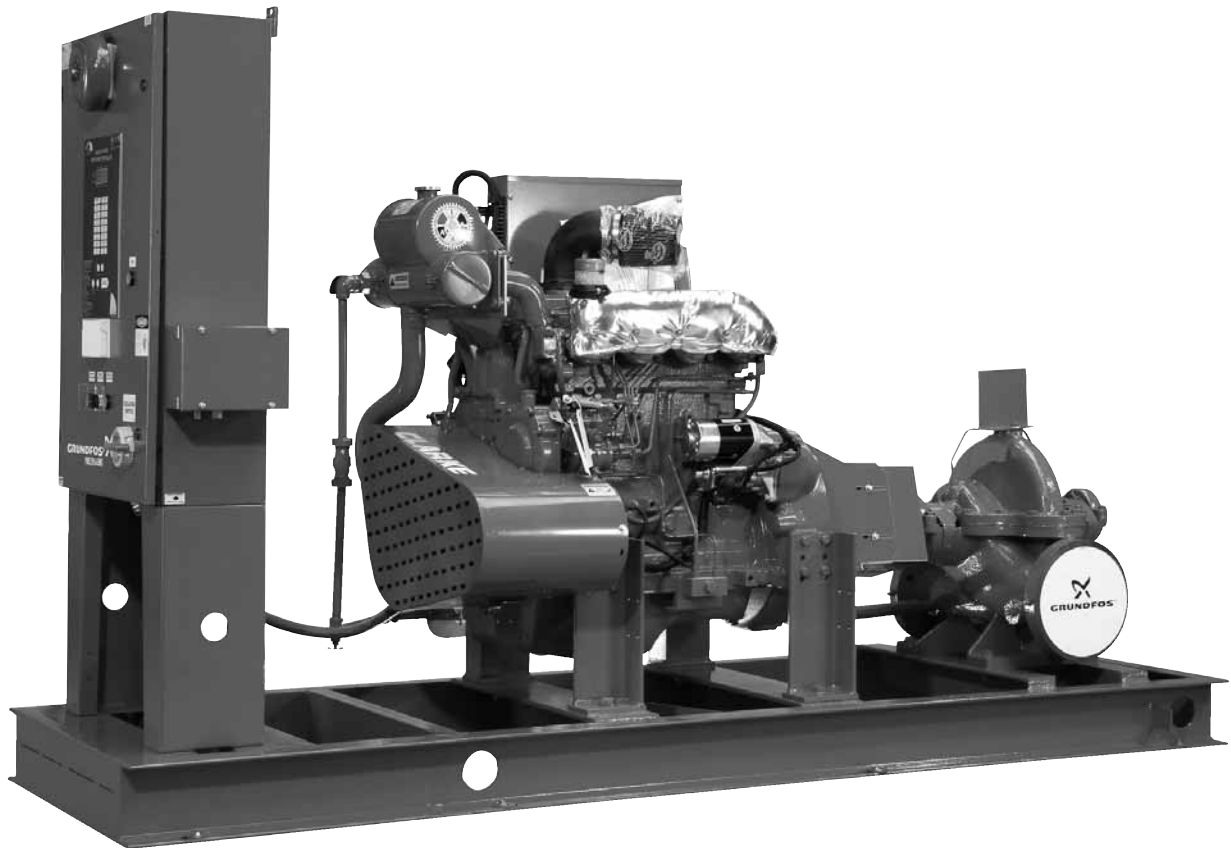


Fire DNF, Fire HSEF - diesel

Ⓞ Installation and operating instructions

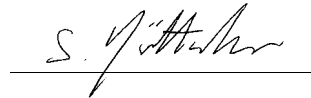


Declaration of Conformity

We, Grundfos, declare under our sole responsibility that the products Fire DNS and Fire HSEF - diesel, to which this declaration relates, are in conformity with these Council Directives on the approximation of the laws of the EC Member States:

- Machinery Directive (98/37/EC)
Standards used: EN 12100-1: 2003, EN 12100-2: 2003 and EN 809: 1998.
- Low Voltage Directive (2006/95/EC)
Standards used: EN 60204-1: 2006 and EN 60439-1: 1999.
- EMC Directive (2004/108/EC)
Standards used: EN 61000-6-2: 2005 and EN 61000-6-3: 2007.


Wahlstedt, 1st September 2009




Stephan Götsche
General Manager


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Warning

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

1. 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.


Safety instructions placed directly on the fire pump set:

WARNING

THIS EQUIPMENT STARTS AUTOMATICALLY
 USE EAR PROTECTION 
 C13187


Warning
The engine starts automatically. Use hearing protection.

WARNING

KEEP GUARDS IN PLACE 
 C13190

Warning
Do not remove safety devices.

WARNING

PREMIXING 50% TREATED WATER AND 50% ANTIFREEZE COOLANT SOLUTION PRIOR TO INSTALLING IS REQUIRED
 C13185

Warning
Fill the engine with a cooling liquid consisting of a mixture of 50 % coolant and 50 % water before start-up.

WARNING

60 P.S.I. MAX.
 C13182

Warning
The pressure in the equalisation tank must not exceed 60 psi or 4.1 bar.

WARNING
TO PREVENT HEATER DAMAGE, INSTALL ENGINE COOLANT BEFORE HEATER IS ENERGIZED
 120 VAC
 +5% -10% SINGLE PHASE
 1500 W 12.6 AMPS
 PIN: C124051 C13187

Warning
In order to prevent damage, the cooling circuit must be connected before making the electrical connection of the cooling water heater.



Warning

In order to prevent damage, the drive shaft must be lubricated regularly with the correct lubricant.



Warning

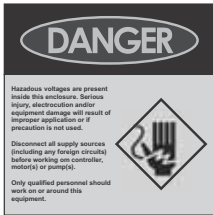
Do not let the engine run without an air filter.

This may cause personal injury or damage to the engine.



Warning

This lifting point is only for lifting the engine, not the entire fire pump set.



Warning

Hazardous voltages are present in this enclosure. Improper use or failure to take precautions can cause serious injury, electric shock and/or damage to the equipment.



Lifting points for the entire fire pump set.

2. Applications

The Grundfos Fire HSEF and DNF pump sets are designed for fire systems for supplying water to hose reels, fire hydrants and sprinkler systems.

Warning



The fire pump set must only be used for the applications mentioned. Any other use is considered improper use. Grundfos cannot be held responsible for damage caused by improper use. The liability rests solely with the operator.

The Grundfos Fire HSEF and DNF pump sets with diesel engine must not be used for ordinary pumping of liquids or common pressure boosting in daily work. They should only be used for fire fighting.

The pump controller must not be used as a junction box for supplying other equipment.

3. Delivery, transport, storage

Check the fire pump set carefully on delivery against the papers and inspect for damage incurred during transport. Immediately notify the carrier of any damage or shortage found. Transport and store it correctly before installation.

Note

3.1 Delivery

The fire pump set is delivered from factory in an open wooden box or wooden/cardboard box which is specifically designed for transport by fork-lift truck or similar device.

3.2 Transport

For lifting the entire fire pump set, use the lifting holes of the base frame. When lifting, the lifting point should always be above the centre of gravity of the fire pump set. See fig. 1.

Warning

Lifting the fire pump set should only be done by qualified personnel.

When lifting the entire fire pump set, never use the lifting eyes of the individual components.

Use only suitable lifting equipment in proper condition. See also weight specifications in section 7. Technical data.

During transport of the fire pump set, the cabinet door must be closed and locked.

Do not stand or place hands under a component in such a way that the component would fall on the hands if dropped.

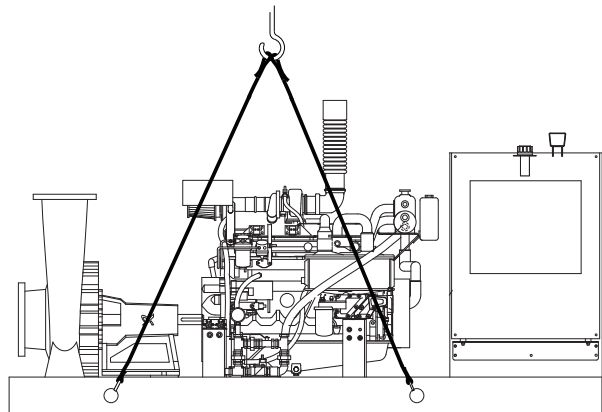


Fig. 1 Correct lifting of fire pump set

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3.3 Storage

3.3.1 Pump

To prevent water, dust, etc. from entering the pump, all openings must be covered until pipes are connected. Apply a suitable antirust agent on all machined, non-coated surfaces.

The antirust agent must meet these requirements:

- It must not attack rubber parts.
- It must be easy to remove.
- It must be applied according to the instructions of the manufacturer.

If the pump must be stored for more than six months before start-up, it must be protected against corrosion and damage:

1. Remove the stuffing box packing.
2. Spray the interior part of the pump case and the stuffing box with a water-soluble type of antirust agent.
3. If the pump has not been connected to the pipework, cover the pump suction and discharge flanges with full natural rubber gasket material, and blank off these openings with metal blanking flanges. Use at least four bolts for fastening.
4. Cover the opening of the stuffing box with a non-hygroscopic tape. The stuffing box gland may be left on the pump shaft, but must be wired or otherwise securely fastened in position.
5. Coat all exposed painted surfaces with an antirust agent that can be readily removed with a petroleum distillate product.
6. Make sure that all exposed painted surfaces are dry, clean and free of grease and other contaminants.
7. Cover the pump with a weather-resistant cover of waterproof paper or plastic material to protect it against dirt and dust.
8. Inspect the pump at regular intervals during storage.
9. Rotate the shaft by hand every four to six weeks to prevent pitting of the bearings.

3.3.2 Engine

Engines may be stored for up to 12 months in a dry room after delivery. It is advisable to protect the engine with an air-permeable cover. At least once a month, the engine should be checked for accumulation of dirt or water. Any dirt or water must be removed immediately.

If the engine is stored for more than 12 months or stopped for more than six months, it must be protected against corrosion and damage:

1. Drain the engine of oil, and replace the oil filter.
See service instructions.
2. Fill the engine housing with MIL-L-21260 oil.
See service instructions.
3. Replace the fuel filter. See service instructions.
4. Separate the engine from the pump by removing the coupling.
See service instructions.
5. Turn on the engine. See section *12.2 Manual operation*.
Let it run for one or two minutes.
6. Drain oil and cooling liquid. See service instructions.
7. Drain fuel. To do so, loosen the drain screw in the tank bottom (fig. 50, pos. A) and collect the diesel fuel in a suitable container. After draining, tighten the drain screw in the tank bottom.

Repeat these steps every six months.

Caution

**Put a warning label on the engine:
Engine without oil. Do not start the engine.**

4. Product description

4.1 Fire pump set

The fire pump set consists of a pump, a diesel engine with fuel tank, and a controller. Pump and engine are connected via a drive shaft or a flexible coupling. All components are adapted to each other and mounted on a common base frame ready for installation. The base frame is made of steel channel. The controller and fuel tank can also be placed separately. This is normally done in connection with JW6 and JX6 diesel engines.

The fire pump set comes ready for operation. The engine is filled with cooling water, engine oil, etc. The batteries are filled with acid and charged. The fuel system is vented, and the fuel tank has a small quantity of diesel fuel. The correct engine speed has been preset from factory.

As an example, the most important components of the fire pump set are shown in figures 2 and 3. They show an HSEF pump set with a Grundfos horizontal split case pump and a 4-cylinder diesel engine, type JUH4, without turbocharger and charge air cooler. Pump and engine are connected by a drive shaft. The controller is mounted on the common base frame, and the fuel tank is placed separately. The fuel tank is not shown.

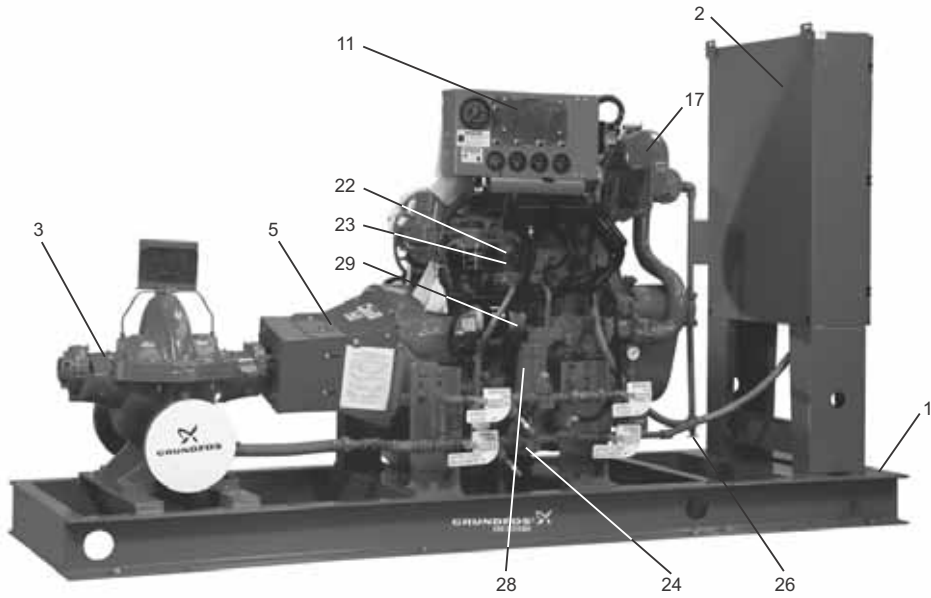


Fig. 2 Fire pump set with JU4H and JU6H diesel engine, front view

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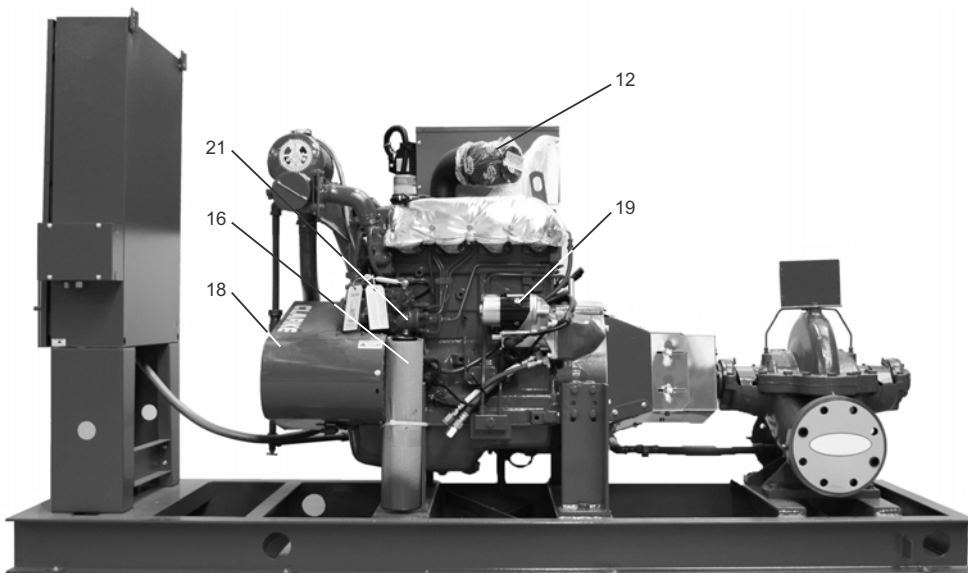


Fig. 3 Fire pump set with JU4H and JU6H diesel engine, back view

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Pos.	Component	Pos.	Component
1	Base frame	21	Diesel injection pump
2	Controller	22	Fuel suction pump
3	Pump	23	Fuel filter
4	Automatic air release valve (not shown)	24	Cooling water circuit
5	Coupling with coupling guard	25	Cooling water heater (not shown)
6	Fuel tank (not shown)	26	Cooling water drain
7	Manual filling pump for fuel tank (not shown)	27	Oil pump (not shown)
8	Tank cap (not shown)	28	Oil filter
9	Filling level indicator, fuel tank (not shown)	29	Oil dipstick
10	Fuel tap (not shown)	30	Oil filler cap (not shown)
11	Control panel of diesel engine		
12	Air filter		
13	Turbocharger (not this model)		
14	Charge air cooler (not this model)		
15	Device for crankshaft venting (optional, not shown)		
16	Flexible exhaust pipe (not fitted)		
17	Heat exchanger		
18	V-belt with protective cover		
19	Starter		
20	Starter batteries (not shown)		

4.2 Pump

The fire pump set comes with a Grundfos HSEF horizontal split case pump or a Grundfos DNF end-suction pump. The pumps are FM-approved and UL-listed.

The impeller diameter of both pumps can be reduced to customise the pump performance to a certain duty point. The actual impeller diameter may therefore deviate from the standard diameters stated in catalogues, data sheets etc. The actual impeller diameter is stated on the pump nameplate.

4.2.1 Split case pump

The Grundfos HSEF horizontal split case pump is a non-self-priming, single-stage pump. It has inline axial suction and discharge ports with PN 10 or PN 16 ANSI flanges. An adapter flange from ANSI to DIN is available and must be ordered separately. The pumps are equipped with a stuffing box, type SNEA or SNFA (see section 6.1.4 *Type key for stuffing box*), and with an automatic air release valve making venting unnecessary.

4.2.2 End-suction pump

The pumps are non-self-priming, single-stage Grundfos DNF standard pumps with spiral housing. The pumps have an axial suction port and a radial discharge port with PN 10 or PN 16 DIN flanges.

The DNF pump is equipped with a stuffing box, type SNEA or SNFA. See section 6.1.4 *Type key for stuffing box*.

4.3 Engine

4.3.1 General description

The pump is driven by a stationary 4-stroke diesel engine from John Deere. It has been especially adapted to meet the requirements of fire pumps. The diesel engine is FM-approved and UL-listed.

The rated engine power is adapted to the power requirement of the pump. The adaptation takes place via the engine speed, which may therefore not be changed. The combinations of diesel engines and pumps are shown in section 19. *Dimensions, weights and engine data*. Depending on output, the engines have a turbocharger and, if necessary, also a charge air cooler.

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

The engine is cooled via a heat exchanger. The water is diverged from the discharge port of the pump. Before the water runs into the heat exchanger, the water flows through a cooling circuit. See fig. 4. The discharge from the heat exchanger is led via an open outlet or a visible waste cone back to the suction reservoir.

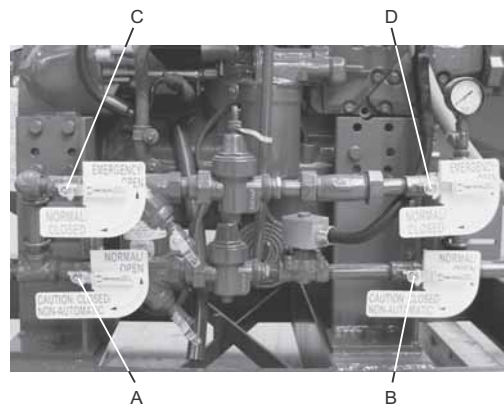


Fig. 4 Cooling circuit

If the cooling circuit is faulty, and the temperature of the cooling liquid becomes too high, close isolating valves (pos. A and B), and open isolating valves (pos. C and D).

4.3.2 Control panel of the engine

The engine is equipped with its own control panel. The fire pump set can be operated via the controller or via the control panel of the engine. Normally, operation takes place via the controller. Only if the controller fails, the control panel of the engine should be used.

Additionally, the control panel of the engine indicates the main parameters of the engine, such as engine speed, voltage of battery 1 and 2, oil pressure and temperature of cooling liquid.

The design of the control panel is shown in fig. 5 for JU/JW engines, and in fig. 6 for JW engines. An explanation of the operating elements and the indicators is given in the table below fig. 5 and 6. How to start the engine via the control panel is described in section 12.2.2 *Manual operation via control panel of diesel engine*.

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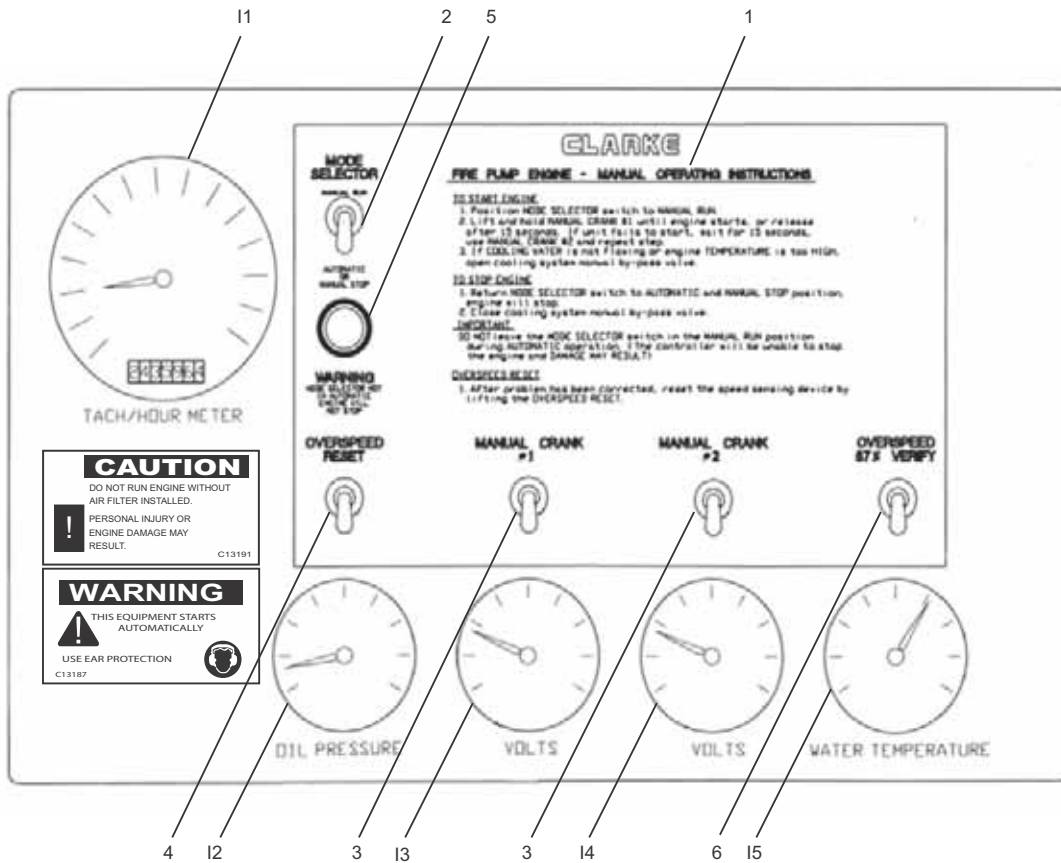


Fig. 5 Control panel of JU/JW diesel engine

Pos.	Operating element	Description
1	Instructions for emergency operation	Instructions as how to start the engine via the control panel.
2	Selector switch	For selection of automatic or manual operation.
3	Manual crank switches, battery 1 or 2	For manual start of engine with battery 1 or 2.
4	Overspeed reset	If the engine has been stopped due to an overspeed condition, the overspeed alarm must be reset with this switch when the problem has remedied.
5	Warning light	Indicates that the selector switch is not set to "AUTOMATIC OR MANUAL STOP".
6	Overspeed verification	For testing if the overspeed function works and the engine stops in case of overspeed. The overspeed signal will be generated at 67 % of the rated speed. Overspeed alarms must be reset with the [OVERSPEED RESET] switch (pos. 4).

