Baumaschinen und Baustoffanlagen

Safety Manual

Concrete delivery and placing machines

Handed out by

Putzmeister

04/2024 Rev20 en

Imprint

Edition 04/2024 Rev20 en

Putzmeister document number:
BP1742-24_en

Published by:

Verband Deutscher Maschinen- und
Anlagenbau e. V. (VDMA)
Baumaschinen und Baustoffanlagen
Lyoner Straße 18
60528 Frankfurt

Telefon +49 69 6603-1262
Fax +49 69 6603-2262
E-Mail bub@vdma.org
Internet bub.vdma.org

This safety manual was produced with the co–operation of the following companies:

Putzmeister Concrete Pumps GmbH
Max–Eyth–Straße 10
72631 Aichtal

SCHWING GmbH
Heerstraße 9–27
44653 Herne

Liebherr–Mischtechnik GmbH
Im Elchgrund 12
D-88427 Bad Schussenried

Table of contents

Changes in this revision 7

Foreword 9

1 Terms, definitions, requirements 11

1.1 Definition of terms 13
1.1.1 Machine 13
1.1.2 Concrete pump 13
1.1.3 Arm assembly 13
1.1.4 Placing boom 13
1.1.5 Base structure 13
1.1.6 Truck mixer 14
1.1.7 Delivery line systems 14
1.1.8 End hose 14
1.1.9 End hose combination 14
1.1.10 Manufacturer 14
1.1.11 Operator 14
1.1.12 Machine operator 14
1.1.13 Hoseman 15
1.1.14 Signaller and other auxiliary personnel 15
1.1.15 Truck mixer driver 15
1.1.16 Subject expert 15
1.1.17 Qualified personnel 15
1.1.18 After Sales Service personnel 15
1.1.19 Maintenance 16
1.1.20 Starting to pump 16
1.1.21 Place of work, working area, danger zone 18

1.2 Designated use 23
1.2.1 Retesting (safety inspection) 23
1.2.2 Inspection intervals for retesting 24

1.3 Improper use 25
1.3.1 Transporting goods 25
1.3.2 Lifting loads 25
1.3.3 Removing obstacles 25
1.3.4 Extending the reach 26
1.3.5 Extending the placing boom and end hose 26
1.3.6 Impermissible end hose 27
1.3.7 Impermissible working area 27
1.3.8 Climbing the placing boom 28

1.——
2.——
3.——
. . .

Table of contents

Concrete delivery and placing machines

1.3.9 Highpressure delivery 28
1.3.10 Accessories and attachments 28
1.3.11 Changes to the machine 28

1.4 Exclusion of liability 28

1.5 Personnel 29
1.5.1 Requirements 29
1.5.2 Qualifications 30
1.5.3 Responsibility of the machine operator 30

1.6 Operating Instructions, operating procedures and other regulations 30
1.6.1 Operating Instructions 30
1.6.2 Operating procedures 31
1.6.3 Other regulations 31

1.7 Personal protective equipment 32

2 Setting up and working with the machine 35

2.1 Before working with the machine 37
2.1.1 Checking that the machine is ready for operation 37
2.1.2 Rendering the machine ready for operation 37

2.2 Danger due to high voltage 37
2.2.1 High-voltage lines 37
2.2.2 Discharge voltage pattern 37
2.2.3 Clearances from highvoltage lines 38
2.2.4 Highvoltage warning devices 39
2.2.5 Procedure in the event of a flash over 40
2.2.6 Earthing in the event of electrostatic charging 40
2.2.7 Earthing on construction sites with special installations 41

2.3 Stationary machines 41
2.3.1 Setup site 41
2.3.2 Stationary placing booms 41
2.3.3 Lifting machines and components 42
2.3.4 Loading and transporting 42

2.4 Mobile machines 42
2.4.1 Setup site 42
2.4.2 Supporting ground 43
2.4.3 Corner bearing loads 44
2.4.4 Supports 45
2.4.5 Driving 46
2.4.6 Towing 47
2.4.7 Loading 48

2.5 Placing booms 48

2.5.1 Unfold placing boom 48
2.5.2 End hose and end hose combination 50
2.5.3 Guiding the end hose ergonomically 51
2.5.4 Connecting drills 51
2.5.5 Procedure in storms 51
2.5.6 Concreting in cold weather 52

2.6 Delivery line systems 52
2.6.1 Suitable delivery lines 52
2.6.2 Securing delivery lines 53
2.6.3 Leak tightness and blockages 53
2.6.4 Opening delivery lines 54
2.6.5 Clearance to delivery lines 54
2.6.6 Securing the delivery lines 54
2.6.7 Continuation delivery lines 54
2.6.8 Devices for shutting off, diverting and cleaning 55

2.7 Pumping operations 55
2.7.1 Place of work 55
2.7.2 Safety 55
2.7.3 Remote control 56
2.7.4 Moving machine components and hot surfaces 56
2.7.5 Constant observation of the machine 57
2.7.6 Truck mixer 57

2.8 Cleaning 57
2.8.1 General 57
2.8.2 Cleaning agents 58
2.8.3 Cleaning with compressed air 59
2.8.4 Protection against water 61
2.8.5 Post-cleaning procedure 61

2.9 Securing the machine 61

3 Maintenance and special work 63

3.1 Requirements for special work 65

3.2 Welding 66

3.3 Working on the placing boom 67

3.4 Safetyrelevant components 68

3.5 Software 68

3.6 Protective and safety equipment 68

3.7 Electrical power 69
3.7.1 General 69

1.——
2.——
3.——
. . .

Table of contents

Concrete delivery and placing machines

3.7.2 Electrical components 69
3.7.3 Power at the construction site 70

3.8 Hydraulic systems 70
3.8.1 General 70
3.8.2 Replacing hydraulic hoses 72

3.9 Noise emissions 72

3.10 Exhaust fumes 72

3.11 Functional fluids 73

3.12 Disposal of the machine 74

Index 75

Changes in this revision

- Definition of terms: End hose combination added
  (End hose combination P. 14)
- Danger zone at the end hose
  - Definition in key updated
  - Definition updated

  (Place of work, working area, danger zone P. 18)
- Designated use: Wording amended
  (Designated use P. 23)
- Extending the placing boom and end hose
  - Reference to the danger zone removed
  - Guiding by hand: Wording updated

  (Extending the placing boom and end hose P. 26)
- Operating Instructions: Last sentence changed
  (Operating Instructions P. 30)
- Personal protective equipment: Standards updated
  - DIN EN 352-1:2021
  - DIN EN 352-3:2021
  - DIN EN 397:2022
  - DIN EN ISO 20345:2022

  (Personal protective equipment P. 32)
- Rendering the machine ready for operation
  - Handling fuel: Reworded
  - Changing the control mode: Wording changed

  (Rendering the machine ready for operation P. 37)
- Mobile machines: Responsibilities on the set-up site reworded
  (Setup site P. 42)
- Placing booms: End hose
  - Title: Replaced by end hose and end hose combination
  - Reference to the danger zone removed

  (End hose and end hose combination P. 50)
- Workplace during pumping operations: Wording changed
  (Place of work P. 55)
- Cleaning – general: Restriction on barrier agents updated
  (Cleaning P. 57)
- Cleaning with compressed air

- Delivery line replaced by delivery line systems
- Specifications for end of the delivery line updated

(Cleaning with compressed air P. 59)

Foreword

This Safety Manual contains important safety instructions for operating concrete delivery and placing machines safely, properly and economically. Observing these instructions helps to avoid danger, to reduce repair costs and downtimes and to increase the reliability and service life of the machine.

This Safety Manual must not be considered a substitute for knowledge of legal regulations, but should supplement and explain this knowledge in a practical way. The manufacturer's Operating Instructions that may be supplemented by this Safety Manual must also be observed. There has been no classification of the hazards according to the degree of injury or amount of damage to be expected.

Infringements of the rules laid down in this Safety Manual may lead to accidents and/or machine failures, even if not expressly described. Significant damage may be caused and persons in the vicinity of the machine could be injured or killed.

This Safety Manual must be read and applied by anyone who is tasked with working with/on the machine, and with the following in particular:

- Operation, including setting up, fault rectification in the course of work, maintenance, disposal of functional fluids and consumables
- Maintenance (servicing, inspection, repair) and/or
- Transport.

This Safety Manual is revised periodically. The current version can be obtained at any time from the publisher.

1 Terms, definitions, requirements

1.1 Definition of terms

The terms used in this Safety Manual are explained below, along with descriptions of the requirements placed on specific groups of people.

1.1.1 Machine

For the purposes of this Safety Manual, concrete delivery and placing machines are defined as:

- Truck-mounted concrete pumps (an ensemble of truck and concrete pump with and without placing boom). The safety regulations issued by the truck manufacturer also apply to the truck.
- Truck mixer concrete pump (an ensemble of truck mixer, concrete pump and placing boom). The safety regulations issued by the truck mixer manufacturer and by the truck manufacturer also apply to truck mixer concrete pumps.
- Stationary concrete pumps
- Stationary placing systems (an ensemble of placing boom and base structure)

1.1.2 Concrete pump

For the purposes of this Safety Manual, concrete pumps are defined as devices which are designed to deliver concrete to placement sites via pipes or hoses.

1.1.3 Arm assembly

Arm assembly is a synonym for placing boom and can be used interchangeably.

1.1.4 Placing boom

For the purposes of this Safety Manual, placing booms are defined as powered, slewable devices consisting of one or more swinging or folding sections for guiding the delivery line.

1.1.5 Base structure

For the purposes of this Safety Manual, base structures are defined as equipment which is designed to hold a stationary placing boom to give the latter the required stability.

1.1.6 Truck mixer

For the purposes of this Safety Manual, truck mixers are defined as vehicles with mixing equipment for transporting concrete.

1.1.7 Delivery line systems

For the purposes of this Safety Manual, delivery line systems are defined as self-contained pipes or hoses in which concrete is pumped from the concrete pump to the placement site. Devices for shutting off, diverting or cleaning delivery lines can be integrated into delivery line systems.

1.1.8 End hose

For the purposes of this Safety Manual, end hose is defined as the hose that is fitted on the placing boom at the end of the delivery line for distributing the concrete. There must be no couplings, spouts, discharge stops or other items fixed to the outlet end of the end hose unless they are approved by the manufacturer.

1.1.9 End hose combination

The end hose combination is the end hose with additional components (e.g. reducer or end hose shut-off valve) after the last elbow.

1.1.10 Manufacturer

Any natural or legal person that markets a machine or incomplete machine that is dealt with in this Safety Manual.

1.1.11 Operator

Authorised representative of the owner of the concrete pumps and/or placing booms. The operator is responsible for the use of these machines.

1.1.12 Machine operator

Persons trained in and charged with the operation of concrete pumps and placing booms.

1.1.13 Hoseman

Persons instructed by the site management in how an end hose is guided. Hosemen must be able to independently evaluate all dangerous situations which may occur in the area of the end hose and react according to the situation.

1.1.14 Signaller and other auxiliary personnel

Persons instructed by the site management to help the machine operator in his work if the latter is unable to observe all areas of operation and danger zones. Signallers must be able to independently evaluate all dangerous situations which may occur when working with a concrete pump and/or placing boom and react according to the situation. The signaller must have a suitable means of communication with the machine operator.

1.1.15 Truck mixer driver

Persons who supply the concrete pump with concrete from a truck mixer. Truck mixer drivers must be instructed by the machine operator to operate the operating elements on the concrete pump provided for their use. Truck mixer drivers must be able to independently evaluate all dangerous situations which may occur when working in the area of the hopper of a concrete pump and react according to the situation.

1.1.16 Subject expert

For the purposes of this Safety Manual, a subject expert is defined as a person who, through their professional training, their professional experience and their recent professional activity, has the required specialist knowledge to inspect the tools.

