameter differs from the standard diameter stated in sales catalogues, data sheets, etc. The actual impeller diameter is stated on the pump nameplate.

The HSEF pump is equipped with a stuffing box seal.

4.5 Engine

The pumps are driven by a stationary 4-stroke diesel engine from John Deere or Doosan which has been specially adjusted to the pump drive requirements of Clarke UK Ltd.

The rated engine power is adapted to the power requirement of the pumps. The adjustment is made via the engine speed and consequently this must not be changed. See appendix page 27 and section 1. *Dimensions and weights* for relationship between the diesel engines and the individual pumps. Depending on performance, the engines have a turbocharger and, if necessary, also a charge air cooler.

Caution The fuel injection pump has been set from factory, and the setting must not be changed.

The engine is cooled via a heat exchanger in the water-cooled John Deere and Doosan engines. The coolant is led to the heat exchanger via a pipe connected to the discharge port of the pump.

5. Identification

5.1 Pump

5.1.1 Nameplate

The nameplate shows all important data of the pump. It is attached to top of the pump.

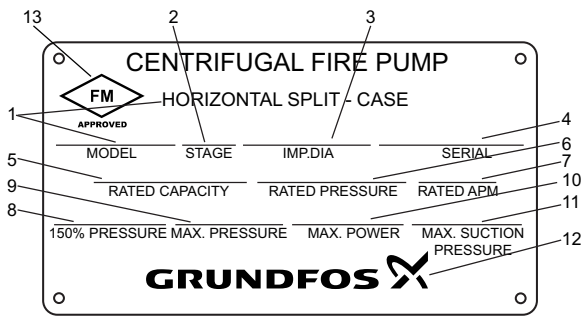


Fig. 4 Nameplate of a HSEF pump with FM approval

Pos.	Description
1	Pump type and model
2	Number of stages
3	Actual impeller diameter [mm]
4	Serial number
5	Rated flow Q [l/min]
6	Rated head H [m]
7	Rated speed n [rpm]
8	Head at 150 % flow [m]
9	Maximum operating pressure [bar]
10	Maximum pump power [kW]
11	Maximum suction pressure [bar]
12	Manufacturer
13	Approval

5.2 Pump set

5.2.1 Nameplate

The nameplate shows all important data of the pump set. It is attached to the base frame.

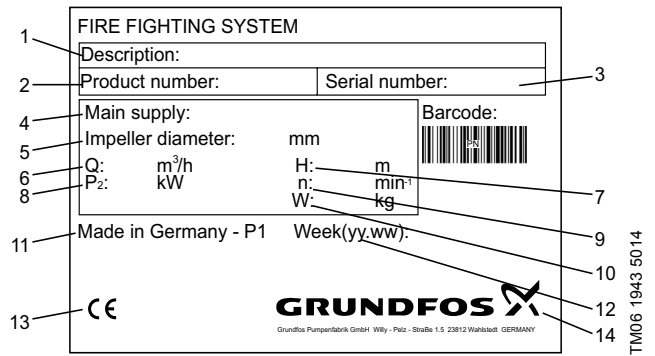


Fig. 5 Nameplate of an FM pump set

Pos.	Description
1	Type designation
2	Product number
3	Serial number
4	Engine type
5	Impeller diameter [mm]
6	Rated flow rate Q [m³/h]
7	Head H [m]
8	Rated engine power P2 [kW]
9	Rated speed n [min ⁻¹]
10	Weight [kg]
11	Country of origin
12	Production date (year and week)
13	CE mark
14	Manufacturer

5.3 Type key

Example	Fire	HSE	F	4	-12	/265	D	C	A	L	S	A	C	C
Grundfos firefighting systems														
Pump type														
Pump for firefighting														
Nominal diameter of discharge port [inch]														
Pump housing size [inch]														
Actual impeller diameter [mm]														
Driver type														
D: Diesel engine														
E: Electric motor, 50 Hz														
F: Electric motor, 60 Hz														
Driver brand, diesel-powered														
C: Clarke JU4H														
D: Clarke JU6H														
E: Clarke DP6H														
F: Clarke DQ6H														
G: Clarke DR8H														
L: Clarke LC2A														
M: Clarke LC3A														
N: Clarke JW6H														
O: Other														
Driver brand, electric-powered														
H: Hoyer														
S: Siemens														
O: Other														
Approval/standard														
A: FM approved and according to NFPA-20														
B: FM/UL listed and according to NFPA-20														
C: LPCB listed and according to BS EN 12845														
D: CNBOP approved and according to VdS CEA 4001														
E: Non-listed and according to VdS CEA 4001														
F: Non-listed and according to NFPA-20														
G: Non-listed and according to CEA 4001														
H: Non-listed and according to EN 12845														
I: APSAD referenced and according to NEF 12845														
J: Non listed and according to DBI 251 4001														
K: Non-listed and according nothing														
S: Customized systems														
Class														
H: High spec														
L: Low spec														
N: None														
Shaft seal														
A: BAQE														
S: Stuffing box														
Pipe connection														
A: ANSI flange according to ANSI B 16.5														
D: DIN Flange according to EN 1092-2														
Design														
Pump set with diesel engine														
C: Compact (all components on a common base frame)														
F: Flex (controller and tank delivered separately)														
B: Flex B (fuel tank delivered separately)														
V: VdS DACH (according to German environmental standard)														
Pump set with electric motor														
B: Basic (without controller)														
C: Compact (all components on a common base frame)														
F: Flex (controller delivered separately)														
Coupling														
C: Compact coupling														
S: Spacer coupling														

The example shows an FM compliant Fire HSEF 4-12 pump set with the following components:

- Nominal diameter of discharge port of 4 inch.
- Pump housing size of 12 inch.
- Actual impeller diameter of 265 mm.
- Driver type is a diesel engine.
- Diver brand is a Clarke JU4H.
- FM approved and according to NFPA 20.
- Class: low spec.
- Shaft seal: Stuffing box.
- Pipe connection: ANSI flange according to ANSI B 16.5 pipework connection.
- Design: compact.
- Coupling: compact coupling.

6. Mechanical installation

This section describes the installation of a complete pump set.



Warning

You must not disconnect any parts of the entire pump set without guidance by Grundfos Service.

Warning

Use personal protective equipment when carrying out commissioning, maintenance and test in order to prevent or minimise the risk of personal injury if other measures cannot be taken.



Such equipment must comply with the requirements specified by the main contractor or operator of the operations room or the site in question.

Minimum requirements are well-fitting clothing, protective gloves, hearing protection, safety goggles and safety shoes.

Caution

The installation should be carried out by qualified staff in accordance with the following instructions.

Note

Observe also the instructions in the standards applying to this product.

6.1 Pump set location

Warning

Pump set with diesel engine:

Ensure an adequate supply of air for the combustion engine and an adequate removal of heat and exhaust.



Non-compliance or impairment of the ventilation or exhaust system may result in suffocation of people.

Lubricants, fuels or other highly volatile or combustible materials must not be stored near the diesel engine. Such materials must be stored in a suitable, separate room.

Place the pump set in a dry, frost-free, well-illuminated and well-ventilated location. The pump set, primarily the control cabinet, must not be exposed to direct sunlight.

Allow sufficient clearance around pump and engine to enable maintenance and operation.



Warning

The area around the pump set must be cleaned and cleared to avoid personal injury due to slipping and falling.

6.1.1 Ventilation

For optimum room ventilation, the air supply ventilator and air discharge must be located on opposite walls. The pump room temperature must be minimum 10 °C.

Ventilation must be provided for the following functions:

1. To control the maximum temperature to 25 °C at the engine air filter inlet with the engine running at rated load.
2. To supply air for engine combustion.
3. To ensure adequate cooling for air-cooled engines.
4. To remove any hazardous vapour.
5. To ensure sufficient oxygen in the breathing air.

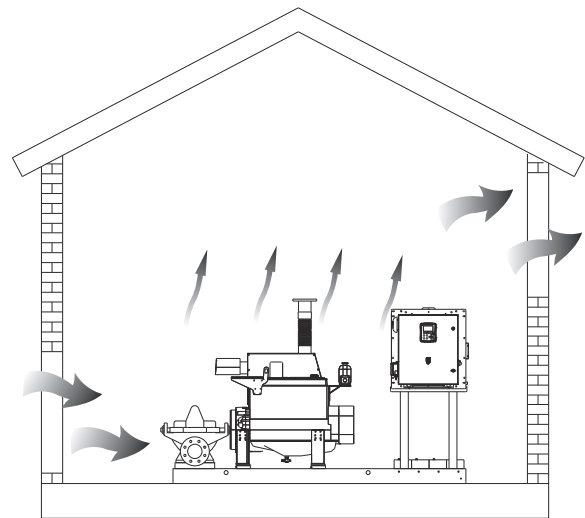
Water-cooled engine

You can use the following as a rule of thumb when removing radiated heat from the engine.

Minimum air flow through the pump room:

- 0.1 m³/min per kW of engine gross power

For further information, see the installation and operating instructions for the engine.



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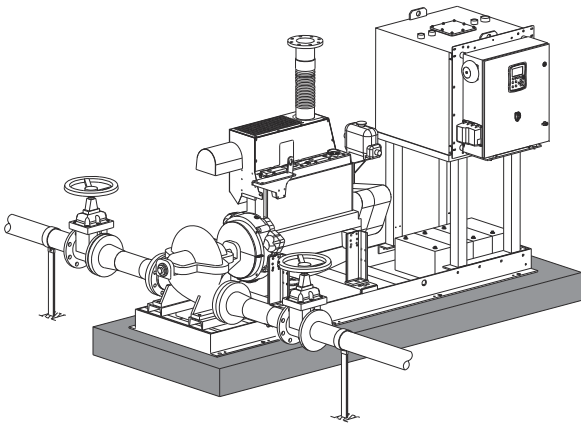
Fig. 6 Ventilation of the pump room

Install louvres on-site that open as soon as the engine starts. The louvres must be dimensioned according to NFPA 20. This will ensure an adequate amount of fresh air to remove engine heat and combustion from the room.

6.2 Foundation

Note The instructions in this section are recommendations. The plant and machinery installer is responsible for making a correct foundation.

We recommend that you install the pump set on a concrete foundation which is heavy enough to provide permanent and rigid support for the entire pump.



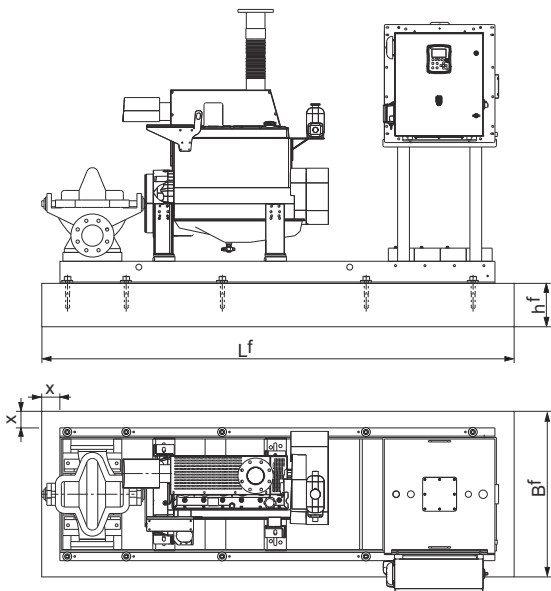
TM06 1864 3314

Fig. 7 Installation example

The foundation must be capable of absorbing any vibration, normal strain or shock.

