



OPERATION MANUAL
PRELIMINARY

M1

WS
WS 450 S x 5000 CNC Monolith™

99310-111/23
2025-06-04
W. Leyendecker
M. Klein

Maschinenfabrik Herkules GmbH & Co.KG
Eisenhüttenstraße 21
57074 Siegen/ Germany

Phone: +49 (0)271 69 06-0
Fax: +49 (0)271 69 06-222
E-mail: info@herkules-machinetools.com
www.herkules-machinetools.com



Maschinenfabrik HERKULES®

Copying of this document, and giving it to others and the use or communication of the contents thereof, are forbidden without express authority. Offenders are liable to the payment of damages. All rights are reserved in the event of the grant of a patent or the registration of a utility model or design.

We would be pleased to receive any improvement suggestions you may have regarding this manual.

Original operating instructions



This Operation manual consists of

BOOK F1	FOUNDATION AND SETUP
BOOK M1	OPERATION MANUAL
BOOK M2	PROGRAMMING MANUAL
BOOK M3	PURCHASED PARTS / SPARE PART LIST
BOOK M4	DRAWINGS
BOOK E1	ELECTRICAL DIAGRAMS



1	INTRODUCTION	1-7
1.1	General Information	1-7
1.1.1	Target Group	1-7
1.1.2	Warranty	1-8
1.1.3	Repairs.....	1-8
1.1.4	Training	1-9
1.1.5	Personnel Requirements	1-9
1.1.6	Warnings.....	1-12
1.1.7	Symbols	1-13
1.1.8	Typographical Conventions	1-13
1.2	Obligations of the Operating Company	1-14
1.3	Proper Use.....	1-15
1.4	Improper Use	1-17
1.5	Safety Instructions	1-18
1.5.1	General	1-18
1.5.2	Electrical Equipment	1-20
1.5.3	Hydraulic and Pneumatic Systems.....	1-22
1.5.4	Repairs.....	1-23
1.5.5	Cooling Lubricant.....	1-24
1.5.6	Telescoping Covers	1-24
1.6	Safeguards / Safety Devices	1-25
1.6.1	General	1-25
1.6.2	Emergency Stop – Loss of Energy – System Damage	1-25
1.6.3	What to do in an Emergency	1-26
1.7	Emergency Stop Buttons.....	1-27
1.8	Technical Data	1-28
1.8.1	Working Range	1-28
1.8.2	Headstock	1-28
1.8.3	Carriage	1-29
1.8.4	Steady Rests	1-30
1.8.5	Tailstock.....	1-30
1.8.6	Machine Site Requirements.....	1-30
1.8.7	Attachments	1-31
2	DESCRIPTION	2-33
2.1	General	2-33
2.2	Machine Bed	2-33
2.2.1	Carriage Side	2-33
2.2.2	Workpiece Side.....	2-33
2.3	Headstock	2-34
2.3.1	General	2-34
2.4	Tailstock.....	2-35
2.5	Steady Rests	2-36
2.5.1	General	2-36
2.5.2	Hydrodynamic Jaws.....	2-37
2.5.3	Hydrostatic Jaws.....	2-38
2.6	Grinding Carriage	2-39
2.6.1	General	2-39

2.6.2	Bottom Slide	2-39
2.6.3	Top Slide.....	2-39
2.6.4	Concave and Convex Grinding.....	2-40
2.6.5	Keeping the Cutting Speed Constant	2-41
2.6.6	Grinding Wheel Synchronization	2-41
2.7	Measuring Device	2-42
2.8	Cooling Lubricant System.....	2-43
2.9	Axes and Measuring Systems	2-44
2.9.1	General	2-44
2.9.2	Feed Axes.....	2-45
2.9.3	Interaction of the Feed Axes.....	2-46
2.9.4	Axes of Rotation	2-46
2.9.5	Roll Measuring System.....	2-47
2.9.6	Measuring Probe	2-47
2.10	Collision Protection	2-48
2.11	Center Adjustment	2-49
2.12	Electrical Equipment.....	2-49
2.13	Attachments.....	2-50
2.13.1	Crack Measuring.....	2-50
2.13.2	Demagnetizer.....	2-52
3	OPERATING ELEMENTS	3-53
3.1	General	3-53
3.2	Control Cabinet.....	3-55
3.2.1	Data Ports	3-57
3.2.2	Power connection	3-57
3.3	Main Control Station	3-58
3.3.1	General	3-58
3.3.2	Monitor.....	3-59
3.3.3	Touchpad.....	3-59
3.3.4	Keyboard.....	3-60
3.3.5	Machine Operating Area.....	3-61
3.3.6	Hand-Held Controller	3-63
3.4	Carriage	3-66
3.4.1	Guard Door	3-66
3.4.2	Balancing Device	3-66
3.4.3	Grinding Wheel Guard.....	3-67
3.5	Headstock.....	3-68
3.5.1	General	3-68
3.5.2	Faceplate	3-69
3.5.3	Manual Operating Elements	3-69
3.6	Tailstock.....	3-70
3.6.1	Manual Operating Elements	3-70
3.7	Steady Rests	3-70
3.7.1	Manual Operating Elements	3-70
3.8	Machine Bed	3-71
3.8.1	Manual Operating Elements	3-71
3.9	Measuring Device	3-71



4	SETUP	4-73
4.1	General	4-73
4.2	Personal Protection	4-74
4.2.1	Danger Zones	4-74
4.2.2	Faceplate Guard	4-75
4.3	Start-up	4-76
4.3.1	Switching On the Machine	4-77
4.3.2	Switching Off The Machine	4-78
4.3.3	Switching On After an Emergency Stop	4-79
4.4	Hand-Held Controller	4-80
4.4.1	General	4-80
4.5	Carriage	4-81
4.6	Grinding Wheel	4-82
4.6.1	General	4-82
4.6.2	Changing the Grinding Wheel	4-89
4.6.3	Dressing the Grinding Wheel	4-98
4.7	Steady Rests	4-99
4.7.1	Support Points	4-99
4.7.1	Changing the False Jaws	4-100
4.7.2	Adjusting the Height of the Hydrodynamic Jaws	4-101
4.7.3	Hydrostatic Steady Rest	4-102
4.7.4	Check the Oil Gap at the Hydrostatic Steady Rest Jaws	4-103
4.7.5	Hydrostatic Jaws	4-105
4.7.6	Splashguards	4-106
4.7.7	Longitudinal Adjustment of the Steady Rests	4-107
4.8	Roll	4-108
4.8.1	General	4-108
4.9	Headstock	4-109
4.9.1	Roll Drive System	4-109
4.10	Inserting the Roll	4-110
4.10.1	General	4-110
4.11	Tailstock	4-111
4.11.1	General	4-111
4.12	Align Roll	4-112
4.13	Removing the Roll	4-113
4.14	Center Adjustment	4-114
4.14.1	Headstock	4-114
4.14.2	Counterstay	4-115
5	DIAGNOSIS	5-117
5.1	Fault Indication	5-117
5.2	Troubleshooting	5-118
5.3	Retracting From an Emergency Limit Switch	5-119
5.4	Reset Safety Monitoring System	5-120
5.5	Service Switches	5-121
5.6	Control Reset	5-122
5.7	Malfunction in the Hydraulic / Hydrostatic Systems	5-123
5.7.1	Pump is not pumping	5-125

5.7.2	Pump or system is not building up pressure.....	5-126
5.7.3	Cavitation in the pump.....	5-127
5.7.4	There are air bubbles in the pressure oil.....	5-127
5.7.5	Excessive noise.....	5-128
5.7.6	The oil in the tank is getting too warm.....	5-129
6	MAINTENANCE.....	6-131
6.1	General.....	6-131
6.2	Maintenance and Inspection Schedule.....	6-132
6.3	Lubrication Instruction.....	6-133
6.4	List of Lubricants.....	6-135
6.5	Handling of Operating Materials and Consumables.....	6-137
6.6	Grinding and Cooling Fluid.....	6-138
6.7	Hydraulic Systems / Operating Media.....	6-140
6.7.1	Treatment of the supply units before filling.....	6-140
6.7.2	Filling the supply units with liquid operating media.....	6-141
6.7.3	Running In The Hydraulic System.....	6-142
6.8	Cleaning the Monitors and Control Panels.....	6-144
6.9	Cleaning the V-Belts.....	6-145
6.10	Waste Disposal Instructions.....	6-146
6.11	Water Pollution Prevention.....	6-147
7	INSPECTION.....	7-149
7.1	General.....	7-149
7.2	Change Measuring Probe Inserts.....	7-150
7.3	Eddy Current Checking Facility.....	7-151
7.3.1	General.....	7-151
7.3.2	Set Test Gap.....	7-152
7.3.3	Calibration.....	7-153
7.4	Exchanging the Dressing Diamond.....	7-154
8	REPAIRS.....	8-155
8.1	General.....	8-155
8.2	Changing and tensioning the driving belts.....	8-156
8.2.1	Headstock.....	8-157
8.2.2	Grinding Wheel Drive.....	8-159
8.3	Checking the Belt Tension.....	8-160
8.3.1	Checking the Tension Manually.....	8-160
8.3.2	Check with OPTIKRIK.....	8-161
8.3.3	Testing with Frequency Meter.....	8-163
8.4	Electric Motors.....	8-165

1 INTRODUCTION

1.1 General Information

This manual is part of the technical documentation for the **Maschinenfabrik HERKULES**- machine. It contains all information needed for operation of the machine.

1.1.1 Target Group

This operating manual is mainly intended for the machine operators and maintenance personnel. Anyone working on or with the machine must be familiar with this manual, which is to be kept handy at all times for reference purposes.

Any personnel engaged in any work on the machine must have read and understood the operating manual, and especially the **Safety Instructions**, prior to doing any work whatsoever. It is too late to consult the manual whilst you are actually working on the machine. This is especially the case for personnel who only occasionally do any work, e.g. tooling or maintenance work on the machine.



All safety and hazard warnings on the machine (signs etc.) must be observed and must be kept in a legible condition.

1.1.2 Warranty

The machine is expected to operate efficiently, safely and accurately for many years. This however can only be guaranteed, if the operating and maintenance instructions are strictly followed.

During the warranty period, any faults will be rectified by the **Maschinenfabrik HERKULES** in accordance with the terms of the guarantee. The user will be held liable for the consequences of any unauthorized conversions or modifications to the machine. This goes in particular for any modifications which impair the safety of the machine. This includes any program modifications (software) done without authorization on the programmable control systems.

1.1.3 Repairs

The **Maschinenfabrik HERKULES** Service Dept. is available for repairs or for moving the machinery at any later date. When making written or telephone enquiries, please state the following:

- The serial number of the machine in question.
- The spare parts number of the respective component.

If you are doing any repairs yourself, please ensure that the spare parts meet the technical specifications laid down by **Maschinenfabrik HERKULES**. With genuine spare parts this is guaranteed. No liability will be accepted for non-genuine spare parts!

1.1.4 Training

As only well-trained specialists are able to operate the machinery economically, in addition to the instruction given by the **Maschinenfabrik HERKULES**. Service Technicians, we recommend that operators and maintenance personnel attend a special training course held at **Maschinenfabrik HERKULES**.

1.1.5 Personnel Requirements

General

The machine tool is a high-performance, technically sophisticated machine. The machine operators and maintenance personnel must be trained on the machine and based on their training and experience, must be able to perform work at the machine and to recognize and avoid potential hazards.

The operating company and the machine operators are responsible for ensuring that nobody works on the machine, who is not authorized or trained to do so, and that only reliable personnel are employed.

Personnel without the necessary training, whether it be in-house training, vocational college training or training by our training department must not operate or work at the machine even for short periods of time.

Machine Operators

The machine operators must be qualified cutting machine operators or have equivalent qualifications. Sound knowledge in the technological basics of machining and the setup and working method of CNC machine tools and CNC controllers are an absolute must. For example:

- Determination of hazards to health and safety at the workplace and take measures to avoid them.
- Selection of transport means, attachment lifting tackle and lifting equipment, assessment of their operational safety, and use them or authorize their use in accordance with the applicable regulations
- Evaluation and use of technical drawings and documents
- Assessment of material properties and changes to such properties and proper handling of the same
- Ensure operational reliability of machine tools, including the tools
- Selection of tools and clamping fixtures, and alignment and clamping taking the shape and material properties into account
- Determination and saving of tool correction data
- Assessment of the machinability of workpieces taking the material composition, the delivery state and the heat treatment state into account
- Determination and input of the processing parameters dependent on the workpiece, material, tool and cutter material
- Monitoring and optimization of the production process
- Recognition and analysis of faults in the production process, determination of the cause and rectification of the fault
- Check safety devices and ensure they are in proper working order
- Rectification of malfunctions or arrange for their rectification



Maintenance Personnel for Electrical Systems

The machine is equipped with a sophisticated, high-performance electrical system, which, for service work purposes, requires careful handling by qualified personnel. The electrical maintenance personnel must be qualified electronics technician in the control and automation area or must have a similar qualification.

The maintenance personnel must be able to operate the machine under normal conditions, put the machine into operation when the safety devices are switched off, and carry out any necessary procedures on the electrical components in order to complete setup jobs, maintenance jobs and repairs.

The maintenance personnel must be duly trained and authorized to carry out necessary procedures on live control cabinets and machine components.

Maintenance Personnel for Mechanical Systems

The machine is equipped with sophisticated, high-performance mechanical, hydraulic and pneumatic systems which, for service work purposes, requires careful handling by qualified personnel. The mechanical maintenance personnel must be qualified industrial mechanics in the maintenance or repair area or must have a similar qualification.

The maintenance personnel must be able to operate the machine under normal conditions, put the machine into operation when the safety devices are switched off, and carry out any necessary procedures on the mechanical, hydraulic and pneumatic components in order to complete setup jobs, maintenance jobs and repairs.

1.1.6 Warnings

This manual contains warnings which you must heed for your own personal safety and to prevent material damage. These warnings are categorised into various hazard levels. If more than one hazard level is present, the highest warning level is always used.

DANGER



Type and Source of the Hazard

Indicates an imminently dangerous situation which will result in death or serious injury if the safety instructions are not heeded.

WARNING



Type and Source of the Hazard

Indicates a potentially dangerous situation that can result in death, severe injury, or major material damage if the safety instructions are not heeded.

CAUTION



Type and Source of the Hazard

Indicates a potentially dangerous situation that could result in material damage, or minor to moderately severe injury if the safety instructions are not heeded.

1.1.7 Symbols

The symbols in this manual point out the necessary procedures for troublefree and productive operation.



Indicates important information about the machinery or the handling of the machinery, or calls particular attention to the respective part of the documentation, which is recommended reading as it contains useful tips.

- The broad arrowhead symbol is an action cue. The operator must perform the actions in the specified order.
- The wide bullet symbol indicates a list or description of properties or automatic sequences.

1.1.8 Typographical Conventions

The menus displayed in these instructions are in German language and are only for orientation purposes within the menu structure. For this reason, no reference is made in these instructions to contents or values displayed.

1.2 Obligations of the Operating Company

The operating company of the machine is obligated to guarantee the safety of the operating and maintenance personnel working on the machine. The following measures must be taken at a minimum:

- Identify hazards and assess risks that can arise in association with the operation of the machine.
- Take all necessary structural and/or organizational risk avoidance measures. Structural measures take precedence over organizational ones!
- Draw up operating directives for working with the machine. These directives must be readily accessible to all persons working at the machine.
- Information and instruction of the personnel about safe handling of the machine before starting the job. Special emphasis must be placed on potential safety and health hazards and protective measures that must be taken.
- Operators, machine setters and maintenance personnel must receive regular training in the proper and thus safe operation of the machine. After training has been given, the operating company must explicitly authorize the aforementioned persons to do the respective jobs.
- Jobs at the machine that are particularly hazardous, such as, e.g. setup, maintenance and repair jobs, as well as monitoring jobs during the machining process, must only be done by duly authorized and qualified personnel.
- The operating company must take suitable measures (e.g. maintenance, repair, training) to ensure that the machine can be used in a safe manner that is not detrimental to health. The machine must always meet the applicable legal requirements.

1.3 Proper Use

The machine is designed for external cylindrical grinding of rolls made of steel, cast iron, rubber, plastic and stone.

The workpieces must be stable enough to withstand the static and dynamic forces, which are produced during the machining operation, without this leading to deformation.

Machining is done solely by means of cutting processes using a rotating grinding wheel with geometrically undefined cutting edges.

The grinding wheels must be clamped onto the grinding wheel arbor at the spindle via a standardized interface.

The cutting motion is created by rotation of the grinding wheel and the workpiece.

The workpiece must be clamped in the machine such that it can absorb the static and dynamic forces that occur during the machining operation without shifting.

The feed motion needed for the cutting operation is achieved by feeding in the grinding wheel.

A combination of feed motions in multiple axes is also possible.



Any other use is deemed to be improper use. The manufacturer accepts no liability whatsoever for any damage caused by improper use. The user alone bears that risk.

Proper use also includes compliance with the assembly, operating, and maintenance instructions prescribed by the manufacturer.

If used improperly or for a purpose for which it is not intended, this machine may be a source of danger.

During a work process, the cycle must be monitored continuously by the operating personnel.



Furthermore, all applicable safety and accident prevention regulations in force locally at the site of installation must be complied with for this machine.

1.4 Improper Use

The following list does not claim to be complete!

Never load the machine beyond the capacity specified in the technical data. Overloading can result in major damage to the machine.

Furthermore, the specified maximum

- workpiece weight
 - workpiece dimensions
 - tool dimensions and weights
- must not be exceeded.

The following are prohibited:

- Any manual intervention, with or without the use of tools, in running machine movements, or rotating tools and workpieces
- Machining of highly combustible and explosive materials
- Machining of workpieces made of ceramic, magnesium, silicon and resin-bonded, compressed wood

The maximum speed of rotation of the faceplate must not be exceeded! If rolls are inadequately balanced, there is a risk of damage to the bearings and damage to the steady rests.

The permitted roll weight for center grinding is shown in the table at the tailstock. This weight must not be exceeded! The tailstock cannot support a roll that is too heavy.

The machine must not be operated in potentially explosive atmospheres.

The use of cooling lubricants or cleaning agents that do not comply with explosion protection regulations is prohibited.

The machine must not be connected to central extractor/exhaust systems in which potentially explosive substances may be present.

1.5 Safety Instructions

1.5.1 General

The machine is state-of-the-art and complies with all applicable safety regulations, norms and directives. It is equipped with safety devices, such as e.g.: safety guards, safety limit switches and EMERGENCY STOP buttons to ensure the greatest possible degree of safety.

The machine must only be operated when it is in perfect technical condition, for the purpose for which it was intended, in a safety- and hazard-conscious manner and in compliance with the instructions given in the operating manual. Operation of the machine must be discontinued if any problems or malfunctions occur that may impair its safety.

The machine must only be operated when all safety devices and safety guards are duly installed and are in proper working order.

Safety-conscious working on the machine is only guaranteed, if:

- the work procedures in this operating manual are strictly followed
- the machine is only operated and maintained by duly trained and authorized personnel (heed any minimum age requirements)
- when the machine is operated by more than one person, the responsibilities of each person are clearly defined and are adhered to
- unauthorized people are kept away from the work area of the machine
- any manner of work that impairs the safety of the machine is refrained from
- the operating personnel pay the necessary attention and exercise proper concentration when operating the machine
- the operating personnel avoid any kind of distraction or fatigue, as well as the consumption of medications, alcohol and other intoxicants



To prevent accidents, the personnel must not wear their hair long, nor must they wear loose clothing or jewellery, including rings and chains, which could get caught in the moving parts of the machine or cause any other type of accident.

Do not touch any moving parts. Risk of serious injury (e.g.: getting crushed, getting hit, or getting caught).

Do not touch any warm or hot machine components or workpieces – Risk of getting burnt!

Wear appropriate protective gear.

Protect the eyes from splashes.

Do not touch any live electrical parts.

Switch off the machine if any unusual noises or vibrations occur.

Keep the operator's platform, stairs and other access areas, as well as all escape routes clear of tools, auxiliary equipment, fluids (coolants, oil, etc.) and other foreign objects – Risk of tripping or slipping! Wear non-slip safety shoes!

Do not use flammable fluids for cleaning purposes.

1.5.2 Electrical Equipment

The electrical machines and equipment are designed for use in industrial power plants.

When in operation, these devices have dangerous, exposed live parts, or moving or rotating parts. Therefore,

- unauthorized removal of the safety guards/covers,
- improper use,
- incorrect operation or inadequate maintenance

could cause severe personal injury or material damage.

Those responsible for the safety of the equipment must therefore ensure that

- only qualified electricians are allowed to do any work on the electrical machinery and/or equipment,
- such persons always have the supplied operating manuals and other required product documents available for all work and are put under obligation to follow the instructions given in these documents to the letter,
- non-qualified persons are prohibited from working on or in the vicinity of such machinery or equipment,
- only original quality fuses of the correct amperage are used,
- the electrical equipment for the machinery is checked regularly for any faults. Defects such as loose connections or charred or damaged cables must be rectified at once,
- any components of the machinery or electrical equipment on which inspection, maintenance and repair work is to be done, must - where stipulated - be rendered powerless first. Check that the components are dead first and then earth and short-circuit them and insulate any neighbouring live parts!

- when doing any work on live parts, ensure that a second person is present, who can press the emergency stop button or switch off the main switch in an emergency.
- seal off the areas in which work is being done with a red/white safety chain and a warning notice
- use only insulated tools!
- for repairs, only the same components or those with the same function may be used. The circuit logic must not be modified or changed in any way. This goes in particular for safety components. Failure to comply can lead to death, severe injury or material damage.
- after maintenance or repair work has been completed, all safety functions must be checked.

Safety circuits and safety devices must not be rendered inoperable!

1.5.3 Hydraulic and Pneumatic Systems



Before any work is carried out on hydraulic or pneumatic equipment, the systems have to be depressurized.

No assembly or dismantling work may be done whilst these systems are in operation, nor may any screw connections be loosened or tightened.

There is a risk of injury due to parts flying off and escaping gases and fluids under pressure.

If any parts need exchanging, such as e.g. hoses, pipes, valves etc., only use replacements which are approved for the required pressures.

No soldering or mechanical machining may be done on the accumulator vessels. The pressure fluid must be depressurized before any work is done on systems with accumulators (repairs, connection of pressure gauges etc.).

1.5.4 Repairs

To carry out repairs, suitable workshop tools and equipment are an absolute must.

Safety guards and railings must not be dismantled. If these fixtures are nevertheless dismantled for any reason, they must be remounted before putting the machine into operation!

Before doing any maintenance or repair work on the equipment, switch off the power switch and secure it to prevent it from being accidentally switched back on again.

If for certain jobs on the machine, the power supply must remain switched on, take suitable measures to ensure that the machine functions cannot be triggered accidentally.

Never do any maintenance or repair work whilst the machine is in operation!

When doing overhead assembly work, use the safety steps provided or other safety steps or work platforms! Do not climb up on the machine components! Wear suitable harnesses when doing maintenance work at great heights!

Keep all handles, steps, railings, platforms and ladders clean.

When starting maintenance or repair work, clean any oil, fuel or cleansers etc. off the machine, connections and screw connections. Do not use aggressive cleansers! Use non-fraying, non-fluffing cloths!

1.5.5 Cooling Lubricant

Wear protective clothing, especially safety goggles and work gloves when handling cooling lubricants. Inhalation of cooling lubricant fumes and mists can result in respiratory tract irritation. Avoid cooling lubricants from coming into contact with the skin. Frequent contact with the skin leads to loss of the skin's natural oils, dehydration and skin irritation. Long-term contact can lead to skin diseases. Even small skin injuries increase the risk of contracting a skin disease.

Use suitable skin barrier creams before starting work. After work and before meal breaks, thoroughly clean dirty skin with water and a gentle cleanser or soap. Apply a barrier cream after washing. Do not carry any cooling-lubricant soaked cleaning rags or similar on your person. Change any clothing that is soaked with cooling lubricant immediately. Keep cooling lubricants away from foodstuffs, drinks and tobacco.

