

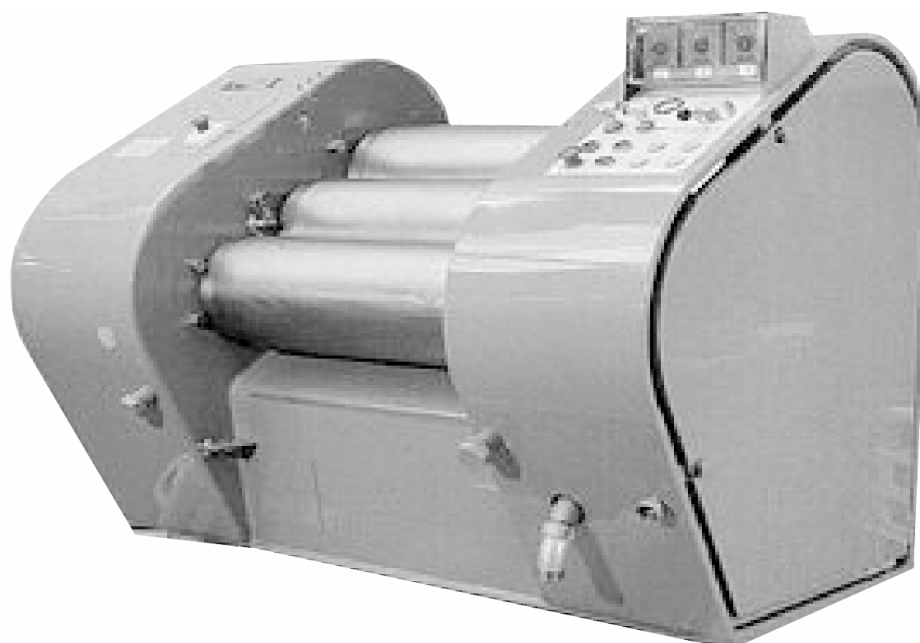
Bühler AG
CH-9240 Uzwil/Switzerland
Phone +41 71 955 11 11
Fax +41 71 955 33 79
www.buhlergroup.com

Operating Instructions

Three-roll Mill

SDW 800/1000

SDW 800/1000-Ex



Introduction

These operating instructions (translation) include basic information on the design, the installation, start-up, operation and maintenance of the machine.

The following separate documentation is integral part of the operating instructions:

- Spare Parts Catalogue, see 80394

For comprehension of these operating instructions

Important notes are distinguished as follows:



DANGER!

Hazards which can result in physical injuries or in death.



CAUTION!

Hazards which can result in operation failures or machine damage.



Note:

Important information or instructions.



- Procedural instructions are marked by point of eyecatcher.
-  If the machine is certified on the Nameplate with the appropriate ATEX designation for operation in the explosion-dangerous area, the information and instructions marked by  are condition for the perpetuation of the ignition protection. Therefore they must be absolutely kept.

Table of contents

1	Safety	9
1.1	General	9
1.2	In the explosion-dangerous area	10
	During maintenance works.....	10
2	Description	11
2.1	Identification.....	11
2.1.1	Nameplate.....	11
2.1.2	Type code.....	11
2.2	Use in accordance with intended purpose.....	12
2.3	Design and function	13
2.3.1	Three-roll Mill	13
2.3.2	Roll positions.....	14
2.3.3	Cambered chilled-iron rolls	16
2.3.4	Hydraulic system.....	17
	Pump unit.....	18
	Hydraulics (standard).....	18
	Options.....	19
2.3.5	Roll drive	20
2.3.6	Roll cooling.....	21
	Open flow-through cooling	21
	Open flow-through cooling with cooling water tank	23
2.3.7	Hydraulic oil cooling	25
2.3.8	Product trough.....	26
	Hopper plates.....	26
2.3.9	Scraper.....	27
2.3.10	Safety bar.....	28
2.3.11	Level monitoring (option).....	29
	Design without certification for explosion-dangerous areas	29
	Models certified for the explosion-dangerous area	29
2.3.12	Filling hydraulic system (option).....	30
2.3.13	Roll nip setting (option)	30
2.3.14	Bucket tilting device (option)	31
	Loading capacity	32
2.3.15	Protective cover (option)	32
2.4	Technical data.....	33
2.4.1	Weight	33
2.4.2	Dimensions.....	33
	Machine.....	33
	Control cabinet.....	33
2.4.3	Power rating	33
	Ratings	33
	Motor power	34
2.4.4	Roll cooling.....	34
2.4.5	Hydraulic system.....	34
2.4.6	Noise data	34

2.5	Operating materials	35
2.5.1	Cooling water	35
2.5.2	Hydraulic oil	35
2.5.3	Gear oil	35
2.5.4	For maintenance work	35
2.6	Specific line pressure	36
2.7	Dimension drawings	37
3	Transport.....	38
3.1	General.....	38
3.2	Storage.....	38
3.3	Suspension on the crane	39
4	Installation.....	40
4.1	General.....	40
4.2	Local conditions.....	40
	Ambient conditions	40
4.3	Erection	40
4.3.1	Installation procedure	41
4.4	Electrical installation.....	42
4.4.1	Connecting to the power supply	42
	Connecting the control cabinet.....	42
4.4.2	Earthing	43
4.5	Installation of supply lines	43
4.5.1	Product lines.....	43
4.5.2	Cooling water lines	43
5	Start-up.....	44
5.1	General.....	44
5.2	Pre-operational inspections.....	45
5.3	Settings	46
5.3.1	Roll cooling setting	46
5.3.2	Filling in hydraulic oil and adjusting operating pressure.....	47
5.3.3	Aligning the rolls	48
5.3.4	Setting counter-pressure, hopper plate and scraper knife contact pressure ..	50
5.3.5	Inserting and fixing the scraper and setting it.....	51
5.3.6	Level monitoring (option).....	53
	Without certification for the explosion-dangerous area	53
	Certified for the explosion-dangerous area	54
5.3.7	Calibrating the position indicator (option).....	57
5.3.8	Filling hydraulic system (option).....	58
5.3.9	Tightening the V-belts	59
5.3.10	Bucket tilting device (Option).....	59
5.3.11	Adjusting of minimum roll nip (option)	60
5.4	Inspection of functions.....	61
5.4.1	Inspection of machine functions	62
	Direction of rotation of the hydraulic pump motor	62
	Direction of rotation of the rolls.....	62

5.4.2	Checking the safety functions	62
	Emergency stop	62
	Safety bar	63
5.5	Checking EU conformity	64
	Check list for establishing EU conformity.....	64
6	Operation	66
6.1	General	66
6.2	Control panel.....	68
	Functions.....	69
6.3	Operation	70
6.3.1	Prepare the start	70
6.3.2	Starting the machine	70
6.3.3	Machine turning off.....	71
6.3.4	Emergency stop	71
	Emergency stop button	71
	Restart after emergency stop.....	71
6.4	Roll nip setting (option)	72
6.5	Instructions for operation	73
6.5.1	“Sifting”	73
6.5.2	Process parameters.....	74
	Influence of roll contact pressure and roll temperature.....	74
6.6	Cleaning	75
6.6.1	Cleaning the machine	75
6.6.2	Cleaning of the rolls	75
	Cleaning the first roll	77
	Cleaning the second and third roll	78
6.7	Faults and troubleshooting.....	79
7	Maintenance	81
7.1	General	81
7.2	Maintenance and lubrication chart.....	83
7.3	Maintenance work.....	86
7.3.1	Hopper plate maintenance	86
7.3.2	Cleaning water filter	86
7.4	Spare and wear parts.....	87
7.5	Disposal	87
8	After-sales service	88
	Address for the after-sales service and the spare parts sale.....	88

1 Safety

1.1 General









The machine is fitted with protection and safety devices in compliance with the recognized safety engineering principles. Improper use of the machine may entail dangers to the health and life of persons, or may cause damage to property.

These operating instructions must be kept close to the machine and be visible anytime.








The machine must only be operated in compliance with all instructions and prescriptions of these operating instructions.

- **Pay special attention to the following danger areas:**
 - Danger of getting caught in nip:
Never reach into the nip or insert any object (such as spatula).
Do not wear thick protective gloves, which impede the capacity of tactile sensation of your fingers.
Do not wear long, wide sleeves. The sleeves may get caught between the rolls.
 - If the machine is equipped with a protective cover (option), it must be operated only with installed protective cover.
 - For cleaning the rolls, insert the safety bar and fasten it, see *sect. 2.3.10*.
 - When cleaning, replacing the scraper knife or unfolding the apron, always put on the scraper knife disassembly device, see *sect. 5.3.5, Fig. 5.10*.
 - When working in any of the machine's danger areas, turn the all-pole disconnecting lockable safety switch to "0" and secure against turning on.
 - When working on the electrical controller or on electrical components, set the main switch on the control cabinet to "0" and lock it (key with personnel).
- In case of a danger of explosion, follow all the decisive safety instructions. See *sect. 2.2 "Use in accordance with intended purpose"*.
- Keep clean and do not remove or cover any warning and instruction signs. Replace any damaged warning and instruction signs with new ones.
- Do not remove or cover any designation numbers on electric wires.
- Only lift the machine at the indicated suspension points, see *chap. 3*. Do not walk or wait under suspended loads.
- Only start-up and operate the machine when the protection devices are intact and the safety equipment is operational, see *sect. 5.1 and sect. 5.5*.
- Maintenance and cleaning work must be carried out only when the machine is out of operation (no motion of the machine), see *chap. 7*. Turn the all-pole disconnecting lockable safety switch to "0" and secure against turning on.
- Before operation of the machine make sure about function and operation of the emergency stop switch, see *sect. 6.3.4 "Emergency stop"*.
- Upon actuation of the emergency stop button, the main motor gets switched off immediately.
The hydraulic pump remains in operation and must be switched off with the push button "Hydraulic pump OFF".
- Always wear protective glasses during operation and maintenance of the machine.

1.2 In the explosion-dangerous area

- In the explosion-dangerous area the machine must only be operated according to its permission. The certification can be seen from the ATEX designation on the Nameplate, see *sect. 2.1 "Identification"*.
 - The information and instructions marked with  in these operating instructions are indispensable for maintaining the ignition protection and thus the certification for the indicated area. Therefore they must be observed without fail.
-  During operation, the machine must be monitored in a way that the operating personnel can react to operating failures.
-  Immediately stop the machine in the event of unusual running noise.
-  The installation and the product container must be in compliance with the ATEX 95 directive.
-  Only operate the roll mill with the approved products, see *sect. 2.2 "Use in accordance with intended purpose"*.
-  Only operate the roll mill with product.
-  When running the machine empty, observe the product inflow closely. If there are foreign objects present, immediately switch off the machine.
-  Only use cleaning agents up to temperature class T3 in conformity with the permission of the machine for the explosion-dangerous area, see *sect. 2.1 "Identification"*.

During maintenance works

- Only personnel who are authorised by the operator in accordance with their safety instructions, must carry out maintenance work.
-  In the explosion-dangerous area, correct maintenance is the prerequisite for maintaining the ignition protection.
-  Only use cleaning agents up to temperature class T3 in conformity with the permission of the machine for the explosion-dangerous area, see *sect. 2.1 "Identification"*.
-  During all maintenance and cleaning work, avoid the build-up of ignitable solvent fumes.
-  Do not stir up dust. Avoid dust settling.
-  In the proximity of combustible materials, do not carry out any welding or emery works.
-  To maintain the ignition protection only use original spare parts, see *separate spare parts catalogue (80394)*.
-  Ensure that the machine is correctly earthed again after maintenance works. (The equipotential bonding must not be broken through the removal of earth conductors, through painting on contact surfaces or pipe joints), see *sect. 4.4.2 "Earthing"*.)

2 Description

2.1 Identification

2.1.1 Nameplate



Note:

The nameplate must not be removed or covered.

The information marked “*” is embossed specifically in the machine’s nameplate:



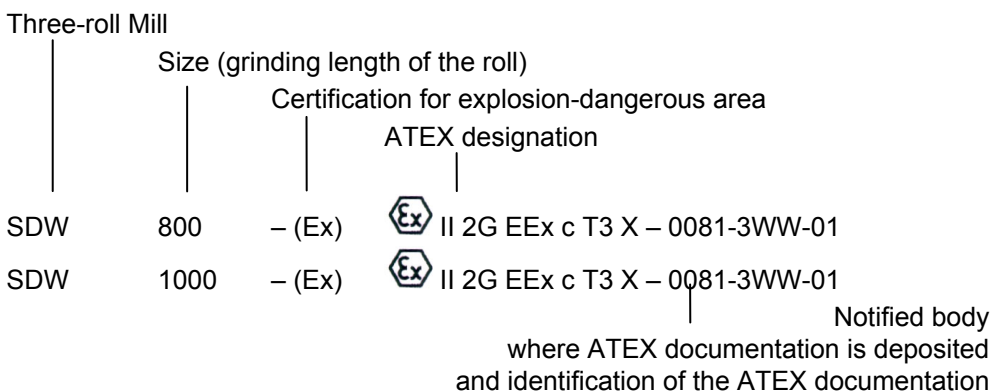
Fig. 2.1: Nameplate on the machine without permission for explosion-dangerous areas



ATEX designation

Fig. 2.2: Nameplate on the machine with permission for the explosion-dangerous area

2.1.2 Type code



The “X” behind the ATEX designation indicates that the denoted ignition enclosure is only ensured under specific conditions. Specifications and restrictions to this are marked in these operating instructions by . Therefore they must be absolutely kept for safe operation in the permitted explosion-dangerous area.

2.2 Use in accordance with intended purpose

The machine is intended only for dispersion, homogenisation and disagglomeration of suspensions in a condition ranging from liquid to highly viscous such as

- offset printing inks,
- paints,
- pigment dispersions,
- coloured pencil cores,
- artists' colours,
- coating substances (PVC pastes).
- chocolate and confectionary masses.



In the explosion-dangerous area the machine must in accordance with ATEX 95 only be operated with adequate permission.

The certification can be seen from the ATEX designation on the Nameplate, see sect. 2.1 "Identification".



In the explosion-dangerous area the machine must only be used to process combustible products up to temperature class T3, see sect. 2.1 "Identification".



The control cabinet must not be located in the explosion-dangerous area.

2.3 Design and function

2.3.1 Three-roll Mill

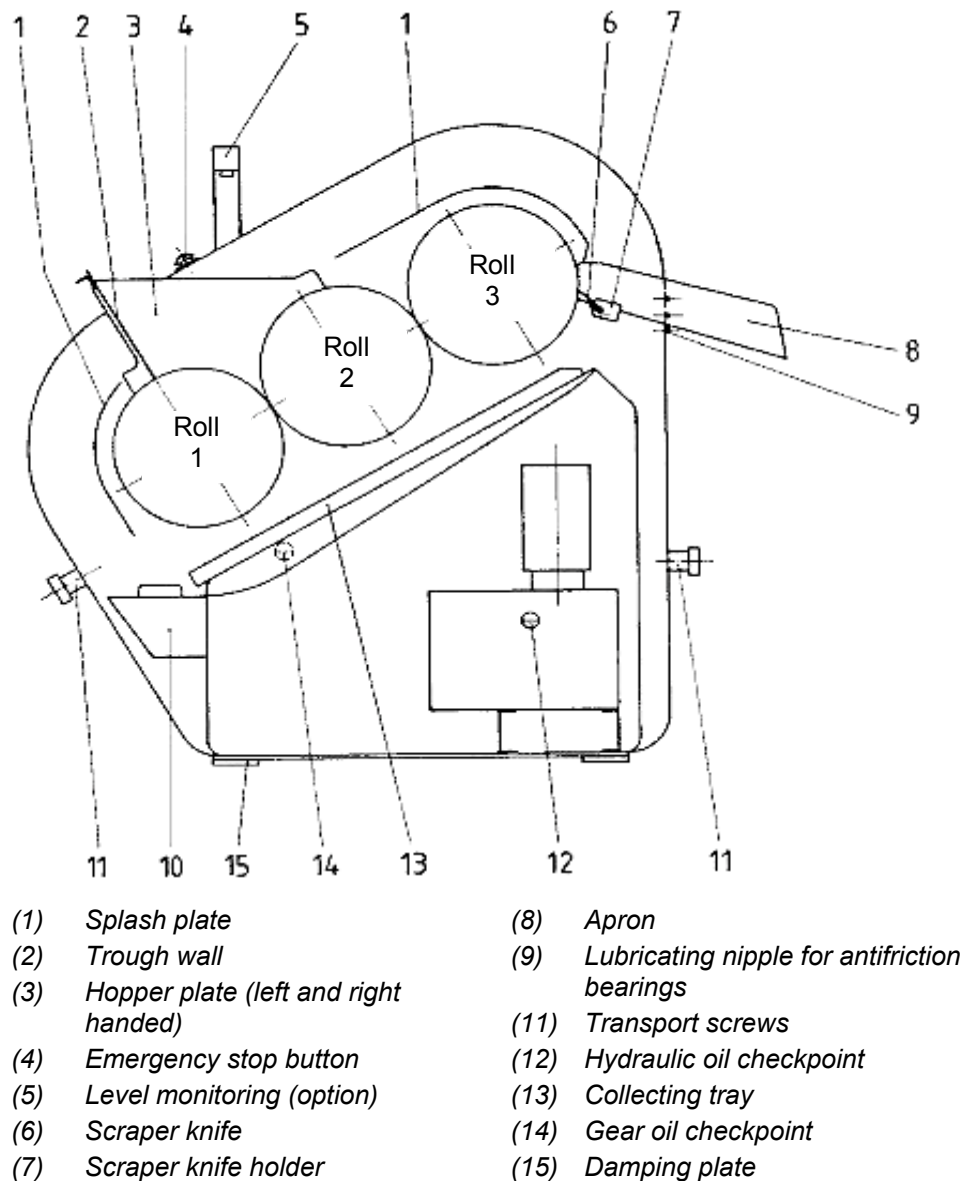


Fig. 2.3

See Fig. 2.4.

The three rolls counter-rotate with different speeds.

The rolls 1 and 2 are flexible and are pressed hydraulically against the roll 3.

The roll 3 is fixed.

The extend of the nip is dependent on the hydraulic roll contact pressure, roll speed and the properties of the product (e.g. viscosity).

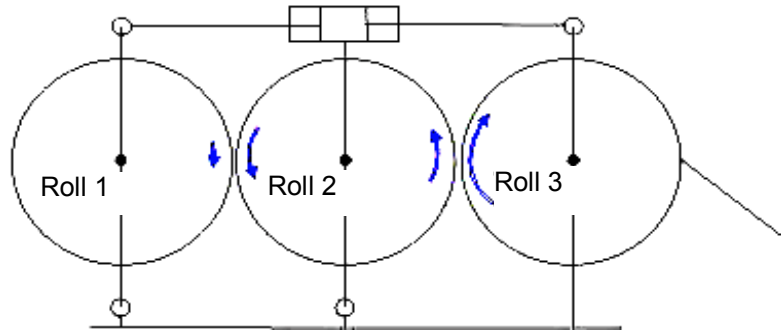


Fig. 2.4

The product is fed between the rolls 1 and 2. In the 1st nip the product is dosed with the predefined process parameters and possibly slightly dispersed. The main dispersion occurs in the 2nd nip between the rolls 2 and 3. Here, the average speed is 3 ... 4 times higher than in the 1st nip. With a scraper knife, the product is scraped off the roll 3 and drains away across the apron.

2.3.2 Roll positions

Mixing

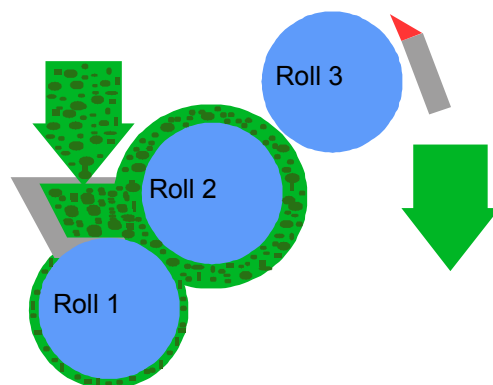


Fig. 2.5

Standby position, to start the machine and to temper the rolls and product. Rolls 1 and 2 are pressed against one another, rolls 2 and 3 are released from each other. Scraper knife and apron are slightly detached from roll 3. The product runs from the product trough through the 1st nip, separated between rolls 1 and 2 and is directed back into the product trough.

Grinding

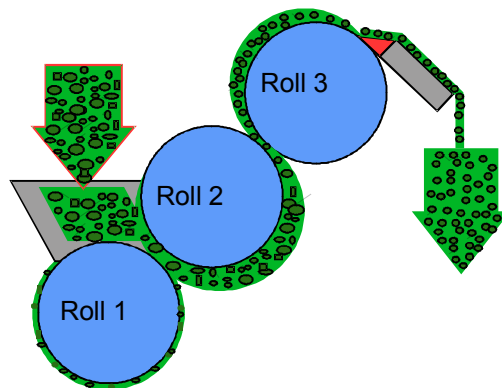


Fig. 2.6

Roll position for dispersion of product.

All 3 rolls are pressed against each other.

Apron and scraper knife are pressed against roll 3.

The product runs from the product trough through the 1st nip and is dosed. The product is dispersed in the 2nd nip. Then the product is scraped off with the scraper knife and drains away across the apron.

Loosen

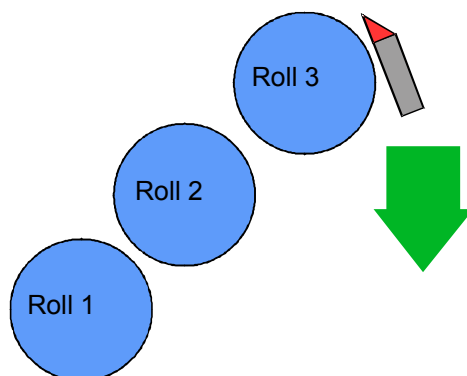


Fig. 2.7

Neutral position or to clean the rolls, see also sect. 6.6 "Cleaning".

All 3 rolls are released from each other.

Scraper knife and apron are slightly detached from roll 3.

2.3.3 Cambered chilled-iron rolls

In a pressured state, the rolls deflect one another and are ovalised differently. In order that the nip remains the same over the entire length of the roll, the rolls are cambered.