As a rule of thumb, the weight of the concrete foundation should be 1.5 times the weight of the pump set. The concrete foundation must have an absolutely level and even surface. In the foundation, install appropriate anchorage dowels to fasten the pump set.

Figure 8 shows how to construct the foundation of the pump set. When setting up the foundation, make sure that the foundation is 100 mm (dimension x) larger in length and width than the dimensions of the base frame.



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Fig. 8 Foundation dimensions

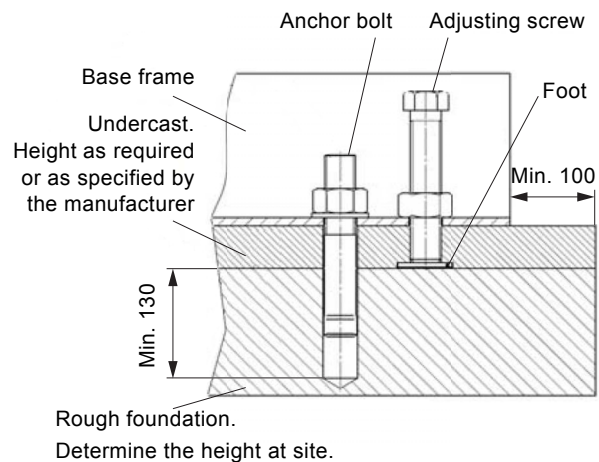
The minimum height of the foundation (h_f) can be calculated as follows, if the mass of the foundation is assumed to be 1.5 times the total mass of the pump set:

$$h_f = \frac{m_{\text{system}} \times 1.5}{L_f \times B_f \times \rho_{\text{concrete}}}$$

The density (ρ) of the foundation is usually taken as 2200 kg/m³. In installations where noiseless operation is particularly important, we recommend that you use a foundation with a mass of up to five times that of the pump set. The minimum height of the foundation (h_f) can then be calculated:

$$h_f = \frac{m_{\text{system}} \times 5}{L_f \times B_f \times \rho_{\text{concrete}}}$$

As ordinary concrete does not set shrink-freely, the resulting gap must be grouted with a suitable, shrink-free hardening and high-strength or reinforced undercast (i.e. Pagel V1 or Eurogrout Premium) to have a force-fit connection between the base frame and the foundation. Before grouting the undercast, align the pump set by means of the adjusting screws used for the base frame. See fig. 9.



TM05 2547 0212

Fig. 9 Aligning the pump set

For grouting the undercast, make a shuttering on the raw foundation. Mix the grouting compound according to the manufacturer instructions and pour it into the shuttering. Wait until the specified hardening time has past before fixing the pump set on the foundation by means of anchor bolts. Anchor bolts are available as an accessory (P/N 97947677).

Caution

Do not use an installation on stud bolts in connection with additional grouting of concrete. The reason is that the volume of the concrete shrinks resulting in a gap between base frame and concrete. The gap will persist even if the pump set is fixed by means of stud bolts later on. This will lead to increased vibrations during operation.

6.3 Mounting the pump set

Warning

Lift the pump set by means of the lifting eyes of the base frame. Never use the lifting eyes of the individual components.



Use only suitable lifting equipment in proper condition. See also the weight specifications on the nameplate.

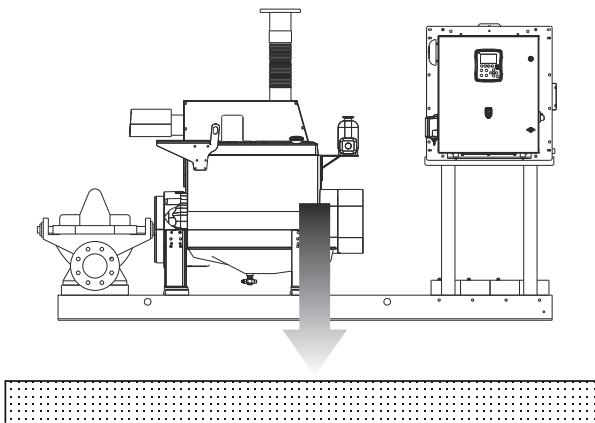
Only transport the pump set when the cabinet door is closed and locked.

Warning

The permissible floor loading must not be exceeded. The weight of the pump set is stated on the nameplate

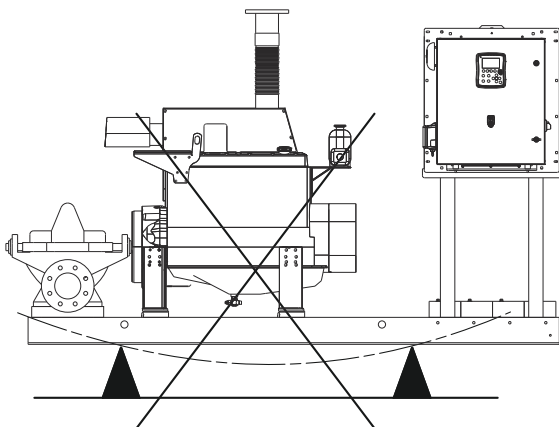


Place the pump set on the foundation and secure it with anchor bolts. The entire base frame must be supported. See fig. 10 and fig. 11.



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Fig. 10 Correct installation



TM06 2420 4214

Fig. 11 Incorrect installation

6.4 Alignment

Caution

Careful alignment is important for a long service life of the coupling. This is particularly important at increased engine speed. Follow the instructions of the coupling manufacturer.

Note

The alignment should be made before connecting the pipes; if not, it may not be possible to move the pump, and it will be difficult to move the driver.

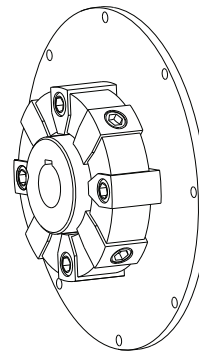
When a complete pump set comes pre-assembled from the factory, the coupling has been accurately aligned by means of shims inserted under the pump and engine.

During transport and installation, the pump/driver alignment may have been affected. Therefore always check the alignment when the pump set has been installed.

Check the final alignment when the pump has obtained its operating temperature under normal operating conditions.

6.4.1 Pump with diesel engine

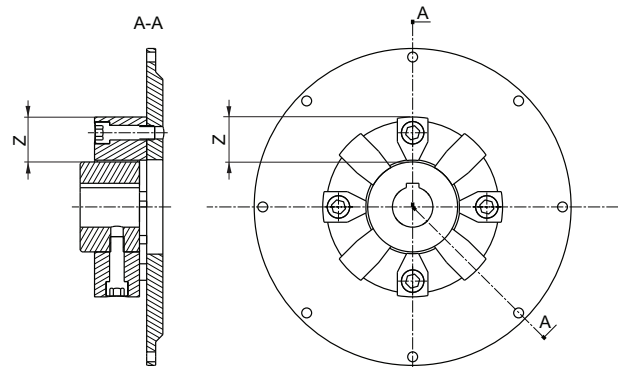
A flexible coupling connects engine and pump. See fig. 12.



TM03 7776 4906

Fig. 12 Flexible coupling between pump and engine

The coupling is fixed axially on the engine fly-wheel. The pump shaft is pushed on axially and fixed radially with four screws. See fig. 13. For further information, see the installation and operating instructions for the coupling.



TM03 7777 4906

Fig. 13 Connection of pump/engine

Checking the alignment



Warning

Disconnect the battery cable before you remove the coupling guard.

Beware of the sharp edges of the coupling guard. Wear protective gloves.

1. Disconnect the negative pole of the starter battery.
2. Remove the coupling guard.
3. Check the alignment according to *the installation and operating instructions for the coupling*.
4. Refit the coupling guard.
5. Reconnect the negative pole of the starter battery.

Aligning pump and engine



Axial and radial screws can be reused maximum three times.

Do not use threadlocker as it may damage the rubber material.

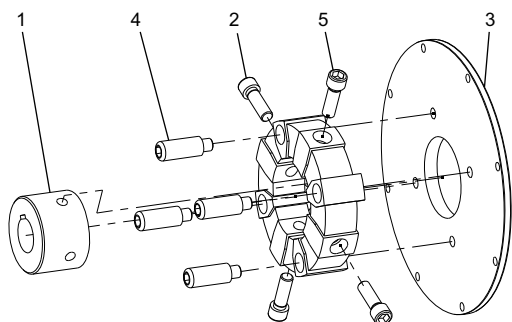


Fig. 14 Axial and radial fixation of the clamping hub of the coupling

6. Align the coupling according to the installation and operating instructions for the coupling.



Warning

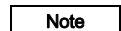
After checking or adjusting the alignment, fit the coupling guard.

6.5 Pipe connection



The pipework must not stress the pump housing or transfer any forces to the pump housing.

See permissible flange forces and torques in section 15.3 *Pump*.



The discharge pipe must have a port for venting and priming the pump. See section 8.2 *Preparations before commissioning*.

The pipes must be installed as straight as possible and be of an adequate size. Take the pump inlet pressure into consideration. Install the pipes so that air locks are avoided. This applies especially to the suction side of the pump. See fig. 15.

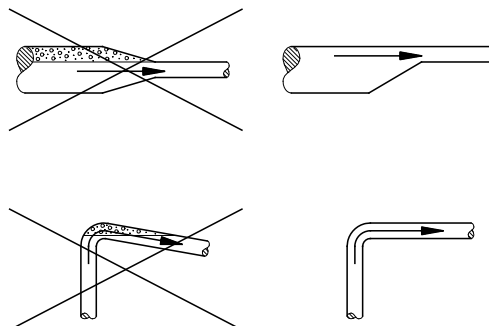


Fig. 15 Installation of pipes

Secure the pipes close to the pump on the suction and discharge side with pipe brackets attached to the building (wall, ceiling, floor). See fig. 16.

The pipes should lie true against the pump flanges without being stressed. Otherwise, the pump may be damaged.

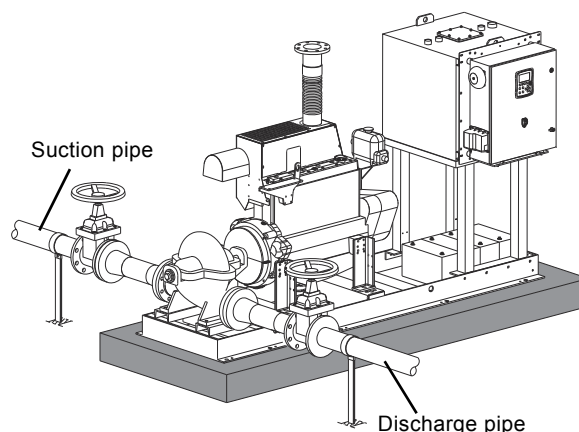


Fig. 16 Fixing points of the pipes

Install isolating valves on both sides of the pump.

Connect the suction pipe to suction pump port and the discharge pipe to the discharge pump port.

6.6 Priming tank and test pipe

If the pump set is supplied from a storage tank and the suction height is negative, install a pump priming tank on the suction side in accordance with local regulations. See also the standard applying to the pump set.