1.1.17 Qualified personnel

Persons who have completed specialist training for a particular activity which qualifies them to carry out their roles.

1.1.18 After Sales Service personnel

Qualified personnel employed by the manufacturer who are responsible in particular for maintenance of the machine.

1.1.19 Maintenance

Maintenance includes all measures required to inspect, maintain and repair a machine.

1.1.20 Starting to pump

Starting to pump describes the phase at the start of the pumping process until the delivery line including the end hose has filled with conveyed material and this conveyed material emerges evenly from the end hose.

The process of starting to pump occurs both when first starting the pumping process and after a break in pumping or another type of interruption. If the delivery line or parts of the delivery line need to be converted and/or refilled, this is also referred to as starting to pump.

1.1.21 Place of work, working area, danger zone

1.1.21.1 Mobile machines

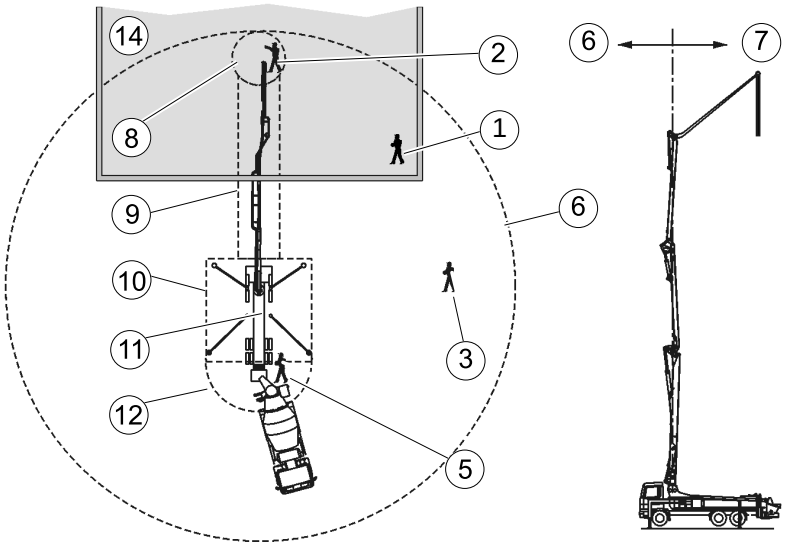


Figure 1: Example

1.1.21.2 Stationary machines

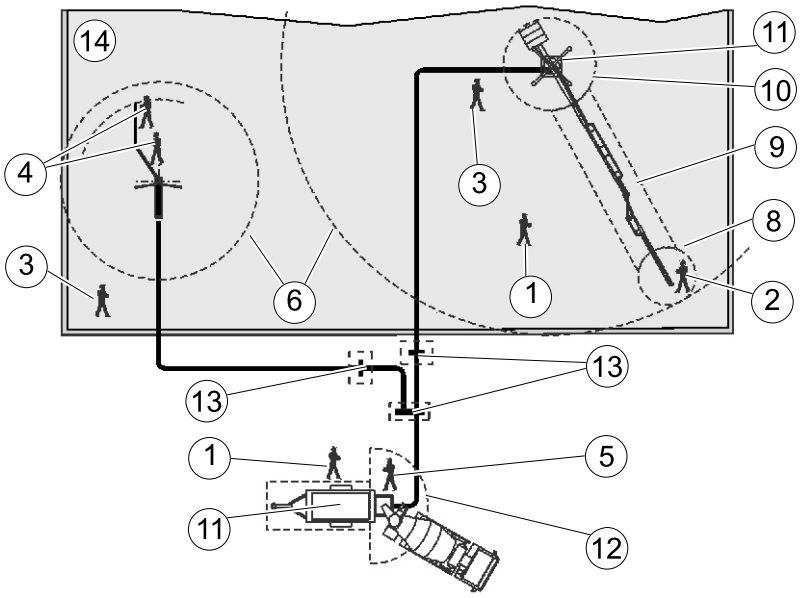
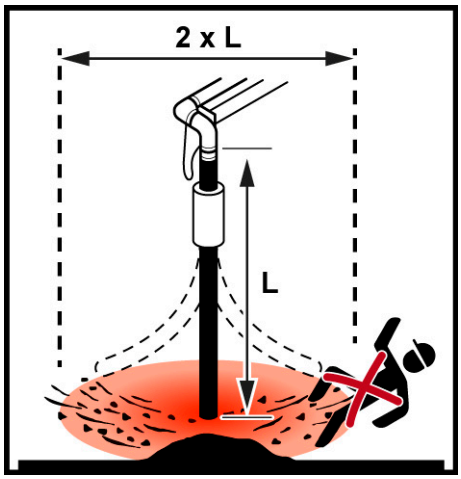


Figure 2: Example

Pos.	Designation		Explanation
1	Place of work (during pumping operations)	Machine operator	In normal operation with the remote control
2		Hoseman	At the end hose in the danger zone
3		Signaller	In the machine operator’s range of vision
4		Auxiliary personnel	As machine operators of the manual placing system
5		Truck mixer driver	At the hopper in the danger zone
6	Working area	Permitted	Area with a radius of the horizontal reach of the placing boom + end hose length
7	Working area	Impermissible	The end hose must not be moved backwards beyond the vertical of the placing boom.
8	Danger zone	At the end hose	Risk of injury when pumping is started, during pumping operations, when removing a blockage and during cleaning procedures. The diameter of the danger zone is twice the length of the end hose/end hose combination.
9	Danger zone	Beneath the placing boom	Risk of injury from falling items
10	Danger zone	Area of the support legs and feet or area of the base structure	Risk of crushing when setting up or dismantling the machine
11	Danger zone	On the machine	Any presence on or below the machine when the pump is in operation is prohibited
12	Danger zone	On the hopper	Risk of injury during cleaning procedures and when the hopper is being filled using a truck mixer
13	Danger zone	Area of the delivery line systems	Hazard posed if lines burst, risk of injury from crushing or shearing, particularly with gate valves
14	Structure or area being concreted		Example

1.1.21.3 Danger zone at the end hose



Item	Designation
L	Length of the end hose/end hose combination

1.1.21.4 Place of work

The place of work is the area in which people must remain in order to carry out the work.

Place of work – machine operator

The machine operator's place of work is with the remote control when the pump is in operation. The place of work must be selected so as to allow visual contact with the placement site and the truck mixer driver, and so that the working area can be observed at the same time. A signaller must otherwise be used.

The machine operator's place of work is with the machine when this is being set up or prepared for driving.

Place of work – hoseman

The hoseman's place of work is within the danger zone of the end hose, but not beneath the placing boom. This requires a greater level of caution. The hoseman and machine operator must have visual contact.

Place of work – truck mixer driver

The truck mixer driver's place of work is in the danger zone of the hopper and at operating elements for the agitator and truck mixer. This requires a greater level of caution. The truck mixer driver and machine operator must have visual contact.

1.1.21.5 Working area

The working area is the area in which work is carried out with or on the machine. Parts of the working area can become danger zones depending on the operation being carried out and the position of the placing boom.

The working area must be secured and clearly identified. Suitable personal protective equipment is required in the working area. The machine operator is responsible for safety in the working area of the machine whilst the machine is in use.

Impermissible working area

Because of their high manoeuvrability, some placing booms can also be shifted into positions for which they are not designed. This may overload or damage the placing boom. Placing booms must therefore only be moved within the permitted working area. *(Impermissible working area P. 27)*

1.1.21.6 Danger zone

The danger zone is the area surrounding the machine, in which people may be at risk of injury from movements required by the work.

The danger zone varies within the working area and depends on the activity being carried out and the position of the placing boom, if one is present. Danger zones must be secured and clearly identified. The machine operator must be capable of seeing the danger zone at all times and under all circumstances. If necessary, he must appoint a signaller to supervise the danger zone.

Depending on the working situation, places of work may occasionally fall within the danger zone, especially the place of work of the hoseman and the truck mixer driver. If a place of work falls within the danger zone, increased caution is required and suitable personal protec-

tive equipment is prescribed. Persons who are authorised to be present in such a place of work must use their own discretion to assess dangerous situations and be able to react according to the situation.

The machine operator is responsible for safety in the danger zone of the machine whilst the machine is in use.

If an unauthorised person enters the danger zone, the machine operator must immediately stop all hazardous machine functions and instruct the unauthorised person to leave the danger zone.

Immediately press the EMERGENCY STOP button if there is a risk to the life and limb of persons!

Support legs and support feet

There is a risk of crushing in the swingout and extension zone for the supports.

Placing boom

The danger zone when working with the placing boom is the zone over which the placing boom is slewed. In this area there is a risk of injury from falling concrete and delivery line components.

Machine

All the time the vehicle is in operation, there is a risk of injury on and below the machine from moving parts and bursting delivery lines or hydraulic hoses, as well as a risk of falling on slippery surfaces or steps.

End hose

As a general rule, the end hose and the area surrounding the end hose are always danger zones as the end hose may swing out unexpectedly. The danger zone has a diameter which is twice the length of the end hose/end hose combination.

(Danger zone at the end hose P. 20)

Hopper

In the area of the hopper, there is a risk of becoming trapped between the truck mixer and the hopper and of being sprayed with concrete. There is a risk of being crushed and of injury by shearing from the transfer tube. There is a risk of becoming caught in the rotating agitator.

Delivery line systems

In the area around the delivery line systems there is a risk of injury from the delivery line bursting if there is an abrupt rise in pressure. There is a risk of crushing and injury by shearing with devices integrated in delivery line systems.

1.2 Designated use

The machine must only be operated as intended and in technically perfect condition. All protective and safetyoriented devices, particularly removable protective devices and EMERGENCY STOP devices, must be available and fully functional.

The machine is only intended for pumping and distributing concrete up to a bulk density of 2400 kg/m^3. It must only be used for pumping operations on construction sites. The maximum delivery pressure must not exceed that specified on the rating plate or in the check book.

You must also observe the Operating Instructions and comply with the intervals and conditions for inspections (particularly retesting) and maintenance work in order to operate the machine within the limits of its proper use.

1.2.1 Retesting (safety inspection)

After initial commissioning of the machine, the operational safety of the machine must be checked regularly by a subject expert. The inspection intervals depend on the age of the machine. The older the machine, the greater the probability of damage. For this reason, regular retesting of the machine, appropriate to its age, must be carried out in order to detect damage in good time. Retesting should be carried out in accordance with the inspection intervals listed below.

Retesting must consist of the following:

- Retesting of the condition of the components and equipment with regard to the formation of cracks, damage, wear, corrosion and other changes;
- Retesting of the completeness and effectiveness of the safety equipment;
- Retesting to find out whether any defects which are found during the tests mentioned above and which could affect safety have been adequately rectified.

Retesting must include components which are used in conjunction with the machine (in particular, delivery line components and accessories).

Furthermore, information provided by the manufacturer to the operator with reference to special instructions for maintenance and inspection must be observed.

1.2.2 Inspection intervals for retesting

The inspection intervals are fixed as follows:

- Machines up to and including 5 years old:

  Inspect after every 1000 operating hours or 1 year, whichever is soonest. The interval is repeated after every retest.
- Machines more than 5 years old:

  Inspect after every 500 operating hours or 1 year, whichever is soonest. The interval is repeated after every retest.
- Machines more than 10 years old:

  Inspect after every 250 operating hours or 1 year, whichever is soonest. The interval is repeated after every retest.

The day of initial commissioning in accordance with the handover report and the machine's operating hours meter are definitive for the intervals. This operating hours meter records the hours of pumping operations. The operating hours meter must always be kept in good working order. It must not be tampered with. For machines without an operating hours meter, the operating hours must be recorded in a traceable form in writing.