If impurities are introduced into the cooling lubricant, harmful substances can form in the cooling lubricant circulation system. If the cooling lubricant is not properly treated, bacteria and fungi can grow, which can cause infections and allergies.



Heed the safety data sheet supplied with the cooling lubricant!

1.5.6 Telescoping Covers

Telescopic covers must never be walked on. There is a serious risk of slipping or stumbling when stepping. Do not leave any objects on the telescoping covers.

1.6 Safeguards / Safety Devices

1.6.1 General

The safeguards/safety devices must never be removed, rendered inoperable or modified in any way. Failure to comply could lead to severe injury (crushing) or could even be fatal!

The User undertakes only to operate the machine when the latter is in perfect condition and to inform the manufacturer immediately of any circumstance or changes arising in the machine which impair its safety.

The grinding wheel safety guard has a safety contact. If the guard is opened whilst the machine is in operation, the machine stops.

1.6.2 Emergency Stop – Loss of Energy – System Damage

If there is a power failure whilst the machine is running, the grinding wheel is automatically retracted from the roll. This prevents damage to the workpiece (roll).

The travels of the axes are limited by software limit switches. For safety reasons, additional emergency limit switches are also installed. If an emergency limit switch is tripped, all axes are safely stopped and the automatic process is switched off.

1.6.3 What to do in an Emergency

The machine is equipped with EMERGENCY STOP buttons, with which the machine can be stopped in an emergency.

The following cycle is triggered when an EMERGENCY STOP button is pressed:

- All automatically operations are interrupted.
- Enabling of all axes is blocked.
- All forward feed movements are stopped.
- The power switch at the control cabinet is switched off after a delay of approximately 1,5sec.
- Grinding wheel and faceplate drives will slowly come to still stand.
- The grinding wheel is retracted.

1.7 Emergency Stop Buttons

There are Emergency Stop buttons at all control panels with electric operating elements from which machine movements can be initiated.

These control panels are described in detail in the chapter **OPERATING ELEMENTS**.

Emergency Stop buttons are installed at the following components of the machine:

- Control panel at control cabinet
- Main control station
- Manual pendant at carriage.
- Operator panel for display of balancing device
- Manual pendant at headstock.

1.8 Technical Data

1.8.1 Working Range

Working Range		
Distance between centers	mm	5000
Largest machinable diameter	mm	1350
Smallest grinding diameter with a grinding wheel of 450 mm	mm	300
Smallest grinding diameter with a grinding wheel of 750 mm		0

Workpiece Weight			
Supported in hydrodynamic steady rest jaws	max.	kg	7400
Supported in hydrostatic steady rest jaws	max.	kg	24800

1.8.2 Headstock

Faceplate Drive		
Drive motor power	kW	31
Faceplate speed of rotation	1/min	10 - 100
Faceplate torque	Nm	5000

1.8.3 Carriage

Grinding Wheel Drive			
Output of grinding spindle motor		kW	51
Grinding spindle speed		1/min	400 - 1200
Cutting speed	max.	m/sec.	45

Z- Axis		
Feedrate, infinitely variable	mm/min	100 - 4000

X-Axis		
Feedrate, infinitely variable	mm/min	0.001 - 3000

C- Axis		
Travel of grinding wheel	mm	5

Grinding Wheel			
Bore		mm	304.8
Diameter	max.	mm	750
Diameter	min.	mm	450
Width		mm	80

Measuring device		
Diameter range	mm	350 - 1350

1.8.4 Steady Rests

Holding Diameter of the steady Rest Jaws		
Hydrodynamic	mm	206,2 270 482.4
Hydrostatic	mm	902.63

1.8.5 Tailstock

Quill		
Quill stroke	mm	150

1.8.6 Machine Site Requirements

Electrics		
Total connecting power	kVA	196
Amperage	A	250
Voltage	V	460
Frequency	Hz	60

Compressed Air		
Pressure	bar	6

1.8.7 Attachments

Crack Detector		
Ultrasound	Type	HCC-KPM

Crack Detector		
Eddy Current	Type	Eddycheck MCP

Demagnetizer		
Maurer	Typ	MM HE2

Band filter		
Medium	Cooling lubricant	
Filter fineness, filter paper dependent	µm	10 - 50
Quantity cooling lubricant	l/min	300

Magnetic filter		
Medium	Cooling lubricant	
Quantity cooling lubricant	l/min	300



2 DESCRIPTION

2.1 General

The purpose and method of functioning of the most important assemblies and supplementary equipment of the machine are described in this chapter.

2.2 Machine Bed

The one-piece, inherent stability machine bed stands unanchored on special compensation plates in the foundation pit.

2.2.1 Carriage Side

The bed is used to hold and guide the grinding carriage. The guide ways are protected by telescoping covers to prevent them against dirt and damage.

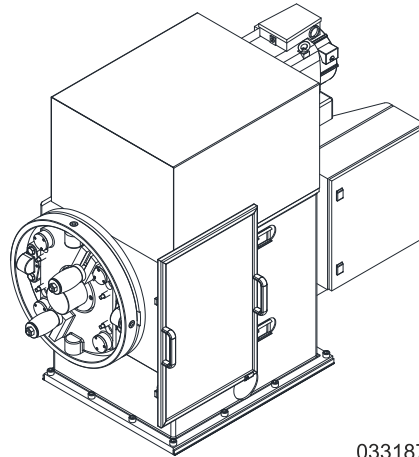
2.2.2 Workpiece Side

The bed is used to hold and guide the headstock, tailstock and the steady rests.

2.3 Headstock

2.3.1 General

The headstock acts as a drive of the roll. The roll is driven uniformly and vibration-free by means of the faceplate and its drivers. Instead of the roll driver, a ball and socket joint driver can be used if required.



033187

Fig.: Headstock (schematic diagram)

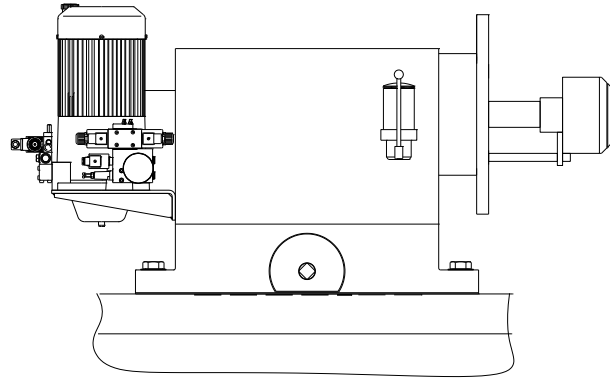
The headstock comprises the following components:

- Infinitely variable drive motor for the faceplate drive
- Gear reduction
- Adjustable drive unit for adjusting the belt tension
- Fixed main axis
- Faceplate

The roll is driven by two driving rollers at the faceplate. The driving rollers are supported on a diametrically moving swing plate.

2.4 Tailstock

The tailstock acts as a counterstay. It prevents axial displacement of the roll during the grinding process.



028517

Fig.: Tailstock (schematic diagram)

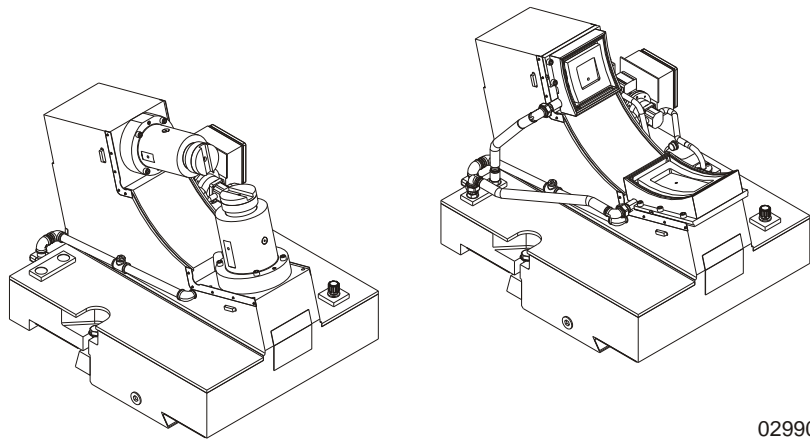
2.5 Steady Rests

2.5.1 General

The steady rests are used to support the roll.

The steady rests can be adjusted to accommodate the workpiece dimensions.

At steady rests with adjustable jaws the bottom jaw bears the main load of the roll, while the top jaw is mainly exposed to the grinding pressure. For special applications, a middle jaw (optional) can be installed to relieve the load on top and bottom jaws.



029900

Fig.: Steady (schematic diagram)



2.5.2 Hydrodynamic Jaws

The jaws are adjusted to the bearing diameter by adjusting them in height accordingly.

The capacity of the steady rests can be extended by using different jaws and false jaws.

The bearing points are lubricated by a uniform oil film.

2.5.3 Hydrostatic Jaws

Hydrostatic jaws / split bearings are produced for a defined bearing diameter and have oil pockets at the bearing points.

Oil is continuously pumped into these oil pockets [1]. This produces a uniform gap [X] between the babbitt metal [3] and the bearing surface [2], through which the oil can flow off to the outside again.

This oil gap remains more or less constant, regardless of the load and speed of travel.

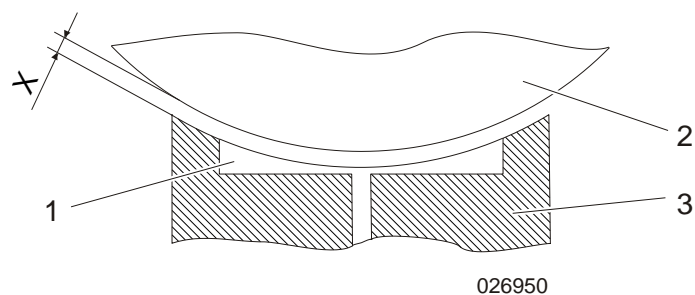


Fig.: Oil pocket

2.6 Grinding Carriage

2.6.1 General

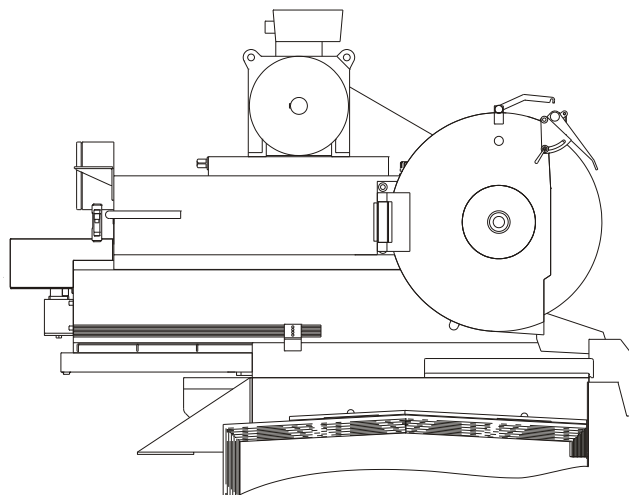
The two main components of the grinding carriage are the top slide and the bottom slide. The carriage oscillates along the length of the roll.

2.6.2 Bottom Slide

The bottom slide moves the carriage along the Z-axis on the guideways of the carriage bed. It is driven by two servo motors coupled in a master-slave arrangement, which work together with the position transducer and the CNC in a closed control loop.

2.6.3 Top Slide

The top slide executes the infeed movement of the X-axis. It is coupled to the position transducer on the bottom slide and is also driven by a three-phase servomotor in a closed loop control system.



027974_3

Fig.: Carriage (schematic diagram)

2.6.4 Concave and Convex Grinding

For concave and convex grinding and for grinding individual base point curves, the band width of the changes in diameter lies within a range of just a few millimeters. The required grinding wheel infeed accuracy is very high in these areas. Therefore, the infeed motion is divided up between two independent feed drives.

Rough infeed of the grinding wheel is done by the top carriage drive (X-axis). For the fine infeed, a high precision feed drive is provided, which tilts the top carriage via a wedge (C-axis). Thanks to this tilting motion, a very precise infeed motion of the wheel spindle can be achieved. Both feed axes work in a closed loop and are coordinated by the CNC as a function of the X-axis.

2.6.5 Keeping the Cutting Speed Constant

The decreasing grinding wheel diameter due to wear must have no influence on the cutting speed. The rotational speed of the grinding wheel is therefore readjusted as the diameter decreases, so that the grinding speed remains constant.

2.6.6 Grinding Wheel Synchronization

To allow the grinding wheel to approach the roll automatically, the controller must know the position value of the front edge of the grinding wheel.

The diameter of the grinding wheel gets smaller and smaller as a result of wear. The position value of the front edge of the grinding wheel must therefore be checked regularly, so that the grinding wheel can be synchronized.

The grinding wheel is automatically synchronized when:

- The grinding wheel measuring device is approached with the grinding wheel at a standstill.
- A diameter measurement is performed after grinding.

2.7 Measuring Device

The course of a curve, roundness or eccentricity of a roll can be measured via the CNC using the measuring device (measuring caliper).

The column unit of the measuring device is fixed to the bottom slide of the grinding carriage.

The measuring arms are adjusted by means of a linear drive and bears the upper [A] and lower [B] measuring probe.

To protect the measuring arms from damage, the whole measuring caliper is swung upwards to it's home position. The measuring caliper will be swung down into measuring position if required. Depending on the type of measurement, measuring will be done with the roll stationary and with the roll rotating.

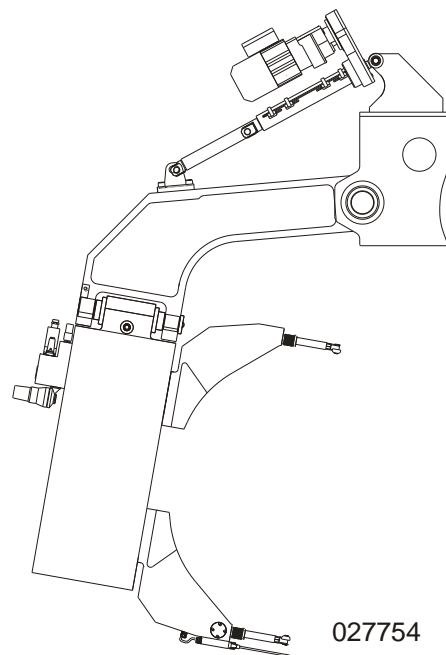


Fig.: Measuring device (schematic diagram)

2.8 Cooling Lubricant System

Cooling lubricant reduces the friction in cutting operations. Premature tool wear and overheating of the tool and workpiece are thus avoided. The surface quality of the machined materials is improved.

The cooling lubricant system transports the cooling lubricant from the collecting tank to the consumers via a pipe system.

The cooling lubricant runs off into channels and is fed to the filter system. After it has been cleaned, the lubricant is returned to the collecting tank.

Due to the filter system, the service life of the cooling lubricant and of the tools is extended and the formation of germs in the cooling lubricant is reduced.

2.9 Axes and Measuring Systems

2.9.1 General

As normal for machine tools, the directions of movement of the main feed and measuring drives are referred to as axes. These designations are used in CNC-programming to be able to allocate rated and actual values of position or speed to the various drives.

For fault messages from the CNC, these axis designations are used to refer to the individual drives or limit switches.

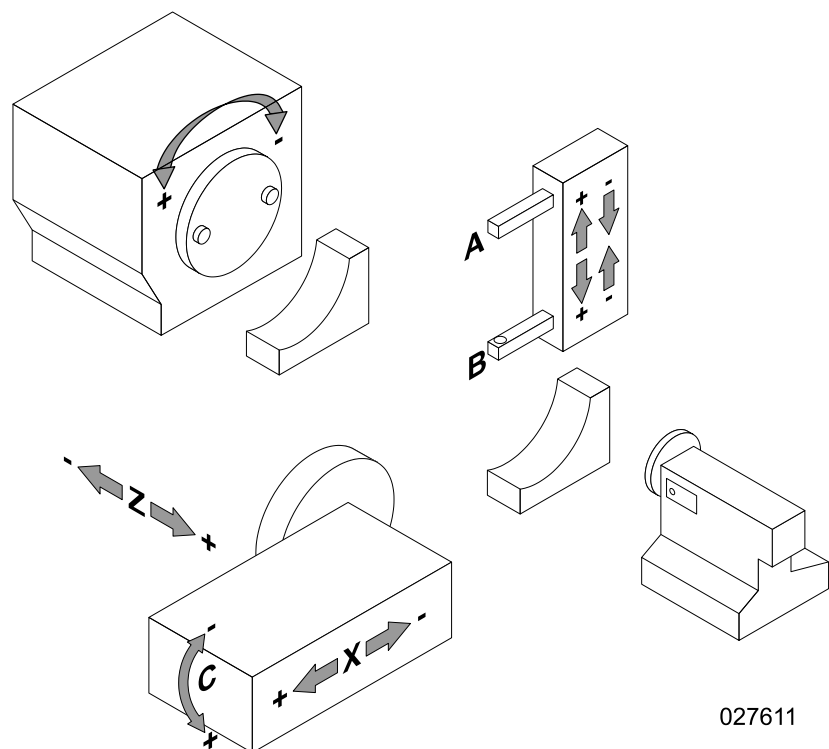


Fig.: Axis definitions

2.9.2 Feed Axes

Z-Axis

The Z-axis is the direction of movement of the carriage in the longitudinal axis. The longitudinal travel of the carriage is limited by limit switches. The axis is equipped with a measuring system.

X-Axis

The X-axis is the direction of movement of the top part of the carriage when in feeding. The transverse (cross) movement of the top slide is limited by limit switches. The axis is equipped with a measuring system.

C-Axis

The C-axis carries out the fine infeed of the grinding wheel. The feed motion of the C-axis is achieved by tilting the top carriage around a pivot point below the grinding wheel axis. A servo drive effectuates a shift of the grinding wheel axis via a wedge. The C-axis drive is equipped with limit switches. When these switches are tripped, the servo drive is switched off.

2.9.3 Interaction of the Feed Axes

When grinding curves, the position of the grinding wheel changes constantly depending on the position of the carriage on the Z-axis. This function is coordinated by the CNC, whereby all of the feed axes involved are operated in a closed loop.

The two infeed movements (X- and C-axis) are superposed. For curve grinding purposes, the C-axis is used due to its higher accuracy. As the stroke of the C-axis is insufficient for taper grinding purposes, in feeding is automatically done in the X- axis.

2.9.4 Axes of Rotation

Face Plate Drive

Rotation of the faceplate. To measure the speed of rotation, the drive is coupled with an incremental rotary encoder.

Grinding Wheel Drive

Rotation of the grinding spindle. In order to keep the cutting speed constant, the grinding spindle is speed-controlled and is coupled with an incremental rotary encoder.

2.9.5 Roll Measuring System

A- / B-Probe

The probes A- and B are mounted at the measuring caliper and are moved motor-driven. The measuring probes are moved concentric apart or together and are coupled each with an incremental, linear encoder. The travel of the measuring probes is limited by end-of-travel switches.

2.9.6 Measuring Probe

C-Probe

The C-probe is mounted to the top part of the carriage and is automatically swung into the measuring position in front of the grinding wheel centerline for alignment and roll approach purposes. The probe is coupled to a incremental linear transducer and determines the situation and position of the roll in X-axis direction.

2.10 Collision Protection

The roll grinding machine is equipped with various safety devices which prevent collisions from occurring:

Grinding Wheel - Roll

The automatic approach of the grinding wheel to the roll can only take place when the grinding wheel synchronisation is active, i. e. the actual position of the front edge from the grinding wheel must be known.

Roll Measuring Device

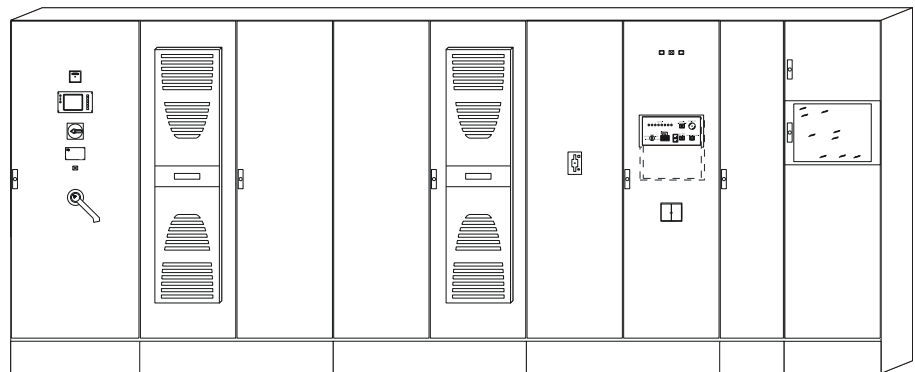
When swinging into the measuring position, there is a risk of the measuring system colliding with the roll, the steady rests and the tailstock. For this reason, safety limits must be input in the CNC which prevent the arms from being swung down or otherwise travelled outside of these given limits.

2.11 Center Adjustment

To extend the operating range the workpiece middle can be shifted in two end positions, in addition headstock, counterstay on tailstock and measuring instrument must be moved in the direction of the x-axis and the steadies be exchanged.

2.12 Electrical Equipment

The complete control system for all drive motors and auxiliary drives and the CNC controller is housed in a multi-section control cabinet installed in the vicinity of the machine.



026804

Fig.: Control Cabinet (schematic diagram)

2.13 Attachments

2.13.1 Crack Measuring

The crack detector is used to find damage on the roll.

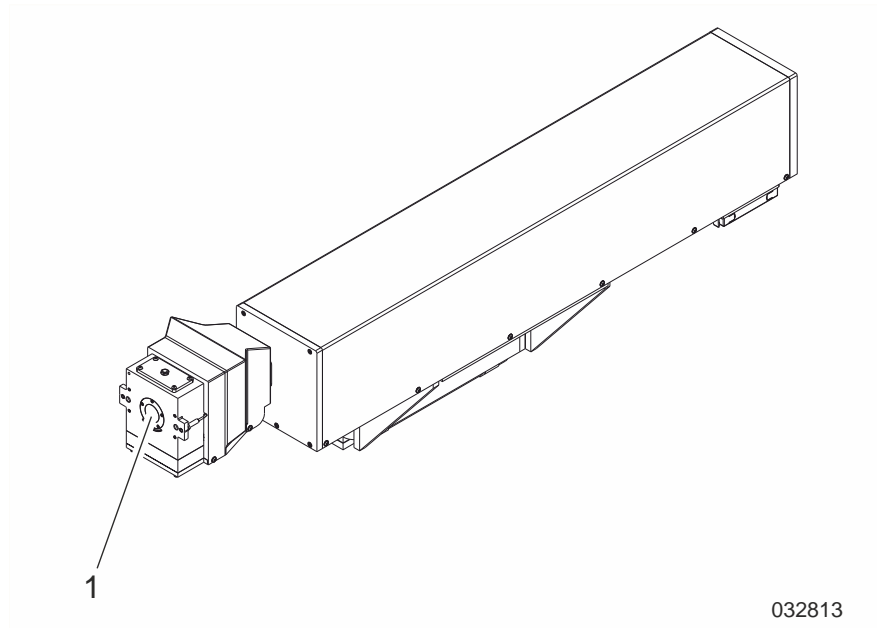


Abb.: Crack detector on the bottom slide

- 1 Ultrasound detector

Ultrasonic Checking

During the ultrasonic measurement, the roll is checked for faults, such as cracks or cavities under the roll surface. In doing so, ultrasound is emitted into the roll surface and reflected by irregularities in the roll material. The reflected sound is received by the ultrasonic receiver. Position and size of the cracks are recognised in this way.

Eddy Current Testing

This method is used to check the roll surface for cracks and structural damage (such as pressure marks and bruising). An eddy current is generated in the roll surface, and its feedback is measured on the measuring sensors. The location and size of any cracks can be determined from the measurements.



The eddy current measuring method does not give any absolute measuring results (e.g. in mm). Measuring device-specific deviations are unavoidable!

The magnetic coupling between the eddy current sensor and the metallic workpiece is influenced by:

- The distance between the sensor and the workpiece
- The magnetic properties of the workpiece
- Impurities on the surface of the workpiece
- The occurrence of cracks and metallurgic defects in the surface of the workpiece



A high inherent magnetism of the workpiece will result in incorrect measurements during the eddy current testing!

- If the inherent magnetism is too high, the workpiece must be demagnetized before testing is done.