Install a test pipe running from the discharge pipe to the storage tank. The discharge pipe and the test pipe must be fitted with isolating valves.

If the pump set is fed directly from the public water supply, the test pipe must have a free outlet according to the standard applying to the pump set.

TM04 0058 4907

TM00 2263 3393

TM06 1864 3314

6.7 Connecting the cooling system

Water-cooled diesel engines are cooled by a flow of water through a pipe connected to the heat exchanger via a cooling circuit.

The cooling circuit consists of the pipework with both a main pipe and a bypass pipe, isolating valves, pressure reduction valves, filters, a pressure gauge as well as a solenoid valve.

See figs. 17 and 18.

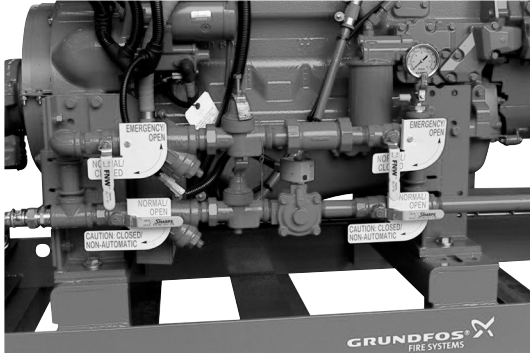


Fig. 17 Cooling circuit with bypass

Install a pipe on the discharge side of the heat exchanger. See fig. 18. The nominal diameter of the pipe must not be smaller than the outlet of the heat exchanger (1 1/4" or 1 1/2").

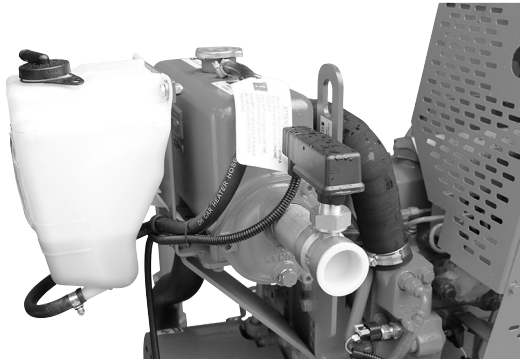


Fig. 18 Heat exchanger with flow switch

6.7.1 Minimum pressure

To ensure correct cooling of the motor, there must be the below-mentioned pressure after the dirt trap.

Type	Pressure [bar]
Cooling water returned to storage tank	2.0

6.7.2 Filter in cooling circuit

The isolating valves in the bypass pipework are closed during normal operation. Only open the valves if the filter in the main pipe is fouled and thus keeps the cooling water from cooling the motor. A fouled filter will result in lack of pressure on the pressure gauge.

6.8 Exhaust system

Note This section applies to pump sets with diesel engine.

Warning
 Exhaust must be directed safely to the open air through the exhaust system.
 Exhaust must not escape indoors. Operation without an exhaust system is not safe.

Warning
 Make sure that persons cannot accidentally come into contact with hot exhaust pipes.

Warning
 When welding the engine exhaust pipe to the main exhaust pipe wear, use the following: protective gloves, protective clothes suitable for the work, an approved safety helmet for welding and safety shoes.

Install the exhaust pipes as straight and with as few bends as possible. Install the supplied silencer horizontally after the first 90 °-bend seen from the engine outlet.

Arrange the exhaust system so that no condensation water can enter the engine. Attach the exhaust system to the building. Connect the exhaust pipe to the flexible exhaust port of the engine. The exhaust port is covered for transportation by a plastic plug which must be removed before connecting the exhaust pipe. See arrow in fig. 19. The flexible connection on the engine must not be used to compensate for misaligned pipework.

Warning
 The exhaust flange seal must be mounted and the flange must be tightened to 220 Nm.
 Retighten all flange bolts after commissioning and cooling down

The minimum diameter of the exhaust pipes must not be smaller than the exhaust port of the engine.

The diameter of the exhaust pipes depends on the pipe length, the type and number of silencers and the bends, as all will affect the flow resistance. In order not to exceed the exhaust counterpressure specified by the manufacturer of the diesel engine, it may be necessary to use pipes with a nominal diameter one or two sizes larger than the engine outlet.

Note



Fig. 19 Exhaust port of the engine

Note The exhaust port is installed with ANSI B 16.5 exhaust flanges

6.9 Separate fuel tank

Note Observe the standards when sizing and installing a separate fuel tank.

You can also install the fuel tank separately in some designs. In these cases, install the fuel tank in a dry and well-ventilated room and as close as possible to the pump set.

6.9.1 Fuel tank installation

The fuel tank outlet must be placed higher than the centerline of the high pressure fuel pump at the engine. The two separate concrete foundations must be in same level $h_1 = h_2$.

Placing the pump set (1) and fuel tank (2) at the same level ensures gravity supported feeding of fuel to the high pressure fuel pump at the engine. See fig. 20.

Warning

Caution Make sure that the base of the fuel tank is installed at the same level as the pump and engine base frame.

The fuel tank must be fastened to the foundation with the mounting brackets.

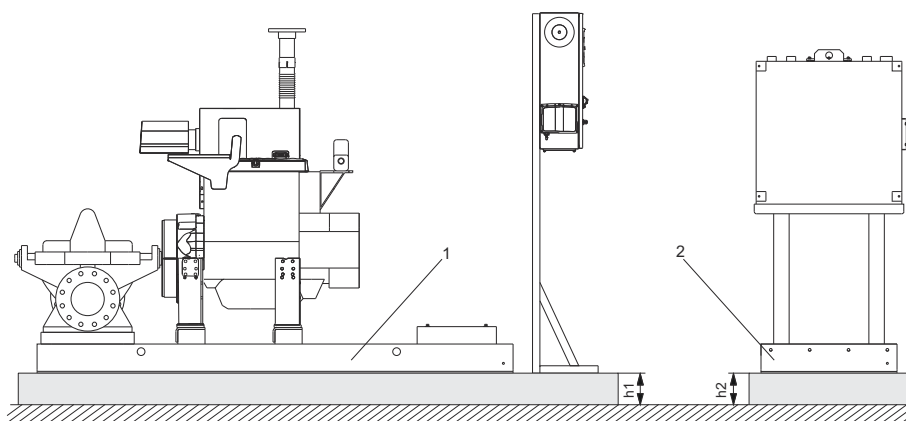


Fig. 20 Example, correct installation of fuel tank.

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6.9.2 Fuel tank connection

If there is no connecting block, connect the fuel pipes as shown in fig. 21 to the flow pipe (pos. A, from the manual fuel supply pump) and the return pipe (pos. B, from the injection pump).

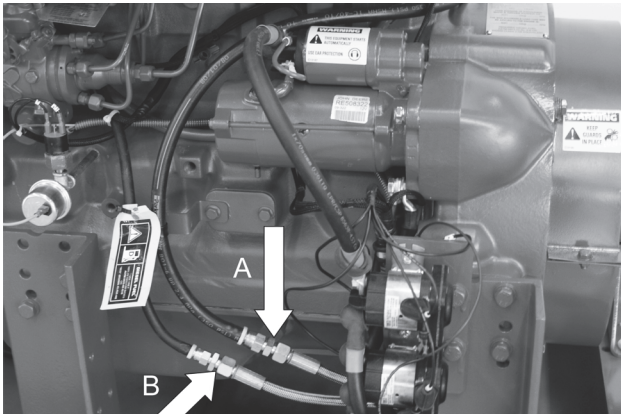


Fig. 21 Connecting the fuel pipes without connecting block.

If there is a connecting block (see fig. 21, pos. A), connect both fuel pipes to the connecting block. The connecting block is marked "SUPPLY" for the incoming pipe and "RETURN" for the return pipe.



Fig. 22 Connecting the fuel pipes to the connecting block

6.10 Separate control cabinet

6.10.1 Flex version

For the "Flex" version, the control cabinet is mounted onto the separate fuel tank. In this case, place the controller as close to the pump as possible and within view of the pump set. The control cabinet must also be easily accessible.

6.10.2 Flex B version

For the "Flex B" version, the control cabinet is delivered on a separate stand. In this case, place the controller as close to the pump as possible and within view of the pump set. The control cabinet must also be easily accessible.

Note See also installation and operating instructions for the controller.

Warning

Make sure that water escaping from the pump or pipework cannot damage the control cabinet.

Caution The control cabinet is only intended to be installed indoors and must not be exposed to direct sunlight. Ensure sufficient ventilation for the components in the control cabinet.

6.11 Mechanical fuel level indicator

Upon arrival of the fire set, the mechanical fuel level indicator is not pre-installed. The fuel level indicator is stored in the base frame.

Caution Install the fuel level indicator before filling the tank.

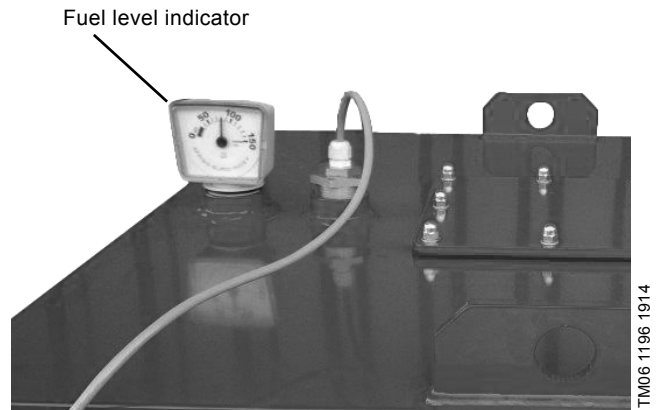


Fig. 23 Fuel level indicator

Installing the fuel level indicator

1. Remove the plastic cap from the connection on the top of the fuel tank.
2. Adjust the indicator disc on the display to equal 100 when the weight is in top.
3. Install the mechanical fuel level indicator. Ensure that the display is facing the same direction as the controller.

6.12 Fuel hand pump

The pump set is equipped with a fuel hand pump. See fig. 2. Use the fuel hand pump to manually pump diesel fuel from transportable containers into the fuel tank. The fuel hand pump is designed for this purpose only. Fuel must not remain in the plastic hoses. The plastic hoses are supplied together with the fuel hand pump.

6.13 Leaklines

The Fire HSEF pump is equipped with leaklines. The leaklines drains excessive water from the stuffing box. The leaklines must be connected to drain. See fig. 24.

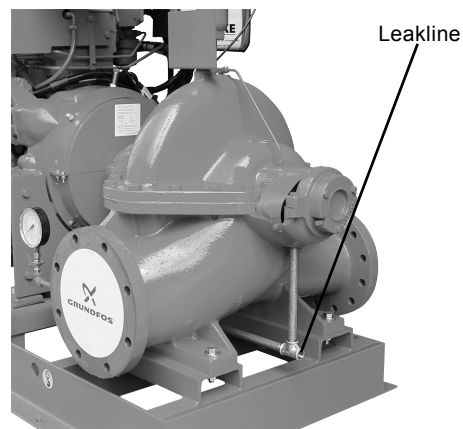


Fig. 24 Leakline

7. Electrical installation



Warning
The electrical installation must be carried out by authorised staff in accordance with local regulations and the wiring diagram in the control cabinet.



