OPERATING MANUAL

ROGRIND E^3

13.49HSK Model 3

Hybrid Rail Head Profile Grinding Machine

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These operating instructions were produced in accordance with the current state of technology at the time of printing.
The right to change on the basis of further developments is reserved.
Dimensions and weights are approximated.
Photographs show special layouts in some cases.

Content

1. General

All personnel that operate or service the product must have read and understood this operating manual.

The manual must be available to all participants at all times.

1.1 About these instructions

The following symbols are used to mark operating procedures, lists and other elements of these instructions:

Symbol	Explanation
1. Action 2. Action	**Operating procedure** - the sequence of actions must not be changed.
• List 1 – List 1.1 • List 2	**List** - Sequence may be changed.
► Measure ► Measure	**Measure** - the sequence must not be changed.

1.2 General Regulations

Appropriate legal requirements and accident prevention measures for use of this appliance must generally be observed. If they are not observed, the operator of the appliance takes responsibility for any legal consequences.

In the event of differences between prevailing regulations that apply to use of the machine and the manufacturer's or subcontractor's specifications, whichever limitations are the most stringent must apply.

The buyer must make available all appliances and operational or supporting materials to enable the delivered product to be used and personnel to be trained. Enough safe and clear track and work sections must be provided to allow personnel to learn and practice how to use the goods delivered.

ROBEL Bahnbaumaschinen GmbH together with its customer service organizations are however happy to provide further advice, training or other consultative services. Further details and conditions can be obtained separately.

1.3 Intended Audience for this Operating Manual

This operating manual contains important information for the intended use of the product described therein.

The manual has been written exclusively for technically qualified personnel.

Qualified personnel in this context are:

- Personnel who have demonstrated their suitability for working with this product, whether through qualifications or experience.
- Persons who are familiar with the safety concepts of machines and equipment;
- Maintenance and service personnel who have been specially trained in the repair of machines and equipment.

Only people who are capable of reading this manual may work on this machine. They must that they have read and understood this manual, and have confirmed this with their signature.

The installation, maintenance and operation of the product may only take place having regard to, and in strict conformance with, the valid operating and safety standards and official regulations, particularly those concerning safety, industrial safety, environmental protection and the prescribed operating, maintenance and safety instructions of manufacturers and suppliers or other regulations.

1.4 Liability Exclusions

The manufacturer accepts no liability whatsoever for such losses that may arise if the product is used for purposes other than its intended use. If the product is operated without safety devices, that is also deemed to be other than intended use.

Every use other than the specified use of this product is considered to be other than intended use and endangers the life and limb of the operating and maintenance personnel as well as the property of the operator. The manufacturer of the product accepts no liability for injury to persons or damage to property, whether of the operator or third parties, if: –

- The product is not used as intended,
- The operating and maintenance personnel have not read and understood this operating manual and have used the product for a purpose other than that intended,
- The operating and maintenance personnel are not sufficiently qualified,
- The product is operated under conditions beyond the stated limits,
- The product is not maintained according to the specified intervals as required,
- The product is not maintained using original spare parts,
- Components and attachments of the product are modified without proper authority.

These grounds for exemption of liability for personal injury or material damage shall not affect other grounds for exclusion.

1.5 Copyright

Specific characteristics and particular attributes of the machine are the intellectual property of ROBEL Bahnbaumaschinen GmbH. The copyright on its use remains with ROBEL Bahnbaumaschinen GmbH. It may not be reproduced either in full or in part, published or otherwise exploited for competitive purposes, whether for payment or not. Its contents may not be passed by company employees to anyone outside the business.

1.6 Acceptance, Equipment and Operating Licence

It is the buyer's responsibility to check that the condition, fittings, performance and especially the safety features of the goods delivered match the relevant specifications agreed and to take account of the regulations specified in the contract.

The buyer must equip the goods delivered with all fittings necessary to meet relevant operational and safety regulations, norms, statutory regulations or other regulations, e.g. fire extinguisher, first aid box, signal and telecommunications equipment, additional warning devices, protective clothing, safety notices etc.

Unless otherwise agreed, no fittings of this nature are provided with the goods delivered.

Furthermore it is the buyer's responsibility to demonstrate that the goods delivered have been accredited for use by the appropriate authority. Any documentation to be provided by the manufacturer or supplier (descriptions, proof, attestations, etc.) to enable this should be specified in the contract of supply.

Any additional measures and costs required to achieve operational accreditation must be borne by the buyer.

1.7 Validity of these instructions

This operating manual is valid for the rail head profile grinding machine 13.49HSK Model 3 with the following EDV number:

- EDP-No. 849 990 0005

2. Safety

2.1 Designated use

The rail head profile grinding machine 13.49HSK Model 3 is designed and manufactured for the grinding of rails with a high degree of contour accuracy.

The machine is designed and constructed solely for the accurate manual grinding of weld joints, running surfaces, rail head gauge corners and rail head sides of steel rails with a Vignole profile without the use of cooling lubricants.

It is suitable for the grinding of welded joints and reprofiling.

The machine can be operated with the following energy sources:

- ROPOWER Hybrid Drive Unit 70.02
- ROPOWER Power supply 70.03
- ROBATTERY 71.02 (2,300 Wh) with adapter

Operation with battery or power supply is only possible with a conversion kit or adapter cable, see chapter “Accessories”.

2.2 Foreseeable misuse

The head profile grinding machine must not be used as a means of transportation for other tools and machinery on site (e. g. Hybrid Drive Unit 70.02).

The head profile grinding machine must not be connected directly to the mains supply.

2.3 Conventions of layout

This operating manual uses the following warning phrases and symbols to ensure the personal safety and physical integrity of the user and to protect the assets of the operator from damage:

DANGER

Indicates that non-observance of the instructions results in death or severe injury of the operator.

WARNING

Indicates that non-observance of the instructions may result in death or severe injury of the operator.

CAUTION

Indicates that non-observance of the instructions may result in injury of the operator.

NOTICE

Indicates that non-observance of the instructions may result in damage to the product or other assets belonging to the operator.

Contains important information about the machine, its operation or about a section of the instructions on hand.

Structure of the warnings

The warnings are structured as follows:

SIGNAL WORD

Type and source of danger!

Possible consequences when ignoring the danger.

► Measure to avoid the danger.

2.4 Design changes, original parts

The manufacturer accepts no liability for unauthorised modifications to components and attachments to the product.

Original parts and accessories are specially designed for this product. In certain circumstances the use of non-approved replacement parts can impair or have a detrimental impact on the design characteristics of the product.

The manufacturer is not liable for any damage which is proven to be attributed to the use of such parts or inferior operating fluids.

2.5 Protective devices

Tampering with the safety devices can endanger the life of the user and others!

► When operating the equipment, the user is also obliged to actually attach the safety devices or to leave them in their factory-installed positions.

► After completing his work, the person instructed to carry out the maintenance must re-attach the safety devices.

2.6 Safety regulations

The handling requirements necessary for the protection of life, health, property and the environment must be ensured as a matter of priority.

► Before using the device, make sure you can prove that all personnel affected have been made aware of the following relevant regulations and provisions:

- statutory safety regulations
- stipulations of the respective building code and works rules
- stipulations of the respective professional and trade associations
- industrial and environmental safety regulations
- approvals regulations
- internal company regulations
- All other applicable regulations, in addition to and in concert with the manufacturer's safety and operating regulations

If necessary, the office in charge of operation must lay down additional regulations and measures geared to the special tasks of the product to ensure that all safety requirements are met.

In addition to the information mentioned above the specific safety regulations must be observed and adhered to.

2.7 Qualifications of staff

Operator

The operator was trained by the operating company in the tasks assigned to him and informed of the potential dangers arising from inappropriate behaviour.

Requirements for the operator

- Extensive training in the product
- Knowledge of content of these operating and maintenance instructions
- Knowledge of content of operating and maintenance instructions of suppliers' and additional equipment
- Knowledge of national regulations and laws concerning the machine and additional equipment
- Physical and mental fitness
- Power of concentration, sense of responsibility, reliability
- Necessary national requirements (qualifications, minimum age)
- No influence of alcohol, medicines, drugs or fatigue, etc.

2.8 Personal Protective Equipment

Use the approved PPE during the operation and maintenance of the product.

	► Wear protective gloves.
	► Wear steel-capped work shoes.
	► Wear a protective helmet.
	► Wear suitable hearing protection for high-frequency noise.
	► Wear a respiratory mask.
	► Wear safety goggles with splinter protection.
	► Wear appropriate snug-fitting clothing that cannot be caught in rotating machine parts or saw blades.

The PPE is defined by:

- Operating Manual
- National safety regulations
- Regulations of the professional associations
- Other applicable regulations

► In the event of any discrepancy between the existing regulations applicable to the product owner and the instructions provided by the manufacturer and its suppliers, the stricter regulation shall apply.

2.9 Instructions for particular types of hazards

Danger due to manual handling

If the permissible per-person lifting weight is exceeded when lifting or carrying, there is a risk of injuring muscles, tendons, joints or bones.

► Prior to transportation, ensure that the pathway is free of obstructions or trip hazards.

► When lifting or carrying machinery or equipment, adhere to the permissible per-person lifting weight.

It is the responsibility of the operating company to ensure that the national safety regulations and guidelines of the trade associations in the respective countries are observed. The values stated in the warning notices of these operating instructions relate to regulations in Germany.

► Ensure that a risk assessment has been carried out and that the following aspects with regard to operators and the transport task have been considered:

- Frequency of transport
- Age
- Gender
- Operator's state of health
- Uneven flooring
- Poorly lit worksites
- Bad weather
- Working under time pressure
- etc.

► Observe the relevant guidelines on lifting and transporting heavy machinery or equipment.

► Mechanical aids to lifting are always the preferred method of handling where possible, e.g. hoists, tail lift, rail trolleys etc.

► Always use the handles to lift the modules.

► Always use two hands and address the modules symmetrically.

► Do not twist the spine when handling.

► Do not carry any of the modules more than 10 meters without a rest, or without using a mechanical aid.

► Contact your Health and Safety Advisor for more information.

Danger due to unergonomic operation

With some activities there is a risk of injuring muscles, tendons, joints or bones if the necessary caution is not exercised with the controls. An example is starting the engine by means of the reversing starter.

- ► Pull the reversing starter vigorously but avoid jerky movements.
- ► Avoid adverse movements and poor posture.
- ► Avoid static postures of the thumb and hand when using the controls.

Dangers from rotating parts

Risk of being caught on or entangled in rotating parts (grinding disc, screwdriver head etc.). Crushing injuries to hands and fingers from rotating parts and abrasives.

- ► Wear appropriate snug-fitting clothing that cannot be caught in rotating machine parts or saw blades.
- ► Remove rings, necklaces etc.
- ► Keep away from abrasives when the motor is running.

Risk of injury, particularly to the eyes from flying fragments and other objects.

- ► Always wear safety goggles or attach a splinter shield when the machine is running.

Dangers from electric current

There may be live parts inside the product, which if touched could cause severe or fatal injuries.

- ► Only authorised qualified electricians are permitted to work on the electrical system.
- ► Any faults (faulty contacts, external damage to cable or housing etc.) should be rectified immediately.
- ► Before working on the electrical system: Switch off the drive, de-energise the system, disconnect the power supply and secure against accidental reconnection.
- ► While working on the electrical system: Do not touch any live wires.
- ► Check that the earthing cable for integrity and secure connection.
- ► Check that the connecting surfaces of the earthing cable are clean and free from corrosion.

Dangers from noise

Risk of permanent damage, particularly to hearing, if the user does not continuously wear suitable hearing protection.

- ► Wear hearing protection.

Dangers from heat

Risk of injury from touching hot parts.

- ► Do not touch hot parts.
- ► Prior to work on heated parts, switch off the machine allow to cool down for at least 30 minutes.

Fire hazard

- ► The machine should be set up at least one metre away from buildings and other equipment.
- ► Make sure that there are no inflammable materials in the vicinity of the motor and that no objects are placed on the motor when it is running.
- ► Do not cover or load the machine until it has properly cooled down.

Dangers from vibration

The transmission of vibrations to the human body is harmful to health. Although the guide handles are vibration-damped, a complete decoupling is not achievable.

- ► Wear padded gloves.
- ► Include other vibration-free activities with mainly vigorous use of the muscles during the work process.

Risk of environmental damage

Most of the parts and components built into the product are subject to special regulations regarding their disposal.

- ► Components must be sorted and properly disposed of according to their material groups (steel, plastics, oils etc,).
- ► Waste oil and hydraulic fluid must be collected and disposed of in accordance with the relevant regulations.

Dangers from unauthorised operation

Unauthorised operation and improper use can lead to all kinds of dangers and damage.

- ► The operation of the machine by unauthorised persons is strictly forbidden.
- ► The operator must assess this risk for himself.
- ► The operator is responsible for taking measures to prevent unauthorised operation of the machine.

Dangers from improper maintenance

The machine can start up unintentionally if buttons are accidentally pressed during maintenance work. This can result in serious injuries.

- ► Before carrying out any adjustments or maintenance, the machine must be switched off (motor off) and secured against unauthorised or accidental restarting. All energy supplies (mechanical, electrical and hydraulic) must be switched off, neutralised and secured against reconnection.

2.10 Accident prevention

The accident prevention regulations of the Civil Engineering association also find application in these operating instructions and are to be carefully read and adhered to.

► Always observe the general and internal accident prevention regulations.

► Consideration must be given to the possible accident risks in connection with the particular tasks undertaken with the product and appropriate instruction provided.

► Before starting up, the product must be checked that it is in proper condition:

- completeness and integrity of equipment, aids, tools, accessories, protective devices etc.
- Inspection and servicing works properly completed on schedule
- Topped-up consumables (fuels, lubricants etc.)
- Compliance with all conditions necessary to carry out the works without risk to the user and other people, property and the environment.

► Watch out for special risks posed by the product and in its working area, particularly:

- persons and obstacles,
- adherence to safety clearances,
- traffic on adjacent tracks,
- secure fitting of all protective equipment,
- compliance with all operationally necessary safety measures.

► Leaking operating fluids (oil, grease, etc.) must be removed immediately to prevent a fire hazard or risk of slipping. Keep suitable oil binding agents and cleaning agents at hand.

► Before leaving the product check that:

- the machine has been properly shut down
- the machine has been secured to prevent accidental movement
- tools and accessories have been stored securely

► only machines, equipment and tools that are in good order are used.

► Rectify even small defects immediately, to prevent them becoming larger.

2.11 First Aid

Please ensure the following to be able to provide First Aid in an emergency:

- ► Make sure that the First Aid kit is in proper condition, complete and clean at all times.
- ► Consult the medical service or doctor at your office regarding First Aid measures and appropriate equipment.
- ► Immediately replenish used up material.
- ► Store First Aid equipment (First Aid kit, blankets etc.) and fire extinguishers within easy reach.
- ► Carry material for securing accident sites.

2.12 Fire safety

Fires involving fuels, oil, paints and varnishes release toxic vapours.

Charring of cables from smouldering fires can release toxic vapours.

- ► As far as is reasonably possible, everyone has the responsibility of avoiding anything that could cause a fire or help it to spread.
- ► In general, any fires that occur are to be fought only with powder extinguishers.

General

The following fire safety measures must be adhered to.

- ► Only use approved fire extinguishers (powder-type extinguishers) of the prescribed fire protection class.
- ► Ensure that fire extinguishers are checked at regular intervals and are marked with a test tag (every 2 years at the latest, note expiry date!).
- ► After using a fire extinguisher, replace it without delay.

3. Technical data

3.1 Drive

Electric motor (synchronous motor)

Nominal voltage	56 V
Nominal current	60 A
Rated power	3 kW

3.2 Energy supply

The machine can be operated with the following energy sources:

- ROPOWER Hybrid Drive Unit 70.02
- ROPOWER Power supply 70.03
- ROBATTERY 71.02 (2,300 Wh) with adapter

3.3 Grinding spindle

Maximum speed of output shaft	5,000 rpm
Mounting diameter for abrasive (with feather key)	20 mm
Fastening thread	M20

3.4 Dimensions

With extendable (telescopic) carrying handles

Length	1,950 mm
Width	460 mm
Height	850 mm
Distance between rollers	1,000 mm

Without extendable (telescopic) carrying handles

Length	1,750 mm
Width	410 mm
Height	850 mm
Distance between rollers	1,000 mm

3.5 Weight

Standard version	56.5 kg
Outrigger for 1,435 mm gauge	14.2 kg

3.6 Abrasives

Bonded grit abrasives for rail head widths up to 120 mm.

These abrasive discs must be ordered separately.

Cup wheel

Outer diameter	150 mm
Inner diameter	55 mm
Height	60 mm
Maximum permissible speed	6,350 rpm
Weight	2.5 kg

3.7 Plunging depth

The plunging depth is controlled steplessly with the aid of a servomotor.

Plunging depth of the grinding spindle	0 - 48 mm

3.8 Noise emissions and vibration

For the personal assessment, the actual working environment of each employee must be considered (e.g. time spent in different places/ with different machines).

3.8.1 Noise emission

The workplace emission values during operation depend on the tool used (abrasive) and the method of operation (e.g. pressure and feed rate). The stated values may therefore also vary. Since the noise level criterion for personnel is exceeded when working, suitable ear protection must be worn (see also national statutory regulations as well as basic health and safety requirements).

Emission sound pressure level L_{pA}	86.8 dB (A)
Sound power level L_{WA}	99.7 dB (A)

3.8.2 Vibration

Vibration total value	< 2.5 m/s²

3.9 Operating conditions

Temperature range operation	-10 °C to 40 °C
Temperature range transport	-20 °C to 50 °C
Temperature range storage	-20 °C to 50 °C

3.10 Brake test

Brake tests have been carried out.

Slope angle	Braking distance
4.00 degrees	Rail wet: 5 m
4.00 degrees	Rail dry: 4 m

4. Description of machine

4.1 Overview

The practical design offers the following features:

- Powerful drive motor
- possibilities of energy supply
  - ROPOWER Hybrid Drive Unit 70.02
  - ROPOWER Power supply 70.03
  - ROBATTERY 71.02 (2,300 Wh)
- PLC for simple operation
- Monorail trolley mounted on roller bearings with stainless steel wheels
- Insulated outrigger, pluggable on both sides
- Adjustable plunge depth at the push of a button, grinding depth can be set on the PLC
- Extendable (telescopic) carrying handles
- Optional: Ergonomically optimised carrying handles
- Low weight

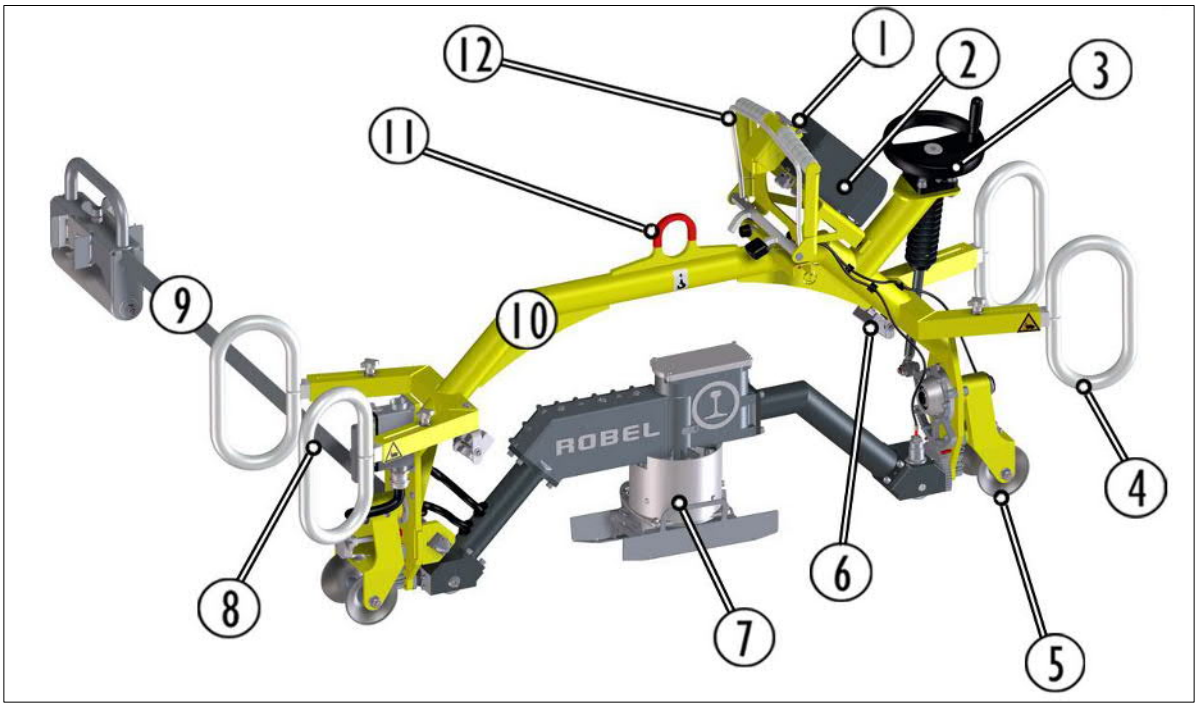

Fig. 1: Design layout

1	Button „Plunging depth“ with two positions	7	Electric motor
2	PLC with emergency stop button	8	Ergonomically optimized carrying handles (option)
3	Tilt adjustment handwheel	9	Outrigger
4	Ergonomically optimised carrying handles (optional)	10	Main frame
5	Guide roller	11	Lifting point
6	Lighting	12	Guiding handle with lever of dead man’s break

Support roller with battery powered lighting (option: re-chargeable battery)

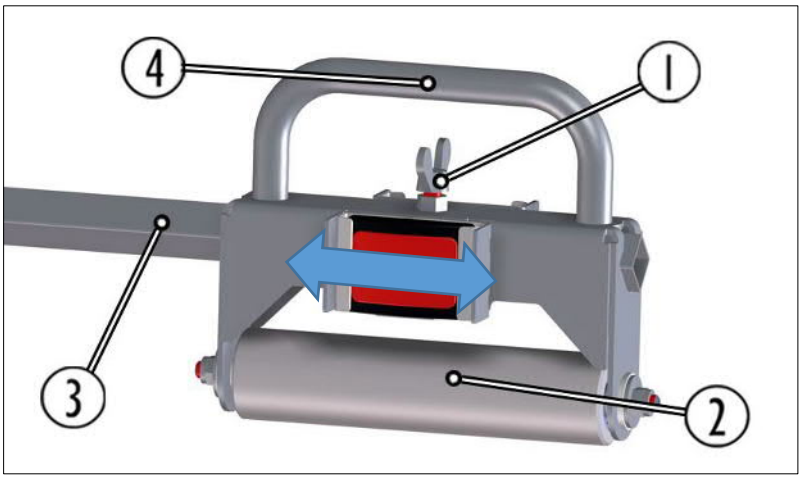

Fig. 2: Support roller of extension arm (Option „Reflector“)

1 Clamp screw
2 Support roller
3 Extension arm
4 Handle

A special version of the supporting roller mount can be ordered which enables the attachment of rear lights.

4.2 Control elements

4.2.1 Dead man's brake

WARNING

Risk of accidents!

