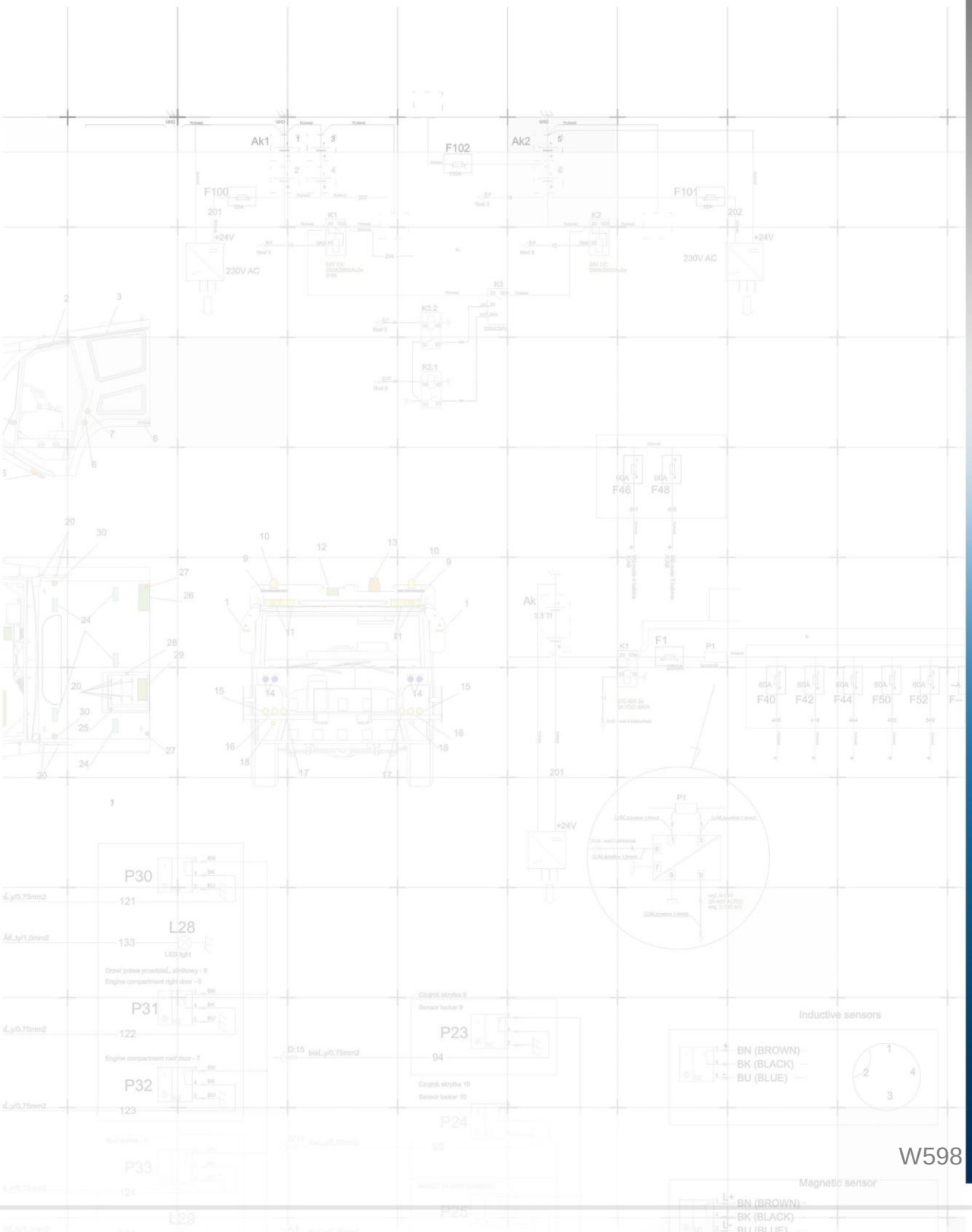
Inżynieria Samochodów Specjalnych

Manual

FIREFIGHTING RESCUE VEHICLE

Renault K 4x4



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CAUTION !

MISHANDLING AND NO OBSERVANCE OF SERVICE AND MAINTENANCE INSTRUCTIONS PUTS THE WARRANTY ASIDE

CAUTION !

THE MANUFACTURER OF THE VEHICLE IS NOT LIABLE FOR DAMAGES RESULTED FROM ITS EXPLOITATION

Introduction

The following description provides the technical details of the firefighting vehicle, on K 380.21 4X4 R HEAVY Euro 6 chassis with diesel engine. Singe cab, accommodation for driver and 1 firemen.

1. Chassis

P.T.L.M.	18000 kg
Wheelbase	4000 mm

Engine

Type	RENAULT DTi 11 - EURO 6
Power	380 hp. (279 KW) @ 1700 and 11850 rpm
Torque	1800 Nm from 950 to 1400 rpm

Clutch

Single-plate
Automatic adjustment
Clutch plate diameter: 430mm

Gearbox

Optidriver gearbox AT 2612E
12-speed forward, synchronised.
3 reverse speed

Transfer case

Single-stage transfer box BT C 2501

PTO

Type	Renault 22810
Max. torque	650 Nm
Gear ratio	1,08

Front axle

Type	Renault PA 903
M.A.W.	8000 kg

Rear axle

Type	Renault P 1361
M.A.W.	13000 kg

Differential lock.

Chassis

Ladder frame, U-shaped cross-members
Fuel tank: 315 litres – lockable

Suspension front

3-leaf reinforced front leaf springs
Stabiliser bar

Suspension rear

4-leaf parabolic rear springs
Stabiliser bar
Rear shock absorbers

Brakes

Braking system with two independent circuits
Drum brakes
Dust protection on rear brake
Anti-lock braking system (ABS)
EPB (Electronic Parking Brake) automatic parking brake
Automatic brake lining slack compensation.
Emergency brake ensured by independence of main device circuits

Steering

Type Renault
Hydraulic power steering, steering ratio 26.2:1.
Adjustable steering wheel angle.
Steering wheel diameter 460 mm
Driving on the right

Wheels

Tyres 398/85 R20 – XZL2
All axles single wheels
Spare wheel 395/85 R20 – XZL2

Electrical equipment

Voltage: 24 V
Batteries: 2 x 12 V - 225 Ah
Alternator: 150 A

2. Superstructure

2.1. Cab

Driver's cab for driver and co-driver.
Steel unibody cab construction.
Heat and sound insulation.
Cataphoresis corrosion-protection.

Driver's seat 3-way adjustable, with headrest.
Co-driver's seat with headrests and safety belts.

Cab with 2 access doors, with front hinges and safety-glass windows with window-lift, laminated glass windscreen, windscreen wipers with intermittent control, double speed and automatic stop position, windscreen wipers with integrated windscreen wash spray, with electric pump, approx. 5-litre windscreen wash tank.

2.2. Water tank and foam tank

The water tank has a 5000-litre capacity and foam tank has 1000L capacity. There are made of composite material, glass fibre reinforced polyester resin, finished with a special, appropriate coating.
This water tank is fitted with removable baffles, built across parallel and cross-sections, configured inside so that the tank is divided into equal, inter-connectable, minimum sections.

A water tank has 500 mm inside diameter manhole. An overflow drain is provided for, as well as a connector for filling from an outside source, a suction take-off to the fire pump, a manually operated drainage port and a tank level gauge on the pump control panel.
The drainage system is mounted in the bottom part of the tank.

2.3. Fire pump

A Ruberg EUROLINE (FPN 10-4000-40-250) of capacity of 4000 litres/min at 10 bars and 250 litres/min at 40 bars is installed on the vehicle.
An automatic priming pump being an integral part of main water pump is provided. The geodesic pump suction height is at least 7,5 metres.

The pump (PTO engagement) is controlled from the control panel.

3. Electrical installation

3.1. Buzzers

The following buzzers are fitted on the dashboard:
* air brake low pressure warning
* reverse gear indicator
* direction indicators

3.2. Monitoring instruments

The control panel at the rear of the vehicle is fitted with:

- 1 high pressure manometer
- 1 low pressure manometer
- 1 vacuum-meter
- 1 pump rpm counter
- 1 engine oil pressure indicator
- 1 engine temperature indicator
- 1 engine start/stop
- 1 PTO start/stop
- 1 switch for rpm changing
- 1 water level indicator
- 1 foam level indicator

A diagram of the hydraulic installation is located near the control panel.

3.3. Electrical equipment

24V with negative earth, using two 12V batteries, wiring entirely protected by switches and fuses.
Electrical system charged by a 150A alternator, to recharge the battery, with engine running idle, with all electrical accessories switched on.

Interior cab lighting, locker lighting and pump compartment lighting.

3.4. Emergency signalling

2 Strobe lights, red on the cab roof.
2 Strobe lights, red on the front grid
2 Strobe lights, red, at the rear
4 Strobe lights, orange – two on the cab and two on the rear part of the superstructure

4. Bodywork

The vehicle superstructure is made from welded aluminium profiles, covered with aluminum plates and equipped with 2(front) and 3 (rear) roller shutters.

A ladder at the rear of the superstructure gives access to the superstructure roof.

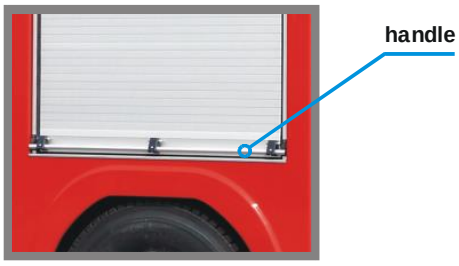
This roof is covered in trimmed aluminium, thickness 3 mm. It is perfectly watertight, can be walked on and is fitted with boxes for the suction hoses, large equipment and spare wheel. The superstructure exterior is finished in fire-engine red RAL 3000.

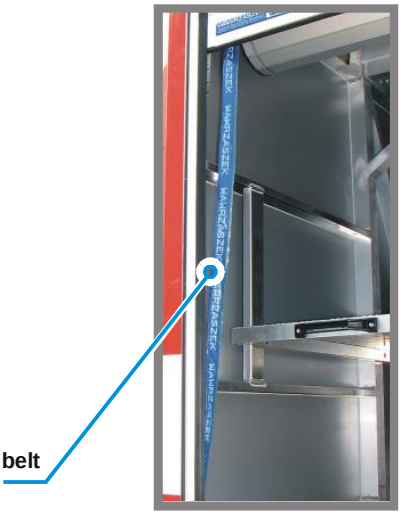
4.1 Roller Shutters

There 5 lockers – two on each side and one at the rear closed by aluminum shutters which are equipped with mechanical blocking systems. Sensors, which control the interior lighting and give a warning signal when the roller shutter is open, have been installed for each locker. Shutter are made from anodised aluminium, double section, carefully assembled to make sure that they don't get stuck or make noise. Therefore, they are fitted with synthetic seals that also ensure water tightness and equipped with belts allowing closing them from different levels from the ground.
The locker access openings are as large as possible

SHUTTERS CAN BE CLEANED ONLY BY EXTRACTION NAPHTHA.

SHUTTERS MUST BE PROTECTED AGAINST MECHANICAL DAMAGE.





4.2 Roof ladder

A ladder, which enables climbing the vehicle's roof is installed at the back of a vehicle's body.
Unfold a ladder before using it.
Pull it towards yourself and direct downwards at the same time**.**

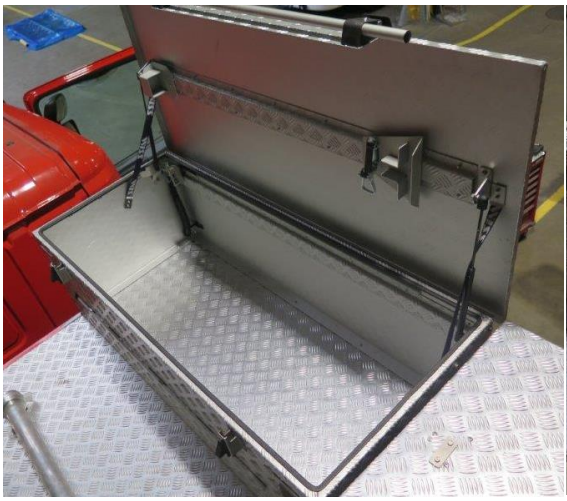
NOTE!
ONLY ONE PERSON AT A TIME CAN STAND ON A LADDER

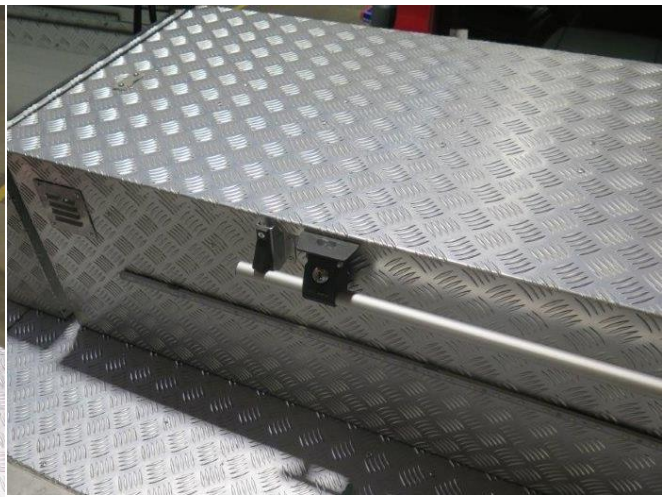
FOLDING
make sure that an entry ladder is folded before driving

4.3 Roof box

Boxes installed on a roof are used for transporting different equipment.
The box' cover is fitted with special securing lock, which enable opening of the box.

STRIKERS
make sure that all locks are shut before driving!





4.4 Batteries

Batteries are installed in a first left lower locker (near cab).

4.5 Platforms

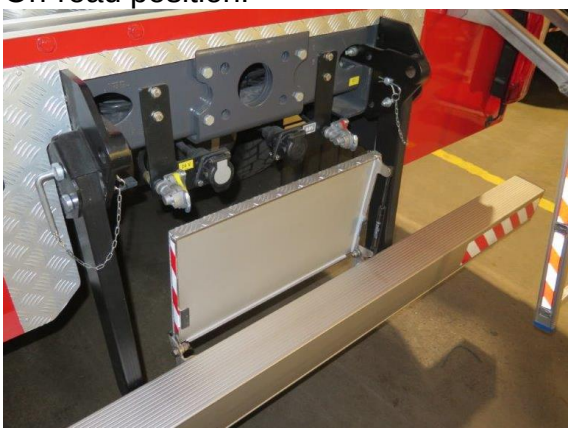
All lockers are equipped with special platforms, which gives better access to higher mounted equipment. Platforms are fixed with handles and locks. To open you need to open rollershutter, move the lock lever and the pull by the handle till open. To close you need only to push the platform back, locks will close automatically.

NOTE! Platforms have to be folded during driving.
Maximum load of a platform equals 150 kg.
ONLY ONE PERSON AT A TIME CAN STAND ON A PLATFORM.

4.6 Rear bumper

Rear bumper has two positions. When driving off-road a bar needs to be lifted. After placing the bar in a certain position you need to make sure if it's blocked.

On-road position:



Off-road position:

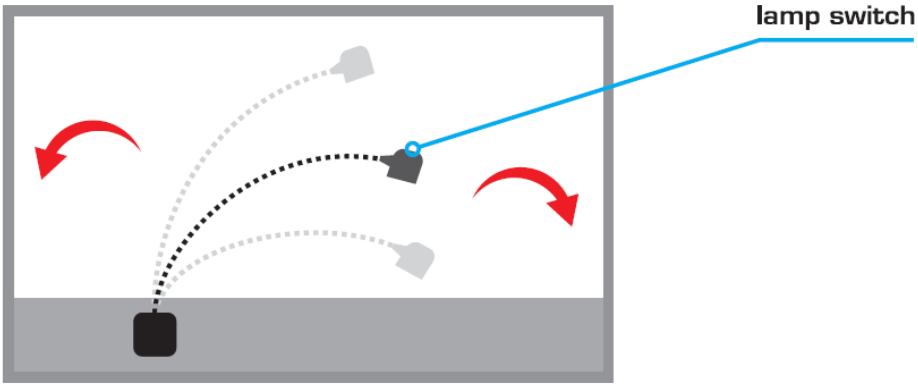
In every position bumper should be blocked by the pivot shown on the picture on both sides.

4.9 Cab equipment

There are some equipment mounted inside the cab.

4.9.1 Lighting

A cab is fitted with a lighting system. Additional halogen lamp on a flexible conductor for map reading, so called 'commander light'. Illumination inside the cab measured in the centre of the outer edge of each seat, equals 40 lx (except for the driver seat).



