

Rolling Mill

RM-1



operators manual

Version 1.0 (11/2023)

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1 safety instructions



Read these instructions carefully and completely before setting up, putting into operation and using the machine. The operating instructions are part of the machine. Therefore, please keep the instructions for future use.

DANGER: For your own safety, you should not attempt to operate this machine until it is fully assembled and installed in accordance with these instructions.

DANGER: When using tools, always follow basic precautions to reduce the risk of fire, electric shock and personal injury.

1.1 Use personal protective equipment (PPE)



When operating machinery, foreign objects can get into your eyes, which can cause serious eye damage. Safety goggles or other appropriate eye or face protection must be used at all times.



Non-slip safety shoes with steel toes and soles are required when operating the machine.



To protect against injuries or burns, appropriate safety gloves must be worn when using the machine. It is important to ensure that the gloves do not fit loosely and become dangerous by getting caught in moving parts of the machine!

1.2 Wear appropriate clothing

- Do not wear loose clothing, ties, or jewelry that could become caught in moving parts of the machine.
- Roll up long sleeves above the elbow.
- If you have long hair, wear a hairnet or put on a hat.

1.3 Safety stickers

- Recognize and read all warnings on the machine.

- It is important that any health and safety labels are not removed, obscured or covered. Stickers that have become unrecognizable must be replaced immediately!

1.4 Physical condition

- Using the machine under the influence of medication, alcohol or drugs is prohibited!
- If you feel tired or unfocused, stop working for your own safety.

1.5 Working method and work area

- Make sure you have enough space to operate the machine safely in any foreseeable operation.
- Untidy work areas create a risk of accidents. Keep work areas clear and tidy and remove tools from the immediate area around the machine.
- Make sure the floor surface is kept clean and free of dust and dirt that may cause a tripping or slipping hazard.
- Always work carefully and in a controlled manner.

1.6 Consider the environmental influences in the workplace

- Do not expose the machine to rain or damp conditions. The machine must not be used outdoors.
- Keep the work area well-lit and ensure artificial lighting is available if there is not enough natural light to effectively illuminate the work area. Lighting should be bright enough to avoid shadows and eye strain.
- Do not use the device in potentially explosive environments, e.g. near flammable liquids, gases or dust.

1.7 Power supply

- The electrical voltage of the machine must match the voltage of the power grid.
- The machine's connection plug must always fit into the socket. The plug must not be modified in any way. If a replacement plug is required, it should be installed by a competent person and correspond to the correct type and load capacity of the machine.
- If you are unsure about all electrical connections, always contact the machine manufacturer or a qualified electrician.
- Keep the power cord away from heat, oil and sharp edges.
- Do not open any of the machine covers when the power cord is plugged in!

1.8 Authorized persons

- Only one person is allowed to start up the machine and push workpieces into the inlet side at the same time. A second person may only assist on the outlet side to return the workpieces in continuous operating mode.
- The machine may only be used by trained people.
- Unauthorized persons and especially children must maintain a safety distance of 2 meters from the running machine.

1.9 While rolling

- Danger on the inlet side! Be aware of the danger of counter-rotating rollers that can pull in objects and body parts! During operation and whenever the machine is connected to the power supply, UNDER NO CIRCUMSTANCES should you or anyone else reach into the roll stand. There is a risk of serious injury!
- Danger on the outlet side! If heavily curved workpieces are fed in, the workpiece can bend around the rollers on the outlet side and possibly collide with structural parts of the roll stand and get stuck. This poses a risk of crushing body parts! During operation and whenever the machine is connected to the power supply, UNDER NO CIRCUMSTANCES should you or anyone else reach into the roll stand. There is a risk of serious injury!
- Danger on the outlet side! Never place any part of your body in the direct direction of the workpieces. These gain length as they are being rolled and can push people against other surrounding objects and cause serious or life-threatening injuries. It is therefore essential to observe the minimum lateral distances when setting up the roller in accordance with the chapter 5!
- Always ensure safe footing when working.
- Never manipulate the workpiece directly, but only using suitable tongs or handles.
- The tables help keep the workpiece straight and prevent the workpieces from bending significantly. They also provide an additional barrier against body parts reaching the roll gap and thereby contribute to safety. When working with the standard cylindrical rollers, the tables must therefore always be mounted. This may not be possible with profile, texture and caliber rollers. Be aware of the additional risk described above when using the machine without tables and apply the safety rules mentioned!
- Please note that workpieces are still hot even if they are no longer glowing! Danger of burns!
- Only roll ductile metals that can absorb the forming energy without breaking. For more details see chapter 3 "Intended Use".
- Blocking, bypassing or otherwise modifying the safety pedal switch is expressly prohibited!
- Adjusting the slip clutch, which protects the machine from overload, is only permitted in the event of false activation and after consulting the machine manufacturer. Adjusting the clutch to higher torques not only leads to premature wear of the machine but can also result in injury due to machine breakage!