An unbraked machine can reach high speeds on inclines. It can result in collisions with people and rail vehicles.

- ► Always test the function of the dead man's brake before using the machine.
- ► Do not take the dead man's brake out of operation
- ► Do not use a cable tie or similar to block the lever.

Pull the lever of the dead man's brake towards the operator in order to disengage the dead man's brake (see arrows).

The dead man's brake acts on the guide roller on both sides and on the friction brake on the other side.

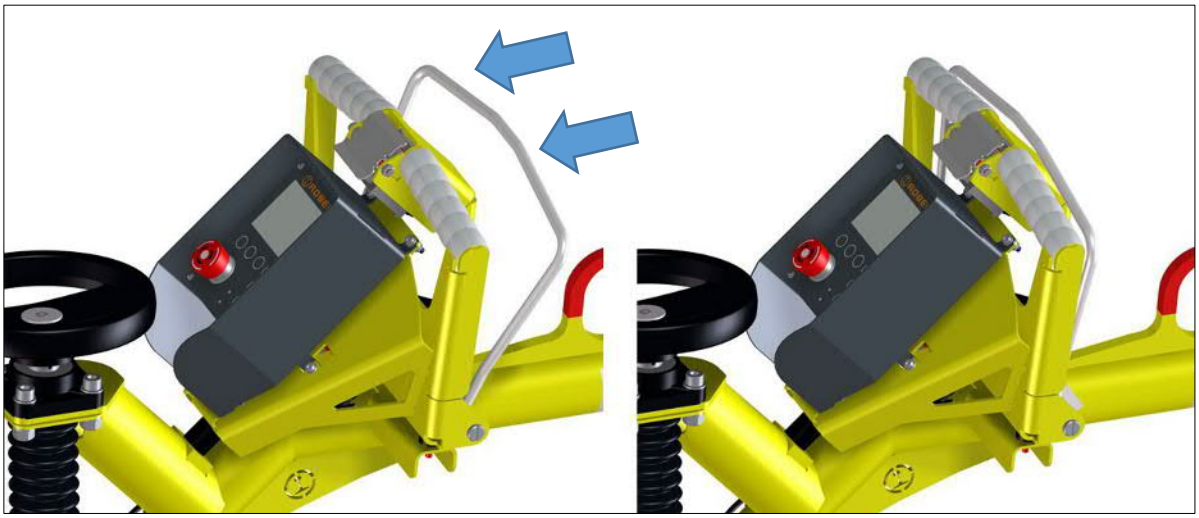

Fig. 3: Disengage dead man's brake

4.2.2 Control system (PLC)

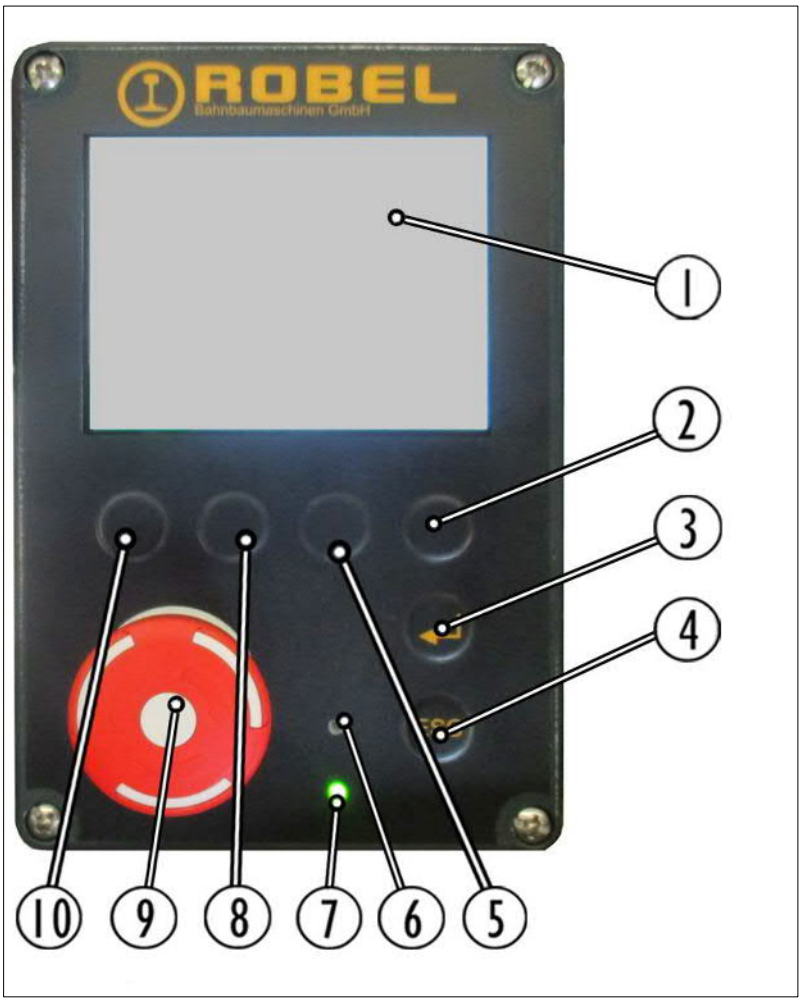

Fig. 4: Control system (PLC)

1	Display
2	Button „4“
3	Button „Enter“
4	Button „ESC“
5	Button „3“
6	Brightness sensor
7	LED green/red
8	Button “2“
9	Motor stop button
10	Button „1“

The PLC is used to control every electrical feature.

The PLC is starting as soon as electrical power is provided.

- Protection class IP66

4.2.3 Tilt adjustment handwheel

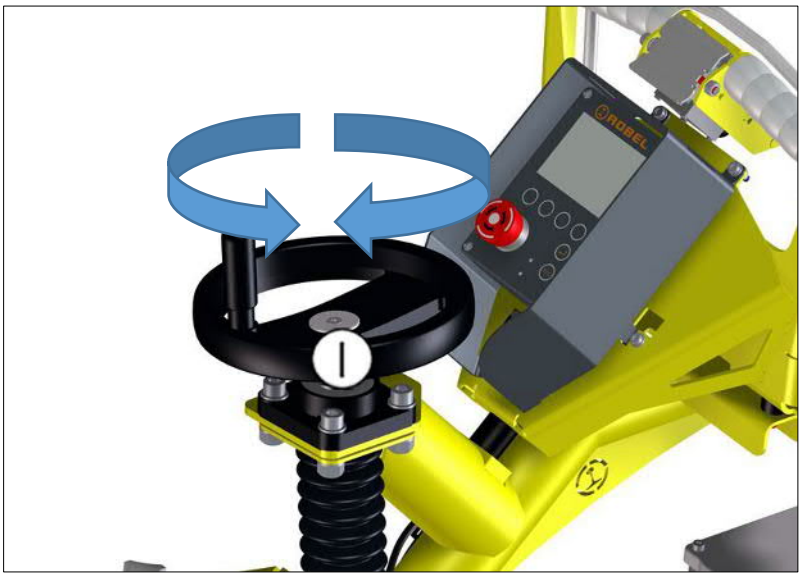

Fig. 5: Tilt adjustment handwheel

- Turn the handwheel clockwise to tilt the swivel frame to the right as seen from the user's standpoint.
- Turn the handwheel anticlockwise to tilt the swivel frame to the left as seen from the user's standpoint.

4.2.4 Grinding depth infeed

The infeed is controlled with the aid of a electric motor. Operation is controlled by a button with two positions.

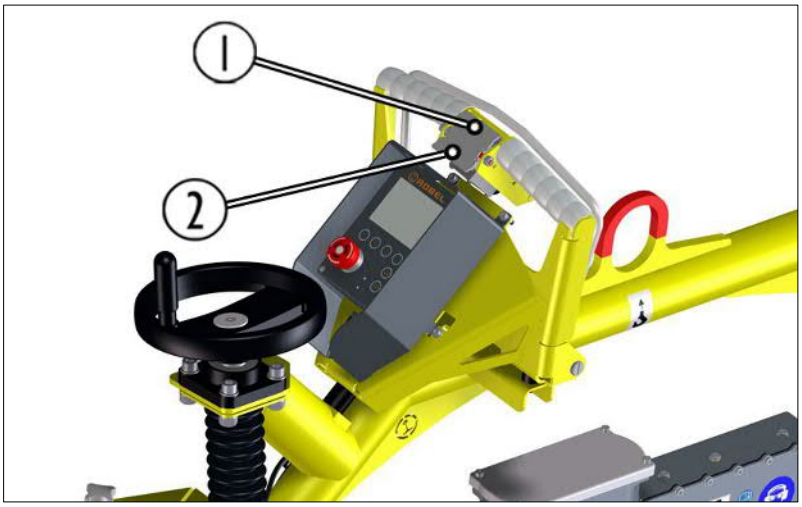

Fig. 6: Grinding infeed buttons

1 'Retract' button (abrasive moves up)

2 'Infeed' button (abrasive moves down)

4.2.5 Track width adjustment

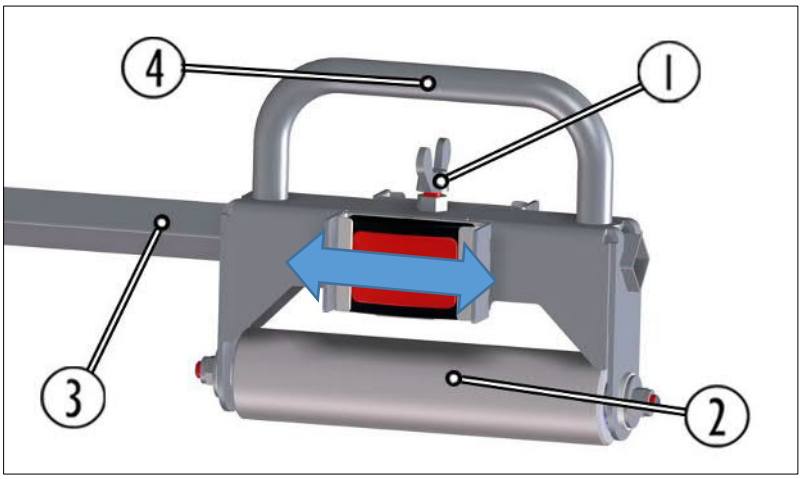

Fig. 7: Support roller of extension arm (Option „Reflector“)

1 Clamp screw
2 Support roller
3 Extension arm
4 Handle

The support roller can be moved along the axis of the outrigger.

4.2.6 Motor stop button

The machine is equipped with an motor stop button.

The motor stop button is located to the left side under the PLC display as seen from the user’s standpoint.

Fig. 8: Motor stop button (1)

4.2.7 Holder for battery or converter

With the help of a lashing strap, the battery or the converter is securely fastened to the holder.

Fig. 9: Holder with battery

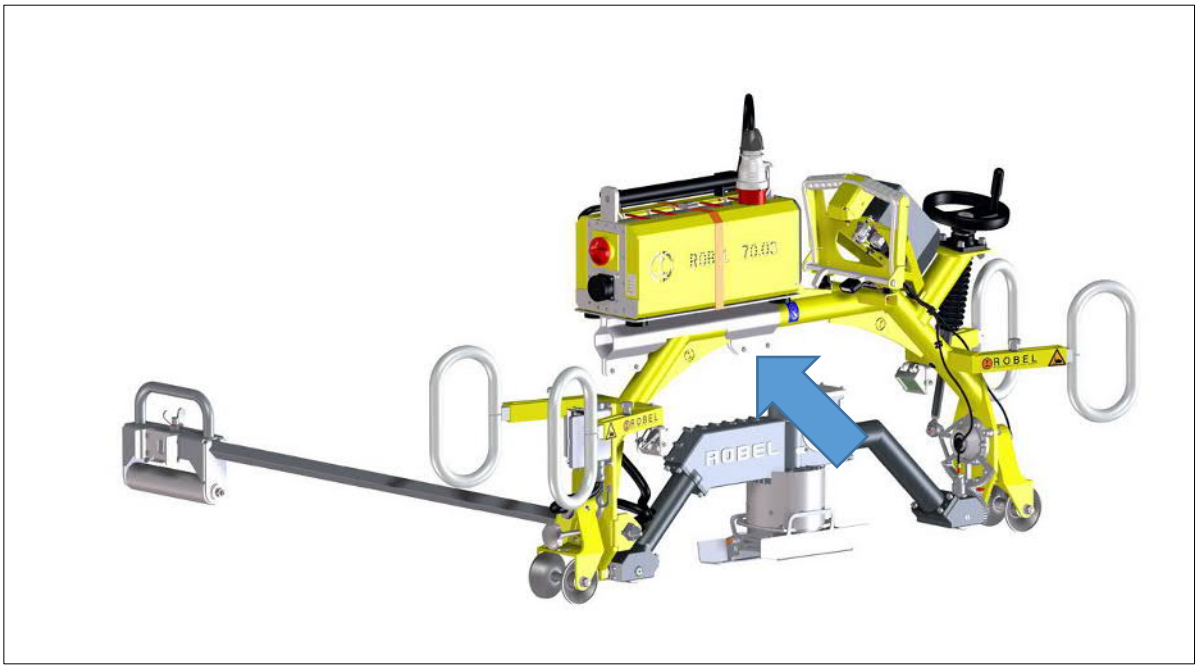

Fig. 10: Holder with converter

4.3 Safety device

Guard plates are attached to both sides of the grinding spindle.

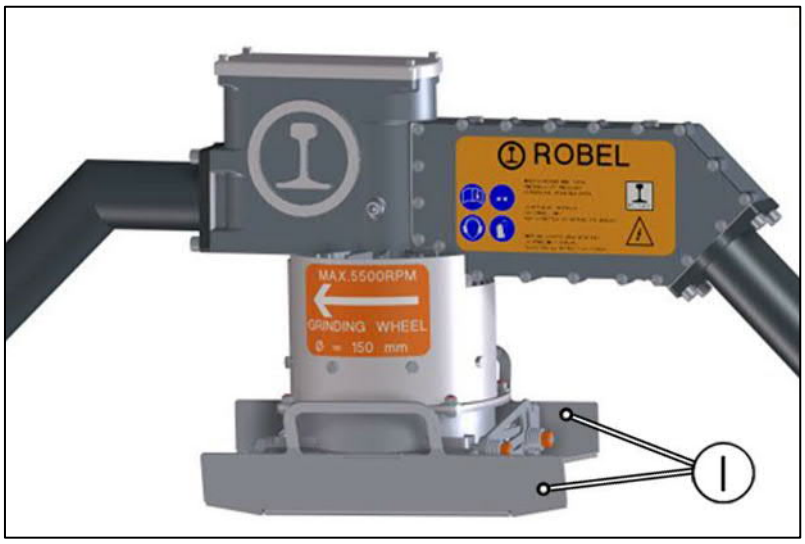

Fig. 11: Guard plates

4.4 Accessory (available to order)

Cup wheels

Fig. 12: Ø 150 mm

4.4.1 Extension set for battery or mains operation

he extension set contains all the adapter cables required to operate the machine with a battery or a converter.

Order No. Extension set for battery or mains operation:

EDP No. 501 606 0250

4.5 Signs and labels

4.5.1 Signs and labels used

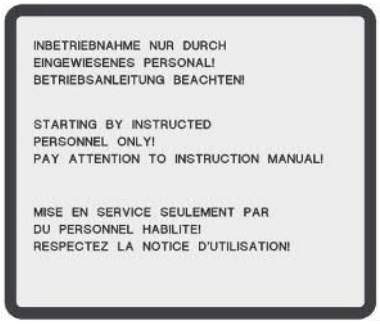

Fig. 13: Label "Instructed personnel only"

Fig. 14: Label "Observe operating instruction"

Fig. 15: Label "Grinding Wheel diameter = 150 mm, MAX RPM = 5500 and Direction of rotation "

Fig. 16: Identification plate (Example)

Fig. 17: Label "Wear hearing protection"

Fig. 18: Label "Wear protective gloves"

Fig. 19: Label "Wear eye protection"

Fig. 20: Label "Crushing hazard"

Fig. 21: Label "EN 13977"

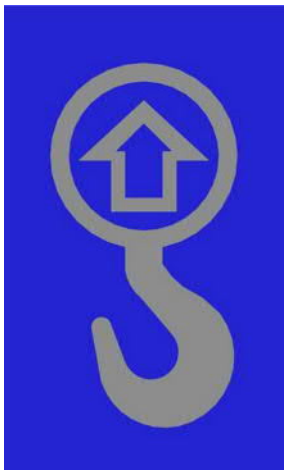

Fig. 22: Label "Lift here"

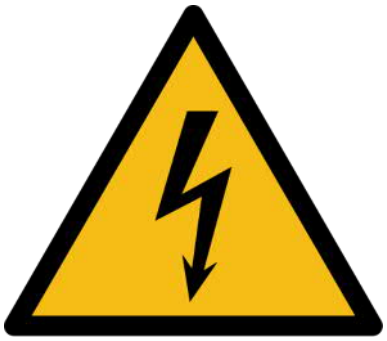

Fig. 23: Label "High Voltage"

Fig. 24: Label "Logo of manufacturer"

Fig. 25: Label "Weight and lift with two person"

4.5.2 Position on the machine

Right side

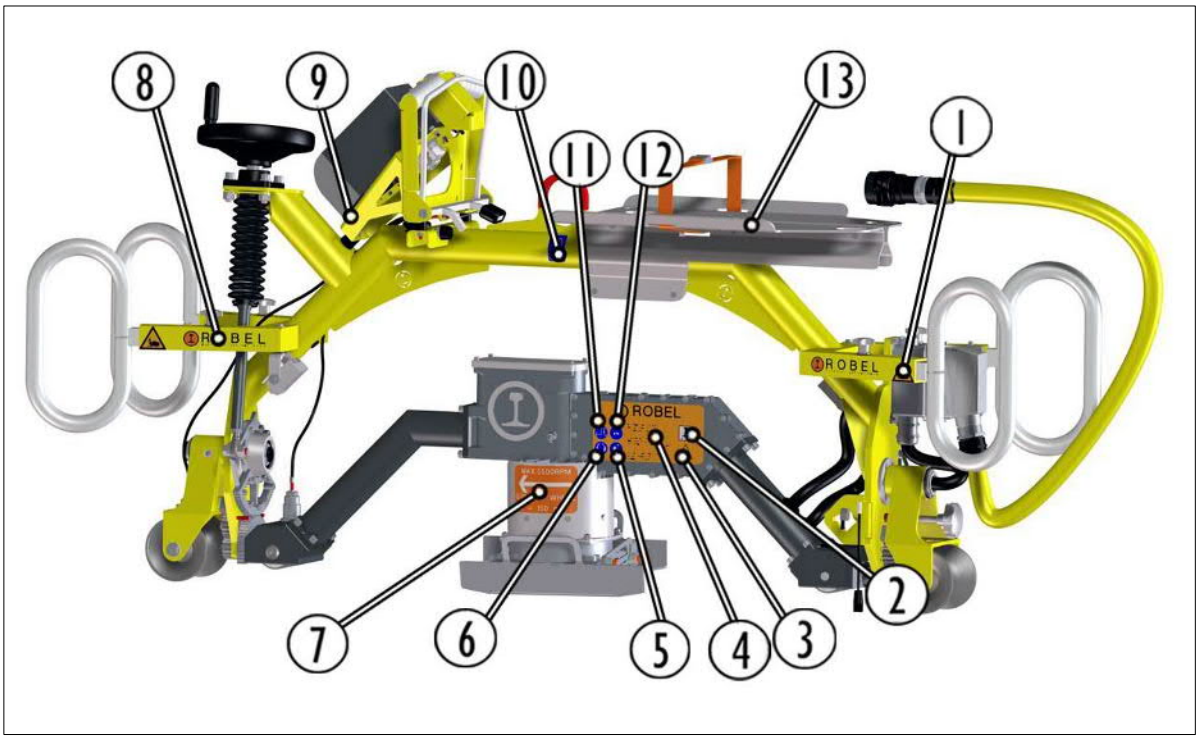

Fig. 26: Right side

1	Label “Crushing hazard”	8	Label “Logo of manufacturer”
2	Label “EN13977”	9	Identification plate
3	Label “High Voltage”	10	Label “Lift here”
4	Label “Instructed personnel only”	11	Label “Observe operating instructions”
5	Label “Wear protective gloves”	12	Label “Wear eye protection”
6	Label “Wear ear protection”	13	Label “Weight and number of persons to lift the machine”
7	Label “Grinding Wheel diameter = 150 mm, MAX RPM 5500 and Direction of rotation”		

Left Side

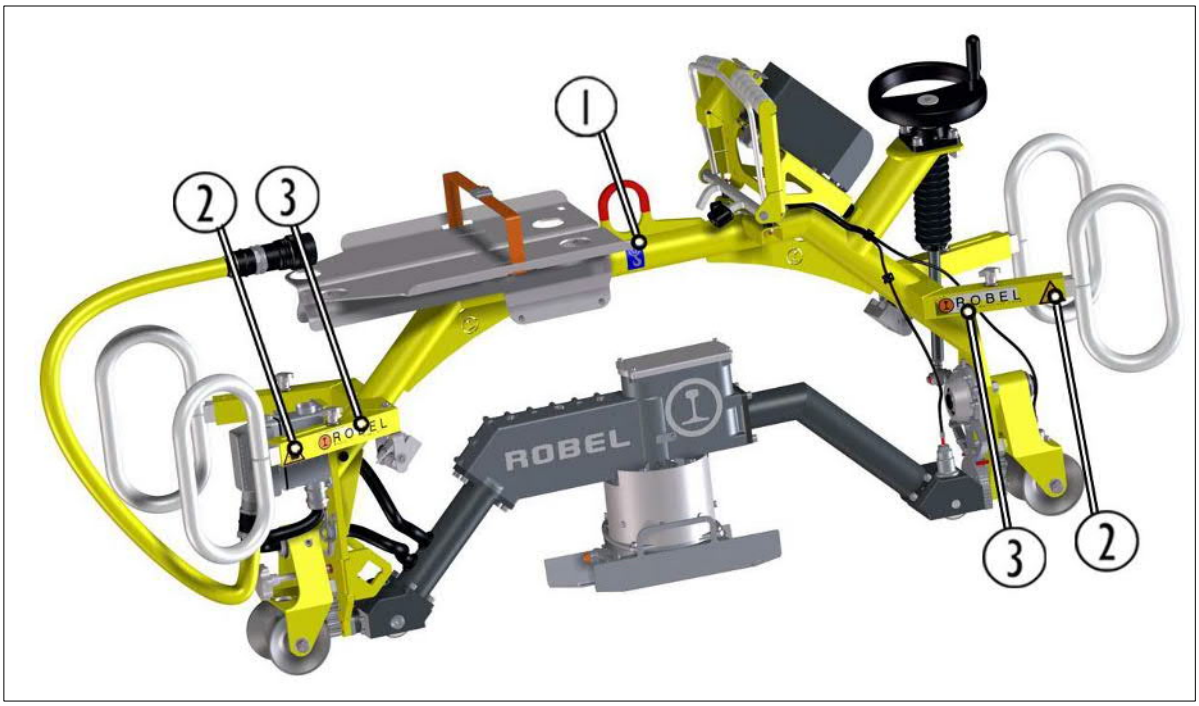

Fig. 27: Left side

1	Label “Lift here”	3	Label “Logo of manufacturer”
2	Label “Crushing hazard”		

4.6 Work place

The guide handle is for guiding the machine along the rail. Ideally, the user should stand between the rails of the permanent way holding the guide handle with both hands, or where necessary, with one hand on the guide handle and the other on the handwheel to adjust the tilt.