5. Operation, maintenance, storage

Service of a vehicle chassis and all its components should be carried out in accordance with the instructions, recommendations and warranty book of a chassis manufacturer.

Service of construction components and permanently installed equipment should be performed in accordance with the vehicle warranty card, maintenance registry and provisions of this manual, contained in this and the following chapters.

Maintenance and operation of the equipment supplied with the vehicle in accordance with the manufacturers' instructions.

VEHICLE MANUFACTURER IS NOT RESPONSIBLE FOR ANY DAMAGES

ARISING FROM IMPROPER USE OF THE VEHICLE

FAILURE TO COMPLY WITH THE OPERATION AND MAINTENANCE

INSTRUCTIONS WILL VOID THE WARRANTY

All damaged parts should be replaced with the original ones, provided by the manufacturer. Failure to do so may void the manufacturer's warranty and the manufacturer's liability for the unit and cause injuries to a person operating it.

All service and repair works must be performed by the manufacturer's service point or a service point authorized by him.

It is not allowed to install components not supplied by the manufacturer.

Warranty does not cover any changes and modifications, repairs, maintenance and periodic inspections that were carried out without informing the producer and without his prior written consent.

Warranty does not cover the costs of dismounting, removing, transportation, storage, product insurance or its defective parts, as well as the cost of re-installation, if the user doesn't follow the instruction.

Each user should read the instructions before operating the unit.

Using a damaged device is prohibited.

Removing warning labels and information is strictly prohibited.

USED VEHICLES MUST BE DECLARED OFF THE ROAD IN ACCORDANCE WITH THE ENVIRONMENTAL PROVISIONS APPLICABLE IN THE COUNTRY IN WHICH IT WAS USED.

1. Use the product:
   - in good condition
   - according to the local regulations
   - in accordance with safety rules

2. Follow this guide

3. Immediately remove any defects that may endanger safety.

6. Body wash

In order to avoid damaging a varnish coat during washing, do not use a strong water jet and detergents. It is recommended not to use brushes, especially during the first months of vehicle's operation, as well as avoid applying high temperature steam jets. It is suggested to use neutral agents, which do not have harmful effects on the varnish.
When washing the body, close the shutters.

You need to remember not to direct the water jet to:
- electric devices
- pneumatic subassemblies
- electronic modules
- air inlets

If you notice any deep scratches on its surface, repair the varnish immediately.

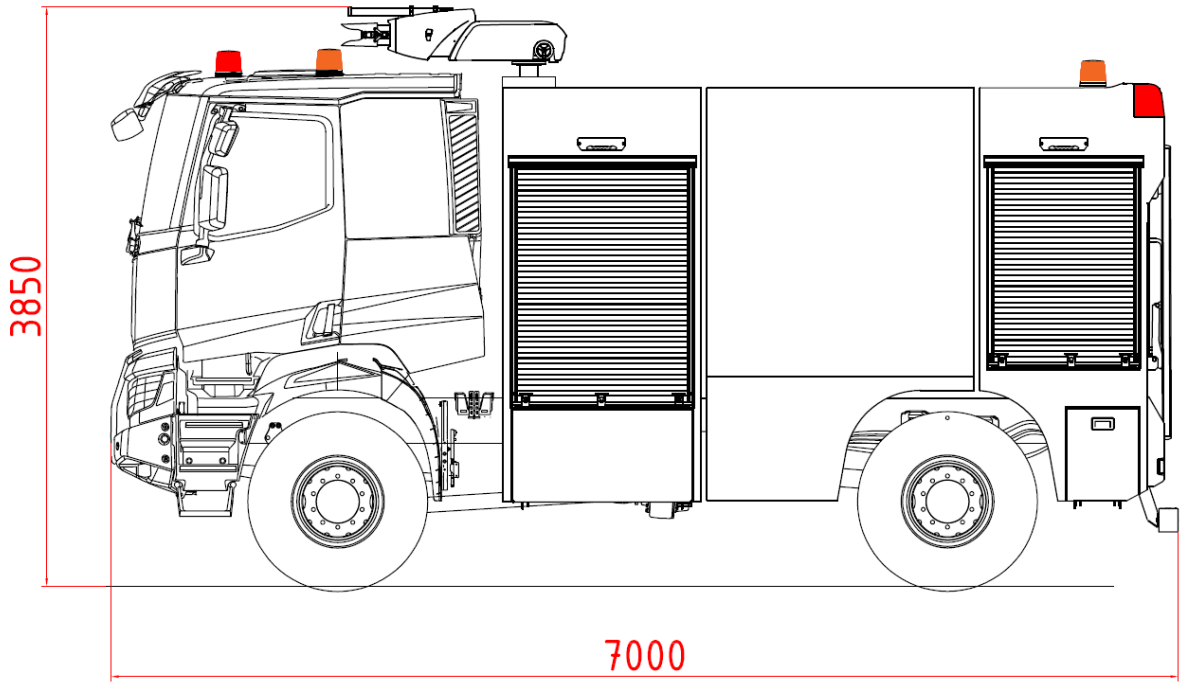
A body construction needs to be checked every now and to eliminate any failure.
Check if there are any scratches or cracks on its surface.
If you notice any, contact the manufacturer immediately.

WASHING body maintenance needs to be carried out in the same way as in case of metal body.

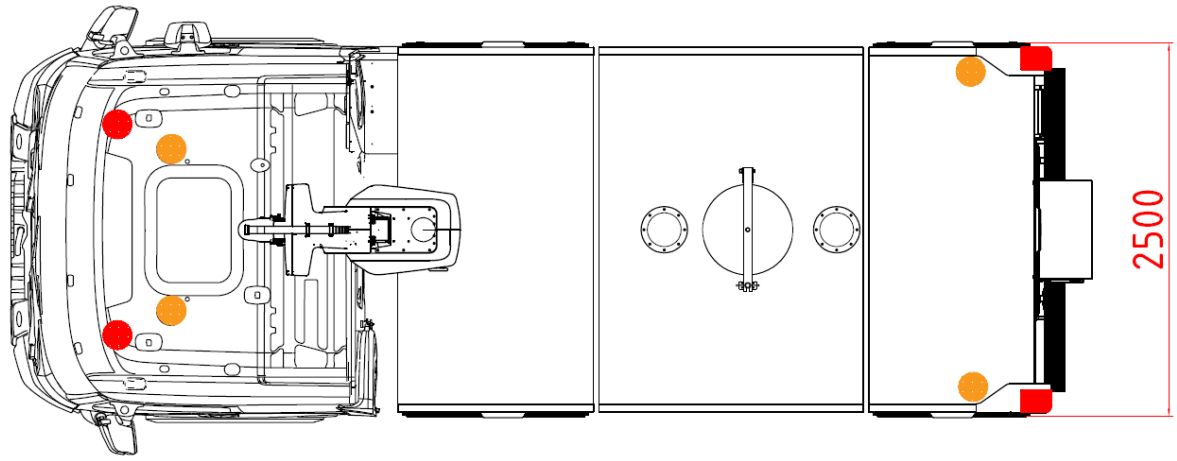
DRILLING it is forbidden to drill in body, any additional holes have to be done by a manufacturer.

WARRANTY if you do not follow the above mentioned notes, you will automatically loose your warranty.

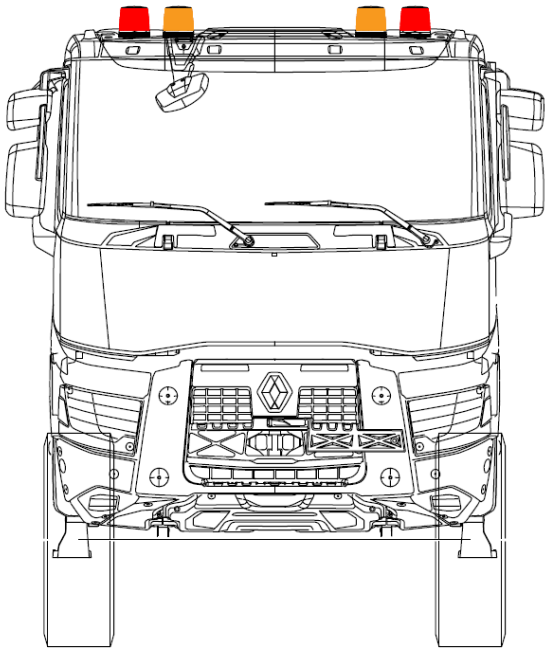
PICTURE - side view

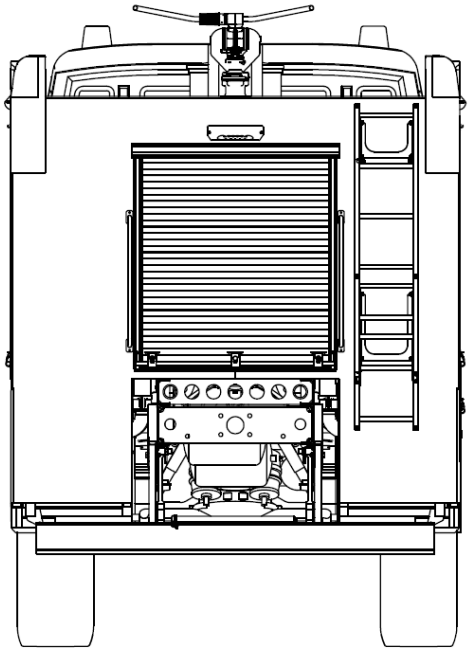


PICTURE - TOP view



PICTURE – FRONT / REAR view





5. Water and foam system

Contents

5. WATER AND FOAM SYSTEM

5.1. WATER-FOAM SYSTEM DESIGN

1. The 4000 l water tank is made of glass fibre reinforced polyester and is fully resistant to corrosion. It is maintenance-free. The tank is equipped with:

Suction pipe	DN150
Overflow-vent pipe	1 x DN150
Drain valve	DN65
Valve for filling through the pump	DN50
Valve for filling from a hydrant grid (connection)	2 x DN 65(STORZ 75)
Tank automatic filling valve (scope of operation)	YES (75-98%)
Inspection manhole	YES
Electronic filling level indicator	YES
Internal baffles	YES
Anti-vortex plates	YES

2. The 1000 l foam tank is made of glass fibre reinforced polyester and is fully resistant to corrosion. It is maintenance-free. The tank is equipped with:

Suction pipe	1 x DN50
Overflow-vent pipe	DN32
Filling/drain valve (connection)	DN50 (STORZ 52)
Possibility for gravitational filling from the roof	YES
Inspection manhole	YES
Electronic filling level indicator	YES

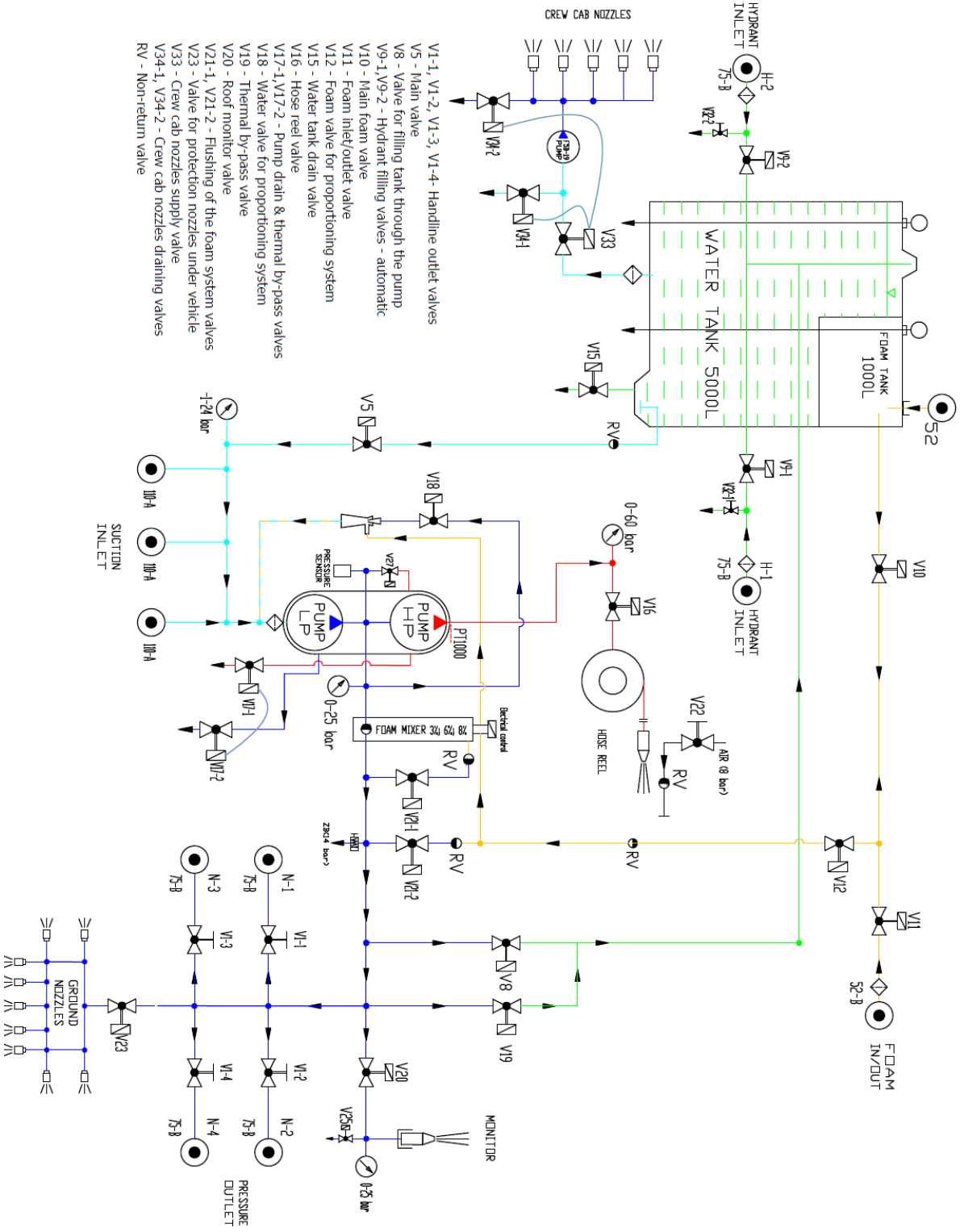
3. The built-in Pomp EUROLINE EH40c R-OPZ(2,19) (FPN 10-4000-40-250) 2(low pressure and high pressure) is made of materials that enable usage of seawater during fire fighting actions. It is

driven by the vehicle's engine through a PTO and a Cardan shaft and is located at the back of a vehicle in the rear compartment closed with shutters. A fully automatic suction device of a Membranat type is driven by pump shaft and controlled by the pump pressure. If a pump loses pressure due to the lack of water, the suction process will start automatically. Pump capacity equals 4000 l/min. at 10 bar when suctioning from the height of 3 m and 250 l/min at 40bars.

Pump connections include:

Suction line from the water tank with main valve	DN150
Suction line from external source	3 x DN100 (STORZ 110)
Non-return valve between the built-in pump and the tank	DN200
Pressure pipes with valves (connections)	4 x DN65 (STORZ 75)
Main monitor firefighting line	YES
Bumper monitor firefighting line	-
Tank filling system via the truck-mounted pump	DN50
Proportioner injector feeding system	1 x DN25
Hose reel firefighting line	1 x DN25
Spray nozzles feeding line	1 x DN40
Truck-mounted pump thermal by-pass line to the water tank	1 x DN15
Drain system of the truck-mounted pump	2 x DN15
Rinsing system of the proportioning system	2 x DN15

5.2. WATER-FOAM SYSTEM DIAGRAM



5.3. RECOMMENDATIONS

- Water-foam system has been installed in a special vehicle and is an integral part of it; therefore it can only be used when other vehicle parts are properly working.
- Always follow the manufacturer recommendations of the water-foam system components.
- Make sure that water-foam system components are in good technical condition.
- Carry out periodic controls of the whole system (frequency of controls depends on the intensity of work).
- Use oil recommended in the manual.
- Avoid getting water onto the control panel.
- Any damaged elements should be replaced and any air leakages should be repaired immediately.

5.4. FORBIDDEN ACTIVITIES

You mustn't:

- make any construction changes in components and sub-assemblies of the water-foam system.
- change pressure on control valves (they were set at the right pressure by the vehicle manufacturer.
- install additional receivers in the water-foam system (the system was selected and calculated in such a way to satisfy the specific functions and existing standards).