Pos.	Indicator	Description
11	Tachometer and operating hour counter	Shows engine speed and the number of operating hours.
12	Oil pressure	Shows the oil pressure of the engine.
13	Voltmeter, battery 1	Shows the voltage supplied by battery 1.
14	Voltmeter, battery 2	Shows the voltage supplied by battery 2.
15	Temperature indicator	Shows the temperature of the cooling liquid.

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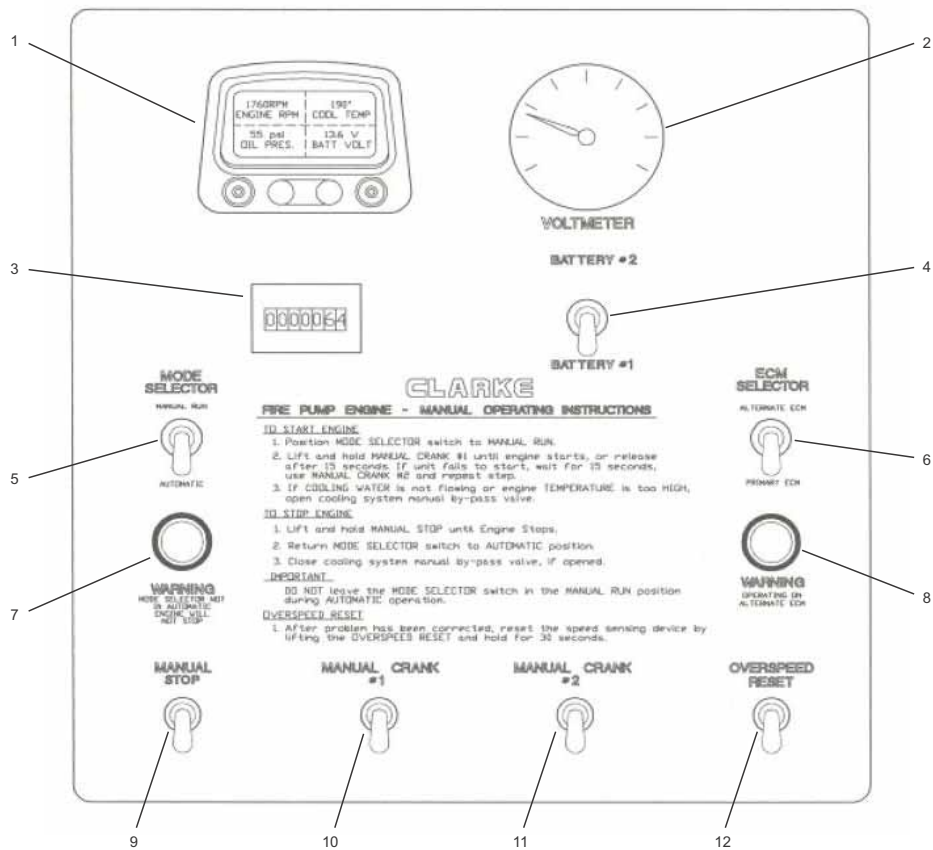


Fig. 6 Control panel of JX diesel engine

Pos.	Operating element	Description
1	Power view gauge	Shows relevant engine parameters and alarm messages.
2	Voltmeter, battery 1 or 2	Shows the voltage supplied by battery 1 or 2.
3	Operating hour counter	Shows the number of operating hours.
4	Battery selector switch, voltmeter	For selection of battery voltage to be indicated by the voltmeter.
5	Selector switch	For selection of automatic or manual operation.
6	ECM selector switch *	Default position is "PRIMARY ECM". Only in case of a failure of the primary ECM, causing the engine to stop or not to start, manually switch to "ALTERNATE ECM."
7	Warning light, manual operation	Indicates that the selector switch is not set to automatic operation.
8	Warning light, alternative ECM *	Indicates that the ECM selector switch is set to "ALTERNATE ECM".
9	Manual stop switch	For manual stop of engine.
10	Manual crank switch, battery 1	For manual start of engine with battery 1.
11	Manual crank switch, battery 2	For manual start of engine with battery 2.
12	Overspeed reset	If the engine has been stopped due to an overspeed condition, the overspeed alarm must be reset with this switch when the problem has remedied.

* Electronic control module

The control panel of the JX6 diesel engine is equipped with a diagnostic gauge. See fig. 7.

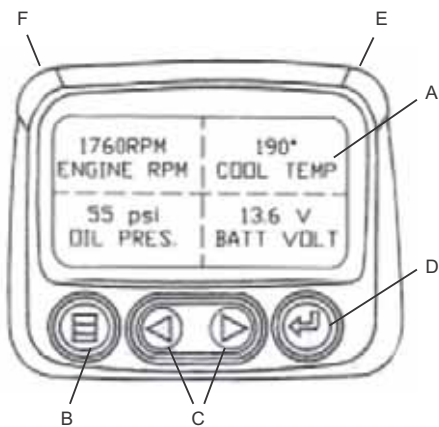


Fig. 7 Diagnostic gauge of JX6 control panel

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Pos.	Designation	Description
A	Display	Shows the four most important engine parameters: <ul style="list-style-type: none"> • engine speed • temperature of cooling liquid (°F) • oil pressure (psi) • battery voltage (1 or 2). If an alarm occurs, the alarm message will be shown instead of the engine parameters.
B	Menu button	Opens the main menu.
C	Arrow buttons	Scrolls through the menus.
D	Enter button	Opens selected submenus. Activates settings and functions.
E	Indicator light Engine stopped (red)	Lights up if a fault occurred that stops the diesel engine (e.g. overspeed).
F	Indicator light Warning (amber)	Lights up if a warning condition occurs.

During normal operation of the diesel engine, the display will show engine speed, temperature of cooling liquid, oil pressure and voltage of battery 1 or 2 selected with the battery selector switch (fig. 6, pos. 4).

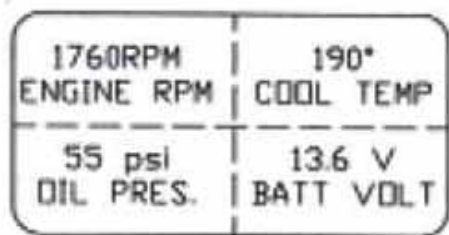


Fig. 8 Example of indications during normal operation, JX6

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If an alarm occurs, the alarm message will be shown instead of the engine parameters.

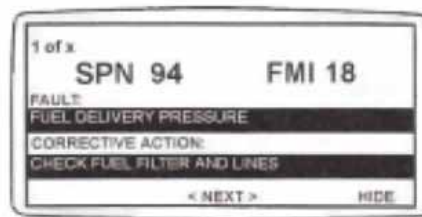


Fig. 9 Example of alarm message, JX6

SPN (Suspect Parameter Number) and FMI (Failure Mode Identifier) codes will be shown along with a description of the problem and the corrective action needed. If the word "NEXT" appears above the arrow buttons, further codes can be viewed by scrolling with the arrow buttons (fig. 7, pos. C). Press the enter button (fig. 7, pos. D) to return to the parameter screen. An overview of possible alarm messages is given in the service instructions together with SPN and FMI codes.

Note *No settings can be made in the diagnostic gauge. Do not use the main menu button (fig. 7, pos. B).*

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4.4 Controller

4.4.1 General description

The fire pump set is controlled via a Tornatech controller especially sized for diesel engines driving fire pumps. The controller starts the pump automatically and monitors the diesel engine. It is FM-approved.

As soon as the sprinklers are activated due to an alarm and water is consumed, the pressure in the discharge pipe will be reduced. If the pressure becomes lower than the cut-in pressure set on the control panel, the pump will start automatically.

Normally, the pump is stopped manually via the controller. But automatic stop is also possible if all starting causes have returned to normal.

For test run and set-up, manual operation is possible.

4.4.2 Controller design

The controller is placed in a control cabinet mounted on the base frame. The control cabinet can also be delivered separately for wall or floor mounting. The controller is operated by means of the control panel and the switches on the cabinet door. See figures 10 and 11. The control cabinet supplies the engine with the power required for starting and operating the engine. The controller therefore has two battery chargers to keep the engine batteries charged. The two batteries are connected to individual battery chargers and power the control circuit. The control circuit is protected by two circuit breakers (CB3 and CB4, fig. 12, pos. 9 and 10) in the top right of the cabinet. The circuit breakers are not monitored and must both be in position "ON".

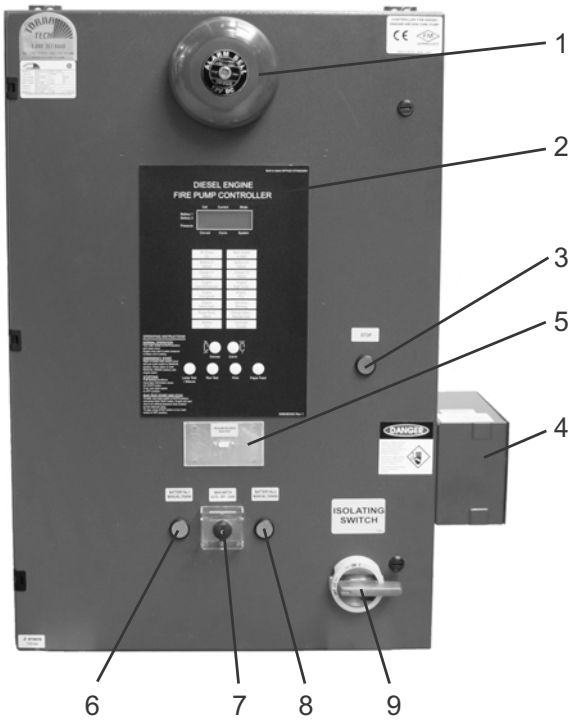


Fig. 10 Control cabinet

Pos.	Designation
1	Alarm bell
2	Control panel
3	Stop button (A5)
4	Box with pressure sensor
5	RS 232 interface (printer as option)
6	Button for manual start, battery 1 (A3)
7	Selector switch (AUTO - OFF - HAND) (A2)
8	Button for manual start, battery 2 (A4)
9	Isolating switch (A1)

The design of the control panel in the cabinet door is shown in fig. 11. It consists of a display, 16 indicator lights and six buttons.

The display shows the status of the fire pump set and gives access to seven menus for setting.

The controller also has two DIP switches on the side of the electronic board fitted on the door. See section 5.1 *Settings via DIP switches*.

The controller has also four standard relays and up to 19 optional relays for indication of operating and alarm status.

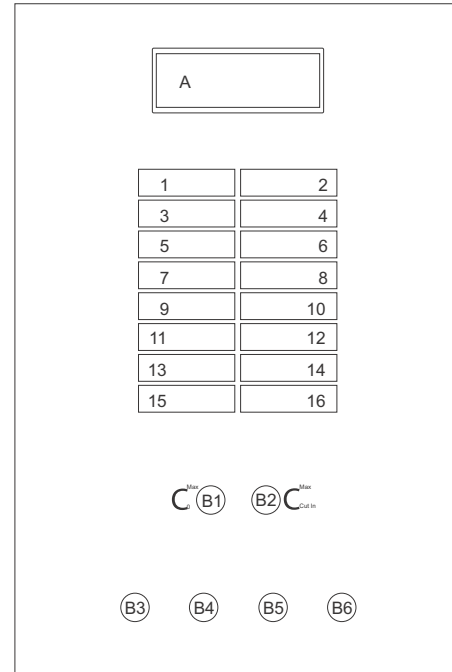


Fig. 11 Control panel of controller

Pos.	Description
A	Display
B1	[Cut-in]
B2	[Cut-out]
B3	[Lamp Test/Silence]
B4	[Run Test]
B5	[Print]
B6	[Paper Feed]
1	"AC Power On"
2	"Main Switch in Auto"
3	"Battery #1 Failure"
4	"Battery #2 Failure"
5	"Charger #1 Failure"
6	"Charger #2 Failure"
7	"Engine Low Oil Pressure"
8	"Engine High Temp."
9	"Engine Overspeed"
10	"Engine Run"
11	"Engine Fail to start"
12	"Fail when Running"
13	"Pump Room Alarm"
14	"Deluge Valve/Remote Start"
15	"Weekly Test"
16	"Controller Trouble"

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The internal components of the controller are shown in fig.12.

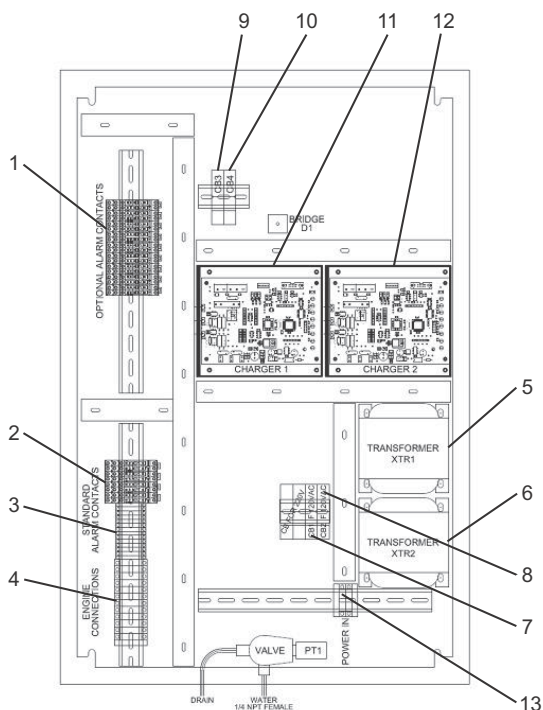


Fig. 12 Internal components of controller

Pos.	Designation	Description
1	AR5 to AR28	Optional alarm relays
2	AR1 to AR4	Standard alarm relays
3	-	Terminals for sensor connections
4	-	Terminals for engine connections
5	XTR1	Transformer for charger 1
6	XTR2	Transformer for charger 2
7	CB 1	Circuit breaker for charger 1
8	CB 2	Circuit breaker for charger 2
9	CB 3	Circuit breaker for control circuit
10	CB 4	Circuit breaker for control circuit
11	-	Charger 1
12	-	Charger 2
13	-	Terminals for mains supply

4.4.3 Operating elements

The operating elements are placed on the cabinet door and control panel. See fig. 10.

Operating elements on the cabinet door

Isolating switch A1 (fig. 10, pos. 9)

The isolating switch interrupts the power supply from the mains.

Main switch A2 (fig. 10, pos. 7)

The main switch is behind a breakable and pad-lockable cover. It allows for selecting three positions:

OFF	Stops the engine and prevents engine start. It also resets all alarms.
HAND	Enables manual start by activating the start fuel solenoid valve.
AUTO	Enables the engine to start in these cases: <ul style="list-style-type: none"> a system pressure drop sensed by the pressure sensor a remote start signal a deluge valve signal a weekly test activation of a run test an AC power failure (selectable).

[BATTERY No. 1 MANUAL CRANK] A3 and [BATTERY No. 2 MANUAL CRANK] A4 (fig. 10, pos. 6 and 8)

These buttons can be used only when the main switch is set to manual mode. Press [BATTERY No. 1 MANUAL CRANK] to start the engine with battery 1 or [BATTERY No. 2 MANUAL CRANK] to start the engine with battery 2. If both buttons are pressed simultaneously, batteries 1 and 2 are used in parallel to start the engine.

[STOP] A5 (fig. 10, pos. 3)

This button can be used to stop the engine only when the main switch is set to automatic operation, and when the system pressure is higher than the cut-out pressure, provided that all starting causes have returned to normal (remote start and deluge valve).

Operating elements on the control panel

[Cut-in] B1 (fig. 11)

This button is used to set the pressure limit for starting the diesel engine. It is enabled with DIP switch S10-1. See section 5.1 Settings via DIP switches.

[Cut-out] B2 (fig. 11)

This button is used to set the pressure limit for stopping the diesel engine. It is enabled with DIP switch S10-1. See section 5.1 Settings via DIP switches.

[Lamp Test/Silence] B3 (fig. 11)

This button has two functions:

1. It is used to test the indicator lights of the control panel and the audible alarm. When activated, the indicator lights of the left column will light up for one second, then the indicator lights of the right column for one second, and finally the alarm bell will ring for one second.
2. It is used to silence the alarm bell in case of "Pump Room Alarm" and "Fail when Running".

[Run Test] B4 (fig. 11)

This button is used to release the pressure on the pressure sensor to simulate a drop of pressure.

It is also used when setting the controller. See section 5.2 Settings via display.

[Print] B5 (fig. 11)

If the controller is equipped with an optional printer, this button is used to print a resume of events of the last 15 days and pressure data of the last seven days. See section 12.4 Retrieving and printing data.

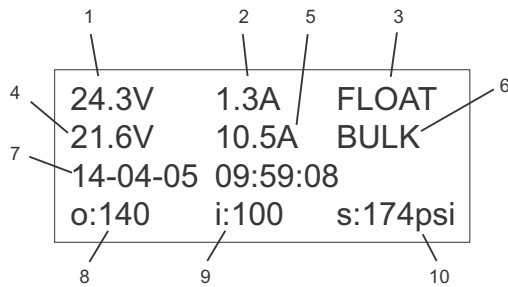
It is also used when setting the controller. See section 5.2 Settings via display.

[Paper Feed] B6 (fig. 11)

If the controller is equipped with an optional printer, this button is used to feed paper through the printer slot in order to avoid tearing the printout.

4.4.4 Display indications

The display shows the status of the fire pump set and alarm messages. It also gives access to the setting menus of the controller. See section 5.2 *Settings via display*.



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Fig. 13 Display of control panel of controller

The display is divided into four lines. The top line shows the battery voltage and the charger status of battery 1. The second line shows the battery voltage and the charger status of battery 2. The third line shows the controller date and time or various alarm messages. The date (D/M/Y) and the time are always shown if there is no alarm. If there is more than one alarm, the line will scroll the different messages. The fourth line shows the system pressure.

The table below explains the display elements.

Pos.	Description
1	Battery voltage of battery 1
2	Charger current delivered from charger 1 to battery 1
3	Charger status of battery 1
4	Battery voltage of battery 2
5	Charger current delivered from charger 1 to battery 2
6	Charger status of battery 2
7	Date and time or alarm messages
8	Cut-out pressure (o)
9	Cut-in pressure (i)
10	Actual system pressure

The table below shows the charger status in pos. 3 and 6.

Status	Description
BULK	The charger is delivering the maximum current for fast recovering of the battery charge.
OVER	The charger is in overcharge mode to maximise the battery charge.
FLOAT	The charger is maintaining the battery voltage.
AC FAIL	The charger is not connected to power source.
no ans	The charger has lost the communication with the main electronic board.

The following operating and alarm messages are shown in fig. 13, pos. 7:












Status	Description
Crank 1/6 Batt#1 10s	Status of cranking cycle and timer countdown.
Low System Pressure	The system pressure is lower than 85 % of the cut-in pressure for more than one second.
Remote Start	The engine has been started by activation (opening) of the remote contact (21-13).
Remote - Pump Demand	The remote signal is still present, and it is impossible to stop the engine with the [STOP] button.
Automatic Start	The engine has been started by detection of a pressure drop (under cut-in pressure).
Auto Start - Pump Demand	The system pressure is still lower than the cut-out pressure, and it is impossible to stop the engine with the [STOP] button.
AC Power Failure	The controller is powered only by batteries.
RPT mm:ss	The remaining time before automatic stop.
Seq. Start Time ss	The remaining time before start sequence.
Press Line Failure	The solenoid valve has been activated, but the pressure drop has not been detected, or the pressure sensor is defective.
Low Fuel Level	Contact 23-24 is closed for more than one second.
Water Reservoir Low	Contact 23-26 is closed for more than ten seconds.
Water Reservoir Empty	Contact 23-27 is closed for more than ten seconds.
Low Pump Room Temp	Contact 23-28 is closed.
High Fuel Level	Contact 23-29 is open for more than half a second.
Low Suction Pressure	Contact 23-30 is closed for more than three seconds.
Weekly Test mm:ss	The remaining time of the weekly test.
Lockout Signal *)	The controller is locked by other equipment and will not start automatically.
Interlock On *)	The controller is supplying voltage to other equipment that must be locked.
AC Failure Start mm:ss	The remaining time before automatic start in case of detection of loss of power supply.
Altern. ECM pos.	The ECM selector switch is in position "ALTERNATE ECM" (engine type JX 6).
System Overpressure	The system pressure is higher than the limit set.
Fuel Injection	There is a malfunction in the fuel injection system. Contact 23-70 is closed.

*) Optional.

4.4.5 Indicator lights on control panel and alarm bell

Sixteen indicator lights show the status of the controller and the engine. See the table below.

The table also shows when the alarm bell will ring, and whether the fault indication is reset automatically (A) or manually (M) by turning main switch A2 (fig. 10, pos. 7) to "OFF".

Pos.	Indicator light	Description	Bell	Reset
1	AC power ON	The controller is connected to an external power source.	-	-
2	Main Switch in Auto	The main switch A2 is in position "AUTO".	-	-
3	Battery #1 Failure	No battery connected. Battery voltage < 50 %. Incorrect battery connection. Problems while charging.		M
4	Battery #2 Failure	No battery connected. Battery voltage < 50 %. Incorrect battery connection. Problems while charging.		M
5	Charger #1 Failure	Internal fault. Charger is not connected to the mains. Current reaches 15 A. Current less than 0.5 A.		M
6	Charger #2 Failure	Internal fault. Charger is not connected to the mains. Current reaches 15 A. Current less than 0.5 A.		M
7	Engine Low Oil Pressure	The oil pressure in the oil circuit of the engine is too low.		M
8	Engine High Temp.	The cooling liquid has reached an abnormal temperature.		M
9	Engine Overspeed	The engine is running with overspeed, and the corresponding contact of the engine is closed.		M *)
10	Engine Run	The engine is running.	-	-
11	Engine Fail to Start	Six start attempts have been made, but the engine did not start.		M
12	Fail when Running	The engine should be running, but is not. The run contact is open.		M
13	Pump Room Alarm	Indicates one or more of these conditions: • low inlet pressure • low fuel level • low level in water reservoir • water reservoir empty • low ambient temperature • power failure.		A
14	Deluge Valve/Remote Start	Engine has started due to deluge valve or remote signal.	-	-
15	Weekly Test	Weekly test run has started.	-	-
16	Controller Trouble	Indicates the following faults: • failure, battery #1 • failure, battery #2 • failure, charger #1 • failure, charger #2 • failure on pressure side.		M

*) Overspeed alarms must also be reset on the control panel of the engine by means of the [OVERSPEED RESET] switch (fig. 5, pos. 4, for JU/JW engines, and fig. 6, pos. 12, for JX engines).