2.13.2 Demagnetizer

To prepare the roll for eddy current testing, the roll can be demagnetized with this device.



Inherent magnetism of the roll material falsifies the results of the eddy current test.

3 OPERATING ELEMENTS

3.1 General

The locations and functions of the individual operating and monitoring elements are described in this chapter.

All procedures and operating sequences for setup and operation of the machine are described in the next chapters.



Operating elements belonging to the standard equipment of the CNC control are described in the manufacturer's documentation for the control.

Many of the operating elements have light emitting diodes to signalize the present operating state of the various functions. The following applies in general: The light emitting diodes flash to indicate that a function has been selected, and light up continuously to indicate and confirm that a function is active.



Differing illumination states of operating elements, which, for example, require the operator to approve or confirm that a function should be executed or continued, are explained individually.

The basic functions and the various types of operating element are described below. All operating elements and their respective functions are explained individually in the course of this chapter.

Buttons

A function is initiated by pressing the button once. After it has been pressed, the button returns to its original state.

Jog Mode Buttons

A function is executed for as long as the button is held depressed. When you stop pressing the button, it returns to its original state.

Key-Operated Switches

Electric switch that is combined with a lock for safety reasons. The key can be locked in one or more positions and remains in that position until changed.

Key-Operated Buttons

Electric button that is combined with a lock for safety reasons. A function is initiated by turning the key at the button to a certain position. The key returns to its original position when you let go of it.

Selector Switches

Electric switch that can lock into several positions. The selector switch remains at the position in which it has been set.

3.2 Control Cabinet

The control cabinet is located in the vicinity of the machine as specified in the on-site factory layout.

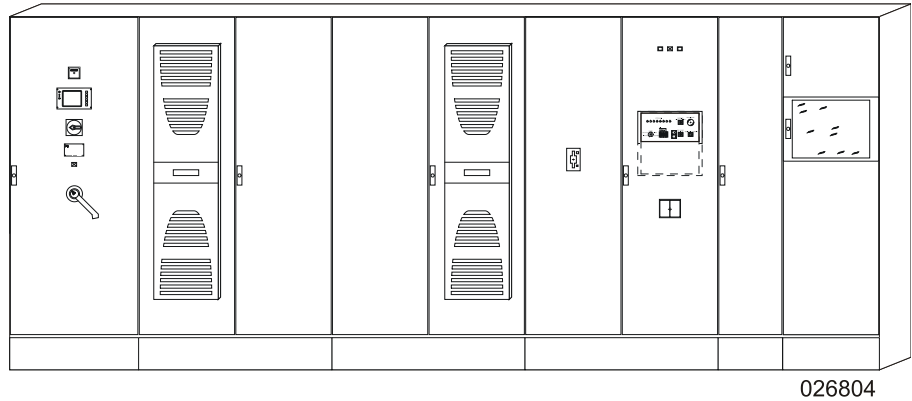


Fig.: Control Cabinet (schematic diagram)



Emergency stop

Button: Stops all processes and movements of the equipment immediately. When pressed, this button locks mechanically into place. Unlocking the button does not start up the machinery again, but simply enables the machine to be put back into operation.



Only press the Emergency Stop button in an emergency, such as if people and/or the machinery are in danger.



PLC POWER SUPPLY FAULT

Indicator lamp: Fault in the controller's power supply.

MAIN SWITCH

Main switch: Power is supplied to the controller. In the Off position, the switch can be locked with a padlock.

3.2.1 Data Ports



RJ45

Data transmission port.



USB

Data transmission port.

3.2.2 Power connection

Socket 230V/50Hz

AC socket.

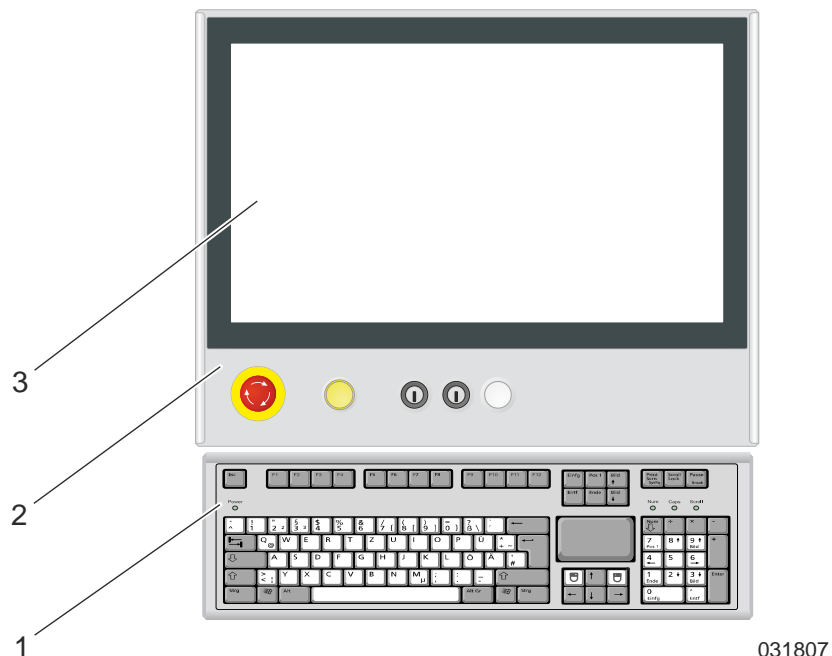
3.3 Main Control Station

3.3.1 General

The following control units are incorporated into the main control station of the machine.

- Monitor
- Keyboard
- Indicators/displays and operating elements

The operating controls at the main control station are divided up into various areas of operation and are described individually below.



031807

Fig.: Main control station (schematic diagram)

- 1 Keyboard with touchpad
- 2 Machine operating area
- 3 Monitor

3.3.2 Monitor

The user interface of the CNC controller is displayed on the monitor in the form of operating and input screens. These screens may contain rated and actual values in the form of tables or curves, grinding and measuring programs, as well as auxiliary functions and other data.

3.3.3 Touchpad

The touchpad works like a mouse. When you drag your finger over the touchpad, the mouse pointer /cursor moves in the desired direction.



Use only fingers to operate the touchpad. The operator may wear gloves, but no hard particles, such as metal chips, glass shards or other such particles must adhere to the gloves.

3.3.4 Keyboard

The controller is equipped with a keyboard which is used for communication with the controller.

The functions assigned to the function keys on the keyboard differ, depending on what screen is active. The selectable function keys are shown in the respective screen.

Enter Key

The Enter key is used e.g. to confirm commands or to transmit them to the controller.

Tabulator Key

When you press the tabulator key, the cursor jumps to the next tabulator position.

Escape Key

Press this key to e.g. close a screen or to cancel an input, provided that the Enter key hasn't been pressed yet.

3.3.5 Machine Operating Area



The actuators in the machine operating area are listed from left to right.



Emergency stop

Button: Stops all processes and movements of the equipment immediately. When pressed, this button locks mechanically into place. Unlocking the button does not start up the machinery again, but simply enables the machine to be put back into operation.



Only press the Emergency Stop button in an emergency, such as if people and/or the machinery are in danger.

Quick stop

Button: All feed motions are stopped and the grinding wheel is retracted from the workpiece.



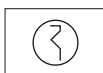
The Feed Hold (Hold all motions) is a software function of the CNC. In the event of CNC or control station faults, this function may be impaired. Use the Feed Hold function to stop the machine in hazardous situations, which do not require the machine to be shut down completely with an Emergency Stop. In true emergency situations, press the Emergency Stop¹ button.

¹ Refer to the chapter INTRODUCTION / Safety Features



Machine

Key switch: The controller is switched on by turning the switch. The various modes of operation of the controller can then be selected by repeated turning of the switch. The emergency limit switch can be overridden by turning and holding the switch so that the axes can be moded in manual mode.



Unlock control station

Key-operated switch:

- 0** Lock the controls at this control station.
- 1** Unlock the controls at this control station.

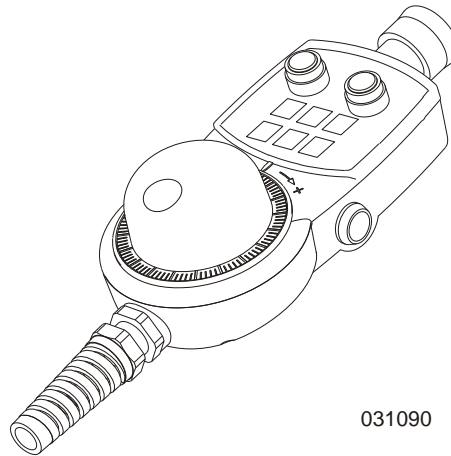


This function has no effect on function and program sequences.

Enable Function

Button: Initialize or enable selected machine- or program functions.

3.3.6 Hand-Held Controller



031090

Fig.: Hand-held Controller (Manual Pendant)



Emergency stop

Button: Stops all processes and movements of the equipment immediately. When pressed, this button locks mechanically into place. Unlocking the button does not start up the machinery again, but simply enables the machine to be put back into operation.



Only press the Emergency Stop button in an emergency, such as if people and/or the machinery are in danger.

Enable

Enabling switch at one side with 3 switch positions:

- 1 Let go while enabling is active: Emergency Stop is triggered
- 2 Hold in the middle position: Enabling is active, machine movements can be initiated.
- 3 Press fully: Emergency Stop is triggered



Hold all motion

Button: All feed motions are stopped and the grinding wheel is retracted from the workpiece.



The Feed Hold (Hold all motions) is a software function of the CNC. In the event of CNC or control station faults, this function may be impaired. Use the Feed Hold function to stop the machine in hazardous situations, which do not require the machine to be shut down completely with an Emergency Stop. In true emergency situations, press the Emergency Stop² button.



Enable Function

Button: Initialize or enable selected machine- or program functions.

² Refer to the chapter INTRODUCTION / Safety Features

Preselect Axis

Selector switch: Activate axis.



Axis adjustment

Handwheel (manual encoder): Move axis incrementally.



Override axis speed

Rotary potentiometer: Set speed of travel of the axis.

7-12

Button: Extension of axis selection on/off.



JOG –

Button: Move the activated axis in negative direction.



JOG +

Button: Move the activated axis in positive direction.



Handwheel (manual encoder)

Handwheel (manual encoder): Move axis incrementally.

3.4 Carriage

3.4.1 Guard Door

Open access door

Button: Unlock access door.

3.4.2 Balancing Device



Emergency stop

Button: Stops all processes and movements of the equipment immediately. When pressed, this button locks mechanically into place. Unlocking the button does not start up the machinery again, but simply enables the machine to be put back into operation.



Only press the Emergency Stop button in an emergency, such as if people and/or the machinery are in danger.

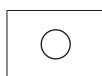


On

Button: Grinding wheel balancing speed on.

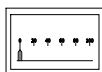


The grinding wheel can be balanced manually.



Off

Button: Grinding wheel balancing speed off.



Balancing device display

Display: Grinding wheel imbalance.

3.4.3 Grinding Wheel Guard

Enable Open safety guard

Button: Unlock guard.

Water nozzle, protective cover flap

According to the diameter of the grinding wheel, the water nozzle and protective cover flap are adjusted manually.



Before changing the grinding wheel, the water nozzle must be moved forward, away from the grinding wheel. After the wheel has been changed, it must be moved backwards, towards the grinding wheel.

Shut-Off Valve for Cooling Lubricant

Regulates the flow of cooling lubricant

Safety guard rinsing facility



The safety guard rinsing facility may only be used when the grinding spindle is running



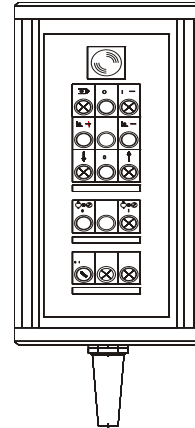
During the grinding process the safety guard rinsing facility should be switched off. Otherwise there is the risk that dirt particles could come off and cause damage to the roll surface!

The safety guard rinsing facility is switched ON/OFF by turning the stop valve to the respective position.

- Safety guard door

3.5 Headstock

3.5.1 General



027812

Fig.: Manual Pendant (schematic diagram)



Emergency stop

Button: Stops all processes and movements of the equipment immediately. When pressed, this button locks mechanically into place. Unlocking the button does not start up the machinery again, but simply enables the machine to be put back into operation.



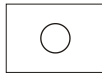
Only press the Emergency Stop button in an emergency, such as if people and/or the machinery are in danger.

3.5.2 Faceplate



Faceplate on

Button: Faceplate drive on. The faceplate rotates clockwise.



Faceplate off

Button: Faceplate drive off.



Rotate faceplate

Jog mode button: The faceplate rotates clockwise at the setup speed.



Rotate faceplate

Jog mode button: The faceplate rotates counterclockwise at the setup speed.

PROTECTIVE DOOR OPEN

Button: Unlock faceplate guard.

3.5.3 Manual Operating Elements

- Hand pump for transverse adjustment
- Hand lubricating pump for transverse adjustment
- Fastening screws

3.6 Tailstock

3.6.1 Manual Operating Elements

- Adjusting spindle for longitudinal adjustment
- Manual hand operated lubrication pump

3.7 Steady Rests

3.7.1 Manual Operating Elements

- Adjusting spindle for longitudinal adjustment
- Adjust spindels of the jaw adjustment
- Manual hand operated lubrication pump

3.8 Machine Bed

3.8.1 Manual Operating Elements

Coolant gutter flushing

The coolant gutter flushing is switched on or off by turning the stop valve to the respective position.

3.9 Measuring Device

The signalling column is located at the measuring device. It signalizes the operating status of the measuring device.

- **ACOUSTIC SIGNAL:** An acoustic signal sounds to indicate that the „measuring arm is swivelling“. When the measuring arm comes to a stop, the acoustic signal ceases.
- **RED:** The indicator lamp flashes to signalize that the „measuring arm is swivelling“. The lamp goes out when the measuring arm comes to a stop.



4 SETUP

4.1 General

This chapter explains the operations that have to be performed to set up the machine. Most operations for setting up the machine are done in jog-mode.

WARNING



Assembly, Disassembly and Setup Jobs

Risk of fatal injury by getting crushed or struck. Risk of major machine damage by suspended loads when using a crane.

- There must not be anybody in the danger zone.
 - Use only lifting equipment with an adequate load bearing capacity and load suspension devices that are suitable for the job.
 - Only attach the load suspension devices to the lifting lugs, eyebolts, suspension blocks and suspension bolts that are provided for that purpose.
 - Comply with all local safety regulations for crane usage.
-

CAUTION



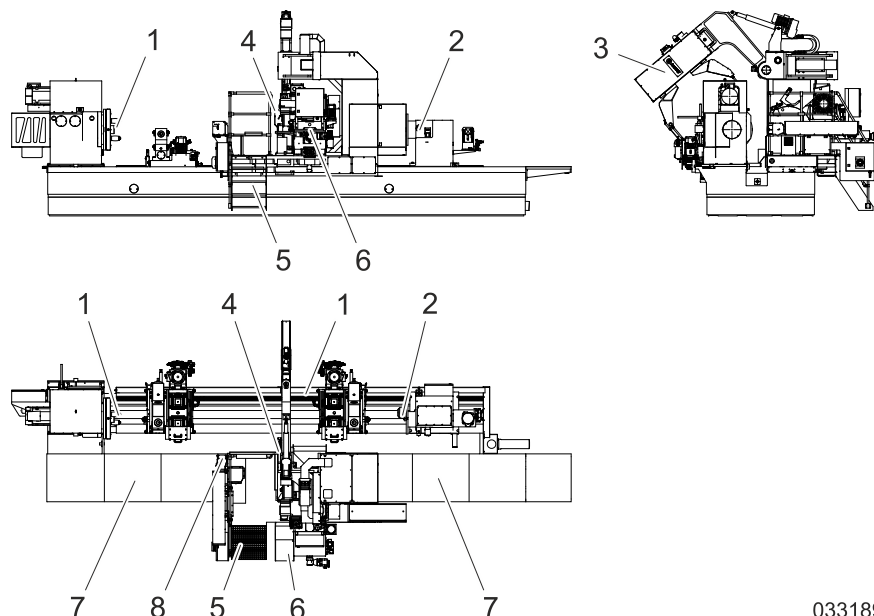
Operating Errors in Jog Mode

In this mode of operation, operating errors are only monitored by the controller to a limited extent. There is a risk of getting crushed and a risk of material damage to the machine and workpiece if collisions occur when the axes are moved manually, or when machine functions are activated.

- Remove any people and any foreign objects from the work area of the machine.
 - Only move the axes after you have made sure that no collisions will occur.
 - Only activate machine functions when you are sure that no collisions will occur as a result.
-

4.2 Personal Protection

4.2.1 Danger Zones



033189

Fig.: Hazardous areas

- 1** Risk of impact, catching and tangling in the area of workpiece and face plate
- 2** Risk of impact and crushing in the traverse range of the tailstock quill
- 3** Risk of impact and crushing in the swivel area of the measuring equipment
- 4** Risk of catching, tangling, friction and abrasion in the grinding wheel area
- 5** Risk of falling when climbing the carriage ladder
- 6** Risk of impact and crushing in the traverse area of the carriage
- 7** Risk of slipping and stumbling on the telescopic covers
- 8** Risk of impact and crushing in the traverse range of the ultrasound detector



There is a risk of slipping, tripping and falling in the whole work area of the machine due to contamination with lubricants and coolants.

4.2.2 Faceplate Guard

Open Faceplate Guard

To protect the machine operator, the headstock is equipped with a faceplate guard. The faceplate guard can be opened in setup mode when the faceplate is at a standstill.

WARNING



Rotating Parts

Risk of sustaining fatal injury, risk of getting crushed and risk of getting caught on or pulled into rotating parts.

- After completing setup jobs, close the faceplate guard.
- Only actuate positioning elements for the faceplate drive or for adjustment of the faceplate when there is nobody in the danger zone.

-
- The illuminated pushbutton **OPEN GUARD** signalizes that the faceplate guard can be opened.
 - Press the button and simultaneously open the faceplate guard
 - The faceplate drive or faceplate adjustment can be operated/executed in Jog mode while the faceplate guard is open.

Close Faceplate Guard

- Close the faceplate guard
- The faceplate guard is locked.
- The illuminated pushbutton **OPEN GUARD** signalizes that the faceplate guard is locked.

4.3 Start-up

The following conditions must be met before you switch on the machine:

- Remove any people and/or foreign objects from the machine area.
- Check the fluid levels in the hydraulic, hydrostatic, lubrication, and cooling lubricant systems.
- Check that the attachments on the workpiece side have been properly secured.
- Check that the workpiece is properly supported and secured into place.
- Make sure that all safety devices/guards are installed and are in proper working order.

4.3.1 Switching On the Machine

- Switch on the main switch at the control cabinet
- The controller is switched on and power is supplied to the measuring systems.



After switching off the machine, you must wait at least 30 seconds before you switch it back on again.

- Heed any messages or fault messages that are displayed at the control station.
- Based on the displayed messages, determine the type and possible cause of the fault and rectify the source of the fault.
- Tap on the **ACKNOWLEDGE** button.
- Press the button **ENABLE FUNCTION**
- Tap on the **MACHINE ON** button
- Press the button **ENABLE FUNCTION**
- Power is supplied to the drives.
- The equipment is switched on and the machine is ready for operation.

4.3.2 Switching Off The Machine



The machine must never be switched off directly at the power switch or the main switch, because this can cause major damage to the machine!

- Wait until all drives have come to a complete stop
- Tap on the **MACHINE OFF** button.
- Press the button **ENABLE FUNCTION**
 - All axes are disabled.
 - The power switch disconnects all drives and auxiliary drives from the power supply.
 - All drives are switched off.



Power is still supplied to individual machine components.

- Turn off the main switch at the control cabinet

4.3.3 Switching On After an Emergency Stop



The cause that led to the Emergency Stop must be thoroughly investigated and rectified before you switch the machine back on !

- Rectify the cause(s) that led to the Emergency Stop.
- The controller remains switched on in the event of an Emergency Stop.

When an Emergency Stop button has been pressed to shut down the machine:

- Unlock the Emergency Stop button that was pressed by turning it
- Tap on the **ACKNOWLEDGE** button.
- Press the **ENABLE FUNCTION** button

If an emergency shutdown has been initiated by the machine's safety monitoring system:

- Turn the key-operated switch Dina reset³ at the control cabinet.
- The safety monitoring system is reset.
- Tap on the **ACKNOWLEDGE** button.
- Press the **ENABLE FUNCTION** button

The subsequent procedure is the same as that for normal switch-on of the machine.

- Move peripheral equipment to the idle or home position.

Functions or programs that were stopped as a result of the Emergency Stop must be started again from the beginning.

³ Refer to the chapter OPERATING ELEMENTS / Control Cabinet, or to the chapter DIAGNOSIS

4.4 Hand-Held Controller

4.4.1 General

For installation reasons, manual pendants (hand-held control units) and additional attachments are often connected to the machine by a plug connector.



There is an emergency stop button on each manual pendant (handheld control unit). If the manual pendant is disconnected from the machine, the safety loop is interrupted and an emergency stop is triggered automatically.

Therefore, to guarantee complete safety and full operation ability, the plug connections must not be disconnected.

If disconnection is a necessity for any reason, e.g. for repairs, a dummy plug must be plugged in at the machine so that the machine can be started. Also refer to "Switching on After an Emergency Stop" in this chapter.

For additional attachments which do not have an emergency off button, a dummy plug must also be plugged into the relevant interfaces at the machine to avoid possible fault messages from occurring and to protect the connection from dirt and damage.

4.5 Carriage

Before setting up the machine components and inserting the roll into the machine, the grinding carriage must be moved to its parking or safety position.

Carriage Parking/Safety Position

- In X-direction, the carriage is at the back end limit position.
- In Z-direction, the carriage is at the end position at the tailstock side.
- The measuring system is at home position.



If the grinding wheel remains switched on while the machine is being loaded or unloaded, there is a risk that you could accidentally come into contact with it!

Moving the Axes

The axes are moved in manual mode⁴ by pressing the relevant buttons at the control station⁵.

⁴ see chapter OPERATION

⁵ see chapter OPERATING AND MONITORING ELEMENTS

4.6 Grinding Wheel

4.6.1 General

This chapter contains only a summary of the most important precautions. Further safety recommendations will be found in the laws, decrees and technical standards of the different countries and in the FEPA-Safety Code.

WARNING



Grinding Wheel Breakage

There is a risk of fatal injury, serious injury and material damage to the machine and the workpiece if fragments of a broken grinding wheel are flung out of the safety guard.

- Grinding wheels are prone to breaking, therefore always handle them with extreme care.
 - Do not use damaged grinding wheels.
 - Only use grinding wheels that are suitable for the respective application.
 - Do not use grinding wheels that cannot be properly identified.
 - Do not use force when clamping the grinding wheel.
 - Do not modify the grinding wheel in any way.
 - Do not exceed the permitted circumferential speed of the grinding wheel.
-

Delivery, handling and storage

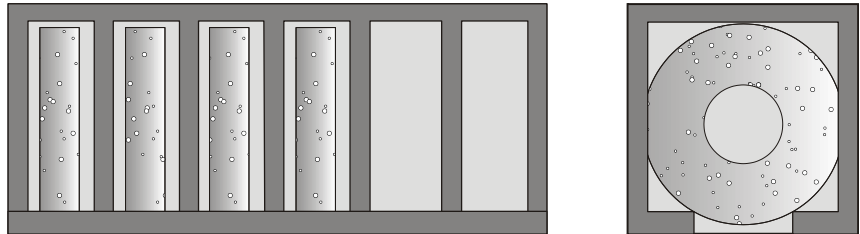
Upon delivery, the packages must be carefully inspected, any deterioration must lead to a special examination of all products.

Always handle grinding wheels and other bonded abrasive products with the utmost care. They should never be dropped, knocked or rolled along the floor without some cushioning between the wheel and the ground. They should always be stored at moderate temperature and humidity in such a manner that mechanical damage is avoided and that the items concerned are not subjected to the damaging influences of moisture, frost, uneven heating or cooling or aggressive media. For resin bonded wheels, use the oldest first.