5.5. OPERATION CONTROL

You must control whether the systems operate correctly at least once a month. This should include:

- checking oil level
- checking flexible connections and hose reel connections condition
- checking if the hose reel brake operates correctly
- inspecting for exterior leakages
- inspecting for damages
- noise level control
- control of indicators correctness
- checking if the units work smoothly.

5.6. MAINTENANCE

Replacement of parts and units can be carried out only by the authorized persons.

Pump maintenance is limited to periodic oil level change after expiry date. The pump maintenance and inspection procedures are included in “Operation manual of Pomp EUROLINE EH30”.

You should also remember about daily control of the whole water-foam system paying special attention to leakages, damages, valve proper operation, too high noise level etc. Moreover, you should remember to rinse the pump and the system with clean water after a fire fighting intervention when water polluted with foam or rust was used.

5.7. GEARBOX OIL CHANGE

Originally, Mobil SHC 627 was used for gearboxes type ‘G’ and ‘Z’.

It is permitted to use oil of other manufacturers, the recommended substitutes are listed in ”Pomp EUROLINE EH40”.

It is unacceptable to use oil of worse properties

5.8. FAILURE OF ELECTRICAL SYSTEM OR PNEUMATIC SYSTEM

In case of electrical or pneumatic system failure you can open remote operated valves. In order to do this you must:

- close the valve, which vents a valve island to vent the secondary pneumatic system (located near the control panel on the left)
- put appropriate lever on a control connecting pipe of a valve pneumatic cylinder, which should be opened, and then turn the lever by 90° in order to open the valve.

5.9. SAFETY MEASURES

- Water-foam system can be operated only by trained operators.
- Follow all safety guidelines included in manuals of water-foam system components.
- Never operate a damaged system.
- Always use operation units in compliance with its intended use.

5.10. OPERATION IN LOW TEMPERATURE

When the temperature drops under 1°C , make sure there is a water flow in all hoses during system operation to eliminate the risk of freezing. Drain the whole water-foam system thoroughly after a finished fire fighting intervention, especially in sections where water flows.

5.11. COMMISSIONING – STARTING FOR THE FIRST TIME

Commissioning takes place at the manufacturer site by the trained operators.

5.12. OPERATION MANUAL

The water and foam system was made with the use of two types of valves, which depending on the way of control are divided into:

- manual – control with a lever directly by the user
- automatic – remote control by means of a button on a control panel.

All valves in the vehicle are labelled with a unique number for easy identification. Additionally, a water and foam system diagram is attached near the control panel on the left side of the vehicle in the final user's language to make it easier to understand the functioning of the whole system. We will refer to the unique numeration when discussing certain operation procedures in the further part of this manual so that the users have no doubts on which valve should be opened or closed in certain times.

For automatic valves, which are used in the water and foam system, some unique pictograms are placed right by the control button of a given valve or on panel. Below there is a list of pictograms with an explanation of their functions in the water and foam system:

 - switching on or switching off the truck-mounted pump

 - emergency stop

 - main water valve switch

 - engine rpm increase in order to increase the required truck-mounted pump pressure

 - engine rpm decrease in order to decrease the required truck-mounted pump pressure

- switching on or switching off the automatic pressure regulator


- opening or closing of the foam to proportioning system valve V12 and V10 (the button is connected with the valve V18 opening or closing the water flow to the proportioner), valve V11 is closed

- opening or closing of the foam to proportioning system valve V12 and V11 (the button is connected with the valve V18 opening or closing the water flow to the proportioner, valve V10 is closed

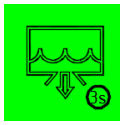
- opening or closing of the automatic tank filling valve V9 - ‘filling’ function – left

- opening or closing of the automatic tank filling valve V9 - ‘filling’ function - right

- foam inlet/outlet valve


- valve for filling tank through the pump


- draining


- water tank drain valve

- the button setting the foam proportioning to 3%,6% and 8%


opening or closing of the crew cab spray nozzles valve V23

 - opening or closing of the vehicle crew cab spray nozzles valve V33

 - opening or closing valves V5,V10,V12,V18 and action PTO

Make sure all valves are closed before starting the truck-mounted pump.

1. STARTING BUILT-IN PUMP:

- start vehicle's engine from the control panel (in accordance with the chassis manual and the attached electric system manual),
- switch on the vehicle's truck-mounted pump from the touch panel (in accordance with the chassis manual and the attached electric system manual),
- open the valve V5 (as for the setting - water supply from vehicle own tank)
- close the valve V5
- when the operation is finished switch off the truck-mounted pump of the vehicle and then switch of the engine of the vehicle (in accordance with the chassis manual and the attached electric system manual)

WARNING!

Switching on or switching off the truck-mounted pump should be done only at idle speed of the vehicle engine. In case of emergency there is a possibility of emergency stopping of the vehicle engine by pressing the 'STOP' button, which is near the water system panel. However, bear in mind that using this function frequently can lead to faster wear of pump drive system elements.

2. FILLING THE WATER TANK FROM A HYDRANT (OR FROM OTHER VEHICLE)

To fill up the tank you need to:

- connect a hose between the STORZ 75 coupling of the vehicle tank filling system and a hydrant (or other vehicle),
- open the hydrant valve V9,

WARNING!

Filling pressure should not exceed 6 bar when we fill the tank using one hydrant line. However, when we fill the tank using both hydrant lines at the same time, the filling pressure should not exceed 4 bar. When the filling pressure is higher than the one mentioned above close the hydrant valve half-way.

- you can start the automatic tank filling system, which can work either in AUTO or MANU mode. The buttons activating this function can be switched on for both filling connections at the same time or for one of them (on the left or the right side of the vehicle). After pressing the 'Filling' button on the control panel, the button is lit and the system starts operation in AUTO mode, opening the automatic tank filling valve V9 (75% of water level) or closing it (98% of water level), depending on the filling level. When you press and hold it for more than 4 seconds, the button starts flashing and the system starts working in MANU mode – the automatic filling valve V9 will be open the whole time, enabling water filling to overflow (under the vehicle).

WARNING!

By default, every time power of control panels is switched on, the system of automatic filling of a tank is started in the AUTO mode for both filling connections.

- When the tank is filled up to the top, close the hydrant valve
- After disconnecting the hose(s) open the valve V32 once again for a few seconds in order to drain any remaining water (this is particularly important in wintertime).

In case of automatic system failure there is the possibility of filling the tank without using the automatic system. Vent the valve island beforehand (see point 5.7) and then open the automatic filling valve V9 manually by means of a spanner for emergency readjusting of valves. Other activities must be carried out in accordance with the above guidelines, except for those regarding the automatic filling valve V9.

WARNING!

Driving a vehicle with a tank, which wasn't filled completely worsens traction properties.

3. FILLING THE WATER TANK VIA THE TRUCK-MOUNTED PUMP

There is a Membramat system for water suctioning, which is integrated with the truck-mounted pump in the vehicle's water system. It is switched on automatically when pressure drops below 2 bars.

WARNING!

Never start working before the pump suction unit is switched off (pressure increases above 2 bar).

To fill up a tank you need to:

- connect a suction hose, with a suction strainer attached to it, to the STORZ 110 suction coupling of the water system and immerse the hose in the external water source
- drain the water and foam system and close all valves, which have direct connection with the truck-mounted pump
- start vehicle's engine from the control panel (in accordance with the chassis manual and the attached electric system manual),
- the activate the truck-mounted pump from the touch panel;
- the main valve V5 will remain in the closed position(for the setting: water supply from external source)
- when the truck-mounted pump is started the suction system will be switched on automatically; observe the pressure-vacuum gauge and the low pressure manometer of the truck-mounted pump; after priming the truck-mounted pump the pressure indicated on the manometer will increase above 2 bar and the suction system will be switched off,
- open the valve V8 for filling the tank through the pump. If pressure on the manometer suddenly drops down repeat the procedure until the filling pressure remains at the same level above 2 bar.

WARNING!

Tank filling pressure should not go over 6 bar.

- after filling the tank close the valve V8 for tank filling via the truck-mounted pump and switch off the pump (see point 5.11.1), a then drain the water and foam system (especially in wintertime).

WARNING!

In order to avoid getting foam into the water tank do not fill in the water tank when operating with foam and do not fill the tank after foam application until the truck-mounted pump is cleaned, as the foam agent from the pump can pollute the water tank.

4. FILLING THE FOAM TANK

Gravitational filling can be done from the superstructure roof, where you can fill the foam tank after opening the inspection manhole. When the foam tank is filled, close the manhole cover.

Pressure filling of the foam tank shall be done via the STORZ 52 connection, which is located on the left side of the vehicle by means of the foam pump.

After connecting the suction hose to the foam coupling, using a button on the control panel which enable the opening valve V10 (main foam valve) and open V11 valve. When foam tank is full, disable 'foam tank filling' function.

WARNING!

When filling the foam tank avoid mixing different types of foam due to the differences in their chemical composition and their properties. The pump pressure of the tank filling should not exceed 4 bar.

5. WATER SUPPLY TO EXTERIOR RECEIVERS

External receivers of the water system can be supplied in two ways – either with water from its own tank or with water from an external source (the procedure is the same as in p. 5.11.3. with a difference that a V8 valve for filling tank through the pump should be closed).

In order to feed pressure hoses with water you need to:

- connect external receivers with appropriate pressure couplings by means of hoses and then start the vehicle's engine and the truck-mounted pump, in accordance with p. 5.11.1,
- wait until the pressure on the manometer goes over 2 bar and then open the appropriate delivery line pressure valve V1. By means of +/- buttons on the touch panel set the required pump pressure by regulating the engine rotations or directly set the required pressure of the truck-mounted pump by starting the automatic pressure regulator,
- When the action is finished reduce the water pressure using +/- buttons on the touch panel or switch off the automatic pressure regulator and then close the pressure valve V1 and switch off the truck-mounted pump, in accordance with p. 5.11.1 and disconnect the external receivers.

WARNING!

Do not close valves at full working pressure of the pump.

In order to feed the roof-mounted water and foam monitor you shall:

- start the vehicle's engine and the truck-mounted pump in accordance with 5.11.1,

- wait until the working pressure on the LP manometer goes over 2 bar and then activate the controlled from the roof-mounted control panel (see separate 'Electric system manual' for more information's) and open the monitor valve V20
- by means of +/- buttons on a touch panel set the required pump pressure by regulating the engine rotations or directly set the required pressure of the truck-mounted pump by starting the automatic pressure regulator and then control the functions in accordance with the attached manufacturer manual of the monitor or 'Electric system manual'
- When the action is finished reduce the water pressure using +/- buttons on the touch panel or switch off the automatic pressure regulator and then close the monitor valve V20 and switch off the truck-mounted pump, in accordance with p. 5.11.1

In order to feed the firefighting hose reel you need to:

- start the vehicle's engine and the truck-mounted pump in accordance with 5.11.1,
- unlock the nozzle from its seat and unlock the hose reel drum and unwind the firefighting hose.
- set the required pump pressure by means of +/- buttons on the touch panel or set the required pressure of the truck-mounted pump directly by starting the automatic pressure regulator and switch on the supply of the hose reel by opening valve V16 using the button on the control panel and then turn the handle on the nozzle to open its valve and control its jet mode and discharge,
- When the action is finished reduce the water pressure using +/- buttons on the touch panel or switch off the automatic pressure regulator and then close valve V16 and switch off the truck-mounted pump, in accordance with p. 5.11.1
- Reel the hose either automatically by means of an electric engine (activation button is on a hose reel panel) or manually by means of a special crank, which is on the hose reel wheel.

WARNING!

The motor of the hose reel has enormous reeling speed and power. If a hose can be reeled electrically with a closed drawer this means that a sensor is damaged . In such case you need to stop reeling electrically and start manual reeling. Damage should be reported to the service point.

In order to feed spray nozzles with water you need to:

- The vehicle's crew cab and chassis has been fitted with an additional protective spraying system (valve V23),

- start the vehicle's engine and the truck-mounted pump in accordance with 5.11.1,
- When the action is finished reduce the water pressure using +/- buttons on the touch panel or switch off the automatic pressure regulator and then close ground spray nozzles valves (V23-1, V23-2) and switch off the truck-mounted pump, in accordance with p. 5.11.1

6. OPERATION IN FOAM PROPORTIONING MODE

The main element of the system, which enables foam production, is a foam proportioner. Foam concentration is set by changing a position of a knob on each casting (% proportioning).

Foam is suctioned from a tank and mixed with water in an inductor. Then the product is transferred to the pressure lines.

Supplying water-foam product via low pressure lines:

In order to feed the low pressure extinguishing lines with foam concentrate (previously the pump worked above 2 bars and is supplied with water from a vehicle's tank or from the exterior tank – procedures described above) you shall:

- Open main foam valves V10, V12 and open V18 water valve for proportioning system. If it's necessary to suction foam from the external sources, the procedure is almost the same as above, except that Storz C coupling should be connected to a container with foam, V11 valve should be open and the main foam valve V10 should be closed.
- Connect a delivery hose(s) (with the attached foam generator) to the appropriate coupling(s).
- Set requested foam mixing ratio (1%, 3% or 6%) on foam proportioner depending on flow.
- Open flow through delivery lines with appropriate ball valve(s) V1,V2 which was connected to a hose (procedure described above).

Supplying water-foam product via quick attack hose:

In order to feed the quick attack hose with foam concentrate (previously the pump worked above 2 bars and is supplied with water from a vehicle's tank or from the exterior tank – procedures described above) you shall:

- Open main foam valves V10. If it's necessary to suction foam from the external sources, the procedure is almost the same as above, except that Storz C coupling should be connected to a container with foam, V11 valve should be open and the main foam valve V10 should be closed.
- Set requested foam mixing ratio (3%, 6% or 8%) on foam proportioner depending on flow.

1) Open flow through quick attack hose by manual handle of V16 valve (and follow procedure described above in 5.11.1 point).

WARNING!

Never open pressure valves, which connect the truck-mounted pump with the tank when the system is operated in the foam proportioning mode (V8 and V19) .

Flushing the foam system

Flushing the system is done by supplying water to Storz C on the rear side of a vehicle or by the open valve for flushing proportioner and foam system V21 in foam proportioning mode.

7. DRAINING WATER-FOAM SYSTEM

A water tank is emptied completely when you open V15 valve.

A foam tank is emptied completely when you open V10 and V11 valves and removing blank cap.

Draining of a pump and pressure side of water system is done by opening of valves: V1, V8, V16, V17, V18, V19,V20, V23, V24, V25 and removing blank caps.

Draining a hydrant manifold takes place by opening V32 valve and removing blank cap.

WARNING!

Take special care when operating the truck-mounted pump as the drain valves V17-1,V17-2 are used to cool down the pump by (automatic) empting hot liquid under the vehicle, when pump overheating is signalled.

A suction manifold is drained completely when you open pump inlet valve V5 and remove cover of the suction inlet STORZ 110.

WARNING!

Pay special attention when removing covers, as it may happen that there is still some water in the pipe system, when the drain procedure is still unfinished.

A pressure manifold is drained completely, when you open V1-1,V1-2,V1-3,V1-4 and V16 valves, with removing covers of pressure outlets STORZ 75 and unroll firefighting hoses and put them on a flat surface to let water flow out (it is not necessary in situation, if they were not used).

A hydrant manifold is drained completely by removing hydrant STORZ 75 covers and then opening V32 and V9 valves.

WARNING!

Each time a water and foam system is used make sure that the drain procedure is done completely, so water doesn't leak through drain connecting pipes. Bear in mind that after turning off the ignition key all valves are closed automatically despite the fact that the drain procedure is still in progress.

5.13. TROUBLESHOOTING

Problem	**Cause**	**Remedy**
Pump doesn't suction	Pump is switched off.	Switch on the pump.
	No water in the tank.	Fill the water tank.
	No water supply to the pump.	Open the main valve V5 (in case of suction from the vehicle's tank) or leave it closed (in case of suction from an external source).
	Suction strainer isn't immersed.	Immerse the suction strainer.
	Suction height is too big.	Reduce the suction height.
	Suction hose is leaking or is damaged.	Seal the connections or tight hose clamps or change the suction hose.
	Drain valves are half-closed.	Close drain valves.
	Pressure valves are half-closed.	Close all valves at the pressure side of the pump.
	Damaged suction unit of the truck-mounted pump.	Call an authorized WISS service.
Pump's operation is too loud and the pump vibrates	Suction height is too big.	Reduce the suction height.
	Too high rotations of the pump.	Decrease the pump rotations.
	Cavitation in the pump.	Decrease the rpm and partially close valves at a pressure side of the pump.

