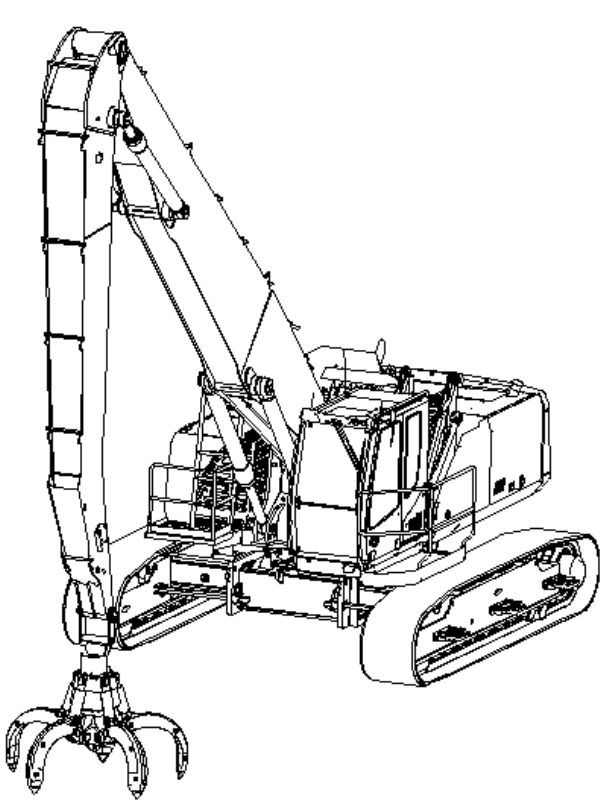
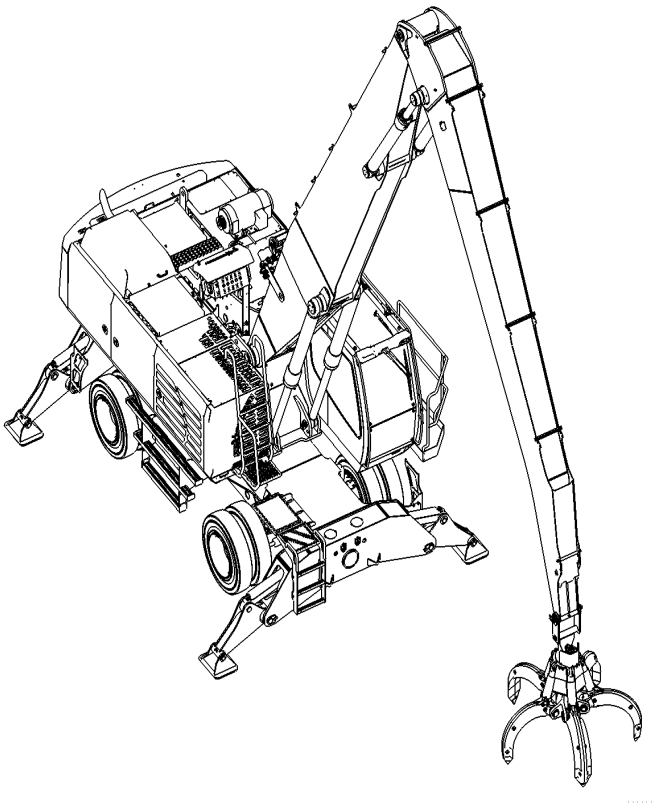
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OPERATING INSTRUCTIONS

Model

830 E







Operating instructions
830.0.xxxx_us

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Foreword

You have decided on a brand quality product from SENNEBOGEN. Thank you for your selection.

It is very important to us that your SENNEBOGEN quality product performs its work reliably, continually, and with no faults.

As you know, the reliability and durability of every machine is greatly influenced by the regular and specialist service and maintenance work performed on it.

We would therefore ask that you read the following service and maintenance information thoroughly and that you implement it accordingly.

For your own safety

Functionality, reliability, availability and advanced technology, e.g. the use of modern materials and technology, requires specially adapted maintenance and repair methods. Only use genuine SENNEBOGEN spare parts. Only allow authorized SENNEBOGEN partners to perform work on your SENNEBOGEN machine. Improperly performed maintenance or service work may result in consequential damages and associated safety risks.

Parts and accessories

Use only genuine spare parts and accessory products that are authorized by SENNEBOGEN. These parts have been tested by SENNEBOGEN for their safety and functional suitability in SENNEBOGEN machines. SENNEBOGEN will not be held responsible for any parts or accessory products that have not been approved.

Warranty

The warranty can become void if, for example:

- Spare parts are not genuine SENNEBOGEN-approved spare parts
- Maintenance is not performed at specified maintenance intervals
- Maintenance has not been performed
- Service and maintenance work has not been performed by a SENNEBOGEN partner
- Alterations are not authorized

In the event of damage, SENNEBOGEN reserves the right to demand written verification that all maintenance work has been performed correctly and completely!

SENNEBOGEN recommends special service and maintenance contracts with the **authorized** SENNEBOGEN partner of your choice to address these issues.

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Notes on the instructions

Carefully read through the instructions, in particular Chapter 1 SAFETY, before beginning work with/on the machine.



CAUTION

- Only work with/on the machine once you have read and completely understood theseoperating instructions.
- Refrain from operating and maintaining the machine in an unsafe manner.
- Do not operate machine if a fault has been detected.
- The machine may be set up, operated and maintained by trained personnel only.
- The employer is responsible for the qualifications and training of personnel.
- These instructions are a part of the machine. Keep the instructions in the cab at all times.
  Recommended storage location: storage compartment behind the driver's seat.
  In the event of sale, disposal or loan, the operating instructions must accompany the machine!
- Contact SENNEBOGEN immediately if there is anything in the operating instructions that you do not understand!
  Your comments will help us to make the operating instructions even more user-friendly.
- Maintenance of the machine is described in separate instructions.



For reasons of clarity, the specified protective features are not illustrated in some of the illustrations. Operation with protective features removed is not permitted!

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Symbols and illustrations

These operating instructions contain safety instructions that highlight dangerous working practices. These safety instructions are marked with a warning symbol and a signal word.



This warning symbol means: *Attention* — this concerns your safety and the safety of others.

The associated signal word signifies the degree of danger:

DANGER
Is used for serious, impending danger. If this danger is not avoided, serious physical injuries or loss of life will result.

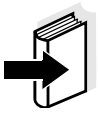
WARNING
Is used for potentially dangerous situations. If this danger is not avoided, serious physical injuries or death may result.

CAUTION
Is used for potentially dangerous situations. If this danger is not avoided, physical injuries or serious material damage may result.

Notes that make the work easier or contribute to better understanding when operating the machine are illustrated in the following way:



Note
Indicates notes that draw your attention to special features.



Note
Indicates a cross reference to other documents.



Optional/special equipment
Designates instructions and information that depends on special applications or special equipment.

Procedures are illustrated in tabular form as follows:

1	Press the switch (1).
2	Actuate the control lever (2).
3	Unfasten the bolt (3).

- Listings are marked with bullet points.
  - Sub-points in listings or procedures are marked with dashes.

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Glossary of terms

Operator
The operator (owner of the company/company) is whoever operates the product and uses it in accordance with its intended use or allows the product to be operated by suitable and instructed personnel.

Operating personnel
The operating personnel are those authorized by the operator to operate the product.

Specialist personnel
Specialist personnel are those authorized by the operator to fulfill certain tasks such as installation, setup, repair and maintenance and troubleshooting.

- **Specialists**
  Specialists are those who, on the basis of specialist training, knowledge and experience with the product and in the full knowledge of the relevant standards, can appraise the work allocated to them and can recognize potential dangers and avoid them.
- **Instructed personnel**
  Trained personnel are those who have received instruction in the tasks allocated to them and in the potential dangers of misuse and misbehavior, who have been taught about the necessary protective features, safety measures, relevant regulations, accident prevention guidelines and operating conditions and who have proved their abilities.
- **Experts**
  Experts are those who, on the basis of specialist training and experience have sufficient knowledge in the area of the product and are sufficiently aware of the relevant national occupational safety guidelines, accident prevention guidelines, regulations and generally recognized technical regulations (e.g. EC directives, VDE regulations, VBG) as to be able to judge the operational safety of the machine.
- **Inspectors**
  Experts are those who are authorized by the technical authorities (TÜV) or by a trade association to check the machinery.
  Authorization by the trade association is in accordance with the “Principles for the authorization of inspectors for the testing of cranes” (ZH 1/518). It is linked with the issue of an identification number. This must be stated by the inspector in the test report and/or test memo.
  Authorizations can be limited to parts of tests or specified crane types.

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Target group

The machine has been developed for demanding work.
Persons working on or with the machine must be trained or instructed for that purpose.

Detailed information on the prior knowledge and qualifications required of the operator can be found in Chapter 1 SAFETY of these instructions.

Which documentation belongs with the machine?

The following documentation belongs with the machine:

- These instructions
- Maintenance instructions
- Spare parts catalog
- Service booklet
- Wiring diagrams
- Hydraulic layouts
- Regulatory documents
- Additional documentation from pre-suppliers.

Note
The complete scope of delivery is defined in the order confirmation.

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How is the manual organized?

The manual is divided into 10 chapters:

- 1: Safety
  Here you will find generally valid safety instructions and must always be complied with.
- 2: Overview
  The main components of the machine are presented in chapter 2.
- 3: Technical data
  Here you will find basic information concerning the machine, e.g. Working loads.
- 4. Start-up
  Here instructions on daily start-up are provided.
- 5: SENNEBOGEN Control System
  Here you will find information on the SENNEBOGEN Control System.
- 6. Operation
  Here you will find information on operating elements and work deployment.
- 7. Transport
  Dimensions and weights of the machine are found in chapter 7.
- 8: Troubleshooting
  This chapter contains instructions on recognizing the causes of faults and how to correct them.
- 9: Setup tasks
  Chapter 9 provides information on optional work tools.
- 10: Appendix
  Here you will find an index of and additional information, about the magnet unit.

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Note
The addresses of the SENNEBOGEN sales and service partners can be found on our homepage on the Internet.

Current when going to press

Ongoing development ensures advanced technology and a high level of quality in our machines. This may result in variations between these instructions and your machine. Errors can also not be excluded. Please understand that no legal claims can be derived from the specifications, illustrations and descriptions within these instructions.

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1 Safety

1.1 General information

The machine is built to state of the art standards. Nevertheless, there may be dangers during its use to persons, machines and other property, if

- the machine is not utilized in accordance with its intended use
- The machine is not operated or maintained by trained personnel
- the safety instructions are not observed.
- the machine is found to be defective.
- the attachment tools attached do not comply with the relevant safety regulations.
- The attachment tools attached are found to be defective.

National and international regulations apply in addition to the safety instructions in these instructions.

In the Federal Republic of Germany e.g.:

- Winches, Lifting and Pulling Equipment (TUR D8)
- Cranes (TUR D6)
- Crane inspections (BGG 905)
- EU Machinery Directive 2006/42/EC
- EMC Directive 2004/108/EC
- Electrical Equipment in Machines (EN 60204-1)
- Safety Requirements for Fluid Power Systems and their Components — Hydraulic Systems (EN 982)
- Earth-Moving Machinery — Safety (EN 474-1/-5)
- Safety of Machinery (DIN EN 12100-1 and DIN EN 12100-2)
- “Outdoor” guideline 2000/14/EC and 2005/88/EC



Note

If national regulations in the country of operation deviate from our recommendations, the more stringent procedure should be followed.

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1.2 Intended use

Intended use of the machine consists solely of hoisting, transport and loading of loads. Permitted attachments are:

- grab
- Magnet units.

In addition, in special cases:

- scrap shears
- Demolition hammer
- Concrete crusher



- Load hook:
  When working with the load hook, the machine that must be used, in accordance with DIN EN 474-5, is an excavator used as a hoist. For this purpose, the machine must be fitted with a load torque monitoring device, which cuts out in the event of overload. The lifting cylinders must be fitted with cable break safety devices. Before commencing work in the hoisting operation, please check the equipment on your machine and consult SENNEBOGEN Customer Service if necessary.



- Trailer:
  The machine is suitable for pulling a trailer but is subject to the permitted axle load. Questions should be directed to SENNEBOGEN Customer Service.

Attachments

An overview of all of the attachments that are currently available including matching machine types can be found in the appendix.



WARNING
Not every attachment is suitable for every type of machine. Only the attachments (type of construction and size) that are approved for the respective type of machine are to be attached.

If any other attachment not listed is mounted, the user/operator is responsible.

Observe the performance specifications of the machine. Lifting capacities are not to be exceeded under any circumstances.

Other or additional applications are considered not in accordance with its intended use and can endanger persons or machinery.

Work station

The machine operator's work station is in the cab of the machine.

Target group

The machine has been developed for demanding work.
Persons working on or with the machine must be trained or instructed for that purpose. Start-up, maintenance, transport, and assembly/ disassembly should only be performed by trained specialists.

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1.3 Potential instances of misuse

The following apply as potential instances of misuse, in particular:

- Exceeding the permitted lifting capacities.
- Using non-SENNEBOGEN parts.
- Use in unauthorized ambient conditions.
- Misuse by untrained and uninstructed personnel.
- Inadequate fittings for the types of use (e.g. protecting the cab against dropping objects with guard grill).
- Operating on insufficiently firm subgrade.
- Failure to perform the necessary inspection and maintenance work.
- Neglecting to lower attached loads and boom if necessary when shutting the machine down (e.g. work stoppages, over night).
- Starting and operating the machine outside the specified starting and operating temperature.
- Insufficient pre-warming and warm-up phase.
- Working in emergency operation over a longer time period.
- Hoisting operation without load torque monitoring

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1.4 Misuse

Misuse (abuse) applies in particular to:

- Hoisting, moving, and transporting of persons
- Lifting loads at an angle
- pulling loads
- Dragging loads
- Pulling free jammed loads
- operation of the machine in explosive environment
- exceeding the permitted safe working load
- the attachment/operation of non-approved/permitted attachments
- Working below or directly next to current-carrying overhead power lines.



WARNING
Misuse excludes all liability on the part of the manufacturer! The risk is borne solely by the user/operator.

1.5 Other risks

The safety notes in these instructions are guidelines for the safe use of the machine by qualified machine operators. However, SENNEBOGEN cannot anticipate every situation, which may result in danger in practice.
Consequently, the safety notes and warnings on the machine and in the instructions cannot be all inclusive. The owner and machine operator still remain responsible for safety.
Warning and notice signs attached to the machine also refer to other risks.

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1.6 Machine labeling

The machine is provided with special warning and notice signs.

- Do not remove the signs.
- Ensure that all signs are undamaged and legible.
- Clean labels with soap and water if necessary, not with fuel or solvents.
- Replace damaged, scratched or illegible signs with new ones.

Note
Signs are available from SENNEBOGEN (see Spare parts catalog).

1.6.1 USA identification plate



1	Machine type
2	Manufacturer's No. (Facility No.)

(*) Note
The data for positions 5, 6 and 7 is not always engraved on the Warning and notice labels

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Explanations of the stickers used on the machine:



Drilling and welding work is only to be done by authorized SENNEBOGEN partners



Open flames prohibited!



Smoking prohibited!



Boarding prohibited!



Access for unauthorized prohibited!



Stay off!



Warning, do not clean with steam cleaner.



Warning, hazardous area.

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	Warning, crushing hazard!
	Warning, danger of amputation! (High pressure)
	Starter batteries, filled with corrosive and poisonous acid. Do not allow to drop and do not open with force
	Warning, rotating component! (drive shaft/universal joint)
	Warning, swiveling range!
	Warning, electric voltage!
	Before performing any maintenance work, switch the engine off and remove the ignition key!
	Belt drive, never reach into the area of the drive belts or pulleys!
	Warning of hot surface or hot parts!

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	Warning, danger of injury! Rotating fan baffles
	Maintain safety distance to overhead power lines in work application!
	Crushing hazard in the vicinity of the raising cab (between the cab and the upper structure)
	Note pertaining to emergency exit, in case of danger, smash the rear window with the emergency hammer and then leave the cab carefully
	The machine fulfills basic safety requirements. Thus, the continuous sound pressure level outside the machine is 103 dB.
	Note regarding the storage location of the fire extinguisher
	Secure the machine in these tie-down locations for transport
	Tie-down points (eyelets) for raising the machine

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	Wear the optional seat belt during work application
	Read and understand the maintenance instructions before starting with any cleaning, service, maintenance, or repair work
	Before starting up the machine, carefully read the operating instructions and the accompanying technical information/additional documentation for attachments.
	Symbol for the battery disconnecting switch
	Supply voltage of on-board electrical system: 24 volts
	Symbol for slewing ring lubrication
	Wear personal protective equipment
	Fuse for ignition lock 40 A
	Note indicating the position of the engine diagnostics plug-in connector

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1.7 Responsibilities of the employer

Routine Tests

Inspection by specialist technician, required for crane or excavating work

The machine must be thoroughly inspected by a specialist technician,

- before initial operation and before operating the machine after significant modifications
- at least once yearly
- intermittently depending on operating and company conditions.

A specialist technician in this context is a person who

- has extensive knowledge of this machine and the relevant regulations and guidelines due to specialist training and
- through special instructions by SENNEBOGEN

and can assess the safe working condition of the machine.

Inspection by an inspector, only required for crane operation

The following cranes must be tested by an inspector every 4 years:

- Fuel driven vehicle crane
- Location changing fuel driven Derrick
- Truck attachment cranes

The inspector inspection is to be performed in the 13th year of operation and annually thereafter.

Faults that are detected in recurring inspections must be eliminated within a suitable time-frame depending on how serious a threat they pose to safety.

Personnel selection and qualification

The machine must only be operated and maintained by qualified personnel.

- Employ only trained and instructed personnel.
- Define responsibility for operation and maintenance.
- Comply with the permitted statutory minimum age.



CAUTION

- Personnel under training or instruction must remain under constant specialist supervision while working on the machine.
- Work on the machine's electrical equipment may only be carried out by a qualified electrician.
- Work on undercarriage, braking and steerage systems may only be carried out by specifically trained technicians!
- Work on hydraulic systems may only be carried out by personnel with specific knowledge and experience on hydraulics!

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Technical condition of the machine

The employer has an ongoing responsibility to monitor the overall technical condition (obvious external faults and damage as well as changes to operational behavior) of the machine.
Do not operate the machine if a fault has been detected!
Observe mandatory time limits for routine checks.

All damages and incidents are subject to the mandatory logging and storage regulations.

Independent conversion and replacement part production

For safety reasons the machine may not be modified or altered in any way. This applies also to the installation and use of safety devices and valves as well as welding on load carrying parts.

Genuine SENNEBOGEN replacement parts and accessories ensure the safety of personnel. Parts and fittings from other manufacturers are not tested by SENNEBOGEN and are not therefore approved. The use of other components can alter the machine's characteristics and present a safety hazard.

If other components are used, SENNEBOGEN will not be considered liable for any resulting consequences.

Unauthorized operating methods

- The operating safety of the machine is only ensured if it is used as intended according to these instructions.
- The specified performance specifications must be observed.
- The performance data listed in the instructions must not be exceeded.
- If a danger of heavy items dropping exists, the machine may only be used if the driver's area is covered by a protective roof (FOPS). The protective roof is optionally available from SENNEBOGEN.

Special dangers

The machine operator must check whether the operation gives rise to specific dangers, e.g. on account of toxic gases, ground quality etc., and adopt appropriate measures to avoid or limit those dangers.

International use

If the machine is used internationally, the following must be observed:

- Observe the safety regulations of the respective country.
- Ensure that the operators have the necessary qualifications for the intended work.
- Ensure that the contents of these instructions are read and fully understood. If necessary, obtain the instructions in the appropriate official language from SENNEBOGEN.

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Permissible ground pressure

The maximum permissible ground pressure of the subgrade is authoritative for the secure operation of the machine. The guidelines in the following table must be taken into consideration for applications planning.



WARNING
If justified doubt exists as to the safe working load of the ground on location, a ground inspection must be carried out prior to start of machine operation.

Check the ground for hidden problems such as melting ice or undercutting.

Type of ground	**Perm. ground pressure in [kg/cm^2]**
A) Stirred ground that has not been packed	0 — 1
B) Grown in, obviously untouched ground	
1) Mud, peat, muck, topsoil	0
2) Non-binding, sufficiently solid, seasoned ground	
- Fine to medium sand	1,5
- Coarse sand to gravel	2,0
3) Cohesive soil	
- soggy	0
- soft	0,4
- firm	1,0
- semi-solid	2,0
- solid	4,0
4) Rock that has not been weathered, with few fissures and is well preserved	15 — 30
C) Artificially packed surface	
1) Asphalt	5 — 15
2) Concrete - Concrete group I	50 — 250
- Concrete group II	350 — 550

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Slopes and ditches

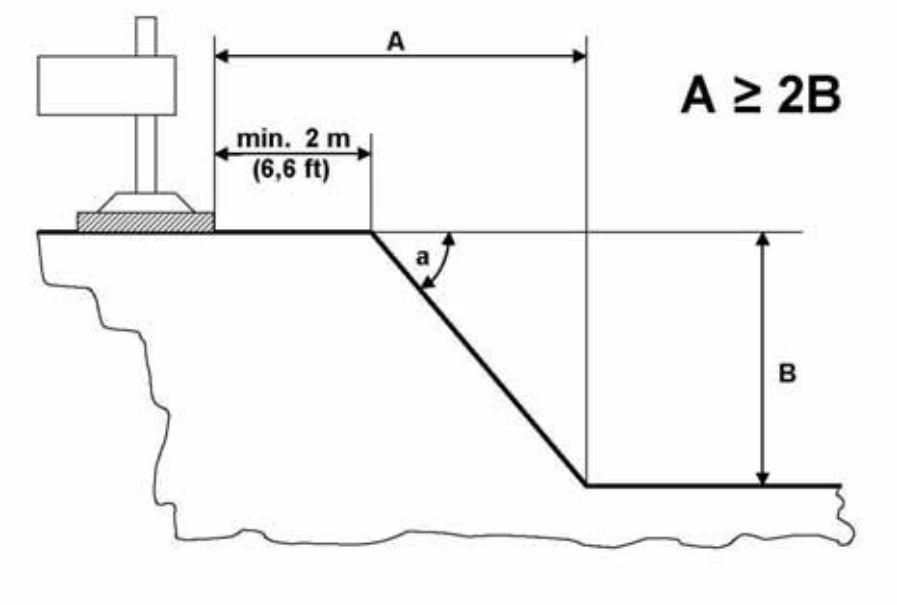
The machine must be set up/operated at a sufficient safety clearance from banks and ditches. The distance depends on the type of ground in the location.

DANGER

The distance to the bank edge must be at least 2 m. It also depends on the type of ground in the location.

Rule of thumb:

- for overgrown ground (or not hilly ground), the safety clearance (A) must be the same as the ditch depth (B), bank angle at < 45°
- for ground fill (or hilly), the safe distance (A) must be twice as far as the ditch depth (B), slope angle a < 30°



Dangers of non-compliance with safety instructions

Non-compliance with safety instructions is dangerous and can be hazardous to persons as well as to the environment and the machine and leads to the loss of any claims for damages.

Fire extinguisher and first-aid kit



The machine is provided with positions for a fire extinguisher and first-aid kit. The operator is obliged to equip the machine with these items. If necessary, obtain fire extinguishers and first-aid kits from SENNEBOGEN.

Warranty conditions

The warranty conditions of SENNEBOGEN Maschinenfabrik GmbH are summarized in the warranty manual.

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1.8 Supplementary and operational equipment

1.8.1 SENNEBOGEN CONTROL System (SENCON)

Note
Sensors monitor the current operating status of the machine and transmit the measurement results to the SENCON. The measurement results are evaluated in the SENCON and displayed automatically or at the push of a button on the unit. The indicator and warning lamps are activated if irregularities occur on the machine.

Correct a minor fault condition (clogged air filter, empty fuel tank or the like) by yourself without delay.

Contact SENNEBOGEN Customer Service to correct a more serious irregularity (one that you cannot correct yourself)

SENNEBOGEN CONTROL System



Note
Further information on SENCON can be found in Abschnitt 5.4 SENNEBOGEN CONTROL SYSTEM (SENCON).

CAUTION
The SENNEBOGEN CONTROL system must never be cleaned with cleaning agents containing alcohol or solvents. Failure to observe the above could result in damage to the plastic surface.

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1.8.2 Oils and lubricants

Note

Only use oils and lubricants approved by SENNEBOGEN. These are listed in the LUBRICANTS TABLE. The ambient temperature for operating the machine must be between - 20 °C (- 4 °F) and + 40 °C (+ 104 °F). If the temperature at the site is outside these values, discuss this with SENNEBOGEN customer services before starting operation.

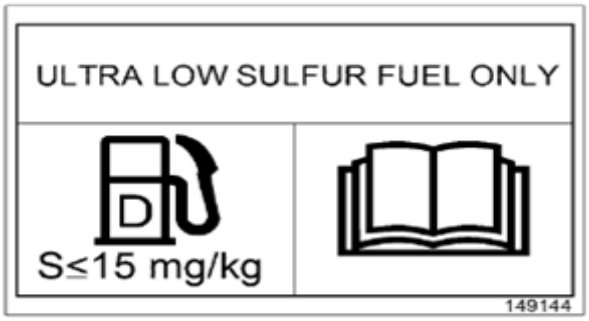
1.8.3 Diesel fuel

SENNEBOGEN factory filling for diesel fuel conforms to EN 590 with a sulfur content of <10 mg/kg.

Note

The use of sulfur-free fuel per EN 590 or ASTM D975 S15 is strictly specified for engines of exhaust level EU stage IIIB and US EPA level 4 interim

If this diesel fuel requirement applies to the installed diesel engine, the sticker shown below must also be attached to the diesel tank filler strainer.



CAUTION

A sulfur content greater than 15 mg/kg causes serious damage to the engine and the exhaust gas treatment system.

This can invalidate the emission certification of the diesel engine and have legal consequences for the operator.

Observe the notes in the engine manufacturer operating instructions.

Note

The use of fuels with a higher sulfur content than 15 mg/kg is permissible under certain conditions for engines of exhaust level EU stage II or IIIA and US EPA level 2 or 3. This however requires the use of engine oil with special properties matched to this requirement.

Engine oil filled at the SENNEBOGEN factory is not suitable for this use and must be replaced.

Observe the notes in the engine manufacturer operating instructions.

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1.8.4 Engine oil

SENNEBOGEN factory filling for engine oil is selected for use with sulfur-free diesel fuel with a sulfur content of <15mg/kg.

Note

The use of low ash engine oils per specification ACEA E9-08 or API CJ-4 is strictly specified for engines of exhaust level EU stage IIIB and US EPA level 4 interim.

Observe the notes in the engine manufacturer operating instructions.

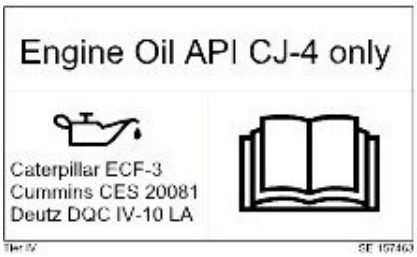
CAUTION

Using engine oils of a specification different than ACEA E9-08 or API CJ-4 causes damage to the exhaust gas treatment system for engines of exhaust level EU stage IIIB and US EPA level 4 interim. This can invalidate the emission certification of the diesel engine and have legal consequences for the operator.

Note

The use of engine oils with a specification other than ACEA E9-08 or API CJ-4 is permissible for engine of exhaust level EU stage II or IIIA and US EPA level 2 or 3.

Observe the notes in the engine manufacturer operating instructions.



WARNING

Mixing oils, lubricants or operational fluids of different types is not permitted!
Filling or mixing oils, lubricants or operating fluids (e.g. hydraulic oil, gear oil, motor oil, coolant, etc.) of different types can lead to damage to machine components caused by chemical reactions for example. This can in turn result in severe damage to property and personal injuries.

Only use oils, lubricants and operational fluids that are approved by SENNEBOGEN.

Only mix oils, lubricants and operational fluids that are of the same type or identical (same specifications) from one manufacturer!

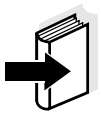
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Oil diagnosis

Regular oil diagnosis helps to avoid unnecessary costs. A series of tests will determine:

- the condition of the oil
- the amount of worn metal in the sample
- the wear rate of components

Recommended for the hydraulic system.



Note
More helpful information is available from SENNEBOGEN Customer Service.

Biodegradable oils and lubricants

The use of such substances is expressly required where the leakage of mineral-based oils and lubricants presents a danger to the environment. The use of environmental-friendly lubricants is mandatory, particularly in water or nature conservation areas. Only synthetic, ester-based biological oils may be used.



WARNING
Switching to bio-oils and bio-lubricants is only permitted subject to the agreement and written confirmation of SENNEBOGEN Customer Service.

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1.8.5 coolant

General

WARNING

Mixing coolants and adding cooling system sealing agents or anti-freeze that contains sealing agents is not permitted.
By filling or mixing different types of cooling fluid or cooling agent additives, gelling, etc. can occur in the coolant leading to the cooler being plugged (build-up) and because of the engine overheating or if the cooling system fails for example, this can damage the machine.

Note

Observe the refrigerant label in the cooler area.



Hinweis / Notice / Indication / Indicio / Indicazione / индикация

Anweisung zum Befüllen des Kühlsystems / Instructions regarding filling the cooling system / Instructions de remplissage du circuit de refroidissement / Instrucciones para llenar el radiador / Istruzioni per il riempimento del sistema di raffreddamento / Указание по заполнению системы охлаждения

de	Nur freigegebene Kühlmittel verwenden. Das Kühlsystem gleichmäßig mit maximal 9 Liter/Minute befüllen. 5 min nach Ende des ersten Füllvorgangs den Füllstand kontrollieren und gegebenenfalls Kühlmittel nachfüllen. Anschließend den Motor 5 min im niedrigen Leerlauf betreiben, danach Füllstand kontrollieren und gegebenenfalls nachfüllen.
en	Only use approved coolant. Fill the cooling system evenly, at a maximum of 9 liters/minute. 5 minutes after the end of the first filling process, check the level and if necessary top up the coolant. Then run the engine for 5 minutes at a low idling speed, afterwards check the level and top up if necessary.
fr	Utiliser exclusivement un liquide de refroidissement homologué. Remplir le circuit de refroidissement avec un débit constant de 9 litres/minute au maximum. Vérifier le niveau 5 min après avoir terminé le remplissage, faire l'appoint en liquide de refroidissement le cas échéant. Laisser ensuite le moteur fonctionner à bas régime pendant 5 min. Vérifier ensuite le niveau et faire l'appoint le cas échéant.
es	Utilice únicamente refrigerante autorizado. Rellene el radiador uniformemente con un máximo de 9 litros/minuto. Pasados 5 minutos tras el primer proceso de llenado, controle el estado de llenado y, en caso necesario, rellene con refrigerante. A continuación, arranque el motor al ralentí durante 5 minutos. Después, controle el estado de llenado y, en caso necesario, rellene.
it	Utilizzare solo liquidi di raffreddamento consentiti. Versare uniformemente nel sistema di raffreddamento massimo 9 litri/minuto. Una volta terminata la procedura di riempimento, attendere 5 minuti, quindi controllare il livello ed eventualmente rabboccare. A questo punto, far girare il motore al minimo per 5 minuti, quindi controllare di nuovo il livello e, se necessario, rabboccare.
ru	Использовать только сертифицированные охлаждающие жидкости. Заполнять систему охлаждения равномерно со скоростью более 9 л в минуту. Через 5 минут после окончания первого заполнения проверить уровень заполнения и при необходимости долить охлаждающую жидкость. Затем на 5 мин. запустить двигатель на низких оборотах, после чего проверить уровень заполнения и при необходимости долить охлаждающую жидкость. SE103181

If the ambient temperature at the work-site is under this value (-36 °C (-34 °F)), observe the operating instructions of the motor manufacturer or contact SENNEBOGEN Customer Service before start-up.

Note

If only a small amount (up to max. 5 l/1.3 gal.) is required to fill the water-refrigerant circuit and no suitable refrigerant is available, you can add clean water in the mean time.

However, we recommend that you test the concentration as soon as possible before temperatures drop down to freezing. In some cases, you must refill with the respective refrigerant so that the required mixture to prevent freezing is achieved again.

The refrigerant is not only required to guarantee protection from freezing, it also performs important tasks with regard to protecting against corrosion. This also requires checking the correct concentration and adding when necessary.

CAUTION

Observe the notes in the engine manufacturer's operating instructions. These are for the operational safety of the machine.

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water

Note

- SENNEBOGEN recommends distilled water as the best option. In exceptional cases, clean, neutral, filtered, fairly soft fresh water can be used.
- Please observe the engine manufacturer specifications!
- Do not use ditch water, industrial drain water, salt water, sea water or rain water.
- Always fill using a water-refrigerant mixture. Observe mixing ratios. Mix before filling!

Ensure that the water has the following characteristics:

pH value	7-8
Chloride content	max. 40 ppm
Sulfate content	max. 100 ppm
Water hardness	3-12 °dGH
Ca + Mg	max. 70 ppm

Note
Observe the recommended mixing ratio (see manufacturer's specifications). If the refrigerant concentration is too high, the cooling and antifreeze characteristics will worsen.

CAUTION

Observe the specifications of the refrigerant manufacturer.

WARNING

Never fill with refrigerant when the engine is warm. This will damage the engine. Allow the engine to cool first.

WARNING
Observe refrigerant manufacturer instructions for using the refrigerant to avoid possible danger to health or environmental hazards.

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Changing refrigerant



WARNING
Scalding hazard!
Be careful when draining hot coolant!
Allow the engine to cool first. Collect the refrigerant in a suitable container when draining and dispose of in accordance with regulations.

- The cooling system is to be emptied completely before filling again.
- Rinse the cooling system several times with clear water to get rid of any residue.
- Fill the cooling system and, after a short waiting period, check the level.
- Start the engine and check the refrigerant levels



CAUTION
Coolant level adjustments may have to be checked more than once to ensure they are correct.

Check the following states when inspecting the refrigerant levels regularly, e.g.:

- lubricant incursion,
- obvious opacity caused by corrosion residue or other particulate matter,

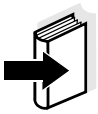
in which case, the refrigerant must be replaced as indicated above.

Changing intervals

Information on changing the refrigerant and changing intervals is provided in the operating instructions of the engine manufacturer.

1.8.6 Fuel (not for equipment with electric motors)

Fill the tank with the specified grade of fuel. Clean fuel is essential for trouble-free operation of the diesel engine.



Notes on quality and fuel selection
Observe the notes in the engine manufacturer's operating instructions.

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1.9 Safety instructions

1.9.1 General

Danger area

The danger area is the area around the machine where persons may come into contact with:

- machine motions while in operation
- working equipment and its attachments
- swinging out or dropping loads
- dropping working equipment.



DANGER
No persons may be within the danger area!
The machine operator must issue warning signals where persons are endangered. If the persons do not leave the danger area despite the warning, work must be stopped.



To avoid becoming crushed by solid objects, e.g. building structures, walls to be removed, scaffolding or other machinery, a sufficient safety distance (at least 500 mm) must be maintained.
If the safety distance cannot be maintained, the area between the solid structures and the work area of the machine must be cordoned off.
If the machine operator has restricted driving and working vision, then he must be guided.

Personal Safety equipment

While working on the machine, operating personnel are obliged to wear personal safety equipment (e.g. safety helmet, ear protection, protective gloves, safety boots) as laid down by national regulations.





Eye bolts are installed as safety eyelets on the upper structure. The safety eyelets are used for hanging a safety belt to protect personnel from falling from the machine. At working heights of 2.00 m or more, SENNEBOGEN recommends the use of a safety harness to prevent falling. At working heights above 3.00 m, using a safety harness is required legally.
Hanging rings are marked.

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Minimizing noise

Casings, coverings, cab doors and windows are to be kept closed during use to decrease noise levels (as long as this conforms with safety requirements). Operating instruments are to be used gently.

Noise emissions

Continuous sound pressure level (LpA) of the machine, measured at the driver´s seat with the cab closed, is below 80 dB. The wearing of ear protection is thus not absolutely required. The measurements are taken according to Directive 2000/14/EC.

Note

If the continuous sound pressure level (LpA) of the machine, measured at the driver´s seat with the cab closed, is between 80 and 85 dB:

- Warning sign in the cab (specification of dB)
- Ear protection within reach in the cab

Vibrations

The machine operator is protected against mechanical vibration with a shock-cushioning seat that can be adjusted for his/her weight. The seat height and backrest are adjustable. The optimal work position can be set for each individual driver. The alarm values for hand-arm vibration (2.5 m/s^2) and for full-body vibration (0.5 m/s^2) shall not be exceeded.

Problems

Report problems or damage immediately to a responsible person!
Prevent the machine from incorrect or inadvertent use.
Repairs must only be performed by qualified specialist personnel.

Qualification of personnel

The machine must only be operated and maintained by qualified personnel.

The independent operation or maintenance of earth-moving machinery must only be carried out by persons who

- are 18 years or over,
- are physically and mentally suitable,
- are trained in the operation and maintenance of earth-moving machinery and have proven their ability to do so to the employer and who
- can be expected to carry out the appointed work reliably.

They must be appointed by the employer specifically for the operation and maintenance of earth-moving machinery.

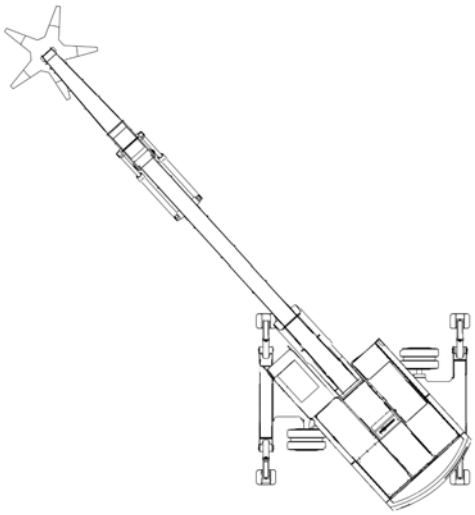
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Work underground and in enclosed spaces

If the machines are implemented in enclosed spaces, the spaces are to be sufficiently ventilated and the respective regulations are to be followed.

Stability

- Position the machine on a firm, even subgrade.
- If necessary, stabilize the subgrade.
- Caution at excavation edge, banks, vaults, etc.
- Position outriggers also on a firm, even subgrade.
- with additional ballast:
  Only slew upper structure when the machine is supported!
- Observe wind speeds!
- Stability is at a minimum when the working gear is transverse to the direction of travel.
- Stability is at a maximum when the operating equipment is positioned diagonally (see illustration below).



DANGER
Do not carry out any form of work that will affect the stability of the machine!

- Stability is reduced when the cab is elevated and when working with loads at great heights.
- Note that stability decreases when the load is swinging outwards.
- Quick motions can lead to decreased stability or uncontrolled load motions.

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Working near power lines



- Before starting work! Clearly mark power lines in the vicinity of construction site while under supervision.
- Always assume that overhead lines are live.
- Guide the machine so that neither parts of the machine nor attached loads extend into the danger area.
- Maintain a safe distance from overhead lines. If national regulations do not recommend other values, adhere to the following minimum distances:

Nominal working voltage (volts)	Safety clearance (meters)
up to 1000 V	1,00
over 1000 V to 110 kV	3,00
over 110 kV up to 220 kV	4,00
greater than 220 kV to 380 kV	5,00
not known	5,00

- Employ a signaling individual to monitor the safety clearance.
- The insulating elements fitted to the machine, protective cages, or proximity warning devices are no substitute for the listed minimum distances.
- In windy conditions, the overhead power lines and the working equipment can swing outwards and consequently reduce the distance.

High voltage contact

In the case of high voltage contact, the following rules apply:

- Do not leave the driver's cab.
- Warn those outside from approaching or touching the machine.
- If possible, move all working gear or the entire machine out of the danger area.
- Arrange for power to be switched off.
- Only leave the machine once the touched or damaged line has been disconnected from the power supply.

DANGER
If it is necessary to vacate the machine in case of emergency, e.g. danger of fire, do not touch the machine and the ground simultaneously. Jump off the machine with your feet together.

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Lightning

Cabs on construction equipment are equipped with protection against lightning strikes. The lightning current flows through the cab to ground.



DANGER

- Do not touch any metal parts that make direct contact with the chassis during storms.
- The electromagnetic field connected with lightning current can affect sensitive electronic components and could lead to malfunction or complete failure in certain circumstances.
  Before putting the machine back into operation, ensure the operating instruments and safety elements are working properly.
- The enormous amount of heat can cause extensive damage to tires (depending on the type of machine).

Before recommissioning the machine, check all subassemblies for damage and perform a functional test.

1.9.2 Cleaning work



CAUTION

- Clean the machine daily.
- For heavy contamination, clean the machine several times per day if necessary, especially in recycling applications.
- Ensure that the cleaning agents used do not damage the seals and components of the machine.
- Do not use aggressive cleaning agents.
- Only use lint-free cleaning cloths.
- Only use dry, filtered compressed air up to max. 2 bar (29 psi).
- Lubricate the lubrication points after every cleaning.
- Replace protective caps on the lubricating nipples.
- After cleaning the engine compartment, check all lines for leaks, loosening or damage and correct any problems.
- Risk of condensation
  After a wet cleaning, check that there is no moisture in the electrical control cabinet.
- On completion of cleaning work on the machine, carry out a visual and functional check according to the machine operating instructions.

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- When cleaning **swiveling connections a pressure washer must not** be used. This can cause large quantities of water, cleaning agents and dirt particles that are placed under pressure, to penetrate the sealing grooves and enter the swiveling connection. These can no longer be removed by heavy greasing. This significantly reduces the service life of the swiveling connection.
- On no account must the exhaust gas treatment system be cleaned with outside water or a high-pressure cleaner. Moisture can penetrate cable connectors and sensors, and cause serious malfunctions. Water must be prevented from entering the exhaust pipe.



WARNING
Electrical and electronic components such as the alternator, control cabinet etc. as well as the bearings of the elevating cab (may cause failure in the bearing surfaces and result in sudden, uncontrolled motion when positioning the cab) must never be subjected to a direct stream of water!

Wet cleaning of these components is prohibited!

When wet cleaning the machine, always make sure that no water/ moisture comes into contact with electrical or electronic components.

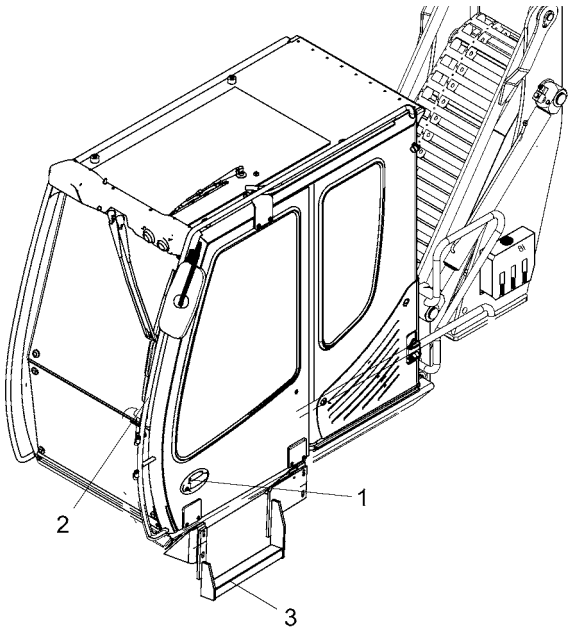
– Water infiltration can otherwise damage or destroy the machine electronics. This can result in sudden, uncontrolled operating movements.

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1.9.3 Safe entry and exit

- If necessary, clean access ladders and ladders prior to use.
- Enter or exit machine only when stationary and after the cab has been lowered completely — never — during any motion.
- Do not carry any items when climbing up or down.
- When entering or exiting, always ensure that you have *three points of contact* on the access ladders, ladders and grip handles. (e.g. two hands and one foot or two feet and one hand)
- Hoist items of equipment onto the machine using rope or lifting equipment.
- Do not use operating instruments in the cab as grip handles.
- Use only the appropriate, provided access ladders and/or ladders.
- When the cab is raised, entering and exiting the cab/gallery is not permitted.
- At working heights of 2.00 m or more, SENNEBOGEN recommends the use of a safety harness to prevent falling. At working heights above 3.00 m, using a safety harness is required legally. Hanging rings are marked.

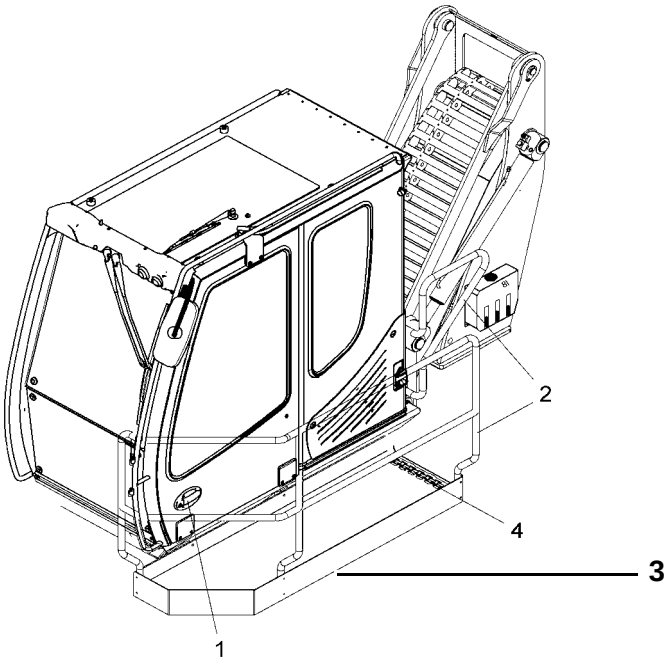
Cab without gallery



1	Open the sliding door (1) from the ground.
2	Hold onto the grip handles (2) and use your feet to step on the access ladders (3) and climb into the cab.
3	Close the sliding door.

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Cab with platform



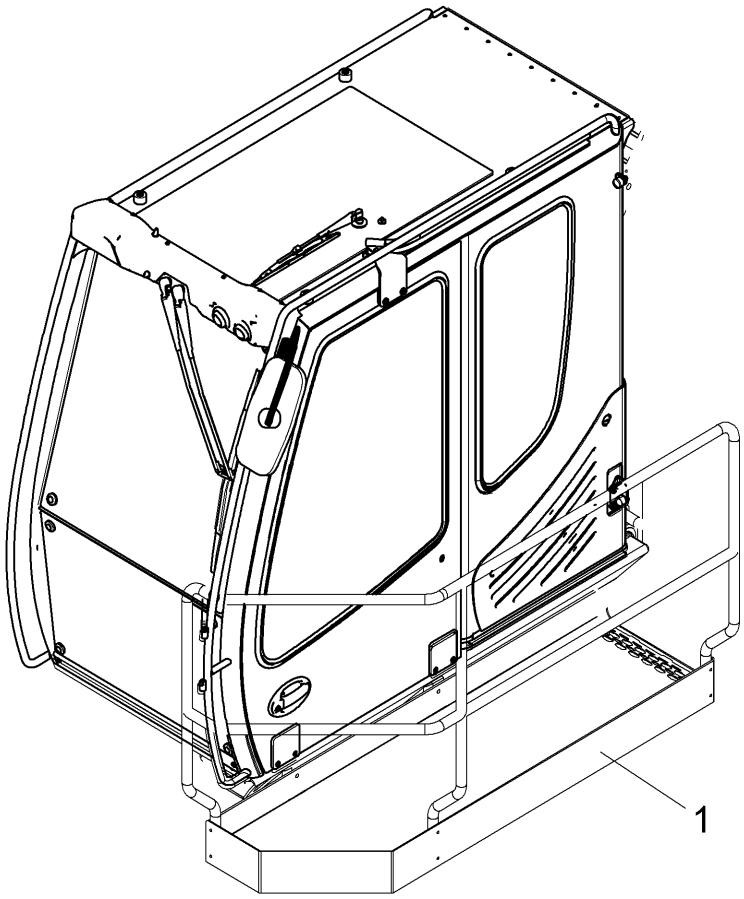
1	Hold onto the grip handles (2) and use your feet to step on the access ladders (4).
2	Step onto the operator catwalk from the rear to the front and open the cab door/sliding door.
3	Close the sliding door.

CAUTION
Risk of falling!
When stabilized, if the brakes are not applied, the wheels will turn!
Only in extreme emergencies and with the utmost care is the cab to be entered or exited via the wheel hub and the tire.

Note
In some cases, it may be necessary to turn the superstructure to 90° offset to the undercarriage to allow safe entry/exit.

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Gallery/operator catwalk

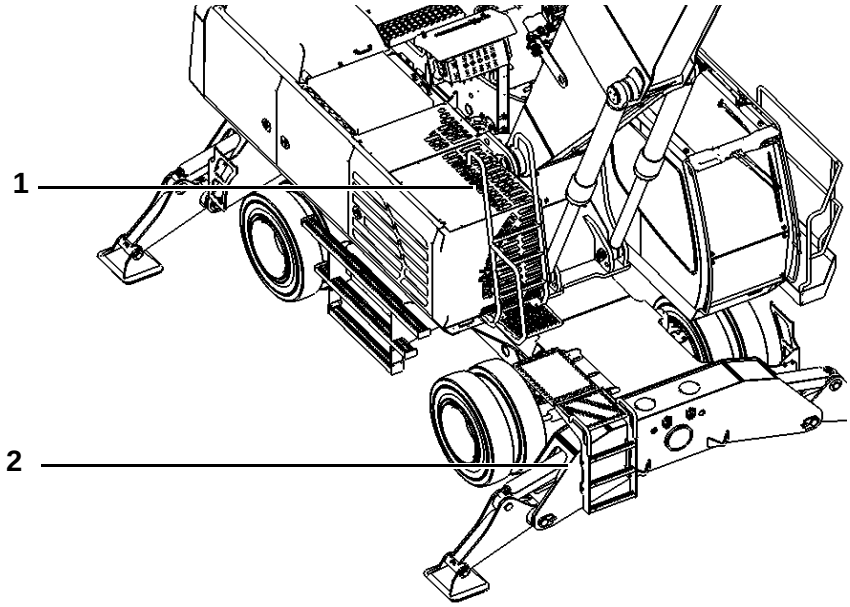


DANGER
Risk of falling!
Assembly of the gallery/operator catwalk (1) is mandatory, since it is part of the safety concept.

CAUTION
Risk of falling!
Gallery — access forbidden when the cab is raised!
The max. load permitted on the gallery is 200 kg (440 lb) per gridiron segment. Overloading will lead to damaging the construction, the results of which can lead to personal injury.
Check the gallery for damage every 3 months (especially cracks) and repair if necessary.

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upper structure



1	Hand grips
2	Access steps

Mounting the upper carriage crawler



1	Hand grips
2	Access steps

1	From the ground climb up the access steps (1).

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2	Hold onto the grip handles and enter the upper carriage via the access ladder (2).



DANGER
Wear personal protection equipment (e.g. safety helmet, ear protection, protective gloves, safety boots) where working conditions require. At working heights of 2.00 m or more, SENNEBOGEN recommends the use of a safety harness to prevent falling. At working heights above 3.00 m, using a safety harness is required legally. Hanging rings are marked.

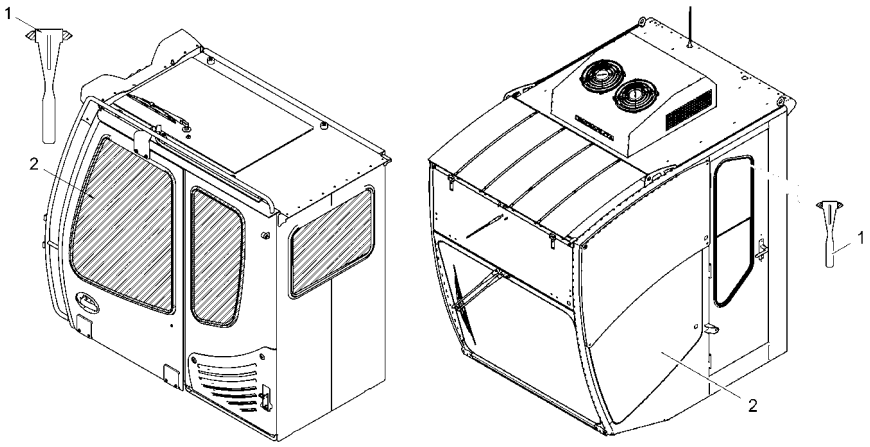
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1.9.4 Emergency exit

Exiting the cab in a case of emergency can be done through the cab doors or the rear window.

A safety hammer that can be used to knock out the rear window is located in the cab.

Raising/lowering



Note
In an emergency, you can exit via the window (2). Use the emergency hammer (1) to break the window.

Option

Protective roof (FOPS):
The emergency exit through the rear window may be blocked by the optional protective roof (FOPS). In this case, emergency exit is only possible through the doors.

CAUTION
Risk of falling!
Exit the cab via the rear structure with extreme caution and climb down from the vehicle.

1.9.5 Emergency exit

CAUTION
Risk of falling!
When stabilized, if the brakes are not applied, the wheels will turn!
Only in extreme emergencies and with great care is the cab to be entered or exited via the wheel hub and the tire!

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1.9.6 Start-up



WARNING

- Check that all machine protective features are complete and properly secured.
- Ensure that the gallery/operator catwalk has been installed properly. Falling out when the door is open (with optional seat belt in place) is no longer possible in this case.
- Wear protective work clothing (e.g. protective helmet, protective glasses) if working conditions necessitate. At working heights of 2.00 m or more, SENNEBOGEN recommends the use of a safety harness to prevent falling. At working heights above 3.00 m, using a safety harness is required legally.
  Hanging rings are marked.
- Take off jewelry or loose clothing.
- Secure loose items e.g. tools or other accessories.
- Agree on hand signals with the banksman.
- Obtain information on first aid and rescue facilities.
- Enter and exit the machine only when it is stationary. Use the appropriate access ladders and ladders:
  - If necessary, clean access ladders and ladders before use
  - Do not carry any items when climbing up or down. Hoist items of equipment onto the machine using rope or lifting equipment.
  - Do not use operating instruments in the cab as grip handles.
- Ensure that there is no one in the danger area.
- Check the machine safety features (e.g. brakes, signal and lighting equipment).
- Check that the operating instruments and protective features are functioning correctly while driving slowly.
- Do not operate the machine if a fault has been detected.
- Ensure that all actuating levers are in the neutral position.
- Start the machine only as described in the information in the instructions.

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1.9.7 Operation/driving operation



WARNING

- Persons working on or with the machine must be trained or instructed for that purpose. Operation and work application may only be carried out by trained personnel.
- The following applies for all work:
  Only carry out work if the subgrade is firm and even and solid enough.
- Proceed with the utmost caution if you bypass the stick end limitation or other safety shutdowns.
- Ensure that there is no one in the danger area.
- Maintain safety clearance to overhead power lines.
- Only operate the machine from the driver's seat.
- When switching the attachment (e.g. grab), release the pressure from the hydraulic system.
- Do not transport persons on the machine.
- Take environmental conditions into account, e.g. poor visibility, wind speeds etc.
- Use the specific lifting capacity tables for the machine.
- Note performance specifications.
- Check that attachment points have a sufficient safe working load.
- Observe banksman signals if they are given.
- If visibility is poor, ensure that a banksman is used for giving the required signs when reversing.
- Before moving onto ramps or inclines, make sure you obtain the maximum permitted values from SENNEBOGEN.
- Position the boom in the travel direction during long journeys.



CAUTION

For crawler undercarriage:
Risk of severe damage to property!
Driving over raised or lowered obstacles such as thresholds, rails or curbs can lead to high point loadings for the track frame, the idlers, the chains, etc. This can cause cracking and breaking of the tracking components (e.g. idlers).
Driving over such hindrances e.g. ties, rails, curbs, etc. is not permitted!
SENNEBOGEN accepts no liability for damages resulting from such unintended usage!
Transit is only permitted on even, smooth and preferably concrete (concrete slabs) paths/streets! Pay attention to ground load capacities.

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1.9.8 Particle filter regeneration (level 4i)

During regeneration, exhaust gas temperatures up to 850°C can be reached and the exhaust system surface temperature can exceed 740°C, which is hot enough to ignite or melt common materials and cause burns.

The exhaust components remain hot after the machine has been shut down.

To avoid the danger of fires, property damage, burns or injuries, allow the exhaust system to cool off before starting this process and ensure that no flammable materials are located nearby.

To perform manual regeneration, follow the points listed:

- Select a suitable location to park the machine in its park position.
- Select a subgrade that will not burn or melt at higher temperatures (such as cement or gravel, not on grass or asphalt!).
- Ensure that there are no objects within 1.0 m of the exhaust opening.
- Materials that burn, melt, or explode must be kept at least 2.0 m from the exhaust opening (such as gasoline, paper, plastics, textiles, compressed gas containers, hydraulic lines).
- Ensure that there are no gases or vapors nearby which can burn, explode, or cause a fire (such as LP gas, gasoline vapors, oxygen, nitrous oxide).
- Park the machine on a firm subgrade.
- Place the attached loads and the boom on the ground if necessary.
- Reduce the engine speed to idle.
- Pull back the safety lever.
- Secure the machine (lights, warning triangle, chocks, etc.).
- Set up a secure exhaust surface. Onlookers must stay at least 2.0 m from the exhaust opening during manual regeneration. If the machine is in a building, an exhaust gas line must be set up. This must be specified for an exhaust gas temperature of at least 850°C.
- Keep a functional fire extinguisher handy.
- Check the surfaces of the exhaust system. Ensure that no items are present near the exhaust system (such as tools, rags, grease, or dirt).
- The accelerator is released.
- Start the manual particle filter regeneration using the particle filter regeneration switch.

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- As soon as the manual particle filter regeneration has started, the speed of the engine may increase, the turbocharger noise increases and the “High exhaust temperature” pilot lamp lights up.
- When the engine control unit detects that the particle filter has been regenerated, the engine automatically returns to normal idle if the engine speed was increased.
- Monitor the machine and its surroundings during particle filter regeneration. If an unsafe state occurs, switch off the engine immediately!