The illustration below shows an example of how grinding wheels and other bonded abrasive products should be correctly stored.

Never use an abrasive product beyond its expiry date where marked. Observe the shelf life for the following specific products:

- Resinoid and Shellac products, 3 years
- Rubber products, 5 years
- Vitrified products, 10 years



026757

Fig.: Rack design suitable for storing grinding wheels

Selection Criteria

The right choice of grinding wheel is of great importance to the quality of the ground roll. It should be selected with regards to abrasive material, grain size, hardness and bond so that a good relationship between the stock removal, grinding time and grinding wheel wear is achieved. The following rules should be observed for this purpose:

- The harder the roll surface, the softer the grinding wheel should be.
- If the grinding wheel wears down too quickly, it is too soft for the grinding operation for which it is being used.

Improvement can be achieved by:

- Increasing the circumferential speed of the grinding wheel.
- Increasing the feedrate up to 3/4 of the wheel width per rotation of the roll.
- Reducing the rotational speed of the roll.

If these measures do not help, then the grinding wheel is unsuitable for the grinding job.

- If the grinding wheel tends to clog or smear, or if burn marks appear on the ground surface, the grinding wheel is too hard

Improvement can be achieved by:

- Reducing the circumferential speed of the grinding wheel and increase the speed of roll.

Grinding wheel

Check abrasive product or package for any warnings or other safety information.

- Ensure that the correct abrasive product is selected. Never use a product if it cannot be properly identified.
- Observe any mounting indications marked on the product such as direction of run or mounting position.
- Never exceed the maximum circumferential speed where specified.
- Follow any restriction of use and any specific instruction which may be indicated on the wheel or on attached documents.

Side grinding

For side grinding only use grinding wheels, which are suitable for this application.

Do not use a straight wheel which has a thickness of less than 10 % of the wheel diameter for side grinding.

Visual inspection and ring test

Always carefully inspect the grinding wheels and bonded abrasives before mounting for possible damage.

Certain types of wheels - particularly vitrified wheels exceeding 80 mm in diameter - can be subjected to a sound test. To make such a test, lighter wheels are held on a mandrel or finger and heavier wheels are stood on a firm base and are tapped at several points with a non-metallic object.

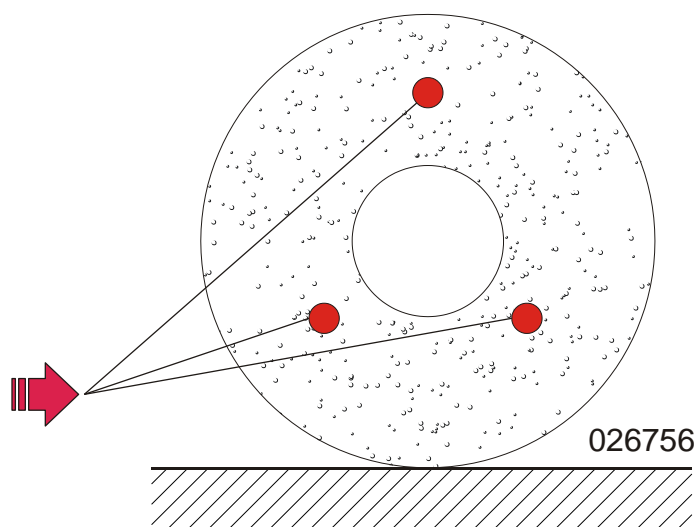


Fig.: Tapping points for a sound test



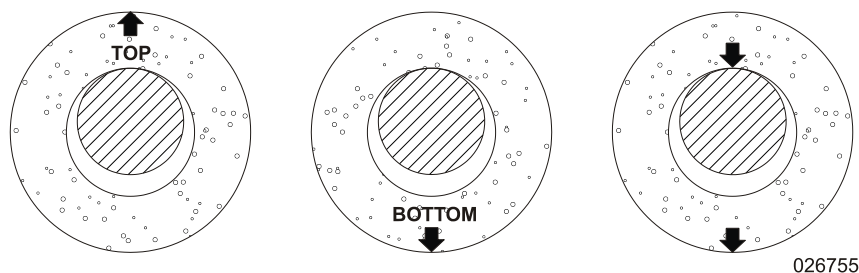
Wheels that are in good condition ring clearly but wheels that are damaged give a dull or chattering sound.

Mounting

This operation shall be performed by a qualified trained person.

No modification should be made to the bore and/or recesses of a grinding wheel after delivery.

Certain wheels have a positioning mark on them. Care must be taken to ensure that this mark occupies the position stated by the manufacturer.



026755

Fig.: Positioning mark

It should be checked that the clamping flanges are of equal diameter and have similarly formed abutment faces.

The abutment faces of the flanges must be clean, flat and without grease. Flange diameter is generally at least one third of the diameter of the wheel and must be recessed around the centre hole.

Where grinding wheels are mounted between flanges, blotters of soft or flexible material, such as cardboard, plastic or rubber have to be fitted between the abutment faces of flanges and the wheel. In the case of fine grain grinding wheels used with a coolant and remaining in use for a long time, it is advisable to use blotters made of plastic or rubber.

Coolant

Where coolant is used, once the grinding operation is completed, the coolant supply should be turned off and the grinding machine kept running at no-load until centrifugal force has drained all the coolant from the wheel.

If the grinding machine is not to be used again for any length of time, it should be ensured that the coolant is prevented from being absorbed by the grinding wheel.

Where resinoid-bond wheels are used for wet grinding, it should be ensured that the coolant has a pH value not exceeding 9 and a temperature not exceeding 40° C.

4.6.2 Changing the Grinding Wheel

The grinding wheel is mounted and dismounted together with the grinding wheel chuck on the taper of the grinding spindle.

After the new wheel has been mounted, it must be synchronised⁶ again.

- Switch off the grinding wheel drive
- Loosen the protective hood locking
- Open the safety guard of the grinding wheel.

⁶ see Chapter DESCRIPTION / OPERATION

Removal

- Loosen the grub screws in the mounting nut of the grinding wheel chuck and remove the nut.

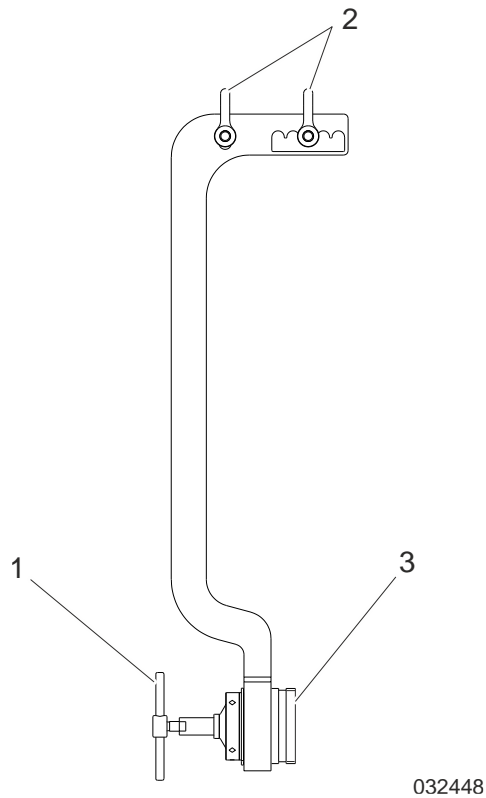


Fig.: Grinding Wheel Changer

- 1 Toggle
- 2 Attachment lug
- 3 Thread for holding the grinding wheel chuck

- Pick up the grinding wheel changer by crane at the attachment lug.



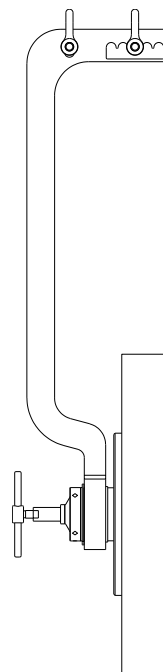
Make sure that the threaded spindle has been turned back completely with the toggle.

- Put the grinding wheel changer into position just in front of the grinding wheel chuck and with the help of the knurled collar, screw the mounting thread fully into the grinding wheel chuck.



To prevent damage to the taper of the grinding spindle or to the grinding wheel chuck, make sure that the attaching cable is properly pre-tensioned!

- Turn the toggle inwards to loosen the grinding wheel and chuck off the grinding spindle taper.
- Pull the grinding wheel and chuck off the grinding spindle and transport it to a suitable storage place.



032449

Fig.: Grinding Wheel Changer with Grinding Wheel and Chuck

- Clean the inside of the safety guard manually with a spatel or a steel brush⁷.

⁷ Refer to chapter MAINTENANCE / Maintenance- and inspection list

Mounting

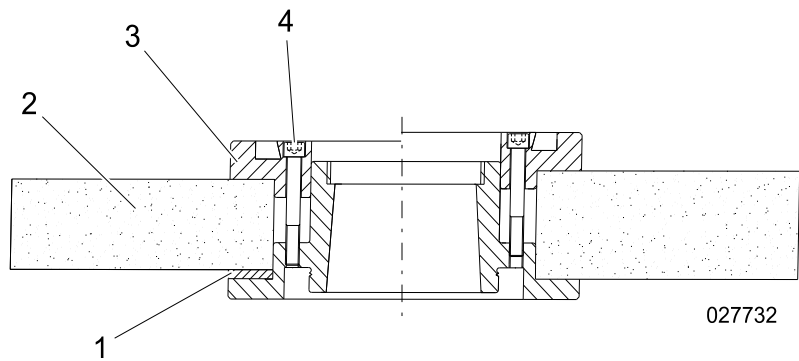


Fig.: Grinding Wheel on the Chuck

- 1** Spacer
- 2** Grinding wheel
- 3** Clamping ring
- 4** Fastening screws

- Put the new grinding wheel onto the grinding wheel chuck so that it is dead centre.
- For thinner grinding wheels, insert spacers for this purpose.
- Place a 1-2 mm paper ring on both sides of the grinding wheel to compensate for any unevenness in the grinding wheel.
- Slide on the clamping ring.
- Uniformly tighten the fastening screws.

Rough Balancing

The grinding wheel must be roughly balanced before it is installed in the machine so that the adjustment range of the balancing device in the wheel spindle is sufficient for fine balancing purposes.

- Place the grinding wheel with adaptor into a suitable support so that it can be rotated with ease.
- Remove the balancing segments from the grinding wheel adaptor.
- Determine the center of gravity line by turning the grinding wheel until it comes to a rest with the heavy side down.
- Insert or adjust the balancing segments so that the grinding wheel stops at any position and no longer swings down.

Mounting

The grinding wheel is mounted in reverse order to that in which it was removed. Before mounting, make sure that the wheel spindle and the grinding wheel adapter are absolutely clean!

After changing the grinding wheel, the actual grinding wheel width must be entered into the CNC controller⁸.



If the grinding wheel was changed while the wheel spindle was warm, the taper of the wheel spindle will be cooled down by the cold grinding wheel adapter and the clamping rings could slacken. The clamping rings must therefore be retightened approx. 5 minutes after mounting the grinding wheel by tightening the screws.

⁸ Refer to the chapter Operation

Dry Run



After installing a grinding wheel, do a dry run for at least 5 minutes at the maximum permitted circumferential speed.

- Cordon off the danger zone.
- Set the maximum permitted spindle or grinding wheel speed.
- Let the grinding wheel run for at least minutes, watching it continuously.
- Reduce the speed of the wheel to its normal idling speed.

Fine Balancing

To achieve an optimal balancing result, all true-running errors of the grinding wheel must be rectified by dressing the wheel before fine balancing is done.

The remaining grinding wheel imbalance prior to fine balancing must not exceed the maximum permitted value specified in DIN EN ISO 6103.

Fine balancing is done on the following principle:

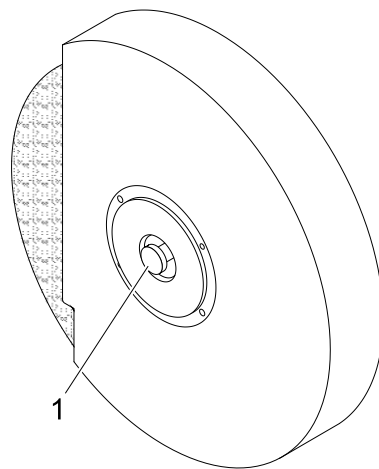
- The remaining imbalance is measured by a sensor and is displayed on the display unit at the top part of the grinding carriage.
- Elimination of the imbalance is done by adjusting the balancing device in the wheel spindle. The actual remaining imbalance is shown on the display unit.

CAUTION**Rotating Parts of the Balancing Device**

When balancing the wheel, there is a risk of injury if you get pulled into and caught in the opening of the grinding wheel safety guard.

- Make sure that your hands are dry and oil-free when you balance the wheel.
- Wear tight-fitting clothing.
- Do not wear gloves.
- Do not touch the balancing device with rags or cloths.

- Switch on the grinding wheel.



027733

Fig.: Balancing Device

- Keep hold of the knob [1] until the smallest achievable residual unbalance is displayed on the display unit.

4.6.3 Dressing the Grinding Wheel

It may be necessary to dress the grinding wheel in the following circumstances:

- Before fine balancing the grinding wheel.
- To roughen a clogged grinding wheel.
- When synchronizing the grinding wheel so that it can approach the roll automatically.
- To produce or recreate a defined surface contour on the grinding wheel.

Dressing Diamond

We recommend that you always check the dressing diamond before you start the dressing operation. If the diamond is blunt, reposition the diamond holder so that the grinding wheel is dressed by a sharp edge of the diamond.

Wheel diameter measuring device

The wheel diameter measuring device is located beside the dressing diamond. In order to synchronize the grinding wheel, it is pushed in a defined distance by the switched-off grinding wheel.

The actual grinding wheel diameter is calculated and is saved in the CNC controller. The grinding wheel can thus be moved up to the roll without the risk of collision.

4.7 Steady Rests

4.7.1 Support Points

The roll is supported in two steady rests. The roll support points and the steady rest jaws greatly influence the grinding results. To achieve good grinding results, the following requirements must be met:

- The points of support at the roll must be geometrically correct and must be clean and undamaged.
- Suitable steady rest jaws must be used dependent on the support points and the jaws must be clean and undamaged.
- The steady rest jaws must be adjusted so that the roll is supported exactly at center height and in alignment with the carriage bed.
- The points of support must be adequately lubricated.

Before the roll is loaded into the steady rests, the steady rest must be set up to accommodate the roll dimensions, i.e.

- Mount the steady rest top parts (option) for the required support diameter.
- Adjust or mount steady rest jaws or false jaws for the required support diameter.
- Adjust the steady rests longitudinally.



Longitudinal adjustment of the steady rests and vertical adjustment of the jaws must not be done under load (with roll)!

4.7.1 Changing the False Jaws

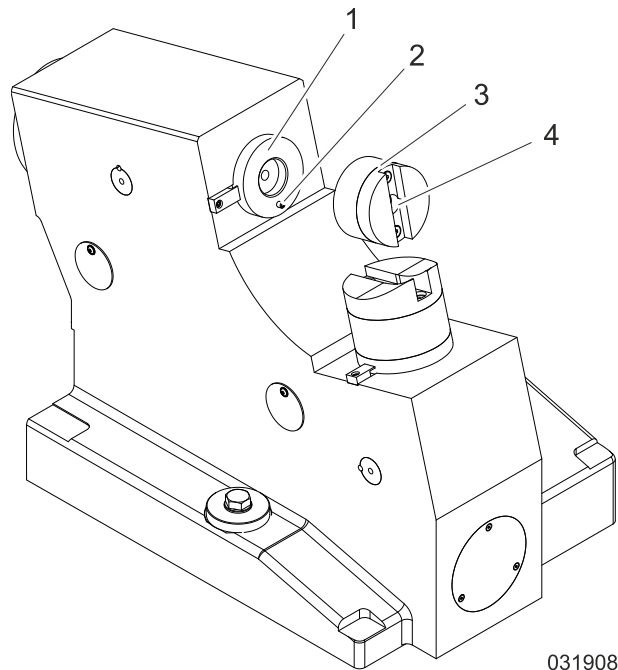


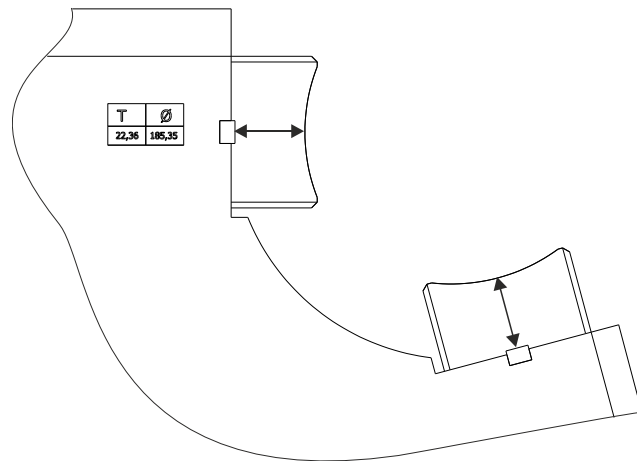
Fig.: Changing the false jaw

- 1 Basic jaw
- 2 Straight pin
- 3 False jaw
- 4 Fastening screws for false jaw

- 1
 - Loosen the fastening screw at the false jaw.
 - Lift off the false jaw either by hand or with a suitable suspension device.
 - Clean and lightly oil the false jaw and the mounting surface of the basic jaw.
 - Put on the new jaw so that the straight pin fits into the locating hole.
 - Fasten the false jaw onto the basic jaw with the fastening screw.

4.7.2 Adjusting the Height of the Hydrodynamic Jaws

The height of the steady rest jaws is measured per jaw with a depth caliper gauge from the center of the bearing surface to the measure shoulder. A sign showing the measured values is mounted at each steady rest top part.



031448

Fig.: Adjusting the Height of the Jaws

4.7.3 Hydrostatic Steady Rest

Split bearings and jaws for hydrostatic steady rests haven't an adjustable range for the diameter. They must be inserted to accommodate the diameter which is be supported

The condition of the split bearings, jaws and hydrostatic oil as well as the oil gap is very important for the working result.

- The safety guards provided (e.g. splashguard) must be properly mounted.
- When the hydrostatic steady rests are in constant use, the oil must be checked at short intervals. Contaminated oil must be separated or changed.

Even when appropriate safety measures are taken, coolant emulsion could get into the hydrostatic oil circuit.

To prevent a build-up of water and to ensure trouble-free operation, we recommend the bypass connection of a separation plant (e.g. centrifuge).



Separation or change of the oil is also necessary if the supply unit has been switched off for less than 8 hours, as then, the water cannot precipitate properly.

4.7.4 Check the Oil Gap at the Hydrostatic Steady Rest Jaws

The gap height between workpiece and hydrostatic jaws can be adjusted by the pocked pressure of every oil pocke. The oil quantity and thus the gap height can be set to the required size over the gear wheel pump and the volume regulator behind the pump.

The gap height depends on the circumferential speed of the roll neck and the surface quality of the supported neck.



To prevent damages to the split bearings, the gap height have to be checked before swithing on the roll drive.

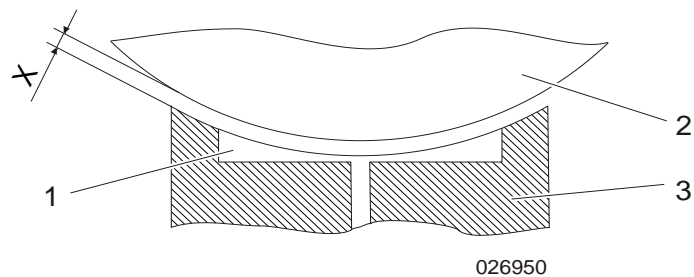


Fig.: Oil gap

- 1 Pocket
- 2 Workpiece
- 3 Hydrostatic jaw
- X Gap height



The gap height between supported neck and bearing metal should be between 0,005 and 0,01 mm.

Measuring probes can be mounted at the hydrostatic steady rests, which can be positioned against the workpiece from below. After the steady rest hydrostatic pressure has built up, an oil film is produced between the workpiece and the hydrostatic jaw. A reading of the amount of lift (oil gap) is given at the measuring probe.

The gap height can also be checked at the 4 corners of the hydrostatic jaw with a suitable feeler gauge.

By adjusting the oil gap following should be observed:

- The pocket pressure has to be lower than the maximum pressure of the pump.
- Note that the oil flow through the pockets changes according to the cube of the gap height i.e. approximately 5 times as much oil flows through a gap of 0,05 mm than through a gap of 0,03 mm.
- Small gap heights, large discharge areas and viscous oils in connection with high circumferential speeds cause a high bearing friction, and on the other hand only allow a low oil flow which leads to high temperature increase.
- Therefore, the greater the circumferential speed in a bearing is, the greater the gap height should be so that friction is reduced and the oil flow for the dissipation of heat is increased.
- In case of there are very high oil temperatures, either the gap height has to be increased or the circumferential speed has to be reduced.

4.7.5 Hydrostatic Jaws

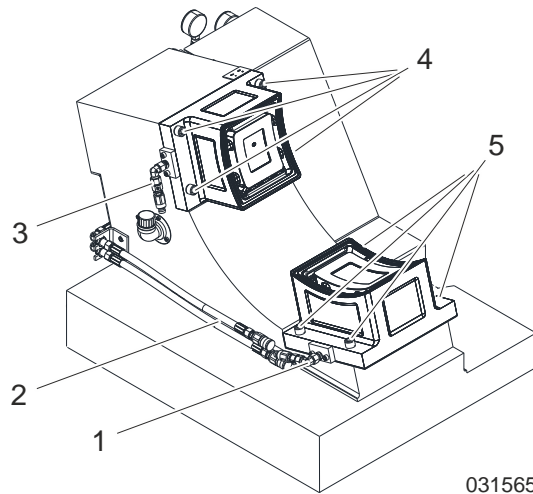


Fig.: Hydrodynamical Steady Rest (schematic diagram)

- 1 Power supply lower jaw
- 2 Power supply lines
- 3 Power supply upper jaw
- 4 Fixing screws upper jaw
- 5 Fixing screws lower jaw

Mounting

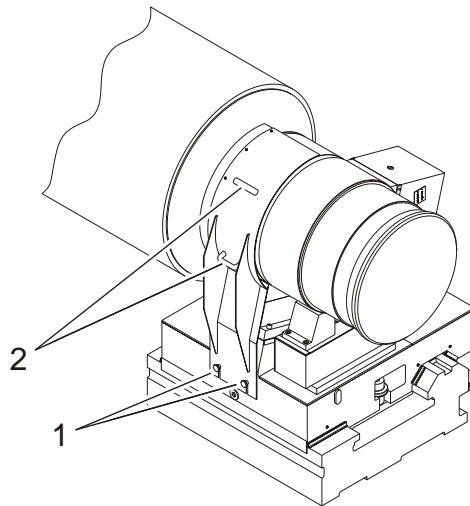
- Clean and lightly oil the false jaw and the mounting surface at the steady rest
- Put the false jaws onto the steady rest and screw them down
- Connect the supply and drain lines for the hydrostatic jaws

Removal

- Detach the supply and drain lines from the false jaws and seal them tightly
- Unscrew the fastening screws and remove the false jaws

4.7.6 Splashguards

The splashguards can be mounted after the roll has been inserted.



030291

Fig.: Splashguard (schematic diagram)

- 1 Clamping screw
- 2 Handle

- Release the clamping screw
- Put on the steady rest splashguard
- Fixing the clamping screws.
 - This minimizes contamination of the hydrostatic oil with cooling lubricant.

- Remove the steady rest splashguards before removing the roll.

4.7.7 Longitudinal Adjustment of the Steady Rests

Before the workpiece is loaded, the steady rests must be adjusted so that they are in the correct positions to support the workpiece.

- Unclamp the steady rests.
- Clean and lightly oil the guideways.
- Actuate the hand lubrication pump before adjustment.
- Adjust the steady rests in accordance with the dimensions of the workpiece.
- Reclamp the steady rests.



When adjusting the steady rests, make sure that the guideways are properly lubricated!