	Suction strainer is dirty.	Clean the suction strainers and filters.
Small output of the pump	Suction strainer is dirty.	Clean the suction strainers and filters.
	Suction hose is leaking or damaged.	Seal the connections or tight hose clamps or change the suction hose.
	Too low engine power.	Increase the pump rotations.
	Valves in the pressure system are not fully open.	Open the pressure valves completely.
A proportioner doesn't supply foam or works improperly.	A proportioner is switched off.	Switch on the proportioner.
	No foam in the tank.	Refill foam in the tank.
	Improper proportioning ratio is set.	Change the proportioning ratio setting.
	Improper nozzle.	Replace a nozzle for a foam nozzle.

6. PNEUMATIC SYSTEM

6.1 PNEUMATIC SYSTEM

Pneumatic system of a vehicle consists of two systems:

- primary – in a standard version mounted by a chassis manufacturer
- secondary - installed by WISS in the superstructure and used for actuators of water valves / throttles operating.

Structure and parameters of a primary system is described in a chassis manual prepared by chassis manufacturer.

Main elements of a secondary system are as follows:

1) Solenoid valves (modules grouped in a block, constituting a valve island) for controlling actuators of water system valves – photo. 1
2) Manual venting valve used for deaeration a secondary system – photo. 2
3) Pneumatic actuators of valves and water throttles – photo.3 and 4
4) Pressure regulator with a condensate separator – photo. 5
5) Pressure regulator for pilot – fot.6
6) Pressure regulator for mast (option - in case light mast is mounted) – photo. 7
7) Instantaneous coupling of air supercharging (photo. 8a) or Rettbox type external socket (photo. 8b) (an option – depending from the vehicle version)
8) Connecting elements (connections, air lines, silencers, non-return vavles etc.)

Photographic documentation

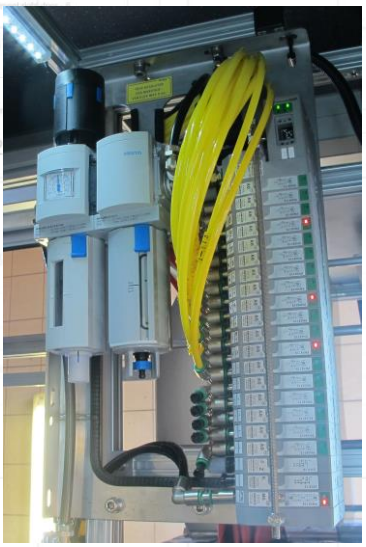


Photo. 1 Valve island

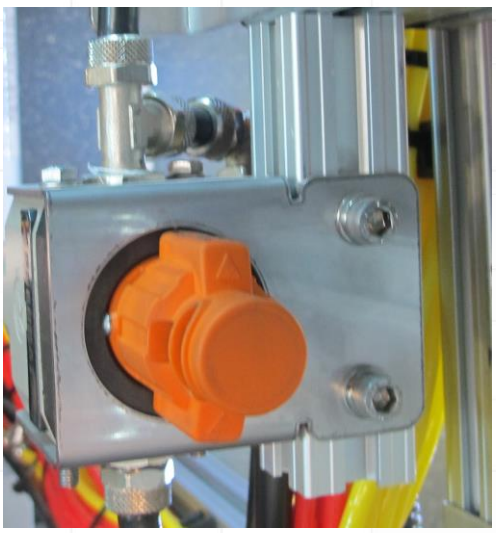


Photo. 2 Venting valve

Photo. 3 Water valves with servo-motors

Photo. 4 Pneumatic cylinder

Photo. 5 Pressure regulator with a filter, condensate separator and automatic draining

Photo. 6 Pressure regulator for pilot

Photo. 7 Pressure regulator for mast (option)

Photo. 8a) Instantaneous coupling of compressed air supercharging

Photo. 8b) Rettbox socket

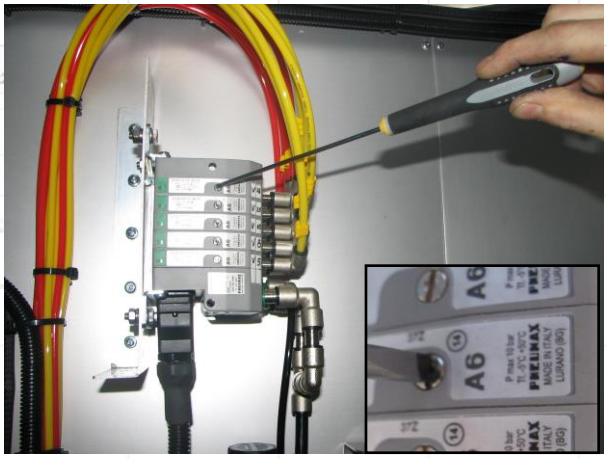
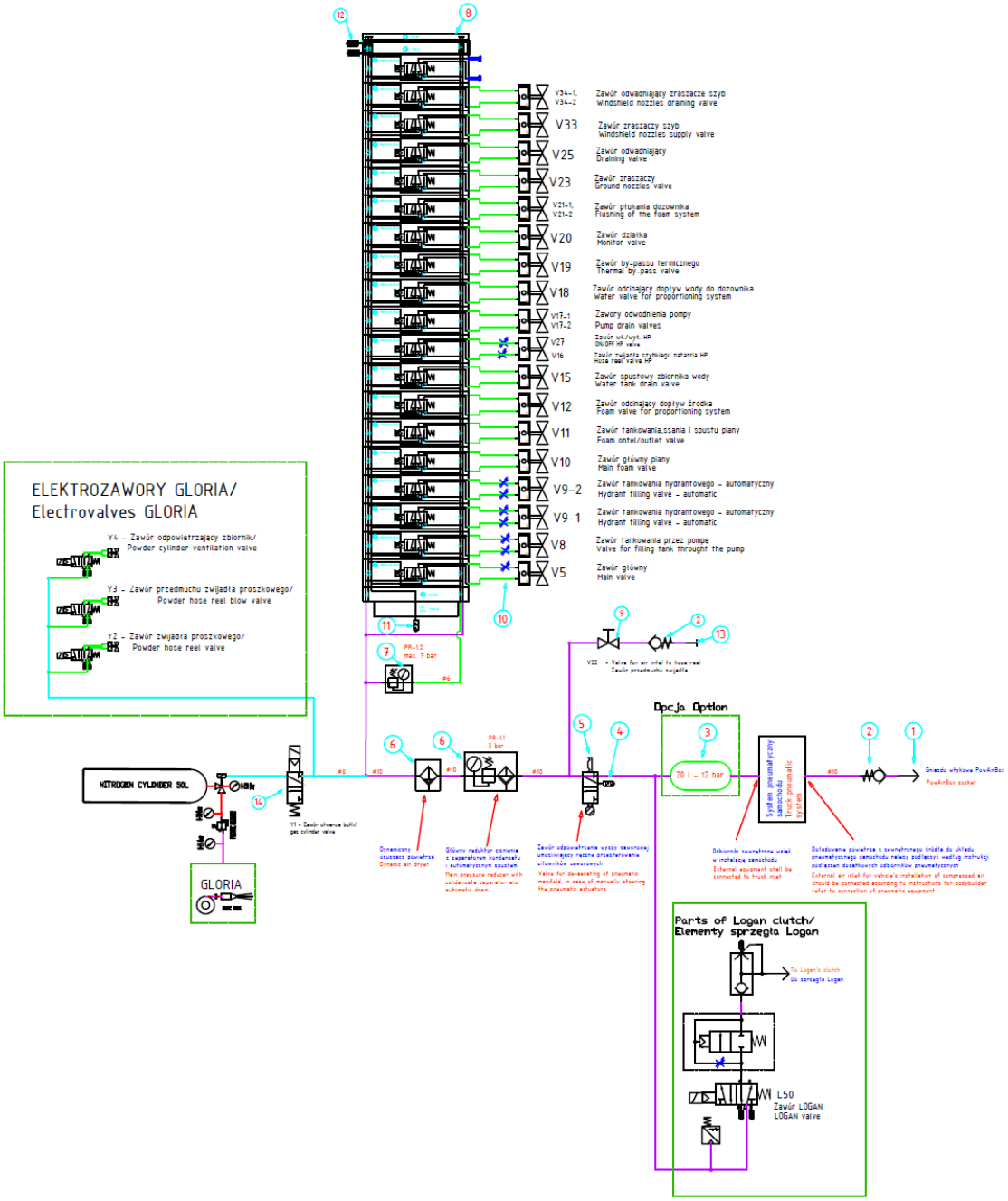


Photo. 9. Switch of manual resetting of water valves' servo-motors

Photo. 10 Dynamic air dryer

6.2 PNEUMATIC SYSTEM DIAGRAM



1	Plug	8	Valve island
2	Check valve	9	Ball valve
3	Air tank	10	Flow regulator
4	Silencer	11	Silencer
5	Shut off valve	12	Silencer
6	Pressure regulator with a filter, condensate separator and automatic draining	13	Outlet air
7	Pressure regulator	14	Valve ECO

6.3 PNEUMATIC SYSTEM - SECUNDARY SYSTEM

1) Solenoid valves are controlled with switches located on a control panel located at the back of a vehicle and vehicle cab.

2) System vent valve of a is manually controlled. Valve knob shall be directed vertical during system operation.

If you need to reset the water valves or throttles actuator manually, you need first to vent the secondary system by rotate the valve knob in right direction

Resetting of this valve cuts off the primary pneumatic system from the secondary one, what allows for driving continuation e.g. in case of leakages in the secondary system.

3) In case of electric system failure, there is a possibility of resetting pneumatic solenoid valves, controlling actuators work, by pressing the head of a screw located in the proper module of a valve island (photo 9). Then, you can change the position of a water valve manually using a special spanner.

4) Pressure reducer / filter is integrated with a condensate separator, which drains itself automatically and does not require any intervention. It is recommended, however, to check it and keep the condensate vessel clean.

5) Dynamic dryer (photo 10) is integrated with a condensate tank. It used for removing a moist from air. It is automatically self-drained, however, it is recommended to check it and keep the condensate vessel clean.

6.4 CHARGING THE PRIMARY SYSTEM WITH COMPRESSED AIR

It is possible to charge the primary system with compressed air from the exterior source e.g. from a compressor or a compressed air tank. You can do it by connecting a pipe ended with an instantaneous coupling RECTUS KB 26 to a connection near the step at the driver side (photo 8a) or by socket Rettbox (photo 8b) - depending on the version of the car. The system is protected against air discharge with a non-return valve.

You must remember to set the vent valve in the position: venting of secondary system (a horizontal knob position). Then both systems, (primary and secondary) are separated.

6.5 NOTICES AND SUGGESTION

Follow the recommendations of manufacturers of various pneumatic components and take care of technical conditions of these components..

Carry out periodic controls of the whole system (frequency of controls depends on the intensity of work).

Due to the solenoid valves and actuators operation it is allowed, but unnecessary to use oiled air.

Use either dry air or oiled air – do not change it.

Pneumatic solenoid valves and manual valves are maintenance-free.

Any damaged elements should be replaced and any air leakages should be repaired immediately.

Number and type of valves included in the valve manifold can be varied depending on the version of the car.

IT IS NOT ALLOWED TO:

1) To change pressure in air reducers (they have been graduated at the right pressure and their values are on the pneumatic system diagram).
2) To make any construction changes in components and subcomponents of a pneumatic system
3) To install additional receivers of compressed air (the pneumatic system was chosen and calculated in such a way to satisfy the specific functions and existing standards).

Hose reel

Hose reel operation manual

1. Safety

Please read carefully the instructions given here. Failure to comply with these instructions may be dangerous and may result in a hose reel damage. More information can be found on the following pages of this manual.

- Hose reel should be operated only after reading this operation manual.

Check the condition and operation of all drive elements.

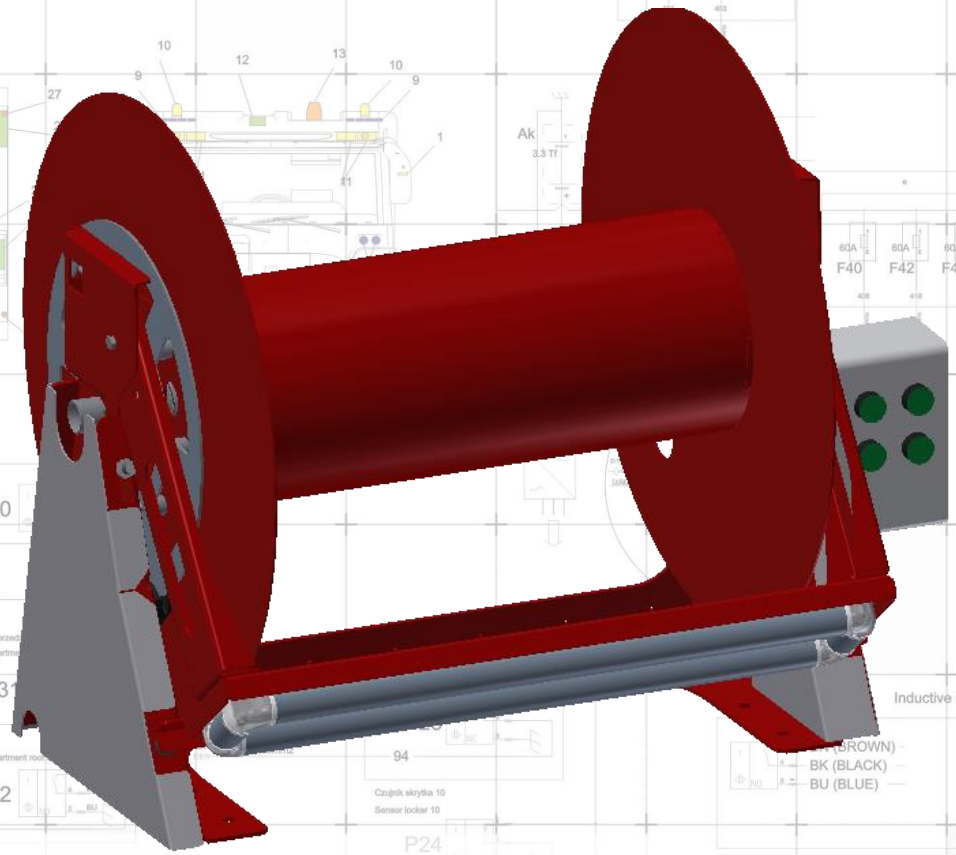
- Check the air pressure
- A hose should not have any visible damages.
- Never wind any other hoses than those specified.

'Warning' indicates actions and procedures, which may cause injury or lead to a safety hazard when carried out improperly. Strictly follow the instructions and act with special caution.

'Note' indicates actions and procedures, which may cause a malfunction or even a damage of the unit when carried out improperly. Strictly follow the instructions.

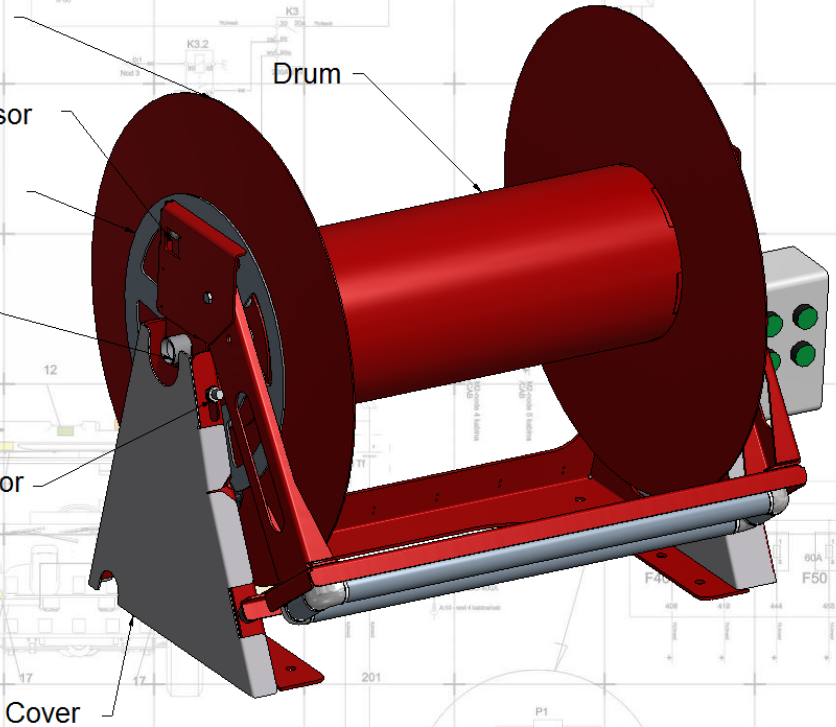
'Indication' means actions and procedures, which can have a direct impact on operation or cause unexpected reaction of the unit.

