MOOS

Solution
smart&simple grinding

Surface grinding machine

Technical introduction

For types : BP 50100,50120,50150,60120,60150,60220,60250

M-MOOS spol., s r.o.
Svatopluka Čecha 519/28, Lipník nad Bečvou
www.m-moos.cz

Obsah:

1 Introduction

Surface grinders series BP are based on many years experience of the company M-MOOS with the overhauling and modernization of the grinding machines for automatic production. They are designed for efficient and precise grinding of the flat and contoured surfaces. The overall machine concept follows the company philosophy to provide modern grinding machines and technologies that will meet the requirements of industrial production in the 21st century

The high level of automation and precision predetermines surface grinders M-MOOS to use in many fields of automotive and aerospace industry, for manufacturing tools and molds, and also in the global engineering industry. A wide variability allows to create customer-oriented programs and turn-key technology for each customer. This system doesn´t require any basic programming knowledge or ISO code, even when the complex shapes are grinded

Key features

+ Intuitive and simple operation
+ Fast dialog type programming
+ Sophisticated and easy cycles
+ Re-grinding to precise dimensions
+ Rigid cast-iron construction machines
+ V-V Guideways guarantee high precision
+ Wide range of standard equipment
+ Comfortable operation and maintenanc

Machine marking – grinding machine versions

	Number of driven axis	Longitudinal table feed	Dressing attachement	Functions
BP XXXX 2AX (standard)	2	Hydraulic **with** proprtional valve, which allows control direction and speed from operation panel	3-poits mounted on table	Automatic grinding of surface and shapes. Automatic wheel dressing as a part of working program include compensation
BP XXXX 2AX (economy)	2	Hydraulic **without** proprtional valve	3-poits mounted on table	Automatic grinding of surface and shapes. Wheel dressing has to be done with manual feed on dressing attachement, compensation after dressing has to be set and confirmed by worker on the display The lenght of grinding is set by manual dogs
BP XXXX 1AX (basic)	1 (vertical axe)	Hydraulic **without** proprtional valve	1-poits mounted on table	Automatic grinding of surface , Automatic pitch grinding with hand travel to required.

	Number of driven axis	Longitudinal table feed	Dressing attachement	Functions
BP XXXX 3AX (multi-task)	3	Ball screw	3-poits mounted on table	Automatic grinding of surface and shapes. Automatic wheel dressing as a part of working program include compensation
BP XXXX 3AX (option)	3	V-belt		

Ranking of each types

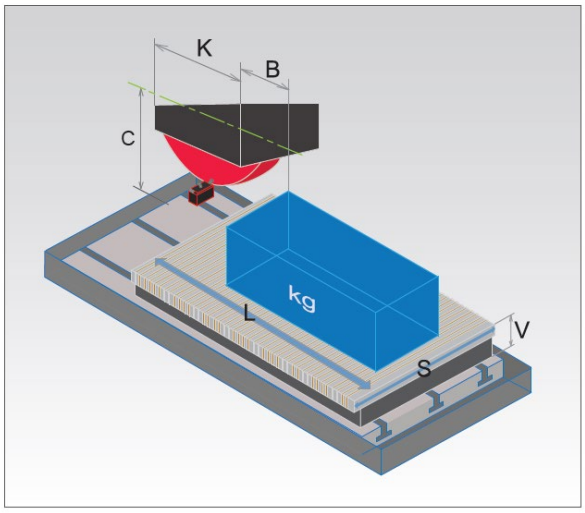
Type	Surface quality	Efectivity	Functions	Service Life	Purchase costs
BP XXXX 2AX (standard)	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
BP XXXX 2AX (opce economy)	●●●●●	●●●●●	●●●●○	●●●●●	●●●○○
BP XXXX 2AX (opce basic)	●●●●●	●○○○○	●○○○○	●●●●●	●○○○○
BP XXXX 3AX (opce multi-task)	●●●●○	●●●●●	●●●●●	●●●○○	●●●○○
BP XXXX 3AX (opce)	●●●●○	●●●●●	●●●●●	●●●●○	●●●○○

2 Technical specification

Type	BP - 50100	BP - 50120	BP - 50150
Max. cross x longitudinal travel	560 x 1150	560 x 1350	560 x 1650
Spindle center height from table	700 mm		
Grinding surface of table	500 x 1000	500 x 1200	500 x 1500
Table speed in longitudinal axis	1-25 m/min		
Working feed	1240 mm/min		
MPG step feed	0,001/0,005/0,01/0,05 mm		
Grinding wheel dimension	(V.P x Š x I.P)- standard 355x50x127mm		
Grinding wheel cover dimension	Standard: 450 x 155 mm		
Spindle speed	Stepless speed change 2400 rpm		
Spindle motor	7.5(11) kW		
Hydraulic motor	3.7 kW/ 5HP		
Machine net weight	5800 kg	6100 kg	7000 kg
Machine gross weight	6900 kg	7500 kg	8500 kg

Type	BP - 60120	BP - 60150	BP - 60220	BP - 60250
Max. cross x longitudinal travel	660 x 1350	660 x 1650	660 x 2350	660 x 2650
Spindle center height from table	700 mm			
Grinding surface of table	660 x 1200	600 x 1500	600 x 2200	600 x 2500
Table speed in longitudinal axis	1-25 m/min			
Working feed	1240 mm/min			
MPG step feed	0,001/0,005/0,01/0,05 mm			
Grinding wheel dimension	(V.P x Š x I.P)- standard 355x50x127mm			
Grinding wheel cover dimension	Standard: 450 x 155 mm			
Spindle speed	Stepless speed change 2400 rpm			
Spindle motor	7.5(11) kW			
Hydraulic motor	3.7 kW/ 5HP			
Machine net weight	6500 kg	7400 kg	8900 kg	12500 kg
Machine gross weight	7900 kg	9000 kg	12000 kg	15600 kg

Working area



Max. workpiece dimension = magnetic table dimension

Distance between spindle axis and surface of working table
C max = 700 mm

Workpiece height = 700 – wheel radius – height of magnetic table = 700-177,5 – 85 = **437,5 mm**

Lenght of grinding wheel cover : K = 400 mm

In frequent dressing wheel has to be considered a safe distance B between the workpiece and the wheel cover, to avoid collision during the wheel dressing. Or choose another type of dressing devices.