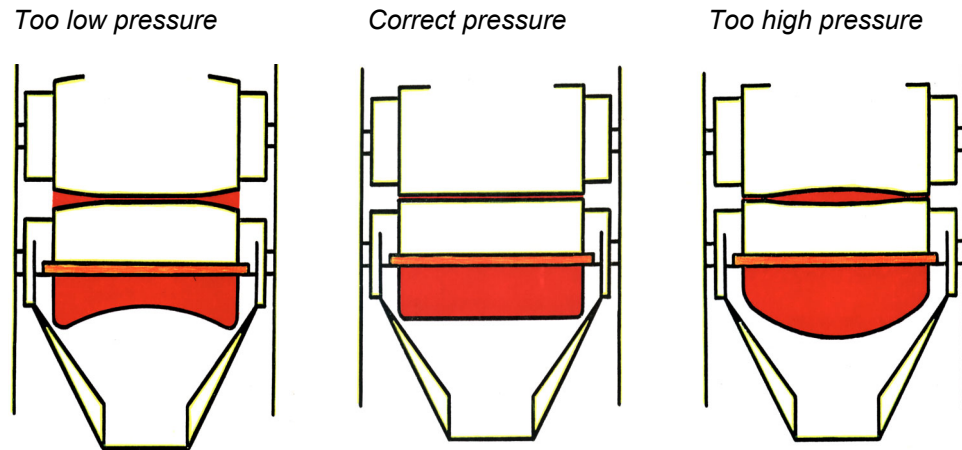


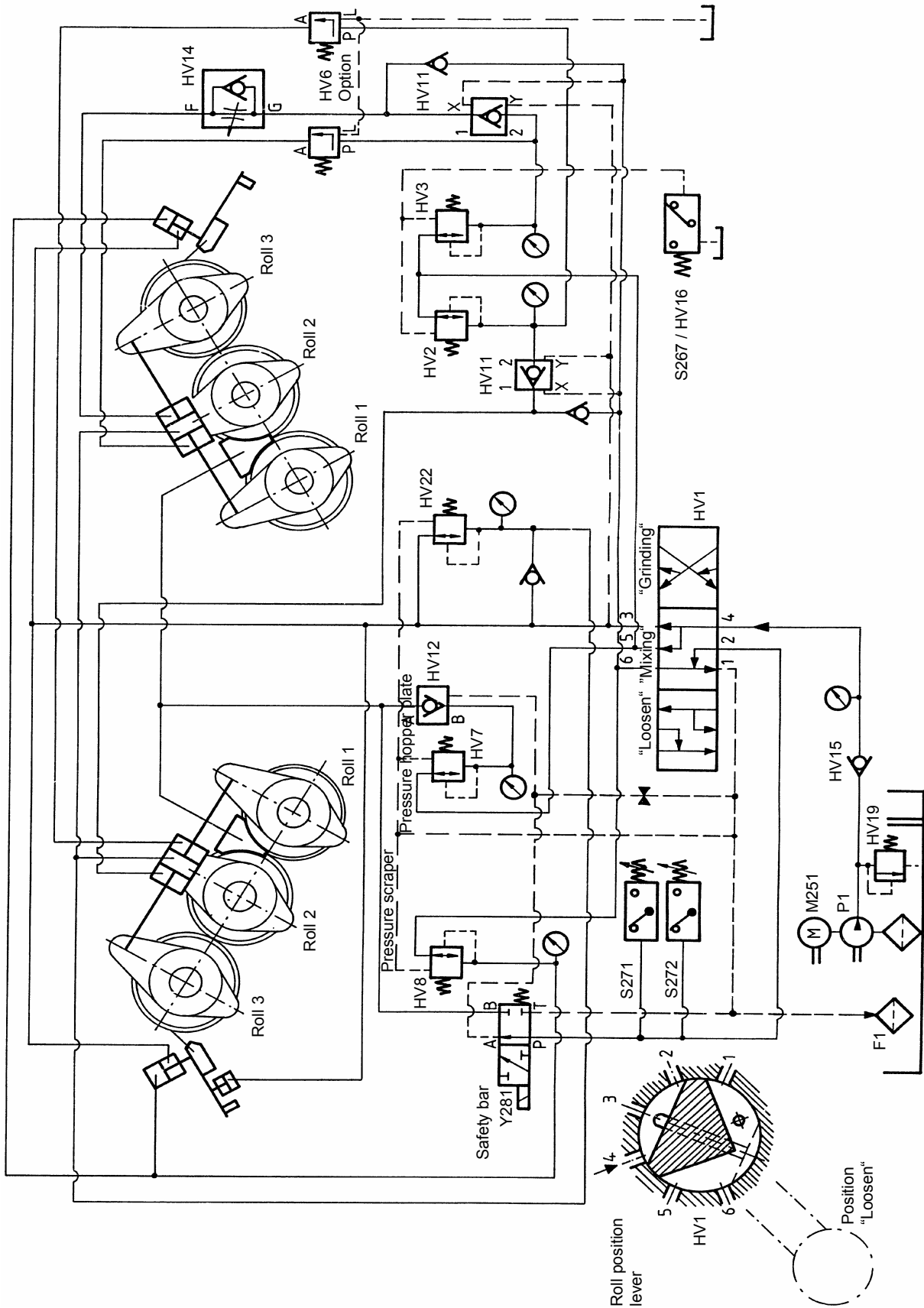
Fig. 2.8



Note:

The cambered chilled-iron rolls are only suitable for operation in a narrow pressure range.

2.3.4 Hydraulic system



SDW-94015

Fig. 2.9: Hydraulic scheme

The rolls, the hopper plate and the apron are hydraulically pressed together. The hydraulic pressure is produced by an electrically driven hydraulic pump. The hydraulic oil is pumped from the hydraulic tank to the relevant hydraulic cylinders.

Pump unit

See Fig. 2.9.

P1	Hydraulic pump, runs in oil.
F1	Suction filter: Clean the cartridge when changing oil.
M251	Hydraulic pump motor: drives the hydraulic pump via the elastic coupling.
HV19	Maximum operating pressure valve: Set the pressure about 10 bar above the optimum roll pressure. In the case of the design with tilting device, set the pressure to 70 bar.
HV15	Non-return valve: In case of a power failure, prevents an immediate drop in pressure of the roll contact.

Hydraulics (standard)

See Fig. 2.9.

HV1	Roll position lever, to set operating modes. “Loosen”: The rolls are loosened. The scraper contact pressure pistons have moved back. The scraper lifting piston is extended. The hopper plate contact pressure pistons are relieved. “Mixing”: The lower and middle roll are pressed on. The upper roll is loosened. The scraper contact pressure pistons have moved back. The scraper lifting piston is extended. The hopper plate contact pressure pistons are extended “Grinding”: The rolls are pressed on. The scraper contact pressure pistons are extended. The scraper lifting piston is relieved. The hopper plate contact pressure pistons are extended
HV2	Pressure reducing valve, to set the roll-contact pressure on the drive side.
HV3	Pressure reducing valve, to set the roll-contact pressure on the cooling side. (The pressure on HV3 is mostly somewhat smaller than on HV2, because the pressure of the gear wheel is compensated from the drive side.)
HV7	Pressure reducing valve for setting the hopper plate contact pressure (approx. 15 bar).
HV8	Pressure reducing valve for setting the scraper knife contact pressure (approx. 10 bar).
HV11	Two releasable non-return valves in the pressure pipes to the 2nd passage (opened in case of operating mode “Grinding”).
HV12	Controlled non-return valve: Relieves the hopper plate-contact pressure piston in operating mode “Loosen”.
HV14	Throttle valve, to reduce the contact pressure speed of the upper passage on the cooling side. (→ The rolls approach each other in parallel.)

- HV16/S267 Overpressure safety control device:
If larger foreign objects are drawn into the nip, there occurs a fast increase in pressure in the roll contact cylinders. This activates limit switch S267, which immediately interrupts the motor protection circuit breaker.
- HV22 Pressure reducing valve for setting the counter-pressure.
This counter-pressure produces a nip in the top and bottom, passages in "Loosen" position.
In the "Mixing" position, the counter-pressure produces a nip in the top passage; the preset contact pressure is reduced in the bottom passage by the value of the counter-pressure.
- S271 Pressure switch (actuated in case of operating mode "Loosen"):
Generates, together with the limit switch signal of the safety bar, the release for the main motor.
- S272 Corresponding to pressure switch S271, connected in series.
- Y281 Solenoid valve:
Fixes the safety bar in operating mode "Loosen".

Options

- HV6 Differential pressure valves:
For the filling hydraulic system (option), *also see sect. 2.3.12.*

2.3.5 Roll drive

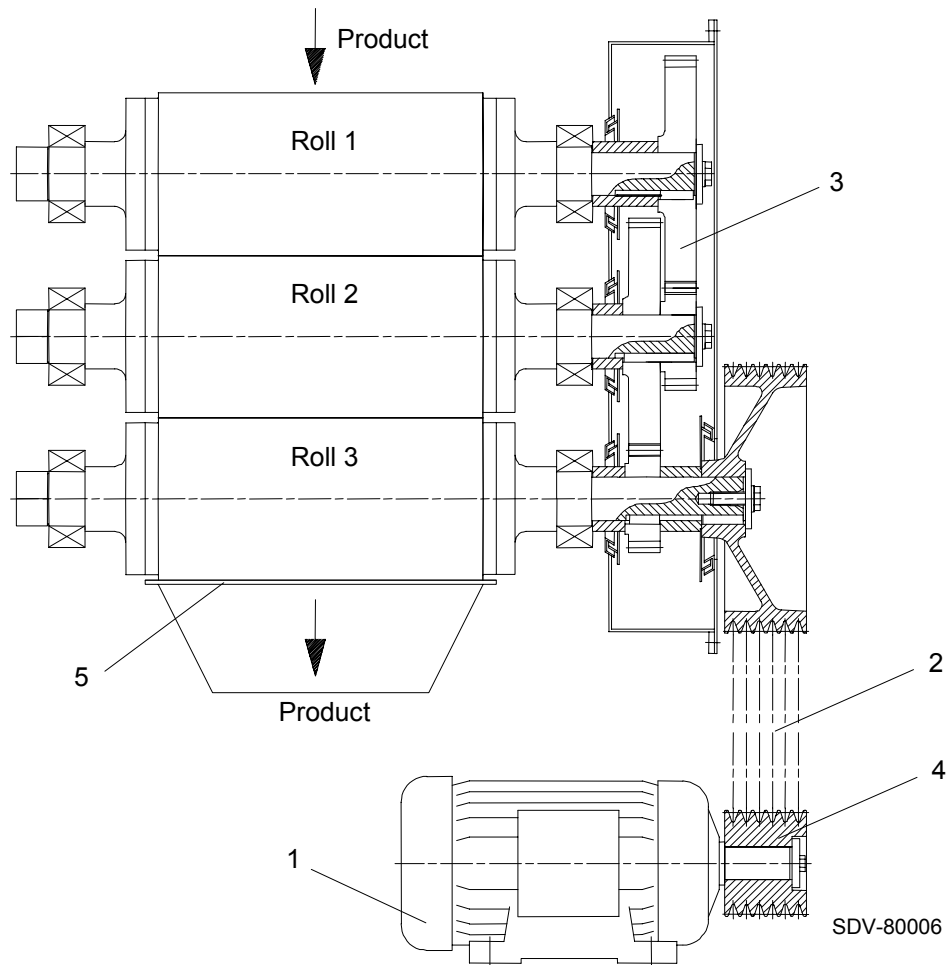


Fig. 2.10

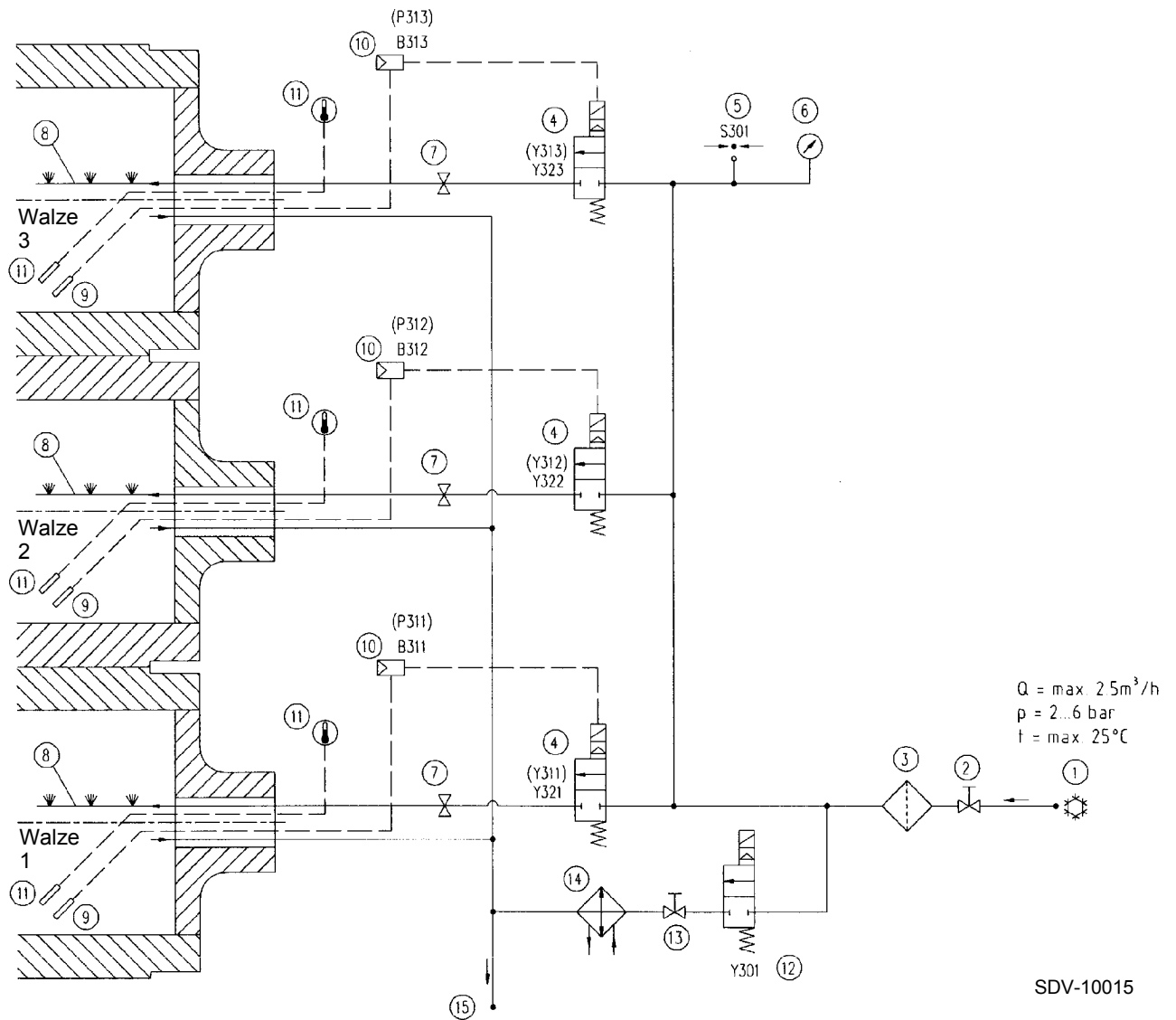
The rolls are driven by an electric motor (1) through V-belts (2) onto roll 3. Roll 1 and roll 2 are driven with gear wheel drive (3).

The rotational speeds of the rolls can be changed by varying the gear wheels and V-belt pulleys (4).

The product is guided between roll 1 and roll 2 and taken off by the scraper knife (5) at roll 3.

2.3.6 Roll cooling

Open flow-through cooling



(...) = designation in case of explosion-protected design

- | | |
|--|---|
| (1) Cooling water inlet, R $\frac{3}{4}$ " | (9) Temperature sensor |
| (2) Straight-way valve | (10) Temperature regulator |
| (3) Cooling water filter | (11) Remote thermometer (in case of explosion-protected design) |
| (4) Solenoid valve (rolls 1 to 3) | (12) Solenoid valve oil cooler |
| (5) Pressure controller | (13) Straight-way valve |
| (6) Pressure gauge | (14) Oil cooler (hydraulic oil tank) |
| (7) Throttle valve | (15) Cooling water outlet, R2" |

Fig. 2.11: Open flow-through cooling

See Fig. 2.11.

The roll cooling is carried out with an open cooling system.

The cooling water injects through the holes into the cooling pipe (8) on the inner side of the roll.

The cooling water flows back through the open roll journal and is guided to the cooling water outlet (15).



Note:

The cooling water must run out free of pressure.

The temperature can be regulated for every roll individually.

The temperature sensor (9) measures the cooling water temperature in the roll.

If the desired temperature is exceeded, the temperature regulator (10) actuates the solenoid valve (4).

The temperature regulation is only active when the main motor is running.

If the cooling water pressure drops for longer than 30 s below the value set on the pressure monitor (5), the main motor gets switched off.

Design without certification for explosion-dangerous areas

The temperature regulation takes place with a resistance thermometer PT100.

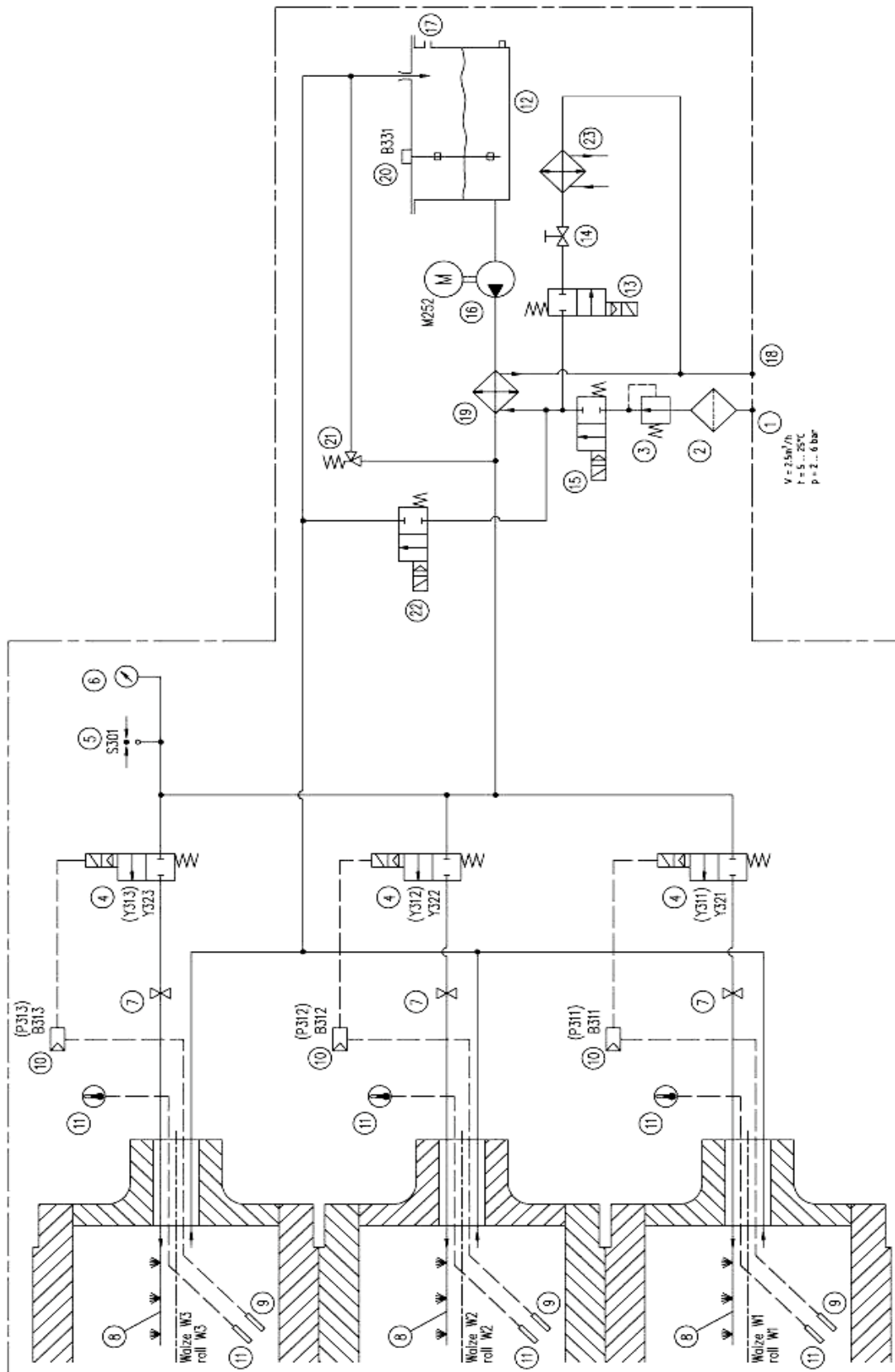
The cooling water temperature is displayed with a digital display on the temperature regulator (10).

Models certified for the explosion-dangerous area

The temperature regulation takes place with a thermostat sensor.

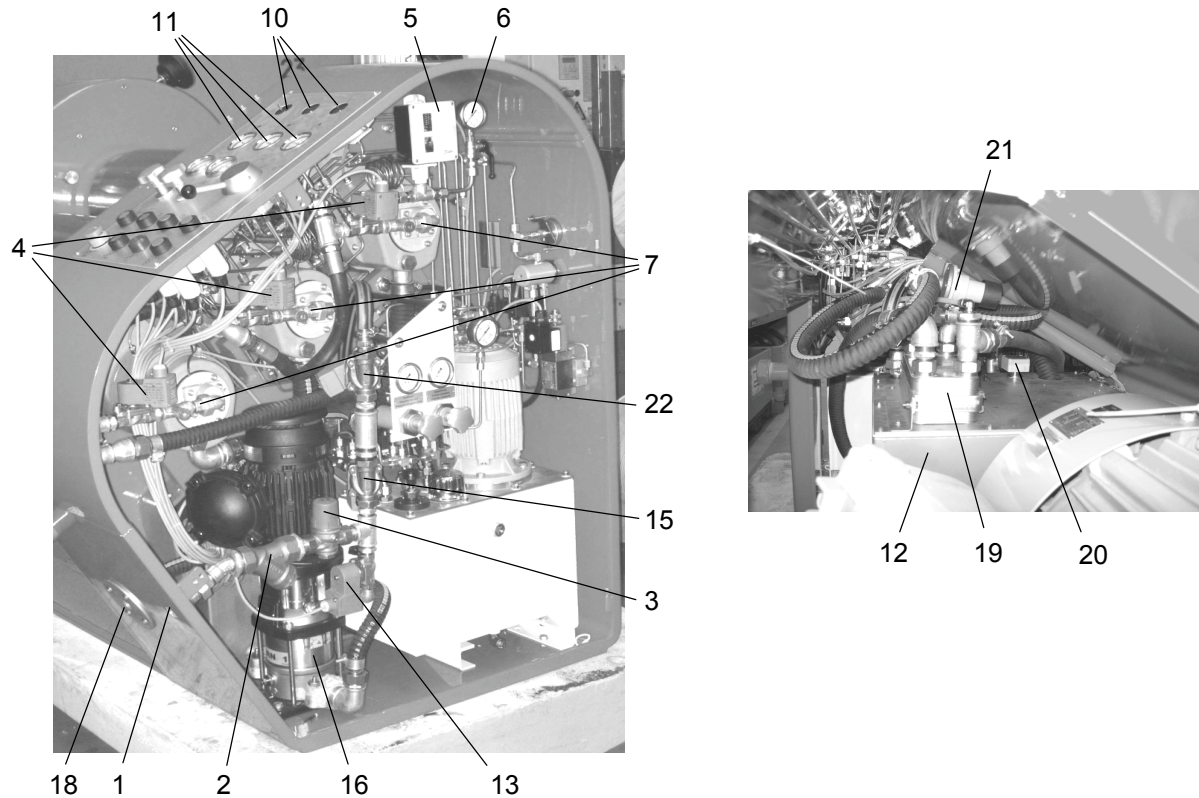
The cooling water temperature is displayed on the remote thermometer (11).

