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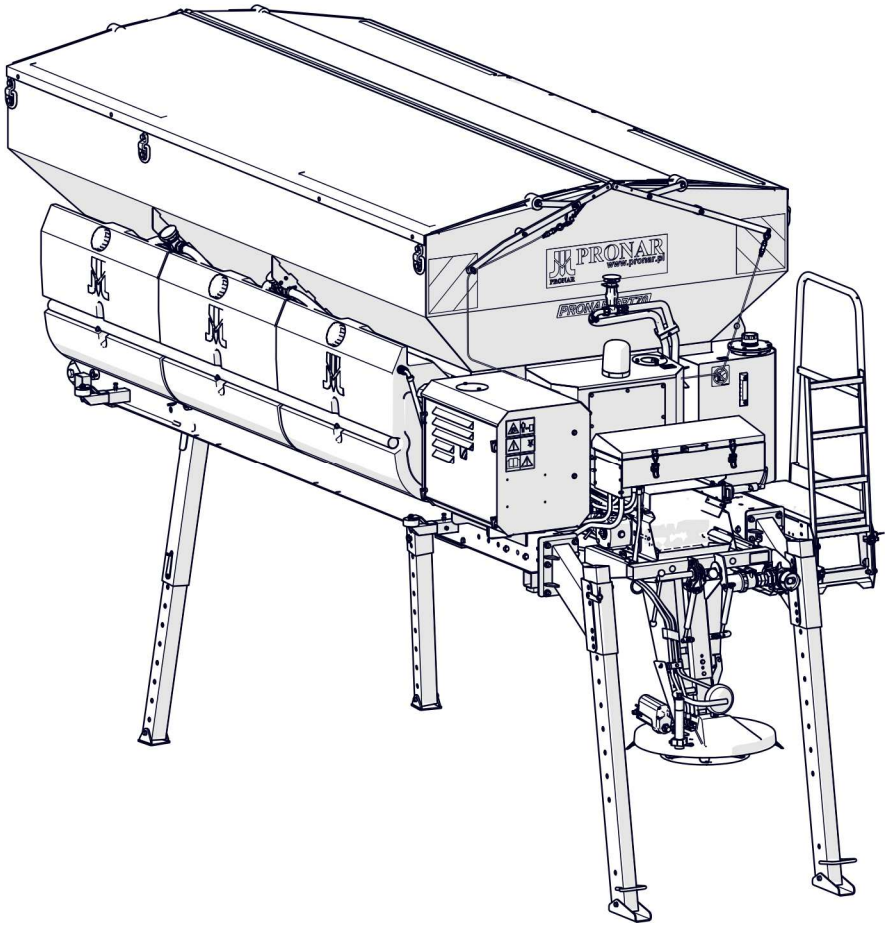
OPERATOR`S MANUAL

SALT AND SAND SPREADER

PRONAR SPT70

HATZ 2G40

TRANSLATION OF THE ORIGINAL COPY OF THE MANUAL



EDITION 2A-01-2021

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EN

SALT AND SAND SPREADER

PRONAR SPT70

MACHINE IDENTIFICATION

TYPE: *SPT70*

SERIAL NUMBER:

INTRODUCTION

Information contained herein is current at date of publication. As a result of improvements, some numerical values and illustrations contained in this publication may not correspond to the factual specification of the machine supplied to the user. The manufacturer reserves the right to introduce design changes in machines produced that facilitate operation and improve the quality of their work, without making minor amendments to this Operator's Manual. This Operator's Manual is an integral part of the machine's documentation. Before using the machine, the user must carefully read this Operator's Manual and observe all recommendations. This guarantees safe operation and ensures failure-free work of the machine. The machine is designed to meet obligatory standards, documents and legal regulations currently in force.

The manual describes the basic safety rules and operation of the sand spreader. If the information stated in the Operator's Manual needs clarification then the user should refer for assistance to the sale point where the machine was purchased or to the Manufacturer.

MANUFACTURER'S ADDRESS:

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SYMBOLS APPEARING IN THIS OPERATOR'S MANUAL

Information, descriptions of danger and precautions and also recommendations and prohibitions associated with user safety instructions are marked:

and also preceded by the word **"DANGER”.** Failure to observe the instructions may endanger the machine operator's or other person's health or life.

Particularly important information and instructions, the observance of which is essential, are distinguished in the text by the sign:

and also preceded by the word **"ATTENTION".** Failure to observe the instructions may lead to damage to the machine as a result of improper operation, adjustment or use.

In order to focus the user's attention on the need to perform maintenance, the relevant section of the Operator's Manual is marked with the pictogram:

Additional tips and advice for machine operation are marked with the sign:

and also preceded by the word **"TIP".**

DIRECTIONS USED IN THIS OPERATOR'S MANUAL

Left side – side to the left hand of the operator facing in the direction of machine's forward travel.
Right side – side to the right hand of the operator facing in the direction of machine's forward travel.

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EC DECLARATION OF CONFORMITY OF THE MACHINERY

PRONAR Sp. z o.o. declares with full responsibility, that the machine:

Description and identification of the machinery	
Generic denomination and function:	**Spreader**
Type:	**SPT70**
Model:	–
Serial number:	
Commercial name:	**Spreader PRONAR SPT70**

to which this declaration relates, fulfills all the relevant provisions of the Directive **2006/42/EC** of The European Parliament and of The Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (Official Journal of the EU, L 157/24 of 09.06.2006).

The person authorized to compile the technical file is the Head of Research and Development Department at PRONAR Sp. z o.o., 17-210 Narew, ul. Mickiewicza 101A, Poland.

This declaration relates exclusively to the machinery in the state in which it was placed on the market, and excludes components which are added and/or operations carried out subsequently by the final user.

"PRONAR" Spółka z o.o. Narew, ul. Mickiewicza 101 A tel. 085 681 6329, 691 6429

Z-CA DYREKTORA d/s technicznych członek zarządu
Roman Kmieliauk

Narew, the 2015-10-02

Place and date

Full name of the empowered person position, signature

CONTENTS

SECTION

1

BASIC INFORMATION

1.1 IDENTIFICATION OF THE MACHINE AND ITS SUBASSEMBLIES

1.1.1 SPREADER IDENTIFICATION

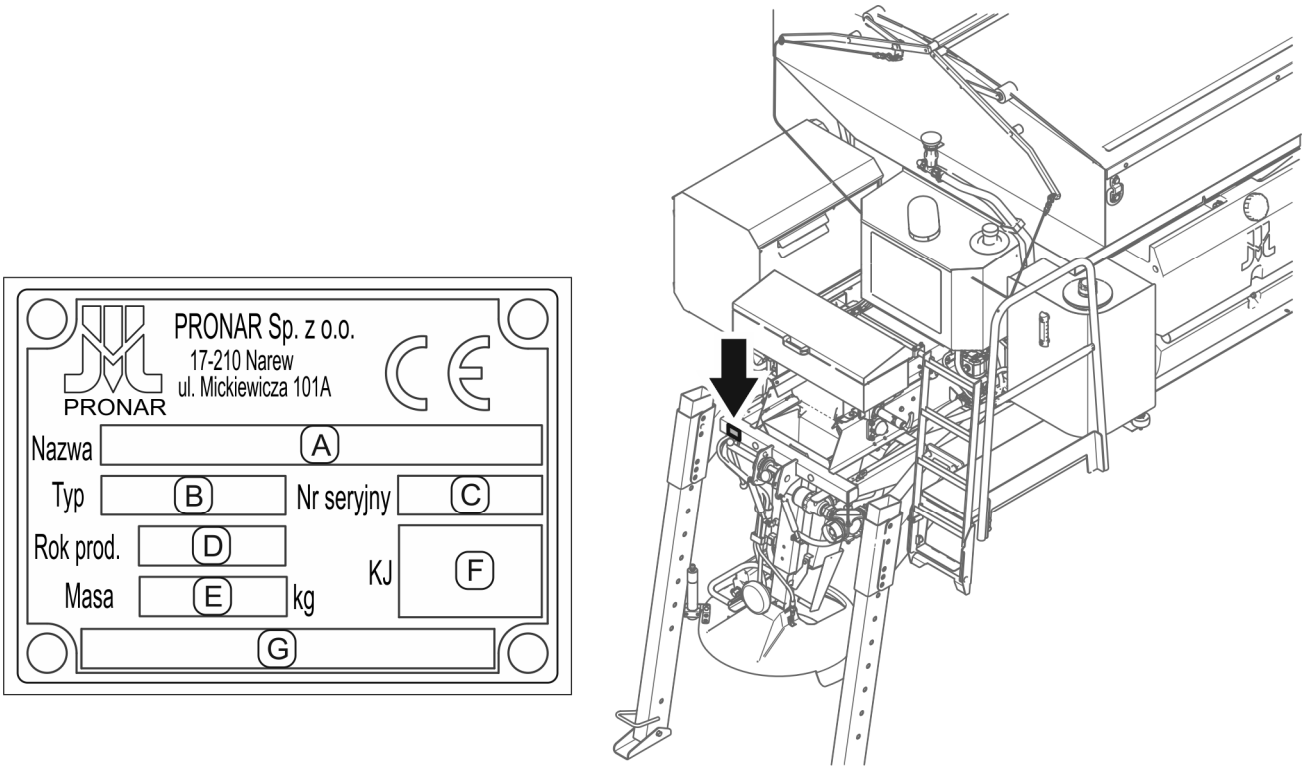


FIGURE 1.1 Location of the data plate

Meaning of data plate items (FIGURE 1.1):

A - machine name
B – type
C – serial number
D – year of manufacture
E – machine tare weight [kg]
F – Quality Control stamp
G – unfilled box or additional information

The factory number is stamped into the data plate and on the frame beside the data plate. Data plate is located at the rear of the machine, on the frame next to the fixing point of the left parking support (FIGURE 1.1). When buying the machine check that the serial number on the machine agrees with the number written in the *WARRANTY BOOK*, in the sales documents and in the *OPERATOR'S MANUAL*.

1.2 PROPER USE

PRONAR SPT70 salt and sand spreader is used for surface spreading of coarse materials (sand, aggregate) and chemical agents (sodium chloride, calcium chloride, magnesium chloride, brine) for winter road maintenance. The use of the implement for other purposes should be regarded as improper. The spreader can be mounted on trucks (tipper trucks) that are equipped with a load platform or load box and that meet the requirements set out in Table 1.1. The machine is equipped with height adjustable support legs that make it possible to load the machine onto a tipper truck without the use of additional equipment (RO-RO system).

Using it as intended also involves all actions connected with the safe and proper operation and maintenance of the machine. Due to the above, the user is obliged to:

- carefully read the OPERATOR'S MANUAL and comply with its recommendations,
- understand the machine's operating principle and how to operate it safely and correctly,
- adhere to the established maintenance and adjustment plans,
- comply with general safety regulations while working,
- prevent accidents,
- comply with the road traffic regulations in force in a given country, in which the machine is used.

The machine may only be used by persons, who:

- are familiar with the contents of this publication and with the contents of the Operator's Manual of the carrying vehicle,
- have been trained in machine operation and safe working conditions,
- have the required authorisation to drive the vehicle and are familiar with the road traffic regulations and transport regulations.

ATTENTION

The machine must not be used for purposes other than those for which it is intended, in particular for:

- **transporting people, animals**
- **transporting whatever materials**
- **spreading other materials than those specified in the Operator's Manual**

TABLE 1.1 Requirements for carrying vehicle

	UNIT	REQUIREMENTS
Mounting method	–	on the carrying vehicle's load platform by means of min. LC 2500 daN securing tapes according to EN 12195-2 standard
Minimum load platform dimensions: – length / width – height from the ground*	 mm mm	 5,000 / 2300 1,350 ÷ 1 700
Carrying vehicle load capacity	t	14/ 15.5/ 17**
Voltage of electrical system of control electronics	V	24
Other requirements	–	connection with travel speed pulse input according to ISO 16844-2

** - for the distance between the spreading disc and the ground equal to 400 mm.*

***- depending on the spreader's tank capacity*

1.3 EQUIPMENT

The spreader's standard equipment includes:

- Operator's Manual,
- Warranty Book,
- tank made of carbon steel or stainless steel with capacity of 7, 8 or 9 m^3,
- galvanised or painted frame,
- support legs,
- side bumpers *(when the spreader is mounted on a carrying vehicle with strong side boards)*,

Additional (optional) equipment:

- automatic control *(automatic change of parameters depending on selected working mode and temperature),*
- programme for collecting data from the counter,
- optical spreading sensor instead of impact spreading sensor.

1.4 WARRANTY TERMS

PRONAR Sp. z o.o., Narew guarantees the reliable operation of the machine when it is used according to its intended purpose as described in the *OPERATOR'S MANUAL*. Defects discovered during the warranty period will be removed by the Warranty Service. The repair period is specified in the WARRANTY BOOK.

The warranty does not cover those parts and sub-assemblies of the machine which are subject to wear in normal usage conditions, regardless of the warranty period. Consumables include the following parts/sub-assemblies:

- blades,
- filters,
- side rubber seals of the conveyor,
- bearings,

- fuses, relays, bulbs,
- conveyor belt,
- rubber lining on drive roller,
- spreading disc shield.

The warranty service only applies to such cases as: mechanical damage which is not the user's fault, factory defects of parts, etc.

In the event of damage arising from:

- mechanical damage which is the user's fault, road accidents,
- inappropriate use, adjustment or maintenance, use of the machine for purposes other than those for which it is intended,
- use of damaged or malfunctioning machine,
- repairs carried out by unauthorised persons, repairs carried out improperly,
- making unauthorised alterations to machine design,

the user will lose the right to warranty service.

TIP

Demand that the seller carefully and precisely fills out the *WARRANTY BOOK* and warranty repair coupons. A missing date of purchase or sale point stamp may make the user ineligible for any warranty repair or refund.

For detailed Terms & Conditions of Warranty, please refer to the WARRANTY BOOK attached to each newly purchased machine.

Modification of the machine without the written consent of the Manufacturer is forbidden. In particular, do NOT weld, drill holes in, cut or heat the main structural elements, which have a direct impact on the machine operation safety.

1.5 TRANSPORT

The machine is prepared for sale completely assembled and does not require packing. Packing is only required for the machine's operation and maintenance manual and control panel with a wiring harness.

The machine can be delivered to the user on a transport vehicle after being attached to the load platform. The machine should be firmly secured by means of certified fastening straps fitted with a tightening mechanism.

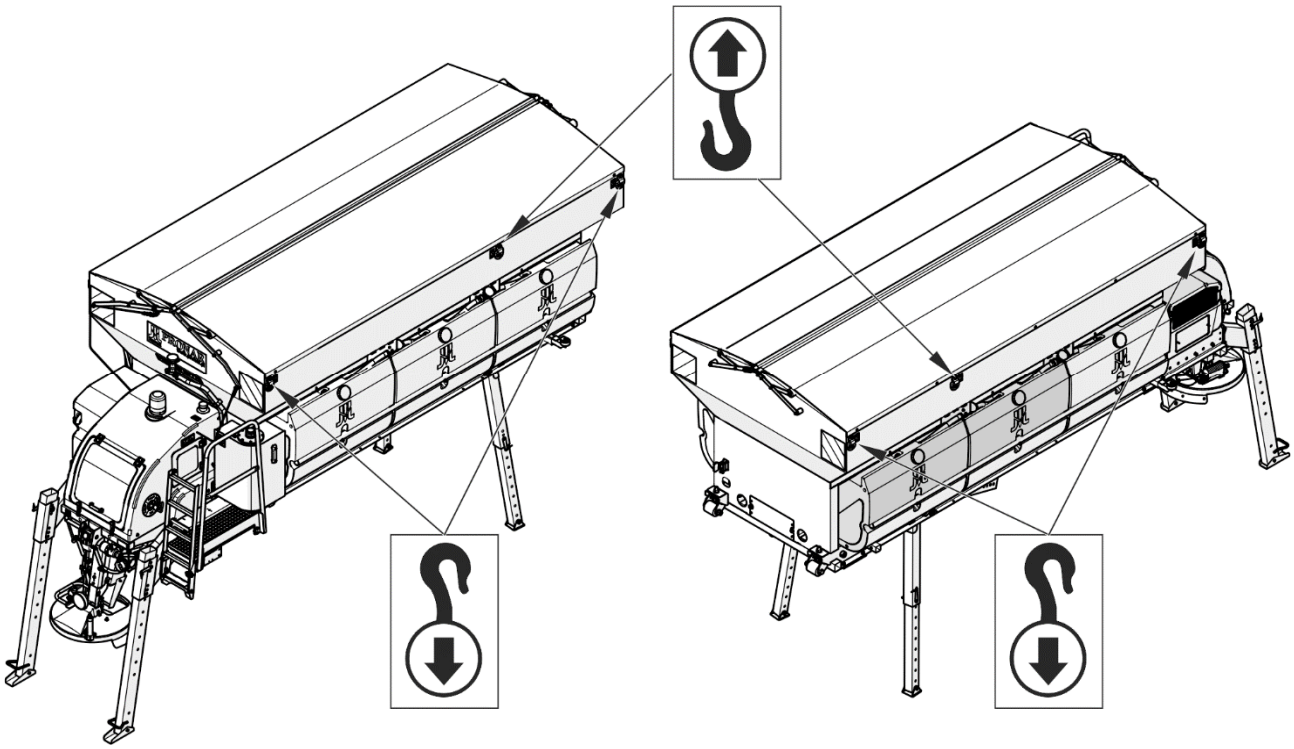


FIGURE 1.2 Transport lugs

DANGER

When being transported on a motor vehicle the machine must be mounted on the vehicle's platform in accordance with the transport safety requirements. The driver of the vehicle should take particular care while transporting the machine. This is due to the vehicle's centre of gravity shifting upwards when loaded with the machine.

When loading and unloading the machine, comply with the general principles of workplace health and safety for reloading work. Persons operating reloading equipment must have the qualifications required to operate these machines.

ATTENTION

The spreader must not be transported on unfolded parking stands.

The machine should be attached to the lifting equipment and to the load box in places specially designed for this purpose (FIGURE 1.2), i.e. by the lugs on the tank sides (6 points). Due to location of the spreader's centre of gravity, lifting equipment should be attached to 4 points (FIGURE 1.4). Suspension points are identified with information decals. When lifting the machine, take particular care due to the possibility of tipping over the machine and the risk of injuries from protruding parts. To keep lifted machine in the correct direction it is recommended to apply additional guy cables. During the loading work particular care should be taken not to damage paint coating.

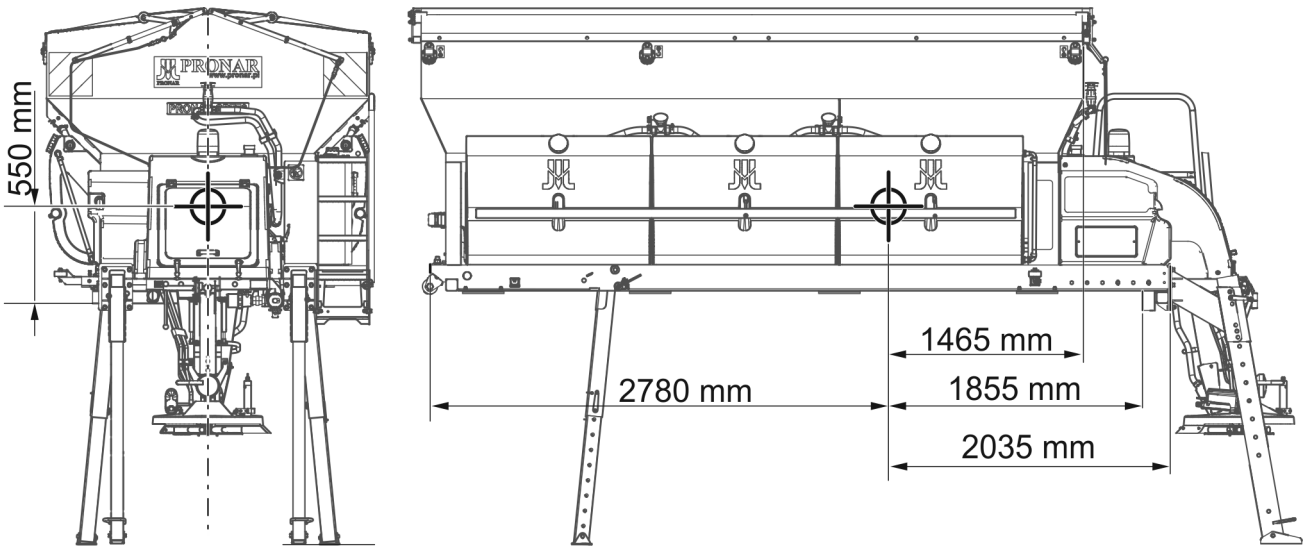


FIGURE 1.3 Location of centre of gravity *(empty tanks)*

ATTENTION

Depending on the machine setting, location of centre of gravity varies in the range of ± 100 mm.

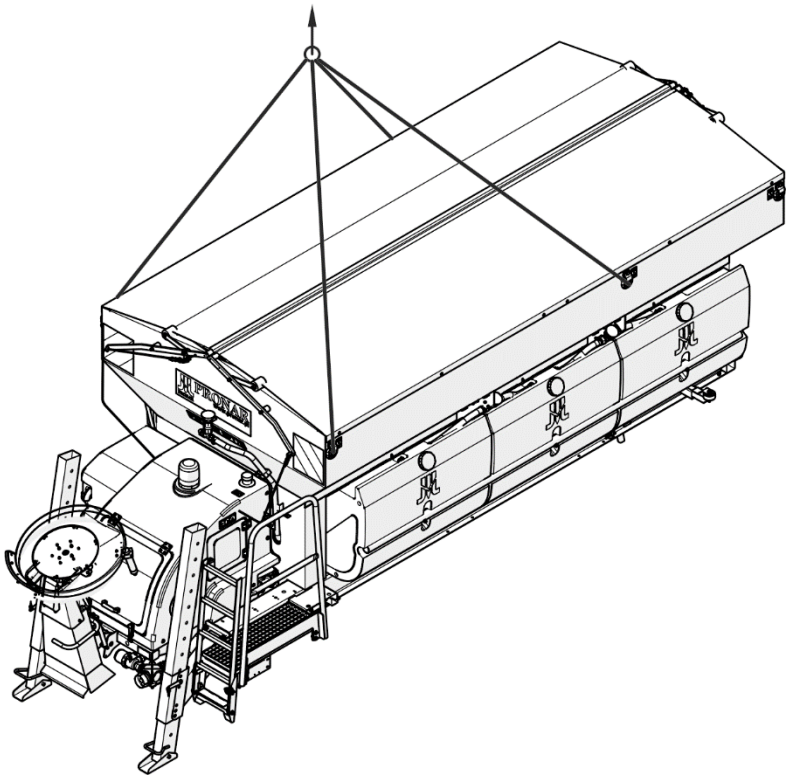


FIGURE 1.4 Lifting by means of lifting equipment

1.6 ENVIRONMENTAL HAZARDS

A hydraulic oil leak constitutes a direct threat to the natural environment owing to its limited biodegradability. Maintenance and repair work which involves the risk of an oil leak should be performed in the rooms with oil resistant surface. In the event of oil leaking into the environment, first of all contain the source of the leak, and then collect the leaked oil using available means. Remaining oil should be collected using sorbents, or by mixing the oil with sand, sawdust or other absorbent materials. The oil contaminations, once gathered up, should be kept in a sealed, marked, hydrocarbon resistant container, and then passed on to the appropriate oil waste recycling centre. The container should be kept away from heat sources, flammable materials and food.

ATTENTION

Waste oil should only be taken to the appropriate facility dealing with the re-use of this type of waste. Do NOT pour oils into sewerage or water tanks.

Oil which has been used up or is unsuitable for further use owing to loss of its properties should be stored in its original packaging in the conditions described above.

1.7 WITHDRAWAL FROM USE

ATTENTION

During dismantling personal protection equipment shall be used i.e. protective clothing, boots, gloves and protective goggles etc.

Avoid contact of skin with oil. Do not allow used oil to spill.

In the event of decision by the user to withdraw the machine from use, comply with the regulations in force in the given country concerning withdrawal from use and recycling of machines withdrawn from use.

Before proceeding to dismantle the machine, remove oil completely from the hydraulic system, transmission and engine and dismantle the battery.

When spare parts are changed, worn out or damaged parts should be taken to a collection point for recyclable raw materials. Used oil and also rubber and plastic elements should be taken to the appropriate facilities dealing with the recycling of this type of waste.

SECTION

2

SAFETY ADVICE

2.1 BASIC SAFETY RULES

2.1.1 USE OF MACHINE

- Before using the machine, the user must carefully read this Operator's Manual and the *WARRANTY BOOK*. When operating the machine, the operator must comply with all the recommendations included in the Operator's Manual.
- The machine may only be used and operated by persons qualified to drive the carrying vehicle and trained in the use of the machine.
- If the information contained in the Operator's Manual is difficult to understand, contact the seller who runs the authorised technical service on behalf of the Manufacturer, or contact the Manufacturer directly.
- Careless and improper use and operation of the machine and also non-observance of the recommendations contained in this Operator's Manual endanger health and life third persons and/or machine operator.
- Be aware of the residual risk. Use caution when operating this machine and follow all relevant safety instructions.
- The machine must never be used by unauthorised persons, including children, and people under the influence of alcohol or other abusive substances.
- Non-compliance with the safety rules of this Operator’s Manual can be dangerous to the health and life of the operator and others.
- The machine must not be used for purposes other than those for which it is intended. Anyone who uses the machine for purposes other than those for which it is intended takes full responsibility for any consequences of this potentially incorrect use. Use other than intended means using the spreader in any way other than that specified in the Operator's Manual including also spreading of other agents than those recommended by the Manufacturer.
- The machine may only be used when all the protective elements (i.e. safety guards) are technically sound and correctly positioned. In the event of loss or destruction of the protective elements, they must be replaced with new ones.

2.1.2 HITCHING TO CARRYING VEHICLE

- The carrying vehicle to which the machine will be hitched must be technically reliable and must fulfil the requirements of the machine Manufacturer.
- The machine should be secured to the carrying vehicle by means of suitable certified belts or chains.
- Be especially careful when hitching the machine to carrying vehicle.
- When hitching, there must be nobody between the machine and the carrying vehicle.
- After completed hitching of the machine, check the safeguards. Carefully read the carrying vehicle Operator's Manual.
- Be especially careful when unhitching the machine from the carrying vehicle.
- Machine removed from the carrying vehicle must be placed on parking stands, on level, sufficiently hard surface in such a manner as to ensure that it is possible to connect it again.

2.1.3 HYDRAULIC SYSTEM

- The hydraulic system is under high pressure when operating.
- Regularly check the technical condition of the connections and the hydraulic conduits. There must be no oil leaks.
- In the event of the hydraulic system malfunction, discontinue using the machine until the malfunction is corrected.
- In the event of injuries being caused by pressurised hydraulic oil, contact a doctor immediately. Hydraulic oil may penetrate the skin and cause infections. In the event of contact of oil with eyes, rinse eyes with a large quantity of water and in the event of the occurrence of irritation consult a doctor. In the event of contact of oil with skin wash the area of contact with water and soap. Do NOT apply organic solvents (petrol, kerosene).
- Use the hydraulic oil recommended by the Manufacturer. Never mix two types of oil.

- Used oil or oil which has lost its properties should be stored in original containers or replacement containers resistant to action of hydrocarbons. Replacement containers must be clearly marked and appropriately stored.
- Do not store hydraulic oil in packaging designed for storing food or foodstuffs.
- Rubber hydraulic conduits must be replaced every 4 years regardless of their technical condition.
- Repair and replacement of hydraulic system elements should be entrusted to the appropriately qualified persons.

2.1.4 MAINTENANCE

- Do NOT perform maintenance or repair work when the engine is turned on. Before commencing work, switch off the carrying vehicle's engine and the machine's engine, disconnect the machine's battery and disconnect the machine's electrical leads from the carrying vehicle.
- During the warranty period, any repairs may only be carried out by warranty service authorised by the Manufacturer. It is recommended that necessary repairs to machine should be undertaken by specialised workshops.
- In the event of any fault or damage, do not use the machine until the fault has been corrected.
- During work on the machine, use proper, close-fitting protective clothing, gloves and appropriate tools. When working on hydraulic systems it is recommended to use oil resistant gloves and protective goggles.
- Any modification to the machine frees PRONAR from any responsibility for damage or detriment to health which may arise as a result.
- The spreader can only be stood on when it is absolutely motionless and the carrying vehicle's engine and the spreader's engine are switched off. Before climbing onto the sand spreader, immobilise the carrying vehicle with parking brake, secure against unauthorized access and remove key from ignition.
- Before undertaking any work on the machine, turn off the carrying vehicle's engine and the machine's engine.

- Regularly check the technical condition of the safety devices and correct tightening of bolt connections.
- Regularly perform service inspections of machine as recommended by the Manufacturer.
- Before beginning work on hydraulic systems, reduce oil pressure.
- Servicing and repair work should be carried out in line with the general principles of workplace health and safety. In the event of injury, the wound must be immediately cleaned and disinfected. In the event of more serious injuries, seek a doctor's advice.
- Should it be necessary to change individual parts, use only original parts. Non-adherence to these requirements may put the user and other people's health and life at risk, and also damage the machine and invalidate the warranty.
- Regularly check technical condition and mounting of all guards and protective elements.
- Before welding or electrical work, the sand spreader should be disconnected from the electrical system. The paint coating should be cleaned. Burning paint fumes are poisonous for people and animals. Welding work should be carried out in a well lit and well ventilated space. Before beginning work, prepare a CO_2 or foam extinguisher.
- Any maintenance work should be performed when the machine is mounted on the carrying vehicle or supported on properly secured parking stands.
- The machine must not be supported using fragile elements (bricks or concrete blocks etc.).
- After completing work associated with lubrication, remove excess of lubricant.
- Used lubricants should be disposed of.
- In order to reduce the danger of fire the machine must be kept in a clean condition.

2.1.5 MACHINE OPERATION

- Before using the sand spreader always check its technical condition. In particular, check the technical condition of indicator lights, spreading mechanism, feeding mechanism and protective shields.
- The sand spreader drive may be started only when there are no bystanders or animals within the radius about two times larger than the set spreading width. The machine operator is obliged to ensure proper visibility of the machine and the working area.
- During machine operation do not occupy a different position than that of the operator in the vehicle's cab. Do NOT leave the cab, when the machine is in operation.
- There must be no bystanders within the machine spreading zone.
- Do not approach the machine until the rotating parts come to a complete standstill.
- When working near pavements or on public roads there is a risk that thrown out particles of sand, salt, stones etc. may pose a threat to bystanders.
- Before loading sand spreader make certain that there are no stones, tools or other objects in the load box and on the spreading disc.
- Load should be uniformly distributed in the machine tank.
- Do NOT exceed permissible load weight of sand spreader because this may cause danger to road traffic and cause damage to the machine.
- Spreading agents must be prepared in accordance with the regulations concerning winter road maintenance in force in the country in which the sand spreader is used. Spreading agents other than those recommended by the Manufacturer must not be used.
- While working with the sand spreader, turn on the beacon light and the light near the spreading disc.
- Exercise particular caution while reversing.
- When spreading is completed, disengage the hydraulic drive of the feeding and spreading mechanisms.

- When driving on public roads, comply with the road traffic regulations in force in the country, in which the machine is used.
- Adjust travel speed to the existing road conditions and other limitations arising from road traffic regulations.
- Do not carry people or animals on the machine.
- Reckless driving and excessive speed may cause accidents.

2.1.6 SAFETY DURING BATTERY MAINTENANCE

- Do NOT use an open flame and do NOT produce sparks near the battery. Danger of explosion.
- Smoking near the battery is forbidden.
- Keep a proper sequence when disconnecting the battery terminals. First disconnect terminal (-) and then disconnect terminal (+). The leads should be connected in reverse order.
- Before commencing electric welding, disconnect the machine from power source. To do this, disconnect both battery leads and wiring harness from the carrying vehicle (power supply of electronic system).
- Do NOT short the battery leads. Risk of fire or explosion.
- The battery contains caustic sulfuric acid. Contact of the acid with skin can cause very severe chemical burns. In case of contamination with electrolyte, immediately take off contaminated clothes and rinse skin or eyes contaminated with acid using plenty of running water. If swallowed, do not induce vomiting. Drink plenty of cold water. Consult a doctor immediately.
- When handling the battery, use rubber gloves and protective goggles.
- The battery should be charged in rooms with efficiently operating ventilation.

2.1.7 SAFETY RULES DURING ENGINE MAINTENANCE

- Do not start the engine in closed rooms or in rooms without ventilation system. Exhaust gas is toxic and it may cause loss of consciousness or even death.
- Do not approach the rotating parts of the engine.

- Keep a safe distance from hot elements of the engine. Risk of burn injuries.
- Lost or damaged fuel filler plug should always be replaced with original replacement plug.
- Do NOT remove the fuel filler plug when the engine is running or near an open flame.
- Fuel fumes are very toxic. Refuelling should be done outdoors or in a well ventilated room.
- Do not fill the fuel tank completely. Allow space for fuel expansion.
- Immediately wipe away spilt fuel. The engine and engine compartment should be kept clean and tidy.
- Used oil and filters should be stored in compliance with the safety principles for hydraulic system operation, without causing any direct threat to natural environment.
- Do NOT approach the engine with an open flame. There is a risk that fuel fumes or oil will catch fire.
- All maintenance and repair work should be performed only when the engine is stopped, cool and disconnected from power supply.

2.2 RESIDUAL RISK

Pronar Sp. z o. o. in Narew has made every effort to eliminate the risk of accidents. There is, however, a certain residual risk, which could lead to an accident, and this is connected mainly with the actions described below:

- using the machine for purposes other than those for which it is intended,
- being between the carrying vehicle and the machine while the machine is being attached,
- being on the machine while the engine is running,
- operating the machine with removed or faulty safety guards,
- not maintaining safe distance from the danger zone or being within the zones while the machine is operating,

- operation of the machine by unauthorised persons or persons under the influence of intoxicating substances,
- cleaning, maintenance and technical checks when carrying vehicle is connected and engine is running.

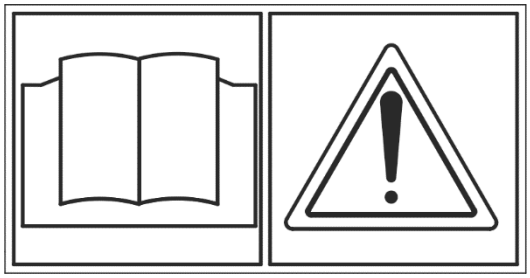
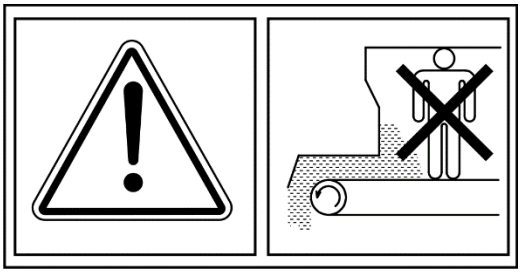
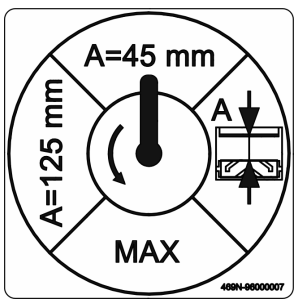
The residual risk may be kept to a minimum by following the recommendations below:

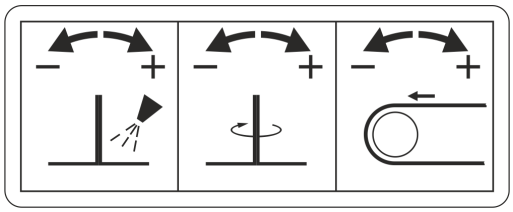
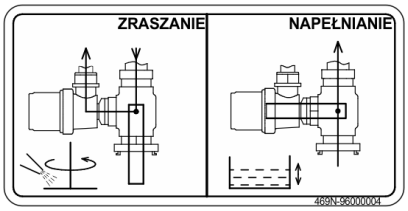
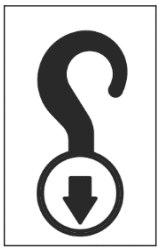
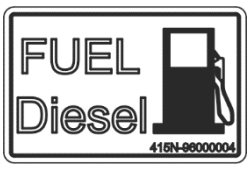
- operate the machine in prudent and unhurried manner,
- reasonably apply all the remarks and recommendations stated in the Operator's Manual,
- carry out repairs and maintenance work in line with operating safety rules,
- repair and maintenance work should be carried out by persons trained to do so,
- use close fitting protective clothing,
- ensure unauthorised persons have no access to the machine, especially children,
- maintain a safe distance from prohibited or dangerous places
- do not climb on the machine when it is operating

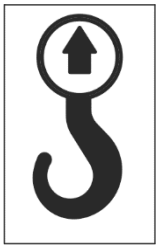
2.3 INFORMATION AND WARNING DECALS

All signs should always be legible and clean, visible to the operator and also to persons possibly being in the vicinity of the machine in operation. If any safety sign is lost or illegible, it should be replaced with a new one. All elements having safety signs replaced during repairs should be affixed with these signs. Safety signs and decals may be purchased from the Manufacturer or the Seller.