Type	Loading capacity			Magnetic table		
	Max. capacity of working table	Weight of magnetic table	Max. workpiece weight	Lenght (L)	Width (S)	Height (V)
BP-50100	900~1600 kg	265 kg	635 ~ 1335 kg	500 mm	1000 mm	81 mm
BP -50120	1200~1880 kg	315 kg	885 ~ 1565 kg	500 mm	1200 mm	81 mm
BP -50150	1200~1880 kg	450 kg	750 ~ 1430 kg	500 mm	1500 mm	88 mm
BP -60120	1200~1880 kg	415 kg	785 ~ 1465 kg	600 mm	1200 mm	81 mm
BP -60150	1200~1880 kg	535 kg	665 ~ 1345 kg	600 mm	1500 mm	88 mm
BP -60220	1800~3000 kg	760 kg	1040 ~ 2240 kg	600 mm	2200 mm	81 mm
BP -60250	1800~3000 kg	865 kg	935 ~ 2135 kg	600 mm	2500 mm	81 mm

Main electric components

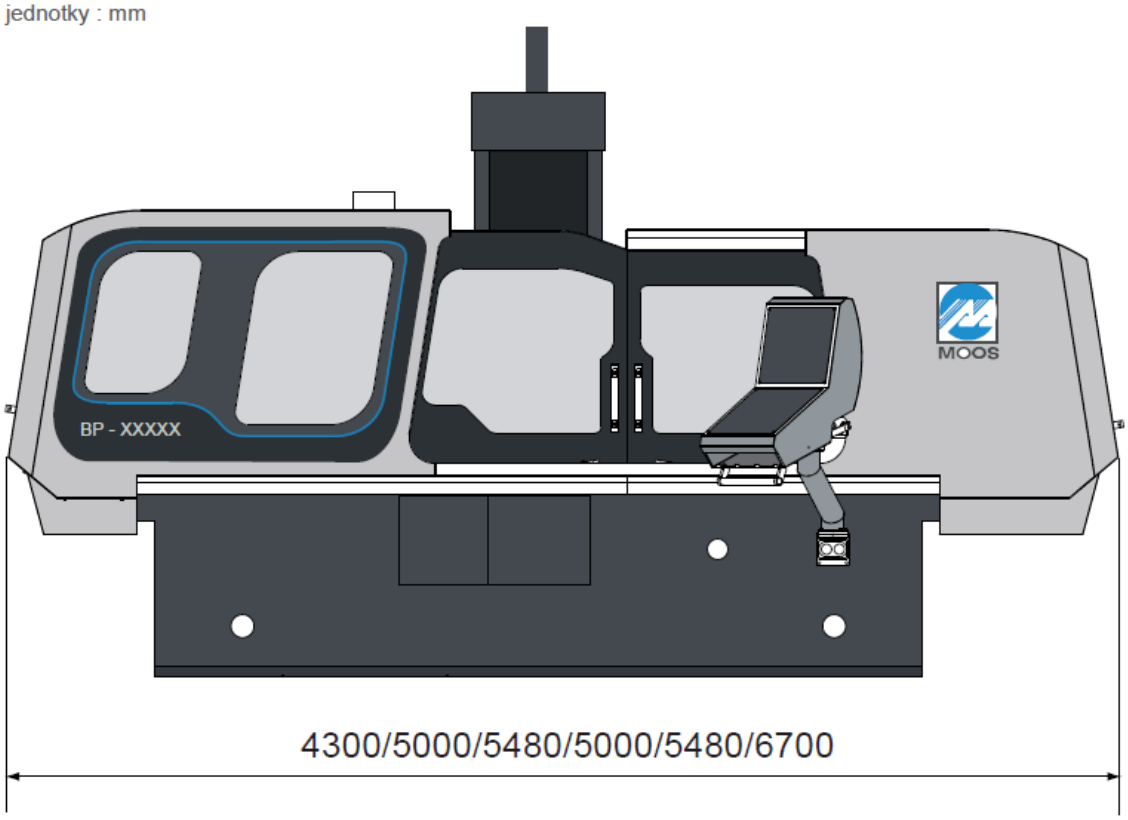
Type	Spindleý motor	Hydraulic pump motor	Coolant pump motor	Cross servomotor	Vertical servomotor	Oil tank 1 (capacity 2l)	Oil tank2 (capacity 20l)
BP-série	7,5 kW	4 kW	0,55 kW	3,9 kW	3,9 kW	0,013 kW	0,18 kW