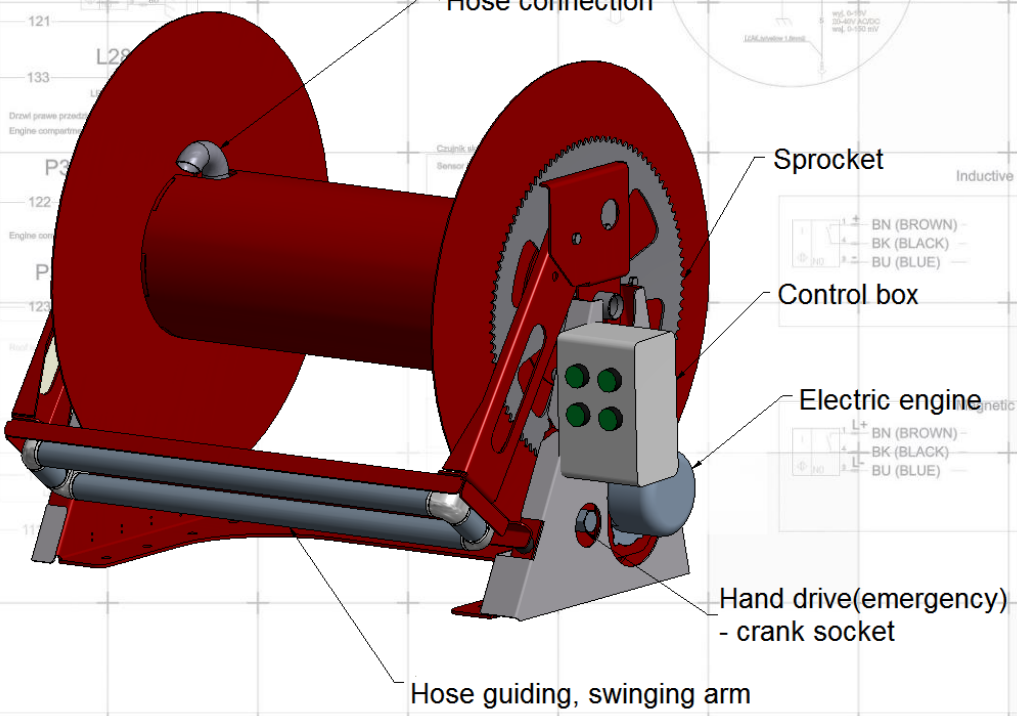
2. Hose reel



Hose reel

The vehicle is equipped with a fire-fighting hose reel. Location of hose reel depends from customer requirements, but usually it is installed in one or two rear or side lockers.

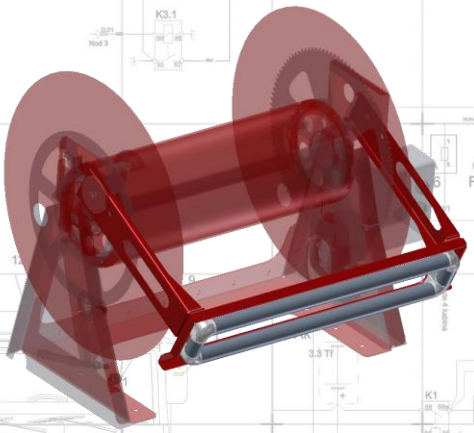




GUIDE ROLLERS

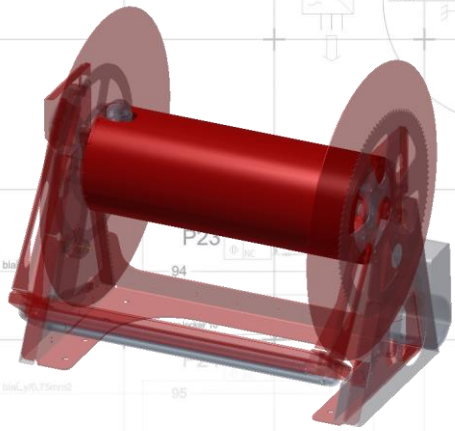
A hose reel is equipped with guide rollers, which protect superstructure corners against rubbing with a hose.

The guide rollers are installed on a swinging arm, which also functions as a release and a disc brake controller.



DRUM

When winding the hose you need to pay special attention to its coiling on the reel drum. The hose should be laid evenly coil by coil making even layers.

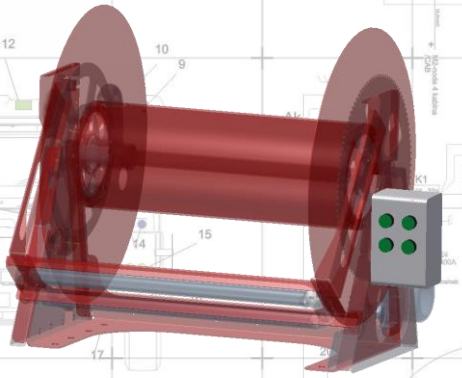


- When the hose is coiled carelessly the reel drum may become blocked.
- Make sure there is no water leak from the water supply connection head during hose reel operation.
- In such a case check condition of the seals.
- If any faults are observed replace elements.

ELECTRIC DRIVE

The electric drive is started by means of a switch located on a control panel.
When winding the hose with the use of an electric motor pay special attention not to block the hose.

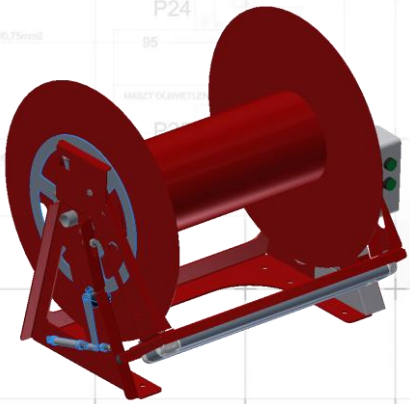
- The hose must be wound in smoothly. The drive switch must not be repeatedly pushed and released.
- Engine overload may result in electrical system overload and fuse blow.



Brake

- The hose reel is equipped with an automatic brake.

The brake on the hose reel is used to block the hose reel drum to protect it against hose self-winding.
The brake unit (a disc with a caliper, a sensor and a lever) used to control the drum is located on the left side of the hose reel.



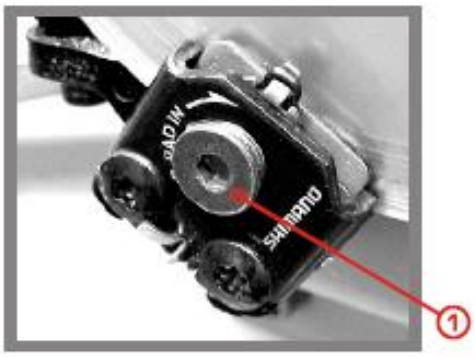
MANUAL WINDING

The hose reel is fitted with a manual drive mechanism.
In order to use a manual drive you must:
- make sure the electric drive is switched off
- position a switch on a control panel on 'MANUAL'
- place a crank in a hole.

3. Technical assistance

Brake adjustment:

Adjustment is done by tightening or loosening a screw (1) on the brake clamp. An Allen key is required (size 3-5, depending on the clamp model). When you tighten the screw greater pressure of the clamp blocks is generated on the brake disc, and the clearance between the disc and facings is decreased. Loosening will result in the reverse situation i.e. pressure will be decreased and the clearance will be increased.



You must remember that over-tightening the screw will block the clutch disc, making a drum rotation impossible.

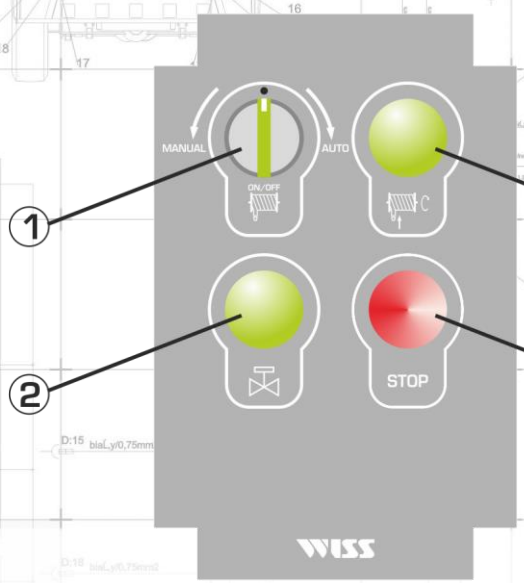
Regularly inspect a drive chain (once every 3 months).
The chain cannot be dry and cannot have any visible mechanical damages.
Lubricate with gear grease e.g. MOTIP.

Hose reel

Check the chain tension.

Chain tension is adjusted by shifting the engine with a sprocket. Loosen 4 M8 screws (A), shift the engine to get a proper chain tension, tighten mounting screws.

A control panel :

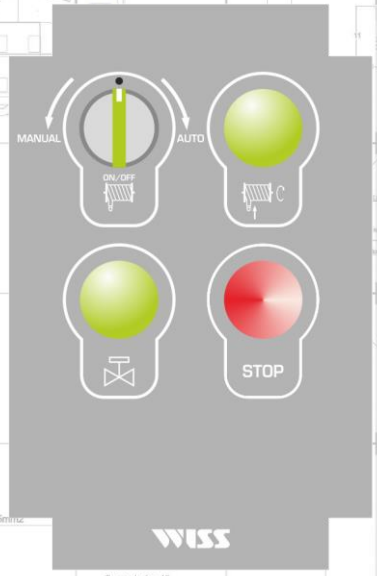


1. Work modes: manual or automatic (ON/OFF)*
2. Hose reel water valve V16
3. Winding up
4. Emergency STOP (mushroom button)

*Automatic mode – hose reel drum is braked or released depending form position of hose guiding arm. It is possible to wind-up hose by pressing button number 3 and open of close hose reel water valve by pressing button number 2.
When a crew member tries to unwind hose, guiding arm raises and releases the hose drum brake. When user stops – guiding arm drops down and brakes the drum.
* Manual mode – hose reel drum is unblocked, the drum brake doesn't work. The guiding arm sensor is disconnected. Other hose reel functions remain without change. Automatic disconnecting the hose reel engine at end of winding is active, so hose reel is still protected from being damaged by a nozzle.

4. Hose reel starting

Press a wind button to wind a hose electrically.
A drum brake is automatically released and the engine is started.

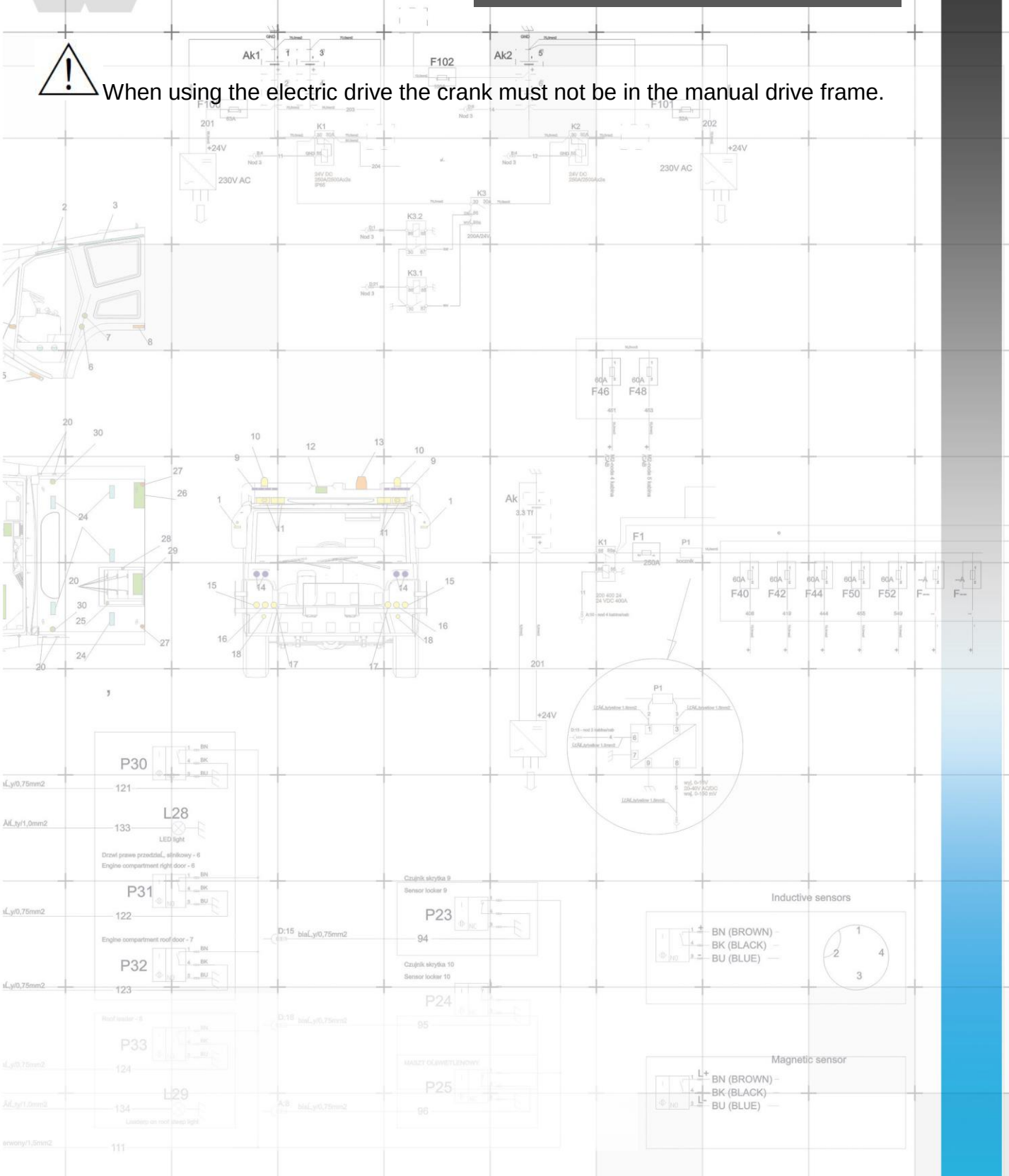


When winding the hose you need to pay special attention to its coiling on the reel drum. The hose should be laid evenly coil by coil making even layers.

BATTERIES. To avoid batteries discharging, the electric winding should be done with the vehicle engine working.

Hose reel

When using the electric drive the crank must not be in the manual drive frame.



MAINTENANCE OF PUMP CARDAN SHAFTS

Installation, assembly and maintenance work is to be performed by **specialists** only.

The balance state of a Cardan shaft may no be altered. An impermissible imbalance of a shaft may result in uneven running and premature wear of the joints and the bearings of the units to which the Cardan shaft is connected. In extreme cases, the Cardan shaft could break and pieces could be flung out of the vehicle. Also vehicle components located near the shaft can be damaged.

MAINTENANCE

MAINTENANCE INTERVALS

We recommend inspections at regular intervals and, if possible, coordination with maintenance work on other parts of the equipment. However, maintenance work should be carried out once a year at least.

LIFETIME

Lifetime of pump Cardan shaft built-in the vehicle is 500 hours of work.

INSPECTION

- Check the flange bolts for tightness and retighten them with the prescribed torque.
- Backlash inspection. By lifting them, check the joint and length compensation for visible or tangible backlash.

Check the Cardan shaft for any unusual noise, vibration or abnormal behaviour and repair the damage, if any.

LUBRICATION

GKN Cardan shafts are delivered greased.

- The Cardan shafts should always be lubricated with lithium-based grease according to DIN 51825-KP2 K-20.

Do not use grease with molycote additives!

- Clean the grease nipples before relubricating.
- Lubrication should not be done with high pressure or impact.
- Max. permissible lubricating pressure 15 bar (15 x 10^5 Pa).
- Cardan shafts that have been stored for more than 6 months must be regreased before use.
- Do not clean Cardan shafts with pressurized water or a steam jet. Do not use any aggressive chemical detergents. This may damage the seals. After a cleaning, the Cardan shaft must be regreased until grease comes out from the seals.

JOURNAL CROSS ASSEMBLIES

The journal cross assemblies are relubricated via a conical grease nipple (DIN 71412) located in the middle of the cross or at the bottom of the bush. The seals of the journal cross bearings must be lubricated until the grease passes through from the seals of the bearings.

LENGTH COMPENSATION

The length compensations of the standard version of the series 687 are maintenance free. The length compensations of other series are generally lubricated via a combined grease and air-relief valve with a conical grease nipple according to DIN 71412.