1.10 Residual risks

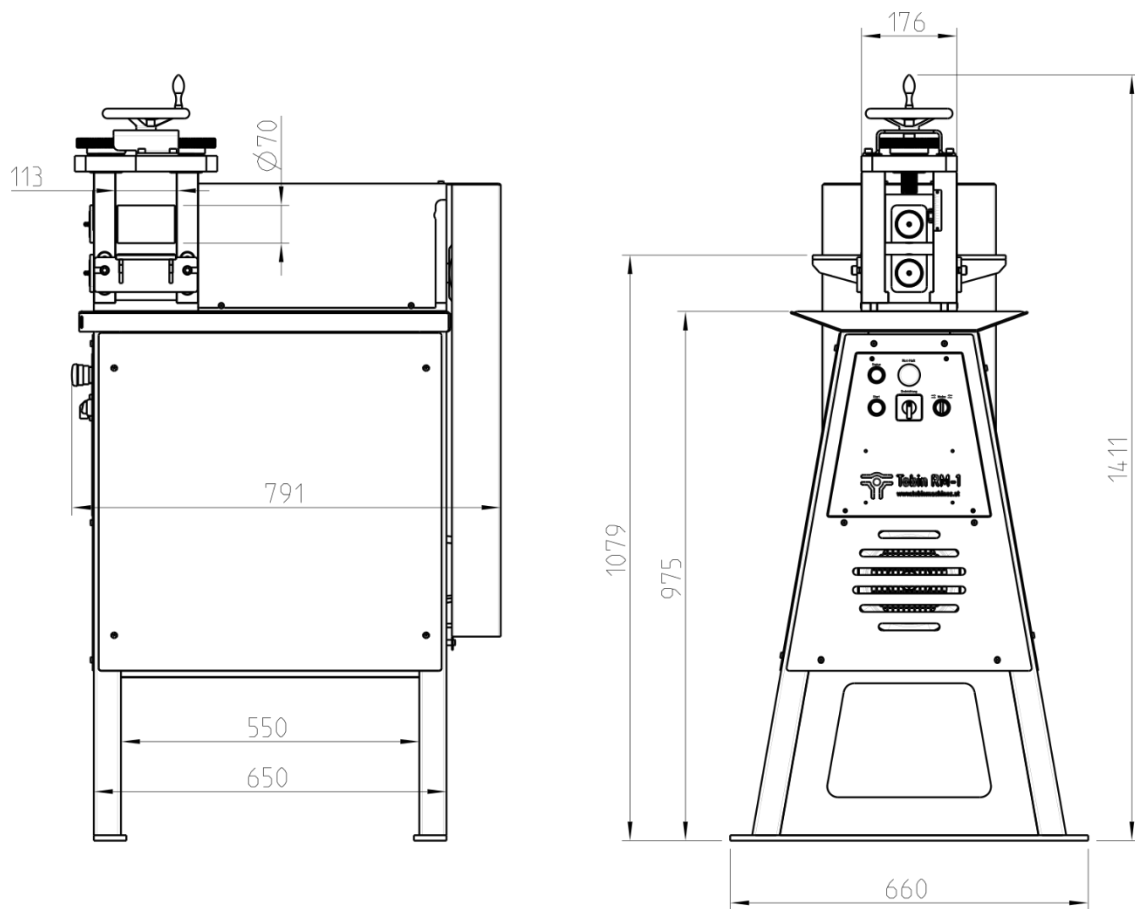
Every machine has residual risks that must be taken into account for safe operation.

- Risk of injury due to hair, jewelry, clothing or body parts becoming trapped between the rollers or other structural components of the roll stand.
- Please note that rollers, structural parts and the tables can also become hot during prolonged work! Danger of burns!
- Danger of splintering when processing unsuitable, brittle materials.
- Risk of electric shock by touching live parts on the control panel.
- Danger of injury due to dragged parts and flying sparks!
- Risk of injury due to incorrectly or inadequately mounted machine!

These risks can be minimized if all safety regulations are applied, the machine is properly maintained and maintained and is operated as intended and by appropriately trained specialist personnel.

Despite all the safety devices, common sense and appropriate technical ability/training to operate a machine remain the most important safety factors!

2 Technical data and main outlines



| | |
|---------------------------|--|
| Machine type | Rolling mill |
| Machine name | RM-1 |
| Electrical connection | 3x 400 V, 50 Hz, 2.5 A |
| Motor | Three-phase asynchronous motor with brake, 3 kW, 1450 rpm |
| Drivetrain | Two-stage spur gear, chain drive, friction clutch |
| Design limits | Maximum rolling torque: 900 Nm Maximum rolling force: 100 kN with symmetrical load |
| Control | Contactors control with safety circuit, safety pedal switch with emergency stop function |
| Operating modes | Continuous operation, reversing operation |
| Rolling speed | 6.5 m/min |
| Diameter of rollers | Standard rollers for flat rolling: 70 mm, special rollers up to 90 mm |
| Sound pressure level | < 70 dB(A) |
| Dimensions L x W x H (mm) | 800x660x1410 |
| Machine mass | 260kg |

3 Description of the machine, intended use

The RM-1 rolling mill is a compact and powerful forming machine for massive forming and in particular stretching of workpieces made of ductile metals that have a yield stress of less than 250 MPa when processed. Depending on the material category, mostly only hot forming is permitted, as the following table shows:

| Material category | Processing temperature (guide value) |
|--------------------------|---|
| Mild steel | 450 – 1250°C |
| Austenitic steels | 650 – 1100°C |
| Tool steels | 750 – 1150 °C, avoid hardening |
| Copper materials | 20 – 950°C |
| Noble metals | 20°C |

Please note the work hardening of materials when processed under the respective recrystallization temperature. Processing materials at higher yield stresses can lead to increased wear or damage to rollers, bearings, and structural components due to an increase in rolling force beyond the design limit of the machine! If in doubt, contact the machine manufacturer before you want to process material categories with expected high flow stresses. Pay attention to the data sheets of the materials you are processing!