Tilting the grinding machine with the aid of the tilt adjustment makes it possible to comfortably reach the rail head and its inside face.

4.7 Structure gauge

While the rails are being processed, a violation of the structure gauge in accordance with DIN EN 15277-2 cannot be excluded, because the user may have to stand beside the track to carry out side grinding as described in chap. 4.6.

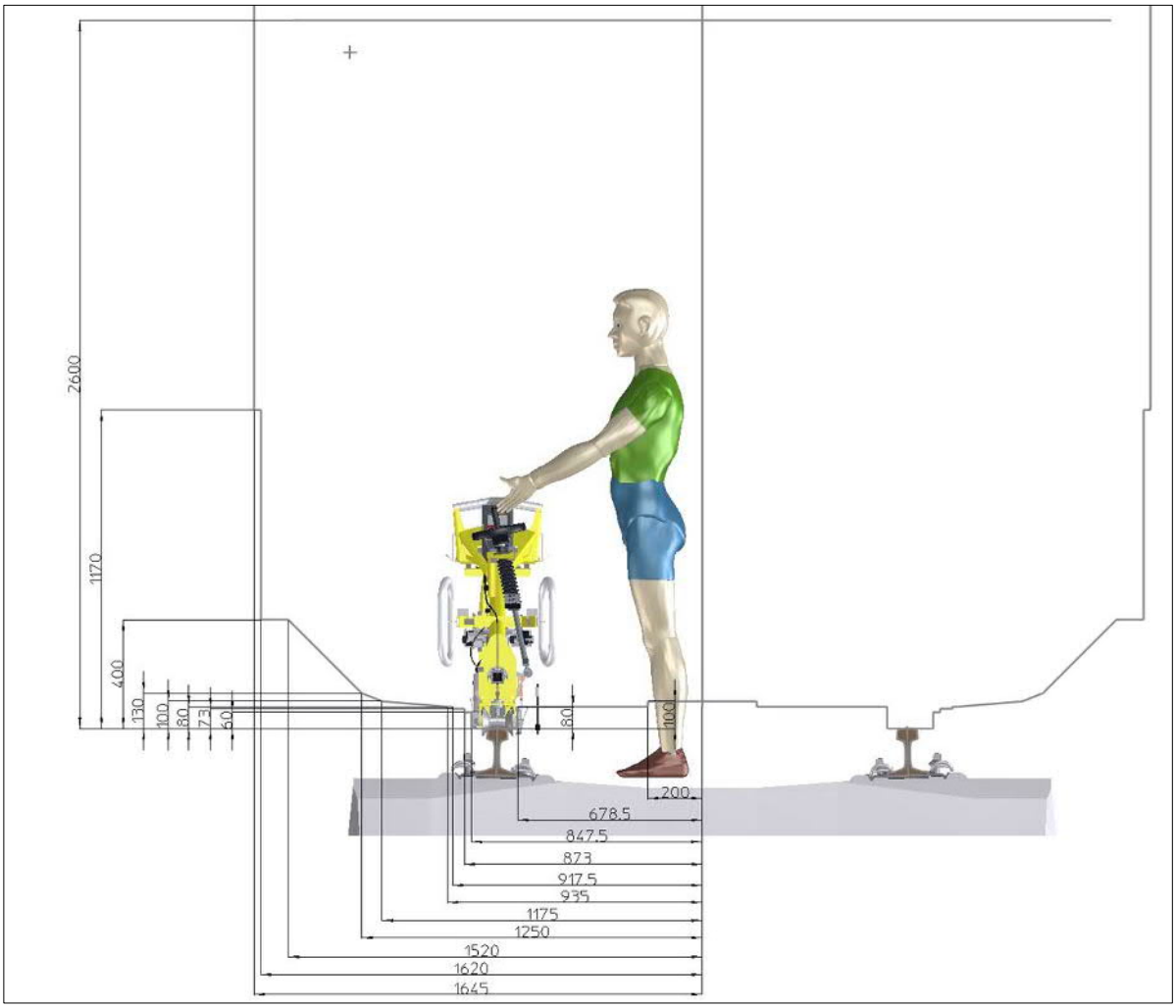

Fig. 28: Structural gauge (right)

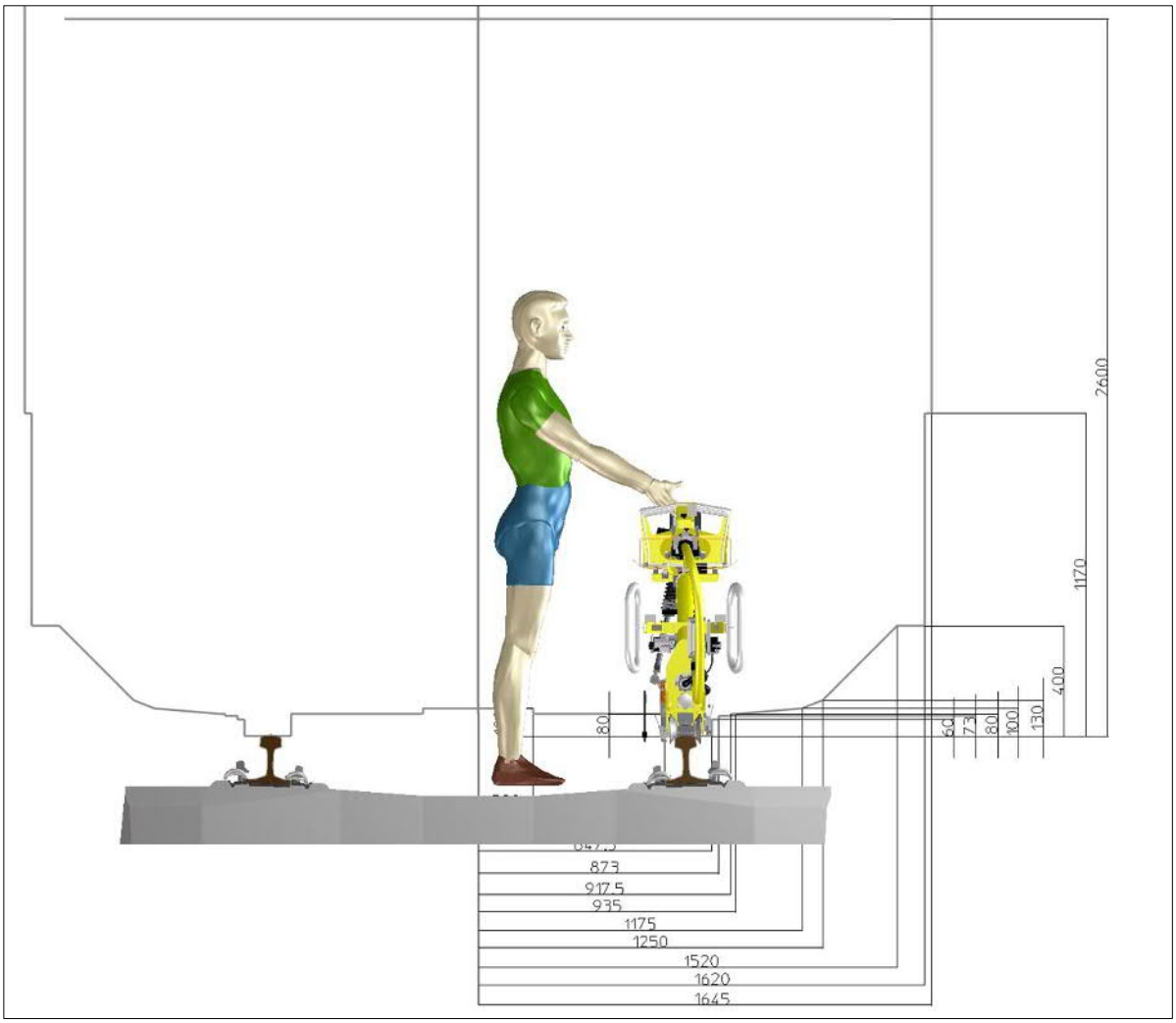

Fig. 29: Structural gauge (left)

5. Operating conditions

5.1 Operating

WARNING

Risk to life from electric shocks!

Exposure to very strong sunshine can heat the apparatus to well over +70 °C. If as a result the outer casing becomes distorted, electrical safety may well be compromised.

► Make sure that the machine is not exposed to direct sunlight for a long time.

Temperature range:

From –10 °C to max. +40 °C (Ambient temperature).

5.2 Storage

Machine

Temperature range for storage of the machine is — 20 °C to +50 °C.

1. Make sure that the place of storage is dry and dust-free.

Abrasives

NOTICE

Risk of damage!

Abrasives become unusable when they become damp or come in contact with grease and oil.

► Store the abrasives in a dry place, making sure they do not come in contact with moisture, oil or grease.

1. Store the abrasives in appropriate shelves or containers in such a way that, on the one hand, they cannot be damaged and, on the other hand, they can easily be unloaded without relocating.

Older stock ought to be used first.

2. Observe the following rules for storage:

- Keep the abrasives in a dry and frost-free place.
- Pile cylindrical abrasives with soft intermediate padding.
- Keep small abrasives in adequate containers.
- Secure abrasives against rolling away.

Correctly stored, the abrasives' shelf life is 3 – 5 years (see expiry date on respective label).

WARNING

Risk of injury!

Abrasives whose use-by date has expired or abrasives with dents or cracks can burst during operation! Fragments can fly everywhere and cause serious injuries.

► Do not use abrasives whose use-by dates have expired.

► Use only abrasives which are free from dents or cracks.

CAUTION

Risk of injury!

If unbalanced abrasives are used, the values for hand-arm vibration will be exceeded.

► Do not use abrasives with an unbalance in excess of 2 m/s^2.

5.3 Transport

WARNING

Risk of injury!

The machine is too heavy for one person alone. An injury to the muscles, bones or tendons may result, particularly those in the back and shoulders.

- ► Always transport the machine with suitable equipment, e.g. suitable trolley.
- ► Lift the machine with suitable lifting equipment e.g. crane, hoist, tail lift or at least a **two*) person** team.
- ► Remove the converter or the battery from the holder before transporting the machine.
- ► Mounting/removing the outrigger requires at least **two people** working together.
- ► See chap. 2.9 for further details on manual handling.

*) This value has been determined according to a risk assessment conducted by Network Rail.

The temperature range for transporting the machine is –20 °C to +50 °C.

Fig. 30: Lifting the machine

NOTICE

Risk of loosing the disc

Transporting the machine without the abrasive (2) mounted, the grinding stone flange (1) may fall out and can be lost.

► Transport the machine with mounted abrasive only.

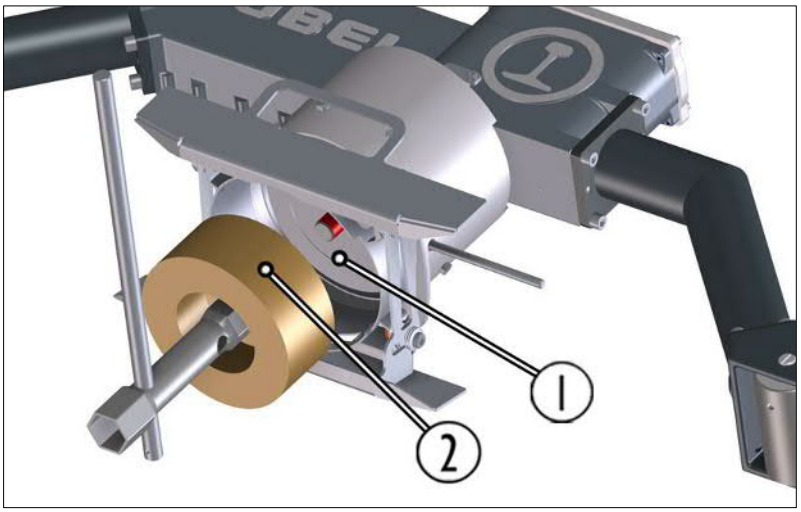

Fig. 31: Abrasive dismantled

1 Grinding stone flange
2 Abrasive

5.3.1 Retracting the handles

1. Retract the carrying handles as described in chap. 6.1.4 for more compact transportation.

5.3.2 Centre of mass

The centre of mass of the grinding machine is at the spot indicated by the centre of gravity symbol.

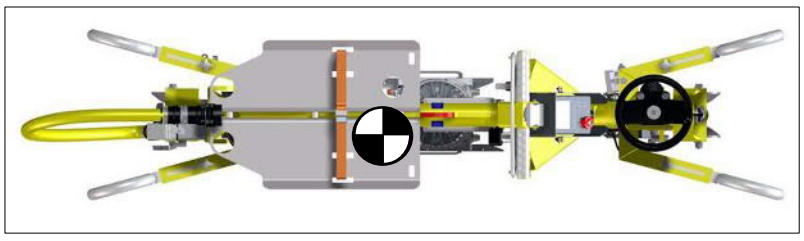

Fig. 32: Centre of mass

6. Putting the machine into operation

6.1 Re-railing

6.1.1 Preparing the machine

NOTICE

Risk of damaging the abrasives!

If the abrasive is outside the protective hood it can be easily damaged when being put on to the rail.

► Make sure the abrasive is completely retracted inside the protective hood before the machine is placed on the rail.

If the abrasive is not retracted, proceed as follows:

1. Connect the machine to the energy source used.

- Connect the machine to the Hybrid Drive Unit and start the Hybrid Drive Unit
- Mount the converter on the bracket and establish electrical connections
- Mount the battery on the bracket and establish electrical connections

2. Wait until the PLC has booted.
3. Drive the abrasive right up to the top with the 'Retract' button.
4. Switch the machine off again and disconnect it from the energy source used.

- Stop the Hybrid Drive Unit and disconnect electrical connection
- Remove the converter from the holder and disconnect electrical connections
- Remove the battery from the holder and disconnect electrical connections

Dismantle the outrigger

1. Loosen clamping screw (3).
2. Remove the outrigger (1) from the socket (4).

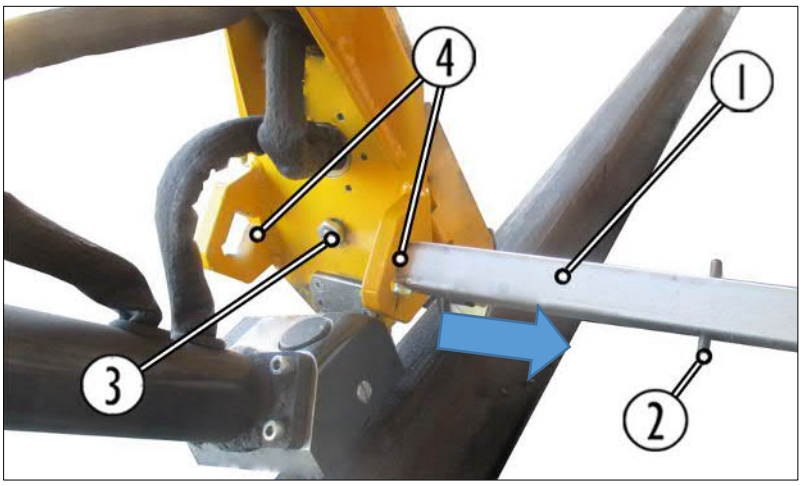

Fig. 33: Plug in outrigger

1	Outrigger
2	Stop
3	Clamping screw
4	Socket

3. Put the swivel frame into a vertical position using the tilt adjustment handwheel.

Extending handles

1. Turn the star knobs counter clockwise.

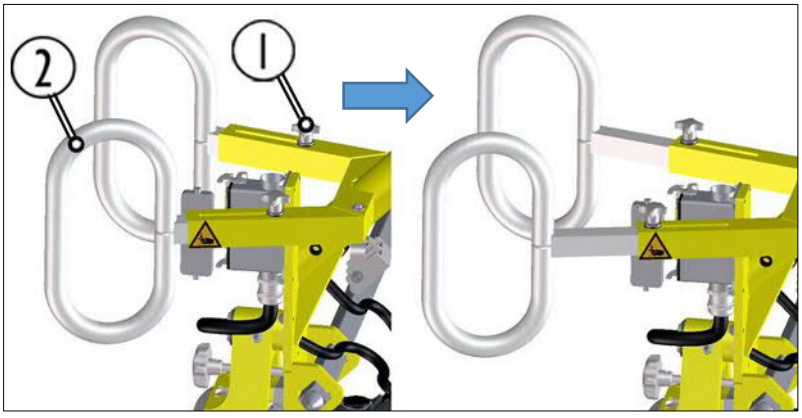

Fig. 34: Pull out carrying handles (image shows ergonomically optimised handles)

1	Star knobs
2	Carrying handles

2. Pull out the carrying handles so that you can comfortably stand between them.
3. Fasten the star knobs (1) clockwise.

6.1.2 Place the machine on the track

WARNING

Risk of injury!

The machine is too heavy for one person alone. An injury to the muscles, bones or tendons may result, particularly those in the back and shoulders.

- ► Always transport the machine with suitable equipment, e.g. suitable trolley.
- ► Lift the machine with suitable lifting equipment e.g. crane, hoist, tail lift or at least a **two*) person** team.
- ► Remove the converter or the battery from the holder before transporting the machine.
- ► Mounting/removing the outrigger requires at least **two people** working together.
- ► See chap. 2.9 for further details on manual handling.

*) This value has been determined according to a risk assessment conducted by Network Rail.

1. Put the machine on the rail.

Fig. 35: Put the machine on the rail

6.1.3 Mounting the outrigger.

1. Ensure that the clamping screw (3) is not protruding, else the outrigger cannot be inserted.
2. Insert the outrigger (1) into the socket (4) and push in up to the stop (2).

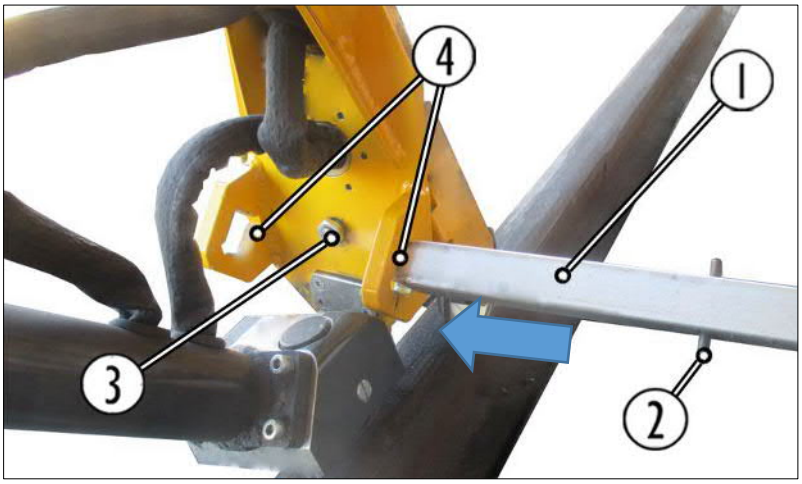

Fig. 36: Plug in outrigger

1	Outrigger
2	Stop
3	Clamping screw
4	Socket

Fig. 37: Plug in outrigger

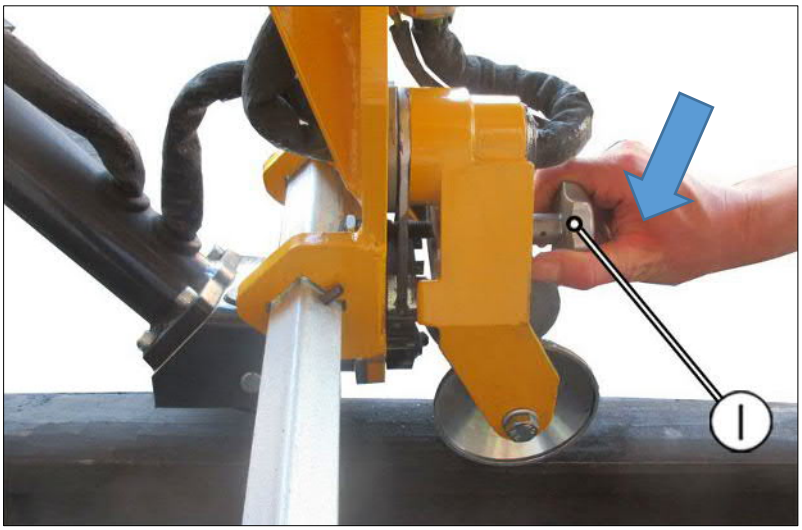

Fig. 38: Engage fastener

3. Fasten clamping screw (1) clockwise by hand.
4. Perform small movements (“toggle”) of the star knob (1) during final tightening so that the contact surfaces (2) are aligned and can build up grip without residual play

   The outrigger has been mounted.
5. After 30min of grinding, check tightness of star knob (1), re-tighten if necessary.

6.1.4 Retracting the handles

Retract the carrying handles during use of machine.

1. Turn the star knobs counter clockwise.

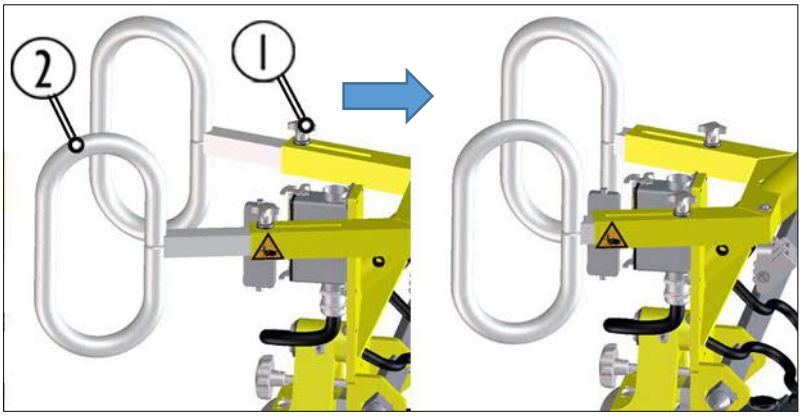

Fig. 39: Retract handles (image shows ergonomically optimised handles)

1	Star knobs
2	Carrying handles

2. Retract the carrying handles.
3. Fasten the star knobs (1) clockwise.

6.1.5 Adjusting the track width of the outrigger

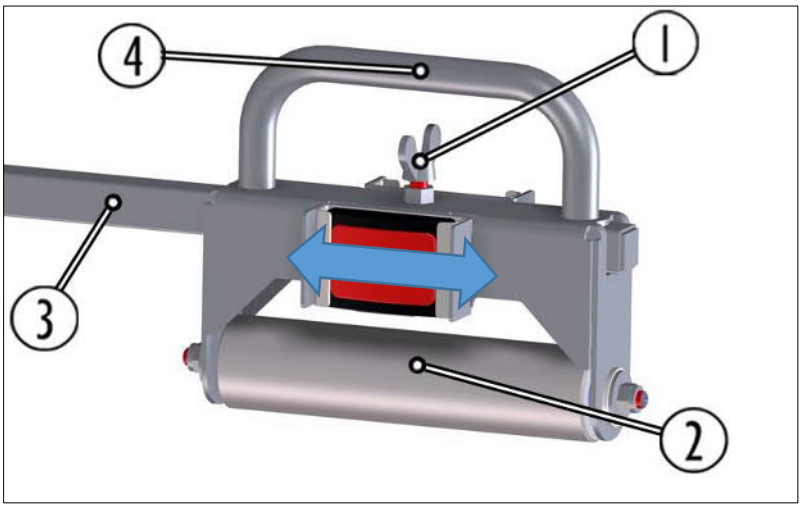

Fig. 40: Support roller of extension arm (Option „Reflector“)

1 Clamping screw
2 Support roller
3 Outrigger
4 Handle

1. Loosen clamping screw (1).
2. Slide the support roller (2) along the outrigger (3) with the aid of the handle (4).
3. Fasten clamping screw (1).