- Grease and air-relief valves may not be removed or replaced by standard grease nipples.
- Relubrication should be done at the shortest compressed length Lz of the shaft.

CONTENTS

7.1 REMARKS AND WARNINGS

Requirements regarding electrical installation may differ in different countries!

During operation you need to follow the manufacturer's guidelines and national safety regulations.

This manual refers to the electrical installation of a vehicle and its bodywork. As far as chassis is concerned, you need to follow the chassis manufacturer manual and the requirements connected with it.

Apart from this manual you need to follow all regulations included in other operation manuals of the equipment supplied with the vehicle.

Electrical system needs to be checked periodically!

It is forbidden to make any modifications in the installation!

Only qualified and trained technicians, who have certificates and the manufacturer's permission, may carry out work on the electric system!

All power supply sources must be disconnected before maintenance and servicing.

Before working with the vehicle's electrical system you need to disconnect all outside sources of power supply, switch off the engine and take out the ignition key, switch off the master switch and disconnect the batteries.

All electrical appliances installed on the vehicle powered by independent power supply systems need to be switched off and disconnected from the vehicle's installation.

In order to ensure correct functioning of all elements installed on the superstructure.

NEVER CONNECT ELECTRICAL APPLIANCES INSTALLED IN THE VEHICLE TO THE OUTSIDE SOURCE OF ELECTRIC POWER 400/230V AC!

APPLIANCES OF 230V AC POSE A DANGER TO LIFE AND HEALTH. GREAT CAUTION NEEDS TO BE EXERCISED.

7.2 SAFETY INFORMATION

Some points of this manual contain very important information regarding safety during operation and are marked accordingly:

DANGER!

Not following the recommendations marked with this sign will lead to serious injuries or death of an operator(s) or other people.

WARNING!

Not following the recommendations marked with this sign may lead to serious injuries or death of an operator(s) or other people.

NOTE!

Information useful during operation are marked with this sign.

7.3 DESCRIPTION OF THE SYSTEM

The vehicle is fitted with low-voltage 12/24V DC system and high-voltage 230V AC system (option).

24V DC power is supplied from batteries mounted in a vehicle.

Battery charging can be done by means of an alternator mounted on a chassis and by an additional power socket.

24V DC installation is a one-cable installation with a negative pole connected to the chassis frame.

GRP bodywork has a 2-cable electrical installation with a separate power cable and ground. Minimal protection level of electrical system outside the superstructure is IP44.

DANGER!

High-voltage 230V AC installation - only qualified and trained technicians may carry out service and operation works on the electrical system!

7.3.1 CHARGING SOCKET

A vehicle must always be connected to the exterior charging socket during parking in a garage. It allows to maintain the vehicle ready to drive in accordance with applicable standards and keep the other systems in a vehicle ready.

Photo 1 CHARGING SOCKET

The charging socket is installed in front of the superstructure, on the left side, under the first step of the cab. This is a non-compact socket (with no possibility to charge a pneumatic system).

Socket parameters:

Manufacturer:	Kussmaul
Type:	ComboBox
Voltage:	230V AC
Air pressure:	175 psi
Current:	30A max
Part number WISS:	01020050

Periodically check a connection and its mechanical functioning in compliance with the regulations.

You must check a disconnecting mechanism every day (if applies). Inform a manufacturer in case of any irregularities.

Never use discharged or damaged batteries.

A vehicle has the main switch. You must switch off power supply during service works.

A control light of charging is on both panels. Driving with a connected socket is forbidden. When the engine is started a plug should automatically disconnect a plug and enable safe departure.

DANGER!

Before connecting a charging socket check the condition of connecting cables, a socket and a source of power supply.

It is forbidden to wash the socket and its vicinity by a stream of water.

Never wash the vehicle with a charging socket switched on!

Avoid getting water to a socket and connecting cables and avoid contact with moisture.

A vehicle standing in a garage should be ready to drive with a connected charging socket.

WARNING!

Failure to comply with the requirements regarding charging batteries can lead to malfunction and leak of harmful chemicals.

Before starting, check that the socket has been disconnected, and in case of self-disconnecting sockets check if it was disconnected automatically.

NOTE!

Do not run the engine with a connected external charging socket, except for disconnecting sockets, which are disconnected when the engine starts.

7.3.2. BATTERIES

A vehicle is equipped with original battery(ies) (12V each) delivered with a chassis.

Batteries should always be connected to a charging system during vehicle's parking in a garage.

Electric chargers allow to charge batteries and maintain them in good condition for a long time. They additionally ensure a process of battery maintenance.

WARNING!

You must remember to check the battery charge level. Damaged batteries may be the reason of vehicle breakdown.

7.2.3 CHARGER

Vehicle is equipment with fully automatic charger.

Photo 2

Charger is fully electronic, automatic adapt to charge accumulators and their conservations. Also charging when long break in use.

Charger parameteres:

Manufacturer:	Ctek
Type:	MXT 14.0 EU-F, 24V 14A 28-300Ah
Voltage:	230V AC / 24V DC
Charging current:	14A max
WISS part number:	01019189

Charging is doing via charging socket (ComboBox). For more information please read original manufacturers operating manual.

7.3.4 MAIN SWITCH

A vehicle have the main switch. It is located in the middle part of a superstructure, on left side.

Photo 3

WARNING!

Remember to switch off the vehicle's engine and ignition before switching off the main switch and wait approx. 1 min. so that some units can stop their operation. It doesn't apply to emergency situations.

Check whether parking heating is switched on before turning off the switch. If so, switch it off and wait until it stops (approx. 5 minutes) and then switch off the main switch.

7.4 24V DC LOW-VOLTAGE installation

Technical data:

Supply and control voltage	24V DC
Operation temperature	-30°C - +50°C acc. to EN 1846-2
IP (min.)	IP44
Standards	EN-1846-2, EN-1846-3

Operation manual:

Due to the complexity of electric installation, we shall discuss only those elements, which do not have separate operation and service manuals delivered by a manufacturer.

The electric installation was designed and made in accordance with EN 1846-2 and regulations in effect.

Due to different customer requirements, constant quality improvement, as well as new technical solutions, the electrical installation may differ in different vehicles.

Before operation:

1. Carefully read all operation manuals, delivered with the vehicle.
2. Visually assess the condition of the electrical installation, taking mechanical faults into account.
3. Follow the guidelines of operation manual provided with each vehicle.

7.4.1 FUSES

Fuses are in two locations:

- inside the cabin (under the seat),

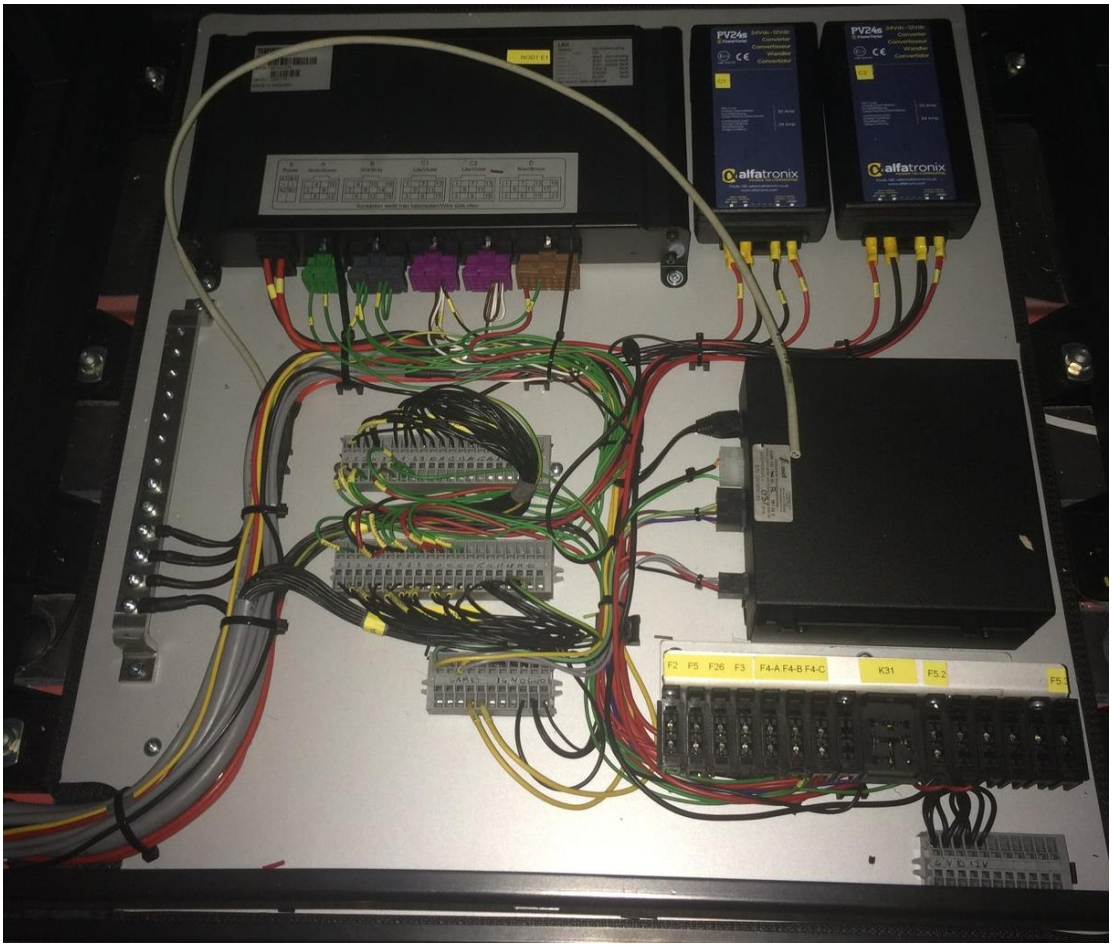


Photo 4

- on the superstructure, in the rear locker:

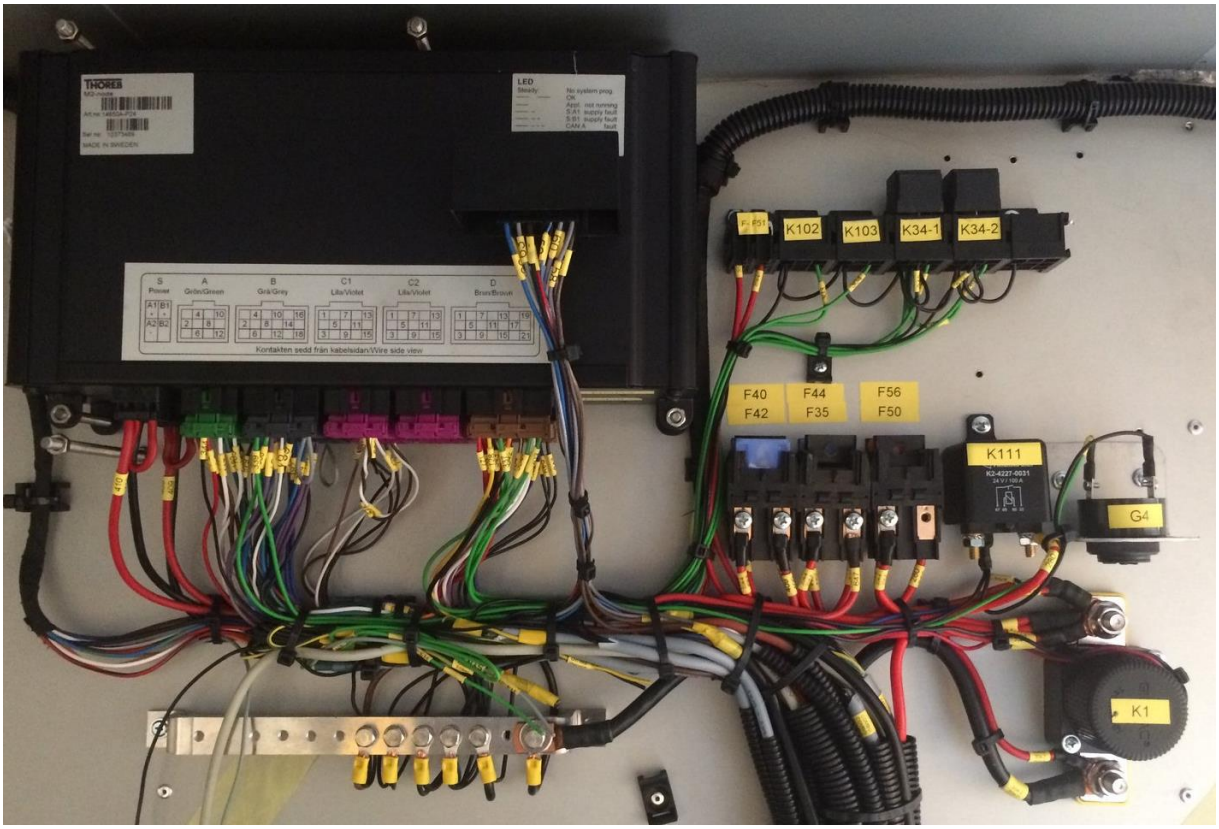


Photo 5 Location of fuses

Table 1: Fuse labelling

Inside cabin:

Numer	Wartość	Opis
F1	25A	Charger Ctek
F2	15A	Stationery radiostation
F3	20A	Siren
F4-A	15A	Red lights on cabin
F4-B	7,5A	Redlights on grill
F4-C	7,5A	Redlights rear
F5	15A	Flashers chargers
F26	15A	Charging socket ComboBox
F101	C6A	Charger 230V AC-24V DC

Fuses in the superstructure.

Numer	Wartość	Opis
F35	35A	Hose reel
F40	60A	Controller Nod 1
F42	60A	Controller Nod 2
F44	60A	Controller Nod 3
F50	20A	Roof monitor
F51	10A	Column TFT for roof monitor
F56	35A	Electric pump for windows sprinklers

7.4.2 WARNING SIGNALLING

Warning signalling was installed in a place easily accessible for a driver and a commander. Available:

- red warning signalling
- sound signal – electronic siren with a loudspeaker 100W.

Warning signaling includes:

- red warning light bar on the cab roof
- 2 corner lights at the back of a superstructure
- two warning directional lights in the front of a cab (on a grille).

The vehicle is fitted with an electronic siren – Gamet GAM150 24V 150W. The siren has different types of signalling modes/tones, minimum four basic ones: HORN, WAIL, YELP, Piercer. Photo 8 shows a view of a siren amplifier and a controller.

Photo 6 Sound signal amplifier.

The siren amplifier is operated from a control panel (both in the front and at the back).

Sound modulation can be changed by a horn signal[1].

Additionally, a sound from a radiotelephone installed in a vehicle can be connected to the siren amplifier in order to transfer information from the radiotelephone via the exterior loudspeaker[2].

[1] Optional equipment

[2] Optional equipment

A manipulator is used for voice messages. The manipulator includes a built-in microphone with an activation button and a spiral connection cable. A detailed description of a manipulator operation is included in the operation manual delivered by a manufacturer.

WARNING!

Warning signal lights give a dazzling light, which can blind people or cause other eye problems. Never look in the warning lights from a short distance. Acoustic signal, amplifier 100W emits sounds, which can cause hearing disorders. Never start the acoustic signal in closed areas, such as a garage.

7.4.3 CAB EQUIPMENT

Warning signalling control panel, LCD display with buttons is located on the top part of a dashboard. The panel is used to control a warning signalling.

Beside a control panel there is a siren with a microphone and water monitors control in the cab. Operation manuals of these units are delivered by the equipment manufacturer.

7.4.4 INSTALLATION IN THE SUPERSTRUCTURE.

The electrical installation in the superstructure is connected with the electrical installation in the cab. The connection is made with hermetic couplings and cables in protective conductors.

7.4.5 WORK LIGHTS AND LOCKER LIGHTS

Technical data:

Work lights:	
Lights type:	LED Starlight 12/24V DC 12W 1100lm
Manufacturer:	GAMET
Voltage/power:	24V / 12W
Protection class:	IP66

Locker lights:	
Lights type:	WISS LED strips
Voltage:	24V
Dimensions:	500 mm and 1000 mm
Standard:	EN 1846-2

Electrical installation:

Lamps are powered by the vehicle's 24V DC electrical installation of a vehicle. Only technicians who are acquainted with the operation manual can operate them.

Work lights.

The work halogen lights installed on the superstructure are activated by a switch on the control panel located in the pump compartment or in the cab. Switching of the work lights is possible only when the ignition is switched on. Lights are in compliance with EN 1846-2 standard.

The use of LED lights round the vehicle, as well as on the roof improves effectiveness of rescue actions, safety of any injured persons and those participating in the action.