To stop the manual particle filter regeneration before it is complete, place the particle filter regeneration switch in the middle position or turn off the engine.

After the manual particle filter regenerationis complete, the exhaust and surface temperatures remain elevated for 3 to 5 minutes.
CAUTION DANGER OF BURNS!



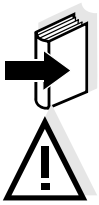
Note
When manual particle filter regeneration has been started, but the “High exhaust temperature” pilot lamp does not light up, contact SENNEBOGEN Customer Service immediately.



Note

If high exhaust temperatures pose a danger when using the machine, regeneration of the particle filter can be prevented.

Regeneration of the particulate filter must be performed after this use.



Note

Observe the notes in the engine manufacturer's operating instructions.

DANGER

High exhaust temperatures can occur!

Non-observance of notes in the engine manufacturer's operating instructions can lead to damage to property and personal injuries.

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1.9.9 Setup work



DANGER

- The work performed may only be completed by trained and instructed specialists.
- Wear personal protection equipment (e.g. safety helmet, ear protection, protective gloves, safety shoes) where working conditions require. At working heights of 2.00 m or more, SENNEBOGEN recommends the use of a safety harness to prevent falling. At working heights above 3.00 m, using a safety harness is required legally.
  Hanging rings are marked.
- The following applies for all setup work:
  Only carry out the work if the work area has a firm, even subgrade that is solid enough.
- Ensure that there is no one in the danger area.
  - During setup and before completion of all setup work, no persons are allowed in the hazardous area in which loads could fall or under hanging loads.
  - During the setup procedure, keep a sufficient safety clearance from areas of unavoidable cutting or pinching/crushing danger.
- Observe the relevant accident prevention regulations for working with hoisting accessories.
- When dismantling components or disassembling equipment, always use hoisting accessories with a sufficient safe working load.
- Suspend components only with the designated lifting brackets.
- Do not step on equipment that is not designed for it (e.g. boom components or ballast).
- Carry out all setup work in sequence. Never carry out more than one setup task at a time.

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1.9.10 Decommissioning

Before leaving the cab:

- Lower cab completely
- Park the machine on a firm subgrade. If necessary, move back from the edge of the excavation
- Lower attached loads
- Secure attachments
- Pull the safety lever back
- Switch off the engine
- Chock tires/undercarriage
- Lock cab, show warning lights if necessary.

1.9.11 Maintenance



DANGER
Danger to life!
There is a risk of serious injury or even death to persons using the machine or in its vicinity if it moves suddenly or is started involuntarily.
Therefore, observe the following:

- Place the machine on a firm subgrade (level, solid, horizontal). If necessary, set back from the edge of the excavation.
- Lower attached loads and boom to the ground.
- Apply the brake.
- Pull back the safety lever (all hydraulic functions are inactive).



- Switch off the machine and secure against unauthorized switching on again before beginning any work.
- Attach warning sign to operating instruments.
- Secure the machine from rolling away and use a chock if necessary.
- Actuate the battery isolator switch

Additional measures:

- Allow the machine to cool; be aware that hot fluids and components can cause burns.
- De-pressurize the hydraulic system to avoid dangers.

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WARNING

- Observe all signs and safety stickers on the machine as well as those in the instructions. They contain important information about maintenance procedures.
- The work performed may only be completed by trained and instructed specialists.
- Wear personal protection equipment (e.g. safety helmet, ear protection, protective gloves, safety boots) where working conditions require. At working heights of 2.00 m or more, SENNEBOGEN recommends the use of a safety harness to prevent falling. At working heights above 3.00 m, using a safety harness is required legally. Hanging rings are marked.
- Use only original SENNEBOGEN spare parts.
- Use only oils and lubricants listed in the lubricant table.
- Collect lubricants and other operational fluids in suitable containers and dispose of them properly.
- Observe statutory accident prevention and safety regulations.
- Observe any additional documentation (e.g. engine, etc.) during maintenance work as well.
- Keep the vehicle (e.g. grips, steps, platforms, railing, etc.) free from dirt, snow and ice.
- Smoking and working with an open flame is strictly forbidden.
- Use safety-compliant access ladder aids or working platforms.
- Maintain a safe distance from rotating and moving parts.
- Relieve the pressure from the hydraulic system and other operational fluids before starting maintenance work.
- Dispose of hydraulic oil according to regulations.
- Wear protective gloves when working on steel wire rope.
- Do not lift heavy components manually. Use lifting equipment.
- For pneumatic tires:
  When pumping up tires, maintain adequate safety clearance and use tire cage.
- Keep the cab clean and orderly.



- Actuate the battery disconnecting switch or disconnect battery poles to interrupt the power supply.
- When working near batteries, they are to be covered with insulating material; do not place tools on top of batteries.
- When handling batteries, observe the safety instructions and protective measures specified by the battery's manufacturer. Fire, sparks, open flames and smoking are prohibited when handling batteries.

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- When working on air conditioning systems, be aware that refrigerants and refrigerant vapors are hazardous to health. Wear the appropriate protective equipment.
- Replace all protective features after completing any work on the machine. Exchange damaged protective features for new ones.
- Carry out function check to ensure it is working properly.
- Only the machine owner or representative may approve the machine for operation following maintenance work.

Qualifications of personnel



DANGER

- Work on the machine's electrical equipment may only be carried out by a qualified electrician.
- Work on undercarriage, braking and steerage systems may only be carried out by specially trained specialists!
- Work on hydraulic systems may only be carried out by personnel with specific knowledge and experience of hydraulics!
- No welding is to be performed on the device without previous discussion with the manufacturer.

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1.9.12 Transport



WARNING

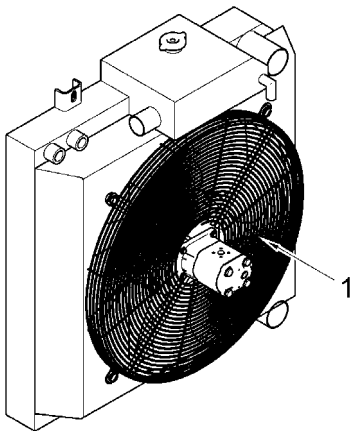
- In Germany:
  Loading and transportation work is only to be carried out by authorized specialist personnel in accordance with VBG 40, §48 and Federal Motor Vehicle Safety Standards (StVo) §22.
- Observe relevant regulations for securing loads.
  The *respective transport operator is always responsible* for transporting the machine and accessories.
- Use a flatbed trailer with sufficient useful load and size.
- When loading and transporting, secure the machine and its working equipment from involuntary motions.
- Clean mud, snow and ice from undercarriage of machine so that ramps can be accessed without danger of slipping.
- Provide flatbed trailer access ramps with wooden planks.
- Check the conditions of the route before starting the journey.
- Only transport the machine on intended securing and lifting points.
- Ensure that the machine does not present any hazards to other road users.
- Wear personal protective equipment (e. g. protective helmet, protective gloves, safety shoes).
- Report any damage that occurred during shipping to SENNEBOGEN customer service immediately.

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1.10 Protective features

DANGER

- Do not remove protective features or coverings.
- Always check that protective features are complete and properly secured before starting the machine.
  Protective features include engine flaps, doors, guard grills, coverings, fire extinguishers and first aid kits.
- Replace all protective features and coverings properly on completion of assembly or maintenance work.
- Exchange damaged protective features (1) for new ones.



Illustration

Overload Warning device

Option

The overload warning device gives an acoustic warning signal if the permitted lifting capacity is exceeded. Ensure that the overload warning device is activated when working with lifting equipment. The danger of tipping is not averted by the overload warning device!

DANGER

Danger of machine tipping!
Decrease the load immediately (e.g. decrease reach, lower load).

Limit shutdown equipment

Option

The following motions are limited by the limit shutdowns:

- Retract stick
- Extend stick
- Hoist up
- Hoist down

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1.11 Disposal

Lubricating and Operational fluids

CAUTION
Observe environment protection!
Handle and dispose of used items and materials correctly, especially

- when working on the cooling systems
- when working on lubrication systems and devices
- when working with solvents and
- when working on the hydraulic oil systems.



Extract from the *Disposal Directive 75/439/EEC*:

- “It is prohibited to mix waste oil with other waste.”
- “Spent oils must not be mixed together.”
- “Used oil filters must be collected, kept, transported and disposed of separately from other waste.”

Information

- Lubricants and other operational fluids must be disposed of at suitable collection points.
- National environmental regulations specified in the country of use also apply to disposal.

Batteries

Observe safety instructions and protective measures when handling batteries.

Information

- Do not dispose of batteries in a domestic waste facility!
  Dispose of defective batteries at a recollection point for spent batteries.



- National environmental regulations specified in the country of use also apply to disposal.

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1.12 Hand signals

Driver and signaling individual communicate with each other using the following hand signals when vision is restricted in the driving and working range. The guide gives the necessary signals to ensure safe operation.

Safety instructions

Observe the safety instructions before starting work.

CAUTION

- Only reliable persons may be employed as signaling individuals. They must receive the necessary training before starting their task.
- The guide must not be diverted from this task.
- Follow the instructions of the TUR A8, *Hand signals for signaling*.

Hand signal	Explanation
	**Attention** Extend arm upwards with hand open.
	**Stop** Stretch out both arms horizontally.

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Hand signal	Explanation
	**Stop! Danger!** Alternately stretch out both arms horizontally and bend at right angles.
	**Drive off** Move arm extended upwards back and forth with hand open.
	**Drive slowly forwards** Bend both arms and beckon forwards with palms of hands turned inwards.

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Hand signal	Explanation
	**Reverse slowly** Bend both arms and wave away with palms of hands turned outward.
	**Turn right** Left thumb outwards
	**Turn left** Right thumb outwards.

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Hand signal	Explanation
	**Slew upper structure to the right** Left thumb outwards to the left, rotate right index finger.
	**Slew upper structure to the left** Right thumb outwards to the right, rotate left index finger.
	**Hoist equipment (load)** Right extended index finger points upwards, left hand moves up and down.

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Hand signal	Explanation
	**Lower equipment (load)** Right extended index finger points downwards, left hand moves up and down.
	**Increase working radius** Both thumbs point outwards.
	**Decrease working radius** Both thumbs point inwards.

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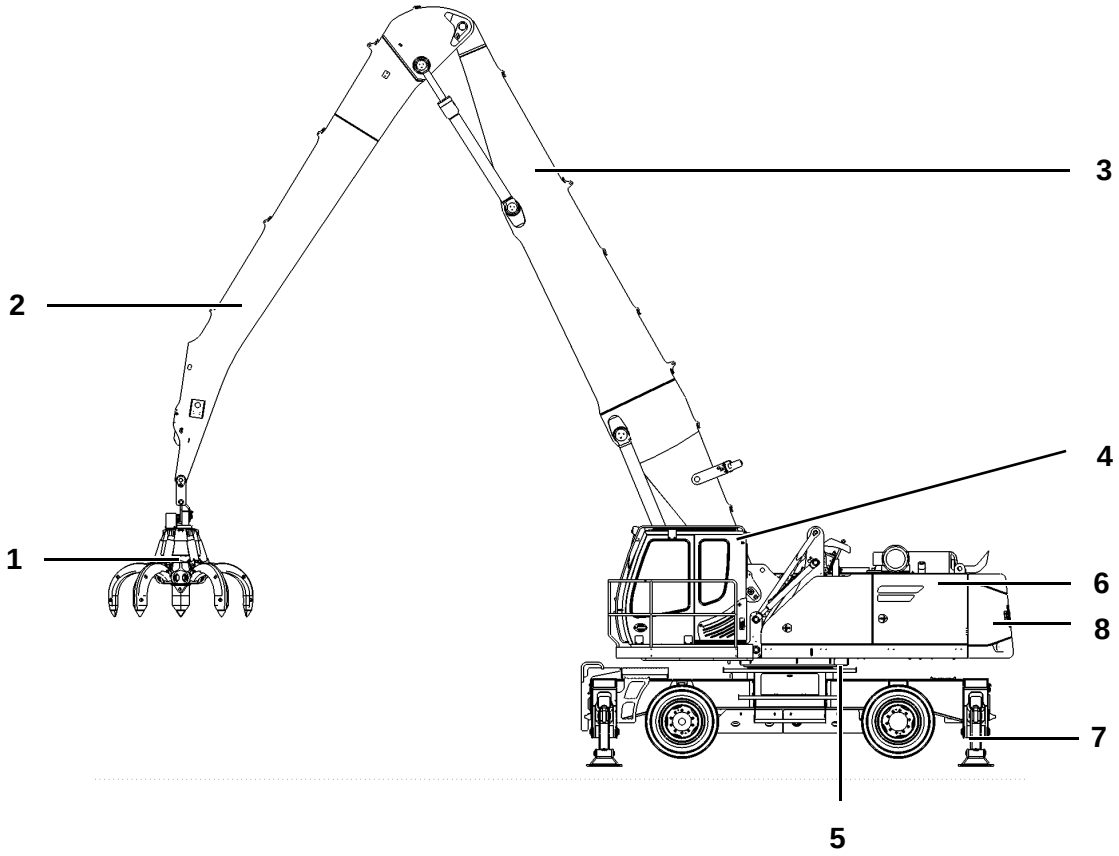
Hand signal	Explanation
	**Open grab** Hold arm horizontal with half open hand to the side.
	**Close grab** Hold arm horizontal with closed hand to the side.

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2 Overview

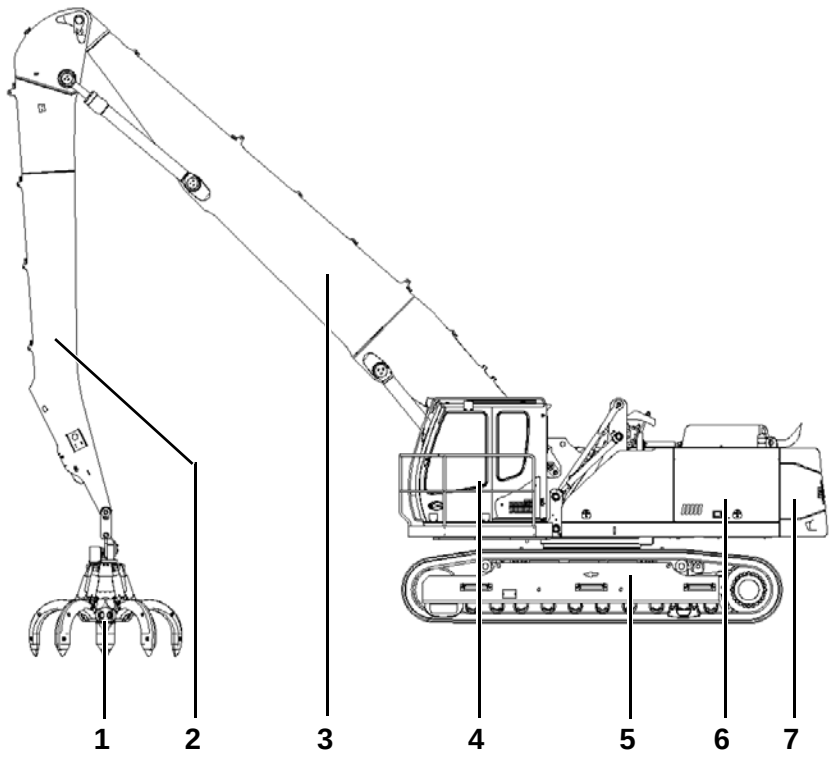
2.1 Overall machine



1	Attachment (example: grab)
2	Grab stick
3	Compact boom
4	Operator's station/cab with gallery, raising
5	Undercarriage
6	Upper structure
7	Outrigger
8	Counterweight

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2.2 Overall machine – crawler

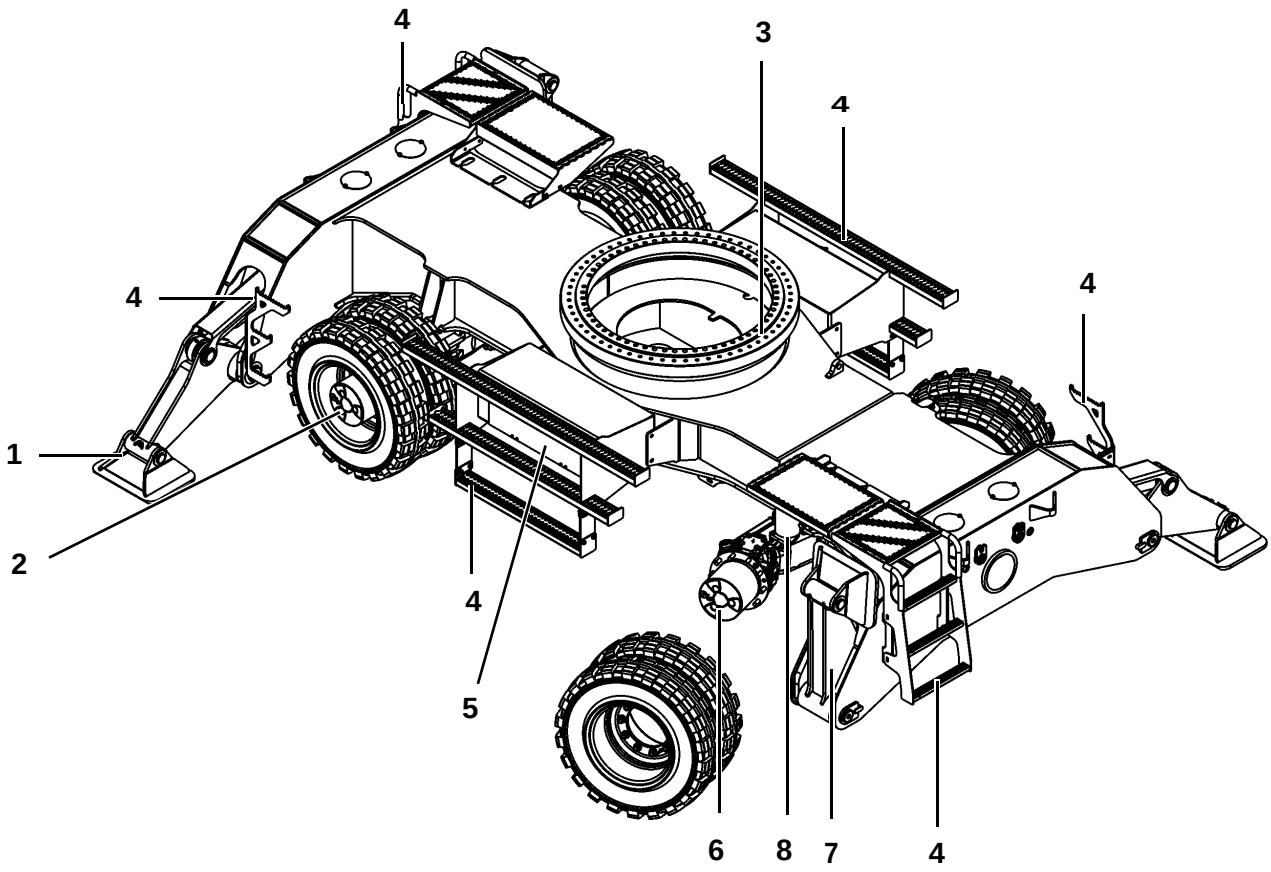


Pos.	Description
1	Attachment (example: grab)
2	Grabbing jib
3	Compact boom
4	Operator's station/cab with gallery, can be elevated
5	Undercarriage
6	Upper carriage
7	Counterweight

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2.3 Undercarriage

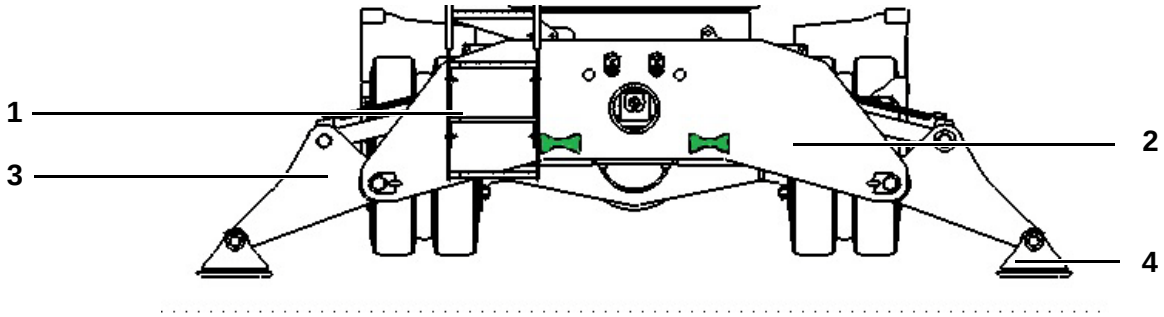
2.3.1 4-point outrigger



1	Rear outrigger	2	Rear axle
3	Flange ring	4	Access ladder
5	Extra storage space	6	Front axle (floating axle)
7	Outrigger, front	8	Floating axle cylinder

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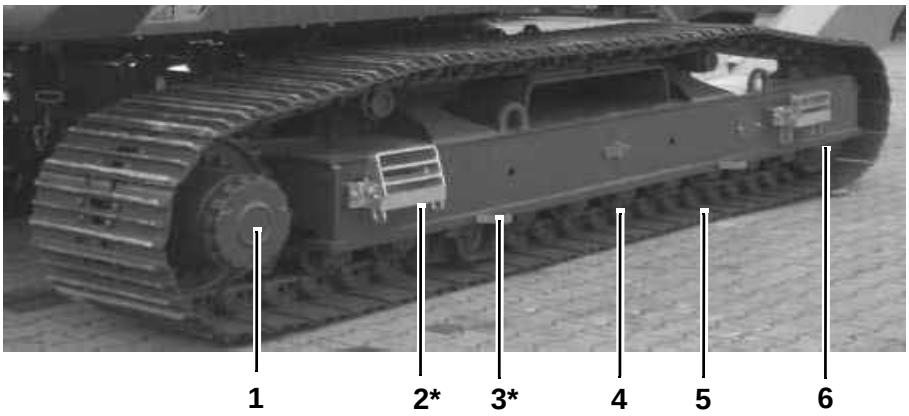
2.3.2 Outrigger front/rear



1	Access ladder
2	Outrigger housing
3	Outrigger foot
4	Outrigger pad

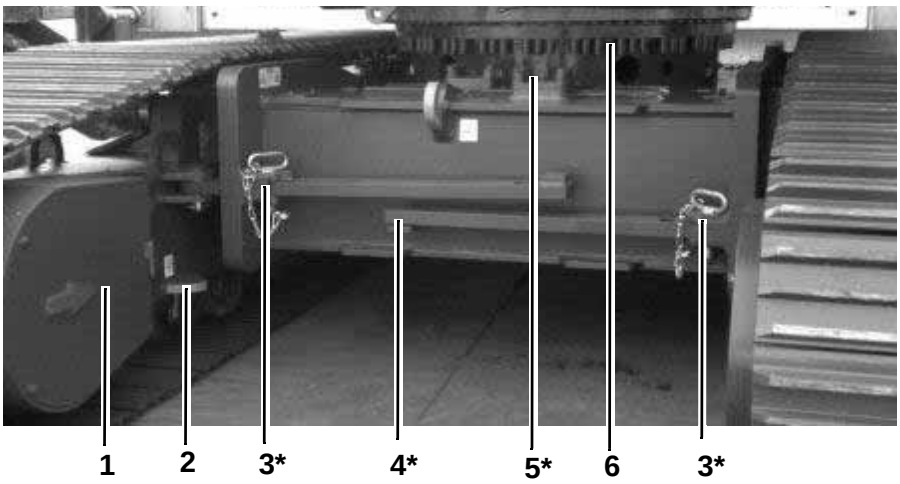
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2.4 Undercarriage – crawler



*: Optional model/special function

1	Drive wheel (reverse direction of travel)	**4**	Track roller
2	Access ladder	**5**	Crawler chain
3	Telescoping – attachment points	**6**	Idler (forward direction of travel)



*: Optional model/special function

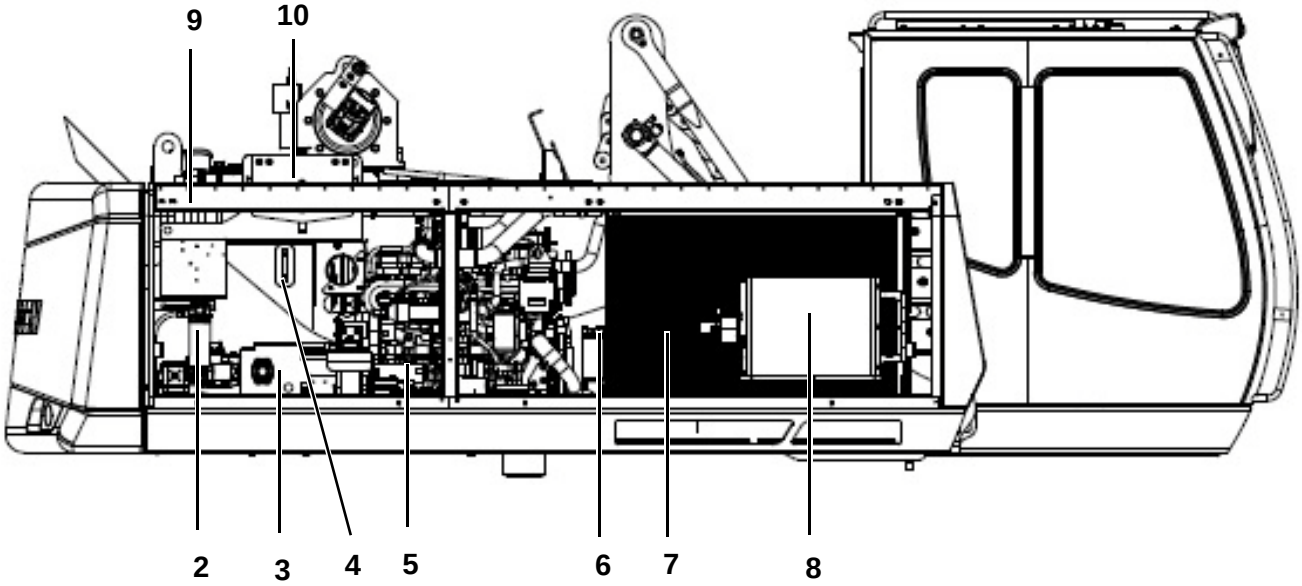
1	Adjustment drive cover	**4**	Telescoping – arrest
2	Lashing points	**5**	Lubrication point
3	Lock bolts	**6**	Slewing ring

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2.5 Upper structure

2.5.1 Side view with diesel engine

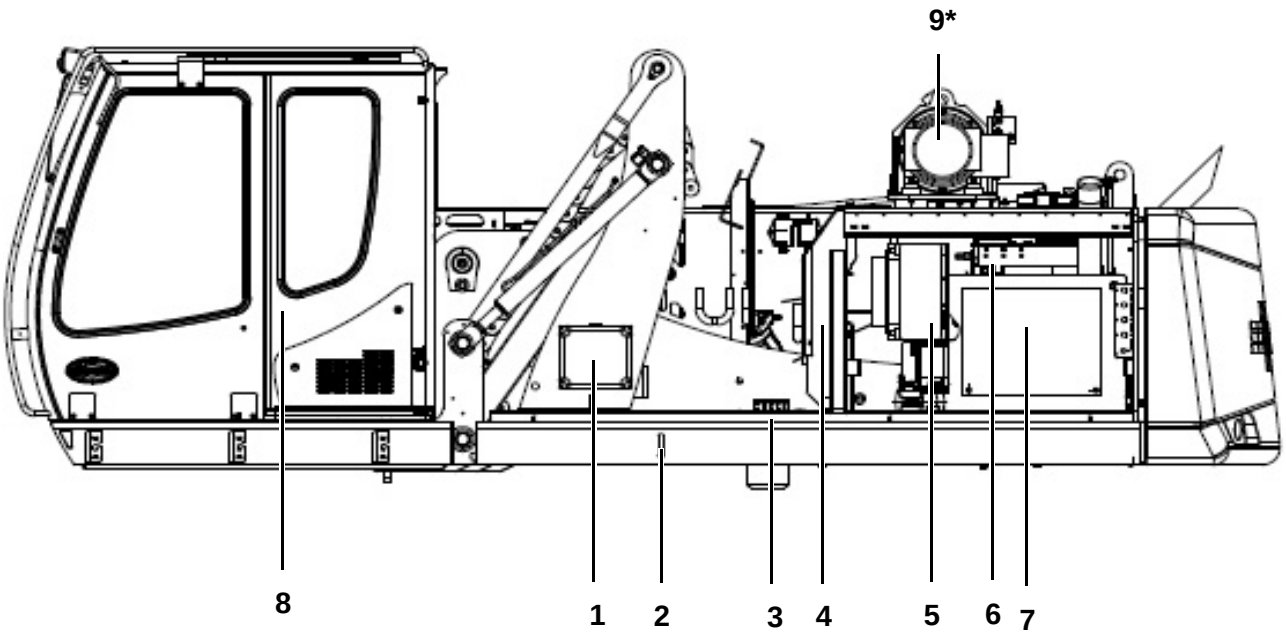
Service access doors for engine compartment



Item	Description
2	Water separator — fuel
3	Pump unit
4	Hydraulic oil level display
5	Driving engine
6	Fan
7	Combination oil/water/charge air cooling system
8	Air conditioning system
9	Exhaust/exhaust gas treatment
10	Expansion tank/refrigerant

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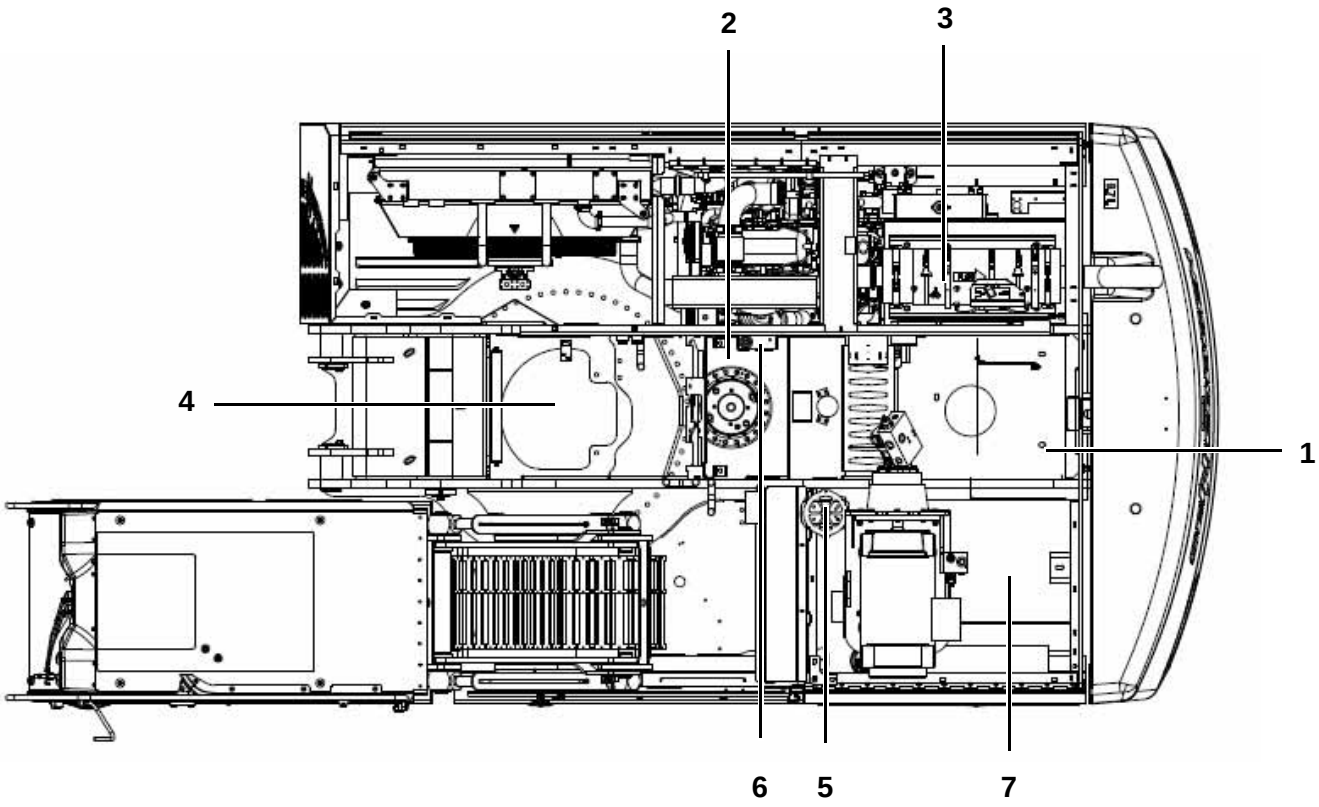
Service access doors for driver's side



Item	Description
1	Container for wiping-washing system
2	Emergency lowering — cab
3	Measurement ports — hydraulic system
4	Central unit, hydraulic components
5	Air filter — air intake
6	Expansion tank/refrigerant
7	Electric switch cabinet
8	Cab
9*	Generator

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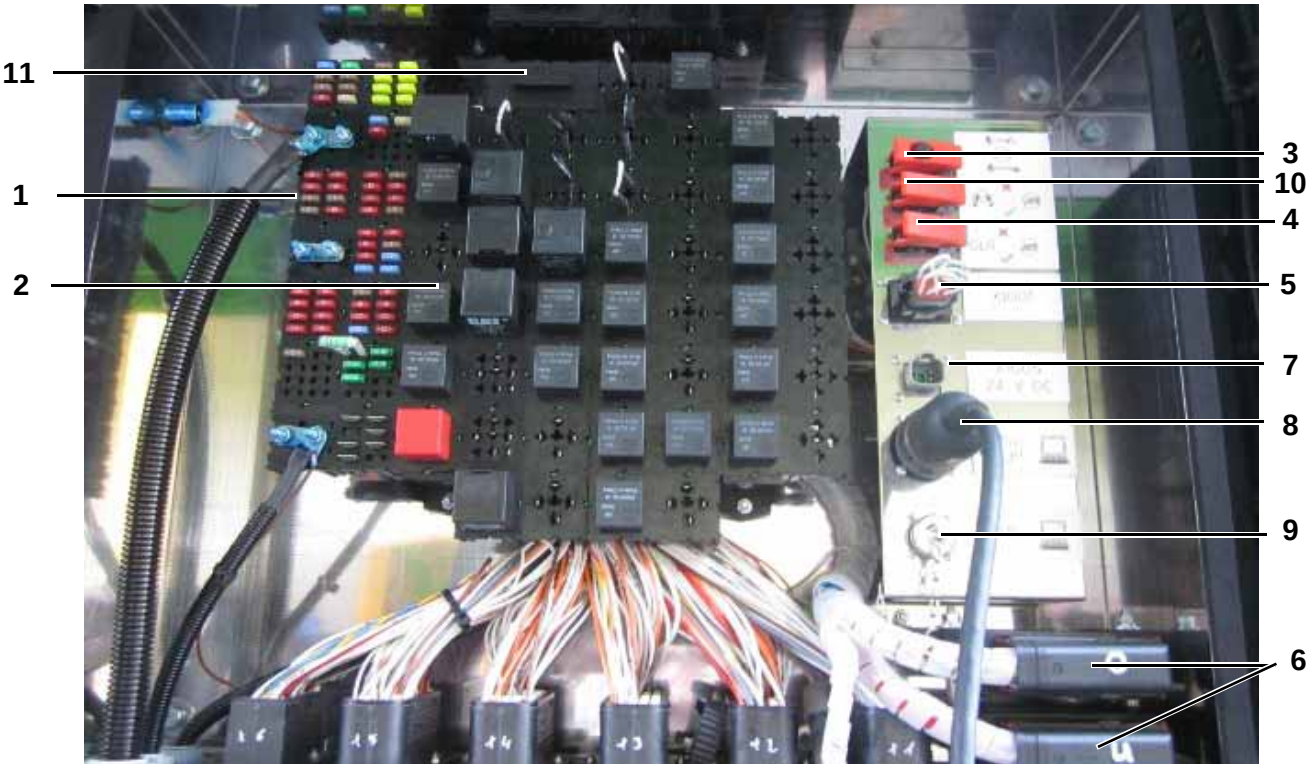
View from above



Item	Description
1	Hydraulic oil tank
2	Swing gear
3	Exhaust system/exhaust gas treatment
4	Rotor (with slip ring assembly*)
5	SENNEBOGEN Hydroclean
6	Swing gear expansion tank
7	Battery
*	Optional

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2.5.2 Central electrical system



Item	Description
1	Fuses
2	Relay
3	Engine emergency speed – Position RIGHT: 50% – Position CENTER: idle – Position LEFT: 100%
4	GLR emergency operation – Position RIGHT: emergency operation – Position LEFT: normal operation
5	LMB X1001 plug (control system) – Bypassed
6	Control unit
7	LMI X1005 plug (power supply)
8	Engine diagnostics plug
9	GLR diagnostics plug

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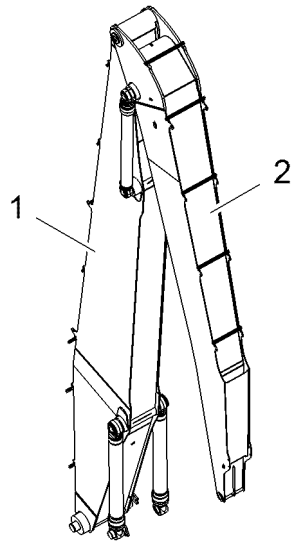
10	Swing brake emergency operation – Position RIGHT: emergency operation – Position LEFT: normal operation
11	Replacement fuses

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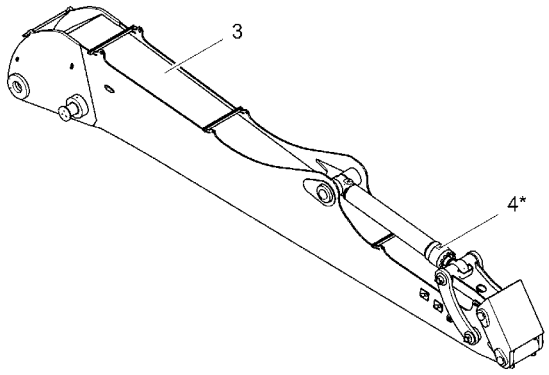
2.6 Equipment

2.6.1 Compact boom

With grab stick



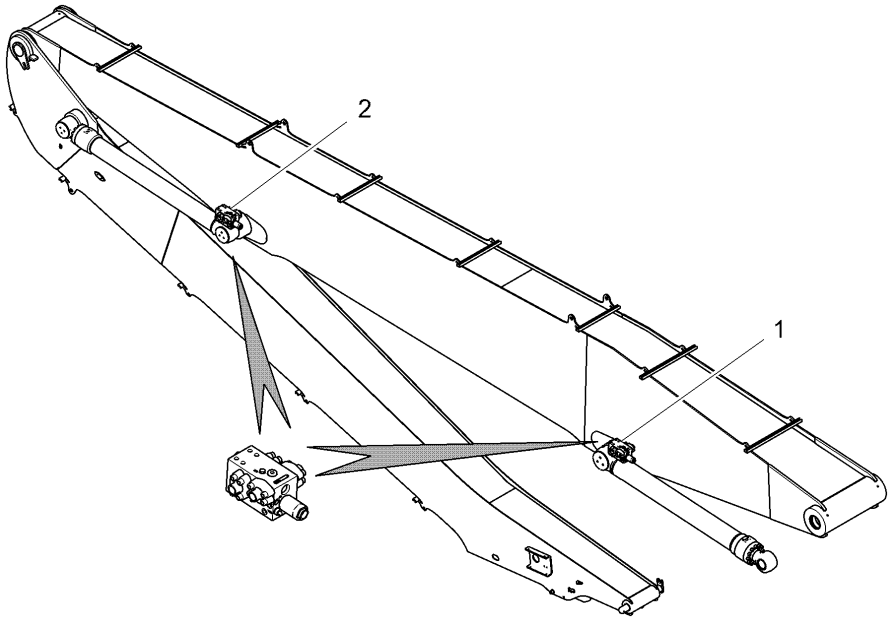
With reversing mechanism (optional)



Item	Description
1	Compact boom
2	Grab stick
3	Grab stick with reversing mechanism
4*	Reversing mechanism
*	Optional

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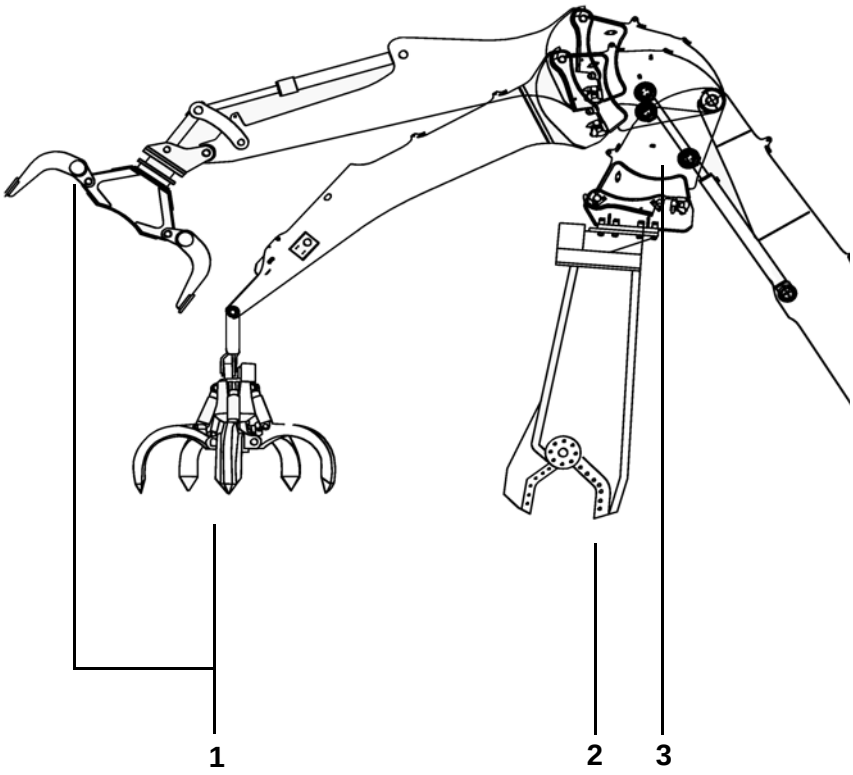
2.6.2 Pipe fracture safety devices



Item	Description
1	Pipe fracture safety device — lifting cylinder
2	Pipe fracture safety device — stick cylinder

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2.6.3 Attachments and Vario Tool (option)



Pos.	Description
1	Grab
2	Scrap shears
3	Jib base with Vario Tool

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3 Technical data

Note
The following values are guidelines. The level specified on the corresponding component is definitive (upper mark on dipstick)

3.1 General

Electrical system 24 V =

Note
Ensure that the available output power of the alternator is not exceeded when installing additional current consumers (e.g. headlights)!

Ambient temperature

Operation/operation under load	approx. - 20°C (- 4°F) to approx. + 40°C (+ 104°F)

Note

If a machine is to be run in ambient temperatures outside the specified temperature range, special temperature packages are available (option).

Please contact SENNEBOGEN Customer Service if you have any other questions.

Hydraulics Operating pressure, max. 350 bar

Swing drive

Swinging speed	0 — 8 rpm, continuously variable

Travel speed – mobile

1st gear	0–7 km/h
2nd gear	0–20 km/h

Travel speed – crawler

1st gear	0–1.5 km/h
2nd gear	0–3.2 km/h

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Limitations during wind

Wind speed		
25 m/s	90 km/h	10 Beaufort



Note
Machine operation is generally possible, without any attachments, at wind speeds of up to 25 m/second.
The decision concerning when operation is to be shut down is to be made by the machine operator and depends on the attachment being used. Various attachments have varying wind loads that affect stability. These are to be determined by the operator and the machine is to be shut down accordingly!



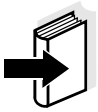
DANGER
Once the specified wind speed is reached, stop operating the machine immediately (lower the load, lower the boom). For the table on wind speeds, see Section 3.7.

3.1.1 Driving engine

3.1.2 Level 4/IIIb



	QSB6.7-C220
Power (according to ISO14396)	164 kW (220 bhp) at nominal speed 2000 rpm
Capacity	6690 cm^3 (408 in^3)
Cylinder(s)	6
Oil capacity with filter	Approx. 17.0 l/approx. 4.48 gal. (US)
Refrigerant capacity (overall system) Engine	Approx. 50 l/approx. 12.68 gal. (US) Approx. 12 l/approx. 2.6 gal. (US)
General drive engine information	See manufacturer's instructions



Note
Observe the notes in the engine manufacturer's operating instructions.

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Note regarding diesel engine exhaust emissions

Quality is of the utmost importance at SENNEBOGEN. Installation of the engine and the cooling system for the engines is designed, tested and manufactured for the high demands associated with moving operations. This means that the device not only has an optimal service life, but is also certified as being compliant with statutory exhaust emission limits.



WARNING

Any modifications made to the following in the supplied device will invalidate the diesel engine exhaust emissions certification:

- Engine
- Engine cooling system incl. ventilation ducts
- Air filter system
- Exhaust gas treatment system
- Exhaust system

This invalidation in turn will result in the invalidation of the operating license for the device and also the expiration of any claims made against SENNEBOGEN.

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3.2 Machine

Fuel tank - Middle level sensor:	Max. 500 l/max. 132,1 gal. (US) Approx. 480 l/approx. 126,8 gal. (US)
Hydraulic tank - Middle inspection glass:	Max. 310 l/max. 81,9 gal. (US) Approx. 245 l/approx. 64,7 gal. (US)
Hydraulic system, complete **(*)**	Approx. 680 l/approx. 179,6 gal. (US)
Axle distributor gearbox	Approx. 3.0 l/approx. 0.8 gal. (US)
Differential	
● Front	Approx. 11.0 l/approx. 2.9 gal. (US)
● Rear	Approx. 15.0 l/approx. 4.0 gal. (US)
Hub gears	
● Front	Each approx. 2.5 l/approx. 0.7 gal. (US)
● Rear	Each approx. 2.5 l/approx. 0.7 gal. (US)
Swing ring lubrication — reservoir	Approx. 1.0 l/approx. 0.26 gal. (US)
Central lubrication system — reservoir	Approx. 2.5 kg/approx. 5.5 lb
Swing gear	Approx. 4.0 l/approx. 1.04 gal. (US)

(*): Note that per 0.5 m mast length, an additional approx. 30 l (approx. 7.9 gal. (US)) of hydraulic oil is required for special machines with a mast.

Tire air pressure (pneumatic tires)

Tire size	**Air pressure**	
	bar	**psi**
10.00-20		
12.00-20	9	130.53
12.00-24	10	145.04

Wheel nuts

The tightening torque is 650 Nm. Use a torque wrench.

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3.2.1 Crawler

Subassembly	Quantity
Fuel tank - Middle level sensor:	Max. 500 l/max. 132,1 gal. (US) Approx. 480 l/approx. 126.8 gal. (US)
Hydraulic tank - Middle inspection glass:	Max. 310 l/max. 134.7 gal. (US) Approx. 245 l/approx. 81,9 gal. (US)
Hydraulic system, complete **(*)**	Approx. 680 l/approx. 179,6 gal. (US)
Traction gear	each approx. 9 l/ approx. 2.4 gal. (US)
Slewing ring lubrication – reservoir	approx. 1.0 l / approx. 0.26 gal. (US)
Central lubrication system – reservoir	approx. 2.5 kg / approx. 5.5 lbs
Swing gear	approx. 4.0 l / approx. 1.04 gal. (US)

(*): Note that per 0.5 m mast length an additional approx. 30 l (approx. 7.9 gal. (US)) of hydraulic oil is required for special machines with pylon.

3.3 Machine dimensions

Note

More information on the dimensions can be found in SECTION 7.2 RAISING THE UPPER STRUCTURE

3.4 Machine weight

Note

More information can be found in SECTION 7.1.3 MACHINE WEIGHT.

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3.5 Working loads



Information

The load ratings

- Are specified in tons (t) and equate to 75% of the static tipping load or 87% of the hydraulic lifting force according to ISO 10567.
- Are applicable for a machine on firm, level ground and apply over a range of 360 degrees.
- Apply when the machine's supports are deployed.

Hoisting accessories (grabs, hooks, equalizers etc.) are part of the lifting capacity.

Deduct the weight of the hoisting accessories (hooks, sling) from the lifting capacities. The values in parentheses apply in a direction along the lengthwise axis of the undercarriage.

Adverse conditions

Limit or reduce the load ratings to compensate for adverse conditions. Adverse conditions are e.g.

- Soft or uneven ground
- Slopes
- Wind
- Lateral loads
- Rocking loads
- Jerking or sudden stopping of load
- Inexperience of operating personnel
- Driving with load



Note

Before changing the kinematic position please contact SENNEBOGEN!

Setup conditions

The machine has two setup conditions:

- Without outrigger
- With outrigger

The load ratings apply to supported operation/setup condition. The load must be deposited when changing between the setup conditions.



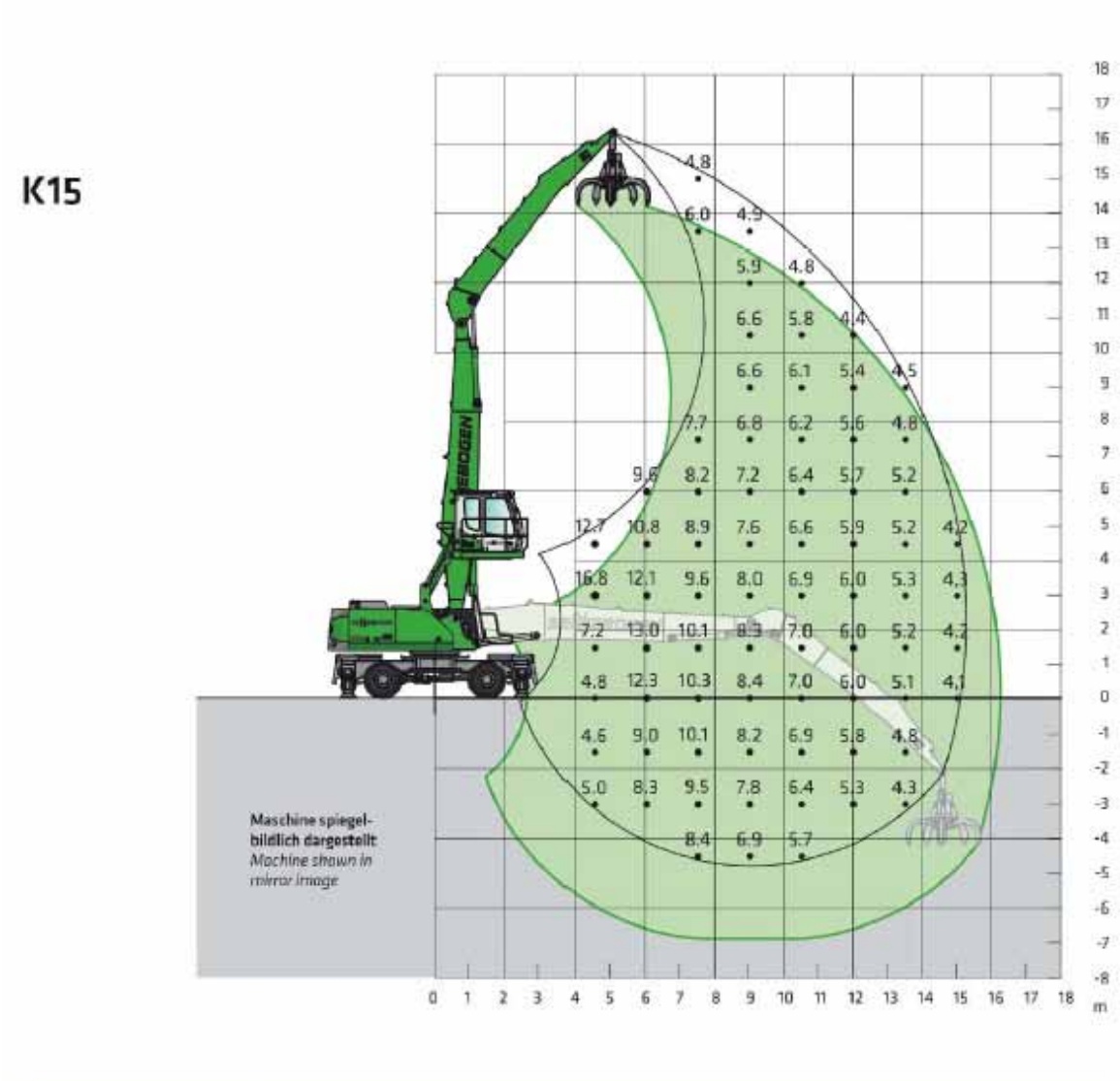
Danger

Changing setup conditions with a raised load can lead to a loss of stability of the machine. This can in turn result in severe damage to property and to personal injuries.

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3.5.1 Lifting capacities 830 E

3.5.2 Compact boom 8.5 m and 7.0 m



Unterwagen *undercarriage*	**MP30E**
Kompaktausleger *compact boom*	**8,5 m**
Ladestiel *Loading stick*	**7,0 m**
Kabine *cabin*	**maXcab E270, hydraulisch hochfahrbar** **maXcab E270, hydraulic elevating**

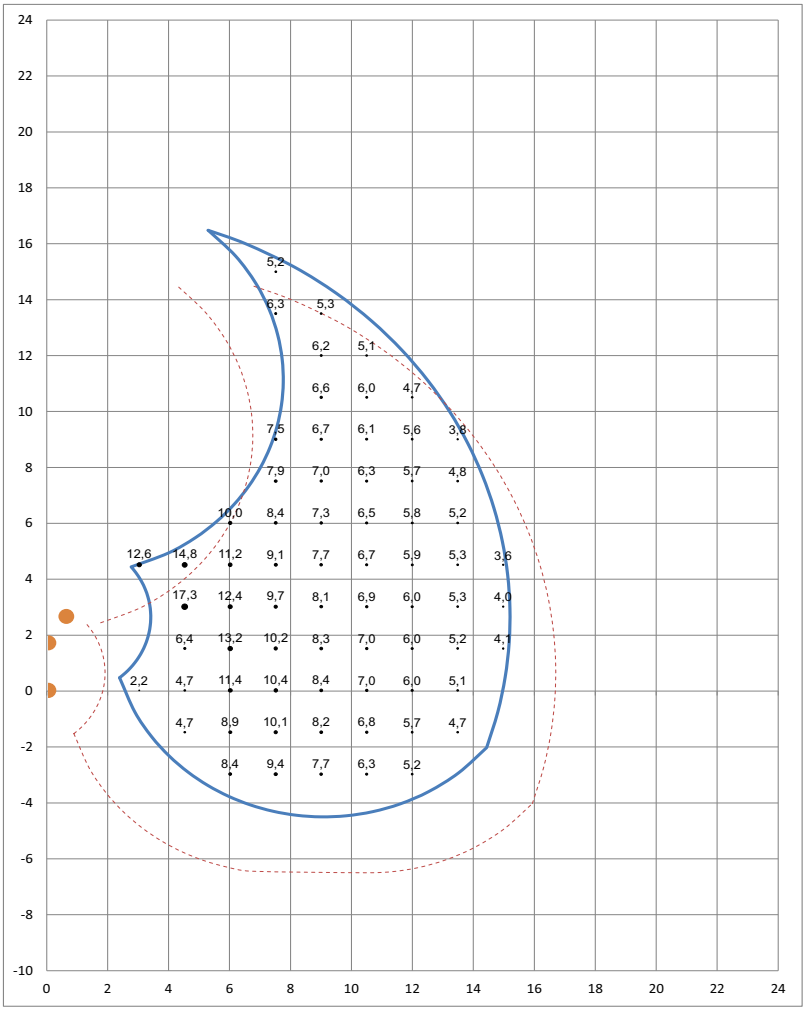
Remarques : Toutes les valeurs sont indiquées en tonnes (t) et comprennent 75% de la charge de basculement statique ou 87% de la force de levage hydraulique conformément à ISO 10567. Elles sont applicables avec stabilisateur et sur un sol plan et résistant, pivotement sur 360°. Les valeurs entre parenthèses [...] sont valables longitudinalement par rapport au châssis.

Observaciones: Todos los valores están especificados en toneladas (t) y constituyen el 75 % de la carga estática de volqueo, o el 87 % de la fuerza de elevación hidráulica conforme a ISO 10567. Rigen con apoyos y con posibilidad de giro en 360° sobre suelo firme y plano. Los valores entre corchetes [...] rigenen el sentido longitudinal para el conjunto inferior

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3.5.3 Compact boom 8.5 m and 7.0 m

830E K15 KA8,5 ST7 Kin1 Mobil MP31E 9,7G



Alle Werte sind in Tonnen (t) angegeben und betragen 75 % der statischen Kipplast bzw. 87 % der hydraulischen Hubkraft gemäß ISO 10567.
Sie gelten auf festem und ebenem Untergrund 360° schwenkbar.
Arbeitsgeräte wie Mehrschalengreifer, Magnet etc. sind Teil der Traglast. Hydraulikbagger im Hebezeugbetrieb sind gemäß der harmonisierten EU-Norm EN 474-5 mit Rohrbruchsicherungen an den Hubzylindern und einer Überlastwarneinrichtung auszurüsten.

830E M K15 KA8,5 ST7 Kin1 MP31E 9,7G 20130308 121206gueai.xlsm

Remarques : Toutes les valeurs sont indiquées en tonnes (t) et comprennent 75% de la charge de basculement statique ou 87% de la force de levage hydraulique conformément à ISO 10567. Elles sont applicables avec stabilisateur et sur un sol plan et résistant, pivotement sur 360°. Les valeurs entre parenthèses [...] sont valables longitudinalement par rapport au châssis.