Open flow-through cooling with cooling water tank



(...) = designation in case of explosion-protected design

Fig. 2.12: Open flow-through cooling with cooling water tank



- | | |
|--|--|
| (1) Mains water inlet, R $\frac{3}{4}$ " | (12) Cooling water tank |
| (2) Dirt strainer | (15) Solenoid valve mains water inlet |
| (3) Pressure reducing valve | (16) Cooling water pump |
| (4) Solenoid valve | (17) Overflow |
| (5) Pressure switch | (18) Mains water outlet, R2" |
| (6) Pressure gauge | (19) Plate heat exchanger |
| (7) Throttle valve | (20) Float switch |
| (8) Cooling pipe | (21) Overflow valve |
| (9) Temperature sensor | (22) Solenoid valve filling cooling system |
| (10) Temperature regulator | |
| (11) Thermometer | |

Fig. 2.13

The rolls are supplied with cooling water from the cooling water tank (12).

The cooling water is cooled down by the plate heat exchanger (19) and thereafter distributed by the solenoid valves (4) to the particular rolls.

The cooling water injects through the bore into the cooling pipe (8) on the inner side of the rolls. The water flows back through the open roll journals into the cooling water tank (12).

The thermometer (11), the sensor of which is mounted in the roll, displays the particular water temperature. The temperature sensor (9) of the temperature regulator (10) is also located inside the roll.

With the temperature regulator (10) the desired roll temperature can be set.

The solenoid valves (4) are closed without energy. In roll position "Mixing" or "Grinding" if the setpoint temperature is exceeded they are opened by the temperature regulator (10) if the main motor of the machine is running simultaneously. When all 3 solenoid valves (4) are closed the cooling water flows through the overflow valve (21) back into the cooling water tank (12).

The cooling water tank is automatically filled from the primary circuit (mains water) by the solenoid valve (22), if the following conditions are fulfilled:

- The control is switched on.
- The main motor is switched off.
- The dead-time for the return of the cooling water from the rolls is up and “High Level” is not covered.
- “Low Level” is covered.
- “High Level” is not covered.

The automatic is filling effected to "High level" and then for more 2 s (factory setting). Filling up to the "Low level" at the float switch (20) must be made manually.

If the machine is started via the hydraulic system the solenoid valve (15) at the mains water inlet opens. The mains water flows through the pressure reducing valve (3) to the plate heat exchanger (19).

The pressure reducing valve (3) limits the mains water pressure to 2 ... 6 bar.

The cooling water pump (16) starts, when the main motor is started.

In case the cooling water pump (16) does not deliver enough water and the pressure drops lower than the value adjusted at pressure switch (5) or das cooling water level drops under “Low Level”, after the time preset on the timing relay in the control cabinet has elapsed the main motor and the cooling water pump (16) shut down.

The primary circuit is not controlled.

2.3.7 Hydraulic oil cooling

See Fig. 2.11.

Max. temperature of the hydraulic oil: approx. 50 ... 60° C

The hydraulic oil cooling is connected to the cooling water-inflow pipe (1).

The cooling water flows through a serpentine cooling pipe in the oil tank.

The cooling water quantity can be regulated with a straight-way valve (13).

Upon switching on the hydraulic system, the solenoid valve Y301 (12) gets actuated and releases the cooling water inflow.

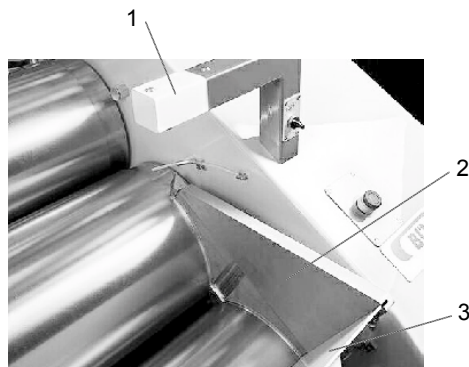


Note:

If the temperature of the hydraulic oil is too high, the seals of the hydraulic system can spring a leak. The straight-way valve (13) must be opened for about 1 revolution of the handwheel.

2.3.8 Product trough

The product trough is located between the rolls 1 and 2.



- (1) *Level probe (option)*
- (2) *Hopper plate (2 counts)*
- (3) *Trough wall*

Fig. 2.14

Hopper plates

The hopper plates are pressed hydraulically laterally onto the roll collars.

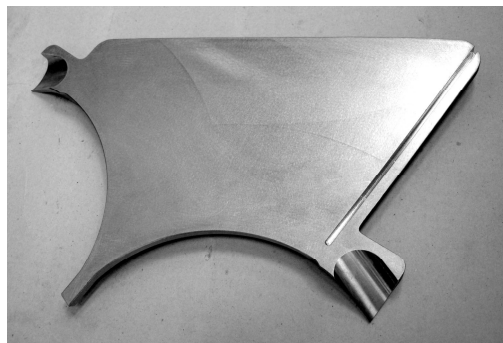
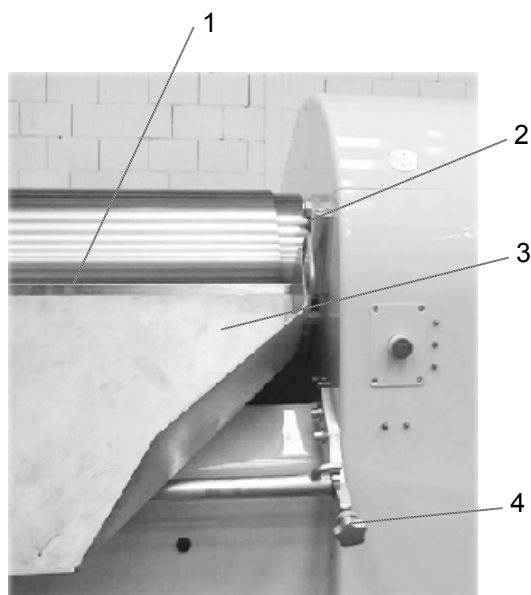


Fig. 2.15: Hopper plate

Hopper plate designs:

- Grey cast iron (standard)
- Bronze (option)
- Plastic (option)

2.3.9 Scraper



- (1) *Scraper knife*
- (2) *Contact pressure pistons*
- (3) *Apron*
- (4) *Adjusting screw*

Fig. 2.16

The scraper scrapes off the product from roll 3 with the scraper knife (1). The scraper knife (1) is located on the apron (3), which is hydraulically pressed. The contact pressure can be adjusted with a pressure reducing valve HV8 according to the product consistency, see *Fig. 2.9*.

For optimal product removal, the scraper knife can be aligned on roll 3 with the adjusting spindles (4).

The scraper knife is only pressed onto the roll in the operating mode "Grinding".

Also see sect. 5.3.5.

Scraper knife designs:

- Width x Depth: 40 x 0.6 mm (standard)
- Width x Depth: 25 x 0.4 mm, spring steel, disposable (option)
- Width x Depth: 40 x 0.6 mm spring steel with ceramic blade (option)

Apron designs:

- Normal steel
- Stainless steel
- Outflow width
 - SDW 800: 350 mm
 - SDW 1000: 500 mm

2.3.10 Safety bar

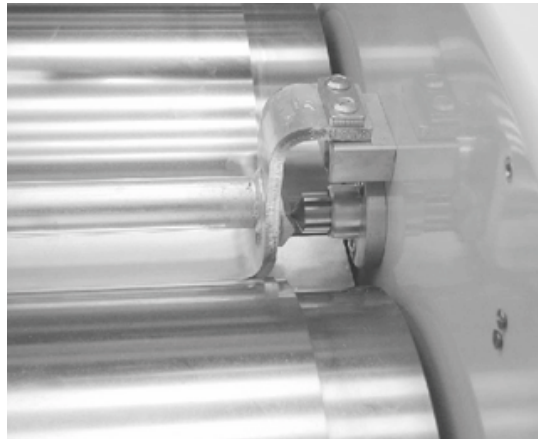


Fig. 2.17

The safety bar covers the nip of the first passage during cleaning and avoids foreign bodies from falling onto the rolls or being drawn in.

With the operating mode “Loosen”, the roll mill can only be started with the inserted safety bar. A position switch ensures that the safety bar is present.

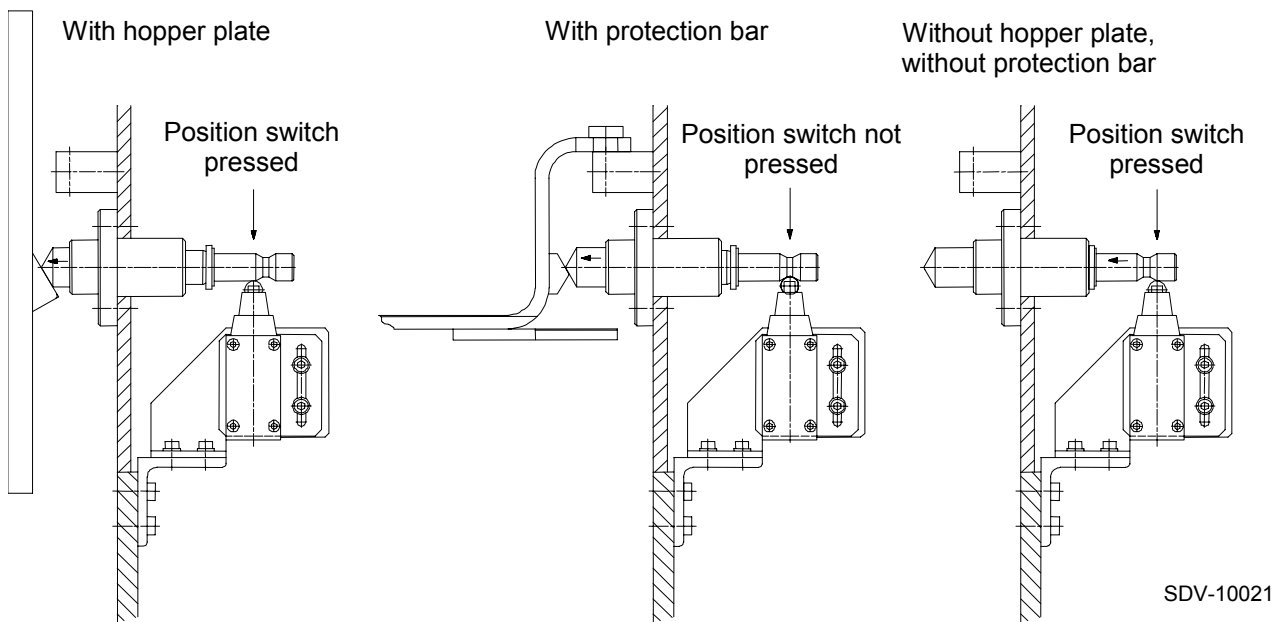


Fig. 2.18: Monitoring the safety bar

2.3.11 Level monitoring (option)

An ultrasonic sensor on the machine records the product level in the product trough between rolls 1 and 2. It outputs pulses that are reflected from the surface of the product and received in the form of an echo. The product level is obtained from the time taken of the ultrasonic pulse.

The level monitor can be designed to protect the rolls from dry running or, additionally, to control the product feeding. In the case that the product level is too high, the ultrasonic sensor turns the main motor off.

- The red empty level indicator lamp on the probe carrier (design without certification for the explosion-dangerous area) or on the operating panel (design with certification for the explosion-dangerous area) glows.



Notes:

- *If the ultrasonic sensor becomes dirty, the machine turns off.*
- *Under pressure, the rolls must rotate only with product (no dry running).*
- *In the case of a low product level, the main motor can be started only in inching mode, for which the push button Main motor ON is to be kept pressed.*

Design without certification for explosion-dangerous areas

The level control can be adjusted with 2 potentiometers on the ultrasonic probe.

Also see sect. 5.3.6, Fig. 5.12.

Models certified for the explosion-dangerous area

The ultrasonic probe can be adjusted on the measurement transducer FMU 860 in the controller (without certification for explosion-dangerous areas).

Also see sect. 5.3.6, Fig. 5.13.

2.3.12 Filling hydraulic system (option)

The filling hydraulic system increases the product throughput, when the machine is used for filling finished product.

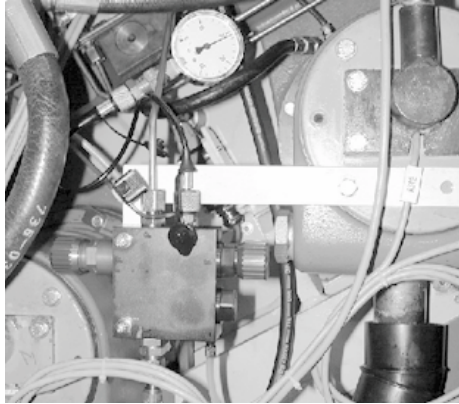


Fig. 2.19

In the case of roll contact pressures below the adjustable toggling pressure, the differential pressure valves HV6 reduce the pressure of the lower passage by the differential pressure that has been set, *also see Fig. 2.9.*

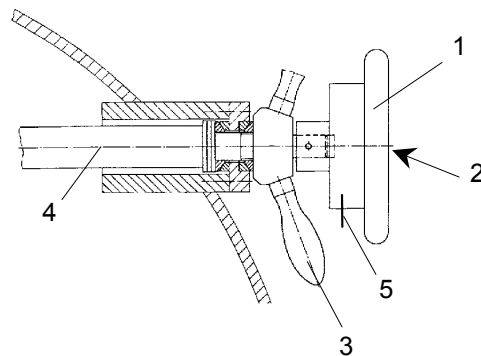
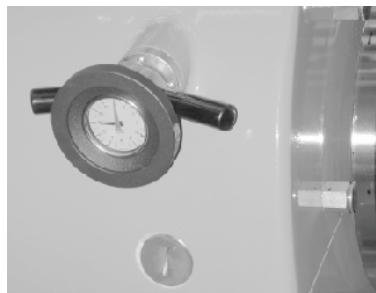
→ The drawing in of the product is increased.

Example: With a toggling pressure of 25 bar and 7 bar differential pressure, a contact pressure of 18 bar is obtained in the 1st passage.

When the roll-contact pressure is greater than the toggling pressure, the pressure in both the passages remains of the same magnitude.

2.3.13 Roll nip setting (option)

The roll nip setting is suitable for processing low-viscosity “short” products which otherwise would be difficult to be drawn into the nip.



- (1) Handwheel
- (2) Position indicator
- (3) Handle
- (4) Spindle
- (5) Headless screw

Fig. 2.20

The nip is set on the handwheel (1) via spindle (4) (depending on execution with gear wheel conversion), *also see sect. 6.4.*

2.3.14 Bucket tilting device (option)

The bucket tilting device is operated via a separate hydraulic system to avoid pressure variations in the roll contact pressure system.

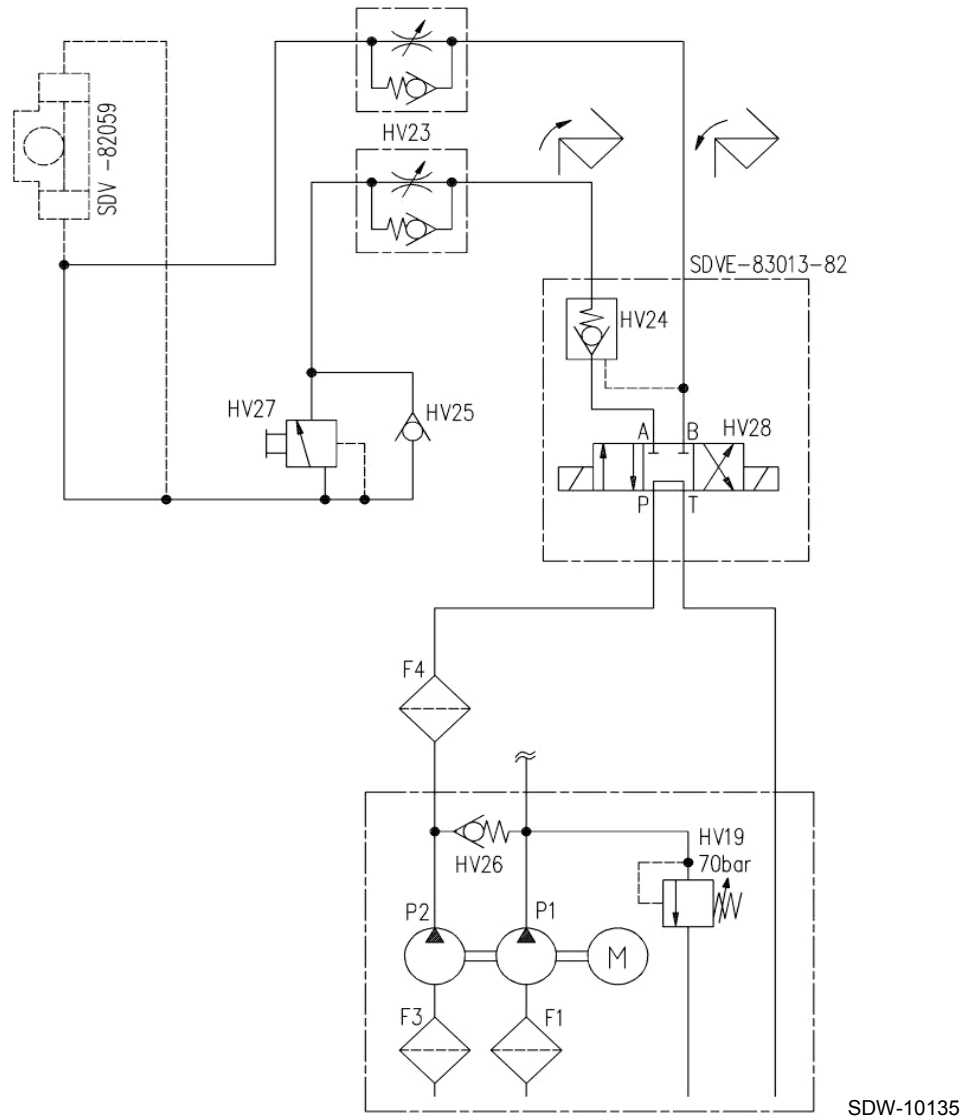


Fig. 2.21: Hydraulic scheme bucket tilting device (option)

See Fig. 2.21.

- P2 Second pump as double pump for P1, with common drive.
- F3 Suction filter: Clean the cartridge when changing oil.
- F4 Pressure filter: Replace the cartridge when changing oil.
- HV23 One-way restrictor: for limiting the speed, "Tilting device DOWN" or "Tilting device UP".
- HV24 Controlled non-return valve: prevents the bucket from tilting when the bucket tilting device has been switched off.
- HV25 Non-return valve: facilitates the movement "Tilting device UP", even if there is no bucket on the platform.
- HV26 Non-return valve: secures the system pressure of pump P2 via the maximum pressure valve HV19.
- HV27 Safety valve: prevents the movement "Tilting device DOWN", when the bucket is not secured.
- HV28 Solenoid valve: controls the movements "Tilting device DOWN" and "Tilting device UP".
- SDV-82059 Rotary drive for platform up to bucket-Ø 1100 mm.
- SDV-82071 Rotary drive for platform up to bucket-Ø 1400 mm.

Loading capacity

Bucket ¹	Without wheels						With wheels			
Height of product filling [mm]	800	800	800	600	600	450	650			
Diameter [mm]	900	800	600	600	500	500	900	800	700	600
Specific product weight [kg/l]	1.15	1.70	3.60	1.60	2.40	1.50	1.35	2.50	3.60	3.50
Max. permissible total weight ² [kg]	680	770	900	350	350	190	650	910	1000	720

2.3.15 Protective cover (option)

During the production process, the rolls and the feeding nip are secured by the roll protective cover (option).

In the "Mixing" or "Grinding" mode, the machine can be started only with installed protective cover.



Earth the protective cover in accordance with the electrical wiring.



Close the cover hood carefully to avoid spark formation because of impacts.

¹ Height of the bucket: 900 mm

² Total weight with which the bucket tilting device may be loaded = weight of the bucket + weight of the product

2.4 Technical data

2.4.1 Weight

	SDW-800	SDW-1000
Machine [kg]	2'500	2'600
Control cabinet [kg]	150	150
Roll [kg]	250	320

Tab. 2.1

2.4.2 Dimensions

Machine

	SDW-800	SDW-1000
Length [mm]	1'910	2'110
Width [mm]	1'210	1'210
Height [mm]	1'355	1'355
Roll diameter [mm]	300	300
Roll working length [mm]	800	1'000

Tab. 2.2

Also see sect. 2.7 "Dimension drawings".

Control cabinet

	Star-delta 400 ... 600 V, wall rack	Star-delta 200 ... 230 V, Soft starter, Frequency converter 400 ... 600 V	Frequency converter 200 ... 230 V
Height [mm] ³	1250	2200	2200
Width [mm] ³	850	1000	1600
Depth [mm] ³	300	500	500

Tab. 2.3

2.4.3 Power rating

Ratings

Voltage:	3 x phase voltage
Frequency:	50 / 60 Hz
Control voltage:	115 / 230 VAC
Control voltage:	24 VDC

³ According to additional fitting (option), the dimensions can differ.

Motor power

	SDW-800	SDW-1000
Main motor [kW]	30	max. 37
Hydraulic pump motor [kW]		
without bucket tilting device	0.75	0.75
with bucket tilting device	1.10	1.10

Tab. 2.4

2.4.4 Roll cooling

Water inflow pipe

Cross-section (nominal width): min. DN20

Pressure: min. 2 bar

Cooling water inflow: R ¾" (inner thread)

Cooling water outflow: R 2" (outer thread)

Cooling water throughput, see sect. 2.5.1.