4.5 Functions

Control and monitoring take place via the functions described in the following subsections.

Some of the parameters monitored are shown in the display of the control panel. See section 4.4.4 *Display indications*. Fault will be indicated if a value is outside the limits set. See section 4.4.4 *Display indications* and 4.4.5 *Indicator lights on control panel and alarm bell*. A fault signal can be transferred to a building management system or similar system by means of an optional alarm relay. An overview of alarm relays is given in section 10.3 *Connection to standard alarm relays*. All operating and alarm messages are shown in section 4.6 *Operating and alarm messages*.

4.5.1 Operating functions

Automatic operation

When the main switch is in position "AUTO" and the built-in pressure sensor detects that the system pressure is lower than the cut-in pressure, the engine initiates the automatic engine cranking cycle to start the fire pump set automatically. The cranking cycle provides for activating the fuel solenoid valve and cranking the engine for 15 seconds and then rest for 15 seconds. This sequence is repeated six times. Prior to each new start attempt, a changeover between starting units takes place. The battery changeover is automatic, but if one battery is inoperative, missing or weak, the cranking sequence will use only the remaining battery.

If the engine is in automatic operation, indicator light "Main Switch in Auto" (fig. 11, pos. 2) will be on. If the engine is running, indicator light "Engine Run" (fig. 11, pos. 10) will also be on, and the display will show "Automatic Start".

If the engine does not start after six attempts, indicator light "Engine Fail to Start" (fig. 11, pos. 11) will be on.

The engine can be stopped with [STOP] button A5 (fig. 10, pos. 3) when the system pressure is higher than the cut-out pressure. Otherwise, the display shows "Auto Start - Pump Demand", and the engine can only be stopped by turning the main switch to position "OFF". Automatic stop is also possible. See below.

The cut-in and cut-out pressures can be set by means of buttons [Cut-in] B1 and [Cut-out] B2 (fig. 11). See section 11. *Start-up*.

All engine alarm signals are operative but do not prevent the engine from running except for the overspeed signal which stops the engine immediately.

Automatic stop

In automatic operation, the engine stops automatically when all starting causes have returned to normal. To use automatic stop, set DIP switch S10-2 to "ON". See section 5.1 *Settings via DIP switches*. Normally, the engine is stopped after 30 minutes, but the run time can be changed. See section 5.2 *Settings via display*. The remaining run time is shown in the display (RPT mm:ss).

Manual operation

For test runs and start-up, manual operation is possible by means of main switch A2 (fig. 10, pos. 7) and buttons [BATTERY No. 1 MANUAL CRANK] and [BATTERY No. 2 MANUAL CRANK].

Turn the main switch to "HAND" to start the engine by activating the start fuel solenoid valve.

Press [BATTERY No. 1 MANUAL CRANK] to start the engine with battery 1 or [BATTERY No. 2 MANUAL CRANK] to start the engine with battery 2. If both buttons are pressed simultaneously, batteries 1 and 2 are used in parallel to start the engine.

To stop the engine, turn the main switch to "OFF" or "AUTO".

If the engine is running, indicator light "Engine Run" (fig. 11, pos. 10) will be on, and the display will show "Automatic Start".

The alarms "Engine Fail to Start" (fig. 11, pos. 11) and "Fail when Running" (fig. 11, pos. 12) are not operative in this position.

An overspeed condition will stop the engine and sound the alarm bell. All other alarm signals are operative but have no influence on the engine operation.

Emergency operation

If the controller fails, emergency operation will be possible via the control panel of the diesel engine. See section 12.2.2 *Manual operation via control panel of diesel engine*.

Remote control

The engine can be started by the momentary opening of a remote contact, independent of the pressure sensor. It can only be manually stopped with [STOP] button A5 (fig. 10, pos. 3), provided that the system pressure is higher than the cut-out pressure.

If the engine has been started by a remote control, indicator light "Deluge Valve/Remote Start" (fig. 11, pos. 14) will be on, and the display will show the message "Remote Start".

All engine alarm signals are operative but do not prevent the engine from running, except for the overspeed signal that stops the engine immediately.

Control by means of deluge valve

If a deluge valve is provided, the controller can be started by opening of a normally closed contact (fail-safe circuit) coming from the fire protection equipment (deluge valve), independent of the pressure sensor. The engine can only be manually stopped with [STOP] button A5 (fig. 10, pos. 3), but only after the fire protection equipment contact has returned to normal (provided that the system pressure is higher than the cut-out pressure).

If the engine has been started by a deluge valve, indicator light "Deluge Valve/Remote Start" (fig. 11, pos. 14) will be on.

All engine alarm signals are operative but do not prevent the engine from running except for the overspeed signal which stops the engine immediately.

Automatic weekly test

The controller can be set for a weekly test. See section 5.2 *Settings via display*. When the weekly test is enabled, the engine starts at the set start time and stops at the set stop time, or when the run time set for automatic stop, whichever is the shortest. The engine can be stopped with [STOP] button A5 (fig. 10, pos. 3) before test is finished (provided that the system pressure is higher than the cut-out pressure).

When the automatic weekly test starts, indicator light "Weekly Test" (fig. 11, pos. 15) is on, and the display shows the message "Weekly Test" together with the remaining time. The optional alarm relay AR5 will also be activated if option A1 is ordered.

All alarm signals are operative. During automatic weekly test, low oil pressure, high temperature, overspeed, fuel injection malfunction or programmable external signal condition will immediately stop the engine to prevent damage.

Manual test run

A test run can also be initiated manually by pressing [Run Test] button B4 (fig. 11). Pressing this button simulates a pressure drop. The engine will stop if [STOP] button A5 (fig. 10, pos. 3) is pressed, or if automatic stop is enabled.

All alarm signals are operative. During manual test run, low oil pressure, high temperature, overspeed, fuel injection malfunction or programmable external signal condition will immediately stop the engine to prevent damage.

Start in case of power failure

In case of power failure, the engine will start automatically after a time set. The engine will stop immediately when the AC power supply is re-established. The function can be disabled by setting the time to 0. The function is disabled from factory. See section 5.2 *Settings via display*.

Start delay

In systems with several pumps, it may be necessary to set a start delay to prevent all engines from starting at the same time. The start delay is selectable (5, 10 and 15 seconds). See section 5.1 *Settings via DIP switches*, subsection *Start delay (S10-3+4)*, and 5.2 *Settings via display*, subsection *Menu 4 (timers)*. The remaining time before the engine will start is shown in the display ("Seq Start Time ss").

Battery charging

The controller is equipped with two independent fully automatic battery chargers for 10 A continuous charging, complete with these functions:

- AC input filter
- current limiter
- overcurrent stop
- 500 mA trickle charge
- dead cell detection
- low battery voltage alarm.

Louvres control

To ensure a sufficient supply of fresh air to the engine and a targeted heat removal, it may be necessary to install louvres. The louvres can be controlled via the control cabinet if the louvres motor powered by an external power source are connected to standard alarm relay AR2, terminals 11 and 12. Standard alarm relay AR2 is activated when the diesel engine is running.

Lockout by other equipment (option C1)

When a lockout signal is present, the controller is inhibited to start on water pressure drop detection, weekly test and run test. All other starting causes will produce a starting cycle.

If the lockout wires are short-circuited, fuse FU1 will blow, and the lockout function will be inoperative. If the lockout wires are cut, relay CR8 cannot be activated, and the lockout function will be inoperative again.

Interlock of other equipment (option C2)

The interlock circuit provides a 12 VDC or 24 VDC voltage on terminals 11-64 in order to prevent other equipment from starting.

Cooling water heater (option C7)

Some fire pump sets are equipped with a cooling water heater for the engine. For this purpose, the control cabinet contains a 10 A circuit breaker (CB5). The heater adjusts itself via an external cooling water thermostat.

Anti-condensation heater (option D9A and D9B)

To avoid formation of condensation, the control cabinet can be equipped with an anti-condensation heater with thermostat (option D9A) or humidistat (option D9B).

4.5.2 Monitoring functions

Monitoring of engine operation

If the engine is in automatic mode and ready for operation, indicator light "Main Switch in Auto" (fig. 11, pos. 2) will be on. During the cranking process, the display shows the number of current starting attempt and the remaining time ("Crank 1/6 Batt#1 10s"). When the engine is running, indicator light "Engine Run" (fig. 11, pos. 10) is on, and the display shows the message "Automatic start". If the start was initiated by a remote signal or a signal from a deluge valve, indicator light "Deluge Valve/Remote Start" will also be on, and the display will show the message "Remote Start". In all cases, standard alarm relay AR2 will be activated.

If the controller does not receive an engine run signal after six start attempts, indicator light "Engine Fail to Start" (fig. 11, pos. 11) will be on, and standard alarm relay AR 1 will be activated. The optional alarm relay AR9 will also be activated if option A5 has been ordered.

If there is a pump demand, but the diesel engine is not running, indicator light "Fail when Running" will be on, and standard alarm relay AR 1 will be activated.

In both alarm situations, the alarm bell will ring.

The pump-on-demand relay AR28 (option B8) will be activated if a start condition is present (remote start contact open, deluge valve open, pressure under cut-out pressure with engine running) when the engine is running. In this situation, the engine will not stop if [STOP] button is pressed.

Monitoring of batteries

If the battery voltage falls below the specified value (normally 50 % of the nominal battery voltage), or when the battery does not reach the appropriate voltage after 24 hours in bulk mode, or no battery is connected, or the battery is connected in reverse polarity, a warning will be given by indicator light "Battery #1 Failure" (fig. 11, pos. 3) or "Battery #2 Failure" (fig. 11, pos. 4), and additionally by indicator light "Controller Trouble" (fig. 11, pos. 16). The alarm bell will ring. Standard relay AR4 will be deactivated. The optional alarm relays AR10 and AR11 will also be activated if option A6 has been ordered.

Both batteries are monitored. A value for alarm can be set. See section 5.2 *Settings via display*, subsection *Menu 6 (weak battery)*.

In case of battery failure, the charger will initiate an alarm and provide a signal to prevent the use of the defective battery during the start attempt cycle.

Monitoring of battery chargers

If the load current is too low (0.5 A) or too high (15 A), or no charger is connected, or the charger is not powered by the mains for more than five minutes, a warning will be given by indicator light "Charger #1 Failure" (fig. 11, pos. 5) or "Charger #2 Failure" (fig. 11, pos. 6), and additionally by indicator light "Controller Trouble" (fig. 11, pos. 16). The alarm bell will ring. Standard relay AR4 will be deactivated. The optional alarm relays AR12 and AR13 will also be activated if option A7 has been ordered. Both batteries are monitored.

Monitoring of power supply

If the power supply is missing (indicator light "AC Power On" (fig. 11, pos. 1) is not on), indicator light "Pump Room Alarm" (fig. 11, pos. 13) will be on, and the bell will ring. Standard relay AR1 will be activated. The optional alarm relay AR14 will also be activated if option A8 has been ordered.

Monitoring of engine speed

If an overspeed condition occurs and the overspeed switch contact of the engine has tripped out, indicator light "Engine Overspeed" (fig. 11, pos. 9) will be on, and the alarm bell will ring. Standard relay AR1 will be activated. The optional alarm relay AR6 will also be activated if option A2 has been ordered.

Overspeed alarms must be reset on the control panel of the engine by means of the [OVERSPEED RESET] switch (fig. 5, pos. 4, for JU/JW engines, and fig. 6, pos. 12, for JX engines).

Note

Monitoring of engine oil pressure

The oil pressure is monitored via a pressure sensor on the engine. The oil pressure must be reached no later than eight seconds after the engine run signal was activated, and the contact of the engine must be closed.

If an abnormal (too low) pressure in the diesel engine oil-pressure circuit has been detected, indicator light "Engine Low Oil Pressure" (fig. 11, pos. 7) will be on, and the alarm bell will ring. Standard relay AR1 will be activated. The optional alarm relay AR7 will also be activated if option A3 has been ordered.

Monitoring of cooling temperature

The temperature of the cooling liquid is monitored via a temperature sensor on the engine. If the temperature of the cooling liquid rises to a value causing the contact of the engine to close, indicator light "Engine High Temp." (fig. 11, pos. 8) will be on, and the alarm bell will ring. Standard relay AR1 will be activated. The optional alarm relay AR8 will also be activated if option A4 has been ordered.

Monitoring of system pressure on discharge side

If the system pressure measured by the built-in pressure sensor of the controller is above the set limit, indicator light "Controller Trouble" (fig. 11, pos. 16) will be on, and the alarm bell will ring. The display will show the alarm message "System Overpressure", and standard relay AR4 will be activated. The optional alarm relay AR27 will also be activated if option A9 has been ordered.

If the system pressure falls below 85 % of the cut-in pressure for more than one second, indicator light "Controller Trouble" (fig. 11, pos. 16) will be on, and the alarm bell will ring. The display will show the alarm message "Low System Pressure", and standard relay AR4 will be activated. The optional alarm relay AR20 will also be activated if option B6 has been ordered.

Monitoring of fuel level

The fuel level in the tank is monitored by two float switches (low and high level). If the fuel level falls below two thirds of the fuel tank capacity for more than one second, an alarm will be given. Indicator light "Pump Room Alarm" (fig. 11, pos. 13) will be on, and the alarm bell will ring. The display will show the alarm message "Low Fuel Level", and standard relay AR3 will be activated. The optional alarm relay AR15 will also be activated if option B1 has been ordered, and the contact is closed for more than one second.

If the fuel level reaches the high-level float switch for more than 0.5 seconds, the display will show the alarm message "High Fuel Level", and the optional alarm relay AR19 will be activated if option B5 has been ordered.

Monitoring of water reservoir level

The level in the water reservoir is monitored by two float switches (low level and empty tank). If a low level is detected and contact 23-26 is closed for more than ten seconds, indicator light "Pump Room Alarm" (fig. 11, pos. 13) will be on, and the alarm bell will ring. The display will show the alarm message "Water Reservoir Low", and standard relay AR3 will be activated. The optional alarm relay AR16 will also be activated if option B2 has been ordered.

If the water reservoir is empty and contact 23-27 is closed for more than ten seconds, indicator light "Pump Room Alarm" (fig. 11, pos. 13) will be on, and the alarm bell will ring. The display will show the alarm message "Water Reservoir Empty", and standard relay AR3 will be activated. The optional alarm relay AR17 will also be activated if option B3 has been ordered.

Monitoring of ambient temperature

If a thermostat for measuring the room temperature is installed, an alarm will be given, and contact 23-28 will be closed when the temperature is below 5 °C. Indicator light "Pump Room Alarm" (fig. 11, pos. 13) will be on, and the alarm bell will ring. The display will show the alarm message "Low Pump Room Temp", and standard relay AR3 will be activated. The optional alarm relay AR18 will also be activated if option B4 has been ordered.

Monitoring of inlet pressure

If a pressure switch is installed in the suction pipe, an alarm is given when the pressure on suction side is below a certain value. If contact 23-29 is closed by the pressure switch for more than three seconds, indicator light "Pump Room Alarm" (fig. 11, pos. 13) will be on, and the alarm bell will ring. The display will show the alarm message "Low Suction Pressure", and standard relay AR3 will be activated. The optional alarm relay AR21 will also be activated if option B7 has been ordered.

Recording of events and pressure data

The controller records events of the last 15 days and pressure data of the last seven days. The information is accessible either by using the RS232 port (standard, see section *12.4.1 Retrieving data via the RS 232 port*), the printer (optional, see section *12.4.2 Printing of data*), or the modem (see section *12.4.3 Retrieving data via modem*).

4.6 Operating and alarm messages











The operating status is shown on the control panel by means of the display and the indicator lights. Some alarms will cause the alarm bell to ring. See section 4.4.4 *Display indications* and 4.4.5 *Indicator lights on control panel and alarm bell*. In the following two subsections, operating and alarm messages are shown together with the contact status of the standard and optional alarm relays.








It is also stated whether fault indications are reset automatically (A), or to be reset manually (M) by turning main switch A2 (fig. 10, pos. 7) to "OFF".

4.6.1 Operating messages

Operating status	Indicator light	Display text	Status of standard relay	Status of optional alarm relay
AC power supply is okay.	AC Power On	-	-	AR14: not activated
The engine is in automatic mode and ready for operation.	Main Switch in Auto	-	-	-
The cranking cycle is activated to start the diesel.	-	Crank 1/6 Batt#1 10s	-	-
The engine is in automatic mode and running because of a pressure drop in the system.	Engine Run	Automatic Start	AR2: activated	-
The engine is running in automatic mode, and the system pressure is still low than the cut-out pressure.	Engine Run	Auto Start - Pump Demand	AR2: activated	AR28: activated
The engine has been started in automatic mode by a remote signal.	Deluge Valve/ Remote Start	Remote Start	AR2: activated	-
The engine is running in automatic mode, and the remote signal is still present.	Deluge Valve/ Remote Start	Remote - Pump Demand	AR2: activated	AR28: activated
The engine has been started in automatic mode by a signal from a deluge valve.	Deluge Valve/ Remote Start	-	AR2: activated	-
The engine starts with a delay.	-	Seq Start Time ss	-	-
The engine is running but will be stopped automatically.	Engine Run	RPT mm:ss	AR2: activated	-
The automatic weekly test run is taking place.	Weekly Test	Weekly Test mm:ss	-	AR5: activated
The engine has been started manually.	Engine Run	-	AR2: activated	-

4.6.2 Alarm messages

Operating status	Indicator light	Display text	Alarm bell	Status of standard relay	Status of optional alarm relay	Reset
The engine did not start after six attempts.	Engine Fail to Start	-		AR1: activated	AR9: activated	M
There is a pump demand, but the engine does not run.	Fail when Running	-		AR1: activated	-	M
AC power supply is missing.	Pump Room Alarm	AC Failure Start mm:ss		AR3: activated	AR14: activated	M
The voltage of battery 1 is lower than a set value (normally 6 V), or no battery is connected, or the battery is connected in reverse polarity, or the battery does not reach the appropriate voltage after 24 hours in bulk mode.	Battery #1 Failure Controller Trouble	-		AR4: deactivated	AR10: activated	M
The voltage of battery 2 is lower than a set value (normally 6 V), or no battery is connected, or the battery is connected in reverse polarity, or the battery does not reach the appropriate voltage after 24 hours in bulk mode.	Battery #2 Failure Controller Trouble	-		AR4: deactivated	AR11: activated	M
The current has reached 15 A or less than 0.5 A, or charger 1 is not connected to the mains or not powered by the mains for more than five minutes, or the micro-processor of the charger has detected an internal fault.	Charger #1 Failure Controller Trouble	-		AR4: deactivated	AR12: activated	M
The current has reached 15 A or less than 0.5 A, or charger 2 is not connected to the mains or not powered by the mains for more than five minutes, or the micro-processor of the charger has detected an internal fault.	Charger #2 Failure Controller Trouble	-		AR4: deactivated	AR13: activated	M
The engine was running with overspeed and has been stopped.	Engine Overspeed	-		AR1: activated	AR6: activated	M*)
The oil pressure in the oil circuit of the engine is too low eight seconds after engine start.	Engine Low Oil Pressure	-		AR1: activated	AR7: activated	M
The temperature of the cooling liquid is higher than 93 °C.	Engine High Temp.	-		AR1: activated	AR7: activated	M

Operating status	Indicator light	Display text	Alarm bell	Status of standard relay	Status of optional alarm relay	Reset
The system pressure measured by the built-in pressure sensor of the controller is above the set value. See section 5.2 <i>Settings via display, Menu 3 (maximum pressure)</i> .	Controller Trouble	System Overpressure		AR4: deactivated	AR27: activated	M
The system pressure is lower than 85 % of the cut-in pressure.	Controller Trouble	Low system pressure		AR4: deactivated	AR20: activated	M
The fuel level in the diesel tank is below two thirds of the capacity.	Pump Room Alarm	Low Fuel Level		AR3: activated	AR15: activated	A
The fuel level has reached the upper float switch.	-	High Fuel Level	-	-	AR19: activated	A
The level in the water reservoir is low.	Pump Room Alarm	Water Reservoir low		AR3: activated	AR16: activated	A
The water reservoir is empty.	Pump Room Alarm	Water Reservoir empty		AR3: activated	AR17: activated	A
The ambient temperature is low.	Pump Room Alarm	Low Pump Room Temp		AR3: activated	AR18: activated	A
The inlet pressure is low.	Pump Room Alarm	Low Suction Pressure		AR3: activated	AR21: activated	A

*) Overspeed alarms must also be reset on the control panel of the engine by means of the [OVERSPEED RESET] switch (fig. 5, pos. 4, for JU/JW engines, and fig. 6, pos. 12, for JX engines).

5. Settings

Settings are made by means of the two DIP switches and the display menu.

5.1 Settings via DIP switches

Possible settings:

- language
- locking of control panel buttons for setting of cut-in and cut-out pressures
- automatic or only manual stop
- engine start delay
- pressure unit, kPa or psi
- pressure interval for recording of pressure data.

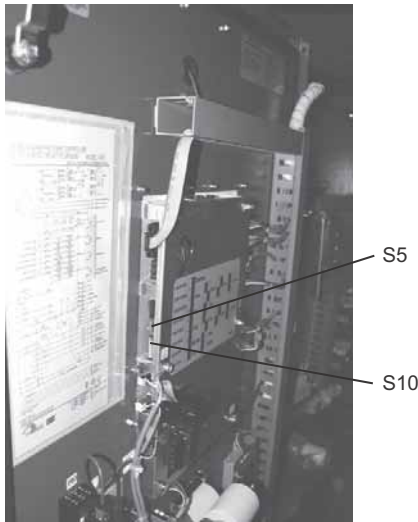


Fig. 14 Position of DIP switches

The two DIP switches are located on the side of the electronic board mounted on the door. DIP switch S5 is at the top, DIP switch S10 is at the bottom. See fig. 14. The configuration and factory settings are shown below.

DIP switch S5

ON	OFF	Switch	Configuration	Factory setting
		S5-1	Language	English
		S5-2	Language	
		S5-3	For factory use	
		S5-4	For factory use	

DIP switch S10

ON	OFF	Switch	Configuration	Factory setting
		S10-1	Buttons B1 and B2	Locked
		S10-2	Run time	Manual stop
		S10-3	Start delay	No delay
		S10-4	Start delay	
		S10-5	Pressure unit	Psi
		S10-6	Pressure interval	5 psi
		S10-7	Pressure interval	
		S10-8	For factory use	-

Language (S5/1+2)

The display language is English, regardless of the DIP switch setting.