Warning
Switch off the power supply before making connections.

Note See installation and operating instructions for the controller.

7.1 Mains

Check that the supply voltage and frequency correspond to the values stated on the nameplate of the control cabinet.

- Connect the control cabinet to a power supply which is dimensioned to the fire pump set.
- Connect PE (protective earth) according to the installation and operating instructions for the controller.

7.2 Connection to earth

The pump set must be connected to the main earth connection in the electrical installation. The connection point is located in the right lower corner of the base frame. See fig. 25, pos. 1.

- Loosen and remove the nut and spring washer.
- Mount an earth cable between the earth rod in the pump room and the pump set.
- Mount the spring washer and nut.
- Tighten to 25 Nm.

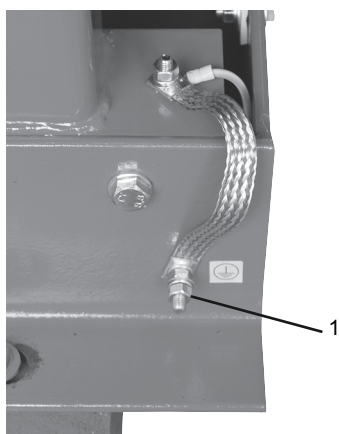


Fig. 25 Earth connection

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7.3 Connection to battery

Caution Before connecting the battery set(s), switch off the power supply by setting the main switch to "O".

12 V version

1. Connect the positive pole of battery 1.
2. Connect the negative pole of battery 1.

The positive pole is marked with red and the negative pole with black. Proceed in the same way with battery 2. See fig. 26.



Fig. 26 Connecting the batteries (12 V version)

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24 V version

One battery set consists of two batteries connected in series at the factory.

1. Connect the positive pole of battery set 1.
2. Connect the negative pole of battery set 1.

The positive pole is marked with red and the negative pole with black. Proceed in the same way with battery set 2. See fig. 27.



Fig. 27 Connecting the battery sets (24 V version)

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8. Commissioning

The diagram in fig. 28 is used as reference.

8.1 Overview of a firefighting application

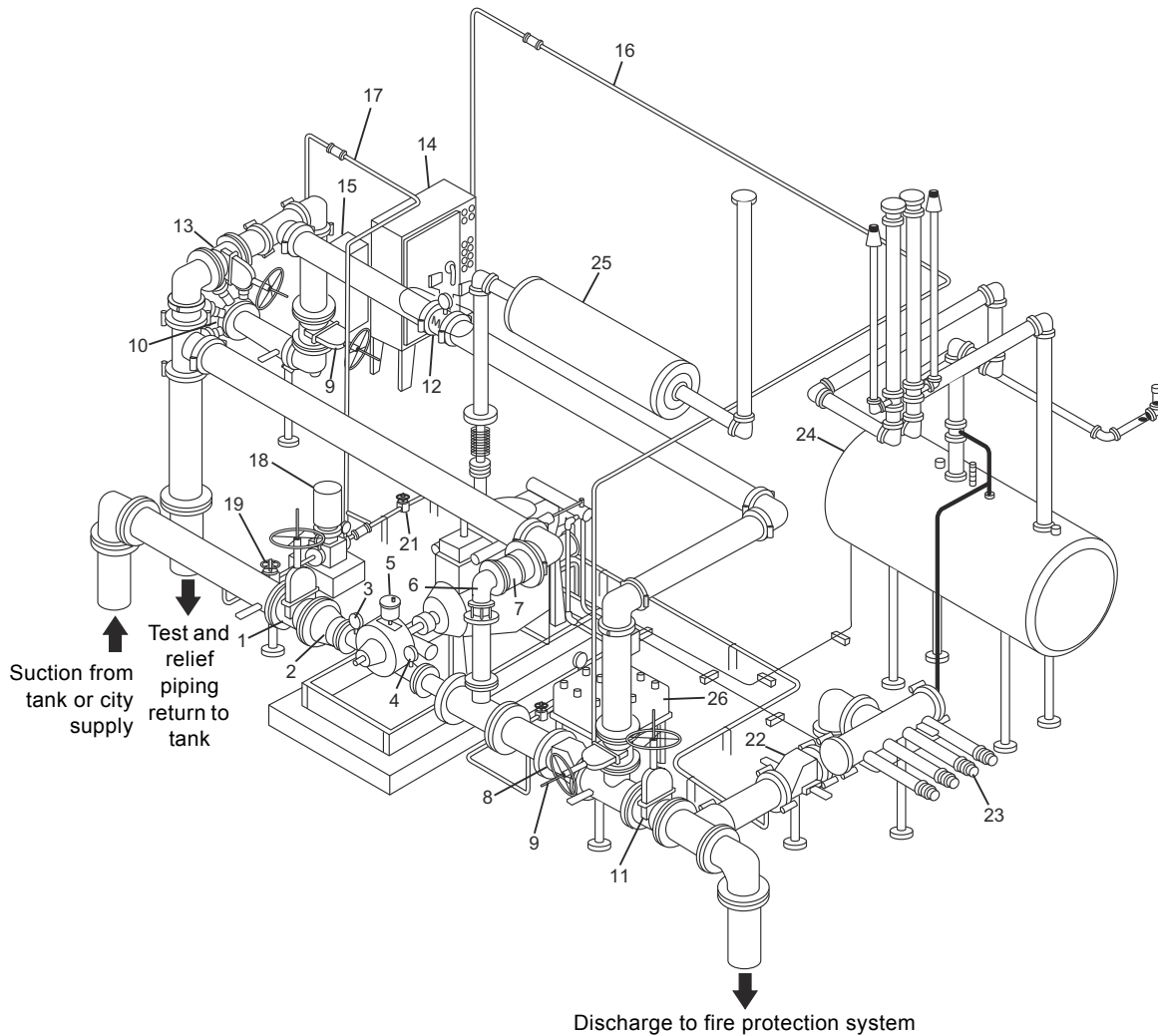


Fig. 28 Overview of a firefighting application

Pos.	Description	Pos.	Description	Pos.	Description
1	OS&Y (outside screw and yoke) gate valve (suction control valve)	10	Test header	19	Isolation valve (jockey pump suction)
2	Eccentric reducer	11	Indicating gate valve or butterfly valve (discharge control valve)	20	Check valve (jockey pump discharge), not displayed
3	Suction pressure gauge	12	Flowmeter	21	Isolation valve (jockey pump discharge)
4	Discharge pressure gauge	13	Indicating gate valve or butterfly valve (flowmeter)	22	Check valve (FDC)
5	Automatic air release	14	Pump controller	23	Fire department connection
6	Pressure relief valve	15	Pressure maintenance pump controller (jockey pump)	24	Diesel fuel tank
7	Relief cone	16	Pressure sensing line (fire pump)	25	Diesel drive exhaust silencer
8	Check valve (pump discharge)	17	Pressure sensing line (jockey pump)	26	Batteries
9	Indicating gate valve or butterfly valve (test header)	18	Pressure maintenance pump (jockey pump)		

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Warning
Commissioning must be carried out by authorised staff.



Warning
The control cabinet of the controller must remain closed during commissioning.

Caution Do not start the pump until it has been filled with water and vented.

Caution The pump must not run against closed valve as this may cause an unacceptable temperature increase or the formation of vapour.

Note See also installation and operating instructions for the controller.

Caution You must not change the engine speed setpoint (rpm).

Pump set with Clarke diesel engine:

We recommend that you register the diesel engine before startup. Otherwise, Clarke cannot provide any warranty if the engine is faulty. Go to www.clarkefire.com: SERVICE, PARTS & WARRANTY.

Note

8.2 Preparations before commissioning

The below listed preparation actions are valid for applications with flooded suction conditions.

1. Check that all screws are tight.
2. Check that all pipes and hoses are installed correctly.
3. Check all electrical connections.
4. Check that all fuses in the control cabinet are switched on.
5. Check the alignment of the coupling. See section *6.4 Alignment*.
6. Check that the coupling guard is installed correctly and that all screws are tightened to 10 Nm for M6 and 25 Nm for M8.
7. Check that all safety devices are installed.
8. Make sure that any storage tank and pump priming tank are filled with water.
9. Set the pressure switches according to the instructions. System pressure minus 0.5 bar can be used as a reference value.
10. Open the isolating valves on the suction and discharge sides. The static geometric suction pressure from the main water tank will fill the suction pipe, discharge pipe and pump with water.

11. Bleed all air from the pump casing and suction pipe by the opening of the automatic relief valve at the top of the pump. Rotate the shaft a few times if possible to evacuate any air trapped inside the impeller passages.
12. Close the isolating valves on the suction and discharge sides.

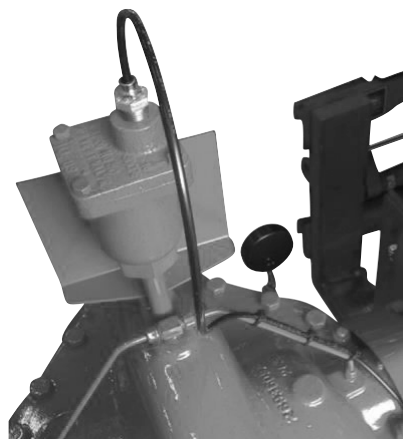


Fig. 29 Air relief valve

8.2.1 Pump set with diesel engine

Caution Check the level of oil and coolant in the engine prior to startup.

Note See installation and operating instructions for the diesel engine.

1. Check the V-belt tension.
2. Check the oil level and refill, if necessary.
3. Check the level of coolant and refill, if necessary.
4. Check that all hose connections in the cooling circuit are tight and leakage-free.
5. Fill the fuel tank with diesel fuel and vent the fuel pipes.

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8.3 Starting the pump set



Warning

Some pump sets have a sound pressure level higher than 70 dB(A). See page 28.

In these cases, wear hearing protection when the pump set is running.

Note

Observe the safety instructions in the installation and operating instructions of the individual components.

Note

See also installation and operating instructions for the controller and diesel engine.

Additional safety instructions for pump set with diesel engine



Warning

Remove the fuel canisters from the room before starting the pump set.



Warning

Fuel vapours are flammable. Do not start the engine if there are fuel vapours in the room.



Warning

Exhaust must be directed safely to the open air through the exhaust system.

Exhaust must not escape indoors.

Operation without an exhaust system is not safe.



Warning

The pump set must not be started without a coupling guard.



Warning

Make sure that persons cannot accidentally come into contact with hot exhaust pipes.

General procedure

1. Open the isolating valve on the suction side (1).
2. Check that the isolating valve on the discharge side is closed (11).
3. Open the isolating valve of the test pipe (9).

Note

Open the fuel valve on the fuel tank and vent the fuel system. See installation and operating instructions for the diesel engine.



Warning

Fuel escaping under pressure can penetrate the skin and cause serious injuries. Always release the pressure before disconnecting the fuel pipes. Re-pressurise when the pipes have been tightened.



Warning

When the pump set is primed, pressurized and the engine is started, check the pump set for any kind of leakage of oil, water or fuel.



Warning

When the engine is started, check for exhaust leakage and abnormal noise level.

Stop the engine immediately if the exhaust system is leaking.

Note

Collect excess fuel in a container and dispose of it in accordance with local regulations.