2.4.5 Hydraulic system

Pump rating:	0.75 kW 1.10 kW ⁴
Maximum pressure:	100 bar
System pressure:	max. 70 bar
Oil flow quantity:	2.8 l/min at 1450 min ⁻¹
Tank volume:	about 25 l

2.4.6 Noise data

Measuring values	
Equivalent, workplace-related sound pressure level (in accordance with ISO 6081)	Leq = 72 dB (A)
Acoustic power level (sound intensity based on ISO 9614)	Lw = 88 dB (A)
Measuring surface measure	Ls = 16 dB (A)

Tab. 2.5

⁴ In the case of the option bucket tilting device

2.5 Operating materials

2.5.1 Cooling water

Cooling water throughput:	max. 2.5 m ³ /h
Cooling water pressure:	2 ... 6 bar
Outflow:	without counter pressure
Water quality (usual drinking or industrial water)	
pH-value:	7.4 ... 7.8
Chloride content: ⁵	< 30 mg/l
Nitrate content:	< 3 mg/l
Sulphate content: ⁵	< 70 mg/l
Calcium content: ⁶	< 6 mg/l
Dry residue:	< 500 mg/l
Total hardness:	< 10° dH
Carbonate hardness:	< 10° dH
Electric conductivity:	< 500 µS/cm



Notes:

- Heavily acidic water may affect the rolls.
- Lime and solid matters deposits on the rolls may affect cooling efficiency.

2.5.2 Hydraulic oil

Quantity:	approx. 30 l
Viscosity class:	ISO VG 46 (e.g. Mobil DTE 25, Shell Tellus 46)
Viscosity class at higher ambient temperatures:	ISO VG 68 possible

2.5.3 Gear oil

Quantity:	approx. 6 l
Viscosity class:	ISO VG 220 (e.g. Mobilgear 630, Shell Omala 220)

2.5.4 For maintenance work

Roller bearing grease:	according to NLGI class 2, with H-LP-additives (e.g. Mobilgrease HP222)
Assembly paste:	Molykote DX
Threaded joints:	Hemp for cooling system, Teflon tape for hydraulic system

⁵ Measured with photometry.

⁶ Measured with atom-absorbing spectrometry.

2.6 Specific line pressure

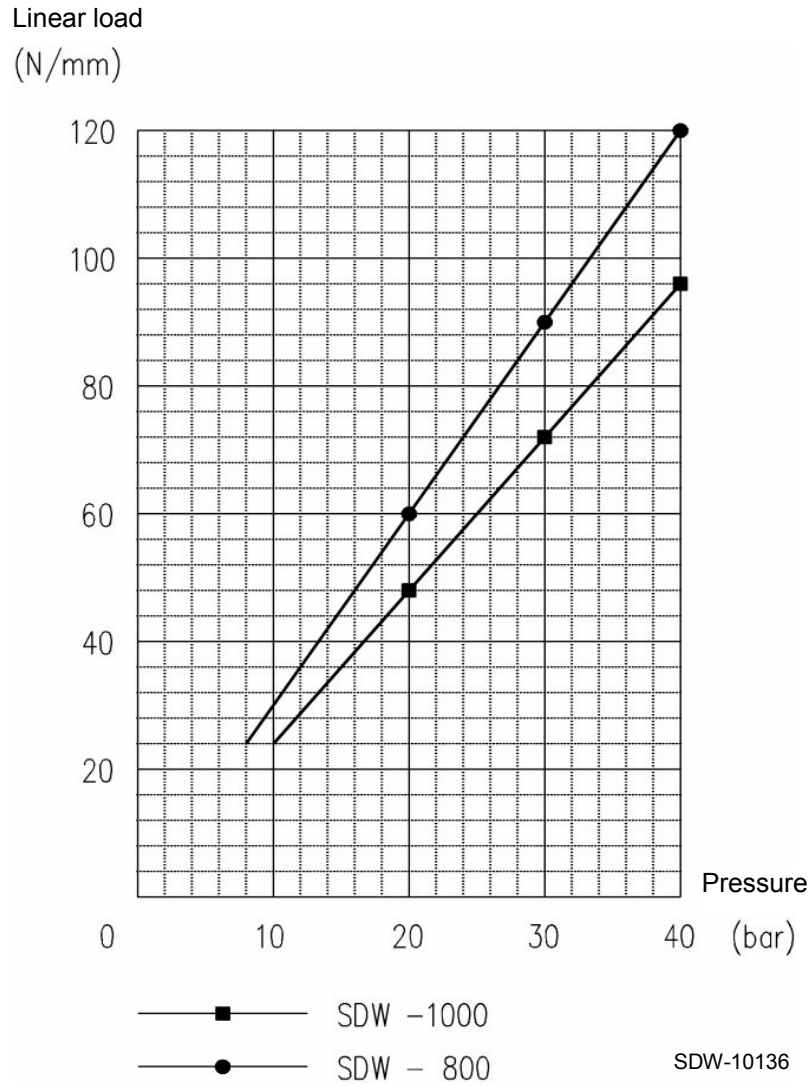
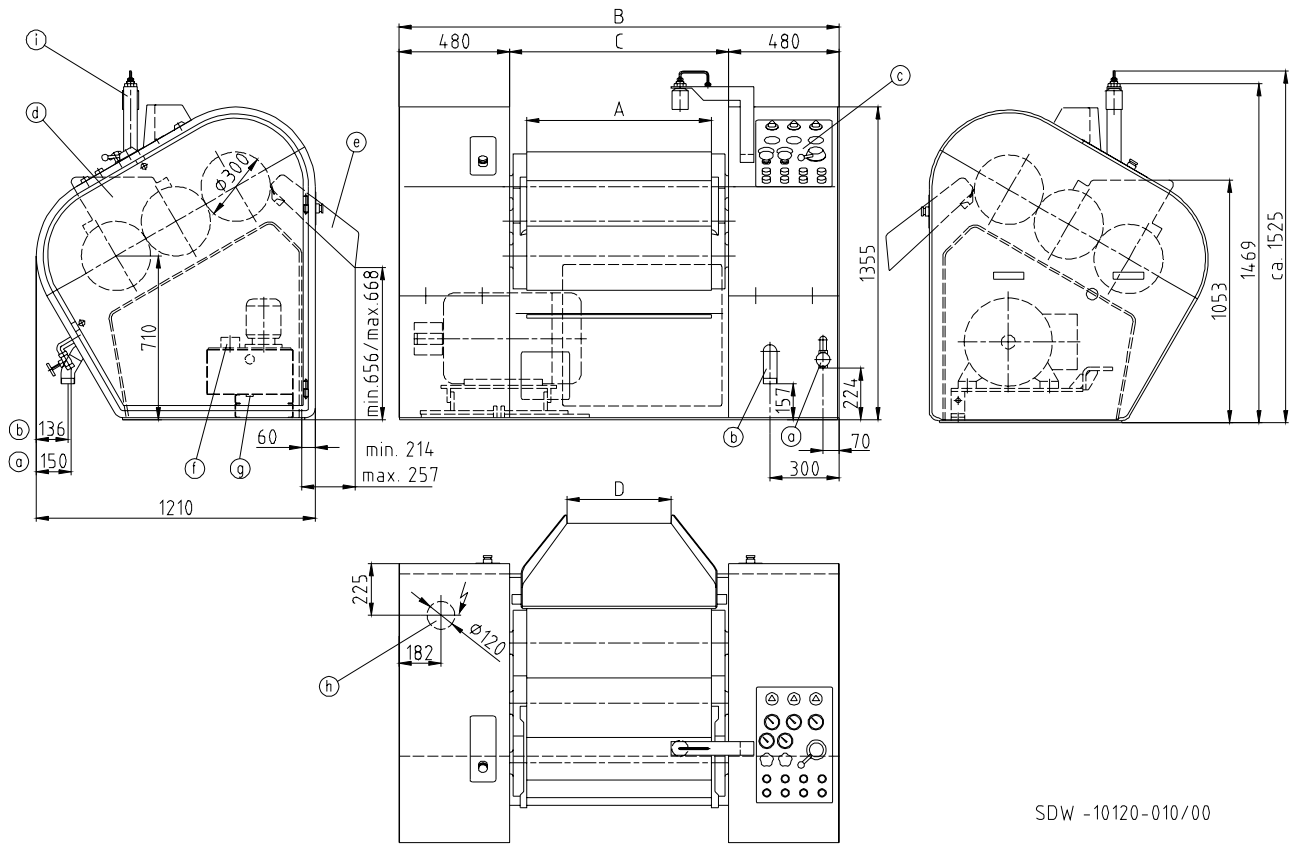


Fig. 2.22

2.7 Dimension drawings



SDW -10120-010/00

SDW	A	W	C	D
800	800	1910	950	350
1000	1000	2110	1150	500

- (a) Water-inlet, R $\frac{3}{4}$ "
- (b) Water-outlet, R2"
- (c) Control panel
- (d) Product trough
- (e) Apron
- (f) Oil filler
- (g) Oil outlet
- (h) Electric connection
- (i) Level monitoring (option)

Fig. 2.23: SDW Three-roll mill

3 Transport

3.1 General

Only specially trained personnel must carry out the transport of the machine.

**CAUTION!**

At temperatures below freezing point, damage can be caused due to freezing of the remaining water. Therefore drain or exhaust all cooling water from machine before transporting or storing.

- Protect the machine against weather influences.
- Avoid damage from transport aids.
- In case of large temperature variations, avoid formation of condensation water.
- Do not (further) disassemble the machine.
- Before transporting the machine or rolls, ensure that they have been completely emptied (cooling water, hydraulic oil, gear oil).

3.2 Storage

- Leave the machine parts in the original packing till the start of assembly and store them in a protected place.
- If necessary, drain or suck out the cooling water completely from the machine and heat exchanger.
- Machine parts and boxes must be covered properly to protect them from direct sunlight, dust and humidity.
- Should the machine be stored outside, it must be placed on a wooden base and not directly on the ground.
- The bright machine parts are factory-protected with conservation agent which under the mentioned conditions has a life of maximum one year. If the storage exceeds this period of time, the conservation must be renewed.

3.3 Suspension on the crane



DANGER OF SUSPENDED LOAD!

Do not walk or wait under suspended loads.

- Check crane and hoisting device for the required design and admissible load.
Weight, see sect. 2.4.1.
- Use only those transport-related devices supplied by Bühler AG.
- Hoist the machine only from the specified points.
For lifting by crane, the machine is provided with 4 tapped holes into which the transport bolts are screwed:

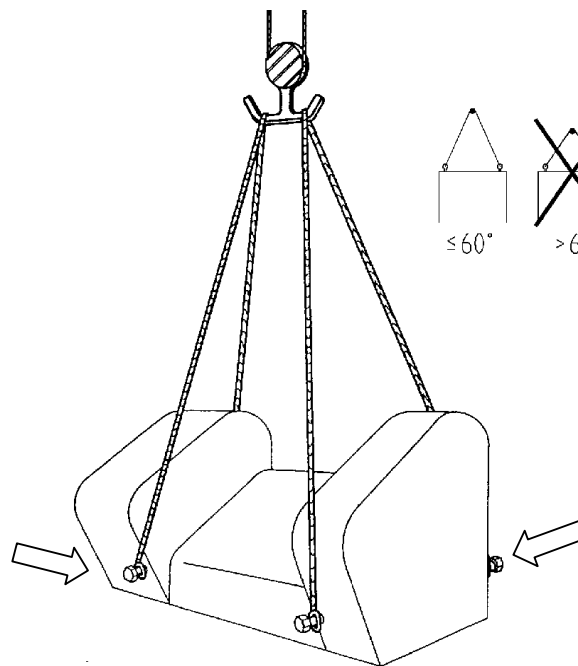


Fig. 3.1

- Select the rope/chain length so that the machine is suspended from the crane as horizontally as possible.



Notes:

- The angle of the ropes/chains may not exceed 60°.
- Pay attention to an adequate rope quality.
- When the machine is correctly positioned, remove the transport bolts. Close the tapped holes with supplied plastic caps.

4 Installation

4.1 General

Only specially trained and authorised specialist personnel must carry out the installation of the machine and machine components, strictly observing all assembly and installation instructions.

4.2 Local conditions



In the explosion-dangerous area the machine must only be operated according to its permission.

The certification can be seen from the ATEX designation on the Nameplate, see sect. 2.1 "Identification".



The control cabinet must not be placed within the explosion-dangerous area.

- For weight, see sect. 2.4.1.
- The machine must
 - be placed on a concrete base, hard wood or metal frame as a support (option), see Fig. 4.2.
 - be placed as an antinoise and antivibration measure, on the supplied vibration-damping pads, see Fig. 4.3.
- Footprint, see sect. 2.4.2 "Dimensions".
- Leave sufficient space for installation and adjustment works.

Ambient conditions

Ambient temperature:	10 ... 45° C
Relative atmospheric humidity:	40 ... 95 %
Height of the installation site:	up to 1000 m above sea level

4.3 Erection



DANGER OF SUSPENDED LOAD!
Do not walk or wait under suspended loads.

- Check the hoisting device for the required design and admissible load. Weight, see sect. 2.4.1.
- Only lift the machine at the indicated suspension points, see Fig. 3.1.
- Block the installation area for unauthorised persons.
- Secure the working environment (avoid stumbling obstacles etc.).
- Allow for ample space around the machine to enable installation and adjustment work, see sect. 2.7 "Dimension drawings".

4.3.1 Installation procedure

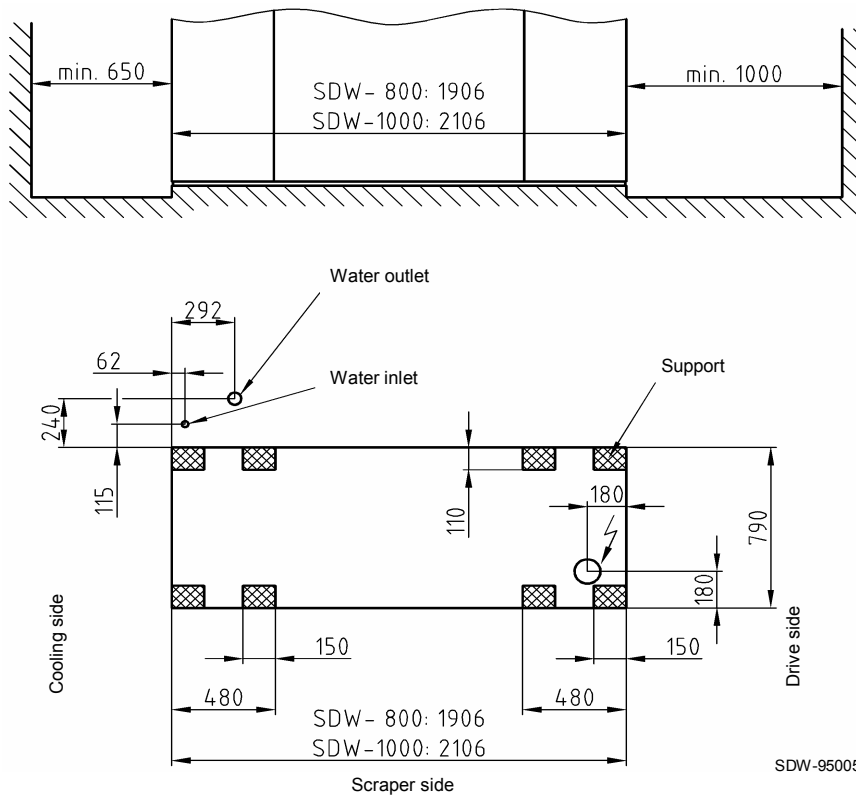


Fig. 4.1: Foundation plan

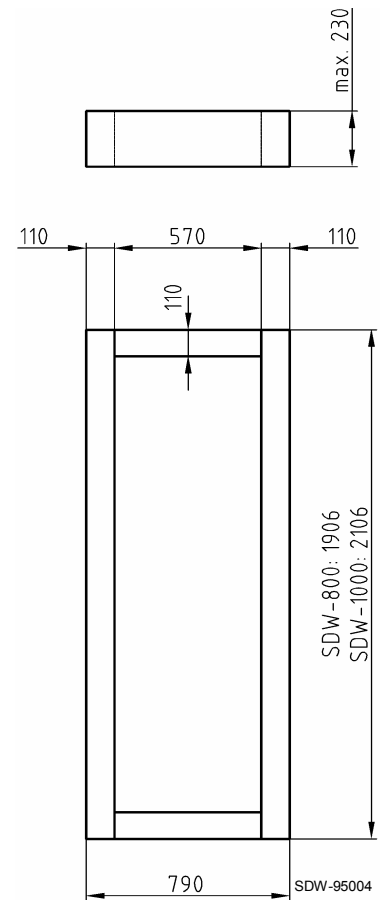


Fig. 4.2: Hard wood support (option)

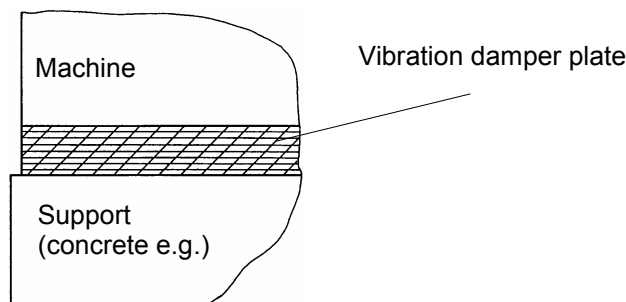


Fig. 4.3

- Prepare the foundation, see Fig. 4.1.
- Put the hard wood support (optional) below the pedestal supports, see Fig. 4.2.
- Place the 8 accompanying damping plates below the pedestal supports.
- Align the machine and position it on the foundation.
- Level the machine:
With the spirit level, check the position of the upper roll.
If necessary, correct with metal supports between the resting surface and the damping plates.

- Remove the transport screws.
Close the tapped holes with supplied plastic caps⁷,
- Fill in gear oil and hydraulic oil, see sect. 7.2.
- Clean the rolls thoroughly and oil them, see sect. 6.6.2.
(The rolls can be rotated by hand.)

4.4 Electrical installation



Note:

Only locally authorised specialist personnel (electrical installers) must carry out all installation and inspection work on electrical components of the machine.

4.4.1 Connecting to the power supply

- Selectively secure the power supply in accordance with the local instructions.
- Observe all electrical installation instructions.
- Check whether the operating voltage and frequency correspond to the data on the nameplate and in the control cabinet.
- Power ratings, see sect. 2.4.3 “Power rating” and separate electrical wiring diagram.
- Electrical supply:
The pre-fuse and the inflow conductor design should be according to the mains voltage and the motor rating.
Voltage fluctuation: $\pm 10\%$
Frequency fluctuation: $\pm 5\%$
- Take the electrical wire from the terminals in the control cabinet to the connection box on the machine and connect it according to the separate diagram.
 - Max. distance between control cabinet and machine: 50 m
 - Keep the explosion-protected connections separate and on the machine side, wire them in a separate terminal box. Use the corresponding installation material.
- Connect the supply voltage (L1, L2, L3) to the main switch.
- Lead the cables through a cable duct to the machine and lay them through the opening in the pedestal base, see Fig. 2.23.

Connecting the control cabinet



The control cabinet must not be located in the explosion-dangerous area.

- Connect the control cabinet from top or bottom directly onto the terminals.⁸
- Connect the machine via the opening in the machine stand (drive side under the pivoted motor base) onto the according terminals of the cable connections.
- Plug up all remaining openings.
- Protect the cable entries on the control cabinet against dust and splash water.

See the separate connection diagram.

⁷ Included in delivery.

⁸ The connecting cables of the clamps of the cable boxes in the machine to the clamps in the control cabinet are not included in delivery.


4.4.2 Earthing

- Earth the machine correctly (equipotential bonding).
- Connect the earth conductor to the location marked by “PE” on the copper earth busbar in the control cabinet.
- Remove the paint around the area of bonding.
- The leakage resistance to earth must, in all parts, be less than $10^6 \Omega$.

4.5 Installation of supply lines

The installation of the connections is carried out by the operator.

4.5.1 Product lines

-  For product lines, use conductive materials with a leakage resistance $< 10^6 \Omega$.



Notes:

- *The feed pipes must not project into the area of the ultrasonic sensor.*
- *If stationary delivery pumps are used, do not obstruct the swinging range of the apron.*

4.5.2 Cooling water lines

See sect. 2.4.4 “Roll cooling” and sect. 2.7 “Dimension drawings”.

- Run mains water connection to the water inlet of the machine.
- Install return lines to the water outlet of the machine.



Note:

Take the water drains to a public system.

The water must be able to flow out without any pressure.

- After assembly, check the water pipes for leaks and flush them thoroughly (remove impurities).
- Cooling water, see sect. 2.5.1.

5 Start-up

5.1 General



Note:

The machine must only be started up when the protection devices are intact and the safety equipment is operational.

Only specially trained and authorised specialist personnel must carry out the (initial) start-up, trial run and adjustment work.



EXPLOSION HAZARD!

Do not use any explosion-dangerous products if the machine is not authorised for operation in explosion-dangerous area.



The product container and the installation must be in compliance with the ATEX 95 directive.



Never run the machine with dry rolls.



Only operate the roll mill with the approved products, *see sect. 2.2 "Use in accordance with intended purpose"*.



In case of unusual running noise immediately stop the machine.



DANGER!

When working in the area of driven or energised components, turn the all-pole disconnecting lockable safety switch to "0" and secure against turning on.

- If the machine is equipped with a protective cover (option), it must be operated only with installed protective cover.



CAUTION!

In roll position "Grinding", "Mixing" or when discharging the machine, do not allow the rolls to rotate dry, otherwise they will be damaged.

5.2 Pre-operational inspections



DANGER!

Only operate the machine with intact protection and operational safety devices.

If the cover on the drive side of the machine has to be opened, set the main switch on the control cabinet to “0” and close it (key is with personnel).

When working on the electrical controller or on electrical components, set the main switch on the control cabinet to “0” and lock it (key with personnel).

- All transport aids and mounting devices have been removed.
- The electrical installation has been carried out and checked by authorised qualified personnel:
 - Power ratings, see sect. 2.4.3 “Power rating” and separate electrical wiring diagram;
 - Earthing of the machine, see sect. 4.4.2;
 - Direction of rotation of the hydraulic pump motor, see sect. 5.4.1.
 - All the checks were carried out according to EN 60204-1, section 20.
 - All the limit switches are correctly set.
- All operating elements and warning devices are operational.
Also see sect. 5.5 “Check list for establishing EU conformity”.
- All screwed connections have been tightened.
- There are no foreign objects in the machine.
- All terminal boxes and sockets are closed.
- The levels of hydraulic oil and gear oil are correct, see sect. 7.2 “Maintenance and lubrication chart”.
- All the motors and bearings are filled with lubricant, see sect. 7.2 “Maintenance and lubrication chart”.
- All the connections of the hydraulic and water pipes are free of leaks
- All instrument glasses are intact.
- The V-belts are correctly tensioned.
- The scraper knife and the scraper knife holder are correctly inserted, see sect. 5.3.5.
- Cooling system:
 - The water pressure is correct, see sect. 2.5.1 “Cooling water”.
 - The water quality corresponds to the requirements, see sect. 2.5.1 “Cooling water”.
 - The pointers of the cooling water thermometer point to room temperature.
- Level control (option) and emergency shutdown are set correctly, see sect. 5.3.6.