Enabling or locking of buttons for setting of cut-in and cut-out pressures (S10-1)

When DIP switch S10-1 is in position "ON", buttons [Cut-in] B1 and [Cut-out] B2 (fig. 11) are enabled. When it is in position "OFF", setting is not possible.

Automatic or manual stop (S10-2)

When DIP switch S10-2 is in position "ON", the controller is set to automatic stop. The engine will stop after the minimum run time set to 30 minutes from factory. The time can be changed in the display menu. See section 5.2 *Settings via display*. When DIP switch S10-2 is in position "OFF", the controller is set to manual stop. The engine can only be stopped with [STOP] button A5 (fig. 10, pos. 3), provided the system pressure is higher than the cut-out pressure.

Start delay (S10-3+4)

The controller delays the engine start cycle by five seconds, ten seconds, or another time that can be set in the display menu (see section 5.2 *Settings via display*) upon a water pressure drop detection, a remote start or a deluge valve detection. The time is factory-set to 15 seconds. All other starting causes will activate the engine immediately. To change the delay, the DIP switch must be set according to the following table.

Switch	ON	OFF	Time
S10-4			0 second
S10-3			
S10-4			5 seconds
S10-3			
S10-4			10 seconds
S10-3			
S10-4			15 seconds
S10-3			

Pressure unit (S10-5)

The pressure can be displayed in kPa or psi. When DIP switch S10-5 is in position "ON", the pressure unit is kPa. In position "OFF", the pressure unit is psi.

Pressure interval for recording of pressure data (S10-6+7)

Pressure data are recorded each time the pressure varies more than the pressure interval. The pressure interval can be set to 1, 2, 5 or 10 psi. To change the pressure interval, set the DIP switch according to the following table.

Switch	ON	OFF	Pressure interval
S10-7			5 psi
S10-6			34.475 kPa
S10-7			10 psi
S10-6			68.950 kPa
S10-7			1 psi
S10-6			6.8950 kPa
S10-7			2 psi
S10-6			13.790 kPa

Test mode (S10-8)

This DIP switch is for factory use and must remain in position "OFF".

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5.2 Settings via display

Seven menus enable setting of several parameters:

- date and time (menu 1)
- time for automatic weekly test (menu 1)
- print (menu 2)
- maximum pressure (menu 3)
- start delay (menu 4)
- run time before automatic stop (menu 4)
- start delay in case of power failure (menu 4)
- calibration of pressure sensor (menu 5)
- alarm value for weak battery voltage (menu 6)
- erase memory (menu 7).

General procedure

- Press [Print] button B5 (fig. 11) for more than 5 seconds to get access to the setting menus. Keep the button pressed.
- To go to the next menu, press [Run Test] button B4 (fig. 11) repeatedly until the desired menu appears. Then release the [Print] button.
- To select a value, press the [Print] button.
- To set a value, press the [Run Test] button.
- To save the setting and return to the "normal" display, select "Save" using the [Print] button, and validate using the [Run Test] button.
- To leave the menu without saving, select "Exit" using the [Print] button, and validate using the [Run Test] button.
- If no button is touched for 30 seconds, the setting will not be saved, and the screen will return to normal mode.

Menu 1 (date and time, and time for automatic weekly test)

In this menu, the display shows these pieces of information:

- First line: Controller date and time.
- Second line: Weekly test activation (Y = yes) or (N = no).
- Fourth line: Day of the week when a weekly test will be performed, and start and stop time.

All of these parameters can be changed.

Note: During weekly test, the stop time may be overridden by the run time. See section 5.1 *Settings via DIP switches*, subsection *Automatic or manual stop (S10-2)*.

Menu 2 (print)

In this menu, the user can select how pressure data are to be shown when printed:

- "Text": Each pressure record is printed on a separate line.
- "Graph": The printout is a series of small lines representative to the pressure. The scaling of the Y axis (pressure) can be changed by entering the Y maximum and Y minimum values. The scaling of the X axis (time) can be changed by selecting between one hour and 15 minutes. Dot lines (0 to 5) can be added to have a better graph reading.

Menu 3 (maximum pressure)

In this menu, the maximum pressure can be set in psi or kPa, depending on the selected unit.

If the system pressure exceeds this value, "Controller Trouble" alarm relay (AR4), indicator light "Controller Trouble" (fig. 11, pos. 16) and "System Overpressure" alarm relay (option A9) will be triggered.

Menu 4 (timers)

In this menu, three different timers can be set:

a) Start delay

The delay time can be set from 0 to 60 seconds. The factory setting is 15 seconds.

Note *The starting sequence will be delayed by the set time only if DIP switches S10-3 and S10-4 are in position "ON". See section 5.1 Settings via DIP switches.*

b) Run time before automatic stop

The engine will stop when the run time has expired, but only if DIP S10-2 switch is in position "ON". See section 5.1 *Settings via DIP switches*. The time can be set from 1 to 60 minutes. The factory setting is 30 minutes.

Note: The time will be reset if the system pressure falls below the cut-out pressure.

c) Start in case of power failure

If this function is selected, the engine will start automatically in case of power failure. "AC Fail Start Timer" can be set from 0 to 255 minutes.

Note: If 0 is selected, "No" will appear on the screen, and the function will be disabled.

The time starts when the AC source is lost. When the time has expired, the engine will be started.

The function is disabled from factory.

Menu 5 (calibration of pressure sensor)

This menu is used only if the pressure sensor has to be replaced. The function is described in the service instructions.

Menu 6 (weak battery)

In this menu, a value for detection of weak battery can be set between 0.0 and 24.0 V. The default value is 6.0 V.

Menu 7 (erase memory)

In this menu, pressure data or the event memory can be erased individually. The elapse time meter and the last engine run can not be reset.

6. Identification

The fire pump set can be identified by the type designation on the nameplate. See fig. 15.

6.1 Type keys

An explanation of the type designation is given in the following subsections.

6.1.1 Type key for fire pump set

Example DNF:	Fire	DN	F	80	-25	/260	D	A	X	A	A	B	B
Example HSEF:	Fire	HSE	F	8	-15	/323	D	B	X	D	A	B	C
Fire: Fire system													
Pump type DN: End-suction pump HSE: Horizontal split case pump													
F : Pump is approved for fire fighting													
Nominal diameter of discharge port [mm] for DN [inch] for HSE													
Pump housing size [cm] for DN [inch] for HSE													
Actual impeller diameter [mm]													
Driver D: Diesel engine E: Electric motor, 50 Hz F: Electric motor, 60 Hz X: Special configuration													
Approvals of pump A: FM/UL B: FM C: UL X: No approval													
Approval of fire pump set X: No approval													
Pipe connection A: ANSI flange D: DIN flange													
Control panel A: Mounted on base frame F: For floor mounting W: For wall mounting X: No control panel													
Stuffing box B: SNEA C: SNFA													
Coupling A: Standard (only DNF) B: Spacer (only DNF) C: Other types D: PTO (Power Take-Off shaft)													

The first example shows a fire pump set with a DNF end-suction pump driven by a diesel engine. The pump with stuffing box with internal barrier fluid is FM-approved and UL-listed. The diameter of its DIN flange on the discharge side is 80 mm, and the impeller diameter is 260 mm. Pump and engine are connected by a spacer coupling. Operation takes place via a controller placed on the common base frame.

6.1.2 Type key for engine

Example	J	U	4	H	UL	2	4
Engine type J: John Deere basic engine adapted by CLARKE UK LTD							
Engine series U: standard range 4-cylinder engine = 4.5 litres 6-cylinder engine = 6.8 litres W: special range 6-cylinder engine = 8.1 litres X: standard range 6-cylinder engine = 12.5 litres							
Number of cylinders 4 6							
Cooling H: via heat exchanger							
Approvals of engine NL: not listed UL: listed							
Code for rated power							
Code for speed range 0: standard speed range 4: 2350-3500 rpm (JU only)							

The example shows a UL-listed John Deere 4-cylinder standard engine with a 4.5 litre cylinder capacity. Cooling takes place via a heat exchanger.

6.1.3 Type key for controller

Example	GPD	N	12	B	E	BCE10-12	FM	B1, C3, C5,C7
Range GPD: Controller for diesel-powered fire pump set								
Type of earth N: Negative earth P: Positive earth								
Battery voltage [V] 12 24								
Mounting B: Mounted on base frame F: For floor mounting W: For wall mounting								
Language E: English F: French S: Spanish								
Type of battery charger BCE10-12 10 A-12 V BCE10-24 10 A-24 V								
Approval A1: Alarm relay, weekly test A2: Alarm relay, overspeed A3: Alarm relay, low oil pressure A4: Alarm relay, high temperature A5: Alarm relay, failure to start A6: Alarm relay, battery 1 and 2 A7: Alarm relay, charger 1 and 2 A8: Alarm relay, power failure B1: Alarm relay, low fuel level B2: Alarm relay, low level in water reservoir B3: Alarm relay, water reservoir empty B4: Alarm relay, low pump room temperature B5: Alarm relay, high fuel level B6: Alarm relay, low system pressure B7: Alarm relay, low inlet pressure B8: Alarm relay, pump-on-demand C3: Supply voltage 220 V, 50-60 Hz C4: Supply voltage 240 V, 50-60 Hz C5: CE mark C6: Nickel-cadmium battery charger C7: Engine block heater circuit C13: Louvre activation circuit D9: Anti-condensation heater and thermostat/humidistat D11: Switch in controller, low inlet pressure D13: Modem for remote monitoring								
Alarm relays A1 to B8 are options.								

The example shows a diesel engine fire pump controller with micro-processor equipped with 10 A 12 V battery charger mounted on the common base frame of the fire pump set. The incoming power for the control cabinet is 220 V with negative earth. The language for the control panel is English. The controller is equipped with optional low fuel level contacts. The controller has also an engine block heater circuit and a CE mark for the European market.

6.1.4 Type key for stuffing box

Example	S	N	E	A
S: Packing-type stuffing box				
N: Uncooled stuffing box				
E: With internal barrier fluid				
F: With external barrier fluid				
A: PTFE-impregnated fibre packing rings and EPDM O-ring in pump housing				

HSEF and DNF pumps are equipped with an uncooled stuffing box with internal or external barrier fluid. The fibre packing rings are PTFE-impregnated, and the O-ring of the pump housing is made of EPDM.

6.2 Nameplates

All important data of the fire pump set are stated on the fire pump set nameplate (fig. 15), pump nameplate (fig. 16 and fig. 17), engine nameplate (fig. 18) and controller nameplate (fig. 19).

Nameplate for fire pump set

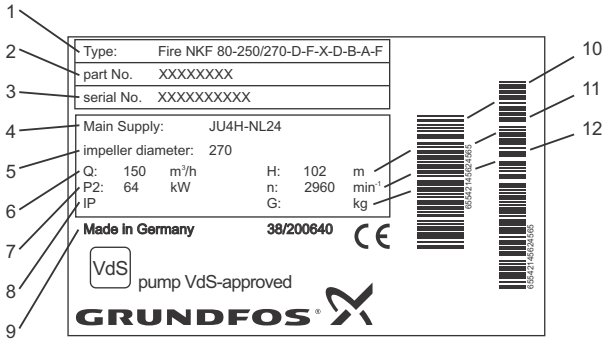


Fig. 15 Example of nameplate for HSEF/DNF fire pump set

Pos.	Description
1	Type designation
2	Product number
3	Serial number
4	Type designation of driver
5	Actual impeller diameter
6	Rated flow rate
7	Power output
8	Enclosure class
9	Country of origin
10	Rated head
11	Speed
12	Weight

Nameplate for HSEF pump

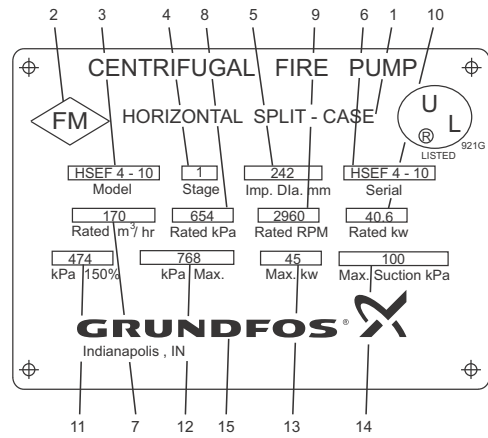


Fig. 16 Example of nameplate for HSEF pump

Pos.	Description
1	Pump type
2	Approvals
3	Type designation
4	Number of stages
5	Actual impeller diameter
6	Serial number
7	Rated flow rate
8	Rated head
9	Rated speed
10	Rated power
11	Head at 150 % flow rate
12	Maximum head
13	Maximum power
14	Maximum suction lift
15	Manufacturer

Nameplate for DNF pump

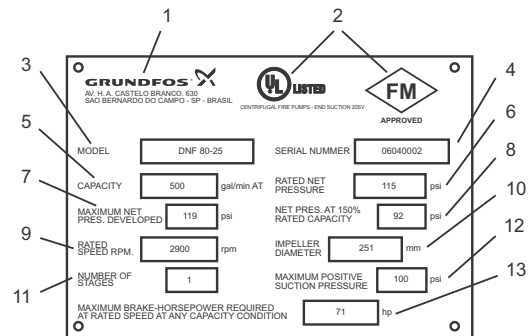
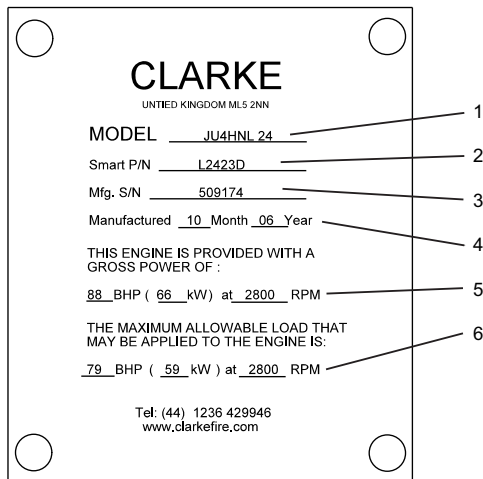


Fig. 17 Example of nameplate for DNF pump

Pos.	Description
1	Manufacturer
2	Approvals
3	Type designation
4	Serial number
5	Rated flow rate
6	Rated head
7	Maximum head
8	Head at 150 % flow rate
9	Rated speed
10	Actual impeller diameter
11	Number of stages
12	Maximum suction lift
13	Maximum power at rated speed

Nameplate for diesel engine



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Fig. 18 Example of nameplate for diesel engine

Pos.	Description
1	Type designation
2	Product number
3	Serial number
4	Date of production
5	Maximum power and speed
6	Rated power and speed

Nameplate for controller



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Fig. 19 Example of nameplate for controller

Pos.	Description
1	Type designation
2	Mains voltage
3	Number of phases
4	Maximum load current
5	Frequency
6	Enclosure class according to NEMA
7	Maximum current
8	Maximum operating pressure
9	Battery voltage
10	Options
11	Drawing number
12	Serial number
13	Date of production

7. Technical data

7.1 Complete fire pump set

Dimensions and weights, see section 19.1.

Sound pressure level

The sound pressure level depends on the diesel engine. It was measured without a silencer, one metre away from the fire pump set. The sound pressure level for the engine types are given in the table below. The engine type is stated on the nameplate of the diesel engine. See fig. 18, pos. 1.

Engine type	Sound pressure level [dB(A)]
JU4H-UF10	97.2
JU4H-UF14	97.2
JU4H-UF24	97.2
JU4H-UF30	98.1
JU4H-UF34	98.1
JU4H-UF40	98.6
JU4H-UF50	98.6
JU4H-UF54	98.6
JU6H-UF30	99.2
JU6H-UF34	99.2
JU6H-UF50	99.2
JU6H-UF54	99.4
JU6H-UF60	99.4
JU6H-UF84	99.4
JW6H-UF30	100.3
JW6H-UF40	101.4
JW6H-UF50	102.3
JW6H-UF60	102.7
JX6H-UF30	103.1
JX6H-UF40	103.1
JX6H-UF50	103.4
JX6H-UF60	103.7
JX6H-UF70	103.7

The dimensions of the silencer delivered from factory are designed to meet the sound pressure level requirements of the installation site. The site or the required sound pressure level must therefore be specified when placing the order.

Note

Warning



When the engine is running, the sound pressure level is > 70 dB(A). Hearing protection must therefore be worn when working on or near the engine.

7.2 Pump

See section 19.1 Dimensions and weights.

7.3 Engine

Type:	4-stroke diesel engine.
Performance:	See section 19.2.
Speed:	See section 19.2.
Weight:	See section 19.2.
Diameter of exhaust gas pipe:	See section 19.2.
Discharge heat exchanger:	3/8".
Amount of oil:	See section 19.2.
Type of oil:	API-classification CF4. Viscosity 15W-40.



Warning

During the initial running time, use "John Deere Break-in" oil (TY22041) for refilling.

Oil pressure:	See section 19.2.
Amount of cooling liquid:	See section 19.2.
Cooling liquid:	Mixture of 50 % coolant and 50 % water.
Coolant:	Ethylene/glycol-coolant according to ASTM D 4985.



Warning

Never use conventional engine vehicle coolants. They can damage the engine due to their high silicate content!

Cooling water temperature:	71 to 93 °C.
Fuel filling quantity:	See section 19.2.
Fuel type:	Diesel.
Permissible counter-pressure exhaust gas:	0.075 bar.

7.4 Battery

2 x CLT120-12 with 12 V - 120 Ah.	
Battery dimensions L x W x H:	410 x 177 x 225 mm.
Weight	38 kg.
The battery is maintenance-free.	

7.5 Controller

Type:	Tornatech GPD.
Control cabinet:	Sheet steel, red.
Enclosure class:	IP24.
Dimensions W x H x D:	24" x 36" x 8".
Weight:	Appr. 68 kg.
Supply voltage:	1 x 220 V, 50/60 Hz.
Voltage tolerance:	± 10 %.
Maximum current consumption (incl. cooling water heater):	30 A.
EMC-noise emission:	According to EN 61000-6-3.
EMC-noise immunity:	According to EN 61000-6-2.
Degree of contamination:	2.
Control voltage:	230 V/12 V.
Battery charger power supply:	12 V.
Battery voltage:	12 V.
Maximum battery capacity:	120 Ah.
Battery type:	CLT (Pb).
Fuse battery charger:	SLO-BLO 3AG-32VDC 20A.

The standard alarm relays are located on the main I/O board. Additionally, 19 alarm relays can be ordered for connecting remote indicators. All relays have DPDT contacts rated for 8 A, 240 VAC.

8. Operating conditions

Warning

Do not operate the pump at any pressure, flow rate or liquid temperature other than those for which the pump was originally purchased. Do not pump any other liquid than the one for which the pump was originally purchased without the consent of Grundfos or its authorised representatives. Disregard of this warning can result in pump failure and serious personal injury or death.



8.1 Minimum inlet pressure

At any time, there must be a positive inlet pressure. A minimum inlet pressure of 5 psi is recommended.

Caution

Inadequate inlet pressure will result in cavitation damage to the impeller and casing.

8.2 Maximum inlet pressure

The sum of actual inlet pressure plus pump pressure against a closed valve must always be lower than the maximum permissible operating pressure. See section 8.7 *Maximum operating pressure*. The maximum inlet pressure is 100 psi (approx. 7 bar).

8.3 Minimum flow rate

Generally, the pump is not allowed to run against a closed valve, as this may cause an increase in temperature or formation of steam in the pump. This may cause damage to the pump.

Caution

Only brief periods of operation during start and stop are permissible with a closed discharge valve. Prolonged operation at less than 15 to 20 % of the pump's rated capacity will cause heating of the pumped liquid, impeller erosion, short life of bearings and packing due to stress or vibration. Some pumps may incur shaft damage and wear on stationary parts. It is therefore advisable to install a bypass pipe to ensure a minimum flow rate of at least 2 % at maximum efficiency. The minimum flow rate helps to dissipate any excessive heat and thus protect the pump against overheating.

Caution

Operation of the pump with flow only through the bypass is not allowed.

How to install a bypass is shown in section 9.6 *Bypass*.

8.4 Pumped liquids

The pumps are suitable for clean and non-aggressive water, not containing solid particles or fibres.

8.5 Liquid temperature

Maximum permissible liquid temperature is 40 °C. The pumps can handle temperatures from 0 °C to +120 °C.

8.6 Pump speed

The maximum pump speed is stated on the test report and shown on the nameplate for the fire pump set. See fig. 15, pos. 11.

8.7 Maximum operating pressure

10, 16 or 25 bar.

The maximum operating pressure is stated on the pump nameplate.

8.8 Ambient temperature

Minimum ambient temperature

- +4 °C if the engine includes preheating.
- +10 °C if the engine does not include preheating.

Maximum ambient temperature

The maximum permissible ambient temperature at the air filter inlet is 40 °C.

8.9 Relative air humidity

The relative air humidity must not be too high, to prevent condensation of moisture in the air, as this can lead to damage of the controller or the engine. If humidity is a problem, install a space heater with a humidistat.

8.10 Effect of ambient temperature and altitude on engine output

If the ambient temperature exceeds +25 °C (fig. 20), or if the engine is installed more than 90 metres above sea level (fig. 21), the engine must not be fully loaded due to the low density and consequently low cooling effect of the air. In these cases, it may be necessary to use a larger engine.

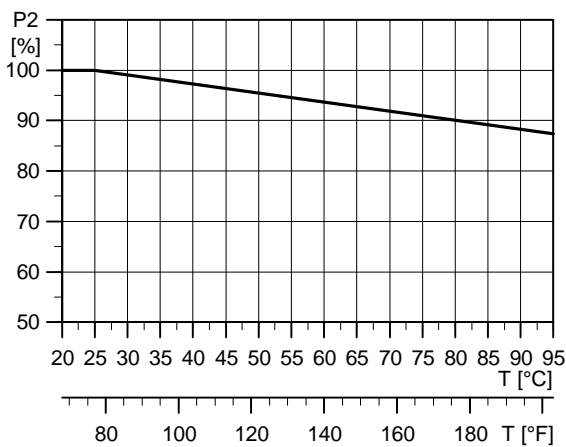


Fig. 20 Relation between engine output and ambient temperature

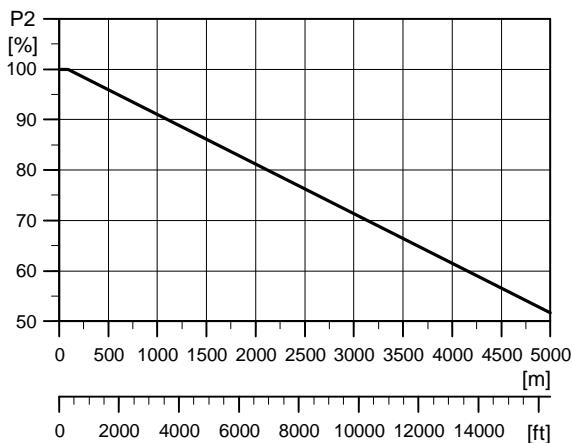


Fig. 21 Relation between engine output and altitude

9. Installation

The installation must be carried out in accordance with the following instructions. Non-compliance may result in functional faults which will damage the pump components.