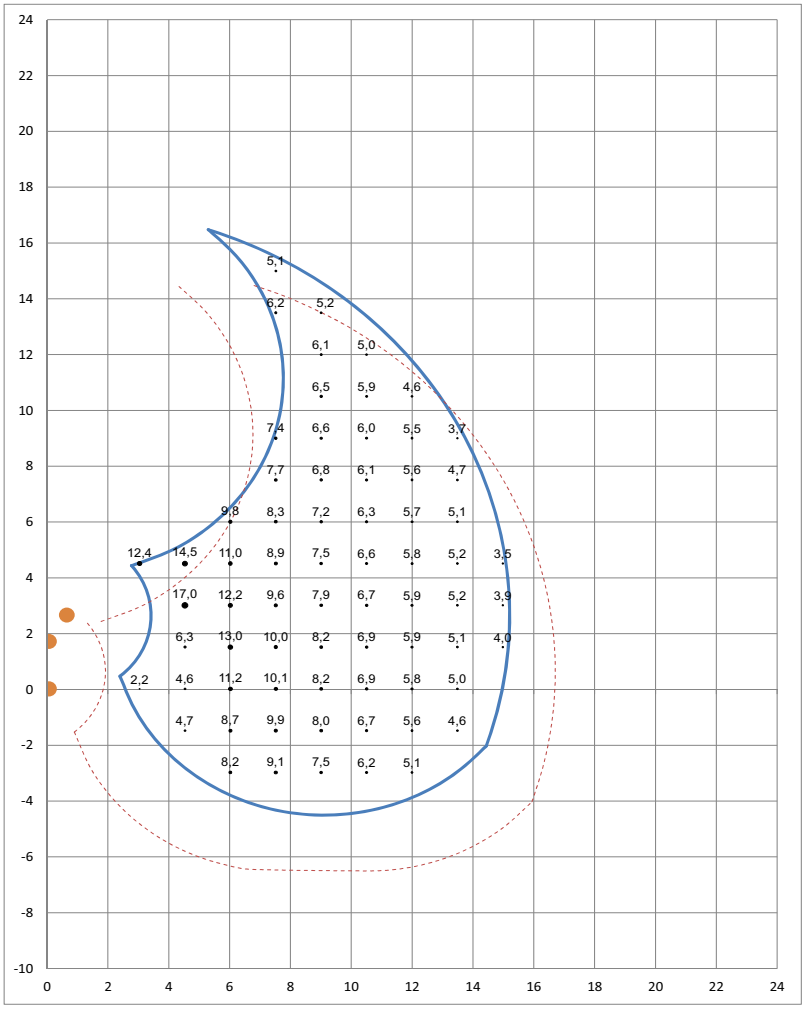
Observaciones: Todos los valores están especificados en toneladas (t) y constituyen el 75 % de la carga estática de volqueo, o el 87 % de la fuerza de elevación hidráulica conforme a ISO 10567. Rigen con apoyos y con posibilidad de giro en 360° sobre suelo firme y plano. Los valores entre corchetes [...] rigenen el sentido longitudinal para el conjunto inferior

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3.5.4 Compact boom 8.5 m and 7.0 m

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830E K15 KA8,5 ST7 Kin1 Mobil MP34E 9,7G



Alle Werte sind in Tonnen (t) angegeben und betragen 75 % der statischen Kipplast bzw. 87 % der hydraulischen Hubkraft gemäß ISO 10567.
Sie gelten auf festem und ebenem Untergrund 360° schwenkbar.
Arbeitsgeräte wie Mehrschalengreifer, Magnet etc. sind Teil der Traglast. Hydraulikbagger im Hebezeugbetrieb sind gemäß der harmonisierten EU-Norm EN 474-5 mit Rohrbruchsicherungen an den Hubzylindern und einer Überlastwarneinrichtung auszurüsten.

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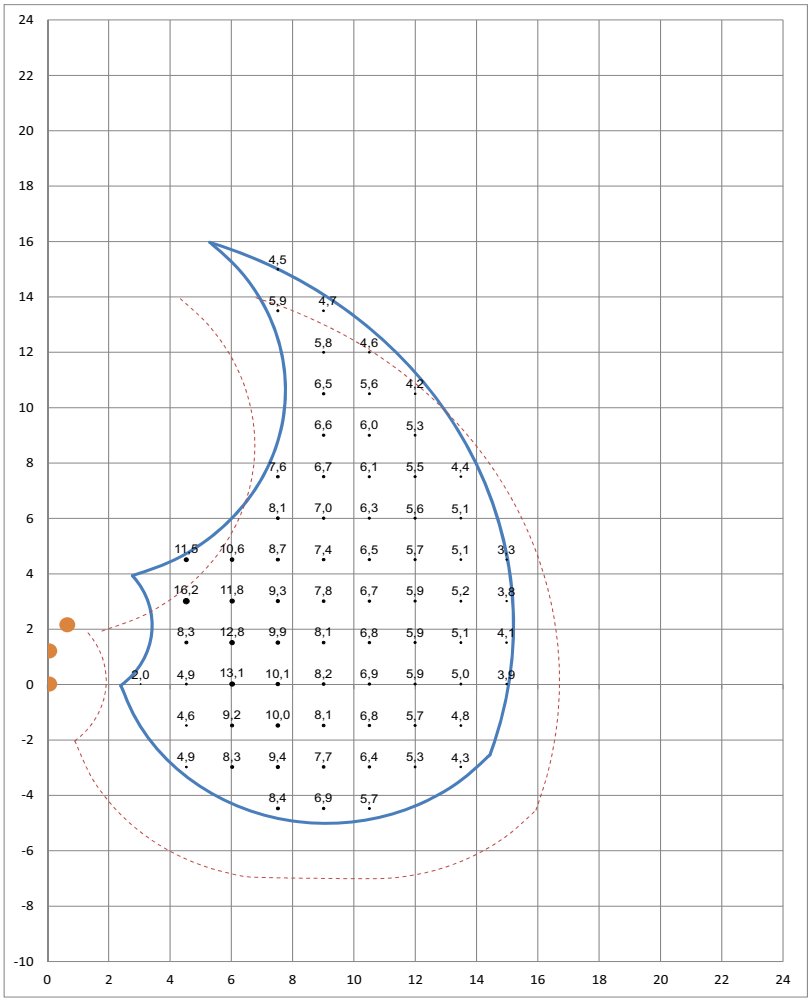
Remarques : Toutes les valeurs sont indiquées en tonnes (t) et comprennent 75% de la charge de basculement statique ou 87% de la force de levage hydraulique conformément à ISO 10567. Elles sont applicables avec stabilisateur et sur un sol plan et résistant, pivotement sur 360°. Les valeurs entre parenthèses [...] sont valables longitudinalement par rapport au châssis.

Observaciones: Todos los valores están especificados en toneladas (t) y constituyen el 75 % de la carga estática de volqueo, o el 87 % de la fuerza de elevación hidráulica conforme a ISO 10567. Rigen con apoyos y con posibilidad de giro en 360° sobre suelo firme y plano. Los valores entre corchetes [...] rigenen el sentido longitudinal para el conjunto inferior

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3.5.5 Compact boom 8.5 m and 7.0 m

830E K15 KA8,5 ST7 Kin1 Raupe TL41_380 9,7G



Alle Werte sind in Tonnen (t) angegeben und betragen 75 % der statischen Kipplast bzw. 87 % der hydraulischen Hubkraft gemäß ISO 10567.
Sie gelten auf festem und ebenem Untergrund 360° schwenkbar.
Arbeitsgeräte wie Mehrschalengreifer, Magnet etc. sind Teil der Traglast. Hydraulikbagger im Hebezeugbetrieb sind gemäß der harmonisierten EU-Norm EN 474-5 mit Rohrbruchsicherungen an den Hubzylindern und einer Überlastwarneinrichtung auszurüsten.

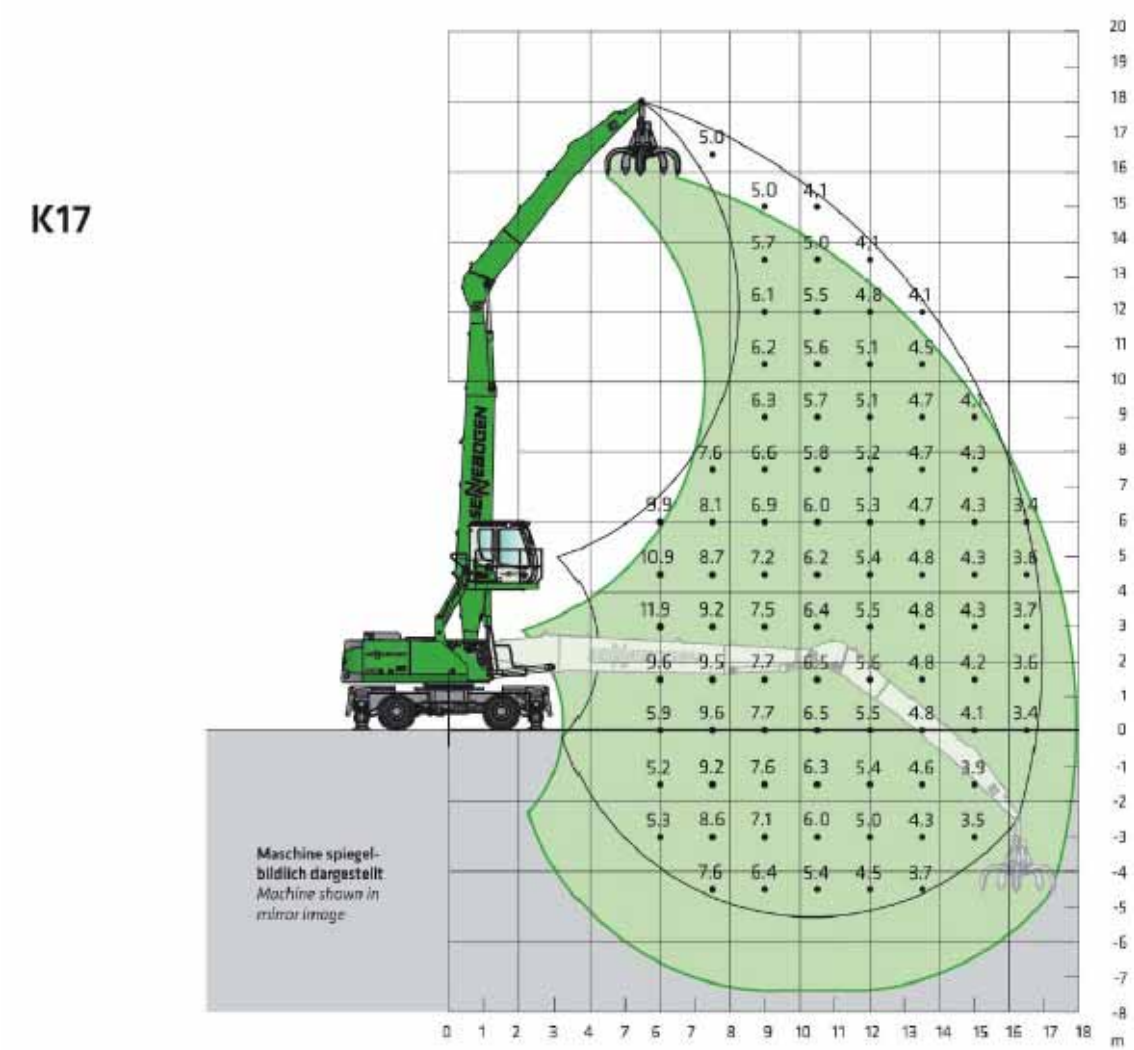
830E R_K15 KA8,5 ST7_Kin1_TL41_380_9,7G__20130123_130438gueai.xlsm

Remarques : Toutes les valeurs sont indiquées en tonnes (t) et comprennent 75% de la charge de basculement statique ou 87% de la force de levage hydraulique conformément à ISO 10567. Elles sont applicables avec stabilisateur et sur un sol plan et résistant, pivotement sur 360°. Les valeurs entre parenthèses [...] sont valables longitudinalement par rapport au châssis.

Observaciones: Todos los valores están especificados en toneladas (t) y constituyen el 75 % de la carga estática de volqueo, o el 87 % de la fuerza de elevación hidráulica conforme a ISO 10567. Rigen con apoyos y con posibilidad de giro en 360° sobre suelo firme y plano. Los valores entre corchetes [...] rigenen el sentido longitudinal para el conjunto inferior

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3.5.6 Compact boom 9.0 m and 7.5 m



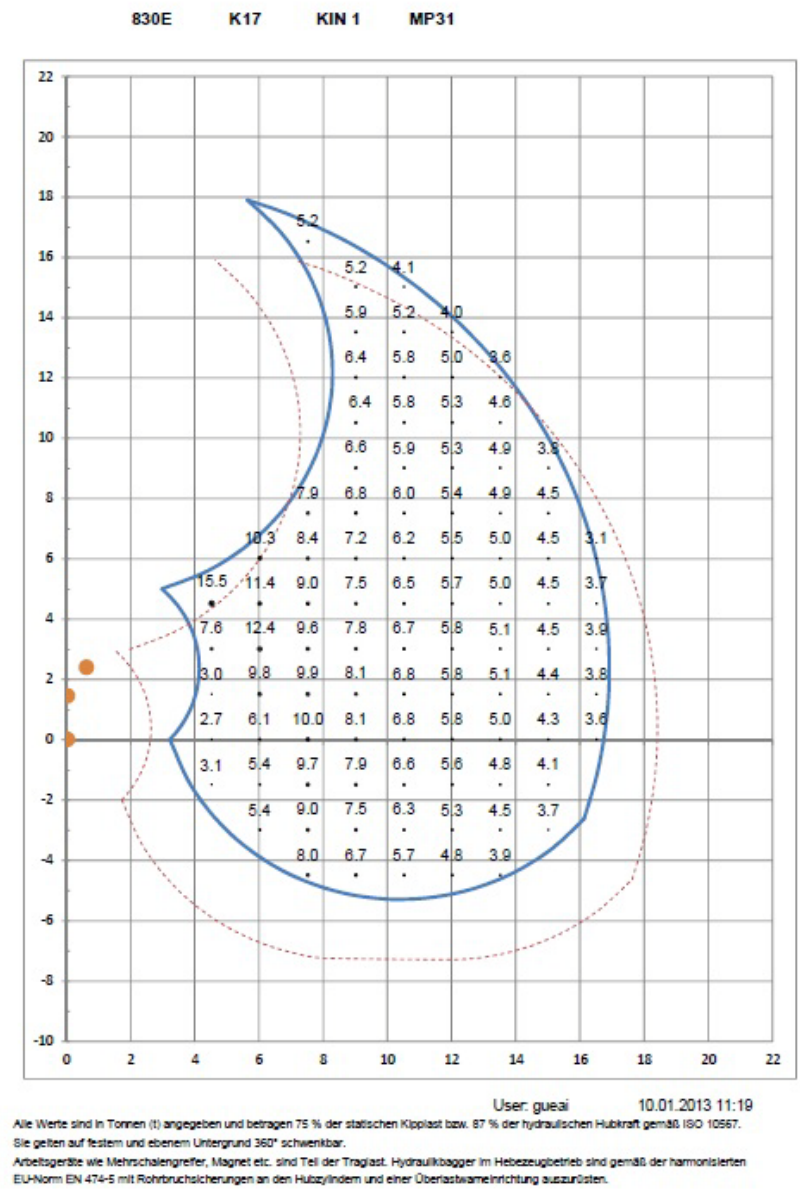
Unterwagen *undercarriage*	**MP30E**
Kompaktausleger *compact boom*	**9,8 m**
Ladestiel *Loading stick*	**7,5 m**
Kabine *cabin*	**maXcab E300/260, hydraulisch hoch- und vorfahrbar** **maXcab E300/260, hydraulic elevating and forward moving**

Remarques : Toutes les valeurs sont indiquées en tonnes (t) et comprennent 75% de la charge de basculement statique ou 87% de la force de levage hydraulique conformément à ISO 10567. Elles sont applicables avec stabilisateur et sur un sol plan et résistant, pivotement sur 360°. Les valeurs entre parenthèses [...] sont valables longitudinalement par rapport au châssis.

Observaciones: Todos los valores están especificados en toneladas (t) y constituyen el 75 % de la carga estática de volqueo, o el 87 % de la fuerza de elevación hidráulica conforme a ISO 10567. Rigen con apoyos y con posibilidad de giro en 360° sobre suelo firme y plano. Los valores entre corchetes [...] rigenen el sentido longitudinal para el conjunto inferior

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3.5.7 Compact boom 9.8 m and 7.5 m



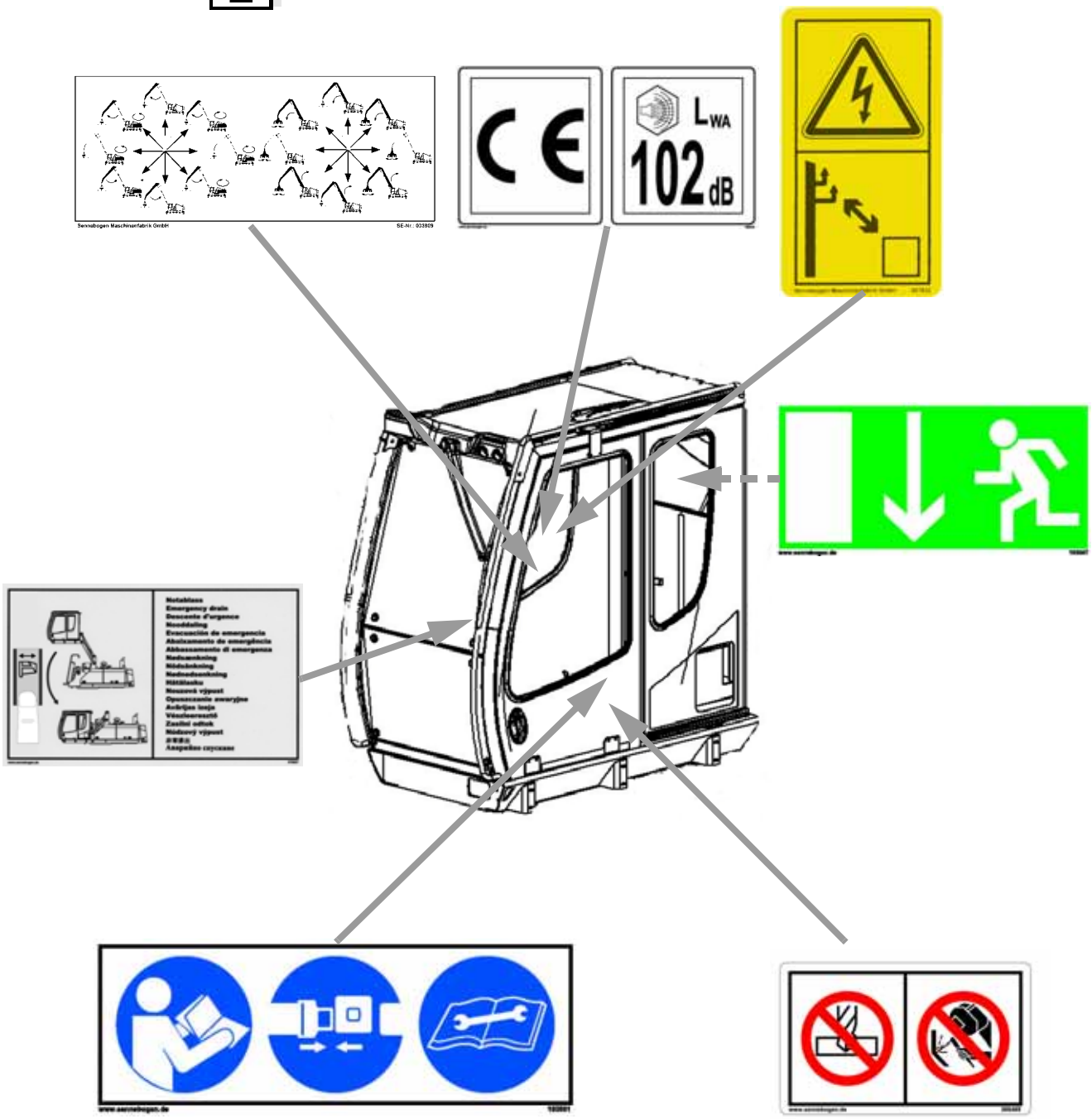
Remarques : Toutes les valeurs sont indiquées en tonnes (t) et comprennent 75% de la charge de basculement statique ou 87% de la force de levage hydraulique conformément à ISO 10567. Elles sont applicables avec stabilisateur et sur un sol plan et résistant, pivotement sur 360°. Les valeurs entre parenthèses [...] sont valables longitudinalement par rapport au châssis.

Observaciones: Todos los valores están especificados en toneladas (t) y constituyen el 75 % de la carga estática de volqueo, o el 87 % de la fuerza de elevación hidráulica conforme a ISO 10567. Rigen con apoyos y con posibilidad de giro en 360° sobre suelo firme y plano. Los valores entre corchetes [...] rigenen el sentido longitudinal para el conjunto inferior

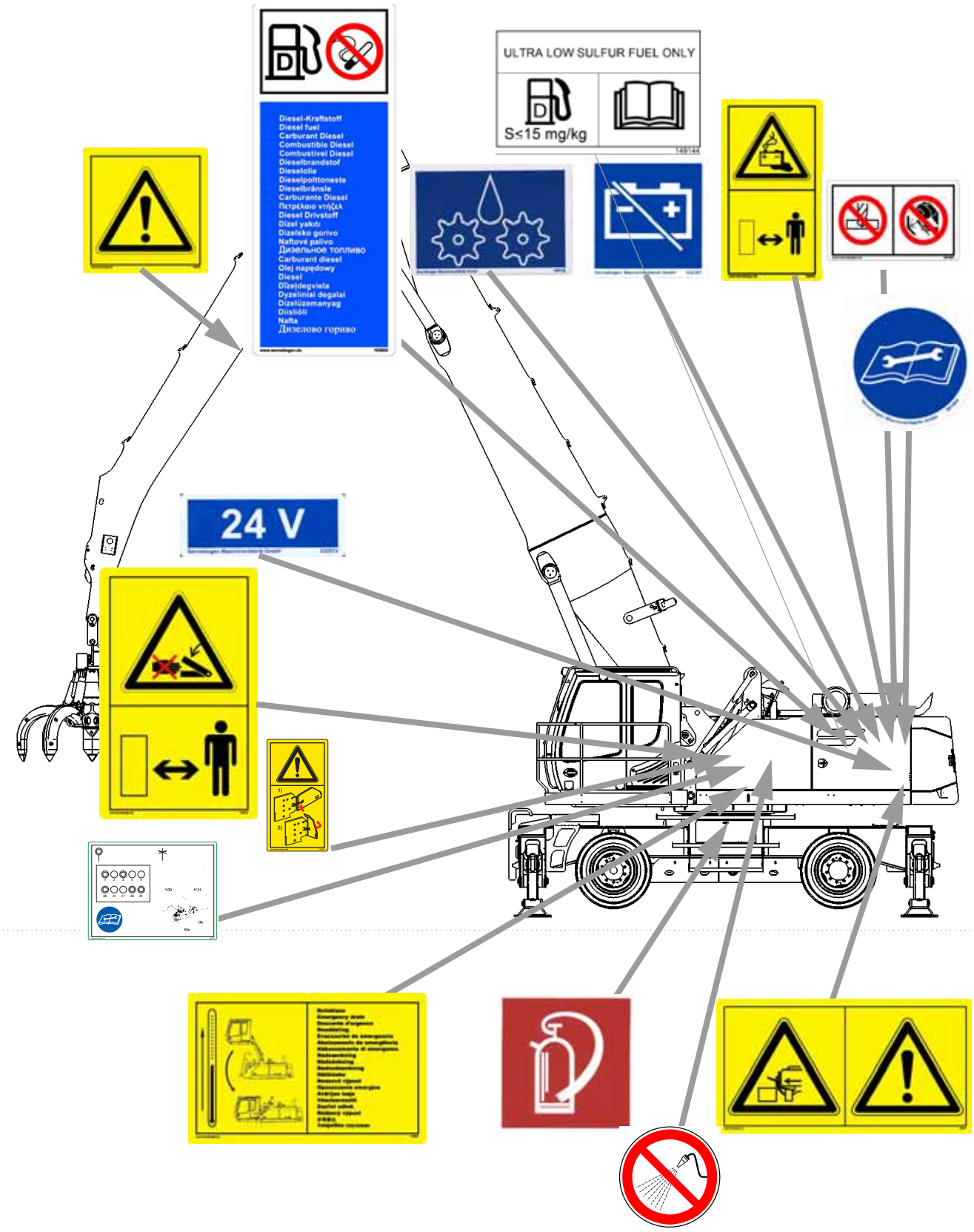
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3.6 Warning and notice labels

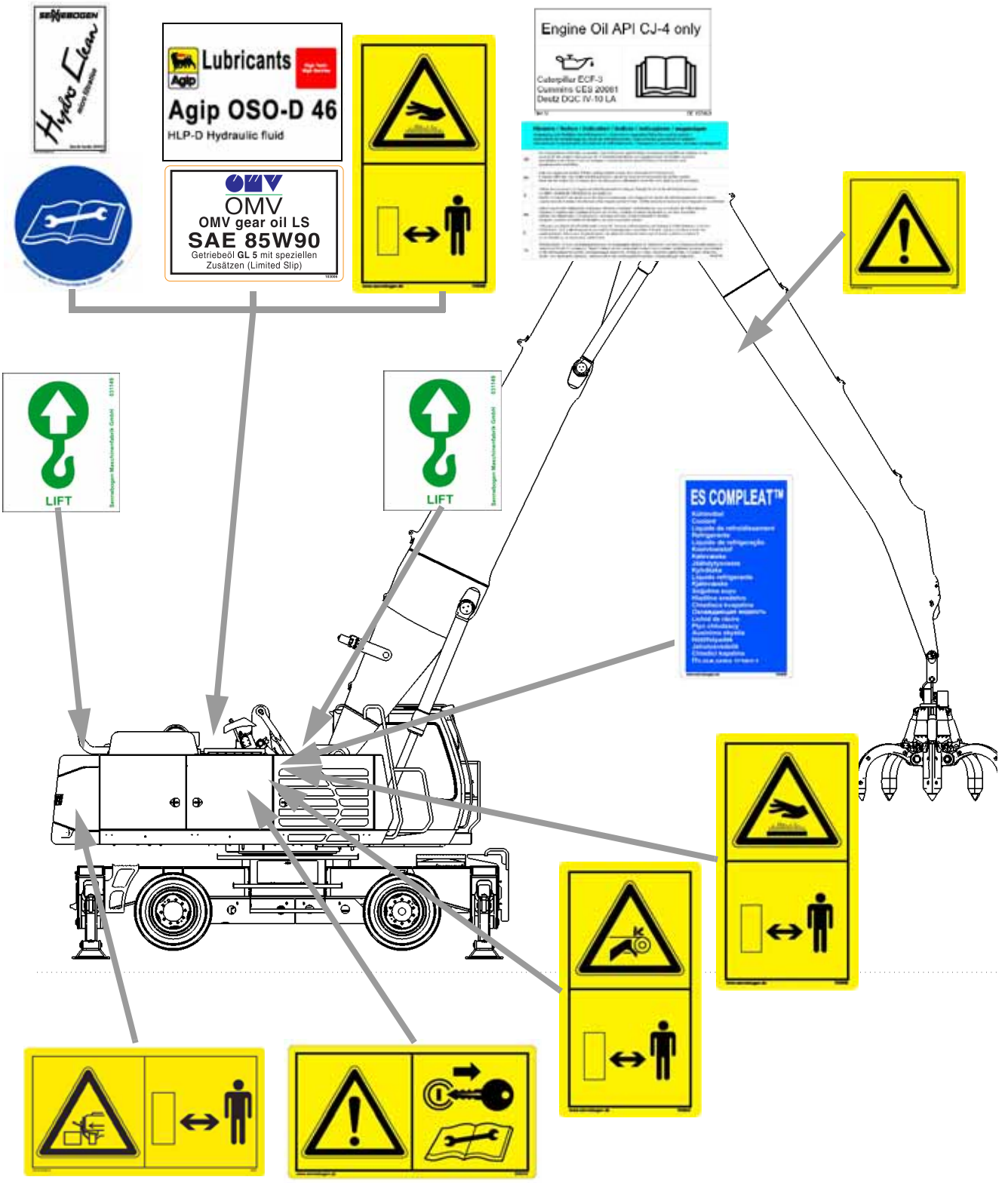
Note
More information can be found in Section .



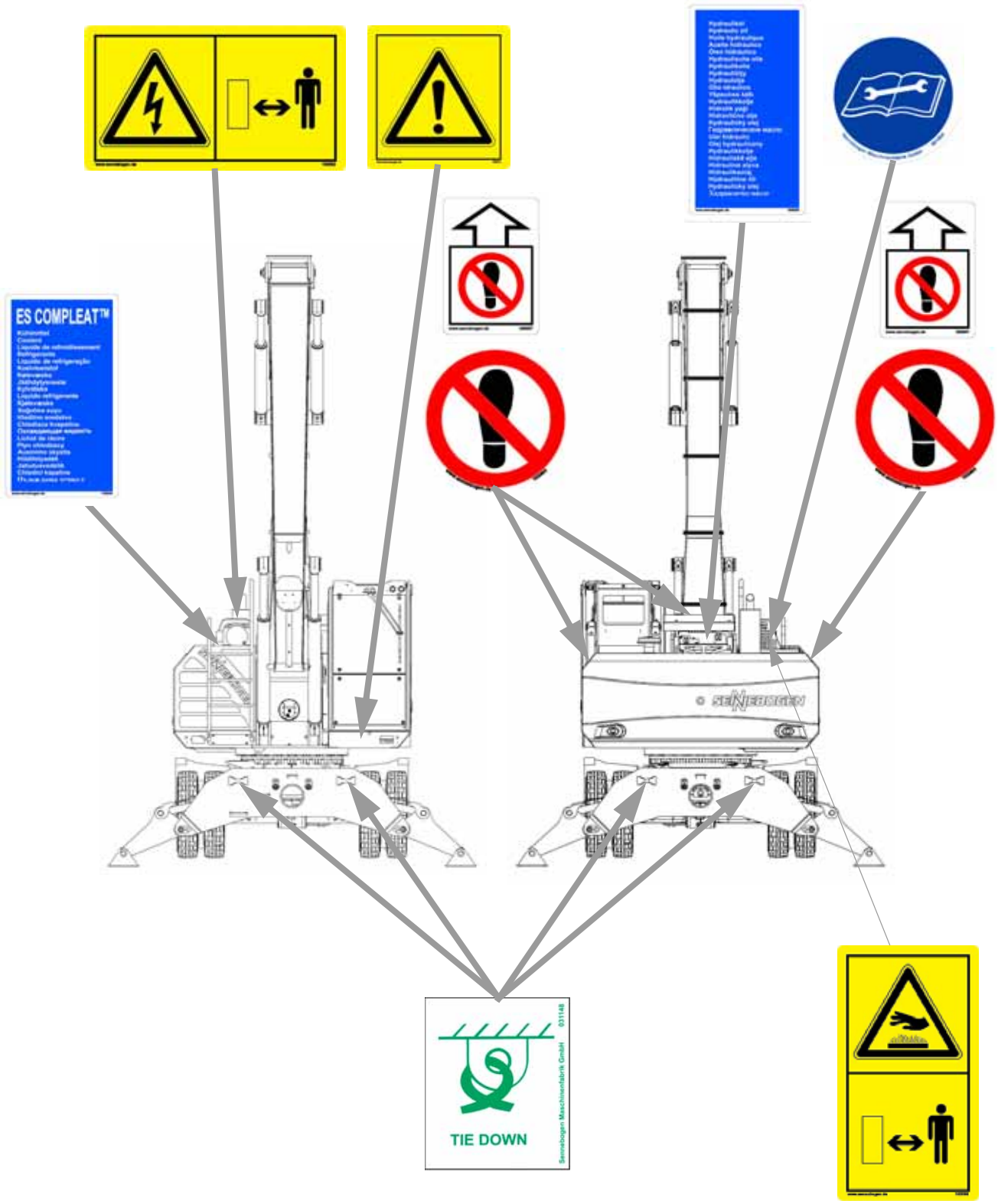
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3.7 Wind speed

Wind force		**Wind speed**		**Effect**
Beau-fort scale	Description	m/s	kph	On shore
0	Calm	0-0.2	1	Calm, smoke rises vertically
1	Light draught	0.3-1.5	1-5	Direction of wind is displayed by the direction of the smoke, but not by a weather vane
2	Light breeze	1.6-3.3	6-11	Wind is felt on the face, leaves rustle, weather vane moves
3	Weak breeze	3.4-5.4	12-19	Leaves and small twigs in constant motion, wind extends a light flag
4	Moderate breeze	5.5-7.9	20-28	Wind raises dust and loose paper; small branches move
5	Fresh breeze	8.0-10.7	29-38	Small-leaved trees begin to sway; crested wavelets form on inland waters
6	Strong breeze	10.8-13.8	39-49	Large branches move; overhead wires whistle; umbrellas are difficult to control
7	Moderate gale	13.9-17.1	50-61	Whole trees sway
8	Fresh gale	17.2-20.7	62-74	Twigs break off trees; walking is difficult
9	Storm	20.8-24.4	75-88	Slight structural damage occurs, shingles may blow off
10	Heavy storm	24.5-28.4	89-102	Trees uprooted; considerable structural damage occurs
11	Hurricane type storm	28.5-32.6	103-117	Extensive storm damages (rarely in inland)
12	Hurricane	32.7-36.9	118-133	Severe devastation

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3.8 Conversion factors

Pressure

1 bar	100 Kpa	14.5 psi
10 psi	68.95 Kpa	0.6895 bar

Flow rate

1 l/min	0.0353 cfm	0.2642 gal/min (US)
1 gal/min (Brit.)	0.1605 cfm	
1 gal/min (US)	3.78541 l/min	

Length

1 mm	0.03934 in	
1 m	39.34 in	3.281 ft
1 in	25.4 mm	
1 ft	0.3048 m	304.8 mm
1 km	39340 in	3280.8 ft
1 km	1093.6 yd	0.62137 mile
1 mile	1.609 km	1609 m

Weight

1 kg	2.205 lb	35.27 oz
1 lb (US)	0.454 kg	16 oz

Power

kW	= HP x 0.746
HP	= kW x 1.341

Temperature

°C	= (°F - 32) x 5/9
°F	= (°C x 9/5) + 32

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Volume

1 m^3	1000 l	35.31 ft^3	1.308 yd^3
1 ft^3	28.32 l	0.02832 m^3	1.728 $inch^3$
1 l	0.2642 gal.(US)	0.2201 gal (Brit.)	-
1 gal. (US)	3.785 l	231 $inch^3$	-
1 gal. (Brit.)	4.544 l	277 $inch^3$	-
1 yd^3	764.55 l	0.765 m^3	27 ft^3

Speed

1 m/s	3.281 ft/s	2.237 mile/h
1 ft/s	0.305 m/s	1.097 km/h

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3.9 Tightening torques for screws

Note

For certain mounting screws on the undercarriage, values differing from those listed in this table may apply. Please observe the notes in the respective sections.

Strength class 8.8

Coarse thread		Fine thread	
Screw	Tightening torque M_A [Nm]	Screw	Tightening torque M_A [Nm]
M4	2,7	M8x1	24
M5	5,4	M10x1	50
M6	9,3	M10x1.25	47
M8	23	M12x1.25	84
M10	45	M12x1.5	81
M12	77	M14x1.5	135
M14	125	M16x1.5	205
M16	190	M18x1.5	305
M18	275	M20x1.5	430
M20	385	M22x1.5	580
M22	530	M24x2	720
M24	660	M27x2	1050
M27	980	M30x2	1450
M30	1350		
M33	1850		
M36	2350		

Note

Applies to clean, zinc-coated, non-lubricated screws!

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Strength class 10.9

Coarse thread		Fine thread	
Screw	Tightening torque M_A [Nm]	Screw	Tightening torque M_A [Nm]
M4	4,0	M8x1	36
M5	7,9	M10x1	73
M6	14	M10x1.25	69
M8	33	M12x1.25	125
M10	66	M12x1.5	120
M12	115	M14x1.5	195
M14	180	M16x1.5	300
M16	280	M18x1.5	435
M18	390	M20x1.5	610
M20	550	M22x1.5	830
M22	750	M24x2	1050
M24	950	M27x2	1500
M27	1400	M30x2	2100
M30	1900		
M33	2600		
M36	3300		

Note

Applies to clean, zinc-coated, non-lubricated screws!

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4 Start-up

Note

Only specialized personnel who have been authorized and trained by SENNEBOGEN are allowed to perform repair, maintenance and measurement tasks.

4.1 Safety instructions

Note

Also comply with the safety instructions in Section 1 Safety before start-up.

WARNING

- Please read CHAPTER 1 SAFETY.
  Before start-up, carry out checks in accordance with Section 4.5.
- Check that all machine protective features are complete and properly secured.
- Ensure that the gallery/operator catwalk has been installed properly. Falling out when the door is open (with optional seat belt in place) is no longer possible in this case.
- Wear protective work clothing (e.g. protective helmet, protective glasses) if working conditions necessitate. At working heights of 2.00 m or more, SENNEBOGEN recommends the use of a safety harness to prevent falling. At working heights above 3.00 m, using a safety harness is required legally.
  Hanging rings are marked.
- Take off jewelry or loose clothing.
- Secure loose items e.g. tools or other accessories.
- Agree on hand signals with the banksman.
- Obtain information on first aid and rescue facilities.
- Enter and exit the machine only when it is stationary. Use the appropriate access ladders and ladders:
  - If necessary, clean access ladders and ladders before use
  - Do not carry any items when climbing up or down. Hoist items of equipment onto the machine using rope or lifting equipment.
  - Do not use operating instruments in the cab as grip handles.
- Ensure that there is no one in the danger area.
- Check the machine safety features (e.g. brakes, signal and lighting equipment).
- Check that the operating instruments and protective features are functioning correctly while driving slowly.

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- Do not operate the machine if a fault has been detected.
- Ensure that all actuating levers are in the neutral position.
- Start the machine only as described in the information in the instructions.

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4.2 Cleaning work

ATTENTION

Comply with the safety instructions before starting tasks.

CAUTION

- Clean the machine daily.
- For heavy contamination, clean the machine several times per day if necessary, especially in recycling applications.
- Ensure that the cleaning agents used do not damage the seals and components of the machine.
- Do not use aggressive cleaning agents.
- Only use lint-free cleaning cloths.
- Only use dry, filtered compressed air up to max. 2 bar (29 psi).
- Lubricate the lubrication points after every cleaning.
- Replace protective caps on the lubricating nipples.
- After cleaning the engine compartment, check all lines for leaks, loosening or damage and correct any problems.
- Risk of condensation
  After a wet cleaning, check that there is no moisture in the electrical control cabinet.
- On completion of cleaning work on the machine, carry out a visual and functional check according to the machine operating instructions.

WARNING



Electrical and electronic components such as the alternator, control cabinet etc. as well as the bearings of the elevating cab (may cause failure in the bearing surfaces and result in sudden, uncontrolled motion when positioning the cab) must never be subjected to a direct stream of water!

Wet cleaning of these components is prohibited!

When wet cleaning the machine, always make sure that no water/ moisture comes into contact with electrical or electronic components.

Water infiltration can otherwise damage or destroy the machine electronics. This can result in sudden, uncontrolled operating movements.

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4.3 Tests before start-up

4.3.1 Service access door locking device

Note

The service access doors are protected from closing unintentionally by means of a locking device (1).



1 2

CAUTION

Before closing the service access door, the locking device (2) must be raised.

This prevents the service access door and locking device from being damaged.

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4.4 Initial commissioning

The initial commissioning of the machine is carried out by SENNEBOGEN or by a trained and authorized specialist.

If the machine is shut down for a prolonged period (> 6 months), it is essential to contact SENNEBOGEN Customer Service before recommissioning.



WARNING
Please read CHAPTER 1 SAFETY.
Before start-up, carry out checks in accordance with Section 4.5.

4.5 Inspections before daily start-up

Observe the safety instructions before starting work.



DANGER

- Familiarize yourself with the machine and equipment. Read these operating instructions before start-up, in particular Chapter 1 Safety.
- Only carry out work for which you have been trained and which is within your working range.



Note
The following pages contain the checklist that should be processed before starting work with the machine every day. It is divided into:

– A general section (e.g. A1),

– A function section (e.g. F1); and

– A visual check section (e.g. S1).



DANGER
Report all irregularities to the person in charge before start-up. Only operate the machine after ensuring that it is in full working order.

No.	General	Steps to take	☑
A1	Are the danger areas on site (overhead power lines, ditches etc.) marked and secured?	Mark and secure as necessary	❒
A2	Do you know the operating and environmental conditions (soil strength etc.)?	If necessary, obtain information	❒
A3	Is an experienced banksman available, if required?	If necessary, arrange for a banksman	❒
A4	Are there people in the danger area?	If so, advise them to leave the danger area	❒
A5	Is the load weight known?	Obtain information	❒
A6	Are the machine and sling devices appropriate for the loads to be suspended?	Refer to the operating instructions and identification plate as necessary	❒

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No.	Functional checks	Steps to take	☑
F1	Is the stick end limitation set correctly?	If necessary, adjust	❒
F2	Is the hoisting limiter set correctly?	If necessary, adjust	❒
F3	Is the overload warning device activated?	If necessary, activate	❒
F4	Is the machine positioned horizontally?	If necessary, position correctly	❒
F5	Is the stability of the machine ensured?	If necessary, support properly	❒
F6	Are all safety features (brakes, monitoring/ warning indicators, signal and lighting equipment) working properly?	If necessary, locate and correct faults	❒
F7	Are any warning or fault messages displayed on the SENCON?	If necessary, locate and correct faults, read fault log	❒
F8	Are the electrical devices (windscreen wipers, heating system, air conditioning system, etc.) working correctly?	If necessary, locate and correct faults	❒
F9	Is the emergency lowering feature of the cab working?	If necessary, locate and correct faults	❒
F10	Does the steering work properly?	If necessary, adjust	❒
F11	Is the central lubrication unit working?	If necessary, refill with grease or locate and correct faults (grease must appear at all connected bearing points)	❒
F12	Refrigerant, grease, diesel hydraulic oil, cleaning water, pivoting gear.	Check/fill if necessary	❒
F13	Lighting, rotating beacons, reverse signal, camera	If necessary, replace	❒

No.	Visual checks	Steps to take	☑
S1	Are all protective coverings, insulating materials and warning signs in place on the machine and undamaged?	If necessary, replace	❒
S2	Are all access ladders, grips and anti-slip surfacing in place and undamaged (e.g. cracking)?	If necessary, repair or replace	❒
S3	Is the machine clean enough to ensure no danger areas exist due to dirt (danger of slipping, falling, poor visibility)?	If necessary, clean using a high-pressure cleaner. Exercise CAUTION around sensitive or electrical components!	❒
S4	Are the windows clean and free of ice and snow?	If necessary, de-ice or clean	❒

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No.	Visual checks	Steps to take	☑
S5	Is the undercarriage (e.g. tires, axles, drive shafts/universal joints) undamaged?	If necessary, repair or replace	❒
S6	Are the wheel nuts tight and the intermediate rings firmly seated?	If necessary, retighten to the specified torque	❒
S7	Is the tire pressure correct? (For pneumatic tires)	If necessary, repair leaks and pump up tires (using a tire cage)	❒
S8	Is the hydraulic system (lines, hoses etc.) free of leaks and undamaged?	If necessary, tighten connections or replace seals	❒
S9	Are the hydraulic cylinders (e.g. outrigger, stick, floating axle cylinders, steering cylinders) free of leaks and undamaged? Do the piston rods show any damage (cracking etc)?	If necessary, tighten connections or replace seals	❒
S10	Is the gate on the hydraulic tank open?	If necessary, open	❒
S11	Are the fluid reservoirs sufficiently full (refrigerant, grease, diesel, hydraulic oil, engine oil, fuel, windshield cleaning water, pivoting gear, etc.)?	If necessary, repair leaks and add fluids. Follow manufacturer's instructions!	❒
S12	Are TopAir and air filter cartridges damaged or contaminated?	If necessary, clean or replace	❒
S13	Is the fan wheel undamaged?	If necessary, replace	❒
S14	Are the cooling fins on the combination cooler soiled or damaged?	If necessary, clean by reversing the fan or replace.	❒
S15	Is the cooling system (cooler, hoses, tubing etc.) free of leaks?	If necessary, repair leaks and add refrigerant. Follow manufacturer's instructions! Replace defective components.	❒
S16	Are all hose clips tight and the hose connections free of leaks?	If necessary, retighten or replace	❒
S17	Has the water separator on the fuel system been drained?	If necessary, drain	❒
S18	Are the V-belts undamaged and tensioned?	If necessary, tension again or replace	❒
S19	Are the electrical lines damaged?	If necessary, repair or replace	❒
S20	Are the cable connections (poles) of the battery corroded?	If necessary, clean and grease; cover terminals with protective caps.	❒
S21	Are the batteries held in place securely?	If necessary, retighten holders	❒
S22	Are all service access doors closed?	If necessary, close	❒

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No.	Visual checks	Steps to take	☑
S23	Are all bolt/screw connections undamaged and tight, particularly on the elevating cab?	If necessary, retighten or replace	❒
S24	Have any possible cable connections to external power sources been disconnected?	If necessary, disconnect	❒
S25	Is the correct counterweight installed and secured in place?	Replace if necessary or retighten to specified torque	❒
S26	Are the boom components undamaged (corrosion, cracking)?	If necessary, repair or replace	❒
S27	Are any pin-type keepers cracked or damaged?	If necessary, replace	❒
S28	Are the pipe fracture safety devices tight and undamaged?	If necessary, replace	❒
S29	Is there enough grease in the central lubrication system?	If necessary, refill	❒
S30	Is there enough grease in the grease reservoir of the swing ring pinion lubrication?	If necessary, refill	❒
S30	Are the lubrication pipes undamaged and all lubrication points being greased?	If necessary, replace, clean and lubricate	❒
S31	Are the hydraulic pipes and hoses secured in place?	If necessary, tighten fasteners	❒
S32	Is the swiveling connection undamaged and lubricated sufficiently?	Repair or actuate pinion lubrication if necessary	❒
S34	Are the mechanical steering stops worn?	If necessary, replace	❒
S35	Is the energy chain damaged/worn?	If necessary, replace	❒

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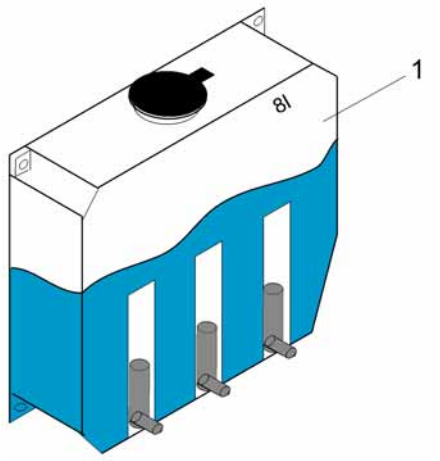
4.6 Tests before start-up

4.6.1 Checking the demister level

Note

The container (1) for the cleaning fluid for the washer system is located behind the left front service access door.

Always fill the container with washer system antifreeze.



Note

Pay attention to the information in the maintenance instructions.

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4.6.2 Check fuel level

Note
The fuel level can be determined as follows:
- by the SENNEBOGEN CONTROL system in the initial screen, see Section 5.

Note
Fill the tank with the specified grade of fuel. Clean fuel is essential for trouble-free operation of the diesel engine. See the label on the fuel tank.

Note

Pay attention to the information in the maintenance instructions.

Notes on quality and fuel selection
Observe the notes in the engine manufacturer operating instructions.

4.6.3 Lubricating the lubrication points manually

Note
All attachments (e.g. grab) must be manually lubricated.

Note

Pay attention to the information in the maintenance instructions.

Note
More information can be found in Section 4.7 and Section 4.9.

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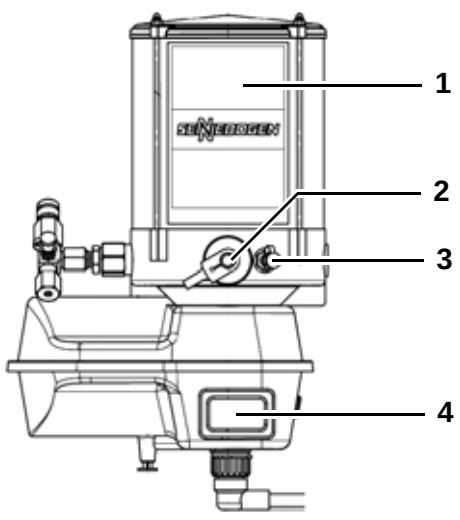
4.6.4 Lubricating the lubrication points manually

Note
More information can be found in Section 3.5.3.

4.6.5 Checking the fill level in the central lubrication system

The central lubrication system automatically lubricates the slewing track of the swiveling connection as well as the bearings of the equipment. The lubrication cycle is pre-set at the factory.

Note
The preset lubricating cycle can be shortened. See the documentation on the central lubrication system in Chapter 10 Appendix of the operating instructions.



1 Grease reservoir — note MIN/MAX marking

2 Refill with grease **/***

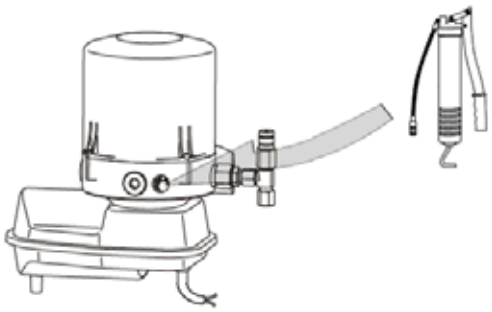
3 Refill with grease */**

4 Adjust the lubrication times

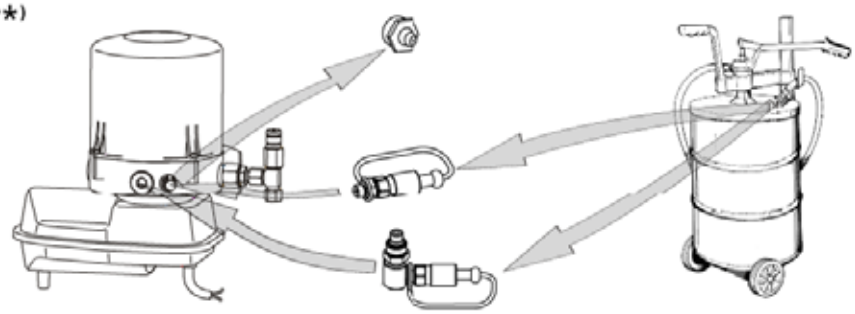
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Replenishing grease (2/3)

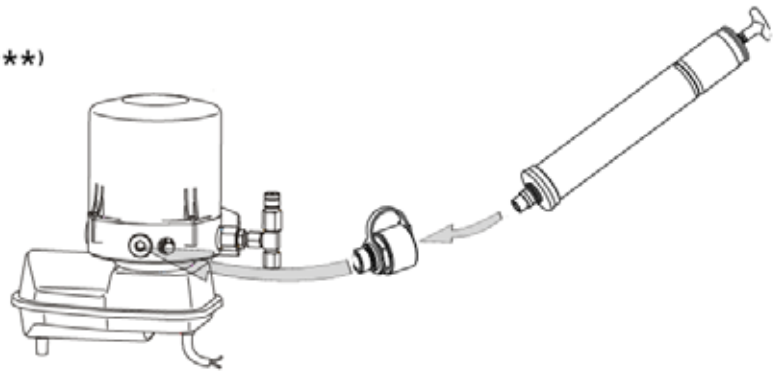
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**)



***)



Warning

Insufficient lubrication can damage the components.

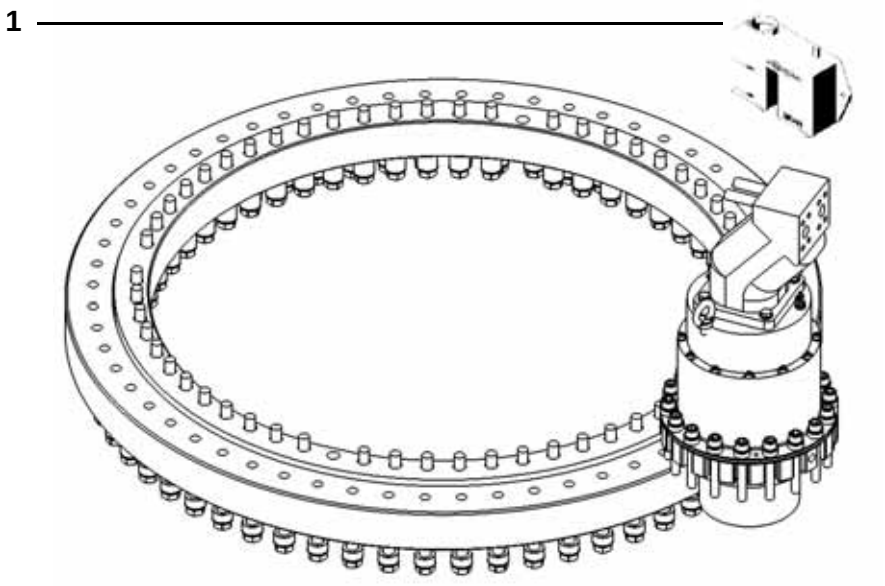
Note

Observe the notes in the maintenance instructions and in the lubrication table.

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4.6.6 Checking the fill level in live ring toothed wheel

Replenishing grease



1	Open the lubricant reservoir cap (1).
2	Add lubricant (see lubricant table).
3	Close the cap.

Note

Pay attention to the information in the maintenance instructions.

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4.7 Checking the swing gear fill level

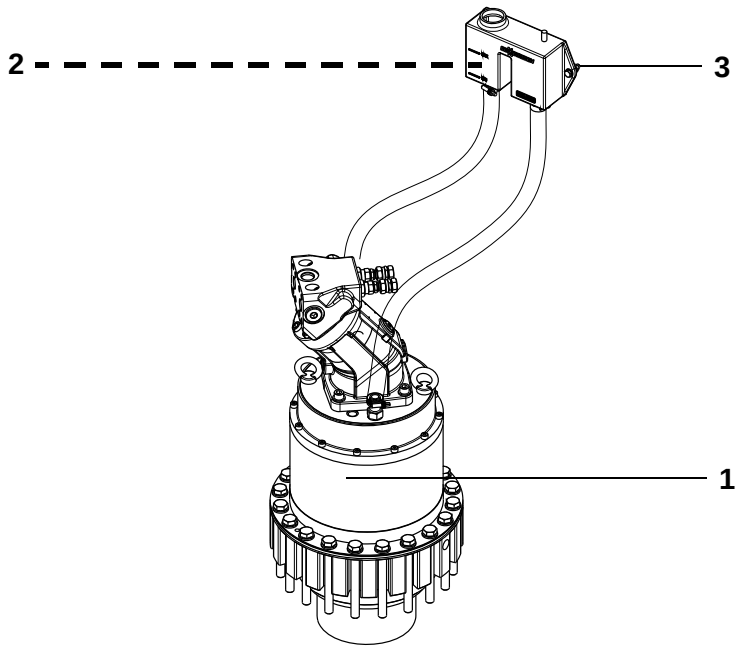
WARNING
Mixing oils, lubricants or operational fluids of different types is not permitted!
Only mix oils, lubricants and operational fluids that are of the same type or identical (same specifications) from one manufacturer!

Note
Depending on the machine type, multiple swing gears with the respective oil expansion tank may be installed. Maintenance must therefore be carried out on all swing gears.

Checking the oil level

1	Lower attached loads and the boom to the ground.
2	Put the machine in a level horizontal position.
3	Shut down the drive engine and secure against re-starting.

Checking the oil level



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1 Swing gear

2 Fill level at 15°C–20°C oil temperature (approx. quarter full marking on the oil expansion tank)

3 Oil expansion tank for each swing gear

4	Allow the oil in the swing gear to cool.
5	Check the oil level: – Fill level at 15°C–20°C oil temperature (approx. quarter full marking on the oil expansion tank). – The oil level can vary according to the oil temperature; up to a three-quarter filling is possible.
6	If necessary add oil of the specified grade.

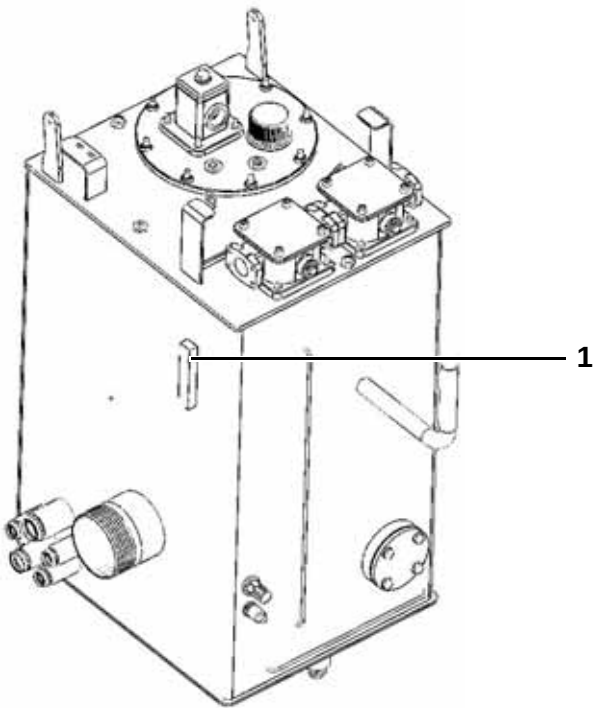


Note

Observe the notes in the maintenance instructions and in the lubrication table.

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4.7.1 Checking the hydraulic oil level



1	Lower attached loads and the boom to the ground.
2	Put the machine in a level horizontal position.
3	Retract all hydraulic cylinders completely.
4	Put the machine in park position. Retract the support cylinders.
5	Shut down the drive engine.
6	Open the service access door on the right.
7	Check the oil level on the oil level indicator (1): the oil level must reach to the upper marking (MAX).
8	De-pressurize the hydraulic system as needed.
9	Add hydraulic oil, if required: – Open the cover plate. – Unscrew the screw cap of the oil filler strainer. – Add hydraulic oil and re-check. – Re-tighten the screw cap. Close the cover plate again.
10	Close the service access door on the right.