5.3 Settings

5.3.1 Roll cooling setting

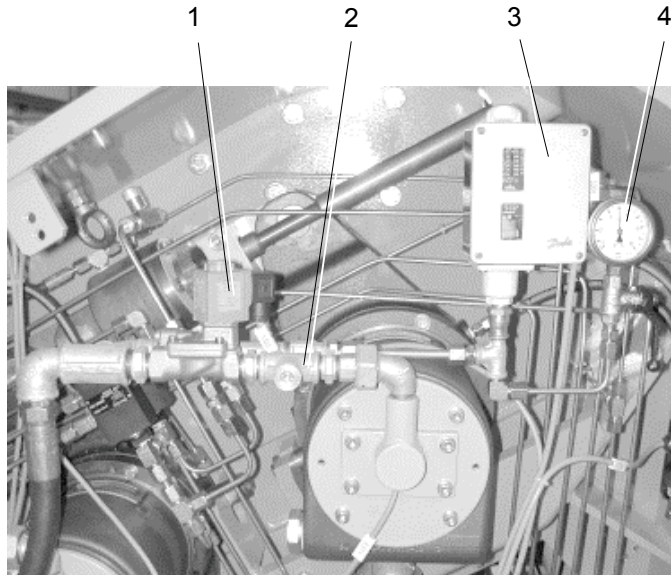
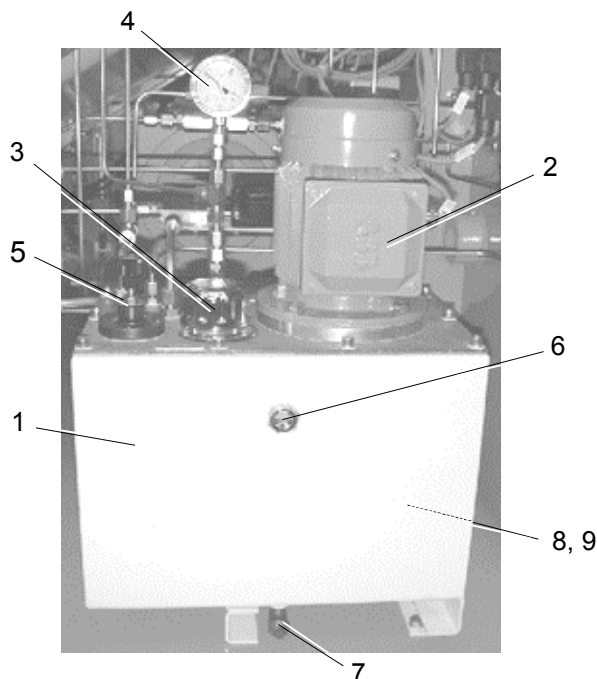


Fig. 5.1

- Set the pressure controller (3) to 0.5 ... 1 bar.
- Set the reducer valve (2) in such a way that upon opening the upstream solenoid valve (1), the pressure at the pressure gauge (4) reduces by maximum 1 bar.

5.3.2 Filling in hydraulic oil and adjusting operating pressure



- | | |
|--------------------------------------|-----------------------------|
| (1) Oil tank | (5) Pressure reducing valve |
| (2) Hydraulic pump motor | (6) Sight glass |
| (3) Filling nozzle | (7) Oil draining screws |
| (4) Pressure gauge (system pressure) | (8) Hydraulic pump |
| | (9) Suction filter |

Fig. 5.2

- Open the side door on the cooling side.
- Fill 25 l hydraulic oil at the filling nozzle (3).
- Switch on hydraulic pump, see sect. 6.3.
- Check the direction of rotation of the hydraulic pump motor, see sect. 5.4.1. (In case the direction of rotation is wrong, no pressure can build up.)
- Set the system pressure at the pressure reducing valve (5):
 - without bucket tilting device: 60 bar
 - with Bucket tilting device (option): 70 bar
- Check the set value at the pressure gauge (4).
- Close the side door.
- Shift the HV1 roll position lever to the “Loosen” mode.



Note:

Before the first start-up, run the hydraulic system for about ½ h, to ensure the oil inflow. With the rolls at standstill, actuate the roll position lever HV1 several times to deaerate the hydraulic system.

5.3.3 Aligning the rolls



Notes:

- During transportation, the rolls may become displaced laterally. They must be realigned.
- The rolls can be adjusted only on the cooling side.
- Set roll 2 in the middle of roll 3. The distance of the edges of roll 3 to the edge of roll 2 must be the same on the drive side and the cooling side. The roll edges of rolls 1 and 2 must be precisely aligned to 0.04 mm. **Check using a straightedge.**

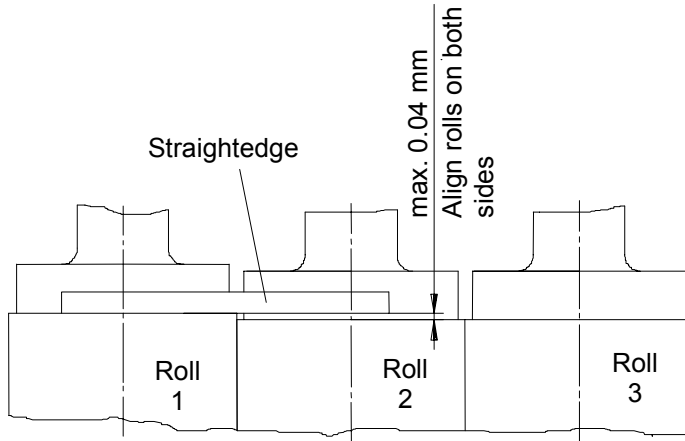


Fig. 5.3

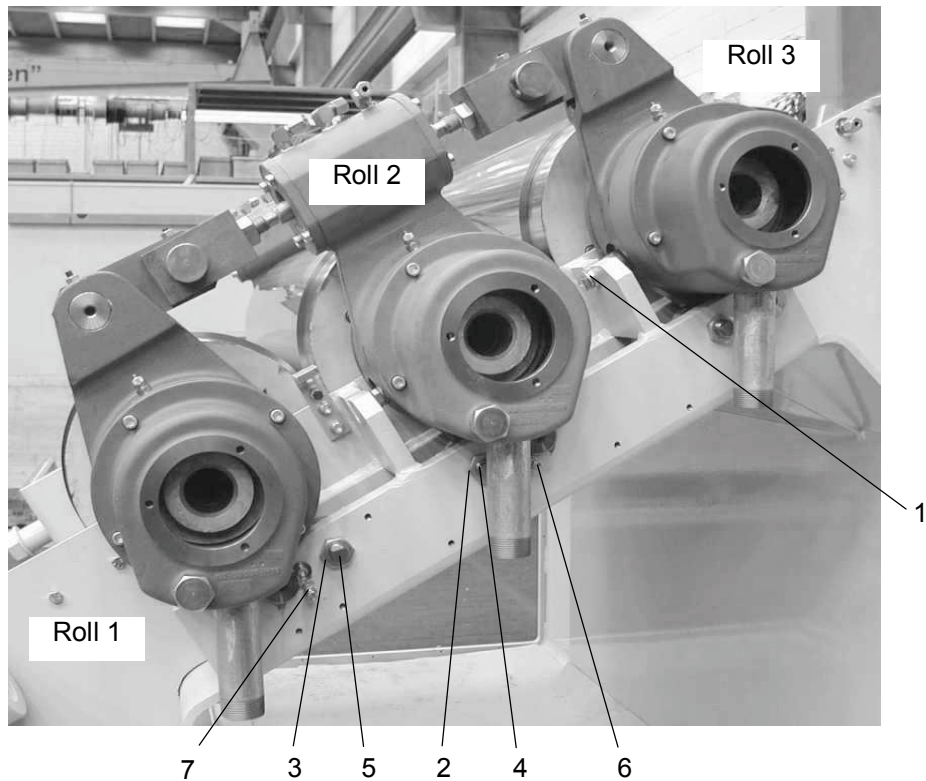


Fig. 5.4

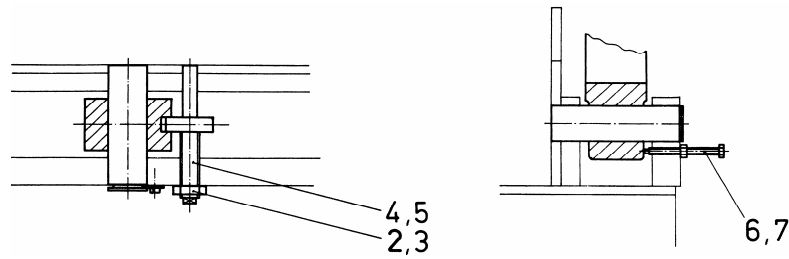


Fig. 5.5

- Ensure that the locking (1) of the bearing body of roll 3 is tightened firmly.
- Align the middle roll 2 to the upper roll 3:
Rotate the square on spindle (4) and move roll 2.
- Lock with hexagonal nut (2) and compensate bearing support clearance with adjusting screw (6).
- Align the lower roll 1 to the middle roll 2:
Rotate the square on spindle (5) and move roll 1.
- Lock with hexagonal nut (3) and compensate bearing support clearance with adjusting screw (7).
- Allow the machine to rotate briefly in **operating mode "Loosen"**.
Check the roll alignment once again with the rolls pressed together.
If necessary, realign the rolls till they align exactly.

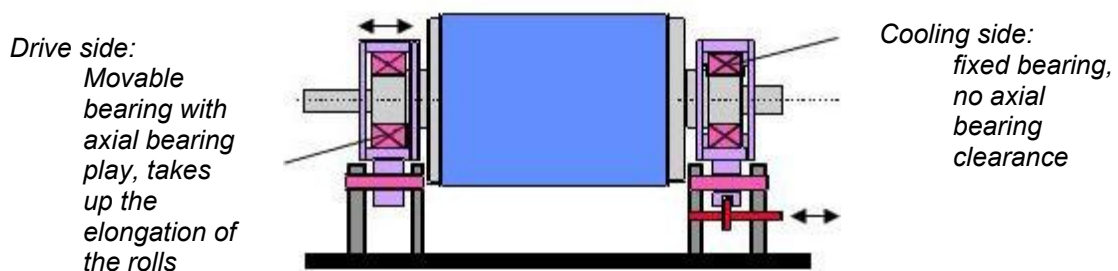
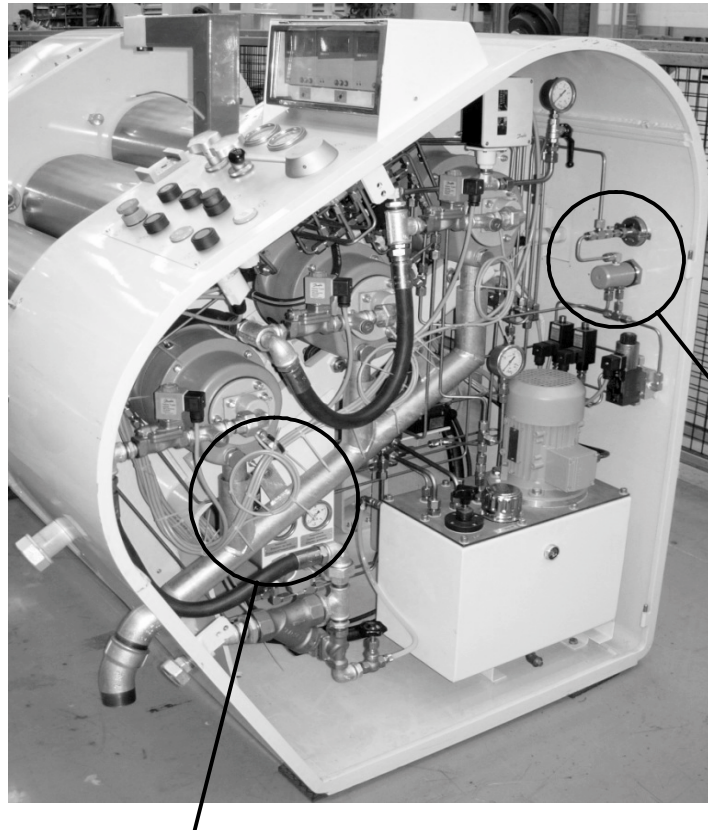


Fig. 5.6

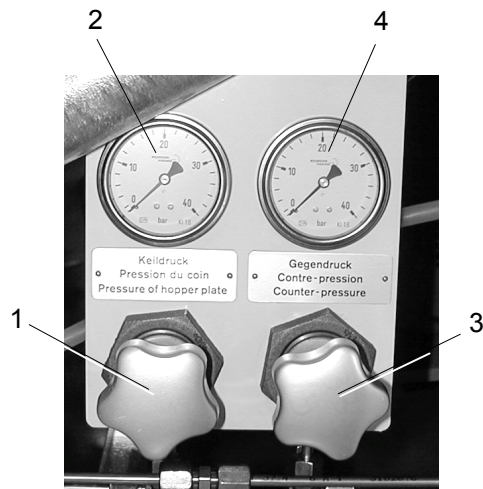
5.3.4 Setting counter-pressure, hopper plate and scraper knife contact pressure



See Fig. 5.9

See Fig. 5.8

Fig. 5.7



- (1) *Regulating valve hopper plate-contact pressure*
- (2) *Pressure gauge hopper plate-contact pressure*
- (3) *Regulating valve scraper counter-pressure*
- (4) *Pressure gauge scraper counter-pressure*

Fig. 5.8: *Adjustment of counter-pressure and hopper plate contact pressure*

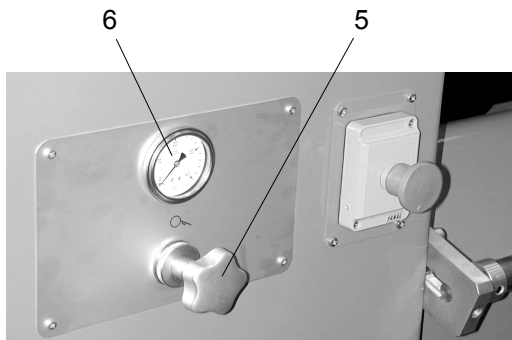


Fig. 5.9: Adjustment of scraper knife-contact pressure

- Set the hopper plate-contact pressure with the regulating valve (1): about 15 bar
- Set the scraper knife contact pressure with the regulating valve (5): about 10 bar
- Set counter-pressure with the regulating valve (3): about 8 bar.

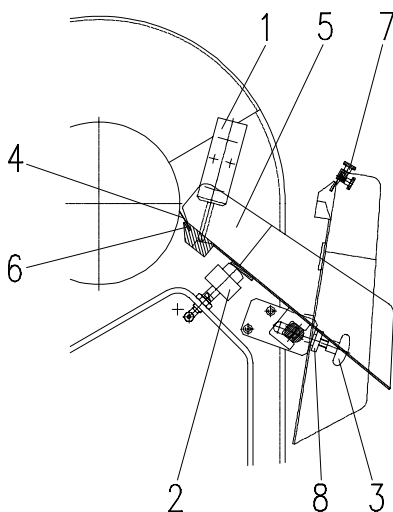
5.3.5 Inserting and fixing the scraper and setting it



DANGER!
 During cleaning, replacing of the scraper knife or swinging out the apron, always apply the scraper knife safety disassembly device (7).



- Notes:**
- The product throughput depends greatly on the correct setting of the scraper knife.
 - The edge of the scraper knife must not be damaged. Dress the blade carefully with a grinding stone.



- | | |
|------------------------------------|--------------------------------------|
| (1) Scraper knife contact cylinder | (6) Scraper knife holder |
| (2) Lifting device | (7) Scraper knife dismantling device |
| (3) Machine knob | (8) Knurled nut |
| (4) Scraper knife | |
| (5) Apron | |

Fig. 5.10

See Fig. 5.12.

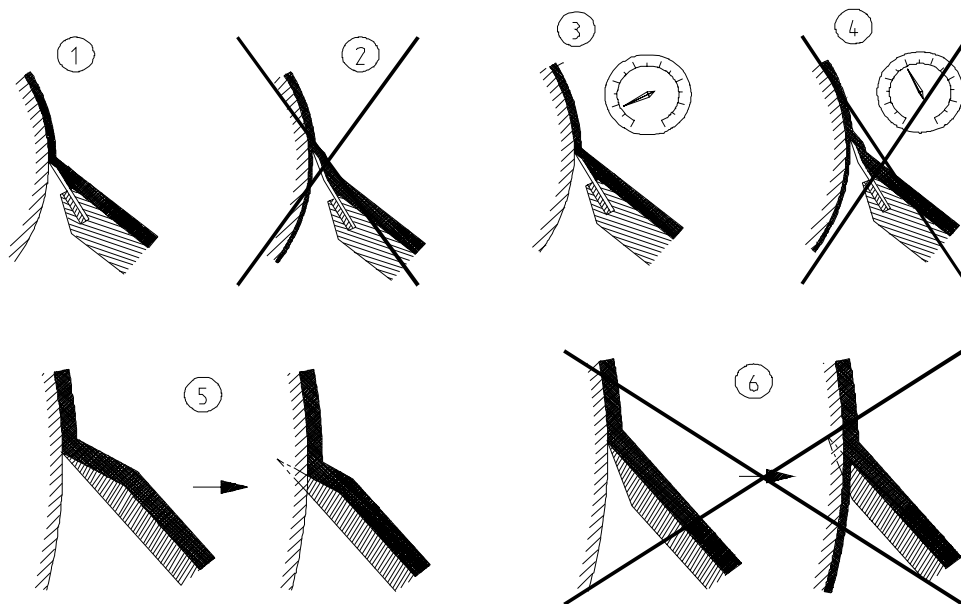
- Carefully insert the scraper knife (4) together with the scraper knife holder (6) into the slot of the apron (5).
- Swing the apron to the roll.
- Check whether the scraper knife (4) is in parallel to the roll:
 - On the left and the right, place one paper strip each between roll and scraper knife (4).
 - Shift the HV1 roll position lever to the “Grinding” mode.
 - Stop the hydraulic pump.
 - Pull out the paper strip upwards. The resistance must be equal in the case of both the paper strips.
 - Readjust if required:
Rotate the machine knobs (3).
 - Fix the setting with the knurled nut (8).



Note:

An apron equipped with a new scraper knife should be set to the top position. The apron can then be lowered as the product removal starts to deteriorate.

- Rotate the machine knobs (3) by $\frac{1}{2}$ revolution to the left.
- Fix with knurled nut (8).



- (1) **Correct:** scraper knife briefly inserted
→ complete product acceptance
- (2) **Incorrect:** scraper knife clamped too far
→ incomplete product removal
- (3) **Correct:** contact pressure correct
→ complete product acceptance
- (4) **Incorrect:** too much pressure bends the scraper knife
→ incomplete product removal
- (5) **Correct:** scraper knife correctly inserted (cut is visible)
- (6) **Incorrect:** scraper knife incorrectly inserted

Fig. 5.11

5.3.6 Level monitoring (option)

The ultrasonic probe is pre-set at the factory.

Without certification for the explosion-dangerous area

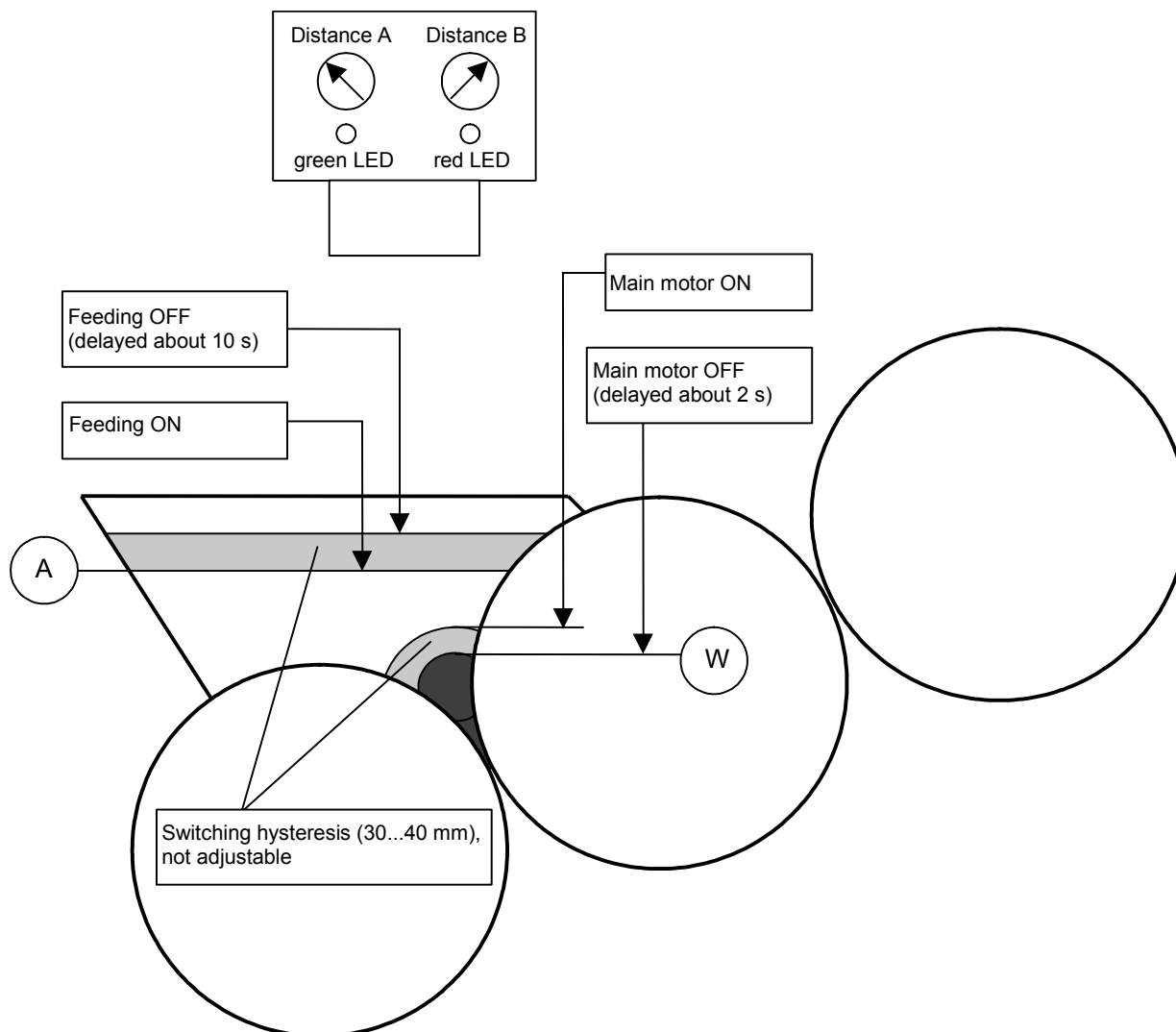


Fig. 5.12

The switching points of the product level (A) and (B) can be set on the ultrasonic probe with potentiometers.