Retesting must be arranged by the operator. The results of retesting must be entered in the check book and signed. The check book must always be kept with the machine and must be produced upon the request of the national supervisory bodies.

Notwithstanding national legislation, the operator can be liable in the event of damage, if it is proved that the damage has arisen as a consequence of regular retesting not being properly carried out.

If retesting is not carried out, the manufacturer will assume that the machine has been shut down. When the machine is restarted, retesting must be carried out.

1.3 Improper use

Improper use is defined as use which is not described in or goes beyond that described in the “Designated use”, *(Designated use P. 23)* section. The manufacturer accepts no liability for damage resulting from such use. Some examples of conceivable improper uses are given below.

1.3.1 Transporting goods

The machine must not be used for the transport of goods, except for carrying the accessories used for the machine, such as pipes, hoses, etc. The maximum permissible gross weight may not be exceeded.

1.3.2 Lifting loads

The placing boom must never be used for lifting loads.

1.3.3 Removing obstacles

The placing boom must not be used under any circumstances to remove obstacles. This would overload the placing boom, causing damage and endangering people.

1.3.4 Extending the reach

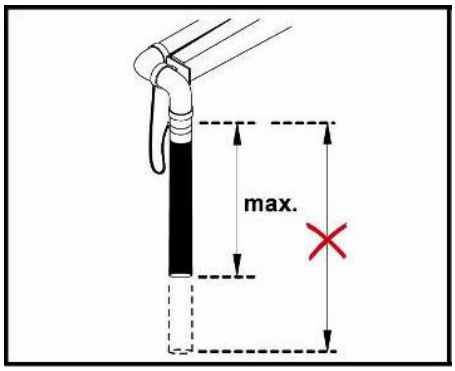
It is prohibited to attach an extension to the end hose or boom tip of the placing boom (e.g. freely suspended transition liner) in order to extend the reach or in order to be able to pump “around corners”. Since the placing boom and the lifting equipment for the extension have differing pivot points and modes of control, it is not possible to co-ordinate their movements.

1.3.5 Extending the placing boom and end hose

Extension of the placing boom and end hose beyond the length specified on the rating plate is forbidden.

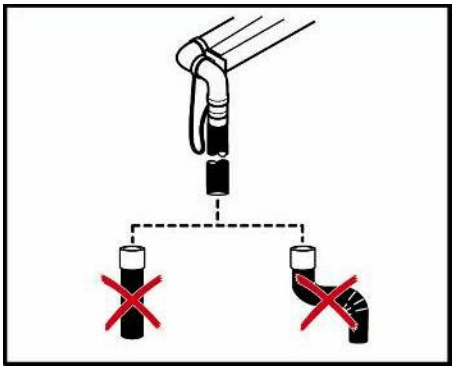
If the manufacturer defines the weight rather than the length of the end hose, you can use a reducer pipe with a longer end hose, for example. The quoted gross weight must not be exceeded. *(End hose and end hose combination P. 50)*

End hoses/end hose combinations with a length of more than 4 m must not be guided by hand.



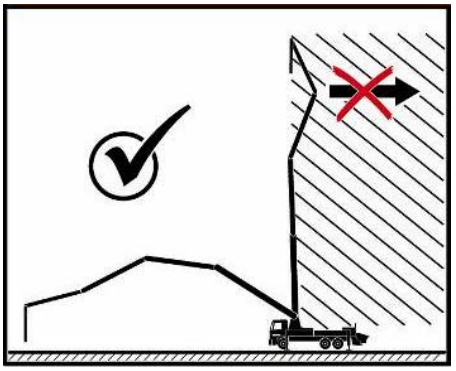
1.3.6 Impermissible end hose

There must be no couplings, spouts, discharge stops or other items fixed to the outlet end of the end hose unless they are approved by the manufacturer.



1.3.7 Impermissible working area

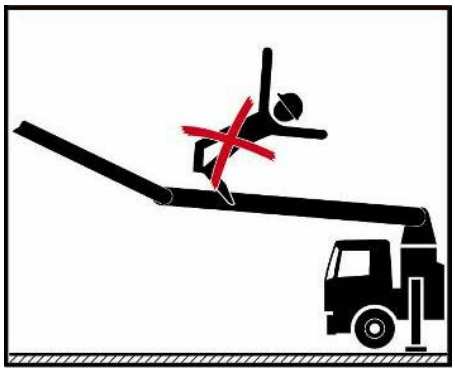
During pumping operations, the end hose must not be moved backwards beyond the vertical axis of rotation of the placing boom.



In addition to this, additional impermissible working areas exist, depending on the machine model and manufacturer, which are described in the Operating Instructions.

1.3.8 Climbing the placing boom

It is prohibited to climb the placing boom, to stand on top of it or to misuse it as a working platform or climbing aid.



1.3.9 Highpressure delivery

It is prohibited to deliver concrete at high pressure (delivery pressure greater than 85 bar) through the delivery line of the placing boom. Delivery line elements are marked with the maximum permissible delivery pressure. The delivery line and end hose are only suitable for delivery pressures of up to 85 bar until the wear threshold is reached. For the wear threshold, refer to the Operating Instructions for the machine.

1.3.10 Accessories and attachments

It is prohibited to fit accessories and attachments to the machine if they have not been expressly approved for use on this machine by the manufacturer.

1.3.11 Changes to the machine

You are not allowed to carry out your own changes to the machine. Changes must always be approved by the manufacturer.

1.4 Exclusion of liability

Where the manufacturer's delivery conditions are agreed, liability will be as described in the provisions there. The manufacturer is not liable for damage in cases specified there.

Unless the responsibility of the manufacturer, the warranty will be invalidated in the following situations in particular:

- use contrary to designated use.
- incorrect operation, maintenance and repair.
- use of spare parts or accessories other than original manufacturer's spare parts and accessories or their equivalents.
- conversions, alterations or modifications to the machine.
- fitting of accessories and attachments not approved by the manufacturer.
- adjustment of safety pressures, speeds of movement, power outputs, speeds of rotation and other settings to values other than those set in the works.

1.5 Personnel

The operator must ensure that only persons who are qualified or have received the necessary instruction work on or with the machine. It is the responsibility of the operator to carry out regular (e.g. annual) safety briefings for their employees. Suitable training can be requested from the machine manufacturer. The operator must clearly define who is responsible for operation and maintenance of the machine. The operating company must also ensure that only persons commissioned to work on the machine do so. In addition, the operator should provide the necessary personal protective equipment.

1.5.1 Requirements

Persons operating or carrying out maintenance work on the machine must meet the following requirements:

- They must be aged 18 years or over.
- They must be physically and mentally capable.
- They must be physiologically capable (rested and not under the influence of alcohol, drugs or medication).
- They must have been instructed in the operation and maintenance of the machine.
- They must have demonstrated their competence to the operator.
- They can be expected to reliably execute the tasks with which they are charged.

The operating personnel must not wear loose garments or jewellery, including rings. Long hair which is not tied back must be covered by a hair net. There is a risk of injury, in particular from being caught or trapped by moving parts.

All persons working on or with the machine must concentrate on the task at hand and not be distracted, particularly by smartphones and music played through headphones.

1.5.2 Qualifications

Persons who are being trained, introduced and instructed in the use of the machine are only permitted to operate the machine under the constant supervision of experienced personnel.

If you do not have qualified personnel, suitable workshop equipment, etc. available, you should commission the manufacturer's After Sales Department with the maintenance of your machine.

1.5.3 Responsibility of the machine operator

The operator must define the responsibility of the machine operator (including in respect to national road traffic regulations) and empower the machine operator to reject instructions from third parties prejudicial to safety. The machine operator must be able to reject the site of operations in the event of doubts regarding technical safety.

1.6 Operating Instructions, operating procedures and other regulations

1.6.1 Operating Instructions

Personnel that are authorised to work on the machine must have read the Operating Instructions, particularly the “Safety Regulations” section, and the Safety Manual before working with the machine. Reading the instructions after work has begun is too late. This applies especially to personnel working only occasionally on the machine, e.g. during setting up or maintenance.

As the operator, you must always make sure that the Operating Instructions are available. The Operating Instructions and check book must always be kept to hand at the site of use of the machine (in the tool compartment or container provided for this purpose).

As the operator, you must have personnel working on the machine confirm in writing their knowledge, understanding and application of the Operating Instructions and Safety Regulations and Safety Manual. At regular intervals of at least once a year, check that personnel are conscious of safety and the hazards involved in their work and are taking account of the Operating Instructions.

Personnel entrusted with work on the machine must observe all safety instructions and warning notices, and must be familiar with the machine itself. You must practice all the operating procedures described in the Operating Instructions (extending the supports, operating the placing boom, shifting the placing boom into the driving position, preparing the vehicle for moving, etc.) under the supervision of a subject expert until you are certain you can execute them safely. Ask questions if there is something you have not understood. Begin operating the machine only once you are fully and explicitly familiar with the layout and significance of all the control and operating elements and monitoring devices and the method of operation of the machine.

1.6.2 Operating procedures

The operator must produce operating procedures for their personnel in accordance with national regulations. These operating procedures must also contain instructions (including the obligation to provide supervision and reports) concerning the observance of special operational features, particularly in respect of work organisation, working procedures or personnel deployment. Furthermore, reference must be made to other generally valid legal and otherwise mandatory regulations relating to accident prevention and environmental protection. Such regulations may also deal with handling hazardous substances, the issuing and wearing of personal protective equipment or with national road traffic regulations. You should familiarise yourself with the site of operations and with how to use fire extinguishers. Observe the firealarm and fire-fighting procedures.

1.6.3 Other regulations

The current regulations for concrete delivery and placing machines as issued by:

- The legal authorities in your country
- The national supervisory bodies
- The responsible commercial liability insurance company.

1.7 Personal protective equipment

To reduce the risk to life and limb, personal protective equipment must be used by the operating personnel whenever necessary or required by regulations. Safety helmet, protective gloves and safety footwear are specified for all persons working at or with the machine.

Personal protective equipment must at least comply with the specified standards.

Symbol	Meaning
	Safety helmet The safety helmet protects your head, e.g. against falling concrete or parts of the delivery line if the lines burst. (DIN EN 397:2022; Industrial safety helmets)
	Safety footwear Safety footwear protects your feet against falling objects and against penetration by projecting nails. (DIN EN ISO 20345:2022; Safety footwear for professional use; category S3)
	Hearing protectors Hearing protectors protect you against the noise generated in the vicinity of the machine when you are standing close to it. (DIN EN 352-1:2021; Hearing protectors - General requirements - Part 1: Earmuffs or DIN EN 352-3:2021; Hearing protectors - General requirements - Part 3: Earmuffs attached to an industrial safety helmet)
	Protective gloves Protective gloves protect your hands against aggressive or chemical substances and against mechanical effects (e.g. knocks) and cutting injuries. (DIN EN 388:2017; Protective gloves against mechanical risks; classification 1111)

Symbol	Meaning
	Protective goggles Protective goggles protect your eyes from injuries due to concrete spatter and other particles. (DIN EN 166:2002; Personal eye protection - Specifications)
	Safety harness When working at heights, use climbing aids and platforms that are intended for this purpose and comply with the safety regulations or wear a safety harness. Relevant national regulations must be observed. (DIN EN 361:2002; Personal protective equipment against falls from a height - Full body harnesses; category III)
	Respiratory protection and face mask Respiratory protection and face masks protect you from particles of building materials that may enter your body through the respiratory passages (e.g. concrete admixtures). (DIN EN 149:2009; Respiratory protection devices - Filtering half masks to protect against particles - Requirements, testing, marking; classification FFP1)

2 Setting up and working with the machine

2.1 Before working with the machine

2.1.1 Checking that the machine is ready for operation

As machine operator, it is your responsibility to check the machine for external damage and defects before any use of the machine. You must immediately report any changes (including changes in the working characteristics) to the organisation or person responsible. If necessary, shut the machine down immediately and secure it.