TABLE 2.1 Information and warning decals

ITEM	SYMBOL	DESCRIPTION (PART NUMBER)
1		Before starting work, carefully read the Operator's Manual. (35RPN-27.00.00.07)
2		Do not enter the tank; do not stand on the feeding mechanism if the machine drive is engaged (254N-96000006)
3		Danger caused by materials thrown out by the machine. Keep a safe distance from the operating machine. (12RPN-15000008)
4		Information decal Control of the feeding mechanism barrier (469N-96000007)

ITEM	SYMBOL	DESCRIPTION (PART NUMBER)
5		Information decal Manual control of hydraulic block (254N-60000008)
6		Information decal Control of the brine valve (469N-96000004)
7		Lifting equipment attachment points while loading the machine (35RPN-27.00.00.09)
8		Warning decal Hot surface (415N-96000003)
9		Outline marking. (R1F TYP 1 DIN 11030)
10		Information decal (187N-00000033)
11		Machine model (469N-96000002)
12		Fuel filler label (415N-96000004)
13		Oil filler label (130N-36000006)

ITEM	SYMBOL	DESCRIPTION (PART NUMBER)
14		Lifting equipment attachment points while loading the machine (35RPN-27.00.00.09)

Numbers in the Item column correspond to decals (FIGURE 2.1)

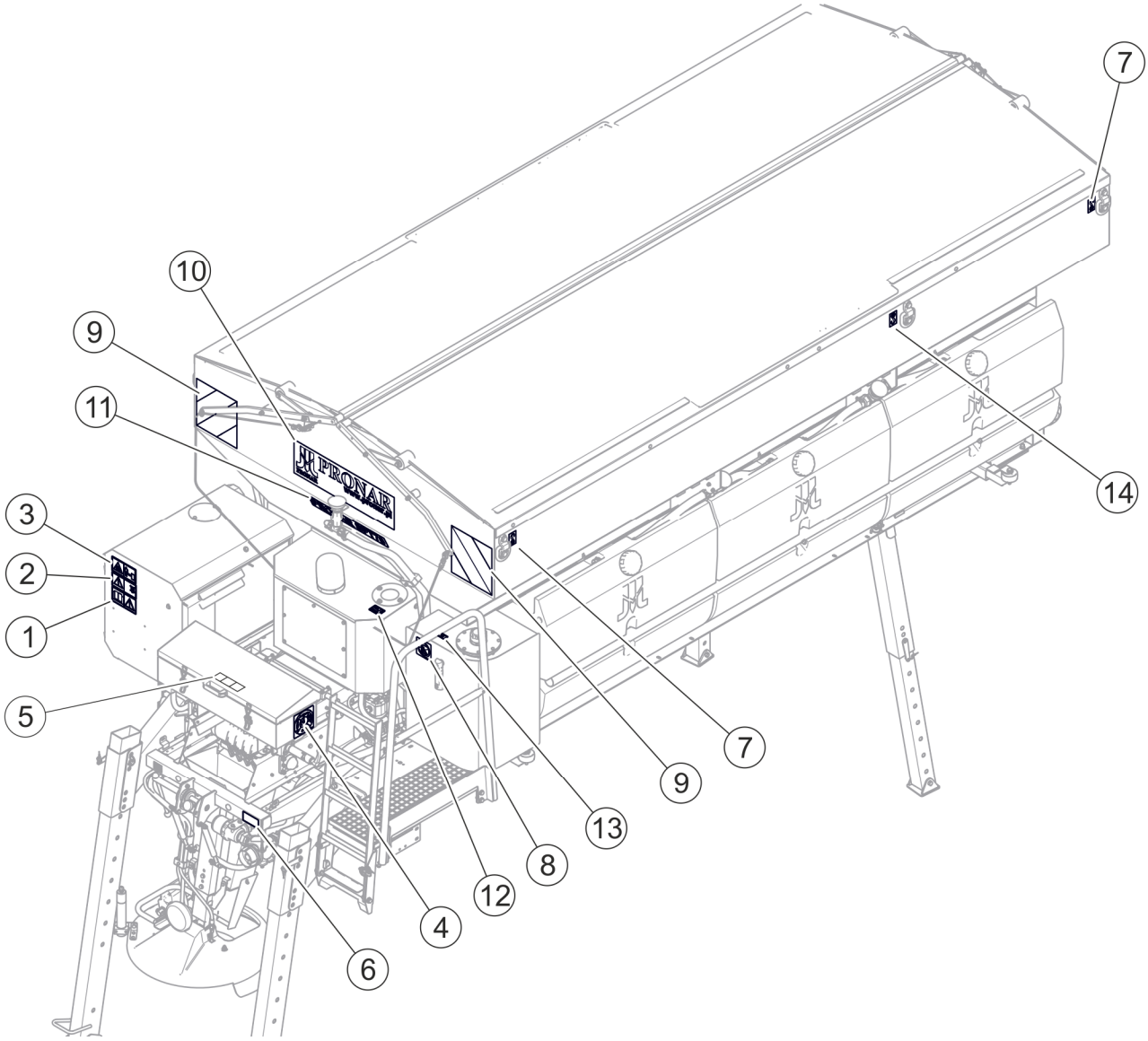


FIGURE 2.1 Locations of information and warning decals

Meanings of symbols are described in TABLE 2.1

SECTION

3

DESIGN AND OPERATION

3.1 TECHNICAL SPECIFICATION

TABLE 3.1 Basic technical specification of the spreader

	Unit	PRONAR SPT70
Mounting method	–	on the carrying vehicle's load platform by means of min. LC 2500 daN securing tapes according to EN 12195-2 standard.
Spreading width: – chemical agents – coarse materials	 m m	 2 – 12 2 – 6
Spreading density: – chemical agents – coarse materials	 g/m^2 g/m^2	 5 – 40 50 – 200
Tank capacity	m^3	7 / 8 / 9*
Capacity of brine tanks	dm^3	2,700
Number of spreading discs	pc.	1
Number of spreading disc blades	pc.	6
Machine drive	–	own hydraulic system supplied by a hydraulic pump driven by an additional combustion engine
Control	–	with the aid of the control panel, from the operator cab
Electric power supply	V	24V
Pressure in the hydraulic system	MPa	16
Maximum working speed	km/h	70
Machine weight (without load)	kg	2 580 / 2 615 / 2 650*
Height of the machine from the carrying vehicle's load platform	mm	1,635 / 1,745 / 1,855*

* - depending on the tank type

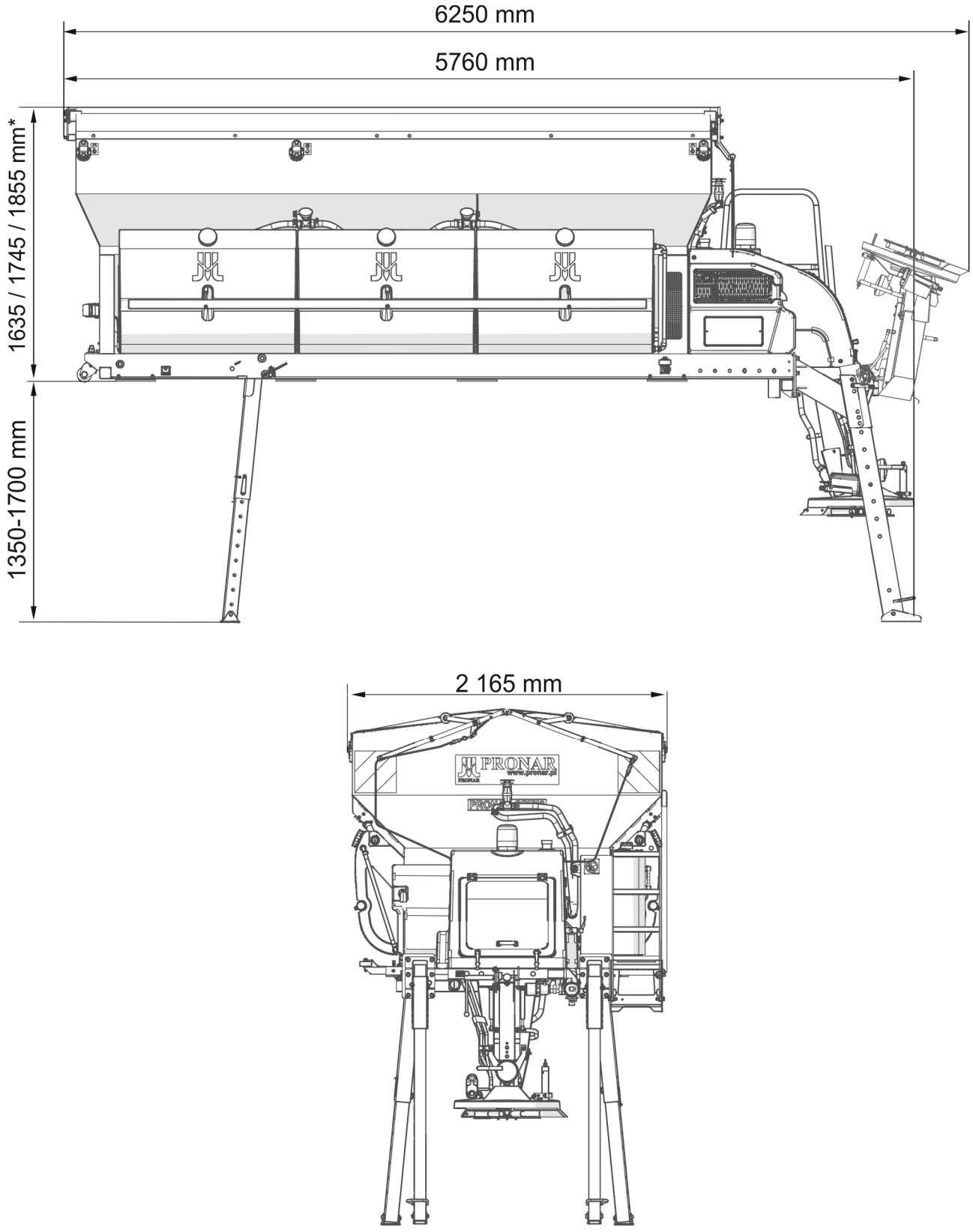


FIGURE 3.1 External dimensions of SPT70 spreader

** - depending on the tank capacity*

3.2 GENERAL DESIGN

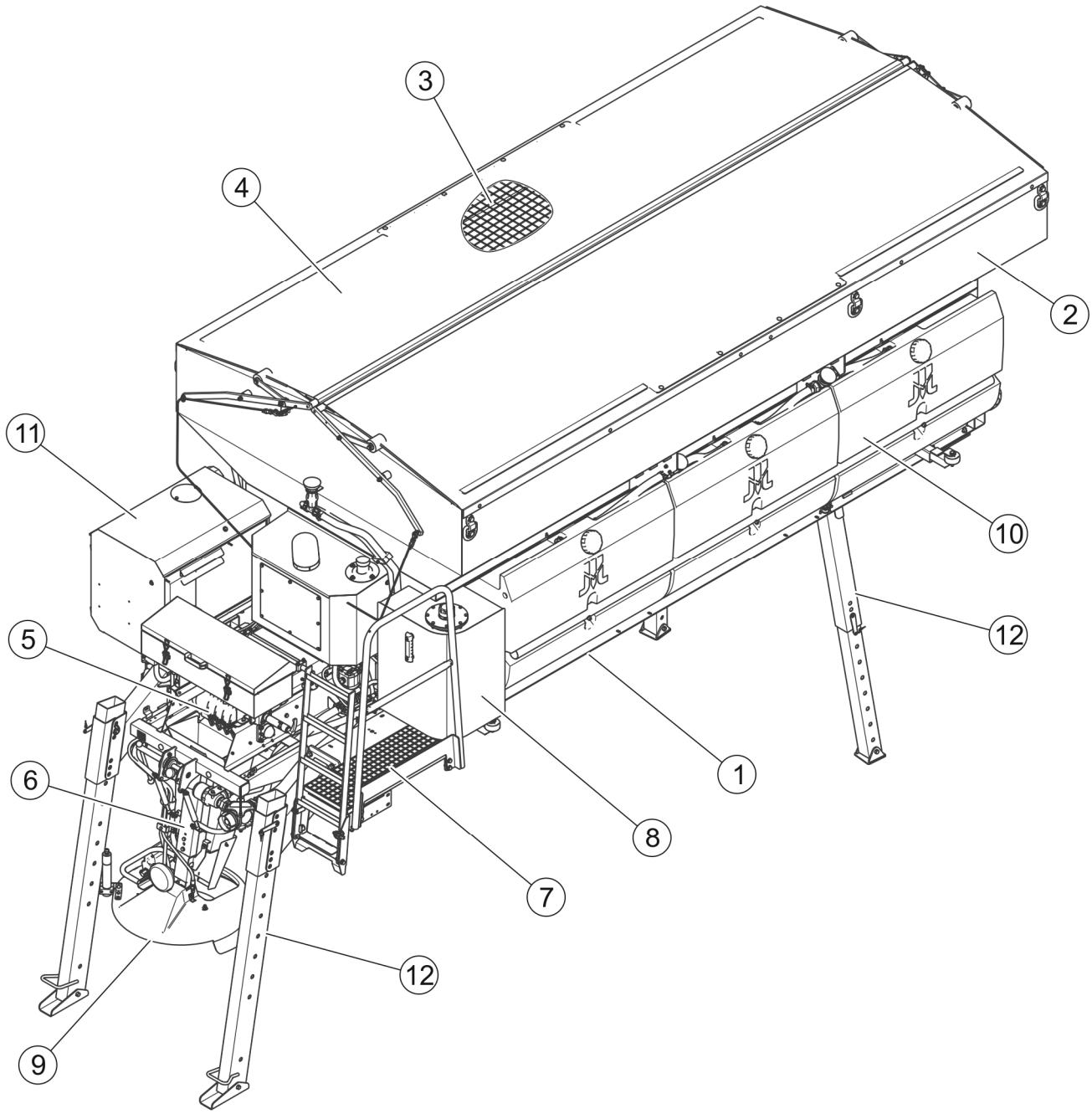


FIGURE 3.2 General design

(1) - frame; (2) - tank; (3) - screen; (4) - tarpaulin cover; (5) - belt conveyor; (6) - hopper system; (7) - platform with ladder; (8) - hydraulic system; (9) - spreading system; (10) - tanks of brine spray system; (11) - combustion engine; (12) - support legs

The spreader consists of a frame (1) with a mounted tank (2) equipped with a screen (3) and a frame with tarpaulin cover (4). Belt conveyor (5) located under the tank (2) carries the material to the hopper system (6), which feeds the material to disc blades of the spreading

mechanism (9). Additionally, the brine spray system (10) makes it possible to feed the brine to the spreading mechanism. The spreader is equipped with its own hydraulic system (8) supplied by the hydraulic pump driven by the additional combustion engine (11). Working parameters are monitored and controlled from the carrying vehicle's cab by means of a control panel.

3.3 HYDRAULIC SYSTEM

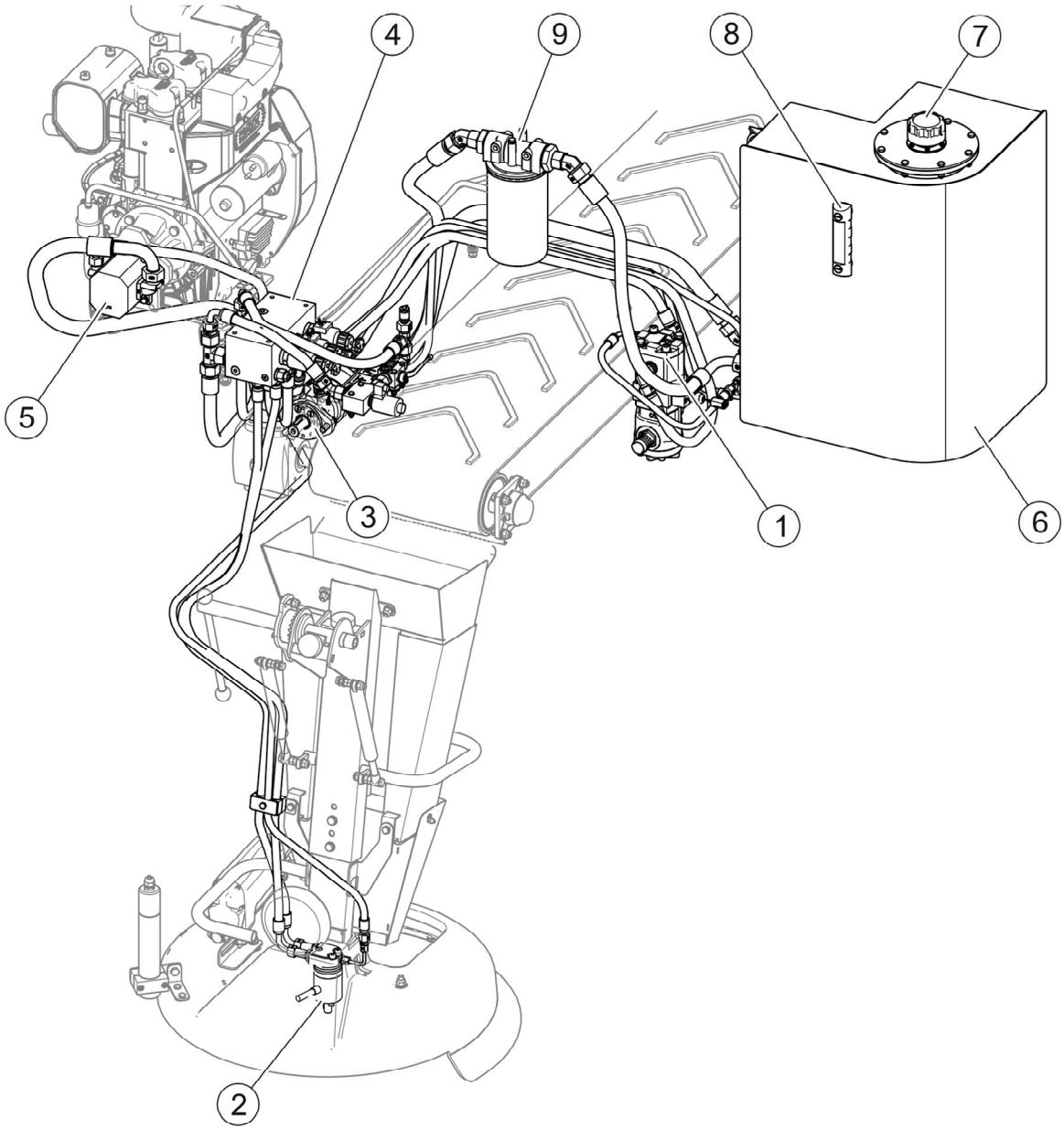


FIGURE 3.3 Hydraulic system design

(1) - hydraulic motor of brine pump; (2) - hydraulic motor of spreading disc; (3) - hydraulic motor of conveyor;; (4) - hydraulic block; (5) - hydraulic pump; (6) - oil tank; (7) - oil filler plug; (8) - oil level indicator; (9) - oil filter

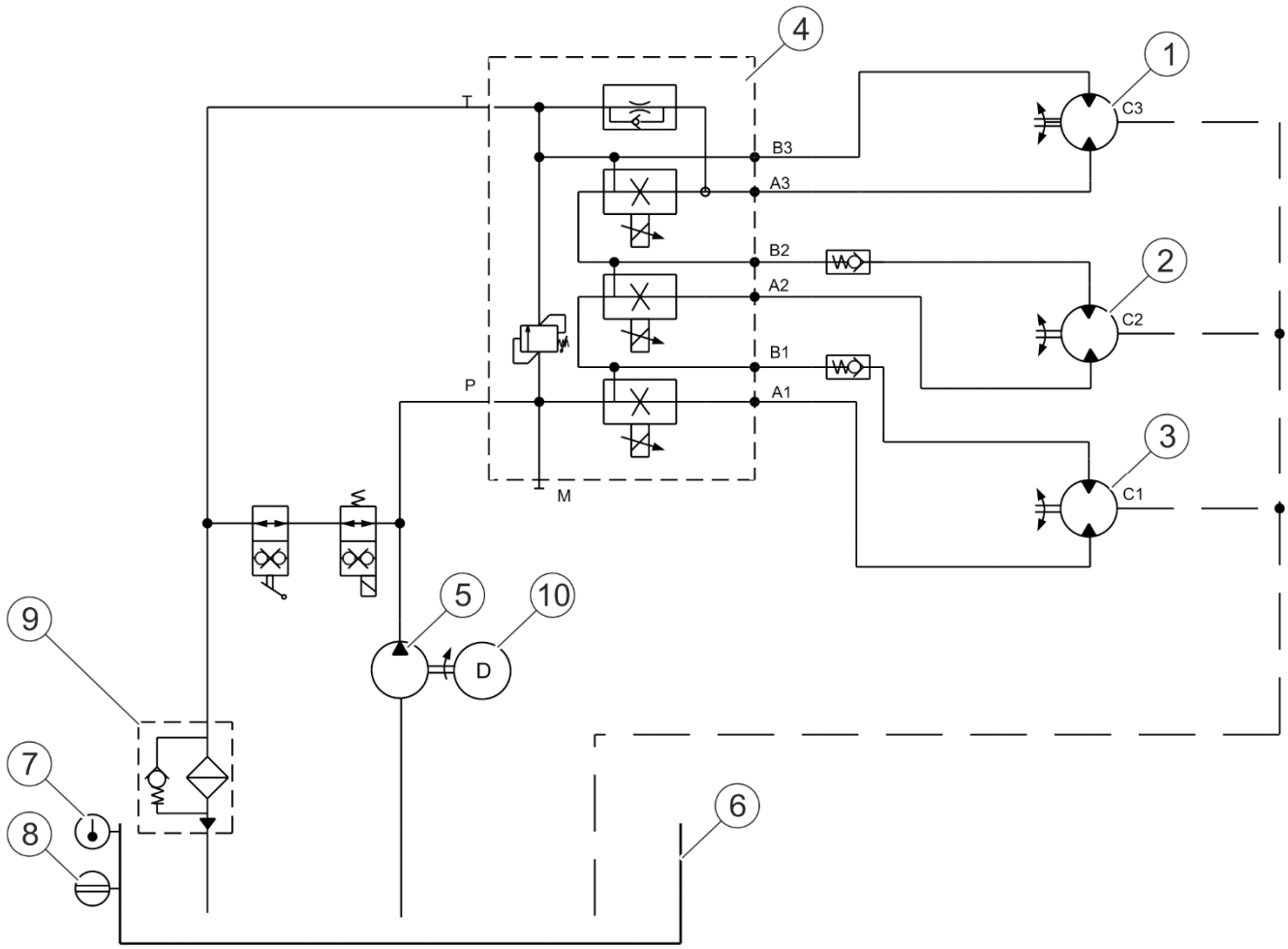


FIGURE 3.4 Hydraulic system diagram

(1) - hydraulic motor of brine pump; (2) - hydraulic motor of spreading disc; (3) - hydraulic motor of conveyor;; (4) - hydraulic block; (5) - hydraulic pump; (6) - oil tank; (7) - oil filler plug; (8) - oil level indicator; (9) - oil filter; (10) diesel engine

3.4 BRINE SPRAY SYSTEM

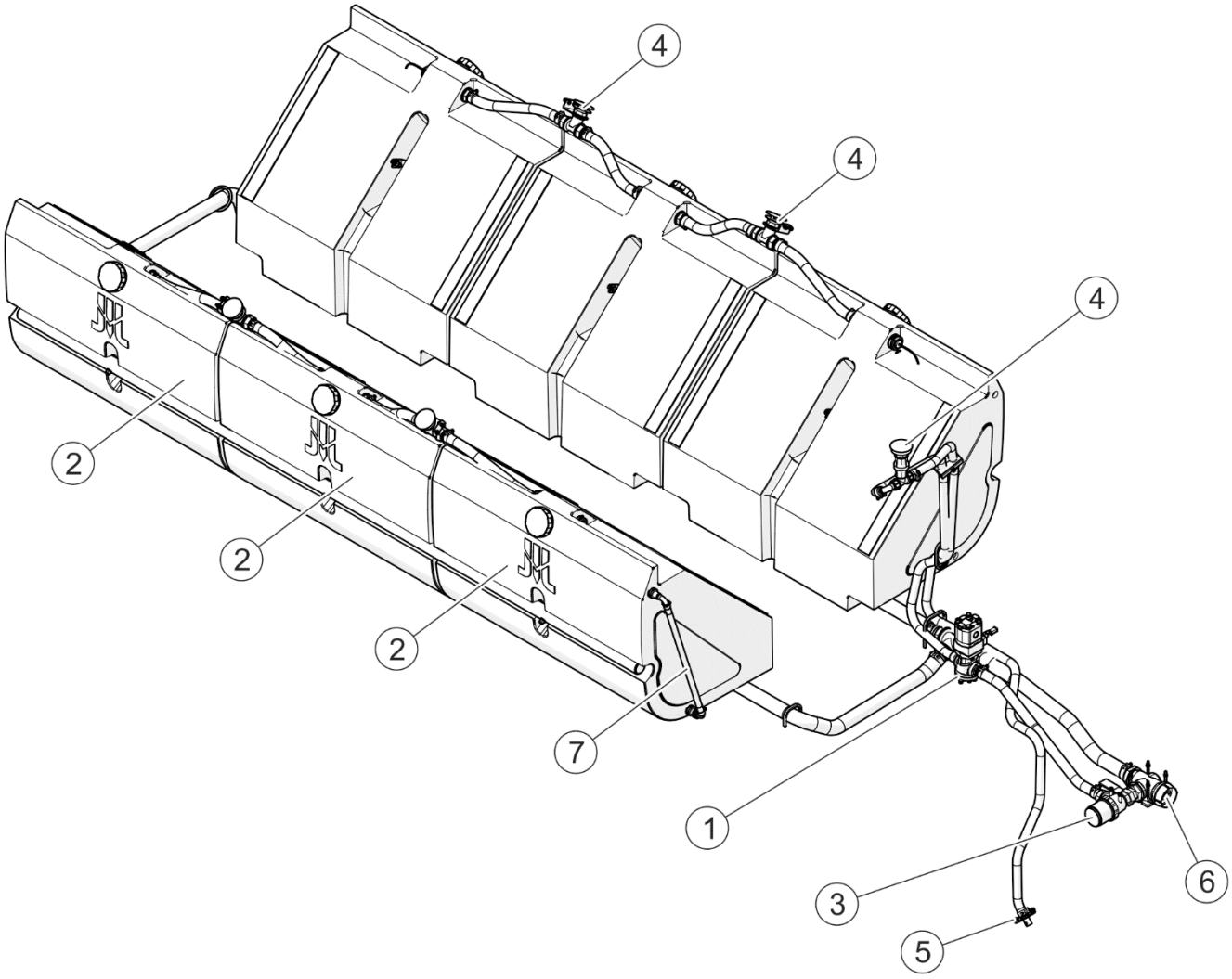


FIGURE 3.5 Design of brine spray system

(1) - pump; (2) - tank; (3) - filter; (4) - air vent; (5) - connector pipe; (6) - filling valve; (7) - brine level indicator

3.5 SPREADING SYSTEM AND CONVEYOR

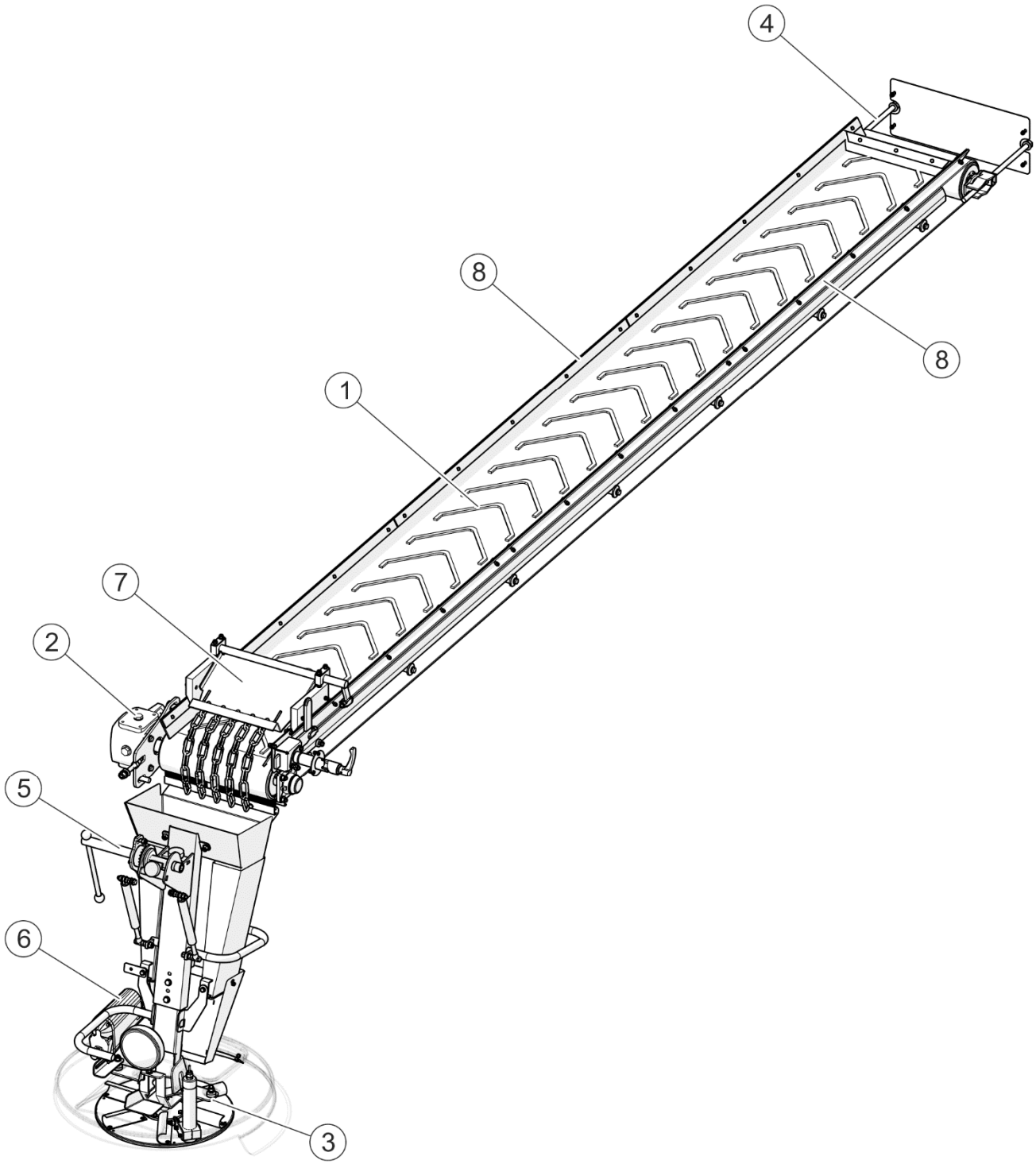


FIGURE 3.6 Design of spreading system and conveyor

(1) - belt conveyor; (2) - transmission; (3) - spreading disc; (4) - conveyor tensioner; (5) - rising interlock lever; (6) - spreading direction adjusting cylinder; (7) - barrier; (8) - conveyor seal

3.6 ELECTRICAL SYSTEM

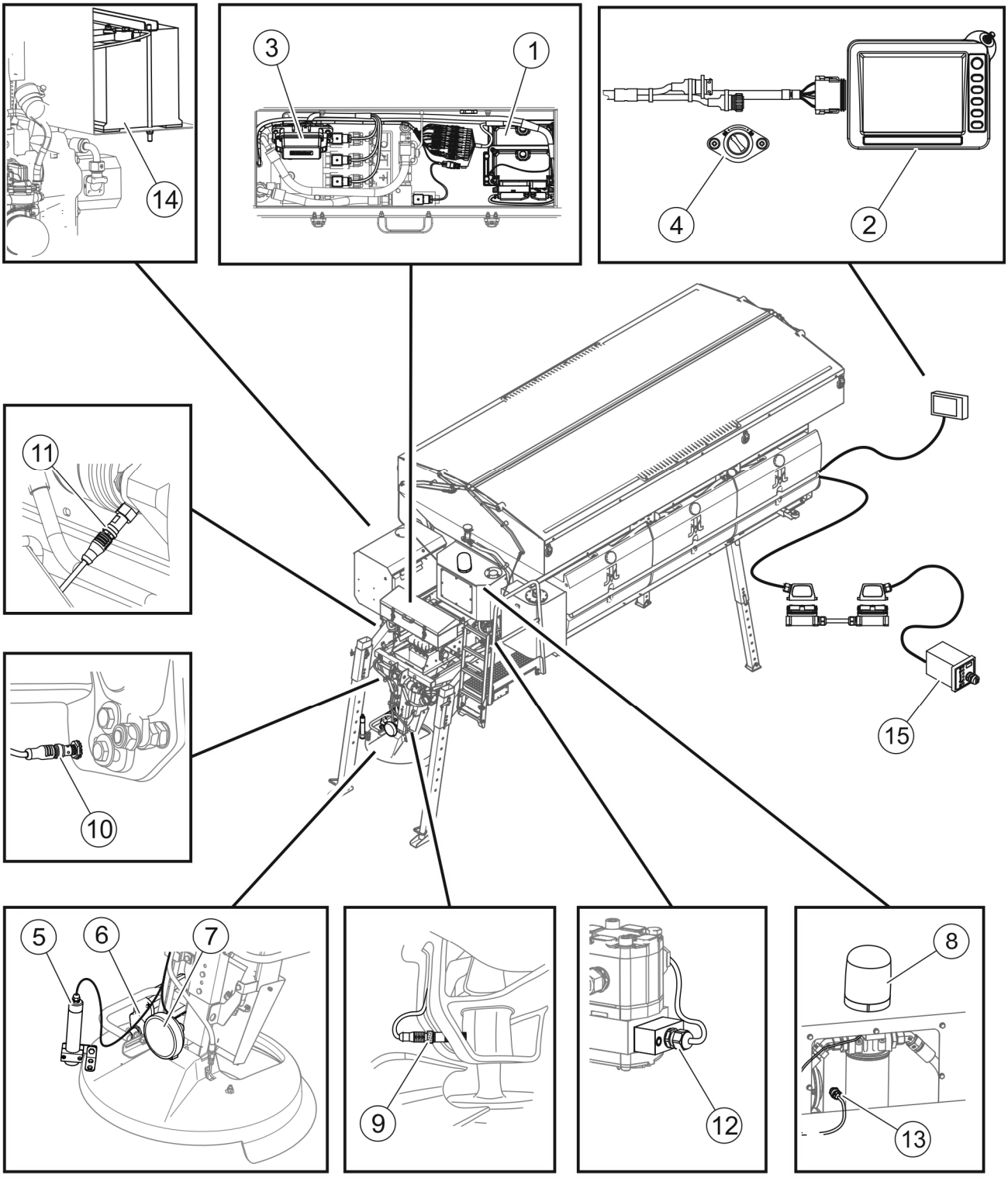


FIGURE 3.7 Electrical system components

(1) - controller; (2) - control panel; (3) - fuses; (4) - main switch; (5) - spreading sensor; (6) - spreading direction adjusting cylinder; (7) - red rear lamp; (8) - beacon light; (9) - disk speed sensor; (10) - spreading mechanism rising sensor;(11) - belt speed sensor; (12) - brine

pump speed sensor; (13) - fuel reserve sensor; (14) - battery; (15) - ignition switch

3.7 CONTROL PANEL

3.7.1 GENERAL DESIGN AND OPERATION

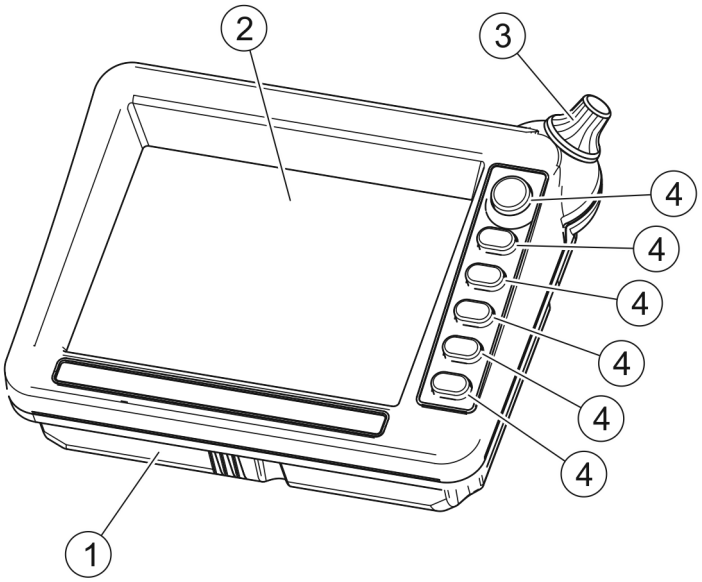


FIGURE 3.8 General design of control panel

(1) - enclosure; (2) - LCD display ; (3) - parameter change knob; (4) - function push-buttons

Control panel (FIGURE 3.8) consists of enclosure (1), colour LCD display (2), parameter change knob (3) and six function push-buttons (4).

Depending on a display menu page selected, (FIGURE 3.9) currently assigned functions (B) are displayed next to function push-buttons (2),(3),(4),(5),(6),(7). On each display menu page, different functions are displayed for a given push-button. Empty function field next to push-buttons (3),(4),(6) means that the push-buttons are not active at the moment (FIGURE 3.9). Knob (1) is used for moving to another field (C) and for changing values of parameters in field (D).