4.8 Roll

4.8.1 General

The roll must meet the following requirements before it is loaded into the machine:

- The roll neck must be geometrically correct and must not be damaged in any way.
- The roll's surface and support points must be free of grease, oil and dirt.
- There must be no foreign objects on the roll's surface, such as, for example, metal residues resulting from an accident in the roll stand.



Dirt and foreign objects on the roll can damage the roll measuring and testing devices.

4.9 Headstock

4.9.1 Roll Drive System

WARNING

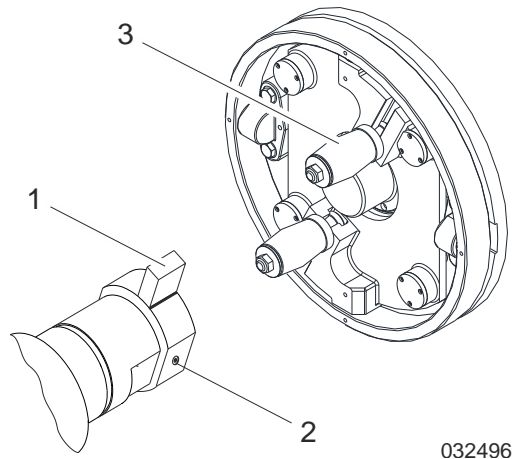


Roll Driver

Loose or damaged roller blocks and roll drivers can be flung out of the machine. Risk of fatal injury, serious injury and risk of damage to the machine and the workpiece.

- Check that the roller blocks are properly secured.
 - Use roll drivers of an adequate size.
 - Do not use damaged roller blocks or roll drivers.
-

Driving with Roller Blocks and Roll Drivers



032496

Fig.: Roll Drive (Schematic Diagram)

- 1 Roll driver
- 2 Roller blocks
- 3 Locking screw

- Adjust the roller blocks in line with the roll driver.
- Tighten the clamping screws of the roller blocks.
- Secure the roll driver with the locking screw to prevent it from shifting on the roll.

4.10 Inserting the Roll

4.10.1 General

WARNING



Loading the Machine

There is a risk of sustaining fatal injury, crushing injuries and the risk of serious damage to the machine and workpiece when using a crane with suspended loads.

- There must be nobody in the danger zone.
 - Use lifting equipment with an adequate load-bearing capacity and suitable slings/tackle to lift all parts.
 - Comply with all local safety regulations for use of the crane.
 - When loading the machine, make sure that no collisions with machine components occur.
-

- Turn the faceplate so that the roller blocks are in the horizontal position.
- Move the tailstock back so that the workpiece can be loaded.
- Position the steady rests according to the bearing points of the roll.
- Mount the roll driver at the roll neck and secure it into place
- Attach the roll to the crane with suitable hoists.
- Carefully place the workpiece into the steady rests or the softloader⁹ (option).
- Remove the ropes or slings
- Switch on the jaw lubrication

⁹ Refer to the Chapter INTRODUCTION / Technical Data

4.11 Tailstock

4.11.1 General

The tailstock must be set up on the bed to accommodate the dimensions of the workpiece.

DANGER



Movement of the Tailstock / Quill With Inserted Workpiece

Risk of fatal injury and getting crushed between the tailstock and the inserted workpiece.

- Make sure that there is nobody in the danger zone before you actuate the adjusting elements for adjustment of the tailstock and the quill.

-
- Retract the quill into the tailstock.
 - Unclamp the tailstock.
 - Operate lubrication
 - Position the tailstock so that the travel of the quill is adequate to secure the workpiece.
 - Clamp the tailstock.
 - Extend the quill up to the roll neck



When making the adjustments, make sure that the guides are clean and have adequate lubrication.

4.12 Align Roll

Before grinding takes place, the roll must be aligned parallel to the path of the carriage (Z-axis). Alignment is done via the controller. The "Align" function must be defined in the grinding program¹⁰ for this purpose.

In the automatic cycle, the out-of-centerline of the roll is then measured and is displayed. If the measured out-of-centerline is within the preset limits, the next program step takes place automatically. The controller compensates for the out-of-centerline during the grinding operation. This function remains stored until the automatic cycle is ended.

If the measured out-of-centerline exceeds the preset limit of accuracy, the message **ATTENTION! ALIGN ROLL MANUALLY** appears.

- Align the roll manually by adjusting the steady rest jaws accordingly.
- Press the Automatic Start button
- The "Align" function is repeated

¹⁰ Refer to CNC Programming

4.13 Removing the Roll

WARNING



Loading the Machine

Risk of fatal injury, getting crushed, and risk of major damage to the machine and workpiece by suspended loads when using a crane.

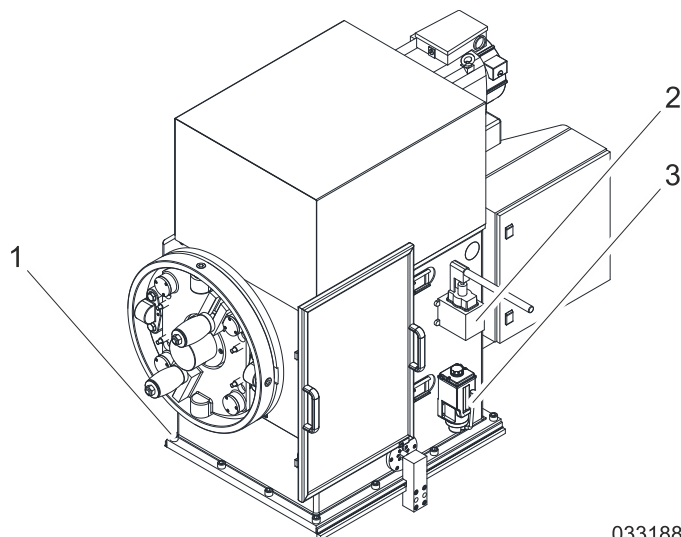
- There must not be anybody in the danger zone.
 - Use only lifting equipment with an adequate load bearing capacity and load suspension devices that are suitable for the job.
 - Comply with all local safety regulations for crane usage.
-

- Pick up the workpiece with the crane
- Turn the faceplate so that the roller blocks are in the horizontal position.
- Remove the roll driver stop
- Retract the quill into the tailstock.
- Unclamp the tailstock.
- Move the tailstock back so that the workpiece can be unloaded.
- Remove the workpiece from the machine with the crane

4.14 Center Adjustment

4.14.1 Headstock

The headstock can be moved sideways to extend the working range.



033188

Fig.: Headstock (schematic diagram)

- 1 Fastening screws
- 2 Hand pump cross adjustment
- 3 Hand-operated lubrication pump

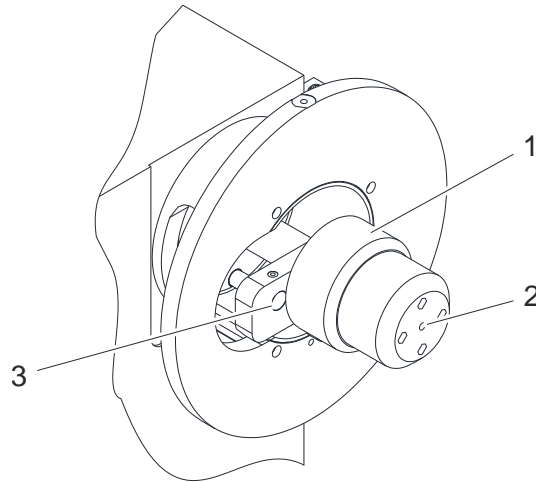
- Loosen and unscrew the fastening screws
- Attach the lever to hand pump for transverse adjustment
- Set the adjustment direction on the pump selection lever.
- Activate the lubrication
- Move the headstock to the appropriate end position
- Remove the lever from the pump
- Insert the fastening screws and screw them tight



When making the adjustments, make sure that the guides are clean and have adequate lubrication.

4.14.2 Counterstay

The counterstay can be moved sideways to extend the working range.



031729

Fig. Moving the counterstay

- 1** Counterstay
- 2** Fastening screw for counterstay
- 3** Mounting center shift

- Fully extend the tailstock quill
- Insert the long Allen key into the hole and unscrew the fastening screw. Secure the counterstay to prevent it from falling down.
- Pull the counterstay forwards out of the base plate
- Insert the counterstay into the center shift mounting and screw it through the hole using an Allen key.



5 DIAGNOSIS

5.1 Fault Indication

All important functions of the machinery are electrically monitored. Any faults and operating messages are displayed on the screen at the control station and at the fault diagnosis system (optional).

Fault

The machine is no longer operational. The cause(s) of the fault must be rectified immediately to prevent machine damage. The fault message must then be reset.

Messages

All warning messages are displayed and are updated continuously. The machine remains operational to begin with. The cause(s) that led to the issuance of the warning must be rectified in order to prevent machine damage and/or operational failure of the machine.

5.2 Troubleshooting

The exact source of a fault can be identified with the help of the documentation and the user surface of the control.

DANGER



Live Components

Risk of electrocution!

- Do not touch any live components!
 - Troubleshooting on this equipment must be done by duly qualified personnel.
-

Documentation

Take the following documents at hand.

- Wiring/circuit diagrams
- Schematics (Hydraulics, Hydrostatics, Pneumatics)
- Assembly drawings
- Information about purchased parts

User surface

Following informations are supplied by the service menu of the user surface:

- Fault messages
- User actions
- Overrides
- Control informations
- PLC- messages
- Cycle messages
- Wiring/circuit diagrams

5.3 Retracting From an Emergency Limit Switch

If an emergency limit switch is tripped, movement of all axes is stopped and the automatic process is switched off. To put the machine back into operation, the axis in question must first be retracted from the emergency limit switch.

CAUTION



Operating Errors

There is a risk of getting crushed and a risk of material damage to the machine and workpiece if collisions occur.

- Remove all foreign objects and people from the work area of the machine
- Determine and rectify the cause of the emergency stop
- Only move the axes when you are sure that no collision will occur

-
- Tap on the **ACKNOWLEDGE** button.
 - Press and hold the **ENABLE FUNCTION** button
 - Turn and hold the key-operated switch **MACHINE**.
 - Wait until the message **BYPASS EMERGENCY LIMIT SWITCH** appears at the control station's display.
 - Retract the axis in question in manual mode

5.4 Reset Safety Monitoring System

For fault rectification purposes, various key buttons are provided at or in the control cabinet.



After use, remove the key and put it away to prevent unauthorized use.

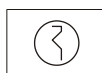
CAUTION



Improper Operation of Key buttons

Improper operation or non-operative machine functions can lead to bodily injury and major machine damage.

- Only duly qualified personnel may use the key button and only when the machine is switched off.
 - The operators must be informed about non-operative machine functions and the possible consequences thereof.
-



Dina reset

Key-operated switch: Resets the safety monitoring system after a fault.

If the machine won't switch on even after a fault has been rectified, e.g. after changing chocks or switching on after an Emergency Stop, the safety monitoring system must be reset.



To prevent damage to the machine, only turn the key-operated switch when the machine is switched off.

- Switch off the machine.
- Turn the key-operated switch
- The safety monitoring system is reset



If faults occur after the safety monitoring system has been reset, switch off the machine and contact Customer Service.

5.5 Service Switches

For fault rectification purposes, various key-operated switches are provided at or in the control cabinet.



After use, remove the key and put it away to prevent unauthorized use.

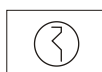
CAUTION



Improper Operation of Service Switches

Improper operation or non-operative machine functions can lead to bodily injury and major machine damage.

- Only duly qualified personnel may use the service switch and only when the machine is switched off.
 - The operators must be informed about non-operative machine functions and the possible consequences thereof.
-



Measuring Unit

Key-operated switch: Switch off damaged measuring device.

When the device is switched off, existing programs are executed without measuring functions.



Only switch off the measuring device when it is at its parked position.



Eddycek

Key-operated switch: Switch off damaged crack detector.

When the crack detector is switched off, existing programs are executed without measuring function.

5.6 Control Reset

PC RESET

Button: Re-boot control.

The control must be re-booted if the main control station no longer reacts, the software is updated, or the power to the machine has been switched off completely.

- Switch off the machine.
- Press the **PC RESET** button.
- The PC is shut down in the proper manner and then reboots again automatically.
- Switch on the machine.

- Tap on the **ACKNOWLEDGE** button.
- Press the button **ENABLE FUNCTION**
- Tap on the **MACHINE ON** button
- Press the button **ENABLE FUNCTION**
- Power is supplied to the drives.
- The equipment is switched on and the machine is ready for operation.
- Move peripheral equipment to the idle or home position.

5.7 Malfunction in the Hydraulic / Hydrostatic Systems

Narrowing Down the Cause of a Fault

The causes leading to a fault or malfunction are generally not immediately apparent. It is therefore best to proceed systematically, in order to isolate the fault. To find a fault, the best way is to conduct a systematic search, starting from the pump and proceeding to the consumers, or vice-versa, because any part of the system may be to blame for the fault.

You should never randomly change any settings on any of the units! If however, it seems sensible to change the pressure or flow rate in the course of searching for the fault, it is important that you note down or mark the original setting.

If a fault has occurred, i.e. a function cannot be performed properly, you can proceed e.g. in the following manner:

- Check whether the limit switch, pressure switch and/or flow controller contact of the previous function has taken place.
- Check whether the solenoids are switching correctly (electrical check, emergency manual actuation, LED at the solenoid).
- Has any other electrical fault message been given, e.g. at the CNC?
- Take a pressure gauge reading for the function in question. Do all pressures correspond with the specifications given in the drawings and operating manuals?
- If the pump assembly is not coming up to pressure, disconnect it from the rest of the system (turn off the shut-off valve (if there is one) and disconnect and close the lines) and check the pump assembly first. If the assembly still does not reach the required pressure, follow the troubleshooting guide below to find the cause of the fault.

- If, however, the pump assembly works properly after it has been disconnected from the rest of the system, then the fault is located in another section of the system. To locate the fault, first reconnect only one valve block to the assembly. Then check the function of the respective consumers. Check the pressure at the Minimes test points. If you do not find the fault, connect the next valve block and check the respective functions, and so on.
- If there is a pressure-reducing valve between the pump assembly and the consumer, check the amount of oil leakage (approx. 0.4 l/min) to see whether the valve is functioning properly.
- Hydraulic motors should also only have a small amount of oil leakage, so it is advisable to check those too (thin stream of oil).

Once you have determined the cause of the fault or malfunction, rectify the fault in accordance with the information given in the troubleshooting guide.

5.7.1 Pump is not pumping

Cause	Remedy
Intake line is blocked/clogged	Clean the intake line
Intake line is leaky and is drawing in air	Seal the leak or tighten the screwed connection
Air in the delivery line cannot escape	Bleed the system
Electric motor is rotating in the wrong direction	Reverse the terminal connections at the electric motor accordingly
The electric motor is not running	Check the electrical connections
	Check the operating voltage
	Check the overcurrent protective device
The rotary shaft seal is damaged	Exchange the rotary shaft seal
The coupling between the pump and the electric motor is faulty	Repair or exchange the coupling
The oil tank is empty	Top up the oil and check the float switch
The compensator is sticking (on zero stroke pumps only)	Remove and clean the compensator
The non-return valve after the pump has been installed the wrong way round	Install the non-return valve correctly

5.7.2 Pump or system is not building up pressure

Cause	Remedy
Pump is worn or damaged (too much oil leaking)	Check the pump and repair or exchange it, if necessary
The pressure control valve (accumulator safety valve) has been set too low	Set the pressure control valve in accordance with the instructions given in the operating manual and seal it
The pressure control valve is not closing	Check whether the pressure control valve is dirty or jammed. Check whether the seat is damaged. Clean, repair or exchange the pressure control valve, as necessary.
The accumulator drain valve is open	Close the valve
The pressure setting on the pressure reducing valve and that on the downstream pressure control valve have not been calibrated	Set the pressure control valve to a value that is at least 10 % higher than that of the pressure reducing valve (see drawing)
The pressure reducing valves installed in the machine are faulty	Check the oil leakage (approx. 0.4 l/min.) Clean or exchange the unit
The solenoid valves are dirty, the pump is pumping from P to T in the tank	Clean or exchange the solenoid valves
The compensator is sticking (on zero stroke pumps only)	Remove the compensator and clean it
The non-return valve after the pump has been installed the wrong way round	Install the non-return valve correctly

5.7.3 Cavitation in the pump

Cause	Remedy
The intake line is blocked/clogged	Clean the intake line
The cross- section of the intake line is too small; the intake line is too long and has lots of bends and/or screwed connections	Increase the cross-section of the intake line or lay the intake line straighter
Oil is too cold, viscosity is too high	Increase the cross-section of the intake line
The tank air filter is clogged	Clean the air filter

5.7.4 There are air bubbles in the pressure oil

Cause	Remedy
The intake line is leaky and is drawing in air	Seal the intake line or tighten the screwed connections
The oil level in the tank is too low	Check the float switch and top up the oil
The oil in the tank is frothing	Determine the cause and rectify it
The shaft seal is faulty (sealing edge is damaged)	Install a new seal
The flange or lid of the pump is leaking	Check the O-ring or seal and reseal the lid/flange
There is still air in the system	Bleed the system

5.7.5 Excessive noise

Cause	Remedy
Cavitation in the pump	Refer to the section Cavitation in the pump
Pump is taking in air	Refer to section There are air bubbles in the pressure oil
The pump is not properly aligned with the electric motor, the coupling is loose	Properly align the pump and the electric motor; pay attention to the play in longitudinal direction; secure the coupling
Pump is worn or damaged	Repair or exchange the pump
The bearing of the electric motor is damaged	Exchange the bearing
The pressure control valve is fluttering	Set the pressure in accordance with the specifications given on the drawing or in the operating manual and secure it, exchange the pressure control valve, if necessary
Pipes are vibrating	Secure them properly; make sure that there is no metal contact between the individual pipes (to avoid resonance); install the pumps such that they are adequately damped

5.7.6 The oil in the tank is getting too warm

Cause	Remedy
The electric motor of the air cooler is not working	Check the electrical connection
	Check the operating voltage
	Check the overcurrent protective device
The air cooler is rotating in the wrong direction	Reverse the terminal connections at the electric motor accordingly
The air cooler is not working because the thermostat in the unit is set incorrectly or is faulty	Check the thermostat setting. Reset it to the value specified in the drawing or operating manual
	Exchange the faulty thermostat
The air cooler is mechanically blocked	Exchange the faulty air cooler
The oil level in the tank is too low	Check the float switch and top up the oil
The cooler grille is very dirty	Clean the cooler grille with compressed air
The circulation pump has failed	(Refer to the section Pump is not pumping)

Also refer to the section **Pump or system is not building up pressure**; the faults listed there can also lead to overheating

If any causes other than those listed here occur, we would be grateful if you would inform us briefly, so that we can include them in future operating manuals.



6 MAINTENANCE

6.1 General

Maintenance jobs on the machinery must only be done by duly qualified, skilled maintenance personnel.

- Before doing any repair work, switch off the power switch and secure it to prevent it from being accidentally switched back on again.



Excepted circuits, such as e.g. lighting circuits, power outlets for repair and maintenance tools or permanent equipment are not switched off by the mains switch.

- If for certain jobs on the machine, the power supply needs to remain switched on, suitable measures must be taken to ensure that the machine functions cannot be accidentally triggered.
- If hydraulic and/or electrical connections have to be loosened or disconnected for doing certain maintenance and repair jobs, they must be protected to prevent them from getting dirty.
- Always re-tighten any screws and screwed connections that may have been loosened in the course of the maintenance and repair jobs.
- Reconnect any hydraulic and electrical connections that were disconnected during the execution of the maintenance and repair jobs.

The long-term operational reliability and precision of the machinery over the course of many years can only be guaranteed if the maintenance regulations contained in this section are heeded and complied with.



6.2 Maintenance and Inspection Schedule

MAINTENANCE AND INSPECTION LIST



Note:

To grant the warranty of the machine the maintenance and inspection schedule has to be strictly followed and a filled and signed scan in .pdf-format has to be sent to maintenance@herkules-machinetools.com every 3 months after acceptance of the machine. The header of the Email has to start with the serial number of the machine

Category	Sub-Category	Work to be done	Measurement and Test Value Operating Media and Aid	Interval every	Remarks	Date/ Signature	Date/ Signature	Date/ Signature	Date/ Signature	Date/ Signature	Date/ Signature	Date/ Signature	Date/ Signature	Date/ Signature	Date/ Signature	Date/ Signature	Date/ Signature
General	Various things	Check machine for leaks (coolant, hydraulic unit, gears etc.)		every day	Visual control												
General	Cooling equipment motor	Check cooling equipment / cooling air passages, if necessary clean		1 week	Pay attention to manufacturer documentation												
General	Guideways	Check wipers, if necessary renew		3 months													
General	Gear	Sight check and check of the tightening torques		1 year	Pay attention to manufacturer documentation												
General	Energy cable chains	Take a visual control of all cable, hoses and cable connections for damages and abrasion		1 week	Visual control												
General	Filters	Check noise filters and filters of fans, clean or replace if necessary.		1 month	Visual control												
General	Machine and add-on components	Check surface protection / corrosion protection, if necessary, repair or renew		1 year	Visual control												
General	Motors	Motor: Change the bearings		As required, or after 6 years	Pay attention to manufacturer documentation												
Headstock	Faceplate	Regrease bearings with grease gun		6 months													
Headstock	Workpiece driver	Take a visual control of the workpiece driver for damages and abrasion			Visual control at each workpiece change												
Headstock	Driving belts, motor / headstock	Check pretension of the belts; if necessary readjust them; when dirty clean them	Test pressure: Natural frequency: 88 Hz	3 months	Pay attention to manufacturer documentation												
Headstock	Faceplate drive, gear	Change oil and clean gear		1 year	Initial inspection. Pay attention to manufacturer documentation												
Headstock	Faceplate drive, gear	Change oil and clean gear		3 years	See lubrication instruction and pay attention to manufacturer documentation												
Headstock	Belt tensioner for headstock drive	Regrease with grease gun		1 year	See lubrication instruction												
Headstock	Lubrication unit for hydrodynamic jaw lubrication	Check level, refill if necessary. Pay attention to Message!		1 week	Pay attention to manufacturer documentation												
Headstock	Cross adjustment, guideway lubrication	Attention! Operate lubrication handpump before traveling the tailstock. Check oil level, if necessary refill.			See lubrication instruction												

MAINTENANCE AND INSPECTION LIST



Headstock	Cross adjustment, hydraulic	Check oil, if necessary exchange		1 year	Pay attention to manufacturer documentation													
Headstock	Cross adjustment, hydraulic	Check level, if necessary refill		1 week	Pay attention to manufacturer documentation													
Headstock	Cross adjustment, hydraulic	Exchange oil		3 years	See lubrication instruction													
Tailstock	Hydraulic unit tailstock clamping and quill	Check level, if necessary refill		1 week	See lubrication instruction and pay attention to manufacturer documentation													
Tailstock	Hydraulic unit tailstock clamping and quill	Check oil, if necessary exchange		1 year	See lubrication instruction and pay attention to manufacturer documentation													
Tailstock	Hydraulic unit tailstock clamping and quill	Exchange oil		3 years	See lubrication instruction and pay attention to manufacturer documentation													
Tailstock	Guideway lubrication	Attention! Operate lubrication handpump before traveling the tailstock. Check oil level, if necessary refill.			See lubrication instruction													
Grinding carriage	X-Axis, Guideways	Check oil collecting vessel, if necessary drain off oil and if dirty, clean the vessel		1 year														
Grinding carriage	Driving belts, motor / grinding spindle	Check pretension; if necessary readjust them; when dirty clean them	Test pressure: 75 N Depth of impression: 25.76 mm	3 months	Pay attention to manufacturer documentation													
Grinding carriage	Lubrication grinding spindle	Check level, if necessary refill		every day	See lubrication instruction for type of oil.													
Grinding carriage	Lubrication grinding spindle	Exchange oil		6 months	See lubrication instruction													
Grinding carriage	Lubrication grinding spindle	Change filter	If message appears	6 months	At every oil change													
Grinding carriage	Lubrication grinding spindle	Check oil flow monitor		1 week	Pay attention to manufacturer documentation													
Grinding carriage	Lubrication grinding spindle	Check vent screw with oil-level gauge, if necessary clean and refill oil		1 week														
Grinding carriage	Belt tensioner for grinding wheel drive	Regrease with grease gun		6 months	See lubrication instruction													
Grinding carriage	Splash water guard	Check the guard, if necessary clean		1 week														
Grinding carriage	Central lubrication	X-axis guideways	If message appears	1 week	Visual control, oil-level gauge at bed end. See lubrication instruction													
Grinding carriage	Central lubrication	X-axis guideways		3 years	See lubrication instruction													