2.1.2 Rendering the machine ready for operation

As machine operator, you are responsible for rendering the machine ready for operation. This also includes topping up the functional fluids. Do not fill with fuel in enclosed spaces. Switch off the engine and the heating. Wipe up spilt fuel immediately. It is prohibited to smoke or use a naked flame when handling fuel.

Set all the control and operating elements to the zero position before you change the mode of control.

Never put the remote control down when the machine is ready for operation. If this is unavoidable in exceptional cases, you must switch off the remote control, disconnect it and lock it away.

2.2 Danger due to high voltage

2.2.1 High-voltage lines

Whenever you touch a high-voltage line, there is a risk of death for all persons either on the machine or in its vicinity or who are connected to it (via the remote control, end hose, etc.). A spark can jump across from a highvoltage line even if you just approach it and this will energise the machine and the surrounding area.

2.2.2 Discharge voltage pattern

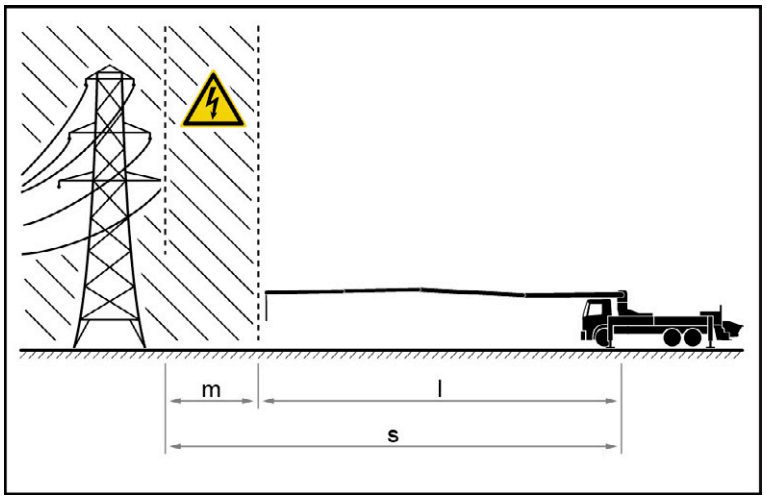
In the event of a flash over, what is known as a “discharge voltage pattern” is formed in the vicinity of the machine. The voltage decreases from the inside to the outside in this discharge voltage pattern. If you step inside this discharge voltage pattern, you will bridge different potentials. This will cause a voltage corresponding to the potential difference to flow through your body.

2.2.3 Clearances from highvoltage lines

Always maintain a safe clearance from high-voltage lines. The safe clearance is determined by adding the maximum placing boom length to the minimum clearance specified in the table. The maximum placing boom length is measured in the horizontal when the placing boom is fully extended. As long as the safe clearance is maintained, hazards caused by the high-voltage lines can be excluded and work can be performed without restrictions.

Rated voltage [V]	Minimum clearance [m]
Less than 1 kV	1,0
Between 1 kV and 110 kV	3,0
Between 110 kV and 220 kV	4,0
Between 220 kV and 380 kV	5,0
More than 380 kV or unknown rated voltage	5,0

The specified clearances are minimum requirements. You must observe any greater clearances that may be specified in the country of use.



Item	Designation
m	Minimum clearance
l	Max. placing boom length
s	Safe clearance

When maintaining the clearances (safe clearance or minimum clearance), the possibility of the high-voltage lines and the placing boom swaying in the wind must also be taken into consideration. You should further note that where air humidity is high, greater clearances are always necessary.

You must stand as close as possible to the unfolded placing boom if you wish to correctly estimate the movements of the boom and, above all, the clearance between the placing boom and obstacles or high-voltage lines.

A clearance smaller than the safe clearance may be used if absolutely required by the conditions on the construction site. The clearance to high-voltage lines must not be smaller than the minimum clearance specified in the table.

In case of clearances smaller than the safe clearance, contact between the placing boom and the high-voltage line cannot be excluded and there is a risk of death. Suitable organisational measures to guarantee the minimum clearance in all working situations must be developed, observed and documented to prevent this risk of death.

In the event that the minimum clearance between the placing boom and high-voltage lines cannot be maintained, the power station responsible must be contacted and you must have the highvoltage line switched off.

Should you have any doubts, it is better to forgo the use of the placing boom and to lay a separate delivery line.

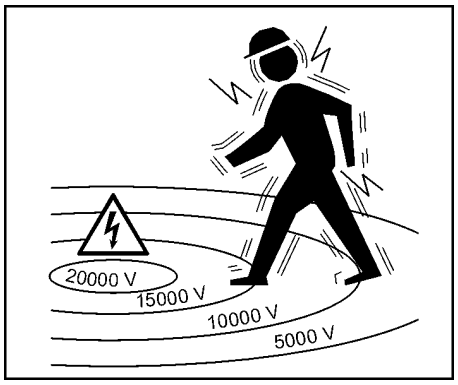
The first priority must always be to set up the machine with the safe clearance (placing boom length plus minimum clearance).

2.2.4 Highvoltage warning devices

According to the current rules of engineering, highvoltage warning devices do not meet a safety standard which enables minimum clearances to highvoltage lines that are smaller than the required minimum clearances to be used. Previous experience has shown that highvoltage warning devices cannot make all situations in working procedures safe. Flash overs and fatal accidents can occur despite the use of a highvoltage warning device. You must therefore always maintain the minimum clearances mentioned above.

2.2.5 Procedure in the event of a flash over

If, despite all precautions, a flash over occurs, stay calm and do not move (potential differential) or touch anything.



If your machine comes into contact with high-voltage lines:

- Warn people standing outside the area not to approach or touch the machine.
- Have the power switched off.
- Only leave the machine once you are sure that the line you have touched or damaged has been deenergised.

Electricity generator works are always equipped with automatic start-up systems. If a circuit breaker trips, the short-circuited line will be switched back on again after a brief interval. Brief intervals where the voltage is absent create a false sense of safety.

You must not move or rescue injured persons until a representative of the power station has notified you that the line has been switched off.

A radio remote control system only protects the machine operator if he is standing outside the discharge voltage pattern.

2.2.6 Earthing in the event of electrostatic charging

Working in the vicinity of transmitters (radio transmitter, etc.) can result in faults in the radio remote control system and dangerous electrical charges in the machine. Persons who bridge the charged parts to the earth suffer life-threatening electrification on contact.

Machines in use in the vicinity of transmitters must be earthed. This earthing may only be carried out by trained personnel.

Even with an earthed machine, the safe clearances to high-voltage lines *(Clearances from highvoltage lines P. 38)* and the instructions relating to storms and bad weather *(Procedure in storms P. 51)* must be complied with.

If you have any further questions about earthing the machine, please contact site management or the operator of the machine.

2.2.7 Earthing on construction sites with special installations

When carrying out work in the area of special installations (particularly overhead lines for railways or substations), it may be the case that the machine needs to be earthed upon request and in consultation with the operator of the special installation. This earthing must only be carried out by qualified personnel.

Even with an earthed machine, the safe clearances to high-voltage lines *(Clearances from highvoltage lines P. 38)* and the instructions relating to storms and bad weather *(Procedure in storms P. 51)* must be complied with.

2.3 Stationary machines

2.3.1 Setup site

Stationary machines are generally used on a construction site for a lengthy period. For this reason, site management should prepare the setup site carefully. Site management must deliver the necessary documents in good time in order to be able to prepare the foundations, base plates or similar on time.

When selecting the setup site, remember that the machine must be dismantled and transported away again at the end of its use on site. The ambient conditions may change as construction work progresses.

Please also observe the *(Setup site P. 42)* section.

2.3.2 Stationary placing booms

Stationary placing booms can be erected on tubular columns, lattice booms or other base structures. The base/structural elements to which the base structure is fixed must be able to withstand the forces and moments transferred via the base structure, as specified in the manufacturer’s information. The base frame of the base structure

must be fastened in place so that it is level on the base/structural elements in every direction. Check the documentation provided by the manufacturer in this regard and the corresponding notes in the operating instructions.

2.3.3 Lifting machines and components

Machines which are transported to the setup site in individual parts or not under their own power must only be lifted with suitable lifting equipment in accordance with the specifications in the Operating Instructions. The lifting gear on the machine must be capable of accepting the lifting equipment and lifting the load. Noone should stand under suspended loads. Before work is started, a subject expert must check that the assembled machine is working properly.

2.3.4 Loading and transporting

Only use suitable means to load and transport stationary machines. Ensure that noone can be injured by the machine tipping over or slipping.

The machine/components must be properly secured during transport. Observe the markings on securing points.

Many lifting points fitted to the machine are provided for assembly purposes only. They are not suitable for lifting the complete machine. The lifting points for lifting the entire machine are specially marked.

The transport vehicle and machine must be marked to conform with the road traffic regulations in the country concerned if they are to use the public highway.

Please also observe the *(Driving P. 46)* section.

2.4 Mobile machines

2.4.1 Setup site

Site management must prepare and assign the set-up site. It is the machine operator who takes responsibility for setting up the machine safely. The machine operator must inspect the setup site proposed by site management and must refuse to set the machine up at the site of operations if there are any doubts regarding safety.

As machine operator, you must familiarise yourself with the working area and surroundings before work is begun. The working area and surroundings include, in particular, obstacles in the work and travelling areas, the load-bearing capacity of the supporting ground and any barriers separating the construction site from public roads.

The setup site must have sufficient lighting to ensure safe operation of the machine. Ensure that the setup site is adequately lit.

Do not set up the machine in areas where equipment may fall down.

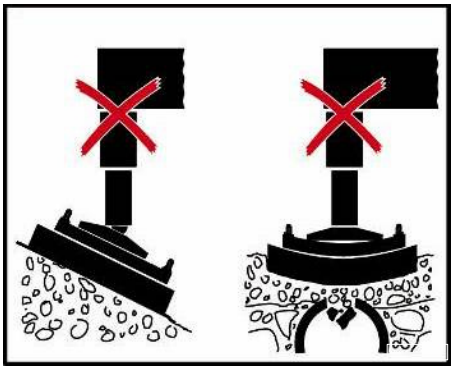
Incidents of overlapping with the working areas of other machines (particularly cranes, other placing booms, etc.) should be avoided as far as possible. If this is not possible, special care and attention is required when setting up and operating machinery. Discuss the necessary measures with the health and safety coordinator (HSC) for the construction site. The HSC must establish the necessary safety measures.

You must also check the approach route to the site where the machine will be set up. If you are unsure whether the approach route is suitable, prepare the route before work is started. It is especially necessary to walk the approach route once in darkness and at dusk or dawn. You should repeat this exercise again before leaving the construction site.

Always ask for a signaller if you need to reverse. If necessary, have the approach route closed off or secured by signallers. Have any materials or equipment that hinder your approach removed.

2.4.2 Supporting ground

Find out the load-bearing capacity of the supporting ground. The site management will be able to state the permitted ground pressure. If the load-bearing capacity is unknown, assume the that worst case scenario applies.



The supporting ground must be level and even. If necessary, set up a level surface on top of the uneven ground. There must be no voids or other ground irregularities under the support feet. Asphalt, concrete slabs, etc. may have been washed out underneath. Never set the machine up on backfilled ground, obvious or known voids or uneven ground.

The support area must be enlarged as required. Support plates and timber blocks may be used to increase the support area. The supports must be undamaged and free from ice, oil, grease, etc. The support blocks and timber blocks must be laid under the support plates such that the load is distributed uniformly and the support leg cannot slip off the side of the support.