4. Switch on the controller (14) and start the pump. See installation and operating instructions for the controller.
5. Slowly open the isolating valve (11) on the discharge side of the pump.
6. When the pump reaches operating pressure, open the isolating valve sufficiently to reach the duty point.
7. Measure and read the relevant operating parameters and compare them with the rated values.
8. Stop the pump via the controller and set the pump set to automatic mode. See installation and operating instructions for the controller.
9. Close the isolating valve of the test pipe (9).
10. Check that the isolating valve at the discharge side (11) is fully open.

The pump set is now operational and in automatic mode.

Note

If the pump does not start, see the fault indications on the controller and section 13. *Fault finding*.

8.4 Checking the function

Note

This section applies to pump sets with diesel engine.

In connection with commissioning, perform a final test run according to the standard applying to the pump set:

1. Activate the automatic startup command by lowering the pressure in the discharge pipe with a closed fuel valve.
2. Lower the pressure by opening the isolating valve of the test pipe.

Every starting cycle consists of a starting phase followed by a pause. A failure warning activates after six failed start attempts. When the fuel valve has been opened and the fault indication has been removed, the pump should start properly.

9. Operating the controller

See installation and operating instructions for the controller.

9.1 Shaft seal run-in (stuffing box)

The pumped liquid lubricates the seal faces, meaning that there will be a certain amount of leakage from the stuffing box.

When the pump is started for the first time, or when a new shaft seal is installed, a certain run-in period is required before the leakage is reduced to an acceptable level. The time required for this depends on the operating conditions, i.e. every time the operating conditions change, a new run-in period will be started.

10. Operation

Detailed operation instructions are described in the installation and operating instructions for the controller.

Note Observe the safety instructions in section 8. *Commissioning* and its subsections, as well as in the installation and operating instructions for the individual components.

Note See also installation and operating instructions for the controller and diesel engine.

10.1 Alarm indicators

The most important operating and alarm indications are shown via indicator lights and/or the display of the controller.

See installation and operating instructions for the controller.

If the controller has outputs for connection to a building management system, you can monitor the pump set remotely.

To remove any faults, see section 13. *Fault finding*.

The following four operating modes are possible:

10.2 Automatic operation

Once you have installed and commissioned the pump set according to the instructions, no further operation is necessary. The pump set works automatically and switches itself on as soon as water is taken from the sprinkler system and the pressure switch thus detects a pressure drop.

Note The pump set will not be shut down in case of disruptions.

You can stop the pump set manually via the controller.

10.3 Manual operation

You can also start and stop the pump set manually for a functional test, for restarting or after service work.

Caution Do not leave the pump room during manual operation. Observe all operating and fault indications as the pump set will not stop automatically in case of fault (e.g. too high cooling water temperature or too low oil pressure).

10.4 Emergency operation

Note This function is only available for pump sets with diesel engine.

If the diesel engine does not start up in automatic operation after six start attempts, the automatic operation is blocked. You can start the pump set manually via the controller.

10.5 Weekly test run

Test the function of the pump set during a test run. See the standard applying to the pump set.

Caution Do not leave the pump room during manual operation. Observe all operating and fault indications as the pump set will not stop automatically in case of fault (e.g. too high cooling water temperature or too low oil pressure).

11. Shutdown

Note This section applies to the complete pump set. See also installation and operating instructions for the controller and diesel engine.

Note Shut down is only possible when the pump is not running. If the pump is running, stop it via the controller.

1. Close the isolating valve on the discharge side.
2. Close the isolating valve on the suction side.
3. Switch off the power supply via the controller.

Additional procedure for pump set with diesel engine

1. Close the fuel valve on the fuel tank.
2. Disconnect the positive pole first and then the negative pole of the batteries.

We recommend that you drain the fuel into a suitable container.

12. Maintenance



Warning
Maintenance must be carried out by authorised staff.

Warning
Personal protective equipment must be used when carrying out commissioning, maintenance and test in order to prevent risk of personal injury if other measures cannot be taken.



Such equipment must comply with the requirements specified by the main contractor or operator of the operations room or the site in question.

Minimum requirements are well-fitting clothing, protective gloves, hearing protection, safety goggles and safety shoes.



Warning
Make sure that persons cannot accidentally come into contact with hot surfaces, liquids or exhaust pipes.

The operator is responsible for ensuring that all maintenance, inspection and installation work is performed by qualified staff according to local regulations and the standard applying to the pump set. A regular maintenance plan will help avoid expensive repairs and contribute to trouble-free, reliable operation.

Note



Warning
Before starting work on the pump set, make sure that the pump set has been switched off and cannot be accidentally switched on.

Note

Observe local regulations, the standard applying to the pump set and the installation and operating instructions of the individual components.

Note

See also installation and operating instructions for the controller and diesel engine.

12.1 Preparation before maintenance

1. Close the isolating valve on the discharge side.
2. Close the isolating valve on the suction side.
3. Switch off the power supply via the controller.

Additional procedure for pump set with diesel engine

1. Close the fuel valve on the fuel tank.
2. Disconnect the positive pole first and then the negative pole of the batteries.

12.2 Maintenance interval

Note The list below is not complete. See also the standard applying to the pump set.

If not otherwise stated in the standard applying to the pump set or in the installation and operating instructions of the individual components, we recommend that you observe the following maintenance intervals:

Complete pump set

Action	Weekly	Monthly	Yearly	Every two years
Check that all screws are tight	x			
Check safety devices	x			
Check electrical connections			x	
Check pump/driver alignment			x	
Carry out test run	x			
Check for leakages	x			

Diesel engine

Action	Weekly	Monthly	Yearly	Every two years
Check fuel level in fuel tank	x			
Check fuel system	x			
Check exhaust system	x			
Check cooling system	x			
Change coolant				x
Check battery condition and liquid level		x		
Check oil level	x			
Change oil and oil filter			x	
Replace fuel filters			x	
Check V-belt		x		
Replace V-belt				x
Check air filter	x			
Replace air filter				x
Replace batteries				x

Controller

Action type	Weekly	Monthly	Yearly	Every two years
Test indicator light	x			
Check cables and connections			x	

12.3 Pump set

- Check that all screws are tight and not corroded.
- Check all safety devices such as coupling guard.
- Check that all electrical connections are tight and intact.
- Replace defective cables and tighten loose connections.
- Check the alignment of the pump and driver. See section 6.4 *Alignment*.
- Carry out a test run according to the standard applying to the pump set. See section 10. *Operation*.

12.4 Shaft seal

Mechanical shaft seals are maintenance-free and almost leak-free. In case of considerable and increasing leakage, check the shaft seal immediately. If the seal faces are damaged, replace the entire shaft seal. See service instructions for the pump and section 9.1 *Shaft seal run-in (stuffing box)*.

12.5 Bearings

The maintenance-free bearings in the pump are permanently lubricated.

12.6 Fuel filters

The engine fuel filter must be replaced according to the installation and operating instructions for the engine. We recommend that you replace the tank fuel filter at the same time.

12.7 Battery

The batteries must be dry under all operating conditions. The liquid level in the batteries must be maintained.



Warning

Too low liquid level can cause overheat and explosion.

The water used for filling must be distilled water.

Check the health of the battery by using a refractometer or similar tool.

12.7.1 Battery replacement

If the battery is low on power, leaking or damaged otherwise the battery must be replaced.

Before you replace the batteries, read the general precautions in section 12. *Maintenance* must be observed.

1. Observe the position of the cables.
2. Remove the black minus cables.
3. Remove the red plus cables.
4. Carefully remove the defect battery.
5. Install the new battery.
6. Mount the two red plus cables.
7. Mount the black minus cables.

For further instructions, see section 7.3 *Connection to battery*.

12.8 Diesel engine

Note See also installation and operating instructions for the diesel engine.



Warning

During and after operation, surfaces, components and working materials of the diesel engine can be very hot.

1. Check the fuel level in the fuel tank and add fuel, if necessary.

Warning

Fuel vapours are flammable. Therefore, never top up fuel when the engine is running or when the engine is warm.



Do not inhale fuel vapours when filling the fuel tank.

Ensure good ventilation of the room during the refuelling so that the fuel vapours dissipate quickly.

Do not start the engine if there are fuel vapours in the room.

Caution Use the diesel fuel specified by the manufacturer of the diesel engine.

2. Check the pipes of the fuel system for leakages.
3. Replace defective fuel pipes and tighten loose pipe connections.
4. Fasten the fuel pipes with Norma type torque brackets.
5. Drain condensate from the fuel tank and the fuel filter.

Note Collect water-containing and excess fuel in a container and dispose of it in accordance with local regulations.

6. Check oil level and add oil, if necessary.

Do not fill oil above the maximum mark. Overfilling may damage the engine.

Caution Use only the type of oil specified by the manufacturer of the diesel engine.

7. Water-cooled diesel engines:

Check the level of coolant in the equalisation tank and add coolant, if necessary.



Warning

Do not remove cap of equalisation tank when the engine is warm. The tank is under pressure.

Caution Use only the type of coolant specified by the manufacturer of the diesel engine.

8. **Water-cooled diesel engines:** Check pipes and hoses of the cooling system for leakages. Replace defective pipes and hoses. Tighten loose pipe and hose connections.
9. Check if the pressure gauge of the cooling circuit, if any, displays a pressure value when the engine is running.
10. Check the entire exhaust pipe system for leaks while the engine is running. Tighten loose pipe connections and replace defective pipes immediately.



Warning

A damaged exhaust system may result in suffocation.

11. Check V-belts for wear and correct tension.
12. Check air filter.

12.9 Coupling

Couplings used for pump sets are maintenance-free. However, check the alignment of the pump and driver once a year. See section 6.4 *Alignment*.

12.10 Controller

Note See installation and operating instructions for the controller.

13. Fault finding

13.1 Pump set with diesel engine



Warning

Before starting service work, make sure that the pump set cannot accidentally start.