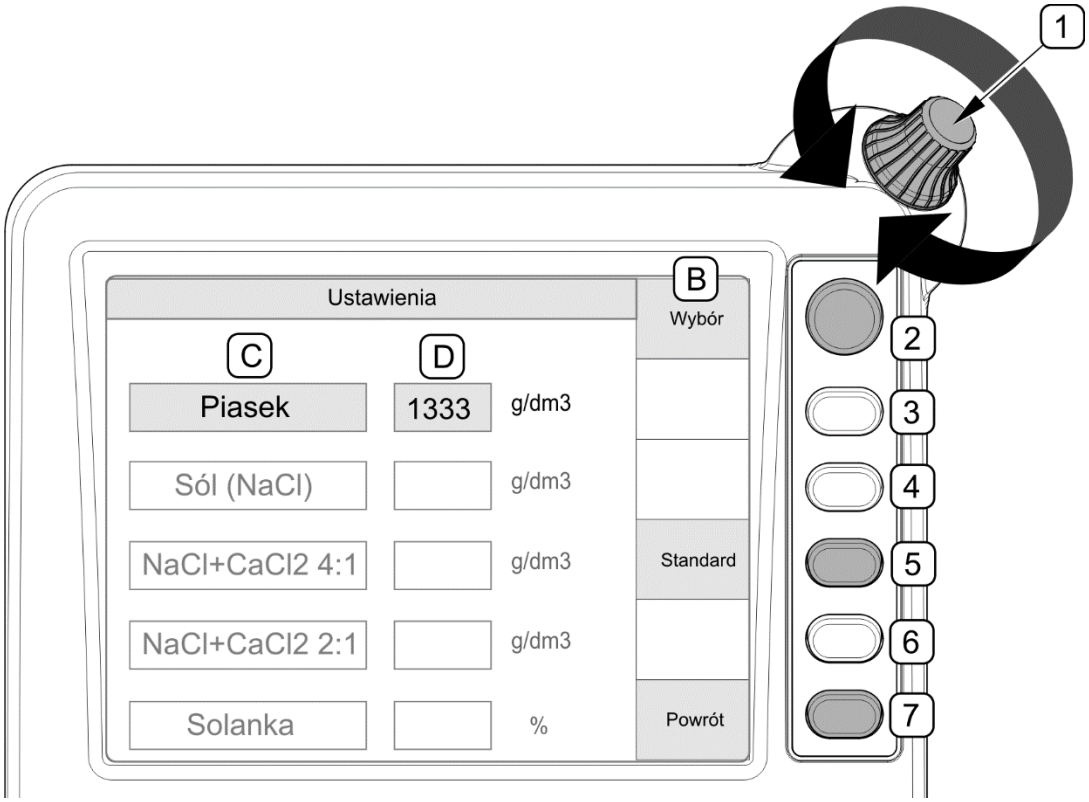


FIGURE 3.9 Example of control panel operation

(1) - parameter change knob; (2), (3), (4),(5), (6), (7) - function push-buttons; (B) - push-button function; (C) - parameter name field; (D) - parameter value field

3.7.2 DESCRIPTION OF CONTROL PANEL MENU

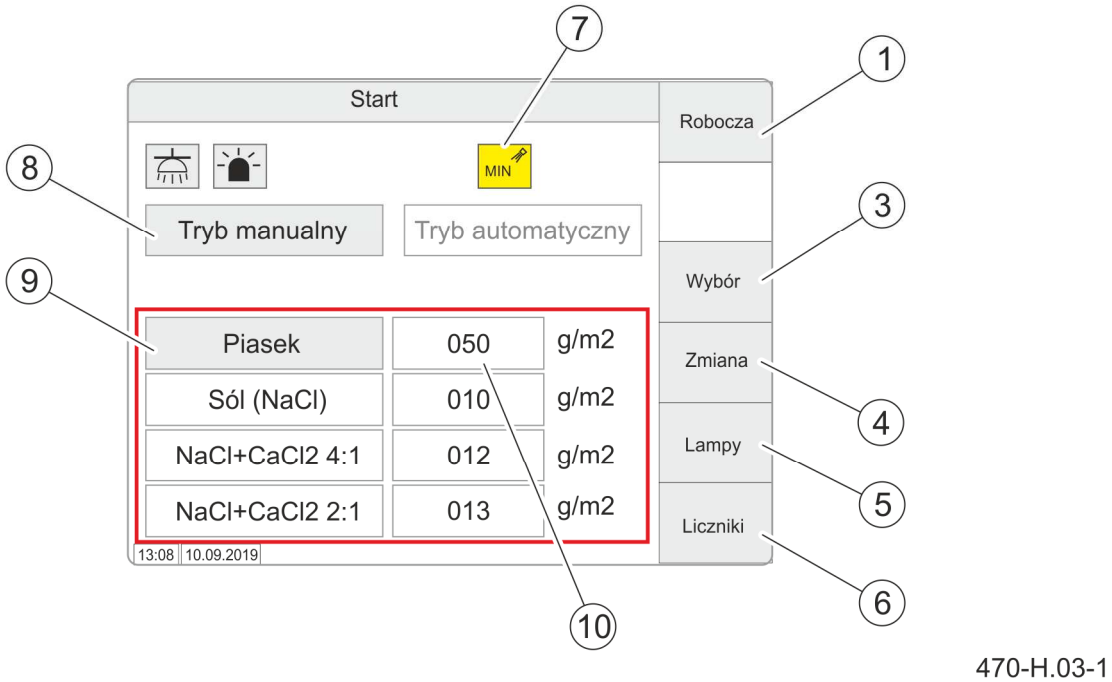


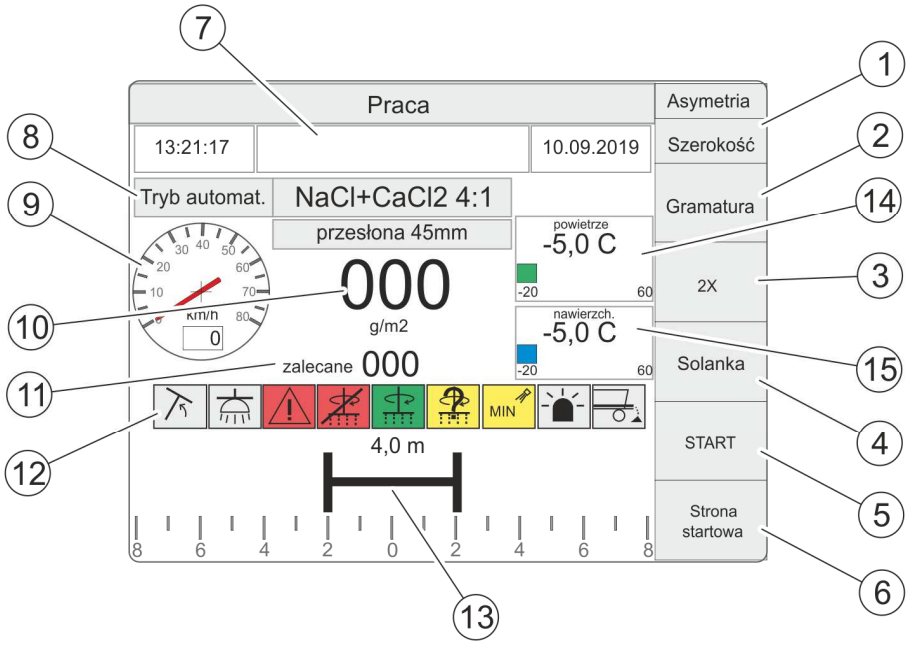
FIGURE 3.10 Home page of control panel display

Description of home page functions is included in TABLE 3.2

TABLE 3.2 Description of functions on control panel home page

MARKING FIGURE 3.10	FUNCTION NAME	DESCRIPTION
1	„Working”	Moving to working page
3	„Selection”	Selecting a field for editing: ** - automatic mode / manual mode - selecting a spreading material
4	„Change”	Editing a selected field
5	„Lights”	Turning on warning lights
6	„Counters”	Moving to counter page
7	-	Information and warning indicators
8	„Manual mode” „Automatic mode”	Manual or automatic working mode is active (option)
9	„Sand”	Currently selected spreading material
10	„050 g/m2”	Preliminary setting of spreading density for a currently selected material

** - *Active selection is marked with a red frame.*



470-H.04-1

FIGURE 3.11 Working page of control panel display

Description of working page functions is included in TABLE 3.3

TABLE 3.3 Description of functions on control panel working page

MARKING FIGURE 3.11	FUNCTION NAME	DESCRIPTION
1	„Asymmetry” „Width”	Editing of asymmetry and spreading width
2	„Spreading density”	Editing of spreading density
3	„2X”	Double dose
4	„Brine”	Activation of brine spraying
5	„Start”	Activation of spreading
6	„Home page”	Moving to home page
7	-	Window of messages and indicator lights
8	„AUTO MODE” „NaCl+CaCl2 4:1” "Barrier opening - 30mm"	Currently selected working conditions
9	„0 km/h”	Current working speed or speed simulation (available in service mode)
10	„000 g/m2”	Defined density
11	"recommended 000"	Recommended density in automatic mode
12	-	Information and warning indicators
13	„4 m”	Spreading pattern (width and asymmetry)
14	"air -5,0 C"	Air temperature (option)
15	"road surface -5,0C”	Road surface temperature (option)

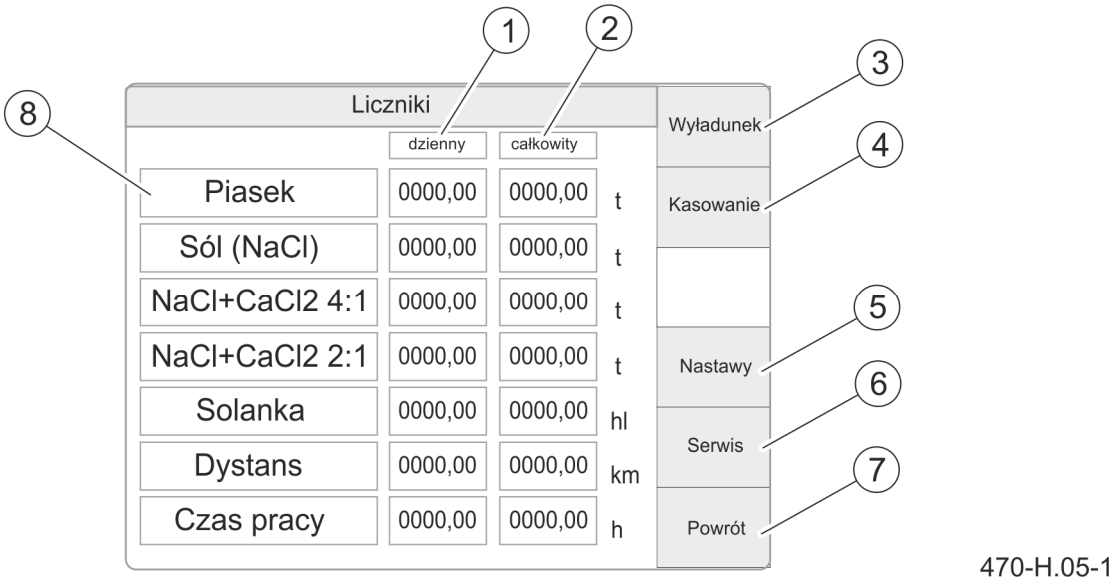


FIGURE 3.12 Counter page of control panel display

Description of the counter page functions is included in TABLE 3.4

TABLE 3.4 Description of functions on control panel counter page

MARKING FIGURE 3.12	FUNCTION NAME	DESCRIPTION
1	"daily"	Daily counter of given material- resettable
2	"total"	Total counter of given material- non-resettable
3	„Unloading”	Start of unloading
4	„Resetting” *	Resetting (zeroing) of daily counter
5	„Settings”	Moving to page with settings (a password must be given in order to enter the page)
6	„Service”	Moving to service page (a password must be given in order to enter the page)
7	„Back”	Back to previous page
8	„Sand”	Type of material

* - press for 3 sec.

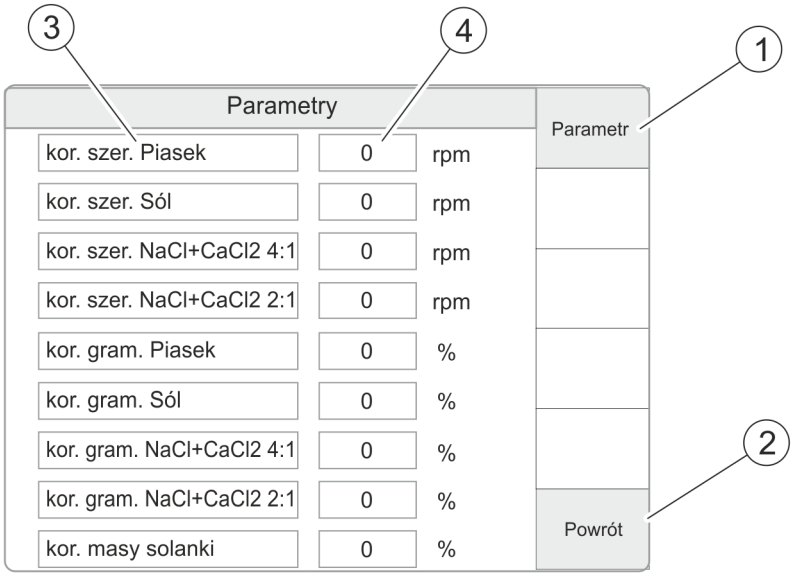


FIGURE 3.13 Material setting page of control panel display

Description of setting page functions is included in TABLE 3.5

TABLE 3.5 Description of material setting page functions

MARKING FIGURE 3.13	FUNCTION NAME	DESCRIPTION
1	„Selection”	Selecting a type of spreading material
2	„Standard”	Selecting standard values
3	„Back"	Back to previous page
4	"1500 g/dm3" "30 %"	Setting of specific gravity of material and percentage content of brine
5	„Brine”	Marked type of material to change

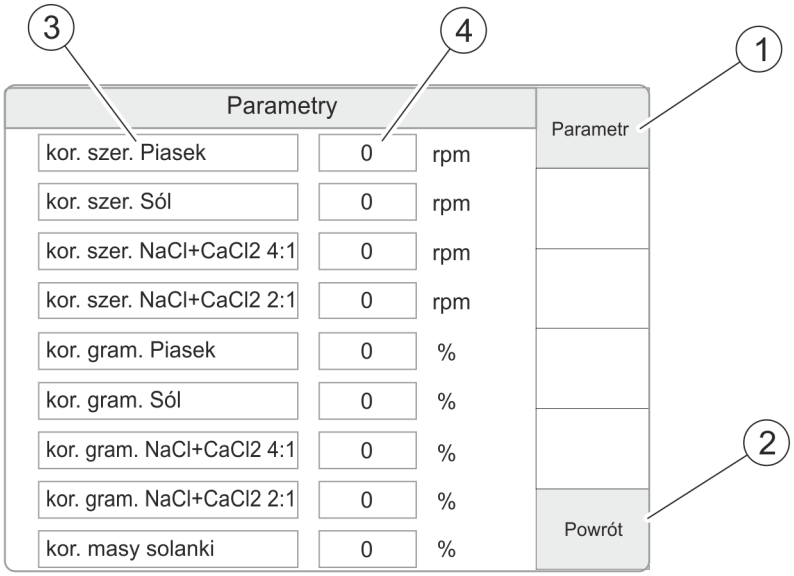


FIGURE 3.14 Parameter correction page

Description of parameter page functions is included in TABLE 3.6

TIP

A password must be given in order to enter the parameter correction page "Parameters".

TABLE 3.6 Description of parameter correction page functions

MARKING FIGURE 3.14	FUNCTION NAME	DESCRIPTION
1	„Parameter”	Selecting a parameter
2	„Back”	Back to previous page
3	"width correction „Sand”	Selecting a type of correction and type of material
4	"0 rpm" or "0%"	Parameter correction value rpm - correction of rotations per minute % - percentage correction

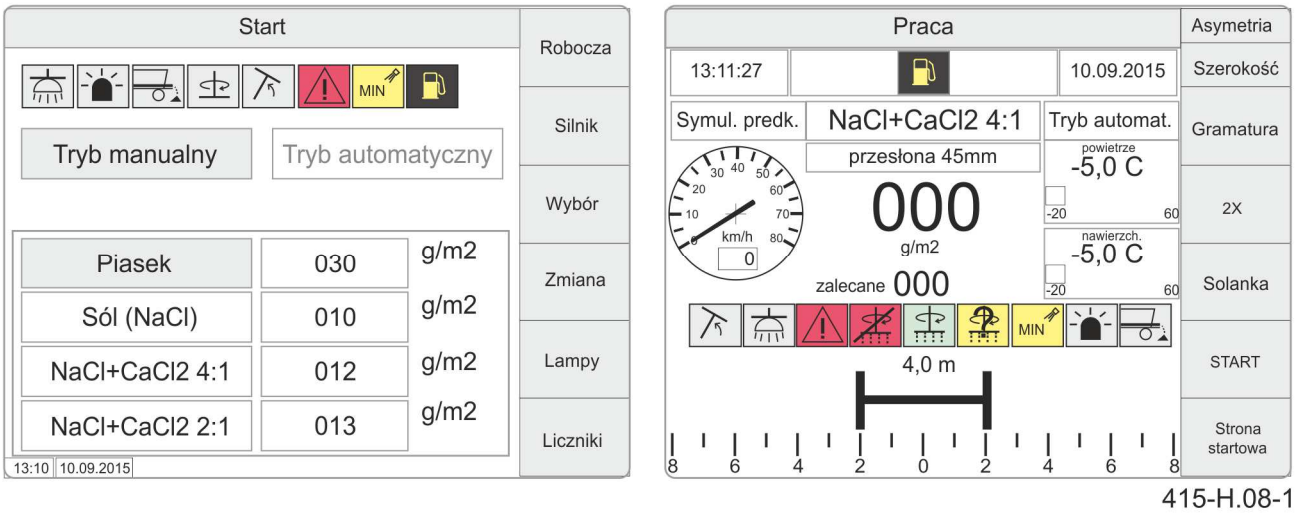
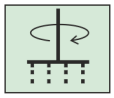
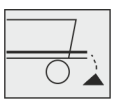


FIGURE 3.15 Arrangement of information-warning indicators

TABLE 3.7 Description of information-warning indicators on the control panel

SYMBOL	DESCRIPTION
	Low fuel level (yellow colour)
	Disc is raised (grey colour)
	Disc lamp is ON (grey colour)
	Error (red colour)
	No spreading (red colour)

SYMBOL	DESCRIPTION
	Spreading is active (green colour)
	Problem with spreading (yellow colour)
	Minimum brine level (yellow colour)
	Beacon light is ON (grey colour)
	Unloading is ON (grey colour)

SECTION

4

CORRECT USE

4.1 PREPARING FOR WORK BEFORE FIRST USE

DANGER

Before using the machine, the user must carefully read this Operator's Manual.

Careless and incorrect use and operation of the machine, and non-compliance with the recommendations given in this Operator's Manual is dangerous to your health.

The machine must never be used by persons who are not authorised to drive carrying vehicles, including children and people under the influence of alcohol or other drugs.

Non-compliance with the safety rules of this Operator's Manual can be dangerous to the health and life of the operator and others.

Before starting the machine, make sure that there are no bystanders in the danger zone.

The manufacturer guarantees that the machine is fully operational and has been checked according to quality control procedures and is ready for use. This does not release the user from an obligation to check the machine's condition after delivery and before first use. The machine is delivered to the user completely assembled (only the wiring harness is loose).

Prior to connecting to carrying vehicle, machine operator must verify the sand spreader's technical condition, prepare it for first use and configure as needed. In order to do this:

- the user must carefully read this Operator's Manual and observe all recommendations, understand the design and the principle of machine operation,
- check technical condition of protective shields and confirm that they open and close correctly,
- inspect sand spreader's individual components for mechanical damage resulting from incorrect transport (dents, piercing, bent or broken components),
- check the condition of protective paint coat,
- check the following: hydraulic oil level in the tank, level of engine lubricating oil,
- add fuel to the fuel tank,
- check all the lubrication points, lubricate the machine as needed according to recommendations provided in section 5,
- check all nut and bolt connections,
- check if spreading discs and blades are correctly installed,

- check tension of conveyor belt.

ATTENTION

Non-adherence to the recommendations contained in the Operator's Manual or incorrect start may cause damage to the machine.

The technical condition before starting the machine must be no cause for concern.

If all the above checks have been performed and there is no doubt as to the machine's good technical condition, it can be connected to carrying vehicle, started and all its individual systems checked. In order to do this:

- connect the machine to carrying vehicle (see „*MACHINE INSTALLATION*”),
- start the engine (see "*ENGINE MAINTENANCE / ENGINE STARTING*"),
- check correctness of electrical system operation,
- check tightness and operation of hydraulic system,
- check operation of hopper system and spreading system,

In the event of a disruption in the operation of the machine immediately discontinue its use, find and remove the fault. If a fault cannot be rectified or the repair could void the warranty, please contact the Manufacturer for additional clarifications.

ATTENTION

Before using the machine always check its technical condition.

The machine must not be used when not in working order.

4.2 INSPECTIONS DURING DAILY OPERATION

- Conduct daily inspection according to the guidelines presented in sections *MAINTENANCE, ENGINE MAINTENANCE.* If necessary, make the necessary repairs immediately.
- Check technical condition of protective shields and wear parts. Check if shields are complete and correctly closed.
- Check the technical condition of belt conveyor and spreading disc, if complete and correctly mounted.
- After completed work, check and possibly remove material accumulated near the tightening roller and on the internal surface of the conveyor belt.

ATTENTION

Do NOT start the machine if its daily inspection was not carried out.

4.3 MACHINE INSTALLATION

4.3.1 INSTALLING THE MACHINE ON THE CARRYING VEHICLE'S LOAD PLATFORM

DANGER

When hitching, there must be nobody under and between the machine and the carrying vehicle.

Exercise caution when hitching the machine to carrying vehicle.

The sand spreader can be installed on the carrying vehicle that meets the requirements contained in table *1.1 REQUIREMENTS FOR CARRYING VEHICLE*.

ATTENTION

Before hitching the sand spreader to carrying vehicle, read the carrying vehicle operator's manual.

ATTENTION

Before installing the machine on the carrying vehicle, remove snow, ice and other contaminants from the load platform.

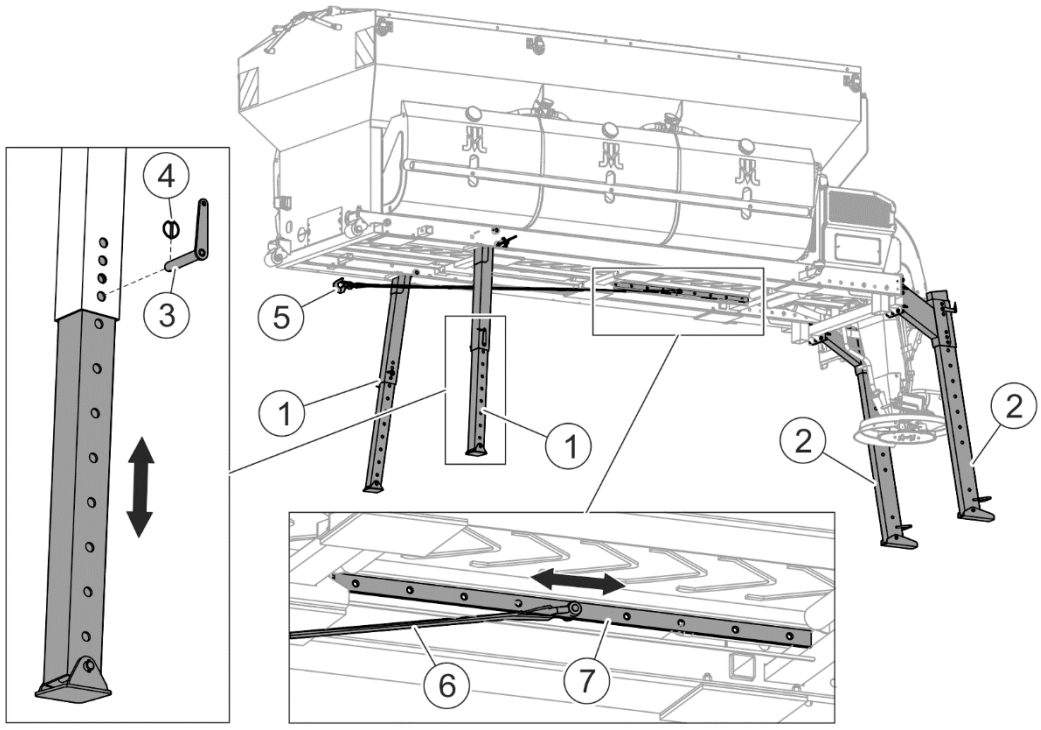


FIGURE 4.1 Parking stands

(1) - front parking stand; (2) - rear parking stand; (3) - pin, (4) - cotter pin, (5) - hook, (6) - belt sling, (7) - mounting

The spreader is equipped with parking stands (FIGURE 4.1). The height of parking stands should be adapted to the height of the carrying vehicle's load platform. Lock the parking stands in their positions using pins (3) and secure with cotter pins (4).

To set the sand spreader position on the carrying vehicle with side walls, use adjustable guides (1) with wheels (FIGURE 4.2) and stops (7) (FIGURE 4.3) installed from the bottom of the frame in the rear of the machine. Set the front and rear guides in such a manner as to ensure that dimension (A) is slightly smaller than the internal width of the carrying vehicle's load platform (FIGURE 4.2).

Reverse the carrying vehicle and position the load platform so as to ensure that the sand spreader is positioned symmetrically on the load platform.

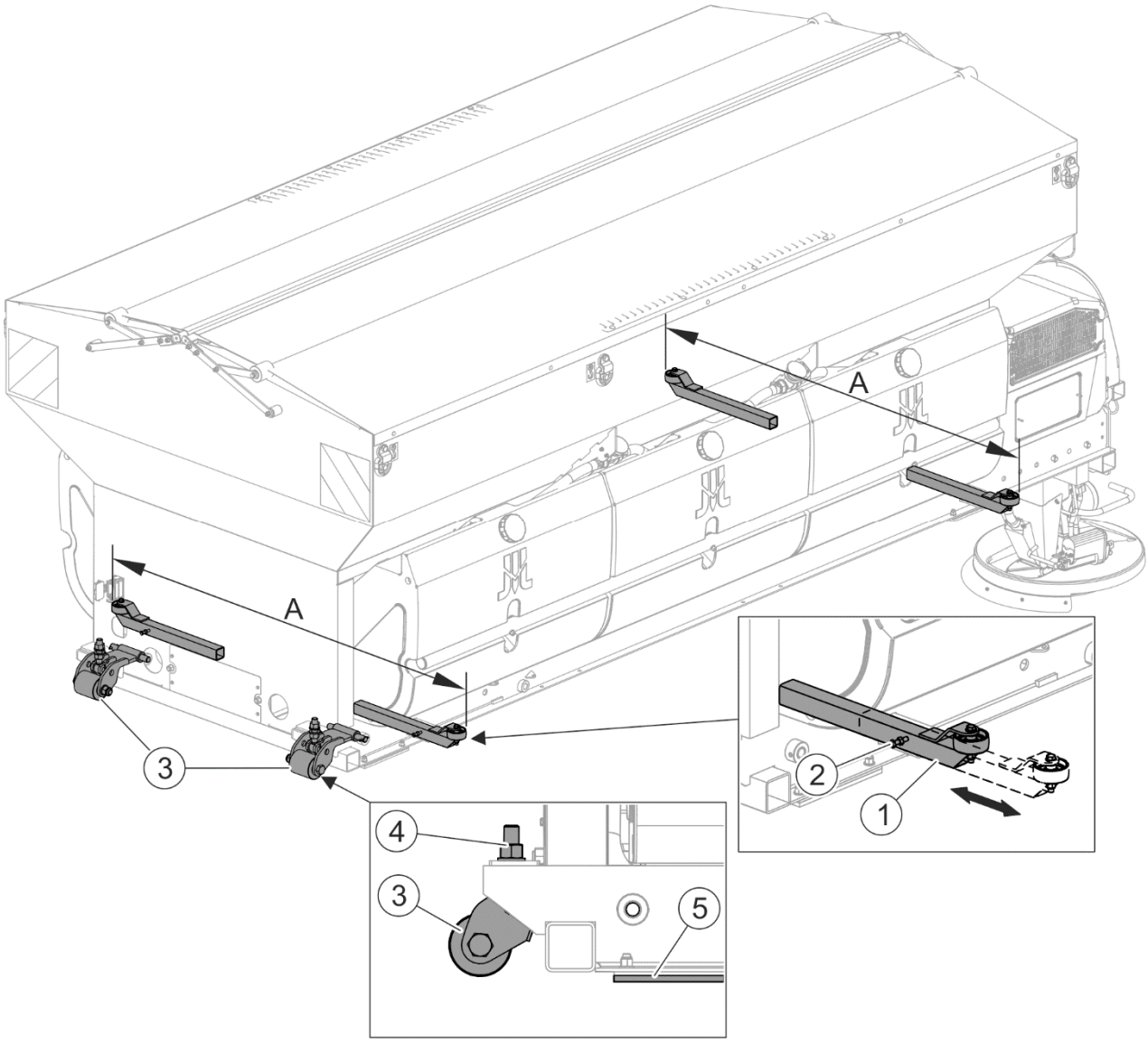


FIGURE 4.2 Guides

(1) - guide; (2) - clamp bolt; (3) - roller, (4) - roller adjustment, (5) - rubber support

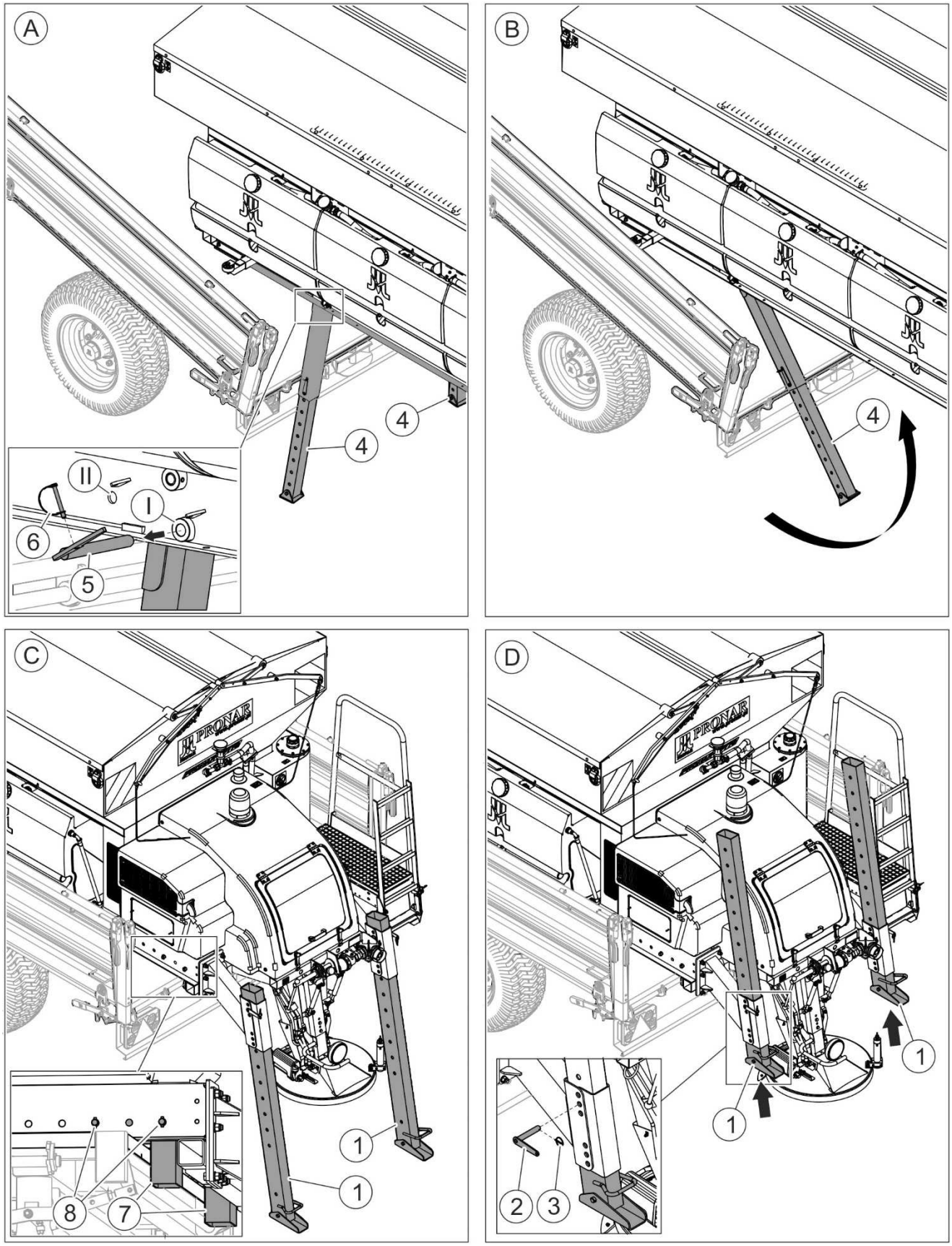


FIGURE 4.3 Machine loading stages

(1) - rear parking stand, (2) - pin (3) - cotter pin; (4) - front parking stand; (5) - front parking stand locking pin, (6) - cotter pin, (7) - stop, (8) - stop locking pin

TIP

Guides (FIGURE 4.2) are used in carrying vehicles which have sufficiently strong side walls of the load platform.

The use of guides (FIGURE 4.2) depends on the method of fixing the machine on the load platform (see 4.3.2 SECURING THE MACHINE TO THE CARRYING VEHICLE'S LOAD PLATFORM).

When the load platform is positioned properly with regard to the sand spreader:

- Reverse the carrying vehicle to the machine so as to ensure that the front part of the machine's lower frame is located above the carrying vehicle's load platform as close as possible to the front parking stands.
- Set the fixing point and attach the belt sling (6) ended with a hook (5) to a fixed and sufficiently strong element of the carrying vehicle (e.g. rear hitch) in order to prevent the machine from sliding off the platform (FIGURE 4.1).
- Unlock the front parking stands (4) on both sides of the machine by unlocking cotter pins (6) and removing securing pins (5). Relocate the pins from hole (I) in the spreader's frame to hole (II) (A - FIGURE 4.3).
- Raise the load platform to such a height (minimum 1,5°) as to ensure that rollers (3) (FIGURE 4.2) are supported on the platform floor (the rollers should be set in such a manner as not to touch the platform floor when the machine is loaded).
- While the carrying vehicle is being reversed with the load platform raised, the front parking stands (4) will be raised above the ground and folded automatically (B - FIGURE 4.3).
- Reverse the carrying vehicle until the stops (7) rest on the rear edge of the platform. The position of the stops should set earlier by means of locking pins (8), depending on the platform length (C - FIGURE 4.3).
- Lower the load platform.
- When the machine is set on the carrying vehicle's load platform, unlock cotter pins (3) and remove pins (2). Raise the rear parking stands (1) and secure them with pins (2) and cotter pins (3) (D - FIGURE 4.3).

ATTENTION

Another person must help the driver in loading and unloading the machine.

4.3.2 SECURING THE MACHINE TO THE CARRYING VEHICLE'S LOAD PLATFORM

DANGER

DO NOT use the machine if it is not properly secured to the carrying vehicle's load platform.

Secure the machine according to the rules for securing loads on vehicles moving on public roads.

The machine positioned on the carrying vehicle should be secured to load platform by means of fastening straps certified according to EN 12195-2 standard and fitted with a tightening mechanism. The sand spreader is fitted with six attachment points for fastening straps. Four of them are used for securing the machine to the carrying vehicle's platform (FIGURE 4.4). In order to correctly secure the sand spreader, the carrying vehicle's load platform must be fitted with attachment points for fastening straps. Otherwise, install such points in a proper manner.

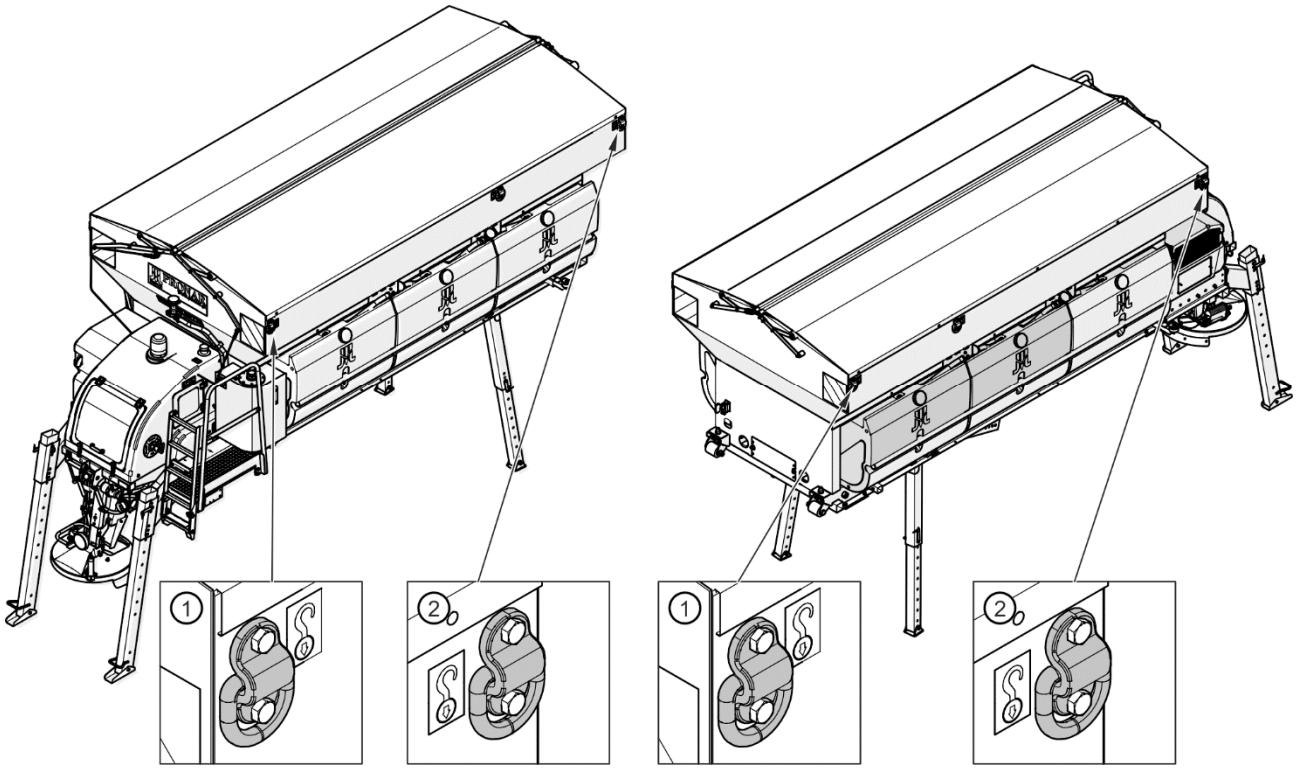


FIGURE 4.4 Attachment points for fastening straps

(1) – rear attachment points for fastening straps; (2) – front attachment points for fastening straps;

Permissible load of fastening straps and method of their attachment depend on a selected method of securing the machine to the carrying vehicle's load platform.