Caution

9.1 Installation site

Place the fire pump set in a clean, dry, frost-free and well-ventilated location. It must be secured that unauthorised persons do not have access to the location.

Warning

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

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



Warning

Do not store lubricants or other volatile substances near the engine. These should be placed in a designated area having a suitable storage enclosure.



Allow sufficient clearance around pump and engine to enable inspection, repair and assembly work.

9.2 Foundation

It is advisable to install the fire pump set on a concrete foundation which is heavy enough to provide permanent and rigid support for the entire fire pump set. 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 fire pump set. Ordinarily, the proportions used are one part cement to three parts sand and four parts medium aggregate.

Warning

Make sure that weight of the fire pump set and foundation does not exceed the permissible bearing load of the floor.



The concrete foundation must have an absolutely level and even surface. Provide the foundation with anchor bolts to fasten the fire pump set.

Recommended length and width of the foundation, see fig. 22. Note that the length and width of the foundation must be 200 mm larger than the length and width of the base frame.

The minimum height of the foundation (h_f) can be calculated as follows if the weight of the foundation is assumed to be 1.5 times that of the pump:

$$h_f = \frac{m_{\text{pump}} \times 1.5}{L_f \times B_f \times \delta_{\text{concrete}}}$$

The density (ρ) of the foundation is usually taken as 2,200 kg/m³.

In installations where low-noise operation is particularly important, we recommend a foundation with a weight of up to five times that of the pump. The minimum height of the foundation (h_f) can then be calculated:

$$h_f = \frac{m_{\text{pump}} \times 5}{L_f \times B_f \times \delta_{\text{concrete}}}$$

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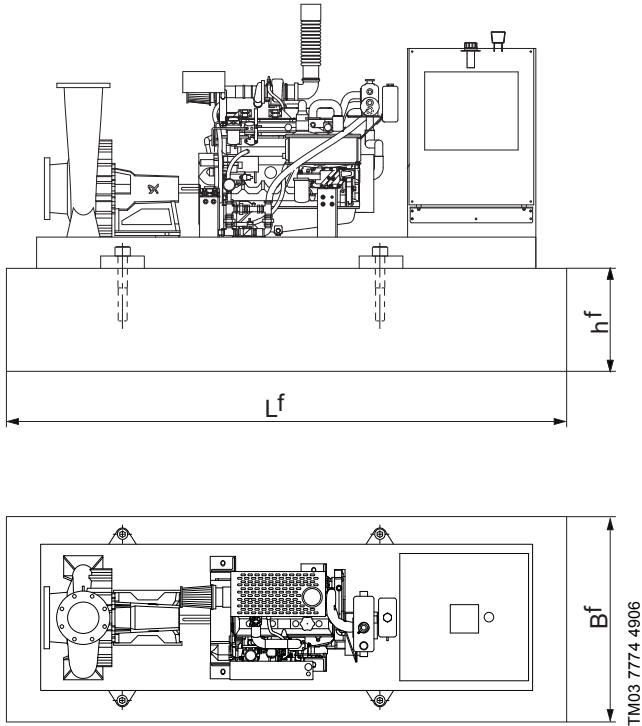


Fig. 22 Dimensions of foundation

9.3 Vibration dampening

To prevent vibrations from being transmitted to the building and pipework, it is advisable to fit expansion joints and vibration dampers. See fig. 23.

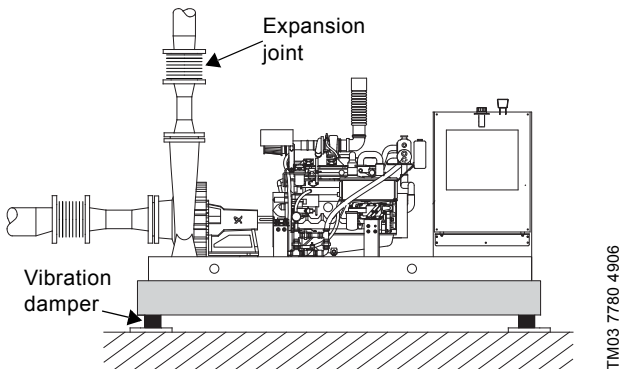


Fig. 23 Vibration dampening

Vibration dampers

To prevent vibrations from being transmitted to the building, it is advisable to isolate the pump foundation from buildings by means of vibration dampers.

To select the correct vibration damper, the following details are required:

- Forces transferred through the damper
- Engine speed
- Desired dampening in % (recommended value: 70 %)

The selection of vibration damper differs from installation to installation. A wrong damper may, in certain cases, increase the vibration level. Vibration dampers should therefore be sized by the supplier.

If the pump is installed on a foundation with vibration dampers, fit expansion joints on both sides of the pump. This prevents the pump from "hanging" from the flanges.

Expansion joints

Expansion joints provide the following functions:

- Absorption of thermal expansion and contraction of pipework caused by variations in liquid temperature.
- Reduction of mechanical influences in connection with pressure surges in the pipework.
- Isolation of structure-borne noise in the pipework (only rubber bellows expansion joints).

Caution

Do not fit expansion joints to make up for inaccuracy in the pipework, e.g. centre displacement or misalignment of flanges.

Fit the expansion joints both on the suction and the discharge sides. The distance from the pump should be at least 1 to 1 1/2 x DN diameter. This prevents turbulence in the joints and ensures optimum suction conditions and minimum pressure drop on the discharge side.

At high water velocities (> 5 m/s), it is advisable to fit larger expansion joints matching the pipework.

9.4 Levelling

Warning

The fire pump set should only be lifted by qualified personnel.

When lifting the entire fire pump set, never use the lifting eyes of the individual components.

Use only suitable lifting equipment in proper condition. See also weight specifications in section 7. Technical data.

During transport of the fire pump set, the cabinet door must be closed and locked.



Place the fire pump set on the foundation or an even floor and anchor it with adequately sized bolts. The entire base frame must be supported uniformly. See figures 24 and 25. If necessary, use shims for horizontal levelling of the base frame.

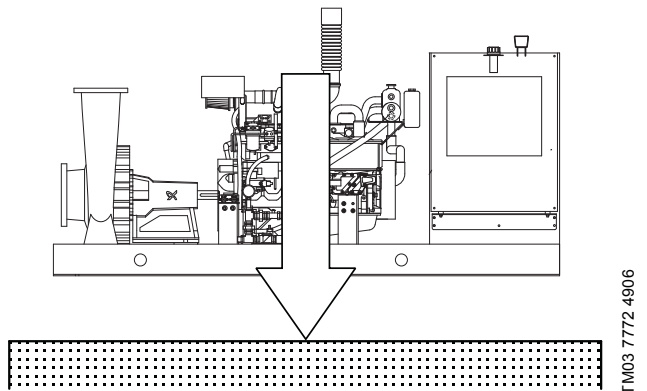


Fig. 24 Correct installation

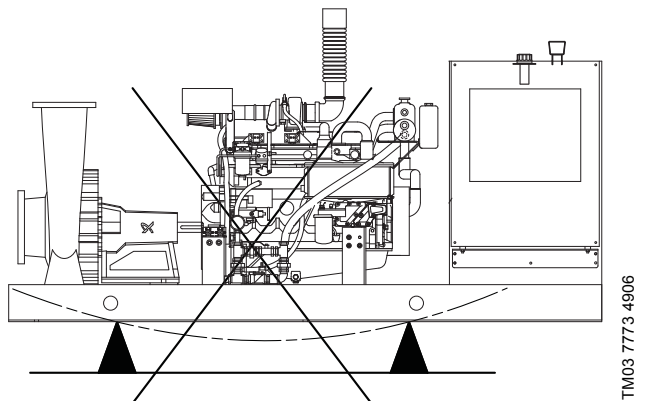


Fig. 25 Incorrect installation

In addition, we recommend fitting vibration dampers under the fire pump set. See section 9.3 *Vibration dampening*.

9.5 Pipework

Warning

Do not put fingers, hands, arms, etc. into the suction or discharge openings or into any other opening, such as that of the air relief valve.

Do not touch the rotating impeller, as this can cause severe injury.

Do not remove protective covers or packaging until installation.



Caution

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

The suction and discharge piping should be arranged for the simplest, most direct layout. The pipes must be of an adequate size, taking also the pump inlet pressure into consideration. The direction of flow is marked with arrows.

Install the pipes so that air locks are avoided, especially on the suction side of the pump. See fig. 26.

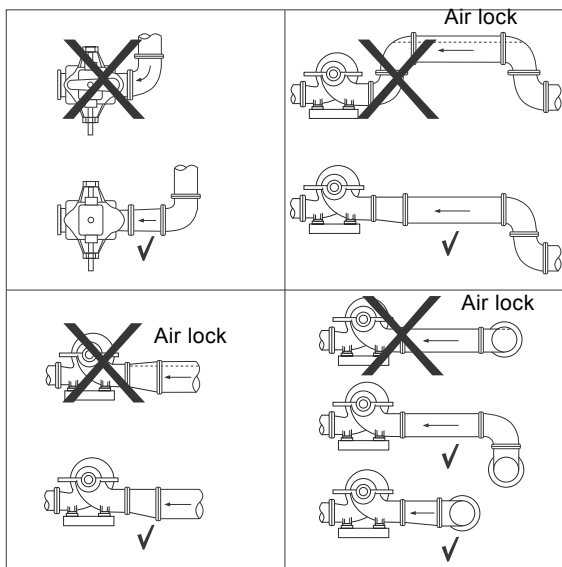


Fig. 26 Correct and incorrect installation of suction pipe

Fit pipe hangers on the wall, ceiling or floor close to the pump on the suction and the discharge side. See fig. 27.

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

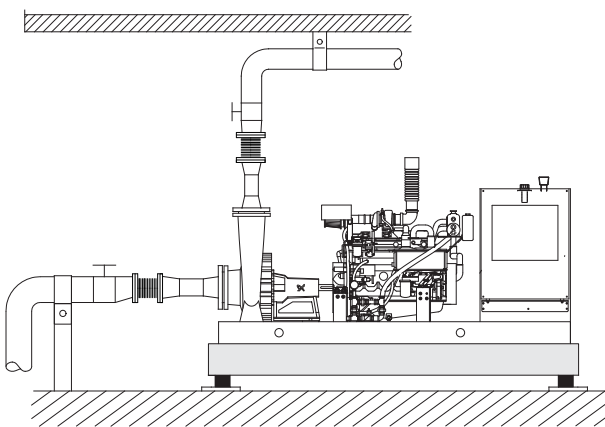


Fig. 27 Fixing points of the pipes

Isolating valves must be installed on the suction and the discharge side of the pump.

9.6 Bypass

A bypass to the suction source, if required, should be made as shown in fig. 28. The distance between bypass pipe and pump discharge flange must be at least ten pipe diameters.

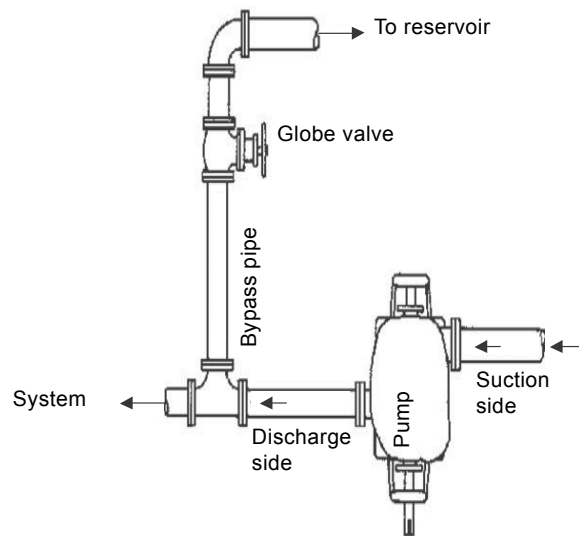


Fig. 28 Possible bypass arrangement

9.7 Connection to the cooling system

The discharge from the heat exchanger is led via an open outlet or a visible waste cone back to the suction reservoir. Connect a tube to the discharge side of the heat exchanger. See fig. 49, pos. A. The connection size is 3/8". The nominal tube diameter must not be smaller than the outlet on the heat exchanger.

9.8 Connection to the pressure sensor

The threaded connection for the pressure sensor (1/4" NPTF) is on the right side of the controller (fig. 10, pos. 4). Run a hose from the discharge pipe to the pressure sensor. Water pipes must be flushed clean before connecting the pressure sensor.

9.9 Priming tank and test pipe

If the fire pump set is supplied from a storage tank, a pump priming tank must be installed on the suction side in accordance with local regulations.

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 fire pump set is fed directly from the public water supply, the test pipe must have a free outlet. If the test pipe is led back to the reservoir, it must be equipped with a waste cone.

9.10 Fresh air supply

Figure 29 shows a possible arrangement of supplied and discharged air ensuring a sufficient supply of fresh air.

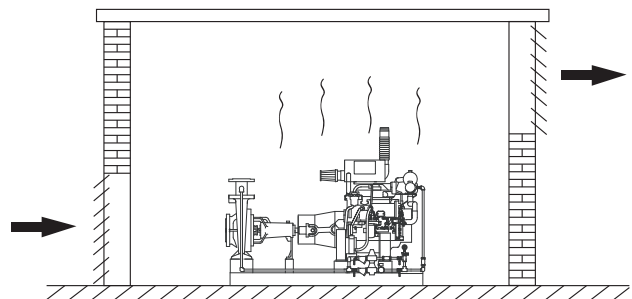


Fig. 29 Supply and discharge of air

If required, install louvres to open as soon as the engine starts. This will ensure an adequate supply of fresh air and removal of engine heat.

TM04 5123 2609

TM04 5122 2609

TM03 7775 4906

TM03 5501 3706

9.11 Exhaust gas system

Warning

The exhaust gas system must be installed correctly according to local regulations and must have no leaks. Operation without exhaust gas system is not permitted.



Exhaust gases are to be directed safely to the open air through the exhaust system. Exhaust fumes must not escape indoors. Danger of suffocation!

Hot exhaust pipes must be protected to prevent accidental touch. Danger of burns!

Remove the protective cap (fig. 46, pos. A), and fit the attached flexible exhaust pipe (fig. 3, pos. 16).

Install exhaust pipes as straight and with as few bends as possible to enable discharge of combustion gases with a minimum of back-pressure. Install the supplied silencer horizontally and at a sufficient distance to the engine. The exhaust system is to be arranged so that no condensation water can enter the engine.

The exhaust system must be fixed to the building. The flexible connection piece must not be used to compensate for misaligned pipework.

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

9.12 Alignment

Pump and engine can be connected by two types of coupling: a drive shaft or a flexible coupling from CENTAFLEX.

If a fire pump set comes preassembled from factory, the coupling has been accurately aligned by means of shims inserted under the pump and engine.

During transport and installation, the pump-engine alignment may have been affected. It must therefore always be checked when the fire pump set has been installed.

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

Caution

9.12.1 Drive shaft

Remove the coupling guard, and check the drive shaft for proper parallel offset and angular tolerance. After the check, fit the coupling guard before connecting the battery cables.



Warning

Before removing the coupling guard, disconnect the battery cable.

At first, check if the bolts of the drive shaft are tightened with the correct tightening torque. See table below. It may be necessary to use a special torque tool if there is not enough space for a standard socket.

Engine type	Drive-shaft type	Horizontal offset [mm]	Vertical offset [mm]	Tightening torque [Nm]
JU4H-10, 12, 14, 20, 22, 24	SC41 SC41A	58 ± 2	60 ± 1	68-75
JU4H-28 and up	SC55 SC55A	68 ± 4	71 ± 1	102-112
JU6H	SC55L-A	68 ± 1.5	70.5 ± 1	122-134
JU6H	SC2130	76 ± 3	78 ± 1	122-134
JU6H	SC2130A	89 ± 1.5	91 ± 1	122-134
JW6H	SC81A	109 ± 2	112.5 ± 1	122-134
JX6H	SC2140	87 ± 3	89 ± 1	122-134

Checking the horizontal parallel offset

1. Rotate the shaft so that the reference "AB" on the flywheel disc or the circumference of the drive shaft flange (against the flywheel) is in 12 o'clock position. See fig. 30.
2. Measure from the rear face of the flywheel drive disc or the drive shaft flange to point A. See fig. 30. The value must be as stated in the table above.
3. If the value is not correct, loosen the screws holding the pump on the base frame and move the pump in the horizontal level.
4. After alignment, tighten the screws, and measure again.

Checking the horizontal angular alignment

1. Leave the drive shaft in 12 o'clock position.
2. Measure from the front face of the drive shaft flange on the pump end to point B. See fig. 30. This measurement must be equal to the measurement at point A ± 1 mm.
3. If the value is not correct, loose the screws for tightening the pump on the base frame and insert shims or foil under the pump base.
4. After alignment, tighten the screws, and measure again.

Checking the vertical parallel offset

1. Rotate the shaft by 90 ° so that the reference "CD" on the flywheel disc or the circumference of the drive shaft flange (against the flywheel) is in the position shown in fig. 31.
2. Measure from the rear face of the flywheel drive disc or the drive shaft flange to point C. See fig. 31. The value must be as stated in the table above.
3. If the value is not correct, loosen the screws holding the pump on the base frame and move the pump in the horizontal level.
4. After alignment, tighten the screws, and measure again.

Checking the horizontal angular alignment

1. Leave the drive shaft in the previous position.
2. Measure from the front face of the drive shaft flange on the pump end to point D. See fig. 31. This measurement must be equal to the measurement at point C ± 1 mm.
3. If the value is not correct, loosen the screws holding the pump on the base frame and insert shims or foil under the pump base.
4. After alignment, tighten the screws, and measure again.

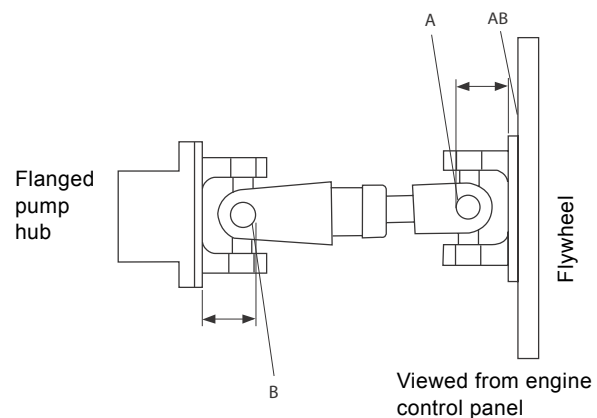


Fig. 30 Horizontal alignment

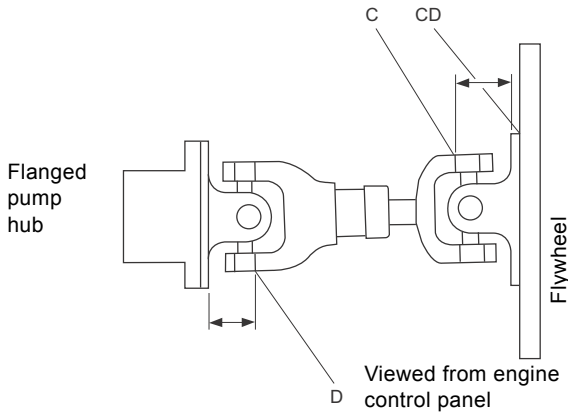


Fig. 31 Vertical alignment

9.12.2 Flexible coupling

CENTAFEX, the flexible coupling for connecting pump and engine, is shown in fig. 32.

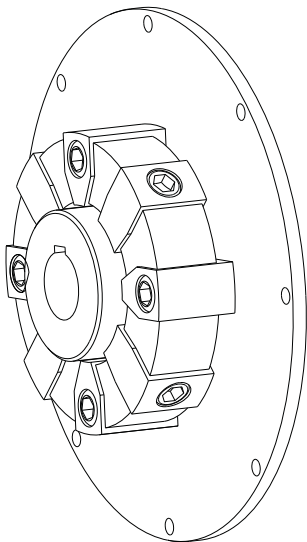


Fig. 32 Flexible coupling

The coupling is bolted axially on the engine flywheel. The pump shaft is pushed in axially and bolted radially with four bolts. See fig. 33.

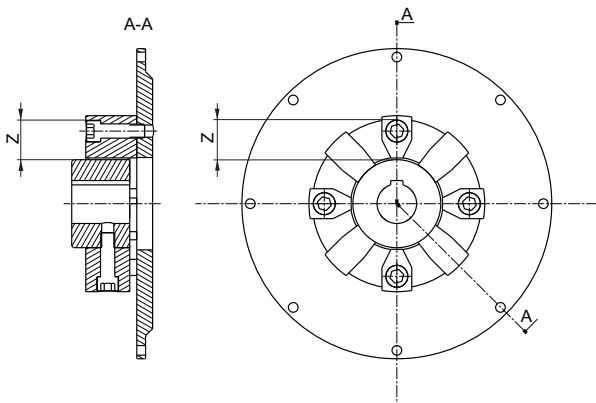


Fig. 33 Connection and alignment of pump and engine

Checking the alignment



Warning

Before removing the coupling guard, disconnect the battery cable.

1. Disconnect the battery (negative pole).
2. Remove the coupling guard.
3. Measure the distance "Z" at the rubber element of all axially bolted points. See fig. 33. The distance must be 50 mm. If the alignment is correct, proceed with step 4. Otherwise, align pump and engine. See below.
4. Fit the coupling guard.
5. Connect the battery.

Aligning pump and engine

1. Unscrew axial and radial bolts from the coupling and push shaft sleeve on the shaft in the direction of the pump.
2. Loosen the screws of the pump base.
3. Insert shims or foil under the pump base.
4. Tighten the screws of the pump base.
5. Push the shaft sleeve on the shaft towards the engine and fit axial and radial bolts. Always fit the axial bolts first. Bolts can be reused a maximum of three times. After that, use new self-locking bolts. Never use threadlocker, as this can damage the rubber compound.
6. Re-check the alignment.

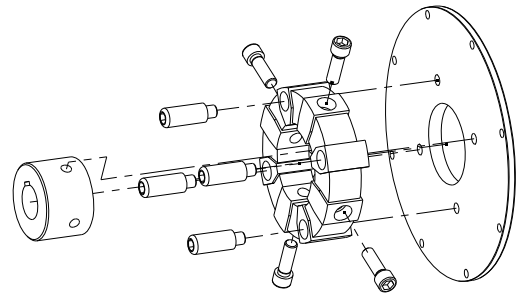


Fig. 34 Axial and radial fixation of the shaft sleeve

9.13 Separate fuel tank

The fuel tank must be located as close as practical to the engine in a dry, well ventilated location. Mount the fuel tank on the floor using the intended fastening holes. Connect the fuel pipes as shown in fig. 35 using both attached connecting pieces (pos. A). The connecting block is marked "SUPPLY" for the incoming pipe and "RETURN" for the return pipe.