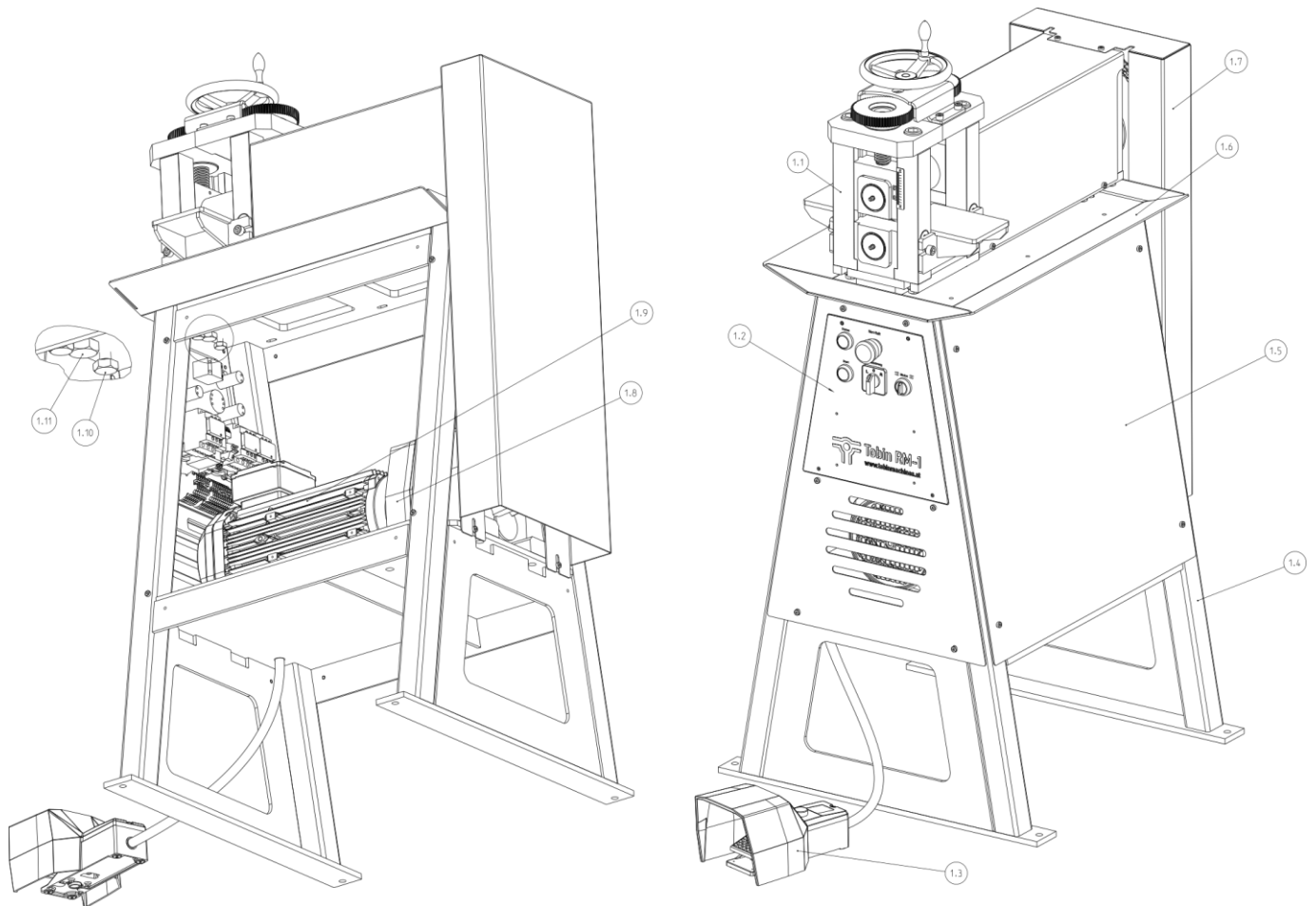
The RM-1 rolling mill was developed with the primary focus on blacksmiths who want to forge weld, stretch, texture, profile and emboss steel materials. To expand the possibilities, the RM-1 was designed so that the rollers can be easily interchanged.

The machine is started using a safety pedal switch, which, when depressed, triggers an emergency stop function together with the brake motor. Another emergency stop button is located on the machine's control panel. These functions can be activated at any time in the event of imminent danger and disconnect the motor from the power supply at all poles, which means that the brake is applied. To (re)activate the machine, a confirmation button must be pressed.

4 Components of the machine

DANGER: Before commissioning, familiarize yourself with the machine parts named in this chapter! The machine parts in this document are subsequently referenced by their number.

4.1 Main assemblies



1.1 Roll stand

1.2 Switchboard

1.3 Pedal switch

1.4 Base frame

1.5 Cover of base frame

1.6 Scale collecting tray

1.7 Chain drive cover

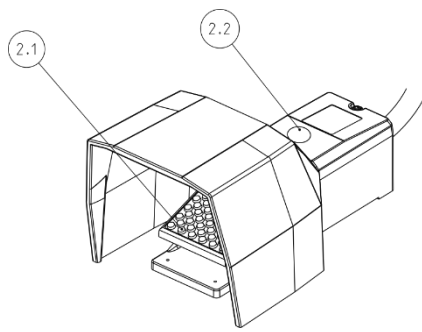
1.8 Primary gearbox

1.9 Electric motor with brake

1.10 Roll stand leveling screw (4x)

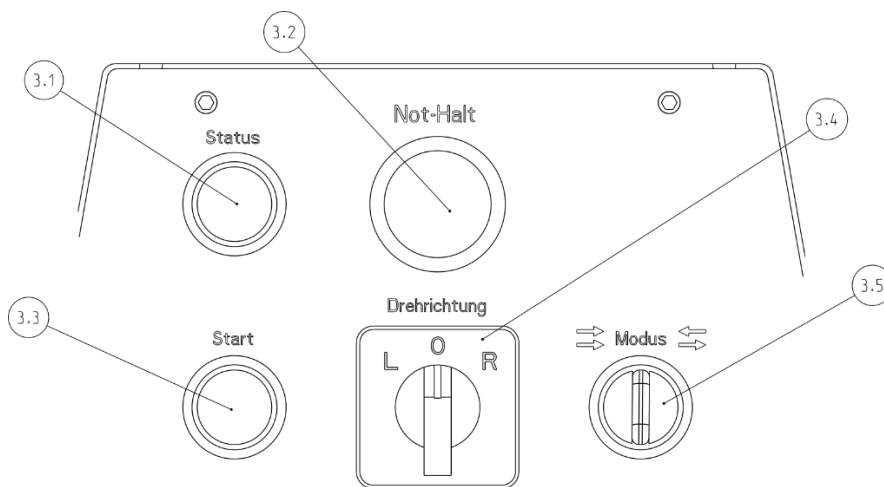
1.11 Roll stand tightening screw (2x)