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Note

Observe the notes in the maintenance instructions and in the lubrication table

4.7.2 Checking and draining the fuel system

WARNING

- No open flames when working on the fuel system! No smoking!
- Observe the instructions in the engine manufacturer operating manual.



Pos.	Description
1	Fuel filter cartridge
2	Drain screw

1	Open the rear right service access door.
2	Set a suitable catch container under the water container of the fuel filter cartridge (1).
3	Open the drain screw (2).
4	Drain the water and debris out of the water container.
5	Shut off the drain valve again.
6	Close the rear right service access door.

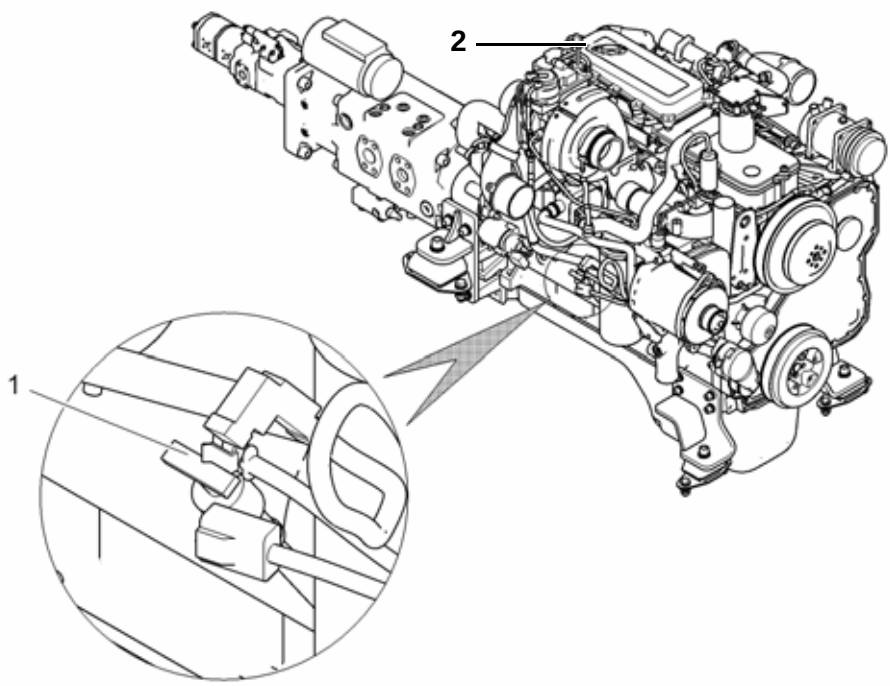
Note

The filter cartridge must be changed after draining the water five times.

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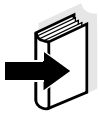
4.7.3 Checking the engine oil level

Note
Observe the notes in the engine manufacturer's operating instructions.

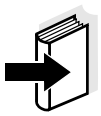


1	Put the machine in a level horizontal position.
2	Run the drive engine for approx. 2 minutes until the system is filled with oil.
3	Shut down the drive engine.
4	Open the service access door on the right.
5	Pull out the oil dipstick (1) by the grip and wipe off using a clean, lint-free cloth.
6	Insert the oil dipstick (1) up to the stop and pull out again.
7	Check the oil level (handle to top!): the oil level must lie between the lower marking (MIN) and the upper marking (MAX).
8	If necessary top up with oil of the specified grade (2).
9	Insert the oil dipstick (1) up to the stop and pull out again.
10	Close the service access door on the right.

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Note
Observe the notes in the engine manufacturer operating instructions.



Note
Observe the notes in the maintenance instructions and in the lubrication table.

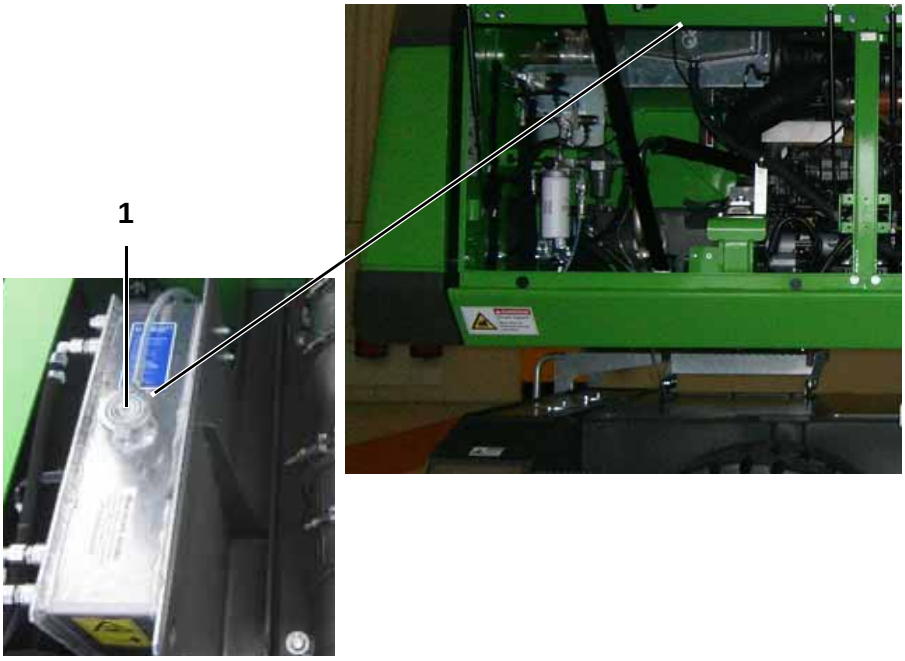
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4.7.4 Checking the refrigerant level



WARNING!

Danger of injury from scalding!
Inspect only when the cooling system has cooled.



Checking the refrigerant level and antifreeze

1	Allow the drive engine and cooler to cool down.
2	Place large, thick cloths on the sealing cap (1) of the refrigerant expansion tank and open it carefully in order to equalize the pressure.
3	Check the antifreeze and coolant level, top up if necessary. Mixing ratio: 50% antifreeze, 50% water. Frost resistance to - 37°C (- 34°F).
4	Re-close the expansion tank sealing cap (1).

Note

Pay attention to the information in the maintenance instructions.

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4.8 Lubricating the machine automatically



ATTENTION

Comply with the safety instructions before you start with the tasks.

4.8.1 General



CAUTION

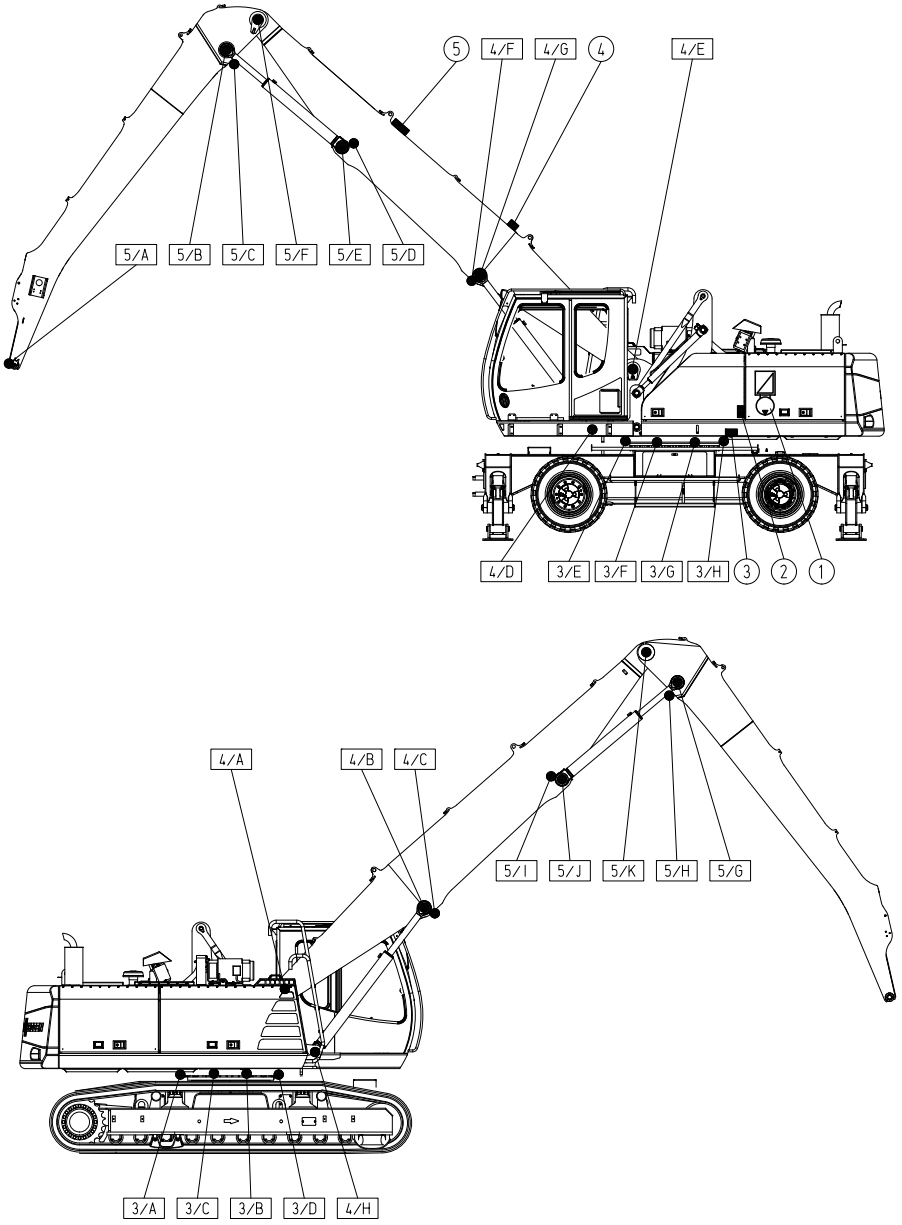
The reservoir for the central lubrication system must always be adequately filled in order to prevent damaging the bearings.



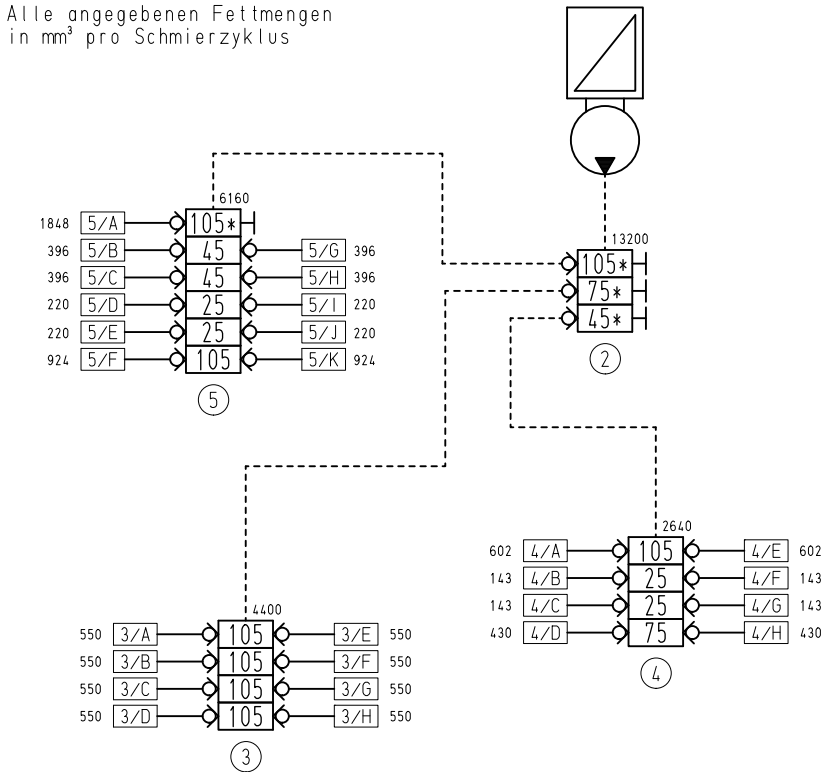
Note
The machine is equipped with a central lubrication system for the swivel and the equipment as standard equipment.

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4.8.2 Overview – central lubrication points



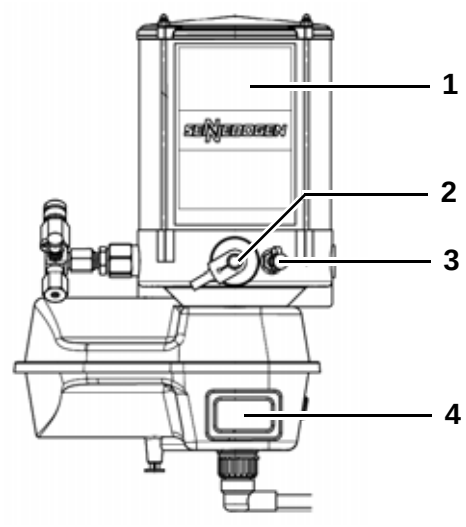
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4.8.3 Adjusting the lubricating cycle

Note
The pre-set lubricating cycle can be shortened. See the documentation on the central lubrication system in Section 10 of the operating instructions.



1 Grease reservoir – note MIN/MAX marking

2 Refill with grease **/***

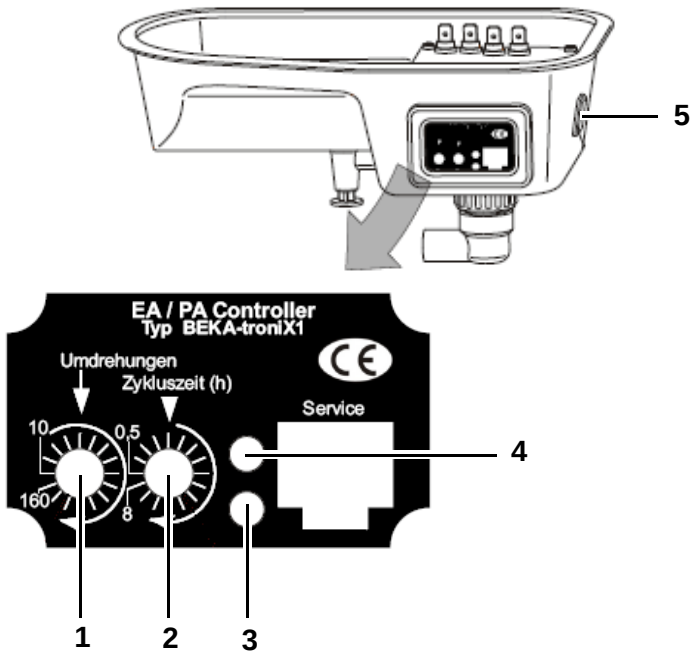
3 Refill with grease */**

4 Adjust the lubrication times

Setting the parameters (4)

1	Using a flat screwdriver, remove the red frame of the control on the motor protective housing of the pump and remove the four Phillips screws as well as the clear cover.
2	Using a Phillips screwdriver, adjust the pause or lubrication time on both click switches.
3	If the control system is closed improperly, water will infiltrate, which will void the guarantee.

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1. Lock switch for adjusting the pump RPM
– Factory setting: 110 revolutions

2. Click switch to set the cycle time
– Factory setting: 1 hour

3. Green LED to indicate function

4. Red LED to indicate faults

5. Button to start intermediate lubrication or to reset a fault

ATTENTION

After a run-in phase of approx. 100 hours and inspecting all lubrication points, the lubrication time can be increased or decreased as needed.

Warning

Insufficient lubrication can damage the components.

Note

Observe the notes in the maintenance instructions and in the lubrication table.

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4.9 Lubricating the machine manually



CAUTION

Comply with the safety instructions before you start with the tasks.

4.9.1 General



CAUTION
The reservoir for the central lubrication system must always be adequately filled in order to prevent damaging the bearings.



Note

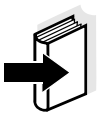
The machine is equipped with a central lubrication system for the swivel and the equipment as standard equipment.



.**Note**
In normal work use each lubricating point must be lubricated once a week. Accordingly, under difficult use conditions lubrication must be executed more often, e.g. daily or once per shift.

Examples of difficult operating conditions:

- Multi-shift operation.
- Increased drive mode proportion of more than 25 % of operating time.
- Operation in extremely wear-promoting material.
- Frequent contact with water or corrosion-promoting substances.
- Operation at extreme temperatures.
- Frequent telescoping.



Note
All lubricating points on attachments (e.g. grab) must be manually lubricated. Comply with the instructions in the supplemental documentation.



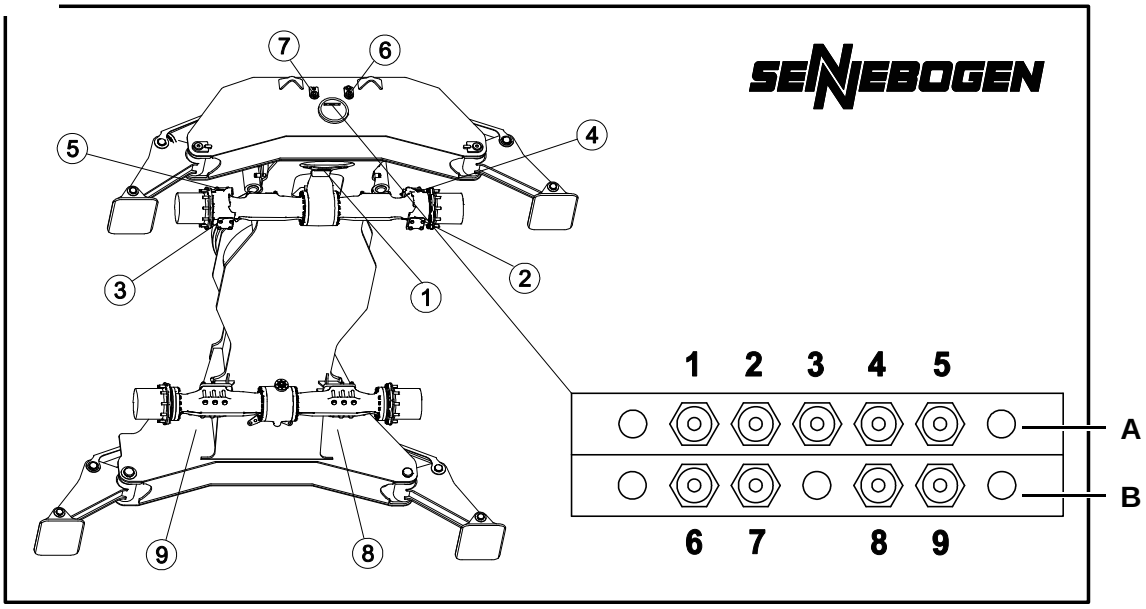
Note

The lubricating nipples must be covered with a red protective cap after the lubricating process

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4.9.2 Central manual lubricating strip – mobile undercarriage

The mobile undercarriage has a central lubricating strip that must be lubricated manually. The central lubricating strip is on the front of the undercarriage.



Pos.	Description	Recommended amount of grease (per lubricating nipple)
A	Upper strip	6.0 ccm / 40 operating hours
B	Lower strip	2.0 ccm / 40 operating hours

Note

When re-lubricating via grease nipples, press in grease until new grease escapes at the lubricating point.

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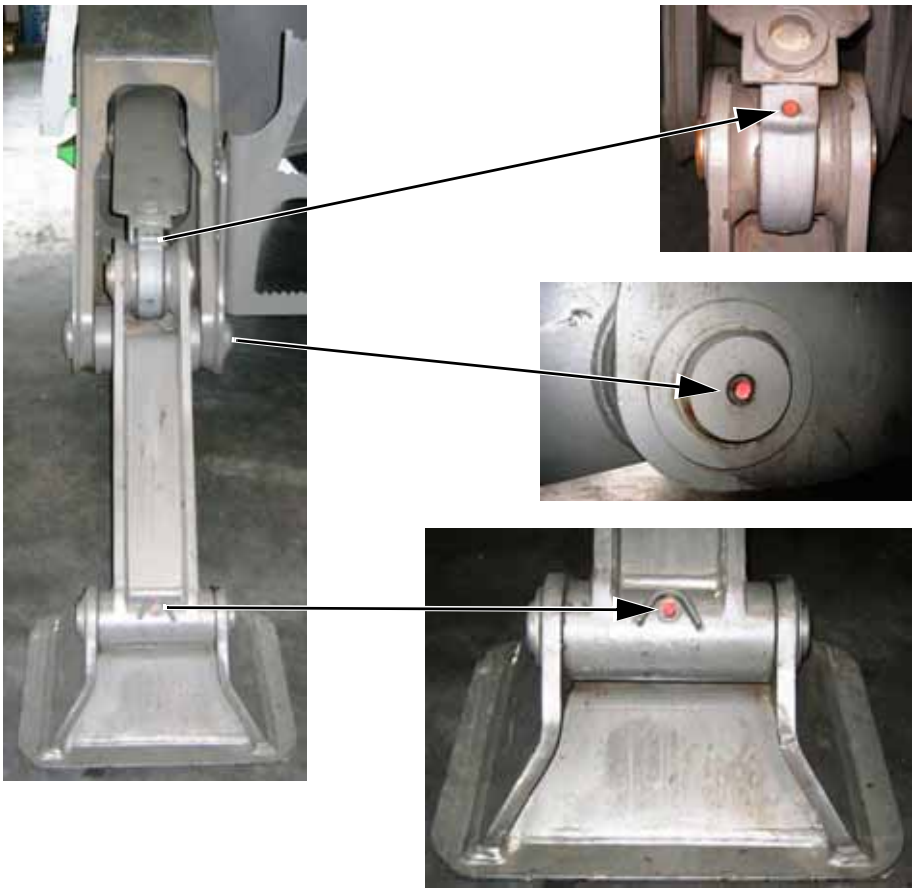
4.9.3 Distributed manual lubricating points mobile undercarriage

The mobile undercarriage has distributed lubricating points that must be lubricated manually:

- 12x undercarriage support.

Undercarriage support

Three grease nipples on each of the four supports must be lubricated manually.



Lubricating specification (per grease nipple)
3.0 ccm / 40 operating hours

Note

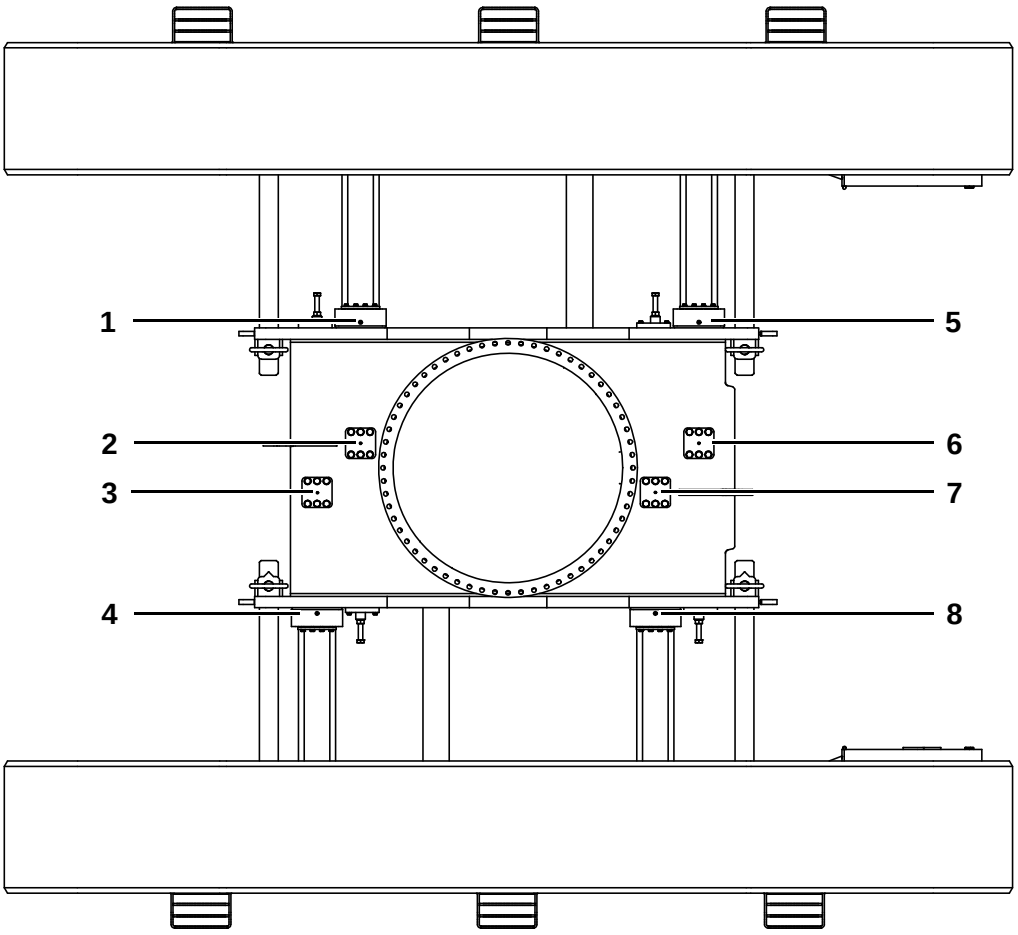
When re-lubricating via grease nipples, press in grease until new grease escapes at the lubricating point.

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4.9.4 Distributed manual lubricating points crawler undercarriage

Telescoping top side

8 grease nipples on the top side must be lubricated manually.

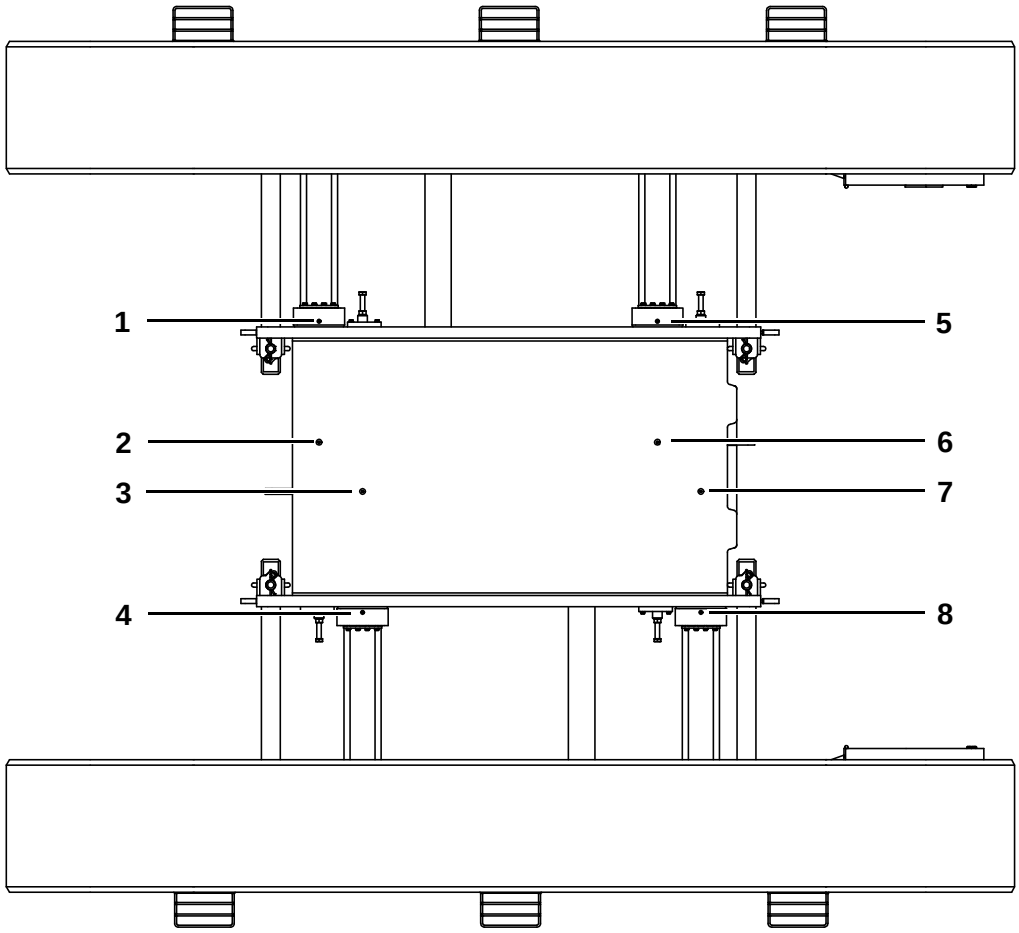


Pos.	Lubricating specification (per grease nipple)
1–8	3.0 – 5.0 ccm / 40 operating hours

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Telescoping underside

8 grease nipples on the underside must be lubricated manually.



Pos.	Lubricating specification (per grease nipple)
1–8	3.0 – 5.0 ccm / 40 operating hours

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4.10 Switching on machine

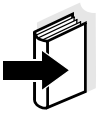
4.10.1 Safety instructions

Observe the safety notes before starting machine.



DANGER

- Danger of injury!
  Keep cab door and service access doors closed.
- Before starting the motor, ensure that there is no one within the danger area.
- The exhaust emission of diesel engines is damaging to health. Only run engine outdoors or in well-ventilated areas.
- Do not start engine if a warning sign is present on the operating elements.
- Adjust driver's seat, steering column and mirror to the correct position.
- Fit seat belt correctly.
- Close the cab doors.



Note

Observe the following instructions before switching on the machine:

- The safety lever must be engaged (rear).
- Check the visual field of the camera and adjust the camera.
- Adjust the mirror.

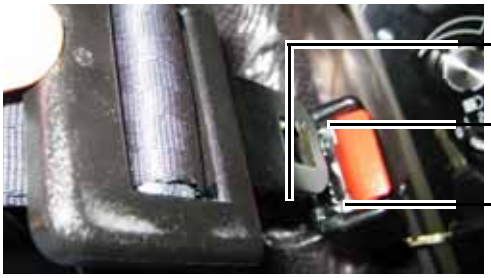
https://truckmanualshub.com/

4.10.2 Seat belt / EU

The machine is equipped with a lap belt. The belt complies with standards FMVSS 209 (EU).

WARNING

- Check belt for signs of wear before machine start-up. Immediately exchange a damaged belt.
- Clean dirty belt using water.
- Do not twist belt when fastening.
- Pass belt as low as possible around the hips, not around the stomach.





1	Push metal catch (1) into belt buckle (2). An audible click indicates that the belt has engaged.
2	To release belt, press red button (3) on belt buckle (2).

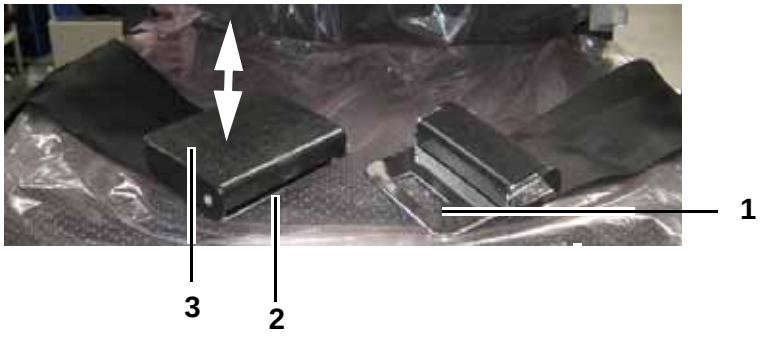
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4.10.3 Seat belt / USA

The machine is equipped with a lap belt. The belt complies with standards SAE J 386 (USA).

WARNING

- Check belt for signs of wear before machine start-up. Immediately exchange a damaged belt.
- Clean dirty belt using water.
- Do not twist belt when fastening.
- Pass belt as low as possible around the hips, not around the stomach.





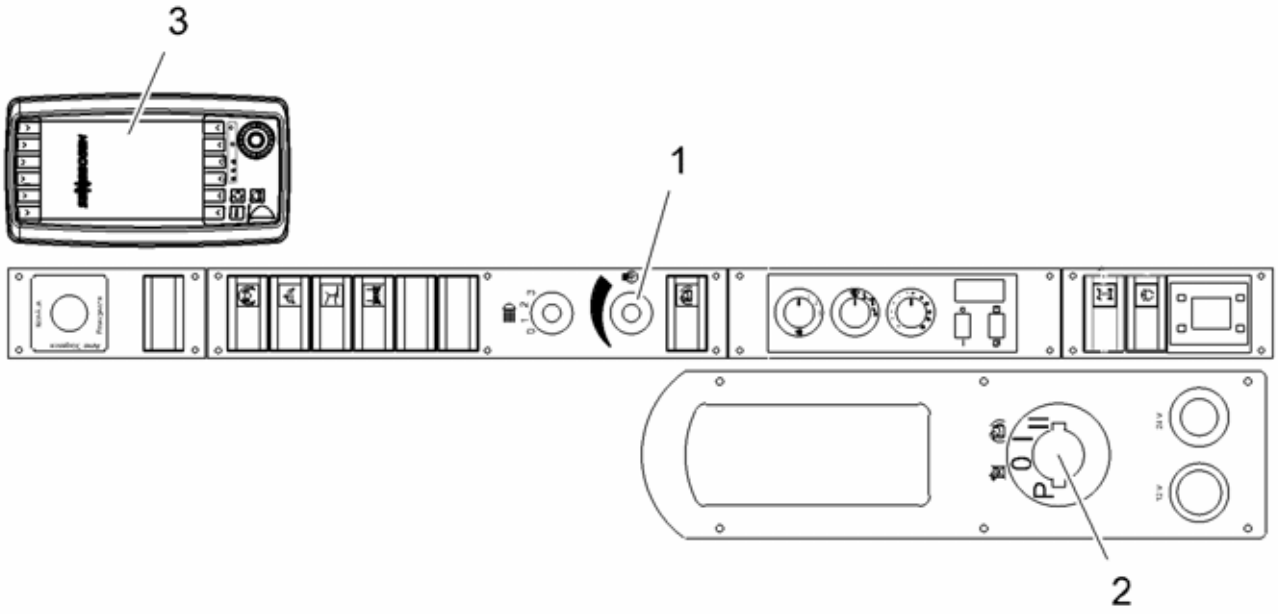
1	Push metal catch (1) into belt buckle (2). An audible click indicates that the belt has engaged.
2	To release belt, pull the black cap (3) upwards..

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4.10.4 Starting the engine

DANGER
Danger of poisoning!
Only run the engine outdoors or in well-ventilated areas. Inhaling exhaust gases is hazardous to your health. It may lead to loss of consciousness and death.

Control panel, right



1	Perform daily inspections in accordance with Section 4.5.
2	Insert the key into the ignition lock (2) and turn to position “I”. – The engine speed, refrigerant temperature and fuel level are now indicated on the SENCON display (3).
3	Start the engine — option 1: – Turn the ignition key (2) to position “II”. Start the engine — option 2: – Start the engine — press the button (4).
4	Set the desired engine rpm using the rotary knob (1).

“Wait to start” lamp in SENCON

The “Wait to start” symbol in SENCON shows the driver that he should wait until the symbol goes out before starting the engine.



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This makes starting the engine easier in low ambient temperatures.

WARNING

After the engine starts, the machine runs at idle speed with ECO mode activated. When activating a function, the speed changes immediately to the higher ECO Mode speed.

CAUTION: Undesired jerky motions possible!

Ignition key position

Ignition key position	Meaning
P	Enabling refueling pump
0	Ignition OFF
I	Ignition ON (Ignition switches off automatically after 20 minutes!)
II	Start the engine

Note
Release the safety lever if necessary to enable the hydraulic functions (see also Section 6.3.2 Safety lever).

DANGER
Never leave the machine unattended with the engine running!

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4.10.5 Bringing the machine to operating temperature

Guidelines values for warm-up period

Ambient temperature	Warm-up period	Max. engine speed
Down to 0°C (32°F)	Approx. 15 min.	Nominal speed — 250 rpm (for nominal speed, see Chapter 4)
- 20°C (- 4°F) -... 0°C (32°F)	Approx. 30 min.	

Procedure for warming up the motor

- Allow the motor to run at idle speed for 3 minutes after starting. Additional warm-up time can be required at temperatures below 0°C (32°F).
- Then increase the engine speed gradually up to nominal speed (no load)
- If approx. 20°C (54 °F) water temperature has been achieved, put a load on the engine by carefully actuating the hydraulic functions and continue to warm the machine up.
- The machine can be loaded if the temperatures indicated below have been achieved.

Note
If the fine screen in front of the cooler ices up, ice and snow can be melted and blown out in the warm-up phase with the aid of the fan reversal function.

Note
If the hydraulics are still slow to respond after the warm-up period, operate for a further 15 minutes at reduced speed.

The following temperatures should be displayed before operating the machine at full speed:

- Hydraulic oil: approx. 40°C (104°F)
- Water: approx. 35°C (95°F).

CAUTION
Not warming up the engine and the machine can result in damage to the engine, hydraulic pump, hydraulic motor, hydraulic oil cooler and hydraulic tank. In addition, machine functions and machine behavior may be negatively impacted, e.g. delayed activation or delayed deceleration of functions.

CAUTION
This may lead to uncontrolled operation of the machine, which may cause accidents!
Only a machine at operating temperature is a fully functioning machine!

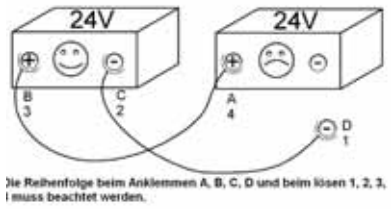
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4.10.6 Jump starting

The machine is equipped with a 24 volt starting system. Ensure that the external power source has the same voltage.

CAUTION
If a power source with a higher voltage is used, this can cause serious damage to the machine's electrical system.





ie Reihenfolge beim Anklemmen A, B, C, D und beim lösen 1, 2, 3,
muss beachtet werden.

1	Actuate the battery isolator switch to disconnect the power supply.
2	Remove the battery cover where applicable.
3	Connect the positive terminal (+) of the power source using appropriate jump leads.
4	Connect the negative terminal (-) of the jumping battery using the jump lead to the engine block or an unpainted metal part of the receiver connected to it.
5	Activate the battery disconnecting switch.
6	Start the engine in accordance with Section 4.10.4.
7	Switch on electrical consumers (protection against overvoltage)
8	Removal: – Detach the jump lead from the negative terminal (-). – Detach the jump lead from the positive terminal (+).
9	Switch off electrical consumers
10	Replace the battery cover where applicable.



Note
The jump lead must be made of copper and have a minimum cross-section of 70 mm^2**.**



WARNING

- Explosion hazard!
  Avoid creating sparks by fire, open fire, or smoking.
- Battery acid is corrosive.
  Avoid any contact with the skin, eyes or clothing. Rinse acid splashes and spills with clean water immediately. It may be necessary to seek the attention of a physician.
- When working on the electrical system, adhere to valid standards and accident prevention regulations.

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4.11 Switching the machine off

4.11.1 Switching the engine off

Note
Switching off the driving engine without allowing a cooling down phase may cause heat storage and overheating of engine parts and especially the turbocharger. Therefore, allow the drive engine to cool down before switching off:

- Lower the engine speed to approx. 50% of the nominal speed (see Chapter 4).
- Allow the machine to run for an additional 5-10 minutes.

Non-observance may cause increased wear to the engine and cooling system!

1	Park the machine on a firm subgrade.
2	Place the attached loads and the boom on the ground if necessary.
3	Lower the engine speed to 50% of the nominal speed in order to prevent damage to the engine and cooling system.
4	Allow the engine to run for approx. another 5-10 minutes.
5	Slow the engine to idle.
6	Turn the ignition key to the “0” position and remove.
7	Pull back the safety lever.
8	Secure the machine (lights, warning triangle, chocks, etc.).

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4.11.2 Disconnecting the electrical system from the battery

If the machine is idle for an extended period or for long transport distances, the electrical system must be isolated from the battery using the mechanical battery disconnecting switch.

WARNING

Do not switch off the mechanical battery isolating switch if:

- The engine is still running
- Other electrical consumers are still switched on

Doing so may damage the electrical system and its systems of control.



Do not activate the battery isolating switch until one minute after switching off the engine (data storage for the engine).



1	Turn the battery isolating switch (1) to the left (counter-clockwise) and remove. The electrical system is now isolated from the battery.

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4.12 Decommissioning

Proceed as follows if the machine is to be decommissioned for a prolonged period:

1	Choose a dry and dust-free storage location.
2	Position the machine on level ground. If the ground is not level, secure the machine using chocks.
3	Switch off the machine as described in Section 4.11.
4	Check the machine for leaks (refrigerant, oil, etc.).
5	Clean the machine according to maintenance instructions. Ensure that the cleaning agents do not corrode the seals or enter the swiveling connection slewing track!
6	Replenish operating fluids and lubricants; see the maintenance instructions for the fill quantities.
7	Lubricate the machine according to maintenance instructions. Lubricate the swiveling connections while slowly swinging the upper structure (fill grease supply if necessary). For this, manually lubricate using central lubrication until fresh grease is released at the lubrication points.
8	Switch off the battery isolator switch.
9	Protect bare metal parts (e.g. piston rods of hydraulic cylinders), see maintenance instructions.



Note
Observe permissible ambient temperatures according to Chapter 3.

CAUTION!
Check the seals every 6 months.

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4.13 Preservation and storage

Proceed as follows if the machine is to be preserved or stored for a longer period of time:

1	Select a storage location where no hazards are precluded.
2	Place the attachment on wooden planks to prevent it from freezing.
3	Perform the 2000 service hours of maintenance (annual).
4	Clean and dry all uncoated surfaces thoroughly (e.g. piston rods).
5	Preserve all uncoated surfaces and bearing points with an anti-corrosion agent. The protective film must cover the surface completely.
6	Retract all cylinders.
7	Check the storage suitability of the diesel (min. - 40°C/- 40°F).
8	Fill the fuel and hydraulic oil tanks up to the maximum fill levels.
9	Check that sufficient antifreeze is in the cooling system. The antifreeze portion must be at least 60% and maximum 65%. **Do not empty the cooling system under any circumstances!**
10	Prepare the diesel engine for storage. Observe the instructions in the engine manufacturer operating manual.
11	Put a label on the engine and on the cab indicating the status of the machine preservation.
12	If the machine is to be stored at temperatures below - 40°C (- 40°F) for long periods of time, all LCD displays should be removed and stored in a weatherproof location.
13	Switch on the air conditioning system regularly: It must run for at least 30 minutes at the highest fan level at least once a month. When doing so, open all windows and doors. This helps the functionality of the air conditioning system.

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4.14 Starting up operating again

Proceed as follows if you want to put the machine back into operation:

1	Remove the anti-corrosion agent using a suitable method, e.g. with a pressure washer and the respective cleaning additives (be careful around sensitive and electronic components!).
2	All uncoated surfaces and bearing points must be oiled or greased according to the service measures and the lubrication plan diagram.
3	Prepare the diesel engine for operation. Observe the instructions in the engine manufacturer operating manual.
4	Check oil levels for sufficient fill quantities (e.g. hydraulic system, drive engine).
5	Check the antifreeze fill level and mixture in the cooling system.
6	Check the machine thoroughly for leaks.
7	Check the entire machine (equipment, undercarriage, etc.) for damage.
8	Install the LCD displays again if necessary.
9	Check that all safety features (brakes, signal and lighting equipment, etc.) are working properly.
10	Investigate hazardous areas at the work site, identify them and secure sufficiently.
11	Align the machine horizontally.
12	Warm up the machine sufficiently before work application. See Chapter “*Bringing the machine to operating temperature”:*

4.15 Disposal

Please contact SENNEBOGEN After Sales should you need to dispose of the machine.

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5 SENCON - Sennebogen Control System

Note

The SENCON machine diagnostic system can centrally determine the current operating data of the machine without additional measurement devices or other aids and evaluate this data statistically as needed. Important settings can be adjusted by the operator at any time.

SENCON is a diagnostic tool that increases the performance of the machine, simplifies and accelerates troubleshooting, lowers operating costs, and can save resources.



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5.1 Start page



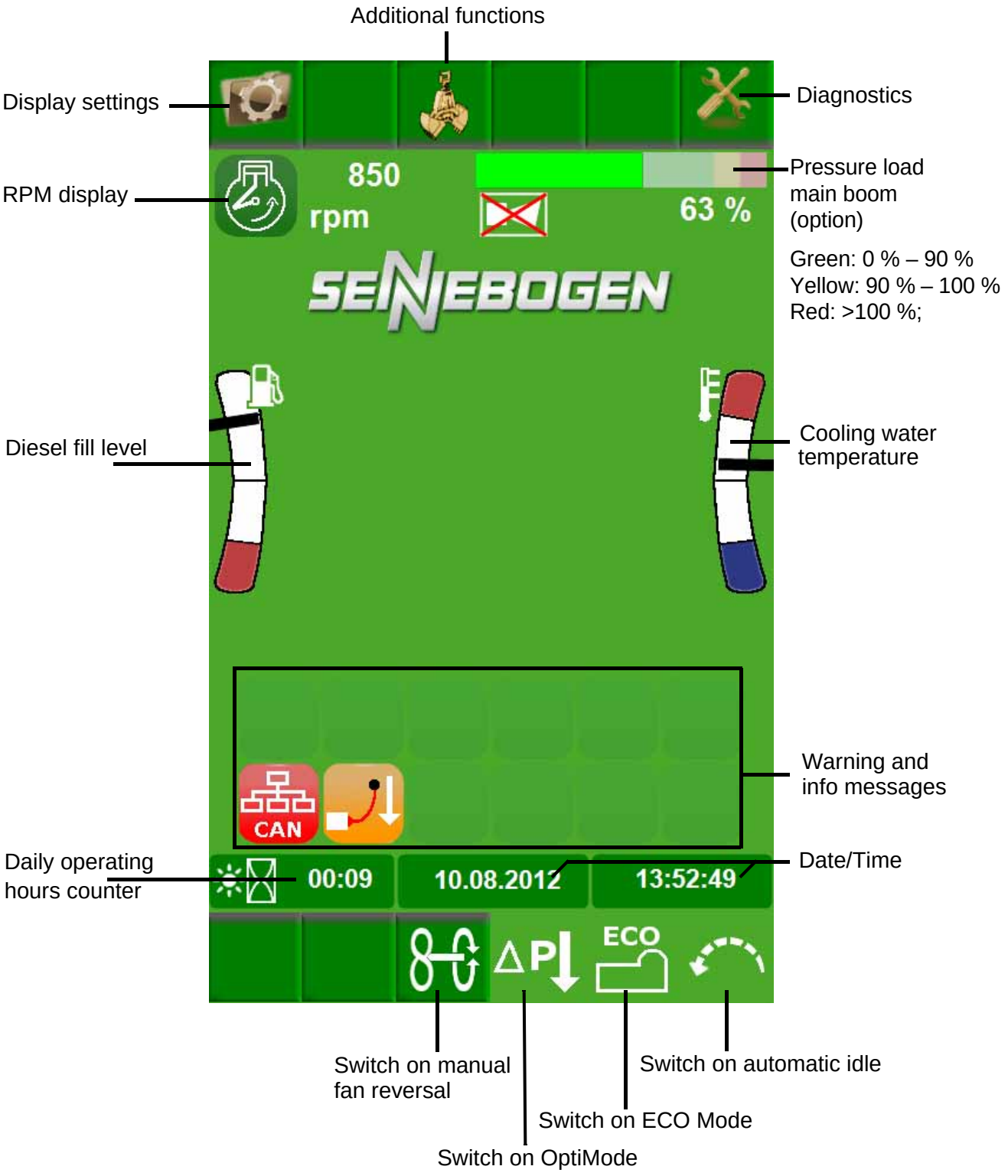
Note on the SCROLL Wheel

As soon as an arrow is displayed on a page, the scroll wheel can be used to scroll (turn) in the appropriate direction. Within lists, "turn to the right" means a movement downward, "turn to the left" means a movement upward.

Note on the HOME Button

The button is not activated if the operator is in a detailed view or is adjusting a setting.

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5.2 Overview of Functions

Below is a list of all SENCON functions.

Diagnostics

- **Diesel Engine** (Section 5.3.1)
- **Hydraulics** (Section 5.3.2)
- **Cooling** (Section 5.3.3)
- **Average Values** (Section 5.3.4)
- **Service** (Section 5.3.5)
- **Active Errors/Error Memory/Acknowledge Errors** (Section 5.3.6)
- **Network** (Section 5.3.7)
- **Statistics** (Section 5.3.8)

Settings/ Parameterization

- **Diesel Engine** (Section 5.4.1)
- **Hydraulics/OptiMode** (Section 5.4.2)
- **Calibration** (Section 5.4.4)
- **Daily Hours Counter** (Section 5.4.5)
- **Display: Language, Date, Time, Brightness, Units** (Section 5.4.6)
- **Activate automatic idle** (Section 5.4.7)
- **Central lubrication** (Section 5.4.3)
- **ECO mode** (chapter 5.4.8)
- **Manual Fan Reversal** (Section 5.4.9)
- **Overload warning device (option)** Section 5.4.10)
- **Grapple rotational speed (Option)** (Section 5.4.11)

Additional Information

- **Indicator and Warning Lamps Overview** (Section 5.5)

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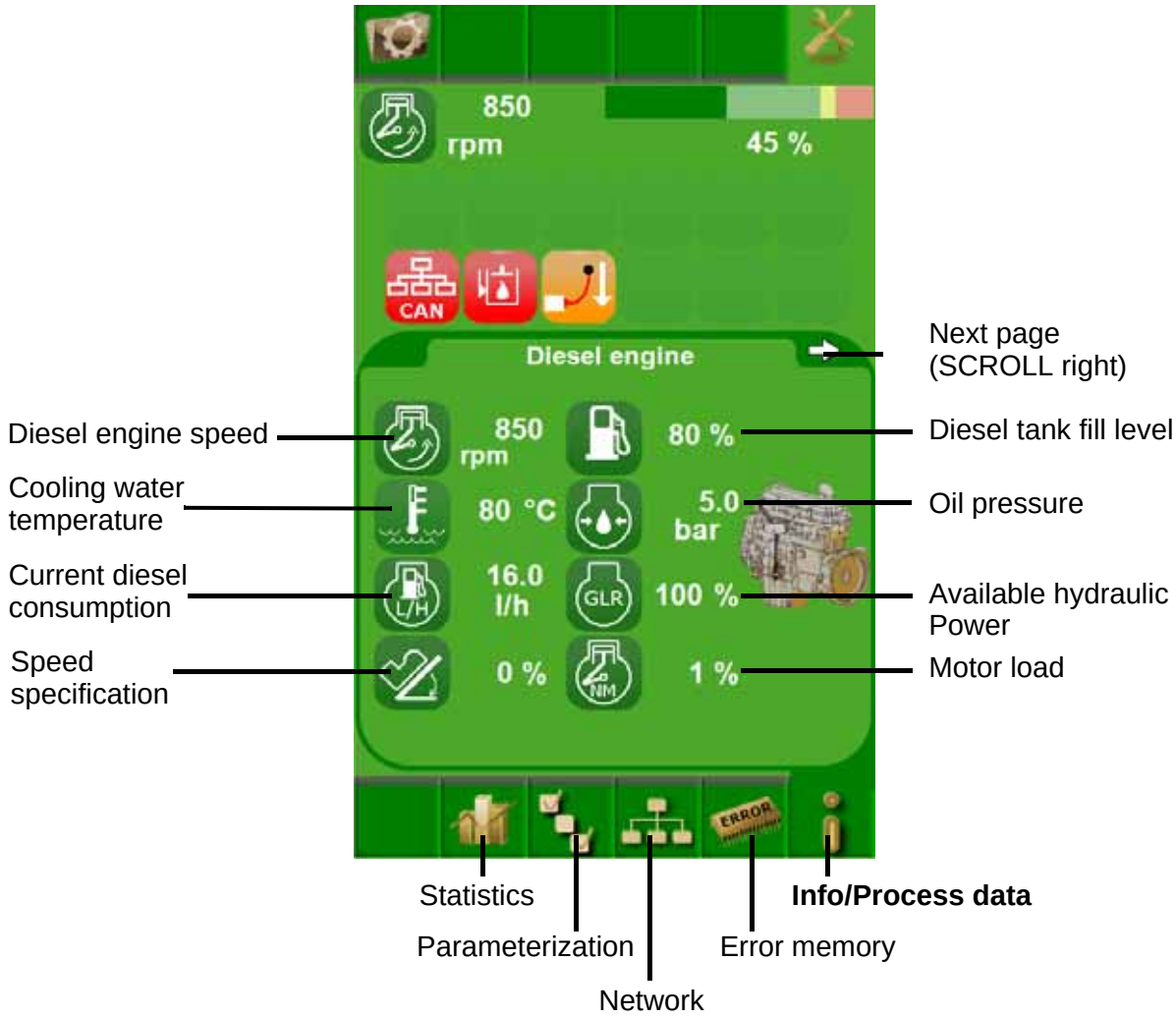
5.3 Diagnostics

Note

The diagnostics function of the SENCON clearly displays all important operating parameters of the machine.