Fault	Cause	Remedy
1. Pump delivers no or too little water.	a) Air in suction pipe.	Fill priming tank with water and vent pump. Make sure that the suction pipe has been installed according to section 6.5 <i>Pipe connection</i> .
	b) Pump draws in air due to defective seals.	Check pipe and pump housing gaskets, and replace if necessary.
	c) Counter-pressure is too high.	Check the sprinkler system for impurities and blockages.
	d) Inlet pressure is too low.	Make sure that the storage tank is filled with water and that the conditions in section 15.6 <i>Minimum inlet pressure</i> are complied with.
	e) Suction pipe or impeller is blocked.	Clean the suction pipe and pump.
2. Pump makes too much noise. Pump runs unevenly and vibrates.	a) Inlet pressure is too low (cavitation).	Make sure that the storage tank is filled with water and that the conditions in section 15.6 <i>Minimum inlet pressure</i> are complied with.
	b) Air in suction pipe.	Fill priming tank with water. Vent pump. Make sure that the suction pipe has been installed according to section 6.5 <i>Pipe connection</i> .
	c) Impeller out of balance.	Clean the impeller and remove foreign particles.
	d) Inner parts worn.	Replace defective parts. See service instructions for the pump.
	e) Pump stressed by the pipework.	Mount the pump so that it is not stressed. Support the pipes. See section 6.5 <i>Pipe connection</i> .
	f) Defective bearings.	Replace bearings.
	g) Defective coupling.	Replace the coupling.
	h) Foreign bodies in the pump.	Clean the pump and remove foreign bodies.
3. Leaking pump housing.	a) Pump stressed by the pipework.	Mount the pump so that it is not stressed. Support the pipes. See section 6.5 <i>Pipe connection</i> .
	b) Pump housing gaskets or flange gaskets defective.	Replace defective gaskets.
4. Leaking shaft seal.	a) Shaft seal dirty or seized up.	Check and clean the shaft seal.
	b) Shaft seal defective.	Replace the shaft seal. See service instructions for the pump.
	c) Shaft surface or shaft sleeve defective.	Replace the shaft or the shaft sleeve. See service instructions for the pump.
5. Too high pump temperature.	a) Air in pump.	Fill the priming tank with water and vent the pump.
	b) Inlet pressure is too low.	Make sure that the storage tank is filled with enough water and that the conditions in section 15.6 <i>Minimum inlet pressure</i> are complied with.
	c) Bearings lubricated with too little, too much or unsuitable lubricant.	Replenish, reduce or replace the lubricant.
	d) Pump bearing seat stressed by pipework.	Mount the pump so that it is not stressed. Support the pipes. Check the alignment of the pump, and correct, if necessary. See section 6.5 <i>Pipe connection</i> and 6.4 <i>Alignment</i> .
	e) Axial pressure too high.	Check the relief holes of the impeller and the lock rings on the suction side.

Fault	Cause	Remedy
6. Engine does not start.	a) Fuel valve closed.	Open the fuel valve.
	b) Fuel pipe are incorrect connected	Check that supply and return pipe are connected according to labels on the connection block.
	c) No diesel fuel in the tank.	Fill tank with diesel fuel. Vent fuel system. See installation and operating instructions for the diesel engine.
	d) Fuel filter blocked.	Change fuel filter. See installation and operating instructions for the diesel engine.
	e) Air in fuel system.	Vent fuel system. See installation and operating instructions for the diesel engine.
	f) Water in fuel or wrong fuel.	Drain fuel from the fuel tank. Fill with new fuel. Vent fuel system. See installation and operating instructions for the diesel engine.
	g) Starter relay defective.	Replace the starter relay.
	h) Insufficient power supply.	Check power supply to the control cabinet, batteries and cables on the pump set.
	i) Incorrect electrical wiring	Check the main and signal cables between the engine and controller.
	j) Pump blocked.	Remove the pump and repair if necessary.
	k) Exhaust pipes blocked.	Remove foreign bodies from exhaust pipes.
7. Oil pressure is too high or too low when engine is running.	a) Oil filter blocked.	Replace the oil filter. See installation and operating instructions for the diesel engine.
	b) Water or fuel in the oil.	Change oil. See installation and operating instructions for the diesel engine.
	c) Oil level too low/too high.	Refill with oil or drain off oil. See installation and operating instructions for the diesel engine.
	d) Oil pump worn.	Replace the oil pump. Contact Grundfos.
8. Engine temperature too high.	a) Insufficient coolant.	Refill coolant. See installation and operating instructions for the diesel engine.
	b) Diaphragm valve blocked or defective.	Clean or replace the diaphragm valve. As an emergency measure, open the isolating valve of the bypass pipe.
	c) heat exchanger defective.	Replace the heat exchanger. Contact Grundfos.
9. Engine does not reach rated speed.	a) Wrong speed setting.	Contact Grundfos.
	b) Fuel filter partially blocked.	Change fuel filter. See installation and operating instructions for the diesel engine
	c) Air in fuel system.	Vent the fuel system. See installation and operating instructions for the diesel engine.
	d) Traces of water in the fuel.	Drain condensate from the fuel filter. See installation and operating instructions for the diesel engine.
	e) Turbocharger or intercooler defective (not all models).	Replace the turbocharger or intercooler. Contact Grundfos.
10. Battery voltage too low.	a) Cell short-circuit in starter battery.	Replace starter batteries. See installation and operating instructions for the controller.
	b) Wiring of the battery charging circuit damaged or insufficient terminal contact.	Check the wiring and replace if necessary. Check terminal connections and tighten, if necessary.
	c) Insufficient power supply to the control cabinet.	Check the power supply.
	d) V-belt tension too low.	Check the V-belt tension and correct if necessary.
	e) Battery charger defective.	Replace the battery charger. Contact Grundfos.
11. Strong exhaust colouring.	a) Dirty air filter.	Replace the air filter.

14. Service, accessories, spare parts

Note Spare parts and accessories not supplied by Grundfos are not inspected or approved by Grundfos either.

The installation and/or use of such products may negatively alter and thus impair the specified properties of the pump set. The use of non-original spare parts and accessories renders any liability on behalf of Grundfos for resulting damage null and void.

Any malfunctions which cannot be repaired should only be corrected by Grundfos or authorised service partners.

If there is a malfunction, please provide a full description of the malfunction so that the service technician can prepare and provide the appropriate spare parts.

To place an order for service parts, please contact Grundfos. Please inform us about the serial number of the pump set and describe the specific part to be replaced. You find the technical data for the system on the nameplates. See section 5. *Identification*.

15. Technical data

15.1 Pump set

Dimensions: See page 27.

Weight: See page 27.

15.2 Sound pressure level

For more information on sound pressure level, see page 28.

The sound pressure is measured without a silencer and 1 m away from the pump set.

Note The silencer supplied is designed for the requirements of the industrial market. If you have higher noise level requirements, you can order and install another silencer.

15.3 Pump

Technical data: See page 27.

Rated flow: See nameplate of the pump.

Rated head: See nameplate of the pump.

Max. operating pressure: See nameplate of the pump.

Approval: See nameplate of the pump.

For further performance data see nameplate of the pump.

15.3.1 Permissible flange forces and flange torques

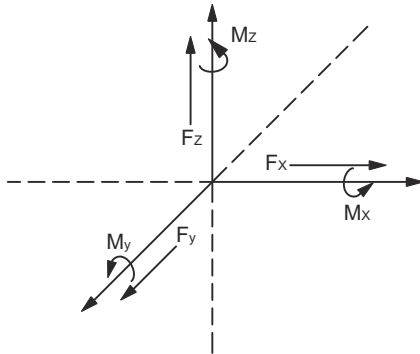


Fig. 30 Flange forces and torques

TM06 2665 4514

Grey cast iron	Flange size [inch]	Forces [N]			
		F _x	F _y	F _z	ΣF*
	2	890	2224	890	2555
	2.5	1112	2780	1112	3194
	3	1334	3336	1334	3832
	4	1779	4448	1779	5110
	5	2224	5560	2224	6388
	6	2669	6672	2669	7666
	8	3559	8896	3559	10221
	10	4137	10364	4137	11901
Horizontal pump x-axis parallel to pump shaft	12	4430	11103	4430	12749
	14	4724	11841	4724	13596
	16	5018	12580	5018	14444
	18	5311	13318	5311	15290
	20	5605	14056	5605	16137
	24	6192	15533	6192	17831
	30	7073	17748	7073	20373

Grey cast iron	Flange size [inch]	Torques [Nm]			
		M _x	M _y	M _z	ΣM*
	2	678	1356	678	1661
	2.5	847	1695	847	2076
	3	1017	2034	1017	2491
	4	1356	2712	1356	3322
	5	1695	3390	1695	4152
	6	2034	4067	2034	4981
	8	2712	5423	2712	6642
	10	3390	6779	3390	8303
Horizontal pump x-axis parallel to pump shaft	12	4067	8135	4067	9963
	14	4745	9491	4745	11624
	16	5423	10847	5423	13284
	18	6101	12202	6101	14944
	20	6779	13558	6779	16605
	24	8135	16270	8135	19927
	30	10169	20337	10169	24908

* ΣF and ΣM are the vector sums of the forces and torques.

If not all loads reach the maximum permissible value, one of the values may exceed the normal limit. Contact Grundfos for further information.

15.4 Battery

Pieces: 12 V - 1 per starter set

24 V - 2 per starter set

Battery voltage: 12 V

Starter set voltage: 12 or 24 V

Technical data: See page 28.

Caution Do not charge the batteries by an external charger when they are connected to the controller.

15.5 Maximum operating pressure

The pumps are designed for a maximum operating pressure of 12 bar (175 PSI).

15.6 Minimum inlet pressure

The minimum inlet pressure "H" in metres head required at the suction part of the pump during operation to avoid cavitation in the pump can be calculated from the following formula:

$$H = p_b \times 10.2 - \text{NPSH} - H_f - H_v - H_s$$

P_b	Barometric pressure in bar. (The barometric pressure can be set to = 1 bar.) In closed systems, p_b is equal to the system pressure in bar.
NPSH	Net Positive Suction Head in metres head (to be read from the NPSH curve at the highest flow the pump will be delivering). You can read it from the curves in the data booklet.
H_f	Friction loss in suction pipe in metres head.
H_v	Vapour pressure in metres head, with t_m = liquid temperature. See fig. 31.
H_s	HSEF pumps according to EN Safety margin = minimum 1.0 metres head.

If the calculated value of "H" is positive, the pump can operate with a maximum suction lift of "H" metres.

If the calculated value of "H" is negative, a minimum suction head of "H" metres is required.

Relation between vapour pressure and liquid temperature t_m

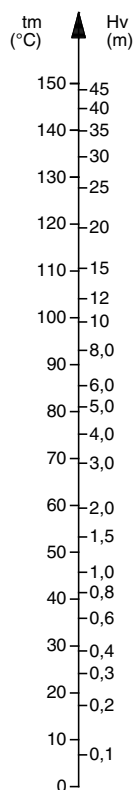


Fig. 31 Vapour pressure scale

TM00 3037 0798

15.7 Maximum inlet pressure

The actual inlet pressure and closed-valve pressure must always be lower than the maximum operating pressure. See section 15.5 *Maximum operating pressure*.

You find the closed-valve pressure of the pump in the data booklet of the pump set.

15.8 Minimum flow rate

Caution The pump must not run against a closed valve as this may cause an unacceptable temperature increase or formation of vapour.

In pump sets with a water-cooled diesel engine, a minimum flow rate of the pump is ensured by a pipe connecting the pump discharge port with the engine heat exchanger.

15.9 Pump speed

The pump speed is stated on the nameplate.

15.10 Direction of rotation

The direction of rotation of the pump is clockwise when seen from the drive end. The correct direction of rotation is indicated by an arrow on the pump housing.

15.11 Liquid and ambient temperature

Liquid temperature

The pump is designed for liquid temperatures up to 120 °C.

Note Pump set with water-cooled diesel engine:
The maximum liquid temperature depends on the coolant temperature required to cool the diesel engine. See installation and operating instructions for the diesel engine.

Ambient temperature

The maximum permissible ambient temperature depends on the driver and controller. See installation and operating instructions for the driver and controller.