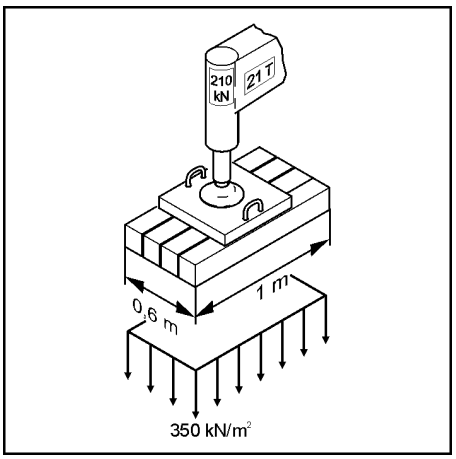
Check the stability of the machine regularly during operation. Interrupt the pumping operation if the machine becomes unstable.

Factors which reduce stability include, for instance:

- Modifications to the ground conditions, particularly caused by rain water or the thawing of frozen ground
- The support sinking on one side
- Fluid losses through leaks in the support hydraulics

2.4.3 Corner bearing loads

The corner bearing load is stated on each support leg. This value must always be legible.



The load supported by each support leg is conically diffused in the ground at an angle of 45 °. Safe clearance to the pits and slopes must be maintained, and such clearance must be determined in accordance with the nature of the ground. The safe clearance is measured from the foot of the pit.

The following guide values apply:

- On undisturbed, compacted ground, the safe clearance corresponds to the pit depth, but must be at least 2 m.
- On loose or backfilled ground, the safe clearance corresponds to double the pit depth, but must be at least 2 m.

If the ground conditions are unclear, you must contact the site management and enquire about the required minimum clearance.

2.4.4 Supports

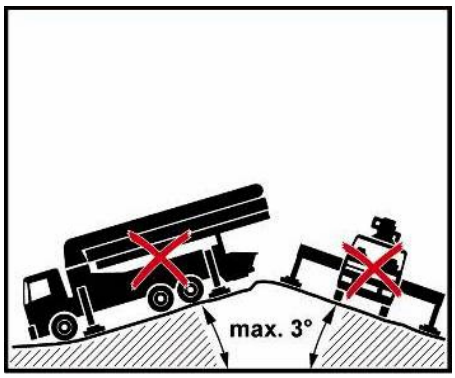
The placing boom must not be raised until the machine has been supported in accordance with the Operating Instructions. There is otherwise a risk of the machine toppling over.

Swing out and telescope the support legs to their end positions in sequence. Intermediate positions are prohibited to guarantee stability. Exceptions are machines which have been equipped by the manufacturer with a device which allows secure erection with a reduction in support. Check the corresponding notes in this regard in the operating instructions.

Do not carry out more than one movement at a time. If a movement is stopped, the entire volume of fluid is available for the remaining movements, and can increase their speeds. Depending on the design, it may be the case that carrying out several movements at once (as opposed to carrying out a single movement at maximum speed at any one time) does not bring any advantage in terms of time. Carrying out several movements at once requires an increased level of attentiveness.

Lock all supports mechanically, if this is provided for in the design. Close all shut-off valves in the support hydraulics. Leaks can cause the supports to sink on one side.

The machine must be made level in all directions. Provided the manufacturer does not state otherwise, the maximum permissible deviation from the horizontal is 3 °. Greater deviations from the horizontal overload the slewing gear for the placing boom as well as its overall support structure, jeopardising the stability of the machine.



Check stability regularly during operation. The elastic distortions to the machine frame occasionally occurring under extreme positions of the placing boom (one support foot lifts from the ground) must be compensated for by resetting the support cylinders until all support feet are firmly placed on the ground.

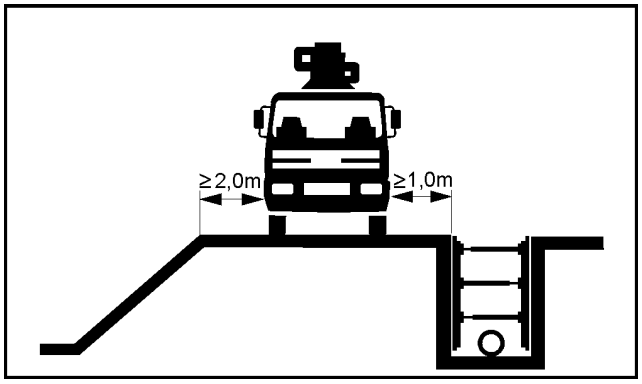
2.4.5 Driving

When preparing the machine for driving, you must perform the following tasks in particular:

- The placing boom must be folded in fully and positioned on the placing boom support provided.
- The support legs and support feet must be fully retracted and secured.
- Raised or locked axles must be lowered and released.
- Accessories and moving parts belonging to the machine must be safely stowed/secured.
- The maximum permissible gross weight must not be exceeded.

While the vehicle is being driven, the delivery line, pump and hopper must be empty. If there is concrete residue in the hopper, there is a risk of injury from the concrete residue, which may be thrown out while the vehicle is in motion. This also affects the centre of gravity of the machine. Observe the road traffic regulations and specifications of the machine manufacturer.

Maintain a distance of at least 1 m to the secured edges of the pit and a distance of at least 2 m to slopes.



Always make sure that there is sufficient clearance when driving under underpasses, over bridges and through tunnels or when passing under overhead cables. The same minimum clearances apply when driving under high-voltage lines as when working with the placing boom. Be aware of the height of the truck. Only drive over arches, bridges or other supporting structures if their load-bearing capacity is sufficient.

Do not drive across uphill or downhill gradients. Be aware of the elevated position of the truck's centre of gravity when travelling on a slope and on ascending or descending routes. Always adapt your travelling speed to the prevailing conditions on sloping terrain.

Observe national road traffic regulations. If necessary, clean the tyres, lights and number plate. Before travelling with the machine, check that the braking, steering, signalling and lighting systems are fully functional.

Persons accompanying the driver must be seated on the passenger seats provided for this purpose.

For truck mixer concrete pumps, only turn the mixer drum at the maximum specified speed of rotation whilst the truck is in motion. The truck is at risk of toppling over, particularly when travelling round corners.

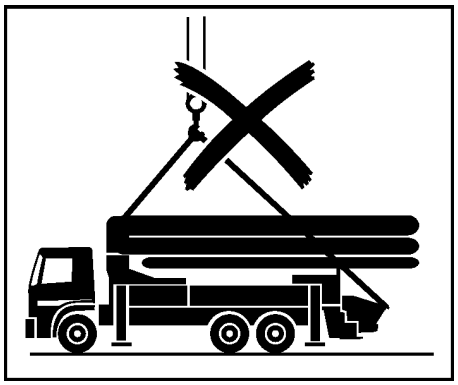
2.4.6 Towing

The machine must only be towed, loaded and transported in accordance with the Operating Instructions. Only use existing towing hitches for towing and observe the truck manufacturer's regulations.

You must comply with the prescribed driving position, permitted speed and itinerary when towing.

2.4.7 Loading

Many lifting points fitted to the machine are provided for assembly purposes only. They are not suitable for lifting the complete machine.



The lifting points for lifting the entire machine are specially marked.

Use only appropriate means of transport and lifting equipment of adequate load-bearing capacity. Lifting equipment, lifting tackle, support trestles and other auxiliary equipment must be reliable and safe in operation.

Only load the machine on stable loading ramps of adequate load-bearing capacity. Ensure that noone is at risk from the machine tipping over or slipping.

Secure the machine on the transport vehicle to prevent it rolling away, slipping and toppling over.

2.5 Placing booms

2.5.1 Unfold placing boom

Only raise a mobile placing boom from the driving position once the machine has been supported in accordance with the Operating Instructions. Stationary placing booms may only be raised after the proper set-up has been checked by a subject expert.

Only raise the placing boom in the sequence described in the Operating Instructions. The correct sequence depends on the “Folding system” (roll-and-fold system, Z fold system, etc.).

Do not carry out more than one movement at a time. If a movement is stopped, the entire volume of fluid is available for the remaining movements, and can increase their speeds. Depending on the design, it may be the case that carrying out several movements at once

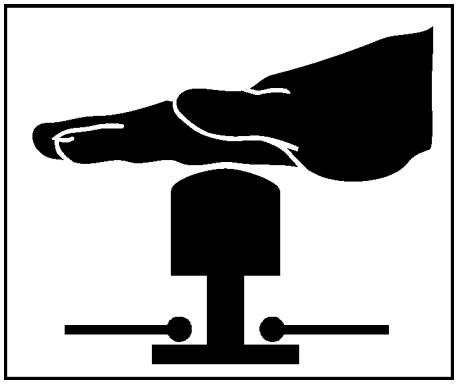
(as opposed to carrying out a single movement at maximum speed at any one time) does not bring any advantage in terms of time. Carrying out several movements at once requires an increased level of attentiveness.

The range of a radio remote control is long enough for the machine to receive control commands (e.g. from a great distance, from inside enclosed spaces) even without visual contact. If there is no visual contact, for example, because you are changing workplace, you must switch off the remote control. If there is no visual contact, for example, because the construction site is unclear, signallers MUST be used, and must remain in contact with the machine operator using suitable means, and have visual contact with the site of concrete placement, work areas and danger zones, and the machine.

Always ask the site management to provide you with an assistant to act as a signaller. Agree clear hand signals or other signals with the signaller so that you can communicate with each other. You should position the signaller such that he can always observe the whole of the placing boom. Your primary duty as the machine operator is to observe the site of concrete placement.

Only slew the placing boom over persons when the delivery line and end hose are empty. There is a risk of concrete falling out of the end hose.

Press the EMERGENCY STOP BUTTON immediately if the placing boom moves unexpectedly. If this should occur, you must cease working and have the cause of the fault rectified by your qualified personnel or our After Sales Service personnel.



Placing booms with placing boom hinges which allow considerable flex angles have a very large potential working area. This high manoeuvrability means different placing booms can also be moved into dangerous positions. Prohibited areas can be found in the Operating Instructions.

There is a risk that you will damage the truck, truck superstructure or obstacles on the construction site with the placing boom. Under certain circumstances it is even possible to overload or cause damage to the placing boom. Uncontrolled movements may result from the sudden, violent release of the placing boom after collisions. This may also result in (possibly fatal) personal injury.

The manufacturer has indicated such impermissible working areas by the use of warning signs and information plates on the machine and appropriate notes in the Operating Instructions.

2.5.2 End hose and end hose combination

The end hose/end hose combination must hang freely each time you start pumping, when you start pumping again after blockages, and during cleaning procedures. No one should stand within the danger zone of the end hose/end hose combination. Do not guide the end hose/end hose combination when starting to pump. There is a risk of accident from the end hose/end hose combination swinging out or stones being ejected.

When using a longer end hose/end hose combination, the diameter of the danger zone also increases. See danger zone *(Danger zone at the end hose P. 20)*

End hoses/end hose combinations with a length of more than 4 m must not be guided by hand.

The end hose/end hose combination must not impede the movement of the placing boom; in particular, the end hose must not catch on the reinforcement or formwork. There is a risk of death if the machine topples over or the end hose shoots out on further movement of the placing boom.

Never bend the end hose over. Never attempt to straighten a bent end hose by increasing the pressure. The end hose must not be submerged below the surface of the concrete being delivered, otherwise the concrete may spray upwards.

The concrete may also spray from the end hose due to the presence of air in the delivery line. To prevent this from occurring, the hopper must be filled with concrete at least as far as the agitator shaft so that no air can be sucked in.

The end hose/end hose combination must be secured against falling.

2.5.3 Guiding the end hose ergonomically

The hoseman must guide the end hose in such a way that prevents excess spraying of concrete, and so that concrete is directed precisely into the site of concrete placement.