5.3.1 Diesel Engine

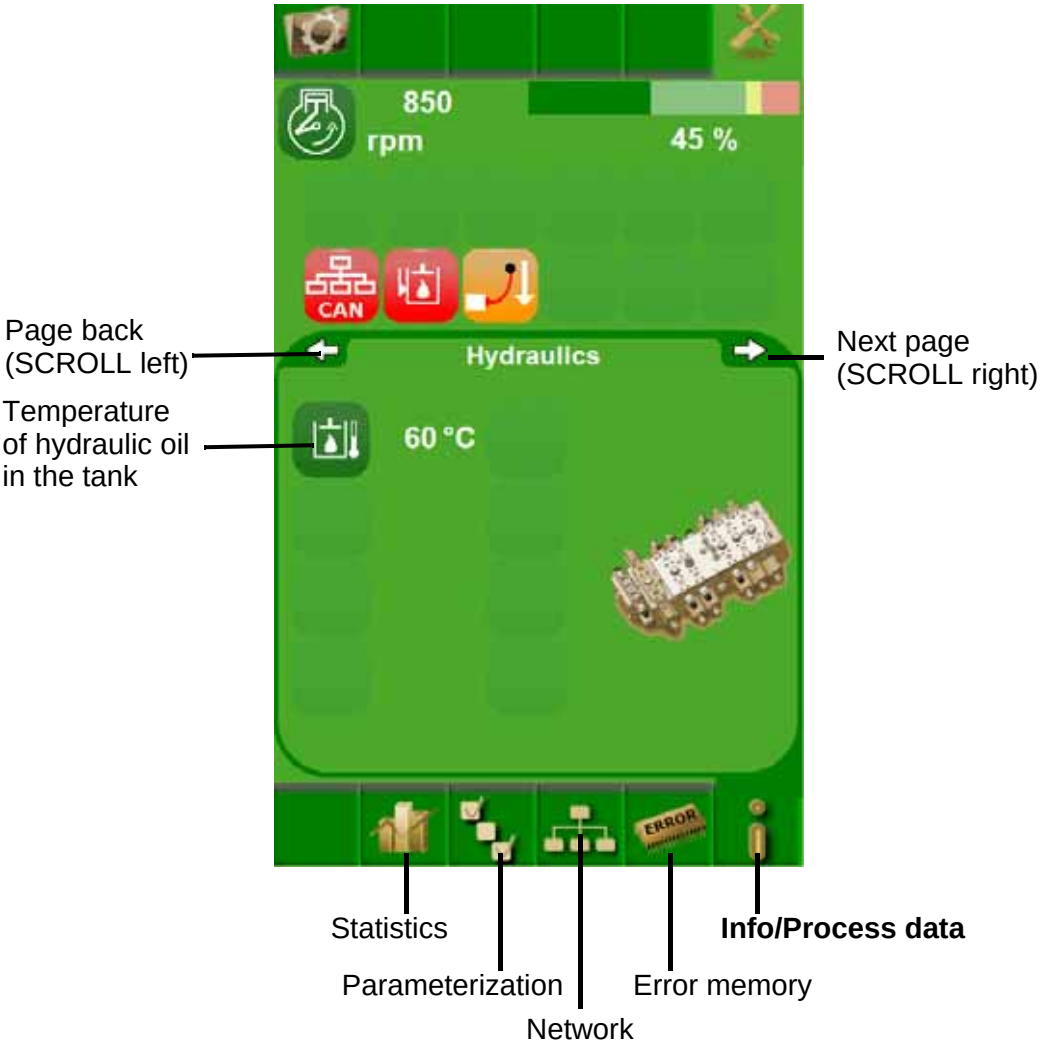




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5.3.2 Hydraulics

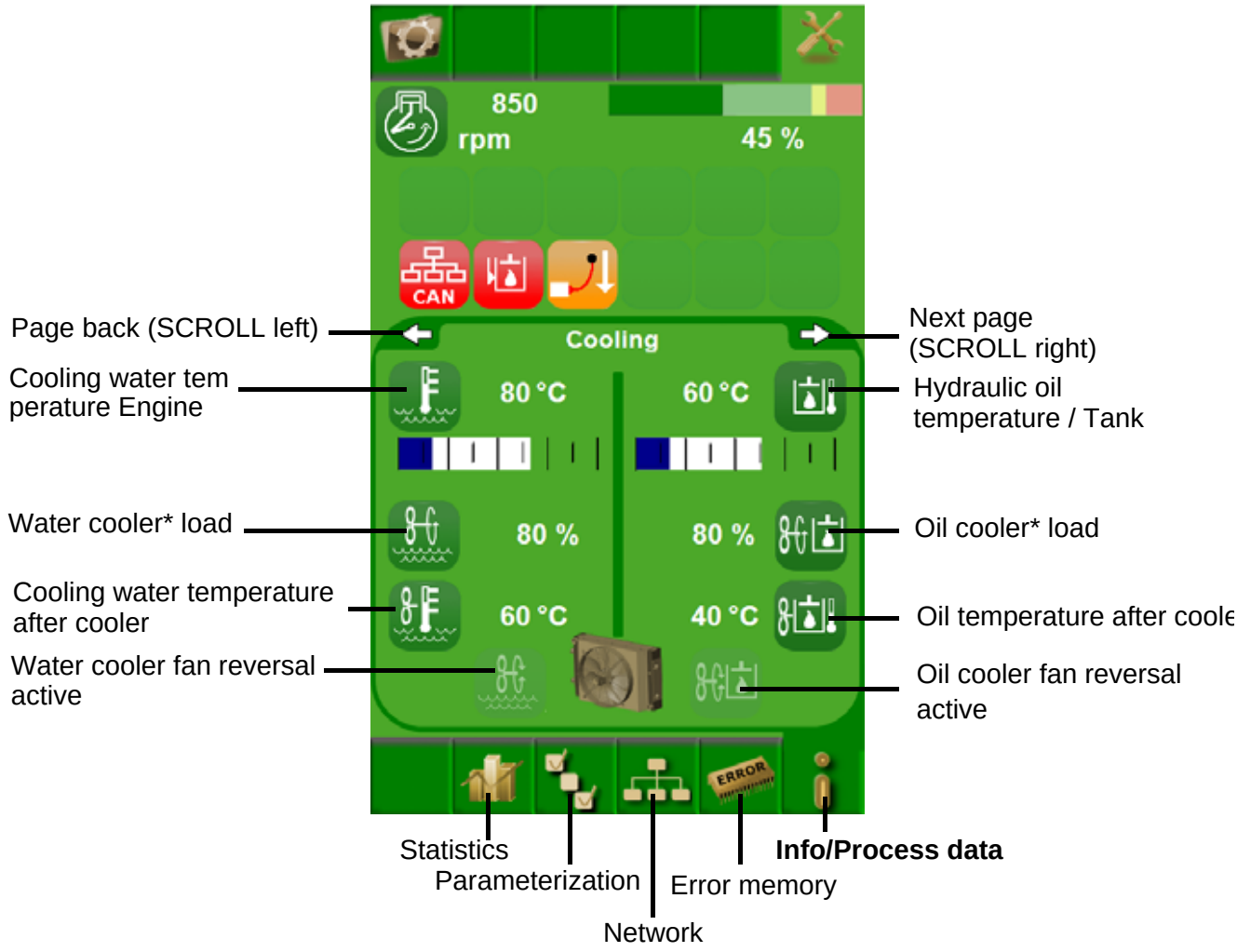




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5.3.3 Cooling



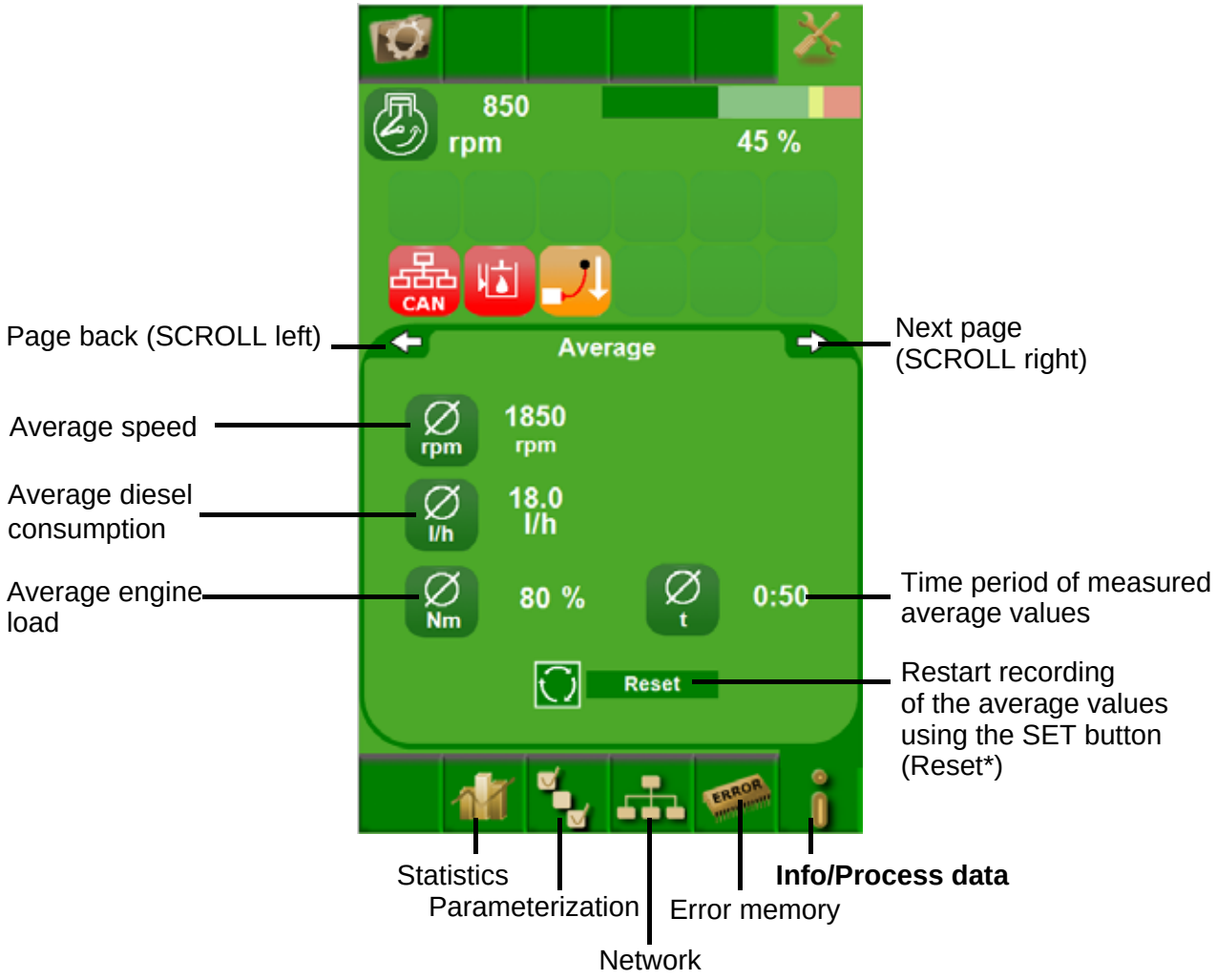


*Identical: combination cooler for cooling water and hydraulic oil

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5.3.4 Average Values





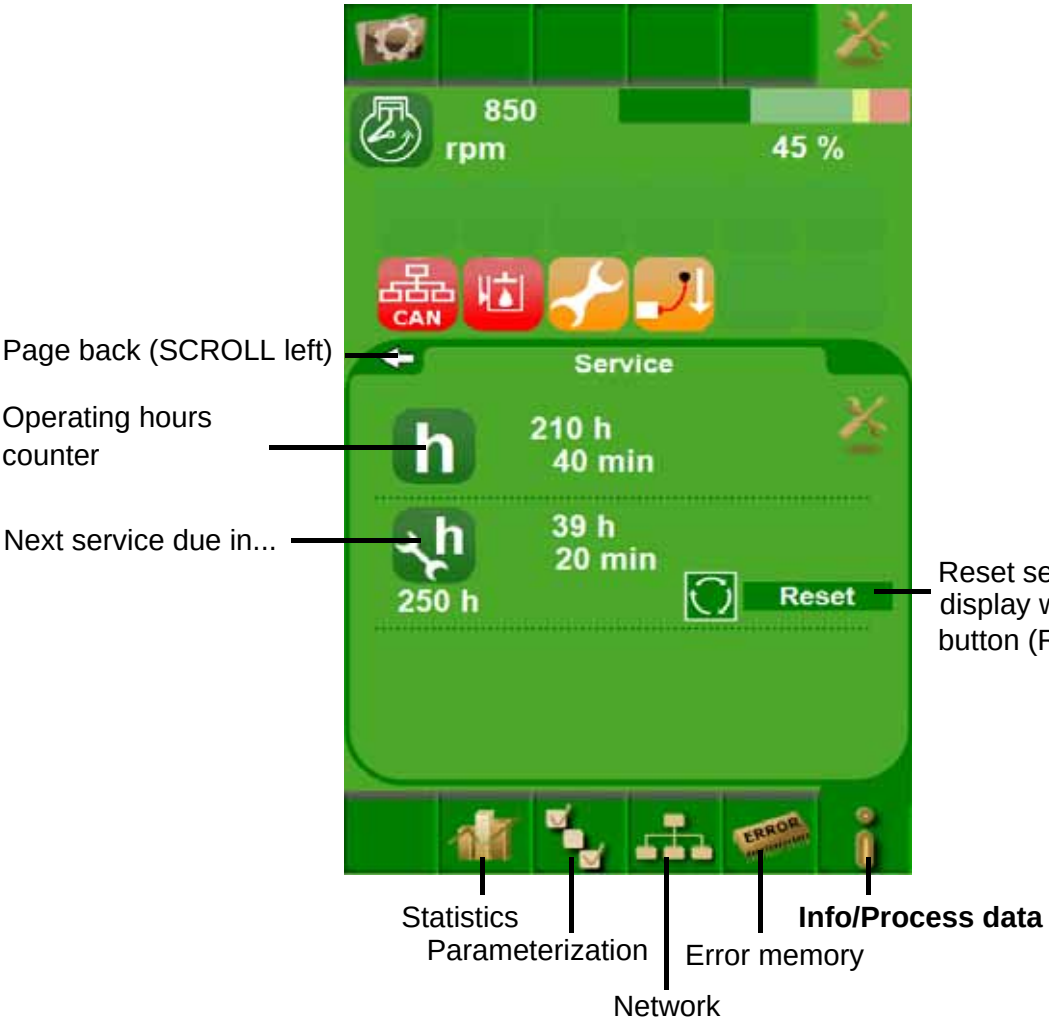
Note on *Reset

The SET button restarts the calculation of average values. To do this, press and hold the SET button for 5 seconds.

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5.3.5 Service





Note on *Reset

50 operating hours before a service deadline, the Reset button appears. Press and hold the SET button for 5 seconds to reset the service interval display. The service interval display then increases by 250 operating hours. The reset display then disappears again.

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5.3.6 Active Error/Error Memory





Next page (SCROLL right)

Display all current errors with time, description, and error code

Statistics

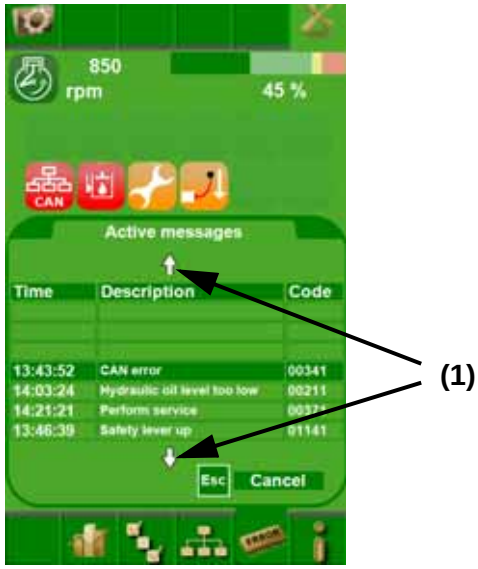
Parameterization

Network

Error memory

Info/Process data

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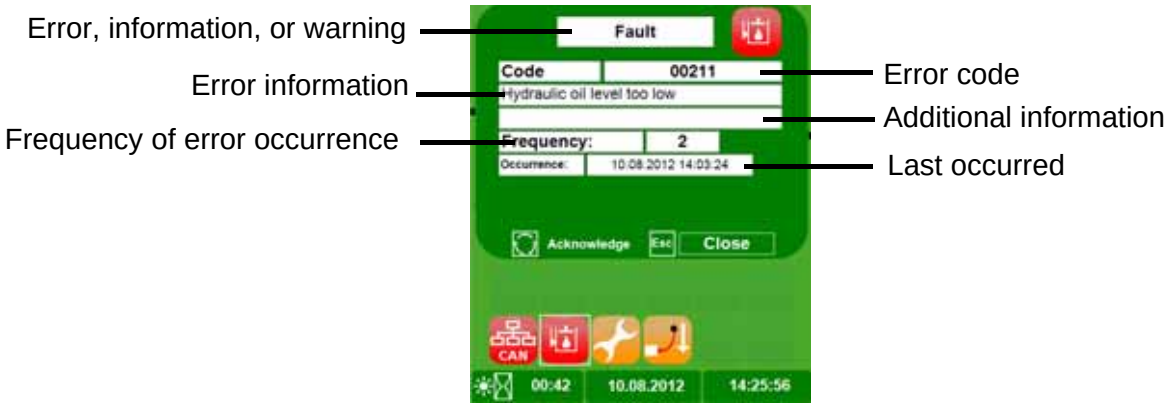


Press the SCROLL wheel to activate the error list. 2 arrows **(1)** appear in the menu, indicating that the list can now be scrolled.

The list can be scrolled by moving the SCROLL wheel up or down. The selected message has a dark green background.

If the SCROLL wheel is pressed, the detailed view of the selected message opens.

Detailed view

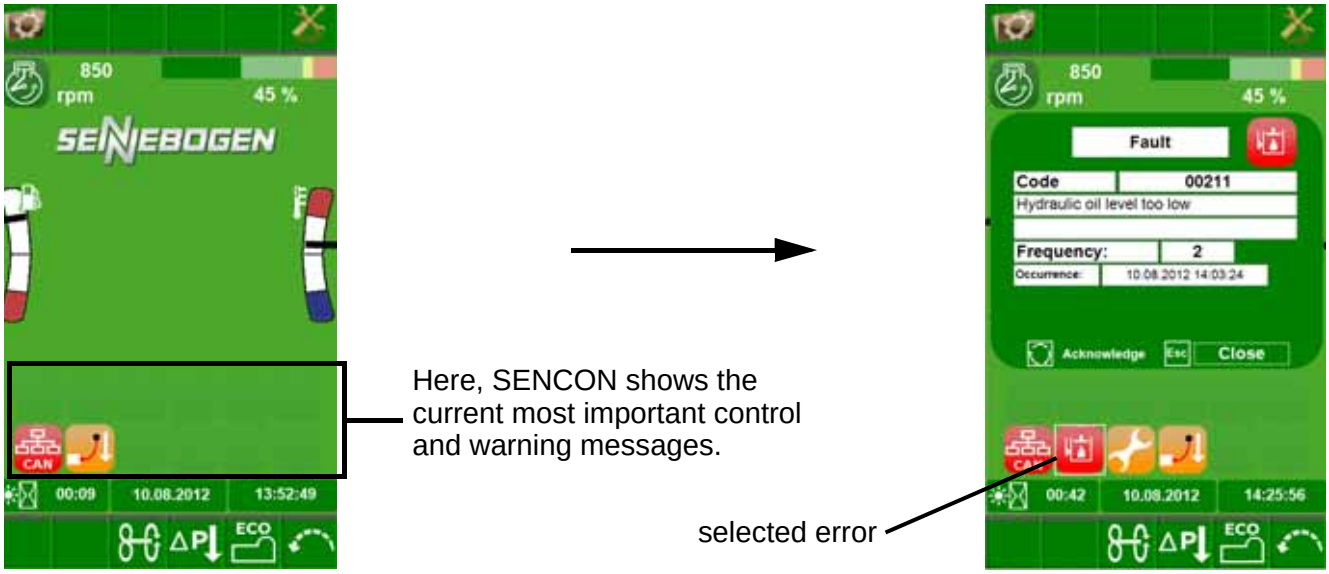


The ESC button returns the operator to the previously active view.

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Select the active error on the start page

The active error messages can be selected directly on the start page using the SCROLL wheel. The error selected is framed in white. After pressing the SCROLL wheel, the detailed overview of the error appears. The selected error is now framed in green.



Acknowledge error

Serious errors must be "acknowledged" by the operator. This confirms that he has read the error. This acknowledgment is noted in the error memory.



WARNING

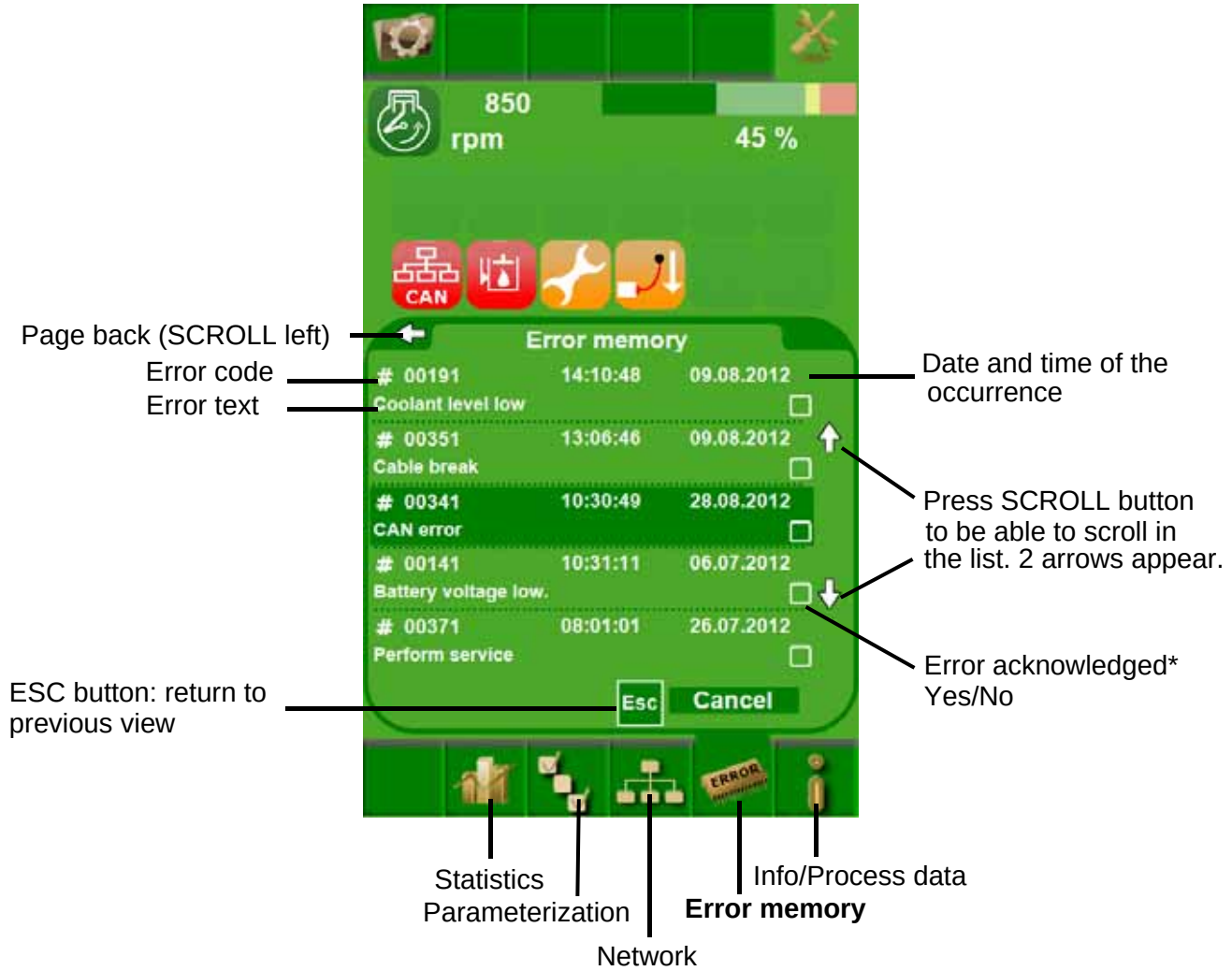
Error messages requiring acknowledgment must immediately be taken seriously! The operator of the machine must immediately take suitable measures that will rectify the fault. Failure to take action may lead to serious personal injury and damage to property.

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Error memory

The error memory saves all errors and associated information and displays it in a list. The error memory stores the complete error history of the machine.





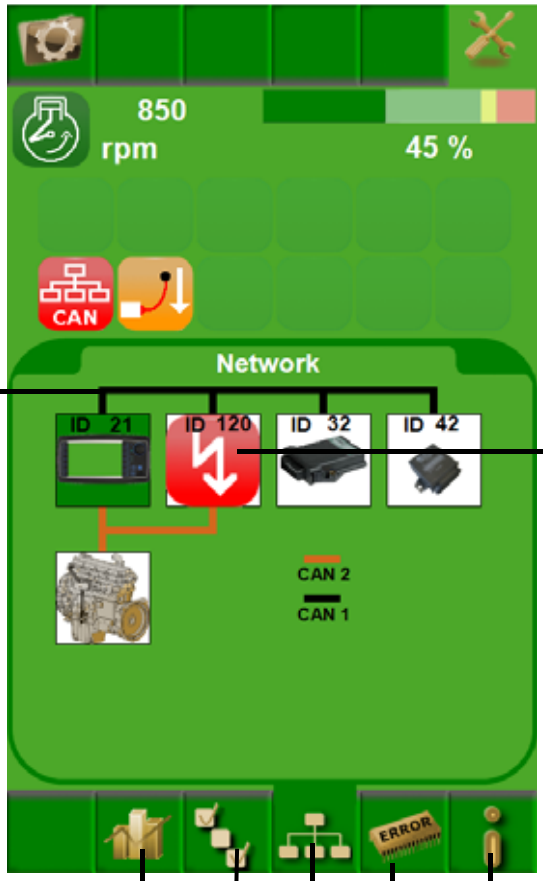
Note on *Error acknowledged**

If an error is acknowledged, a check mark appears in the corresponding box.

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5.3.7 Network





Representation of all network components

Network error/no connection to network components

Statistics

Parameterization

Network

Error memory

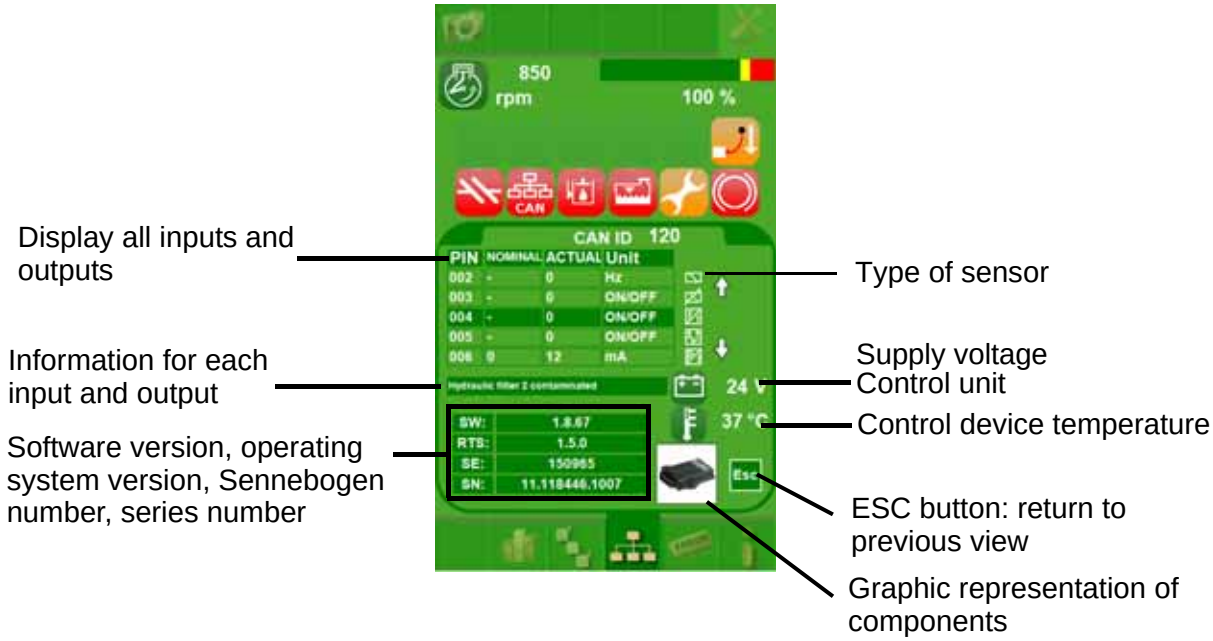
Info/Process data

Note

The scroll wheel is used to select the individual components of the network. Selected components have a green background. Pressing the scroll wheel takes the operator to the detailed view.

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Detailed view



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5.3.8 Statistics





Start of recording

Information about machine load: overview of speed ranges.

Restart recording using the SET button (Reset*)

Statistics

Parameterization

Network

Error memory

Info/Process data

Note on *Reset

The SET button restarts recording. To do this, press and hold the SET button for 5 seconds.

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5.4 Settings/Parameterization

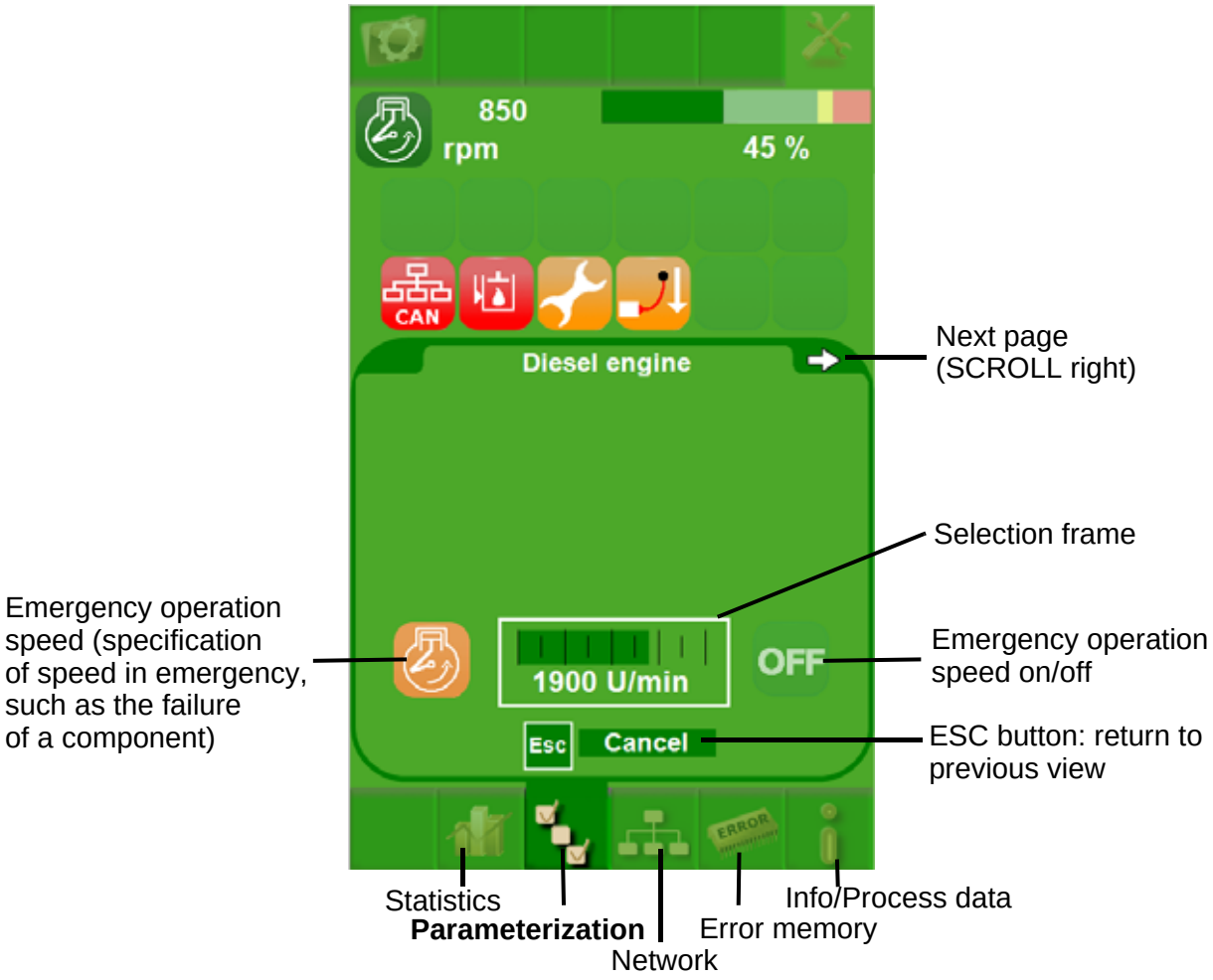
SENCON, in addition to diagnostics, also facilitates setting important parameters to optimize the operating state of the machine.

Note

All quick selection buttons are deactivated when processing parameters.

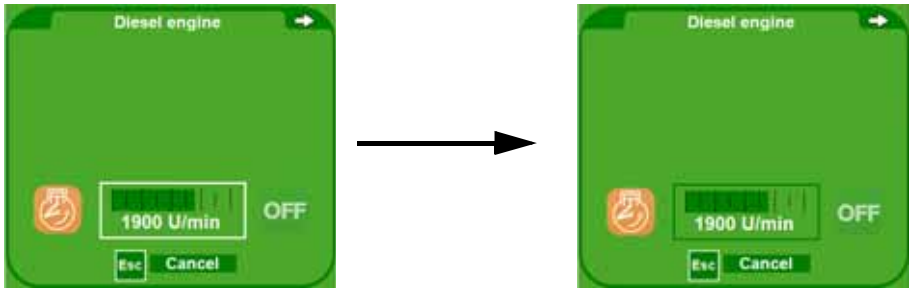
5.4.1 Diesel Engine





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Change parameters



Note

If the operator presses the SCROLL button, he enters selection mode and can switch between the functions.

A white frame indicates a selected field. Switch between the various fields using the SCROLL wheel. If the SCROLL wheel is pressed again, the selected field becomes active and the value can be changed by turning the SCROLL wheel.

The selected field then has a green frame. To save the value, the operator must press the SCROLL wheel again. The value can be reset using the ESC button.

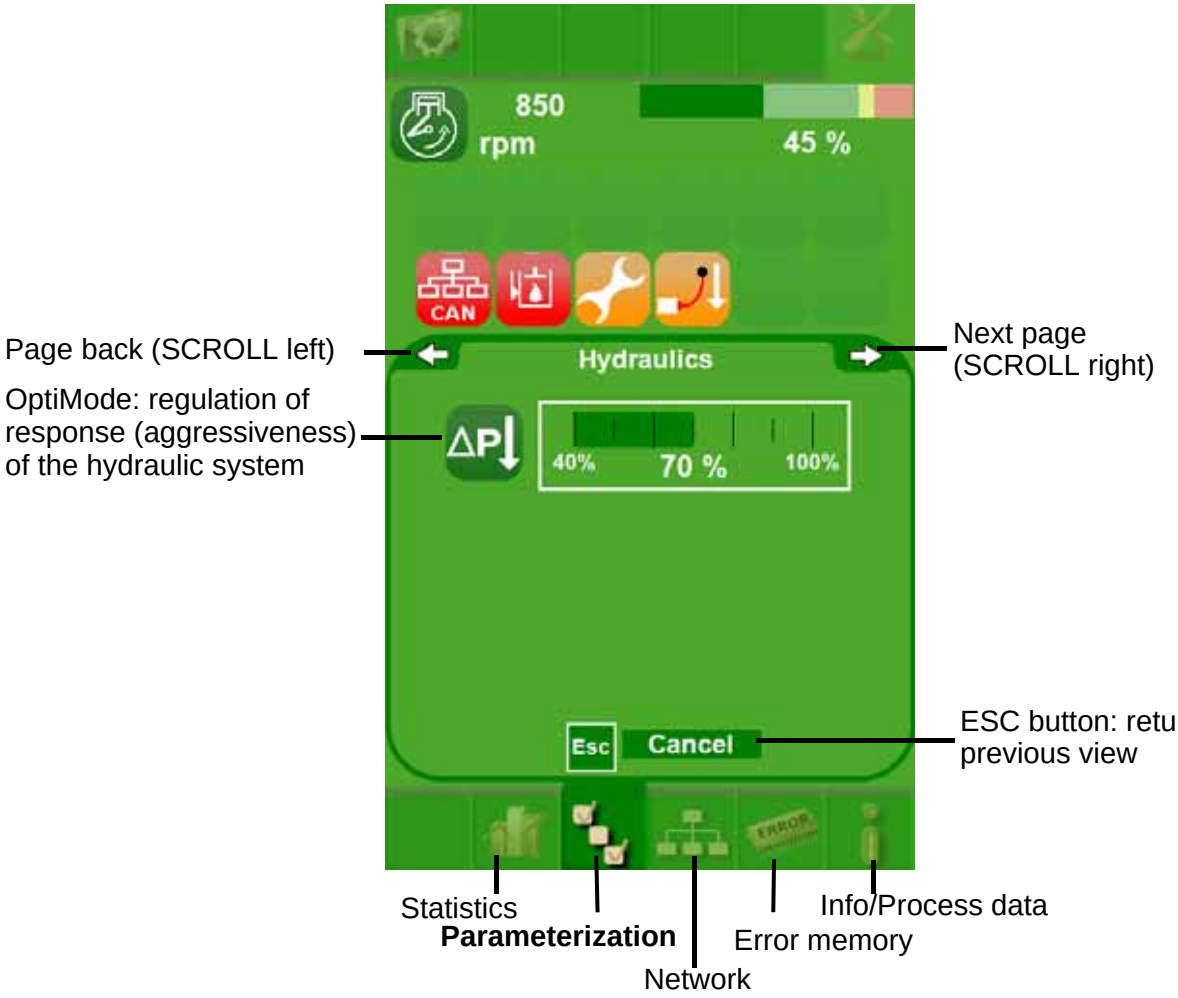
Note - engine restart

The emergency rpm setting remains intact after restarting the engine.

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5.4.2 Hydraulics





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Note

If the operator presses the SCROLL button, he enters selection mode and can switch between the functions.

A white frame indicates a selected field. Switch between the various fields using the SCROLL wheel. If the SCROLL wheel is pressed again, the selected field becomes active and the value can be changed by turning the SCROLL wheel.

The selected field then has a green frame. To save the value, the operator must press the SCROLL wheel again. The value can be reset using the ESC button.



OptiMode must be switched on using the quick selection button on the start page. Just a quick click is enough. Use the same method to switch the OptiMode off again.



If the operator presses the quick selection button for 2 seconds, the parameterization of the hydraulic system appears.

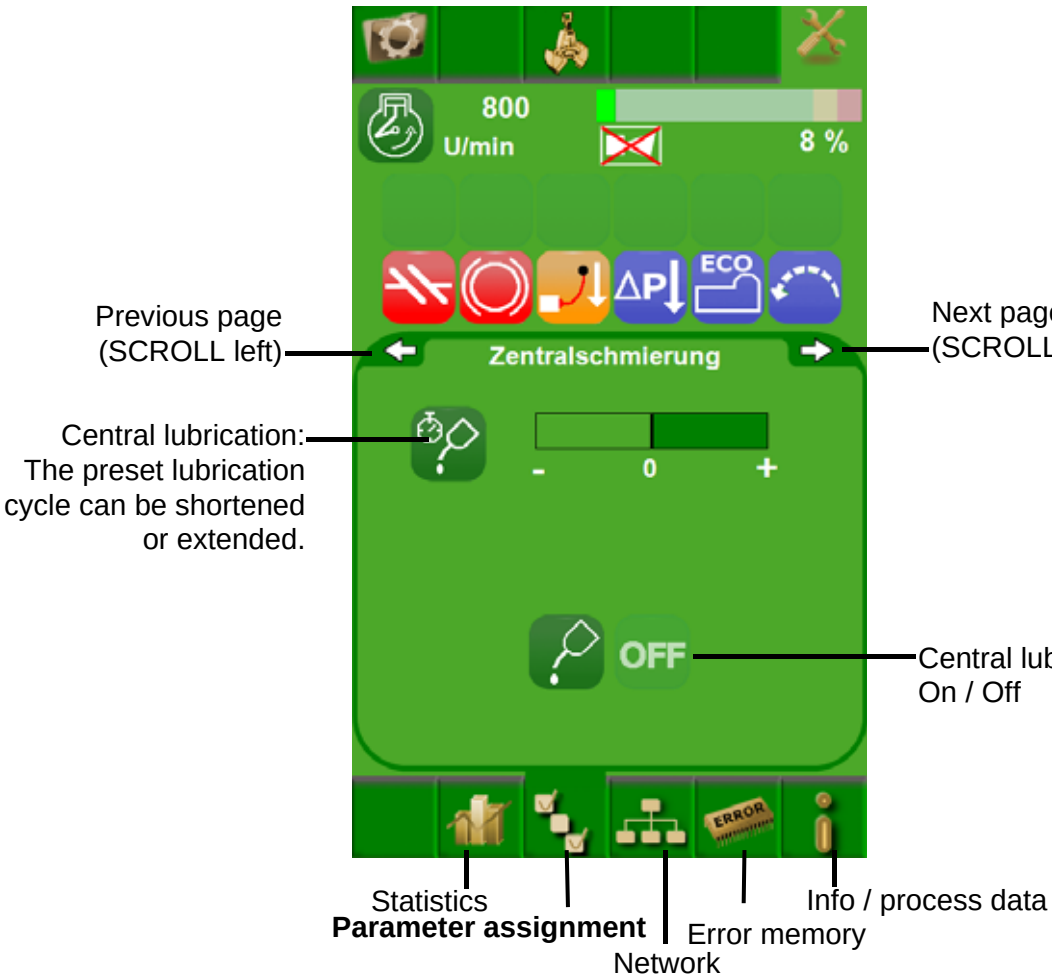
Note on OptiMode

OptiMode can be adjusted in increments of 10 from 40% to 100%. OptiMode enables active regulation of the response (aggressiveness) of the hydraulic system, allowing you to operate the machine with more sensitivity and more economically as needed. For this reason, Optimode is already activated after restart of the machine and is set at 60 %.

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5.4.3 Central lubrication





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Note

If the operator presses the SCROLL button, he is in selection mode and can switch between the functions.

A white frame indicates a selected field. Switch between the various fields using the SCROLL wheel. If the SCROLL wheel is pressed again, the selected field becomes active and the value can be changed by turning the SCROLL wheel.

The selected field then has a green frame. To save the value, the operator must press the SCROLL wheel again. The value can be reset using the ESC button.

Information concerning the central lubrication system

The machine comes standard with a central lubrication system for the rotary connection and the equipment.

The lubricating cycle can be adjusted in increments from -1 (75 min) to +1 (45 min). The standard setting is 0 (60 min). The lubrication cycle setting remains intact after restarting the engine.

CAUTION
Insufficient lubrication can damage the components.

Note
See the documentation Chapter 4.7 "Lubricating the machine automatically" in the operating manual.

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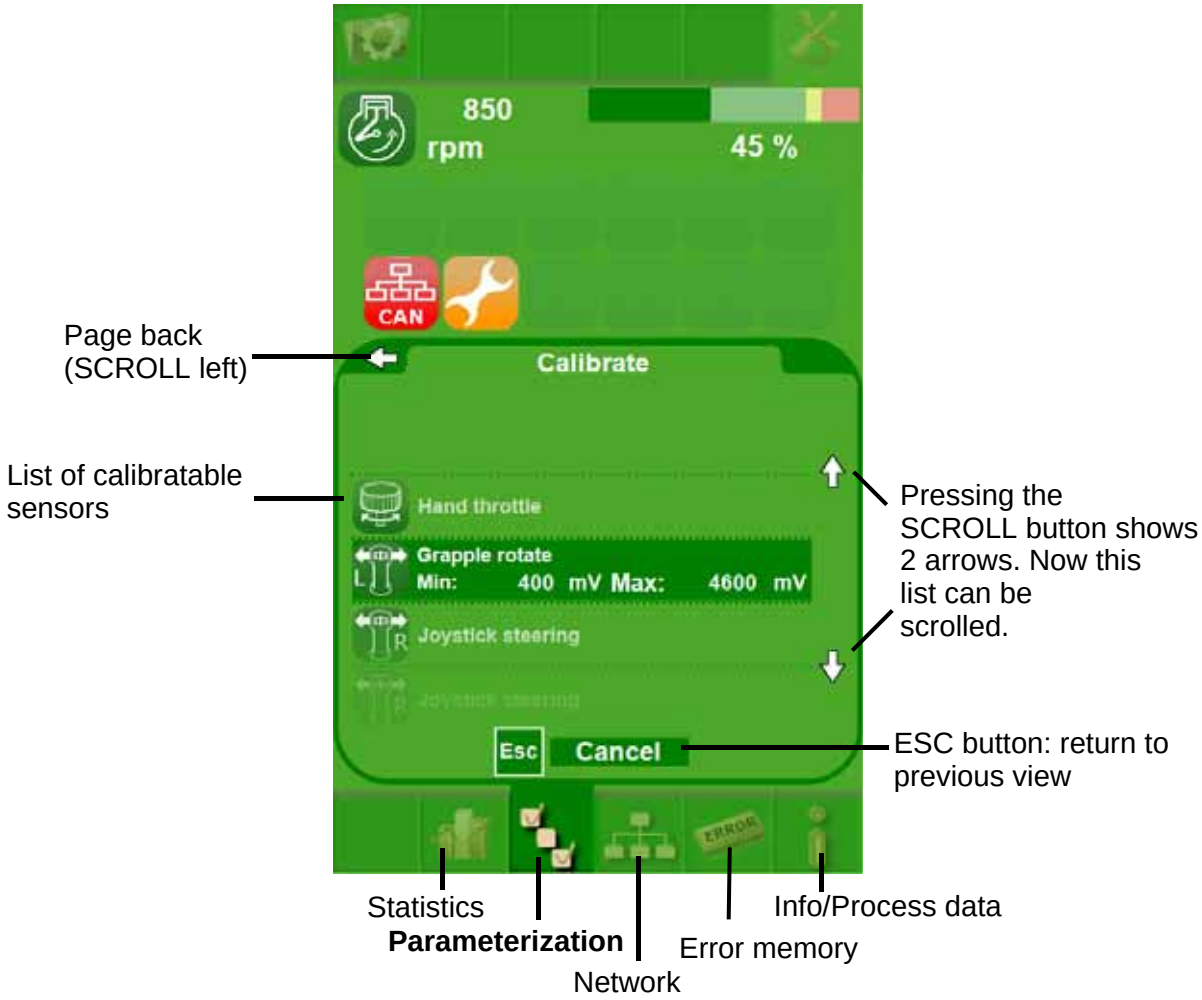
5.4.4 Calibration

WARNING

Before starting calibration: deposit load, switch off engine, and put ignition key in position 1. Otherwise, serious damage to property or personal injury could result.

Only specialist personnel authorized by Sennebogen may perform calibration!





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Note

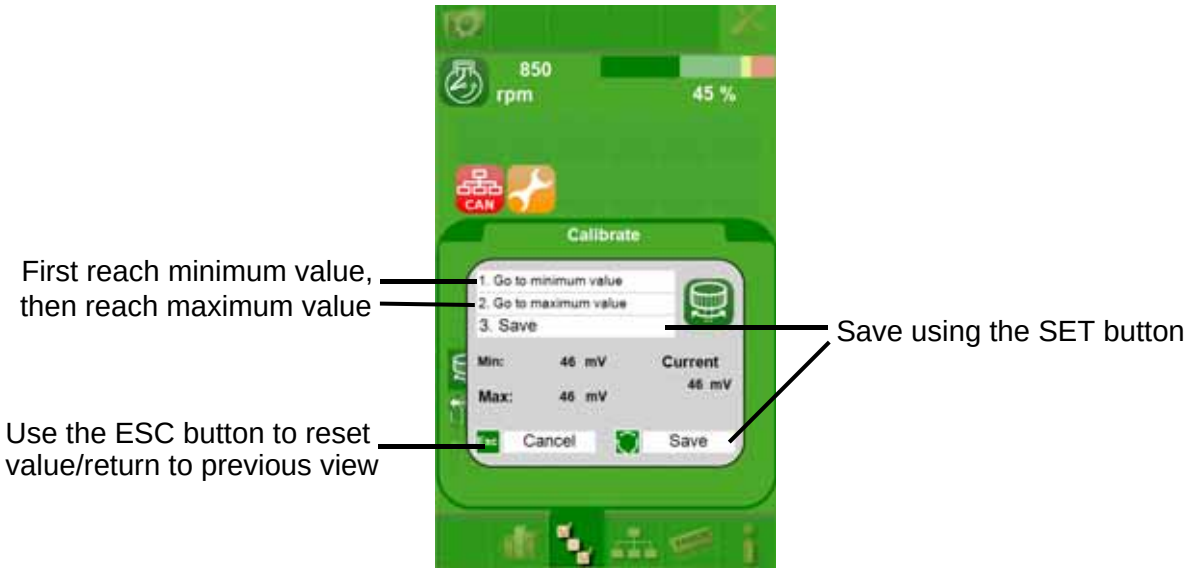
Calibration is only necessary when a component, a control unit, or the display has been changed, and after a software or parameter update has been performed.

Note

If the operator presses the SCROLL button, he enters selection mode in the list and can change between the sensors.

The selected field has a dark green background. Switch between the various fields using the SCROLL wheel. If the SCROLL wheel is pressed again, the detailed view is opened.

Detailed view



WARNING

When calibrating joystick steering and grab turning, the operator must ensure that the rocker is in the middle position (inoperative position) at the start. Otherwise, serious problems with the steering could occur as a result.

After calibration a function test must be performed in a safe area.

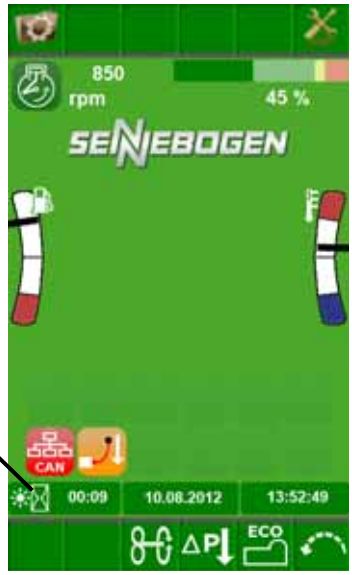
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5.4.5 Daily Operating Hours Counter

Note

After activating the battery disconnection switch, or when the machine has been switched off for 18 hours, the daily operating hours counter resets automatically. It is also possible to reset the counter manually.

Select daily operating hours counter using SCROLL wheel. Then press and hold SCROLL wheel for 5 seconds to have the display reset.



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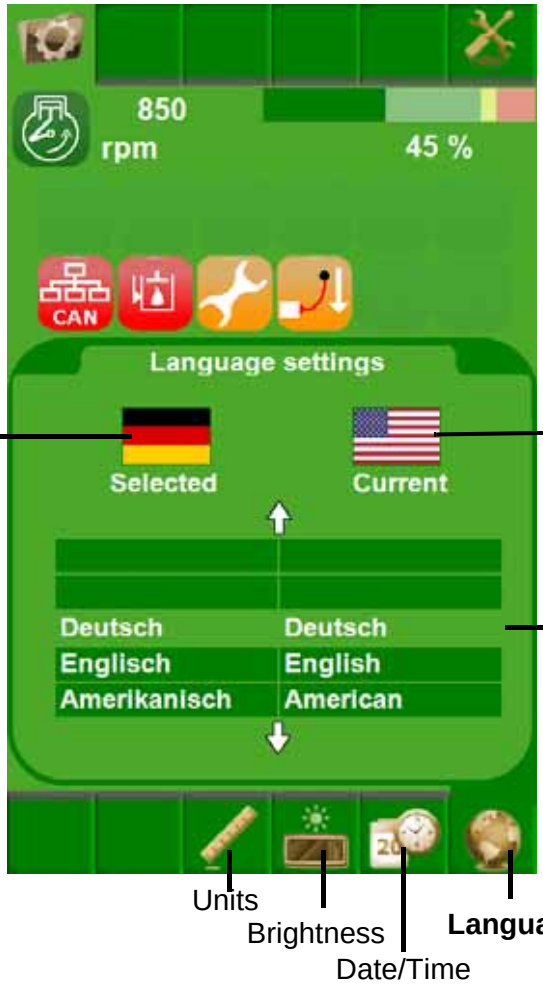
5.4.6 Display

Note

In the display setting menu, the language, time, date, brightness, and units can be adjusted as required.

Language settings





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Note on Language Settings

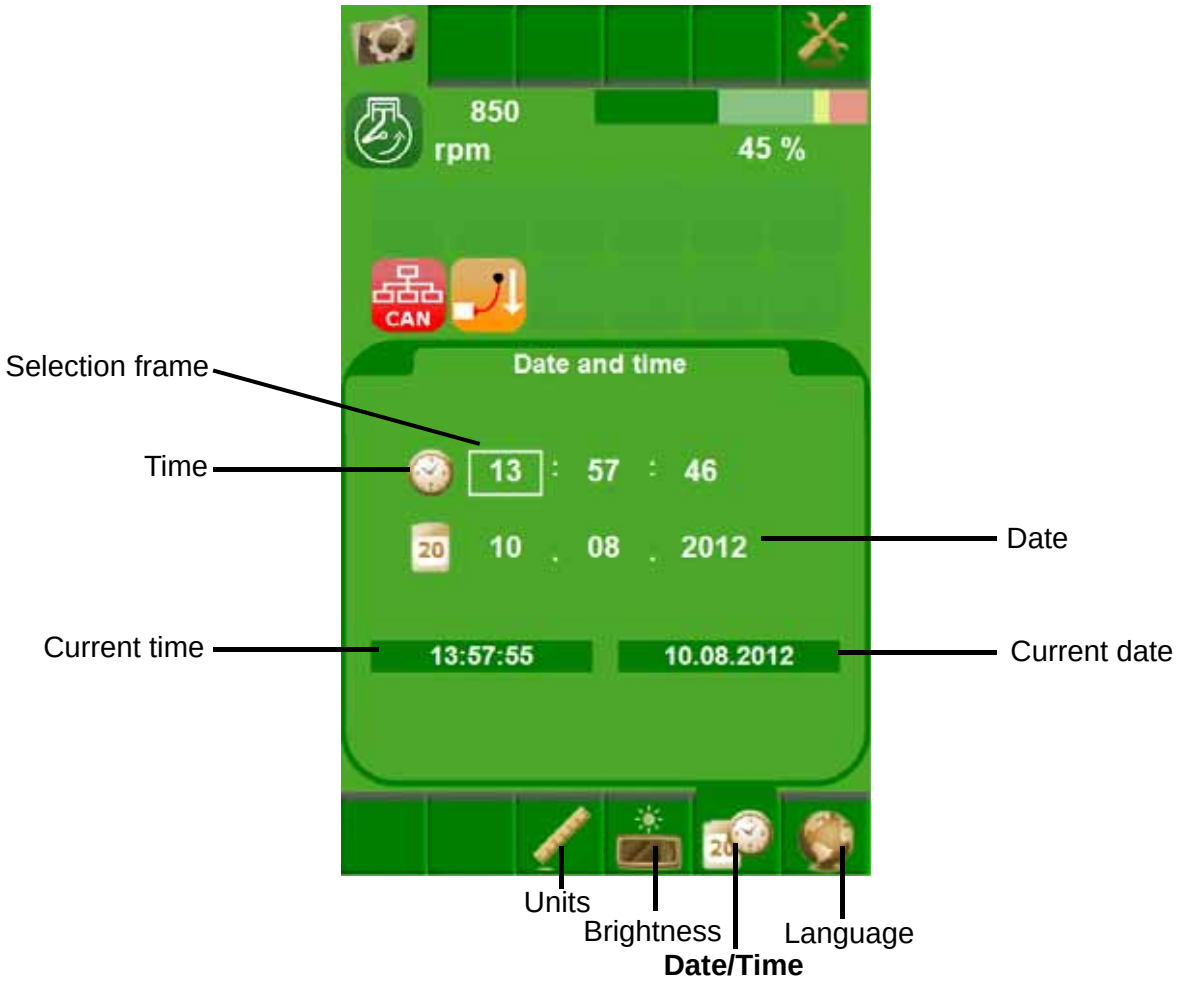
The operator can change between languages in the list directly using the SCROLL wheel.

The selected field has a light green background. If the SCROLL wheel is pressed again, the language is saved.

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Date/Time





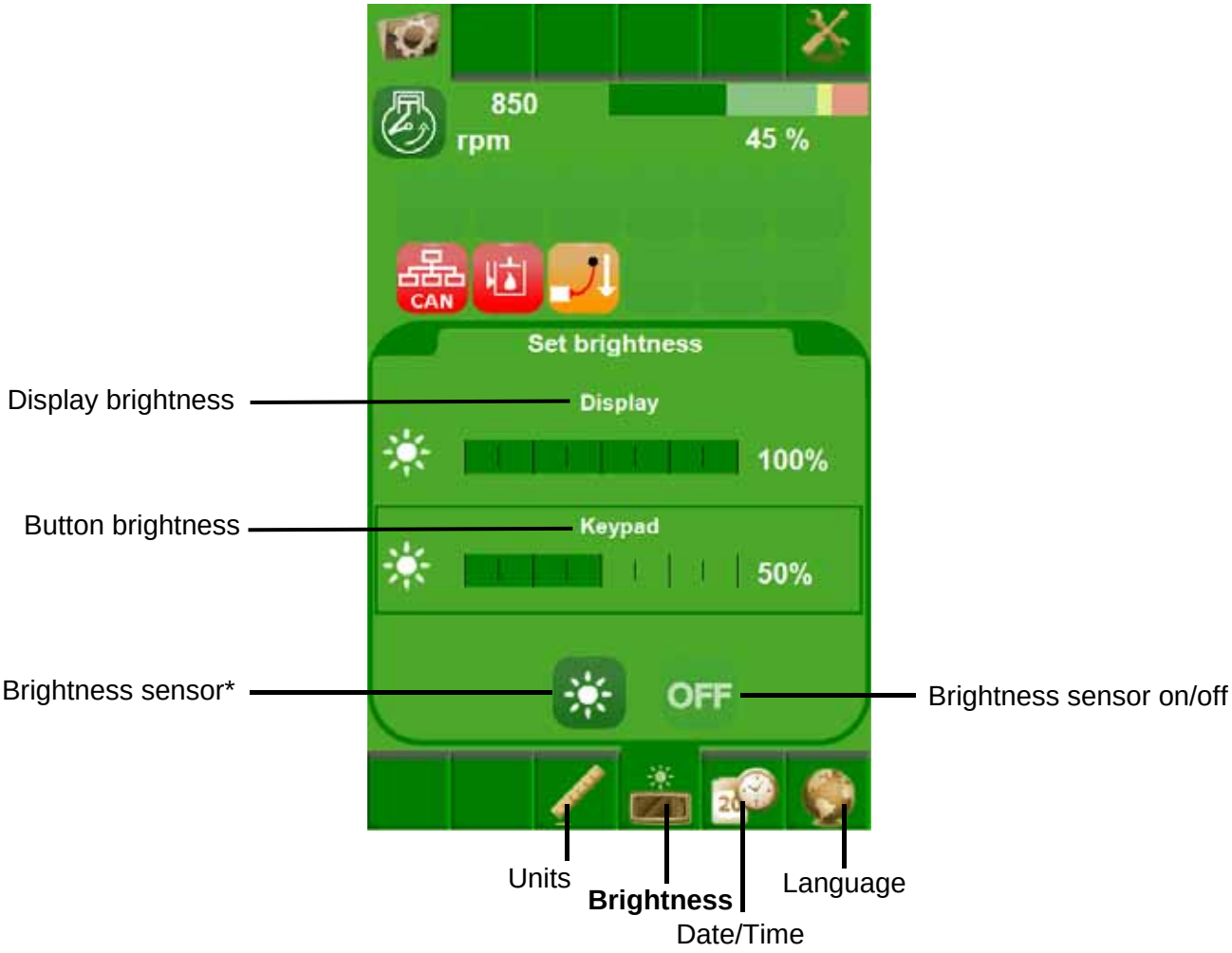
Note on Setting Date and Time

The operator can switch between the individual values using the SCROLL wheel. The currently selected value is framed in white. If the SCROLL wheel is pressed, the field becomes active (green frame) and the value can be adjusted with the SCROLL wheel. If the SCROLL wheel is pressed again, the new value is saved and immediately appears in the view below.

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Brightness





Note on the Brightness Sensor*

The brightness sensor controls brightness automatically as soon as it is switched on. If it is switched off, the brightness set by the operator is used.

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Note on Setting Brightness

The operator can use the SCROLL wheel to switch between the brightness of the display and the buttons. The currently selected value is framed in white. If the SCROLL wheel is pressed, the field becomes active and the value can be adjusted with the SCROLL wheel. The active field has a green frame. If the SCROLL wheel is pressed again, the new value is saved.

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Units





List of all available units

Note on Setting Units

The SCROLL wheel can be used by the operator to switch between the various units in the list. The currently selected value has a dark green background. If the SCROLL wheel is pressed, the detailed view is displayed and a unit can be selected with the SCROLL wheel.
Press the SCROLL wheel again to select the new unit. To change back to the previous view, press the ESC button.

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5.4.7 Activate automatic idle

Automatic idle helps to save resources by automatically lowering the engine speed during longer pauses while working.

The automatic idle must be switched on via the quick-select button (1) on the start page. A brief click suffices. Automatic idle can be switched off in the same manner. When starting the machine automatic idle is already activated.



Note on the lowering stages of the automatic idle

Automatic idle has 3 stages:

- Stage 1 reduces the speed to 50 % of the maximum speed after 5 seconds.
- Thereafter, stage 2 reduces the speed to idle after an additional 8 seconds.
- Stage 3 switches off the engine after an additional 5 minutes.

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5.4.8 ECO mode

ECO mode enables speed regulation, allowing you to operate the machine more economically, if required. When starting the machine ECO mode is activated.

ECO mode can be switched off via the quick-select button on the start page. A brief click suffices. ECO mode can be switched on again in the same manner.



Note on ECO mode

The speed of ECO mode is set at 1850 RPM.

WARNING

After the engine starts, the machine runs at idle speed with ECO mode activated. When activating a function, the speed changes immediately to the higher ECO mode speed.

CAUTION: Undesired jerky motions possible!

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5.4.9 Manual fan reversal / reverse

Fan reversal or fan reverse is set automatically and is activated by the system every 30 minutes.

Fan reversal can also be switched on manually. To do so, the operator must activate the respective quick selection button (1) on the start page.

The symbol does not illuminate immediately upon actuation of the button, but only after starting reverse.



Note

Reverse can only be started once the speed of the engine is above the minimum speed threshold and the standby time between two reverses has finished.

Note on the Ambient Temperature Sensor (Optional)

When the ambient temperature sensor is connected, the temperature must be between -20°C and 40°C for reversal to take place.