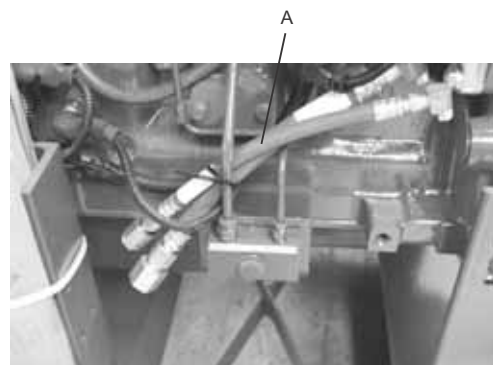


Fig. 35 Connecting the fuel pipes

Note

For sizing and installation of separate fuel tanks, see standard NFPA 20.

9.14 Separate control cabinet

The controller must be installed as close as practical to the engine and within sight of the engine.



Warning

Installation in hazardous locations and potentially explosive environments is not allowed. The controller must be located or protected so that it will not be damaged by water escaping from pump or pump connections.

The controller is not designed for outdoor installation. It must not be exposed to direct sunlight and must be installed in a dry, well ventilated but frost-free location.

Caution

Ensure easy accessibility to the controller or its components and adequate air supply for cooling.

Wall-mounted controller

Attach the controller to the structure or wall not less than 305 mm (12 inches) above floor level. Drill holes in the wall according to the drilling template on the rear panel of the control cabinet. Use dowels and screws of adequate size. All four mounting holes must be used.



Warning

When drilling the holes, take care not to damage any cables or water and gas pipes. Ensure a safe installation.

Floor-mounted controller

Attach the controller to the floor using all holes of the mounting feet. The mounting feet provides the required 305 mm (12 inches) clearance for current-carrying parts. A concrete slab is recommended to avoid water accumulation at the controller's feet.

10. Electrical connection

Warning



Check that the supply voltage specified on the nameplate of the control cabinet corresponds to the local conditions.

The electrical connection should be carried out by qualified personnel in accordance with local regulations.

10.1 Controller on base frame

The electrical connection must be carried out according to the wiring diagram in the control cabinet.

Connection of power supply

- The connection to the power supply must be fitted with a fuse of the correct size in accordance with local regulations and connected to the terminal block on the bottom right in the control cabinet marked L1-L2 for a 220-240 VAC incoming voltage. See fig. 12, pos. 13. The terminals are sized for #16 to #6 AWG wire. The earth terminal is next to the terminal block.

Connection of external sensor signals

- If the fuel tank is installed separately, connect the float switch (NO) for low level to terminals 23-24 and the one for high level to terminals 23-29. Remove jumper J3 to enable the function. See fig. 12, pos. 3.
- If the water reservoir level is to be monitored, connect the float switch (NO) for low level to terminals 23-26 and the one for empty tank to terminals 23-27. See fig. 12, pos. 3.
- If a pump room thermostat (NO) is installed, connect it to terminals 23-28.
- If a pressure switch (NO) is installed in the suction pipe, connect it to terminals 23-30. See fig. 12, pos. 3.

Connection of external control signals

- If the diesel engine is to be started by a remote signal, connect the signal cable to terminals 21-13. Remove jumper J1 to enable the function. See fig. 12, pos. 3.
- If the diesel engine is to be started by a signal from a deluge valve, connect the deluge valve contact (NC) to terminals 23-25. Remove jumper J2 to enable the function. See fig. 12, pos. 3.
- If the diesel engine is to be locked by other equipment, connect the signal cable to terminals 60-62. See fig. 12, pos. 3.
- If the diesel engine is equipped with an electronic control module (engine type JX), connect the signal cables to terminals 23-69 to receive an "Altern. ECM pos." signal and to terminals 23-70 to receive a "Fuel Injection" malfunction signal in the display.

Connection of external equipment

- If louvres are to open when the diesel engine starts, connect the louvres motor to terminals 11-12 of standard alarm relay AR2. See fig. 12, pos. 2. The louvres motor must be powered by its own source.
- If the engine block heater of the diesel engine is to be used, connect it to terminals 50-51 (only 220-240 VAC). The engine block heater will then be supplied with power from the controller. See fig. 12, pos. 3.
- If the controller is to lock other equipment, connect the external circuit to terminals 11-64 and the interlocking contact to terminals 23-32. See fig. 12, pos. 3.

Finally, connect the battery.

10.2 Wall- and floor-mounted controller

In the case of wall- or floor-mounted controllers, the connections to the diesel engine must also be made besides the connections described in section 10.1 *Controller on base frame*.

The terminals are located vertically on the bottom left and are labelled 1 to 12. See fig. 12, pos. 4. They are sized for #16 to #6 AWG wire and numbered according to the engine standards as follows:

Terminal	Element to connect
1	Fuel solenoid valve
2	Engine run contact
3	Engine overspeed contact
4	Engine oil pressure contact
5	Engine coolant thermostat contact
6	Battery 1 positive
8	Battery 2 positive
9	Start contactor 1
10	Start contactor 2
11	Engine earth
12	Activated to stop fuel solenoid valve

10.3 Connection to standard alarm relays

If operating and alarm messages are to be transferred for instance to a building management system, conductors can be connected to the standard alarm relays (fig. 12, pos. 2). The alarm relays have one NO and one NC contact. The signal can be transferred to maximum two external controllers. If the NO contact is to be used, connect the cable to terminal 14 (24); if the NC contact is to be used, connect the signal cable to terminal 12 (22). The common conductor has to be connected to terminal 11 (21).

The table below gives an overview of standard alarm relays:

Relay	Function
AR1	Indicates engine fault as a common alarm in these cases: <ul style="list-style-type: none"> • Engine fails to start after six attempts. • Engine fails when running. • Low oil pressure. • High cooling temperature. • Overspeed. • System overpressure.
AR2	Indicates that the engine is running.
AR3	Indicates pump room fault as a common alarm in these cases: <ul style="list-style-type: none"> • low inlet pressure • low fuel level • low level in water reservoir • water reservoir empty • low pump room temperature • high fuel level • power failure (no signal "AC Power On").
AR4	Indicates controller fault as a common alarm. The relay is activated when conditions are normal. This fail-safe relay will be deactivated and remain deactivated in these cases: <ul style="list-style-type: none"> • failure, battery #2 • failure, charger #1 • failure, charger #2 • failure on pressure side.

10.4 Connection to optional alarm relays

If more detailed information about operating and alarm conditions is required, conductors can be connected to the optional alarm relays for transferring operating and alarm messages to for instance a building management system. The alarm relays have one NO and one NC contact. The signal can be transferred to maximum two external controllers. If the NO contact is to be used, connect the cable to terminal 14 (24); if the NC contact is to be used, connect the signal cable to terminal 12 (22). The common conductor must be connected to terminal 11 (21). The position of the optional alarm relays (pos. 1) is shown in fig. 12.

The table below shows the function of the alarm relays.

Option	Relay	Function
A1	AR5	Weekly test
A2	AR6	Overspeed
A3	AR7	Low oil pressure
A4	AR8	High temperature
A5	AR9	Failure to start
A6	AR10	Failure, battery #1
A6	AR 11	Failure, battery #2
A7	AR12	Failure, charger #1
A7	AR13	Failure, charger #2
A8	AR14	Power failure
A9	AR27	System overpressure
B1	AR15	Low fuel level
B2	AR16	Low level in water reservoir
B3	AR17	Water reservoir empty
B4	AR18	Low pump room temperature
B5	AR19	High fuel level
B6	AR20	Low system pressure
B7	AR21	Low inlet pressure
B8	AR28	Pump on-demand

11. Start-up



Warning

Start-up may only be carried out by authorised personnel.

The control cabinet must remain closed during start-up. Danger of electric shock!

11.1 Check before start-up

1. Check oil level. See section 14.4.1 *Checking of oil level.*
2. Check cooling liquid level. See section 14.4.3 *Checking of cooling system.*

To prevent damage to the engine, it is essential to check the levels of oil and cooling liquid in the engine prior to start-up. If the oil level is too low, fill with oil. See section 14.4.2. If the level of cooling liquid is too low, fill with cooling liquid. See section 14.4.4.

Caution

3. Check V-belt tension. See section 14.4.10 *Checking of V-belt.*
4. Check coupling alignment. See section 9.12 *Alignment.*
5. Check that all bolts are properly tightened.
6. Check that pipework has been installed correctly.
7. Check all electric connections in and outside the control cabinet.



Warning

Do not start the engine while fuel fumes remain evident or may be present.

11.2 Start-up



Warning

Use hearing protection while engine is running.

1. Fill the fuel tank with diesel. See section 14.4.6 *Filling of fuel.*
2. Switch on the controller by means of the isolating switch A1 (fig. 10, pos. 9).
3. Set the cut-in and cut-out pressures. See section 11.3 *Setting of cut-in and cut-out pressures.*
4. Open the fuel tap of the fuel tank.
5. Close the isolating valve on the discharge side of the pump. Open the isolating valve on the suction side of the pump. Open the isolating valve to the test pipe.
6. Start the pump manually with the controller or the control panel of the engine. See section 12.2 *Manual operation.*

Note

If the engine does not start, check for error messages and instructions in the display. Other causes, see section 15. *Fault finding.*

7. Slowly open the isolating valve on the discharge side.
8. Vent the system.
9. When the pump reaches the operating pressure, open the isolating valve sufficiently to reach the duty point.
10. Compare the oil pressure, temperature and speed with the rated values. See section 7.3 *Engine.*
11. Adjust the stuffing box, if necessary. See section 14.3 *Pump.*
12. Stop the pump manually. See section 12.2 *Manual operation.*
13. Turn both main switch A2 (fig. 10, pos. 7) and the selector switch (fig. 5, pos. 2, for JU/JW engines and fig. 6, pos. 5, for JX engines) to "AUTO".

The fire pump set is now operational and in automatic mode.

In connection with the start-up, carry out a final test run.

See section 12.3 *Test run.*

11.3 Setting of cut-in and cut-out pressures

To enable setting, DIP switch S10-1 must be set to "ON". See section 5.1 *Settings via DIP switches.*

It is important to set the cut-out pressure first. It must be lower than the maximum pressure of the pump; otherwise the engine will never stop. The cut-in pressure must be set according to the system pressure.

A quick push on buttons [Cut-in] B1 and [Cut-out] B2 (fig. 11) increases the value by one unit. A long push increases the value by ten units. The value only increases from minimum to maximum. When the maximum value is reached, the value returns to the minimum value.

Note

It is important to set DIP switch S10-1 back to "OFF" to prevent unauthorised changes.

12. Operation



Warning

The engine will become hot during normal operation. Its surfaces may remain hot for some time after the engine has been stopped.

The important operating parameters are shown in the display of the controller (see section 4.4.4 *Display indications*) and on the control panel of the diesel engine (see section 4.3.2 *Control panel of the engine*). If the controller outputs are connected to a building management system, the operation can be remotely monitored.

In case of failure, see sections 4.4.4 *Display indications*, 4.4.5 *Indicator lights on control panel and alarm bell*, 4.6 *Operating and alarm messages* and 15. *Fault finding.*

12.1 Automatic operation

Both main switch A2 (fig. 10, pos. 7) and the selector switch (fig. 5, pos. 2, for JU/JW engines, and fig. 6, pos. 5, for JX engines) must be set to "AUTO" or "AUTOMATIC OR MANUAL STOP" respectively.

Caution

Once the fire pump set has been installed and started up according to the instructions, no further preparation is necessary. The fire pump set starts automatically when the sprinkler system is activated, and the pressure switch detects a pressure drop. The fire pump set will also start automatically if it receives a remote start signal or a signal from a deluge valve, when it is time for the weekly test, or in case of a power failure.

When the system pressure reaches the cut-out pressure, the engine will stop if [STOP] button A5 (fig. 10, pos. 3) is pressed, or it will stop automatically if set to automatic stop. See section 4.5.1 *Operating functions*. If not all starting conditions have been eliminated, turn main switch A2 (fig. 10, pos. 7) to "OFF".

If started due to a false alarm, the pump should not operate for more than 48 hours. If the pump has run for more than 48 hours after a false alarm, always dismantle and inspect it for signs of wear or damage. Replace any defective components.

Note

12.2 Manual operation

The fire pump set can be started manually for a test run, servicing or temporary switching on or off during start-up, the fire pump set can be started manually by means of the controller and the control panel of the diesel engine. Normal operation is operation via controller.

12.2.1 Manual operation via controller

Turn main switch A2 (fig. 10, pos. 7) to "HAND". Press [BATTERY No. 1 MANUAL CRANK] (fig. 10, pos. 6) to start the engine with battery 1, or button [BATTERY No. 2 MANUAL CRANK] (fig. 10, pos. 8) to start the engine with battery 2. If both buttons are pressed simultaneously, batteries 1 and 2 are used in parallel to start the engine.

To stop the engine, turn main switch A2 to "OFF" or "AUTO".

12.2.2 Manual operation via control panel of diesel engine

In case of controller failure, the fire pump set can also be started by the control panel of the engine. Turn the selector switch (fig. 5, pos. 2, for JU/JW engines, and fig. 6, pos. 5, for JX engines) to "MANUAL RUN". Lift [MANUAL CRANK #1] (fig. 5, pos. 3, for JU/JW engines, and fig. 6, pos. 10, for JX engines) for maximum 15 seconds until the engine starts. If the engine does not start, wait for 15 seconds and try to start it with [MANUAL CRANK #2] (fig. 6, pos. 11).

To stop the JU/JW engine, turn the selector switch (fig. 5, pos. 2) back to "AUTOMATIC OR MANUAL STOP".

To stop the JX engine, lift [MANUAL STOP] (fig. 6, pos. 9) until the engine has stopped. Turn the selector switch (fig. 6, pos. 5) back to "AUTOMATIC".

Do not leave the selector switch (fig. 5, pos. 2, for JU/JW engines, and fig. 6, pos. 5, for JX engines) in position "MANUAL RUN" during automatic operation. The controller will be unable to stop the engine, and damage may result.

Caution

12.3 Test run

To do a test run, close the fuel tap and activate the automatic start-up command by pressing [Run Test] on the control panel of the controller. Every starting cycle consists of a 15-second starting phase followed by a 15-second pause. After six failed start attempts, a start failure warning must be activated (fig. 11, indicator light 11, and ringing of bell). When the fuel tap has been opened and the fault indication has been removed by turning main switch A2 (fig. 10, pos. 7) to "OFF" and back to "AUTO", the pump should start properly.

Regular test runs to ensure operation efficiency should be limited to a maximum of 30 minutes per week.

Note

12.4 Retrieving and printing data

12.4.1 Retrieving data via the RS 232 port

As standard, the controller has an RS 232 port (fig. 10, pos. 5) for reading of data. The port must be connected to a laptop with an RS 232/DB9 port. A communication software, such as HyperTerminal (provided with the latest Windows version), must be installed on the laptop. The procedure for using HyperTerminal as communication software is described below.

1. Connect the communication port of your laptop to the controller using a DB9 male/female cable.
2. Select from the Windows toolbar: Start > Program > Accessories > Communications > HyperTerminal.
3. If your HyperTerminal software has not been configured, double-click on hypertrm.exe. Otherwise, continue with step 6.
Note: This procedure may not be available on certain versions of software.
4. In the window "New Connection", enter a connection name, for instance "Tornatech Controller", and click [OK].
5. In the next window, set communication parameters as follows:
 - bits per second: 9600
 - data bits: 8
 - parity: none
 - stop bits: 1
 - flow control: hardware.Click [OK].
6. If your HyperTerminal software has already been configured to communicate with a fire pump controller, select this configuration.
7. Select Transfer > Capture Text.
A window opens so that you can select a file. Enter the name of the file using the browse function.
8. If the window "Select Capture File" is open, click [Open] (available with certain HyperTerminal versions only).
9. Click [Start] to begin retrieving or downloading data.

The data will not start downloading to your laptop until [Print] button B5 (fig. 11) is pressed on the controller display.

The data required for the creation of the pressure graph are both the resume of events and the pressure data. To obtain the resume of events, press the [Print] button once. To obtain the pressure data, press the [Print] button once again within 60 seconds of the first time it was pressed. The data will be saved in the file chosen.

Note

10. To close the session, click on [File] and select "Exit". Click [Yes] to disconnect, and confirm saving with [Yes].

The downloaded data is saved in the file created in step 4 and selected in step 7. This file is a *.txt file and can be read by programs such as Notepad, Word, Lotus and Excel.

When the file is opened, the *.txt file type to must be selected to be shown in the file list.

12.4.2 Printing of data

If the controller is equipped with a printer, it is located behind a plastic cover. The cover protects the printer from humidity and dust. The cover must be lifted when printing. The printer works on demand only. However, in order to prevent a paper drum deformation, the paper drum is activated automatically at regular intervals.

Printing

First press [Print] button B5 (fig. 11) to print the resume of events. When it has been printed, press the button again within 15 seconds.

Paper replacement

- The paper must be thermal paper and be correctly oriented. The following operations must be followed to replace the paper:
1. Unscrew the axle and remove the empty roll.
 2. On the printer, open the top cover to get access to the roller.
 3. Lift the cover completely.
 4. Insert the thermal paper in the slot. The thermal side must be face down.
 5. Close the cover.

12.4.3 Retrieving data via modem

To use a modem for retrieving data and remote monitoring of the fire pump set, a program delivered together with the controller must be installed on your computer. Go to the Windows Explorer and double-click on [GPD viewer EXE] file. Click on the configuration icon, and enter the phone number of the GPD controller after the equal sign.

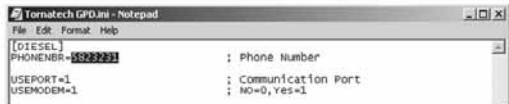


Fig. 36 Tornatech GPD.ini - Notepad

Check that USEPORT is the one your computer is connected to and USEMODEM=1. Save and close the file.

After the installation is done, the fire pump set can be remotely monitored by clicking [Diesel control]. The following window appears:

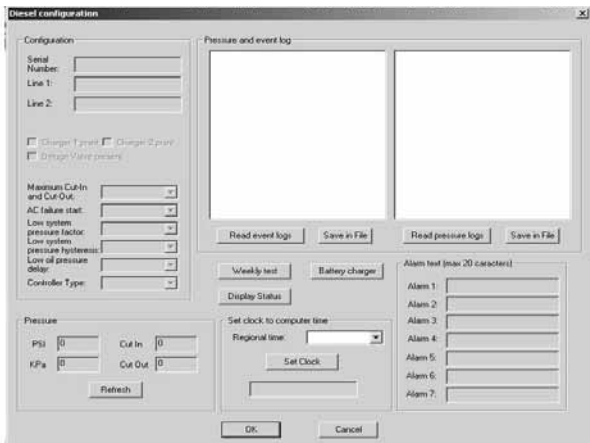


Fig. 37 Monitoring of fire pump set

The modem reads the actual status of the controller. The system is not live, i.e. it reads the pressure when the window is open, and each time the [Refresh] button is clicked.

Click [Read event logs] to download events of the last 15 days. Depending of the number of events and the speed of the communication, downloading may take several minutes. The events can be saved in *.txt format by clicking [Save in File]. All events can be visualised using the vertical bar that appears after download.

Click [Read pressure logs] to download pressure data of the last seven days. Depending of the number of pressure data and the speed of the communication, downloading may take several minutes. The pressure data can be saved in *.txt format by clicking [Save in File]. All pressure data can be visualised using the vertical bar that appears after download.

Weekly test

Click [Weekly Test] to access the settings of the weekly test. The following window appears:

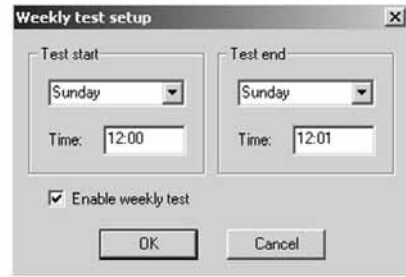


Fig. 38 Setting of weekly test

Battery chargers

Click [Battery charger] to access the battery charger monitoring. The following window appears:

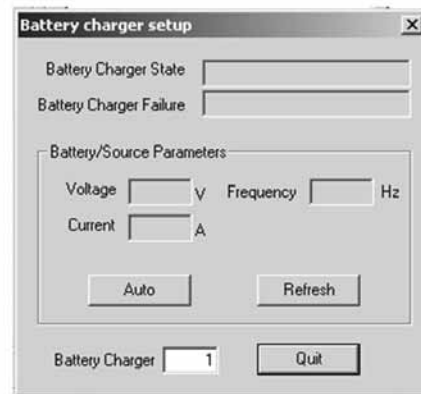


Fig. 39 Setting of battery charger

By default, the status of battery charger 1 appears in the screen. To access battery charger 2, enter "2" in the bottom window and click [Refresh].

If [Auto] is clicked, the battery charger will be monitored continuously.

Controller status

To see the status of the display, input contacts and output signals, click [Display Status].

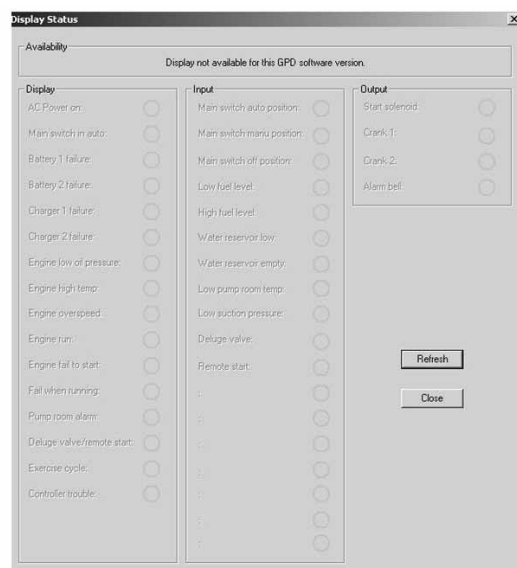


Fig. 40 Reading of status

As the monitoring is not permanent, click [Refresh] to get the actual status of the controller.

This window is the monitoring of the electronic board. As the manual control is independent from the electronic board, this window does not monitor a possible manual crank.

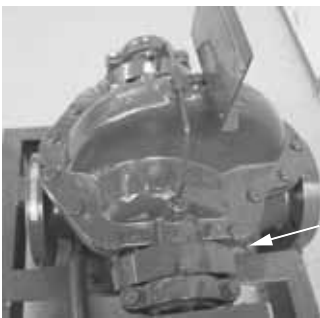
Note

13. Taking the pump out of operation

Note *The fire pump set must not be running.*

1. Close the isolating valve on the discharge side.
2. Close the isolating valve on the suction side.
3. Close the fuel tap on the fuel tank.
4. Turn main switch A2 (fig. 10, pos. 7) and isolating switch A1 (fig. 10, pos. 9) to "OFF". Secure the isolating switch with a padlock so that the fire pump set cannot be accidentally switched on.
5. Disconnect the battery.