- Left potentiometer: controls the feeding.
When the product level drops to (A), the feeding gets switched on.
When product level (C) (= product level (A) + hysteresis) is reached, after the value adjusted at the time relay the feeding gets switched off again.
- Right potentiometer: controls the main motor.
When the product level drops to (B), the main motor gets switched off after 2 s, so that the rolls do not rotate without product (dry run protection in case of shortage of product).
The main motor can only be restarted, if product level (D) (= product level (B) + hysteresis) is reached.

**Notes:**

- The switching point for product level (B) (dry run protection in case of product shortage) is set at the time of start-up and must not be readjusted any more. If not otherwise possible, adjust the cut-off time on the timer.
- Check the working of the ultrasonic probe weekly, also see sect. 7.2 "Maintenance and lubrication chart".
- If no production is to take place after the start-up, empty the product from the machine, see sect. 6.3.3 "Machine turning off".

Certified for the explosion-dangerous area

The parameters can be set with the 6 push buttons on the front panel of the measurement transducer FMU 860 (integrated in the control cabinet), also see separate documentation of the manufacturer.

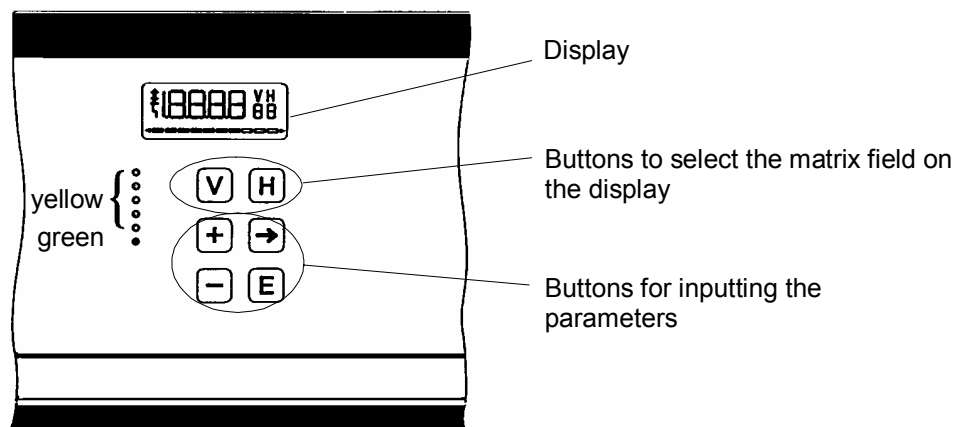


Fig. 5.13

- Buttons for selecting matrix fields:
 - V** Select vertical position.
 - H** Select horizontal position.
 - Press **V** + **H** simultaneously: display of matrix field jumps to V0H0.
- Buttons for inputting parameters:
 - The display jumps to the next numeric position in the display. The selected number flashes. The number can be changed.
 - Press **+** + **→** simultaneously: the decimal point is now moved one position to the right.
 - +** The flashing number is incremented by +1.
 - −** The flashing number is decremented by −1. If the cursor is at the extreme right, pressing several times switches to "+".
 - E** Confirm input and save (Return). When the matrix field is changed without pressing "E", the earlier value is retained.

Procedure

1. Cancel the input lock:
V9H6 → 0519 → E
2. General Reset (factory setting):
V9H5 → 0333 → E
3. Input probe type:
V0H4 → 80 → E
4. Max. measurement distance (equalisation "Empty" = 550 mm):
V0H1 → 0.550 → E
5. Input measurement range (equalisation "Full" = 190 mm):
V0H2 → 0.190 → E
6. Input filling/ measurement range (190 mm):
V0H6 → 190 → E
7. Activate relay "Fault" (= 1):
V3H3 → 1 → E
8. Set the relay 1 "Empty" (Switching on and release points in [mm], measured from the 0% point):
V1H0 → 1 → E
V1H1 → 0 → E
V1H2 → 20 → E
V1H3 → 18 → E
9. Set the relay 2 "Feeding" (Switching on and release points in [mm], measured from the 0% point):
V1H0 → 2 → E
V1H1 → 0 → E
V1H2 → 60 → E
V1H3 → 80 → E

**Note:**

Leave all the other values as they are (factory settings).

10. Activate input lock:
V9H6 → 111 → E
11. Activate display:
Press V and H simultaneously.

**Note:**

The measuring transducers can be synchronized at the synchronization connection to prevent interference by other machines in the proximity.

See also separate documentation of the manufacturer and wiring diagram.

Adjustment values

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0		0.550	0.19		80		190			
V1										
V2										
V3				1						
V4										
V5										
V6										
V7										
V8										
V9							111			

V1H0	V1H1	V1H2	V1H3	V1H4
Relay	Relay function	Switch-on point	Release point	Alternating pump controller
1	0	20	18	
2	0	60	80	
3				
4				
5				

Tab. 5.6

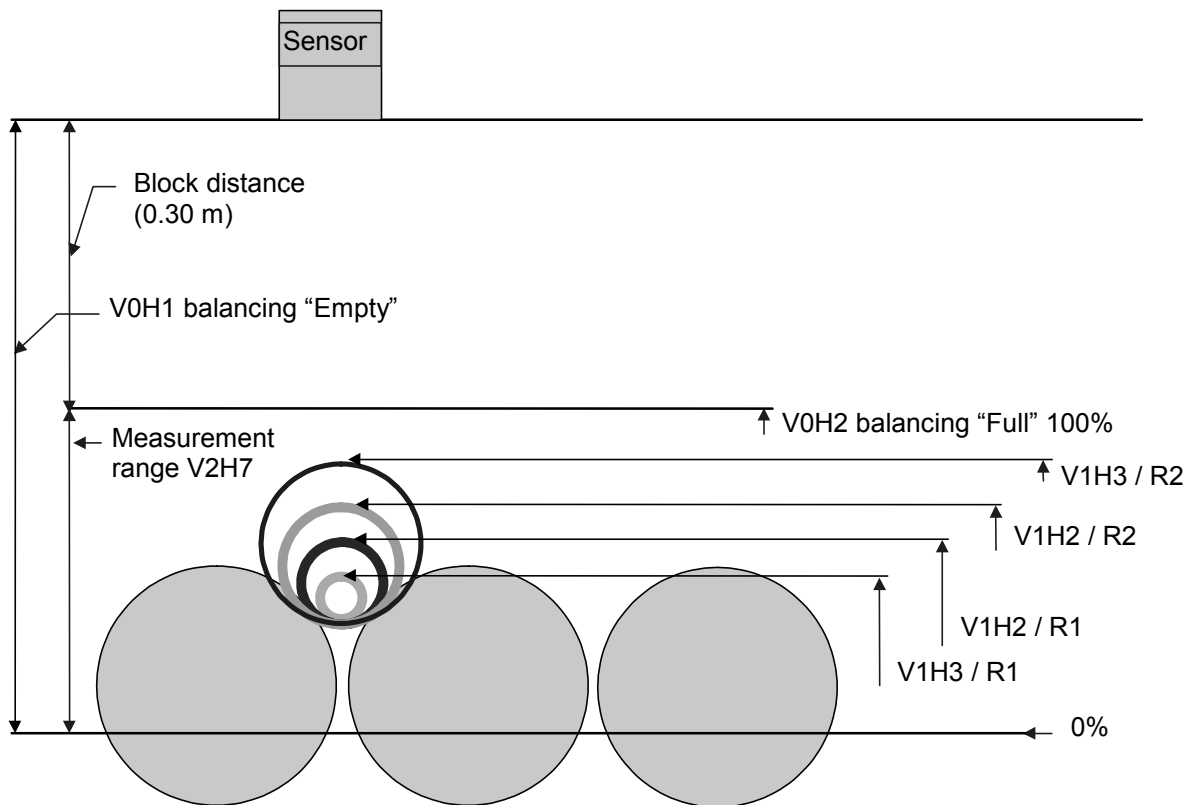


Fig. 5.14

5.3.7 Calibrating the position indicator (option)

The calibration of the position indicator in the handwheels simplifies the reproduction of the nip setting.



Note:

Calibrate the position indicator as far as possible with the same roll contact pressure, at which the machine is to be operated.

- Clean the rolls, see sect. 6.6.2.
- Switch on hydraulic pump motor.
- Shift the roll position lever to the “Grinding” mode.

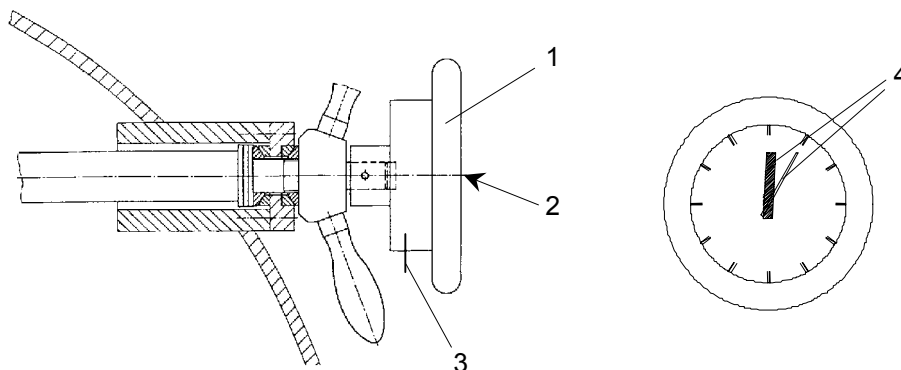


Fig. 5.15

- Rotate the handwheel (1) clockwise, till a slight resistance is felt and the pointer at the pressure gauge gets slightly deflected briefly.
- Loosen the headless screw (3) and rotate the position indicator (2) in the handwheel (1) to such an extent that both the pointers (4) overlap at “12 o'clock”.

Important: The handwheel (1) must not rotate along as well.

- Tighten the headless screw (3) firmly once again.
- Carry out this procedure on all 4 handwheels.

5.3.8 Filling hydraulic system (option)

On both the differential pressure valves HV6 (see Fig. 2.9), the cutover pressure “Grinding” – “Fill” and the differential pressure of the upper to the lower passage must be set (e.g. 7 bar).

- On the control panel (see Fig. 5.19), set the roll-contact pressure to the desired cutover pressure “Grinding” – “Fill” (e.g. 30 bar).



Notes:

- The cutover pressure should be, as far as possible, about 10 bar lower than the optimum roll contact pressure.
- In the cutover point ± 2 bar, the machine should not be operated.

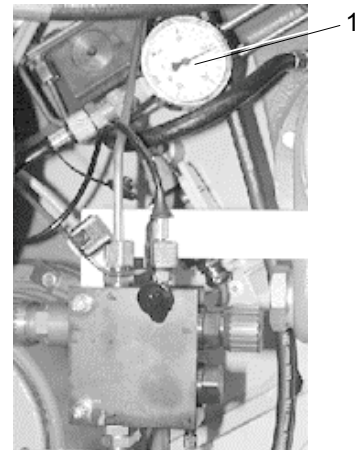
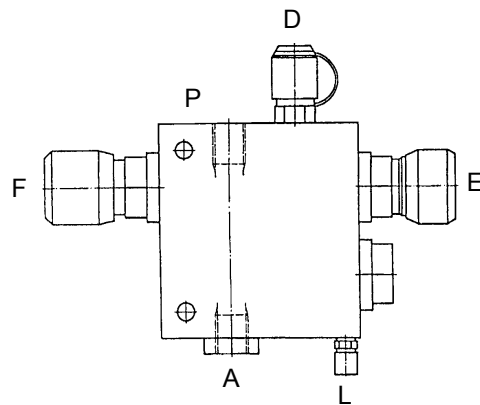


Fig. 5.16

- Differential pressure valve (F) opens.
- Toggle valve (E) closed.
- Connect the accompanying pressure gauge (1) at the connection (D).
- Set the desired differential pressure (e.g. 7 bar). To do so, rotate the differential pressure valve (F) till the desired pressure is reached.
- Read the differential pressure that has been set on the pressure gauge (1) and check it.
- Open the toggle valve (E) till on the pressure gauge (1), the display of the reduced pressure jumps back to the set roll-contact pressure (e.g. 30 bar).
- Reduce the roll contact pressure by about 3 bar:
 - The differential pressure gets set
 - The differential pressure can be read on the pressure gauge (1)
- Lock the toggle valve (E).
- The differential pressure can now still be corrected, if necessary, with the differential pressure valve (F).
- Lock the differential pressure valve (F).
- Check the setting:
 - Set the roll-contact pressure to toggle pressure + 2 bar.
 - The pressure gauge on the operating panel and the pressure gauge of the hydraulic filling system (1) must indicate the same pressure.
 - Set the roll-contact pressure to toggle pressure – 2 bar.
 - The pressure gauge of the hydraulic filling system shows the pressure of the first passage, reduced by the differential pressure that has been set.
(E.G. 30 bar – 7 bar = 23 bar)
- Separate the pressure gauge (1) from connection (D).

5.3.9 Tightening the V-belts



- Turn the allpole disconnecting lockable safety switch to “0” and secure against turning on.

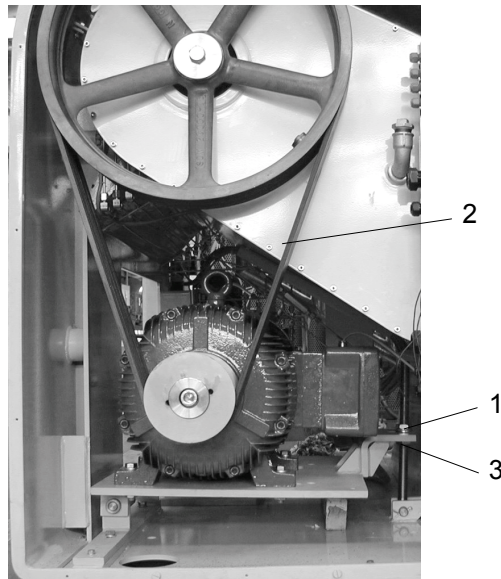


Fig. 5.17

- Remove the side cover.
- Loosen the lower nut (3) of the pivoted motor base.
- Tension the V-belts (2) with the upper nut (1).
- Counter the pivoted motor base with the lower nut (3)
- Re-fix the side cover.



Note:

The V-belts are correctly tensioned if they do not slip through when the machine is started.

5.3.10 Bucket tilting device (Option)

- Check the tilting functions “Lifting” and “Lowering”.
 - The bucket must only tilt, if the locking spindle is attached and locked in place.
- Adjust the speeds of the tilting functions.
 - Opening the cooling side door.
 - Adjust the speeds by means of the valves HV23, see sect. 2.3.14, Fig. 2.21.

5.3.11 Adjusting of minimum roll nip (option)

(Option with roll nip adjustment by gear wheels)

Set a minimum roll nip as follows:

- Stop main motor.
- Switch roll position lever into position „Grinding“.

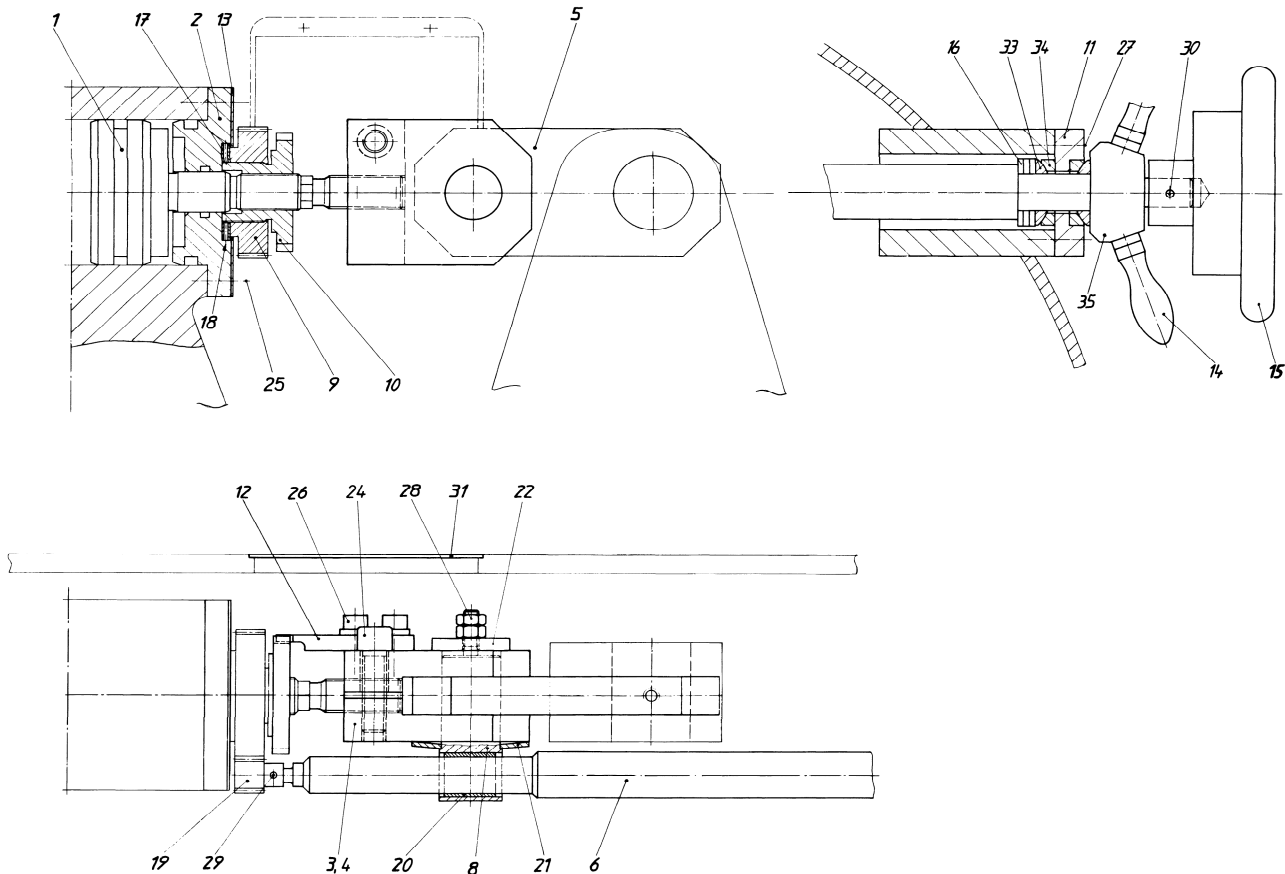


Fig. 5.18

- Remove side covers (31).
- Turn hand wheel (15) and move spur wheel (9) until it abuts on the spacer bush (10).
- Set the roll contact pressure to approx. 15 bar on the pressure reducing valves HV2 and HV3, see sect. 2.3.4, Fig. 2.9.
- Disengage locking device (12).
→ Spacer (10) can be turned.
- Use a hook spanner and move the spacer bush (10) towards the median bearing support until the desired minimum roll nip is obtained in the relevant passage.
- Move locking device (12) until it engages in the spacer bush (10) and tighten screws (26).
- Reset the former roll contact pressure at the pressure reducing valves HV2 and HV3.



Note:

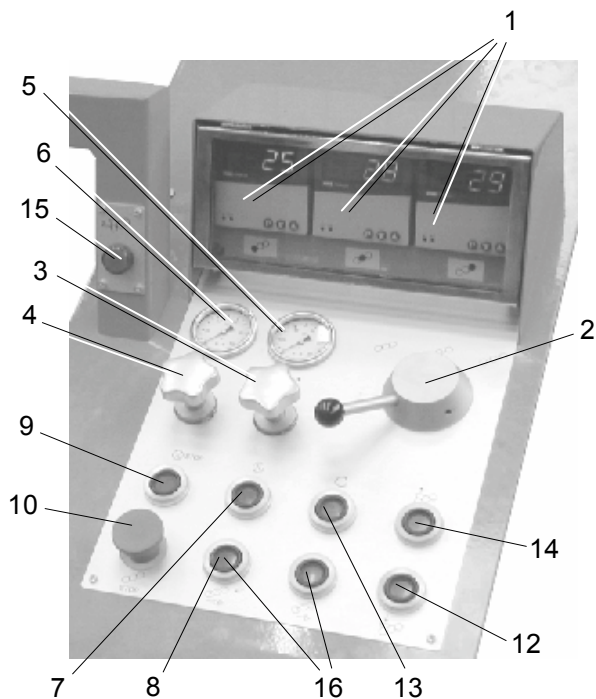
The roll nip adjustable by turning the hand wheel (15) can not be smaller than the minimum roll nip.

5.4 Inspection of functions

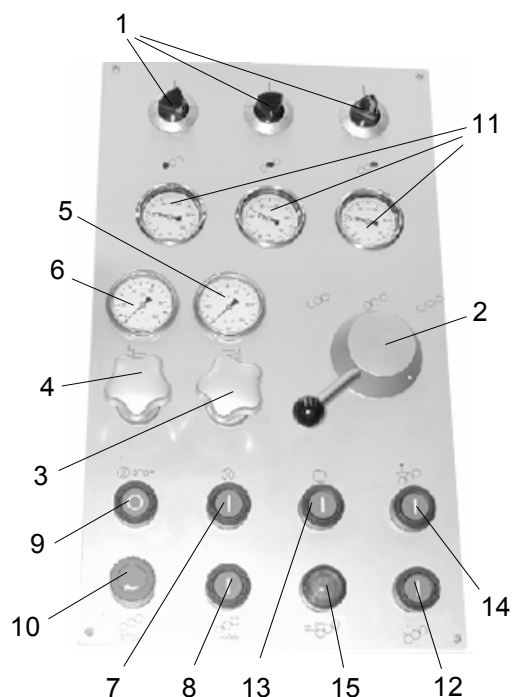


Note:

Only locally authorised specialist personnel (electrical installers) must carry out inspection work on electrical components of the machine and the machine control cabinet.