ATTENTION

Install fastening straps in such a manner as to protect them against damage caused by sharp edges of the machine or carrying vehicle.

Fastening strap may be used only if it is not damaged and has a legible label with a proper certificate according to EN-12195-2.

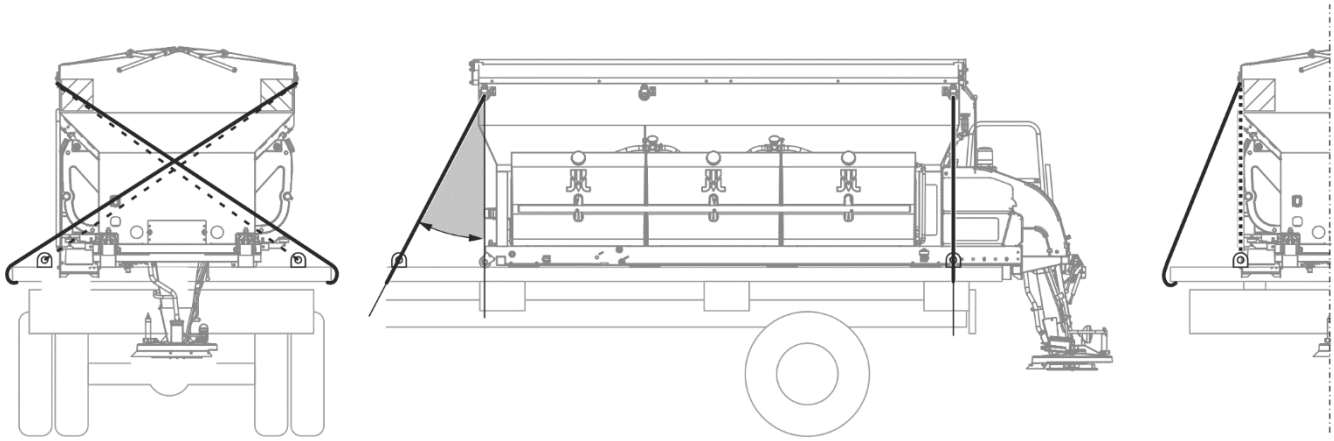


FIGURE 4.5 Securing method 1

Securing method 1 (FIGURE 4.5) is used in case of carrying vehicles with weak or without side walls of load platform. To secure the machine, use four LC 2 500 daN fastening straps according to EN 12195-2 standard and attach them to special catches on the load platform or to the load platform side.

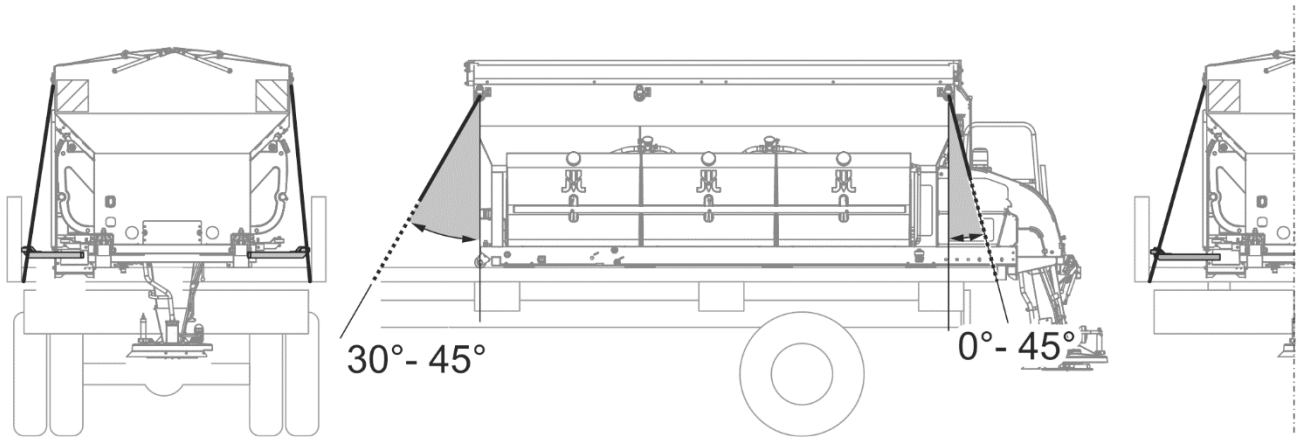


FIGURE 4.6 Securing method 2

Securing method 2 (FIGURE 4.6) is used in case of carrying vehicles with strengthened side walls of load platform. To secure the machine, use four min. LC 2 500 daN fastening straps according to EN 12195-2 standard and attach them to the load platform side.

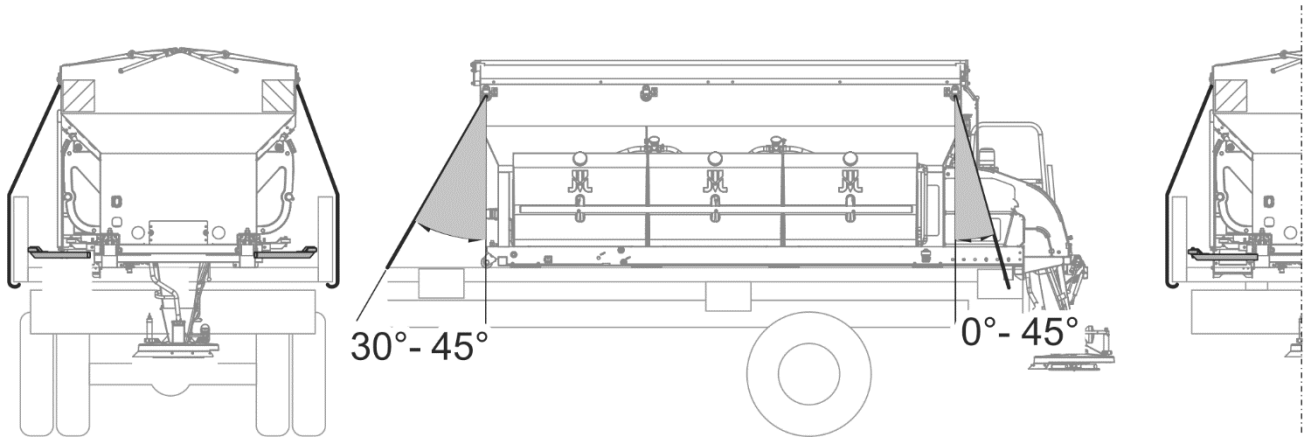


FIGURE 4.7 Securing method 3

Securing method 3 (FIGURE 4.7) is used in case of carrying vehicles with strengthened side walls of load platform. To secure the machine, use four min. LC 2 500 daN fastening straps according to EN 12195-2 standard.

DANGER

If the carrying vehicle's load platform has "tipper" function, switch this function off or lock to prevent accidental use.

4.3.3 CONNECTING THE ELECTRICAL SYSTEM

DANGER

Prior to connecting individual system conduits, the user must carefully read the carrying vehicle operator's manual and observe all Manufacturer's recommendations.

To ensure correct operation of the sand spreader's control system, the carrying vehicle should be equipped with a connection with travel speed pulse input according to ISO 16844-2.

When connecting the sand spreader to carrying vehicle electrical system:

- Connect the leads of the power supply wiring harness (1) equipped with a 3-pin socket (2) to the carrying vehicle's battery (24V). Connect the red lead to the positive end of the vehicle's battery (+) and the black lead to the negative battery end (–) (FIGURE 4.8).
- The vehicle travelling speed signal should be fed to the contact (4) in the 3-pin socket (2) (FIGURE 4.8).

- Connect the plug (3) to the socket (2) of the power supply wiring harness (1). Contact 82 of the plug must be connected to the vehicle travelling speed signal contact (4) (FIGURE 4.8).
- Connect the control panel's main switch (8) to the connector in the wiring harness of the display (5) (if it is not connected) (FIGURE 4.8).
- Connect the control panel (7) to the wiring harness connector (5) (FIGURE 4.8).
- Connect the wiring harness of the display (5) terminated with the 10-pin connector to the 10-pin socket (6) of the sand spreader's wiring harness (FIGURE 4.8).

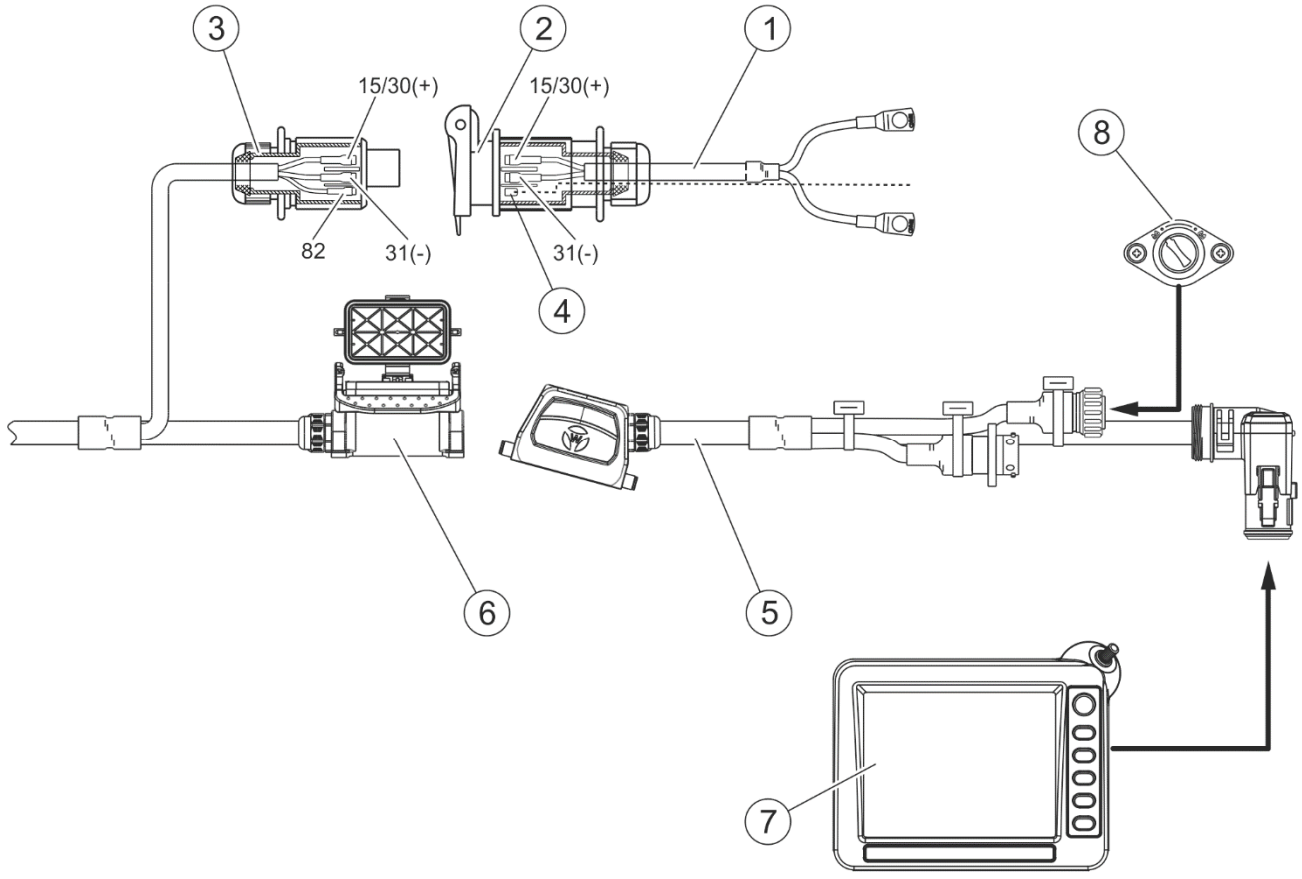


FIGURE 4.8 Connecting the electrical system

(1) - supply wiring harness, (2) - 3-pin socket; (3) - 3-pin plug, (4) - vehicle travelling speed signal, (5) – control panel wiring harness, (6) –10-pin socket, (7) – control panel, (8) –main switch of control panel, 82 - contact of 3-pin plug, 15/30(+) - power supply plus, 31(-) - groung

ATTENTION

During operation, the connecting conduits should be routed so that they do not get entangled in moving machine and carrying vehicle parts.

4.4 PREPARING FOR WORK

4.4.1 SETTING THE SPREADING MECHANISM

DANGER

The spreading mechanism may be lowered, raised and set in any manner only when the machine installed on the carrying vehicle's load platform is switched off.

Before starting work, set the spreading mechanism in a proper manner. Adjustments are made after installing the machine on the carrying vehicle.

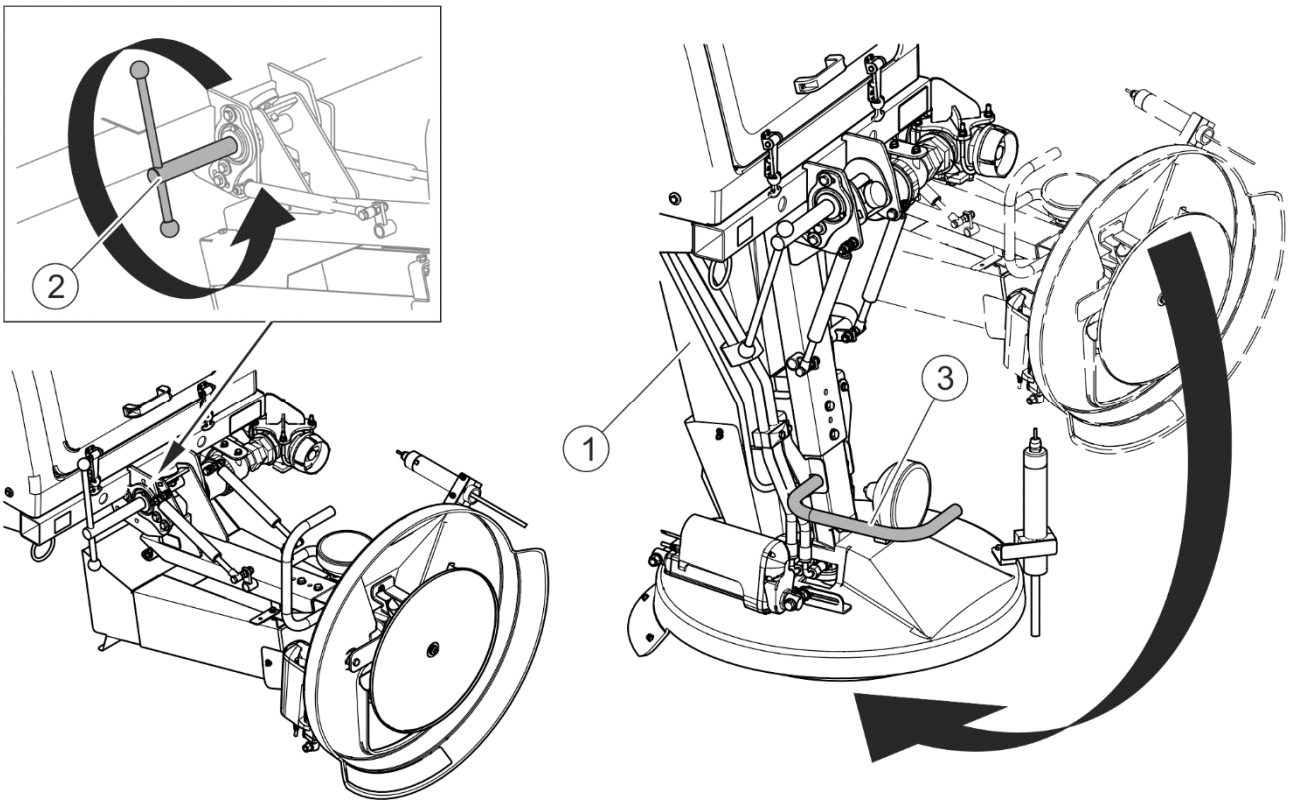


FIGURE 4.9 Lowering the spreading mechanism

(1) - spreading mechanism; (2) - clamp bolt; (3) - grip

Lower the spreading mechanism (FIGURE 4.9) to working position:

- loosen clamp bolt (2),
- lower the spreading mechanism (1) while holding grip (3),
- tighten clamp bolt (2).

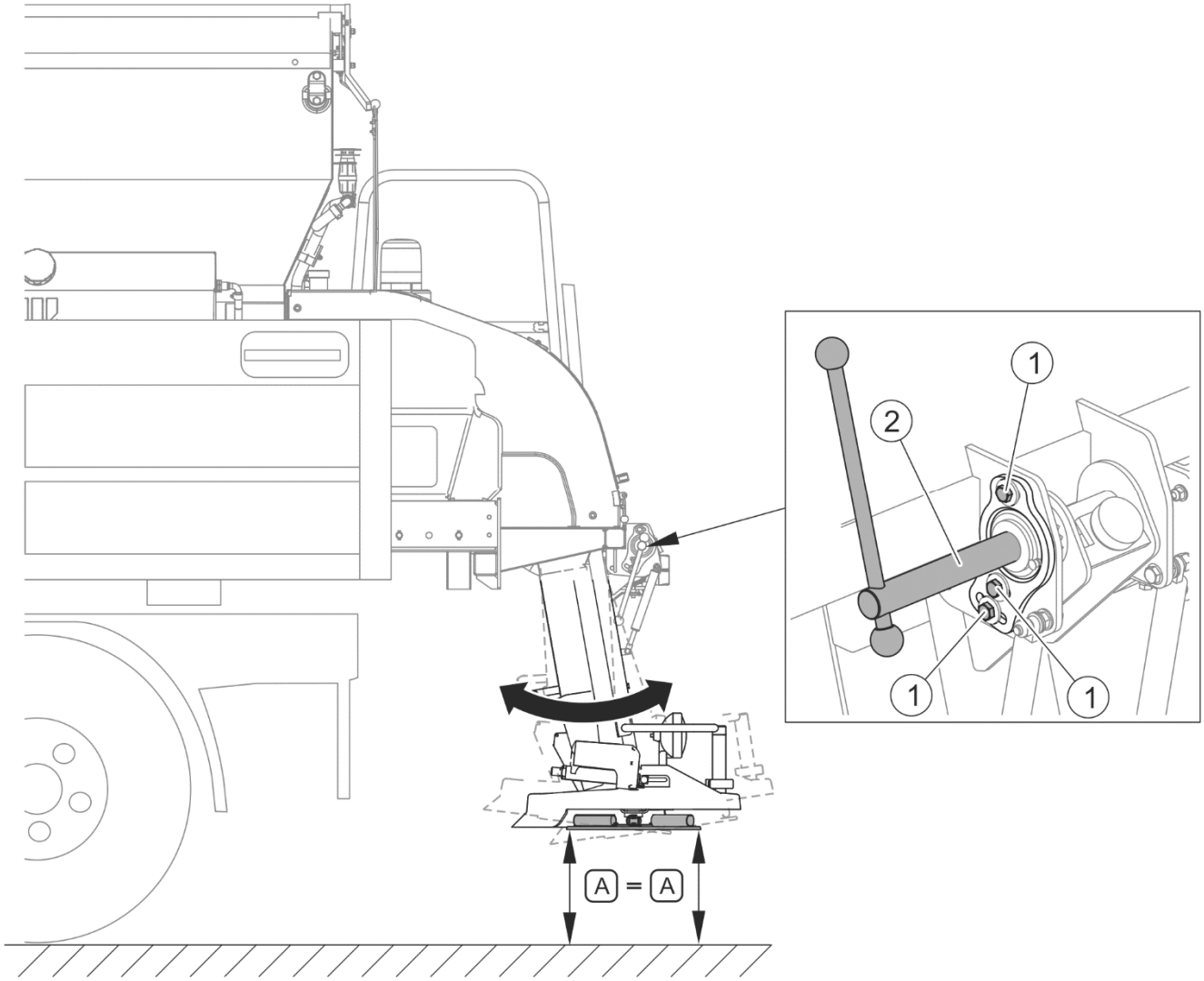


FIGURE 4.10 Levelling the spreading disc

(1) - M10x35 bolt; (2) - clamp bolt

During operation, the spreading disc should be levelled. To check that the spreading disc is level, measure the distances between the disc and the ground in two extreme points (A) to confirm that the distances are the same (FIGURE 4.10). Otherwise, make adjustment as follows:

- check that clamp bolt (2) is tightened,
- loosen three bolts (1),
- shift the spreading mechanism forwards or backwards in order to set the spreading disc in such a manner that distances (A) are the same,
- tighten bolts (1).

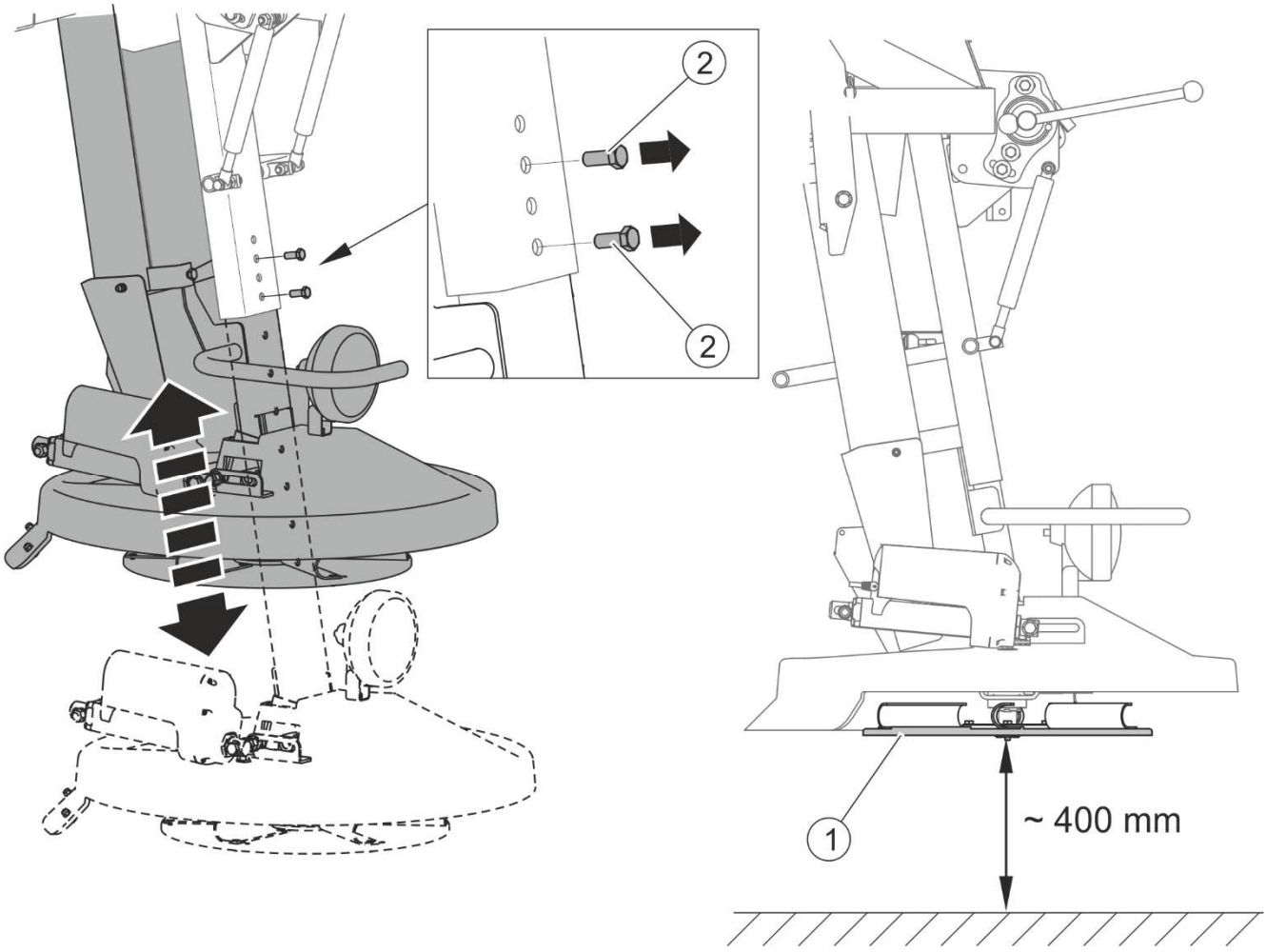


FIGURE 4.11 Setting the distance between the spreading disc and road surface

(1) - spreading disc; (2) - M10x25 bolt

After levelling the spreading disc, check its height above the road surface. After lowering of the spreading mechanism, correctly set spreading disc should be located at the height of 400 ±15 mm above road surface (FIGURE 4.11).

To set the distance between the spreading disc and road surface (FIGURE 4.11):

- unscrew two bolts (2) while holding the spreading mechanism,
- set the spreading mechanism so as to ensure that the distance between spreading disc (1) and road surface is approximately 400 ±15 mm,
- screw bolts (2) into proper holes of the guide.

The distance between the spreading disc and road surface is recommended to be checked again after loading the tank and filling the tank with brine. Please note that the spreading width depends on the height of spreading disc above the road surface.

4.4.2 SETTING THE BELT CONVEYOR BARRIER

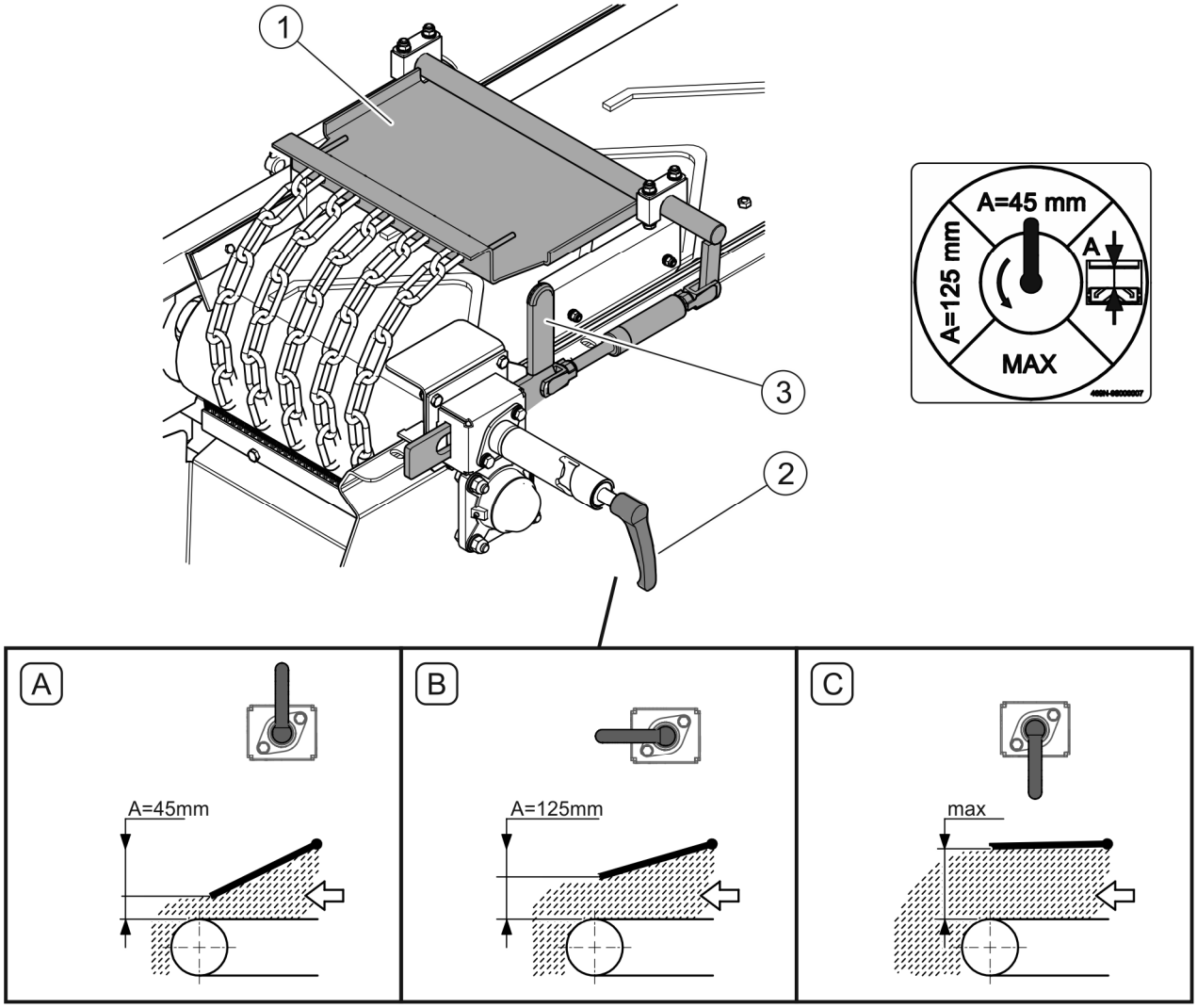


FIGURE 4.12 Setting the belt conveyor barrier

(A) - salt spreading; (B) - sand spreading; (C) - tank emptying; (1) - barrier; (2) - lever handle; (3) - slide

Depending on spreading material, belt conveyor barrier (FIGURE 4.12) should be set in one of the three positions:

- Position (A) – salt spreading (conveyor barrier opening: 45 mm).
- Position (B) – sand spreading (conveyor barrier opening: 125 mm).
- Position (C) – tank emptying (conveyor barrier maximally opened).

To change the position of barrier (1), pull and turn handle (2) to a selected position (A), (B) or (C). Position (C) is used only when unloading material from the tank of parked sand spreader (see *UNLOADING*). Proper position of the barrier can be checked by means of slide (3).

4.5 LOADING THE MACHINE

4.5.1 LOADING THE TANK

DANGER

Loading may be performed only if the sand spreader is switched off and mounted on the carrying vehicle's load platform. Be especially careful when loading the machine.

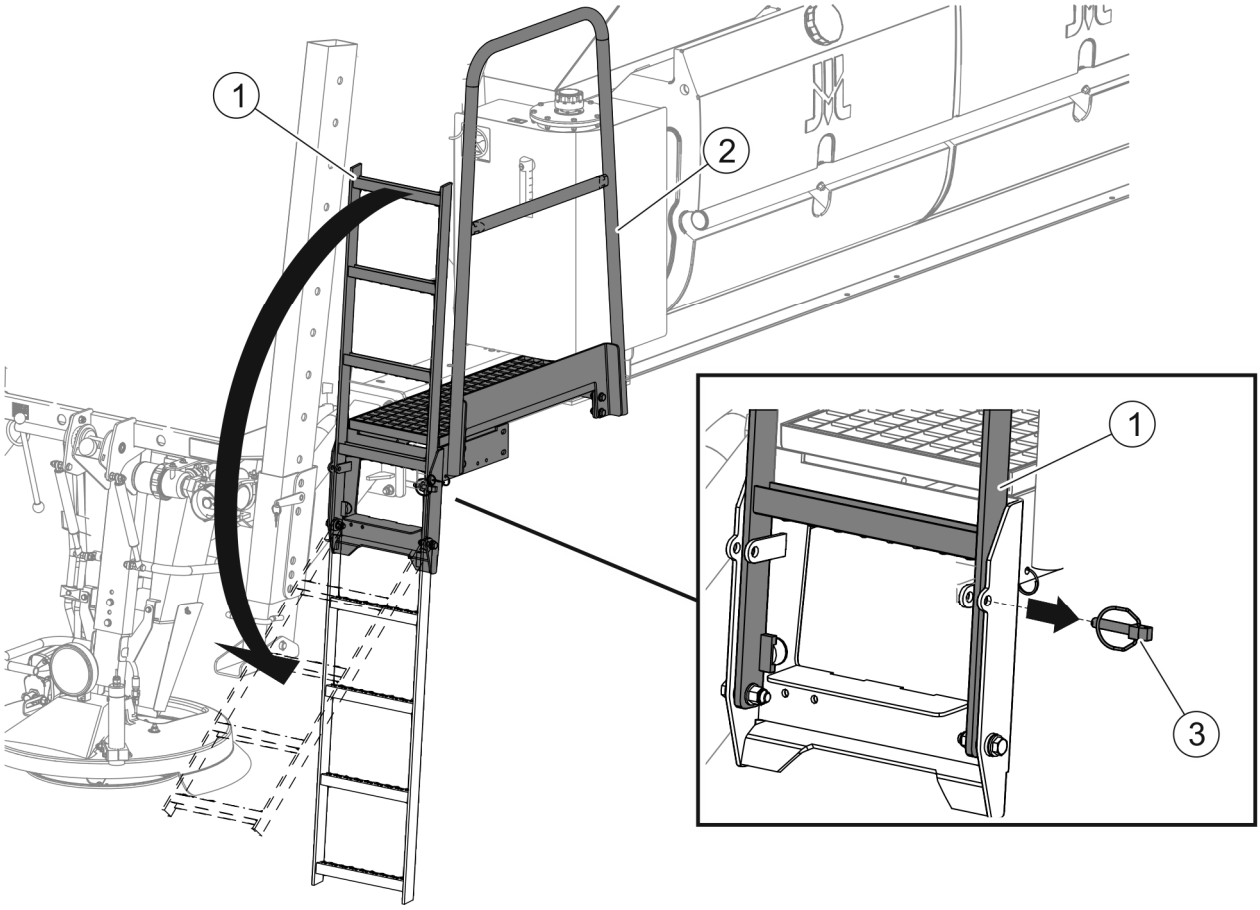


FIGURE 4.13 Platform with ladder

(1) - ladder; (2) - platform; (3) - securing cotter pin

The platform (FIGURE 4.13) fitted with ladder (1) facilitates raising and lowering the tarpaulin cover.

To lower (FIGURE 4.13) the ladder:

- hold the ladder (1) and remove securing cotter pin (3),
- lower the ladder (1).

Release pawl (3) by pulling a cord and raise tarpaulin cover by means of frame lever (4). Tarpaulin cover rising sequence (I) - (II) is shown in (FIGURE 4.14).

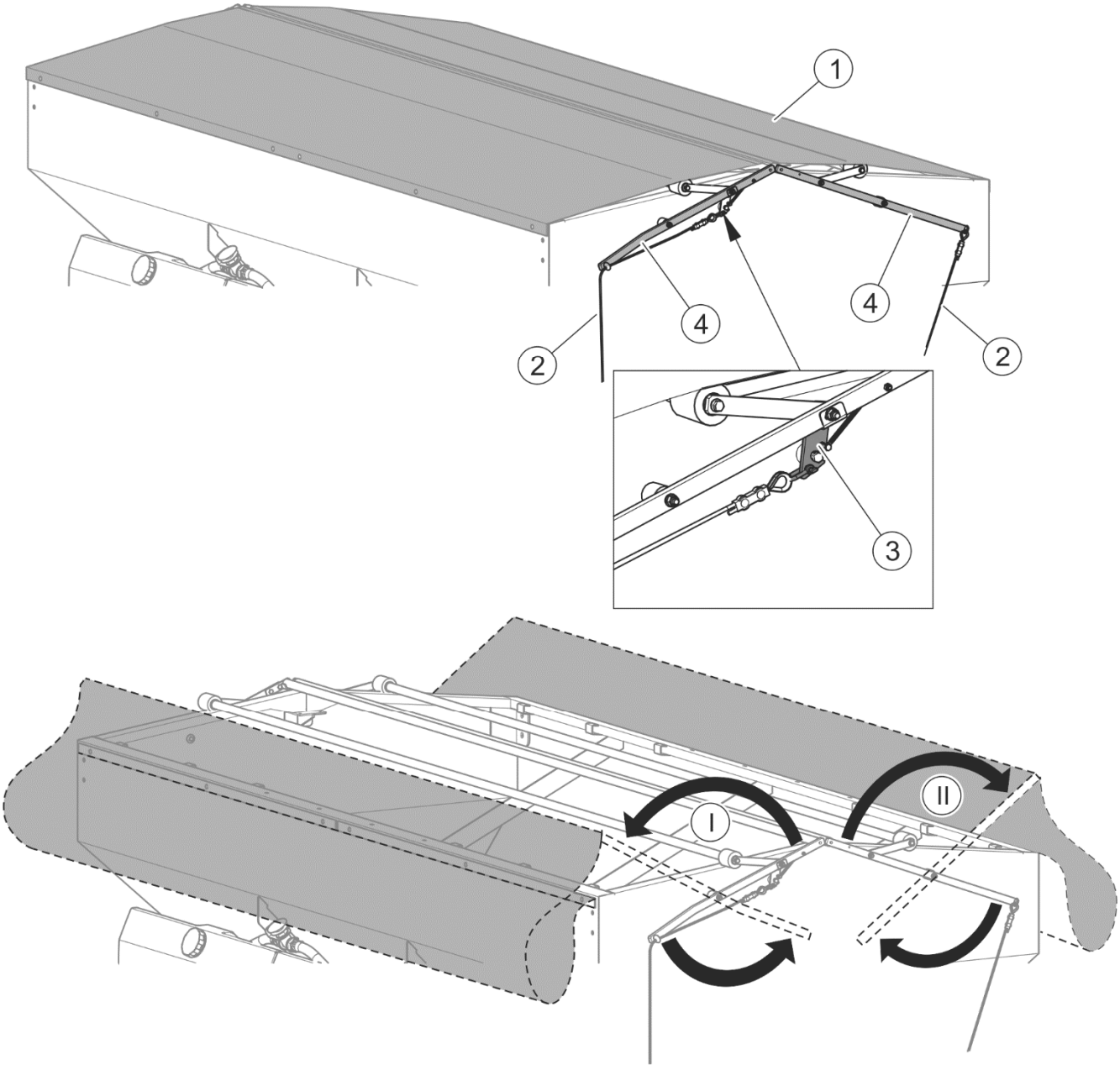


FIGURE 4.14 Raising the tank's tarpaulin cover

(1) - tarpaulin cover; (2) - pawl cord; (3) - pawl; (4) - lever

Before loading, check that there are no foreign objects (tools, stones etc.) in the tank. The tank should be loaded from above through the sieve that prevents lumps of material from entering the tank. When loading the tank, it is recommended to use a front loader or belt conveyor. Efforts should be made to evenly distribute the load in the tank in order to ensure proper stability of the sand spreader. Avoid throwing material into the tank from a great height. After loading, cover the tank with tarpaulin cover (FIGURE 4.14) and make sure that the pawl (3) is locked.