Control the placing boom so that the hoseman can guide the end hose without power consumption. The hoseman must not carry the end hose by hand, because the weight of it may cause permanent personal injury.

2.5.4 Connecting drills

If a drill is connected to the delivery line for the placing boom, it must not place any further strain on the placing boom. The placing boom must be connected to the drill in such a way that the placing boom does not require adjustment. There should be 1-2 delivery hoses between the placing boom and the drill; these must be secured so that they cannot move in an uncontrolled manner. If the drill is moved on the construction site, the placing boom must not be connected.

2.5.5 Procedure in storms

Return the placing boom to the driving position or rest position in the event of storms or bad weather.

Observe the manufacturer specifications for the maximum wind speed during operation!

The definitive wind speed is measured at the height of the boom tip.

Wind speeds in accordance with the Beaufort scale are average wind speeds measured over a period of 10 minutes. Higher speed gusts of wind may occur briefly during the measuring period.

Higher wind speeds jeopardise the stability and safety of structural elements. There is a risk of lightning strike in a thunderstorm.

Lightning strikes pose a risk of death. The machine and the surrounding area will be charged with electricity. Earthing the machine does not reduce this risk. For this reason, you should fold in the placing boom if there is a risk of lightning strike.

Wind speed measuring equipment is usually installed on construction sites, so you can find out the wind speed from the site management.

If there is no wind speed measuring equipment, request information about the current wind and weather situation from a reliable source.

2.5.6 Concreting in cold weather

Placing booms must not be used at temperatures of below minus 15 °C (+5 °F) except with the express approval of the manufacturer. There is a danger of damage to the steel (brittle fracture) and the seals throughout the system at such extreme minus temperatures.

In addition, such minus temperatures should be considered the realistic lower limit for concrete placement, as it is no longer possible to prepare concrete such that it can achieve its strength without the use of special additives.

2.6 Delivery line systems

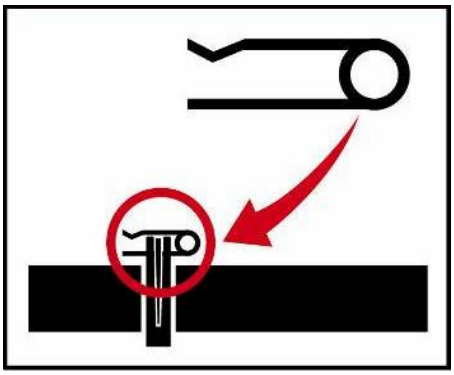
2.6.1 Suitable delivery lines

Use only delivery lines, end hoses, couplings, etc. which are in perfect condition and suitable for the delivery job and have been approved by the machine manufacturer. Delivery lines are subject to wear which varies according to the delivery pressure, concrete composition, the material from which the delivery line is made, etc.

If you are not responsible for the separate delivery lines, the permissible operating pressures of these should be confirmed by the operating company.

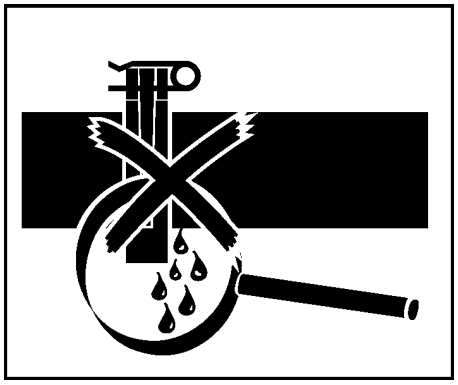
2.6.2 Securing delivery lines

Delivery lines, delivery hoses, end hoses and couplings must be securely fastened and secured to prevent spontaneous opening.



2.6.3 Leak tightness and blockages

Regularly force water through the delivery line under operating pressure to check that the system is watertight.

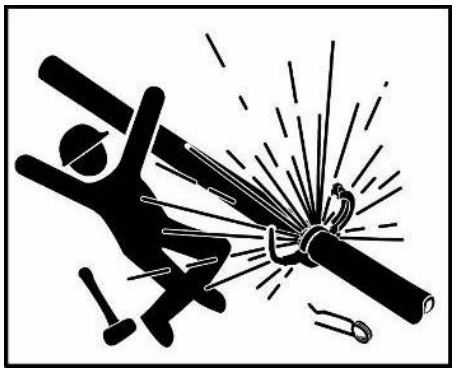


A properly cleaned delivery line is the best insurance against the formation of blockages. Blockages increase the risk of accidents. Never attempt to push through a blockage (e.g. by increasing the delivery pressure, using compressed air, etc.). There is a risk of death from the delivery line bursting or from concrete being ejected from the end of the delivery line.

Prevent blockages by adjusting the operating conditions. Remove blockages by reverse pumping and then restarting forward pumping. Repeat this process several times if necessary. If the blockage is not removed, relieve the pressure on the delivery line before removing the section of delivery line concerned.

2.6.4 Opening delivery lines

Delivery lines must not be opened or tapped off while they are pressurised. Concrete exiting under pressure can cause injury. The concrete column must be depressurised by reverse pumping before the delivery line is opened. Never bend over the coupling when you are working.



2.6.5 Clearance to delivery lines

Noone should remain in the vicinity of separate delivery lines during pumping operations. Cordon off the danger zone. If it is not possible to place a large enough cordon around the danger zone, the delivery line must be covered by suitable means.

2.6.6 Securing the delivery lines

Delivery lines, in particular riser lines which are not laid along placing booms, must be securely fastened in order to transfer the forces generated in them into the structure or other structural members. The lines must be laid so as to avoid kinks, sharp bends, stresses and damage during pumping operations.

2.6.7 Continuation delivery lines

Continuation delivery lines not described in the Operating Instructions must not put an additional strain on the placing boom.

While you connect, use and disconnect a continuation delivery line, you must switch off the placing boom control system to prevent unintended movements of the placing boom. There is a risk of accident posed by jerky movements of the boom tip.

2.6.8 Devices for shutting off, diverting and cleaning

During operation, there is a risk of being crushed and of injury by shearing. Hydraulically driven devices are generally supplied with power by the hydraulic system of a machine. For this reason, there must always be a line of sight between the devices and the machine fitted with the control unit. Observe the safety regulations for the machine and the device when connecting and operating a device. Before operating devices, ensure that no persons are present in the danger zone.

Use only devices that are suitable and in perfect working order to shut off, divert and clean the delivery line. Defective and unsuitable devices can lead to damage to the entire delivery system and injure people in the vicinity if they fail.

2.7 Pumping operations

2.7.1 Place of work

The machine operator's place of work is with the remote control when the pump is in operation. If you operate the machine using the remote control, all control and operating elements on the machine that are not protected by the control console lock must be secured. This is to prevent unauthorised access.

Do not leave your place of work while the machine is ready for operation, e.g. during breaks in pumping, interruptions or maintenance work. Secure the machine to prevent unauthorised use if you leave your place of work.

In the case of stationary placing booms, platforms or similar equipment are only provided for assembly and maintenance work. Use of these platforms as a place of work during operation is prohibited.

It is forbidden to climb onto the machine during operation. In the case of stationary placing booms, it is forbidden to climb ladders during operation.

2.7.2 Safety

Before switching on or restarting the machine or individual machine functions, you must ensure that doing so will not endanger anyone's safety.

Refrain from any procedures that may impair the stability of the machine or are prejudicial to safety in any other way.

2.7.3 Remote control

You must always carry the remote control on your person when the machine is ready for operation. Only in this way can it be guaranteed that you can press the EMERGENCY STOP BUTTON in the event of an emergency situation. The EMERGENCY STOP BUTTON may only be unlocked once the cause/emergency has been remedied.

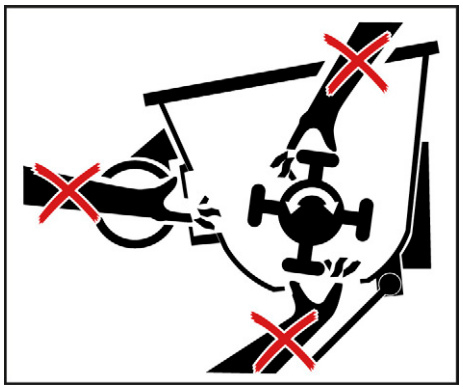
As a general rule, you must carry the remote control so that no control and operating elements are actuated unintentionally. If your attention is drawn away from the machine (particularly when changing place of work), you must switch off the remote control.

During breaks in pumping, interruptions, maintenance work, or before you leave the machine, you must secure it to prevent unintended movements and unauthorised use. Switch off the remote control and lock it away.

2.7.4 Moving machine components and hot surfaces

Keep all access covers, maintenance flaps, guards, etc. closed and locked during operation. This also applies in particular to the grille, water box cover and covers over cylinders. There is otherwise a risk of injury from moving machine components and a risk of burning on hot surfaces. In particular, there is a risk of burning from the engine, attached parts and the exhaust.

Never start work unless the grille is closed and bolted down or otherwise secured.



Do not touch moving parts of the machine, whether the machine is running or switched off. Always switch off the engine first, and dump the accumulator pressure where an accumulator is fitted.

Do not insert any objects (shovel handle, trowel, etc.) into moving machine components. Such objects could become trapped and dragged into the machine. They might then hit you or be torn from your hands and cause you injury.

2.7.5 Constant observation of the machine

You should be constantly observing the machine for any damage or faults while it is in use. In the event of faults or malfunctions that impair safety at work, shut the machine down immediately and secure it. Have the faults rectified immediately. If it is not possible to rectify faults which jeopardise the safe operation of the machine, you must suspend operations until the defects are rectified.

2.7.6 Truck mixer

As the machine operator, it is your role to instruct the truck mixer drivers who deliver the concrete to you, so that they are able to operate the operating elements on the concrete pump provided for their use. Only allow the truck mixer drivers to work alone once you are certain that they have understood your instructions.

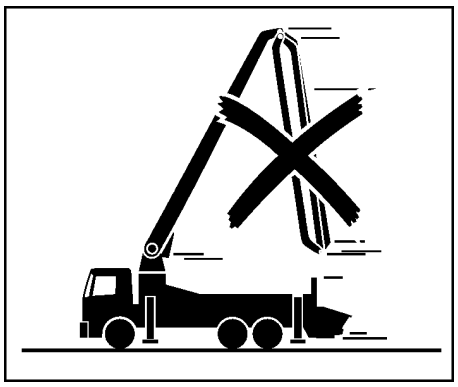
Make sure that no-one stands between the approaching truck mixer and the machine. There is a risk of crushing between the truck mixer and the machine.

2.8 Cleaning

2.8.1 General

You must drain the delivery line, pump and hopper completely. Concrete residue in the hopper, in particular, may be thrown out whilst the truck is moving.

The machine must not be driven with the placing boom unfolded or the support legs extended, even over short distances. This rule also applies when you have to drive the machine to a different site for cleaning. The placing boom and support legs must be fully retracted and secured.



The preferred methods for cleaning the delivery line are reverse pumping or forced cleaning with water. The agitator must be switched on during reverse pumping. Otherwise, the concrete flowing back into the hopper can bend the agitator shaft. Use a catch basket, pipe cleaning head and wash-out ball for forced cleaning to prevent any water from flowing into the formwork.

Do not spray electrical/electronic components with barrier agents (mould oil, etc.). This causes significant corrosion damage to the electrical system.

There is a risk of injury at all points on the machine from slipping, tripping, bumping into things, etc. Use the handles and steps to climb into and out of the machine. It is forbidden to stand on the grille. Do not jump from the machine.