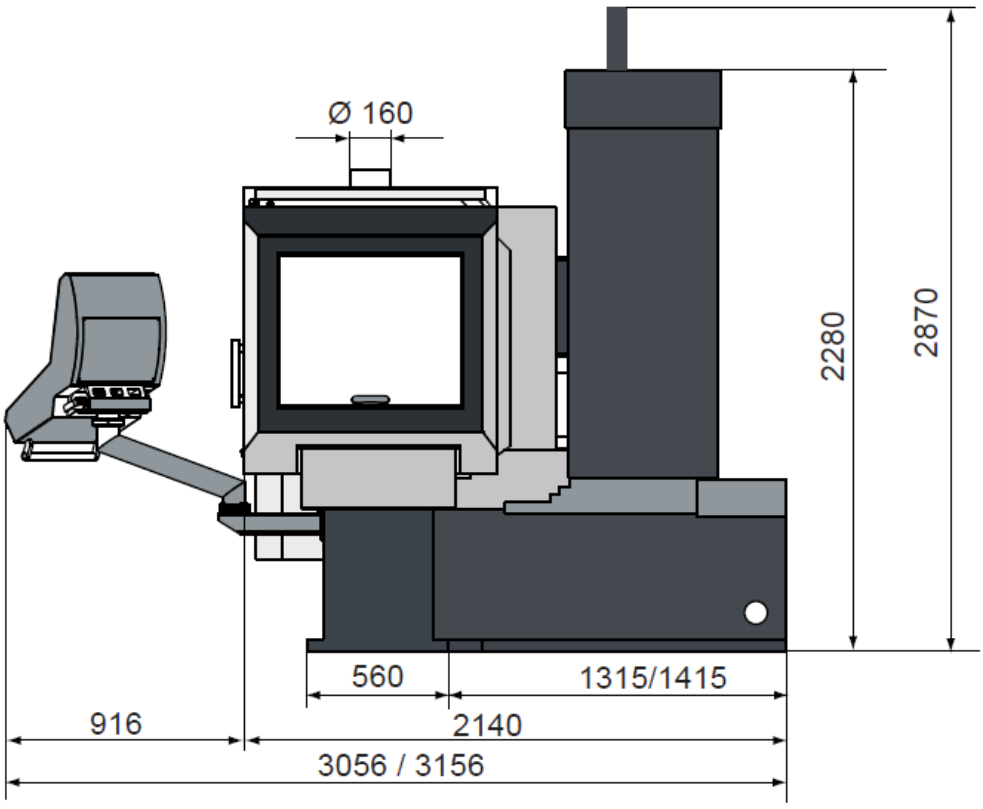
Hydraulick system a lubrication

Model	Hydraulic motor	Capacity of hydraulic oil tank	Capacity of lubrication oil tank
BP-serie	4 kW	120 L	20 L and 2L

3 Instalation– size and foundation plan

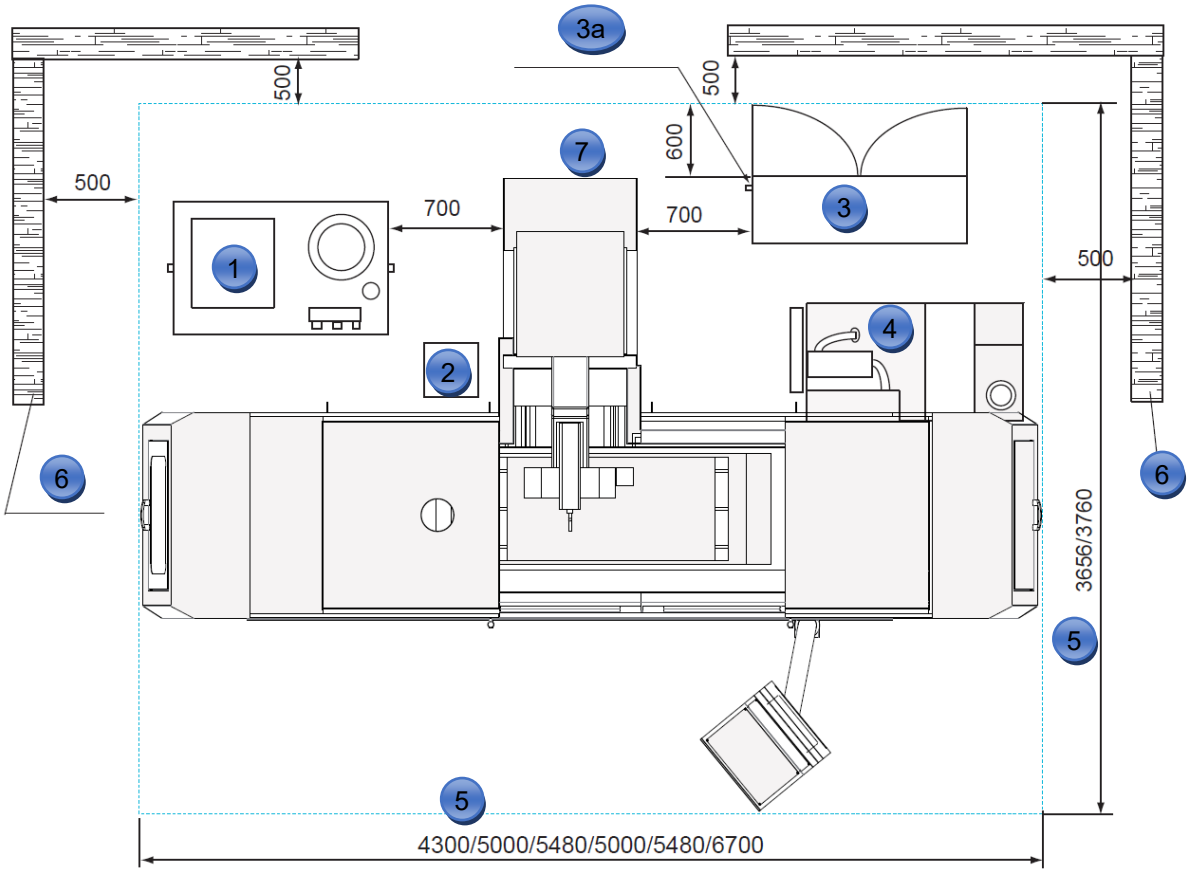
BP - 50100 / 50120 / 50150 / 60120 / 60150 / 60220
jednotky : mm





Machine placement

It is very important to install the grinder in the correct place to be able to achieve a high working accuracy. Best location:
- A place with minimal fluctuations in temperature
- Do not install the machine where the surrounding machinery departures chips and dirt
- Install a place without vibration, away from compressors, presses, planers and other machines, which can cause vibration, unless sufficiently strong base or near the vibration source, than the new base should be done or install anti-vibration protection.