ATTENTION

Spreading agents must be prepared in accordance with the regulations concerning winter road maintenance in force in the country in which the sand spreader is used. Spreading agents other than those recommended by the Manufacturer must not be used.

4.5.2 FILLING THE TANK WITH BRINE

DANGER

Filling the tanks with brine should be performed only if the sand spreader is switched off and mounted on the carrying vehicle's load platform. Be especially careful when filling the tanks.

Each time before filling the tanks with brine, check and, if necessary, tighten the bolts fixing the tanks to the frame.

The tanks can be filled with brine (FIGURE 4.15) through tank openings secured with plugs (1) or through STORZ 52C connection (2) secured with a plug (3).

In order to fill the tanks with brine (FIGURE 4.15) through connection (2):

- set valve lever (4) in position (B),
- unscrew plug (3) and connect filling hose to connection (2),
- set valve lever (4) in position (A) and start filling,
- brine level is checked on brine level indicator (5) located on the tank,
- when filling is completed, set lever (4) to position (B),
- disconnect filling hose and tighten plug (3).

TIP

If filling with brine is performed too quickly, the tank to which brine is poured directly may be filled faster than the other tanks. In such a case, stop filing and wait until level of liquid in all tanks is the same.

To fill the tanks directly through filler opening, unscrew plug (1) and insert filling hose to filler opening. It is enough to fill one tank only, because all tanks are connected. When filling is completed, tighten the tank plug.

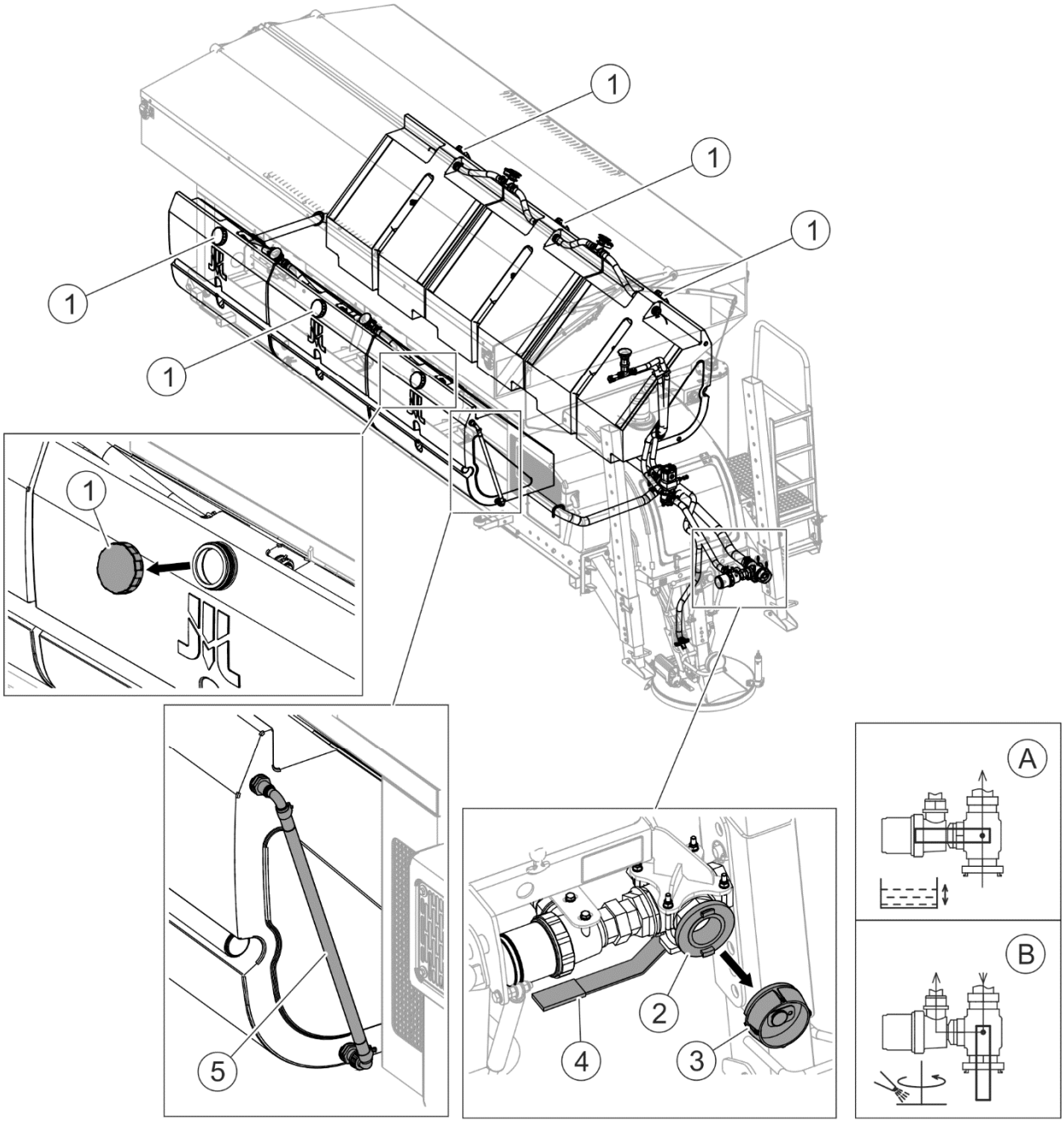


FIGURE 4.15 Filling the tank with brine

(1) - tank plug; (2) - STORZ 52C connection; (3) - valve plug; (4) - valve lever; (5) - brine level indicator; (A) - valve in position „filling/emptying”; (B) - valve in position "brine spraying";

4.6 MACHINE OPERATION

4.6.1 PRELIMINARY INFORMATION

DANGER

The machine must not be used when not in working order.

Proper starting of the sand spreader includes a range of preparatory activities such as:

- daily inspection,
- machine installation,
- preparing for work and loading,
- starting the engine,
- starting proper working.

If no contraindications for starting the sand spreader are found, commence starting the machine.

ATTENTION

Do NOT start the machine without making certain that it is in perfect technical condition.

4.6.2 STARTING THE ENGINE

ATTENTION

Before starting the engine make certain that all shields are closed.

SCOPE OF ACTIVITIES

- To switch on power supply of control panel, turn main switch (FIGURE 4.16) clockwise to (ON) position - switched on (the switch is installed on the control panel power lead).
- Start the engine (see chapter ENGINE MAINTENANCE / STARTING THE ENGINE)

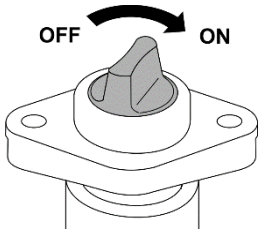


FIGURE 4.16 Main switch of control panel

(ON) - switched on; (OFF) - switched off

4.6.3 START OF SPREADING

Mark mode selection field (A) on "START" home page of the control panel (FIGURE 4.17) by means of push-button (1) "Selection". In field (A), select "Manual mode" by means of push-button (2) "Change". Move to field (B) by means of push-button (1) „Selection" and select the type of material to be spread. In field (B), by means of „Change" push-button, select the type of material to be spread that is currently in the tank. By means of push-button (3), turn on warning lamp (6) at the rear of the machine and lamp (7) near the spreading disc.

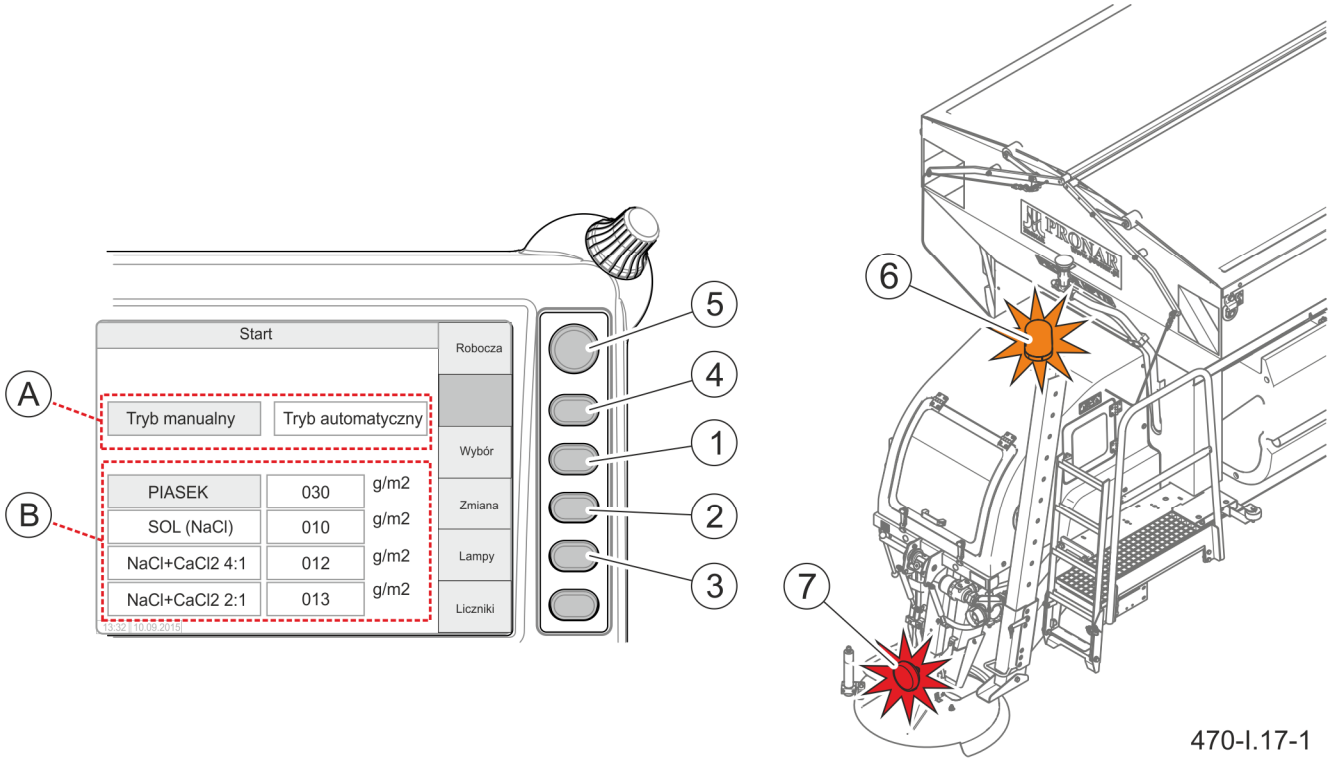


FIGURE 4.17 Activating individual functions on control panel home page

(A) - working mode selection field; (B) - material selection field; (1),(2),(3),(4),(5) - function push-buttons; (6) - beacon light; (7) - rear light

On control panel working page "Operation" (FIGURE 4.18) , activate spreading by means of push-button (1); "Start" function will be highlighted. Activation of spreading disc drive and belt conveyor is signalled by indicator light (4), (5), or (6). Brine spraying is switched on and off by

means of push-button (2) "Brine" (not active for sand). Push-button (3), marked „2X", is used for momentary doubling of spreading material dose.

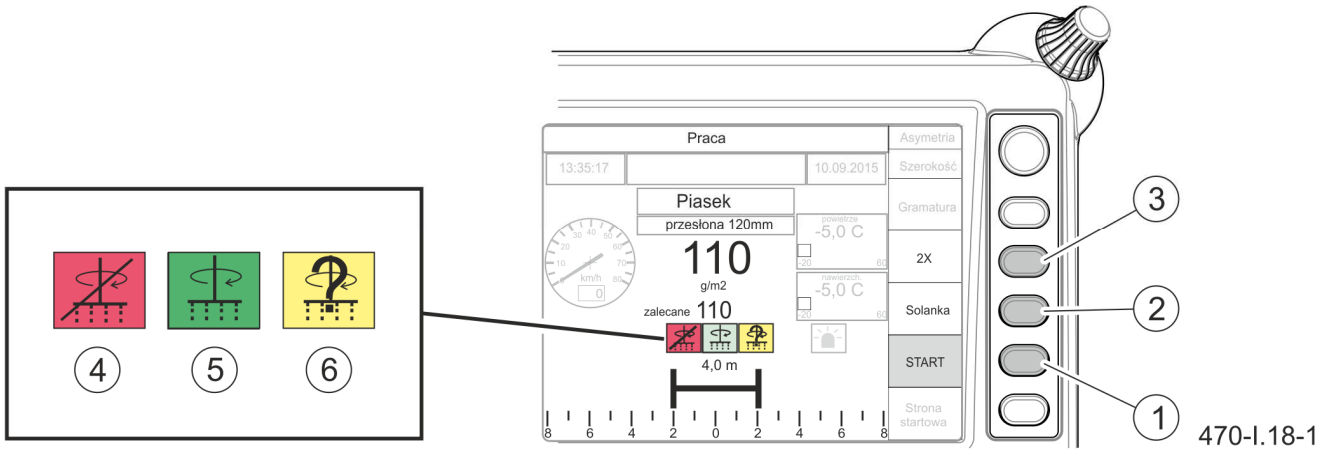


FIGURE 4.18 Start of spreading

(1) - spreading activation push-button; (2) - brine spraying activation push-button; (3) - double dose push-button; (4)(5)(6) - spreading condition indicator lights

ATTENTION

The optical sensor detects 3 conditions. Spreading - green indicator light, no spreading - red indicator light, clogged sensor - yellow indicator light and green indicator light are ON simultaneously.

Spreading can be started before moving off or during travel. Adjust travelling speed to road conditions and spreading material:

- travelling speed during sand spreading: 10 – 40 km/h,
- travelling speed during salt spreading: 10 – 70 km/h.

DANGER

There must be no bystanders within the sand spreader working zone.

4.6.4 CHANGING WIDTH AND ASYMMETRY OF SPREADING

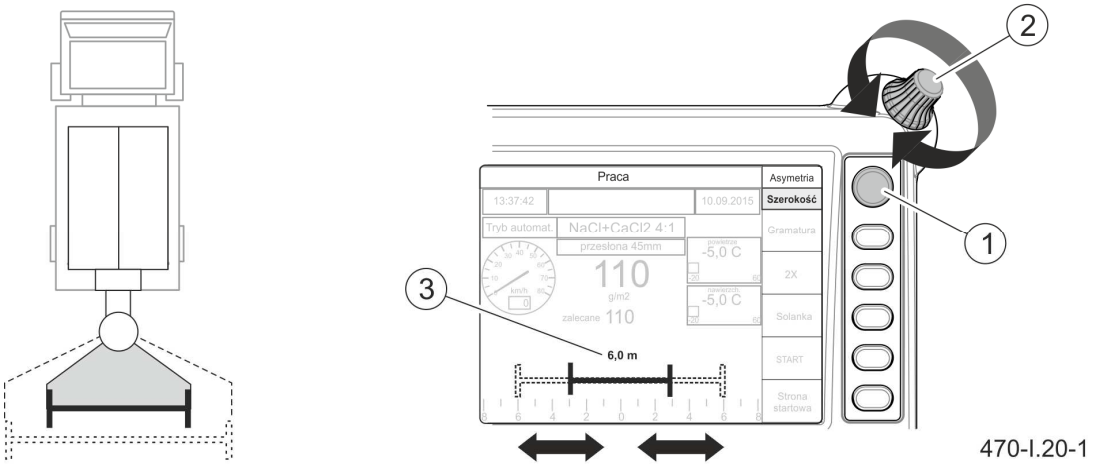


FIGURE 4.19 Adjustment of spreading width

(1) - selection push-button "Asymmetry-Width"; (2) - parameter value change knob; (3) - current spreading width

Spreading width is changed (FIGURE 4.19) from the operator cab, on control panel working page ("OPERATION"). To change spreading width:

- highlight "Width" function by means of push-button (1),
- turn knob (2) to set a required width (3) – (2 m ÷ 12 m for salt and mixtures, 2 m ÷ 6 m for sand)

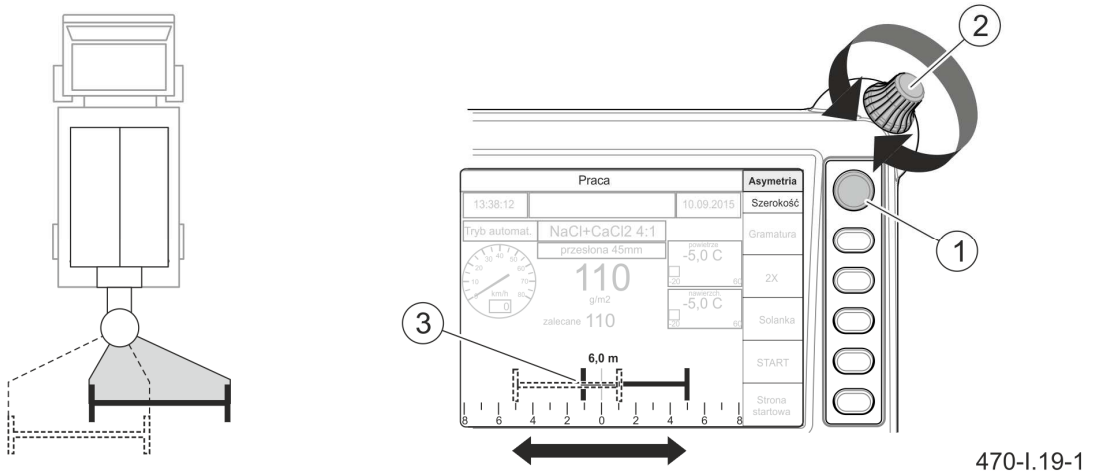


FIGURE 4.20 Changing asymmetry of spreading

(1) - selection push-button "ASYMMETRY-WIDTH"; (2) - parameter change knob; (3) - graphic image of spreading asymmetry

To change asymmetry of spreading, highlight "Asymmetry" field on working page "Operation" by means of push-button (1). Turn knob (2) to move current spreading width to the right or to the left (FIGURE 4.20).

For example (FIGURE 4.20), in the figure above, for spreading width of 6 m, spreading asymmetry is shifted to the right.

4.6.5 OPERATION IN AUTOMATIC MODE (OPTION)

Optionally, the sand spreader can operate in automatic working mode. In automatic working mode, the electronic system selects a proper dose of material on the basis of road surface temperature measurement and selected, defined working mode. Three working modes are defined in the automatic working mode according to the guidelines for winter road maintenance issued by the General Directorate of Domestic Roads and Motorways:

- **T1** – prevention of formation of black ice, glazed frost, hoarfrost,
- **T2** – prevention of snow freezing to road surface,
- **T3** – elimination of black ice, hoarfrost, thin layers of compacted or icy snow, remains of fresh snow.

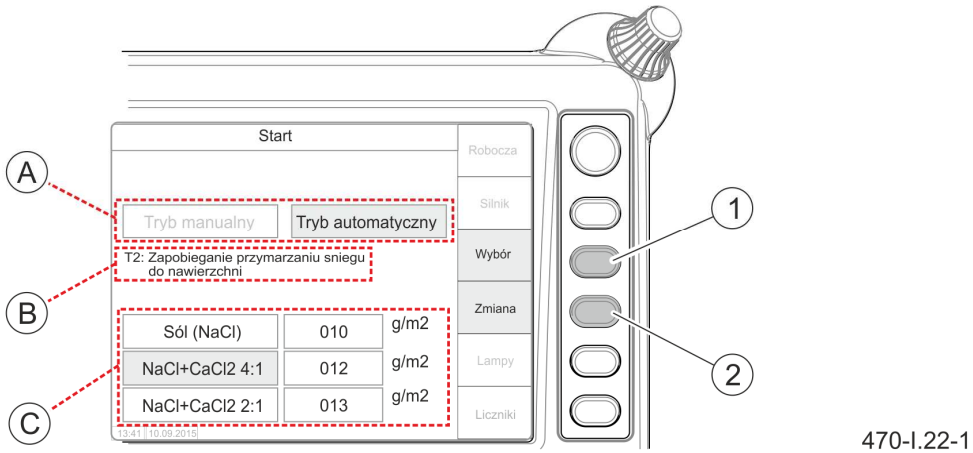


FIGURE 4.21 Selection of automatic mode (option)

(1) - push-button for selecting field A,B or C for editing; (2) - push-button for changing a marked field;(A) - field of working mode type (automatic/manual); (B) - field for selecting automatic mode type T1, T2, T3; (C) - field for selecting a spreading material

To select automatic mode (option):

- mark working mode type selection field (A) on „Start” home page of the control panel (FIGURE 4.21)by means of push-button (1),
- select "Automatic mode" by means of push-button (2) "Change" in field (A),

- select one of the three defined modes T1,T2,T3 by means of push-button (1) "Selection" in field (B),
- by means of push-button (1), mark field (C) and then, by means of push-button (2) „Change", select (C) type of material to be spread that is currently in the tank (automatic mode can not be selected for „Sand").

TIP

Doses of material for particular temperature ranges and working modes are defined in table included in the guidelines for winter road maintenance issued by the General Directorate of Domestic Roads and Motorways (Attachment to Ordinance No. 18 of General Director of Domestic Roads and Motorways of 30 June 2006).

On control panel working page ("Operation") (FIGURE 4.22), the operator can correct the dose for a defined automatic mode after selecting "Spreading density" function by means of push-button (1). Correction is made by means of knob (5). Recommended density (3) for a defined mode T1, T2 or T3 is displayed below spreading density set by the operator (2) (FIGURE 4.22).

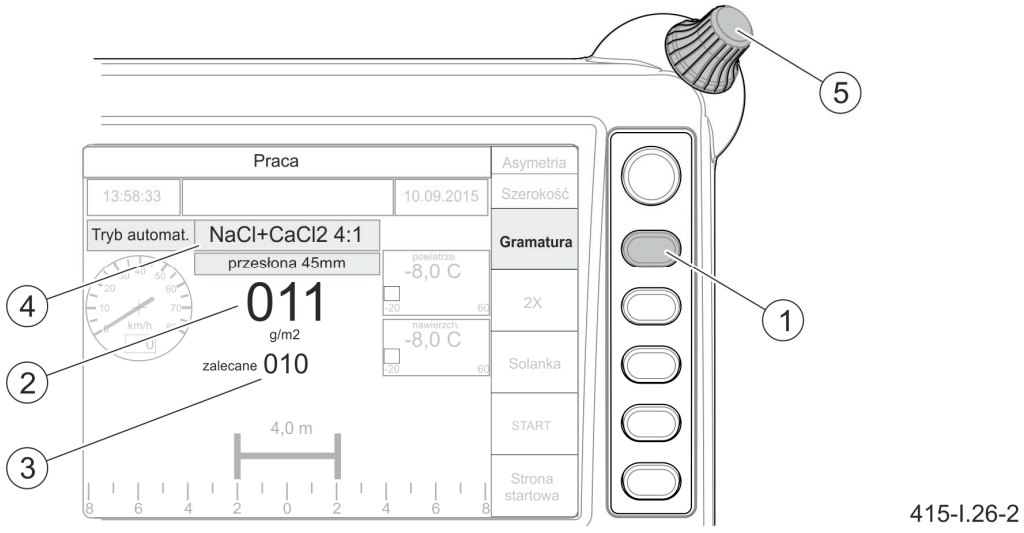


FIGURE 4.22 Correction in automatic mode (option)

(1) - dose correction push-button; (2) - values set by the operator; (3) - recommended value; (4) - previously selected material and working mode; (5) - parameter change knob

TABLE 4.1 Examples of specific weights of spreading materials

Type of material	Material name	Specific weight [g/dm^3]	Weight per m^3 [kg]
Solid material	Medium sand	1,600	1,600
	Coarse sand	1,600	1,600
	Fine salt (NaCl)	1,200	1,200
	Coarse salt (NaCl)	1,320	1,320
Type of material	**Material name**	**Specific weight [g/dm^3]**	**Weight per 1 000 litres [kg]**
Liquid	Calcium solution ($CaCl_2$)	1,160	1,160
	Saline solution (NaCl)	1,200	1,200

TIP

When road surface temperature change is detected in automatic working mode, the electronic system will change preset spreading density while maintaining the value added or subtracted previously by the operator.

If spreading density is not corrected by the operator in automatic mode, the preset value and recommended value will be equal.

4.6.6 STOPPING OF SPREADING AND THE ENGINE

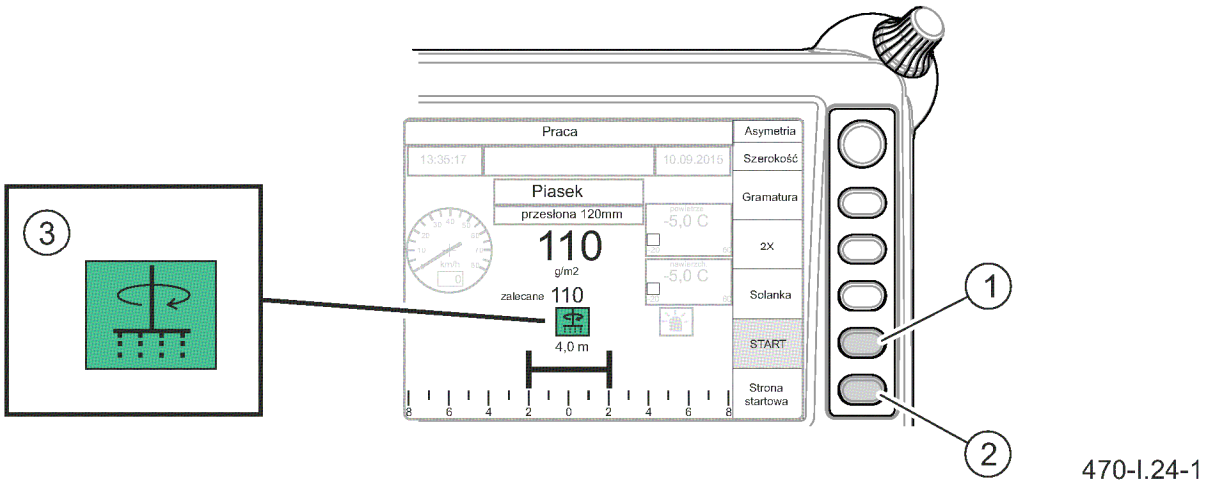


FIGURE 4.23 Stopping of spreading

(1) - spreading activation/deactivation push-button; (2) - return to home page push-button; (3) - indicator light of activated spreading

On control panel working page ("Operation") (FIGURE 4.23), switch off spreading by means of push-button (1). Indicator light (3) will go out when the spreading disc drive and the belt conveyor are stopped. Next, go to "Start" home page by means of push-button (2).

Stop the engine (see *ENGINE OPERATION / ENGINE STOP*)

Switch off the sand spreader's lights by means of push-button (2) and set the main switch of the control panel to OFF position.

ATTENTION

Do not turn the engine off when working at full load. Before turning the engine off, let it run at low speed for a short time.

4.7 DRIVING ON PUBLIC ROADS

When driving on public roads, respect the road traffic regulations, exercise caution and prudence. Make sure that the machine is correctly attached to the carrying vehicle. During operation, ensure that there is suitable visibility, turn on the orange beacon light at the rear of the machine. Special attention should be paid to the bystanders likely to be near the working machine.

DANGER

During spreading, adjust travelling speed to the prevailing road conditions and do not exceed the following values:

- **travelling speed during sand spreading: 10 – 40 km/h**
- **travelling speed during salt spreading: 10 – 70 km/h**

Avoid ruts, depressions, ditches or driving on roadside slopes. Driving across such obstacles could cause the carrying vehicle and the machine to suddenly tilt. Driving near ditches or canals is dangerous as there is a risk of the slope collapsing. Speed must be sufficiently reduced before making a turn or driving on an uneven road or a slope. For the period of sand spreader operation, protect the lifting system of the carrying vehicle's load platform (if any) against automatic or accidental activation.

4.8 UNLOADING

4.8.1 EMPTYING THE TANK

DANGER

Before leaving the cab turn off the engine, engage the parking brake and secure the vehicle's cab against access of third persons.

Exercise caution while unloading.

Before dismounting the sand spreader from the carrying vehicle's load platform, before adjusting works, repairs and in case of spreading material change, the machine's tank should be completely emptied. In order to do this:

- raise the spreading unit and lock it in the upper position (FIGURE 4.24),
- set the belt conveyor barrier to maximally open position (FIGURE 4.25),
- start the engine,
- on control panel "Counters" page, select "Unloading" function,

To raise the spreading mechanism for unloading (FIGURE 4.24) do the following:

- loosen clamp bolt (2),
- raise spreading mechanism (1) while holding grip (3), this will be signalled by "Raised disc" indicator light (FIGURE 4.24)
- tighten clamp bolt (2).

ATTENTION

Do NOT dismount the sand spreader (from the carrying vehicle's platform) if its tank is filled with material.

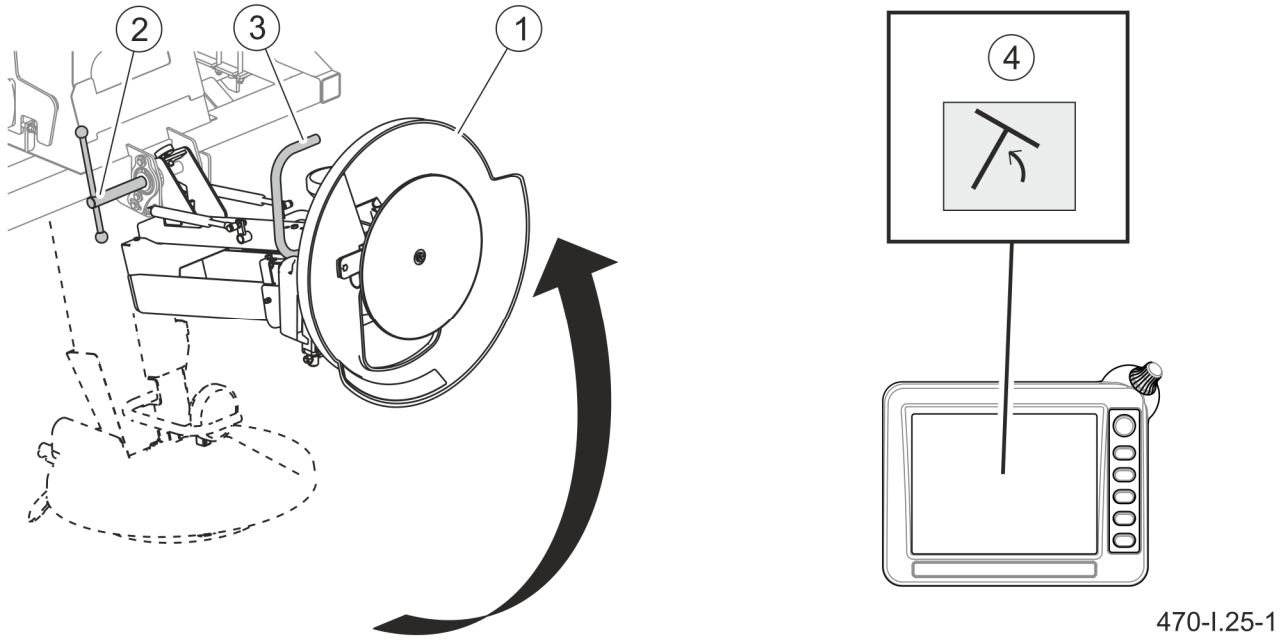


FIGURE 4.24 Raising the spreading mechanism

(1) - spreading mechanism; (2) - clamp bolt; (3) - grip; (4) - raised disc" indicator

To set the barrier (1) for unloading (FIGURE 4.25) turn and pull the pin (2). The barrier is set to maximally open position (FIGURE 4.25) only when material is being unloaded from the tank.

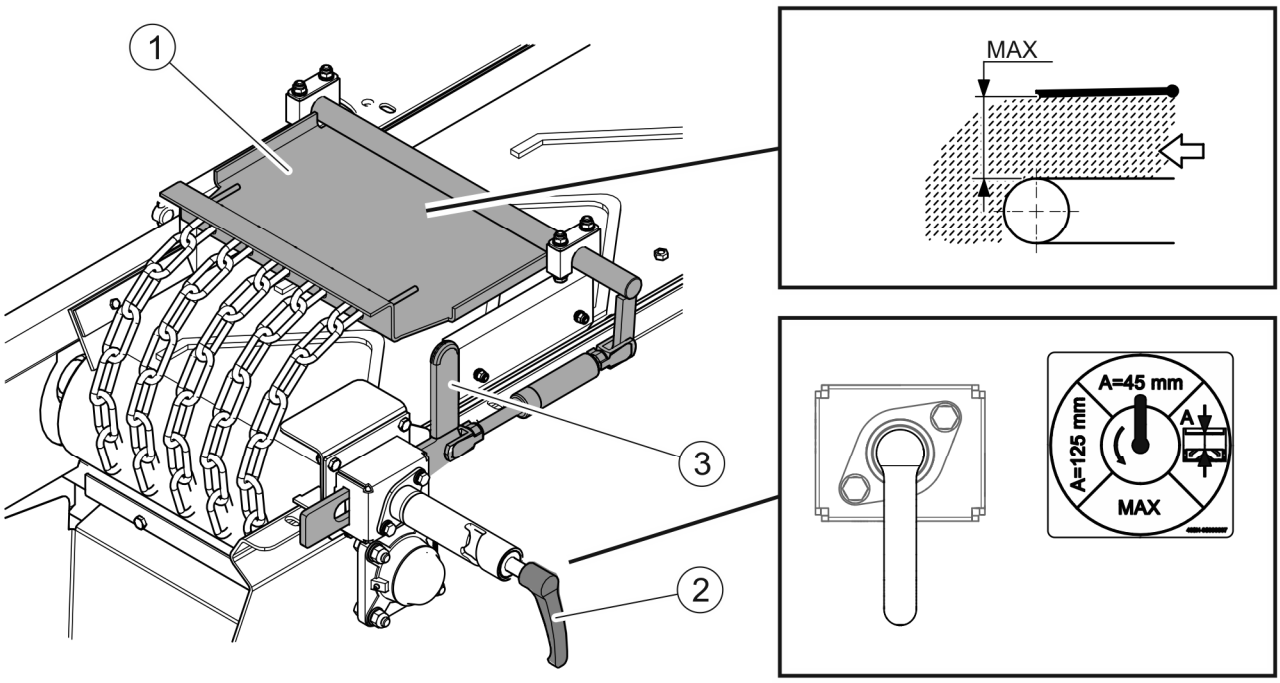


FIGURE 4.25 Setting the belt conveyor barrier for unloading

(1) - barrier; (2) - locking pin; (3) - slide

When the tank is empty, switch off "Unloading" function on the control panel and turn off the engine. Set the belt conveyor barrier to proper position.

4.8.2 EMPTYING BRINE TANKS

Before dismounting the sand spreader from the carrying vehicle's load platform and before repairs of the spray system, empty the brine tanks.

ATTENTION

Before unscrewing plug (2), make sure that valve lever (1) is in position (B) (FIGURE 4.26).

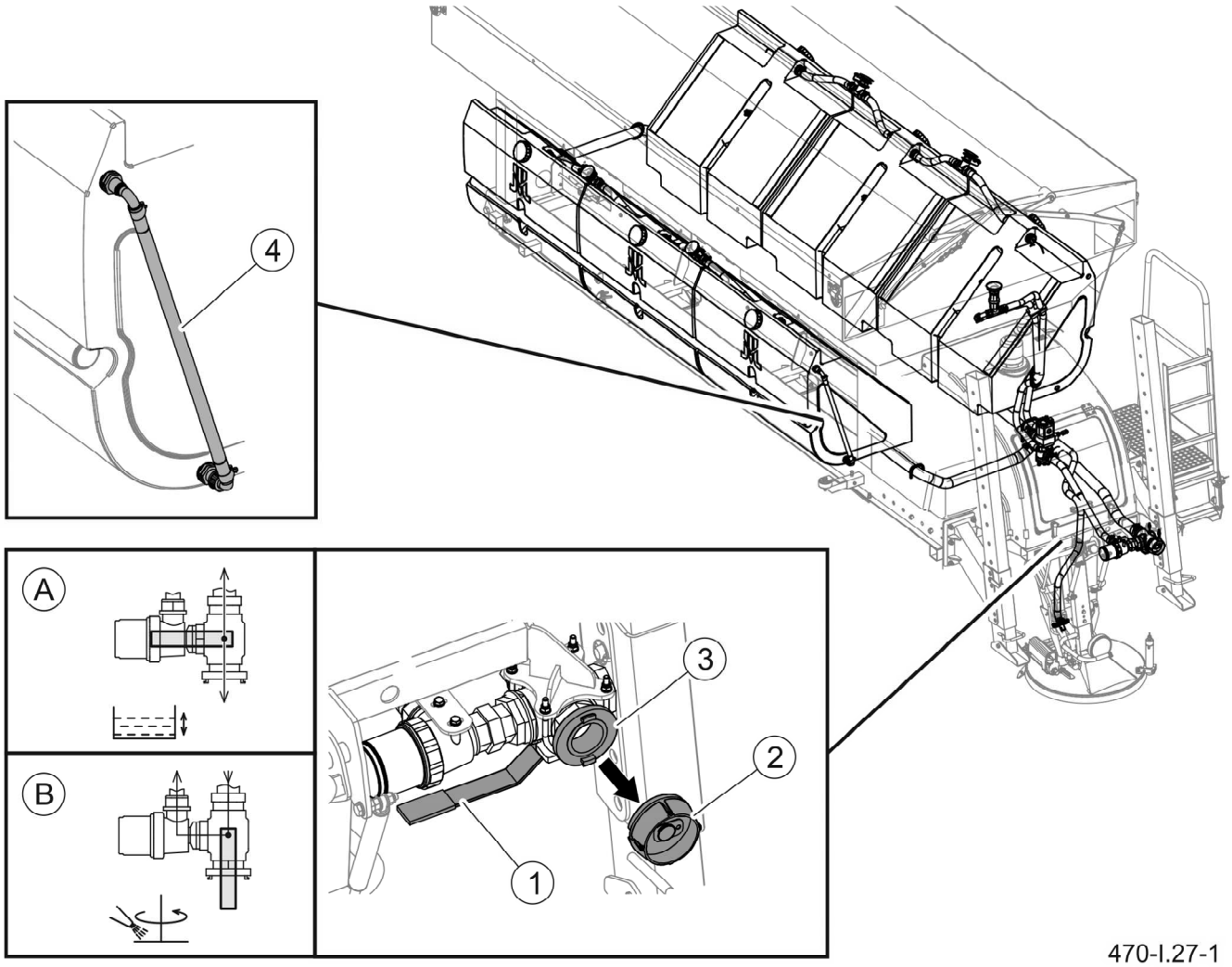


FIGURE 4.26 Emptying brine tanks

(1) - valve lever; (2) - valve plug; (3) - STORZ 52C valve connection; (4) - brine level indicator; (A) - valve in „filling/emptying" position; (B) - valve in "brine spraying" position

To empty the brine tanks proceed as follows:

- prepare a container for brine,
- set valve lever (1) in position (B),
- unscrew plug (2) and connect proper drain hose to connection (3),

- set valve lever (1) to position (A) and start emptying the tanks,
- brine level is checked on brine level indicator (4) located on the tank,
- after emptying the tanks, set lever (1) to position (B),
- disconnect drain hose from connection (3) and tighten drain plug (2).