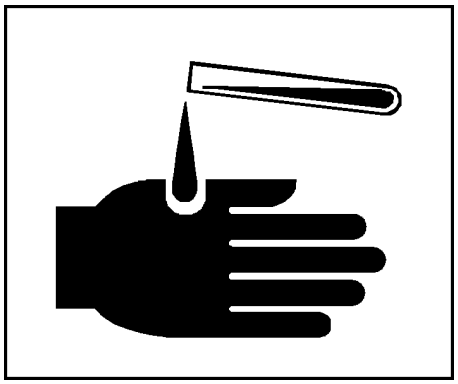
Do not reach into the hopper or any other moving machine components. This rule must also be followed when you are opening the outlet on the bottom of the hopper. Do not remove the grille.

Only point the water jet into the hopper or other moving machine components. Do not insert the hose. It could become entangled with moving machine components.

2.8.2 Cleaning agents

Take care when using aggressive cleaning agents. Aggressive cleaning agents may attack materials (e.g. rubber) and painted surfaces. You can use commercially available paint cleaning and care agents, as long as these have a pH value of between 4 and 9. Ask the manufacturer of the cleaning agent to confirm its suitability. Observe the

manufacturer's instructions regarding use and safe handling. Wear protective clothing. Always rinse off cleaning agent thoroughly with clean water; do not allow puddles to form.



Do not use sea water or other water containing salt for cleaning purposes.

Do not use any highly flammable agent for cleaning; there is a risk of fire.

2.8.3 Cleaning with compressed air

When the delivery line systems are being cleaned with compressed air, there is an increased risk of accidents caused by compressed air escaping explosively, spurting concrete, and the delivery line systems moving uncontrollably.

Compressed air should only be used for cleaning purposes under the supervision of a subject expert. All persons participating in the cleaning procedure must be instructed in the safety regulations.

The manufacturer accepts no liability for damage caused by incorrectly performed compressed air cleaning. You must observe the following rules without fail when you use compressed air to clean out delivery line systems:

- Individual pipes and short pipe runs up to 10 m in length must not be blown through with compressed air. There is a risk of accident from rebound.
- Only blow out delivery line systems that have the same nominal diameter throughout their length. Reducer pipes must be drained and flushed out by hand.
- At the end of the delivery line system, the end hose/end hose combination must be removed.

- A catch basket must be fastened at the end of the delivery line system and a wash-out adaptor must be fitted at the start of the delivery line system. The catch basket and washout adaptor must fit the delivery line system.
- The concrete must be able to flow freely from the end of the delivery line.
- There must be no persons present within the danger zone around the delivery line, at the end of the delivery line and, in particular, in front of the opening in the catch basket.
- Care must be taken to ensure that any concrete that might be expelled from the catch basket cannot injure anybody or cause any damage.
- The wash-out adaptor must be fitted with a separate, large dump cock and a pressure gauge.
- The pressure gauge must be kept under constant observation during the cleaning process. The pressure in the delivery line must be rapidly dumped via the dump cock in the event of a sudden drop in pressure (concrete column exiting from the end of the line) or increase in pressure (risk of blockage).
- The sponge ball or the plug used to push the concrete out must be sufficiently dense that the air does not pass through it into the concrete. In addition, the delivery line must be sealed to the rear when the sponge ball or plug is caught in the catch basket.
- Only work on delivery line systems (particularly when opening the delivery line) if these have been depressurised. Make sure that the compressed air has been dumped completely.
- The dump cock must be opened in such a way that no-one can be injured by concrete residue that might be expelled from the dump cock.
- Separate delivery line systems that are cleaned with compressed air must be securely fastened so that they cannot move uncontrollably.
- If continuing distribution systems (e.g. rotary distributors), gate valves or other delivery line elements are connected to the delivery line systems, they must be secured in such a way that they cannot move uncontrollably.
- Ensure that any elbows on the end of the delivery line are removed in the case of rotary distributors.

2.8.4 Protection against water

Water spraying on the machine from random directions has no damaging effect. The electrical system is protected against spray water, but is not waterproof.

You must close/seal all openings into which water/steam/cleaning agent must not penetrate for safety or functional reasons before cleaning the machine with water or a steam jet (high-pressure cleaner) or other cleaning agents. Electric motors and control cabinets are particularly at risk.

2.8.5 Post-cleaning procedure

After the machine is cleaned, the covers/tapes must be completely removed and the machine must be checked to ensure that it is ready for operation *(Before working with the machine P. 37)*.

Look out for leaks, loose connections, chafe marks and damage during the cleaning procedure. Any identified defects must be rectified immediately. The machine must be greased after it has been cleaned using a highpressure cleaner.

2.9 Securing the machine

If you need to leave your place of work, secure the machine as follows:

- Switch off the remote control.
- Remove the remote control, if applicable, and lock it away.
- Switch off the ignition or the main switch.
- Close and lock all control cabinets.

3 Maintenance and special work

3.1 Requirements for special work

As the operator, it is your responsibility to provide all the necessary information to the personnel involved before special work or maintenance work is carried out. Someone should be nominated as the person responsible for this.

Carry out the maintenance and inspection operations and comply with intervals specified in the Operating Instructions, including specifications for the replacement of parts and equipment. These tasks may only be carried out by qualified personnel.

Workshop equipment appropriate to the task in hand is absolutely necessary for the execution of maintenance work.

If changes have been made to the machine, it must be checked by a subject expert before recommissioning.

Secure a wide area around the maintenance area as far as is necessary.

A machine that has been completely shut down for maintenance and repair work must be secured to prevent it being restarted inadvertently:

- Lock the main control devices and remove the key.
- If a main switch is fitted, attach a warning plate to it.

Only carry out maintenance work if the machine is parked on level and sufficiently supporting ground and is secured to prevent it rolling away.

Use specially designed or otherwise suitable climbing aids and working platforms when carrying out assembly work above head height. Never use machine parts as climbing aids. Keep all handgrips, steps, railings, platforms and ladders free from dirt, snow and ice.

Carefully secure individual parts and large assemblies to lifting equipment when carrying out a replacement operation. Use only suitable and technically perfect lifting equipment and suspension systems with adequate lifting capacity. Never stand under suspended loads.

Attachment of loads and signalling to crane operators should only be entrusted to experienced personnel. The signaller must be within visual range of or in voice contact with the crane operator.

Observe national regulations when working with lifting equipment.

Work on chassis, braking and steering systems must only be carried out by qualified personnel trained for such work.

Clean any traces of oil, fuel or preservatives from the machine, especially connections and threaded unions, before carrying out maintenance or repair work. Do not use aggressive cleaning agents. Use lint-free cleaning rags.

Bolted connections that you have loosened for carrying out maintenance and repair work must always be replaced or retightened in accordance with manufacturer specifications.

Do not open gas-filled spring elements, as used on maintenance flaps, for instance. The spring elements are filled with gas under high pressure which can escape explosively if you attempt to open them. Relieve the tension on systems under mechanical stress.

Be aware of hot functional fluids and surfaces (hydraulic fluid, hydraulic fluid radiator, etc.).

Ensure that all functional fluids, consumables and replaced parts are disposed of safely and with minimum environmental impact.

3.2 Welding

Only carry out welding, flame cutting and grinding operations on the machine once this has been expressly approved by the manufacturer.

Only qualified personnel may carry out welding work in line with manufacturer specifications, especially on the placing boom, on the supports, on load-bearing parts, on fuel and oil tanks or other components which are important for industrial safety. This work must be inspected by qualified welding personnel. The operator must document the evidence of the formal qualifications of the welder and the qualified welding personnel.

Always attach the earth cable of the welding unit directly to the component which is being welded. The welding current must not flow through hinges, cylinders, etc. Significant damage may be caused in the event of a flash over.

Electronic components can be destroyed by stray voltage during arc welding processes. For this reason:

- Disconnect the remote control cable from the control console.
- Disconnect all cables leading to the receiver of the radio remote control system.
- Close connector sockets with caps.
- Disconnect the positive and negative leads from the battery.

Clean the machine and its surroundings of dust and flammable substances and make sure that the premises are adequately ventilated before carrying out welding, flamecutting and grinding operations, otherwise there is a risk of explosion.

3.3 Working on the placing boom

Only carry out maintenance and repair work on the placing boom if the placing boom is folded or properly supported, the engine is switched off and the support legs are secured.

Support the placing boom arms before starting work on the valves, cylinders or hydraulic lines on the boom.

The delivery line was installed without tension with the placing boom in the driving position and can only be replaced without difficulty in this condition. Stresses may be generated on folding if the delivery line is replaced when the placing boom is unfolded.

Do not remove the entire delivery line but rather replace the delivery line boom arm by boom arm, for example. Otherwise, the pivot points of the new delivery line will have to be redetermined using special equipment.

3.4 Safetyrelevant components

Work on safety-relevant components requires particular specialist knowledge.

The following activities in particular must only be carried out by qualified personnel that have been authorised by the manufacturer:

- Repairing, replacing or adjusting safety-relevant components and adjustable devices (pressure limiting valves, potentiometers, fluid flow limiters, hydraulic cylinders, sensors, etc.)
- Removing lead seals

Modifications to the machine data (in particular, increasing pressures, modifying speeds, etc.) are not permitted.

3.5 Software

If a machine is equipped with software, the software may only be used as is provided for in the manufacturer’s Operating Instructions.

Only persons authorised by the manufacturer may intervene in the machine's software. This also applies to updates.

Unauthorised interventions in the machine's software may lead to severe damage and accidents.

3.6 Protective and safety equipment

Any safety equipment removed for maintenance purposes must be refitted and checked immediately upon completion of this work.

All equipment required for safety and accident prevention (warning signs and information plates, grilles, guards, etc.) must be in place. Such equipment must not be removed, modified or damaged.

Keep all warning signs and information plates on the machine complete and in a perfectly legible condition.

It is your responsibility as operator to ensure that any warning signs and information plates that have been damaged or rendered illegible are replaced without delay.

3.7 Electrical power

3.7.1 General

Work on electrical systems or operating equipment must only be carried out by qualified personnel. For further information on machines that are operated using the site power supply, see also the *(Power at the construction site P. 70)* section.

Machine components which are to undergo maintenance work must be deenergised. Ensure that disconnected machine components cannot be restarted. First of all, you must check that deenergised parts are indeed deenergised, then earth and shortcircuit them and isolate adjacent live parts.

Disconnect the negative lead from the battery before starting any work on the electrical system of machines with an internal combustion engine. When reconnecting, connect the positive terminal first, and then the negative terminal.

Before starting work on highvoltage assemblies and after cutting the power supply, you must connect the supply cable to earth and shortcircuit the components, particularly the capacitors, with a rodtype earth electrode.

If work is to be carried out on live parts, the presence of a second person is required who can switch off the power supply to the machine in the event of an emergency. Secure the working area with a red-and-white safety chain and a warning plate. Use insulated tools only.

3.7.2 Electrical components

Control cabinet, motor and control elements are protected as standard in accordance with degree of protection IP 54.

IP 54 means:

- Complete protection against contact with live components or internal moving parts. Protection against damaging dust deposits.
- Water spraying on the equipment from random directions must not have a damaging effect.

Use only original fuses with the specified voltage rating. Bridging or the use of fuses with too high a rating can irreparably damage the electrical system. You must switch off the machine immediately if a fault occurs in the power supply.

3.7.3 Power at the construction site

The power on the construction site must be supplied from a special feed point (construction site power distribution point). Machines with an electric motor must not be connected to the mains power supply.

Only trained and qualified personnel are permitted to work on electrical systems with an operating voltage of more than 25 volts alternating voltage or 60 volts direct current. Only such qualified personnel may install, connect, disconnect and open electrical control cabinets.