1 Hydraulic tank– floor space 940 x 700 mm

2 Dust suction systém stand - floor space 410 x 410 mm

3 Elektric box– floor space 420 x 1260 mm + dveře 600 mm

3a Main power

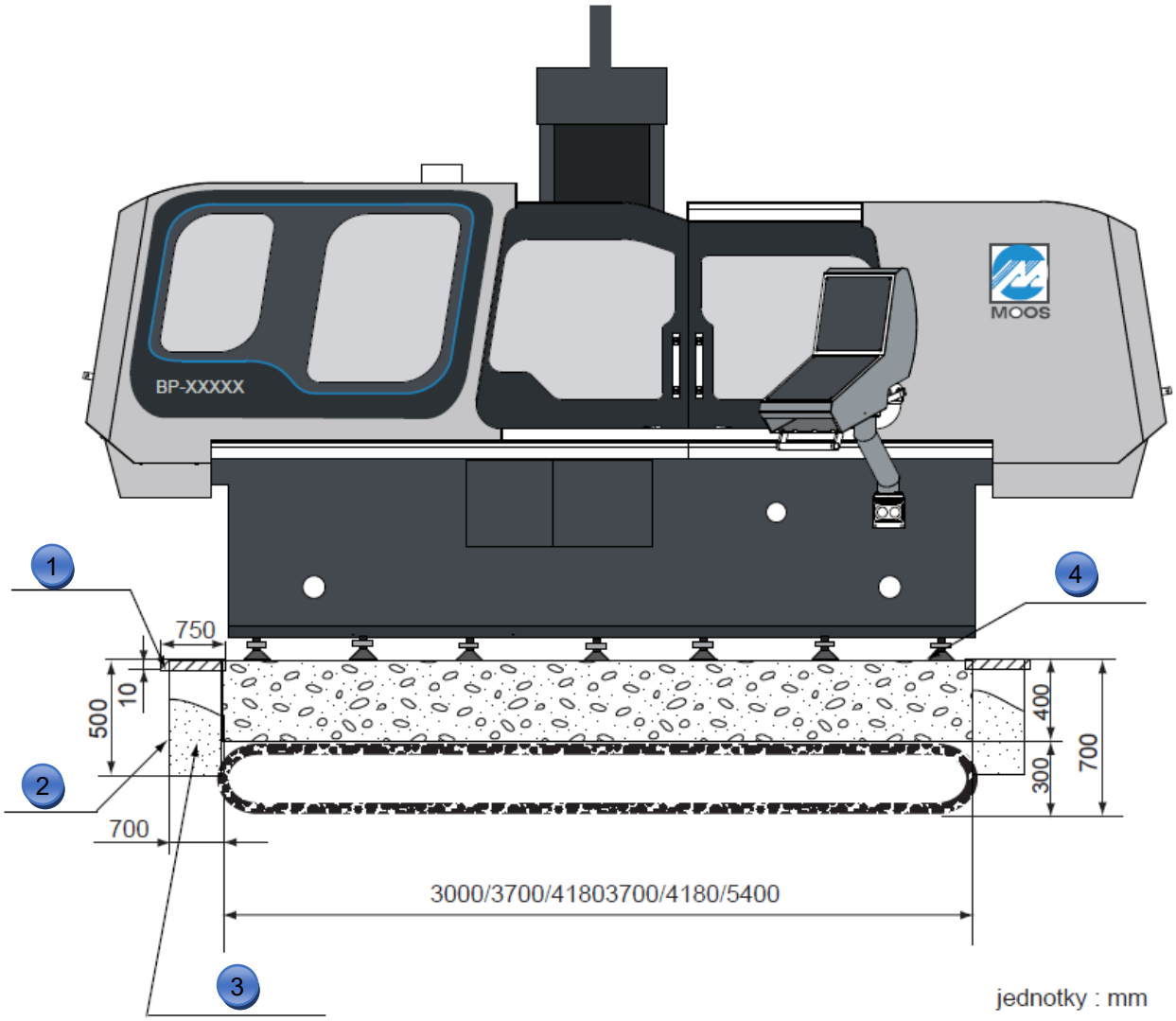
4 Coolant tank with paper filter and magnetic separator- floor space 1010 x 750 mm