6.1.6 Mount battery or converter

The holder for the battery or converter consists of two aluminium shells that are mounted on the machine. With the help of a lashing strap, the battery or the converter is securely fastened to the holder.

Fig. 41: Holder with battery

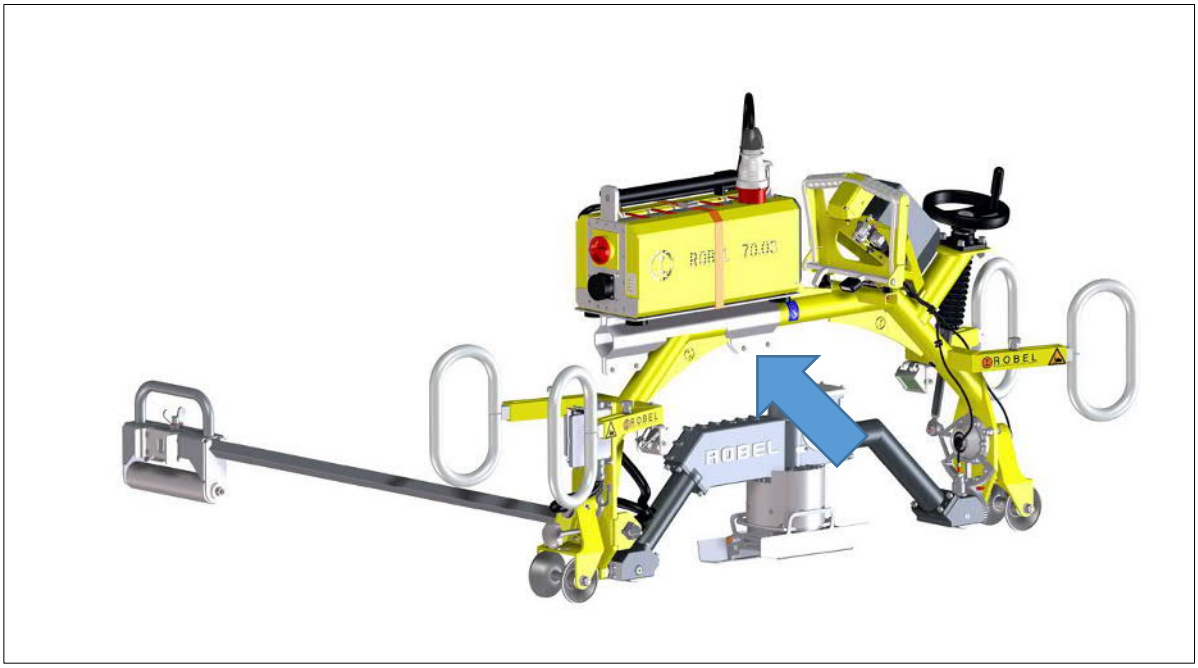

Fig. 42: Holder with converter

1. Insert the battery or the power pack into the holder.
2. Close and tighten the lashing strap.

6.2 Checking the machine

6.2.1 Grinding spindle and abrasive

WARNING

Risk of injury!

Abrasives whose use-by date has expired or abrasives with dents or cracks can burst during operation! Fragments can fly everywhere and cause serious injuries.

- ► Do not use abrasives whose use-by dates have expired.
- ► Use only abrasives which are free from dents or cracks.
- ► Do not use abrasives if they run out-of-true.

CAUTION

Risk of injury!

If unbalanced abrasives are used, the values for hand-arm vibration will be exceeded.

- ► Do not use abrasives with an unbalance in excess of 2 m/s².

1. Check the abrasive pad for tightness.

NOTICE

Risk of damage to the grinding shaft!

If the abrasion limit is not reached the grinding shaft can contact the rail and be damaged.

- ► Observe the abrasion threshold von 25 mm!

2. Perform the following checks:

Visual checks

- Make sure that during the planned grinding work, the grinding does not fall below the abrasion threshold of 25 mm. See also chap. 8.2 Maintenance.
- Check the abrasive pads for cracks or other damage (fractures).
- Check safety devices for correct seating and integrity.

Functional checks

- Check the integrity and free movement of the tilt adjustment.
- See also chapter on Maintenance.

6.2.2 Electric motor

WARNING

Risk to life from electric shocks!

Defective or loose cable connections and cable connections that are not properly plugged in can cause fatal electric shocks if they are touched.

- ► Check the cable connections are in good condition (visual inspection).
- ► Do not use any defective cables.
- ► Plug in connector entirely and lock.

1. Check that the power supply cable is fitted with the correct plug.
2. Establish a connection with the energy source used:

- Plug in the power supply to the Hybrid Drive Unit and start Hybrid Drive Unit
- Mount the converter on the bracket and establish electrical connections
- Mount the battery on the bracket and establish electrical connections

Operating the connector

The connecting cable is equipped with special connectors. Refer to the following procedure for plugging in and locking the connector.

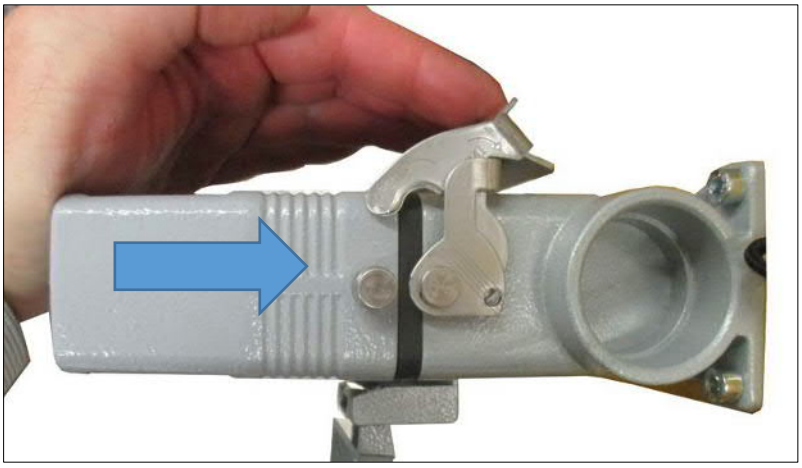

Fig. 43: Plug in the connector

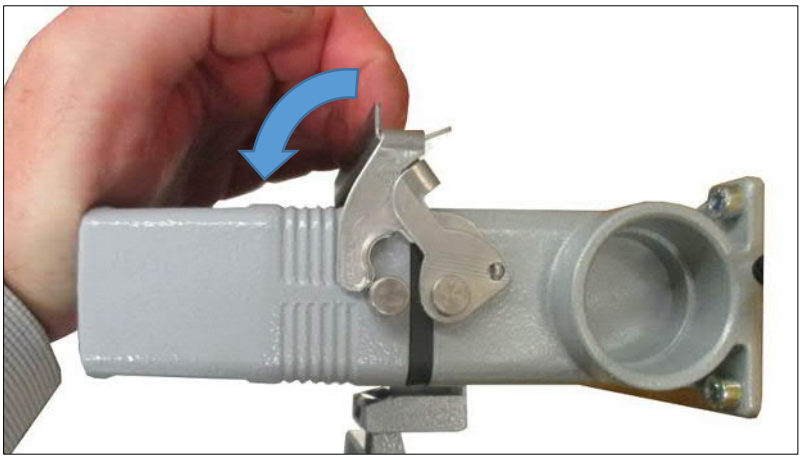

Fig. 44: Close the bracket

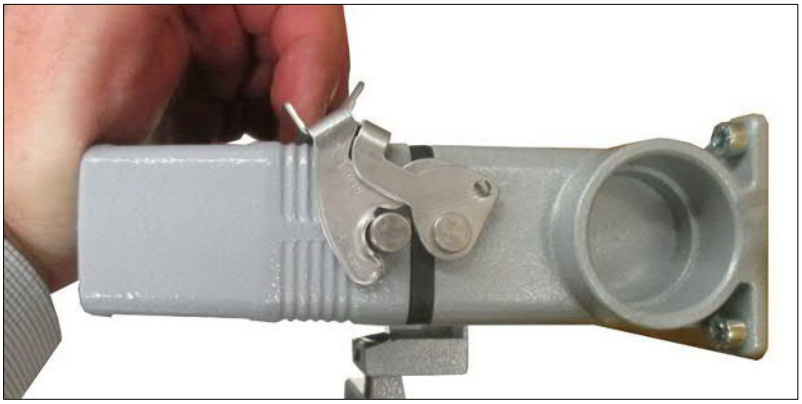

Fig. 45: Bracket closed

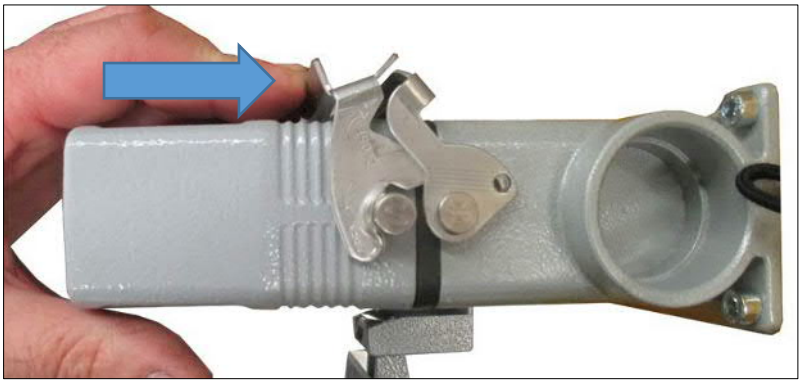

Fig. 46: Close the lock

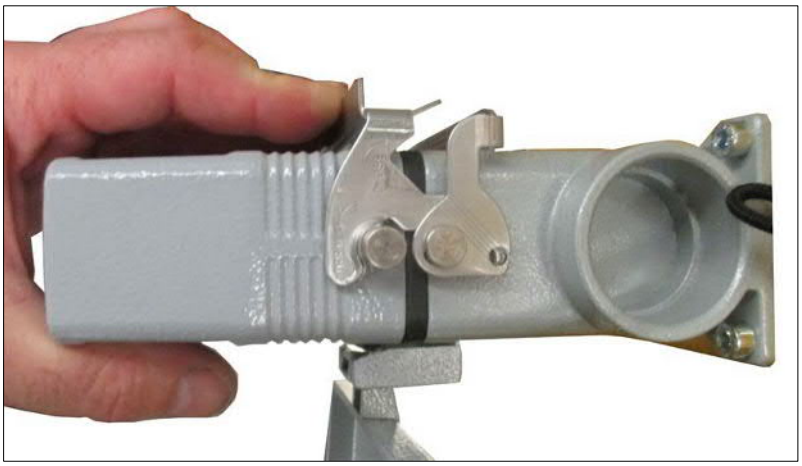

Fig. 47: Connector locked

Use adapter cable when used with ROBATTERY 72.02.

NOTICE

Risk of damage!

If the cable is left dangling over the rail, it might be rolled over during work.

► Thread the power supply cable through one of the carrying handles, see pictures below.

Fig. 48: Correct: Power supply cable threaded through one of the carrying handles

1. Thread the power supply cable through one of the carrying handles in order to avoid damaging the cable while moving the machine back and forth.

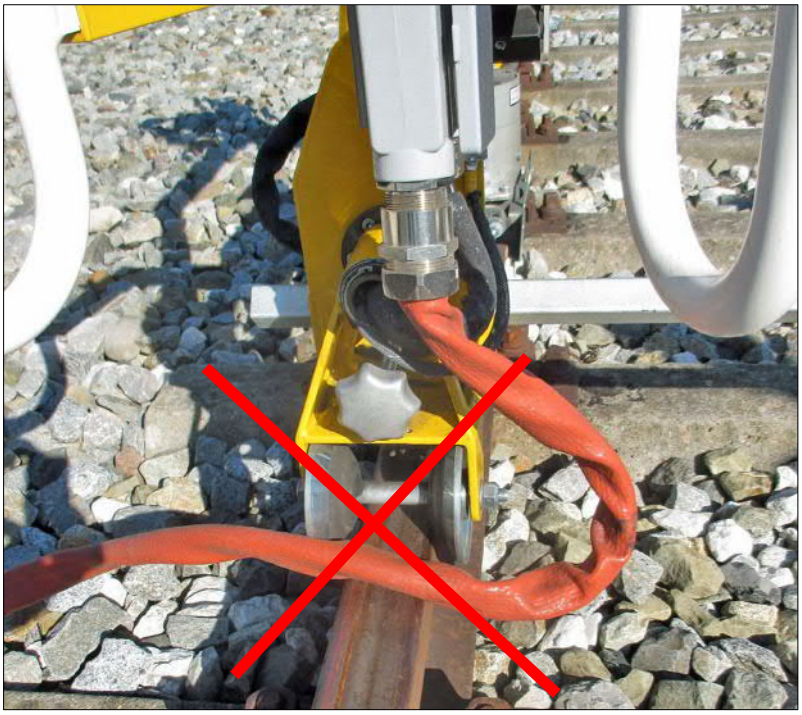

Fig. 49: Wrong: Cable prone to damage

6.2.3 Dead man's brake

The machine must not be braked while the dead man's brake lever is not actuated.

WARNING

Risk of accident!

An unbraked machine can reach high speeds on inclines. It can result in collisions with people and rail vehicles.

- ► Always test the function of the dead man's brake before using the machine.
- ► Do not take the dead man's brake out of operation.
- ► Do not use a cable tie to block the lever.

Functional test

1. Try to push the machine along the rail while the dead man's brake is not actuated.

   It should not be possible to move the machine, or only with great force.
2. If the dead man's brake is not working properly, take the machine off the rail immediately, and rectify the fault.

6.3 Starting the PLC

1. Connect the machine to the energy source used.

- Connect the machine to the Hybrid Drive Unit and start the Hybrid Drive Unit
- Mount the converter on the bracket and establish electrical connections
- Mount the battery on the bracket and establish electrical connections

2. In case of Hybrid Drive Unit: start the engine of the Hybrid Drive unit

   The PLC of the grinding machine is supplied with power.

Bevor any actuators on the machine (buttons. PLC etc.) are actuated:

Start the engine (grinding spindle) of the Hybrid Rail Head Profile Grinding Machine (see chap. 6.7) and allow to warm up for at least 2 minutes, to ensure that all components have reached operating temperature).

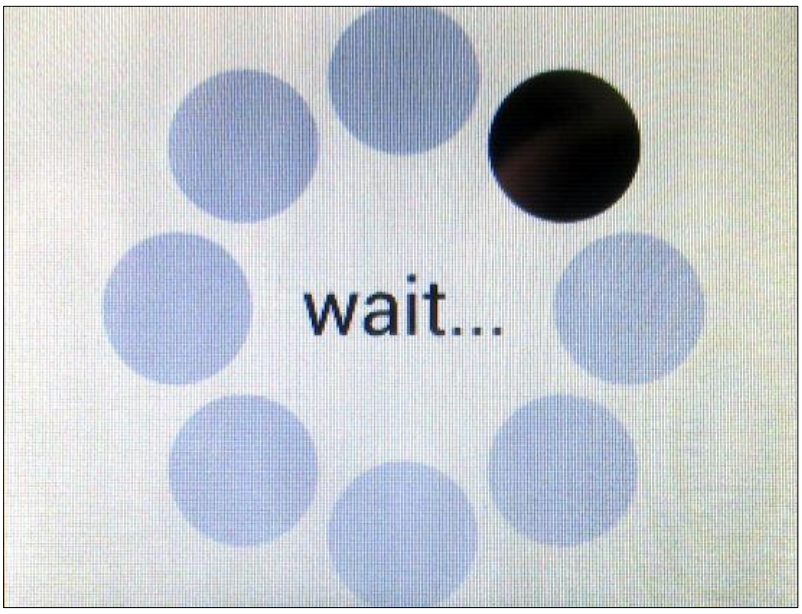

Fig. 50: Start screen

The display (see chap.4.2.2, item 1) shows the message "wait...". The LED (see chap. 4.2.2, item 6) flashes red.

After the start-up procedure is completed, the LED (see chap. 4.2.2, item 6) lights up green.

6.4 Operating the PLC

Main menu

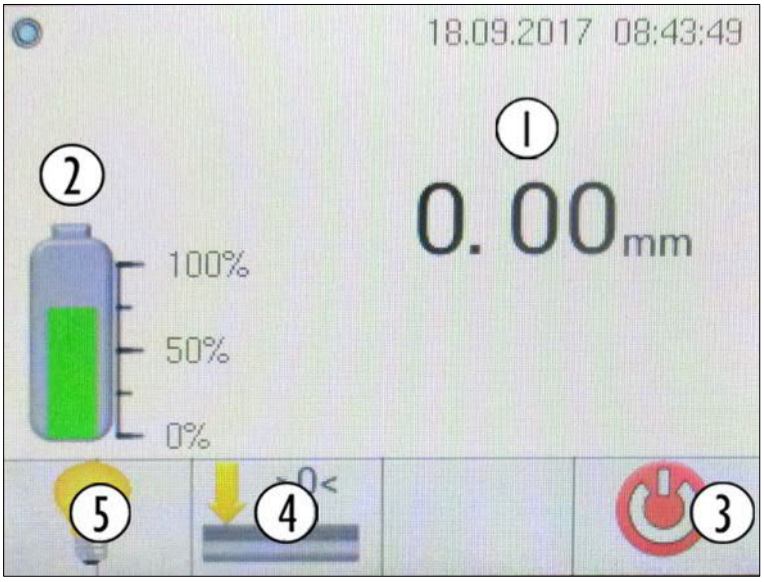

Fig. 51: Main menu

1	Display of actual Infeed depth of abrasive
2	Display of actual voltage
3	'switch symbol' button
4	'Zeroing' button
5	'Illumination' button

6.5 Button function

Switch symbol Switch the motor on/off (Switching on needs confirmation with "Enter" within 1 second)

>0< Zeroing at actual feed depth and toggle between operating mode "Standard" or "Controlled depth".

Lamp symbol Switch the illumination on/off.

6.5.1 Switch on illumination

There are two laps on the machine, one at the front (left) and one at the back (right). Both lamps are switched with the button "1" (with lamp symbol) on the PLC.

Initial condition: both lamps are switched off, the lamp symbol is highlighted in grey (see following picture)

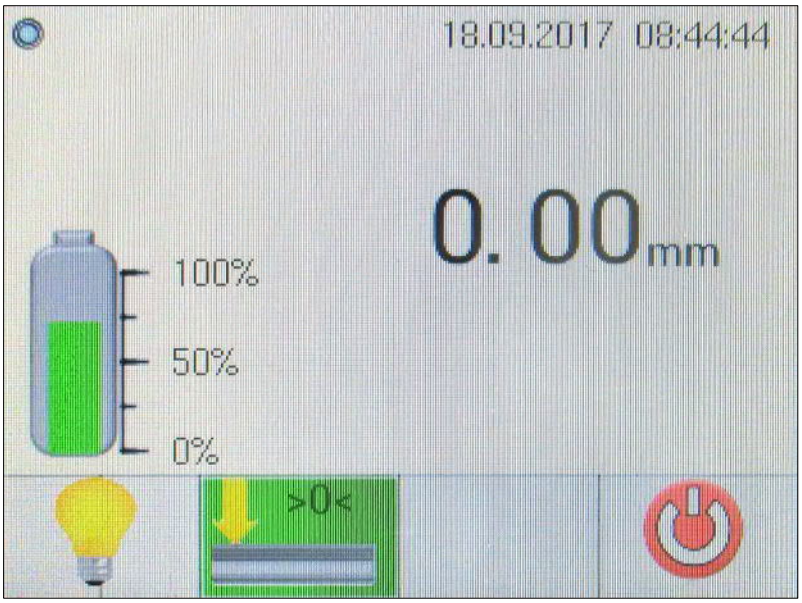

Fig. 52: Switch on illumination

1. Press the button with the lamp symbol.

   The left side of the lamp symbol is highlighted green and the lamp at the front (left) is switched on.
2. Press the button with the lamp symbol again.

   The right side of the lamp symbol is highlighted green also and the lamp at the back (right) is switched on.
3. Press the button with the lamp symbol again.

   The lamp at the front (left) is switched off and the left side of the lamp symbol is highlighted grey.
4. Press the button with the lamp symbol again.

   The lamp at the back (right) is switched off and the right side of the lamp symbol is highlighted grey.

If the button is pressed again, the cycle starts again at step 1.

6.5.2 Feinschliffprogramm

Während der Schleifbearbeitung nutzt sich das Schleifmittel ab. Dieser Verschleiß muss beim Feinschliff ausgeglichen werden.

5. Die Taste mit dem Zustellsymbol drücken.

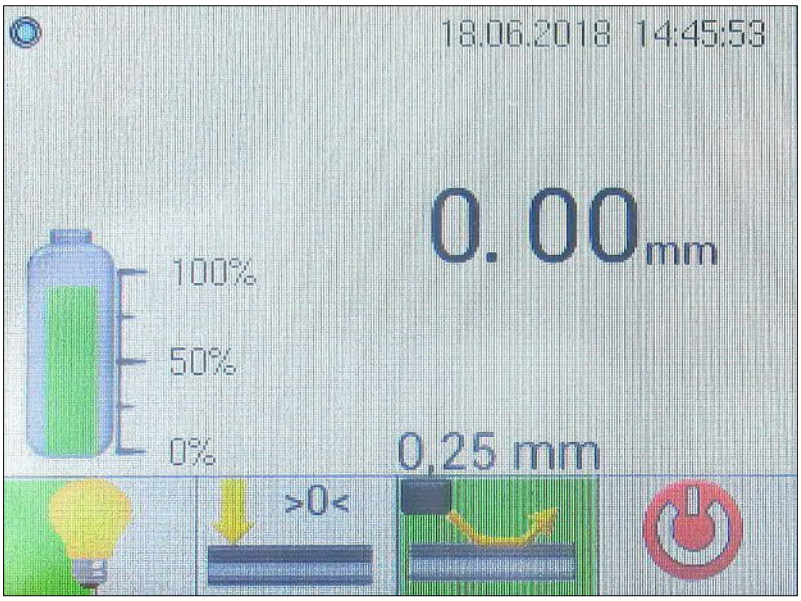

Abb. 53: Zustelltiefe 0,25

Die Zustelltiefe ist auf den Wert „0,25“ eingestellt.