4.2 Pedal switch



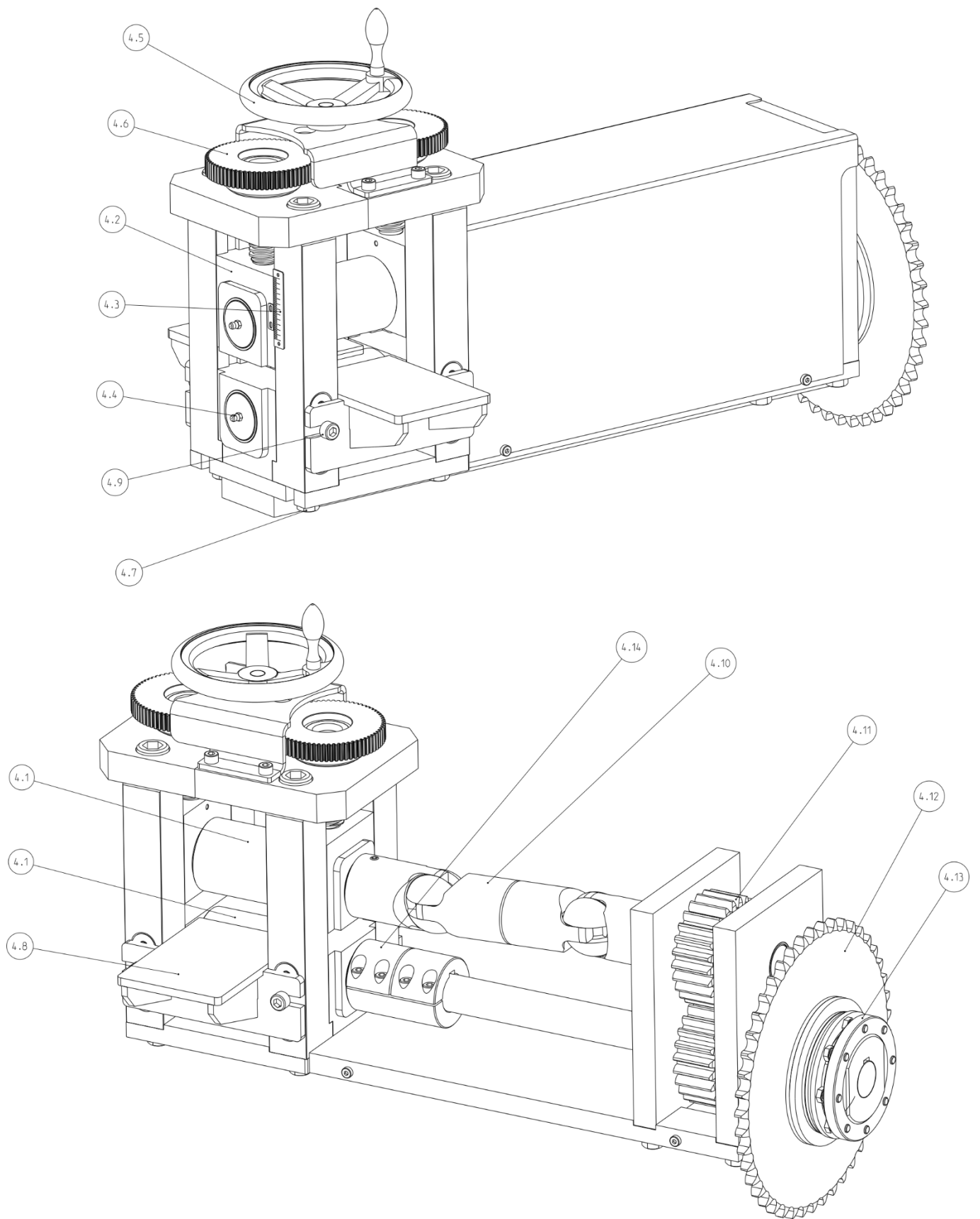
- 2.1 Pedal tongue with pressure point for emergency stop function
- 2.2 Release for pressure point

4.3 Switchboard



- 3.1 Status light
- 3.2 Emergency stop button
- 3.3 Start button
- 3.4 rotation direction selector switch
- 3.5 Operating mode selector switch