During extended periods of inactivity, drain the pump (see figures 41 and 42), and remove and discard the stuffing box packing according to service instructions. Then take the measures listed in section 3.3 Storage.



Drain plug

Fig. 41 Drain plug of HSEF pump

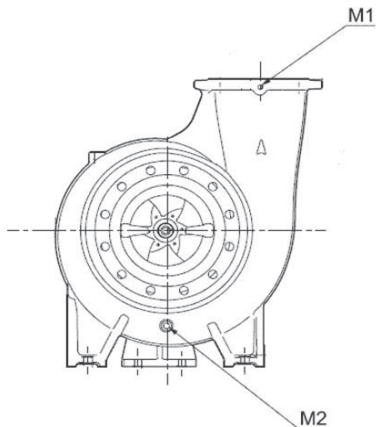


Fig. 42 Drain plug of DNF pump (M2)

To restart the fire pump set, remove all protective covers, fit a new stuffing box packing (see service instructions), fill with engine oil and cooling liquid, and align the coupling. Then continue as described in section 11. Start-up.

14. Maintenance

The operator is responsible for ensuring that all maintenance, inspection and installation work is performed by qualified personnel. A regular maintenance plan will help avoid expensive repairs and contribute to trouble-free, reliable operation. It is recommended to place a maintenance contract with Grundfos.

Note

Warning



Before starting work on the pump, make sure that the fire pump set has been switched off and cannot be accidentally switched on. Maintenance work must only be carried out by qualified personnel.



Warning

Do not place tools on or near the batteries. This could result in a short-circuit.

14.1 Fire pump set

A test run should be carried out once a week. See section 12.3 Test run.

14.2 Maintenance intervals

Pump

Lubrication of bearing: Once a year.

Diesel engine

	Interval	
	Inspection	Replacement
Oil level	Once a week	-
Oil change with filter	-	Once a year
Cooling system	Once a week	-
Cooling liquid	-	Once a year
Fuel system/filter	Once a week	Once a year
Exhaust system	Once a week	-
Air filter	Once a week	Every six months
V-belt	Once a month	Once a year

Coupling

Lubrication of drive shaft: Once a year.

Controller

Testing of indicator lights: Once a week.

Checking of wire connections: Once a year.

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14.3 Pump



Warning
Before carrying out maintenance work on the pump, disconnect the battery cable.

Stuffing box

Warning
If the area between the stuffing box and bearing bracket is left open to allow for inspection and adjustment of packing, do not place hands or fingers into this area. Do not wear loose clothing, long hair, or jewellery around this area. Failure to observe caution may result in entanglement or friction burns.



Caution

Do not use excessive force when adjusting the stuffing box gland, as wrench slippage can result in impact of the hand against the casing or the pump can be damaged.

Check the packing carefully, allowing a slight leakage for lubrication. Never force the packing into a leak-proof position, as this will create excessive friction and cause damage to the packing or shaft sleeve. Maximum packing life can be expected with a leakage of minimum of 40 to 60 drops per minute. A reduction of leakage considerably reduces the life of both the packing and shaft sleeve. If leakage is excessive, tighten the gland bolts evenly, about 1/6 of a turn at a time. Do not be confused if the leakage seems to increase when the packing has been adjusted. The leakage will normally reduce after a period of time as the packing adjusts itself to its new position. It should be kept in mind that it takes time for newly installed packing to "run-in", and that during this initial period, frequent attention and adjustments are necessary. It sometimes takes several days to achieve the desired results.

To set the leakage rate of the stuffing box, remove the protecting guards of the shaft on both sides. This gives access to the setting screw. See service instructions.

Bearing lubrication

If the pump is provided with lubrication nipples, the bearings should be relubricated once a year. Use lithium soap base, worked penetration, meeting NLGI Grade 2 specifications. Minimum dropping point: 180 °C (355 °F).

Operating temperature range: -23 °C to 116 °C (-10 °F to 240 °F).

The required amount depends on the bearing size. See service instructions.

14.4 Diesel engine



Warning
The engine can get hot during operation. To avoid burns, do not touch the engine while it is running. Before any work, let the engine cool down. Wear protective gloves.

14.4.1 Checking of oil level

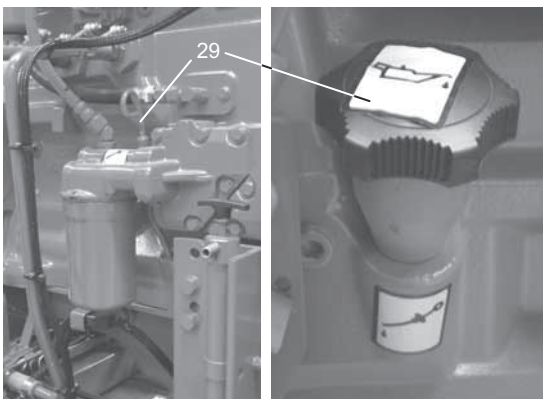


Fig. 43 Arrangement of oil dipstick

To read the oil level, pull out the oil dipstick (JU4H, JU6H and JX6H), or unscrew it (JW6H) (fig. 43, pos. 29). Oil level measurements are to be taken when the engine is cold. The oil level must be between the minimum and maximum marks on the oil dipstick. See figures 44 and 45.



Fig. 44 Correct oil level, JU4H, JU6H and JX6H

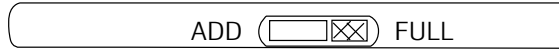


Fig. 45 Correct oil level, JW6H

14.4.2 Filling of oil

Remove the oil filler cap (fig. 46, pos. 30) and fill oil up to the corresponding mark on the oil dipstick.

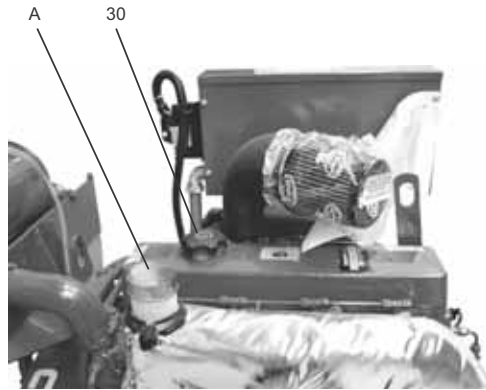


Fig. 46 Oil filler cap

14.4.3 Checking of cooling system



Warning
Do not remove the cap of the equalisation tank or heat exchanger when the engine is warm. Tank is under pressure! Danger of burns from escaping liquid!

1. Check all pipes of the cooling system for leaks. Replace defective pipes.
2. Check the level of cooling liquid in the heat exchanger. For a cold engine, the minimum and maximum fill levels are shown in fig. 47 for JU/JW engines, and in fig. 48 for JX engines. If the level of the cooling liquid is too low, fill with cooling liquid. See section 14.4.4 Filling of cooling liquid.

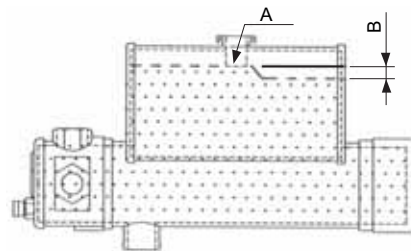
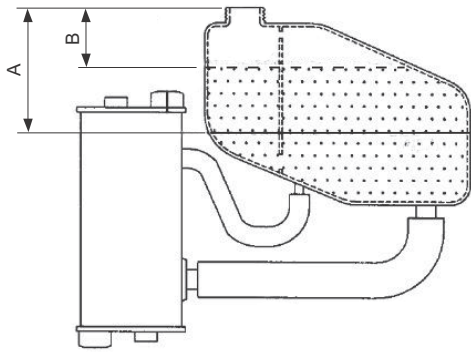


Fig. 47 Level of cooling liquid, JU/JW

A: Maximum fill level = bottom of down tube.

B: Minimum fill level = 25 mm (1") below bottom of down tube.



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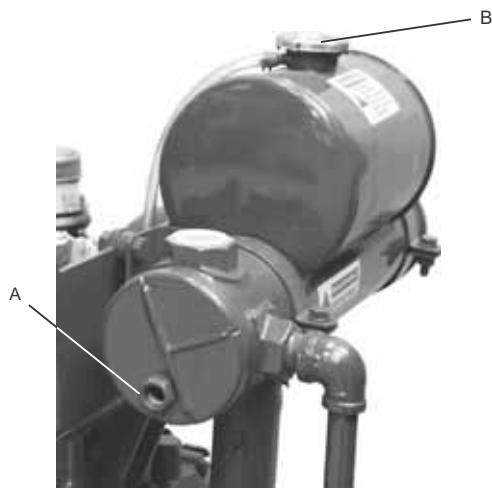
Fig. 48 Level of cooling liquid, JX6H

- A: Maximum fill level = 70 mm (2 3/4").
- B: Minimum fill level = 155 mm (6 1/8").

14.4.4 Filling of cooling liquid



Warning
Do not remove the cap of the heat exchanger when the engine is warm. Tank is under pressure! Danger of burns from escaping liquid!



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Fig. 49 Heat exchanger

If there is too little cooling liquid in the heat exchanger, remove the cap of the heat exchanger (fig. 49, pos. B) and fill cooling liquid up to the maximum level. See fig. 47 for JU/JW engines, and fig. 48 for JX engines. Put the cap back on.

Caution *Only use prescribed coolant. See section 7.3 Engine.*

Note *Over time, the coolant in the cooling liquid loses its effect. The cooling liquid must therefore be changed every year. See service instructions.*

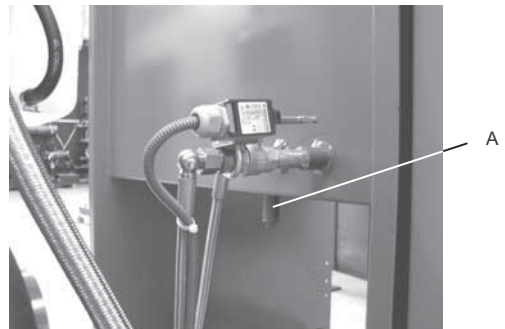
14.4.5 Checking of fuel system

1. Check all fuel pipes for leaks. Replace defective fuel pipes.
2. Read the fuel level from the fuel level indicator. See for instance fig. 51, pos. 9. To prevent damage by condensation and to maintain the system ready for operation, the fuel tank must always be full.
3. Drain the condensate from the fuel filter and fuel tank.

Draining the condensate

The condensate collector of the fuel filter is under the fuel filter (fig. 52, pos. A). Loosen the knurled nuts of the condensate collector. Collect the fuel containing water in a suitable container and dispose of it in an environmentally sound way. Tighten them when the diesel fuel runs clean, i.e. without water.

Normally, there is a drain screw in the tank bottom. See fig. 50, pos. A, for an example. Loosen the drain screw, and remove accumulated water and dirt. Collect the diesel fuel in a suitable container and dispose of in an environmentally sound way. Tighten the drain screw when the diesel fuel runs clean, i.e. without water.



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Fig. 50 Drain screw of fuel tank

14.4.6 Filling of fuel

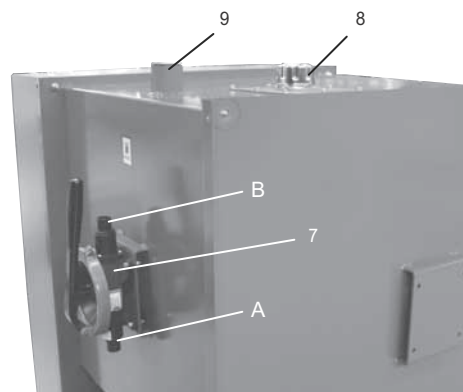
Caution *Only use diesel fuel.*

Warning
Fuel fumes are highly flammable! Do not refuel the engine when it is running or still hot from recent running.



When refuelling, avoid breathing the fuel fumes, particularly if the pump is installed in an enclosed pump room. Maintain maximum ventilation to clear the fumes quickly.
Do not start the engine while fuel fumes remain evident or may be present.

An example of a fuel tank is shown in fig. 51.



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Fig. 51 Example of a fuel tank

The fuel tank can be filled either from the top using a canister, or using the manual filling pump on the side (fig. 51, pos. 7). For filling quantities, see section 7.3 Engine.

To fill using a canister, remove the tank cap (fig. 51, pos. 8) and pour in the fuel. Put the cap back on.

To fill using the hand pump, connect the tube from the diesel barrel to the lower connection port of the hand pump (fig. 51, pos. A), and connect a second tube to the upper connection port of the hand pump (fig. 51, pos. B). Remove the tank cap and put the tube from the upper connection port of the hand pump into the tank opening. Operate the hand pump to fill the tank with fuel. When the tank is full, take the tube out of the tank and put the tank cap back on. Disconnect both tubes from the hand pump.

14.4.7 Venting of fuel system

Warning



Fuel expelled under pressure can penetrate the skin and cause serious injuries. The pressure must therefore always be released before the fuel pipes are disconnected. Before repressurising, tighten all pipes securely.

JU4H and JU6H

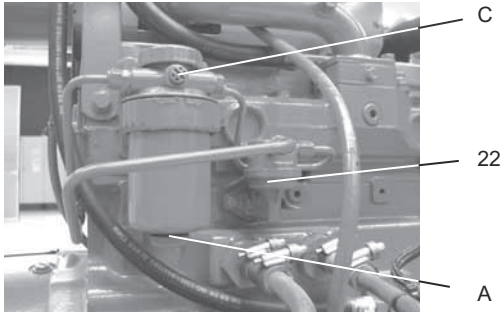


Fig. 52 Venting of fuel system through the fuel filter, JU4H and JU6H

1. Loosen the vent screw (fig. 52, pos. C) of the filter holder by turning it two turns by hand.
2. Operate the lever of the fuel suction pump (fig. 52, pos. 22) until the diesel fuel running out of the vent port does not contain air bubbles. Collect the fuel in a suitable container and dispose of it in an environmentally sound way.
3. Carefully tighten the ventilation port. Keep operating the lever of the fuel suction pump until no resistance is felt. Then push the handle as far as possible in the direction of the cylinder block.
4. Start the engine manually. See section 12.2.1 *Manual operation via controller*, and check for leaks. Stop the engine by turning main switch A2 to "OFF" or "AUTO".

If the engine does not start, the fuel system may also need to be vented through the fuel injection pump. The procedure is as follows:

1. Loosen the connector (fig. 53, pos. A) of the fuel backflow pipe.
2. Operate the lever of the fuel suction pump (fig. 52, pos. 22) until the diesel fuel running out of the connector does not contain air bubbles. Collect the fuel in a suitable container and dispose of it according to regulations.
3. Tighten the connector with 16 Nm.
4. Press the handle as far as possible in the direction of the cylinder block.
5. Start the engine manually. See section 12.2.1 *Manual operation via controller*. Check for leaks. Stop the engine by turning main switch A2 to "OFF" or "AUTO".

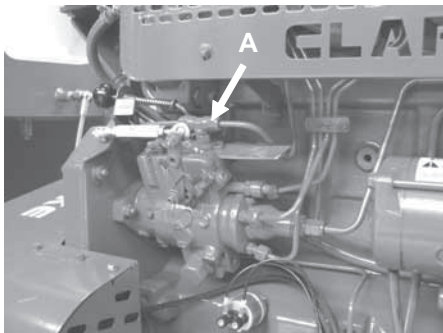


Fig. 53 Venting of fuel system through the diesel injection pump, JU4H and JU6H

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JW6H

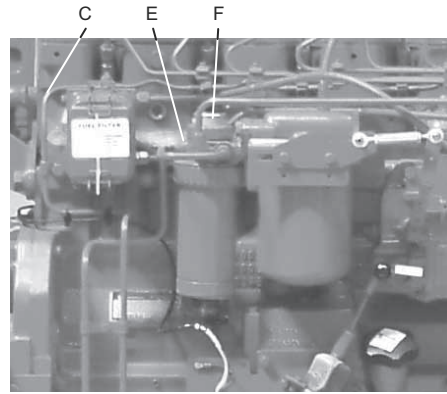


Fig. 54 Venting of fuel system through the fuel filter, JW6H

First vent the fuel system through the primary filter:

1. Loosen the vent screw (fig. 54, pos. E) of the filter holder.
2. Operate the manual venting system (fig. 54, pos. F) until the diesel fuel running out of the vent port does not contain air bubbles. Collect the fuel in a suitable container and dispose of it in an environmentally sound way.
3. Carefully re-tighten the vent port. Keep the manual venting system pressed downwards.

Then vent the fuel system through the secondary filter:

1. Loosen the vent port (fig. 54, pos. C) of the fuel filter holder.
2. Operate the manual venting system (fig. 55, pos. A) of the fuel supply pump until the diesel fuel running out of the vent port does not contain air bubbles. Collect the fuel in a suitable container and dispose of it in an environmentally sound way.
3. Carefully re-tighten the vent port. Keep the manual venting system pressed downwards.
4. Start the engine manually. See section 12.2.1 *Manual operation via controller*. Check for leaks. Stop the engine by turning main switch A2 to "OFF" or "AUTO".

If the engine does not start, the fuel system may also need to be vented through the fuel injection pump. The procedure is as follows:

1. Remove the connector (fig. 55, pos. B) of the fuel pipe from the first injection nozzle.
2. Crank up the engine with the starter until fuel without air bubbles runs out of the connector. Collect the fuel in a suitable container and dispose of it in an environmentally sound way.
3. Fit the connector.
4. Repeat steps 1 to 3 for all injection nozzles.
5. Start the engine manually. See section 12.2.1 *Manual operation via controller*. Check for leaks. Stop the engine by turning main switch A2 to "OFF" or "AUTO".

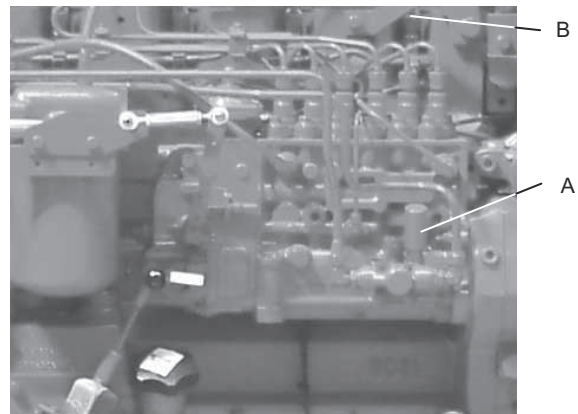


Fig. 55 Venting of fuel system through the diesel injection pump, JW6H

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For venting of JX engines, a fuel priming assist kit is required. See manual. Under normal conditions, however, fuel system bleeding is not required. Priming the system with a hand primer is normally sufficient.

Note

14.4.8 Checking of exhaust system

Check the entire exhaust pipe system for leaks while the engine is running. Tighten any loose pipe connections. Replace defective pipes immediately.

14.4.9 Checking of air filter

Examine the air filter for dirt particles. Replace dirty air filters. To remove the air filter, loosen the brackets and pull off the filter element. Fit a new filter in reverse order. It is advisable to change the air filter every six months.

14.4.10 Checking of V-belt

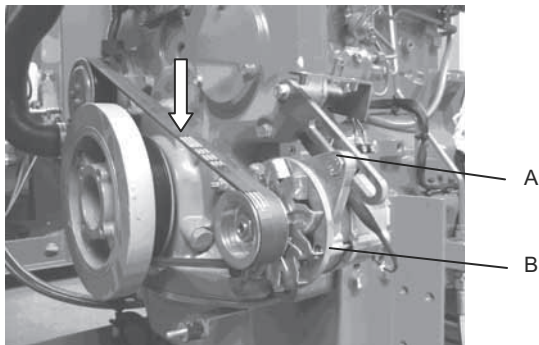
Check the V-belt and belt pulleys for wear. Check also the V-belt tension.

Caution

V-belts must be stretched according to regulations to ensure an optimum functioning of the pump and electric generator.

The V-belt elasticity midway between the two V-belt pulleys must be 1 to 1.5 cm. See arrow in fig. 56. The V-belt tension can be increased by loosening both generator fixing screws (fig. 56, pos. A) and pushing the generator outwards (fig. 56, pos. B). Then retighten the screws.

Worn V-belts must be replaced. See service instructions.



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Fig. 56 Checking of V-belt

14.5 Coupling

Flexible coupling

Couplings with elastomer drive parts do not require lubrication.

Drive shaft



Warning

Before carrying out maintenance work on the drive shaft, disconnect the battery cable.

1. Remove the top of coupling guard.
2. Rotate the engine shaft manually so the U-joint grease fittings are accessible.
3. Use a hand-held grease gun with N.L.G.I. grade 1 or 2 grease position on grease fitting. Fill with grease until grease is visible at all four cap seals.
4. Check that all drive shaft bolts remain tight.
5. Fit the top of guard, and connect negative battery cables.

14.6 Controller



Warning

Before opening the control cabinet, switch off the power supply by means of the isolating switch. Risk of electric shock!

The following maintenance work must be carried out regularly:

- Test indicator lights.
- Check wire connections.

To test the function of the indicator lights on the control panel and the alarm bell, press [Lamp Test/Silence] button B3. If an indicator light fails, please contact Grundfos.

All screw connections on the brackets and all frame connections must be checked once a year to ensure a secure fit. Any loose connections must be tightened. Check all cables for visible damage and replace, if necessary. This applies also for the cables of the diesel engine and the signal cables.

If the fuse of the charger, on the board charger No 1 or 2, has blown, replace it by the exact fuse model (SLO-BLO 3AG-32VDC-20A).

15. Fault finding



Warning

Before carrying out any service of the pump, make sure that the fire pump set cannot accidentally start.