WARNING!

Activated work lights and lockers lights with the engine switched off can discharge batteries and stop the vehicle.

Locker lights

The lockers lights have the main switch in the cab, and they are activated automatically when lockers are opened with the ignition on. In the standard version the lights will turn on when you fully/slightly open the shutters. Opening of lockers is controlled with maintenance-free magnetic sensors.

Maintenance:

Periodically check if the lights work properly, check the condition of lamps and of shutter and locker opening limit sensors.

After each intervention check the condition of lights. Worn out parts should be replaced for new ones of the same type.

– locker lights and platform lights

– bulbs in work halogen lamps

– warning lights in the cab and on a control panel in the pump compartment.

The lighting installation shall be checked periodically according to national requirements regarding car installations 12 and 24V DC, at least once a year. These inspections should be registered in protocols of tests and inspections of electrical installation.

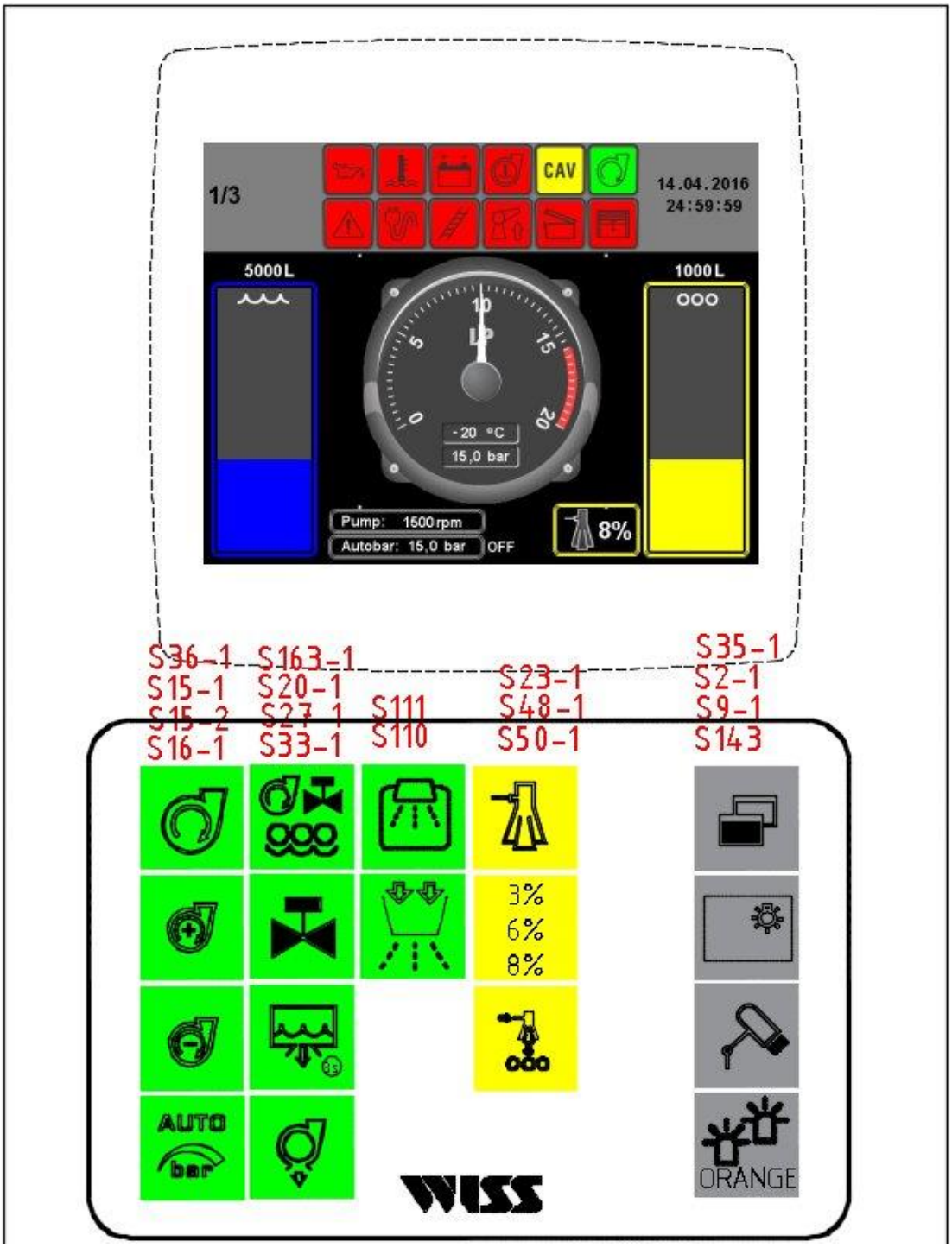
Inspection needs to be done after each breakdown or damage, after each firefighting intervention, and at least once a week after long-term parking.

NOTE!

After each intervention remember to check light installation condition.

7.4.6 CONTROL PANEL IN CABIN

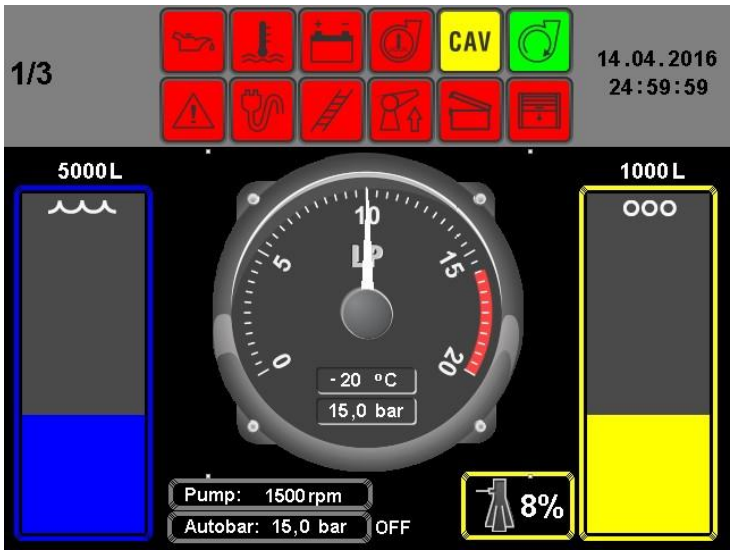
A control panel 24V DC is located outside the cab and in the pump compartment at the back of the vehicle. These are 2 coupled panels (parallel operation).



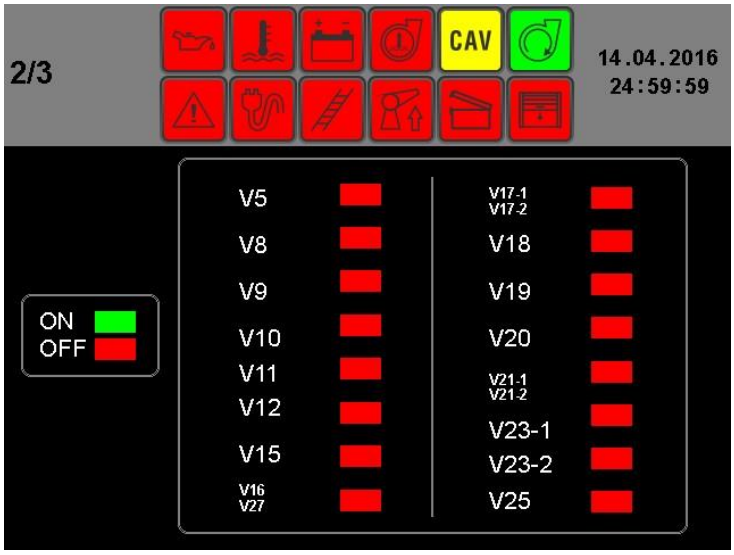
Function description of switches:

S163	Switch "fast action"
S143	Turn off orange lights
S111	Sprinklers cabin
S110	Sprinklers bottom
S50	Flushing from foam
S48	Foam concentration
S36	Switch PTO
S35	Page change LCD
S33	Draining water from system
S27	Drain water tank V15
S23	Foam dozing
S20	Main valve V5
S16	Auto Bar
S15	Increase/decrease RPM
S9	Work light switch
S2	Lockers light enable

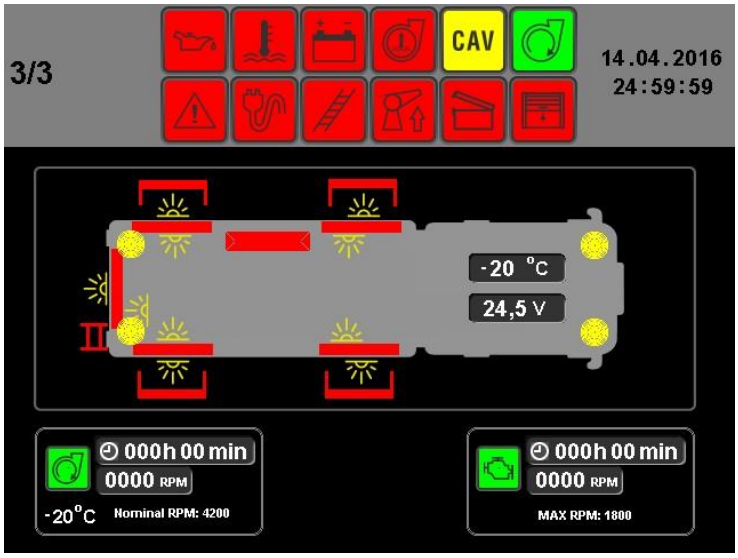
LCD screens (both panels front and rear have identically screens):



pressures, water/foam levels



electro valves state



truck view, lighting, voltage

Controls on the all screens:

	Engine overheat		Emergency state, damage
	Low oil pressure		Charging
	Low battery voltage		Ladder to the roof
	Cavitation in pump		Open box (roof)
	Pump overheat		Open one of lockers/steps
	Pump running		Light mast lift up
	Roof monitor lift up		

7.4.7 CONTROL PANEL ON THE SUPERSTRUCTURE 24V DC

A control panel 24V DC is located outside the cab and in the pump compartment at the back of the vehicle. These are 2 coupled panels (parallel operation).

Panel control is possible if the vehicle's engine is started. Some functions do not require operation of the water-foam system and operate after switching on the ignition.

The panel includes control and signal elements necessary for correct operation of water-foam system and the vehicle equipment.

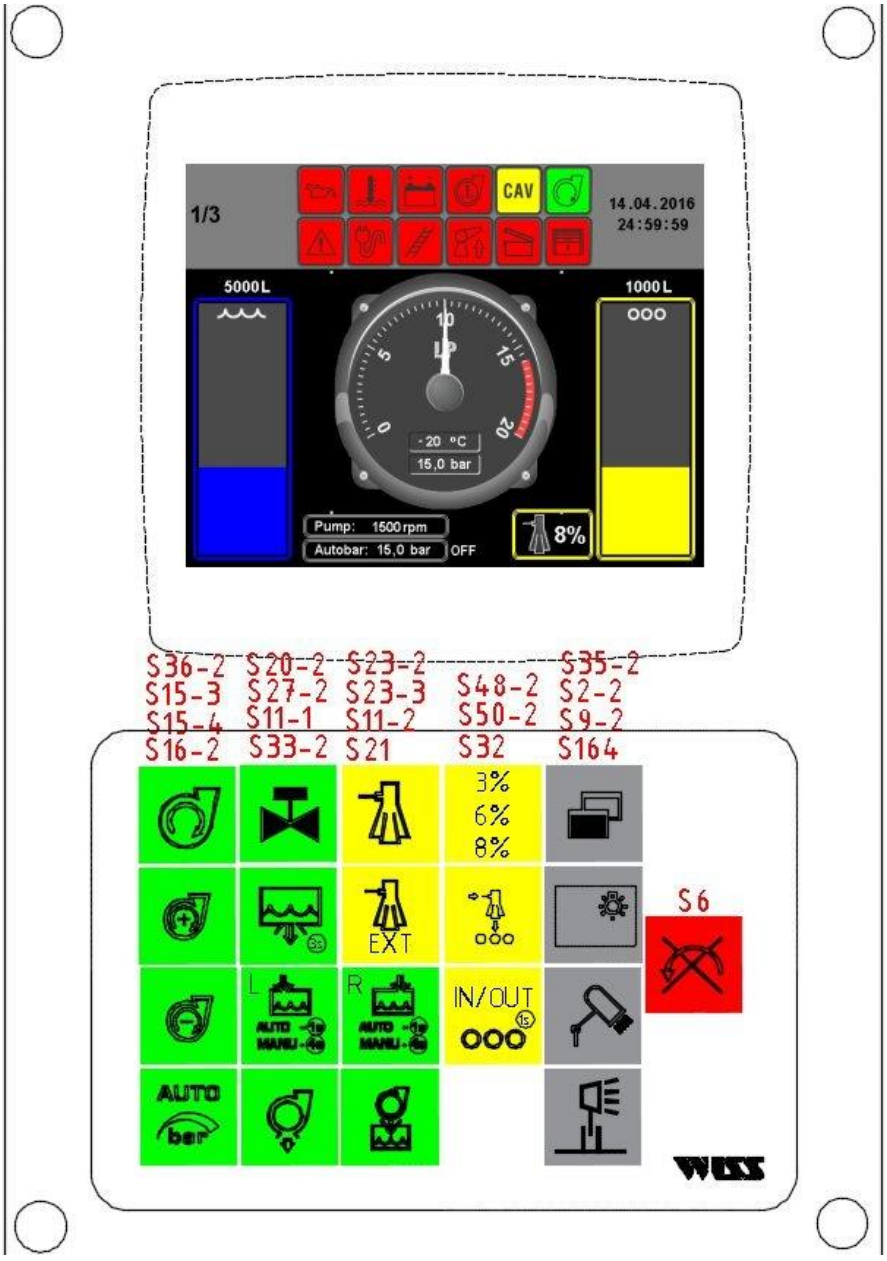


Photo 12 Control panel on a superstructure with a display

Function description of switches:

S164	Roof reflector LED
S163	Switch "fast action"
S50	Flushing from foam
S48	Foam concentration
S36	Switch PTO
S35	Page change LCD
S33	Draining water from system
S32	Foam tank/drain valve V11
S23	Foam dozing internal/external
S27	Drain water from tank V15
S21	Tank through the pump V8
S16	Auto Bar
S15	Increase/decrease RPM
S11	Automatic filling V9
S9	Work light switch
S6	Emergency stop engine
S2	Lockers light enable

7.4.8 LIGHT MAST (option)

! DANGEROUS !

Before working on the mast disconnect the power supply.

Never drive with an extended mast!

It is forbidden to extend the light mast under high voltage power lines, near the lines, as well as in areas posing a threat to the people!

The cab driver is informed of the raised light mast.

When lowering the mast light there is a risk of collision with the roof of buildings. When lowering the mast control the location of lamps and avoid mechanical collisions.

Parameters:

Type of a lamp:	SPIDER 1000
Manufacturer:	SBP
Voltage/Power:	230V AC / 1000W
IP:	IP65
Power supply controller:	24V DC/5A

Electrical installation

The vehicle is equipped with a light mast installed in front of the superstructure on the right. The mast has 2x 1000W halogen lamps controlled in the vertical and horizontal plane. Mast lamps are powered by an external source of 230V AC. This source can be a portable generator or external 230V AC mains.

Mast control is done with the control cartridge is installed in the front right locker.

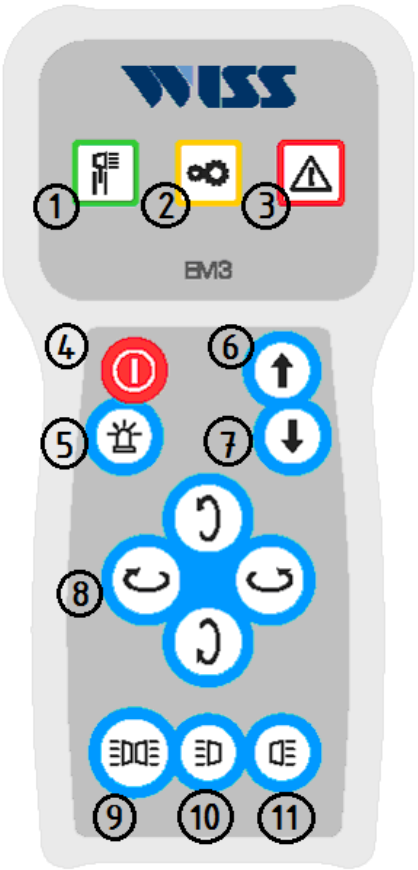
Picture 7 Mast cartridge

Mast lighting control system comprising:

- The control box, so-called. MDCE mast

- Wired remote control WRC

Light mast can be controlled locally, with wired remote. To control the mast, it must be brought to the signal power + 12 / 24V DC and must be handbrake. The disappearance of the signal at the time of operation of the system makes it automatically goes into idle state, ie. The following positioning of the mast head
and submit to the transport position.
If the parking brake is not engaged (no signal going to the controller of the mast) when you turn on the flashing warning light on the remote control.