5 Machine working area

6 Environment like a wall or other equipment inside the hall

7 Press air inlet

Foundation plate



1 SPHC desk 750 x 10 mm

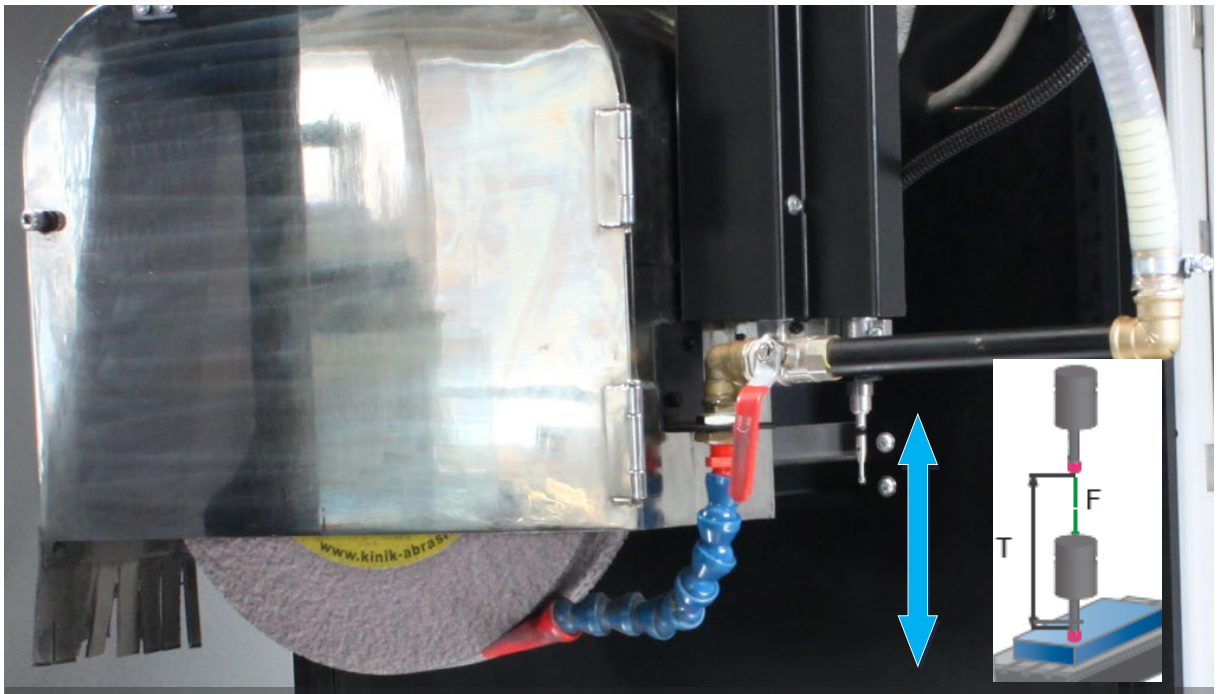
2 Moisture barrier coating - eg. Asphalt

3 Cushioning layer - fine sand or empty

4 Leveling pads and screws

4 Standard and optional accessories

Item	Standard configuration
1	Working table
2	Electromagnetic chuck
3	Max.crossxlongit. travel
4	Center height from working table 700 mm
5	Grinding wheel 355x50x127 mm + flange
6	Spindle speed 2400 ot/min, frequency converter
7	Spindle motor 7,5 kW
8	Hydraulic longit. Table feed, proportional valve
9	Servomotor Schnider in axis Y a Z
10	controller. X-SOLUTION +10" color touch display
11	Cooling systém with paper and magnetic filtr
12	Operation manual in EN
13	Cross and longit gudeways V-V type
14	Liner scales in Y and Z, accurancy 0,001 mm
15	Dressing unit mounted on table
16	Ouput chaneels flushing + watter gun
17	Semi-closed guarding with 2 doors
18	Automatic lubrication system
19	Maintance tools and box
20	2 led working led lamp
21	MPG- Electric hand wheel
22	Balance stand + arbor



Obrobková sonda (opce)

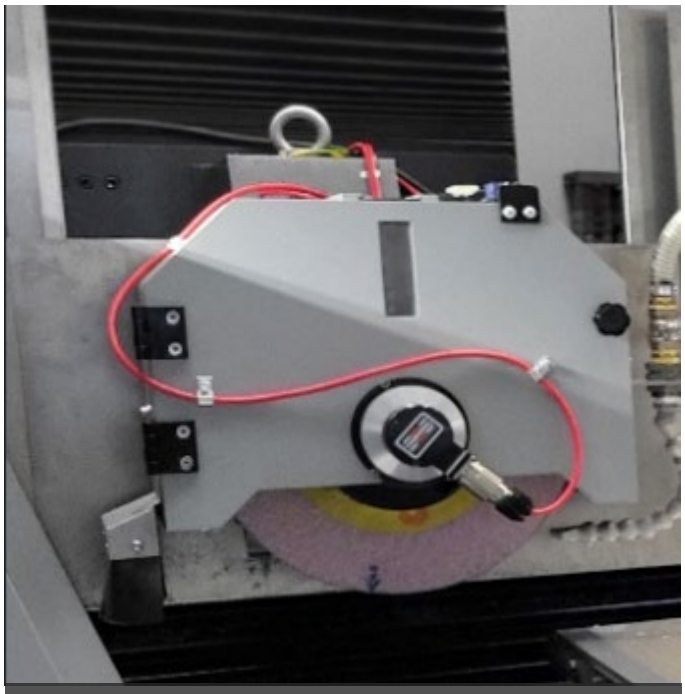
Slouží k proměření obrobku před nebo po broušení. Měření lze provádět v ručním nebo automatickém režimu. Systém je vybaven makrem pro měření obrobku, kde lze jednoduše zvolit místo a počet měřících bodů .

Řídící systém Fanuc (opce)

Pro složitější tvarové broušení nebo obrobky vyžadující interpolaci více os doporučujeme zvolit řidící systém Fanuc. Comfortní 15“ obrazovka poskytuje dokonalý přehled a orientaci i v obsáhlejších makrech

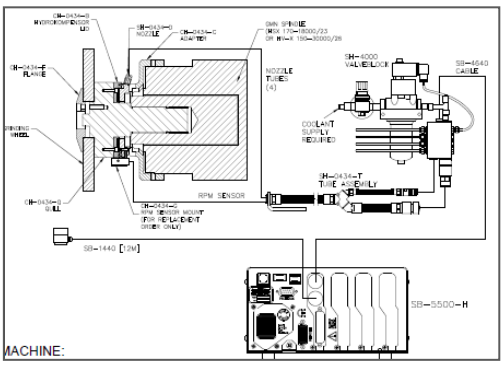
Elektromag. stůl s jemným dělením (opce 1) a pneumatickým nadlehčením (opce 2)

Pro naložení menších obrobků nebo pro obrobky, které nemají rovný povrch doporučujeme osadit brusku magnetickou deskou s jemným dělením. Tím je zaručeno bezpečné upnutí obrobku. Jako další opci lze zvolit pneum. odlehčení obrobku při demagnetizaci. Tento systém snižuje efekt „ přilepení“ obrobku k mag. desce.