4.9 DISMOUNTING THE MACHINE FROM THE CARRYING VEHICLE'S LOAD PLATFORM

DANGER

Before dismounting the machine from the carrying vehicle's load platform, turn off the vehicle's engine, engage the parking brake and secure the vehicle's cab against access of third persons.

Exercise due caution when dismounting the machine.

Another person must help the driver in unloading the spreader from the carrying vehicle.

ATTENTION

Before dismounting the machine from the carrying vehicle's load platform , the spreading material tank and the brine tanks should be completely emptied.

Machine dismounted from the carrying vehicle must be placed on parking stands, on level, sufficiently hard surface in such a manner as to ensure that it is possible to connect it again.

To dismount the machine from the carrying vehicle's load platform proceed as follows:

- Place the carrying vehicle's load platform in the area where the machine is to be stored.
- Disconnect control panel and electric leads.
- Remove straps fastening the machine to the carrying vehicle's load platform.
- Unlock cotter pins (3), remove pins (2), lower the rear parking stands (1) so that they touch the ground and secure them again in a selected position (A- FIGURE 4.27).
- Carefully raise the load platform to such a height as to ensure that rollers (7) (FIGURE 4.2) are supported on the platform floor.

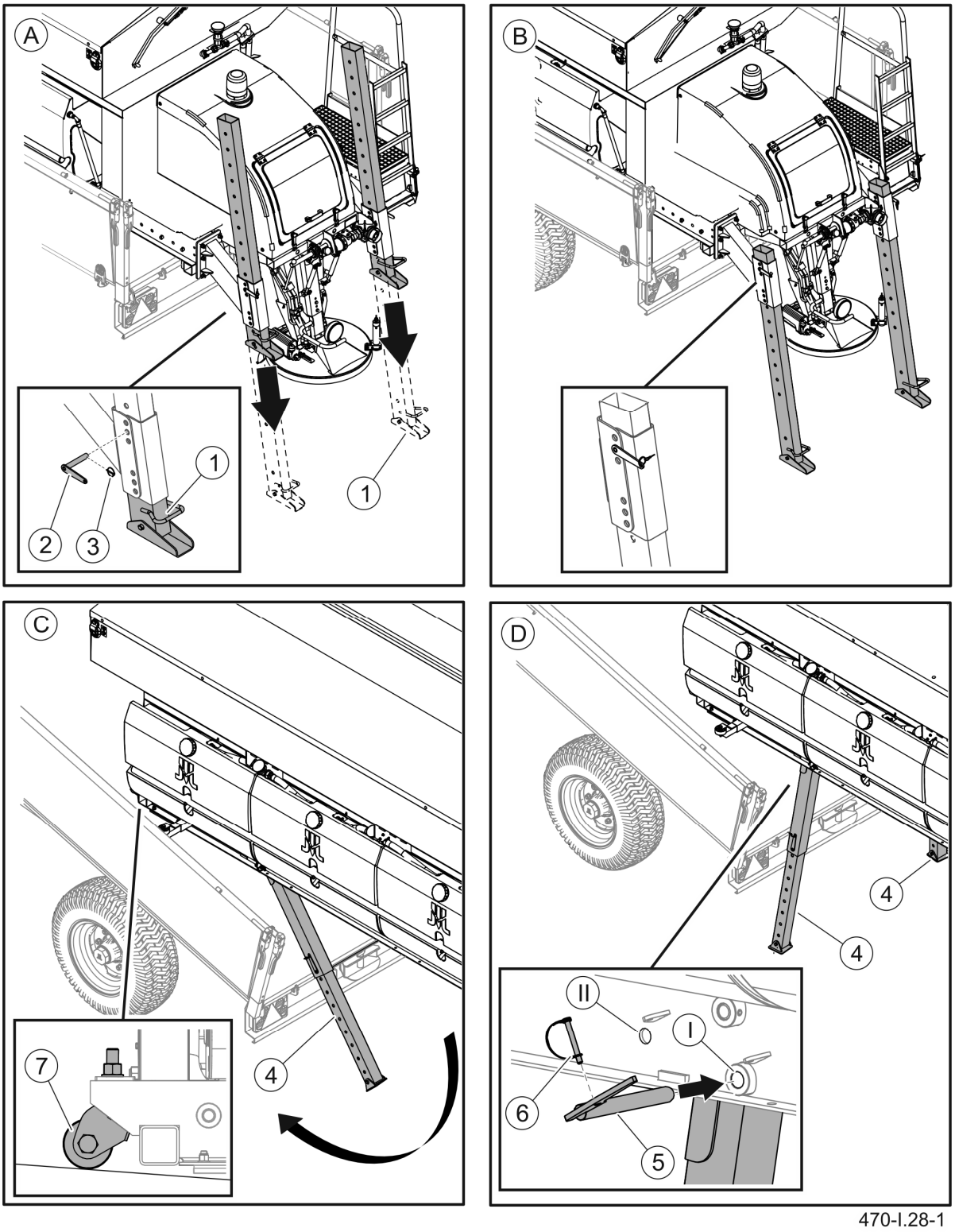


FIGURE 4.27 Dismounting the machine

(1) - rear parking stand, (2) - pin (3) - cotter pin; (4) - front parking stand; (5) - front parking stand locking pin, (6) - cotter pin; (7) - roller

- Drive the carrying vehicle with the raised platform forwards until the front parking stands (4) unfold automatically and stop the carrying vehicle.
- Lock the parking stands (4) by relocating the pins on both sides of the machine from hole (II) to hole (I). If necessary, adjust the height of the front parking stands to the height of the carrying vehicle's load platform. To do this, unlock cotter pins (3), remove pins (2), adjust the parking stands and secure the pins again.
- Unhitch the belt sling (6) ended with a hook (5) from the carrying vehicle's element (e.g. rear hitch) (FIGURE 4.1).

DANGER

The belt sling ended with a hook is used in order to prevent the machine from sliding off the platform during unloading. Be especially careful when hitching and unhitching the hook from the carrying vehicle's element.

- Lower the carrying vehicle's load platform until its rear part is located several centimetres below the spreader frame and drive the carrying vehicle away from the machine.

SECTION

5

MAINTENANCE

5.1 PERIODIC MAINTENANCE SCHEDULE

TABLE 5.1 Expected periodic inspections of the machine

Inspection	Description	Inspection conducted by
A	Inspection conducted daily before the first start or every 10 hours of continuous operation in shift mode.	User.
B	Inspection performed every 50 hours of engine operation. Before commencing work, perform also all the activities included in the scope of daily inspection.	User.
C	Inspection performed every 250 hours of engine operation. Before starting work, also perform all inspection steps every 50 hours of operation.	Warranty Service.
D	Inspection performed every 500 hours of engine operation.	Warranty Service.
E	Inspection performed every 1000 hours of engine operation. Before starting work, also perform all inspection steps every 50 and 350 hours of operation.	Warranty Service.
F	Inspection performed every 3000 hours of engine operation. Before commencing work, perform also all the activities included in the scope of inspections conducted every 50, 250, 500 and 1000 working hours.	Warranty Service.
G	Inspection conducted every 4 years of the machine use.	Warranty Service.
H	Inspection should be conducted as needed.	User.
I	Inspection carried out right after the end of the season	User.

During the warranty period, C, D, E, F and G inspections are performed by a manufacturer service point. After the warranty period, we recommended that these inspections should be performed by specialised workshops. The A, B, H and I inspections are performed by the machine operator according to the schedule.

Having performed the machine inspections described below, also carry out the scheduled engine inspection - see table *"Engine maintenance schedule".*

DANGER

Before inspection, make sure the machine is secured against unauthorized start-up.

TABLE 5.2 Inspection schedule

Description of activities	A	B	C	D	E	F	G	H	I
Check fuel level and refuelling	●								
Check hydraulic oil level and add hydraulic oil	●								
Inspect rollers and conveyor belt	●								
Checking tension and adjusting the conveyor belt								●(3)	
Checking the conveyor belt brushes operation								●(3)	
Replacement of conveyor belt brushes								●	
Inspect spreading disc	●								
Inspect the hydraulic system	●								
Check technical condition of electrical system	●								
Inspection of tightening torque of nut and bolt connections		●							
Drain water from fuel tank			●						
Checking the battery		●(1)	●(2)						
Battery charging								●	
Replace the battery								●	
Clean brine filter								●(3)	
Change hydraulic oil				●(2)					
Replacement of hydraulic oil filter				●(2)					
Checking oil level in conveyor drive transmission			●(2)						
Changing oil in the conveyor drive transmission				●(2)					
Replace hydraulic lines							●		
Post-season inspection									●
Lubrication – according to a separate schedule									

[1)]- first time [(2)]- or every 12 months depending on which occurs first [(3)]- at least once a month

5.2 CHECKING FUEL LEVEL

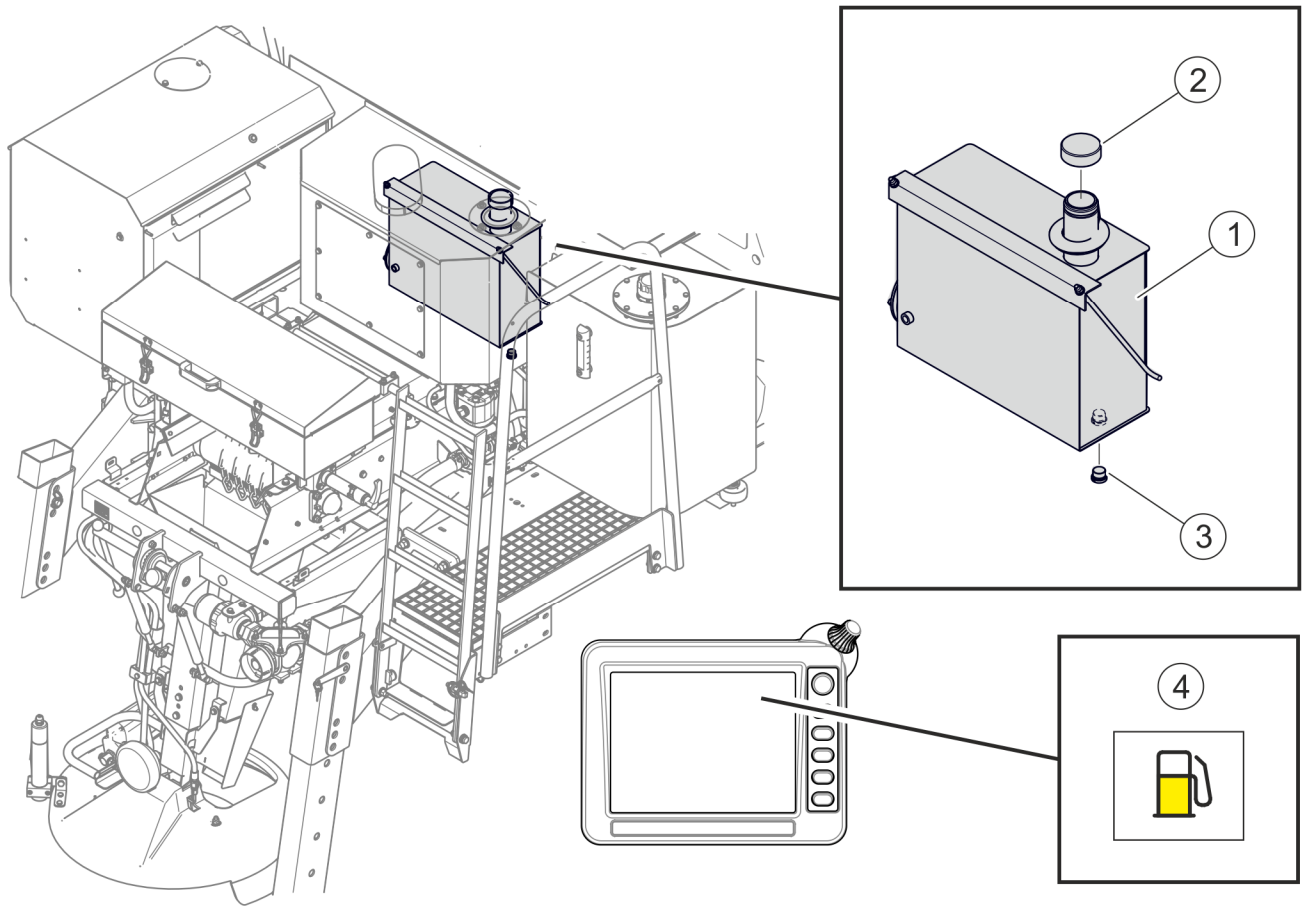


FIGURE 5.1 Checking fuel level

(1) - fuel tank; (2) - fuel filler plug; (3) - fuel drain plug; (4) - "Low fuel level" indicator (yellow)

Switch on power supply of the control panel by means of the main switch.

If the "Low fuel level" indicator (4) (FIGURE 5.1) lights up on the control panel display, add fuel to the fuel tank.

DANGER

Be especially careful when refuelling.

Remember about static electricity.

Fuel is a flammable material. Never refuel the machine when smoking or near open flames or sparks.

In order to fill the fuel tank it is necessary to:

- clean the surface around the filler plug (2) to prevent dirt from getting into the tank (1) and contaminating fuel,
- unscrew filler plug (2) and add fuel (use a funnel to prevent fuel spill),

in case of fuel spill, wipe the spilt fuel carefully and tighten the filler plug.

ATTENTION

Lost or damaged plug should always be replaced with an original replacement plug

Never remove the plug or refuel when the engine is running.

Use only winter grade Diesel oil.

When refuelling, use a funnel to prevent fuel spill. Wipe the spilt fuel immediately.

Do not use contaminated Diesel oil or Diesel oil mixed with water, because it may cause a serious damage to the engine.

Do not fill the fuel tank completely. Allow space for fuel expansion.

5.3 CHECKING HYDRAULIC OIL LEVEL

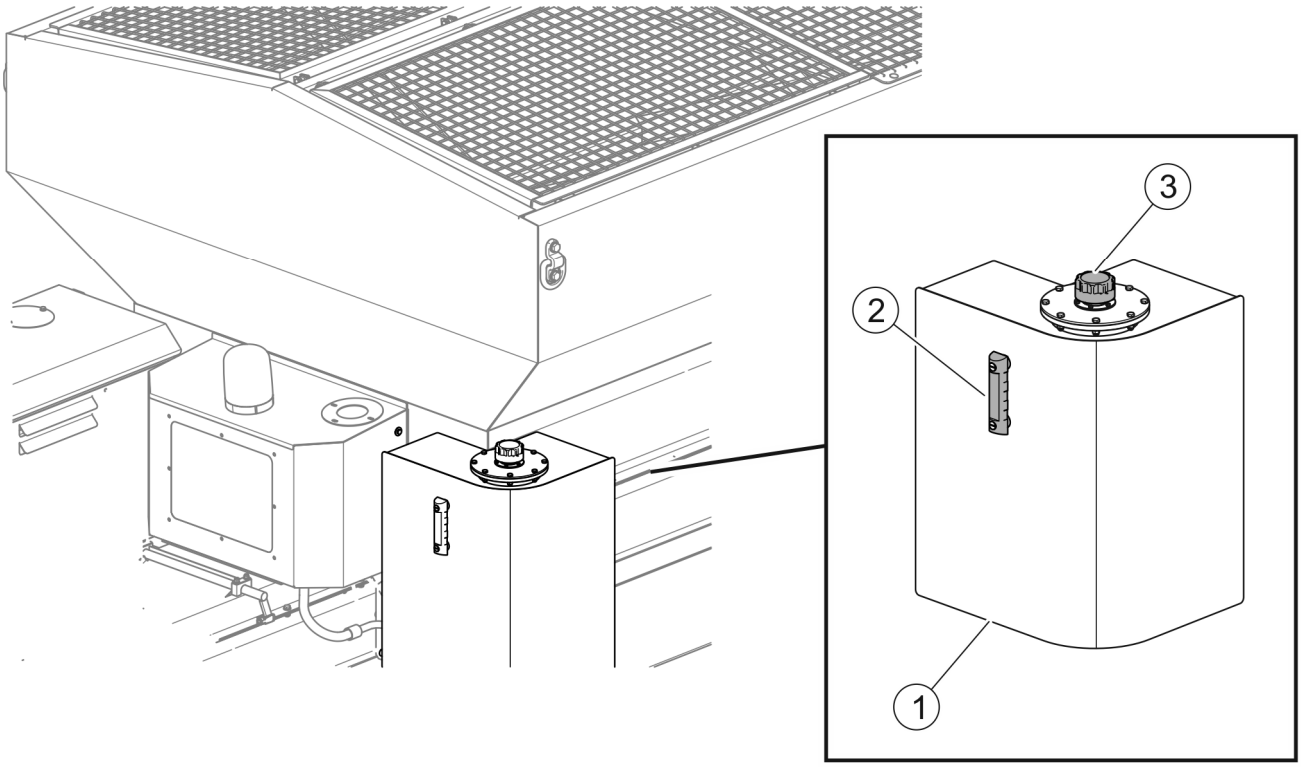


FIGURE 5.2 Checking the hydraulic oil level

(1) - oil tank; (2) - oil level indicator; (3) - oil filler plug

SCOPE OF ACTIVITIES

- Check hydraulic oil level on the oil level indicator (2) (FIGURE 5.2).
- If oil level is too low, unscrew filler plug (3) and supplement oil.
- Tighten the filler plug

ATTENTION

Oil level should be halfway up the indicator scale on the tank casing.

5.4 WYMIANA OLEJU HYDRAULICZNEGO I FILTRA OLEJU

The duties of the operator connected with the hydraulic system maintenance include:

- visual inspection of tightness of hydraulic pumps, motors and connections,
- inspection of technical condition of conduits,
- visual inspection of hydraulic connections.

Hydraulic oil change and replacement of filter cartridges during warranty period may be performed only at an Authorised Point of Sale and Service (APSS).

DANGER

Do not repair hydraulic system on your own. All hydraulic system repairs must be performed only by suitably qualified personnel.

ATTENTION

Before starting work, visually inspect the hydraulic system components.

DANGER

During work on hydraulic system, use the appropriate personal protection equipment i.e. protective clothing, footwear, gloves and eye protection. Avoid contact of skin with oil.

In the event of contact of oil with skin wash the place of contact with water and soap. Do NOT apply organic solvents (petrol, kerosene). Contaminated clothing should be changed to prevent access of oil to skin. In the event of contact of oil with eye, rinse with large quantity of water and in the event of the occurrence of irritation consult a doctor.

DANGER

Oil fires should be quenched with carbon dioxide (CO_2), foam or extinguisher steam. Do NOT use water for fire extinguishing!

Spilt oil should be immediately collected and placed in a marked tight container. Used oil should be taken to the appropriate facility dealing with recycling or regeneration of oils.

The hydraulic system should be completely tight sealed. Minimum leaks are permissible with symptoms of "sweating", however in the event of noticing leaks in the form of "droplets" stop using the machine until faults are remedied.

ATTENTION

The machine with a leaking hydraulic system must NOT be used.

The hydraulic system is under high pressure when operating.

Regularly check the technical condition of the connections and the hydraulic conduits.

The hydraulic system is filled with L-HL-32 hydraulic oil.

The condition of hydraulic system should be inspected regularly while using the machine.

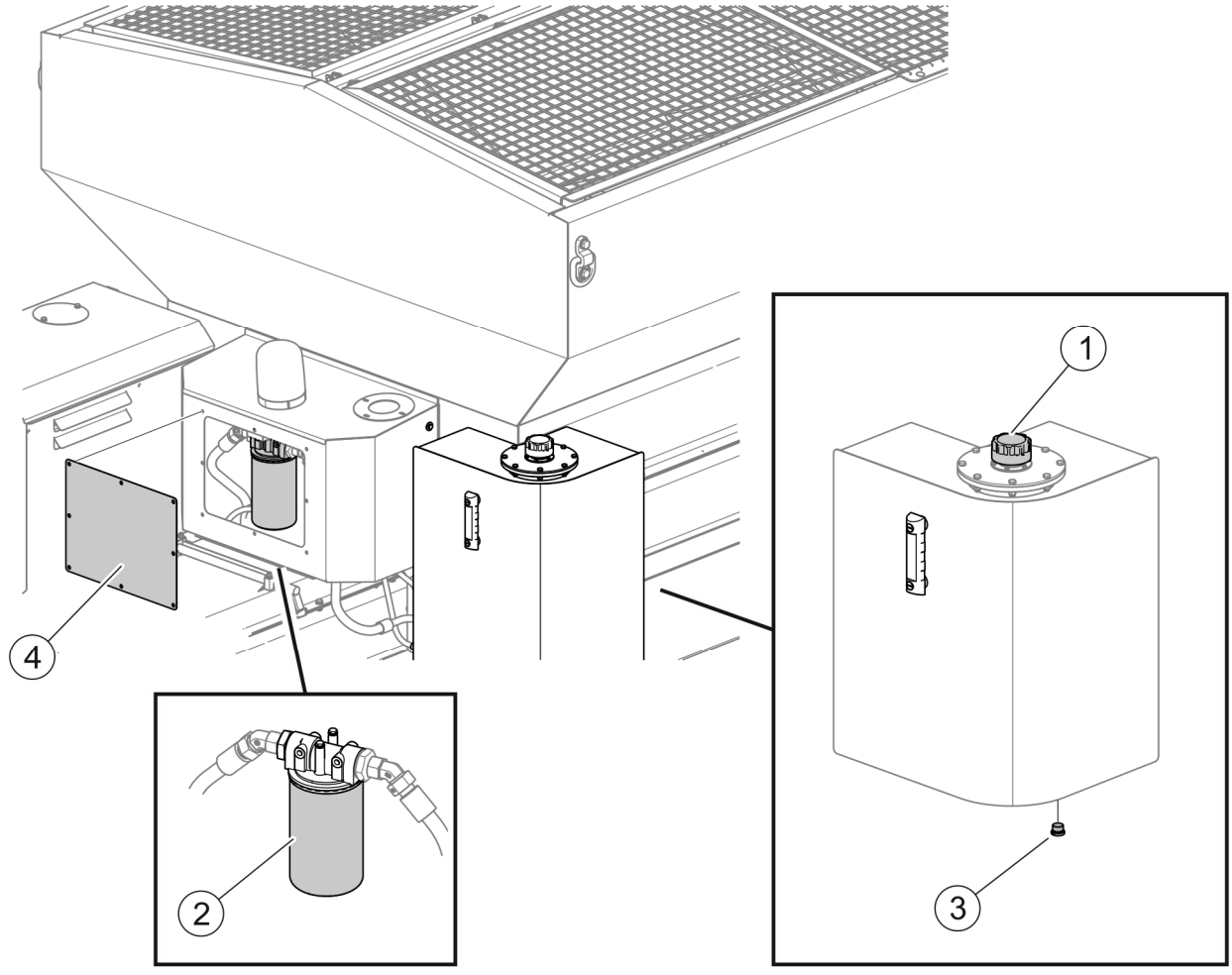


FIGURE 5.3 Change of oil and oil filter

(1) - filler plug with filter; (2) - replaceable filter cartridge; (3) - oil drain plug; (4) - cover

SCOPE OF ACTIVITIES

- Unscrew filler plug (1) and oil drain plug (3) (FIGURE 5.3).
- Drain oil to previously prepared container (about 100 litres).
- Unscrew contaminated filter cartridge (2).

TIP

Replaceable filter cartridge is installed in the hydraulic system part number CCA301FD1

- Clean the surface where the filter cartridge and filter body join.
- Cover the gasket of the new filter cartridge with a film of oil.
- Tighten the new filter cartridge.
- Remove the strainer (from under the filler plug) and blow it with compressed air.
- Check the filler plug seal (1), confirm that vent openings in the plug are not blocked. Tighten the plug.
- Pour new oil into the tank until oil reaches the required level marked on the indicator located on hydraulic system tank.
- Start the machine and check oil level again.
- Used hydraulic oil should be disposed of according to local regulations.

The hydraulic system is vented automatically during machine operation.

Cartridge of oil filter (FIGURE 5.3) should be replaced every 500 engine working hours or once a year.

Rubber hydraulic conduits must be changed every 4 years regardless of their technical condition.

5.5 CHECKING THE BATTERY

ELECTROLYTE LEVEL

Electrolyte evaporates during battery use. Electrolyte level should be between the marks of the upper and lower level or, if there are no marks, electrolyte level should be 10 – 15 mm above the upper part of the battery electrodes. If loss of electrolyte is large, add only distilled water to the battery cells.

ELECTROLYTE DENSITY

Using a densimeter, check density of electrolyte in each battery cell. Density of electrolyte in a properly charged battery should be 1.28 g/cm³ (not more than 1.29 g/cm³). If density of electrolyte is lower than 1.26 g/cm3, charge the battery. Make the measurement at temperature of 25°C.

CHARGING

If the battery is maintenance-free and you cannot check the electrolyte density, check the battery no-load voltage. If voltage drops below 12.5 V, you must charge the battery.

- The battery should be charged using current with value not higher than 10% of the battery's rated capacity (e.g. 6.3A at capacity of 63Ah). The charging time should be at least 10 hours.
- Disconnect lead (-) from the battery.
- Disconnect lead (+) from the battery.
- Dismantle the battery.
- Place the battery in a well-ventilated place.
- Remove plugs and check level and density of electrolyte.
- If necessary supplement electrolyte with distilled water.
- Check condition of terminals and any obstruction of ventilation openings in caps and clean if necessary.
- Connect lead (+) of the rectifier and then connect lead (-). Set charging current and connect the rectifier to the mains.

- Charge the battery until electrolyte reaches constant density of 1.28 g/cm3 or the voltage on the clamps of unloaded battery is at least 12.5V.
- After tightening, protect terminals with industrial grade petroleum jelly.

ATTENTION

Ensure proper ventilation when charging battery

in a closed building.

Before replacement of battery, make certain that the battery discharge is not caused by faulty electrical system (e.g. parasitic battery drain) or defective charging system (alternator failure).

REPLACEMENT OF BATTERY

- Turn the engine off and turn the main switch to OFF position.
- Disconnect lead (-) from the battery.
- Disconnect lead (+) from the battery.
- Dismantle the battery.
- Install a new battery.
- Connect the (+) lead to the battery.
- Connect the (–) lead to the battery.

DANGER

Electrolyte contained in the battery is a strongly caustic acid. Wear safety goggles and proper working clothes during battery maintenance.

Do not approach the battery with an open flame during battery charging (or just after charging). Danger of explosion.

Wash hands after completed works concerning batteries.

In case of contact with acid:

- rinse skin with plenty of water,

- rinse eyes with water for about 15-30 minutes and consult a doctor immediately.

5.6 ELECTRICAL SYSTEM MAINTENANCE

DANGER

Do not independently repair electrical system, except items described in chapter ELECTRICAL SYSTEM MAINTENANCE. All electrical system repairs must be performed only by suitably qualified personnel.

Electrical system maintenance is conducted during the periodical inspection of the operation of control system and lighting system.

ATTENTION

Before beginning work on electrical system, disconnect the machine from power source (disconnect power lead from the carrying vehicle and the leads connecting battery with engine).

In case of bulb burnout in beacon light or fog light, replace the bulbs. List of bulbs is shown in TABLE 5.3.

TABLE 5.3 List of lighting components

LAMP TYPE	**BULB TYPE**	**QUANTITY** [pcs]
Beacon light 2RL-007 550-021	H1, 70W 24V	1
Red fog light M56 56/03/01	BA15S (P21W), 24V	1

The fuses and relays are located under the cover (FIGURE 5.4). Remove a blown fuse from the holder and replace it with a new one. List of fuses is shown in (TABLE 5.4).

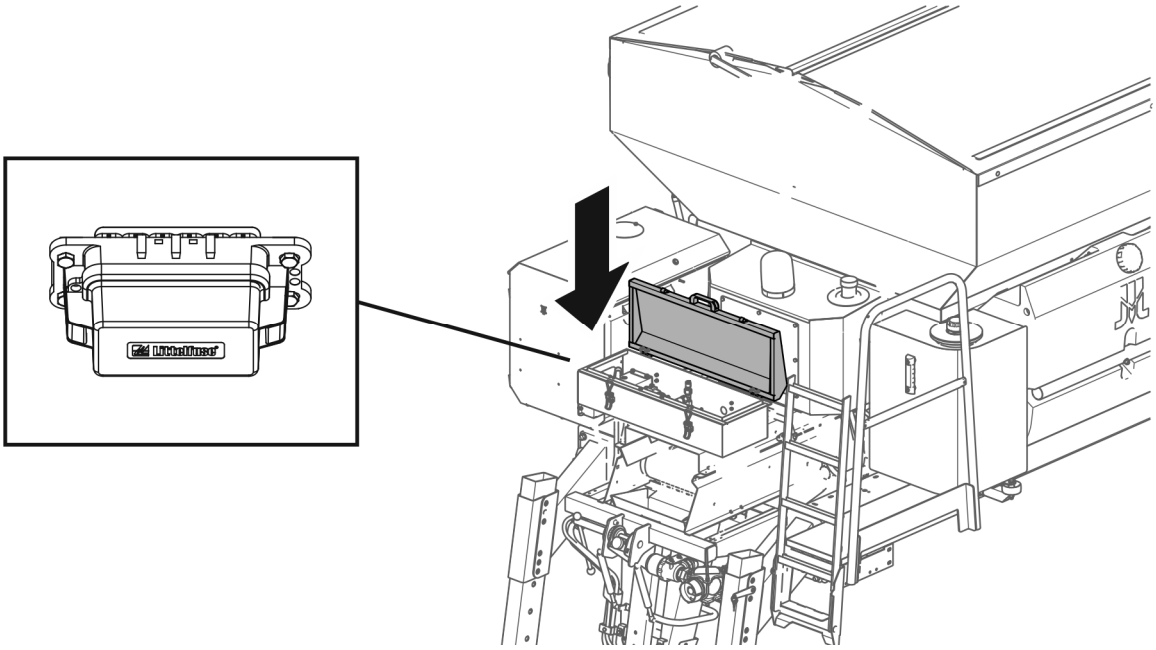


FIGURE 5.4 Location of fuse box

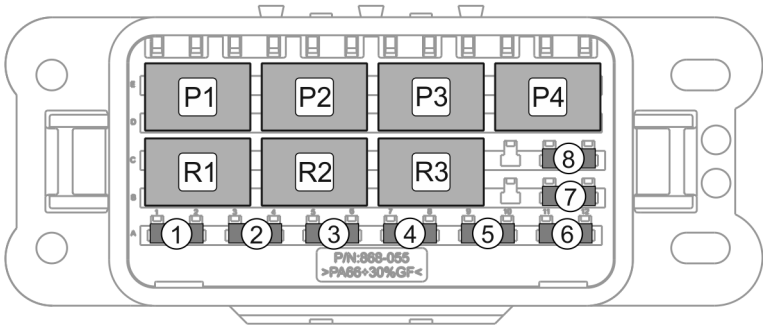


FIGURE 5.5 Fuses and relays

(1)-(9) - fuses; (P1, P2) - electric spreading direction adjustment cylinder relay; (P3) - rear lamp relay; (P4) - warning beacon relay; (R1) - engine start-up relay (option); (R2) - engine shutdown relay (option); (R3) - relief valve supply relay

TIP

Relays (P1), (P2) – type Micro 280 10 / 15A 24V.

Relays (P3), (P4), (R1), (R2), (R3) – type Micro 280 15A 24V.

TABLE 5.4 Fuses

MARKING (FIGURE 5.5)	**PROTECTED CIRCUIT**	**FUSE**
1	Control panel power fuse	MINIVAL 5A
2	extension module and sensor power supply fuse (RCE12-4/22)	MINIVAL 3A
3	Main controller power supply fuse (RC2-2/21)	MINIVAL 3A
4	Extension module and relay power supply fuse (RCE12-4/22)	MINIVAL 20A
5	Main controller power supply fuse (RC2-2/21)	MINIVAL 3A
6	Sensor power supply fuse (RC2-2/21)	MINIVAL 3A
7	Sensor power supply fuse (RCE12-4/22)	MINIVAL 2A
8	Engine start/stop relay power supply fuse (option)	MINIVAL 15A

5.7 MAINTENANCE OF BELT CONVEYOR

CHANGING OIL IN THE CONVEYOR DRIVE TRANSMISSION

DANGER

When checking oil level and changing oil, use appropriate personal protection equipment i.e. protective clothing, safety shoes, gloves, safety goggles. Avoid contact of skin with oil.

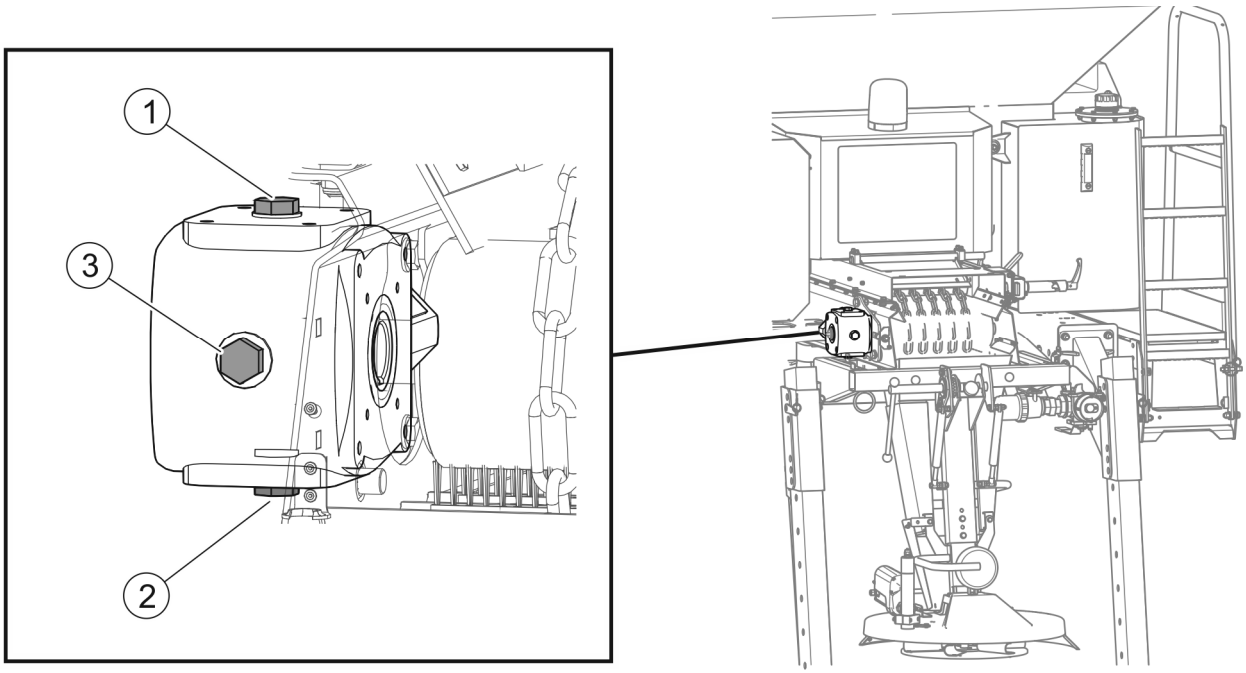


FIGURE 5.6 Changing oil in the belt conveyor drive transmission

(1) - oil filler plug; (2) - drain plug; (3) - inspection plug

Maintenance of belt conveyor drive transmission involves periodical checking of oil level and changing oil.

- Unscrew filler plug (1) (FIGURE 5.6).
- Unscrew drain plug (2) and drain oil to a previously prepared container.
- Tighten drain plug (2) and pour new oil through filler plug opening (1) up to the inspection plug level (3).
- Tighten inspection plug (3) and filler plug (1).

TIP

To lubricate the belt conveyor drive transmission use gear oil of SAE 90 EP class in the amount of 0.6 L (litres).

It is recommended to check oil in the belt conveyor drive transmission before commencing the working season but no less frequently than once a year. Possible oil change is carried out during transmission repair.