Fault	Cause	Remedy
1. Pump delivers no or too little water.	a) Air in suction pipe.	Fill storage container with water. Vent pump. Make sure the suction pipe has been installed according to section 9.5 <i>Pipework</i> .
	b) Pump draws in air due to defective gaskets.	Check the pipe gaskets and pump housing gaskets, and replace if necessary.
	c) Counter-pressure too high.	Check the system for impurities and blockages.
	d) Inlet pressure too low.	Make sure that the storage tank is filled with enough water and that the conditions in section 8.1 <i>Minimum inlet pressure</i> are complied with. Open the isolating valve on the suction side completely.
	e) Suction pipe or impeller blocked.	Clean suction pipe and pump.
2. Pump is noisy and/or runs unevenly.	a) Inlet pressure too low (cavitation).	Make sure that the storage tank is filled with enough water and that the conditions in section 8.1 <i>Minimum inlet pressure</i> are complied with. Open the isolating valve on the suction side completely.
	b) Air in suction pipe or pump.	Fill storage tank with water. Vent pump. Make sure the suction pipe has been installed according to section 9.5 <i>Pipework</i> .
	c) Impeller out of balance.	Clean the impeller.
	d) Inner pump parts worn.	Replace defective parts.
	e) Pump stressed by the pipework.	Install the pump so that it is not stressed. Support the pipes.
	f) Defective bearings.	Replace bearings.
	g) Defective coupling.	Replace coupling.
	h) Foreign bodies in the pump.	Clean the pump.
3. Leakage from pump.	a) Pump stressed by the pipework.	Install the pump so that it is not stressed. Support the pipes.
	b) Pump housing gaskets or pipe gaskets defective.	Replace defective gaskets.
4. Excessive leakage from stuffing box.	a) Stuffing box packing too loose.	Tighten the gland bolts evenly to obtain a leakage of 40 60 drops per minute.
	b) Stuffing box packing worn.	Replace stuffing box packing. See service instructions.
5. Too high pump temperature.	a) Air in the pump.	Fill the storage tank with water.
	b) Inlet pressure too low.	Make sure that the storage tank is filled with enough water and that all conditions in section 8.1 <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 with bearing seat stressed by pipework.	Install the pump so that it is not stressed. Support pipes. Check the alignment of the pump, and correct, if necessary. See section 9.12 <i>Alignment</i> .
	e) Axial pressure too high.	Check the relief holes of the impeller and the lock rings on the suction side.
6. Engine does not start.	a) Fuel tap closed.	Open fuel tap on the diesel tank.
	b) No diesel in the tank.	Fill tank with diesel. Vent fuel system, if necessary. See sections 14.4.6 <i>Filling of fuel</i> and 14.4.7 <i>Venting of fuel system</i> .
	c) Fuel filter blocked.	Change fuel filter. See service instructions.
	d) Air in fuel system.	Vent fuel system. See section 14.4.7 <i>Venting of fuel system</i> .
	e) Water in the fuel.	Drain fuel from the fuel tank. Fill new fuel. Vent the fuel system, if necessary.
	f) Starter relay defective.	Replace starter relay.
	g) Insufficient power supply.	Check power supply to the control cabinet, batteries and cables of the fire pump set.
	h) Exhaust pipes blocked.	Clean exhaust pipes.

Fault	Cause	Remedy
7. Oil pressure is too high or too low when engine is running.	a) Oil filter blocked.	Replace oil filter. See service instructions.
	b) Water or fuel in the oil.	Change oil. See service instructions.
	c) Oil level too low/too high.	Fill or drain oil. See section 14.4.2 <i>Filling of oil</i> .
	d) Oil pump worn.	Replace oil pump.
8. Engine temperature too high.	a) Cooling system faulty.	Bypass the cooling circuit. See section 4.3.1 <i>General description</i> .
	b) Insufficient cooling liquid.	Fill cooling liquid. See section 14.4.4 <i>Filling of cooling liquid</i> .
	c) Heat exchanger defective.	Replace heat exchanger.
9. Engine does not reach rated speed.	a) Incorrect speed setting.	Please contact Grundfos.
	b) Fuel filter partially blocked.	Change fuel filter. See service instructions.
	c) Air in fuel system.	Vent fuel system. See section 14.4.7 <i>Venting of fuel system</i> .
	d) Traces of water in the fuel.	Drain condensate from the fuel filter. See section 14.4.5 <i>Checking of fuel system</i> .
	e) Turbocharger or charge air cooler defective.	Replace turbocharger or charge air cooler.
10. Battery voltage too low.	a) Cell short in starter battery.	Replace starter batteries.
	b) Wiring of the battery charging circuit damaged or insufficient terminal contact.	Check wiring and replace, if necessary. Check terminal connections and tighten, if necessary.
	c) Insufficient power supply to the control cabinet.	Check power supply.
	d) V-belt tension too low.	Check V-belt tension and correct, if necessary. See 14.4.10 <i>Checking of V-belt</i> .
	e) Battery-charging unit defective.	Replace battery-charging unit.
11. Strong exhaust gas colouring.	a) Dirty air filter.	Replace air filter. See section 14.4.9 <i>Checking of air filter</i> .

16. Service, spare parts and accessories



Warning

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

The installation and/or use of such products may negatively alter and thus impair the specified properties of the fire pump set.

The usage of non-original spare parts and accessories renders any liability on behalf of Grundfos for resulting damages null and void.

Any malfunctions which cannot be repaired should only be corrected by Grundfos or authorised specialist companies.

Please provide an exact description in the event of a malfunction so that our service technician can prepare and provide the appropriate spare parts.

Please obtain the technical data for the system from the nameplate.

17. Warranty

The warranty is governed by the framework of our general terms of delivery. Liability for any damage resulting from incorrect installation, electrical connection or use, as well as liability for consequential damage, is excluded. The start of the warranty period is to be verified.

18. Further documentation

These operating instructions are to be used in conjunction with the following documentation:

- wiring diagram of controller
- service instructions of the fire pump set.

19. Dimensions, weights and engine data

19.1 Dimensions and weights

Data apply to standard versions.

Fire HSEF

Pump type	Engine type	Fire pump set		Pump				Engine		
		Dimensions L x W x H [mm]	Weight [kg]	Suction port [inch]	Discharge port [inch]	Height, suction port [mm]	Height, discharge port [mm]	Weight [kg]	Exhaust gas port [mm]	Weight [kg]
HSEF 4-10	JU4H-UF14	2900 x 1310 x 1882	1024	5	4	391	391	143	76	413
	JU4H-UF14	2900 x 1310 x 1882	1052							
HSEF 4-12	JU4H-UF24	2900 x 1310 x 1882	1052	5	4	391	359	171	76	413
	JU4H-UF34	2900 x 1310 x 1882	1063							
HSEF 5-8	JU4H-UF14	2900 x 1310 x 1882	1024	6	5	410	264	143	76	413
	JU4H-UF14	2900 x 1310 x 1882	1054							
HSEF 5-11	JU4H-UF24	2900 x 1310 x 1882	1054	6	5	385	385	172	76	413
	JU4H-UF34	2900 x 1310 x 1882	1065							
HSEF 5-12	JU4H-UF54	2900 x 1310 x 1882	1149	6	5	353	194	257	102	424
	JU6H-UF34	3700 x 1310 x 2032	1475							
HSEF 5-14	JU4H-UF10	2900 x 1310 x 1882	1110	6	5	378	340	229	76	413
	JU4H-UF30	2900 x 1310 x 1882	1121							
HSEF 6-10	JU4H-UF34	2900 x 1310 x 1882	1097	8	6	366	385	204	102	424
	JU4H-UF54	2900 x 1310 x 1882	1097							
HSEF 6-12	JU4H-UF30	2900 x 1310 x 1882	1234	8	6	362	346	342	102	424
	JU4H-UF54	2900 x 1310 x 1882	1234							
	JU6H-UF34	3700 x 1310 x 2032	1560							
	JU6H-UF54	3700 x 1310 x 2032	1560							
	JU6H-UF84	3700 x 1310 x 2032	1576							
HSEF 6-14	JU4H-UF30	2900 x 1310 x 1882	1169	8	6	327	315	277	102	424
	JU4H-UF40	2900 x 1310 x 1882	1169							
	JU4H-UF50	2900 x 1310 x 1882	1169							
	JU6H-UF30	3700 x 1310 x 2032	1495							
	JU6H-UF50	3700 x 1310 x 2032	1495							
	JW6H-UF30	2350 x 1000 x 1941 *)	1392 *)							
HSEF 6-16	JU4H-UF30	2900 x 1310 x 1882	1205	8	6	324	147	313	102	424
	JU4H-UF40	2900 x 1310 x 1882	1205							
	JU4H-UF50	2900 x 1310 x 1882	1205							
	JU6H-UF50	3700 x 1310 x 2032	1531							
	JU6H-UF60	3700 x 1310 x 2032	1547							
HSEF 6-18	JU6H-UF50	3700 x 1310 x 2032	1531	8	6	378	340	313	127	750
	JU6H-UF60	3700 x 1310 x 2032	1547							
	JW6H-UF30	2390 x 1000 x 1941 *)	1428 *)							
	JW6H-UF40	2390 x 1000 x 1941 *)	1424 *)							
	JW6H-UF50	2390 x 1000 x 1941 *)	1447 *)							
HSEF 8-15	JU4H-UF40	2900 x 1310 x 1882	1278	10	8	327	302	386	102	424
	JU4H-UF50	2900 x 1310 x 1882	1278							
	JU6H-UF30	3700 x 1310 x 2032	1604							
	JU6H-UF50	3700 x 1310 x 2032	1604							
	JU6H-UF60	3700 x 1310 x 2032	1620							
	JW6H-UF30	2370 x 1000 x 1941 *)	1501 *)							
	JW6H-UF40	2370 x 1000 x 1941 *)	1497 *)							
	JW6H-UF50	2370 x 1000 x 1941 *)	1520 *)							
	JW6H-UF60	2370 x 1000 x 1941 *)	1520 *)							
	JX6H-UF30	2490 x 1020 x 2190 *)	2020 *)							
HSEF 8-17	JU6H-UF50	3700 x 1310 x 2032	1677	10	8	353	302	459	127	750
	JU6H-UF60	3700 x 1310 x 2032	1693							
	JW6H-UF30	2470 x 1050 x 1941 *)	1574 *)							
	JW6H-UF40	2470 x 1050 x 1941 *)	1570 *)							
	JW6H-UF50	2470 x 1050 x 1941 *)	1593 *)							
	JW6H-UF60	2470 x 1050 x 1941 *)	1593 *)							

Pump type	Engine type	Fire pump set		Pump				Engine		
		Dimensions L x W x H [mm]	Weight [kg]	Suction port [inch]	Discharge port [inch]	Height, suction port [mm]	Height, discharge port [mm]	Weight [kg]	Exhaust gas port [mm]	Weight [kg]
HSEF 8-20	JW6H-UF30	2470 x 1050 x 1941 *)	1720 *)	10	8	366	315	605	127	910
	JW6H-UF40	2470 x 1050 x 1941 *)	1716 *)			366	315		127	906
	JW6H-UF50	2470 x 1050 x 1941 *)	1739 *)			366	315		152	929
	JW6H-UF60	2470 x 1050 x 1941 *)	1739 *)			366	315		152	929
	JX6H-UF30	2490 x 1050 x 2190 *)	2239 *)			533	508		152	1429
	JX6H-UF40	2490 x 1050 x 2190 *)	2284 *)			533	508		152	1474
	JX6H-UF50	2490 x 1050 x 2190 *)	2284 *)			533	508		152	1474
	JX6H-UF60	2490 x 1050 x 2190 *)	2284 *)			533	508		152	1474
HSEF 10-16	JW6H-UF30	2470 x 1035 x 1941 *)	1787 *)	12	10	366	340	672	127	910
	JW6H-UF40	2470 x 1035 x 1941 *)	1783 *)			366	340		127	906
	JW6H-UF60	2470 x 1035 x 1941 *)	1806 *)			366	340		152	929
	JX6H-UF30	2745 x 1050 x 2190 *)	2306 *)			483	457		152	1429
HSEF 10-20	JW6H-UF30	2520 x 1150 x 1941 *)	2024 *)	12	10	366	289	909	127	910
	JW6H-UF40	2520 x 1150 x 1941 *)	2020 *)			366	289		127	906
	JW6H-UF60	2520 x 1150 x 1941 *)	2043 *)			366	289		152	929
	JX6H-UF30	2745 x 1150 x 2190 *)	2543 *)			508	431		152	1429
	JX6H-UF40	2745 x 1150 x 2190 *)	2588 *)			508	431		152	1474
	JX6H-UF50	2745 x 1150 x 2190 *)	2588 *)			508	431		152	1474
	JX6H-UF60	2745 x 1150 x 2190 *)	2588 *)			508	431		152	1474
	JX6H-UF70	2745 x 1150 x 2190 *)	2588 *)			508	431		152	1474

*) Tank and controller are placed separately.

Fire DNF

Pump type	Engine type	Fire pump set		Pump				Engine		
		Dimensions L x W x H [mm]	Weight [kg]	Suction port [inch]	Discharge port [inch]	Height, suction port [mm]	Height, discharge port [mm]	Weight [kg]	Exhaust gas port [mm]	Weight [kg]
DNF 65-20	JU4H-UF14	2650 x 1160 x 1619	880	100	65	455	680	71	76	413
DNF 65-25	JU4H-UF14	2650 x 1160 x 1619	875	100	65	455	705	69	76	413
DNF 80-20	JU4H-UF14	2650 x 1160 x 1619	880	125	80	455	705	72	76	413
	JU4H-UF14	2650 x 1160 x 1619	880			455	735			
DNF 80-25	JU4H-UF24	2650 x 1160 x 1619	890	125	80	455	735	82	76	413
	JU4H-UF34	2650 x 1160 x 1619	890			455	735			

19.2 Engine data

Fire HSEF

Pump type	Engine type	Engine output	Engine speed	Air requirement	Exhaust volume	Oil quantity	Oil pressure	Cooling liquid quantity	Fuel tank volume
		[kW]	[rpm]	[m ³ /min]	[m ³ /min]	[litre]	[litre]	[litre]	[litre]
HESF 4-10	JU4H-UF14	53	2960	6.2	18	8.5	2.5 - 3.4	14.2	605
	JU4H-UF14	53	2960	6.2	18	8.5	2.5 - 3.4	14.2	605
HSEF 4-12	JU4H-UF24	62	2960	6.2	18	8.5	2.5 - 3.4	14.2	605
	JU4H-UF34	86	2960	10.0	25.8	8.5	2.5 - 3.4	14.2	605
HESF 5-8	JU4H-UF14	53	2960	6.2	18	8.5	2.5 - 3.4	14.2	605
	JU4H-UF14	53	2960	6.2	18	8.5	2.5 - 3.4	14.2	605
HSEF 5-11	JU4H-UF24	62	2960	6.2	18	8.5	2.5 - 3.4	14.2	605
	JU4H-UF34	86	2960	10.0	25.8	8.5	2.5 - 3.4	14.2	605
HSEF 5-12	JU4H-UF54	108	2960	11.7	33.8	8.5	2.5 - 3.4	14.2	605
	JU6H-UF34	132	2960	17.1	45.7	8.5	2.5 - 3.4	14.2	1155
HSEF 5-14	JU4H-UF10	31	1760	4.0	11	8.5	2.5 - 3.4	14.2	605
	JU4H-UF30	48	1760	4.2	9	8.5	2.5 - 3.4	14.2	605
	JU4H-UF40	70	1760	4.8	12	8.5	2.5 - 3.4	14.2	605
HSEF 6-10	JU4H-UF34	86	2960	10.0	25.8	8.5	2.5 - 3.4	14.2	605
	JU4H-UF54	108	2960	11.7	33.8	8.5	2.5 - 3.4	14.2	605
HSEF 6-12	JU4H-UF30	48	1760	4.2	9	8.5	2.5 - 3.4	14.2	605
	JU4H-UF54	108	2960	11.7	33.8	8.5	2.5 - 3.4	14.2	605
	JU6H-UF34	131	2960	17.1	45.7	8.5	2.5 - 3.4	14.2	1155
	JU6H-UF54	161	2960	18.3	50.9	8.5	2.5 - 3.4	14.2	1155
	JU6H-UF84	205	2960	20.3	55.3	8.5	2.5 - 3.4	14.2	1155
	JU4H-UF30	48	1760	4.2	9	8.5	2.5 - 3.4	14.2	605
HSEF 6-14	JU4H-UF30	59	2100	5.5	13	8.5	2.5 - 3.4	14.2	605
	JU4H-UF40	70	1760	4.8	12	8.5	2.5 - 3.4	14.2	605
	JU4H-UF40	78	2100	6.1	15	8.5	2.5 - 3.4	14.2	605
	JU4H-UF50	82	1760	5.4	16	8.5	2.5 - 3.4	14.2	605
	JU4H-UF50	97	2100	6.9	20	8.5	2.5 - 3.4	14.2	605
	JU6H-UF30	104	1760	7.8	21	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF30	119	2100	10.2	27	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF50	137	1760	8.9	26	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF50	157	2100	12.3	34	19.5	2.8 - 4.1	19.0	1155
	JW6H-UF30	205	2100	21	47	32.0	2.1 - 3.8	21.0	- *)
HSEF 6-16	JU4H-UF30	48	1760	4.2	9	8.5	2.5 - 3.4	14.2	605
	JU4H-UF40	70	1760	4.8	12	8.5	2.5 - 3.4	14.2	605
	JU4H-UF50	82	1760	5.4	16	8.5	2.5 - 3.4	14.2	605
	JU6H-UF50	137	1760	8.9	26	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF60	149	1760	10.0	27	19.5	2.8 - 4.1	19.0	1155
HSEF 6-18	JU6H-UF50	137	1760	8.9	26	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF60	149	1760	10.0	27	19.5	2.8 - 4.1	19.0	1155
	JW6H-UF30	205	2100	21	47	30.0	2.1 - 3.8	21.0	- *)
	JW6H-UF40	224	2100	22	49	30.0	2.1 - 3.8	22.0	- *)
	JW6H-UF50	254	2100	25	59	30.0	2.1 - 3.8	22.0	- *)
HSEF 8-15	JU4H-UF40	70	1760	4.8	12	8.5	2.5 - 3.4	14.2	605
	JU4H-UF50	82	1760	5.4	16	8.5	2.5 - 3.4	14.2	605
	JU4H-UF50	97	2100	6.1	20	8.5	2.5 - 3.4	14.2	605
	JU6H-UF30	104	1760	7.8	21	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF30	119	2100	10.2	27	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF50	137	1760	8.9	26	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF50	157	2100	12.3	34	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF60	149	1760	10.0	27	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF60	179	2100	14.0	35	19.5	2.8 - 4.1	19.0	1155
	JW6H-UF30	198	1760	16.0	40	30.0	2.1 - 3.8	21.0	- *)
	JW6H-UF30	205	2100	21.0	47	30.0	2.1 - 3.8	21.0	- *)
	JW6H-UF40	224	2100	22.0	49	30.0	2.1 - 3.8	22.0	- *)
	JW6H-UF50	254	2100	25.0	59	30.0	2.1 - 3.8	22.0	- *)
JW6H-UF60	280	2100	27.0	65	30.0	2.1 - 3.8	22.0	- *)	
JX6H-UF30	322	2100	26.5	65	40.0	3.1	28.0	- *)	

Pump type	Engine type	Engine output	Engine speed	Air requirement	Exhaust volume	Oil quantity	Oil pressure	Cooling liquid quantity	Fuel tank volume
		[kW]	[rpm]	[m ³ /min]	[m ³ /min]	[litre]	[litre]	[litre]	[litre]
HSEF 8-17	JU6H-UF50	137	1760	8.9	26	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF50	157	2100	12.3	34	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF60	149	1760	10.0	27	19.5	2.8 - 4.1	19.0	1155
	JU6H-UF60	179	2100	14.0	35	19.5	2.8 - 4.1	19.0	1155
	JW6H-UF30	198	1760	16.0	40	30.0	2.1 - 3.8	21.0	- *)
	JW6H-UF30	205	2100	21.0	47	30.0	2.1 - 3.8	21.0	- *)
	JW6H-UF40	216	1760	17.0	43	30.0	2.1 - 3.8	22.0	- *)
	JW6H-UF40	224	2100	22.0	49	30.0	2.1 - 3.8	22.0	- *)
	JW6H-UF50	254	2100	25.0	59	30.0	2.1 - 3.8	22.0	- *)
	JW6H-UF60	268	1760	22.0	56	30.0	2.1 - 3.8	22.0	- *)
HSEF 8-20	JW6H-UF60	280	2100	27.0	65	30.0	2.1 - 3.8	22.0	- *)
	JW6H-UF30	198	1760	16.0	40	30.0	2.1 - 3.8	21.0	- *)
	JW6H-UF40	216	1760	17.0	43	30.0	2.1 - 3.8	22.0	- *)
	JW6H-UF40	224	2100	22.0	49	30.0	2.1 - 3.8	22.0	- *)
	JW6H-UF50	254	2100	25.0	59	30.0	2.1 - 3.8	22.0	- *)
	JW6H-UF60	268	1760	22.0	56	30.0	2.1 - 3.8	22.0	- *)
	JW6H-UF60	280	2100	27.0	65	30.0	2.1 - 3.8	22.0	- *)
	JX6H-UF30	313	1760	23.0	58	40.0	3.1	28.0	- *)
	JX6H-UF40	362	2100	31.2	73	40.0	3.1	28.0	- *)
	JX6H-UF50	380	2100	32.2	76	40.0	3.1	28.0	- *)
HESF 10-16	JX6H-UF60	392	2100	33.2	79	40.0	3.1	28.0	- *)
	JW6H-UF30	198	1760	16.0	40	30.0	2.1 - 3.8	21.0	- *)
	JW6H-UF40	216	1760	17.0	43	30.0	2.1 - 3.8	22.0	- *)
	JW6H-UF60	268	1760	22.0	56	30.0	2.1 - 3.8	22.0	- *)
	JX6H-UF30	313	1760	23.0	58	40.0	3.1	28.0	- *)
HSEF 10-20	JX6H-UF30	322	2100	26.5	65	40.0	3.1	28.0	- *)
	JW6H-UF30	198	1760	16.0	40	30.0	2.1 - 3.8	21.0	- *)
	JW6H-UF40	216	1760	17.0	43	30.0	2.1 - 3.8	22.0	- *)
	JW6H-UF60	268	1760	22.0	56	30.0	2.1 - 3.8	22.0	- *)
	JX6H-UF30	313	1760	23.0	58	40.0	3.1	28.0	- *)
	JX6H-UF40	343	1760	25.4	62	40.0	3.1	28.0	- *)
	JX6H-UF50	362	1760	27.3	67	40.0	3.1	28.0	- *)
	JX6H-UF60	380	1760	29.2	72	40.0	3.1	28.0	- *)
	JX6H-UF70	429	1760	32.1	82	40.0	3.1	28.0	- *)

*) Tank and controller are placed separately.

Fire DNF

Pump type	Engine type	Engine output	Engine speed	Air requirement	Exhaust volume	Oil quantity	Oil pressure	Cooling liquid quantity	Fuel tank volume
		[kW]	[rpm]	[m ³ /min]	[m ³ /min]	[litre]	[litre]	[litre]	[litre]
DNF 65-20	JU4H-UF14	53	2960	6.2	18	8.5	2.5 - 3.4	14.2	605
DNF 65-25	JU4H-UF14	53	2960	6.2	18	8.5	2.5 - 3.4	14.2	605
DNF 80-20	JU4H-UF14	53	2960	6.2	18	8.5	2.5 - 3.4	14.2	605
	JU4H-UF14	53	2960	6.2	18	8.5	2.5 - 3.4	14.2	605
DNF 80-25	JU4H-UF24	62	2960	6.2	18	8.5	2.5 - 3.4	14.2	605
	JU4H-UF34	86	2960	10.0	25.8	8.5	2.5 - 3.4	14.2	605

20. 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.

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