6. Die Taste mit dem Zustellsymbol erneut drücken.
7. Die Zustelltiefe wird der Reihe nach auf 0,4; 0,5; 0,6; 0,75; 1; 2; und 3 mm eingestellt.

Nach einem erneuten Tastendruck wird die Option wieder zurückgesetzt

6.5.3 Setting the zero point

There are two operating modes:

Standard

When the mode "Standard" is activated, the infeed depth can be moved up and down with the ‘Retract’ and ‘Infeed’ buttons.

Controlled depth

When the mode "Controlled depth" is activated, it is not possible to move the infeed depth below the height "0.00mm".

When the operating mode „Controlled depth” is activated, the ">0<" button is highlighted green.

Setting the zero point

1. Position the grinding spindle above a point on the rail that is in good order.
2. In ‘standard mode’, press the ‘Infeed’ button to extend the grinding spindle until the abrasive just touches the surface of the rail.
3. Press the ">0<" button.

   The zero point is set at the current grinding depth.

The infeed of the grinding spindle can be increased at any time in “Standard” mode.

4. Press the ">0<" button once again

   The ">0<" button is highlighted in grey

   Machine is in "Standard" mode

6.6 PLC settings

The following actions can be selected in the "Settings" menu:

- Stepper manually
- Put into service
- Debugging
- Service
- Brightness
- Date/Hour
- Country settings
- Contact

Call up the 'settings' Menu

1. Press the 'ESC' button.

   The following menu appears.

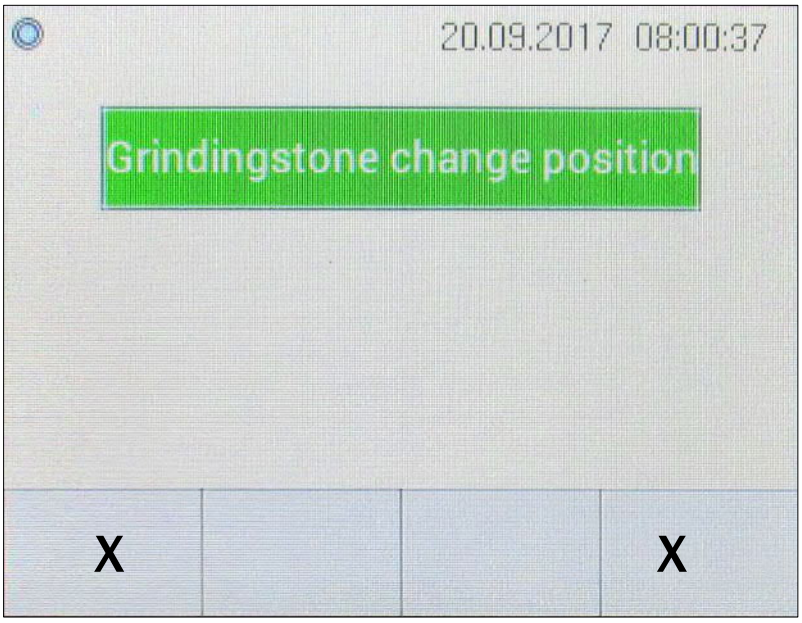

Fig. 54: Display „Grindingstone change position"

2. Press both soft keys under the outer keys ("1" and "4", marked "X" in the picture) **simultaneously.**

   The "Settings" option is now displayed.

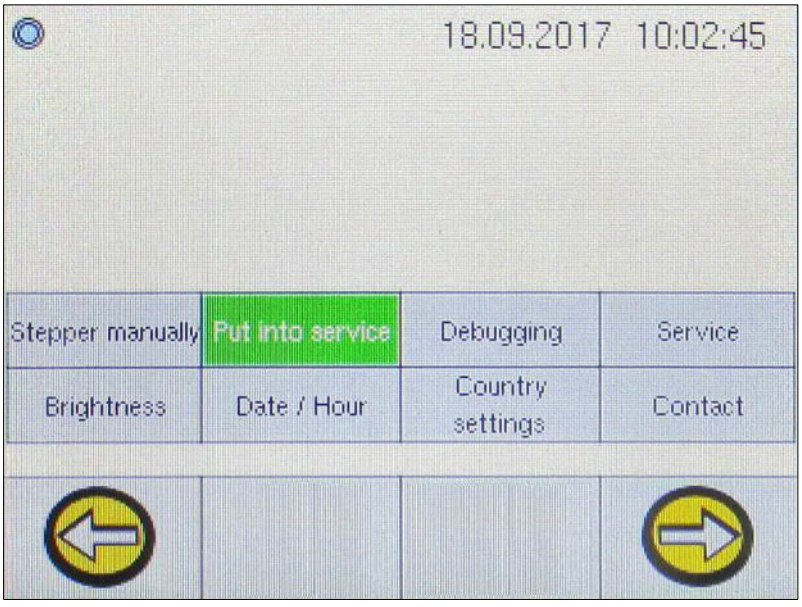

Fig. 55: Menu "Settings"

3. Navigate to the desired option using the arrow keys.

   The desired option is highlighted in green.

4. Press "Enter".

6.6.1 Stepper manually

This option is needed in case the infeed drive is blocked and the movement of the infeed drive shall be possible without the restriction of software end-stops.

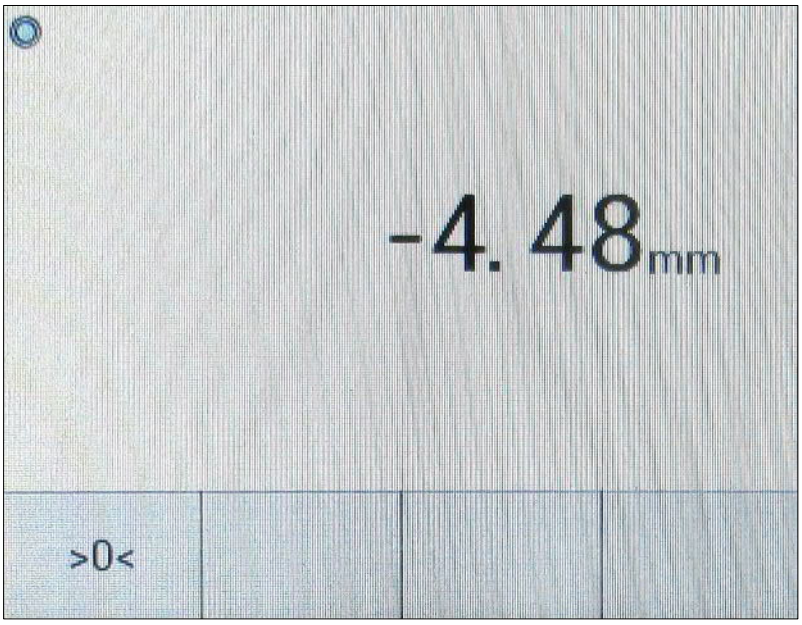

Fig. 56: "Stepper manually"

1. Use the ‘Retract’ or ‘infeed’ button to move the drive to the desired direction.
2. If desired or after a blocked infeed drive has been repaired in the fully retracted position, move the infeed approx. 1mm down and press the ">0<" button.

   The internal position measurement has been referenced (homing procedure).

6.6.2 Put into service

This option can only be accessed by start-up engineers (ROBEL staff), the message "No authority for the next step" appears.

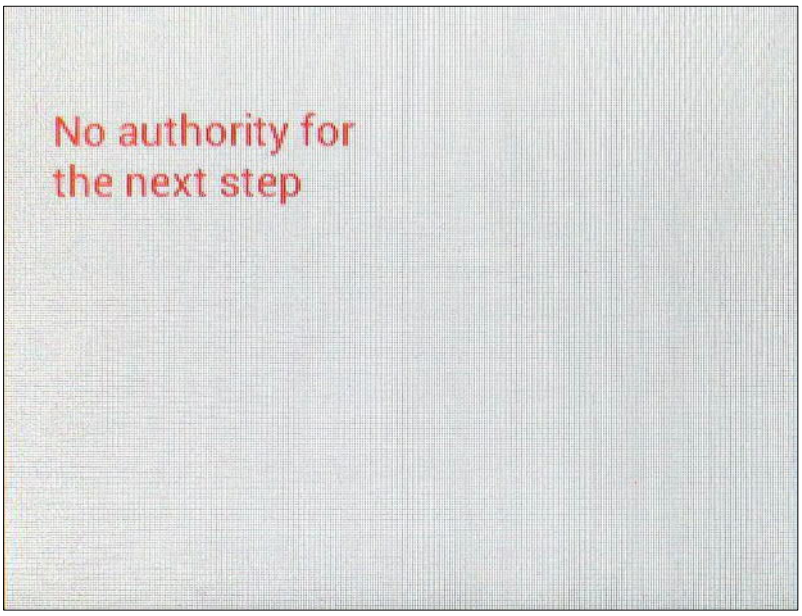

Fig. 57: Message „No authority“

6.6.3 Debugging

Use this option in order to get additional status information for error tracking.

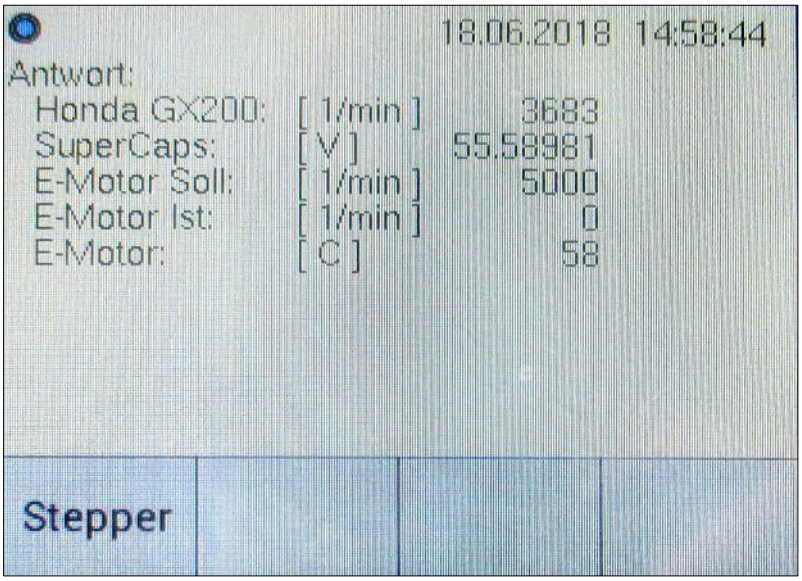

Fig. 58: Debugging Information

1. Press the "Stepper" button.

   The following menu appears:

Fig. 59: Debugging-information for Stepper

1	Command
2	Response PLC
3	Approval
4	Up
5	Down
6	Depth stop
7	Tool change

Use this menu in order to check whether the signals of operating buttons or sensors are reaching the PLC or not.

The following gives an example, how the debugging procedure is meant to be carried out. Presumption in this example: Pressing the "Infeed down"-button does not trigger any response:

2. Press the "infeed down" button

   If this is the case, it is an indication that either the button itself is out of order or the line to the PLC is interrupted.
3. Localise and deal with the fault.

If the button is working, the circle before “Down” will be green, see following screen:

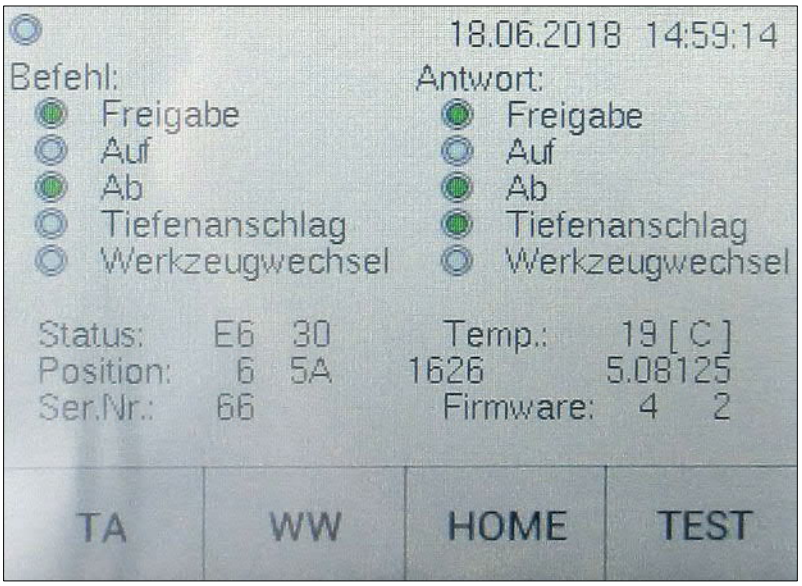

Fig. 60: Button “Down” pressed and registered

The button is working properly.

In the right column “Response”, the circle before “Down” is also highlighted green. This is indicating that the PLC has acknowledged the command correctly. If the circle before “Down” will remain grey, the CAN- bus participant has not acknowledged the command.

4. Localise and deal with the fault of the CAN- bus participant.

6.6.4 Service

In this menu the operating hours and the remaining time until the next service is displayed.

Figures in red and with “-“ indicate that maintenance has been exceeded.

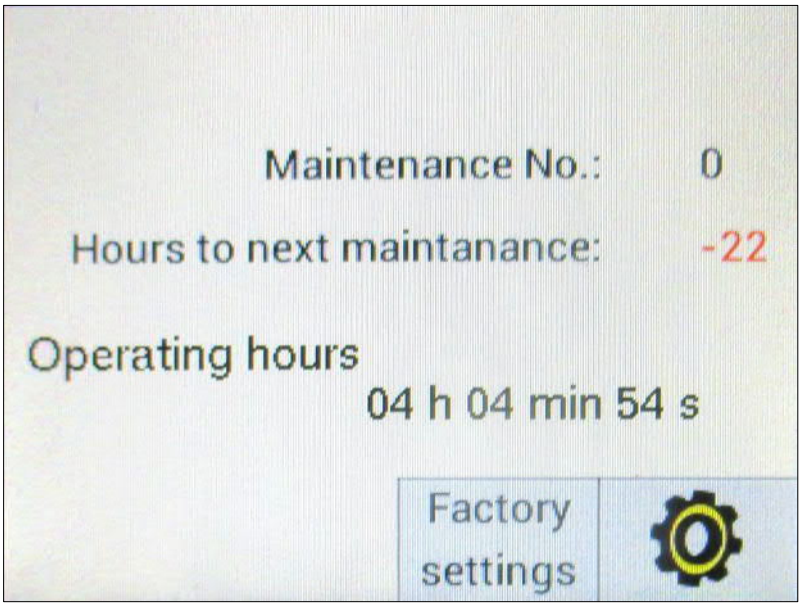

Fig. 61: Service Information

Reset service interval

1. Press the button with the gear symbol and keep depressed.
2. Press “Enter”

   Service interval is reset.

Reset to factory settings

1. Press the soft key below “Factory settings”.

   A query appears as to whether the factory settings are definitely to be reinstated.

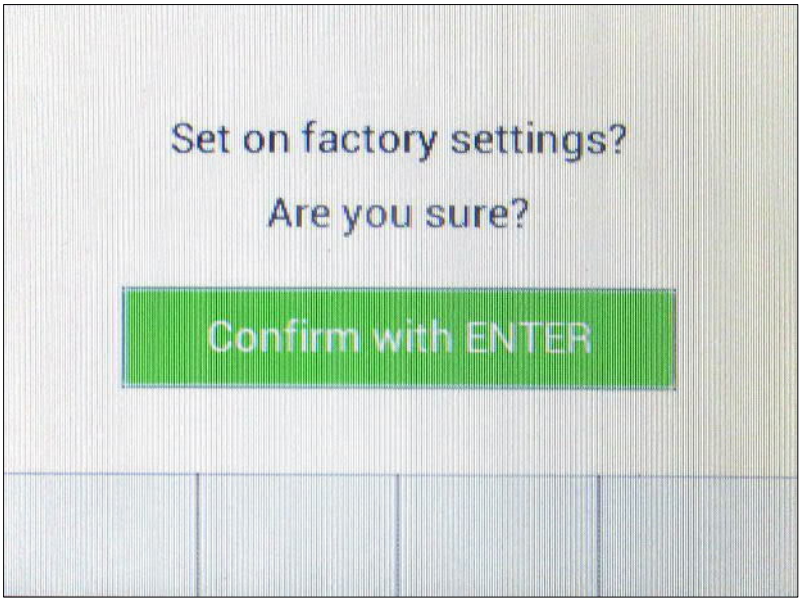

Fig. 62: Confirm with ENTER

2. Press “Enter”.

   The factory settings of the PLC are reinstated.

6.6.5 Brightness

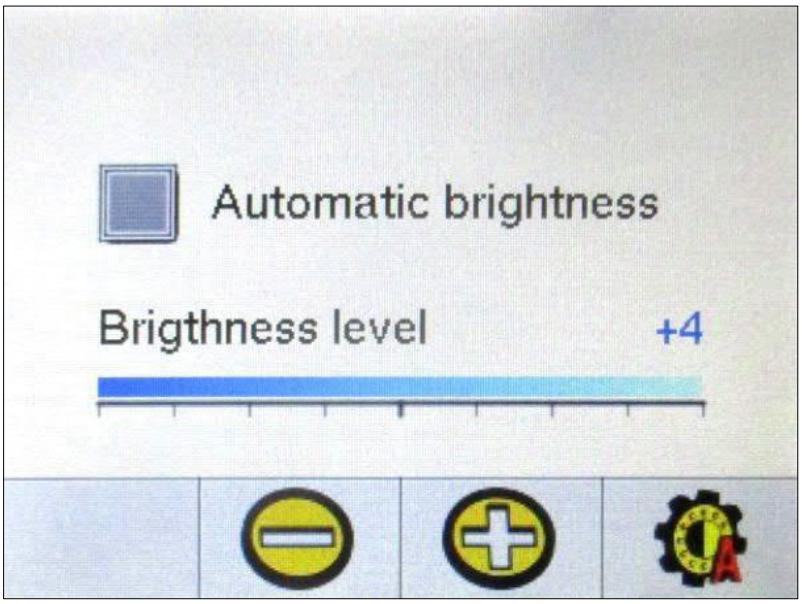

Fig. 63: Brightness level

1. Set the desired brightness using the "-" and "+" keys.

Or:

2. Select the "Automatic brightness" option (symbol "A" at bottom right of picture).

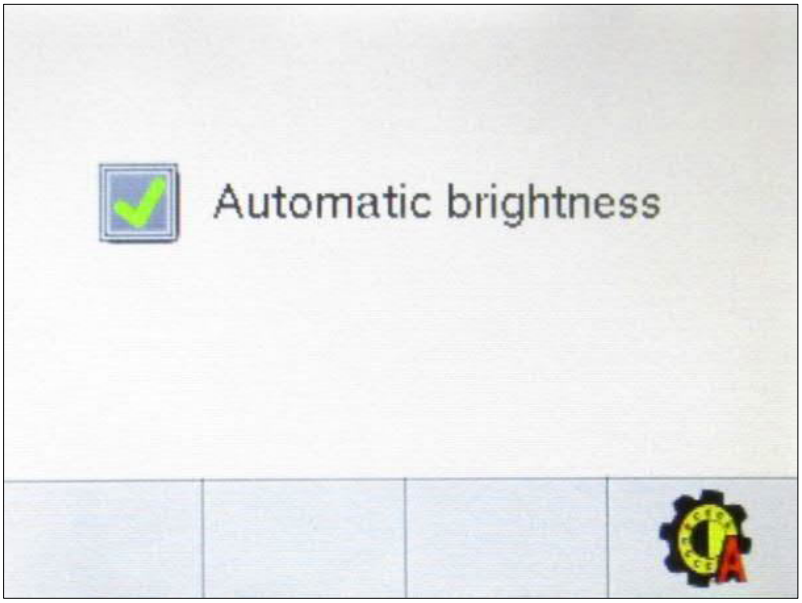

Fig. 64: Option: Automatic brightness

The brightness is adjusted automatically by the brightness sensor on the PLC.

6.6.6 Date/Hour

The following screen appears:

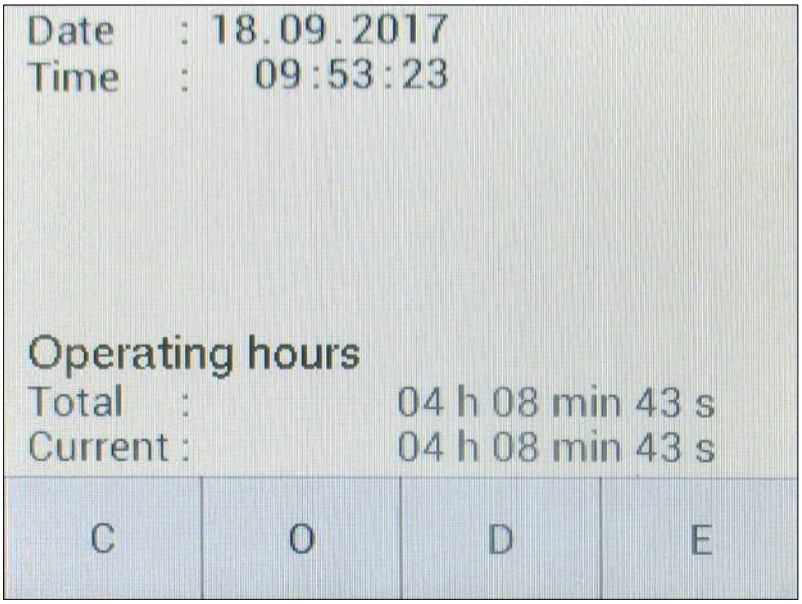

Fig. 65: Date and time

1. In order to change the settings, press the characters "CDDC" (code).

The following screen appears:

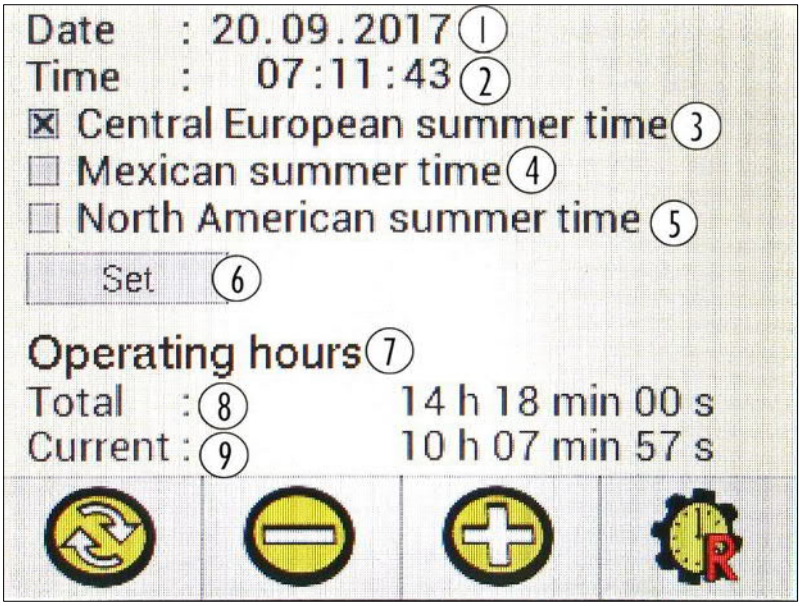

Fig. 66: Date and time settings

1	Date
2	Time
3	Central European summer time
4	Mexican summer time
5	North American summer time
6	Set
7	Operating hours
8	Total
9	Current

Set date, time and choose a summer time according to the time zone.