MAINTENANCE AND INSPECTION LIST




Grinding carriage	Grinding cover	Clean the grinding cover manually.		1 week or at each grinding wheel change	It is not allowed to apply high pressure devices or similar accessories like water hoses for cleaning!													
Grinding carriage	Grinding cover	Lubrication hinge		3 months	See lubrication instruction													
Grinding water supply	Pneumatics	Change filter cartridge and clean the filter bowl		6 months	Recommendation of manufacturer, pay attention to manufacturer documentation													
Steady rests	General	Take a visual control of the steady pads for damages and abrasion		every day	Visual control													
Steady rests	Steady pads	Lubricate the bearing points well, before mounting a roll		at each workpiece change	See lubrication instruction for oil or grease type.													
Steady rests	Steady pad adjustment	Remove the jaws and grease the spindles, spindle nuts and jaw guides.		1 week	See lubrication instruction													
Steady rests	Longitudinal adjustment, guideway lubrication	Attention! Operate lubrication handpump before traveling the steady rests. Check oil level, if necessary refill.			See lubrication instruction													
Steady rests	Hydrostatic Steady rest	Check level, if necessary refill		1 week	See lubrication instruction													
Steady rests	Hydrostatic Steady rest	Check oil, if necessary exchange		1 year	See lubrication instruction													
Measuring device	Swivel device	Check connection bolt between swivel cylinder and measuring caliper for wear and damage		3 months	Visual control													
Measuring device	Swivel device	Change oil		3 years	See lubrication instruction													
Measuring device	HCKKPM caliper and measuring arms	Remove cover and clean inside with air-hose and/or cloth		3 months														
Measuring device	HCKKPM Kalibre and measuring arms	Clean the linear guides of the measuring arms and side shift, chain and sprocket and relubricate		3 months	See lubrication instruction													
Measuring device	HCKKPM caliper	Regrease bearing lubricating nipple for swiveling movement.		1 month														
Measuring device	Eddy Current Sensor	Check correct position of sensor, readjust if necessary		1 week	Pay attention to manufacturer documentation													
Measuring device	Eddy Current	Calibrate the device		1 month	Pay attention to manufacturer documentation													
Measuring device	Ultrasonic-Measuring Device	Check function / Signal level of calibration ring		1 week	See programming manual, pay attention to manufacturer documentation													
Measuring device	Ultrasonic water supply	Exchange washer		1 year	Pay attention to manufacturer documentation													

MAINTENANCE AND INSPECTION LIST



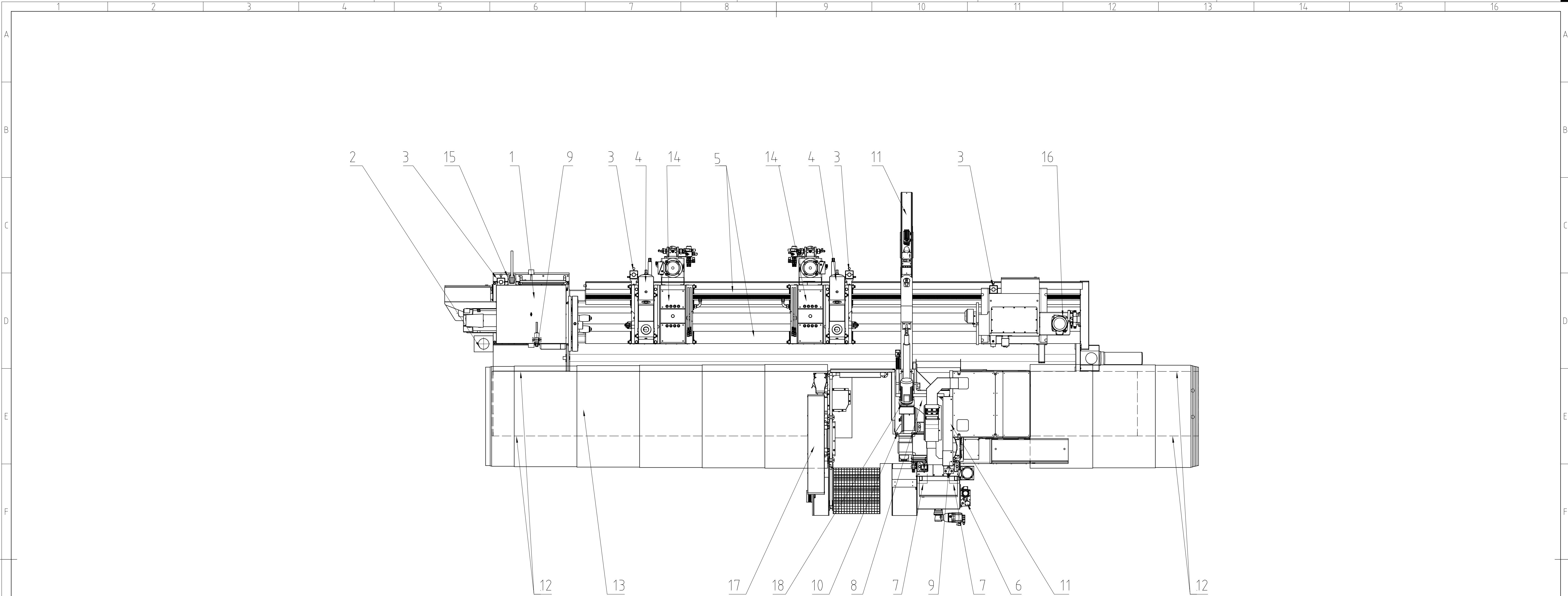
Measuring device	Ultrasonic approach unit	Lubricate linear drive		2 years														
Measuring device	Pneumatics	Change filter cartridge and clean the filter bowl		6 months	Recommendation of manufacturer, pay attention to manufacturer documentation													
Carriage bed	Telescoping covers	Clean outside and rub with oil		1 week	See lubrication instruction													
Carriage bed	Guide way	Check oil level, if necessary refill		1 week	Visual control, see lubrication instruction													
Carriage bed	Guide way	Change oil		3 years	See lubrication instruction													
Workpiece bed	Guide way and toothed rack	Clean and lubricate guideways before traveling the steady rests or tailstock			See lubrication instruction													
Filtering unit	Coolant	Check and refill.	customized	every day														
Filtering unit	Coolant	Check coolant level. Fill up with water because evaporation		daily	Customized													
Filtering unit	Coolant	Check concentration		1 week	Customized													
Filtering unit	Coolant	Check soiling, smell, colour. Change at bad result.		1 week	Customized													
Filtering unit	Coolant	Check pH-value, nitride-value. Change at bad result.		1 week	Customized													
Filtering unit	General	Visual inspection, check for tightness		1 week	Pay attention to manufacturer documentation													
Filter system	Endless-loop filter fabric	Check after backflush	Visual inspection	1 week	Pay attention to manufacturer documentation													
Filter system	Fill-level sensors	Clean		3 months	Pay attention to manufacturer documentation													
Filter system	Conveyor chain	Check chain tension, if necessary increase the tension	Visual inspection	1 month	Pay attention to manufacturer documentation													
Filter system	Drive chain	Check chain tension, if necessary increase the tension	Visual inspection	1 month	Pay attention to manufacturer documentation													
Filtering unit	General	Check wiping sheets and seals for wear		1 month	Pay attention to manufacturer documentation													
Filtering unit	General	Empty sludge bin. Check filter fleece in the storage box.		1 year	Pay attention to manufacturer documentation													
Filtering unit	Stripping-off sheet, magnetic roll	Cleaning		1 year	Pay attention to manufacturer documentation													

MAINTENANCE AND INSPECTION LIST														 HERKULES			
Electrical equipment	Control cabinet and CNC- control	Clean monitor		3 months													
Electrical equipment	Control cabinet and CNC- control	Check function of switch elements		6 months													
Electrical equipment	Control cabinet and CNC- control	Check all visible cable connections		6 months	Visual control												
Electrical equipment	Control cabinet and CNC- control	Clean filter of control cabinet blower; if necessary exchange it		3 months													
Electrical equipment	Control cabinet and CNC- control	Compressed air cleaning of cabinet cooling units.		1 year	Pay attention to manufacturer documentation												
Electrical equipment	Uninterruptible Power Supply	Check the operational readiness		6 months	Pay attention to manufacturer documentation												



6.3 Lubrication Instruction





WS450 S x 5.000 CNC Monolith																		
<div>Pos.</div>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<div><div></div>50</div>			<div><div></div></div>				<div><div></div></div>											
<div><div></div>200</div>		<div><div></div></div>		<div><div></div></div>	<div><div></div></div>	<div><div></div></div>		<div><div></div></div>				<div><div></div></div>						
<div><div></div>600</div>											<div><div></div></div>							
<div><div></div>2000</div>								<div><div></div></div>	<div><div></div></div>	<div><div></div></div>				<div><div></div></div>				
<div><div></div>8000</div>	<div><div></div></div>												<div><div></div></div>		<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>						<div><div></div></div>				<div><div></div></div>	<div><div></div></div>		<div><div></div></div>		
DIN 51502	CLP 220		CGLP 220	KP2 K-20	CGLP 220	CGLP 220		HLP (CLP) 10	KP2 K-20	KP2 K-20	KP2 K-20	CGLP 220	CGLP 220	CGLP 220	HLP 32	HLP 32	KP2 K-20	CLP 220
Bezeichnung Name	FUCHS Renolin	FUCHS Plantocut 40 SR	SHELL Tonna S3 M 220	SHELL Gadus S2 V 220 2	SHELL Tonna S3 M 220	SHELL Tonna S3 M 220		SHELL Tellus S2 MA 10	SHELL Gadus S2 V 220 2	SHELL Gadus S2 V 220 2	SHELL Gadus S2 V 220 2	SHELL Tonna S3 M 220	SHELL Tonna S3 M 220	SHELL Tonna S3 M 220	MOBIL DTE 24	MOBIL DTE 24	SHELL Gadus S2 V 220 2	FUCHS Renolin
Menge Volume	5,5 l	2 l	5 l			2,7 l		15 l					350 l	38 l	1 l	4,65 l		1,7 l

Erläuterungen / Explanations:



Intervall
Clearance



Ölwechsel
Oil change



Ölstand kontrollieren und nachfüllen
Oil level check and fill up



Ölablass
Oil drain




Ölschauglas
Oil level gauge




Fettpresse
Grease pistol

				Auftrag/Km. 99310 V-Line	Maßstab/Scale 1:25	Erstellt 21.02.2025 Max. Weber Geprüft Freigabe 25.02.2025 Max. Weber	
				Benennung/Designation Schmierplan Lubrication plan			
Rev.	Änderung	Datum	Name	291-00-00-6153-001		Zeichnungsnummer (TNR) / Drawing No. 6139629	Bl./Sh. von/for 1 1
Entstanden aus 291-00-00-6147-001				Status:	Rev.	Spalte	Format A1
Dateiname/name 291-00-00-6153-001.dwg				110 Änderung nur mit CAD/not allowed to be changed by hand			

1) R = Relubricate/ Refill; E = Examination; Cl = Clean; Ch = Change; 2) in operating hours; 3) Unit Comment: Pay attention to the maintenance signs at the machine!

LUBRICATION INSTRUCTION				Product: Roll Grinding Machine WS450 S x 5.000 CNC Monolith			Product No.: 99310-111/23		 HERKULES 6139629	
Lubr. point		Machine part	Operation		Lubricant		Quantity	UQ 3)	Remarks	
Item.	No.		Type	Period 2)	MHS recommendation					
1	1	SPLASH LUBRICATION: Gear at faceplate drive	Ch	8.000	FUCHS RENOLIN CLP 220	-	5.5	I	Change the oil, clean the gear. Fill only with filtered oil (filter fineness 10µm).	
2	1	CENTRAL LUBRICATION (oil mist): Stedy rest jaws at headstock and tailstock side	E/R	200	FUCHS PLANTOCUT 40 SR	-	2	I	Check the oil level; top up if necessary. Pay attention to any messages.	
3	4	CENTRAL LUBRICATION: Headstock guideways X movement Tailstock guideways and quill movement Steady rest guideways	E/R	50	SHELL TONNA S3 M 220 CGLP 220	-	1.25	I	Operate handpump before each adjustment. Check the oil level; top up if necessary.	
4	-	INDIVIDUAL LUBRICATION: Spindles and guides for steady rest jaw adjustment	R	200	SHELL Gadus S2 V 220 2 KP2 K-20	-	-	-	Remove the jaws, grease the spindles, threads and the jaw guides.	
5	-	INDIVIDUAL LUBRICATION: Guideways at workpiece side	R	200	SHELL TONNA S3 M 220 CGLP ISO VG220	-	-	-	The guideways must be cleaned and sprayed with sliding oil before every adjustment of the steady rests or the tailstock on the bed. This protects the bedways and guideways.	
6	1	CENTRAL LUBRICATION: Carriage: X axis guideways	E/R	200	SHELL TONNA S3 M 220 CGLP ISO VG220	-	2.7	I	Check the oil level; top up if necessary. Pay attention to any messages.	
7	2	GUIDEWAY LUBRICATION Carriage: X axis guideways	E	50			-	-	Drain off oil fom the collecting vessels	
8	1	HYDROSTATIK: Grinding wheel spindle bearings	E	200	SHELL TELLUS S2 MA 10 HLP ISO VG 10	-			Check the oil level; top up if necessary. Pay attention to any messages.	
			E/Ch	2.000	or FUCHS RENOLIN MR3 HLP ISO VG 10	-	15	I	Take an oil sample for analysis by the oil supplier. If necessary, change the oil and clean the tank.	
		Pressure filter	CH	-					If message is displayed, switch off the machine, open the filter bowl and clean it. replace filter element	
9	2	INDIVIDUAL LUBRICATION: Belt stretcher (headstock drive and grinding spindle drive)	R	2.000	SHELL Gadus S2 V 220 2 KP2 K-20	-	-	-	Grease the lubricating nipples with a grease gun, 3-4 shots.	
10	2	INDIVIDUAL LUBRICATION: Hinges at the safety hood cover	R	2.000	SHELL Gadus S2 V 220 2 KP2 K-20	-	-	-	Grease the lubricating nipples with a grease gun, 3-4 shots.	

1) R = Relubricate/ Refill; E = Examination; Cl = Clean; Ch = Change; 2) in operating hours; 3) Unit Comment: Pay attention to the maintenance signs at the machine!

LUBRICATION INSTRUCTION				Product: Roll Grinding Machine WS450 S x 5.000 CNC Monolith			Product No.: 99310-111/23		 HERKULES 6139629	
Lubr. point		Machine part	Operation		Lubricant		Quantity	UQ 3)	Remarks	
Item.	No.		Type	Period 2)	MHS recommendation					
11	12	INDIVIDUAL LUBRICATION: Linear guides of the measuring arms and X adjustment, chain and pinion	R	600	SHELL Gadus S2 V 220 2 KP2 K-20	-			Clean and regrease the chain and pinion with a brush.	
12		INDIVIDUAL LUBRICATION: Telescoping covers	R	200	SHELL TONNA S3 M 220 CGLP ISO VG220				Clean and spray with lubricating oil. If necessary, carry out at shorter intervals.	
13	1	SPLASH LUBRICATION: Z axis guideways	E	200	SHELL TONNA S3 M 220 CGLP ISO VG220	-	-	-	Check the oil level (middle of oil sight glass); top up, if necessary. Pay attention to any messages.	
			Ch	8.000			app. 350	l		
14	2	HYDROSTATIC: Jaw lubrication	Ch	2.000	SHELL TONNA S3 M 220 CGLP ISO VG220 CGLP 220	-	each 38	l	Check the oil level, top up if necessary. At least once per year, drain off all of the oil, check whether it is dirty and replace it with new oil, if necessary.	
15	1	HYDRAULIC: Headstock adjustment in X direction	Ch	8.000	MOBIL DTE 24 HLP 32	-	1	l	Check the oil level, top up if necessary. At least once per year, drain off all of the oil, check whether it is dirty and replace it with new oil, if necessary.	
16	1	HYDRAULIC: Hydraulic tailstock quill	Ch	8.000	MOBIL DTE 24 ISO ISO VG 32	-	4.65	l	Change oil, replace oil filter	
17	1	INDIVIDUAL LUBRICATION: Linear module ultrasonic approach unit	R	2000	SHELL Gadus S2 V 220 2 KP2 K-20	-	-	-	Grease the lubricating nipples with a grease gun	
18	1	SPLASH LUBRICATION: Gear, swiveling measuring caliper	Ch	8.000	FUCHS RENOLIN CLP 220	-	1.7	l	Change the oil, clean the gear. Fill only with filtered oil (filter fineness 10µm).	



6.4 List of Lubricants



Schmierstoffe für Walzenbearbeitungsmaschinen

Betriebssicherheit und Erhaltungszustand der Maschinen sind in hohem Maße von einer sorgfältigen Schmierung abhängig. Im Interesse unserer Kunden empfehlen wir für unsere Maschinen z.B. die in dieser Übersicht aufgeführten Schmierstoffe. Schmierstellen, Art der Schmierung und Schmiermengen sind aus dem Schmierplan der Betriebsanleitung zu ersehen.

Lubricants for Roll shop machinery

Reliability of operation and maintenance standard of the machines depend on correct lubrication. In our customers interest we recommend therefore to use the lubricants as indicated in this chart. Points, kind and amount of lubrication are shown on the lubrication plan in the operating instructions.

Lubrifiants pour Machines pour l'usinage des cylindres

La sécurité de fonctionnement et l'entretien des machines dépendent d'un graissage correct. Dans l'intérêt de nos clients, nous recommandons l'utilisation des lubrifiants figurant dans ce tableau. Les points, manière et quantité de graissage sont indiquées dans le plan de lubrifications en l'instruction de service.

Lubrificantes para Máquinas para Cilindros de Laminación

La seguridad del funcionamiento de las máquinas depende de una lubricación correcta. En interés de nuestros clientes recomendamos los lubricantes que figura en esto cuadro. Los puntos de lubricación, la cantidad y el modo de llevarlo a cabo para cada máquina, se indican en el plano de lubricación de las instrucciones de operación.

Смазочные материалы для вальцеобрабатывающих станков

Надёжность станков и их состояние в большой мере зависит от тщательности смазки. В интересах заказчика мы рекомендуем использовать для наших станков указанные в данном проспекте смазочные материалы. Точки и вид смазки указаны в схеме смазки инструкции по эксплуатации станка.

Diese Empfehlungen erfolgen ausschließlich unter Ausschluss jeglicher Verantwortung, Haftung und etwaiger Nebenverpflichtungen unsererseits.

All these recommendations are exclusive of any responsibility, liability and any additional obligations on our part.

Toutes les recommandations s'entendent à l'exclusion de toutes les responsabilités et/ou obligations de notre côté.

Las presentes recomendaciones no suponen ninguna responsabilidad ni obligación accesoria por nuestra parte.

Эта рекомендация исключает какую либо ответственность или гарантию с нашей стороны.

ACHTUNG:

- Vergleichstabelle nur in Verbindung mit finaler Erstfüll-Liste bzw. finalem Schmierplan verwenden!
- Für Schleifwellenschmierung gestatten wir während der Garantieperiode nur die zugelassenen Öltypen!

ATTENTION:

- Only use the comparison table in conjunction with the final first-fill list or the final lubrication plan!
- For lubrication of grinding shafts, we allow only the permitted oil types during the guarantee period!

ATTENTION :






- N'utiliser les tableaux comparatifs qu'en association avec la liste finale de remplissage initial ou le calendrier de graissage final !
- Nous autorisons l'exploitation de seulement types d'huile agréés pour la lubrification de l'arbre de meulage pendant la période de garantie !

ATENCIÓN:

- Utilice la tabla comparativa únicamente en combinación con la lista final de primer llenado o con el esquema de lubricación final
- Para la lubricación de los árboles de rectificado solo está permitido durante el periodo de garantía el uso de los tipos de aceite autorizados



ВНИМАНИЕ:

- Сравнительную таблицу использовать только в сочетании с окончательным перечнем первичного заполнения или с окончательной схемой смазки!
- Для смазки шлифовального вала в течение гарантийного срока мы разрешаем использовать только допущенных типа масла!