Used oil should be taken to the appropriate facility dealing with recycling or regeneration of oils.

If a leak is noticed, carefully inspect seals and check oil level. Operation of the transmission with insufficient oil level or without oil may cause permanent damage to the transmission mechanisms.

Repairs of the transmission during warranty period may only be performed at authorised mechanical workshops.

ADJUSTMENT OF CONVEYOR BELT

Moving conveyor belt should be positioned in the middle of the conveyor roller. Make adjustments if the conveyor belt is shifted sideways to the edge of the conveyor roller or rubs against the frame.

DANGER

Conveyor belt adjustment is performed when the sand spreader is parked and the conveyor drive is switched on. Be especially careful when making the adjustment.

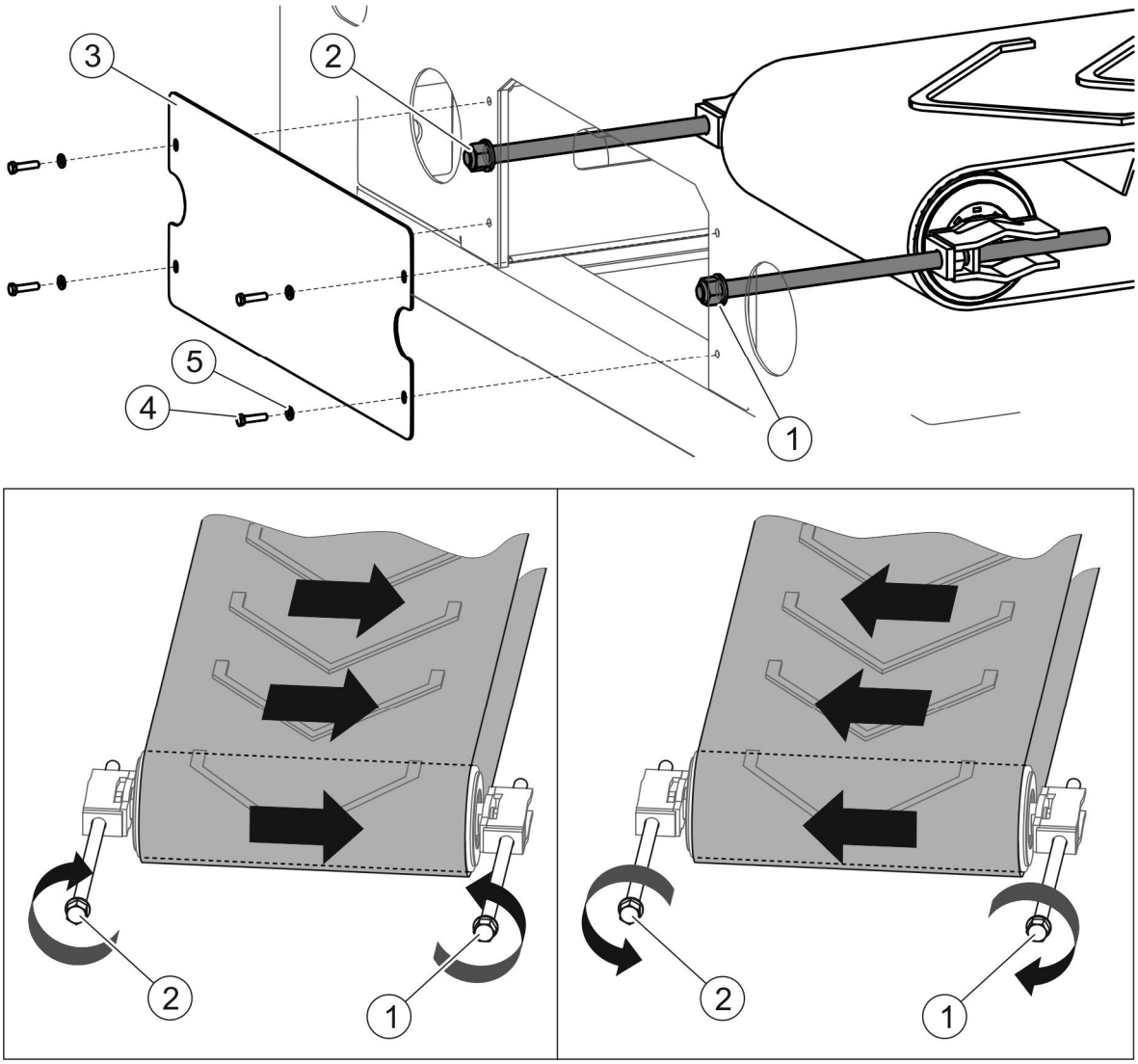


FIGURE 5.7 Adjustment of tightening roller

(1), (2) - adjusting screws; (3) - cover; (4) - bolt; (5) - washer

Before starting the conveyor belt adjustment (FIGURE 5.7), unscrew bolts (4) and remove cover (3). Start the sand spreader's engine. Activate "Unloading" function in "Counters" menu on the control panel. A detailed description can be found in section *UNLOADING*.

Conveyor belt is adjusted during conveyor operation by means of tensioning bolts (1) and (2) located on the front wall of the tank (FIGURE 5.7). Depending on shifting of conveyor belt (FIGURE 5.7), choose proper rotation direction of tensioning bolts (1) and (2). During the adjustment, make one turn of each bolt and wait for some time to see the effect of the adjustment. Repeat the activity until moving conveyor belt is positioned in the middle of the conveyor roller.

Regularly check whether moving conveyor belt is positioned in the middle of the tightening roller and drive roller of the conveyor. Make adjustments if the conveyor belt is shifted sideways to the edge of the conveyor roller.

Tension of conveyor belt should be checked at least once a month during the working season.

Conveyor belt may be tightened when the conveyor drive is switched off. Conveyor belt is tightened by means of bolts (1) and (2) located on the front wall of the tank (FIGURE 5.7). Turn both bolts (1) and (2) clockwise. To avoid shifting the belt sideways to the edge of the roller, turn both bolts by the same number of rotations.

TIP

The conveyor belt tensioning bolts should be tightened using the tightening torque of 20Nm.

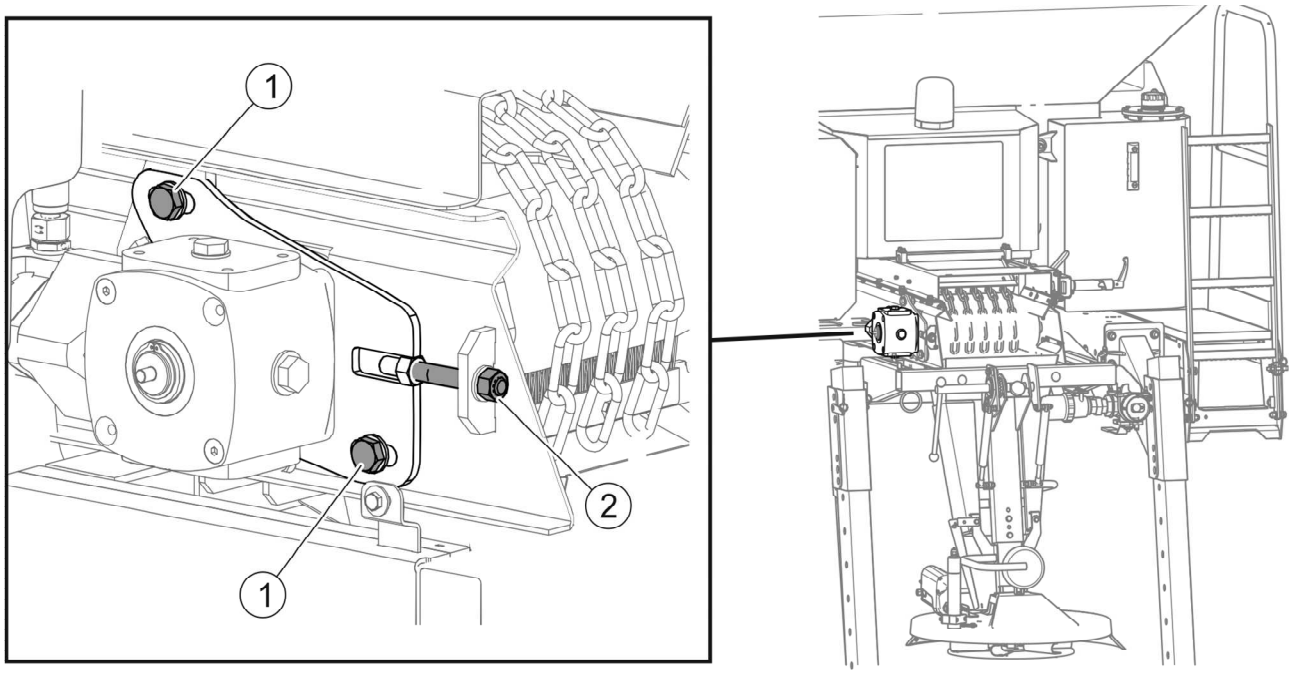


FIGURE 5.8 Adjustment of drive roller

(1) - locking bolts; (2) - adjusting bolt

If the conveyor belt is shifted sideways to the edge of the conveyor drive roller (FIGURE 5.8), make proper adjustment of the roller. The adjustment is made only on one side of the conveyor using bolt (2) by changing the position of the roller drive transmission bracket. Start the sand spreader's engine. Activate "Unloading" function in "Counters" menu on the control panel. A detailed description can be found in section *UNLOADING*. Loosen locking bolts (1) and position the belt in the middle of the roller by means of adjusting bolt (2). During the adjustment, make one turn of bolt (2) and wait for some time to see the effect of the

adjustment. Repeat the activity until moving conveyor belt is positioned in the middle of the conveyor roller. After adjustment, disengage conveyor drive and tighten locking bolts (1).

INSPECTION AND REPLACEMENT OF CONVEYOR BELT BRUSHES

DANGER

Before inspection or replacement of conveyor brushes, turn off the carrying vehicle's engine and the sand spreader's engine and secure the vehicle's cab against access of third persons.

Belt conveyor is equipped with two brushes located under the belt, near the chute. Brushes are used for collecting remains of spreading material from conveyor belt. Degree of wear of brushes should be checked periodically. Brushes should be pressed against the whole width of the lower side of the conveyor belt. In the event of confirmation of wear of the brushes, they must be replaced.

Regularly check the condition of brushes under the conveyor belt. In the event of confirmation of excessive wear of the brushes, they must be replaced.

The brushes should be inspected at least once a month during the working season.

TIP

Belt conveyor is equipped with two replaceable brushes with the length of L= 410 mm, part number STL4999-255662, located under the drive roller.

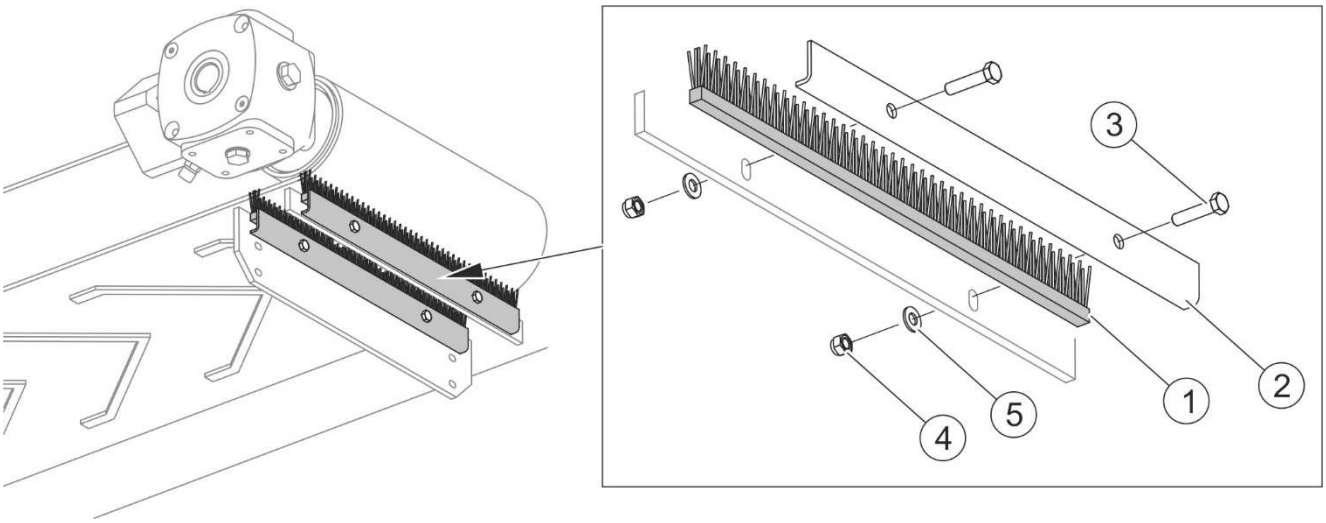


FIGURE 5.9 Replacement of conveyor belt brushes

(1) - brush; (2) - clamping strip; (3) - bolt; (4) - nut; (5) - washer

REPLACEMENT OF CONVEYOR BELT BRUSHES

- Unscrew bolts (3) and remove clamping strip (2) (FIGURE 5.9).
- Remove worn or damaged brush (1) and replace it with a new one.
- Set the brush in parallel to the belt.
- Assemble the complete unit performing the above activities in reverse sequence.
- Replace the second brush in the same way.

5.8 MAINTENANCE OF BRINE SPRAY SYSTEM

Each time before filling the tanks with brine, check and, if necessary, tighten the bolts fixing the tanks to the frame.

Maintenance of brine spray system involves periodical cleaning of filter, checking operation and tightness of the system.

TIP

It is recommended to maintain such a level of brine as to ensure that the pump is filled with the solution at all times. This prevents corrosion of internal pump components and facilitates suction of fluid in the beginning of spraying.

Brine filter cartridge should be cleaned at least once a month during the working season.

BRINE FILTER CLEANING (FIGURE 5.10)

- Set valve in position (A) - "filling/emptying".
- Unscrew filter housing (4).
- Remove filter cartridge (3) and wash it in water.
- Install the cartridge and tighten filter housing (4).
- Set valve in position (B) - "brine spraying".

TIP

Filter of brine spray system is equipped with a reusable mesh cartridge with part number of C00100036. In the event of damage to the cartridge, replace it with a new one.

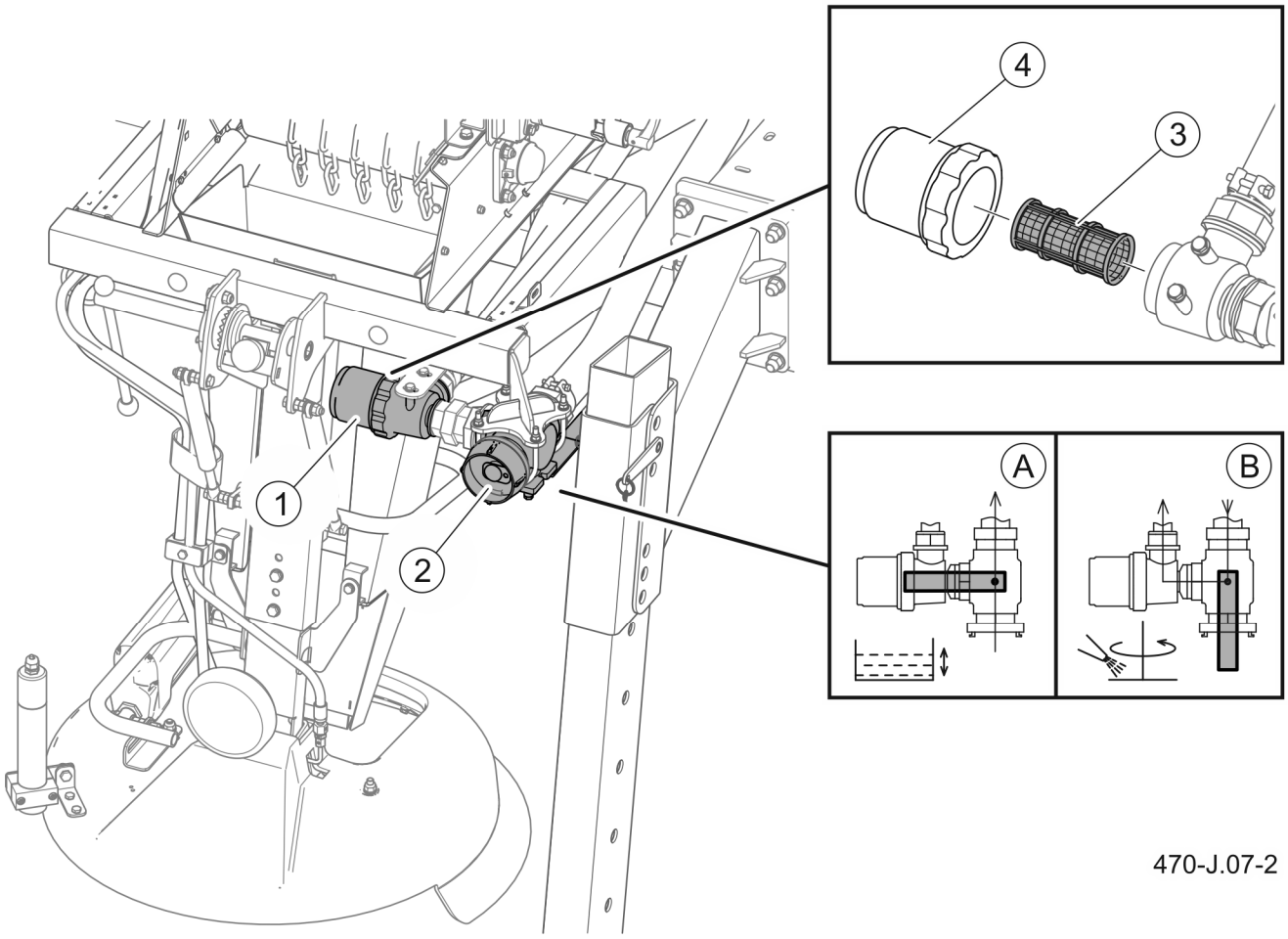


FIGURE 5.10 Brine filter cleaning

(1) - brine filter; (2) - valve; (3) - mesh cartridge of filter; (4) - filter housing; (A) - valve in "filling/emptying" position; (B) - valve in "brine spraying" position

5.9 ADJUSTMENT OF SPREADING MECHANISM

If there are differences in spreading symmetry during spreading mechanism operation, with regard to values set on the control panel, it may be necessary to adjust the setting of the electric cylinder.

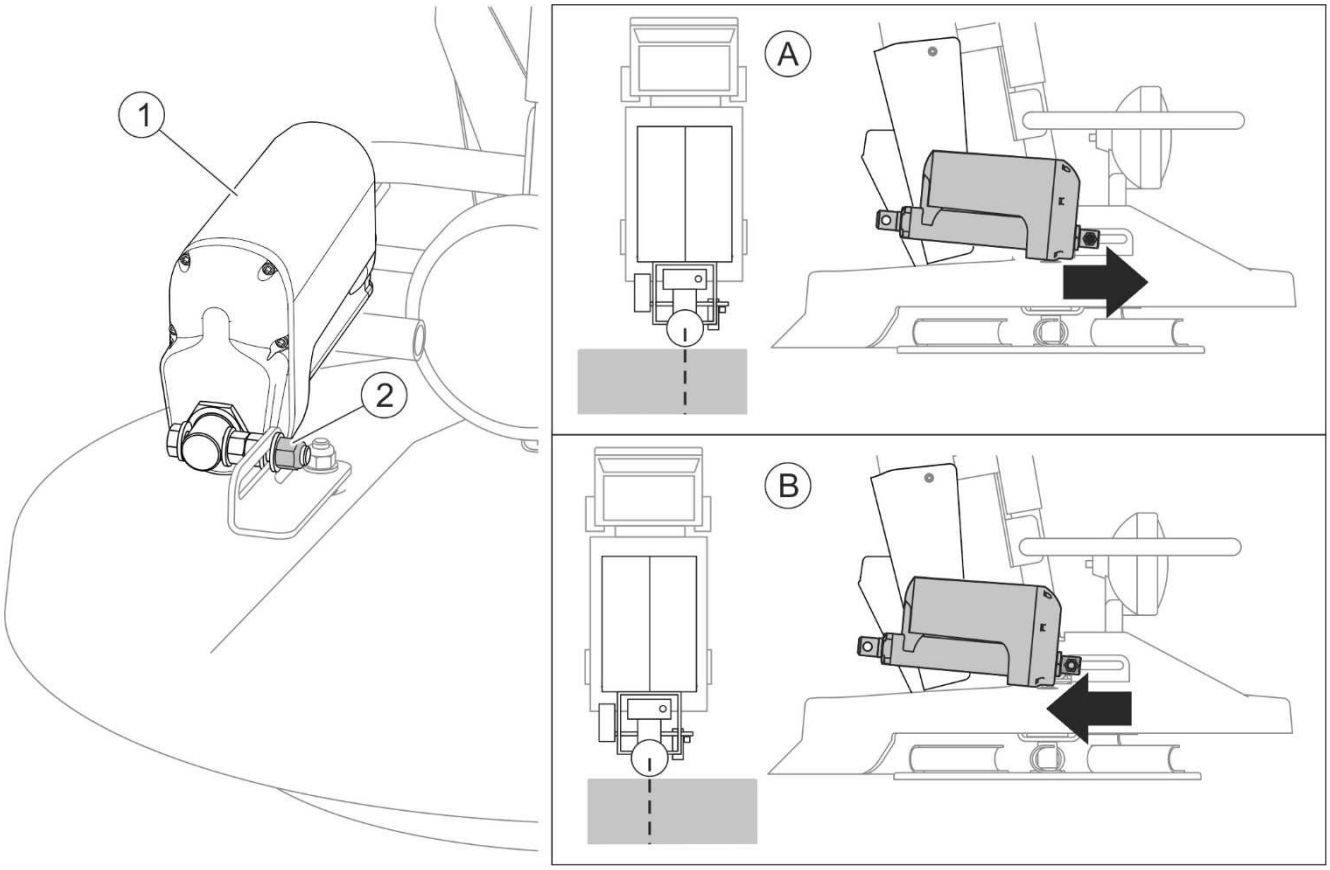


FIGURE 5.11 Adjustment of spreading mechanism

(1) - spreading direction adjusting cylinder; (2) - nut; (A) - spreading zone excessively shifted to the left, (B) - spreading zone excessively shifted to the right

In order to adjust the spreading mechanism, set symmetric 4 meter-wide spreading zone on the control panel. Activate spreading and drive a short distance at a constant speed. Stop the vehicle and check effect of spreading. If spreading to the right side and to the left side is not the same, adjust spreading direction adjusting cylinder (1) (FIGURE 5.11) as follows:

- Loosen nut (2).
- Move cylinder (1) forwards if spreading zone is excessively shifted to the left (A).
- Move cylinder (1) backwards if spreading zone is excessively shifted to the right (B).

- Tighten nut (2), conduct test spreading, if necessary, repeat the adjustment.

5.10 CHECKING THE SPREADING DISC

DANGER

Spreading disc blades may be checked and replaced only if the machine is switched off and secured.

Technical condition of spreading mechanism disc blades should be checked periodically paying attention to mechanical damage, excessive wear and completeness of securing elements.

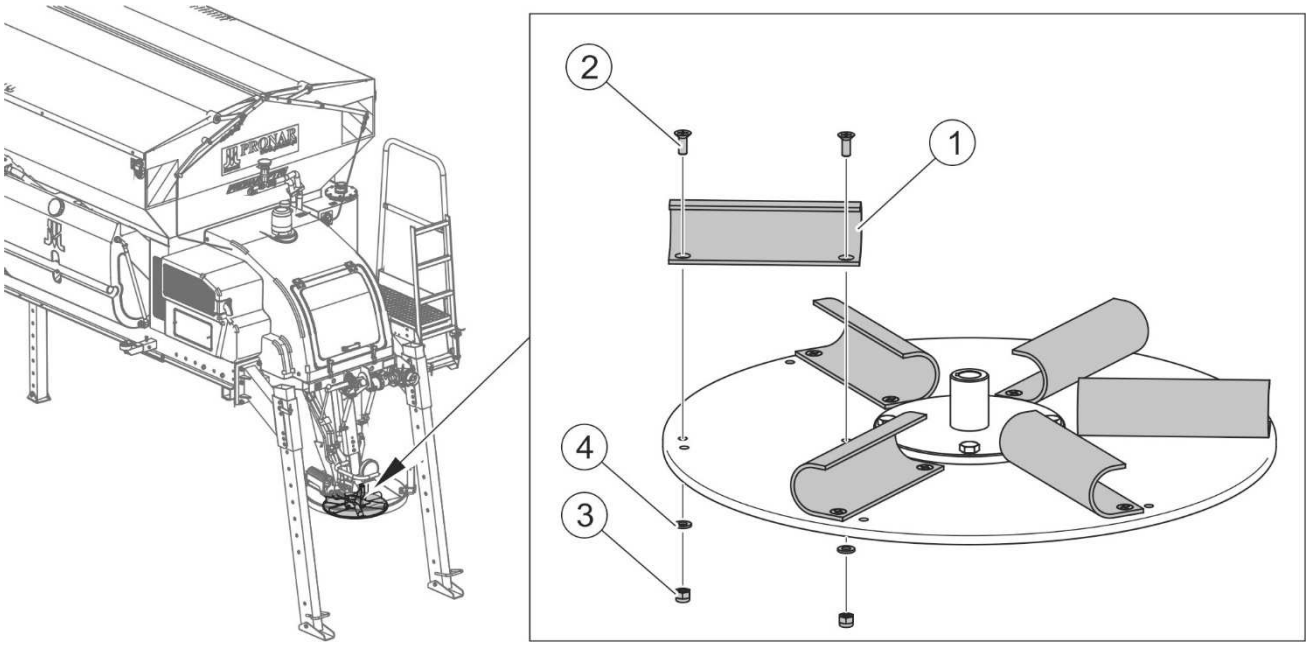


FIGURE 5.12 Replacement of spreading mechanism disc blades

(1) - blade; (2) - bolt; (3) - nut; (4) - washers

SCOPE OF ACTIVITIES

- Undo nuts (3) (FIGURE 5.12),
- Remove bolts (2) and washers (4),
- Replace blades (1) with new ones, check condition of bolts and nuts, if necessary replace (see TABLE 5.5).
- Install in reverse order.

TABLE 5.5 The list of working components of spreading disc

Marking FIGURE 5.12	**Name / part number or standard**	**Quantity** [pcs]
1	Blade / 254-07000001	6
2	Bolt M6x16-A2-70 / PN-EN ISO 7046-2	12
3	Self-locking nut M6-A4-70 / PN-EN ISO 7040	12
4	Washer 6-200HV-A2 / PN-EN ISO 7089	12

5.11 LUBRICATION

Before commencing lubrication insofar as is possible remove old grease and other contamination. Remove and wipe off excess oil or grease The following grease is recommended for lubrication: ŁT-43-PN/C-96134.

When using the machine the user is obliged to observe lubrication instructions according to attached schedule. Excess lubricant causes depositing of additional contaminants in places requiring lubrication, therefore it is essential to keep individual machine components clean.

TABLE 5.6 Lubrication points and lubrication frequency

ITEM	**NAME**	**NUMBER OF LUBRICATION POINTS**	**TYPE OF GREASE**	**LUBRICATION FREQUENCY**
A	Bearing of belt conveyor drive shaft	1	grease	every 20 hours of work
B	Pivot point of hopper system	1	grease	once a month
C	Conveyor drive transmission	1	oil	inspect once a year

Marking description in Item column (TABLE 5.6) conforms with numbering shown (FIGURE 5.13

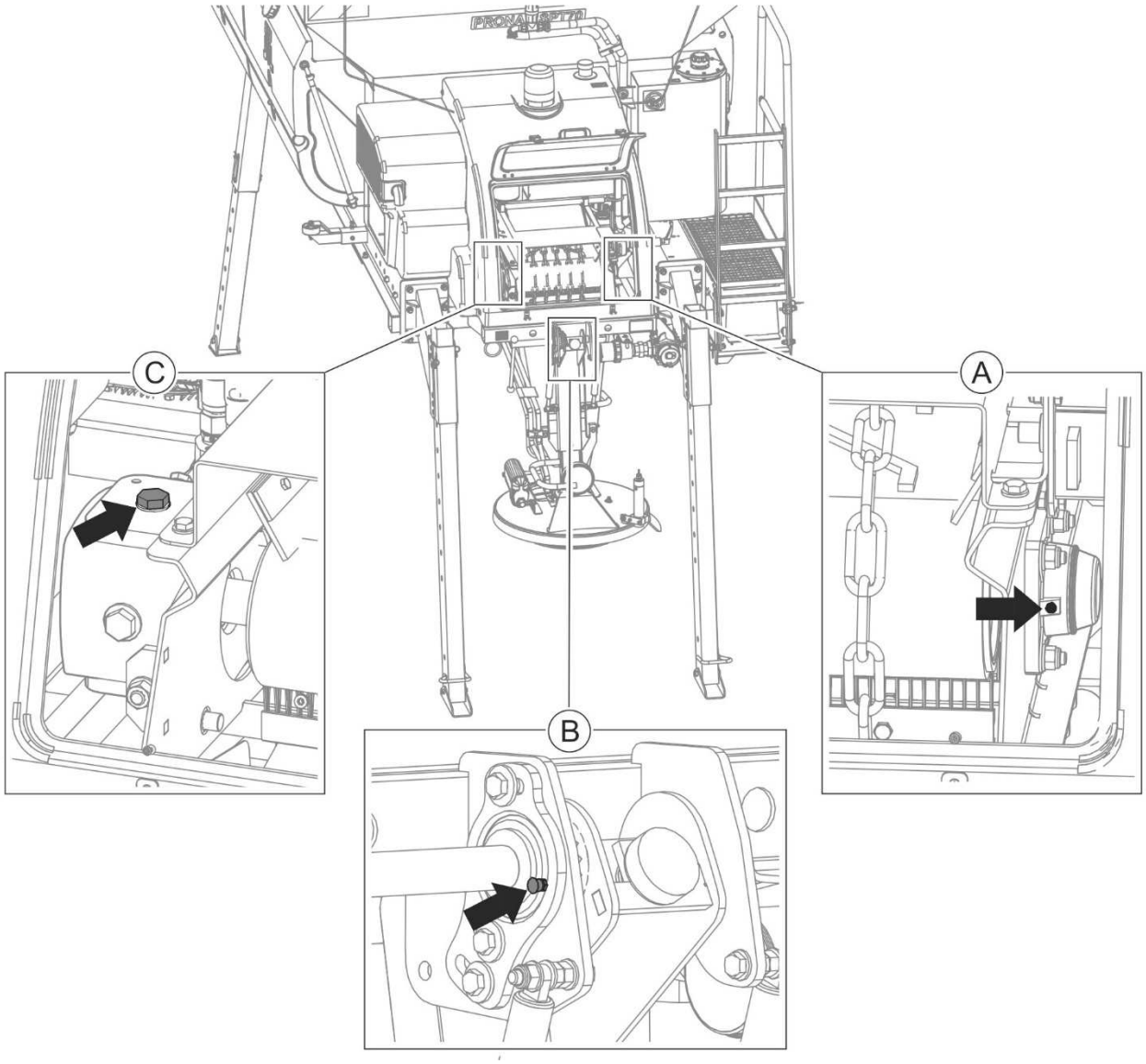


FIGURE 5.13 Lubrication points

Lubrication points are described in Table 5.5

5.12 CONSUMABLES

TABLE 5.7 List of recommended consumables

PLACE OF APPLICATION	QUANTITY	NAME / NUMBER
Fuel tank - Diesel oil	26 L	PN-EN 590+ A1:2010
Hydraulic system - Hydraulic oil (1)	93 L (2)	L-HL-32
Hydraulic system - oil filter (filter cartridge)	-	AMF301EFD1BB606 (CCA301FD1)
Reduction gear	0.6 L	Gear oil SAE 90 EP
Brine spray system - filter (filter mesh element)	-	8074008 (C00100036)

(1) – the oil level should be in the middle of the scale indicator on the tank housing

(2) – tank capacity

TABLE 5.8 List of sensors

NAME AND PLACE OF APPLICATION	QUANTITY	PART
Disc and belt rotation speed sensor	2 pcs	151-5662
Brine pump rotation speed sensor	1 pcs	E2A-S12KSO4-WS-B1 PNP NO

5.13 STORAGE

After finishing work, the machine should be thoroughly cleaned and washed with a water jet. While cleaning, do not direct a strong water or steam jet at information and warning decals or hydraulic conduits. Nozzle of pressure or steam washer should be kept at a distance of not less than 30 cm from cleaned surface.

After cleaning, inspect the whole machine, inspect technical condition of individual elements. Used or damaged elements should be repaired or replaced.

In the event of damage to the paint coat, clean rust and dust from damaged area, degrease and then paint with undercoat and after it is dry paint with surface coat paint retaining colour uniformity and even thickness of protective coating. Until the time of touch-up painting, the damaged place may be covered with a thin layer of grease or anticorrosion preparation. Machine should be kept in a closed or roofed building.

If the machine shall not be used for a long period of time, protect it against adverse weather conditions. Disconnect control panel from the machine. Remove the battery and periodically check the charge level. If you need to charge the battery. Do not allow the battery to fully discharge.

Lubricate machine according to the instructions provided. In the event of a prolonged work stoppage, it is essential to lubricate all components regardless of the date of the last lubrication.

The sand spreader's tank should be emptied and covered with tarpaulin cover.

ATTENTION

Remains of material containing salt cause quick corrosion of metal parts.

If the machine is not be used for a long time, start the sand spreader's engine once a month for 20 minutes and switch the engine speed from low to high ten times.

5.14 TIGHTENING TORQUE FOR NUT AND BOLT CONNECTIONS

During maintenance and repairs use appropriate torque for bolt connections (unless other is specified for a particular connection). Recommended tightening torque values apply to non-greased steel bolts (TABLE 5.9)

TABLE 5.9 TIGHTENING TORQUE FOR NUT AND BOLT CONNECTIONS

THREAD DIAMETER [mm]	**5.8**[1]	**8.8**[1]	**10.9**[1]	**A2-70**	**A2-80**
	TIGHTENING TORQUE [Nm]				
M8	18	25	36	17	22
M10	37	49	72	33	44
M12	64	85	125	57	76
M14	100	135	200	91	121
M16	160	210	310	140	187
M20	300	425	610	273	364
M24	530	730	1 050	472	629

(1) –DIN ISO 898

ATTENTION

Should it be necessary to change individual parts, use only original parts or those indicated by the Manufacturer. Non-adherence to these requirements may put the user and other people's health and life at risk, and also cause damage to the machine.

5.15 TROUBLESHOOTING

TABLE 5.10 TROUBLESHOOTING

TYPE OF FAULT (ALARM)	CAUSE	REMEDY
Control panel is not working	Main switch of control panel is off	Turn on the main switch (power supply)
	Electric lead is disconnected from control panel	Connect the power supply to control panel
	Burnt out fuse	Replace
	No contact in electrical connections	Clean or replace a connection
Belt conveyor does not move or does not move smoothly	Oil level in hydraulic system is too low	Check and add oil if necessary
	Too slack belt is slipping on drive roller	Adjust according to the operator's manual
	Hydraulic system is damaged	Repair *
	Damaged transmission of conveyor belt drive	Repair *
Hydraulic system works incorrectly	Oil level in hydraulic system is too low	Check and add oil if necessary
	Leakage in hydraulic system	Check and correct the fault
Spreading disk works incorrectly	See *"Wrong operation of hydraulic system"*	See *"Wrong operation of hydraulic system"*
	Damaged hydraulic motor of spreading disc drive	Repair *
Brine spray system does not work	Brine level in tanks is too low	Check brine level on the brine level indicator, supplement brine.
	Brine valve is set in "*filling/emptying*" position	Set the valve in "*brine spraying*" position
	Oil level in the system is too low	Check oil level in the system, add oil if necessary.
	Leakage in hydraulic system	Check and correct the fault
	Clogged brine filter	Check and clean if necessary
	Brine pump drive damaged	Repair *
	Leakage in hydraulic system	Check and correct the fault
Incorrect spreading of material	Incorrect machine settings	Set the belt conveyor barrier in a manner suitable for a given type of spreading material, conduct a test and correct settings.
	Electrical spreading direction adjusting cylinder is incorrectly set	Check and adjust according to operator's manual
	Damaged relay in fuse box	Replace
	Damaged spreading disc blades	Replace

TYPE OF FAULT (ALARM)	CAUSE	REMEDY
Lights do not work	Burned-out bulb	Replace
	Damaged relay	Replace
Low level of hydraulic oil	Loss of oil	Check hydraulic system for tightness, check condition of hydraulic lines and connections
High temperature of hydraulic oil	Faulty temperature sensor	Replace
	Faulty pump	Check and repair the pump *

** inspection and repair should be performed by the Authorised Point of Sale and Service (APSS)*

TIP

Refer to the ENGINE MAINTENANCE / TROUBLESHOOTING section for a list of engine faults and their remedies (see "Engine Faults and Troubleshooting" table).

SECTION

6

ENGINE MAINTENANCE

6.1 GENERAL INFORMATION

Chapter *ENGINE MAINTENANCE* contains only the technical description of the engine and instructions for starting, operating and maintaining the engine. When operating the engine, observe standards and legal regulations currently in force as well as all internal regulations.

To ensure correct use of the engine, the prescribed inspection and maintenance intervals must be adhered to. Failure to follow the above-mentioned rules will cause damage to the engine.