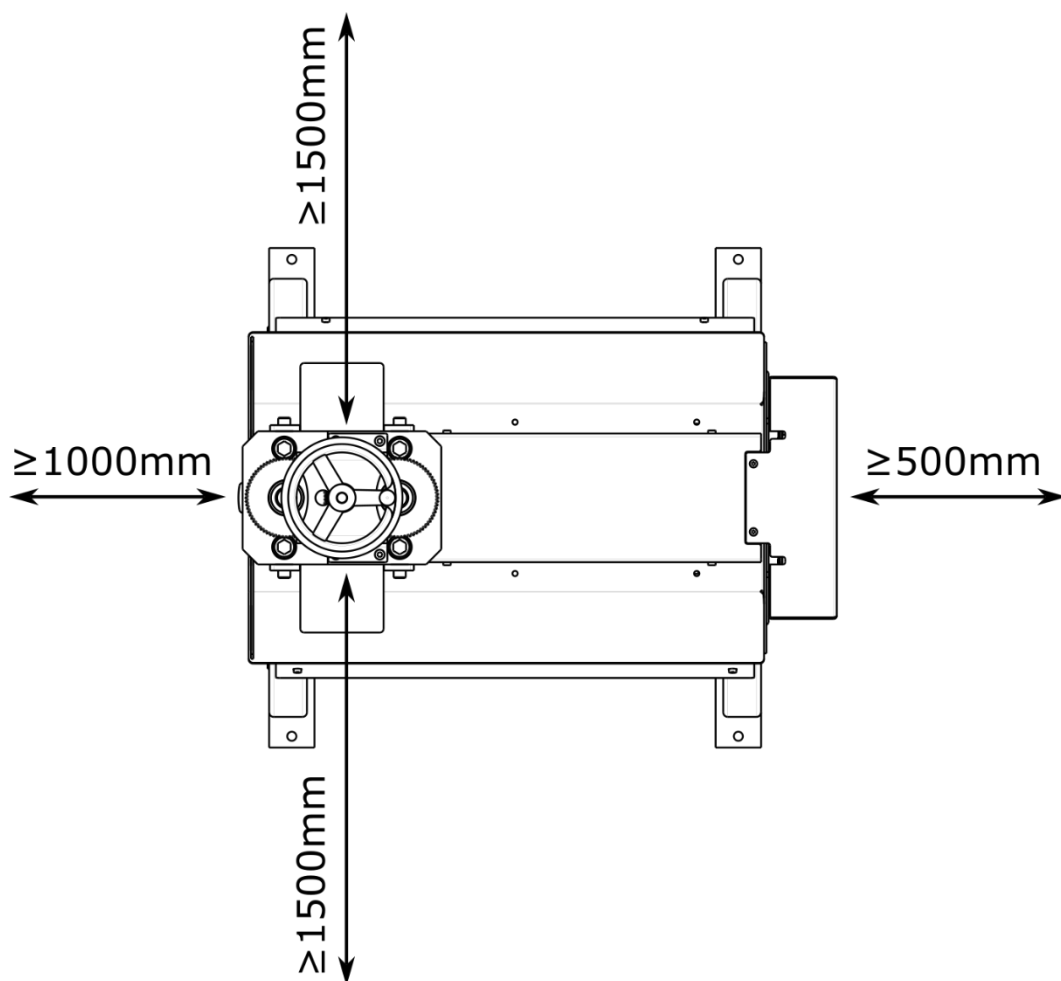
4.4 Roll stand



| | | | |
|-----|---------------------------------------|------|---|
| 4.1 | Work rollers (2x) | 4.8 | Rolling tables (2x) |
| 4.2 | Main bearing units (4x) | 4.9 | Fastening bolts for rolling tables (4x) |
| 4.3 | Roll gap ruler | 4.10 | Cardan shaft |
| 4.4 | Grease fittings for main bearing (2x) | 4.11 | Main gears |
| 4.5 | Roll gap adjustment wheel | 4.12 | Sprocket disc |
| 4.6 | Roll gap adjustment gears | 4.13 | Safety clutch |
| 4.7 | Fastener bolts outer frame half (2x) | 4.14 | Shaft coupling |

5 Installation

DANGER: Before commissioning, familiarize yourself with the machine parts named in Chapter 4!



The following points must be followed when setting up the machine:

1. The installation surface of the machine must be horizontal, level, firm and resistant to glowing objects and elevated temperatures!
2. The machine must be screwed using suitable fastening material and at all prepared fastening points on the base surface.
3. Installation outdoors is not permitted.
4. The minimum distances to surrounding objects shown in the above installation plan not only guarantee unrestricted operation, but also that workpieces of normal length can be handled

safely. Never place body parts between the outgoing workpiece and surrounding objects or parts of the building!

5. Please ensure that no flammable substances are stored in the same room within a radius of 5m around the machine. Danger of fire!

6 Commissioning and use

DANGER: Before commissioning, familiarize yourself with the machine parts named in Chapter 4!

DANGER: Commissioning and use are only permitted if the machine has been set up and installed in accordance with the points in Chapter 4. If the machine is used without the correct setup, there is a risk of injury!

DANGER! Never put the machine into operation without the covers completely closed and bolted on!

6.1 Making the machine ready

1. If necessary, connect the machine's power cord to the power supply.
2. Check that both the emergency stop button on the control panel (>3.2) and the emergency stop pressure point on the pedal switch (>2.2) are unlocked.
3. By pressing the start button (>2.3), the machine is ready. This is signaled by the status light (>2.1).

6.2 Emergency stop functions

The machine can be stopped and taken out of operation at any time if there is imminent danger. To do this, either hit the emergency stop button on the control panel (>3.2) or depress the emergency stop pressure point on the pedal switch, which is reached at 300 N of stepping force.

6.3 Starting and stopping the rolling process

1. Make sure that the roll gap is free of workpieces, tools or other foreign objects.
2. Make sure that there are no people or body parts in proximity to the roll stand.
3. Make sure that the machine is ready according to Chapter 6.1.
4. Select a direction of rotation using the selector switch (>3.4).
5. Start the motor by pressing the pedal switch.
6. The motor will stop again as soon as the pedal switch is released.

6.4 Adjustment of the roll gap

1. Stop the machine.
2. Make sure that the roll gap is free of workpieces, tools or other foreign objects.
3. Turn the adjustment wheel (>4.5) to increase or decrease the roll gap. With the standard rollers, the roll gap can be adjusted in the range 0-60 mm. One revolution of the adjustment wheel corresponds to a change of 2 mm.
4. If necessary, check the setting using the attached gap ruler (>4.3).
5. Do not try to change the gap during the rolling process!

The recommended or feasible thickness reduction (infeed) per rolling pass depends on the following parameters:

- Friction conditions between rollers and workpiece
- Geometry of the workpiece (width and thickness)
- Yield stress of the workpiece, which in turn depends on temperature and material.
- Accuracy requirement for the thickness: under high rolling force the roll stand deflects, and the roll gap slightly opens. The set target thickness is exceeded. Therefore, plan a final finishing pass with no additional infeed to the desired target thickness.