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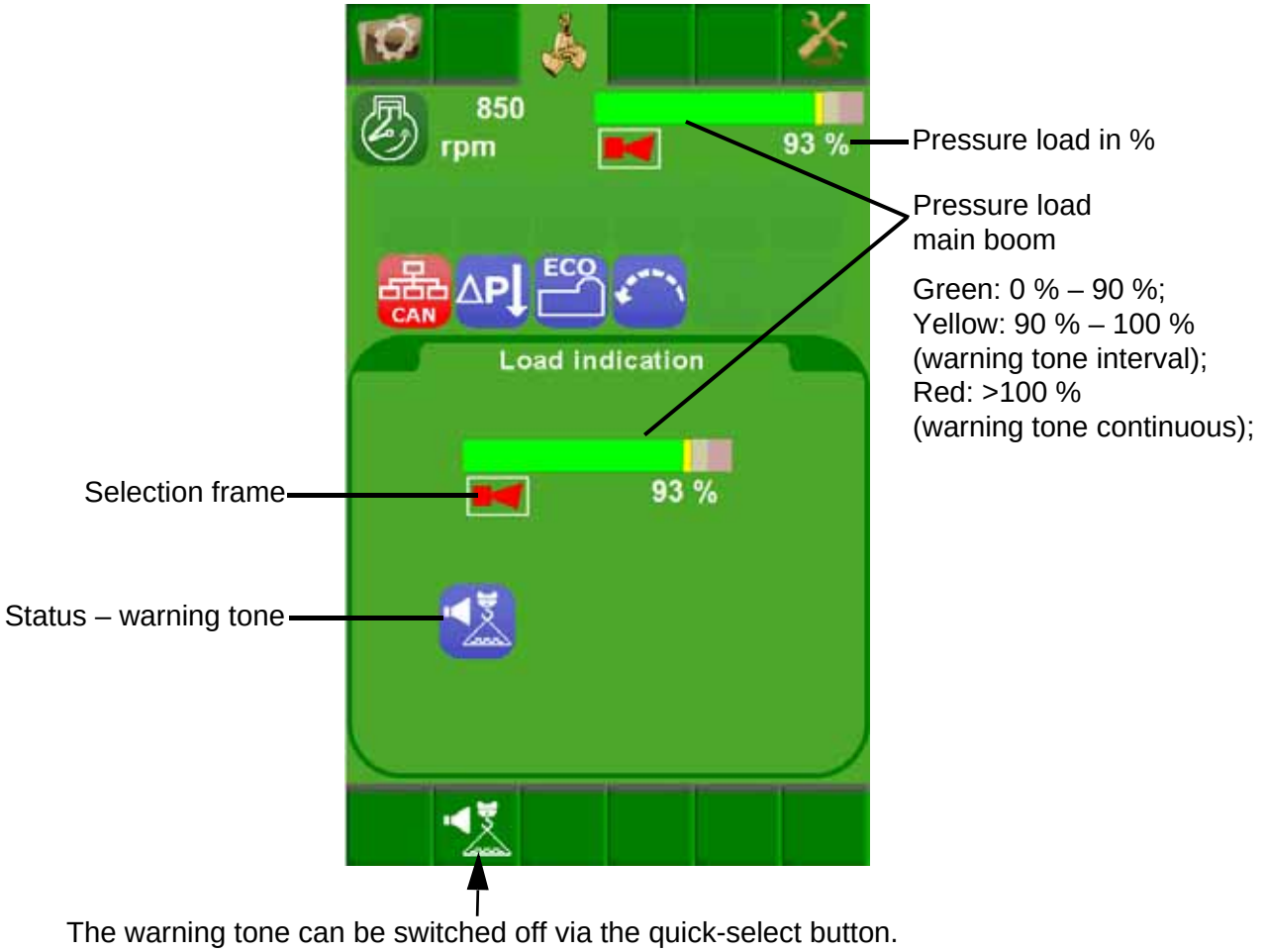
5.4.10 Overload warning device (option)

The overload warning device is activated at start and is equipped with a two-stage warning tone (interval and continuous). The warning tone can be switched off.

WARNING

No automatic shut-off at overload! Owner and machine operator are responsible for proper operation.





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5.4.11 Grapple rotational speed (Option)

Adjustment of the grapple rotational speed enables high-precision operation when rotating the grapple.





Previous page (SCROLL left)

Grapple rotational speed: Regulation of the maximum rotational speed.

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Note

If the operator presses the SCROLL button, he is in selection mode and can switch between the functions.

A white frame indicates a selected field. Switch between the various fields using the SCROLL wheel. If the SCROLL wheel is pressed again, the selected field becomes active and the value can be changed by turning the SCROLL wheel.

The selected field then has a green frame. To save the value, the operator must press the SCROLL wheel again. The value can be reset using the ESC button.

Information on grapple rotational speed

The grapple rotational speed can be adjusted in increments from 0 (slow) to +4 (fast). The factory setting is +4 (fast). The grapple rotational speed setting remains intact after restarting the engine.

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5.5 Indicator and Warning Lamps Overview

Errors and Warnings

	Description	Remedy	Code
	Oil pressure too low **Acknowledgment required!**	– Switch off engine immediately – Checking engine oil level – Add engine oil if necessary	00111
	Diesel tank fill level low Warning threshold 1	– Refueling the machine	00121
	Diesel tank fill level low Warning threshold 2	– Refueling the machine	00122
	Hydraulic oil temperature too high, warning threshold 1	– Run engine at idle – Clean cooling fins on oil cooler	00131
	Hydraulic oil temperature too high, warning threshold 2 **Acknowledgment required!**	– Run engine at idle – Clean cooling fins on oil cooler – Do not load machine	00132
	Battery charge weak	– Check battery charge; recharge or replace batteries if necessary – Check battery connections – Check the V-belt tension; tighten or replace if necessary	00141

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	Description	Remedy	Code
	Air filter contaminated **Acknowledgment required!**	– Clean filter as described in the maintenance instructions – Replace filter if necessary	00151
	Hydraulic filter 1 (main filter) contaminated **Acknowledgment required!**	– Check filter, change if necessary	00161
	Hydraulic filter 2 contaminated **Acknowledgment required!**	– Check filter, change if necessary	00171
	Hydraulic filter 3 (HydroClean) is contaminated (optional) **Acknowledgment required!**	– Check filter, change if necessary	00181
	Cooling water level too low **Acknowledgment required!**	– Add refrigerant	00191
	Hydraulic tank lock closed **Acknowledgment required!**	– Open hydraulic tank lock	00201
	Hydraulic oil level low **Acknowledgment required!**	– Switch off machine immediately! – Adding hydraulic oil	00211
	Exhaust gas after treatment (regeneration) deactivated (Optional)		00221
	Exhaust gas after treatment (regeneration) active (Optional)		00231

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	Description	Remedy	Code
	Wait to start lamp active		00241
	Exhaust temperature high **Acknowledgment required!**		00251
	Brake pressure low	– Have system checked by hydraulics specialist	00291
	Engine warning: switch off engine **Acknowledgment required!**	– Notify Service	00301
	Engine warning: check engine **Acknowledgment required!**	– Notify Service	00311
	Additional hydraulic tank level too low (optional) **Acknowledgment required!**	– Switch off machine immediately! – Adding hydraulic oil	00321
	Additional hydraulic temperature too high (optional) Warning threshold 1 **Acknowledgment required!**	– Run engine at idle – Clean cooling fins on oil cooler	00331
	Additional hydraulic temperature too high (optional) Warning threshold 2 **Acknowledgment required!**	– Run engine at idle – Clean cooling fins on oil cooler – Do not load machine	00332
	Can error	– Notify Service	00341

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	Description	Remedy	Code
	Cable break	– Notify Service	00351
	Short circuit	– Notify Service	00361
	Service interval active	– Notify Service	00371

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Information

Pictogram	Meaning	Explanation
	Automatic idle active	The automatic idle helps to save resources by automatically lowering the engine speed during longer pauses while working.
	ECO Mode active	ECO Mode enables active speed regulation, allowing you to operate the machine more economically as needed.
	OptiMode	OptiMode enables active regulation of the response (aggressiveness) of the hydraulic system, allowing you to operate the machine with more sensitivity and more economically as needed.
	Air conditioning system active	
	Safety lever up	
	High beam on	
	Central lubrication active (optional)	
	Start Stop active	– After automatic idle
	Magnet unit active (optional)	

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Pictogram	Meaning	Explanation
	Reverse airflow active	
	Floating axle control active (optional)	
	Swing bearing brake active	
	Magnet unit loaded (Optional)	
	Unload magnet unit (Optional)	
	Automatic swing bearing brake active	

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6 Operation

6.1 Safety instructions

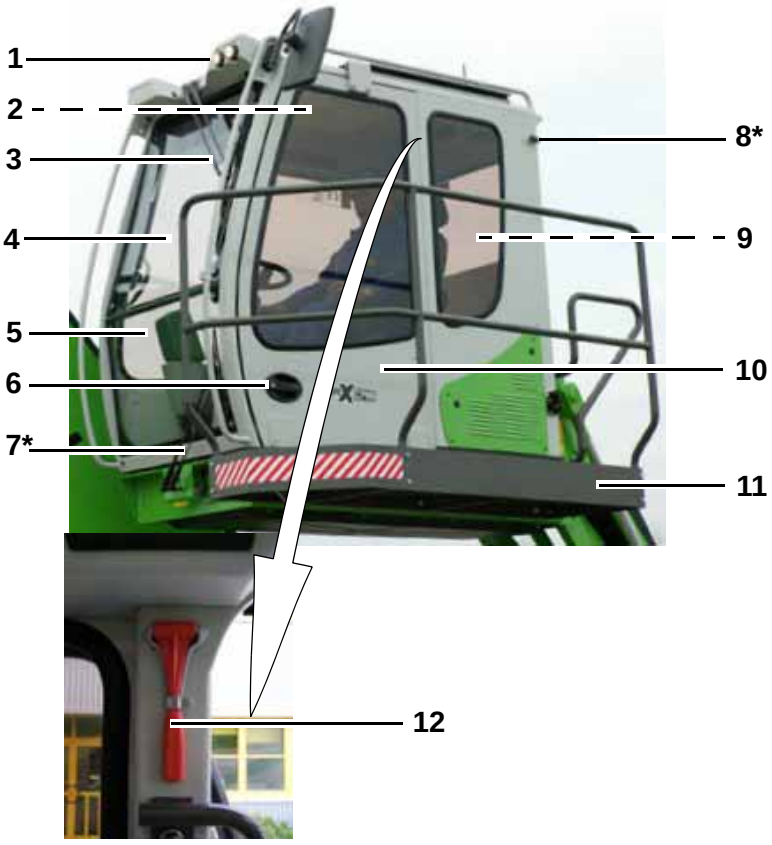


DANGER

- Please read Chapter 1 Safety.
  Before start-up, please carry out checks in accordance with Section 4.5.
- Persons working on or with the machine must be trained or instructed for that purpose. Operation and work application may only be carried out by trained personnel.
- The following applies for all work:
  Only carry out work if the subgrade is firm and even and solid enough.
- Proceed with the utmost caution if you bypass the stick end limitation or other safety shutdowns.
- Ensure that there is no one in the danger area.
- Maintain safety clearance to overhead power lines.
- Only operate the machine from the driver's seat.
- When switching the attachment (e.g. grab), release the pressure from the hydraulic system.
- Do not transport persons on the machine.
- Take environmental conditions into account, e.g. poor visibility, wind speeds etc.
- Use the specific lifting capacity tables for the machine.
- Note performance specifications.
- Check that attachment points have a sufficient safe working load.
- Observe banksman signals if they are given.
- If visibility is poor, ensure that a banksman is used for giving the required signs when reversing.
- Before moving onto ramps or inclines, make sure you obtain the maximum permitted values from SENNEBOGEN.
- Position the boom in the travel direction during long journeys.

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6.2 Operator's station/cab with gallery, raising



Emergency exit

*: Optional model/special function

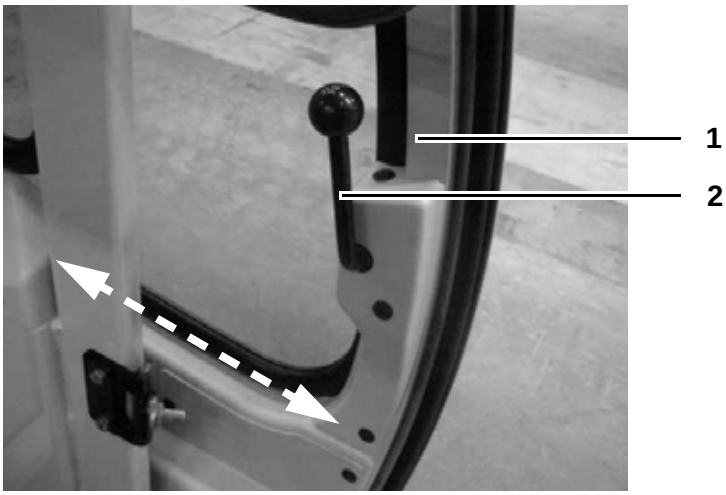
Item	Description
1	Work lighting
2*	Windscreen wiper, roof
3	Windscreen wiper, top
4*	Front windshield, top, adjustable
5	Front windshield, bottom
6	Door lock and handle
7*	Windscreen wiper, lower
8	24 V plug socket (connection for beacon)
9	Emergency exit — rear window
10	Sliding door
11	Gallery
12	Hammer — emergency exit

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Note
In an emergency, you can exit via the rear window (9). Use the emergency hammer (12) to break the window.

Note
The cab door is equipped with an emergency release. If necessary, consult SENNEBOGEN Customer Service!

Sliding door



The sliding door (1) can be locked in the open position on the side panel of the cab. You can release the lock again by pulling on the release lever (2) on the inside of the door.

Front windshield



To open the front windshield, tilt it forward. The top windscreen wiper swivels ahead with the window. Press on both buttons (4) and swivel the window ahead. The two shock absorbers hold it in position. Pull the two grips (3) on the window frame inward to close it. Ensure that the front windshield latches in place again.

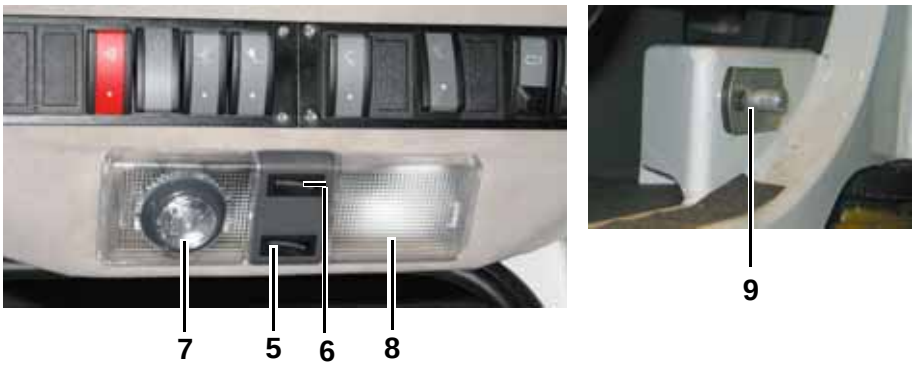
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Note

Do not switch on the windscreen wiper with the front window open.

Interior lighting

The switches (6) enable you to turn the lighting (7,8) on and off.



The spotlight (7) can be adjusted by the operator.

The interior lighting (8) switches on when you open the cab door (9). The function can be switched off with switch (5).

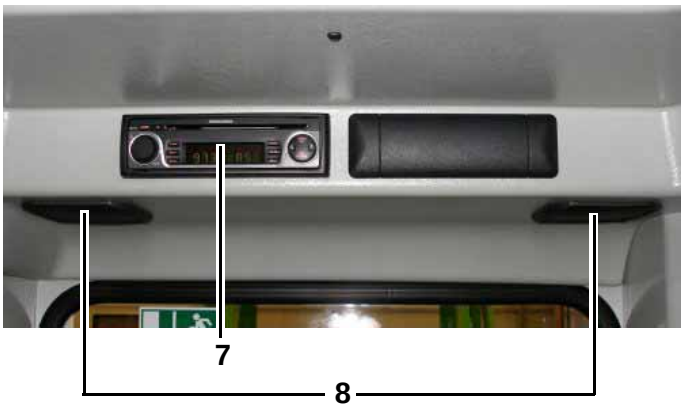
Washer system

The windscreen wipers are operated via the switch on the top right control panel. The container for cleaning fluid for the washer system is located behind the left front service access door. Always fill the container with window antifreeze.

Radio

Option

The radio (7) and the loudspeakers (8) are located behind the driver's seat below the cab roof.



Note

More information can be obtained from the radio manufacturer.

Document case

A SENNEBOGEN document case holding the machine documentation is located in the cab.

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6.2.1 Driver's seat



CAUTION

- In order to avoid risk of an accident, check that all the settings are properly locked in place before starting the vehicle.
- The driver's seat adjustment mechanisms should not be actuated during operation.
- To prevent injury, no objects are to be stored within the pivot range of the driver's seat.
- Functionality testing should be performed at least as often as the maintenance intervals of the vehicle.



Note

To prevent any possible damage to health, the weight setting should be adjusted to match the weight of the individual driver prior to each vehicle start-up and each time there is a change in driver.

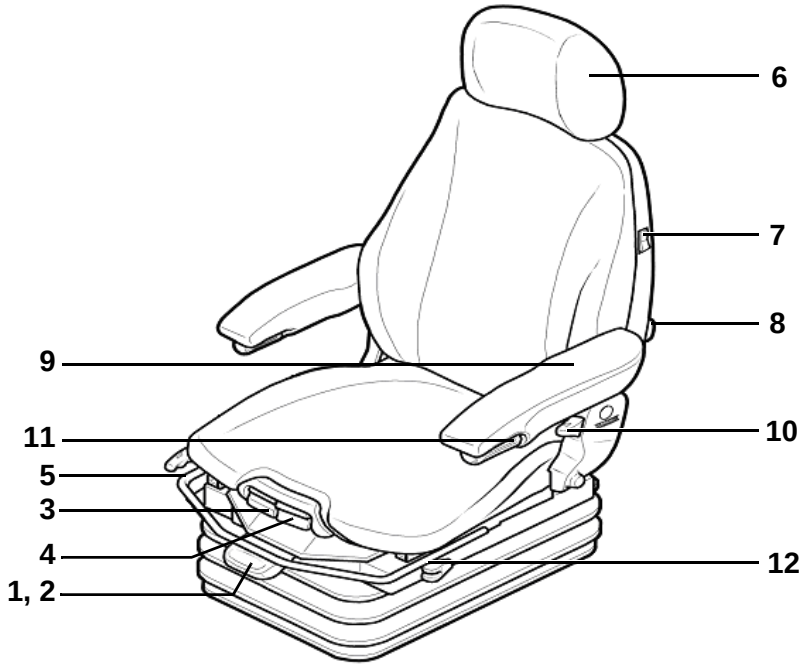


Note

Bolt/screw connections should be checked regularly for solid seating. Seat jiggling may be caused by loose bolt/screw connections or other defects. If irregularities are found in the functionality of the seat (e.g. in the spring of the seat), call an authorized professional immediately to remedy the cause. Non-compliance leads to dangers for your health and increased risk of an accident.

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Air-suspended driver's seat



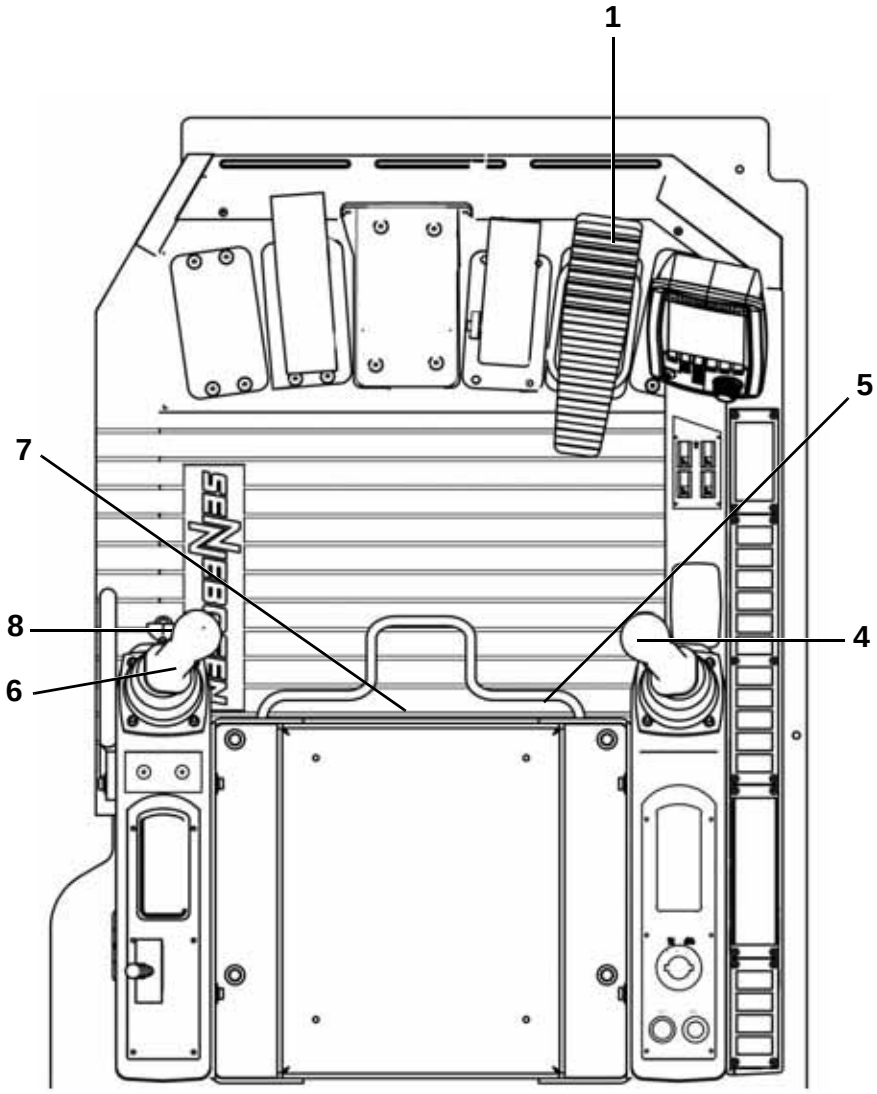
Item	Description
1	Weight adjustment
2	Height adjustment
3*	Seat depth setting
4*	Seat tilt setting
5*	Length adjustment
6*	Head support
7*	Seat heater
8*	Spinal disk support
9*	Arm rests
10*	Backrest tilt
11	Arm rest tilt
12	Horizontal suspension
*	Optional

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6.3 Operating instruments

6.3.1 Overview with joystick steering

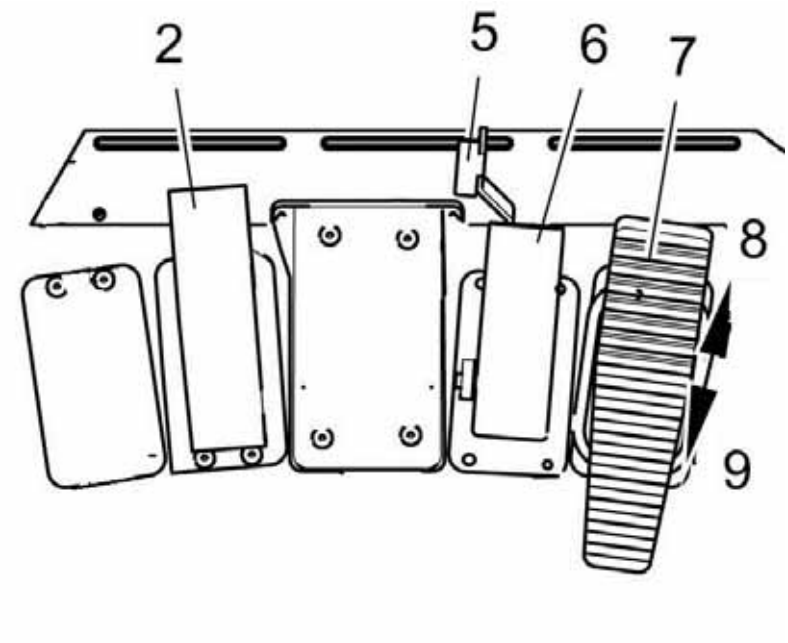
Joy stick steering



Item	Description
1	Pedals
4	Control lever, right
5	Seat adjustment
6	Control lever, left
7	Lower air outlet vents
8	Safety lever

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Pedals



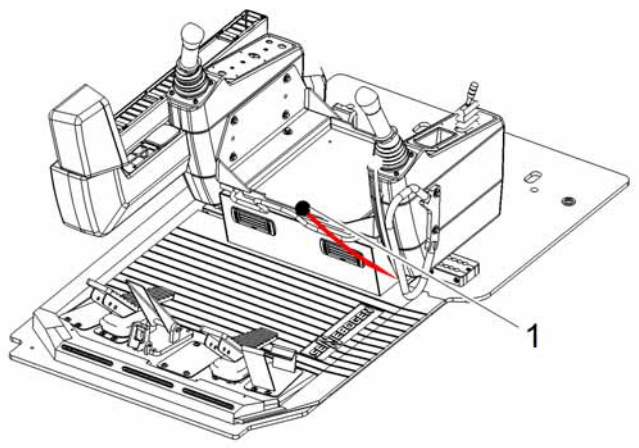
Item	Description
2	Footrest
5	Release the brake pedal lock
6	Brake pedal — driving action
7	Drive pedal
8	Drive — forwards
9	Drive — backwards
*	Optional

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6.3.2 Safety lever

The safety lever (1) serves as a protective feature.

Safety lever released (pushed forward)



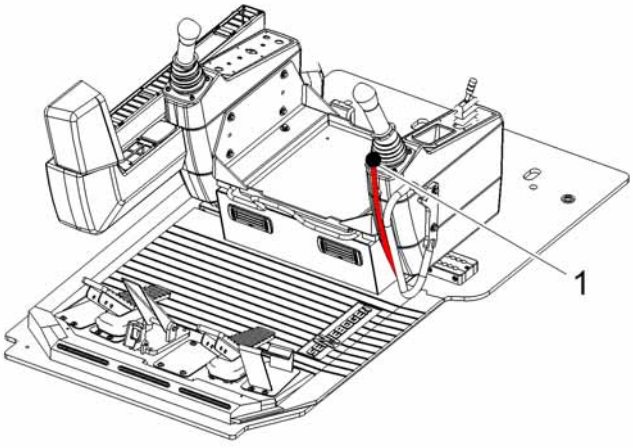
When the safety lever is released (see illustration)

- All hydraulic functions are available.
- All work maneuvers can be carried out.

Note
The swing bearing holding brake remains open after the safety lever is released (pushed forward) if the “right-hand” switch in the right-hand control panel has previously been actuated.

Loosen the swing bearing holding brake by pressing the “left-hand” switch in the right-hand control panel (see Section 6.5.6).

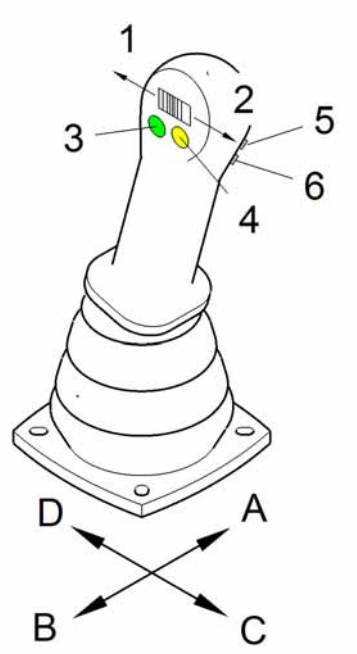
Safety lever actuated (pulled back)



Note
All hydraulic functions are deactivated when the safety lever is actuated.

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6.3.3 Control lever, left



Item	Description
1	Grab, swing left (proportional)
2	Grab, swing right (proportional)
3	Unused
4	Horn
5	Unused
6	Boom shutdown bypass

Directions of movement

Direction	Description
A	Extend stick
B	Retract stick
C	Swing upper structure, right
D	Swing upper structure, left

Note
The bypasses for the safety limit shutdown “Retract/extend stick” and “Hoist up/down”.

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DANGER
All safety cut-outs in the equipment are deactivated.

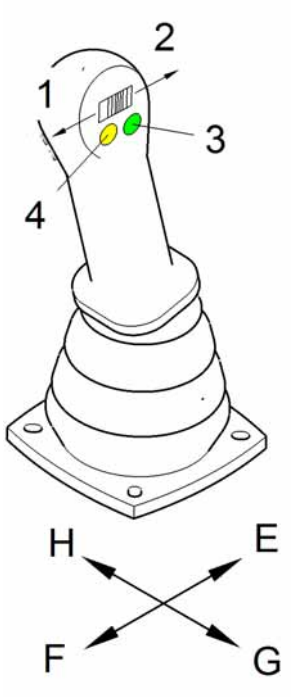


DANGER
Risk of fatal injury by bypassing the “Retract stick” safety limit shutdown!
Attachments or parts of the load can strike and penetrate the cab.
Proceed with extreme caution.
Observe the attachments and load continuously. Operation is the sole responsibility of the machine operator.

Please also read the instructions in Section 6.5.12.

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6.3.4 Control lever, right



Pos.	Description
1**	Steer left (proportional)
2**	Steer right (proportional)
3*	Magnet unit on
4*	Magnet unit off
5***	Drive forward preselection on/off
6***	Drive reverse preselection on/off

*****: Optional model/special function

******: Optional model, only for joystick steering (mobile)

*******: Optional model, only with drive pedal

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Directions of movement

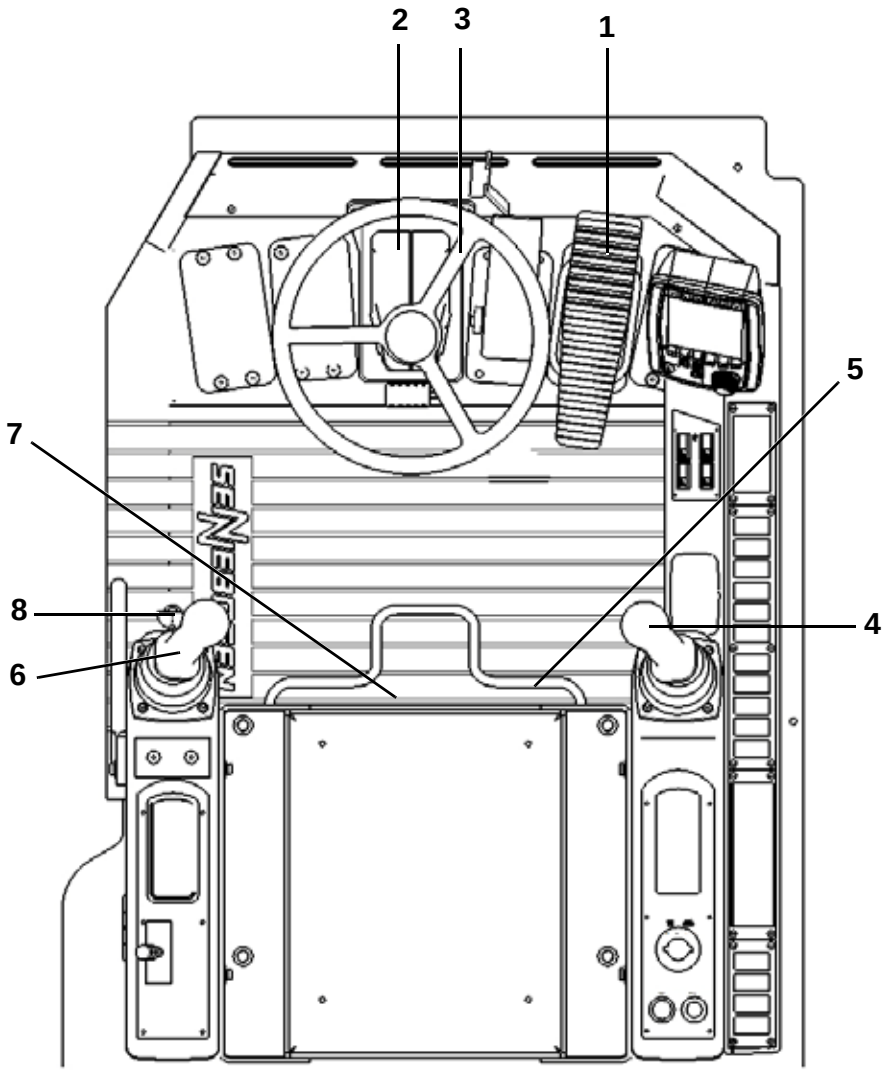
Direction	Description
E	Open grab
F	Close grab
G	Compact boom up
G****	Movement, right traveling gear back
H	Compact boom down
H****	Movement, right traveling gear forward

********: Optional model, only for crawler undercarriage

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6.3.5 Overview for steering wheel control (optional)

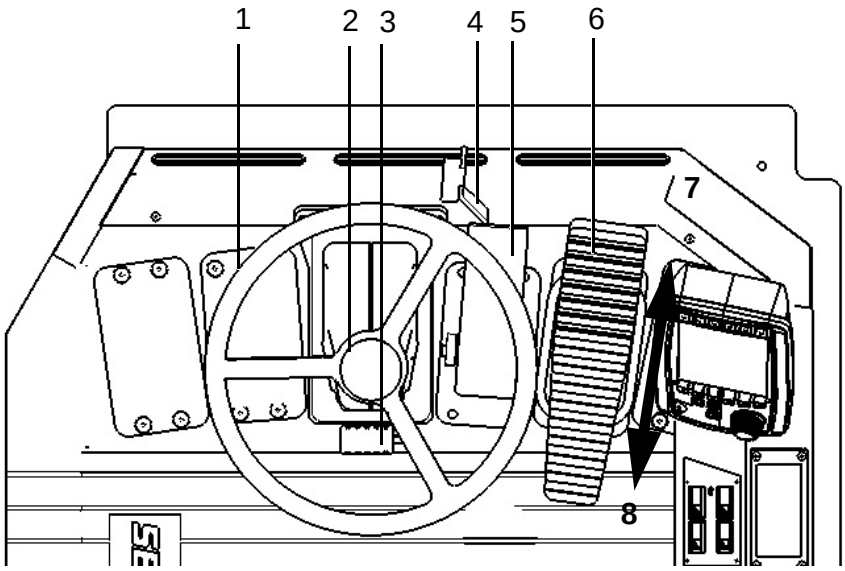
Steering wheel control



Item	Description
1	Pedals
2	Steering column
3	Steering wheel
4	Control lever, right
5	Seat adjustment
6	Control lever, left
7	Lower air outlet vents
8	Safety lever

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Pedals



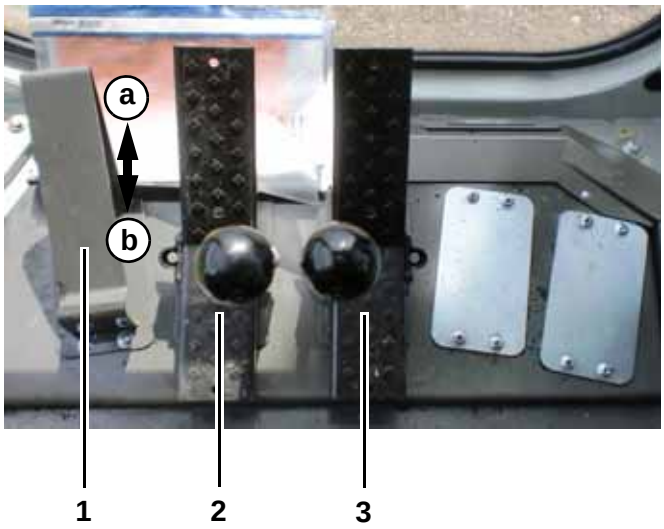
Item	Description
1	Footrest
2*	Steering column
3*	Release the steering column lock
4	Release the brake pedal lock
5	Brake pedal — driving action
6	Drive pedal
7	Drive — forwards
8	Drive — backwards
9*	Optional

Note
The *swing bearing holding brake* is a holding brake for the upper structure but is not a service brake or a working brake. A symbol also lights up in SENCON when switched on.

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6.3.6 Overview – crawler steering

Lever / pedals



Pos.	Description
1	Footrest
2	Movement, left traveling gear
3	Movement, right traveling gear

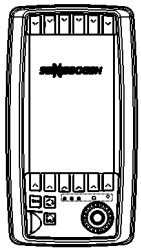
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6.3.7 Additional indicators

Analog hour meter



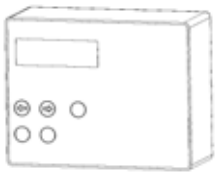
SENCON



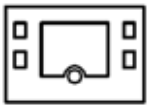
Generator and magnet unit



Tool Control



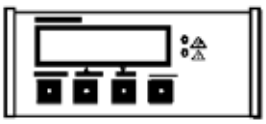
Auxiliary heating system



Camera



LMI

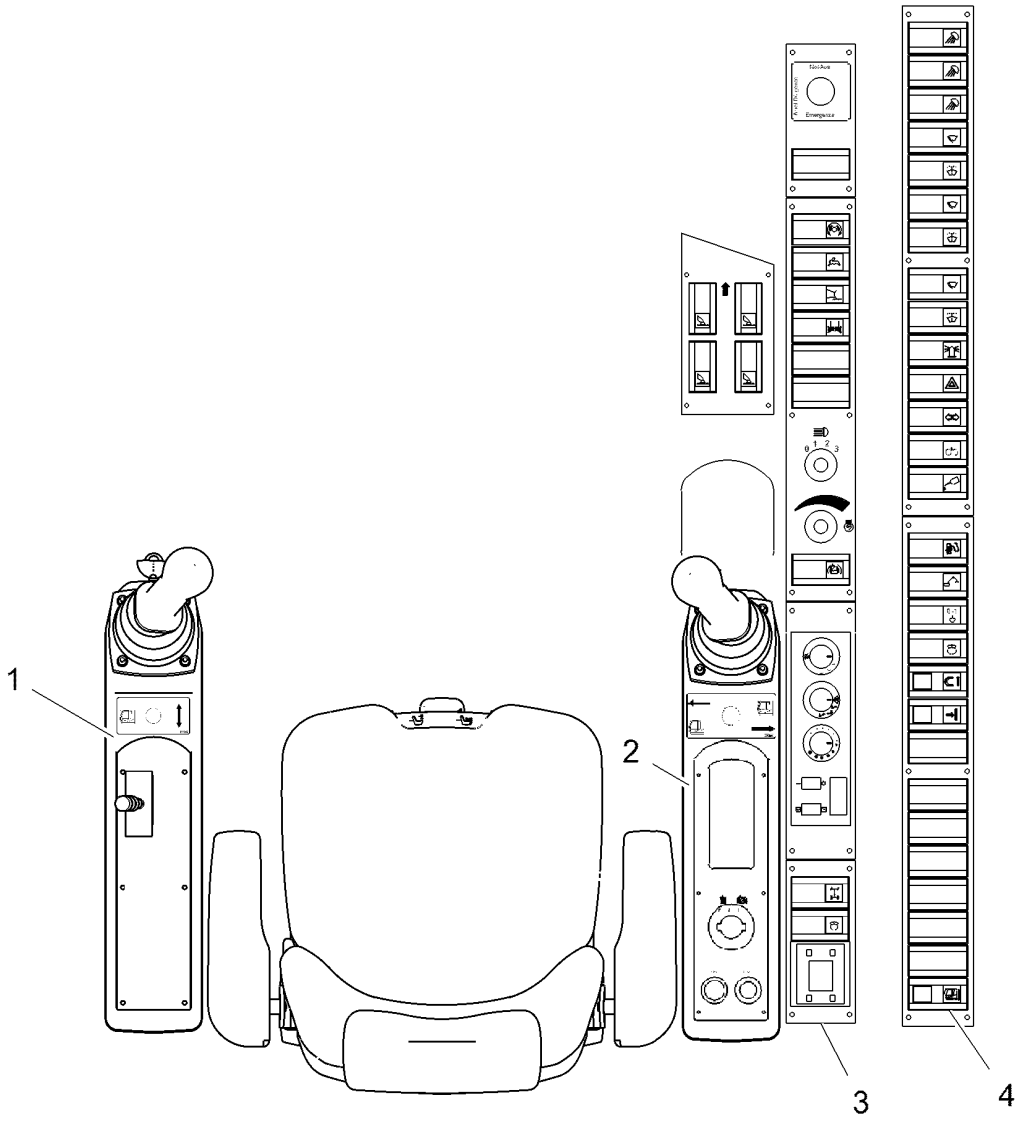




Note
Further information can be found in Section 6.4 and Section 10.

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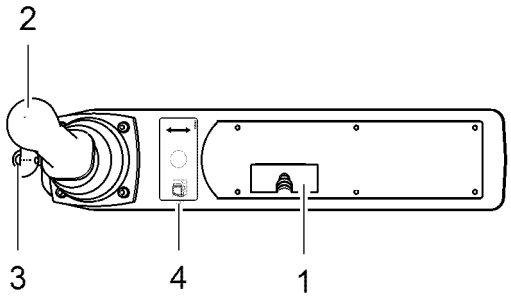
6.3.8 Overview of the control panels



Item	Description
1	Left control panel, next to driver's seat
2	Right control panel, next to driver's seat
3	Control panel, bottom right
4	Control panel, top right

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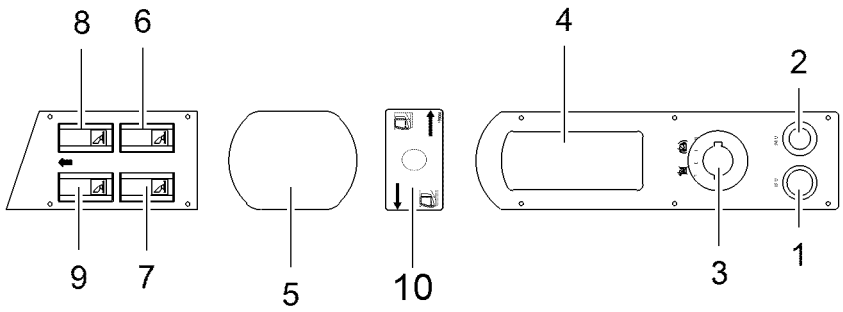
6.3.9 Left control panel, next to driver's seat



Item	Description
1	Lever for all supports
2	Joystick, left
3	Safety lever
4	Lower/raise cab
*	Optional

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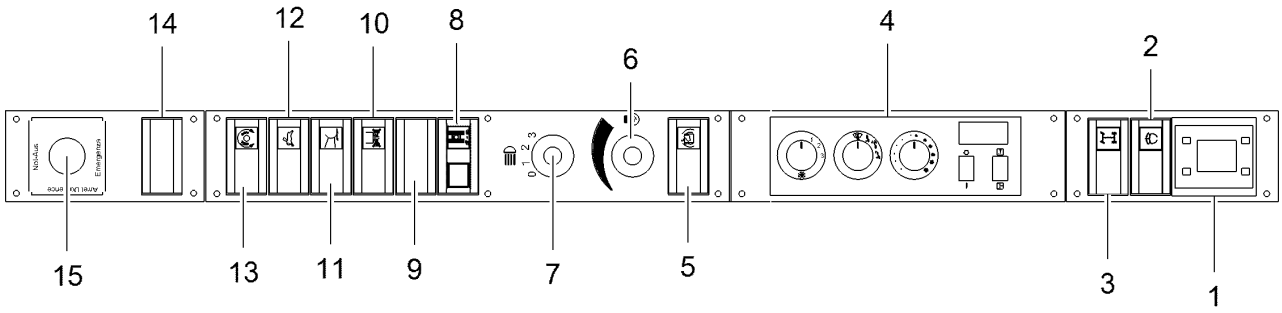
6.3.10 Right control panel, next to driver's seat



Item	Description
1	Socket outlet 12 V
2	Socket outlet 24 V
3	Ignition — start the engine P = Enable the refueling pump 0 = Ignition OFF I = Ignition ON (switches off after 20 minutes!) II = Start the engine
4	Storage compartment
5	Ashtray
6	Outrigger, rear right
7	Outrigger, rear left
8	Outrigger, front right
9	Outrigger, front left
10*	Retract/extend cab

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6.3.11 Control panel, bottom right



Item	Description
1*	Auxiliary heating system timer
2	Swing the emergency operation grab
3	Emergency operation steering
4	Air-conditioning unit
5*	Start the engine
6	Hand throttle
7	Upper structure lighting
8	Unused
9	Unused
10	Automatic floating axle
11*	Plow
12	Drive slow —fast
13	Swing bearing holding brake
14	Unused
15*	Emergency stop
*	Optional

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Auxiliary heating system timer (optional)



Item	Description
1	Reverse control button
2	Forward control button
3	Activation button
4	OK button
5	Display

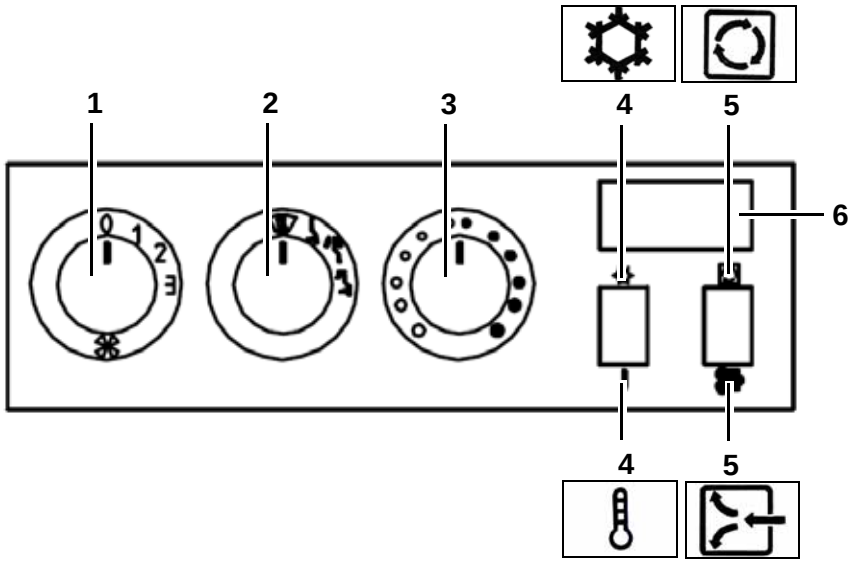
Note
More information can be found in Chapter 10.

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Air conditioning control panel

Note

The machine is equipped with an automatic climate control system that permits precise heating or cooling.



1	Rotary selection switch: blower speeds
2	Rotary selection switch: air distribution
3	Temperature regulator
4	Combination switch: outside temperature indicator, air conditioning on/off
5	Outside/circulating air switch
6	Temperature indication (°C or °F)

Note
The air conditioning can be operated with outside air or circulating air.

Note
Switching on the heating or air conditioning requires **two** activations of the A/C button (4)!

Note
Keep the windows and cab door closed to ensure effective air conditioning.

The air conditioner regulates the temperature in relation to the outside temperature.

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Outside air mode



When windows are misted, to dehumidify the cab.

Circulating air mode



Faster warm-up of the cab and higher top temperature.
The air in the cab interior is re-circulated, i.e. very little fresh air is drawn in from outside. Do not leave in this rating for longer than 15 minutes, as the air quality in the cab will deteriorate significantly. Ensure that there is a sufficient outside air supply.

Switching on the climate control system



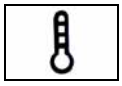
1	Start the drive engine.
2	Switch on the fan (1) on the right control panel.
3	Open the air-inlet vents in the cab to prevent the evaporator from icing up.
4	Press the a/c switch (4) on the control panel ● Press once briefly: the current status is displayed (heating or cooling) ● Press twice: operating mode is changed
5	Set the desired temperature using the temperature regulator (3) on the right-hand control panel.



Note
Switch on the air conditioning system regularly. This greatly contributes to the unit being ready for operation.

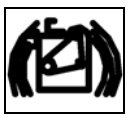
Switch on the air conditioning system once a month for at least 30 minutes at the maximum fan rate; open windows and doors.

Changing the temperature indication °C/°F



1	Press the combination switch (5) for more than 5 s.
2	The set unit is displayed.
3	By pressing the combination switch again, the temperature display changes (°C <--> °F).

Starting the engine



The engine can be restarted automatically using this switch after the engine has been switched off for 5-10 minutes without any load and with automatic idle activated.

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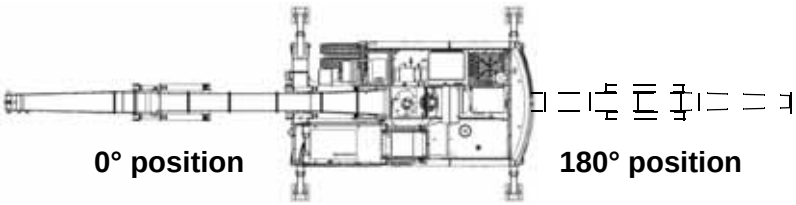
Floating axle control

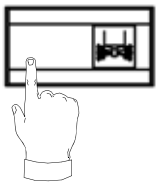
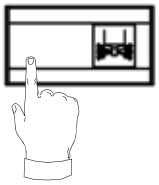




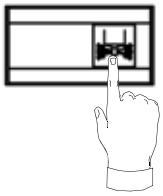
The front axle has oscillating suspension; the oscillating axle can be used to level out unevenness in the track.

Note
The floating axle control minimizes the danger of tipping. The boom can be found above both the front and rear axles (upper structure parallel to the undercarriage/0° or 180° position).



Switch position	Conditions	Status
 Floating axle control activated	● 0° position or 180° position ● Driving the machine – Symbol is displayed in SENCON 	Control lamp does not light up  – Floating axle free, must be in 0° or 180° position
 Floating axle control activated	● **No** 0° position or 180° position **or** ● Machine is **not** being moved – Symbol is **not** displayed	Control lamp does **not** light up  – Floating axle locked

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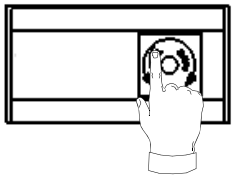
Switch position	Conditions	Status
 Floating axle control deactivated, floating axle always free	– Symbol is displayed in SENCON 	Control illuminates  – Floating axle always free

Swing bearing holding brake



The swing bearing holding brake is a holding brake for the upper structure but is not a service brake or a working brake.

Switch position 1 = Automatic operation

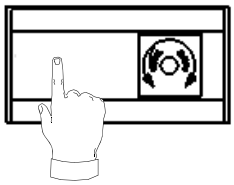


Preselection of the swing bearing brake, which engages at the start or at the end of an action:

- When the upper structure is stationary, the swing bearing brake engages automatically.
- When the upper structure swings, the swing bearing brake disengages automatically.
- The following symbol appears in SENCON: 

Switch position 0 = Swing bearing brake applied

(LED switch lights up)



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Preselection of the swing bearing brake, which engages at the end of an action:

- When the upper structure is stationary, the swing bearing brake engages automatically.
- The following symbol appears in SENCON: 
- To loosen the swing bearing brake, switch to
- **Switch position 1 = Automatic operation**.

Note
If the safety lever is in its upper position, the swing bearing brake is activated. When the safety lever is in its lower position and **Automatic operation** is activated, the swing bearing brake can be released.

WARNING
Never rotate the upper structure when the swing gear holding brake is applied!

If the speed sensor has failed, then the swing brake engages 12 sec. after the last message of the 5 bar pressure switch.

Emergency stop

The emergency stop switch is located on the control panel in the cab.

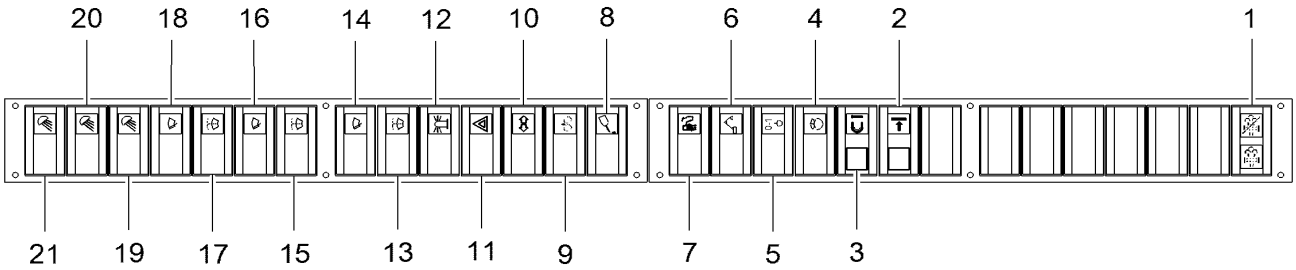
The emergency stop switches shut down the machine immediately following actuation.

Positions:

Pulled = machine on
Pushed = machine off

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6.3.12 Control panel, top right



Item	Description
1	Start/cancel particulate filter regeneration
2*	Auxiliary limiting boom, extend stick
3*	Magnet unit
4	Grab control
5*	Grab function
6*	Floating boom setting
7*	Diesel filter heating off/on
8	Central lubrication
9	Swing ring lubrication
10	Direction indicator
11	Flashing warning lamps
12*	Flashing alarm lamp
13*	Front window washer system, lower
14*	Front windscreen wiper, bottom
15*	Roof light washer system
16*	Rooftop window wiper
17	Front window washer system
18	Front windscreen wiper
19*	Headlights, upper structure

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Item	Description
20*	Boom headlight
21*	Roof work lighting
	Optional

Emergency lowering, cab

The emergency lowering feature still functions in the event of engine or hydraulic system failure.

Auxiliary limiting boom, extend stick

Use the *Auxiliary limiting* switch to activate/deactivate optional auxiliary limiting for “Hoist up” and/or “Extend stick”. This is an important function, for example, when working with height limitations.

Magnet unit

Using the magnet unit switch, the optional magnet unit can be activated/deactivated.

Grab control



The *grab control* function can be used to control the pressure for the “*Close grab”* function.

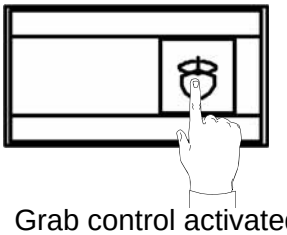
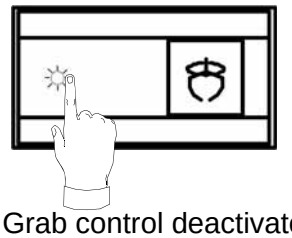
A reduction in pressure for the “*Close grab”* function is only activated when the followingoperating movements are performed simultaneously:

- “*Close grab*” and “*Swing upper structure*”.
- Or “*Close grab* “ and “*Hoist up*”.
- Or “*Close grab*” and “*Extend stick*”.

When the grab is closed, there are no losses of speed during the “*Swing upper structure”*, “*Hoist up” and “Extend stick”* operating movements.

- The grab symbol always lights up.
- If the switch is pressed, the green LED also lights up.

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Switch position	Closing pressure for grab	Swing speed, upper structure
 Grab control activated – LED lights up	Grab closes with max. pressure. Additional actuation of the “Hoist up”, “Swivel” and “Retract/extend stick” functions decreases the pressure for “Close grab” so that no notable speed losses occur during the operating movements.	Fast
 Grab control deactivated	Grab closes with max. pressure. In the worst-case scenario, additional actuation of operating movements may cause speed losses during the operating movements.	Slow

Note

If working with the machine equipment in a negative range (e.g. unloading ships) or the load is to be stored high up or pivoted over a large radius, it is advantageous to activate the grab control. This will achieve quicker working cycles.

SENNEBOGEN recommends:

Always leave the grab control switched on when operating the grab. This guarantees the functions specified above.

CAUTION

The machine liter levels and pressure specifications that are set at the factory must be observed when mounting/replacing attachments in order to avoid damaging the attachments through excess pressure or an excessive number of liters.

If necessary, consult SENNEBOGEN Customer Service!

Grab function (optional)



Accidental actuation of the “Open grab/Close grab” functions in magnetic plate mode is prevented when the *grab function* is switched off.

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Boom floating position



The floating position function depends on the working tool. *Floating grab setting:* When the “Close grab” function is actuated, the compact boom is simultaneously raised at low speed. This prevents the grab from scratching on the ground.
Floating hammer setting: The full weight of the stick acts on the hammer. The stick cylinder is not pressurized in this case.

Diesel filter heating Off/On

The *diesel filter heating* is used for preheating at low temperatures.

Central lubrication



The central lubrication system automatically lubricates the slewing track of the swiveling connection as well as the bearings of the equipment. The lubrication cycle is pre-set at the factory.

Lubrication can be actuated manually in addition to the pre-set lubrication cycle.

Pinion/gear lubrication

The pinion/gear lubrication lubricates the gear teeth of the swing ring. Lubrication can be actuated manually.

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Particulate filter regeneration

Note

The particulate filter can only be regenerated if the load status of the diesel particulate filter is adequate for the regeneration process.

If the load status is adequate, the following pilot lamp lights up in SENCON:



Escalation levels for the load status of the diesel particulate filter

In SENCON, the escalation levels in relation to the load status of the diesel particulate filter are displayed as follows:

	Display in SENCON	Action
Level 1	– Pilot lamp is displayed: 	– Start particulate filter regeneration at the next opportunity
Level 2	– Pilot lamp flashing: 	– Start particulate filter regeneration at the next opportunity
Level 3	– Pilot lamps flashing:  	– Start particulate filter regeneration **IMMEDIATELY**
Level 4	– Pilot lamps flashing:  	– **Deposit loads and turn off the engine immediately!** – **Contact SENNEBOGEN Customer Service immediately!**

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Note

Observe the notes in the engine manufacturer's operating instructions.

DANGER

High exhaust temperatures can occur!

Non-observance of notes in the engine manufacturer's operating instructions can lead to damage to property and personal injuries.

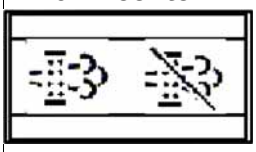
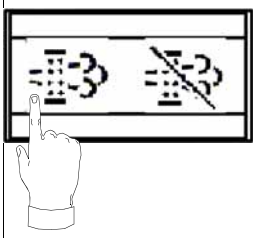
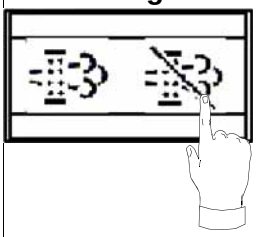
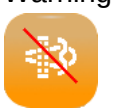
Note

If high exhaust temperatures pose a danger when using the machine, regeneration of the particulate filter can be prevented for a limited time period.