1. Use the soft key under the double arrow to select the value that is to be changed.

   The values are stepped through in turn, the currently selected value flashes red.
2. Edit the values as desired.
3. When altering the date and time:

- Press "+" to increase the value
- Press "-" to decrease the value

4. When selecting a summer time: Press "+" or "-" to set or remove a cross.
5. If the value for the current operating hours is to be reset, press the key with the clock symbol and “R”.

   The value for the current operating hours is reset.
6. Once the values have been set correctly, use the double arrow to select the "Set" option and press the “Enter“ key.

6.6.7 Country settings

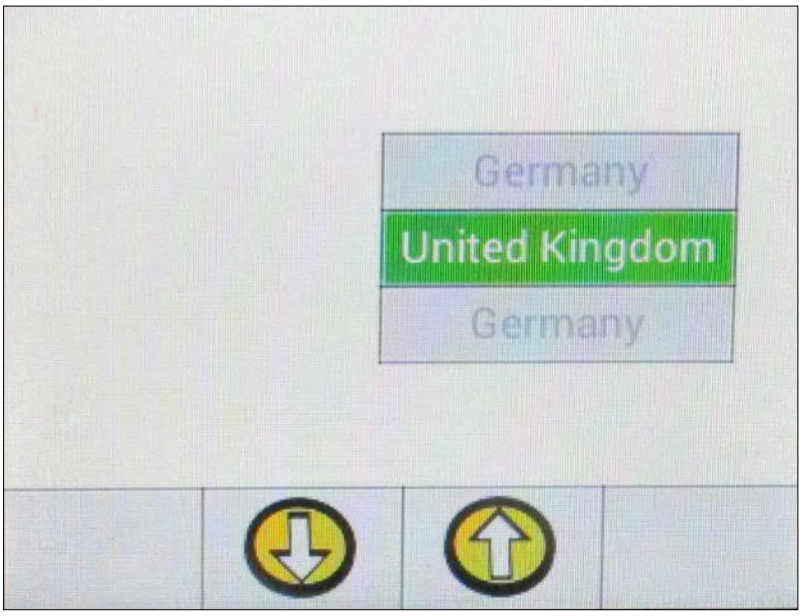

Fig. 67: Country settings

1. Use the arrow keys to select the desired country setting.
2. Press the "Enter" key.

   The country setting is set.

6.6.8 Contact

Fig. 68: Contact information manufacturer

6.7 Starting the motor

WARNING

Risk of accident!

Risk of catching or abrasion if the abrasive is touched while the motor is starting.

- ► Do not reach into the danger zone.
- ► Be aware that the abrasive starts turning as soon as the motor starts (even during the starting process).

WARNING

Fire risk!

If the motor is covered, there is a risk of overheating. The motor could be damaged and parts could ignite.

- ► Never cover the electric motor.

1. Run the motor for at least 2 minutes to allow the spindle to warm up.
2. Press button "4" on the PLC, below the switch symbol.

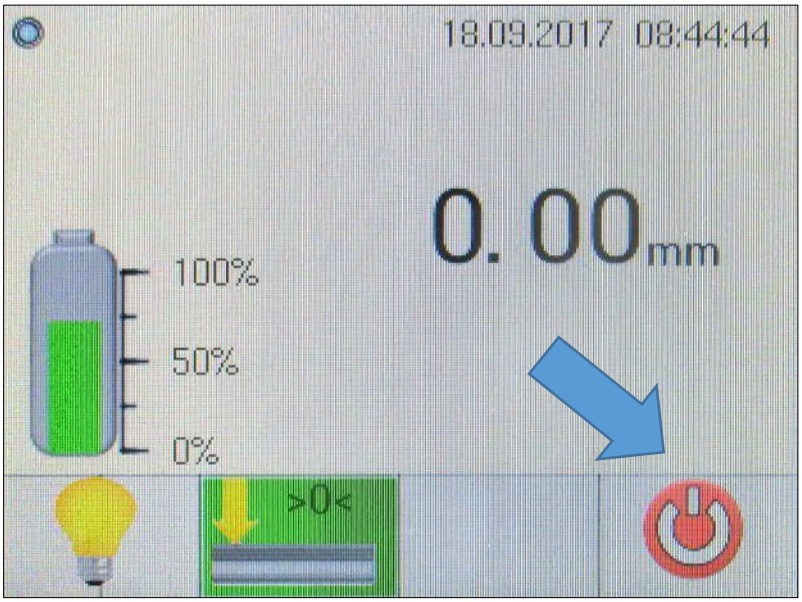

Fig. 69: Press button below the switch symbol

3. Press the "Enter" button within 1 second.

   Motor starts.

   The switch symbol is highlighted green.

6.8 Test run

CAUTION

Risk of injury!

If the operator pulls the guide handle towards himself when guiding the machine, it may tip over. Risk of bruises and skin abrasion.

► Do not apply a force that rotates the machine in the direction away from the outrigger (see blue arrow in figure below).

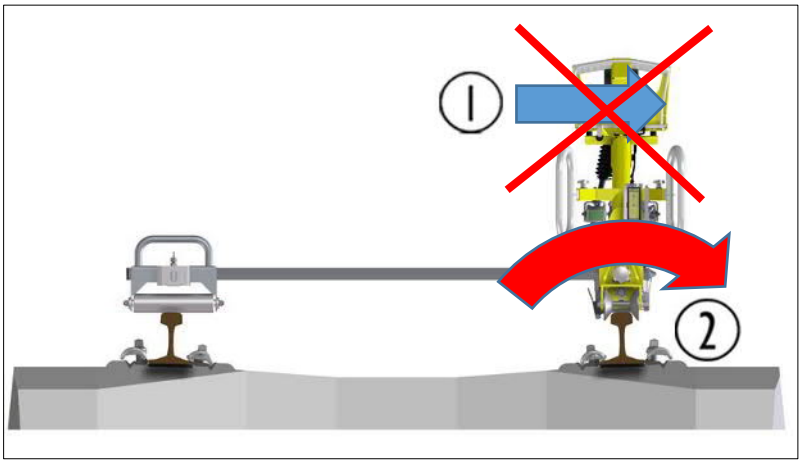

Fig. 70: Danger of tipping over: Do not pull the machine to the operator side.

1 Force applied by operator

2 Tipping over

WARNING

Risk of accidents!

Risk of serious injuries, when a non-circular abrasive fractures when running or fragments of a previously damaged abrasive are flying around.

► Perform a test run, complying with the following guidelines!

Start the machine correctly and perform a test run during initial commissioning and after each time the abrasive is replaced.

1. Position the machine so that the abrasive can turn freely and without hindrance.
2. Make sure that no-one is standing in the danger zone (direction of possible flying debris).
3. Taking all safety precautions into account, carry out a test run for at least **one minute**.
4. Take notice of the course of the grinding spindle and any unusually strong vibrations.

5. If the abrasive is not running properly, stop the motor immediately (emergency stop button).

   The machine may only be used if the abrasive is running perfectly (no wobbling, no non-circular running, no scraping noises).
6. If any of the above occurs, find out the reason, carry out remedial action.
7. Repeat the test run.

6.9 Working with the machine

6.9.1 General Information on the grinding process

The weight of the machine is already putting a significant amount of grinding pressure on the abrasive.

If additional load is put on the machine or the infeed depth is too much, this will result in a reduction of spindle RPM and several warnings appear on the PLC screen. These warnings should make the user to release the grinding pressure.

If these warnings are ignored for approx. 20 minutes, the machine will automatically switch of for approx. 10 seconds. After this, the PLC will reboot and the engine can be started again.

If the machine is used in a normal manner now, work can be continued without any further breaks for cooling, as the machine will even cool down if it is used properly.

In this context, an optimal grinding process can be obtained if the level of the battery indicator is at approx. 75% during grinding and is allowed to recover to 100% approx. every 30 seconds.

Do only actuate the ‘infeed’ or ‘retract’ button when there is no load on the spindle!

If the infeed drive is actuated despite load is applied to the abrasive (e.g. engine is switched off and machine is resting on the extended abrasive on the rail), the stepper motor will loose steps or a hard stop is detected erroneously.

In this case perform a reference run of the spindle as described in chap. 9.3.4.

6.9.2 Grinding Vignole rails

The machine is tailored to the required grinding pressure through its self-weight. During the grinding of the sides of the rail head the machine is pulled on to the rail by the guide discs, thus generating the required grinding pressure.

CAUTION

Risk of injury!

If the operator pulls the guide handle towards himself when guiding the machine, it may tip over. Risk of bruises and skin abrasion.

► Do not apply a force that rotates the machine in the direction away from the outrigger (see blue arrow in figure below).

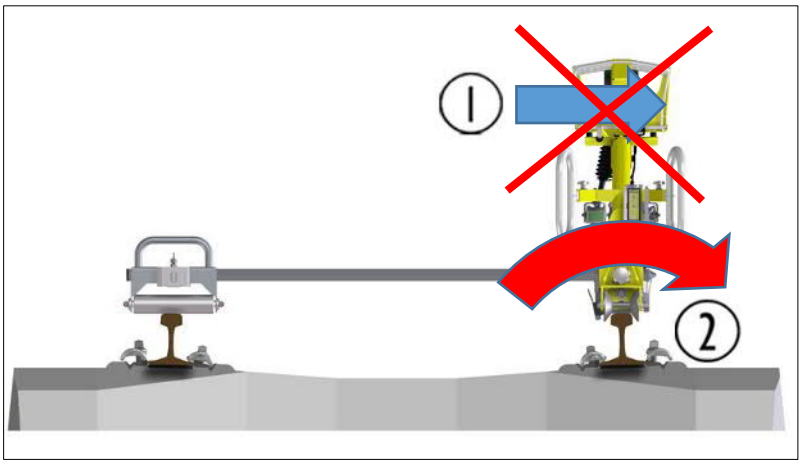

Fig. 71: Danger of tipping over: Do not pull the machine to the operator side.

1 Force applied by operator

2 Tipping over

The infeed depth of the grinding spindle can be adjusted with the 'Infeed' button, the current depth is indicated on the display. Pressing the 'Infeed' button on the upper side will retract the abrasive, pressing on the lower side will infeed the abrasive.

Fig. 72: Grinding infeed button

1 'Retract' button

2 'Infeed' button

In the standard mode the infeed is adjusted via the buttons (1) and (2).

Coarse grinding (warm)

1. Deactivate the dead man's brake (pull the dead man's handle in the direction of the handle).
2. Position the abrasive above the start of the section of rail to be ground.
3. With the motor running, lower the abrasive by means of the electric height adjustment until the first flying sparks appear.
4. Roll the grinding machine backwards and forwards over the grinding place on the copying rollers until no more sparks are visible.
5. Then slightly lower the abrasive by means of the electric height adjustment until sparks start reappearing.
6. Repeat the grinding process until the residual height of the welded joint is approximately 0.5 mm.

   The grinding process can be viewed through the cranked part of the swivel frame.

Precision (cold) grinding

1. For precise depth adjustment, push the grinding machine from the grinding area to a previously matched section of rail (original or ground).

NOTICE

Risk of damage to the rail!

If significant grinding occurs on the rail during the probing of the zero point, this can lead to an impairment of the rail surface.

► Take great care when probing the rail surface.

2. Lower the abrasive with the electric height adjustment extremely carefully and slowly until the first sparks appear when the motor is running.
3. Set the zero point and activate “controlled depth” mode (see chap. 6.5.2).
4. Without further depth infeed, move the grinding machine over the section of rail to be ground.

   The grinding area is then ground to the final finish, when no more flying sparks are visible.

   The grinding area is then ground to the final finish, when no more flying sparks are visible.

Grinding the sides of the rail head

1. To grind the sides of the rail head, adjust the angle of the abrasive by turning the grinding angle adjustment wheel.

   During the grinding of the sides of the rail head the grinding machine is supported against the rail by the copying rollers, thus generating the required grinding pressure.
2. The grinding process is as described above.

6.9.3 Evaluate the grinding pattern

1. When assessing the surface finish on the run-outs pay attention to:

- Try to achieve ‘triangular’ run-outs (refer ‘good’ picture)

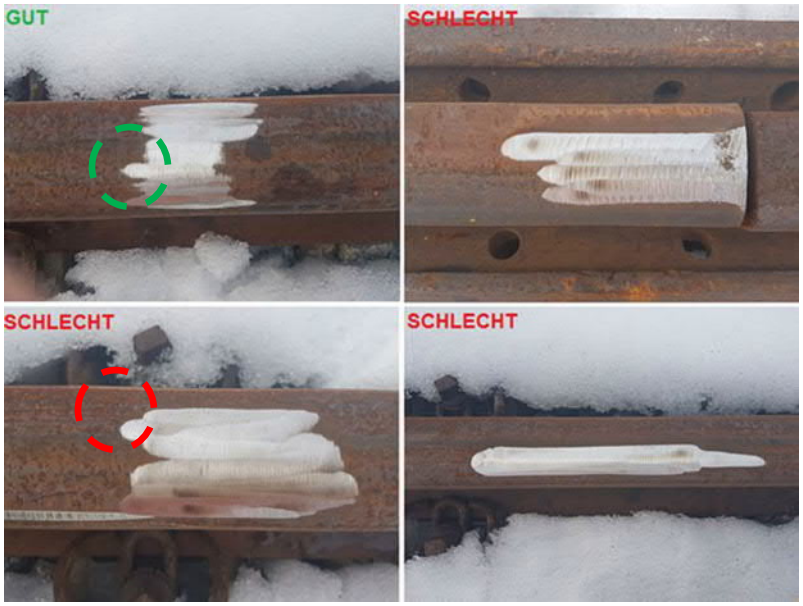

Fig. 73: Grinding patterns good (gut)/poor (schlecht)

6.10 Switching off the engine

Do not stop the engine of the grinding machine with the motor stop button. Using this button will also stop the Honda engine of the Hybrid Drive Unit 70.02.

Use the motor stop button only in an emergency.

1. Press the switch symbol on the PLC.

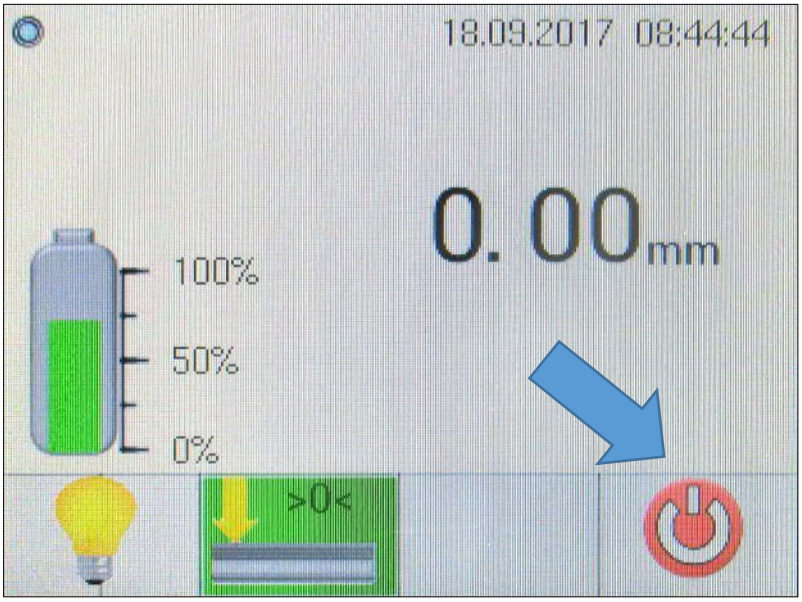

Fig. 74: Press the switch symbol on the PLC

Motor stops.

The switch symbol is highlighted grey.

2. Retract the grinding spindle completely into the protective housing by pressing the 'Retract' button.
3. Switch the machine off again and disconnect it from the energy source used

- Stop the Hybrid Drive Unit and disconnect electrical connection
- Remove the converter from the holder and disconnect electrical connections
- Remove the battery from the holder and disconnect electrical connections

With the super capacitors fully charged, it is still possible to use the illumination for approx. 20 minutes.

6.11 Unrailing the machine

6.11.1 Preparing the machine

1. Put the swivel frame into a vertical position using the tilt adjustment handwheel.

Separate connectors

2. Disconnect the machine from the energy source used, refer to chapter 6.2.2 (in reverse order):

- Stop the Hybrid Drive Unit and disconnect electrical connection
- Remove the converter from the holder and disconnect electrical connections
- Remove the battery from the holder and disconnect electrical connections

Close protective caps

NOTICE

Risk of damage!

Water and dust may ingress the connectors if the protective caps are not properly closed and locked.

► Always close and lock the protective caps.

3. Close and lock the protective caps of the connectors on the machine and on the Hybrid Drive Unit, see following Figure.

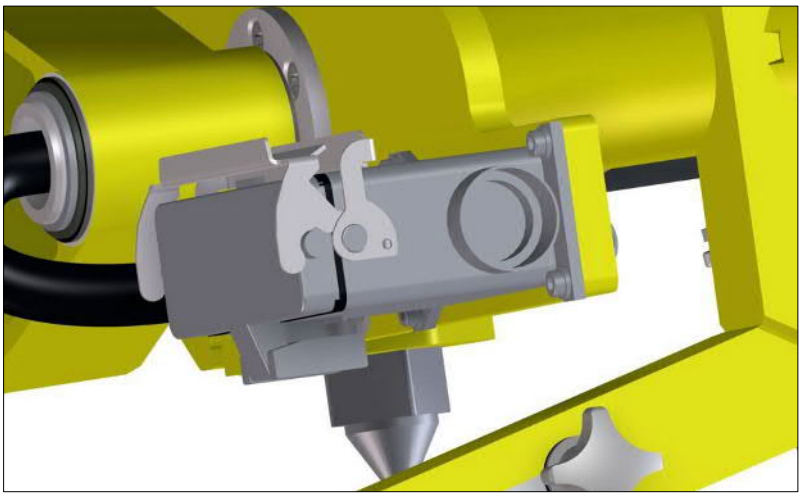

Fig. 75: Protective caps closed (Example: Machine)

Pull out the carrying handles

4. Turn the star knobs counter-clockwise.

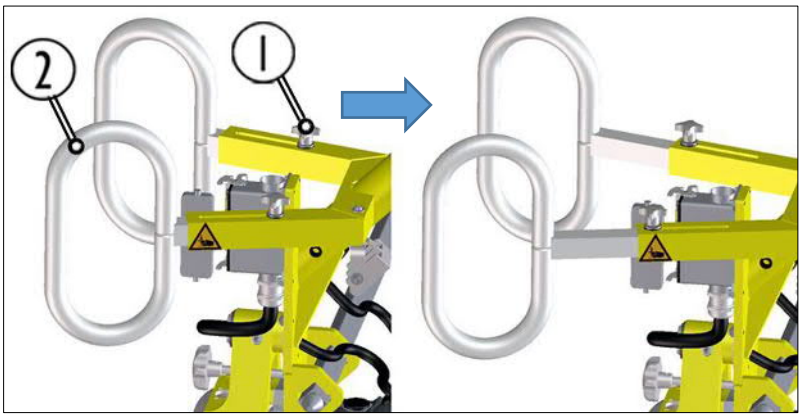

Fig. 76: Pull out carrying handles (image shows ergonomically optimized handles)

1 Star knobs
2 Carrying handles

5. Pull out the carrying handles so that you can comfortably stand between them.
6. Fasten the star knobs clockwise.
7. Dismantle the outrigger before unrailing the machine.

6.11.2 Dismantling the outrigger

1. Loosen clamping screw (3).
2. Remove the outrigger (1) from the socket (4).

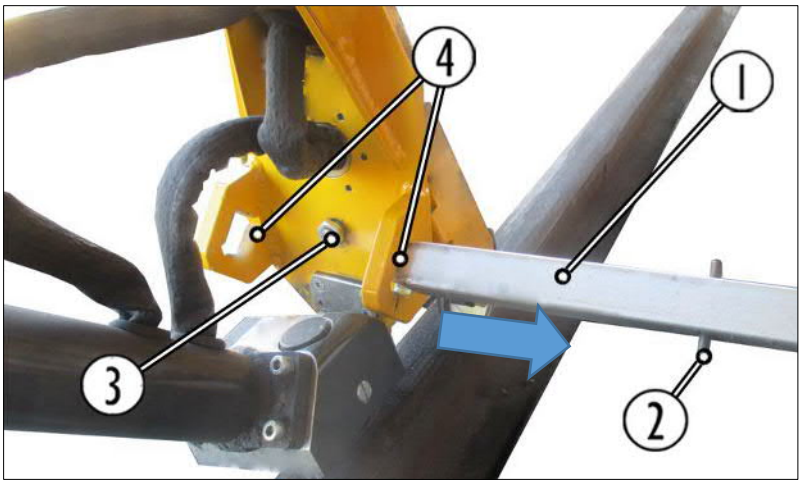

Fig. 77: Dismantling the outrigger

1 Outrigger
2 Stop
3 Clamping screw
4 Socket

6.11.3 Lifting the machine off the rail

WARNING

Risk of injury!

The machine is too heavy for one person alone. An injury to the muscles, bones or tendons may result, particularly those in the back and shoulders.

- ► Always transport the machine with suitable equipment, e.g. suitable trolley.
- ► Lift the machine with suitable lifting equipment e.g. crane, hoist, tail lift or at least a **two*) person** team.
- ► Remove the converter or the battery from the holder before transporting the machine.
- ► Mounting/removing the outrigger requires at least **two people** working together.
- ► See chap. 2.9 for further details on manual handling.

*) This value has been determined according to a risk assessment conducted by Network Rail.

1. Lift the machine off the rail.

7. Connecting the electric motor

WARNING

Risk to life from electric shocks!

Machine parts can carry a lethal voltage through exposed or damaged cables and electrical components.

- ► Ensure that the machine is shut down properly to prevent damage to the electrical parts or the whole machine.
- ► If electrical parts are defective due to environmental effects (cracks in the housing, cable breakages etc.), they must be replaced to ensure safe further use.
- ► For further safety instructions refer to the EN standards.

Risk to life from uncontrolled starting!

Accidental switching on of the machine can result in serious injuries.

- ► Disconnect the power supply after work to prevent unauthorised people from tampering with the machine (risk of accidents).

The electrical parts are insulated and constructed for maintenance-free protection against dust and sprayed water, as is the electric motor (IP 54 constructed to VDE guidelines).

8. Maintenance

WARNING

Risk to life from electric shock and uncontrolled starting!

The machine can start at any moment, if a button is accidentally pressed during maintenance work.

► Before commencing all maintenance work, switch off the machine, disconnect the power supply and secure against accidental restarting.

NOTICE

Risk of damage!

The use of spare parts that do not meet quality requirements can damage the motor.

► Only use original spare parts or parts of equal quality

1. Use only the recommended lubricants and, when carrying out repairs, use only original spare parts.

This is important, firstly for warranty cases and secondly to enhance the operational reliability of your machine.

Correct ordering of spare parts is an essential contribution to a speedy delivery of spare parts and consequently to the economic viability of the machine.