Experience has shown that infeed of up to 4 mm per pass is possible. If the set infeed exceeds the limits of the machine, this can manifest in two ways:

- If the infeed is too high or the friction conditions are poor, the rollers cannot grip the workpiece because the “grip condition” of the roll is not met. Remedy: Reduce infeed.
- If the rolling torque is too high, the rollers cannot pull the workpiece further because the activated safety clutch protects the drive train from overload. In this case, reverse the direction of rotation of the machine to remove the workpiece from the roll gap. Remedy: Reduce the infeed or increase the workpiece temperature.

6.5 Operating modes

The RM-1 rolling mill has two operating modes that can be selected using the mode selector switch (>3.5). Depending on the operating mode, working on the machine is only permitted alone or with an assistant. Operating with more than two people is always prohibited. Pay particular attention to the specific safety instructions in chapter 1.9!

- ⇒ “Continuous” operating mode: The direction of rotation of the rollers and thus the direction of the material flow through the rolling mill is constant and determined by the position of the direction selector switch (>3.4). In this operating mode, working on the rolling mill is permitted with an assistant. The main operator controls the rolling mill with the pedal switch and feeds the workpiece to the roller. The helper receives the material on the outlet side with suitable tongs or handles and returns it to the operator on the inlet side. If the direction of the rollers is reversed, the roles of the operator and helper must also be switched out.
- ⇒ “Reversing” operating mode: The direction of rotation of the rollers and thus the direction of the material flow through the rolling mill is reversed each time the pedal switch is pressed again. After selecting this operating mode, the first direction of rotation is determined by the position of the direction selector switch (>3.4). This operating mode allows the workpiece to be conveyed back to the inlet side without having to change the direction of rotation using the switch (>3.4). The operator's second hand is free and can be used, for example, to adjust the roll gap. In this operating mode, working on the roller is only permitted alone!

6.6 Switching off the machine

By pressing the emergency stop button on the control panel (>3.2), the control circuit and the power circuit of the machine are broken, and the machine is no longer ready for operation. However, for maintenance or when opening the covers, the machine must be completely disconnected from the power supply (unplug the power cable).

7 Cleaning and lubrication

The service life of the machine depends on its intended use and regular lubrication and cleaning. By observing the following points, you will ensure a long-lasting machine that delivers the required workpiece quality!

7.1 Cleaning

When hot rolling steel materials, scale falls off the workpiece and over time collects under the rollers and in the scale pan. Remove scale regularly. The side part of the scale tray can be removed and the scale can be swept out of the tray to the side.

If necessary, clean the roll stand of oily or greasy substances. Pay particular attention to keeping the surfaces of the rollers free of oil, as this negatively affects the friction conditions for pulling in the workpieces.

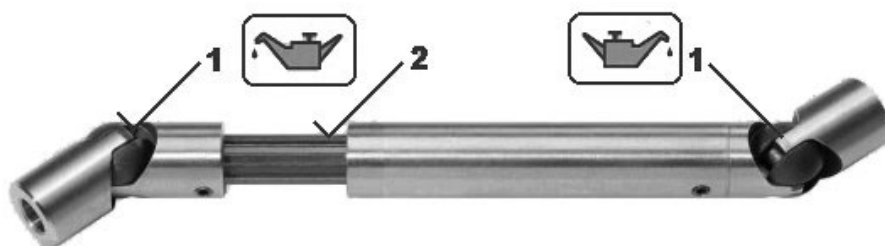
7.2 Lubricating

The rollers are supported by 4 bronze plain bearings that are fit with lubrication pockets. In order for this bearing to function properly and with little wear, it is essential to ensure that there is plenty of clean lubricant at regular intervals and to push dirty particles and mill scale out of the bearing points. To do this, use a grease gun and the grease fittings on the work rolls. Lubricate until clean grease comes out of all 4 bearing points.

- Lubricant: High temperature heavy duty grease
- Recommended products: Total Ceran XM 460; RENOLIT PU-FH 300; Völkel HEVOLIT CSM 720-12; Fox STABYL EHT 2;
- Lubrication interval: every 4 operating hours for hot rolling of steel. However, the lubrication interval depends largely on the operating conditions and the degree of mill scale contamination. However, re-lubricate after 5 days of operation at the latest.

If the bearing points are heavily soiled, remove the rollers according to chapter 8 and clean the plain bearings and shafts.

The cardan shaft (>4.10) must be lubricated on the sliding surfaces of the joint pieces once a week. To do this, remove the drive shaft cover. Mineral oil-based lubricants with viscosity class 68 are suitable.



The main gears (>4.11) are also lubricated with grease. If necessary, replace the greasing. Simple multi-purpose grease (e.g. Mobilgrease XHP 222) can be used for this, or the grease used for roller bearings.