Design without permission for explosion-dangerous areas



Design with permission for the explosion-dangerous area

- (1) Temperature regulator
- (2) Roll position lever (HV1) for operating modes "Loosen", "Mixing", "Grinding"
- (3) Regulating valve for roll contact pressure, cooling side
- (4) Regulating valve for roll contact pressure, drive side
- (5) Manometer for roll contact pressure, cooling side
- (6) Manometer for roll contact pressure, drive side
- (7) Push button (S262) "Hydraulic pump ON"
- (8) Push button (S291) "Hydraulic motor ON"
- (9) Push button (S261) "Hydraulic pump OFF"
- (10) Emergency stop button (S263 ... S266)
- (11) Thermometer for cooling water (roll temperature)

Options:

- (12) Push button (351) "Feeding ON" / "Tilting device DOWN"
- (13) Push button (S362) "Automatic feeding system ON"
- (14) push button (S361) "Feeding STOP" / "Tilting device UP"
- (15) Indicator lamp (H351) "Product level LOW"
- (16) In case of design with main motor with 2 rotational speeds:
Push button (S292) "Main motor SLOW"
Push button (S293) "Main motor FAST"

Fig. 5.19: Control panel

5.4.1 Inspection of machine functions

Direction of rotation of the hydraulic pump motor

See Fig. 5.19 "Control panel".

- Turn the all-pole disconnecting lockable safety switch to „I“.
- Turn on the motor circuit switch.
- Switch on hydraulic pump motor:
Press the push button "Hydraulic pump ON" (7).
- Inspect the rotational direction of the motor of the hydraulic pump:
from above, looking down on the motor, it should be clockwise.
- Inspect whether the switch-on hydraulic pump is generating pressure.
If not:
 - Check whether the rotational direction of the motor of the hydraulic pump is incorrect.
 - Check whether the hydraulic tank is filled sufficiently with hydraulic oil, see sect. 2.3.4 "Hydraulic system".
- Switch off hydraulic pump motor:
Press the push button "Hydraulic pump OFF" (9).

Direction of rotation of the rolls

See Fig. 5.19 "Control panel".

- Turn the all-pole disconnecting lockable safety switch to „I“.
- Turn on the motor circuit switch.
- Ensure that the roll position lever (2) is set to the operating mode "Loosen" and that the safety bar is inserted.
- Switch on hydraulic pump motor:
Press the push button "Hydraulic pump ON" (7).
- Switch on main motor:
Press the push button "Main motor ON" (8).
- Check the directions of rotation of the rolls.
- Switch off the main motor with emergency stop button (10).
- Switch off hydraulic pump motor:
Press the push button "Hydraulic pump OFF" (9).

5.4.2 Checking the safety functions

Emergency stop



Note:

Upon actuation of the emergency stop button, the main motor must get switched off immediately.

See Fig. 5.19 "Control panel".

- Turn the all-pole disconnecting lockable safety switch to „I“.
- Turn on the motor circuit switch.
- Set the roll position lever (2) to the operating mode "Loosen".
- Insert safety bar.
- Switch on hydraulic pump motor:
Press the push button "Hydraulic pump ON" (7).
- Press the emergency stop button (10).
→ The emergency stop button (10) must remain in the pressed position.

- Press the push button “Main motor ON” (8).
→ The main motor must not start.
- Release the emergency stop button (10).
Press the push button “Main motor ON” (8).
→ The main motor starts.
- Press the emergency stop button (10).
→ The main motor must immediately switch off.
→ The hydraulic system remains in operation.
- Carry out the function testing for each of the 4 emergency stop buttons.

Safety bar



Note:

The main motor can only start in the operating mode “Loosen” if the safety bar is inserted.

See Fig. 5.19 “Control panel”.

- Turn the all-pole disconnecting lockable safety switch to „I”.
- Turn on the motor circuit switch.
- Set the roll position lever (2) to the operating mode “Loosen”.
- Remove the safety bar and hopper plates.
- Switch on hydraulic pump motor:
Press the push button “Hydraulic pump ON” (7).
- Press the push button “Main motor ON” (8).
→ The main motor must not start.
- Switch off hydraulic pump motor:
Press the push button “Hydraulic pump OFF” (9).
- Insert the hopper plates.
- Switch on hydraulic pump motor:
Press the push button “Hydraulic pump ON” (7).
- Press the push button “Main motor ON” (8).
→ The main motor must not start.
- Switch off hydraulic pump motor:
Press the push button “Hydraulic pump OFF” (9).
- Remove the safety bar and insert the hopper plates.
- Switch on hydraulic pump motor:
Press the push button “Hydraulic pump ON” (7).
- Switch on main motor:
Press the push button “Main motor ON” (8).
→ The main motor starts.
- Pull the plug of pressure switch S271.
→ The main motor must immediately switch off.
- Insert the plug of the pressure switch S271.
Pull the plug of pressure switch S272.
Press the push button “Main motor ON” (8).
→ The main motor must not start.
- Insert the plug of the pressure switch S272.
- Press the push button “Main motor on” (8):
→ The main motor starts.
- Switch off the main motor with emergency stop button (10).
- Switch off hydraulic pump motor:
Press the push button “Hydraulic pump OFF” (9).

5.5 Checking EU conformity



Within the EU, the machine must not be taken into service until its EU conformity has been checked and confirmed by means of the check list.

- **Start-up of the machine by Bühler AG**
Having met the checklist, Bühler AG will hand over the Declaration on EU Conformity and attach the CE mark to the machine below the nameplate or to the control cabinet of the plant.
- **Start-up of the machine by third parties**
In case of commissioning by a third party, the owner/operator is responsible for checking the EU-conformity with the help of the checklist.

Check list for establishing EU conformity

- The operator is informed that personnel must have access to the operating instructions and that he is responsible for the personnel being familiar with these operating instructions.
- The assembly and installation work have been carried out according to the operating instructions.
- All the safety-relevant procedures and checks were carried out according to the checklist by the person carrying out the commissioning:
 - The 4 transport screws are removed and the threads are covered, see *sect. 3, Fig. 3.1.*
 - All protection devices and safety devices are intact and in working order, see *sect. 5.3.9.*
 - The machine covers are firmly tightened.
 - The scraper knife disassembly device and the safety bar are provided.
 - The machine immediately stops when the individual emergency stop buttons are actuated.
The machine does not automatically start again after emergency stop button has been reset.
 - An all-pole isolating lockable main switch is provided,
The operating or maintenance personnel are in possession of a suitable padlock.
 - The machine cannot be started when the main switch is in the “0” position.
 - In the operating mode “Loosen”, the machine can only be started with safety bar.
 - The machine cannot be switched directly from the “Grinding” to “Loosen” mode or vice versa with rotating rolls.
 - In the case of the option level control:
In operating modes “Mixing” and “Grinding”, the main motor can only be started with product. (Exception: the inching mode, for which the push button Main motor ON is to be kept pressed.)
 - In the case of the option protective cover:
When the protective cover is opened, the machine switches off immediately.
 - The hydraulic unit is correctly filled with hydraulic oil, see *sect. 2.5.2 and sect. 7.2.*
 - The gear casing is correctly filled with oil, see *sect. 2.5.3 and sect. 7.2.*

- On the support cover on the drive side, there is a warning sign put up “When cleaning the rolls, insert the safety bar”.
- The following warning sign is put on the cover on the drive side:



6 Operation

6.1 General



Note:

The machine must only be operated when the protection devices are intact and the safety equipment is operational, see sect. 5.2 and sect. 5.5.

Only specially trained and instructed personnel must operate the machine.



EXPLOSION HAZARD!

Do not use any explosion-dangerous products if the machine is not authorised for operation in explosion-dangerous areas.

In the roll positions “Grinding”, “Mixing” and when discharging the machine, do not allow the rolls to run dry.



DANGER!

Only operate the machine with intact protection and operational safety devices.

Do not reach into the nip. Do not insert any object (such as a spatula).



DANGER OF GETTING CAUGHT!

Do not wear thick protective gloves which impede the capacity of tactile sensation of your fingers.



Run the machine only with products of the temperature class according to the certification for the explosion-dangerous area, see sect. 2.1 “Identification”.



During operation, the machine must be monitored in a way that the operating personnel can react to operating failures.



Immediately stop the machine in the event of unusual running noise.



When running the machine empty, observe the product inflow closely. If there are foreign objects present, immediately switch off the machine.



Product vessels and installation must correspond to the ATEX 95 directive.



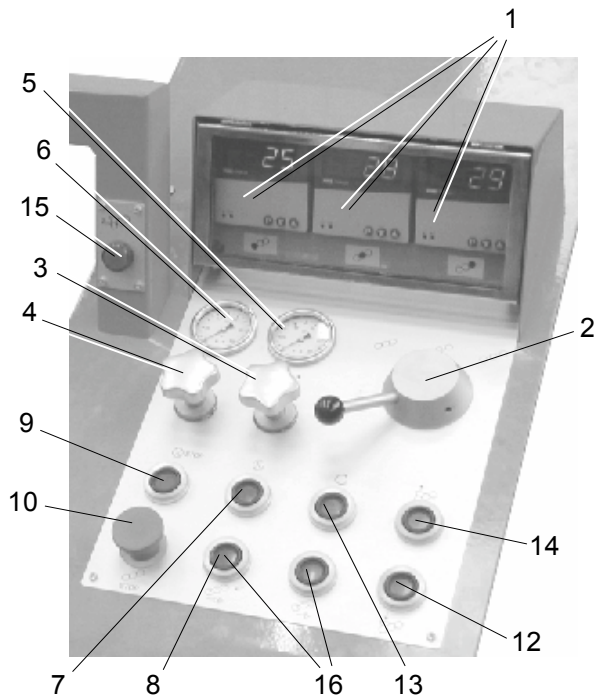
Keep safety limit switches, positioning switches, level monitoring etc. in an operational condition.

- Before operation of the machine make sure about function and operation of the emergency stop switch, see sect. 6.3.4 “Emergency stop”.
- The side cover must be kept closed during operation.
- If the machine is equipped with a protective cover (option), it must be operated only with installed protective cover.
- Repair leaky pipes immediately.

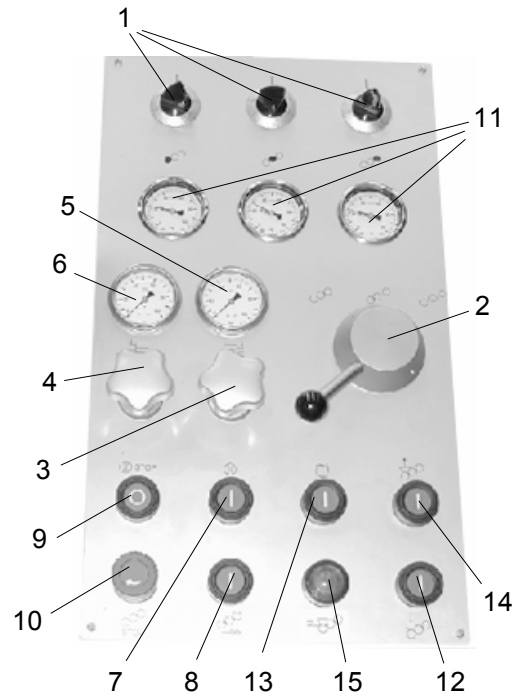
- With respect to your personal safety equipment, observe the applicable industrial safety regulations.
- During operation of the machine and cleaning of the rolls, protective glasses must always be worn.



6.2 Control panel



Design without permission for explosion-dangerous areas



Design with permission for the explosion-dangerous area

- (1) Temperature regulator
- (2) Roll position lever (HV1) for operating modes "Loosen", "Mixing", "Grinding"
- (3) Regulating valve for roll contact pressure, cooling side
- (4) Regulating valve for roll contact pressure, drive side
- (5) Manometer for roll contact pressure, cooling side
- (6) Manometer for roll contact pressure, drive side
- (7) Push button (S262) "Hydraulic pump ON"
- (8) Push button (S291) "Hydraulic motor ON"
- (9) Push button (S261) "Hydraulic pump OFF"
- (10) Emergency stop button (S263 ... S266)
- (11) Thermometer for cooling water (roll temperature)

Options:

- (12) Push button (351) "Feeding ON" / "Tilting device DOWN"
- (13) Push button (S362) "Automatic feeding system ON"
- (14) push button (S361) "Feeding STOP" / "Tilting device UP"
- (15) Indicator lamp (H351) "Product level LOW"
- (16) In case of design with main motor with 2 rotational speeds:
 Push button (S292) "Main motor SLOW"
 Push button (S293) "Main motor FAST"

Fig. 6.1

Functions

See Fig. 6.1.

- (7) Push button (S262) "Hydraulic pump ON"
Switch on hydraulic system.
(Only active when the main switch of the controller is switched on.)
- (8) Push button (S291) "Hydraulic motor ON"
Switch on the main motor.
In the case of the option level control, with insufficient product and operating mode "Grinding" or "Mixing" the main motor runs for as long as the button is kept pressed. (→ empty the product trough)
- (9) Push button (S261) "Hydraulic pump OFF"
Switch off hydraulic system.



CAUTION!

When the rolls are rotating, do **not** press the push button (9) "Hydraulic pump OFF": Stop the hydraulic and main motors and product can get thrown off from the disengaging rolls.

- (10) Emergency stop button (S263 ... S266)
Switch off main motor. The hydraulic pump remains in operation and must be switched off with the push button (9) "Hydraulic pump OFF".
To start the main motor again, release the button by turning or pulling.

Options:

- (12) Push button (S351) "Feeding ON"
Start according to the design
 - Product pump,
 - Squeezing device
 - or function "Tilting device DOWN".
- (13) Push button (S362) "Automatic feeding system ON"
Switch on automatic feeding system. (Product level is regulated by a level controller.)
According to the design, the following are started
 - Product pump,
 - Squeezing device
 - or Bucket tilting device.

In case of a shortage of product, the machine switches off with a delay via a timer. The red indicator lamp (H351) gets lit, see sect. 2.3.11, sect. 5.3.6 and Fig. 6.1.
- (14) Push button (S361) "Feeding STOP" / "Tilting device UP"
Switch off the automatic feeding.
In the case of the bucket tilting device option, the solenoid valve (HV28), see Fig. 2.21, is actuated till the button is pressed.

6.3 Operation

6.3.1 Prepare the start

See Fig. 6.1 "Control panel".

- Clean the rolls, (remove any rust protection if present), *also see sect. 6.6.2.*
- Ensure that the scraper knife and scraper knife holder are inserted correctly, *see sect. 5.3.5.*
- Swing in the apron.
- Insert the hopper plates and trough wall.
- Open the water cock.
- Turn the all-pole separating, lockable safety switch to "I".
- Press the push button "Hydraulic pump ON" (7).
→ The hydraulic pump gets switched on.
- Set the individual roll temperatures at the temperature regulators (1).
- Shift the roll position lever (2) to the "Mixing" mode.
- By rotating the regulating valves (3) and (4), set the optimum roll contact pressure, *see sect. 5.3.2.*
Check the readings of the pressure gauges (5) and (6).
- Check the hopper plate contact pressure, *see sect. 5.3.4, Fig. 5.8.*
- Check the scraper knife-contact pressure, *see sect. 5.3.4, Fig. 5.9.*
- Check whether the scraper knife is installed in parallel to the roll, *see sect. 5.3.5, Fig. 5.11.*
If necessary, adjust with adjusting screws.
- Place an empty product vessel under the apron.

6.3.2 Starting the machine

See Fig. 6.1 "Control panel".

- Load the roll mill with product.
- Press the push button "Main motor ON" (8).
→ The rolls start rotating.



CAUTION!

Only allow the rolls to rotate in the "Grinding" or "Mixing" mode **with product**, otherwise they will be damaged.

- When the desired temperature is reached, put the roll position lever (2) to operating mode "Grinding".
- In the case of the option level control:
Press the push button "Automatic feeding system ON" (13).
- Check the product delivery of the scraper knife.
If necessary, correct, *see sect. 5.3.5.*
- If necessary, use the regulating valves (3) and (4) to regulate the roll contact pressure. To do so, on the drive side, set a somewhat higher pressure (compensate gear wheel pressure).

6.3.3 Machine turning off



When running the machine empty, observe the product inflow closely. If there are foreign objects present, immediately switch off the machine.

See Fig. 6.1 "Control panel".

- If there is only a little product in the tank, set the roll position lever (2) to operating mode "Mixing".
- Switch off the main motor by actuating an emergency stop button (10).
→ The rolls stop.
- Press the push button "Hydraulic pump OFF" (9).
→ The hydraulic pump motor gets switched off.
- In the case of the model with level control (option):
To empty the machine of product, keep the push button "Main motor ON" (8) pressed till only a little product is present in the tank.
When the button is released, the main motor immediately gets switched off.
- At the end of production clean the machine and rolls, see sect. 6.6.
- In case of prolonged operation pauses, close the cooling water cut-off valves.



Note:

- The machine stops automatically in case of*
- *shortage of cooling water,*
 - *too little product level (in case of option level control);*
- or if the following safety devices get actuated:*
- *overpressure safety control device (1st passage)*
 - *thermo-relay hydraulic pump motor*
 - *main motor thermal relay*

6.3.4 Emergency stop

Emergency stop button

The machine is equipped with four emergency stop buttons. Upon actuation of an emergency stop button on the machine, only the roll drive (main motor) gets switched off immediately. The hydraulic pump continues to run and the rolls finish rotating, also see sect. 5.4.2.

Restart after emergency stop

1. Eliminate the fault source, see sect. 6.6.
2. Release the emergency stop push button.
3. Restart the machine using the control system.



Notes:

- *Release the emergency stop button and start the machine after an emergency stop only when the cause of fault has been rectified. see sect. 6.7 "Faults and troubleshooting".*
- *Only operate the machine when the protection devices are intact and the safety equipment is operational, see chap. 5.*

6.4 Roll nip setting (option)

The roll nip setting is suitable for processing low-viscosity “short” products which otherwise would be difficult to be drawn into the nip.
 By turning the handwheels (1), the pressed rolls can be mechanically released. There is a gap.

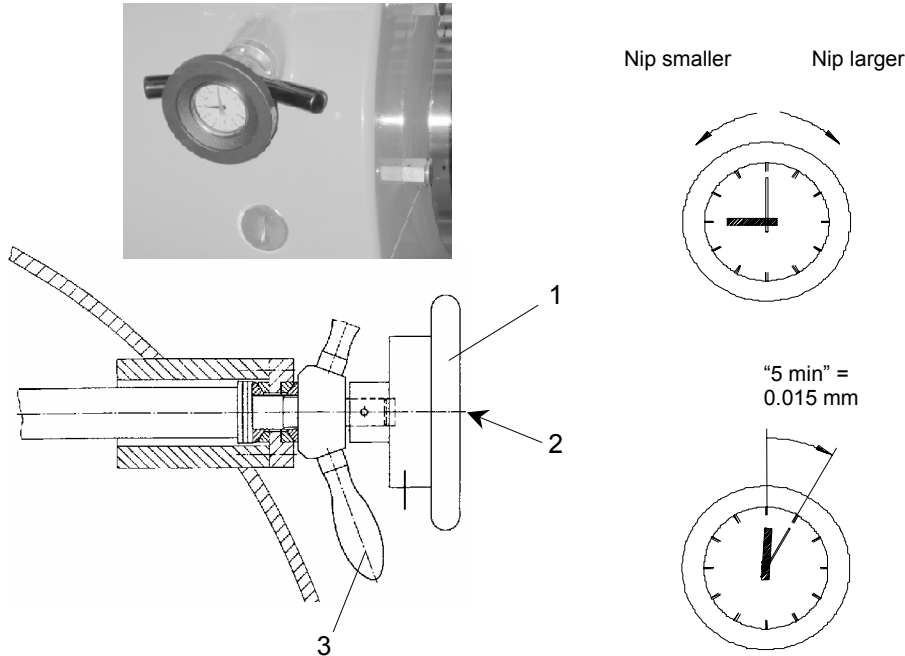


Fig. 6.2: Handwheel with position indicator

The mechanical roll nip setting uses four spindles (2 for each passage):

- Turn the handwheels (1) clockwise.
→ The roll nip increases.
- Turn the handwheels (1) anticlockwise.
→ The roll nip decreases.

In each of the handwheels, one position indicator (2) is provided.

The nip is reproducible with the help of a pointer-pair:

- Small red hand: movement unidirectional to the handwheel, 1:12 reduction ratio
- Large black hand: movement unidirectional to the handwheel, no reduction

	Execution with spindle	Execution with spindle and gear wheels
1 turn on the handwheel ("60 min"):	0.388 mm	0.143 mm
1/12 turn on the handwheel ("5 min"):	0.032 mm	0.012 mm

The handle (3) locks the handwheel (1) against unintentional adjustment.



Notes:

- In case of wear of the rolls and roll changing, the nip must be set afresh.
- The roll nip in the 2nd passage can show a slightly smaller distance than in the 1st passage (approx. 1/3 of the 1st passage).
- After operation with the nip setting, the position indicators (2) must be rotated back three revolutions in the counter-clockwise direction so that the pointers point to "9 o'clock".
- The nip setting is adjustable with the rolls pressed together.

6.5 Instructions for operation

- When hard foreign objects are drawn in between the rolls, a hydraulic overload protection device switches off the main motor to prevent damage to the rolls and antifriction bearings.
Remove the foreign objects so drawn in and visually check the machine for damage.
- Use product-compatible lubricant for the hopper plates.
- If necessary, exactly regulate the roll-contact pressure to the left or right, so that the product film is uniform, see sect. 2.3.4.
- Regulate the roll cooling in such a way that the product is processed in an optimum manner, see sect. 2.3.6.
- Use only scraper knives that are well ground, so that the product is taken off uniformly and completely.
- Press the scraper knife with as little pressure as possible on the rolls. However, the product must be taken off completely, see sect. 5.3.4 and sect. 5.3.5.
- If the product take-off of the scraper knife is insufficient after a certain operating time adjust the knurled screws equally towards the left by approx. half a turn, see sect. 2.3.9.
→ The scraper knife is moved downwards.
- Keep the hopper plate contact pressure as low as possible (wear), see sect. 5.3.4.
- In operating mode "Mixing", the following deployment options are available:
 - Mixing of badly pre-mixed product;
 - Product mixing of different base pastes that are already fine-ground;
 - Addition of small quantities of liquid and pasty additives;
 - Pre-heating the product;
 - Bridging short production pauses, e.g. when the product tank is replaced.
- If the rolls cannot be contact pressed, check whether a minimum roll nip (option) is set, see sect. 5.3.11.

6.5.1 "Sifting"

During operation, large particles, impurities etc. collect in the 1st roll nip. These are drawn in at the end of the batch.

To protect the scraper knife and protect already processed product from contamination:

- Switch off the main motor.
- Remove the remaining product or dilute it with processed product.



Note:

Accumulations of large particles suggest insufficient pre-mixing of the product. The product particles should be < 100 µm before processing in the machine.

6.5.2 Process parameters

- Roll speeds
- Roll contact pressures
- Roll temperatures

Influence of roll contact pressure and roll temperature

Process parameters	Modification	→ Product quality	→ Rate
Temperature	>	+	<
Temperature	<	–	>
Pressure	>	+	<
Pressure	<	–	>
Temperature profile ⁹	Standard: Temperature of roll 3 = Temperature of roll 2 – 5° C		

Tab. 6.7

The temperature profile influences the product transfer:
More product will be transferred onto roll 3 if it is colder than roll 2.