2. When ordering spare parts provide the following information:

- Type of machine
- Number of the machine
- Assembly
- Description and number of spare part
- Quantity
- Shipping method
- Despatch address

3. Adhere to the prescribed service intervals.
4. Adhere to the country-specific safety and environmental regulations when carrying out maintenance work.

8.1 Maintenance schedule

1. To determine the service intervals, evaluate the operating hours counter.

Interval	Component	Maintenance work
Each time before commissioning	Dead man's brake	Service and check function, see chap. 6.2.3
Initially after 20 operating hours, then: After every season or every 50 operating hours.	Pivot bearing (2x)	Lubricate, see chap. 8.4.1
	Gear wheels of swivel mechanism	Lubricate, see chap. 8.4.2
	Bearing of tilt adjustment handwheel	Lubricate, see chap. 8.4.4
	Electric motor	Clean cooling fins (Dust from grinding)
Every 50 operating hours	Grinding spindle	Lubricate, see chap. 8.4.5
After grinding approx. 8 rail joints	Abrasive	Replace (wearing threshold 25mm, see chap. 8.2)
Every 100 operating hours	Grinding spindle infeed	Lubricate, see chap. 8.4. Caution only one half pump stroke!

8.2 Changing the abrasive

8.2.1 Preparing the machine

The machine is equipped with an M20 mount to accept abrasives with M20 thread.

1. Store the grinding machine on a clean, level and smooth surface and secure to prevent falling over.

On a level surface

2. If the machine is stored on a level surface, support one guiding roll with approx. 5 cm, see arrow in following Figure:

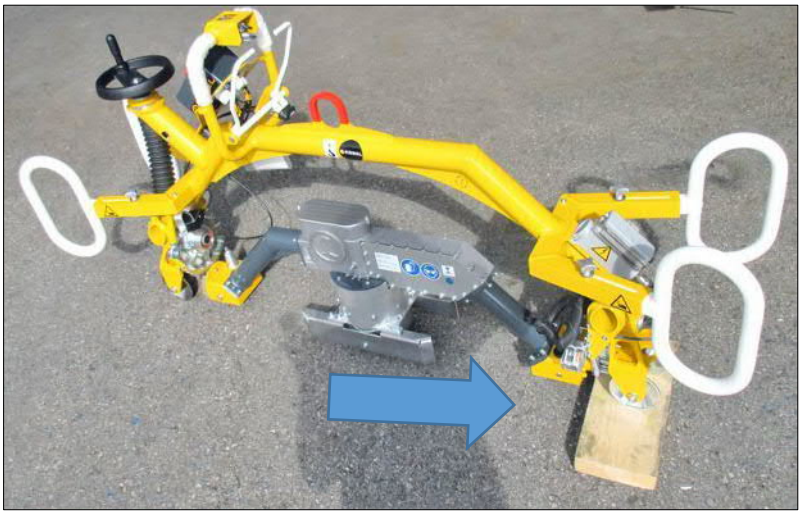

Fig. 78: Support one guiding roll

On the tracks

3. If changing the abrasive is carried out on the track, store machine as shown in the following figure:

Fig. 79: Place the machine securely

8.2.2 Moving into change position

If the travel measurement of the infeed drive is not referenced, follow the referencing procedure described in chapter 6.6.1.

1. Make sure that the abrasive can travel without obstruction full way up and down.
2. If the message „Grindingstone change position“ does not already show on the PLC, use the „retract“ button to drive the abrasive to the fully retracted (Top) position until the message „Grindingstone change position“ appears, see following figure.

   The message „Grindingstone change position“ appears.

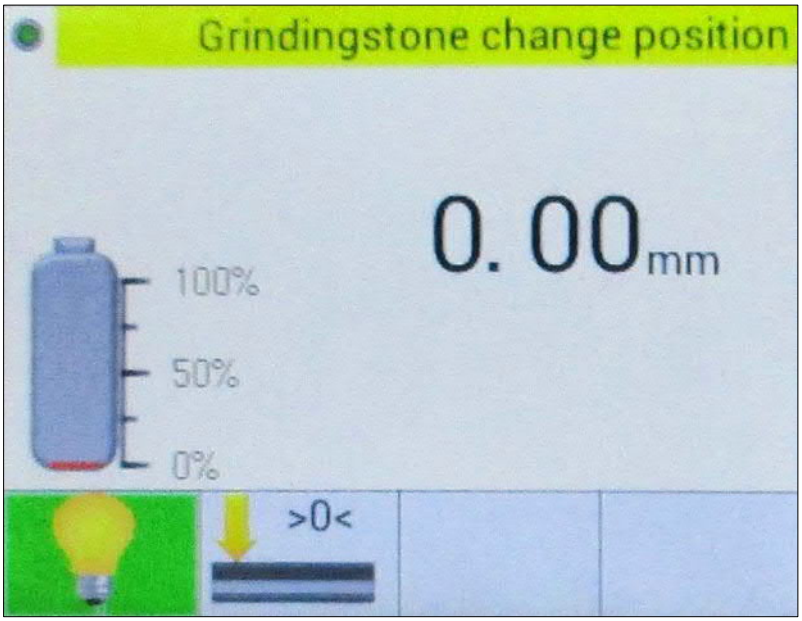

Fig. 80: Message „Grindingstone change position“

3. Press “ESC” on the PLC.
4. Press “Enter”.

   The following message appears:

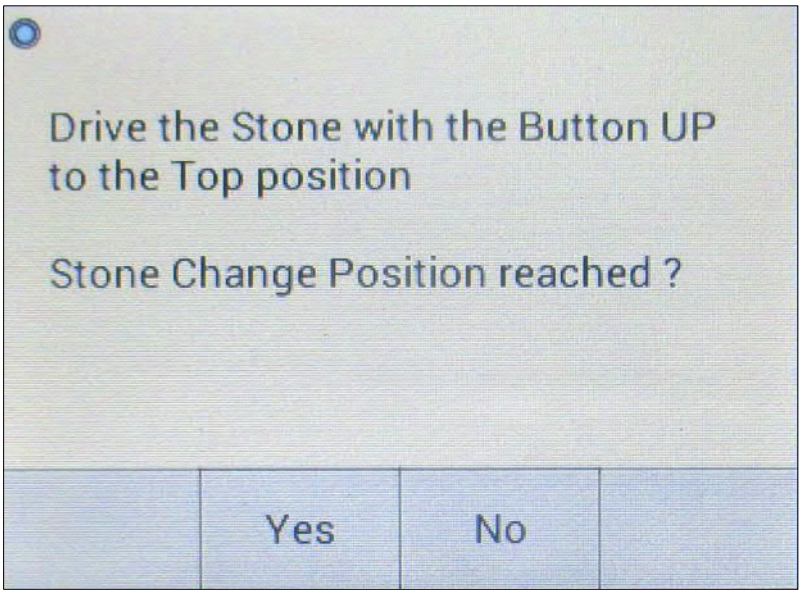

Fig. 81: Message“ Drive the stone with the Button UP to the Top position“

5. Make sure that the abrasive is in the fully retracted position: the rim of the fan propeller must be visible through the orifice on the side oft he spindle housing (see arrow in the following figure).

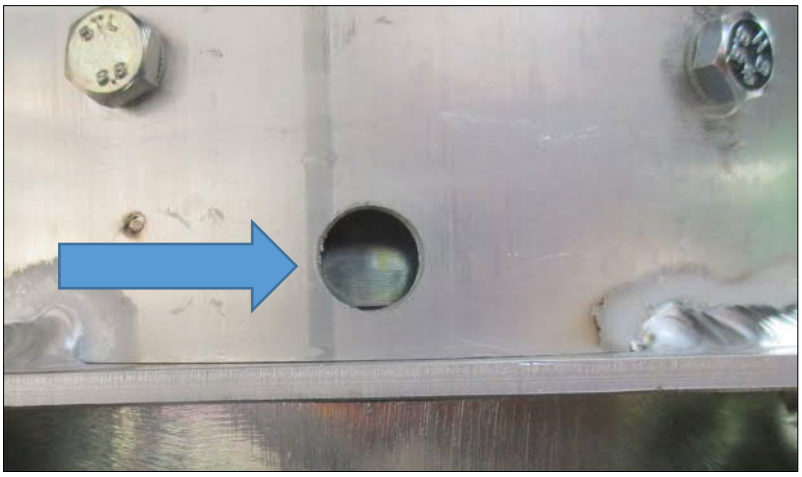

Fig. 82: Rim off an propeller visible (arrow)

Rim of fan propeller visible

1. If the rim of the fan propeller is visible as shown, confirm by pressing “Enter”.
2. Follow the procedure for changing the abrasive as described in chapter 8.2.3.

Rim of fan propeller not visible

1. Press “No”.

   An automatic homing procedure will be executed:

   The abrasive moves to the fully retracted position (uo) and afterwards approx. 2 mm down.
2. Make sure that the abrasive is in the fully retracted position: the rim of the fan propeller must be visible through the orifice on the side oft he spindle housing.

Rim of fan propeller visible

1. If the rim of the fan propeller is visible, confirm by pressing “Enter”.
2. Follow the procedure for changing the abrasive as described in chapter 8.2.3.

Rim of fan propeller not visible.

1. If the automatic homing procedure was not successful, press “No”.

   The message “Honda Off” appears.

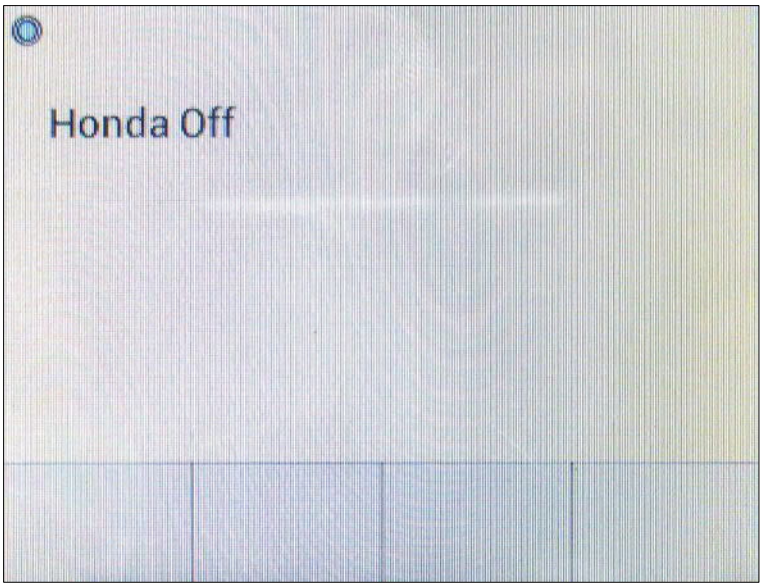

Fig. 83: Message “Honda Off”

2. Switch off the Honda motor of the Hybrid Drive Unit using the motor switch on the Hybrid Drive Unit.

If the Honda motor of the Hybrid Drive Unit is switched off using the motor stop button on the PLC of the grinding machine, an error message appears.

3. Use the “Retract” button to move the abrasive to the fully retracted position, until a loud rattle can be heard.

   The abrasive is now in the fully retracted position.
4. From this position, move the abrasive approx. 2mm down.
5. Make sure that the abrasive is in the fully retracted position: the rim of the fan propeller must be visible through the orifice on the side of the spindle housing.

Movement is possible, rim of fan propeller visible

1. If the rim of the fan propeller is visible, confirm by pressing “Enter”.
2. Follow the procedure for changing the abrasive as described in chapter 8.2.3.

Loud rattle, no movement possible

Very likely the spindle drive is blocked.

1. Press the “No” button or the “High Power” button.

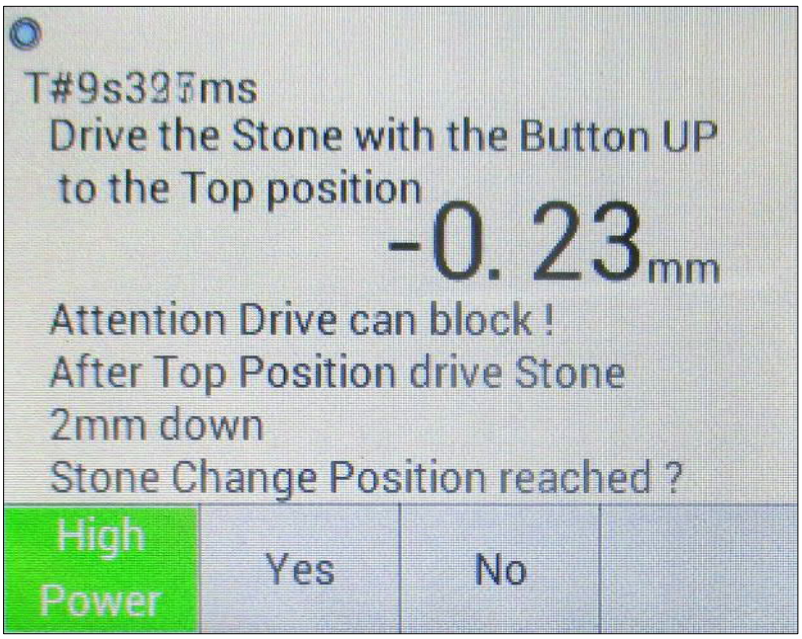

Fig. 84: Option „High Power“

For approx. 20 seconds, increased torque is available for the spindle drive. The option “High Power” is highlighted in green.

2. Use the “High Power” option and try to unblock the spindle drive (e.g. by pressing the “infeed” and “retract” buttons alternatingly).

   Spindle drive gets unblocked.

3. Wait until the “High Power” option expires or stop it manually by pressing the “High Power” button again.
4. Use the “Retract” button to move the abrasive to the fully retracted position until a loud rattle can be heard.

   Abrasive is now in the fully retracted position.

5. From this position, move the abrasive approx. 2mm down.
6. Make sure that the abrasive is in the fully retracted position: the rim of the fan propeller must be visible through the orifice on the side of the spindle housing.

Changing the abrasive is only possible when the spark guard is folded up.

7. Lift up spark protection.

Fig. 85: Lift up spark protection (both sides)

8. Follow the procedure for changing the abrasive as described in chapter 8.2.3.

If it is still not possible to move the abrasive despite the option “High Power” is activated, follow the procedure to manually unblock the spindle as described in chapter 9.3.

8.2.3 Changing the abrasive

WARNING

Risk of severe injury!

Risk of severe injury of hand and fingers if abrasive starts to rotate unintentionally.

- ► Stop engine of Hybrid Drive Unit and disconnect cable before changing the abrasive.
- ► Disconnect cable to battery or converter before changing the abrasive.

After the position for changing the grindingstone has been reached correctly and is has been confirmed, the following message appears on the PLC for a short time:

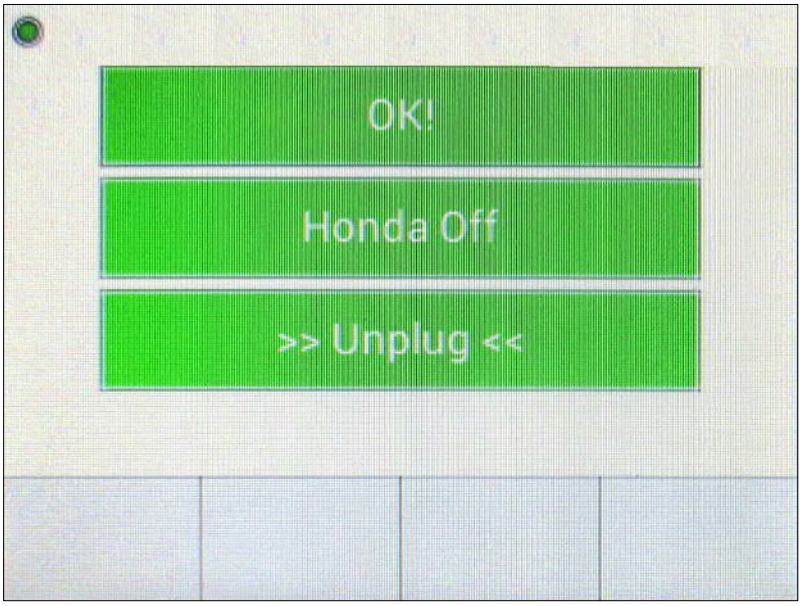

Fig. 86: Instructions for tool change

Follow instructions:

1. If the Hybrid Drive Unit 70.02 is used: Switch off motor of Hybrid Drive Unit 70.02.
2. Disconnect cable.
3. Turn the swivel frame through 90° with the tilt adjustment handwheel.

Fig. 87: Swivel frame at 90°

4. Turn the abrasive by hand into the proper position: A notch in the rim of the fan propeller must be visible (dark).

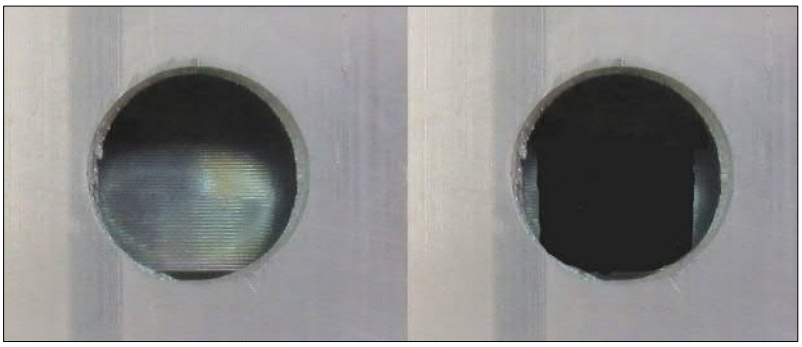

Fig. 88: Rim of fan propeller visible (left) and notch visible (right)

5. Insert a bar in the opening and engage in order to block the spindle.

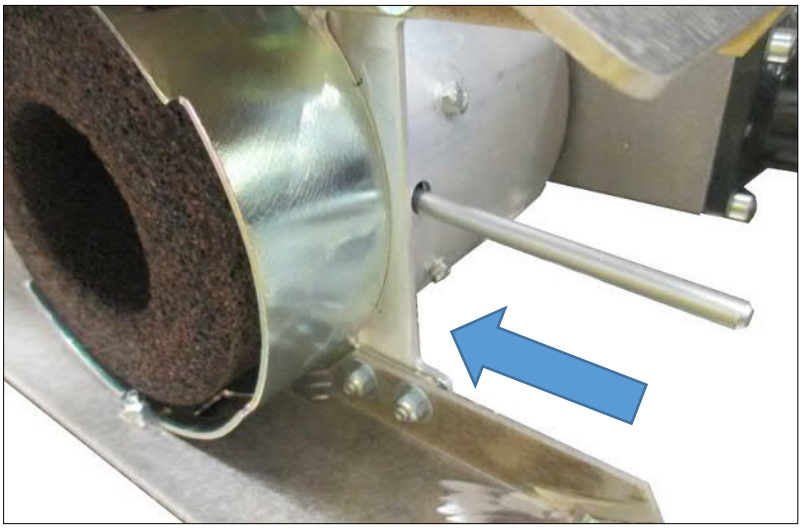

Fig. 89: Insert bar

6. Unscrew the abrasive with a SW30 spanner.

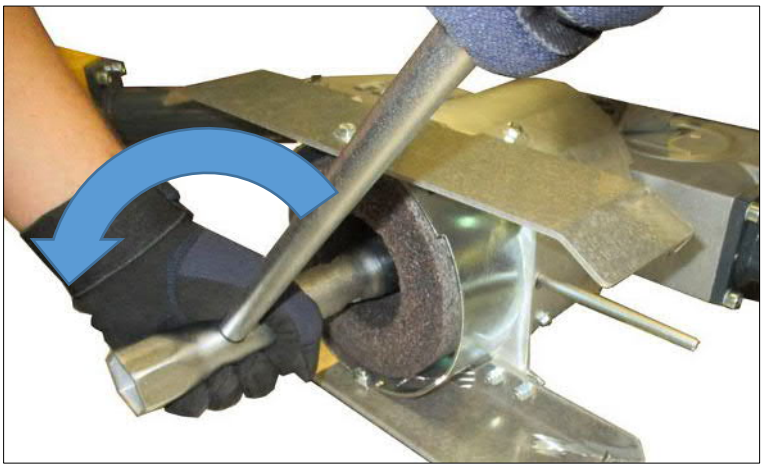

Fig. 90: Unscrew the abrasive

7. Pull off the abrasive (2), making sure to retain the disc (1).

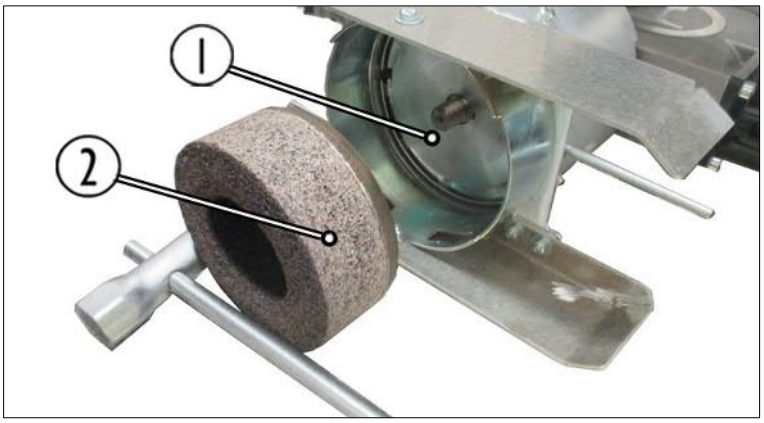

Fig. 91: Pull off abrasive

8. Check the new abrasive (visual inspection), insert the abrasive and slide the disc on to the shaft.
9. Tighten the abrasive to a torque of 100 Nm.
10. Remove bar from spindle housing.
11. Return the swivel frame to the vertical position with the tilt adjustment handwheel.

After every change of abrasive carry out a test run as described in chap. 6.8.

12. Put the machine back on to the rail.

8.3 Servicing the dead man's brake

1. Oil the Bowden cables and maintain smooth running.
2. Check the pins that engage the orifices in the wheels and the orifices in the rolls.

Carry out brake test

1. Try to push the machine along the rail while the dead man's brake is not actuated.

   It should not be possible to move the machine, or only with great force.
2. If the dead man's brake is not working properly, take the machine off the rail immediately, and rectify the fault.

8.4 Lubrication

1. Lubricate the following lubrication points every 50 operating hours or as necessary with 1 stroke per grease nipple.

The roller bearings of the copying rollers are maintenance-free.