Aut. Wheel Balancing systém SBS (opt. 1)

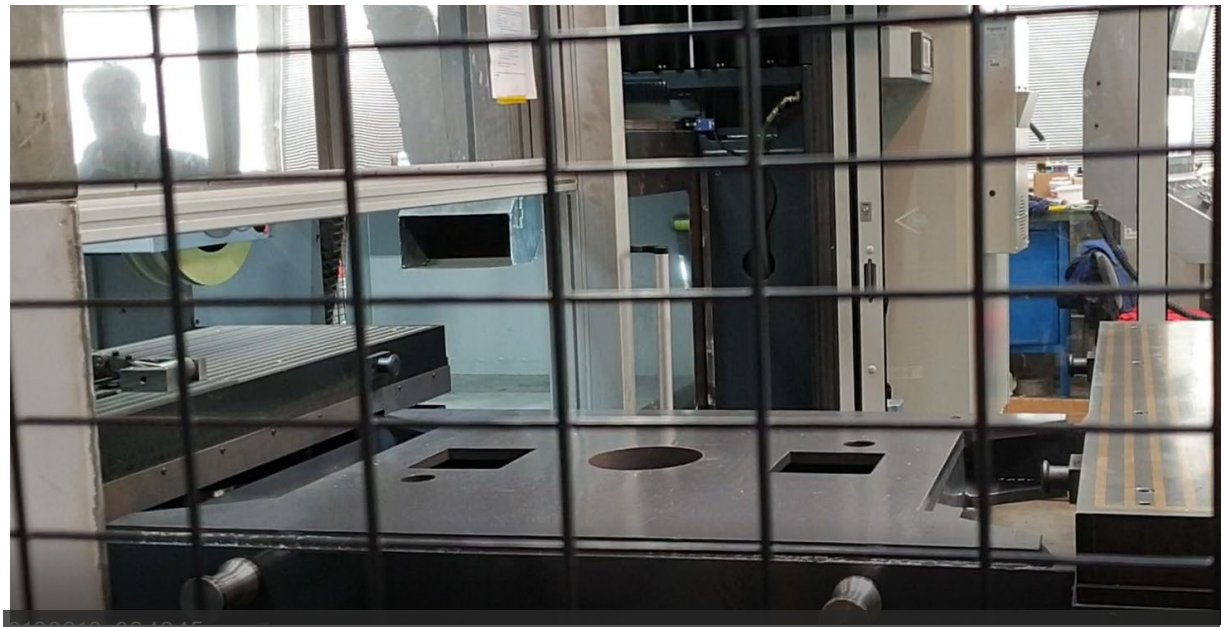
Improves workpiece quality with automatic balancing down to 0.02 microns.
Provides longer life for grinding wheels, dressing wheels and spindle bearings.



Aut. Wheel Balancing systém (opt. 2- type hydro)

Thanks to the direct-to-back mounting, it does not limit the stroke or the working space.

The Hydrokompenser system uses process coolant, water or other available liquids for balancing.
The four-chamber balancing disc is integrated into the disc holder or the grinding disc flange so that the correction medium can be injected through the nozzles



Aut. Palet changing system– APC (otion)

Automatic pallet changer in grinders replaces the fixed electromagnetic plate with a permanent one, but has the advantage of rapid workpiece change by allowing the preparation and positioning of another workpiece while one is being machined. This significantly speeds up the machining process.

Item	Optional accessories
A	Additinal price of electromagnetic table with fine pitch 1+1
B	Coolant tank capacity 250l
C	Coolant tank capacity 300l
D	Additional coolant jet
E	Spare paper role
F	Dust suction system Raven X-Cylone RJ-2; 250W,1000 m^3/hour
G	Dust suction system Raven X-Cylone RJ-3; 500 W,1000 m^3/hour
H	Dust suction system LOSMA DARWIN 1200; 1,5 kW, 1270 m^3/hour
I	Dressing unit over the wheel - type EM (elektric cross feed, manual vertical feed)
J	Dressing unit - type Auto (elektric cross feed, servomotor in vertical axe)
K	Rotary type dressing unit DR-KAISER - for profile grinding
L	Svivel type dressing unit with height preseting
M	Economy version without proportional valve
N	Table movement control by timing belt and servomotr
O	Table movement control by servomotor and ball screw
Q	Measuring systém without linear scales
R	Full splash guarding with 2 doors
S	Stainless steel cover of grinding wheel
T	Automatic balancing systems of grinding wheel SB- 5500 (SBS Autobalance systém)

According to the government decision, all machine placed on the market in the Czech Republic and Europe have to meet the following guidelines and government regulations:
- Law no. 22/1997 Coll. amended
- Government Decree no.176 / 2008 Coll., No. 616/2006 Coll.
- Directive 2006/42 / EC, 2004/108 / EC, 2006/95 / EC, 2009/105 / EC

If the grinding machine meets the above constitution, then from the standpoint of safety all perfect order. However, the above mentioned directive and regulation does not address the special regime grinders. We deal with this issue until the standard is directly related to the grinder
- Harmonized standard - EN 13218 + A1 / 2008

In order grinder meet standard EN 13218 + A1 / 2008 shall be selected following accessories:
- **Extraction systems for emulsion mist with dirt**

Grinding BP series to tap **extraction comply with standard EN 13218 + A1 /, 2008**. It's up to you to what level of security you choose. It is you who will invest in your own health or the health of your employees.

5 Description of Main parts

Main parts

Construction of machine is based on the classic concept of the "T" shape, the cross displacement (Z axis) is performed by column with grinding headstock and longitudinal feed is performed by working table (X-axis). Vertical displacement of the headstock (Y axis), is implemented on the sliding guide surfaces which are located on the front of the column.