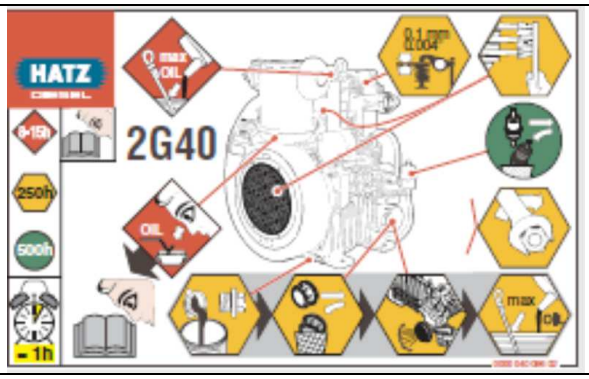
6.2 SAFETY RULES DURING ENGINE MAINTENANCE

- Before starting the engine, it is absolutely necessary to carefully read the Operator Manuals of the machine and the engine. This will prevent accidents, enable proper operation and maintenance and thus ensure maximum service life of the engine.
- Before starting the engine, make sure that all required protection devices are installed.
- The engine may be operated, maintained and repaired only by authorized (qualified) people.
- Do not start the engine in closed rooms or in rooms without ventilation system. Exhaust gas is toxic and it may cause loss of consciousness or even death.
- Do not approach the rotating parts of the engine.
- Keep a safe distance from hot elements of the engine. Risk of burn injuries. Keep flammable and explosive materials away from the engine.
- Lost or damaged fuel filler plug should always be replaced with original replacement plug.
- Do NOT remove the fuel filler plug when the engine is running or near an open flame.
- Fuel fumes are very toxic. The fuel producer's instructions must be complied with.
- Only refuel when the engine is switched off.
- Do not fill the fuel tank completely. Allow space for fuel expansion.

- Immediately wipe away spilt fuel and oil. The engine and engine compartment should be kept clean and tidy.
- Do NOT approach the engine with an open flame. There is a risk that fuel fumes or oil will catch fire.
- All maintenance and repair work should be performed only when the engine is stopped, cool and disconnected from power supply. Disconnect the electrical leads from the battery. Ensure unauthorised people have no access to the ignition key.
- While performing maintenance and repair work, use proper, close-fitting protective clothing, gloves, protective shoes, protective goggles and appropriate tools. Do not wear chains or other loose objects that can be easily caught by the engine components.
- Start the engine using only the starting system installed in the machine. The use of electrical bypasses is forbidden.
- The engine is marked with information-warning decals. Follow the instructions on the decals.
- Ensure that the information and warning decals are legible throughout the entire period of the engine use. Clean the decals with clean water or water with a small amount of detergent. If any are destroyed or damaged, they must be replaced with new.
- The applicable regulations for the protection and disposal of used oils, coolants, filters and cleaning agents must be complied with.
- Visually inspect the fuel hoses before starting the engine. Fuel released under high pressure may cause bodily injuries and burns as well as it may cause a fire. Perform technical inspections regularly.
- When performing maintenance work, be particularly aware of condensate from the exhaust system, which may contain sulfuric acid. Sulfuric acid burns are dangerous to health and life. The use of fuels with a sulphur content exceeding 15ppm increases the amount of sulfuric acid. In the event of contact of acid with skin, rinse the place of contact using plenty of clean running water. Immediately take off damp clothing. Consult a doctor.

- Running the engine at no load or at a very low load for a long period may negatively affect its performance. Make sure that the engine load is at least 15%. With such a low degree of the engine power utilization, the engine load should be increased shortly before it is turned off.

TABLE 6.1 Information and warning decals on the engine

Item	Decal	Meaning
1		Maintenance instructions
2		Only refuel with diesel fuel acc. to the specifications (see section *CONSUMABLES*) Do not use biodiesel
3		The engine may run only on very low sulphur or sulphur-free fuel

6.3 TECHNICAL DATA AND DESIGN OF ENGINE

ENGINE PARAMETERS

TABLE 6.2 Basic engine specification

Type		**2G40 / 2G40H**
Type of engine	-	four-stroke Diesel engine air cooled
Combustion system	-	direct injection
Number of cylinders	-	2
Bore / stroke	mm	92 / 75
Engine displacement	cm^3	997
Oil pressure	Minimum	1.0 bar at 900 rpm (min^{-1})
Engine oil capacity	L	3.0 (1)
The difference between MAX and MIN marks	L	0.8
Battery power	max. Ah	12V / 88Ah – 24V / 88Ah
Toxicity standard	-	EU Stage V EPA Tier IV

(1) *- These values should be treated as approximate. The MAX mark on the oil level indicator is always decisive*

ENGINE NAMEPLATE

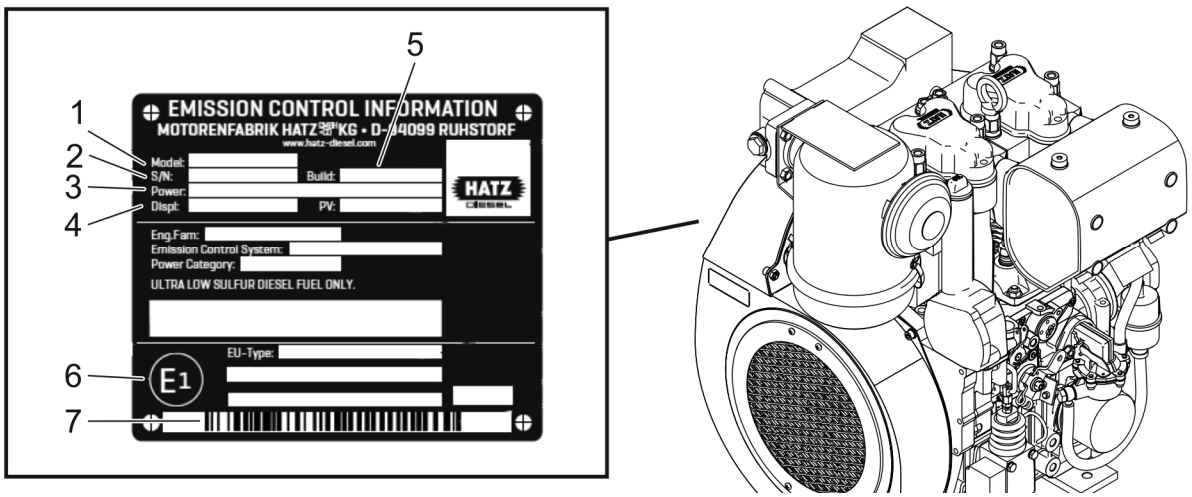


FIGURE 6.1 Location of the nameplate

(1) - engine model; (2) - engine serial number; (3) - engine power; (4) - engine displacement (litres); (5) - year of manufacture; (6) - EU country of origin (Germany); (7) - barcode (engine serial number)

PHYSICAL CONDITIONS OF THE ENGINE OPERATION

The engine will normally adapt to operation under the standard reference conditions as defined in ISO 3046-1.

TABLE 6.3 Physical conditions of the engine operation

Parameter	Unit	Value
Intake air temperature	°C K	+25 298
Relative humidity	%	30
Air pressure (about 100 meters above sea level)	kPa	100
Intake air temperature	°C K	+25 298
Relative humidity	%	30

TIP

If the machine is operated at high altitudes and in high temperatures, adjustment of the engine settings may be necessary if climatic conditions were not taken into account when purchasing the machine. In this case, contact the nearest Manufacturer's service point.

GENERAL DESIGN OF THE ENGINE

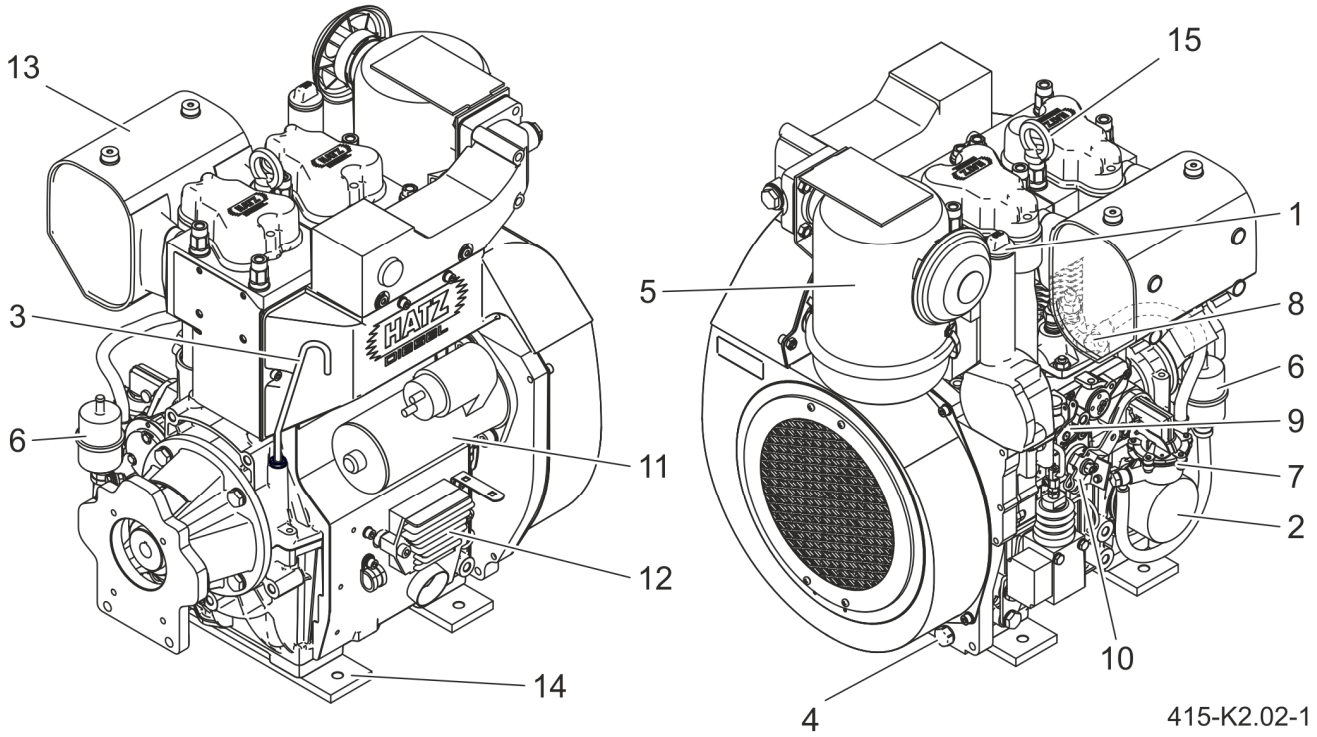


FIGURE 6.2 General design of the engine

(1) - oil filler neck; (2) - oil filter; (3) - oil dipstick; (4) - oil drain plug; (5) - wet air filter; (6) - fuel filter; (7) - fuel pump; (8) - fuel injection pump; (9) - stop lever; (10) - gear change lever; (11) - starter; (12) - voltage regulator; (13) - muffler; (14) - engine mounting; (15) - eyebolt

6.4 STARTING THE ENGINE

Before the first start-up of the engine, carry out checks in accordance with the guidelines contained in section *PREPARING FOR WORK BEFORE THE FIRST START-UP*.

PREPARING THE ENGINE FOR START-UP

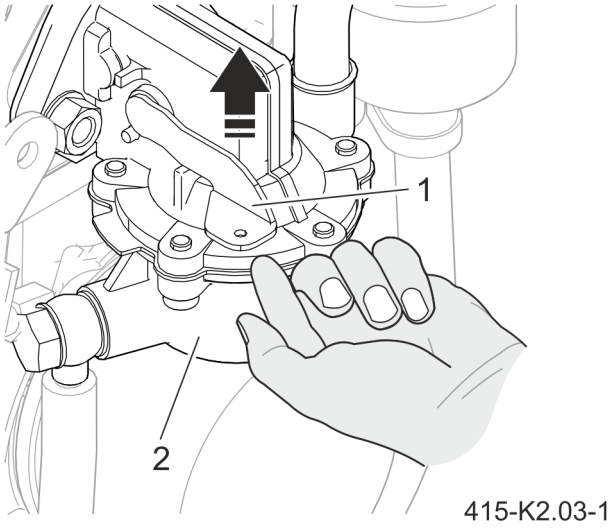


FIGURE 6.3 Pumping fuel using a hand lever

(1) - hand lever; (2) - fuel pump

- Check the engine oil level and add oil if necessary.

  ⇨ The engine must be positioned horizontally when checking the oil level.

- Check the oil level and add oil, if necessary, in the wet air filter (option).

  ⇨ Fill the oil tank with engine oil up to the level mark. Install the oil tank and ensure that the seal is correctly positioned and the clamps are properly mounted. In the version with an attached separating cyclone, pay attention to the correct position of the dust outlet.

- Check the fuel level in the tank and add fuel if necessary.

  ⇨ When filling the fuel tank for the first time, when the fuel system is empty or after replacing the fuel filter, pump fuel using the hand lever (1) of the fuel pump (2) (FIGURE 6.3) until you can hear that fuel returns to the fuel tank via the injection pipe.

- At temperatures below 0°C, use winter fuel or add kerosene early enough (see *CONSUMABLES*).

STARTING THE ENGINE

- Set the engine speed control lever (1) to 1/2 START or START position, as required (FIGURE 6.4).
- Make sure that the stop lever (2) is in the START resting position.

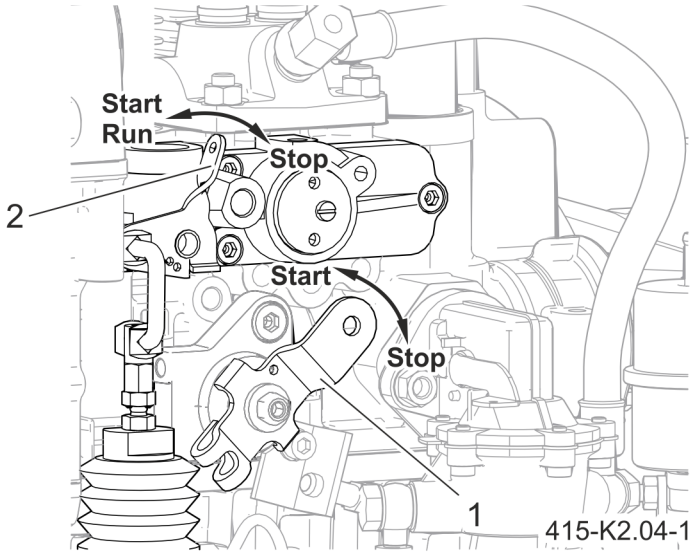


FIGURE 6.4 Engine speed setting lever

(1) - engine speed control lever; (2) - stop lever

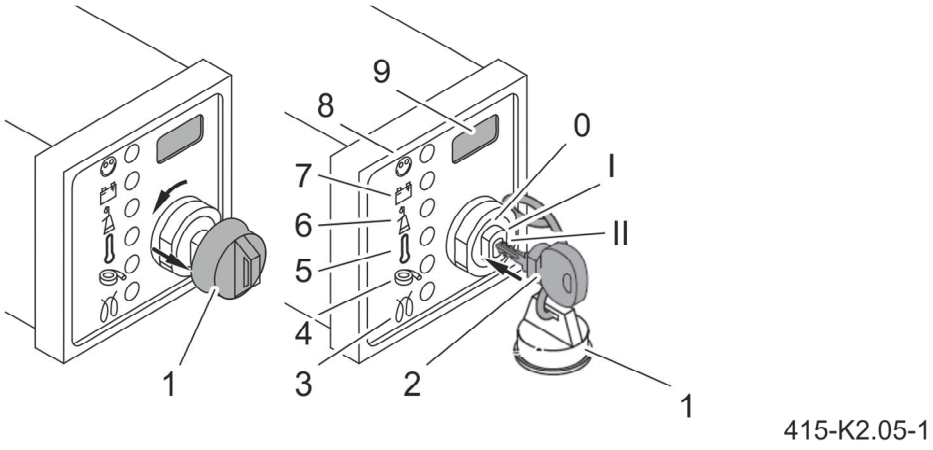


FIGURE 6.5 Starter

(1) - protective cap; (2) - ignition key; (3-8) information and warning indicators; (9) - working hours counter - option

- Remove the protective cap (1) from the ignition switch *(FIGURE 6.5).*
- Insert the ignition key (2) into the ignition switch and turn to the "I" position.

- Wait until the engine preheating indicator (3) goes out, then turn the key to position "II".

    ⇨ Do not hold the key in position "II" for more than 30 seconds.

- Release the ignition key after starting the engine.

    ⇨ The key returns to position "I" and remains in this position during the engine operation. The battery charging indicator light (7) and the oil pressure indicator (6) go out. The working indicator (8) lights up and shows that there is no engine fault. The next start-up can be performed after the ignition is reset (the key in "0" position).

TABLE 6.4 Description of information and warning indicators on the starter

Marking FIGURE 6.5	Symbol	Description
3	Engine preheating	Lights up in temperatures below 0°C. Start the engine when the indicator light goes out.
4	Air filter maintenance	Lights up when the air filter is dirty. Clean or replace the filter element immediately.
5	Engine overheating	The engine temperature is unacceptably high. Danger of damage to the engine. Stop the engine immediately!
6	Low oil pressure	Engine oil pressure too low Danger of damage to the engine. Stop the engine immediately and check the oil level. If the oil level is correct, contact the service centre.
7	No battery charging	Malfunction in the alternator or the alternator charging circuit. The battery is no longer being charged. Rectify the fault immediately.
8	Working indicator	Lights up during the engine operation when there is no engine fault.

TIP

If the engine does not start, turn the ignition key back to position "0" and remove the cause of the problem.

In the event of a fault, stop the engine immediately. Identify and remove the fault (see *TROUBLESHOOTING*).

TIP

If the engine is equipped with a starter protection module, return the key to position "0" for at least 8 seconds after a failed engine start. Otherwise, the starter will remain locked and the engine will not start.

6.5 ENGINE SHUTDOWN

NOTE

During breaks or after finishing the engine operation, secure the key against unauthorized access.

Protect the ignition switch against dirt and moisture. After removing the ignition key, seal the ignition switch with the protective cap.

Depending on the equipment, the engine can be turned off using:

- Engine speed control lever (mechanically).
- Stop lever (mechanically).
- Ignition key (electrically).

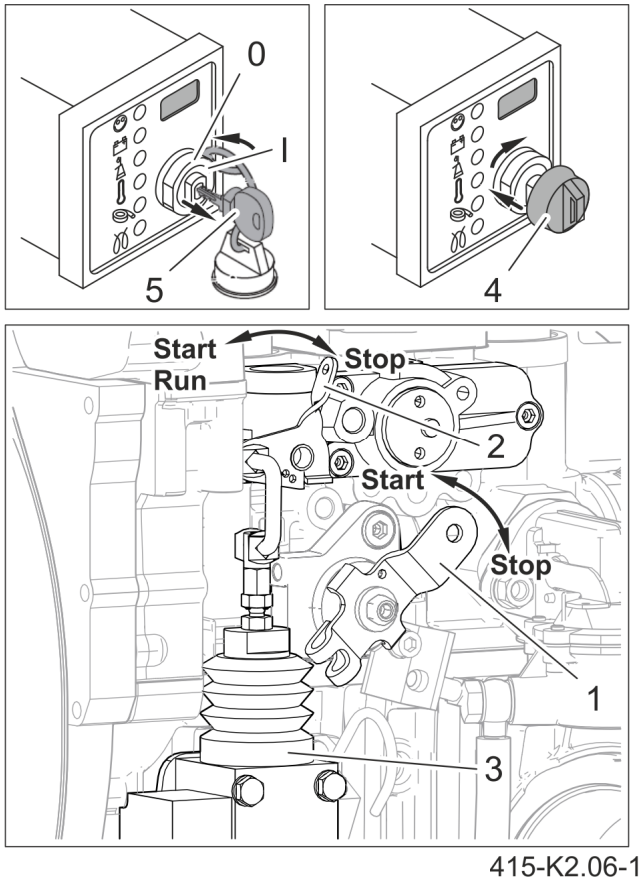


FIGURE 6.6 Engine shutdown

(1) - engine speed control lever; (2) - stop lever; (3) - stop magnet; (4) - protective cap; (5) - ignition key

Engine shutdown (mechanical)

- Move the engine speed control lever (1) back to the "STOP" position (FIGURE 6.6).

    ⇨ The engine will shut off.

- In engines with blocked lower idle speed, after moving the engine speed control lever (1) back, move the stop lever (2) towards the STOP position and hold it there until the engine shuts off.
- With the engine off, release the stop lever (2) and ensure that it returns to its START position.

    ⇨ The battery charging indicator and the oil pressure indicator will light up.

- Turn the ignition key (5) to position “0” and remove the key from the ignition.

    ⇨ All indicator lights should go out.

TIP

Engines with the lower idle speed locked cannot be turned off using the speed control lever. Such engines are turned off using the stop lever or the ignition key, depending on the engine equipment.

Engine shutdown (electrical)

- Turn the ignition key (5) to position “0” (FIGURE 6.6).

    ⇨ The stop lever (2) is moved to the STOP position by the stop magnet (3). The engine shuts off. All indicator lights go out.

- Remove key from ignition.
- Seal the ignition switch with the protective cap (4).

TIP

When the machine is turned off, always turn the ignition key to position "0" , otherwise the battery may be completely discharged.

6.6 TECHNICAL INSPECTIONS

TABLE 6.5 Engine maintenance schedule

	After the first 25 hours of operation	every 8 - 15 hours or daily before the first start-up	every 250 hours	every 500 hours	If needed	Inspection conducted by
Walk-around inspection		•				U
Engine cleaning					•	U
Checking the level of engine lubricating oil		•				U
Checking the combustion air intake area		•				U
Checking the cooling air area		•				U
Checking the bottom of the wet air filter for oil level and degree of contamination, change contaminated oil if necessary		•				U
Wet air filter maintenance			•			S
Oil change	•(1)		•			S
Replacement of oil filter	•(1)		•			S
Checking and adjusting the engine valve clearance	•		•			S
Cleaning the cooling air area			•			S
Inspection of tightening torque of nut and bolt connections	•		•			S
Replacement of fuel filter				•(2)	•	S

(1) - or after 12 months at the latest, irrespective of the total number of engine operating hours

(2) - the frequency of the fuel filter servicing depends on the fuel cleanliness; it may be necessary to reduce the frequency to 250 engine operating hours

***S** - Warranty Service; **U** - User*

During the warranty period, the inspections marked with the letter "S" are performed by a Warranty Service. After the warranty period, we recommended that these inspections should be performed by specialised workshops.

The inspections marked with the letter “U” are performed by the machine operator according to the schedule.

Maintenance work beyond the scope described in the Operator Manual may only be performed by authorized (qualified) people.

6.7 WALK-AROUND INSPECTION

DANGER

Damaged fuel system conduits may cause a leak of fuel under pressure, which may cause a fire.

IMPORTANT

Do NOT use the machine with damaged conduits. Damaged and leaking conduits may cause a serious defect.

Walk-around inspection is a detailed inspection of the engine compartment. Carry out the inspection each time before starting the machine. During walk-around inspection, pay special attention to leaks of fuel and oil. If a leak is detected, determine the place and cause of the leak. Wipe up any spilled liquid and repair or replace damaged parts before starting the engine.

- Check completeness of plugs, stoppers, etc.
- Confirm that protective shields are technically sound and correctly positioned.
- Check wiring harnesses for damage (abrasion of insulation, broken leads, loosening, contact with hot components, etc.).
- Pay attention to loosen bolt and nut connections and tighten them, if necessary.
- Check elastic conduits for mechanical damage and leaks. Damaged or worn conduits should be replaced. Check band clips and tighten them, if necessary.
- Make sure that the engine compartment is clean, and remove dirt, if necessary.
- If DO NOT START (or similar) label is attached, contact the person who has attached the warning label. The engine may be out of order.

6.8 ENGINE CLEANING

Before engine cleaning, switch off the engine and set the main electric switch to OFF position. The plate with the inscription DO NOT START should be suspended in a well visible place for the period of cleaning (e.g. near the main electric switch or the ignition).

Always keep the engine clean. Do not clean the engine using aggressive chemicals. Blowing with compressed air is usually sufficient. In case of doubts, contact the engine manufacturer experts. When cleaning, avoid dampening the electrical system components (cables, starter, sensors, etc.) If this is unavoidable, disconnect the battery first and dry all components thoroughly with compressed air before reconnecting.

Visually inspect the engine for leaks.

Do not clean the engine and its accessories with a pressure washer. Pressure can cause a lot of damage, and water can get to undesirable places. Observe the rules contained in chapter *"Cleaning the machine"*.

DANGER

Cleaning, maintenance and repair work should only be carried out with the engine turned off.

Engine contaminated with grease, fuel or oil creates fire hazard. Accumulated deposits or spilt flammable liquids should be regularly removed.

6.9 CHECKING THE LEVEL OF ENGINE LUBRICATING OIL

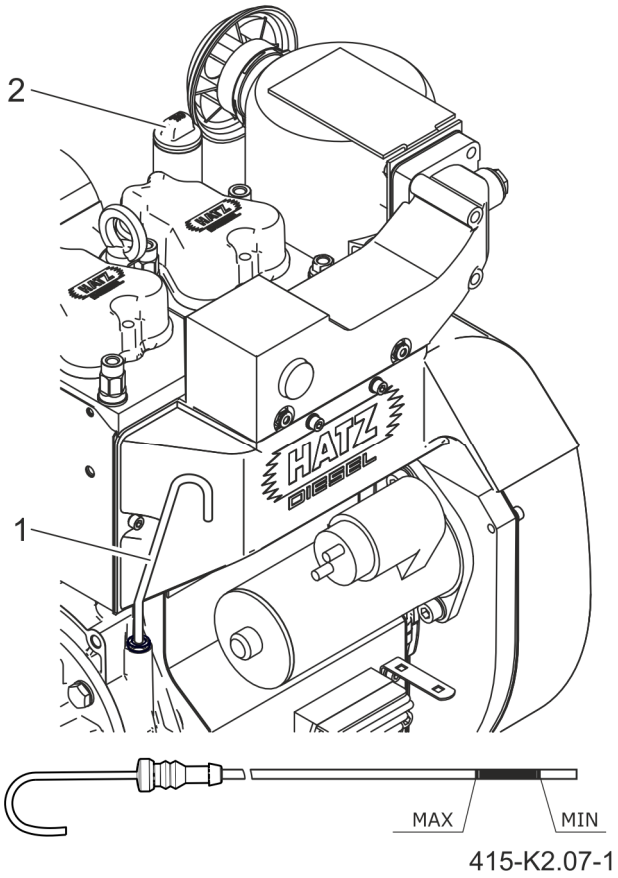


FIGURE 6.7 Checking engine oil level

(1) - oil dipstick; (2) - oil filler cap

- Turn off the engine and wait a few minutes for the engine oil to flow down to the crankcase.

  ⇨ The engine must be cool and level.

- Clean debris from the engine in the area of the oil dipstick (1).
- Take out oil dipstick and wipe it until dry.
- Insert oil dipstick and take it out again to check the engine oil level.

  ⇨ Add engine oil up to the top mark on the oil dipstick.

- If engine oil level is too low, unscrew filler plug (2) and add proper amount of oil.
- After fresh oil is added, wait until oil flows into the oil pan and check oil level again.
- Tighten the filler plug (2) and insert the oil dipstick (1).

NOTE

Operating the engine with the oil level below the MIN level or above the MAX level can cause damage to the engine.

The engine must be cool and positioned horizontally when checking the oil level.

Excessive oil level may be caused by leaky fuel system, leaky cooling system or other defect.

6.10 CHECKING THE COMBUSTION AIR INTAKE AREA

Wet air filter

- Check the air intake opening (1) - depending on the version - for heavy contamination, clean if necessary.
- In the version with a separating cyclone, check that the dust outlet (2) is not obstructed, clean if necessary.

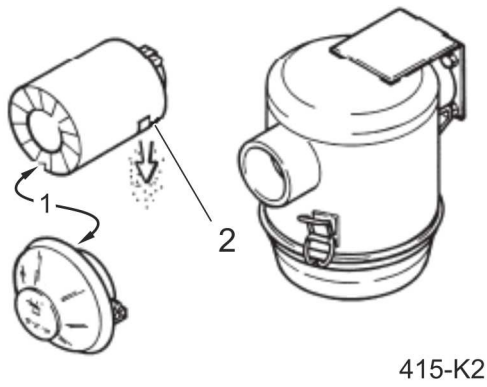


FIGURE 6.8 Checking the combustion air area

(1) - air inlet; (2) - air outlet

TIP

Heavy contamination indicates that the air filter maintenance intervals should be shortened accordingly due to heavy dusting.

6.11 CHECKING THE COOLING AIR AREA

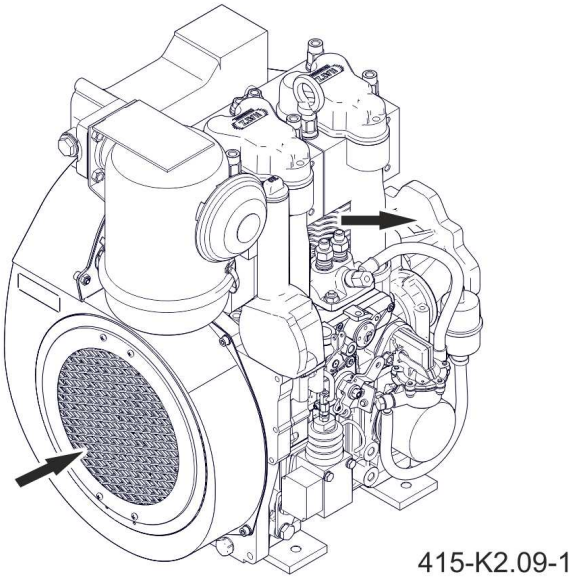


FIGURE 6.9 Checking the combustion air area

Check the cooling air inlet and outlet area for heavy contamination with leaves, dust etc., clean if necessary.

NOTE

The engine temperature indicator light (option) lights up when the engine temperature is unacceptably high. Turn off the engine immediately and remove the cause of the problem.

TIP

Heavy contamination indicates that the air filter maintenance intervals should be shortened accordingly due to heavy dusting.

6.12 CHECKING THE BOTTOM OF THE WET AIR FILTER

DANGER

The applicable regulations for the protection and disposal of used oils, filters and cleaning agents must be complied with.

Do not allow the oil to get into ground water, water reservoirs or sewage system.

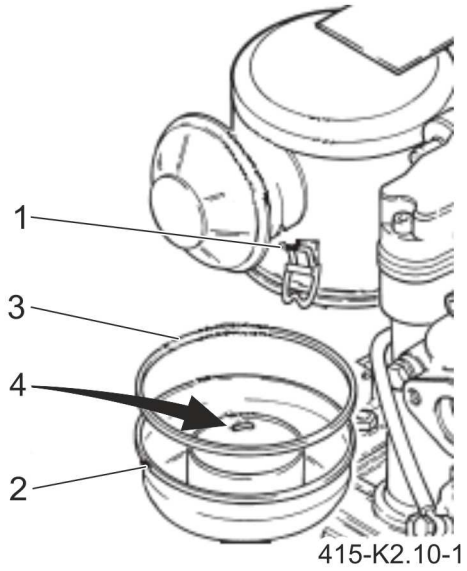


FIGURE 6.10 Checking the bottom of the wet air filter

(1) - clamp; (2) - oil tank (3) - seal; (4) - oil level mark

- Release the clamps (1) and remove the oil tank (2).
- Check cleanliness of the filter and clean it if necessary.

  ⇨ When the deposited dirt has reached about half the oil filler level or the oil becomes sticky, clean the air filter.
- Check the oil level and, if necessary, add engine oil to the level mark (4) as required.
- Install the oil tank and ensure that the seal (3) is correctly positioned and the clamps (1) are properly mounted.

6.13 TROUBLESHOOTING

TABLE 6.6 Engine faults and how to remove them

Fault (Alarm)	Possible cause	Solution
Engine does not start or starts poorly, but the starter rotates the engine crankshaft.	The engine speed control lever is in the STOP or idle position.	Place the lever in the START position.
	The stop lever is in the STOP position.	Place the lever in the START position.
	No fuel in the injection pump.	Add fuel. Check the entire fuel system thoroughly. If no defects are found, check: - conduit leading to the engine - fuel filter - operation of the fuel supply pump
	Compression too low: - Incorrectly set valves. - Worn valves. - Worn cylinder and / or piston ring.	Check valve clearance, adjust if necessary. * Repair *
	Faulty injectors.	Repair *
Engine does not start in cold weather	Temperature lower than the minimum operating temperature of the engine.	Start the engine preheating system (additional equipment).
	Faulty engine preheating system (additional equipment).	Repair *
	Fuel loses its consistency due to insufficient frost resistance.	Check that the fuel that flows out of the detached fuel conduit is clean and not cloudy. If the fuel has changed its consistency, warm up the engine or drain the entire fuel system. Pour in frost-resistant fuel mixture
	Engine starting speed too low: - Oil too thick. - Insufficiently charged battery.	Change engine oil. Pour in oil of the correct viscosity grade * Check the battery, if necessary, contact the service centre.
	The machine is not declutched.	If possible, disengage the clutch to disconnect the engine from the machine *
Defective starter or engine does not rev up.	Disturbances in the electrical system: - Battery cables and / or other cable connections incorrectly connected. - Loose and / or rusty cable connections. - Defective and / or not charged battery.	Check the electrical system and its components or contact the service centre

Fault (Alarm)	Possible cause	Solution
	- Defective starter. - Defective relays or monitoring devices, etc.	
The engine starts, but immediately cuts out when the starter is disengaged.	The engine speed control lever is not sufficiently moved to the START position.	Place the lever in the START position.
	The machine is not declutched.	If possible, disengage the clutch to disconnect the engine from the machine *
	Clogged fuel filter.	Replace the filter *
	Fuel circulation interrupted.	Check the entire fuel system thoroughly.
The engine shuts off by itself.	Fuel circulation interrupted: - No fuel in the fuel tank. - Clogged fuel filter. - Defective fuel supply pump.	Refuel. Replace the filter * Check the entire fuel system*
	Mechanical damage.	Contact the service centre
The engine loses power and revs.	Defective fuel system. - No fuel in the fuel tank. - Clogged fuel filter. - Insufficient fuel tank venting.	Refuel. Replace the filter * Provide sufficient fuel tank venting.
	Leaky conduit connections.	Check conduit connections for tightness.
	The engine speed control lever moves by itself.	Lock the engine speed control lever.
The engine loses power and revs, black smoke comes out of the exhaust pipe.	Contaminated air filter.	Clean the air filter or replace it with a new one if necessary. *
	Incorrectly adjusted valves.	Adjust the valves *
	Faulty injectors.	Contact the service centre
The engine is overheating. The engine temperature indicator light (option) lights up	Too much lubricating oil in the engine.	Drain the engine oil to the upper mark (MAX) on the oil dipstick
	Insufficient cooling: - Contaminated the entire cooling air area. - Air supply plates not properly closed.	Clean the cooling air area. Check that air supply plates or supply channels are intact and properly sealed.

** during the warranty period, inspections and repairs are carried out be authorised service*

6.14 CONSUMABLES

TABLE 6.7 List of consumables

Place of application - name	Quantity	Number / type / standard
Air filter, set	1 pc	HATZ 011 222 10
Engine oil filter	1 pc	HATZ 503 028 00
Fuel filter	1 pc	HATZ 504 788 00 (> -6°C), 400 894 01 (< -6°C)
Engine oil (including sump capacity)	3 L	SAE 5W30
Fuel tank - Diesel oil	26 L	PN-EN 590+A1:2010

ENGINE OIL

NOTE

Wrong engine oil significantly shortens the engine's service life.

Use only engine oil that meets the above specifications.

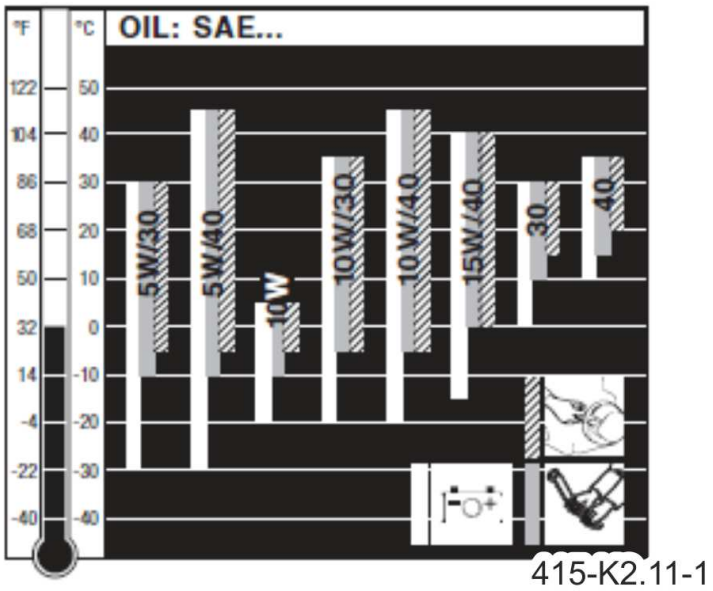


FIGURE 6.11 Oil viscosity grade depending on temperature

All branded oils that meet at least one of the following specifications are allowed:

- ACEA - B3 / E4 or better.
- API - CF / CH-4 or better.

Select the recommended oil viscosity depending on the ambient temperature for starting the cold engine.

FUEL

NOTE

The use of out of specification fuel may cause damage to the engine.

All types of Diesel fuel that meet the minimum requirements of the following specifications can be used:

- Europe: EN 590.
- UK: BS 2869 A1 / A2.
- USA: ASTM D 975-09a 1-D S15 or 2-D S15.

At temperatures below 0°C, use winter fuel or add kerosene early enough.

TABLE 6.8 Winter fuel

Lowest ambient temperature in °C at start-up	Percentage of kerosene for	
	summer fuel	winter fuel
0 to -10	20 %	–
-10 to -15	30 %	–
-15 to -20	50 %	20 %
-20 to -30	–	50 %

NOTE

When Diesel fuel is stored for long periods, deposits may form in the fuel tank or canister due to the fuel aging. These deposits cause malfunctions of the engine due to clogging of the fuel filters and damage to the fuel injection system.

NOTES