8.4.1 Pivot bearings

Pivot bearing 1

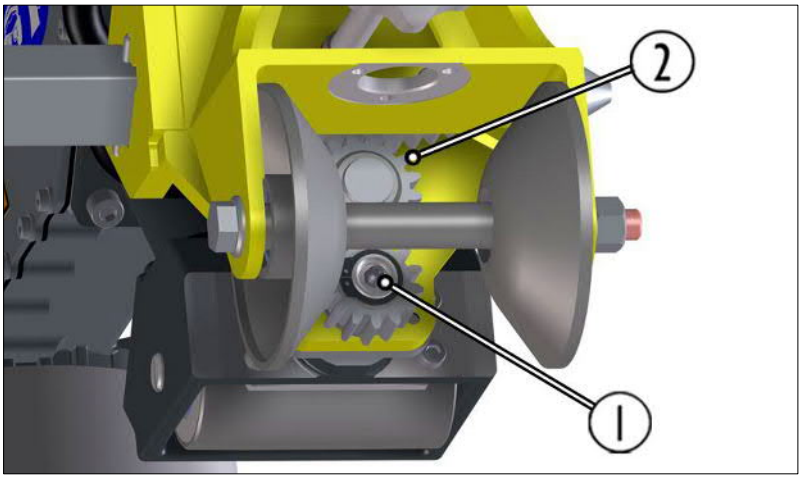

Fig. 92: Lubrication point pivot bearing 1

1 Lubrication point 1
2 Lubrication point 2

Pivot bearing 2

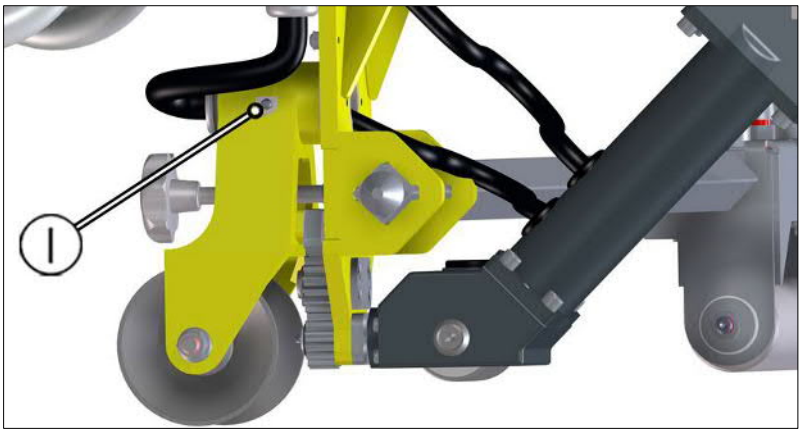

Fig. 93: Lubrication point pivot bearing 2

8.4.2 Gear wheels

1. Clean teeth from grinding dust before greasing the gear wheels.

Gear wheels operator's side

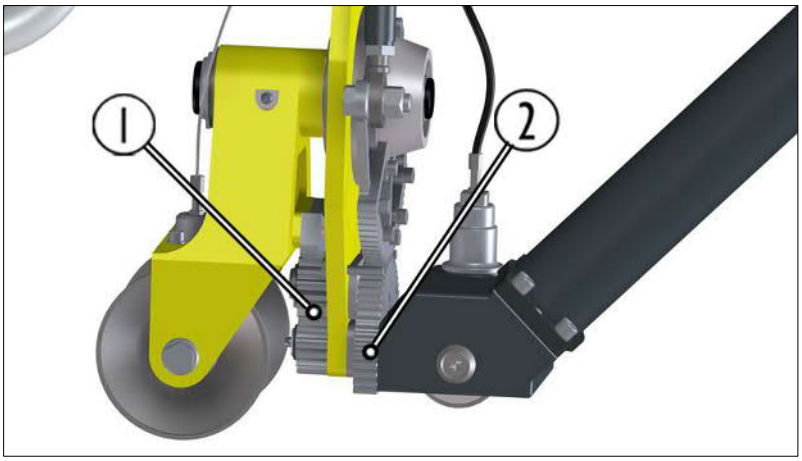

Fig. 94: Lubrication point gear wheels swivel mechanism (operator's side)

1 Lubrication point 1

2 Lubrication point 2

Gear wheels front side

Fig. 95: Lubrication point gear wheels swivel mechanism (front side)

8.4.3 Grinding spindle infeed

NOTICE

Risk of damage!

The electric motor will be damaged if these lubrication points are greased too generously.

► Only pump the grease gun a half stroke!

1. Lubricate the grinding spindle every 100 operating hours.

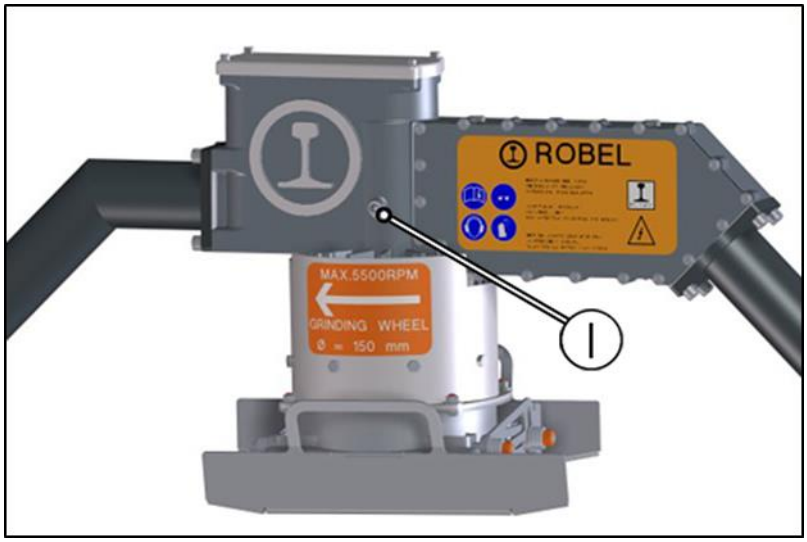

Fig. 96: Lubrication point grinding spindle

8.4.4 Tilt adjustment handwheel

1. Lubricate the bearing of the tilt adjustment handwheel every 50 operating hours.

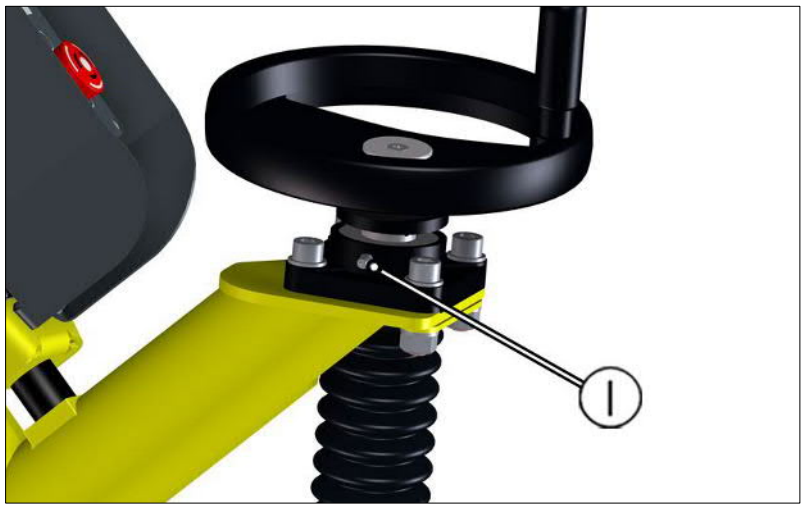

Fig. 97: Lubrication point of the tilt adjustment handwheel

8.4.5 Grinding spindle

Re-grease the grinding spindle every 50 operating hours.

1. Using the “infeed” button, drive abrasive to the tool change position (fully retracted, see chap. 8.2.2.)
2. Move abrasive even further up by hand.

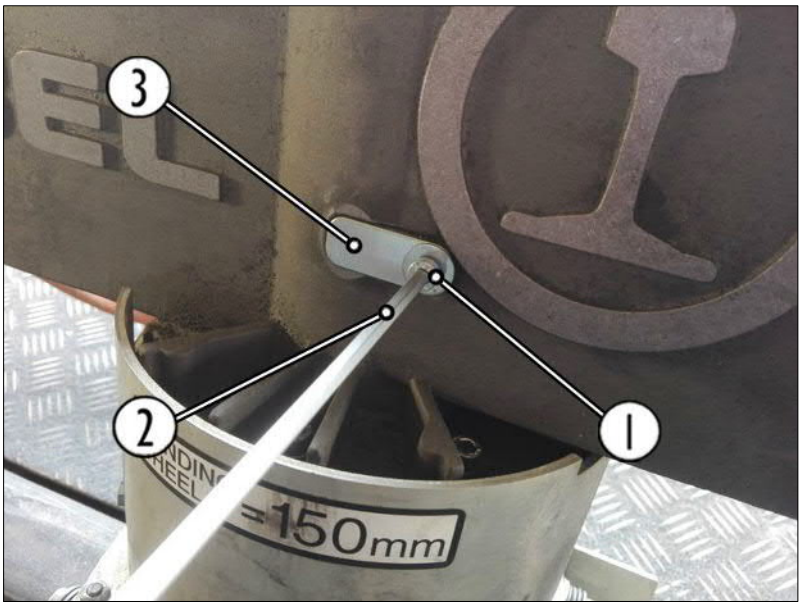

Fig. 98: Remove Hexagon screw

1 Allen screw
2 Allen key
3 Rotation lock

3. Remove Allen screw.
4. Carefully remove rotation lock.

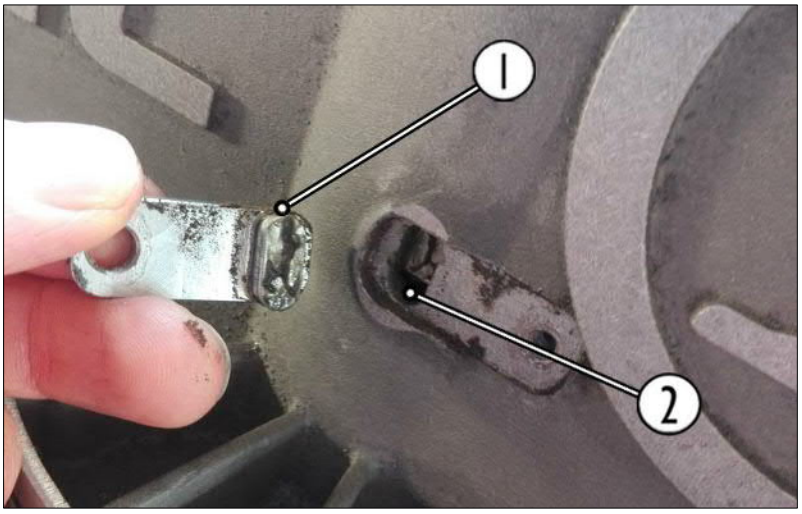

Fig. 99: Remove rotation lock

1 O-ring
2 Lubrication hole

5. Use a spray can (high performance, temperature resistant lubricant, e. g. CRC MULTILUBE PRO high performance adhesive lubricant 32697-AA). At a 45° angle, spray for approx. 1 second down to the grinding spindle.

Fig. 100: Lubricate grinding spindle

6. Slightly grease O-ring of rotation lock.
7. Mount rotation lock.
8. Clean Allen screw.
9. Using crew locking varnish "medium-tight", insert Allen screw and tighten with 6 Nm.

8.5 Cleaning and care

NOTICE

Risk of damage

The use of solvents, aggressive or combustible cleaning agents can result in damage.

The use of high-pressure washers can result in damage caused by water getting into the motor and articulated joints of the machine.

► Do not use any solvents or aggressive, combustible cleaning fluids.

► Do not use petrol for cleaning.

► Do not use a high-pressure washer or harsh water jet for cleaning.

- Clean the machine regularly so that it does not suffer a production outage due to dirt.
- Only use a damp cloth to clean the machine. Only use water and, if necessary, a mild detergent without any chemical additives.

9. Troubleshooting

Error	Reason	Remedy
Motor does not start	No power supply	► Insert plug, check fuses etc.
		► Start Hybrid Drive Unit
	Emergency stop button depressed	► Disengage emergency stop button
Motor gets hot	Motor is covered or very dirty	► Do not cover motor ► Clean motor if necessary
Dead man's brake is not working	Bowden cables not smooth-running	► Oil Bowden cables and ensure smooth action
	Brake pads worn, brittle or hardened	► Replace (rubber) brake pads
Depth infeed is not working, rattling noise	Indeed drive blocked in end-position	► Unblock, see chap. 9.3
No or poor grinding	Worn abrasive	► Change abrasive, see chap. 8.2
Infeed drive has lost its reference	Heavy infeed while grinding the sides of the rails, regardless if the abrasive is turning or not	► Use a smaller amount of infeed at a time ► Do not actuate the infeed button if the abrasive is not turning
	Leaning on the machine/pushing on the machine while actuating the infeed button.	► Do not put additional force on the machine (e.g. leaning on the machine) while actuating the infeed button

9.1 Warning and error messages of PLC control

Warning or error message	Reason	Remedy
Display of SPS remains dark		► See chap. 9.2
Maintenance necessary	maintenance is due	► Perform maintenance
	Maintenance interval has not been reset.	► Reset maintenance interval
Grindingstone change position	Abrasive is fully retracted	► Move the abrasive down
Rotating grinding stone	Actual rpm of spindle is less than 80% of nominal value	► Reduce load on spindle
Rotation Honda low	Actual rpm of Hybrid Drive Unit is too low.	► Apply full throttle on Hybrid Drive Unit
Volt < 50.0V	Voltage of super capacitors is lower than 50.0V	► Reduce load on spindle
Volt < 42.0V and warning sign in display	Voltage of super capacitors is lower than 42.0V	► Reduce load on spindle immediately
Volt < 38.0V, (engine will be switched off)	Voltage of super capacitors is lower than 38,0V	► Switch on motor again, reduce load on spindle
Volt >59.0V	Voltage of super capacitors is higher than 59.0V	► Switch off motor of Hybrid Drive Unit 70.02 immediately, charge controller defective, contact ROBEL service.

Warning or error message	Reason	Remedy
E-Motor Temp > 100 Celsius	Load on grinding spindle is too big, motor gets hot	► Reduce load on spindle, allow motor to cool down
E-Motor Temp > 120 Celsius	Load on grinding spindle is too big, motor is too hot, motor is switched off by PLC-control	► Allow the motor to cool down, continue work with reduced load
Revolution < 2500	Actual rpm of Hybrid Drive Unit is lower than 2,500 rpm	► Apply full throttle on Hybrid Drive Unit
Temperature sensor error	Defective cable or defective temperature sensor	► Change cable or sensor

9.2 Display remains dark

If the display remains dark, perform the following steps in order to locate the error.

1. Check if the LED below the display is illuminated (red or green). Depending on the result, continue with chap. 9.2.1 or chap. 9.2.2.

9.2.1 LED illuminated

If the LED is illuminated, the PLC is supplied with voltage.

1. Open housing of PLC.
2. Check ribbon cable of display for cable break.
3. Check if ribbon cable is properly connected.

   If the display remains dark, it is very likely that either the display or the PLC main board is defective.
4. Change defective parts or contact ROBEL after-sales service.

9.2.2 LED is not illuminated

If the LED is not illuminated, the PLC is not supplied with voltage.

1. Open housing of PLC.
2. Check if the wiring has been disconnected (e. g. supply voltage).
3. Check for cable break:

- Cable from the machine connector to the PLC
- If no error is found, check Hybrid Drive Unit, see separate manual of 70.02 Hybrid Drive Unit.

9.3 Unblock infeed drive

If the drive of the infeed is not responding to the actuating buttons or when a loud rattle can be heard, the drive is blocked. This might be the case if - e.g. during maintenance work on the infeed drive – the chain tension has been adjusted on the tight side.

WARNING

Crushing hazard on sprockets!

If the drive starts unintentionally, fingers can be crushed.

- ► Stop engine of Hybrid Drive Unit and disconnect power supply before carrying out work on the infeed drive.
- ► Disconnect battery or converter and secure against being switched on again.

9.3.1 Remove cover

1. Loosen 4 screws on the cover plate of the depth infeed and unscrew.

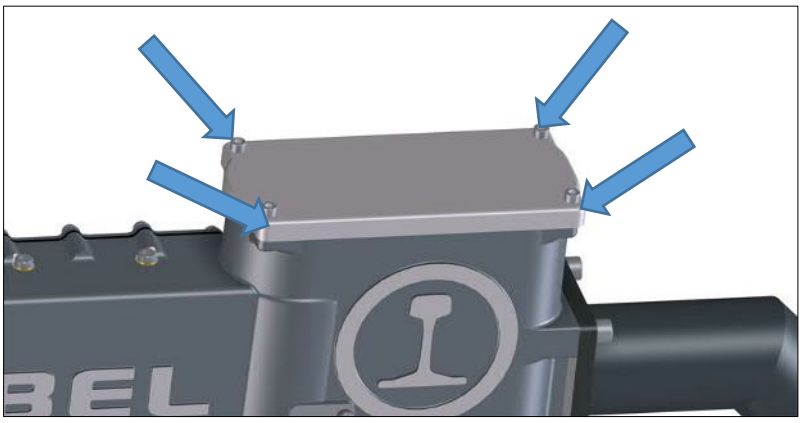

Fig. 101: Unscrew screws

2. Pry off the cover and set aside

9.3.2 Check chain tension

1. Press sideways against the chain (see arrow)

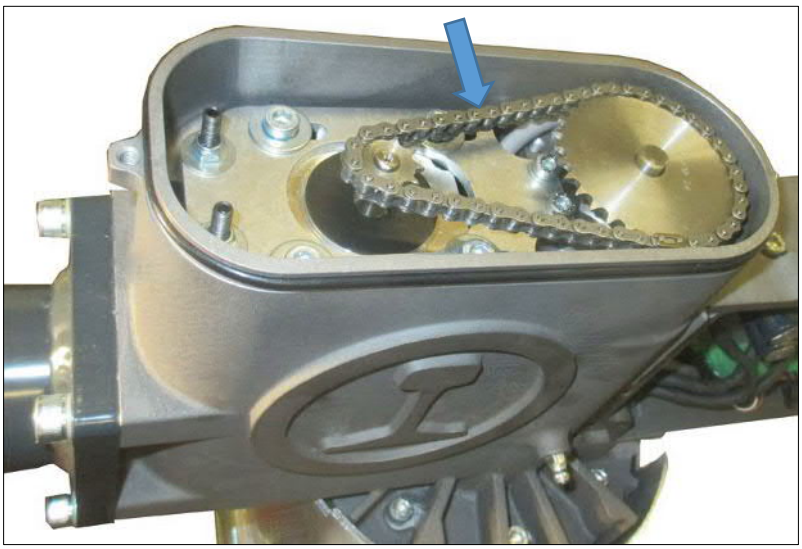

Fig. 102: Check chain tension

The chain tension is correct if it is possible to shift the chain about 1 mm.

2. If the chain is too tight, adjust chain tension.

9.3.3 Adjust chain tension

1. Loosen the four screws (1) of the stepper motor.

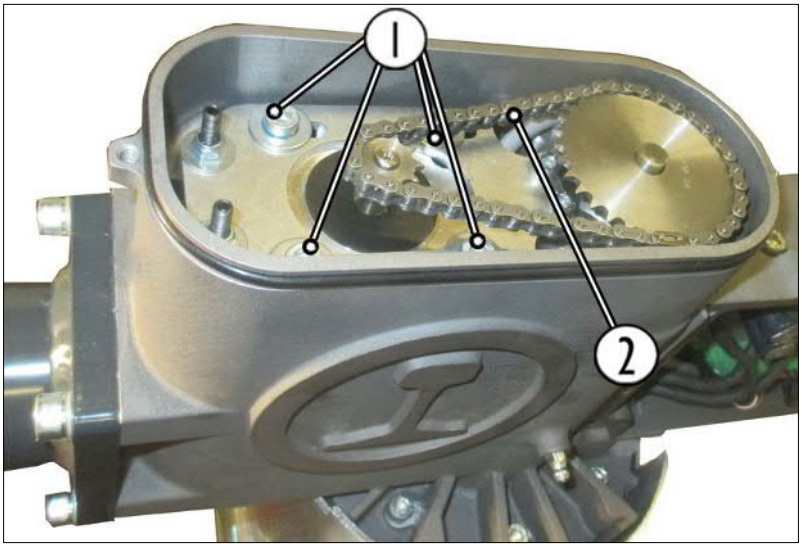

Fig. 103: Adjust chain tension

1 Attachment screws stepper motor
2 Chain

2. Adjust chain tension.
3. Fasten screws (1).
4. Check chain tension, repeat chain adjustment procedure if necessary.

5. Ensure that the drive is not blocked, unblock if necessary.
6. Clean cover plate and O-ring groove, insert a new O-ring.
7. Replace cover and tighten screws.
8. Perform a reference run on the depth infeed.
9. Put the machine into service again.

9.3.4 Perform a reference run on the depth infeed

1. Perform reference procedure (homing procedure) as described in chap. 6.6.1.

   The machine is ready for work again.

10. Environmental protection and disposal

10.1 Environmental protection

- While working on or with the product, comply with the legal regulations for waste prevention and proper recycling/ disposal and also follow the environmental laws applicable in the user country.
- Particularly, make sure that during the repair and maintenance work, water polluting substances such as greases and oils do not pollute the ground or get into the drains.

10.2 Disposal

The disposal of the product (including machine parts, engine oil and fuel) will depend upon the local regulations for waste disposal.

If the product reaches the end of its life cycle, ensure a safe and proper disposal, particularly of parts or substances which are harmful for the environment. These include, among others, fuel, lubricants, and plastics.

- Since there is a risk of potential environmental pollution, have the product disposed of by an approved specialist firm.
- In any case, check which materials can be used for recycling. Have these disposed of by appropriate waste management companies.

11. Appendix

EC Declaration of Conformity

ROBEL Bahnbaumaschinen GmbH

EG-Konformitätserklärung (deutsche Originalfassung)
EC Declaration of Conformity (English translation)
Déclaration „CE" de Conformité (Traduction francaise)

gemäß Maschinen-Richtlinie 2006/42/EG, Anhang II A
as defined by the Machinery Directive 2006/42/EC Annex II A
conformément à la directive „CE" relative aux machines 2006/42/CE, Annexe II A

Hersteller (Name und Anschrift): Manufacturer (name and address): Fabricant (nom et adresse):	ROBEL Bahnbaumaschinen GmbH Industriestraße 31 D-83395 Freilassing
Hiermit erklären wir, dass die Herewith we declare that the model Par la présente, nous déclarons, que le modèle fourni par	Hybrid Schienenkopf-Konturschleifmaschine Hybrid Rail Head Profile Grinding Machine Meuleuse de profil de rails hybride Typ 13.49 HSK
folgenden einschlägigen Bestimmungen entspricht: complies with the following provisions applying to it: correspond aux dispositions pertinentes suivantes:	2006/42/EG
Angewandte harmonisierte Normen: Applied harmonized standards: Normes harmonisées appliquées:	DIN EN ISO 12100: 2011 DIN EN 13977 : 2011
Bevollmächtigt für die techn. Dokumentation: Responsible person for technical documentation: Personne chargee pour la documentation technique:	Mag. Bernhard Lair Abt. Technische Dokumentation Industriestraße 31, D-83395 Freilassing

Freilassing, 12.05.2017

Otto Widlroither
Leiter HMG/Head of HGM/ Direct. gestion de mach.

Wolfgang R. Fally
Geschäftsführer/General Manager/ Gérant

Ort, Datum
Place, date / Lieu, date

Unterschrift, Angabe der Funktion im Unternehmen
Signature, acting in the company / Signature, en qualité de

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Ust-ID-Nr.: DE 131554634

Bankverbindung:
Hypo Vereinsbank Freilassing
IBAN: DE34 7102 0072 0009 333100
BIC: HYVEDEMM410

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Fig. 104: EC Declaration of Conformity