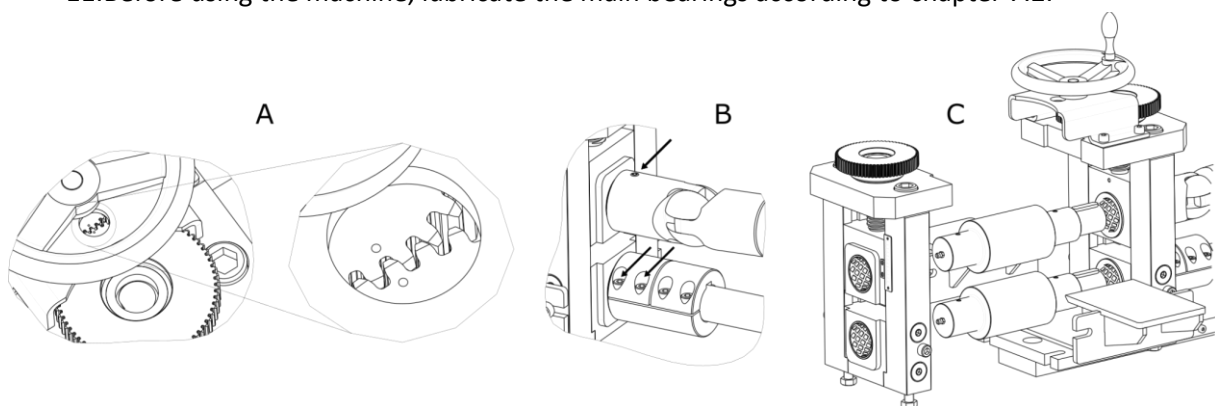
The chain drive comes with initial greasing. If necessary, replace the greasing with chain grease.

The plain bearings of the main gears are maintenance-free and do not need to be lubricated. The feed gears (>4.6) and other parts of the feed mechanism do not need to be lubricated.

8 Replacing the rollers

To expand the range of uses, the rollers of the RM-1 rolling mill are easy to interchange. To replace the rollers, proceed as follows (note the figures below)

1. Unplug the machine's connection cable.
2. Clean the roll stand.
3. Crank the roll gap adjustment to a position where the marking points of the adjustment gears (>4.6) can be seen according to figure A. Do not turn the mechanism any further as you continue to the following points.
4. Remove the drive shaft cover.
5. Loosen the screws marked in figure B.
6. Remove the side part of the tinder tray (>1.6)
7. Loosen the fastening bolts of the outer half of the frame (>4.7) and the fastening bolts of the tables (>4.9).
8. Remove the outer half of the frame and then the rollers (figure C).
9. If necessary, clean the main bearings (>4.2).
10. Insert the new rollers and follow these instructions in reverse order to assemble the roll stand. When placing the outer frame half, make sure that the feed gears are fully engaged according to the marking (figure A) and that the frame half is placed as far as it will go.
11. Before using the machine, lubricate the main bearings according to chapter 7.2.



9 Maintenance

Under certain circumstances, the following work steps may be necessary to ensure that the rolling mill functions correctly.

9.1 Checking and adjusting the chain tension

Over the course of the chain's service life, it can be stretched by the load and thus lose tension. This may manifest itself in noises and unwanted vibrations. The chain should be stretched so far that the strand between the sprockets can be deflected by 1.5-2 cm in any direction without any effort.

To change the chain tension, proceed as follows:

1. Unplug the machine's connection cable.
2. Remove the base frame cover (>1.5).
3. Remove the chain drive cover (>1.7).
4. Loosen the 2 tightening screws of the roll stand (>1.11). Make sure that the screws are not entirely removed, as the roll stand will then be completely separated from the base frame and may fall!
5. The roll stand can now be adjusted up or down by turning the 4 leveling screws (>1.10). When adjusting, make sure that all 4 screws are operated evenly so that the roll stand remains horizontal and rests on all 4 leveling screws without wobbling. Continuously check the chain tension during adjustment.
6. Check and, if necessary, replace the chain lubrication.
7. Tighten the two tightening screws again.
8. Close and bolt on the covers.

9.2 Correction of lateral bending

When rolling, especially thin workpieces, the workpiece can bend laterally during rolling. This effect is due to an unevenly large roll gap between left and right side of the roll stand and can be corrected by appropriately pairing the gap adjustment gears of the two frame halves. The roll gap is initially set parallel, and the position is marked, as can be seen in chapter 8, figure A. If (e.g. due to wear) this setting leads to a noticeable bending of the workpieces, the gears can be paired in a different position. Each advance of one tooth leads to an increase or decrease in the roll gap on the outer half of the roll stand by 0.07 mm.

Please note: This adjustment is only intended to adjust the roll gap as evenly and parallel as possible within narrow limits. The adjustment must not be used to create a deliberate misalignment in the roll gap (e.g. for tapering workpieces), as the bearings of the rolls are not designed for this!

9.3 Adjusting the safety clutch

If the drive train is overloaded, the safety clutch separates the power flow and thus protects the machine components. The clutch may only be modified in consultation with the manufacturer.

Due to wear or the entry of oily media into the friction linings of the clutch, the triggering torque of the friction clutch can fall below the factory-set value of 950 Nm, which leads to the clutch being triggered even under moderate operating conditions.

For instructions on adjusting the clutch, contact the machine manufacturer.