Note:

The cambered chilled-iron rolls are only suitable for operation in a narrow contact pressure range, see sect. 2.3.3.

⁹ Dependent on product.

6.6 Cleaning



Note:

The cleaning intervals depend on the product, the place and the climate. Therefore, observe the outer conditions.

6.6.1 Cleaning the machine



DANGER OF GETTING CAUGHT!

Do not wear thick protective gloves which impede the capacity of tactile sensation of your fingers.



- Only carry out any cleaning works when the machine is switched off (all machine motions have stopped).
Turn the all-pole disconnecting lockable safety switch to “0” and secure against turning on.



Only use cleaning agents up to temperature class T3 in conformity with the permission of the machine for the explosion-dangerous area, see sect. 2.1 “Identification”.



During all maintenance and cleaning work, avoid the build-up of ignitable solvent fumes.



Remove any dust and dirt deposits on the machine.

- Do not use acid to decalcify or clean the cooling system.
- Use a damp cloth only without any solvent for cleaning electrical cables.
- Ensure sufficient ventilation.
For MAK values, see *safety data sheet of the solvent manufacturer*.
- If the machine is used for foodstuffs, clean only with hot water and dry.

6.6.2 Cleaning of the rolls



DANGER OF GETTING CAUGHT!

Do not wear thick protective gloves which impede the capacity of tactile sensation of your fingers.

Do not wear long, wide sleeves. The sleeves may get caught between the rolls.



CAUTION!

The roll surface is very impact-sensitive: prevent, without fail, foreign objects from falling on the rolls or being drawn into them.



Notes:

To provide optimal cleaning of the rolls, we recommend using a special cleaning paste (recipe available from Bühler AG):

- The cleaning paste has a re-greasing effect and protects the rolls.
- Lower amounts of expensive cleaning agent are necessary.

See Fig. 6.1 “Control panel”.

- Apply 1 ... 2 spatulas of cleaning paste on the surface of roll 1.
- Operate the machine for 1 ... 2 min in the “Mixing” mode.
→ Cleaning paste is mixed with the product residue on the roll surface.
- Shift the roll position lever (2) to the “Grinding” mode.
→ Cleaning paste passes through the machine.

**Note:**

In the case of the option level control keep push button "Main motor ON" (8) held down till only a little cleaning paste remains between the rolls.

**CAUTION!**

Only allow the rolls to rotate in the "Grinding" or "Mixing" mode **with cleaning paste**, otherwise they will be damaged.

- Press the emergency stop button (10).
- Remove the cleaning paste from the apron.
- Set the roll position lever (2) to the operating mode "Loosen".
- Remove and clean splash plates, trough wall and hopper plates.

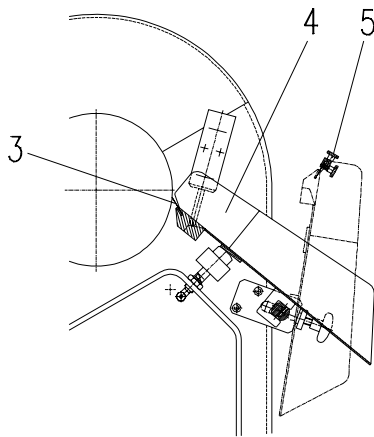


Fig. 6.3

- Cover the scraper knife (3) with the scraper knife disassembly device (5) and remove it
or
- Remove the apron (4).

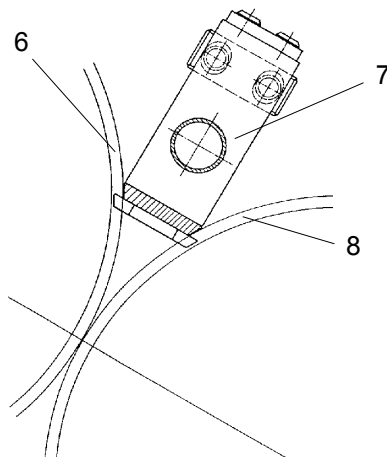


Fig. 6.4

- Insert the safety bar (7) between roll 1 (8) and roll 2 (6), also see sect. 2.3.10 "Safety bar".



DANGER OF GETTING CAUGHT!

Do not wear thick protective gloves which impede the capacity of tactile sensation of your fingers.

Do not wear long, wide sleeves. The sleeves may get caught between the rolls.



Notes:

- Use a tear proof cleaning cloth for cleaning the rolls; **do not use fraying fabrics** such as cleaning wool etc.
Soak the cleaning cloth with a cleaning agent or a solvent.
- Hold the cleaning cloth with your fist, **do not use your flat hand** (to protect your fingers).

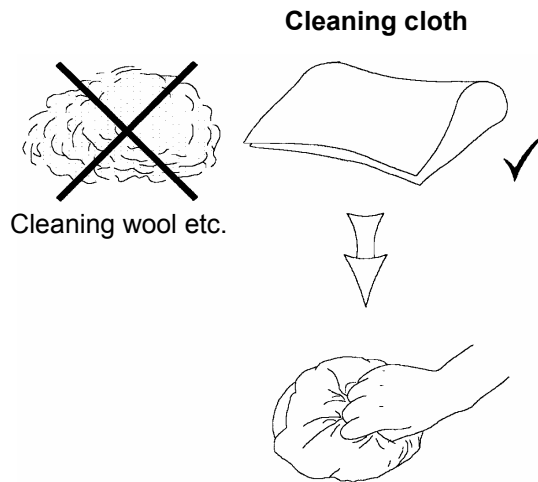
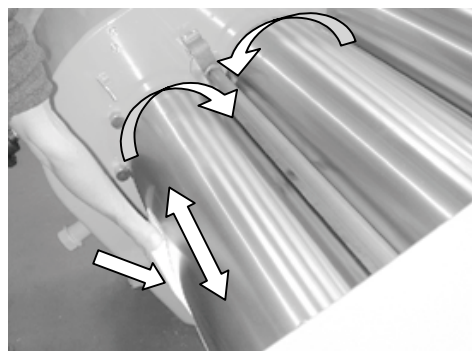
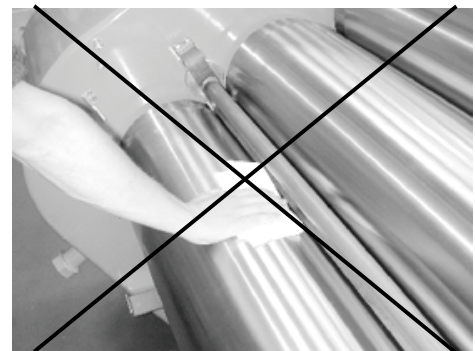


Fig. 6.5

Cleaning the first roll



Correct



Incorrect

Fig. 6.6: 1. Clean the roll

- Safety bar is inserted.
- Hold the cleaning cloth firmly with your fist. Press on the roll 1 with downwards facing fist.



DANGER OF GETTING CAUGHT!

Keep away from the nip of the roll 1.

- Put a cleaning cloth around a spatula and keep it on the roll collar.



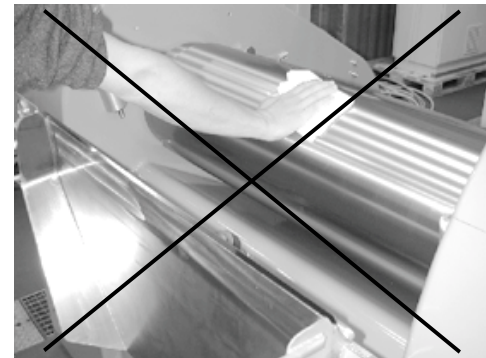
Fig. 6.7

Cleaning the second and third roll

- Remove the apron and scraper knife, see Fig. 6.3.



Correct



Incorrect

Fig. 6.8: Cleaning the rolls 2 and 3

- Hold the cleaning cloth firmly with your fist. Push into the 2nd nip between the rolls 2 and 3.

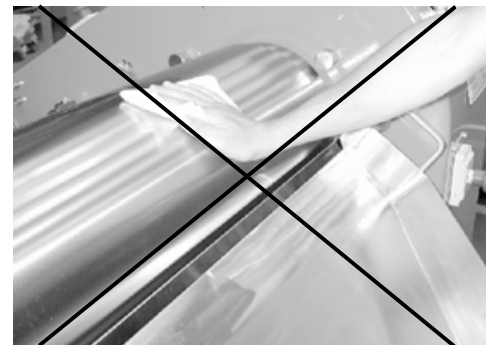


Fig. 6.9



DANGER!

Do not clean the roll 3 with the apron mounted or with the scraper knife inserted!

- After roll cleaning:
 - Remove the safety bar.
 - Switch off the hydraulic pump.
 - Put the cleaned hopper plates, aprons etc. back in the machine.

6.7 Faults and troubleshooting

In case of faults determine the fault case and eliminate the fault.



Note:

For elimination of faults contact trained and authorised specialist personnel.



DANGER!

When working in the area of driven or energised components, turn the all-pole disconnecting lockable safety switch to “0” and secure against turning on.

Fault	Possible cause	Troubleshooting	See sect.
Main motor / pump motor fails	No supply voltage.	Establish and correct the fault in the power supply.	
	Main fuse is switched off.	Rectify the cause of fault (short-circuit, short to earth etc.). Check the motor protection circuit breaker. Switch on the main fuse again.	
Main motor fails	Emergency stop push button is pressed down.	Release the emergency stop push button.	6.2
	No cooling water pressure	Open the water cock. Ensure the cooling water inflow.	
	Protective cover (option) not installed.	Install protective cover (option).	2.3.15
	In “Loosen” mode: safety bar is not inserted.	Insert safety bar. Check electric contact.	2.3.10
	No cooling water pressure	Ensure cooling water inlet; open water inlet	
	Ultrasonic sensor of the level monitoring (option) contamination.	Clean membrane of the ultrasonic sensor.	2.3.11 5.3.6
	Product level too low.	Load the roll mill with product.	
Product temperature too high	Water valve is shut.	Open water valve.	
	Insufficient cooling water level.	Clean the cooling water filter. Replace, if necessary.	
	Cooling water valve does not open.	Clean the cooling water valve. Replace coil or complete valve, if necessary.	
	Lime or other deposits in the rolls.	Clean rolls internally or get them overhauled.	
Product temperature too low	Cooling water valve does not close.	Clean the cooling water valve. Replace coil or complete valve, if necessary.	
Hydraulic pressure varies	Level in the tank too low.	Check oil level. If necessary, refill oil.	2.5.2 7.2
	Hydraulic pump defective.	Replace the hydraulic pump.	2.3.4

Fault	Possible cause	Troubleshooting	See sect.
Hydraulic pressure too low	Oil flow rate is too low.	Clean the suction filter in the oil tank. Replace, if necessary.	
	Hydraulic pump defective.	Replace the hydraulic pump.	2.3.4
Hydraulic pressure too high	Pressure control valve defective.	Replace pressure control valve.	2.3.4
Roll contact pressure too high	Control valve defective.	Clean control valve. Replace coil or complete valve, if necessary.	2.3.4
Roll contact pressure too low	Control valve defective.	Clean control valve. Replace coil or complete valve, if necessary.	2.3.4
	Hydraulic pump defective.	Check the coupling / pump. Replace, if necessary.	2.3.4
	Piston gasket faulty.	Replace piston gasket.	
Irregular product delivery	Scraper knife worn.	Replace scraper knife.	
	Scraper knife wrongly inserted or not parallel to roll.	Clamp the scraper knife correctly.	5.3.5
	Scraper knife contact pressure too high.	Reduce scraper knife contact pressure.	5.3.4
Product throughput too low	Roll contact pressure too high.	Reduce roll contact pressure.	2.3.4
	Scraper knife worn.	Replace scraper knife.	
	Scraper knife incorrectly inserted.	Clamp the scraper knife correctly.	5.3.5
	Scraper knife contact pressure too high.	Reduce scraper knife contact pressure.	2.3.4 5.3.4
Product throughput too high	Nip setting still active.	Turn back the handwheel of the nip setting.	6.4
High water consumption	Lime or other deposits in the rolls.	Clean rolls or get them overhauled.	
Roll contact pressure "pulsating"	Faulty antifriction bearing causes vibration of the rolls or noisy running.	Replace antifriction bearing.	

Tab. 6.8

7 Maintenance

7.1 General

Only personnel authorised by the operator must carry out maintenance work according to the operator's safety instructions.

Only locally authorised specialist personnel (electrical installers) must carry out maintenance work on electrical components of the machine.



EXPLOSION HAZARD!

Avoid the formation of ignitable solvent vapours with maintenance work. Do not disperse dust and avoid dust deposits with maintenance work. In the area of combustible materials do not carry out welding or emery works.



Ensure that after maintenance works the machine is connected to earth correctly again. (The equipotential bonding must not be disconnected caused by removing of grounding conductors, painting at mating surfaces or pipe connections, *see sect. 4.4.2 "Earthing".*)



In explosion-dangerous areas, to maintain the ignition protection only use original spare parts, *see separate spare parts catalogue (80394).*



Comply with the maintenance and lubrication chart, *see sect. 7.2.*



Only use cleaning agents up to temperature class T3 in conformity with the permission of the machine for the explosion-dangerous area, *see sect. 2.1 "Identification".*



DANGER OF GETTING CAUGHT!

Do not reach into the roll nip. Do not insert any object (such as a spatula). Do not wear thick protective gloves which impede the capacity of tactile sensation of your fingers. Do not wear long, wide sleeves. The sleeves may get caught between the rolls.



CAUTION!

In roll position "Grinding", "Mixing" or when discharging the machine, do not allow the rolls to rotate dry, otherwise they will be damaged.



- **Maintenance work must be carried out only when the machine is out of operation (no motion of the machine).**


- Turn the all-pole disconnecting lockable safety switch to "0" and secure against turning on.
- Ensure no voltage sources – including any outside source (external control) – are connected to the machine.
- Ensure that all energy sources are switched off or interrupted (electrical energy, water pipes and hydraulic system).

- Depressurise the internal line system of the machine:
Shift the roll position lever several times.

- Keep clean and do not remove or cover any warning and instruction signs. Replace any damaged warning and instruction signs with new ones. Do not remove or cover any designation numbers on electric wires.


- Wear protective glasses during maintenance work on the machine and during cleaning of the rolls. If necessary, use a helmet (with face protection), hearing protection and safety shoes.




- Do not introduce any acid into the cooling system.
 - Remove foreign objects or material accumulations from the machine.
 - Remove any waste in accordance with the applicable regulations.
-  **Before operating the machine, replace protection and safety devices removed for maintenance, and check them for operation, see sect. 5.2 “Pre-operational inspections”.**

7.2 Maintenance and lubrication chart

The maintenance and lubrication plan includes checking and maintenance instructions for normal operation of the machine. In case of special operation conditions, wear control, maintenance and upkeep must be defined according to the requirements.

 **In the explosion-dangerous area, correct maintenance is the prerequisite for maintaining the ignition protection.**

The instructions marked with  must therefore absolutely be kept.



DANGER!

Only carry out lubrication and oil change if the machine is switched off (all machine movements stopped).



DANGER OF OVERHEATING!

Comply with maintenance intervals. The machine can become excessively hot owing to insufficient maintenance or lubrication.



CAUTION!

Comply with maintenance intervals. Inadequate maintenance and lubrication can damage the machine.

- After all inspection and maintenance work, check the safety functions, see *sect. 5.4.2.*

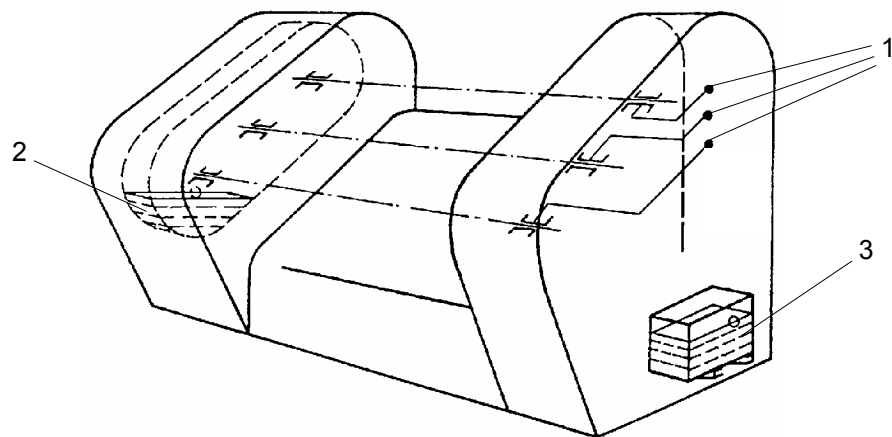








Fig. 7.1

Interval	Checkpoint	Activity	Operating material	See sect.
 Daily	Electrical installation and devices.	Check and repair. Replace, if necessary.		
Weekly or when product is changed	Trough walls, hopper plates and rolls	Clean and inspect thoroughly.	Cleaning cloth, cleaning paste, solvent	6.6
	Apron	Clean.		
	Scraper knife	Inspect. Replace, if necessary.		5.3.5
	Level monitoring (option)	Check function of the ultrasonic sensor. If necessary, readjust the adjustments.		5.3.6
	 Three-roll Mill	Clean the exterior.		6.6.1
 Monthly	V-belts	Check for damage, correct tension and wear. Replace if necessary.		
	Hoses, tubes	Check for leakproofness. Tighten or replace, if necessary.		
	Emergency stop button, safety bar, protective cover (option)	Check safety functions.		5.4.2
	Warning and instruction signs	Inspect. Replace, if necessary.		5.5
 Every three months or 500 hours of operation	Oil tank-hydraulic assembly (3)	Check oil level. If necessary, refill oil.	Hydraulic oil ISO VG 46	2.5.2 5.3.2
	Housing toothed gearing (2)	Check oil level. If necessary, refill oil.	Gear oil ISO VG 220	2.5.3
	Antifriction bearing (1)	Re-lubricate. Roll 3 at 500 min ⁻¹	High-pressure grease ISO VG 220 (e.g. Mobilgrease HP222) 3,0 g ¹⁰	2.5.4

¹⁰ 1 stroke with grease gun → approx. 1.5 g

Interval	Checkpoint	Activity	Operating material	See sect.
Half-yearly	Control cabinet	Clean filter mat.	Compressed air	
Annually or every 1000 hours of operation	Cooling water inflow pipe	Clean the cooling water-filter. Replace, if necessary.		
Every 4 years or after 8 hours of operation	Oil tank-hydraulic assembly (3)	Oil change Clean the filter. Replace if necessary.	about 30 l hydraulic oil ISO VG 46 (e.g. Mobil DTE25)	2.5.2 5.3.2
	Housing toothed gearing (2)	Oil change	About 6 l gear oil ISO VG 220	2.5.3
After 10000 hours of operation or during revision	Rolls	Regrind.		

Tab. 7.1

7.3 Maintenance work

7.3.1 Hopper plate maintenance

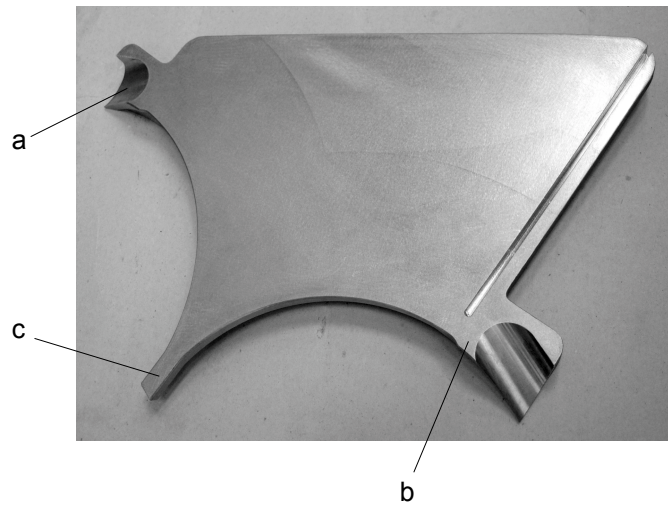


Fig. 7.2

The sealing tracks are worn the most in the areas (a), (b) and (c) (→ leaks).
At the positions (a) and (b), the hopper plate must lie on the approx. 10 mm wide sealing track on the roll.



Note:

The hopper plates can only be removed in case of roll position “Loosen” and the hydraulic pump running.

7.3.2 Cleaning water filter

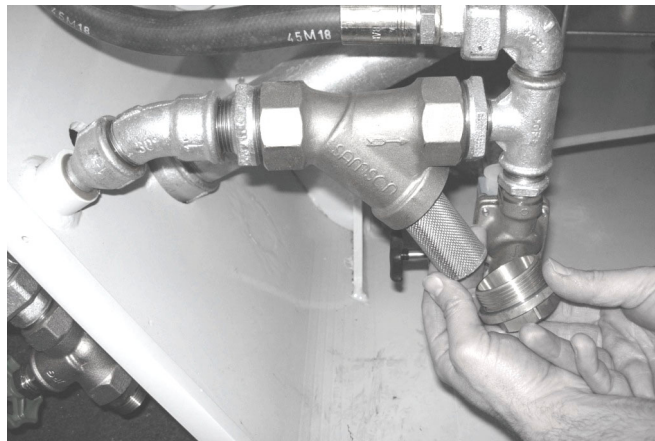


Fig. 7.3

- Remove water filter cartridge.
Rinse thoroughly with water.
Replace, if necessary.
- Refit the water filter cartridge.

7.4 Spare and wear parts

To ensure continuous machine operation, Bühler AG recommends that the most important spare and wearing parts are kept in stock.

Check the following wearing parts regularly.

If necessary, replace.

- Hopper plates;
- Scraper knife;
- Rolls (can be after-ground)¹¹
- V-belts

Also see the separate spare parts catalogue (80394).



In the explosion-dangerous area, only use original spare parts in order to maintain the ignition protection.



Note:

The warranty of Bühler AG only applies to original spare parts.

7.5 Disposal

- Send up metal parts for scrapping by categorising the parts according to metal type.
- Remove plastic parts and send for recycling.
- Drain any liquids (oil, coolant etc.) into special containers and send for treatment.
- Dispose any special waste (harmful substances, etc.) in accordance with the applicable regulations.



Note:

Observe any regulations on environmental protection.

¹¹ The rolls must only be changed by Bühler AG personnel.

8 After-sales service

When problems regarding to the machine or questions arise, the customer support service of Bühler AG is available.

It is recommended to call personnel of Bühler AG for briefing, initial start-up, installation and maintenance of the machine.

Address for the after-sales service and the spare parts sale

Bühler AG
Abt. EPCS
CH-9240 Uzwil
E-mail: customerservice@buhlergroup.com