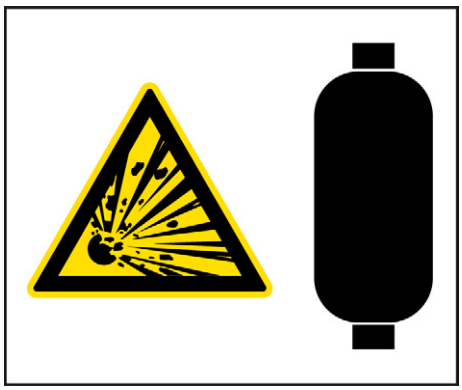
An electric shock (possibly with fatal consequences) may be the result of touching machines with electric motors or contact with other electrical cables if the electrical connection has not been made properly or the supply cable is damaged.

3.8 Hydraulic systems

3.8.1 General

Work on hydraulic systems must only be carried out by qualified personnel.

Always wear your personal protective equipment when carrying out work on the hydraulic system. Escaping fluid is toxic and can penetrate the skin.



Injection through the skin is a major medical emergency. In the event of injuries caused by pressurised fluid, inform the company medical officer and call a medical specialist immediately. This also applies for injuries which may seem only slight. Hydraulic fluid which has penetrated underneath the skin must be removed immediately. Otherwise, there is a risk of death due to impaired blood circulation and infections.

Before starting repair work, depressurise the system sections and pressure lines (hydraulic system, pneumatic system, delivery line) that are going to be opened in accordance with the assembly descriptions.

Never work on systems that are still under pressure. Switch the hydraulic pump drive and the engine off. Otherwise there is a risk of injury caused by functional fluids escaping under pressure. If there is a hydraulic accumulator, open the accumulator dump valve to prevent any machine movements caused by residual pressure. Modifications to the hydraulic accumulator are prohibited.

Be aware that enclosed hydraulic fluid can remain pressurised for a certain length of time. Do not open any hydraulic systems if they are under load from an external force (particularly from a raised placing boom).

Lay and install hydraulic lines in accordance with the current rules of engineering. Connections must be fitted at the appropriate points. Fittings and the length and quality of the hoses must comply with requirements.

The hydraulic system must be properly vented after all maintenance work. Otherwise there is a risk of injury caused by swinging and telescopic support legs extending rapidly, the placing boom lowering, etc.

Open vent valves very carefully until hydraulic fluid starts to escape. You should on no account open vent valves further than necessary or go so far as to remove them.

Damaged hydraulic lines must be replaced rather than repaired. You must replace damaged or saturated hydraulic hoses immediately. Hydraulic fluid spray escaping under pressure can cause injuries and fires.

3.8.2 Replacing hydraulic hoses

During retesting, hydraulic hoses must be checked by a subject expert for external damage. The retest must be recorded in the check book. The operator must have hydraulic hoses replaced if they show signs of external damage.

3.9 Noise emissions

The place of work in normal operation is with the remote control. For this reason, it is not possible to specify a particular place of work for the machine operator. Take the values for the sound pressure level and sound power level from the machine Operating Instructions.

Wear suitable personal protective equipment in the vicinity of the machine.

As the operator, you must instruct your personnel to always wear their personal hearing protectors. You are responsible for ensuring that your personnel comply with this regulation.

All soundproofing equipment must be fitted and in perfect condition. All soundproofing equipment must be closed during operation. A high sound level can cause permanent hearing damage.

3.10 Exhaust fumes

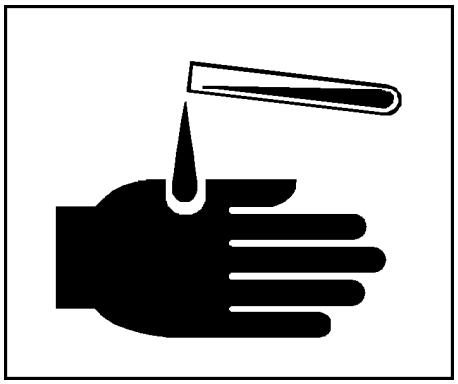
Vehicle exhaust gases contain constituents that can be deadly or carcinogenic. Operate internal combustion engines and fuel-operated heating systems only in adequately ventilated premises. Before starting up the engine in enclosed spaces, make sure that there is adequate ventilation and direct the exhaust gases away from the place of work.

Wear personal protective clothing and equipment for all work in which exhaust gases or particles of building material can enter the body through the respiratory passages. Comply with the information issued by the manufacturer of the building material.

3.11 Functional fluids

When handling oils, greases and other functional fluids, observe the safety regulations applicable to the product concerned (see the safety data sheet).

Oils, fuel and other functional fluids may be hazardous to health upon contact with the skin, etc. You must therefore always wear personal protective clothing and equipment when you are handling toxic, caustic or other functional fluids that are hazardous to health and always take note of the manufacturer’s information.



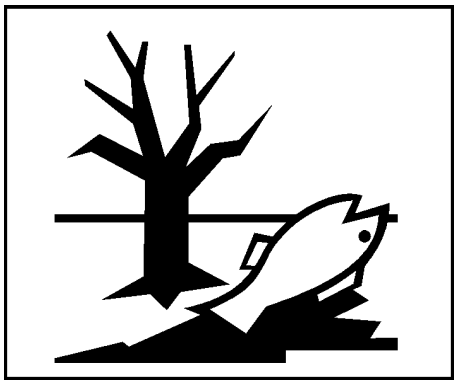
Take care when handling toxic and caustic functional fluids (brake fluid, battery acid, water glass, concrete set accelerating admixtures, cement, etc.). Building materials containing cement have a highly alkaline effect when they react with water (and also with perspiration). Admixtures are toxic and caustic.

Cleaning agents, concrete release agents, preserving agents etc. propelled by compressed air can cause very serious damage to the respiratory tract if a respiratory protection mask is not worn. Spray mist enters the lungs very easily.

Frequent injuries are eye injuries caused by concrete spatter, water glass or other chemical substances.

Take care when handling hot functional fluids and consumables (risk of burning or scalding).

Have used operating equipment and functional fluids such as filters, batteries, oil, brake fluid, etc. disposed of properly. Used cleaning rags should also be disposed of properly.



3.12 Disposal of the machine

To dispose of the machine, you must proceed in accordance with all points in the disposal regulations which apply in your country.

During the disposal operation, you must observe the following in particular:

- Remove the functional fluids, particularly hydraulic fluids, engine oils, fuel, brake fluid, concrete admixtures, any environmentally hazardous functional fluids or functional fluids which are hazardous in any other way, and dispose of these correctly.
- Remove the operating equipment, particularly the hydraulic fluid reservoir, hydraulic cylinder, hydraulic fluid radiator, hydraulic lines and hoses and other components which may contain residual functional fluids, and dispose of these correctly.
- Remove the steel structure and dispose of it correctly, e.g. by recycling.
- Dispose of the truck or the drive unit correctly.

Index

In this chapter, you will find the most important keywords and the number(s) of the page(s) on which they appear. This index of key words is in alphabetical order.

A

Accessories and attachments *P. 28*

After Sales Service personnel *P. 15*

Arm assembly *P. 13*

B

Base structure *P. 13*

Before working with the machine *P. 37*

C

Changes in this revision *P. 7*

Changes to the machine *P. 28*

Checking that the machine is ready for operation *P. 37*

Cleaning *P. 57*

Cleaning agents *P. 58*

Cleaning with compressed air *P. 59*

Clearances from highvoltage lines *P. 38*

Clearance to delivery lines *P. 54*

Climbing the placing boom *P. 28*

Concrete pump *P. 13*

Concreting in cold weather *P. 52*

Connecting drills *P. 51*

Constant observation of the machine *P. 57*

Continuation delivery lines *P. 54*

Corner bearing loads *P. 44*

D

Danger due to high voltage *P. 37*

Danger zone *P. 21*

Danger zone at the end hose *P. 20*

Definition of terms *P. 13*

Delivery line systems *P. 14, 23, 52*

Designated use *P. 23*

Devices for shutting off, diverting and cleaning *P. 55*

Discharge voltage pattern *P. 37*

Disposal of the machine *P. 74*

Driving *P. 46*

E

Earthing in the event of electrostatic charging *P. 40*

Earthing on construction sites with special installations *P. 41*

Electrical components *P. 69*

Electrical power *P. 69*

End hose *P. 14, 22*

End hose and end hose combination *P. 50*

End hose combination *P. 14*

Exclusion of liability *P. 28*

Exhaust fumes *P. 72*

Extending the placing boom and end hose *P. 26*

Extending the reach *P. 26*

F

Foreword *P. 9*

Functional fluids *P. 73*

G

General *P. 57, 69, 70*

Guiding the end hose ergonomically *P. 51*

H

Highpressure delivery *P. 28*

High-voltage lines *P. 37*

Highvoltage warning devices *P. 39*

Hopper *P. 23*

Hoseman *P. 15*

Hydraulic systems *P. 70*

I

Impermissible end hose *P. 27*

Impermissible working area *P. 21, 27*

Improper use *P. 25*

Inspection intervals for retesting *P. 24*

L

Leak tightness and blockages *P. 53*

Lifting loads *P. 25*

Lifting machines and components *P. 42*

Loading *P. 48*

Loading and transporting *P. 42*

M

Machine *P. 13, 22*

Machine operator *P. 14*

Maintenance *P. 16*

Maintenance and special work *P. 63*

Manufacturer *P. 14*

Mobile machines *P. 18, 42*

Moving machine components and hot surfaces *P. 56*

N

Noise emissions *P. 72*

O

Opening delivery lines *P. 54*

Operating Instructions *P. 30*

Operating Instructions, operating procedures and other regulations *P. 30*

Operating procedures *P. 31*

Operator *P. 14*

Other regulations *P. 31*

P

Personal protective equipment *P. 32*

Personnel *P. 29*

Place of work *P. 20, 55*

Place of work, working area, danger zone *P. 18*

Place of work – hoseman *P. 20*

Place of work – machine operator *P. 20*

Place of work – truck mixer driver *P. 21*

Placing boom *P. 13, 22*

Placing booms *P. 48*

Post-cleaning procedure *P. 61*

Power at the construction site *P. 70*

Procedure in storms *P. 51*

Procedure in the event of a flash over *P. 40*

Protection against water *P. 61*

Protective and safety equipment *P. 68*

Pumping operations *P. 55*

Q

Qualifications *P. 30*

Qualified personnel *P. 15*

R

Remote control *P. 56*

Removing obstacles *P. 25*

Rendering the machine ready for operation *P. 37*

Replacing hydraulic hoses *P. 72*

Requirements *P. 29*

Requirements for special work *P. 65*

Responsibility of the machine operator *P. 30*

Retesting (safety inspection) *P. 23*

S

Safety *P. 55*

Safetyrelevant components *P. 68*

Securing delivery lines *P. 53*

Securing the delivery lines *P. 54*

Securing the machine *P. 61*

Setting up and working with the machine *P. 35*

Setup site *P. 41, 42*

Signaller and other auxiliary personnel *P. 15*

Software *P. 68*

Starting to pump *P. 16*

Stationary machines *P. 18, 41*

Stationary placing booms *P. 41*

Subject expert *P. 15*

Suitable delivery lines *P. 52*

Supporting ground *P. 43*

Support legs and support feet *P. 22*

Supports *P. 45*

T

Terms, definitions, requirements *P. 11*

Towing *P. 47*

Transporting goods *P. 25*

Truck mixer *P. 14, 57*

Truck mixer driver *P. 15*

U

Unfold placing boom *P. 48*

W

Welding *P. 66*

Working area *P. 21*

Working on the placing boom *P. 67*

Verband Deutscher Maschinen- und
Anlagenbau e. V. (VDMA)
Baumaschinen und Baustoffanlagen
Lyoner Straße 18
60528 Frankfurt

Telefon +49 69 6603-1262
Fax +49 69 6603-2262
E-Mail bub@vdma.org
Internet bub.vdma.org

bub.vdma.org