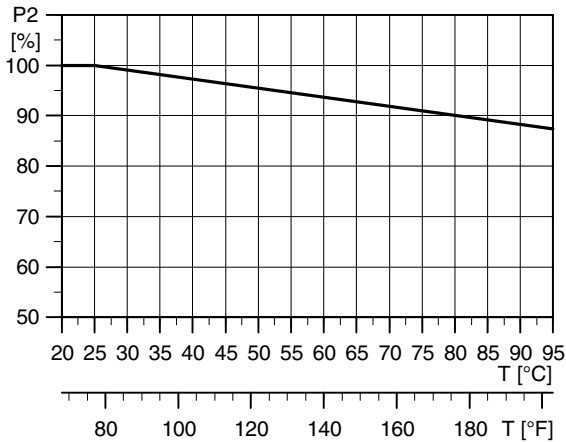
15.12 Relative air humidity

The relative air humidity must not exceed 80 %. Otherwise the controller may be damaged. If humidity is a problem, install a space heater with a hydrostat.

15.13 Effect of ambient temperature and altitude on engine output

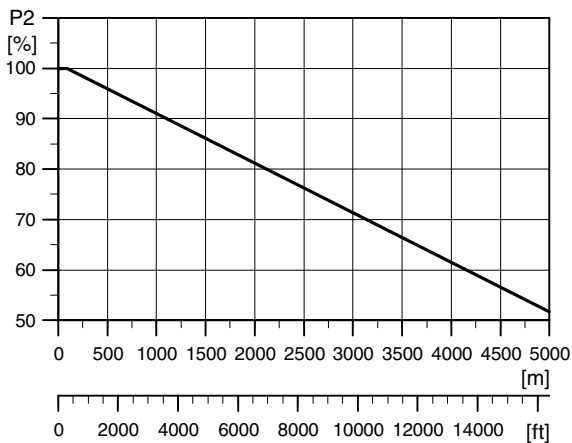
Note See installation and operating instructions for the engine for more detailed information.

If the ambient temperature exceeds 25 °C (see fig. 32) or if the engine is installed more than 90 m above sea level (see fig. 32), the engine must not be fully loaded. In such cases, it may be necessary to use a larger engine.



TM03 4718 2606

Fig. 32 Relation between engine output P2 and ambient temperature



TM03 4717 2606

Fig. 33 Relation between engine output P2 and altitude

16. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.

1. Dimensions and weights

The values apply to compact systems with fuel tank installed on the base frame.

Pump type key	Engine type	Pump			Engine		Fire pump set	
		Suction flange [inch]	Discharge flange [inch]	Weight** [kg]	Exhaust outlet	Weight** [kg]	Dimensions L x W x H [mm]	Weight** [kg]
HSEF 4-12	JU4H-UF14	5"	4"	171	ANSI 3"	413	53	1210
HSEF 4-12	JU4H-UF24	5"	4"		ANSI 3"	413	62	1210
HSEF 5-14N	JU4H-UF52	6"	5"	229	ANSI 4"	424	95	1300
HSEF 5-14N	JU4H-UF52	6"	5"		ANSI 4"	424	95	1300
HSEF 5-14N	JU6H-UFD2	6"	5"		ANSI 5"	750	110	1660
HSEF 5-14N	JU6H-UF32	6"	5"		ANSI 5"	750	119	1660
HSEF 4-12	JU4H-UF24	5"	4"	171	ANSI 3"	413	62	1210
HSEF 5-14N	JU4H-UF52	6"	5"	229	ANSI 4"	424	95	1300
HSEF 5-14N	JU4H-UF52	6"	5"		ANSI 4"	424	95	1300
HSEF 5-14N	JU6H-UF32	6"	5"		ANSI 5"	750	119	1660
HSEF 5-11	JU4H-UF34	6"	5"	173	ANSI 4"	424	86	1240
HSEF 5-11	JU4H-UF34	6"	5"		ANSI 4"	424	86	1240
HSEF 5-12	JU4H-UF54	6"	5"	257	ANSI 4"	424	108	1330
HSEF 5-12	JU4H-UF54	6"	5"		ANSI 4"	424	108	1330
HSEF 5-14	JU6H-UFABL2	6"	5"	229	ANSI 5"	750	129	1670
HSEF 5-14	JU6H-UFABL2	6"	5"		ANSI 5"	750	129	1670
HSEF 5-14	JU6H-UF52	6"	5"		ANSI 5"	750	157	1670
HSEF 6-17	JU6H-UF30	8"	6"	313	ANSI 5"	750	119	1760
HSEF 6-17	JU6H-UF30	8"	6"		ANSI 5"	750	119	1760
HSEF 6-17	JU6H-UFABL0	8"	6"		ANSI 5"	750	129	1760
HSEF 6-17	JU6H-UFM2	8"	6"	313	ANSI 5"	750	149	1800
HSEF 6-17	JU6H-UF52	8"	6"		ANSI 5"	750	157	1760
HSEF 6-17	JU6H-UF62	8"	6"		ANSI 5"	766	179	1780
HSEF 6-17	JU6H-UF30	8"	6"	313	ANSI 5"	750	119	1760
HSEF 6-17	JU6H-UF30	8"	6"		ANSI 5"	750	118	1760
HSEF 6-17	JU6H-UFABL0	8"	6"		ANSI 5"	750	129	1760
HSEF 6-17	JU6H-UF52	8"	6"	313	ANSI 5"	750	157	1760
HSEF 6-17	JU6H-UF62	8"	6"		ANSI 5"	766	179	1780
HSEF 6-14Q	JU6H-UF50	8"	6"	277	ANSI 5"	750	157	1760
HSEF 6-14Q	JU6H-UF50	8"	6"		ANSI 5"	750	157	1760
HSEF 6-14Q	JU6H-UF60	8"	6"		ANSI 5"	766	179	1740
HSEF 8-17W	JU6H-UFKAS0	10"	8"	459	ANSI 5"	766	194	1980
HSEF 8-17W	JU6H-UFKAS0	10"	8"		ANSI 5"	766	194	1980
HSEF 8-17W	DP6H-UFKA50	10"	8"	459	ANSI 5"	1020	209	2430
HSEF 8-17W	DP6H-UFKA70	10"	8"		ANSI 6"	1020	233	2440
HSEF 8-15A	DQ6H-UFKA50	10"	8"	386	ANSI 6"	1134	254	2480
HSEF 8-15A	DQ6H-UFKA50	10"	8"		ANSI 6"	1134	254	2480
HSEF 8-17Q	DQ6H-UFKA50	10"	8"	459	ANSI 6"	1134	254	2560
HSEF 8-17Q	DQ6H-UFKA60	10"	8"		ANSI 6"	1134	268	2560
HSEF 8-20G	DQ6H-UFKA60	10"	8"	605	ANSI 6"	1134	257	2720
HSEF 8-20G	DQ6H-UFKA88	10"	8"		ANSI 6"	1134	280	2720
HSEF 8-20G	DQ6H-UFKA98	10"	8"		ANSI 6"	1134	306	2730
HSEF 8-15A	DP6H-UFKA70	10"	8"	386	ANSI 6"	1020	233	2350
HSEF 8-15A	DQ6H-UFKA50	10"	8"		ANSI 6"	1134	254	2480
HSEF 8-15A	DR8H-UFKA40	10"	8"		ANSI 5"	1225	365	2670
HSEF 10-20	DQ6H-UFKA60	12"	10"	909	ANSI 6"	1134	257	3020
HSEF 10-20	DQ6H-UFKA88	12"	10"		ANSI 6"	1134	280	3020
HSEF 10-20	DQ6H-UFKA98	12"	10"		ANSI 6"	1134	306	3030
HSEF 10-20	DR8H-UFKA40	12"	10"		ANSI 5"	1225	343	3200
HSEF 10-20	DR8H-UFKA68	12"	10"		ANSI 5"	1225	369	3220

2. Sound pressure level

Designation	Engine type	Sound pressure level [dB(A)]
HSEF 4-12	JU4H-UF14	97.2
	JU4H-UF24	97.2
HSEF 5-11	JU4H-UF34	98.1
HSEF 5-12	JU4H-UF54	98.1
	JU4H-UF52	Contact Grundfos
	JU6H-UF24	Contact Grundfos
HSEF 5-14N	JU6H-UF32	Contact Grundfos
	JU6H-UF32	Contact Grundfos
HSEF 5-14	JU6H-UFABL2	Contact Grundfos
	JU6H-UF52	Contact Grundfos
HSEF 6-14Q	JU6H-UF50	Contact Grundfos
	JU6H-UF60	Contact Grundfos
HSEF 6-17	JU6H-UF30	Contact Grundfos
	JU6H-UFABL0	Contact Grundfos
	JU6H-UFM2	Contact Grundfos
	JU6H-UF52	Contact Grundfos
	JU6H-UF62	Contact Grundfos
HSEF 8-15A	DP6H-UFKA70	Contact Grundfos
	DQ6H-UFKA50	Contact Grundfos
	DR8H-UFKA40	Contact Grundfos
HSEF 8-17W	JU6H-UFKAS0	Contact Grundfos
	DP6H-UFKA50	Contact Grundfos
HSEF 8-17Q	DP6H-UFKA70	Contact Grundfos
	DQ6H-UFKA50	Contact Grundfos
HSEF 8-20G	DQ6H-UFKA60	Contact Grundfos
	DQ6H-UFKA60	Contact Grundfos
	DQ6H-UFKA88	Contact Grundfos
	DQ6H-UFKA98	Contact Grundfos
HSEF 10-20	DQ6H-UFKA60	Contact Grundfos
	DQ6H-UFKA88	Contact Grundfos
	DQ6H-UFKA98	Contact Grundfos
	DR8H-UFKA40	Contact Grundfos
	DR8H-UFKA68	Contact Grundfos

3. Data for battery

Engine	Battery name	Battery type	Capacity [Ah]	CCA (EN)	Weight [kg]
JU4H					
JU6H					
DP6H	Exide EG1803	WET Flooded	180	1000	43
DQ6H					
DR8H					

4. Flange size and pressure rating

Pump type	Suction flange					Discharge flange				
	Size [inch]	Pressure rating [lbs ANSI]	No. of bolts	Size of bolt circle	Size of bolts	Size [inch]	Pressure rating [lbs ANSI]	No. of bolts	Size of bolt circle	Size of bolts
HSEF 4-12	5	125	8	8500"	M20	4	250	8	7880"	M16
HSEF 5-11	6	125	8	9500"	M20	5	125	8	8500"	M20
HSEF 5-12	6	125	8	9500"	M20	5	250	8	9250"	M20
HSEF 5-14	6	125	8	9500"	M20	5	125	8	8500"	M20
HSEF 5-14N	6	125	8	9500"	M20	5	125	8	8500"	M20
HSEF 6-14Q	8	125	8	11750"	M20	6	125	8	9500"	M20
HSEF 6-17	8	125	8	11750"	M20	6	250	8	10625"	M20
HSEF 8-15A	10	125	12	14250"	M24	8	125	8	11750"	M20
HSEF 8-17Q	10	125	12	14250"	M24	8	125	8	11750"	M20
HSEF 8-17W	10	125	12	14250"	M24	8	125	8	11750"	M20
HSEF 8-20G	10	125	12	14250"	M24	8	250	12	13000"	M24
HSEF 10-20	12	125	12	17000"	M24	10	125	12	14250"	M24