Regeneration of the particulate filter must be performed after this use.

Note

Observe the notes in the engine manufacturer's operating instructions.

Switch position	
0 — center 	– Particulate filter regenerates **automatically** – Particulate filter regenerates during operation (observe the safety instructions in Chapter 1.10.8)
1 — left 	– **Start** manual particulate filter regeneration – Prerequisite: warning display appears in SenCon 
1 — right 	– Particulate filter regeneration **canceled** – Warning display appears in SenCon: 

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Note

Particulate filter regeneration should be authorized at the next opportunity.

The particulate filter can only be regenerated manually if the load status of the diesel particulate filter is adequate for the regeneration process.

If the load status is adequate, the following pilot lamp appears in SENCON:



To start the manual regeneration process, the engine must be run at an idle speed of 800 rpm.

No operating functions can be executed during manual regeneration.

Note

Observe the notes in the engine manufacturer's operating instructions.

DANGER

High exhaust temperatures can occur!

If there are exhaust temperatures above 625°C the following pilot lamp lights up in SENCON:



Non-observance of notes in the engine manufacturer's operating instructions can lead to damage to property and personal injuries.

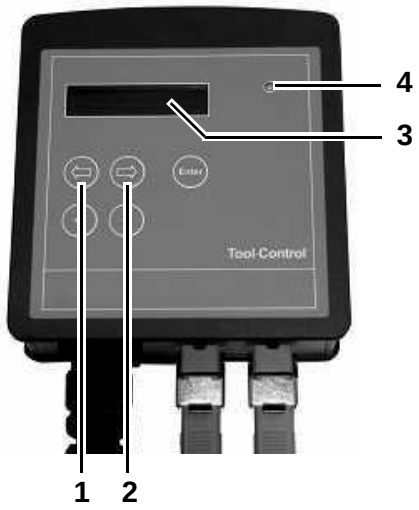
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6.4 Additional displays (optional equipment)

6.4.1 SENNEBOGEN Tool Control

The *SENNEBOGEN Tool Control* enables operation of several attachment tools (e.g. grab, demolition hammer) with different requirements for maximum permissible flow volumes and pressures. The maximum permissible flow volume and pressure is adapted to the corresponding work tool by the *SENNEBOGEN Tool Control*.

CAUTION
Before the work application, select the rating for the respective tool!



Selecting the rating

1	Start the engine in accordance with Section 4.10.4.
2	Release the safety lever (see Section 6.3.2).

Note
After releasing the safety lever, the last selected tool is indicated on the display (3).

3	Press buttons (1) and (2) and select the desired rating. The selected tool (rating) appears on the display (3).

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Note
To change the setup parameters, use special tools and contact SENNEBOGEN customer service if necessary.

Note
If a button is pressed and held for a longer period of time, the button lock is activated. The button lock can be released by simultaneously pressing buttons (+) and (-).

If no button is pressed for a longer period of time, the display (3) switches off (energy/screensaver), the operation LED (4) continues to be lit however. By pressing any button, the display (3) is activated again.

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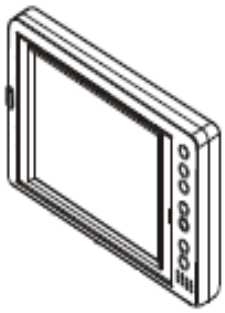
6.4.2 Generator and magnet unit

Note
The engine “start/stop” function remains deactivated as long as the magnet unit is switched on.



Note
Further information can be found in Section 6.5.2 Moving the cab and Chapter 10.

6.4.3 Camera/monitor



Note
More information can be found in Chapter 10.

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6.4.4 Low-temperature package (optional)

Auxiliary heating (Optional)

The machine is equipped with an engine-independent heater for pre-heating the engine and cab.

Note
The battery capacity can be used by operating the heater.



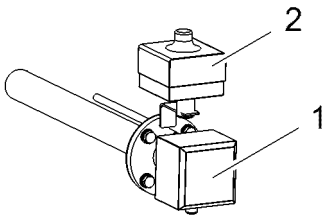
Item	Description
1	Reverse control button
2	Forward control button
3	Activation button
4*	OK button
5	Display

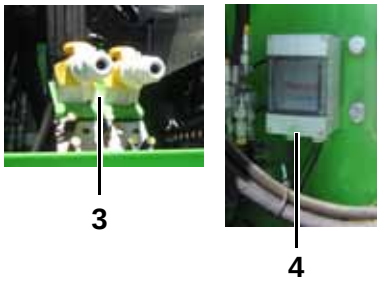
Note
More information can be found in Chapter 10.

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Hydraulic oil pre-heater (electrical) (optional)

The hydraulic oil pre-heater (1) is attached to the hydraulic tank. The warm-up period is significantly reduced by the hydraulic oil pre-heater.





To activate the hydraulic oil pre-heater, the socket (3) in the left-hand storage space of the machine must be connected to the mains. The socket (3) is fused via the fuse box (4).

Only the plug and not the cable for power supply to the socket is supplied by SENNEBOGEN!

The cable must only be connected by a trained specialist!

Set the temperature using the regulator (2) on the thermostat (pre-setting: 40°C [104°F]).

The thermostat switches off once the operating temperature has been reached.

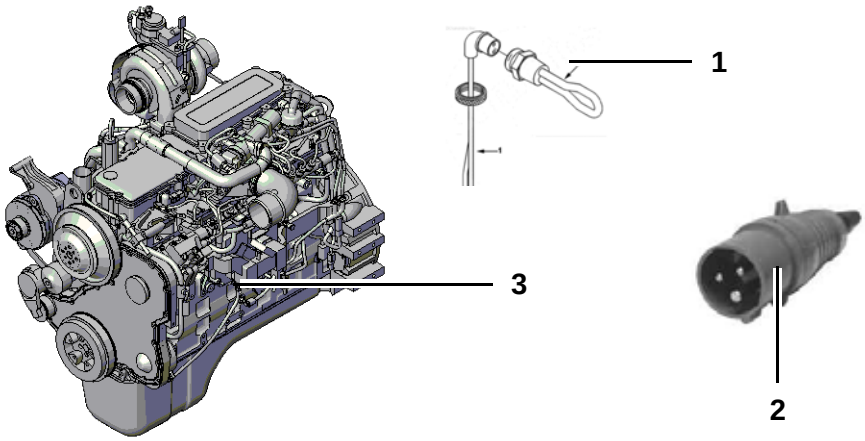
Warning
Maintenance and repair work must only be carried out by trained specialist personnel.

Note
To increase the effectiveness of the hydraulic oil preheating, retract all hydraulic cylinders.

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Engine oil preheating

The machine is equipped with an engine oil pre-heater (1).



To activate the engine oil pre-heater (1) of the engine (3), the socket (2) in the left-hand storage space of the machine must be connected to the mains. The socket (2) is fused via the fuse box (4).

Only the plug and not the cable for power supply to the socket is supplied by SENNEBOGEN!

The cable must only be connected by a trained specialist!

Warning
Maintenance and repair work must only be carried out by trained specialist personnel.

Note

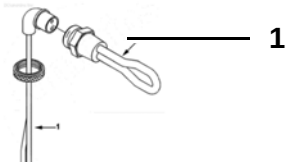
Observe the notes in the engine manufacturer's operating instructions.

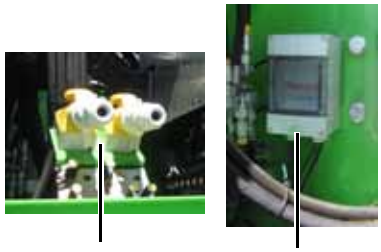
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Refrigerant pre-heating (electrical) (optional)

The machine is equipped with a refrigerant pre-heater (1).

The heating element is installed directly on the engine block.





To activate the refrigerant pre-heater (1) in the engine, the socket (3) in the left-hand storage space of the machine must be connected to the mains. The socket (3) is fused via the fuse box (4).

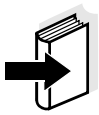
Only the plug and not the cable for power supply to the socket is supplied by SENNEBOGEN!

The cable must only be connected by a trained specialist!



Warning

Maintenance and repair work must only be carried out by trained specialist personnel.



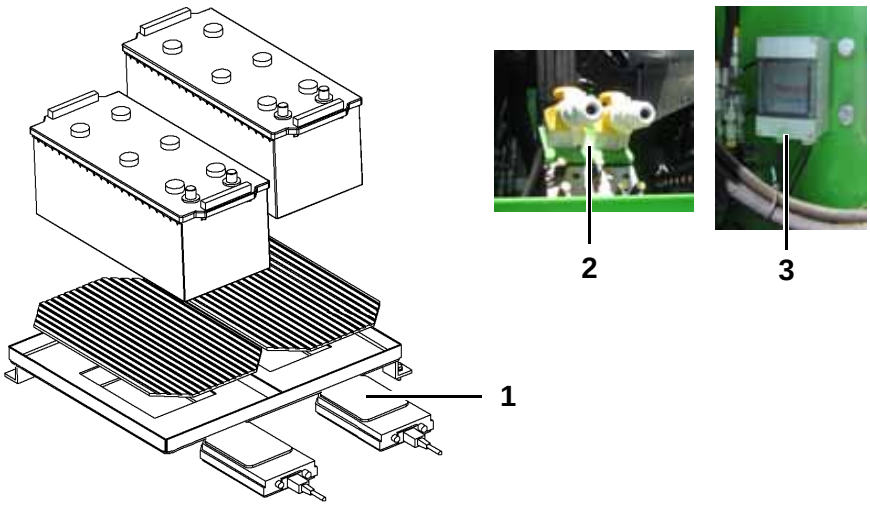
Note

Observe the notes in the engine manufacturer's operating instructions.

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Battery heater (electrical) (optional)

The machine is equipped with a battery heater (1).



To activate the battery heater, the socket (2) in the left-hand storage space of the machine must be connected to the mains. The socket (2) is fused via the fuse box (3).

Only the plug and not the cable for power supply to the socket is supplied by SENNEBOGEN!

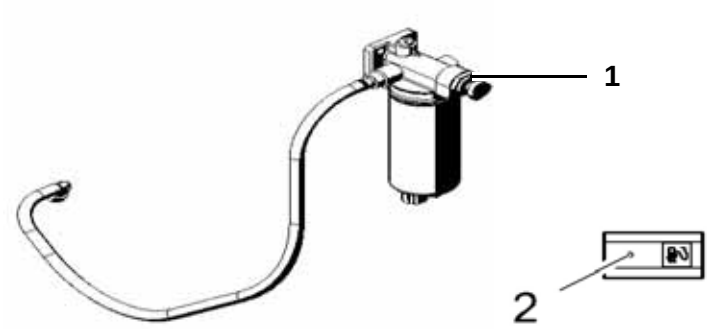
The cable must only be connected by a trained specialist!

Warning
Maintenance and repair work must only be carried out by trained specialist personnel.

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Heater for water separator (optional)

The machine is equipped with a heated water separator (1).



In order to activate the heating system for the water separator (1), activate the switch (2) in the right-hand control panel.

1	Start the engine in accordance with Section 4.10.4.
2	Switch on the heating system for the water separator with switch (2). – The pilot lamp in switch (2) lights up until the fuel has achieved operating temperature (=thermostat).

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6.5 Work application

6.5.1 Safety instructions



DANGER

- Please read Chapter 1 Safety.
  Before start-up, carry out checks in accordance with Section 4.5.
- Persons working on or with the machine must be trained or instructed for that purpose.
  Operation and work application may only be carried out by trained personnel.
- Proceed with extreme caution whenever you bypass the limit position sensor for the arm.
- Ensure that there is no one in the danger area.
- Maintain safety clearance to overhead power lines.
- Only operate the machine from the driver's seat.
- Do not transport persons on the machine.
- Take environmental conditions into account, e.g. poor visibility, wind speeds etc.
- Use the specific lifting capacity table for that machine.
- Note performance specifications.
- Check that attachment points have a sufficient safe working load.
- Observe banksman signals if they are given.
- Never allow the machine to roll with the ignition switched off. When the engine is not running, there is no power-assisted steering.
- Position the boom in the travel direction during long journeys.
- Before leaving the cab:
  - Park the machine on a firm subgrade. If necessary, move back from the edge of the excavation
  - Lower attached loads
  - Secure equipment
  - Pull the safety lever back
  - Chock tires/undercarriage
  - Switch off the engine
  - Lock the cab, show warning lights if necessary
  - Lock the floating axle.

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6.5.2 Moving the cab

Safety instructions



DANGER
Risk of accident from raised cab!
Check the cab suspension, bolt, and screw connections daily!

- Move the machine only with the cab lowered and retracted and the swing bearing holding brake engaged.
- Exit the cab only when it is in the completely lowered and retracted position.
- Move the cab only when the undercarriage supports are deployed!
- Keep the cab doors closed.
- Fasten the seat belt in accordance with Section 4.10.4.
- Moving the cab is prohibited when individuals and/or objects are on the gallery (operator catwalk).



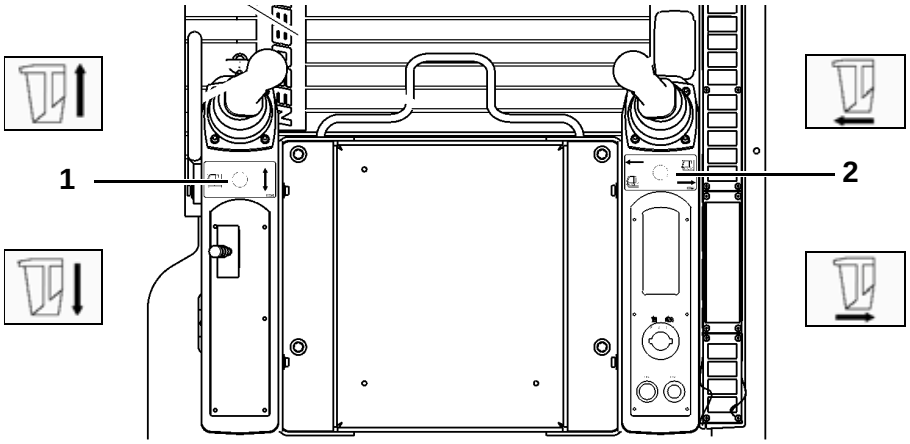
DANGER
Danger to life through shearing and crushing forces!
Ensure that no persons are within the danger area of the cab suspension. The danger area is the area

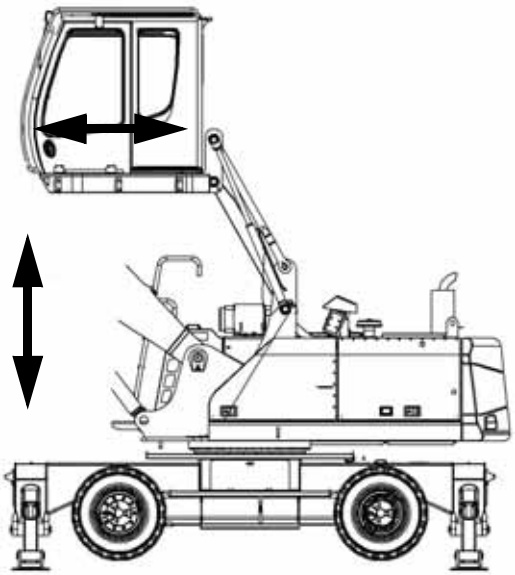


- On/under the cab
- On/under the mechanical cab suspension.

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Moving the cab





*****: Optional model/special function

Raising/lowering the cab

1	Press the safety lever (see Section 6.3.2) forwards.
2	Switch the machine on as described in Section 4.10.4.
3	Push the rocker switch (1) forward. The cab is raised (cab up).
4	Push the rocker switch (1) backward. The cab is lowered (cab down).

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Note
Do not move the cab to the uppermost/foremost limit position. Stop the cab approx. 10 cm before the uppermost/foremost limit position. This provides optimum damping characteristics and pleasant working conditions in the cab.

Extending/retracting the cab (optional)

1	Press the safety lever (see Section 6.3.2) forwards.
2	Switch the machine on as described in Section 4.10.4.
3	Push the rocker switch (2) forward. The cab is extended (Cab out).
4	Push the rocker switch (2) backward. The cab is retracted (Cab in).

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6.5.3 Emergency lowering — cab

Note

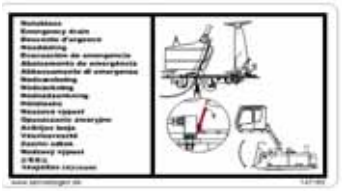
The emergency lowering feature still functions in the event of engine or hydraulic system failure. The machine is equipped with the following feature to lower the cab in an emergency:

- Emergency lowering (in the cab)
  Installation location: bottom right, next to the driver's seat.
  Necessary e.g. in event of a fault in the drive system.
- Emergency lowering (outside the cab) Location: Below the front left service access door. Necessary in case the machine operator has an emergency due to a health condition.

DANGER
Danger to life through shearing and crushing forces!
Ensure that no persons are within the danger area of the cab suspension. The danger area is the area

- On/under the cab
- On/under the mechanical cab suspension.

Emergency lowering — in the cab





Illustrated = cab elevated

1	Press lever (1) upwards. The cab lowers slowly.
2	Pull lever (1) back again after reaching the lower limit position.

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Emergency lowering — outside the cab





Illustrated = cab elevated

1	Press lever (2) upwards. The cab lowers slowly.
2	Pull lever (2) back again after reaching the lower limit position.

Note

The emergency lowering lever is located under the front left service access doors.

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6.5.4 Moving the machine

DANGER
Risk of accident as a result of incorrect use!
If the boom is positioned above the rear axle, the driving actions of the machine are reversed. Proceed with extreme caution whenever you wish to work or maneuver over the rear axle.

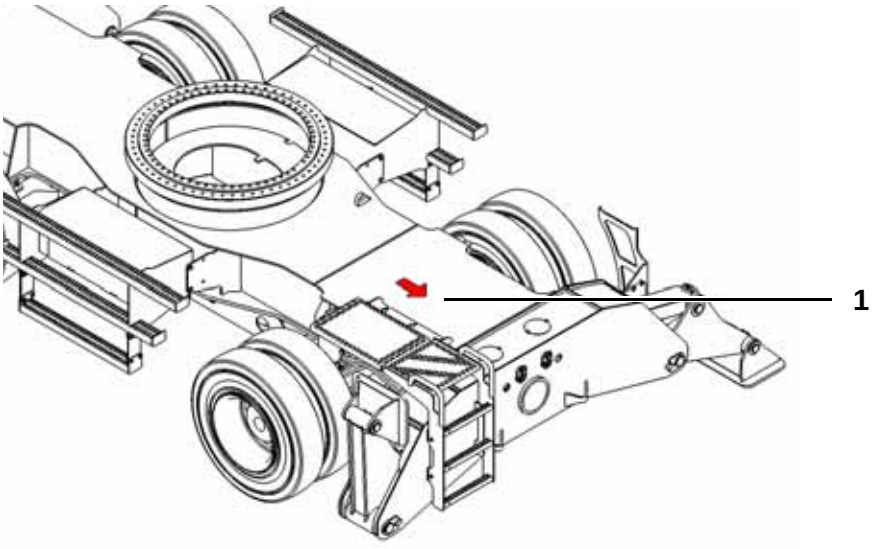
Driving with a suspended load

Please note the following points when driving with a suspended load:

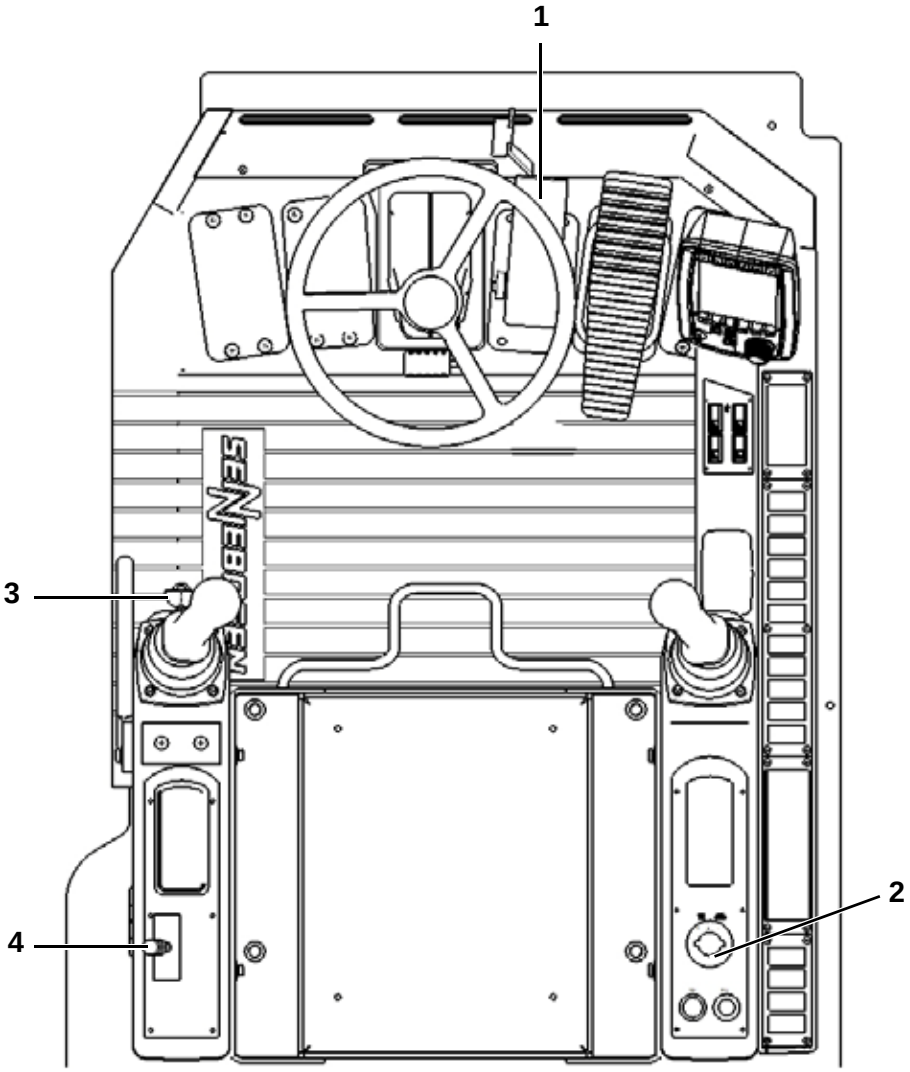
- Danger of tipping!
  Keep loads as close as possible to the ground when moving.
- Always position the boom lengthwise to the undercarriage.
- Only carry 50% of the permitted safe working load.
- Mast (optional) — only drive the machine lengthwise and without load.
- Only drive on even ground with sufficient safe working load.
- Reduce pendulum movements of the load by sensitive driving.
- Negotiate corners with as wide a radius as possible.

DANGER
Risk of accident as a result of incorrect use!
If the boom is positioned above the rear axle, the driving actions of the machine are reversed. Proceed with extreme caution whenever you wish to work or maneuver over the rear axle.

Note
A red indicator arrow (1) is located at the front of the undercarriage. This can be seen through the right-hand cab window. It indicates that the boom is over the front axle.



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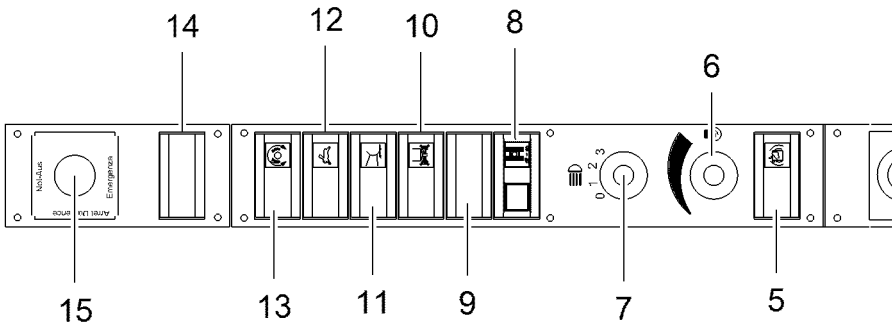


Moving

1	Actuate and lock the service brake (1).
2	Start the drive engine (2).
3	Push the safety lever (3) forward.
4	Retract outriggers (4) if necessary.

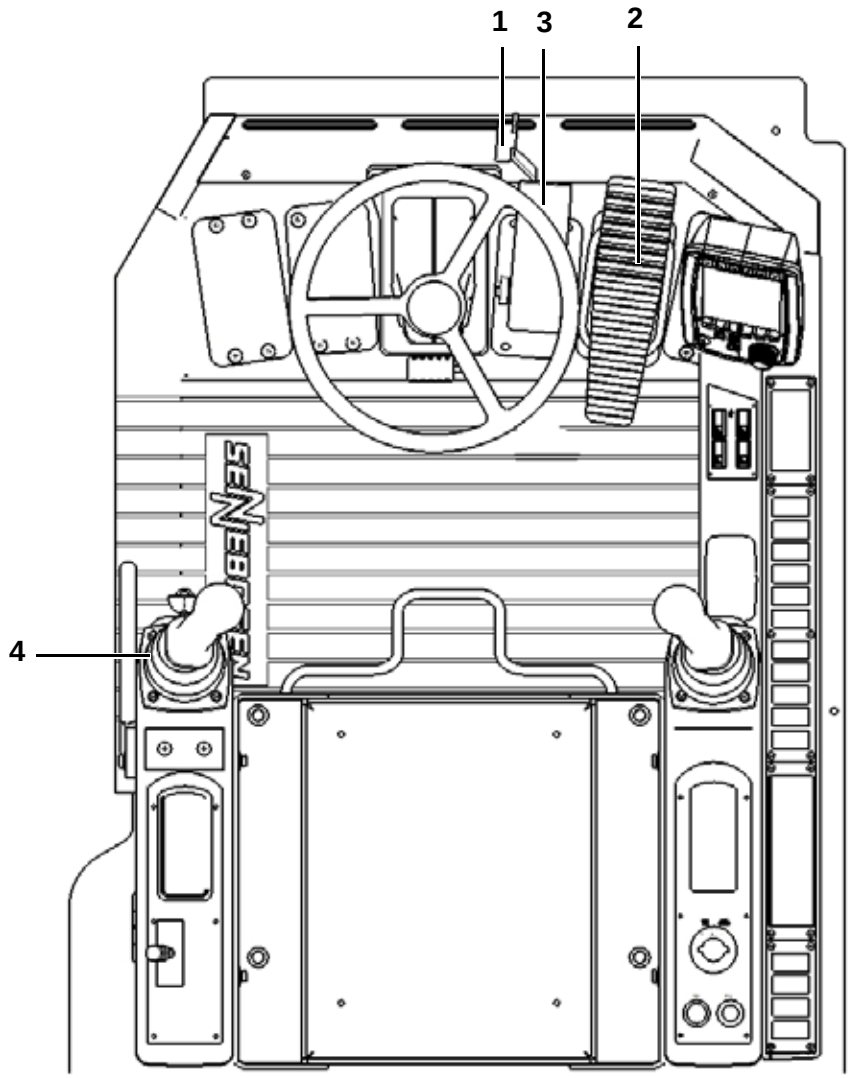
Note
Further information on steering can be found in Section 6.3.4.

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5	Select off-road or on-road operation (12).
6	Release the floating axle (10) if necessary.

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1	Actuate the release lever (1) for the service brake (3).
2	Select the direction of travel by operating the drive pedal (2).
3	Decelerate the machine via the service brake (3).
4	Always apply the service brake (3) when leaving!
5	Pull back the safety lever (4).

Note
Avoid excessive heating of the hydraulic oil. Do not hold the steering at the limit stop longer than necessary.

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6.5.5 Stabilizing the machine

The machine is stabilized on an uneven surface by using the claw outrigger. This increases the stability. For lifting capacities see Section 3.5 Working loads.

CAUTION
Extend the claw outrigger only when the machine is stationary and immediately before picking up a load. Danger of tipping!

CAUTION
Position the outriggers on a firm, even subgrade.
Do not raise machine using the outrigger. The tires must remain in contact with the ground.

CAUTION
Never extend the outriggers completely (= to the stop). The weight will not be distributed evenly over the individual outrigger pads this way, i.e. the maximum stability is not guaranteed.

Eight-point contact

The weight of the machine must be on the claw outrigger, while the tires remain on the ground.

If you extended the outriggers completely (audible sound), retract them slightly!



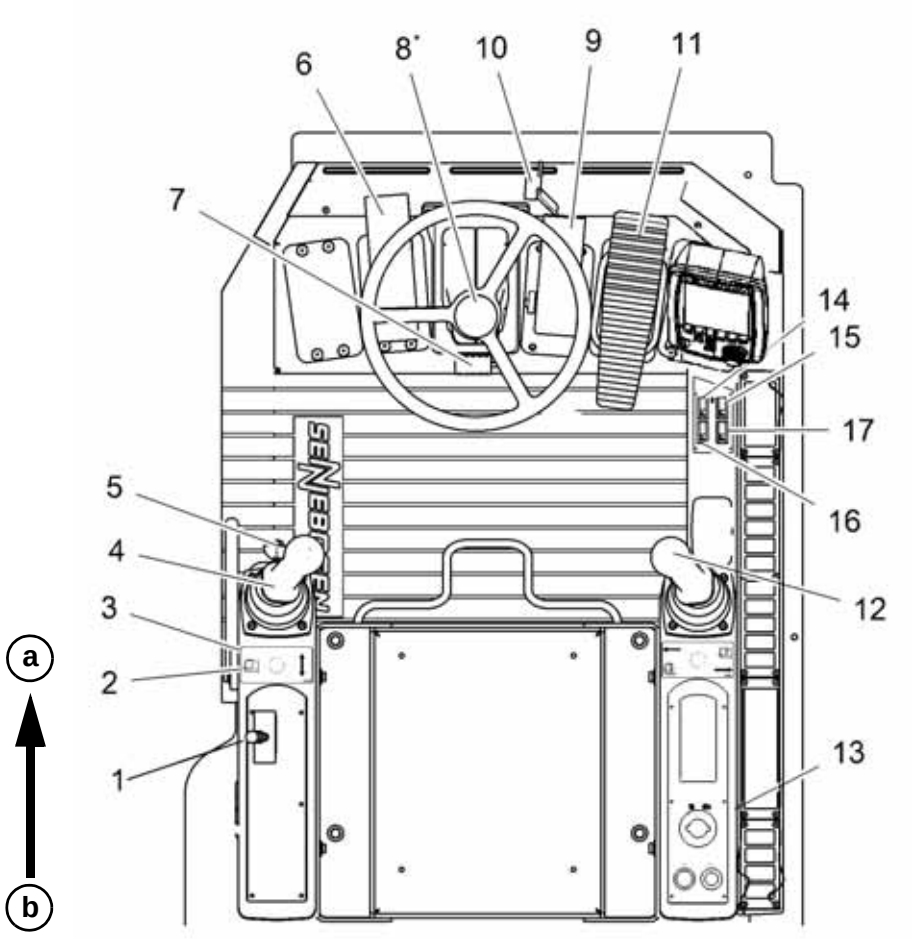
Incorrect

Correct

Illustration

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Extending the full outriggers



Item	Description
Total actuation	
1	Outrigger lever
a	Forward = extend
b	Back = retract (push lever as far as it will go)
Individual actuation	
Outrigger	
14	Front left
15	Front right
16	Rear left
17	Rear right

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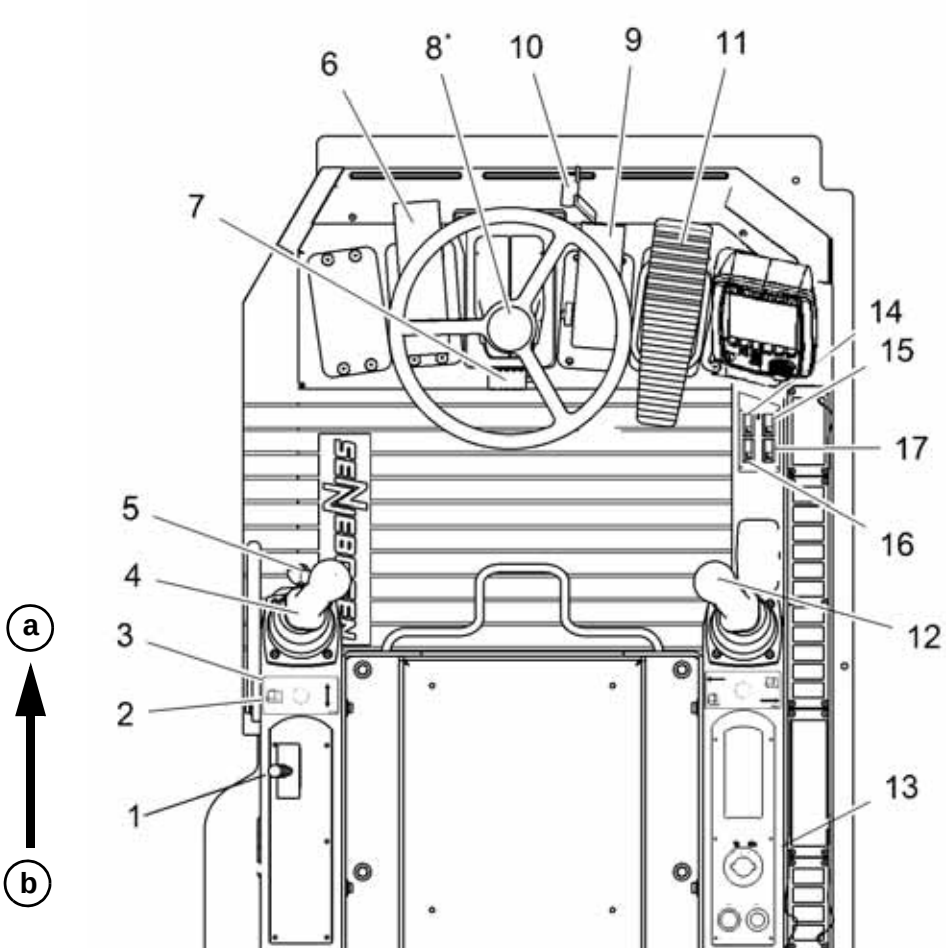
1	Apply the parking and service brakes.
2	Start the engine in accordance with Section 4.10.4.
3	Release the safety lever (see Section 6.3.2).
4	Lock the floating axle with the switch on the front right of the control panel (the lamp in the switch does not light up).
5	Push the lever for actuating all supports (1) forward until the outriggers are extended completely. Then pull the lever back until the wheels are in contact with the ground.

Extend single outrigger (optional)

1	Apply the parking and service brakes.
2	Start the engine in accordance with Section 4.10.4.
3	Release the safety lever (see Section 6.3.2).
4	Lock the floating axle with the switch on the front right of the control panel (the lamp in the switch does not light up).
5	On uneven ground, make sure to level the machine by using the individual outrigger feet. – Press the switch (14) (and hold pressed) and simultaneously press the lever (1) forwards. Release the switch (2). – Press the switch (15) (and hold pressed) and simultaneously press the lever (1) forwards. Release the switch (3). – Press the switch (16) (and hold pressed) and simultaneously press the lever (1) forwards. Release the switch (5). – Press the switch (17) (and hold pressed) and simultaneously press the lever (1) forwards. Release the switch (4).

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Retracting the outrigger



1	Apply the parking and service brakes.
2	Start the engine in accordance with Section 4.10.4.
3	Release the safety lever (see Section 6.3.2).
4	Press the lever completely and (1) pull back.
5	Retract the outrigger up to 75%
6	Fold in the fork hook manually (danger of collision with the upper structure)
7	Retract the outrigger completely
8	Check that all four outriggers are retracted completely.

DANGER
Observe reduced lifting capacities for a machine that is not stabilized!
For lifting capacities see Section 3.5 Working loads.

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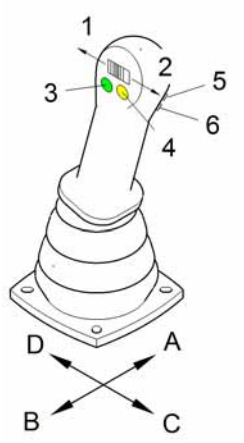
NOTE
To make sure the outrigger is retracted evenly, the lever (1) must be pulled back once briefly as far as it will go. Afterwards, the retraction speed can be selected as needed.

6.5.6 Swinging/decelerating the upper structure

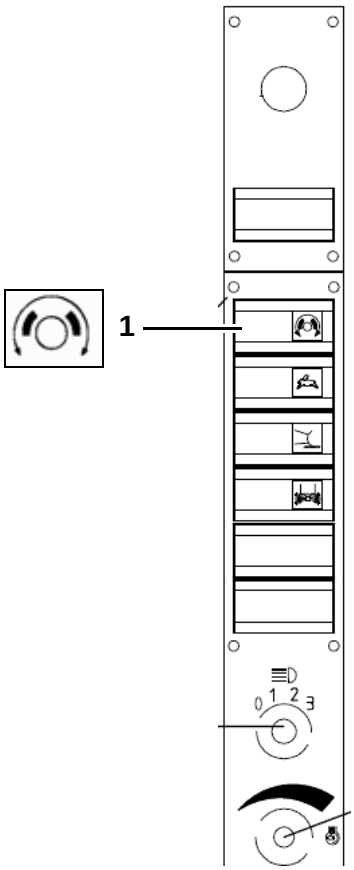
The upper structure is swung using the *left* control lever.

DANGER
Danger of tipping!
Never swivel machines with long equipment and additional ballasting without an outrigger.

WARNING
Never rotate the upper structure when the swing gear holding brake is applied!



Left control lever



1 Swing bearing holding brake switch

D Swing upper structure, left

C Swing upper structure, right

*: Optional model/special function

Note
In order to swing the upper structure, the drive engine must be switched on, the safety lever must be released (pressed forward) and the swing bearing holding brake switch “right” must be pressed.

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If only one of these criteria is not met, swinging is impossible.

Swing speed

The swing speed is dependent on the:

- Speed of the drive engine
- Deflection of the left control lever.

DANGER

No persons, buildings or machines may be within the swing range of the upper structure (danger area).

The swing speed must be appropriate to the situation. An excessively high swing speed presents a risk of tipping.

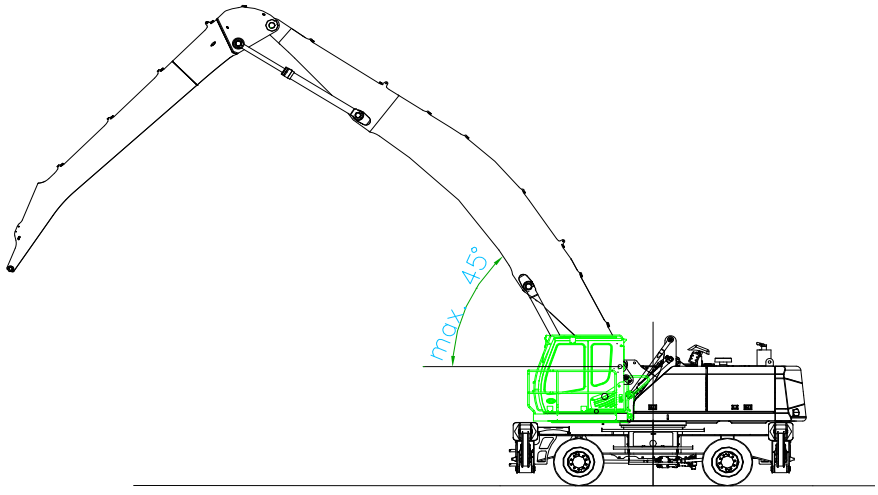
Stopping the swinging motion (decelerate)

1	Place the left control lever in the neutral position (0-position). The upper structure is braked hydraulically. The swinging movement gradually stops. Note: countersteering with the control lever increases the force with which the brake is applied.

DANGER

Danger of tipping

If the upper structure is turned when the machine is unsupported, the compact boom may only be raised to a maximum of 45 degrees.



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Swing bearing holding brake

The swing bearing holding brake serves exclusively as a parking and holding brake when the upper structure is at rest.

WARNING

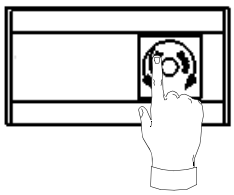
The swing bearing holding brake is not a service brake for decelerating the upper structure. If the swing bearing holding brake is used to decelerate the upper structure, serious damage will be caused to the brake or the swing gear. This damage can be of the following nature:

- Slackened braking effect due to clutch plate damage
- Irreparable damage to the brake or other components
- Irreparable damage to the swing bearing

This damage is excluded from the terms of the warranty issued by SENNEBOGEN Maschinenfabrik GmbH.

The operator of the machine alone is liable for such damage as well as any consequential damage — for instance, damage resulting from reduced braking action!

Switch position 1 = Automatic operation



Preselection of the swing bearing brake, which engages at the start or at the end of an action:

– When the upper structure is stationary, the swing bearing brake engages automatically.

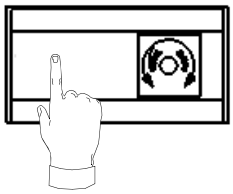
– When the upper structure swings, the swing bearing brake disengages automatically.

– The following symbol appears in SENCON:

If the speed sensor on the swing motor does not issue a signal for 4 seconds, the swing brake engages automatically 12 seconds after the last message of a swing process.

Switch position 1 = Swing bearing brake applied
(LED switch lights up)

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Preselection of the swing bearing brake, which engages at the end of an action:

- When the upper structure is stationary, the swing bearing brake engages automatically.
- The following symbol appears in SENCON: 
- To release the swing bearing brake, switch to **Switch position 0 = Automatic operation**.

Note
If the safety lever is in its upper position, the swing bearing brake is activated. When the safety lever is in its lower position and **Automatic operation** is activated, the swing bearing brake can be released.

WARNING
Never rotate the upper structure when the swing gear holding brake is applied!

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6.5.7 Moving the machine (crawler undercarriage)

DANGER
Danger of accident due to faulty operation!

If the boom is positioned above the drive wheel, the drive movements of the machine are reversed. Proceed with utmost caution when working above the driving wheel or want to move the machine.

CAUTION
Significant material damage is possible!
Driving over raised or lowered obstacles such as thresholds, rails, or curbs can cause high point loadings for the track frame, the idlers, the chains, etc. This can cause cracking and breaking of the tracking components (e.g. idlers).
Driving over such hindrances e.g. ties, rails, curbs, etc. is not permitted! SENNEBOGEN accepts no liability for damage resulting from such non-intended use!
Travel operation is only permitted on even, smooth and preferably concrete (concrete slabs) paths/streets! Pay attention to ground load capacities.

Moving with suspended load

Comply with the following instructions when moving with a suspended load:

- Danger of tipping! Keep loads as close to the ground as possible when moving.
- Always position boom lengthwise to the undercarriage.
- Only attach 50% of the rated lifting capacity.
- Mast (option) – only move the machine lengthwise and without load.
- Only drive on even ground with sufficient load-bearing capacity.
- Lock the floating axle.
- Reduce pendulum movements of load by sensitive driving.
- Negotiate corners with as wide a radius as possible.

Joystick steering (option)

The machine is driven using both control levers. The left-hand traveling gear is controlled with the left-hand control lever. The right-hand traveling gear can be controlled with the right-hand control lever.



1 Changeover – control equipment / move machine

To enable the control lever for the function *move machine* press the switch (1).

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Note
The normal function of the control lever (lift up/down and extend/retract jib) is switched off.

DANGER
Before beginning work, check which function of the control lever has been enabled.

Crawler steering

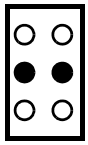
The machine is driven by manipulating the two hand levers attached to the two driving pedals. The left drive pedal/hand lever controls the left traveling gear. The right-hand traveling gear can be controlled with the right-hand drive pedal/hand lever.

Joystick and crawler steering

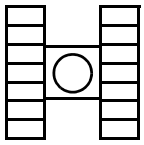
The following description applies if the boom is positioned above the idler.

Stopping the machine

Setting
Drive pedal/hand lever:



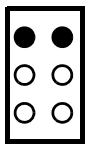
Travel gear movement:



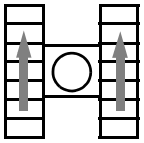
Release drive pedals/hand levers.
The drive pedals/hand levers automatically return to the middle position (neutral).

Forward – drive straight ahead

Setting
Drive pedal/hand lever:



Travel gear movement:

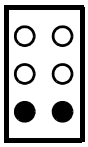


Push both drive pedals/hand levers forwards.

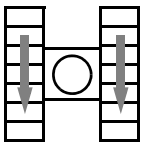
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Reverse – drive in a straight line

Setting
Drive pedal/hand lever:



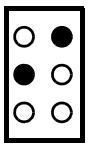
Travel gear movement:



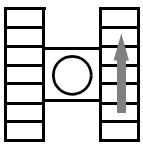
Pull both drive pedals/hand levers back.

Forwards – drive to the left

Setting
Drive pedal/hand lever:



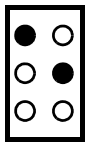
Travel gear movement:



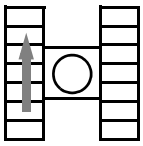
Leave *left* drive pedal/hand lever in middle position (neutral).
Push *right* drive pedal/hand lever forward.

Forward – drive to the right

Setting
Drive pedal/hand lever:



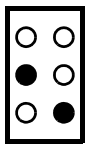
Travel gear movement:



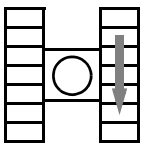
Push *left* drive pedal/hand lever forward.
Leave *right* drive pedal/hand lever in middle position (neutral).

Reverse – drive to the left

Setting
Drive pedal/hand lever:



Travel gear movement:



Leave *left* drive pedal/hand lever in middle position (neutral).
Push *right* drive pedal/hand lever back.

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Reverse – drive to the right

Setting Drive pedal/hand lever: *Travel gear movement:*



Push *left* drive pedal/hand lever back.
Leave *right* drive pedal/hand lever in middle position (neutral).

Slew left – at a standstill

Setting Drive pedal/hand lever: *Travel gear movement:*



Push *left* drive pedal/hand lever back.
Push *right* drive pedal/hand lever forward.

Slew right – at a standstill

Setting Drive pedal/hand lever: *Travel gear movement:*



Push *left* drive pedal/hand lever forward.
Push *right* drive pedal/hand lever back.

Note
More extensive information on steering is provided in Section 6.3.

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6.5.8 Changing crawler track width (mechanical)

General information

You can alter the track width of the machine:

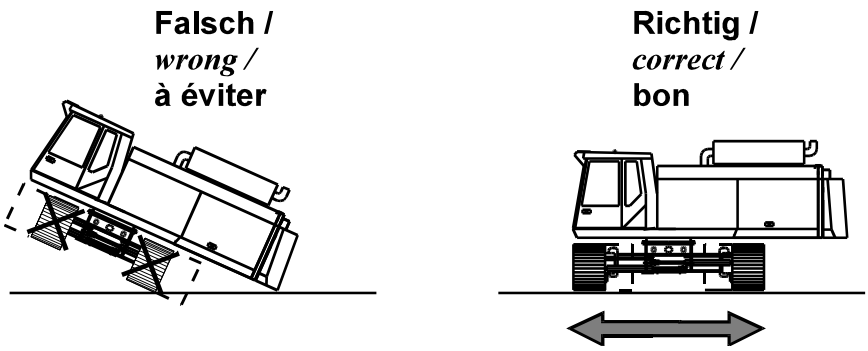
- When deployed and during maintenance and servicing, always extend the running gear to the maximum track width and secure.
- The running gear track width can be reduced in order to transport the machine on a flatbed trailer. If necessary, remove extension pieces.

Safety instructions

Comply with the safety instructions before starting to telescope the running gear.

DANGER

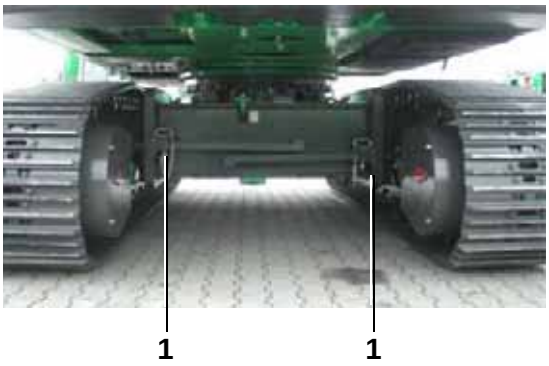
- Danger of accident through tipping of machine!
  Never slew the upper structure when the running gear is retracted and the operating equipment has been removed.



- Before telescoping, position the upper carriage parallel to the undercarriage and apply the rotating mechanism brake to prevent twisting.
- Do not rotate the upper carriage during the telescoping procedure.
- The machine is ready to operate after the running gear has been extended, pinned and secured. Hydraulic cylinders offer no degree of security. The running gear may move in the event of leaks or seal failures.

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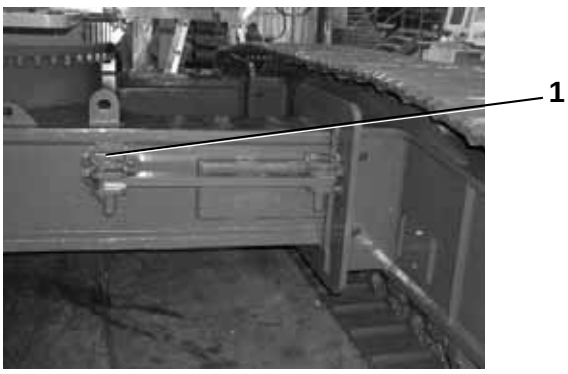
Extending the running gear



1	Unlock and remove the 4 locking bolts (1) on the telescoping running gear of the undercarriage.



2	Fasten a sufficiently rated suspension gear (2) on the track wheel carrier.
3	Pull the track wheel carrier out to the stop with a suitable towing machine.



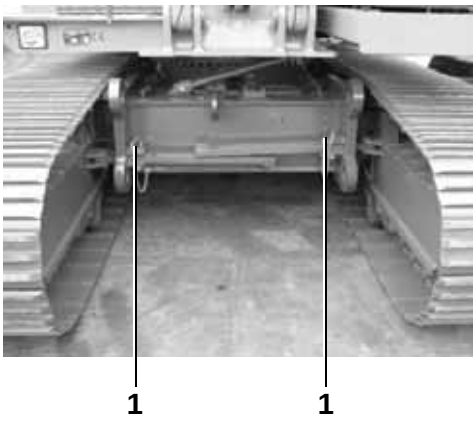
4	Reinsert the 4 locking bolts (1) and secure.

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Retracting the running gear



1	Unlock the 4 locking bolts (1) on the extension gear for the telescope of the undercarriage and remove.
2	Push the track wheel carriers together.



3	Reinsert the 4 locking bolts (1) and secure.

DANGER
Danger of accident through tipping of the machine!
The machine is not operational with retracted running gear.

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6.5.8

6.5.9 Changing the crawler track width (hydraulic – optional)

General information

You can alter the track width of the machine:

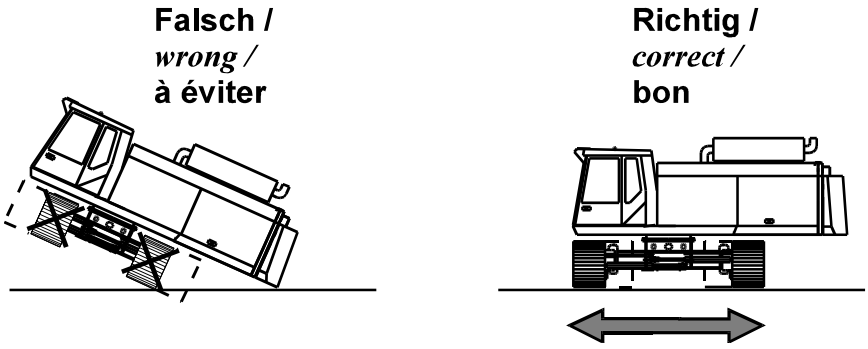
- When deployed and during maintenance and servicing, always extend the running gear to the maximum track width and secure.
- The running gear track width can be reduced in order to transport the machine on a flatbed trailer. If necessary, remove extension pieces.

Safety instructions

Comply with the safety instructions before starting to telescope the running gear.

DANGER

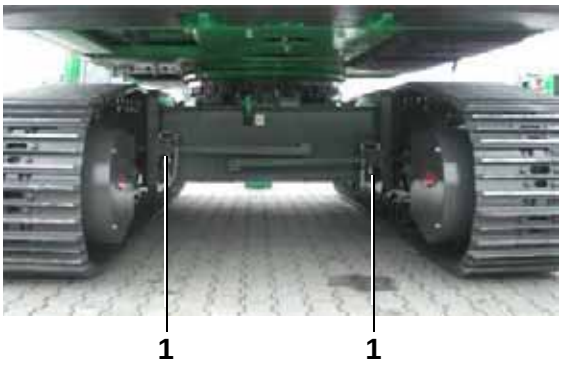
- Danger of accident through tipping of machine!
  Never slew the upper structure when the running gear is retracted and the operating equipment has been removed.



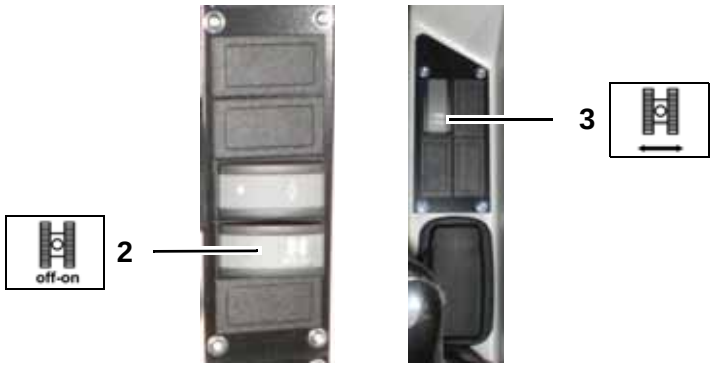
- Before telescoping, position the upper carriage parallel to the undercarriage and apply the rotating mechanism brake to prevent twisting.
- Do not rotate the upper carriage during the telescoping procedure.
- The machine is ready to operate after the running gear has been extended, pinned and secured. Hydraulic cylinders offer no degree of security. The running gear may move in the event of leaks or seal failures.

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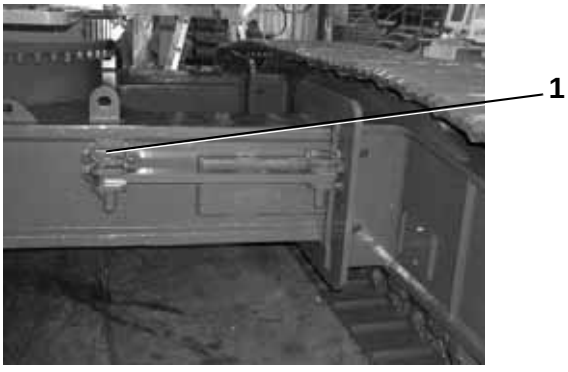
Extending the running gear



1	Unlock and remove the 4 locking bolts (1) on the telescoping running gear of the undercarriage.



2	Enable telescoping with switch (2).
3	Use switch (3) to extend the undercarriage.



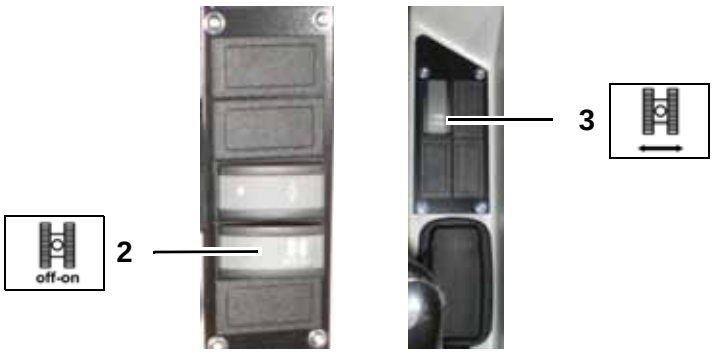
4	Reinsert the 4 locking bolts (1) and secure.
5	Disable the telescoping function with switch (2).

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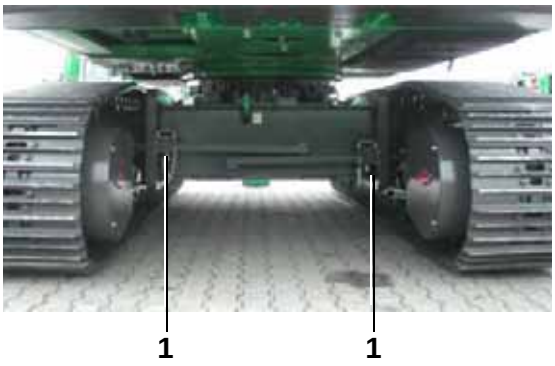
Retracting the running gear



1	Unlock the 4 locking bolts (1) on the extension gear for the telescope of the undercarriage and remove.



2	Enable telescoping with switch (2).
3	Use switch (3) to retract the undercarriage.



4	Reinsert the 4 locking bolts (1) and secure.

DANGER
Danger of accident through tipping of the machine!
The machine is not operational with retracted running gear.

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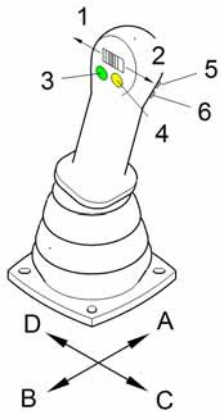
6.5.10 Hoisting/lowering loads

Follow the following safety instructions:

DANGER

- Risk of accident as a result of suspended loads!
  Always lower the load when work is interrupted.
  Never leave the driver's cab when a load is suspended.
- Activate the overload warning device
- Do not carry out any form of work that will reduce the stability of the machine.
- Attachments (e.g. grab) and load elements can rock. Proceed with extreme caution.
- Observe the danger area.

The load is raised/lowered via the *left* control lever and/or via the *right* control lever.