Schmierstellen und Viskositäten (siehe Schmierplan in der Betriebsanleitung) Lubrication Points and Viscosities (see lubrication plan in the operating instructions) Point de lubrification et viscosités (voir plan de lubrification en l'instruction de service) Puntos de lubricación y viscosidades (ver plano de lubricación en las instrucciones de operación) Точки смазки и вязкость (см. схему смазки согласно инструкции)	Schmierstoff – Qualität Lubricant Quality Lubrifiant Lubrificante Качество смазочного материала	Kennzeichnung nach Designation according to Désignation suivant Designación según Качество по DIN 51 502 (Viskosität bei 40°C)					
Schleifspindellagerungen Grinding spindle bearings	nur für den US-Markt! for US-Market only!	CL 10	Hyspin Spindle Oil 10	Renolin DTA 10 ^{2.)}	---	---	Morlina S2 BL 10
Hydraulik- und Maschinenöl Hydraulic- and machine oil Huile hydraulique et machine Aceite hidráulico y de máquina гидравлическое и машинное масло	Legierte Spindel-, Hydraulik-, Maschinen- und Umlauföle Doped spindle, hydraulic, machine and circulating oil Huiles de broche, hydrauliques, de machine et de circulation alliées Aceites aleados para husillos, hidráulicos, de máquinas y circulantes Легированные шпиндельные, гидравлические, машинные и циркуляционные масла	CL 220	Magna CT 220	Renolin DTA 220 ^{2.)}	---	Vacuoline 133, VG 220	Morlina S2 B 220
Getriebe, allgemein (auch Handschmierstellen) Gears, general (and hand lubricated points) Boîtes des vitesses (et points de lubrification à la main) Cajas de engranaje (y puntos de lubricación manual) Редукторы общего назначения (также ручная смазка)	Getriebeöl mit Wirkstoffen zum Herabsetzen des Verschleißes und Erhöhen der Belastbarkeit, Korrosionsschutz und Alterungsbeständigkeit Gear oil with wear resisting and extreme pressure properties and anti-corrosion and antioxidant additives Huile à engrenages avec des additifs anti-usure, extrême pression, anti-corrodants et anti-oxydants Aceite de engranajes con aditivos antidesgaste, extrema presión, anticorrosivos y antioxidantes Трансмиссионное масло с присадками для снижения износа, увеличения нагрузки, антикоррозионных свойств и стойкости против старения	CLP 150	Alpha SP 150 ^{2.)} Optigear BM 150	Renolin CLP 150 Renolin CLP 150 PLUS Renolin CLP 150 VCI	Klüberoil GEM 1-150 N	Mobilgear 600 XP 150	Omala S2 GX 150 Omala S4 GXV 150
		CLP 220	Alpha SP 220 ^{2.)} Optigear BM 220	Renolin CLP 220 Renolin CLP 220 VCI	Klüberoil GEM 1-220 N	Mobilgear 600 XP 220	Omala S2 GX 220 Omala S4 GXV 220
		CLP 320	Alpha SP 320 ^{2.)} Optigear BM 320	Renolin CLP 320 Renolin CLP 320 VCI	Klüberoil GEM 1-320 N	Mobilgear 600 XP 320	Omala S2 GX 320 Omala S4 GXV 320
		CLP 460	Alpha SP 460 ^{2.)} Optigear BM 460	Renolin CLP 460 Renolin CLP 460 PLUS Renolin CLP 460 VCI	Klüberoil GEM 1-460 N	Mobilgear 600 XP 460	Omala S2 GX 460 Omala S4 GXV 460
		CLP 680	Alpha SP 680 ^{2.)} Optigear BM 680	Renolin CLP 680	Klüberoil GEM 1-680 N	Mobilgear 600 XP 680	Omala S2 GX 680 Omala S4 GXV 680
Sondergetriebe Special gears Engrenages spéciales Engranajes especiales Специальные приводы передач	Synthetiköl mit besonderen Schmiereigenschaften Basis: POLYGLYKOL (nicht mit Mineralöl mischbar) Synthetic oil with special lubrication quality. Base: POLYGLYCOLE (not miscible with mineral oil) Huile synthétique avec pouvoir lubrifiant spéciale Base: POLYGLYCOLE (ne pas miscible avec de l'huile minérale) Aceite sintético con poder lubricante especial Base: POLYGLYCOLE (no mezclable con aceite mineral) Синтетическая смазка со специальными смазочными свойствами Основа: POLYGLYCOLE (не смешивается с минеральными маслами)	CLP PG 150	Alphasyn PG 150 Optigear Synthetic 800/150	Renolin PG 150	Klübersynth GH 6-150	Mobil Glygoyle 150	Omala S4 WE 150
		CLP PG 220	Alphasyn PG 220	Renolin PG 220	Klübersynth GH 6-220	Glygoyle 30 Glygoyle HE 220	Omala S4 WE 220

Legende / explanatory notes / notes d'explication / notas explicatorias / пояснительные примечания


2.) Schwermetallfrei / Free of heavy metals / Sans métaux lourds / Libre de metales pesados / Без тяжелых металлов

Schmierstellen und Viskositäten (siehe Schmierplan in der Betriebsanleitung) Lubrication Points and Viscosities (see lubrication plan in the operating instructions) Point de lubrification et viscosités (voir plan de lubrification en l'instruction de service) Puntos de lubricación y viscosidades (ver plano de lubricación en las instrucciones de operación) Точки смазки и вязкость (см. схему смазки согласно инструкции)	Schmierstoff – Qualität Lubricant Quality Lubrifiant Lubrificante Качество смазочного материала	Kennzeichnung nach Designation according to Désignation suivant Designación según Качество по DIN 51 502 (Viskosität bei 40° C)					
Schleifspindellagerungen Grinding spindle bearings Paliers de la broche de meule Cojinetes del husillo de rectificado Опоры шлифовальных шпинделей	Niedrig viskoses Spindelöl mit Wirkstoffen zum Herabsetzen des Verschleißes und Erhöhen der Belastbarkeit, Korrosionsschutz und Alterungsbeständigkeit Thin bodied spindle oil with wear resisting and extreme pressure properties and anti-corrosion and antioxidant additives Huile de broche très fluide avec des additifs anti-usure, extrême pression, anti-corrodants et anti-oxydants Aceite para husillo, muy fluido, con aditivos antidesgaste, extrema presión, anticorrosivos y antioxidantes Шпиндельное масло низкой вязкости с присадками для снижения износа, увеличения нагрузки, антикоррозионных свойств и стойкости против старения	HLP (CLP) 10	Hyspin DSP 10 ^{1.), 2.)} Hyspin ZZ 10 ^{2.)}	Fuchs Renolin MR 3 VG 10 ^{1.)}	---	---	Tellus S2 MA 10 ^{1.), 2.)}
Gleitbahnen (auch von Hand geschmierte Bahnen) Guides (also hand lubricated guides) Glissières (aussi lubrifiées à la main) Guías (lubrificar también a mano) Направляющие (также с ручной смазкой)	Gleitbahnöl mit Wirkstoffen zur Verhinderung von Stick-Slip und Erhöhen des Korrosionsschutzes und der Alterungsbeständigkeit Oil for guides with additives to prevent stick-slip, with anti-corrosion and anti-oxidant additives Huile à glissières avec des additifs anti-„stick-slip“, anti-corrodants et anti-oxydants Aceite para guías, con aditivos anti „stick-slip“, anti-corrosivos y antioxidantes Масло для направляющих с присадками во избежания эффекта прилип-поехал и увеличения антикоррозионных свойств и стойкости против старения	CGLP 68 CGLP 220	Magna SW 68 Magna SW D 68 Magna SW DX 68 Magna SW 220 Magna SW D 220 Magna SW DX 220	Renep CGLP 68 Renep CGLP 220	Lamora D 68 Lamora D 220	Mobil Vactra Oil No. 2 Mobil Vactra Oil No. 4	Tonna S3 M 68 Tonna S2 M 68 Tonna S2 MX 68 (USA only) Tonna S2 M 220 Tonna S3 M 220
Hydraulikanlagen Hydraulic attachment Dispositifs hydrauliques Dispositivos hidráulicos Гидроузлы	Hydrauliköl mit Wirkstoffen zum Herabsetzen des Verschleißes, zum Erhöhen des Korrosionsschutzes und der Alterungsbeständigkeit Hydraulic oil with additives for anti-corrosion and anti-oxidation Huile hydraulique avec des additifs anti-corrodants et anti-oxydants Aceite hidráulico con aditivos anti-corrosivos y antioxidantes Гидравлические масла с присадками для увеличения антикоррозионных свойств и стойкости против старения	HLP 32 HLP 46	Hyspin DSP 32 ^{1.), 2.)} Hyspin AWS 32 Hyspin ZZ 32 ^{2.)} Hyspin DSP 46 ^{1.), 2.)} Hyspin AWS 46 Hyspin ZZ 46 ^{2.)}	Renolin B 10 VG 32 Renolin ZAF B 32 HT ^{2.)} Renolin MR 10 VG 32 ^{1.)} Renolin B 15 VG 46 Renolin ZAF B 46 HT ^{2.)} Renolin MR 15 VG 46 ^{1.)}	Lamora HLP 32 Lamora HLP 46	Mobil DTE 24 Ultra Mobil DTE 25 Ultra	Tellus S2 MX 32 Tellus S3 M 32 ^{2.)} Tellus S4 ME 32 Tellus S2 MX 46 Tellus S3 M 46 ^{2.)} Tellus S4 ME 46

Legende / expanatory notes / notes d'explication / notas explicatorias / пояснительные примечания

1.) als detergier- /emulgierfähige Ausrichtung alternativ / as detergent- /emulsive product alternative / comme alternative aux détergents/produits émulsifs / como alternativa a productos detergentes/emulsivos / в качестве альтернативы изделие, поддающееся демульгированию/мульгированию

2.) Schwermetallfrei / Free of heavy metals / Sans métaux lourds / Libre de metales pesados / Без тяжелых металлов

<p>Schmierstellen und Viskositäten (siehe Schmierplan in der Betriebsanleitung)</p> <p>Lubrication Points and Viscosities (see lubrication plan in the operating instructions)</p> <p>Point de lubrification et viscosités (voir plan de lubrification en l'instruction de service)</p> <p>Puntos de lubricación y viscosidades (ver plano de lubricación en las instrucciones de operación)</p> <p>Точки смазки и вязкость (см. схему смазки согласно инструкции)</p>	<p>Schmierstoff – Qualität</p> <p>Lubricant Quality</p> <p>Lubrifiant</p> <p>Lubrificante</p> <p>Качество смазочного материала</p>	<p>Kennzeichnung nach</p> <p>Designation according to</p> <p>Désignation suivant</p> <p>Designación según</p> <p>Качество по</p> <p>DIN 51 502 (Viskosität bei 40°C)</p>					
<p>Hydrostatikanlagen</p> <p>Hydrostatic attachment</p> <p>Dispositifs hydrostatique</p> <p>Dispositivos hidrostáticos</p> <p>Гидростатические установки</p>	<p>Hydrauliköl wie oben, jedoch mit sehr hohem Viskositätsindex zum Einsatz über einen großen Anwendungstemperaturbereich</p> <p>Hydraulic oil as mentioned above, however with very high viscosity index for operation over a wide temperature range</p> <p>Huile hydraulique comme décrit ci-dessus, mais avec indice de viscosité très élevé pour application dans un écart de températures étendu.</p> <p>Aceite hidráulico como arriba mencionado pero con índice de viscosidad muy elevado para utilización en un amplio rango de temperaturas.</p> <p>Гидравлические масла с присадками для увеличения антикоррозионных свойств и стойкости против старения</p>	<p>HVLP 46</p>	<p>Hyspin AWH-M 46 Hyspin HVI 46 ^{2.)}</p>	<p>Renolin MR 46 MC ^{1.)} Renolin B 46 HVI</p>	<p>---</p>	<p>Mobil DTE 10 Excel 46 ^{2.)}</p>	<p>Tellus S2 VX 46 Tellus S2 VA 46 Tellus S3 V 46 ^{2.)} Tellus S4 VE 46</p>
		<p>HVLP 68</p>	<p>Hyspin AWH-M 68 Hyspin HVI 68 ^{2.)}</p>	<p>Renolin B 68 HVI</p>	<p>---</p>	<p>Mobil DTE 10 Excel 68 ^{2.)}</p>	<p>Tellus S2 VX 68 Tellus S3 V 68 ^{2.)} Tellus S4 VE 68</p>
<p>Hydrostatikanlagen (NUR für hydrostatische Lagerschalen/hydrostatische Backen)</p> <p>Hydrostatic device (ONLY for hydrostatic shells/hydrostatic steady pads)</p> <p>Dispositifs hydrostatique (UNIQUEMENT pour les tasses hydrostatiques/chaussures hydrostatiques)</p> <p>Dispositivos hidrostáticos (SOLO para copas hidrostáticas/zapatillas hidrostáticas)</p> <p>Гидростатические установки (ТОЛЬКО для гидростатических чашек/гидростатических башмаков)</p>	<p>Hydrauliköl mit hohem Viskositätsindex zum Einsatz für hydrostatische Lünettenbacken/hydrostatische Lagerschalen.</p> <p>Hydraulic oil with high viscosity for application hydrostatic steady pads/hydrostatic bearing shells</p> <p>Huile hydraulique avec un indice de viscosité élevé pour une utilisation dans les paliers hydrostatiques/coussinets de palier hydrostatiques</p> <p>Aceite hidráulico con un alto índice de viscosidad para usar en soportes hidrostáticos/cojinetes hidrostáticos</p> <p>Гидравлическое масло с высоким индексом вязкости для использования в гидростатических устойчивых блоках/вкладышах гидростатических подшипников.</p>	<p>CGLP 220</p>	<p>Magna SW 220 Magna SW D 220 Magna SW DX 220</p>	<p>Renep CGLP 220</p>	<p>---</p>	<p>Mobil Vactra Oil No. 4</p>	<p>Tonna S2 M 220 Tonna S3 M220</p>

Legende / expanatory notes / notes d'explication / notas explicatorias / пояснительные примечания

- 1.) als detergier- /emulgierfähige Ausrichtung alternativ / as detergent- /emulsive product alternative / comme alternative aux détergents/produits émulsifs / como alternativa a productos detergentes/emulsivos / в качестве альтернативы изделие, поддающееся демульгированию/эмульгированию
- 2.) Schwermetallfrei / Free of heavy metals / Sans métaux lourds / Libre de metales pesados / Без тяжелых металлов

<p>Schmierstellen und Viskositäten (siehe Schmierplan in der Betriebsanleitung)</p> <p>Lubrication Points and Viscosities (see lubrication plan in the operating instructions)</p> <p>Point de lubrification et viscosités (voir plan de lubrification en l'instruction de service)</p> <p>Puntos de lubricación y viscosidades (ver plano de lubricación en las instrucciones de operación)</p> <p>Точки смазки и вязкость (см. схему смазки согласно инструкции)</p>	<p>Schmierstoff – Qualität</p> <p>Lubricant Quality</p> <p>Lubrificant</p> <p>Lubrificante</p> <p>Качество смазочного материала</p>	<p>Kennzeichnung nach</p> <p>Designation according to</p> <p>Désignation suivant</p> <p>Designación según</p> <p>Качество по DIN 51 502</p>					
<p>Fettschmiereinrichtungen</p> <p>Grease lubricant attachments</p> <p>Lubrification à la graisse</p> <p>Lubricación con grasa</p> <p>Устройства для консистентной смазки</p>	<p>Gleitlagerfett mit Wirkstoffen zur Erhöhung der Belastbarkeit, wasserabweisend</p> <p>Bearing grease with extreme pressure properties, water resistant</p> <p>Graisse pour palier lisse avec des additifs pour extrême pression et résistant à l'eau</p> <p>Grasa para cojinete liso con aditivos para extrema presión y restantes al agua</p> <p>Густая водоотталкивающая смазка с присадками для</p>	<p>KP 2 K-20</p>	<p>Spheerol EPL 2</p> <p>Tribol GR 100-2 PD</p>	<p>Renolit FEP 2</p>	<p>Klüberlub BE 41-542</p>	<p>Mobilux EP 2</p> <p>Mobilgrease XHP 222</p>	<p>Gadus S2 V220 2</p> <p>Gadus S2 V220AC 2</p>
<p>Fettschmiereinrichtungen</p> <p>Grease lubricant attachments</p> <p>Lubrification à la graisse</p> <p>Lubricación con grasa</p> <p>Устройства для консистентной смазки</p>	<p>Getriebe-Fett</p> <p>Gear grease</p> <p>Graisse pour engrenages</p> <p>Grasa para engranajes</p> <p>Трансмиссионная смазка</p>	<p>GP00G-20</p>	<p>Spheerol EPL 00</p> <p>Tribol GR 100-00 PD</p>	<p>Renolit SF 7-041</p>	<p>Microlube GB 00</p> <p>Klübersynth BEM 44-4600</p>	<p>Mobilux EP 004</p>	<p>Gadus S2 V220 00</p>
<p>Öl-/Luft-Sprühsystem für Setzstockbacken (STEIDLE Lubrimat)</p> <p>Oil-/air spray system for steady rests pads (STEIDLE Lubrimat)</p> <p>Système de pulvérisation d'huile/d'air pour les coussins de repos stables (STEIDLE Lubrimat)</p> <p>Sistema de pulverización de aceite/aire para patines de luneta (STEIDLE Lubrimat)</p> <p>Система масляно-воздушного распыления для подушек люнетов (STEIDLE Lubrimat)</p>	<p>Gleitöl</p> <p>Sliding oil</p> <p>Numéros flash</p> <p>Números de destello</p> <p>Флэш-номера</p>	<p>---</p>	<p>---</p>	<p>Plantocut 40 SR ^{2.)}</p> <p>Ecocut 8732</p>	<p>---</p>	<p>---</p>	<p>---</p>

Legende / expanatory notes / notes d'explication / notas explicatorias / пояснительные примечания

2.) Schwermetallfrei / Free of heavy metals / Sans métaux lourds / Libre de metales pesados / Без тяжелых металлов

6.5 Handling of Operating Materials and Consumables

- When handling oils, greases, and other chemical substances, the applicable safety regulations¹¹ for the product must be complied with!
- Let the machine components cool down before starting any maintenance work!
- Avoid excessive contact with the skin.
- Apply a protective skin cream and wear protective clothing.
- Change oil-soaked clothing without delay.
- Do not keep oily cleaning rags in your pockets.
- Do not inhale oil mist and fumes.
- After completing the job and before meal breaks, clean oil-stained skin with a gentle skin cleanser.
- Apply an emollient skin cream to replace the natural oils that have been washed out of the skin.

¹¹ Refer to the chapter MAINTENANCE / Waste Disposal Instructions

6.6 Grinding and Cooling Fluid

The grinding and cooling fluid should be changed approx. every 4 weeks. This may however need to be done more or less often, depending on various factors:

Ambient Temperature

At high ambient temperatures with a high relative humidity, the grinding and cooling fluid begins to decay more quickly than at cooler temperatures.

Type of Grinding Operation

Despite filtering, grinding residues collect in the grinding and cooling fluid. How quickly an inadmissible high degree of contamination is reached depends on whether rough grinding, finish grinding or only polishing work is done on the machine.

To avoid rust from forming due to the grinding and cooling water, various additives are used. The concentrations of these additives in the grinding and cooling water can lie between 1-5 %. For rough grinding, lower amounts are added and for finish grinding and polishing, higher amounts. The correct dosage depends on the roll material and on the type of grinding wheel in use.

Properties and Advantages of the Grinding Additives:

- Nitrate - free
- Good cooling capacity and safe anti-corrosive properties
- Non-skidding, open grinding wheels due to good flushing effect
- Clean machines and good flushing out of particles
- Non-foaming, transparent solution, without clouding by bacteria
- Stable, long-life solutions
- Good skin compatibility, hygienic



Mixture ratio

The mixture ratio of the grinding admixture is depending on the requirements of the protection against corrosion. (Anticorrosion data in accordance with DIN 51360/2).

We recommends an **concentration** at grinding as follows:

- Paper industry: **1 % up to 2 %**
- Steel industry: **2 % up to 4 %**

These instruction apply to a wide range of applications. Due to the variety of applications, no guarantee can be given for the correctness of the data given here.

6.7 Hydraulic Systems / Operating Media

6.7.1 Treatment of the supply units before filling



Cleanliness is one of the most important conditions for problem-free operation.

- This must be used as a basis for all assembly, maintenance and repair work.

For this reason, the hydraulic supply units or individual devices are supplied under clean conditions and must be handled with extreme care.

- Before putting the hydraulic unit into operation the complete system has to be rinse out.
- Check the cleanliness of all operating media tanks and clean these if necessary.

Especially:

- Remove the cleaning lid of the oil tank. Check that the tank is clean, wash it out if necessary (do not use cleaning wool or fibrous cloths to clean the tank). After cleaning the tank, close the lid.
- Open the return filter and check it for cleanliness; if it is dirty, insert a new filter element.
- Check the mountings of the pump and drive motor. The coupling must have some clearance; it must be possible to turn the pump by hand. Check the direction of rotation of the pumps and motors.
- Prior to installing them in the unit, set all pressure switches, pressure reducing and pressure relief valves to the pressure stated in the hydraulic schemes, using a hand or motor-operated pump and secure them (counter) them accordingly. This should only be done for those devices which have not already been preset to the correct pressure given in the order (parts list) by the manufacturer himself.
- Check that all piping to the unit has been correctly laid in accordance with the circuit diagram and that the pipes are properly secured; ensure that hose pipes are not bent or twisted.

6.7.2 Filling the supply units with liquid operating media

If the first inspection of the unit proved to be satisfactory, the unit can be filled with oil (resp. cooling media, dielectric fluid etc.).

- Only the media stipulated in the operating instructions or a suitable equivalent may be used!
- Only fill the unit with media when the machine is switched off!



Fresh oil out of the barrel is impure and must not be poured into the tank unfiltered!

The following filter finenesses are needed for filling the tank:

Unit	Filter fineness
Servo units	3 µm absolute
Other hydraulic units	10 µm absolute

- Control the fluid level in the inspection glass or on dipstick. Fill up equipment to given mark or middle of inspection glass.¹²
- Fill up the hydraulic pump and motor with hydraulic fluid before starting them up (in accordance with the manufacturer's instructions).
- After filling, seal the filling hole tightly.



Control the fluid level once more after the initial operation, because all consumers and connecting pipelines must be filled.

- Topping up must also only be done when the machine is switched off and has been left to stand for adequate downtime.

¹² Refer to lubrication instructions

6.7.3 Running In The Hydraulic System

The hydraulic system is deemed to have been run in after all functions of the system have been adjusted and tested.



The necessary reference values for adjustment of the components can be seen in the hydraulic schematics for the system!

- Pressure reducing valves, pressure control valves, chokes and flow control valves should be set at the minimum pressure or rate of flow to begin with, unless they were already preset to the correct value prior to installation.



When running in hydraulic systems, it is imperative to closely watch the system, the installation and the individual movements!

- Remove foreign objects and any people from the work area of the machine.
- Execute all movements/functions of the hydraulic system manually (without load, if possible).
- Re-adjust the pressure control and pressure reducing valves until the correct operating pressure is achieved.
- On systems with zero stroke pumps, the pressure control valve must be set approx. 10% higher than the operating pressure.
- On systems with fixed displacement pumps, the pressure control valve must be set to the minimum required pressure for safe operation of the system (refer to the specifications given in the hydraulic schematics).
- Set the pressure switches so that they only respond after the function has been fully executed.
- Pressure switches must respond at up to 10% below the maximum operating pressure.
- Set choke and flow control valves such that the required speed of movement or the intended flow rate is achieved.

- Set the electrical actuating elements (beros, limit switches, etc.) for feedback to the electrical controller and check their functions.
- Bleed the cylinders and piping until oil emerges without any bubbles.
- Check the oil temperature.
- Check that the oil/air cooler has been correctly connected.
- Check the thermostat settings at the cooling unit.
- Check the heating and cooling switching.
- Check the piping for leaks when running in system.
- Loose screwed connections must be tightened when the system is in a depressurized state.
- Clean / exchange the filter element when the „dirty“ indication is given.



6.8 Cleaning the Monitors and Control Panels

The fronts of the monitors and the surfaces of the control panels can be cleaned.

For normal dirt, household detergent (washing-up liquid) or suitable industrial cleaners can be used. These cleaners will also remove graphitic dirt.

Cleansers which contain one or more of the following substances may also be used occasionally:

- Diluted mineral acids
- Bases
- Alcohol
- Organic hydrocarbons
- Soluble detergents
- Greases and oils
- Benzene (naphtha)

6.9 Cleaning the V-Belts

You are strongly advised to inspect the V-belt drives regularly. This includes checking the belt tensions and correcting them if necessary.



If the V-belts are dirty and the required power is no longer transmitted, the drive must be cleaned. Do not under any circumstances tension the belts too tightly, as this could destroy the motor drive bearing.

If individual V-belts are worn, a new set of V-belts must be mounted. V-belts of different makes must not be used.

The use of belt wax and belt sprays is to be avoided at all costs.

Dirty V-belts can be cleaned with a **glycerine-white spirit mixture at a ratio of 1:10**. Naphtha, benzene turpentine etc. should not be used. Moreover, sharp-edged objects, wire brushes, sandpaper etc. must never be used, as they can mechanically damage the V-belts.

6.10 Waste Disposal Instructions

When operating the machine and in the course of regular maintenance, waste products such as coolant, slurry, old oil and greases accrue, which must be disposed of in accordance with the applicable national waste disposal regulations in force locally.

Transport



The waste products must be transported in sealed transport containers that meet local legal requirements, and must be disposed of at proper hazardous waste dump sites by a specialist waste disposal company.

6.11 Water Pollution Prevention

It is becoming increasingly important nowadays to prevent pollution of our water. This plant is therefore designed in such a way as to keep the risk of contamination of the water by the consumables used (grease, oils, coolants, lubricants, etc.) to a minimum, by ensuring that these substances cannot leak out under normal circumstances. However, the User must also comply with various conditions and laws (with regards to the foundation, collecting tanks, etc., if these have not been supplied by the machine manufacturer), to eliminate the risk of water pollution¹³.

To keep the risk of water pollution as low as possible, the following points must be heeded:

- The User must instruct his machine operators / maintenance personnel about the types, amounts and dangerousness of the water-polluting substances used, the potential risks involved with the use of the machine, and what to do if malfunctions occur. This instruction must be repeated at least once per year; especially after any conversions or modifications have been done.
- Only allow specially trained personnel to maintain, repair and clean the machine.
- Make sure that all jobs listed in the maintenance schedule are duly done by properly trained experts.
- Shut down and empty the machine if it is damaged, if there is no other way to prevent pollution of the water.
- Find the source of any leaks without delay and prevent any more fluids from leaking out.
- Recycle any consumables coming out of the machine or dispose of them in the proper manner (also refer to the disposal instructions).

¹³heed the water pollution prevention regulations and laws in force in your country



7 INSPECTION

7.1 General

Machine inspections must only be carried out on the plant by suitably qualified personnel.



The operability and working accuracy of the plant over a period of many years can only be guaranteed if the inspection instructions in this section are observed and strictly followed.

How often inspections need to be done depends on the quality of the foundation, the degree to which the plant is loaded and the required plant accuracy.

➤ Any irregularities or faults occurring must be rectified at once!



If you have any questions regarding the repair and maintenance of the plant, our Customer Service Dept. will be happy to give you assistance.

If the accuracy of the machine fail to meet the requirements, all elements which could be the cause of the inaccuracy must be checked, readjusted or, if necessary, exchanged.