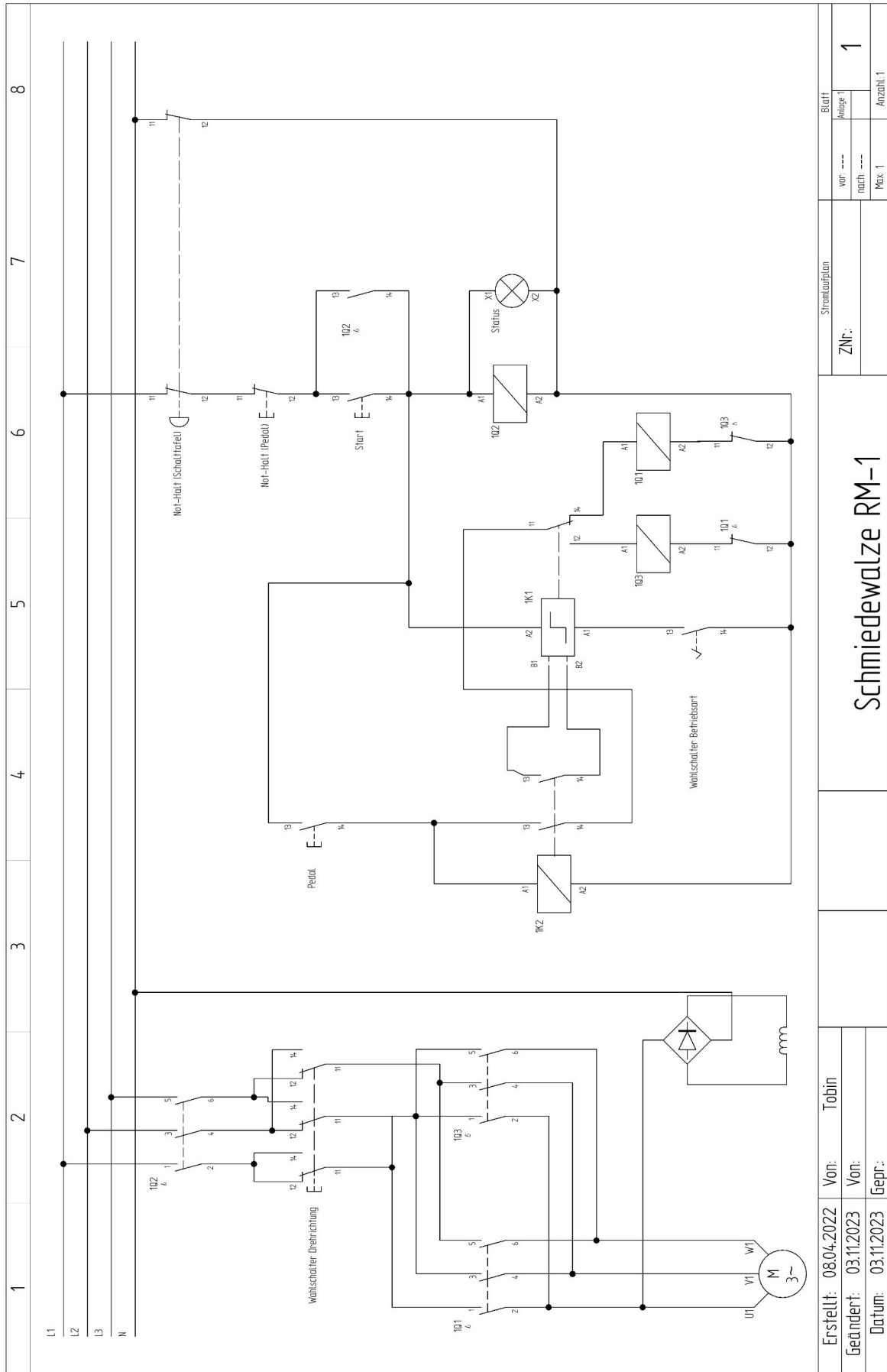
10 Troubleshooting

In the event of malfunctions that could pose an immediate danger to people, property or operational safety, stop the machine immediately using the main switch (=emergency stop) and disconnect it from the mains. Only then try to analyze the problem and, if necessary, contact the machine manufacturer. Do not use the machine again until the malfunction has been resolved.

If errors other than those described here occur, please contact the manufacturer! In the event of electrical faults, only open the covers once the machine has been disconnected from the mains using the power plug! Maintenance or repairs to electrical components must only be carried out by qualified specialist personnel!

| Disturbance | Reason | Solution |
|---|--|--|
| Machine stalls when feeding in the workpiece | Safety clutch slips - machine performance limit exceeded | Higher workpiece temperature, smaller infeed. If necessary, adjust the safety clutch, see chapter 9.3. |
| | Motor does not deliver torque | Check electrical connection and all phase voltages |
| The machine does not start when the pedal switch is pressed, but you can hear a contactor switching. | Brake doesn't release | Check the electrical connection and all phase voltages, check the electrical connection of the brake. |
| | Selector switch for direction of rotation is set to "0" | Select direction of rotation. |
| The machine does not start when the pedal switch is pressed, and no contactor switching can be heard. | Machine not ready for operation | Prepare for operation, see chapter 6.1. |
| | Control board defective | Contact the manufacturer. |
| Vibrations | Chain tension too high or too low | Check chain tension and adjust if necessary, see chapter 9.1. |
| warming | ...of the outer surfaces of the rollers | Permissible maximum temperature: 260°C. If necessary, pause operation. |
| | ...of the bearing shafts on the rollers | Permissible maximum temperature: 160°C. If necessary, pause operation. |
| | ...of the structural components of the roll stand and the rolling tables | Permissible maximum temperature: 80°C. If necessary, pause operation. |
| Running noises or squeaks | Lubrication inadequate | Lubricate the machine, see chapter 7.2. |
| Sickle when rolling workpieces | Roll gap is not parallel | Correct the adjustment, see chapter 9.2. |
| Rolled thickness does not correspond to that shown by the ruler | Ruler mis-adjusted | Readjust ruler |
| | Roll stand deflects due to high rolling force | Do a final rolling pass without high infeed for a true-to-size result. |

11 circuit diagram



Erstellt: 08.04.2022 Von: Tobin
 Geändert: 03.11.2023 Von:
 Datum: 03.11.2023 Gepr.:

Schmiedewalze RM-1

Stromlaufplan

ZNr.:

| | |
|-----------|-----------|
| Blatt | 1 |
| Anlage 1 | |
| Vor: --- | |
| nach: --- | |
| Max. 1 | Anzahl: 1 |

12 EC declaration of conformity

Oliver Tobin

Wallnerstraße 8

3004 Ollern

Austria

hereby declares that the machine

Rolling mill type RM-1

complies with the following European directives:

MACHINERY DIRECTIVE: 2006/42/EC

LOW VOLTAGE DIRECTIVE: 2014/35/EU

ELECTROMAGNETIC COMPATIBILITY DIRECTIVE: 2014/30/EU

Ollern, November 8th, 2023



Oliver Tobin