Control lever, left		Control lever, right	
Directions of movement			
A	Lift load (stick out)	H	Lower load (hoist down)
B	Lower load (stick in)	G	Lift load (hoist up)

Stick speed

The stick speed depends on the:

- Speed of the drive engine
- Deflection of the left control lever.
- Load on the end of the stick

Hoisting speed

The hoisting speed depends on the:

- Speed of the drive engine
- Deflection of the right control lever.
- Load on the end of the stick

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6.5.11 Limit shutdown equipment

The limit shutdown prevents the hydraulic cylinders from striking against the limit stops.

DANGER
Never change the limit shutdown settings set at the factory! Adjustment to the setting may be carried out only by SENNEBOGEN Customer Service or an authorized SENNEBOGEN Service Partner!

The following damage can occur if the operator adjusts the limit shutdown on his own:

- Wear in the cylinder mounting bearings and boom.
- Damage to the hydraulic cylinder.
- Increased machine wear.

This damage is excluded from the terms of the warranty issued by SENNEBOGEN Maschinenfabrik GmbH.

The operator of the machine alone is liable for such damage as well as any consequential damage!

Safety limit shutdown for “Retract stick”

The safety limit shutdown “retract stick” is set at the factory as follows:

- Retract stick: stick (without attachment) approx. 2.5 m in front of the lowered cab



Item	Description
1	Compact boom
2	Sensor element
3	Grab stick

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DANGER
Danger to life if the safety limit shutdown for “Retract stick” is set incorrectly!

Attachments or parts of the load can strike and penetrate the cab. Always adjust the basic factory setting to the particular attachment (e.g. grab). The operator alone is responsible for operation of the machine with an incorrectly set safety limit shutdown for “Retract stick”!

Auxiliary limiting



Using the optional Auxiliary limiting you can limit the “Extend stick” or “Hoist up”. This is useful

- In the vicinity of power lines (see
- In buildings with limited headroom
- Under bridges
- When working with attachments not supplied by SENNEBOGEN



Note

The following safety limit shutdowns can be used optionally:

- “Extend stick”
- “Boom up” (hoist up)
- “Boom down” (hoist down)

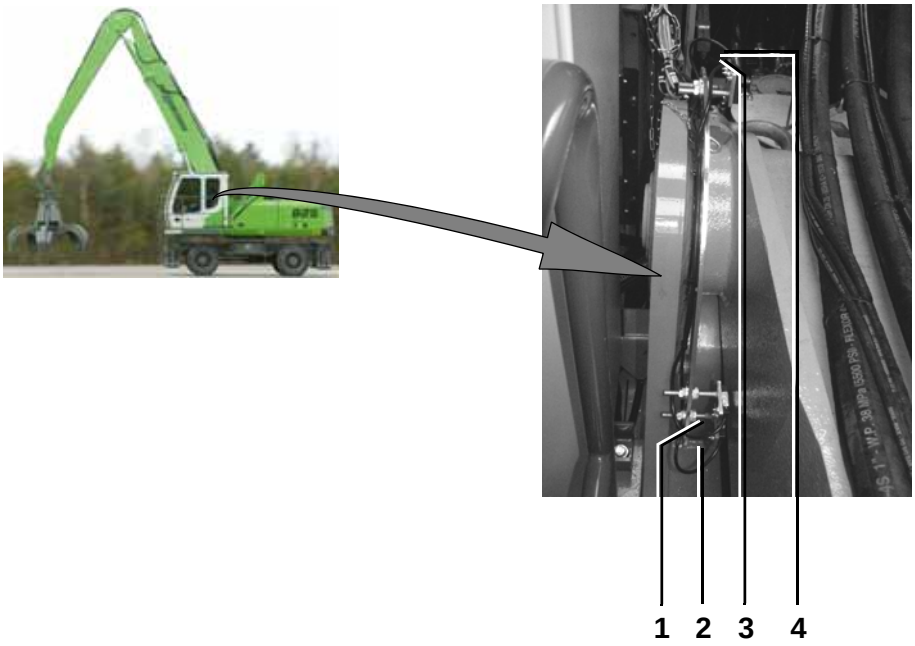


Note
The optional auxiliary limiting cannot be bypassed.

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Auxiliary limiting — hoist

Option



1	Auxiliary limiting “Hoist down” (optional)
2	Limit shutdown — Hoist down
3	Auxiliary limiting “Hoist up” (optional)
4	Limit shutdown — Hoist up

DANGER
Never change the limit shutdown (2, 4) setting set at the factory! Adjustment to the setting may be carried out only by SENNEBOGEN Customer Service or an authorized SENNEBOGEN Service Partner!

With auxiliary limiting installation — set the hoist as follows:

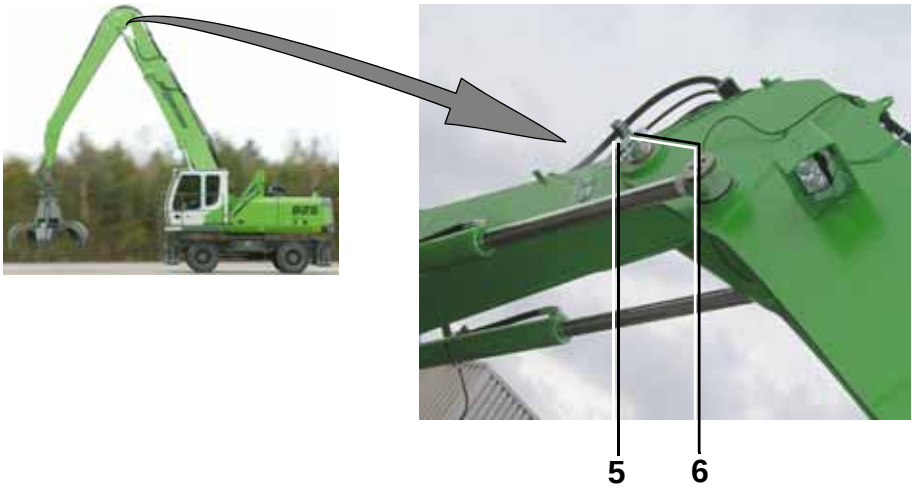
1	Raise the compact boom carefully to just below the maximum height/depth limit (maintain safety clearance!).
2	Loosen the hexagonal nuts for auxiliary limiting (1) or (3).
3	Auxiliary limiting (1) or (3) are to be moved until the sensors are triggered (LED on sensor goes out).
4	Tighten the hexagonal nuts for auxiliary limiting (1) or (3).
5	Switch the Auxiliary limiting flip switch on at the control panel.
6	Check the setting carefully and repeat if necessary.

Note
The optional auxiliary limiting (1,3) cannot be bypassed.

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Auxiliary limiting — extend stick

Option



5	Auxiliary limiting “Extend stick” (optional)
6	Limit shutdown “Extend stick” (optional)

DANGER
Never change the limit shutdown (6) setting set at the factory! Adjustment to the setting may be carried out only by SENNEBOGEN Customer Service or an authorized SENNEBOGEN Service Partner!

With auxiliary limiting installation — set the stick as follows:

1	Raise the stick carefully to just below the maximum height limit (maintain safety clearance!).
2	Loosen the hexagonal nuts for auxiliary limiting (5).
3	Adjust the auxiliary limiting (5) until the sensors respond (LED on sensor goes out).
4	Tighten the hexagonal nuts for auxiliary limiting (5).
5	Switch the *Auxiliary limiting* flip switch on at the control panel.
6	Check the setting carefully and repeat if necessary.

Note
The optional auxiliary limiting (5) cannot be bypassed.

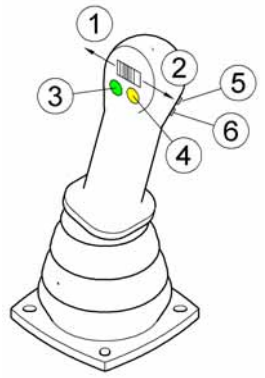
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6.5.12 Bypassing the safety limit shutdown

In exceptional circumstances, it may be necessary to move the stick beyond the safety limit shutdown (bypass safety limit shutdown).

Note

The optional auxiliary limiting cannot be bypassed.



Joystick, left

Item	Description
6	Boom shutdown bypass

DANGER
Danger to life through overriding the safety limit shutdown!

1	Press and hold the push button (6) on the left control lever.
2	Move the control lever in the respective direction with extra care depending on the work function (retract/extend stick, hoist up/down). See also Section 6.3.3 and Section 6.3.4.

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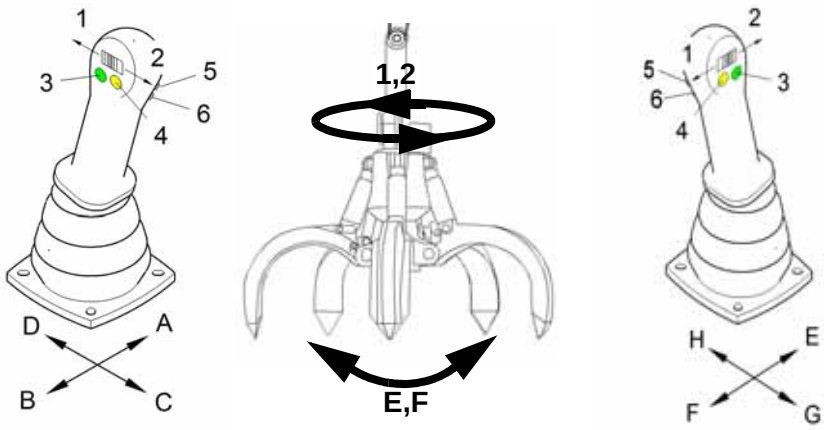
6.5.13 Operation with the grab

Follow the following safety instructions:

WARNING

- Risk of accident as a result of suspended loads!
  Always lower the load when work is interrupted.
  Never leave the driver's cab when a load is suspended.
- Activate the overload warning device.
- Do not carry out any form of work that will reduce the stability of the machine.
- Attachments (e.g. grab) and load elements can rock. Proceed with extreme caution.
- Observe the danger area.

The grab is opened/closed using the *right* control lever and swung using the potentiometer on the *left* control lever.



Grab motions

1 Swinging, left

2 Swinging, right

Directions of movement:

E Open grab

F Close grab

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6.5.14 Operation with the generator and magnet unit (special function)

Follow the following safety instructions:



WARNING

- Connection and assembly work on electrical installations must only be performed by trained specialists and must be performed in accordance with the applicable national regulations.
- Connection and assembly work on electrical installations must only be performed when the installations are switched off and de-energized. Risk of fatal injury as a result of an electric shock! Drive units that are switched off must be secured against involuntary re-starting (e.g. by removing and storing away the ignition key)!
- Never connect the generator system to the public mains system or to other power generation systems. Never connect several generator systems together. Risk of fatal injury and damage!
- The generator system is designed for permanent installation. Start-up is prohibited until it has been established that the entire system complies with the provisions of all applicable guidelines.
- Only operate the system with protective covers for the drive; these must be fitted in accordance with the applicable regulations. Danger of injury!
- Never perform visual inspections for maintenance purposes or cleaning work on the generator system during operation. Switch off the drive machine in advance and ensure that it cannot be started unintentionally (e.g. by removing and storing away the ignition key). Risk of fatal injury as a result of an electric shock!
- Earthing the load line (positive or negative conductor) of the generator cancels out the “protective isolation” safety measure and is therefore prohibited.
- The strong electromagnetic fields of the magnetic plate can temporarily affect the functionality of pacemakers. People with pacemakers must not perform service work on the generator system and must maintain an adequate safety clearance to the magnetic plate.
- Parts of the generator can become very hot during and after operation. Danger of burns!

During operation, the generator supplies potentially fatal electrical voltages! Never touch the generator itself or the devices connected to the generator with wet hands during operation. Risk of fatal injury as a result of an electric shock!

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DANGER

- Danger to life!
  Risk of accident as a result of suspended loads!
  If the magnet system fails, the load will fall.
  Always lower the load when work is interrupted.
  Never leave the driver's cab when a load is suspended.
- Activate the overload warning device and check that it is operating properly.
- During operation, dangerous voltages can occur.
- Inserting or removing plugged connections during operation is not permitted.
- Assembly/start-up of the generator as well as maintenance and service work on the magnet unit are to be performed only by authorized and qualified specialists.
- Before using the magnet unit, read the manual.
- Use permitted accessories only. For more information, please contact SENNEBOGEN Customer Service.
- Operation is only allowed with magnetic plates: other applications are unauthorized.
- Observe operating data.
- Cleaning with a high-pressure washer (steam cleaner) is not allowed.
- The openings for the condensation vent must be at the lowest point.
- Observe further safety guidelines.
- No alterations may be made to the generator (e.g. location, drive type).

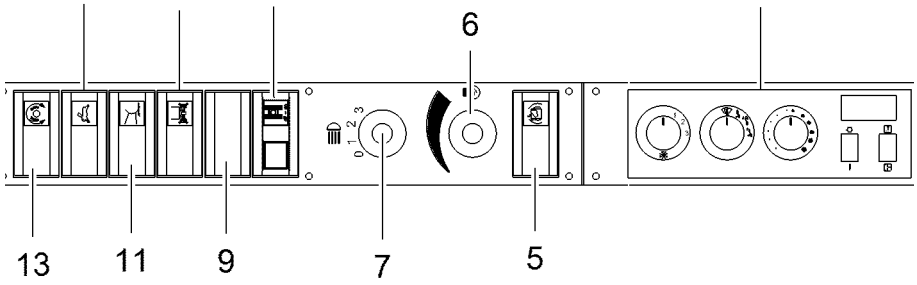


CAUTION

- If the magnet unit is not switched off after use, the entire system (generator and magnetic plate) can overheat.
- The generator must not be used in potentially-explosive environments!
- Never switch on the magnetic plate unless it is required for the work being performed. Material can be unintentionally pulled into an activated magnetic plate suspended in the air.
- Neither the system itself nor the individual system components may be modified. Any modification, incorrect repair or use of inappropriate third-party parts will invalidate any warranty claims. SENNEBOGEN Maschinenfabrik GmbH accepts no liability in this instance.
- Never expose the components of the generator system to high-pressure cleaning jets. Danger of destruction!

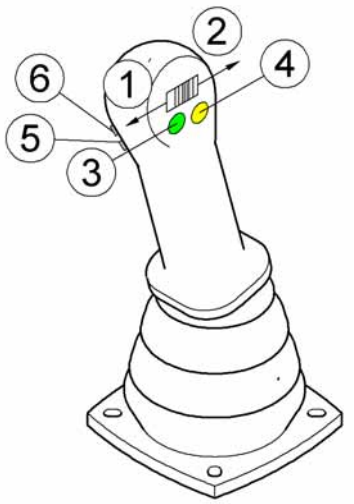
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Operation



1	Start the engine in accordance with Section 4.10.4.
2	Set the RPM adjustment (6) on the right rear control panel to maximum.
3	Set the magnet according to the load material.

WARNING
Ensure that the permitted load limits are not exceeded.



4	Switching on the magnet unit: – Actuate the switch on the upper right control panel. The following symbols appear in SenCon:  – Press the front pushbutton (4) on the right-hand control lever. The following symbols appear in SenCon: 

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5	Deposit the load: – Press the pushbutton (3) or *(4) (* customer-specific switch allocation) The following symbols appear in SenCon: 
	6 Switch off the magnet unit. – Actuate the switch on the control panel.

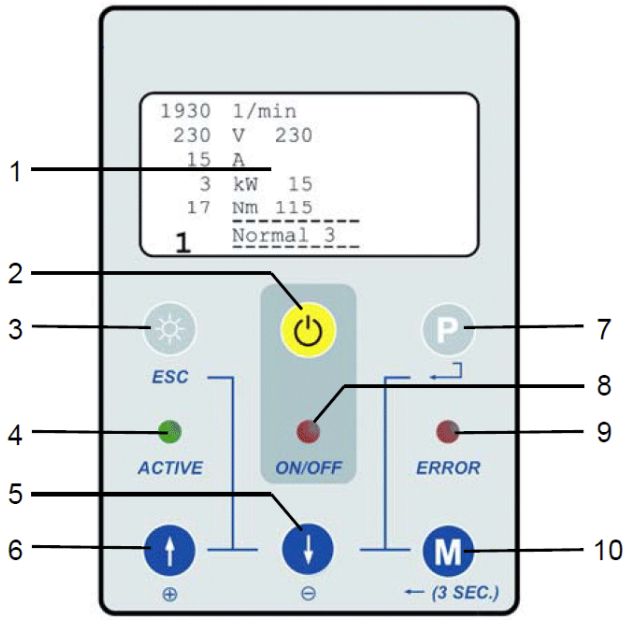


Note
The engine “start/stop” function is deactivated for as long as the magnet unit is switched on.

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Control unit SENNEBOGEN generator (optional)

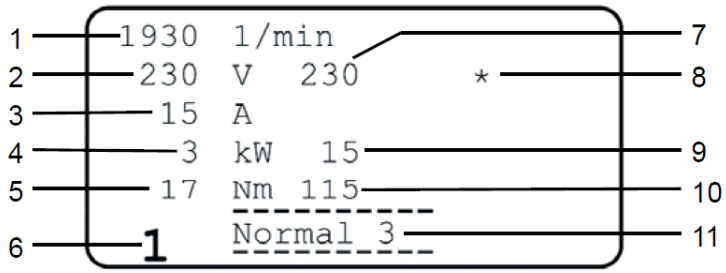
Overview of the control unit



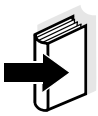
Designation	Function
Graphic display (1)	Displays system and operating data and error messages.
“Magnet” button (2)	Switches the magnet on and off.
“Display” button (3)	Adjusts the display brightness and the back lighting.
“ACTIVE” LED (4)	Lights up when the system is ready for operation.
“Minus” button (5)	- Reduces values. - Displays the previous page.
“Plus” button (6)	- Increases values. - Displays the subsequent page.
“Program selection” button (7)	Selects a pre-set program.
“ON/OFF” LED (8)	Lights up when the magnetic plate is switched on.
“ERROR” LED (9)	Lights up when there is a fault.
“Menu” button (10)	Toggles between programming and diagnostic mode (press and hold the button for three seconds).

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Overview of the display



Designation	Function
Speed (1)	Displays the current drive speed of the generator.
Magnetic voltage (2)	Displays the magnetic voltage currently being applied.
Magnetic current (3)	Displays the present current measured on the magnetic plate.
Power consumption (4)	Displays the current power consumption on the magnetic plate.
Torque (5)	Displays the current torque on the generator drive.
Program display (6)	Displays the selected program.
Magnetic voltage preselection (7)	Displays the set maximum magnetic voltage (for special applications with reduced magnetic force).
Programming mode (8)	Programming mode active. The parameter marked “*” can be selected for processing.
Magnetic power preselection (9)	Displays the set maximum magnetic power (load limit sensing control).
Torque preselection (10)	Displays the set maximum torque.
Plain text display (11)	Displays system and operating statuses as well as error messages.



Note
Additional information on the control unit (4) can be found in Chapter 10.

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6.5.15 Working with scrap metal shears (special function)

Follow the following safety instructions:

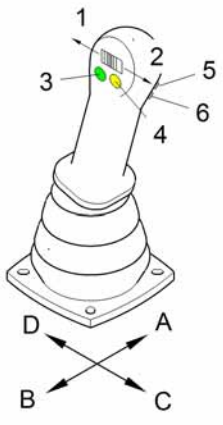
WARNING

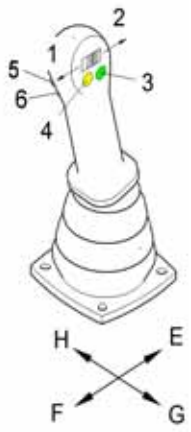
- Risk of accident as a result of suspended loads!
  Always lower the load when work is interrupted.
  Never leave the driver's cab when a load is suspended.
- Activate the overload warning device.
- Do not carry out any form of work that will reduce the stability of the machine.
- Attachments (e.g. scrap metal shears) and load elements can swing. Proceed with extreme caution.
- Observe the danger area.

CAUTION

Select the correct rating in *SENCON* (see Section 6.4.1).

The scrap metal shears are opened/closed using the *right* control lever and swung using the potentiometer on the *left* control lever.





Scrap metal shear motions:

1 Swinging, left

2 Swinging, right

Directions of movement:

F Close scrap metal shears

E Open scrap metal shears

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6.6 Refueling the machine

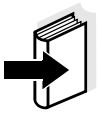
The machine can be refueled in two ways:

- Manually
- Using a refueling pump/refueling pump (mast).



DANGER

- Fuel is damaging to health and easily inflammable.
  Smoking or an open flame is strictly forbidden.
- Position the machine on a firm, even subgrade.
- Only refuel when the engine is shut down.
- Fuel must not ingress ground or waterways.
  Always ensure that no fuel overflows during refueling.
- Before filling, the fluid level in the tank must be determined, and thus how much more fuel the tank can hold.
- When refueling from a tanker: the maximum filling speed is 200 l/min. (52 US gpm); if the filling speed is any higher, the fuel will overflow.
- The filling procedure must be monitored at all times, no matter how the filling is done.



Note

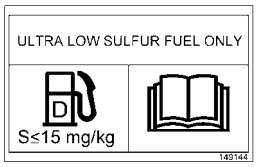
Observe the notes in the operating instructions of the engine manufacturer.

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Manually



1	Swivel the upper structure 30 degrees to the left.
1	Lower attached loads and the boom to the ground.
2	Shut down the engine.
3	Using the step (2), climb onto the step grid at the rear left.
4	Open the filler strainer cap (1).
5	Clean the strainer.
6	Insert a funnel in the filler strainer.
7	Carefully pour in fuel through the funnel.
8	Close the cover (1) again.

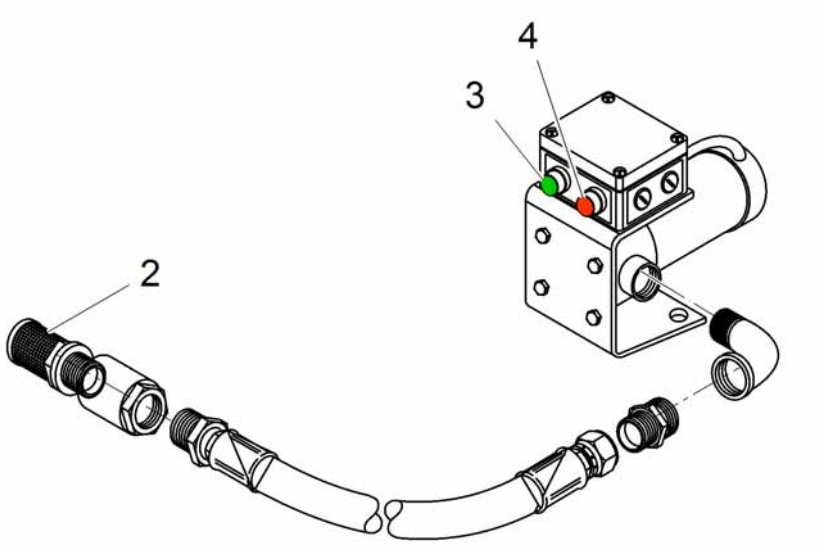


Using a refueling pump

1	Lower attached loads and the boom to the ground.
2	Shut down the engine.
3	Move the key switch to the “P” position.
4	Open the left rear service access door.
5	Open the filler strainer cap. This will allow air to escape from the fuel tank.

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DANGER
If the cap is not open, excess pressure can build up in the tank while it is being filled. The tank can become deformed or can burst and potentially cause damage to property or injure personnel. Spilled fuel also causes environmental damage.



6	Insert the refueling hose (2) in the external fuel container.

Note
Risk of cavitation!
Ensure that the maximum suction height of 3 m (3.28 ft) is not exceeded.

7	Switch on the refueling pump with the green button (3). The tank is filled automatically.

CAUTION
Ensure that the pump does not run dry (> 30 s).
Switch off the refueling pump with the red button (4) if necessary to prevent damage.

8	The refueling pump switches off automatically as soon as the tank is full.
9	Remove the refueling hose (2) from the external fuel tank and stow.
10	Re-close the cover of the filler strainer.
11	Close the service access door again.

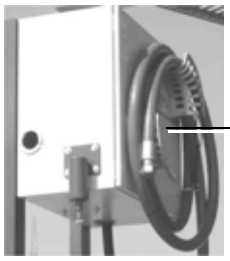
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Note
Check the following points if the refueling pump does not start after approx. 5 seconds:

1	Is the battery charged?
2	Are all fuses in order?
3	Is the suction side free of leaks?
4	Is the maximum suction height 3 m or less?

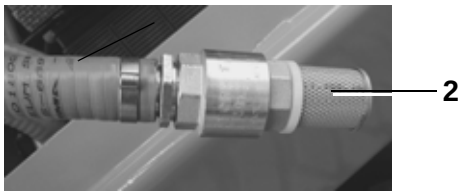
Using a refueling pump (mast)

1	Lower attached loads and the boom to the ground.
2	Shut down the engine.
3	Move the key switch to the “P” position.
4	Open the filler strainer cap. This will allow air to escape from the fuel tank.



*: Optional model/special function

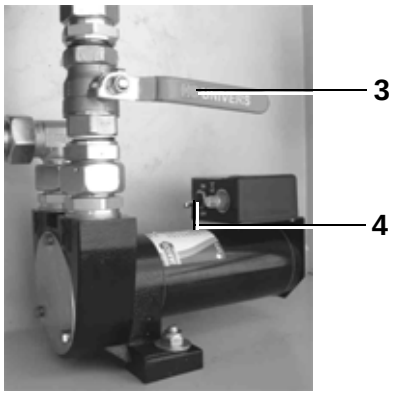
5	Open the doors (1) of the box for the refueling pump.



6	Insert the refueling hose (2) in the external fuel container.

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Note
Risk of cavitation!
Ensure that the maximum suction height of 3 m is not exceeded.



7	Move the lever (3).
8	Switch on the refueling pump with switch (4). The tank is filled automatically.

CAUTION
Ensure that the pump does not run dry (> 30 s).
Switch off the refueling pump with the switch (4) if necessary to prevent damage.

9	The pump switches off automatically as soon as the tank is full.
10	Remove the refueling hose from the external fuel tank and stow securely.
11	Re-close the cover of the filler strainer.
12	Re-close the service access doors.

Check the following points if the refueling pump does not start after approx. 5 seconds:

1	Is the battery charged?
2	Are all fuses in order?
3	Is the suction side free of leaks?
4	Is the maximum suction height 3 m or less?

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7 Transport

Preliminary tasks

Transport the machine using a flatbed trailer. Carry out the following preliminary tasks:

- Select a suitable transport vehicle.
  Note the dimensions (Section 7.1.1) and weights (Section 7.1.3) of the machine.
- Clean the machine.
- Place the boom and stick in the transport position.
- Lock the upper structure and undercarriage according to Section 7.1.5.
- Secure the outriggers in accordance with instructions.
- If necessary, take down attachments.

7.1 Safety instructions

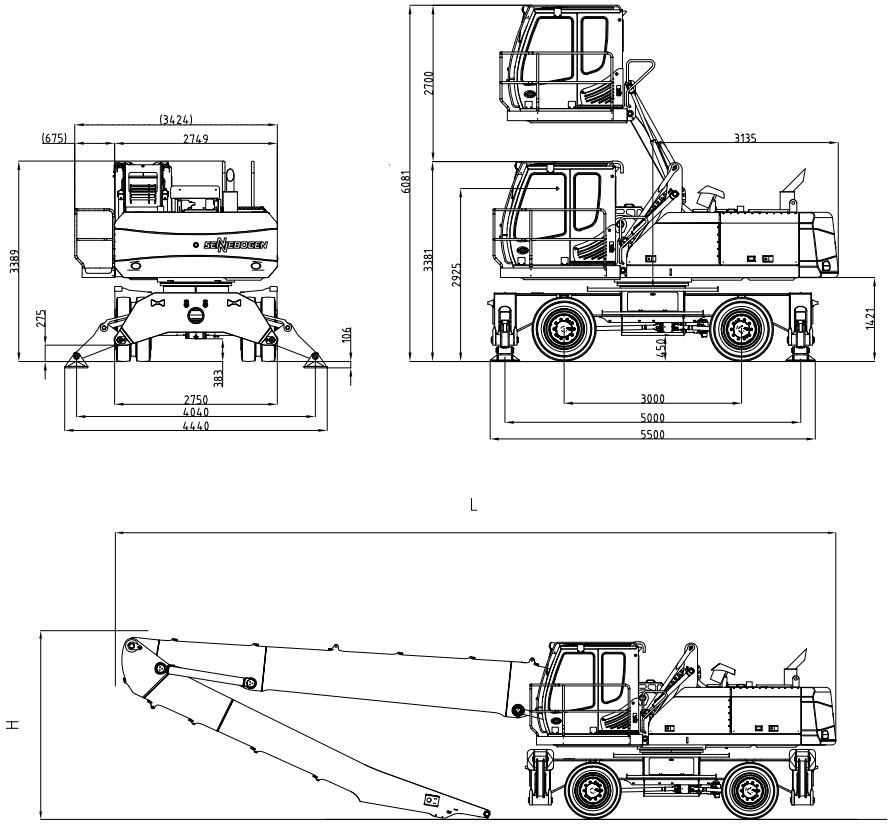


WARNING

- In Germany:
  Loading and transportation work is only to be carried out by authorized specialist personnel in accordance with VBG 40, §48 and Federal Motor Vehicle Safety Standards (StVo) §22.
- Observe relevant regulations for securing loads.
  The *respective transport operator is always responsible* for transporting the machine and accessories.
- When loading and transporting, secure the machine and its working equipment from involuntary motions.
- Clean mud, snow and ice from undercarriage of machine so that ramps can be accessed without danger of slipping.
- Provide flatbed trailer access ramps with wooden planks.
- Check the conditions of the route before starting the journey.
- Only transport the machine on intended securing and lifting points.
- Ensure that the machine does not present any hazards to other road users.
- Wear personal protective equipment (e. g. protective helmet, protective gloves, safety shoes).
- Report any damage that occurred during shipping to SENNEBOGEN customer service immediately.

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7.1.1 Machine dimensions

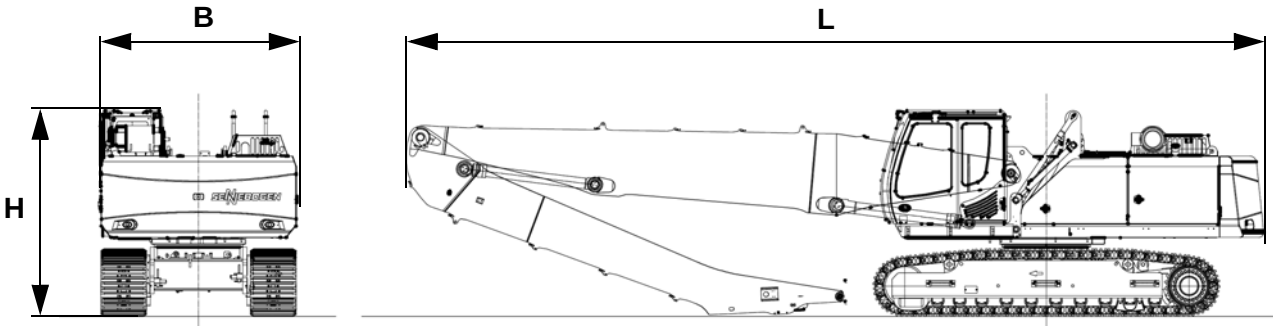


Measurement information [mm]

	Load boom	Grab stick	Transport length (L)	Transport height (H)
K15	8,5 m	7,0 m	12,45 m	3,40 m
K17	9,8 m	7,5 m	13,75 m	3,45 m
B16	9,4 m Banana	7,0 m	13,40 m	3,50 m
K14 Ulm	8,5 m	6,0 m	12,45 m	3,40 m

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7.1.2 Dimensions – crawler



Gesamtmaschine

	Load boom	Grabbing stick	Transport length (L)	Transport height (H)	Transport width (W)

Mast (optional)

	Transport length (L)	Transport height (H)

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7.1.3 Machine weight



Note
The machine weight may deviate from these figures due to optional attachments. The information includes the weight of the engine, the undercarriage and the compact loading equipment.

Machine with	Component	Weight
K 15	Machine	Approx. 36.0 t.

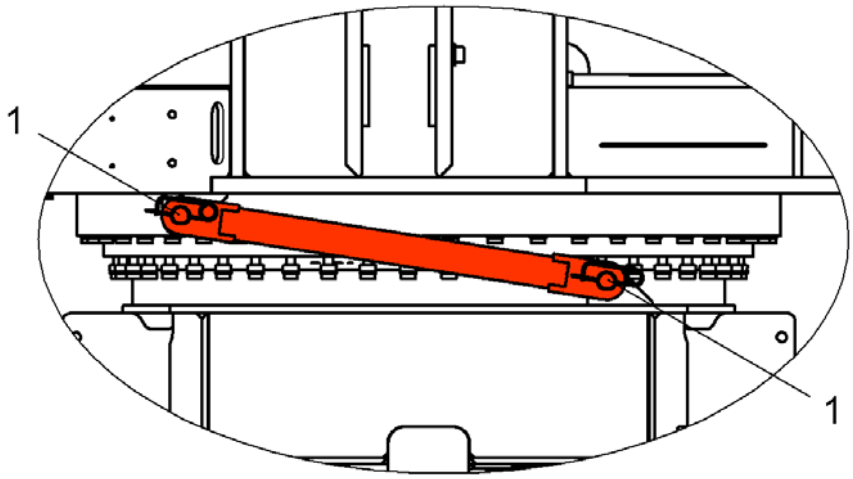
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7.1.4 Weight – crawler

Machine with	Components	Weight

7.1.5 Locking the upper structure

1	Move the upper structure in the direction of travel.
2	Engage the swing bearing holding brake.
3	Bolt and secure the locking rod (1) to the undercarriage and the upper structure.



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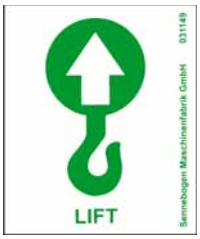
7.2 Raising the upper structure

Safety instructions

Observe the safety instructions before starting work.

DANGER

- Sling the upper structure only at the designated lifting points. The lifting points are marked yellow and have a green loading hook symbol.
- Ensure that the lifting equipment has a sufficient safe working load and stability is secure.



- The following is suitable lifting equipment:
  - Crane
  - Telescopic crane
- Ensure that the sling devices have sufficient safe working load and are intact.
- The following are suitable sling devices:
  - Chain suspension
  - Cable suspension
  - Round loops/sling devices
- Be careful of the danger zone!
  There must be no one next to, on or below the machine.

Procedure with counterweight



1	Select a suitable lifting crane and sling devices. Note the weight and center of gravity of the machine.
2	Fasten the sling devices on lifting points F_1 and F_2.
3	Hoist the upper structure carefully.

DANGER

The area below a suspended load must be kept clear!

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Lifting point weight

Weight at lifting points F_1 and F_2:

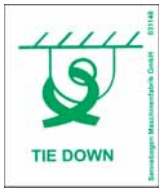
F_1	Approx. t
F_2	Approx. t
$F_{Tot.}$	= 38 t

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7.3 Tying down the machine

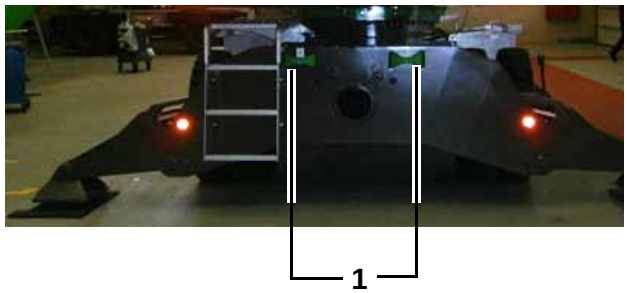
CAUTION

- Sling the machine at the designated tie-down points (1). The tie-down points are marked in green and are located on the undercarriage.
- Ensure that the sling devices have sufficient safe working load and are intact.
- Ensure that the machine is not damaged if additional securing is necessary.
- The *respective transport operator is always responsible* for transporting the machine and accessories.



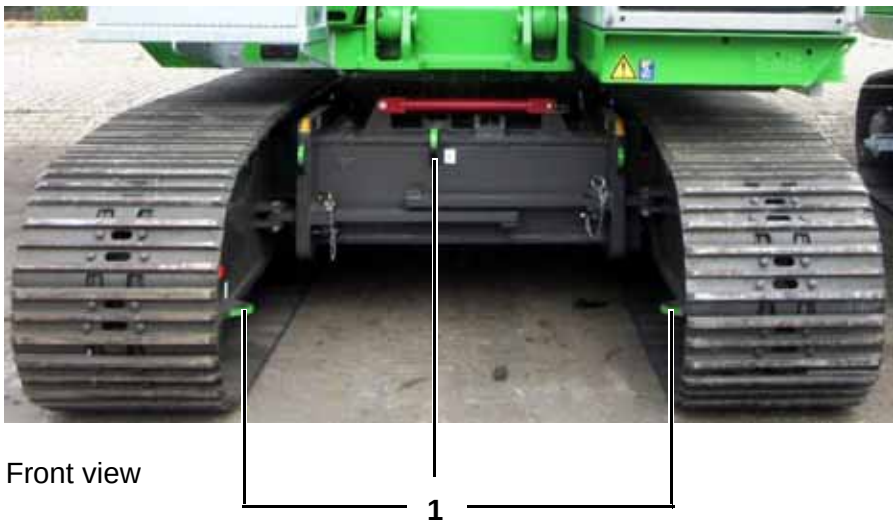


Front view



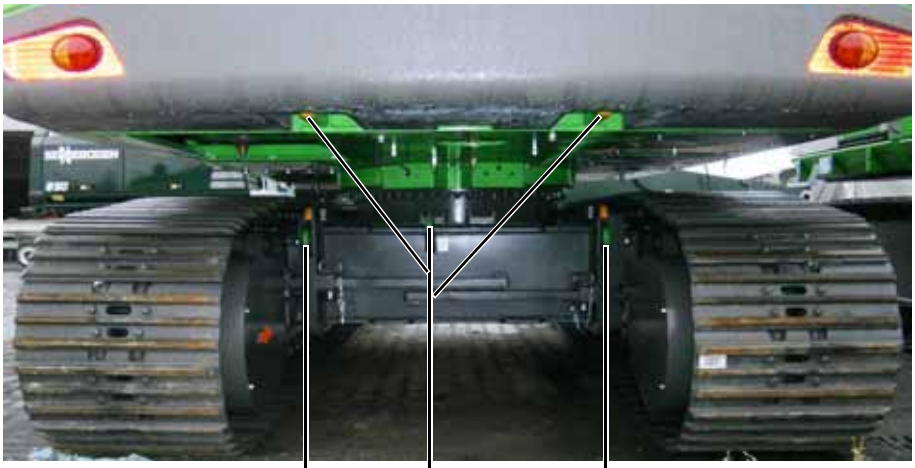
Rear view

Lashing the machine – crawler



Front view

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Rear view

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8 Troubleshooting



WARNING

- Please read CHAPTER 1 SAFETY.
- The personnel for maintenance, inspection and troubleshooting must have the appropriate qualifications for this work.
- For work not described in detail, please notify SENNEBOGEN Customer Service.

8.1 Driving engine

Engine does not start

Cause	Remedy
Battery power too low	– Recharge or replace the battery. – Start the machine using the auxiliary battery. – Ambient temperature too low.
Fuel tank empty	– Refuel the machine.

Engine power drops

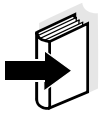
Cause	Remedy
Suction resistance too high (fuel)	– Exchange the filter in the water separator. – Use fuel pre-warming (at temperatures below 0°C)

Machine does not move

Cause	Remedy
Parking brake actuated	– Release the parking brake.
Gearbox defective	– Have the fault remedied.

Oil or fuel leaks from the engine

Cause	Remedy
Hose connections loose	– Tighten the hose connections.
Hoses or seals damaged	– Replace the hoses or seals.



Note
Observe the instructions in the engine manufacturer operating manual.

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8.2 Hydraulic system

Oil leaks from hydraulic system

Cause	Remedy
Hose connections loose	– Tighten the hose connections.
Hoses or seals damaged	– Replace the hoses or seals.

Hydraulic pump not working

Cause	Remedy
Fault in the pump circuit	– Have the fault inspected and corrected by a hydraulics specialist.

Operating equipment out of order or operating incorrectly

Cause	Remedy
Hydraulic oil level too low	– Check the hydraulic oil level. – Add hydraulic oil if required.
Leaks in the hydraulic system	– Check the working cylinder, connections and hoses for leaks. – Have the fault corrected by a hydraulics specialist.
Fault in one of the working circuits	– Have the fault corrected by a hydraulics specialist.

Noises when moving a working cylinder

Cause	Remedy
Piston rod of the cylinder has no lubrication	– Have the fault corrected by hydraulics specialist.

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No or low hydraulic system power

Cause	Remedy
Hose connections loose	– Tighten the hose connections.
Hoses or seals damaged	– Replace the hoses or seals.
Pressure relief valve opens too soon	– Have the fault corrected by a hydraulics specialist.
Hydraulic pump worn or defective	– Have the pump replaced by hydraulics specialist.

Noises in the hydraulic system

Cause	Remedy
Hydraulic pump takes in air	– Have the fault corrected by a hydraulics specialist.
Hydraulic pump delivers insufficient oil	– Check the hydraulic oil level. – Add hydraulic oil if required.
Pressure relief valve chatters	– Have the fault corrected by a hydraulics specialist.

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8.3 Heating system

Fan not working

Cause	Remedy
Fuse defective or loose	– Check the fuse seating and insert correctly if necessary. Replace the defective fuse. If another defect occurs shortly, it indicates a short-circuit or a blockage. Check the fan for blockages or other defects and rectify the fault.
Power supply interrupted	– Check the lines for loose contacts or open circuit.
Blower motor defective	– Replace the fan.
Defective operating instrument	– Check the operating instrument and replace if necessary.

Fan cannot be shut off

Cause	Remedy
Short-circuit in the cable	– Rectify the short-circuit, install a new cable if necessary

Fan works with decreased power

Cause	Remedy
Contacts dirty	– Clean the plug contact. Be careful to avoid short-circuits.
Heat exchanger heavily contaminated	– Clean thoroughly and prevent damages that could lead to leakages. Attention! Please observe the safety instructions.
Air flow insufficient because the air filter is blocked	– Clean or replace the filter.

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No heat or insufficient heating power

Cause	Remedy
Water intake temperature too low	– Wait until the vehicle engine is warm
Engine thermostat defective	– Replace the thermostat
Heat exchanger fins dirty	– Check the heat exchanger and clean if necessary
Water lines kinked or squashed	– Rectify the cause of the fault or run the hose properly.
Water pump pressure too low	– Coolant is not flowing through the heat exchanger.
Air flow insufficient because the air filter is blocked	– Clean or replace the filter.
Resistor defective	– Replace the resistor
Climate control defective	– Check and replace if necessary.

Water escaping from the unit

Cause	Remedy
Hose connection loose	– Check the hoses and tighten the hose clips
Water hose damaged	– Run and connect a new hose
Heat exchanger damaged	– Install an original replacement part and connect. Attention! Observe the safety instructions.

Air flaps can no longer be adjusted

Cause	Remedy
Servomotor defective	– Replace the servomotor
Foreign object blocking flap	– Check the flap, remove the foreign object.
Flap deformed	– Check the flap and straighten if necessary.
Flap mount defective	– Check the flap mount and replace if necessary.
Control system defective	– Check the control system and replace if necessary.

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8.3.1 Cooling capacity of the air conditioning

Compressor not working

Cause	Remedy
Open circuit in the solenoid coil on the compressor	– Check the current flow to the coupling.
V-belt loose or broken	– Adjust the V-belt tension, replace the V-belt.
The V-belt pulley does not turn, even though the magnetic clutch is engaged	– Check the compressor, replace if necessary.
Compressor coupling slipping	– Repair coupling or replace compressor.
Control system defective	– Check the control system and replace if necessary.

Vaporizer clogged

Cause	Remedy
Cooling ribs dirty	– Clean the evaporator

Cooling capacity inadequate

Cause	Remedy
Air flow insufficient because the air filter is blocked	– Clean or replace the filter.
Relay defective	– Replace the relay.
Fan flow hindered	– Check the air channels for hindrances. Rectify the fault.
Outside air/circulating air flap set to outside air at higher outside air temperature	– Set to circulating air.
Air flow of the liquefier insufficient because the cooling ribs are dirty	– Clean the cooling ribs.
Fill level for refrigerant too low	– Fill with refrigerant (service engineer).

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Cause	Remedy
Moisture in the system	– Empty the air conditioning system, replace the collector drier, evacuate and fill (service engineer).
Collector drier saturated	– Empty the air conditioning system, replace the collector drier, evacuate and fill (service engineer).

System cools intermittently

Cause	Remedy
Line break, faulty ground connection or loose contacts in the solenoid coil of the compressor	– Check the lines, repair or replace.
Blower motor defective	– Replace the fan.

8.3.2 System extremely loud

System extremely loud

Cause	Remedy
V-belt loose or worn excessively	– Tighten or replace the V-belt.
Coupling loud	– Repair the coupling.
The holder for the compressor is loose or the internal components of the compressor are worn	– Repair the holder; replace the compressor.
Excessive wear on the blower motor	– Replace the fan.

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8.4 Tires and undercarriage

Oil leaks on the differential, hub, or axle distributor gearbox

Cause	Remedy
End plugs loose	– Tighten the end plugs.
Seals damaged	– Replace the seals.

8.5 Swing gear

Oil leaks from the swing bearing transmission

Cause	Remedy
Loose connections	– Tighten the connections. – Check the expansion tank.

Noises in the swing bearing

Cause	Remedy
Insufficient lubrication on the gear rim	– Lubricate the gear rim according to the lubrication plan.

8.6 Hose lines

Rotary transmission leaking

Cause	Remedy
Seals damaged	– Replace the seals.
Lines loose	– Retighten the fixing bolts.

8.7 Cab

Cab moves or rocks drastically

Cause	Remedy
Cab suspension or cab attachment damaged	– Check all connection elements, screws and bolts of the cab suspension and fastening for damage, cracking or deformation. – Have damaged parts exchanged immediately by trained and instructed specialist personnel.

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9 Setup work

9.1 Safety instructions

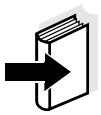


DANGER

- The work performed may only be completed by trained and instructed specialists.
- Wear personal protective equipment (e.g.protective helmet, ear protection, protective gloves, safety shoes) where working conditions require. At working heights of 2.00 m or more, SENNEBOGEN recommends the use of a safety harness to prevent falling.
- The following applies for all setup work:

Only carry out the work if the work area has a firm, even subgrade that is solid enough.

- Ensure that there is no one in the danger area.
  - While setting up, and before completing all fastening work, no persons are allowed in the hazardous area in which loads could fall or under hanging loads.
  - During the setup procedure, keep a sufficient safety clearance from areas of unavoidable cutting or pinching/crushing danger.
- Observe the relevant accident prevention regulations for working with hoisting accessories.
- When dismantling components or disassembling equipment, always use hoisting accessories with a sufficient safe working load.
- Suspend components only with the designated lifting brackets.
- Do not step on equipment that is not designed for it (e.g. parts of the boom or ballast), hanging on a crane.
- Carry out all setup work in sequence. Never carry out more than one setup task at a time.



Note

The setup work to be carried out depends on the selected attachment tools. Observe the notes in the operating instructions of the tool manufacturer.

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WARNING
There may be dangers during operation to persons, the machine and other property, if

- The setting of the safety limit position sensor for “Retract stick” was not adjusted for the attached tool
- The attachment tools attached do not comply with the relevant safety regulations
- The attachment tools have not been approved by SENNEBOGEN
- The attachment tools attached are found to be defective.

The machine operator is wholly liable for any damage or consequential damage caused by tools!
This damage is excluded from the terms of the warranty issued by SENNEBOGEN Maschinenfabrik GmbH.

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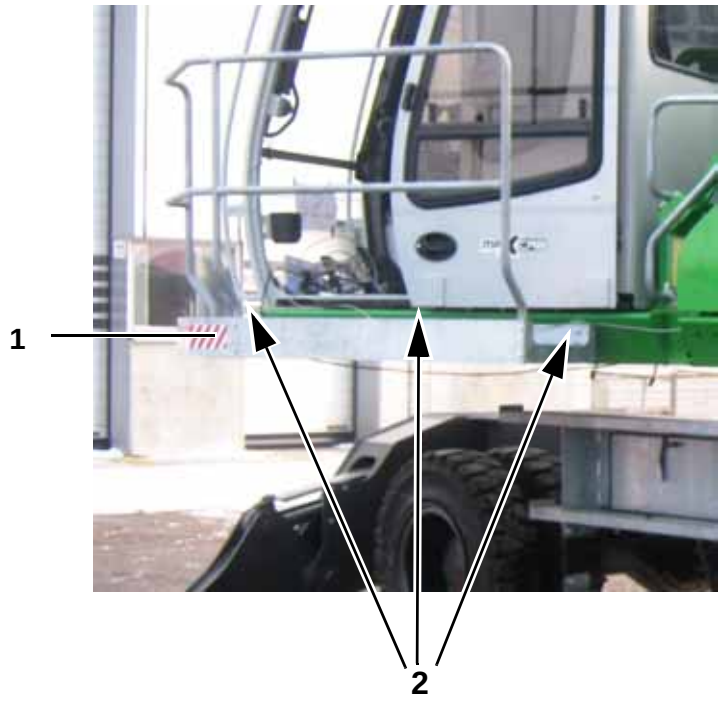
9.2 Fitting the step grip on the cab

Note

Observe the safety instructions in CHAPTER 1 SAFETY.

DANGER
Danger to life from crashing cab

- The step grip on the cab must be assembled/disassembled by trained and instructed technicians only!
- Always replace any fixing bolts after disassembly, do not reuse.
- Components are to be tested by specialists before reusing and replaced if necessary.
- Use only original SENNEBOGEN spare parts.



1	Carefully raise the step grip (1) to the cab using suitable equipment.
2	Screw the step grip to the frame (2) (observe torques, see Kapitel 3.11 ANZIEHDREHMOMENTE FÜR SCHRAUBEN).
3	Check the step grip is properly secured.

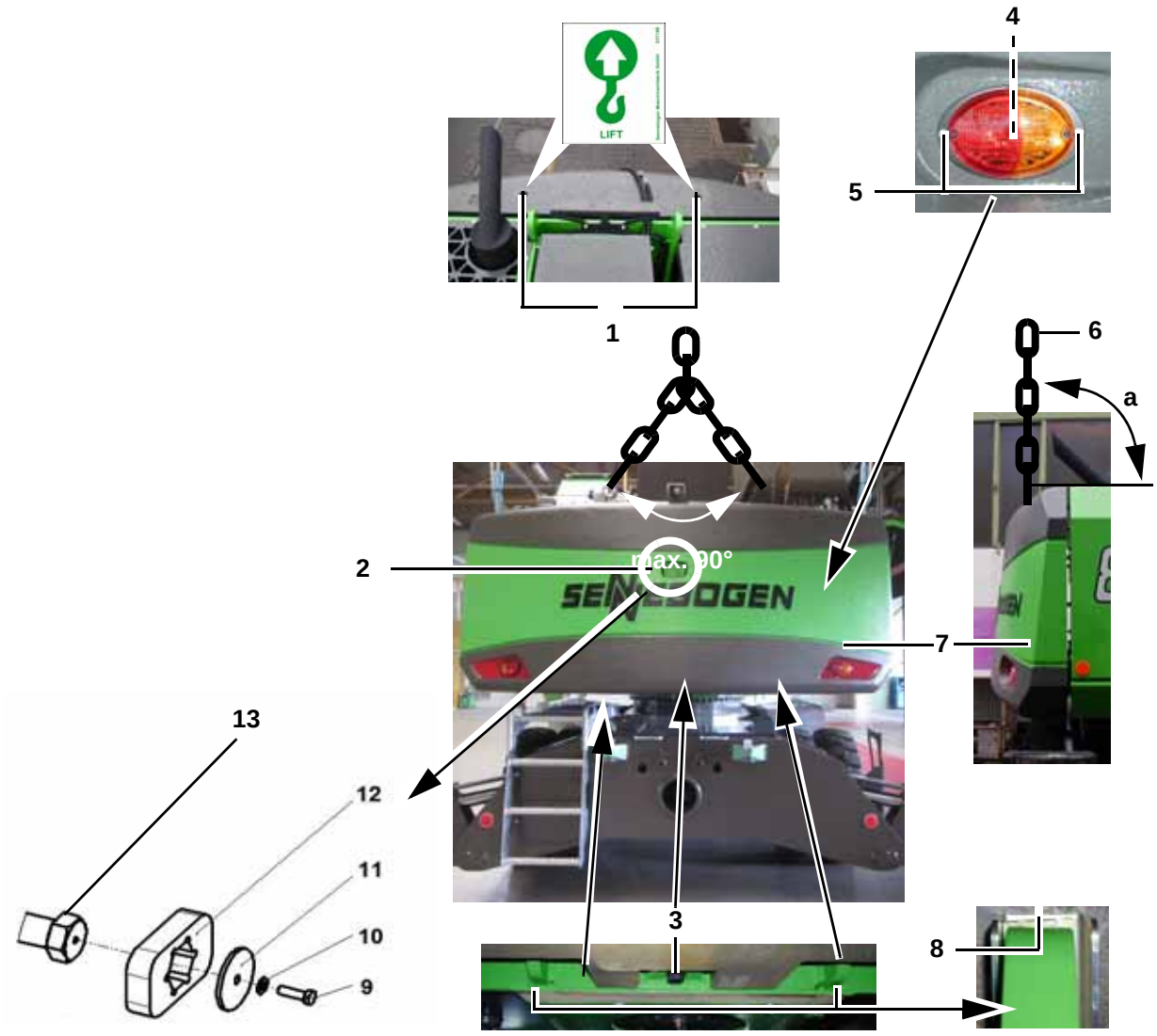
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9.3 Mounting/disassembling the counterweight

Note
The mass of the counterweight is cast into its upper surface. The counterweight can be disassembled to transport the machine.

Note
The counterweight must be assembled/disassembled by trained and instructed technicians only!

DANGER
The machine can tip over. Without the counterweight, the machine is not suitable for operation.



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Item	Description
1	Threaded attachment points for lifting eyes
2	Rear hexagonal screw
3	Lower hexagonal screw
4	Taillight connector
5	Taillight mounting screws
6	Sling devices
7	Counterweight
8	Spacer packs
a	Angle for sling devices: 90°

9.3.1 Disassembling the counterweight

1	Move the upper structure in the direction of travel. Place the working tools/equipment on the ground.
2	Unscrew the taillight mounting screws (5); withdraw the taillights slightly. Carefully unplug the connector (4) from each taillight.
3	Screw the two lifting eyes included with the on-board accessories completely into the threaded attachment points (1) for the counterweight.
4	Attach suitable sling devices (6) to the auxiliary crane and the lifting eyes on the counterweight (7). Keep the sling devices tensioned.



DANGER
Angle “a” between the machine and the sling devices must always be 90°. If the angle is greater or less, the counterweight can tip away from the machine or injure persons or damage parts of the machine.

5	Loosen the hexagonal screw 9. Remove item 10; 11; 12, loosen the hexagonal screw 13 and unscrew.
6	Loosen and unscrew the lower hexagonal screw (3) from the counterweight.

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Danger
Risk of being crushed or trapped.

The area below a suspended load must be kept clear.

7	Swivel the counterweight (7) to the rear slightly and lift away. Deposit the counterweight in a safe location and secure against tipping.
8	Remove both spacer packs (8) and retain for re-assembly in the future. ATTENTION! Do not mix up the left and right sides.

9.3.2 Mounting the counterweight

1	Attach suitable sling devices (6) to the auxiliary crane and the lifting eyes on the counterweight (7).
2	Place both spacer packs (8) on the support blocks in the correct positions.

DANGER
Risk of being crushed or trapped.
The area below a suspended load must be kept clear.

3	Lift the counterweight (7) onto the machine by means of the auxiliary crane.

CAUTION
Secure the bolts (2) and (3) with “Loctite 270” each time you mount the counterweight!
Follow the instructions on the “Loctite” package!

4	Attach the counterweight (7) to the machine using the rear hexagonal screw (2).
5	Screw in the lower hexagonal screw (3).
6	Using a torque wrench, tighten the rear hexagonal screw 13 to a torque of 2350 Nm. Place item 12; 11; 10 into position, tighten the hexagonal screw 9 to a torque of 45 Nm. Using a torque wrench, tighten the lower hexagonal screw (3) to a torque of 960 Nm.
7	Remove the sling devices (6).
8	Unscrew both lifting eyes from the counterweight (7) and stow with the on-board accessories.
9	Re-attach the taillight connectors (4), place the taillights in the recesses in the counterweight (7) and tighten the mounting screws (5).

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10 Appendix

10.1 List of abbreviations

ACTU	Association of Commercial Trade Unions
Co.	Company
e.g.	For example
EMC	Electromagnetic compatibility
FOPS	Falling Objects Protective Structure
FV	Flange connection
GmbH	Limited liability corporation
HAB	Lifting working platform
HGV	Truck
HMI	Control/indicator for magnet unit
if necessary	if necessary
LED	Light emitting diodes
LMI	Load moment indicator
L_{pA}	Continuous sound pressure level
L_{WA}	Sound power level
max.	Maximum
min.	Minimum
No.	Number
Oh	Hours of operation
or	or
SENCON	SENNEBOGEN Diagnostic System
StVO	Federal Motor Vehicle Safety Standards
TUR	Trade Union Regulations
UCTU	Underground Construction Trade Union

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10.2 Driver's seat

10.3 Cleaning the cooling system

10.4 Installing large roller bearings, swing gears, flange connections

10.5 Central lubrication system

10.6 Warranty conditions

10.7 Tool Control

10.8 Load moment indicator (LMI)

10.9 Magnet unit

10.10 Camera system/monitor

10.11 Display/auxiliary heating system

10.12 Lubricants table

Note
There are only references to the additional documentation in “Appendix — Chapter 9”; the actual documentation can be found in the rear section of the book depending on the machine equipment.

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