All main parts of the machine such as, bed, table, stand, sleds are made of high quality certified část iron, column has a hexagonal ribs to ensure high rigidity. Castings pare are annealed twice with an emphasis on removing any metallurgical tensions. A characteristic feature of the casting base, which is made of one piece.

Bed

Undivided base made from one piece

The machine bed is made of one piece. This ensures maximum stiffness of the entire system of the machine and reduces unwanted twisting, which is typical for the bolted connections. Thanks to this concept can achieve high working accuracy.

Vodící plochy

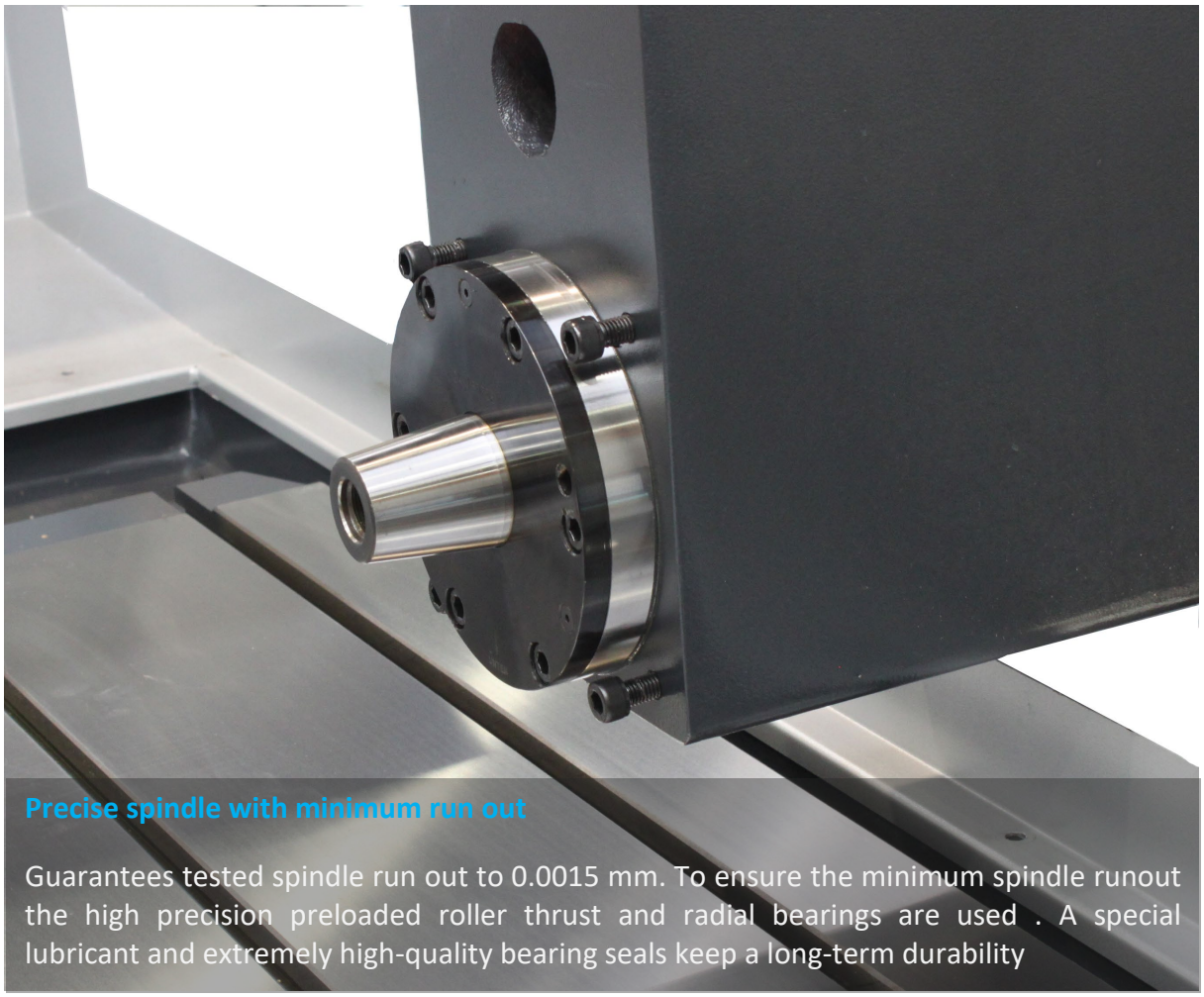
V-V guideways as a guaranteed perfect linear accuracy

Movement in the crossl and the longitudinal axis is implemented on the sliding guide surfaces of the V-V type. This prismatic guideways ensures perfect linear accuracy. Moreover, this concept provides a much longer life and working accuracy than when grinding e.g. with roller guidance or with one V.

Excellent abilities for absolutely precise grinding.

The surface of the guide surfaces of the table and slide is hand-scraped, thus ensuring high accuracy and achieve a perfect seating pattern between the contact surfaces. High rigidity of moving system, large loading capacity of table and the lowest possible value for warping and twisting - it is a guarantee for maximum productivity with high quality grinde surface and constant accuracy.