5. Parts list and sectional drawing

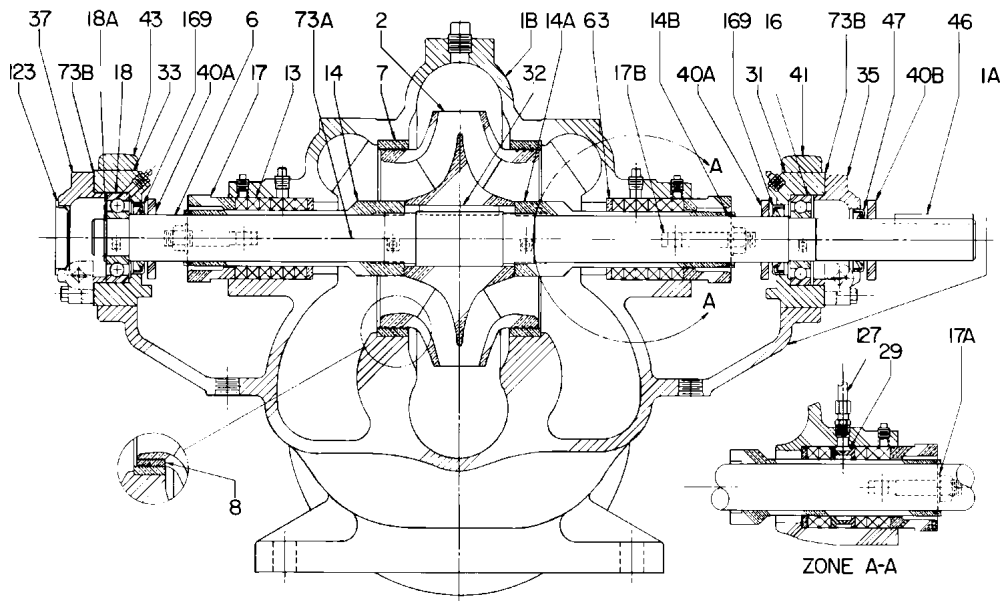


Fig. 1 Packed type cross sectional drawing

Item No.	Description		Item No.	Description
1A, 1B, 41, 43	Upper and lower casings		31	Inboard bearing housing
2	Impeller		32	Impeller key
6	Shaft		33	Outboard bearing housing
7	Casing ring		35	In-board bearing housing cover
8	Impeller ring (optional)		37	Outboard bearing housing cover
13	Packing ring		40A	In-board deflector
14, 14A	Shaft sleeve	RH LH	40B	Out-board deflector
14B	Shaft sleeve O-ring		46	Coupling key
16	In-board ball bearing		47	In-board bearing cover seal
17	Packing gland		63	Stuffing box bushing
17A	Gland clip (when used)		73A	Casing gasket (nNot shown)
17B	Gland bolt		73B	Bearing cover gasket
18	Outboard ball bearing		123	Bearing end cover
18A	Bearing lock washer		127	Water seal piping
29	Lantern ring (optional)		169	Bearing housing seal
-	Casing hardware			

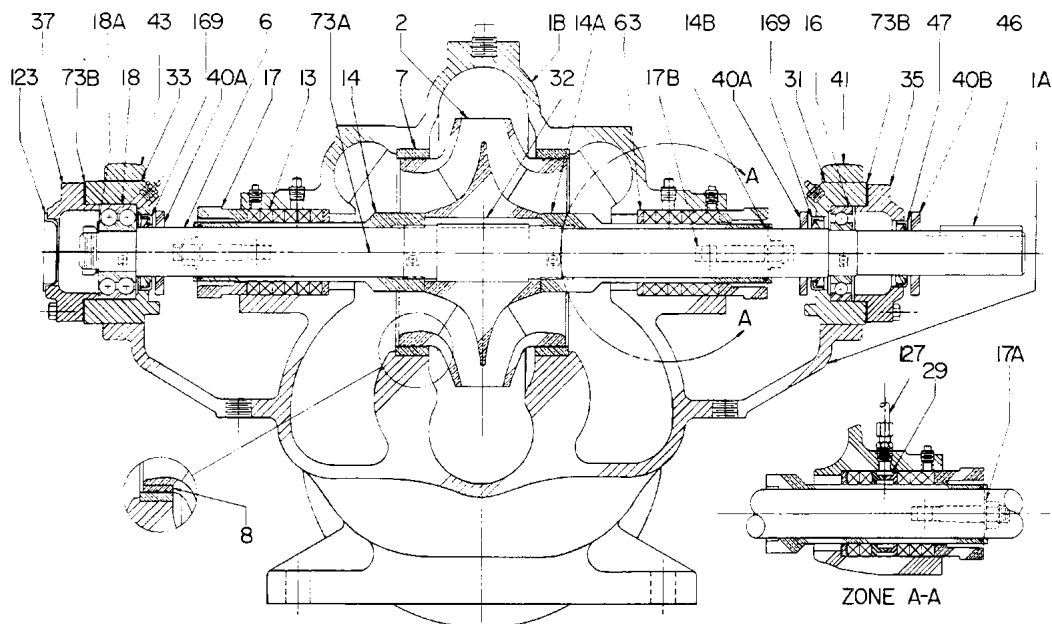


Fig. 2 Packed type with double row thrust bearing cross sectional drawing

Item No.	Description	Item No.	Description
1A, 1B, 41, 43	Upper and lower casings	31	Inboard bearing housing
2	Impeller	32	Impeller key
6	Shaft	33	Out-board bearing housing
7	Casing ring	35	In-board bearing housing cover
8	Impeller ring (optional)	37	Out-board bearing housing cover
13	Packing ring	40A	In-board deflector
14, 14A	Shaft sleeve	40B	Out-board deflector
	RH LH		
14B	Shaft sleeve O-ring	46	Coupling key
16	Inboard ball bearing	47	In-board bearing cover seal
17	Packing gland	63	Stuffing box bushing
17A	Gland clip (when used)	73A	Casing gasket (not shown)
17B	Gland bolt	73B	Bearing cover gasket
18	Outboard ball bearing	123	Bearing end cover
18A	Bearing lock washer	127	Water seal piping
22	Bearing lock nut	169	Bearing housing seal
29	Lantern ring (optional)	-	Casing hardware

Subject to alterations.

TM06 0980 1314

Declaration of conformity

GB: EC/EU declaration of conformity

We, Grundfos, declare under our sole responsibility that the product Fire HSEF system, EN, to which the declaration listed below relates, is in conformity with the Council Directives listed below on the approximation of the laws of the EC/EU member states.

Note: There are two sets of Council Directives and standards listed below. One set applies until and including 19th April 2016. The other set applies from 20th April 2016 and onwards.

HU: EC/EU megfeleléségi nyilatkozat

Mi, a Grundfos vállalat, teljes felelősséggel kijelentjük, hogy a(z) Fire HSEF system, EN termék, amelyre az alábbi nyilatkozat vonatkozik, megfelel az Európai Közösség/Európai Unió tagállamainak jogi irányelveit összehangoló tanács alábbi előírásainak.

Megjegyzés: Az alábbiakban a Tanács irányelvei és szabványai közül két csomagot ismertetünk. Az egyik csomag 2016. április 19-ével bezárólag érvényes. A másik csomag 2016. április 20-tól érvényes.

NL: EG/EU-conformiteitsverklaring

Wij, Grundfos, verklaren geheel onder eigen verantwoordelijkheid dat product Fire HSEF system, EN, waarop de onderstaande verklaring betrekking heeft, in overeenstemming is met de onderstaande Richtlijnen van de Raad inzake de onderlinge aanpassing van de wetgeving van de EG-/EU-lidstaten.

Opmerking: Hieronder worden twee reeksen Richtlijnen van de Raad en normen weergegeven. De ene set geldt tot en met 19 april 2016. De andere set is vanaf 20 april 2016 van kracht.

PT: Declaração de conformidade CE/UE

A Grundfos declara sob sua única responsabilidade que o produto Fire HSEF system, EN, ao qual diz respeito a declaração abaixo, está em conformidade com as Diretivas do Conselho sobre a aproximação das legislações dos Estados Membros da CE/UE.

Nota: Abaixo estão listados dois grupos de Diretivas do Conselho e normas. Um dos grupos é aplicável até 19 de Abril de 2016, inclusive. O outro grupo é aplicável a partir de 20 de Abril de 2016, inclusive.

These Directives and standards apply until and including 19th April 2016:

- Machinery Directive (2006/42/EC).
- Standard used: EN 809:1998 + A1:2009.

FR: Déclaration de conformité CE/UE

Nous, Grundfos, déclarons sous notre seule responsabilité, que le produit Fire HSEF system, EN, auquel se réfère cette déclaration, est conforme aux Directives du Conseil concernant le rapprochement des législations des États membres CE/UE relatives aux normes énoncées ci-dessous.

Remarque : Deux groupes de Directives du Conseil et normes sont énoncés ci-dessous. Un groupe s'applique jusqu'au 19 avril 2016 inclus. L'autre groupe entrera en vigueur le 20 avril 2016.

IT: Dichiarazione di conformità CE/UE

Grundfos dichiara sotto la sua esclusiva responsabilità che il prodotto Fire HSEF system, EN, al quale si riferisce questa dichiarazione, è conforme alle seguenti direttive del Consiglio riguardanti il riavvicinamento delle legislazioni degli Stati membri CE/UE.

Nota: Di seguito sono elencate due serie di direttive del Consiglio e norme. Una serie si applica fino al 19 aprile 2016 (incluso). La seconda serie si applica a partire dal 20 aprile 2016.

PL: Deklaracja zgodności WE/UE

My, Grundfos, oświadczamy z pełną odpowiedzialnością, że nasz produkt Fire HSEF system, EN, którego deklaracja niniejsza dotyczy, jest zgodny z następującymi dyrektywami Rady w sprawie zbliżenia przepisów prawnych państw członkowskich.

Uwaga: Poniżej podano dwa zestawy dyrektyw i norm. Pierwszy zestaw obowiązuje do 19 kwietnia 2016 r. włącznie. Drugi zacznie obowiązywać 20 kwietnia 2016 r.

RO: Declarația de conformitate CE/UE

Noi Grundfos declarăm pe propria răspundere că produsul Fire HSEF system, EN, la care se referă această declarație, este în conformitate cu Directivele de Consiliu specificate mai jos privind armonizarea legilor statelor membre CE/UE.

Notă: Există două seturi de directive și standarde ale Consiliului specificate mai jos. Un set se aplică până la, și inclusiv în 19 aprilie 2016. Celălalt set se aplică de la 20 aprilie 2016 și în continuare.

These Directives and standards apply from 20th April 2016 and onwards:

- Machinery Directive (2006/42/EC).
- Standard used: EN 809:1998 + A1:2009.

The "Fire HSEF System, EN" contains the following main components: HSEF pump, diesel engine, controller and coupling.

The EC declaration of conformity of the HSEF pump is below. Please find the EC declaration of conformity of the rest of the main components in their respective installation and operating instructions delivered with the firefighting pump set:

Bare shaft pump:

We, Grundfos, declare under our sole responsibility that the product "HSEF PUMP", to which this declaration relates, is in conformity with these Council directives on the approximation of the laws of the EC member states:

- Machinery Directive (2006/42/EC)
- Standard used: EN 809:1998 + A1:2009

Bjerringbro, 7th July 2015



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