7.2 Change Measuring Probe Inserts

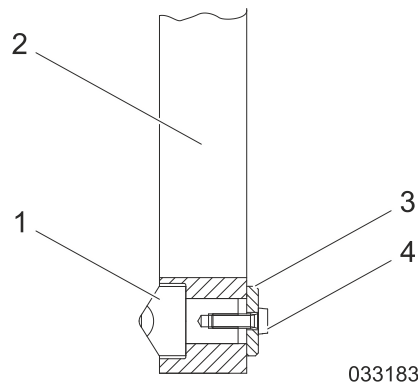


Fig.: Diamond measuring probe insert (schematic diagram)

- 1 Measuring probe insert
- 2 Measuring lever
- 3 Washer
- 4 Measuring probe insert fastening screw



When working on the measuring device, the measuring lever must not be subjected to sudden loads or knocks.

- Loosen the fastening screw
- Pull out the measuring probe insert
- Push in the new measuring probe insert up to the shoulder and fasten it into place with the screw
- Calibrate the measuring system

7.3 Eddy Current Checking Facility

7.3.1 General

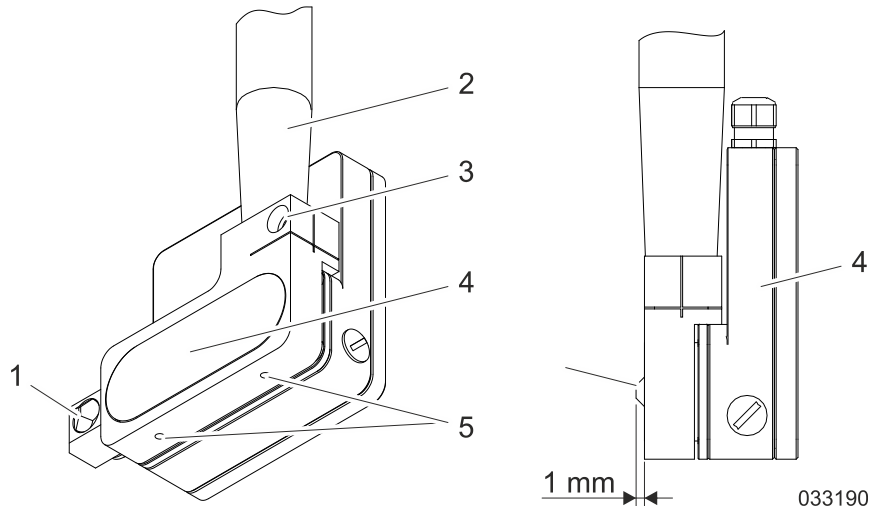


Fig.: Measuring probe insert and crack detector (schematic diagram)

- 1 Measuring probe insert
- 2 Measuring lever
- 3 Test probe holder fastening screws
- 4 Test probe
- 5 Test probe fastening screws



When working on the measuring device, the measuring lever must not be subjected to sudden loads or knocks.

7.3.2 Set Test Gap

The distance from the test probe to the workpiece must be a uniform 1 mm. The surface of the test probe must therefore be set back exactly 1 mm with respect to the measuring probe insert. After changing the measuring probe inserts, the distance must be checked. The easiest way to do this is on an inserted workpiece.

- Position the measuring device so that the measuring probe insert is in contact with the surface of the workpiece.
- Check the distance between the surface of the workpiece and the test probe with a 1 mm caliper.



If the distance is not correct, the test probe must be adjusted.

- Loosen the clamping screw at the test probe.
- Uniformly adjust the test probe so that it is 1 mm away from the workpiece. To do this, hold the 1mm caliper between the workpiece and the test probe.
- Carefully tighten the clamping screw at the test probe.



If the roll surface and test probe are not parallel, the holder can be loosened and rotated.

7.3.3 Calibration

The crack detector must be calibrated regularly to ensure reproducible test results. To do this, a calibrating unit is mounted in front of the test probe arm:

- Position the measuring device such that there is enough room to mount the calibrating unit
- Clean and dry the test probe with a clean cloth
- Mount the calibrating unit



For mounting and operation of the calibration unit, please refer to the manufacturer's instructions¹⁴.

- Switch on the calibration device and wait until the light-emitting diode lights up green
- Tap on **MANUAL** in the Start menu
- Tap on **NON-DESTRUCTIVE TESTING (NDT)**
- Tap on **EDDY**
- Tap on **EDDY SERVICE**
- Tap on the button **EDDY CRK GAIN SETUP** and confirm with the button **ENABLE FUNCTION**
 - The actual value display for cracks should show a value of approximately 360
- If there is a deviation, adjust the gain starting from the value 56dB until the actual value display for cracks shows a value approximately 360
- Switch off and remove the calibration device
- Mount the permanent magnet on the probe
 - The actual value display for the magnetism should show the value of the magnetic field strength from the test certificate of the calibration device
- Tap on the **ENABLE** button and confirm with the button **ENABLE FUNCTION**
- Tap on the **OK** button and confirm with the button **ENABLE FUNCTION**
 - The settings are saved
 - The crack detector is calibrated

¹⁴ see book PURCHASED PARTS

7.4 Exchanging the Dressing Diamond

To achieve the best possible dressing and grinding results, a worn dressing diamond must be exchanged for a new one.

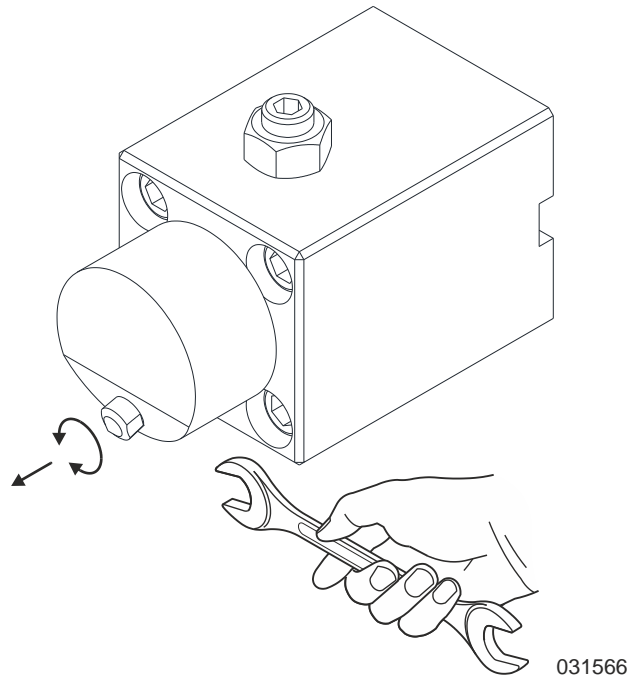


Fig.: Dressing Diamond with Holder

- Fit appropriate open-end wrench at the wrench opening of the wheel dressing diamond
- Release the wheel dressing diamond by rotating it and pull it forward to remove it
- Clean the taper and new dressing diamond
- Insert the dressing diamond into the taper and push it down by hand
- Calibrate dressing tool

8 REPAIRS

8.1 General

Repairs to the plant must only be done by suitable qualified personnel.

- Before doing any repair work, switch off the power switch and secure it to prevent it from being accidentally switched back on again.
- If for certain jobs on the machine, the power supply needs to remain switched on, suitable measures must be taken to ensure that the machine functions cannot be accidentally triggered.
- Never do any maintenance or repair work whilst the plant is in operation!
- Any irregularities or faults must be put right immediately!
- Make sure that any screwed connections which were loosened during maintenance or repair work are tightened again afterwards!



Our Customer Service Dept. would be happy to answer any questions which may arise with regards to maintenance or repair of the plant.

8.2 Changing and tensioning the driving belts

Procedure for changing

Before removing the belts, the respective center distance must be reduced so that the belts can be taken off without force or can be laid in the grooves.



If all of the belts are removed, the belts must be numbered, and the initial groove must be marked. Make absolutely sure that each belt is returned to its original groove and that the running direction remains the same.

- Mounting of V-belts on motor side beginning from inner V-belts groove.

After changing the belts, the drive should be tightened after running 0.5 to 4 hours under full load, in order to compensate for initial stretching.

In this case, the drives must be checked after ca. 40 hours of operation and tightened if necessary.



Forced mounting using mounting bar, screw driver etc. is strictly prohibited, as this often leads to (invisible) damage to the high quality tensile train or to the fabric covering of the belts.

8.2.1 Headstock

The drive motor, gears and counter-bearing in the headstock are mounted on a drive slide. This slide can be adjusted for the purpose of tensioning or changing the drive belt [X].

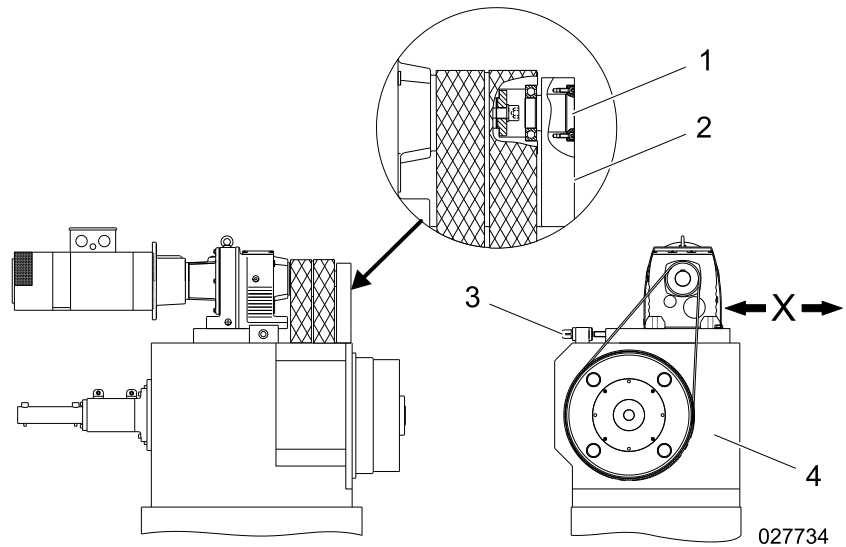


Fig.: Faceplate Drive (schematic diagram)

- 1 Bearing shaft
- 2 Bearing block
- 3 Tensioning bolt
- 4 Front cover

Changing the Drive Belt

- Remove the motor cover
- Remove the front cover
- Loosen the clamping bolts of the motor sledge
- Uniformly loosen the tensioning bolts
- Remove the fastening screws at the bearing block
- Pull off the bearing block with the bearing shaft in axial direction
- Change the drive belt
- Re-assembly is done in reverse order

Tensioning the Drive Belt

The belt tension is adjusted by changing the distance between the main shaft and the drive. This is done by moving the drive slide accordingly.

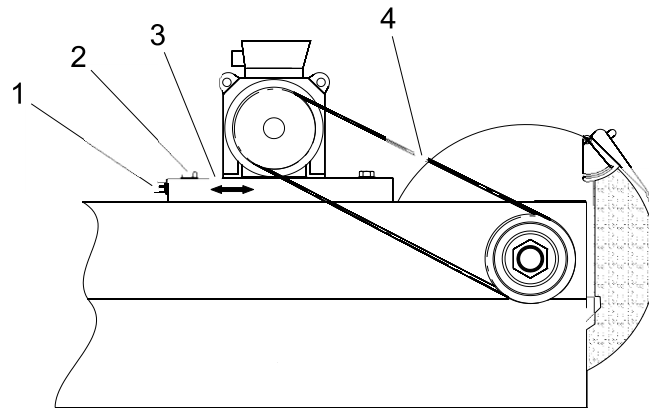
- Remove the motor cover.
- Measure the belt tension with a suitable frequency meter.
- To correct the belt tension, loosen the clamping bolts at the drive slide.
- Adjust the belt tension with the tensioning bolts.



When adjusting the drive slide, pay attention to the parallelism of the main and the drive shafts!

- Uniformly tighten the clamping bolts.
- Check the belt tension again.
- Put the motor cover back on.

8.2.2 Grinding Wheel Drive



027713

Fig.: Grinding Wheel Drive

- 1 Set screw
- 2 Fastening screws
- 3 Motor base plate
- 4 V-belts

Changing and Tensioning the V-Belts:

- Switch the **MACHINE OFF** lock the switch to prevent the machine from being switched back on again.
- Remove the guard.
- Loosen the fastening screws.
- To change the V-belts, turn the set screw to move the motor base plate towards the grinding spindle until the V-belts can be removed and the new ones installed.



When installing the new V-belts, pay attention to the running direction.

- To tension the V-belts, turn the set screw to move the motor base plate away from the grinding spindle.
- Tighten the fastening screws at the motor base plate and check the belt tension again.
- Mount the guard.
- Do a slip test; check the belt tension again, if necessary.

8.3 Checking the Belt Tension

To ensure trouble-free power transmission and to get the maximum possible life expectancy from the belt, the correct belt tension is extremely important. If the initial tension is too low or too high, the belt will fail prematurely. Overtensioning also often results in damaged bearings at the motor.



General initial tension readings (e.g. using the thumb-push-in method) are not suitable.

To optimally tension the belts and to utilize them most economically, suitable measuring instruments should be used to check the belt tension.

8.3.1 Checking the Tension Manually

For most drives, the belt tension can be checked using simple means. To do this, you will need a spring balance, a straightedge, and a caliper gauge.

- To determine the correct belt tension, a certain test force¹⁵ must be applied perpendicular to the center of the strand of a belt of the respective belt set.
- The belts must be adjusted so that the correct depth of impression is achieved when the test force is applied.

¹⁵ Refer to the section "Drive Belt Tensions"

8.3.2 Check with OPTIKRIK

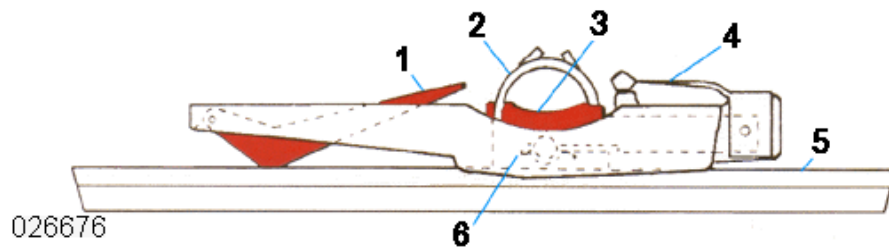


Fig.: Measuring device for depth of impression

1. Indicator arm
2. Rubber finger loop
3. Pressure surface
4. Pocket clip
5. V-belt
6. Pressure spring

The ways of using the tension gauge are shown in the figures A, B and C



Fig: Operating possibilities of the tension gauge

- The gauge is placed in the middle between the two pulleys on the back of the belt, in the case of sets of belts ideally on the central belt. Before doing this, ensure that the indicator is pushed down into the gauge body (First press the indicator arm onto the scale).
- Lay the gauge loosely on the belts to be measured and press with **only one** finger slowly onto the pressure surface (see figuration A, B, and C).
- Once you hear or feel a **definite click**, immediately release pressure and the indicator arm will remain the measuring position.
- Carefully lift the gauge without moving the indicator arm. Read off the belt tensioning¹⁶. Read off the measurement at the exact point, where the top surface of the indicator arm crosses the scale.

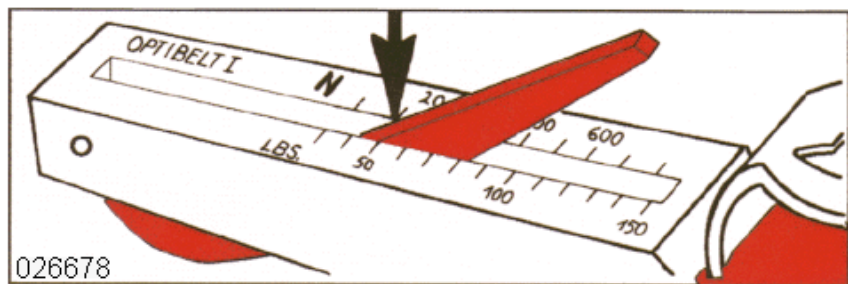


Fig.: Read the belt tension

- If necessary, correct the pre-tension until the calculated depth of impression E_a is reached.



Try not to touch the gauge with more than one finger during the measuring process.

For a reliable read off, the top side of the indicator can be fixed on the scale by the thumbnail and after that the device can be turned.

¹⁶ refer to Tension Values of V-Belts

8.3.3 Testing with Frequency Meter



Fig.: Frequency Meter TT2 (Example)

Measurement Without Inputting the Belt Parameters

- Hold the gauge head over the belt and tap the belt to cause it to vibrate.
- Take a frequency reading [Hz].
- Compare that with the rated value from the drive calculation provided by the belt manufacturer.
- Correct the initial tension.

Measurement with Determination of the Initial Tension

To make it easier to determine the initial belt tension, some frequency-type tension meters allow the belt profile to be pre-selected from a built-in database.

- Select the profile from the database.
- Input the required parameters.
- Hold the gauge head over the belt and tap the belt to cause it to vibrate.
- Take a reading of the actual value.
- Compare that with the default value; correct the initial tension, if necessary.



Overtightening of the belts is to be avoided under all circumstances. Therefore, the maintenance intervals and the instructions for checking/tightening and cleaning the belts in chapter MAINTENANCE absolutely must be observed without fail. Otherwise, the full drive power is not transmitted and the drive motor bearings could be damaged.

8.4 Electric Motors

When doing repair work to the electric motors, e.g. exchanging the motor bearings, please refer to the original instruction manual of the respective manufacturer of the motor.



A

Accident prevention 1-19
Accumulator drain valve 5-126
Actuating element 6-143
Additive 6-138
Air bubble 5-127
Air cooler 5-129
Assembly work 1-23
Axial displacement 2-35
Axis 2-44
Axis designation 2-44
Axis of rotation 2-46

B

Balancing result 4-96
Balancing the grinding wheel 4-93
Belt 8-156
Belt parameter 8-163
Belt tension 8-160, 8-162
Bleed 5-127
Bottom slide 2-39
Bruising 2-51
Button 3-54

C

Calibrate 7-153
Calibrating unit 7-153
Capacity 1-17
Carriage 2-39
Cause of a fault 5-123
Cavitation 5-127, 5-128
Cavity 2-50
C-axis 2-45
Center distance 8-156
Changing 4-89
Choice of grinding wheel 4-84
Circulation pump 5-129
Clean 6-147
Cleanser 6-144
Collision 4-73
Collision protection 2-48
Compensator 5-125
Concave grinding 2-40
Condition and law 6-147
Consumable 6-147
Control cabinet 3-55

Control panel 6-144
Convention 1-13
Convex grinding 2-40
Coolant 4-88
Cooler grill 5-129
Cooling fluid 6-138
Cooling lubricant 1-24
Cooling lubricant system 2-43
Cooling unit 6-143
Corrosive property 6-138
Coupling 5-125
C-Probe 2-47
Crack detection 2-51
Crack detector 2-50, 7-152, 7-153
Cracks 2-50, 2-51
Curve grinding 2-46
Cutting speed 2-41

D

Delivery 4-83
Delivery line 5-125
Depth of impression 8-162
Description 2-33
Dressing diamond 4-98, 7-154
Drive belt 8-157, 8-158
Driving rollers 2-34
Dry run 4-95

E

Eddy current testing 2-51
Electric motor 5-125, 5-128, 8-165
Electrical equipment 1-20, 2-49
Emergency limit switch 1-25, 5-119
Emergency stop 3-55, 3-61, 3-63, 3-66, 3-68, 4-79
Emergency stop button 1-26, 1-27
Enter key 3-60
Escape key 3-60
Expiry date 4-83

F

Face plate drive 2-46
Fault 5-117
Fault message 5-117
Feed axis 2-45, 2-46
Filling 6-140
Filter element 6-143
Filter fineness 6-141

Finding a fault 5-123

Fine balancing 4-96

Fixed displacement pump 6-142

Flap type potentiometer 2-41

Flushing effect 6-138

G

Gap height 4-103, 4-104

Gauge 8-162

Grinding additive 6-138

Grinding carriage 2-39, 4-81

Grinding fluid 6-138

Grinding residue 6-138

Grinding result 4-99

Grinding wheel 4-82, 4-83, 4-85, 4-89, 4-92

Grinding wheel drive 2-46, 8-159

Grinding wheel infeed 2-40

Grinding wheel retraction 1-26

Grinding wheel synchronization 2-41

Guiding 2-33

H

Handling 4-83

Hazardous waste dump site 6-146

Headstock 2-34, 8-157

Height adjustment 4-101

Hydraulic motor 5-124

Hydraulic supply unit 6-140

Hydraulic system 6-142, 6-143

Hydrodynamic jaw 2-37

Hydrostatic 4-102

Hydrostatic jaw 2-38

Hydrostatic split bearing 2-38

I

Improper use 1-17

Inspection 6-141

Intake line 5-125, 5-127

J

Jaw 2-36

Jog mode button 3-54

K

Key button 5-120

Keyboard 3-60

Key-operated button 3-54

Key-operated switch 3-54

L

Light emitting diode 3-53

Longitudinal adjustment 4-107

M

Machine Bed 2-33

Machine operator / maintenance personnel 6-147

Machine operators 1-10

Main control station 3-58

Maintain 6-147

Maintenance job 6-131

Maintenance personnel 1-11, 6-131

Maintenance regulation 6-131

Malfunction 6-147

Manual pendant 4-80

Manufacturer's instruction 6-141

Material damage 1-12

Measuring axis 2-47

Measuring system 2-44

Message 5-117

Mixture ratio 6-139

Monitor 3-59, 6-144

Mounting 4-92

Moving the axes 4-81

N

Noise 5-128

Non-return valve 5-125

O

Obligations 1-14

Oil gap 4-103, 4-104

Oil in tank 5-129

Oil level 5-127

Oil tank 5-125

Operating company 1-14

Operating element 3-53

Operating error 4-73, 5-119

Operating media tank 6-140

Operation of the machine 1-7

Operationability 5-117

Operational reliability 6-131

Overheating 5-129

Overloading 1-17

Overtensioning 8-160

P

Parked position 4-81

PC RESET 5-122

Personnel 1-7, 1-9

Position the steady rests 4-110

Precision 6-131
Pressure control valve 5-126, 5-128, 6-142
Pressure marks 2-51
Pressure reducing valve 5-126, 6-142
Pressure switch 6-142
Pre-tension 8-162
Proper use 1-15
Protective cover flap 3-67
Pump 5-128
Pump assembly 5-123
Put into operation 6-140

R

Recycle 6-147
Remaining imbalance 4-96
Repair 1-8, 1-23, 6-147
Requirements 4-108
Roll 4-108
Roll dimension 4-99
Roll drive 2-34
Rotary shaft seal 5-125
Rust formation 6-138

S

Safeguard / safety device 1-25
Safety 1-8, 1-12
Safety guard 1-23
Safety guard rinsing facility 3-67
Safety monitoring system 4-79
Safety position 4-81
Safety regulation 1-18, 6-137
Selector switch 3-54
Service switch 5-121
Setup 4-73
Shaft center distance 8-158
Shaft seal 5-127
Shelf life 4-83
Side grinding 4-85
Signalling column 3-71
Software limit switch 1-25
Solenoid valve 5-126
Speed of movement 6-142
Splashguard 4-102
Split bearing 4-102
Start-up 4-76
Steady rest 4-99, 4-107

Steady rest jaw 2-36, 4-99, 4-101, 4-102
Storage 4-83
Support point 4-99
Switching back on 4-79
Switching on 4-77
Switching on the machine 4-76
Synchronization 4-98

T

Tabulator key 3-60
Tailstock 2-35
Tank-air filter 5-127
Target group 1-7
Telescopic covers 1-24
Test force 8-160
Test probe 7-152
Thermostat 5-129
Top slide 2-39
Touchpad 3-59
Training 1-9
Transport container 6-146

U

Ultrasonic 2-50

V

V-belt 6-145
V-belt drives 6-145
V-belt groove 8-156
Viscosity 5-127
Visual inspection and ring test 4-86

W

Warning 1-12, 5-117
Warranty 1-8
Water nozzle 3-67
Water pollution 6-147
Water pollution prevention 6-147
What to do in an emergency 1-26
Work area 4-73

X

X-axis 2-45

Z

Z-axis 2-45
Zero stroke pump 5-125, 6-142