Picture 8 Cartridge buttons and controls

Description of the wired remote controller to the mast:

1 - Green indicator light mast raised. The light flashes when the mast is lowered, lights continuously when the mast is raised.
2 - The orange warning light indicating the work of the mast, activated when the motor control is enabled on the mast lamps.
3 - The red indicator light to indicate trouble in the control system.
4 - Press the on-off control of the mast.
5 - flash control button / s warning signals on the mast, the circuit O1.
6 - Press the lift mast.
7 - Button lowering the mast.
8 - buttons control the rotation of the mast lamps.
9 - activation button on the mast lamps (single circuit O4, or all circuits O2-4).
10 - the inclusion of the left button on the mast lamp circuit (circuit O2).
11 - on button right on the mast lamp circuit (circuit O3).

The functions of the buttons / controls

1 - LED (green) raised the mast lighting.
When the mast is down light blinks when it is raised permanently illuminated.

2 - Indicator (orange) raised the mast lighting.
The indicator is activated when the head of the mast is working.

3 - LED (red) indicates a failure of the system.

4 - Button on / off control of the mast.

5 - Flash control button / s warning signals on the mast (Optional)

6 - Lifting the mast.

This button is used to control the lift mast. The mast is raised as long as long as the user presses the button. The maximum end position of the mast is limited mechanically.

7 - The lower the mast

Button is used to lower the mast lighting. Total lowering the mast by a single press of a button.

At any time, leaving this operation can be stopped by pressing lifting. After pressing the lowering of the mast head is automatically set to the transport position. When the mast was raised on a small height when leaving the head can not make it stand in the transport position. After leaving, always check the position of the head

8 - The buttons control the rotation of the mast lamps

Button is used to control the rotation of the mast lamps. Up-down movement of the lamp is limited electric limit switches in the range of 330°.
Button is used to control the rotation of the mast lamps. Left-right movement is limited electric lamps limit switches in the range of 330°.

9 - Activation button on the mast lamps

Halogen lamps switch on the mast. Lamps will be automatically turned off when the mast is lowered to the transport position.

10 - The inclusion of the left button on the mast lamp circuit (optional)

11 - The inclusion of the right mast lamp circuit (optional)
Pneumatic valve is used to manually lower the mast lighting, eg. The failure of the electrical system. The use of such mast widens the field of lighting, significantly improves the effectiveness of rescue operations, and thus the safety of the people affected and involved in the action. User manual mast lighting. Mast movements up and down takes place via the "RAISE / LOWER" (Picture 31, pos. 3 and 4) on the panel. Raising the mast is done by pressing and holding it as long as it is needed. The ejection of the mast to the extreme position is limited mechanically.

If you want to lower the mast you need to push the mast lowering button once. You can also do it manually by opening a valve.

When reaching a required height you shall switch on the lights by means of a bottom button on a remote control.

Steps before you beginning the work:

- connect the power supply to the switchgear 230VAC- (Picture 32)
- enable remote control button mast 4, picture 30
- using the button on the remote control to raise the mast
- using the 9, 10 or 11 to power lights on the mast
- using the remote control can control the position of the mast head

Activities after work

- halogens on the mast off
- halogens set in the transport position
- lower the mast
- turn off the generator / 230V AC disconnect power from the chapter
- turn off the remote control mast

Lowering the mast is done automatically by a single press the key and releasing the button to leave.
Halogen lamps when the mast is lowered are protected against turning.

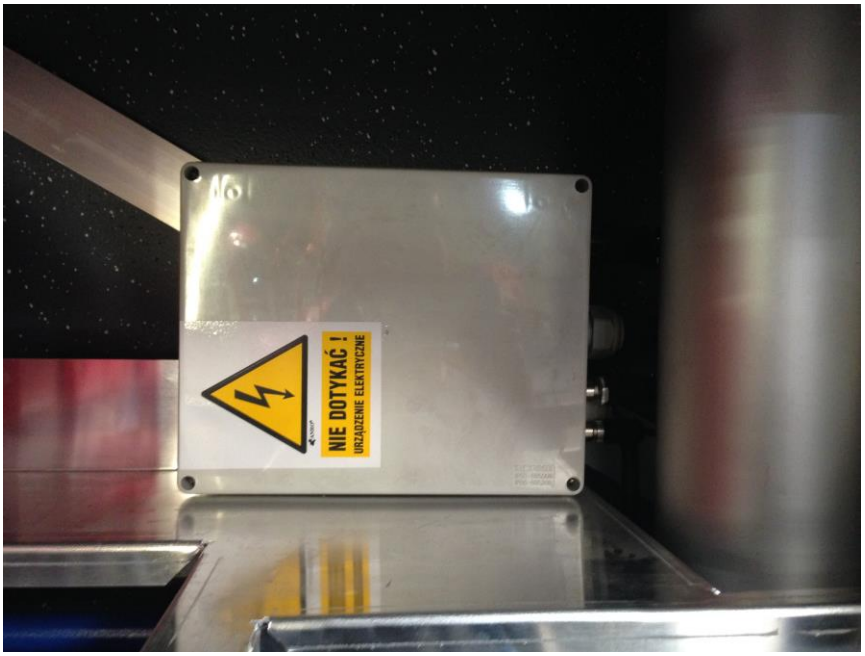
Operations:

- Periodically lubricate the mixture of grease and oil or silicone grease the moving parts of the mast.
  - Check the condition of the light sources. Replace with new ones of the same type if they have been used:
  - Halogen lamps installed on the mast;
  - Control of the remote control mast.

Are required to install the mast to be periodically tested in accordance with national requirements for 24V DC and 230V AC, but not less frequently than every year. Appropriate controls should be recorded in the minutes of the examination and inspection of the electrical system.

For 230V AC installation is required as a minimum:
- Perform the installation inspection min. 1 once a week or after every action and failure,
- Performance measurement:

a) the continuity of the protective conductor
b) the insulation,
c) fire protection
d) other, if required by the current rules.

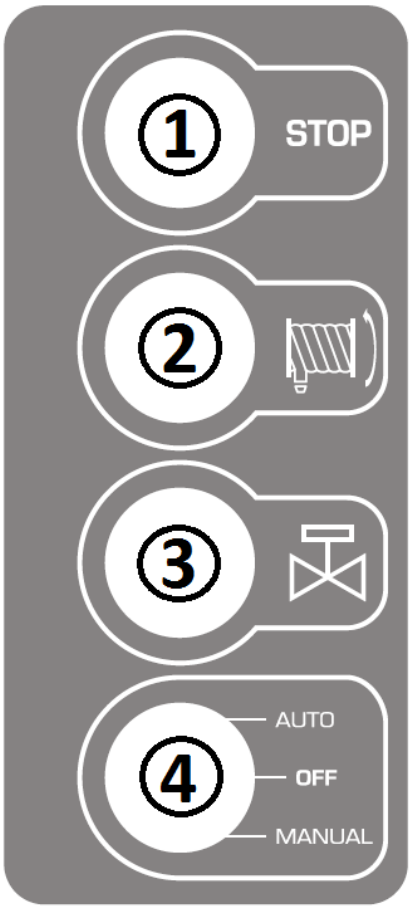


Picture 9 Control box

!DANGEROUS !

Mast lamps are supplied with 230V AC. Note caution when connecting the power supply to the grid and lights during operation. 230V AC electrical connections should always be dry and free from defects in mechanical and electrical. 230V AC electrical installation on the mast shall be subject to periodic inspections and reviewed in accordance with national regulations on installation 230V AC. All service work on the mast can be performed only by personnel trained WISS or the manufacturer. Processing of the mast prohibited. All service work should be carried out with the power disconnected 230V AC for the mast.

7.4.9 HOSE REEL (option)



Picture 10 Remote control layout

A description of the control elements of the case:

1. The red emergency stop button drive reels "STOP".
2. Switch roll up the hose.
3. Switch to open/close valve.
4. Switch the inclusion of control and mode selection:

a. AUTO - automatic operation

b. OFF - control is off

c. MANUAL - work in manual mode.

Principle of operation:

1. Set the inclusion of control (item 4) to 0 - all off.
2. Set the control integration (item 4) to the AUTO position.
Developing a hose is possible after picking up the hose guide arm. When the arm is raised, the brake hose reels is released and it is possible to develop a hose.
3. Switch the inclusion of control (item 4) in the MANUAL position.
4. When the movable frame hose guide is in the upper position, eg. When the hose will work exclusive limit switches power off the drive. Refolding is possible after releasing the lever.
5. When an overload of the drive motor operation, the light in the button folding (pos. 2) flashes. Refolding is possible after removing the cause of the overload and restarting the controller switch position 4.
6. Pressing the Switch,(pos. 02) turns off the brake and turn on the motor drive. Folding can be disconnected automatically in the following cases
a. The drive motor overload - flashing indicator light in the button collapsing. Re-reeling after switching off and switching control.
b. raise the arm hose leading to the upper limit switch.
c. Work continuous motor> 2min. The system is equipped with a temporary protection automatically disconnect the drive, if the collapse (Pictures 33, pos. 2) was active> 2min. Re-activation of the folding occurs after the next enabled.
7. The red emergency stop button is used to turn off the control system at any time during operation.

7.5 HIGH-VOLTAGE INSTALLATION 230V AC

230V AC installation includes a system of halogen lights on a mast (option).

There are lamp covers and contactors switching these lights on in the mast control box.

The installation should be connected with an exterior electrical power supply or power generator via an industrial coupler CEE 16A 230V AC.

DANGER!

You must read the power generator operation manual before operating the vehicle.

Installation 230V AC installed in a superstructure should be checked in accordance with the national guidelines regarding 400/230V AC installation.

Only qualified and trained technicians, who have certificates may carry out work on 400/230V installation! It is forbidden to make any modifications in the 400/230V AC installation without the consent of a manufacturer!

7.6 ELECTRIC SYSTEM CONTROL AND INSPECTION.

Electric system needs to be inspected periodically in compliance with the applicable regulations!

7.6.1 24V DC INSTALLATION CONTROL

As far as the 12/24V DC installation is concerned, all appliances need to be inspected and checked in accordance with EN 1846-3.

Before a vehicle is certified for use a manufacturer makes an inspection of the vehicle, functional tests, as well as necessary measurements, in accordance with EN 1846-2, point 6.

Periodical inspection of electric installation includes:

- Control of parameters of the installed fuses compared to the parameters given by the manufacturer and amendment of any discrepancies
- Measurement of working voltage;
- Checking whether all electrical appliances function properly, in accordance with EN 1846-2 and EN 1846-3,
- Checking whether all bulbs and control lights in control appliances function properly.

WARNING!

Damaged parts e.g. bulbs must be replaced with new ones of the same type immediately.

All irregularities and faults need to be reported to the manufacturer or to the authorized service as soon as possible.

7.6.2 230V AC INSTALLATION

Periodically a user should check the high pressure installation 230V AC or 400V AC. The user is a qualified technicians with appropriate certificate with the described installation.

The periodical inspections should include:

- visual inspection (connections and elements),
- inspection of all control elements
- installation testing in accordance with national rules and requirements.

You need to make measurements of:

- insulation resistance,
- effectiveness of fire-fighting protection,
- inspection of Residual Current Protective Devices, if available,
- protective conductor continuity control.

DANGER!

In some cases it may be necessary to make measurements including units connected permanently to the installation e.g. generators, battery chargers. The units may require other tests and measurements indicated by the manufacturer. It may be essential to disconnect the units during some electric measurements.

Only qualified and trained electricians may carry out repairs of 230 AC appliances! It is forbidden to make any modifications in the installation!

7.6.3 PERIODS OF ELECTRIC SYSTEM INSPECTIONS

A detailed inspection of electric installation needs to be carried out once a year, unless the national regulations state otherwise.

A minor inspection consisted in visual inspection of all connections, and electric and electronic appliances needs to be made after each fire-fighting action, at least once a week. Then you need to check whether all electric and electronic appliances function properly.

DANGER!

In case of vehicle's breakdown or a road accident you need to make a full inspection after each incident!

Some of the appliances may require other tests and controls indicated in the operation manuals.

7.7 GUIDELINES TO FOLLOW IN CASE OF FAULTS – PROBLEM SOLVING

LP.	PROBLEM	CAUSE	REMEDIAL ACTION
1.	Blocked automatic pressure regulation	- Damaged water pressure sensor, contact gap, damaged connection	- Visually inspect the sensor connection with the pump and its technical condition. Contact the service point.
2.	Limiting max. engine rotations to 1500 rot./min. during pump operation	Failure of water pressure sensor	- as above
3.	Automatic pressure regulation button flashes	Failure of water pressure sensor	- as above
4.	Oil pressure control light is lit	too low oil pressure in the chassis engine	- see operation manual of chassis manufacturer.
5.	Warning light of cooling liquid temperature is lit	- too high temperature of the engine cooling liquid	- see operation manual of chassis manufacturer.
6.	Oil pressure warning light and cooling liquid temperature warning light flash the same time	- Error on CAN communication between chassis and superstructure	check the condition of connection s in the cab and in the superstructure
7.	All water level warning lights flash at the same time	Failure of water level sensor	Check the condition and connection of the water level sensor
8.	All foam level warning lights flash at the same time	Failure of foam level sensor	- Check the condition and connection of the foam level sensor

9.	Hose reeling doesn’t work.	- burnt fuse, damaged drawer sensor or brake sensor	Check the supply voltage of a hose reel control box (fuse F35, F36). Inspect a hose reel drawer opening sensor, inspect brake release sensor.
10.	Water system valves don’t work:	Damaged CAN-VALVE module (electrovalves control island).	Check electric connections, technical condition. Check LED warning light on the valve-island. If it turns on for a given valve, check the air system, air pressure, electro-valves, blow-off valve.
11.	No regulation of pump’s rotation.	Contact the service point	Contact the service point
12.	Engine STOP switch doesn't work.	Contact the manufacturer service point	Contact the manufacturer service point
13.	Engine START switch doesn't work.	- a vehicle is in gear, parking brake is not applied, the panel is switched off, STOP switch was activated earlier and since then has not been reset.	- reset chassis controllers – turn on and turn off the ignition key. Check if the STOP button is not pushed.
14.	The work lights button doesn’t work	- Failure in the light circuit, all bulbs are burnt out.	Check the light connection. Check the lamps.
15.	Superstructure lockers lights don’t work. Note! There is a superstructure locker light switch in the cab.	Sensors are regulated in the wrong way. Burnt, damaged locker lights.	Check if the LED light on the opening sensor is ON upon shutters or a hatch opening. Adjust.

16.	Monitor valve in the control box doesn't work.	- No power supply, damaged cable, control panel switched off, damaged valve-island.	Check if the pump control panel is switched on. Check if LED warning light for monitor valve V20 on the valve island switches on. Check the condition of electric connections when a control light doesn't switch on. When the warning light switches on check the air system. Check if there is pressure and if the island air vent valve is open.
17.	Charging socket 24V DC no charging of batteries	Damaged fuse	Check F1 fuse.
18.	230V AC charging socket Defa Mini Plug or Rettbox or Combobox no charging of batteries	- Damaged rectifier or burnt fuse. Damaged or completely discharged batteries.	Check power supply of a rectifier. LED control light on the rectifier should be: green – charged batteries; Orange – charging is on, red – damaged or discharged batteries Check batteries.
19.	Warning signalling, blue flash lights and a sound signal don’t work.	- damaged fuse, damaged rectifier of a warning signal.	- Check F3 fuse in the cab from a signalling device.
20.	Pneumatic signal doesn’t work.	Damaged fuse. Damaged electro-valve. No air in the system.	- Check F10 fuse. Check a coil of the electro-valve and a pneumatic system.
21.	Radio-comm. doesn’t work	Damaged fuse. Damaged antenna/ wrongly tuned.	- Check F2 fuse, converters 24/12V P2. Check antenna connections.
22.	Comm. radio – problems with receiving messages	Damaged antenna/ wrongly tuned. Interference from vehicle	Check ‘SWR’ of the antenna, connection and cables. Check the ground connections of the comm.

	and transmission, interferences	systems i.e. strobe warning signalling.	radio and antenna.