Headstock



Precise spindle with minimum run out

Guarantees tested spindle run out to 0.0015 mm. To ensure the minimum spindle runout the high precision preloaded roller thrust and radial bearings are used . A special lubricant and extremely high-quality bearing seals keep a long-term durability

The spindle is connected with the motor via a flexible coupling to ensure the transmission of rotary motion without vibration. The integrated frequency converter enables you to change the spindle speed continuously, thereby guaranteeing a constant circumferential speed

Spindle spped	Spindle change	Spindle motor	Driven	Spindle taper
2400 rpm	Steplees with frequency inverter	7,5 kW (option 11 kW)	Direct through clutch	6°1´38"

Grinding wheel (Standard)

Grinding wheel diameter: 355 mm / Max. 400 mm
Grinding wheel width: 50 mm
Inner hole diameter of grinding wheel: 127 mm
Type: 32A 46J 11V 7NP1
Using: *grinding of semi-hard steel, no better than 0,4/0,6 Ra*

Hydraulic system – Longitudinal travel of working table

Two separate hydraulic cylinders are anchored at specific positions of the piston rod, whereby improved rigidity and stability. This creates a very stable and smooth movement of the table and eliminates its swimming. The speed of movement while damping in each reversal points is controlled proportional valve. Reverse limits are set on the operation screen. Temperature stability is guaranteed independent oil cooling equipment.

Hydraulic unit and pump are separated from the main part of the machine, which provides the following benefits:

a) Preventing superheated entry of oil into the machine, which causes stretching and distortion, which can affect the final accuracy of the workpiece.

b) prevents any vibrations and oscillations, which are produced by hydraulic pump and transmitted to the base of the machine and causing a flatter track on the workpiece.

Hydraulic system filtration is necessary part, which keeps the oil without impurities and prolongs the life of the individual components of the hydraulic circuit.

Lubrication system of the machine.

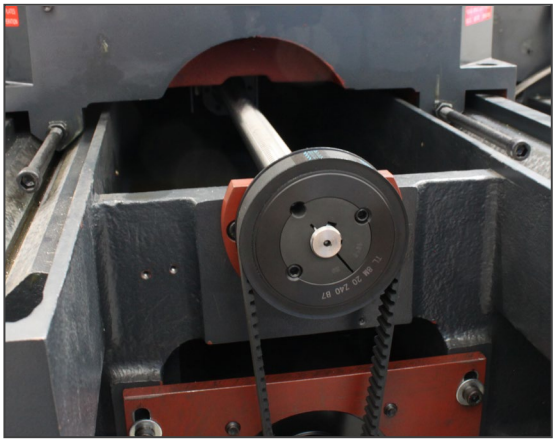
The machine is equipped with an automatic pressure lubrication system, which through a dispenser with a filter supplying important machine components: the sliding surface of the column, ball screws in the vertical and cross axis, and a guideways surface cross axis. The time interval is controlled by the PLC of the machine. Longitudinal guides have their own unit and the circuit. For the spindle bearings used special grease with exactly the given amount, which does not need to be supplemented. The oil level is controlled by the device. At a low state signal is issued in the form of error message is stopped and the machine operation. Oil supply is also controlled by the pressure sensor.

Lubrication tank:

Lubrication tank 1 – capacity 20l

Lubrication tank 2 – capacity 2l, waste type lubrication

Vertical and cross travel



The machine is driven by servomotors in the cross and vertical axes. The individual axes are equipped with precision ball screws, which provide long-term working accuracy.

Cross and vertical axis is equipped with an optical linear scale with an accuracy of 0.0001 mm, which ensures high positioning accuracy. Perfect protection of rulers is ensured by supply of compressed air directly into the ruler. The air is filtered by a system Heidenhain DA 400 that ensures filter particles down to 0.01 microns

For the installation of the machine is required to supply clean compressed air with a pressure of 0.6 MPa. Supply is at the back of the machine

The machine is equipped with an electronic handwheel, which can perform a manual shift in each axis. Other Operations feed is via a button on the control panel in JOG

Elektromagnetic table (chuck)

There is en electromagnetic table with the control unit for regulating the clamping force and the demagnetizer in standard equipment. Controls are mounted on the control panel. This system allows choose optimal force for clamping, so as to avoid distortion during the clamping process. Adjusting of clamping force is in the range from 0 to 100% of the nominal magnetic performance.

Magnet type	Dimension		BP						
			50100	50120	50150	60120	60150	60220	60250
Standard		A	4 mm						
		B	17,5 mm	18 mm	20 mm	17,5 mm	18 mm	18 mm	18 mm
Fine pitch (option)		A	1 mm						
		B	3 (1) mm						

Beware of varying heights magnetic tables

Height of standard magnet: 81-88 mm (more details on page 6)

Height of standard magnet with fine pitch: 113 mm

Dressing attachement

3-point dressing attachement mounted on the table (standard)

Standard 3- point dressing device that is placed in the corner of the worktable. Adjustable stand allows you to change the height as needed. Dressing cycle can be activated automatically from the program without interrupting the grinding process. The wheel moves to the dressing device automaticly and wheels dressing with subsequent compensation is executed.

Dressing attachement over the grinding wheel - type EM (option)

Cross travel (forward / reverse) of dresser is driven by a motor and controlled through the touch screen. Vertical displacement is controlled manually. Material removal is deducted on a scale with a resolution of 0.01 mm. After dressing, you can enter a compensation value actually removed from the wheel. It doesn´t allowed to dress shapes

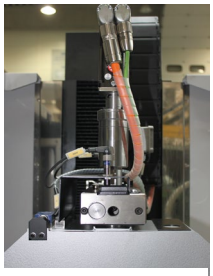
Dressing attachement over the grinding wheel - type AUTO (option)

Cross travel (forward / reverse) of dresser is driven by a motor and controlled through the touch screen. Vertical displacement is driven by a servomotor and ball screw. It enables efficient and automatic wheel dressing as a part of the grinding cycle including automatic compensation. Suitable for grinding plane surfaces, which require frequent wheel dressing. It doesn´t allowed to dress shapes.

Rotary disc Dr. Kaiser (option)

The device placed on a workbench. Dressing cycle can be activated automatically from the program without interrupting the grinding process. The wheel moves to the dressing device automaticly and wheels dressing with subsequent compensation is executed. The main advantage is a long-term accurate and efficient form dressing wheel.

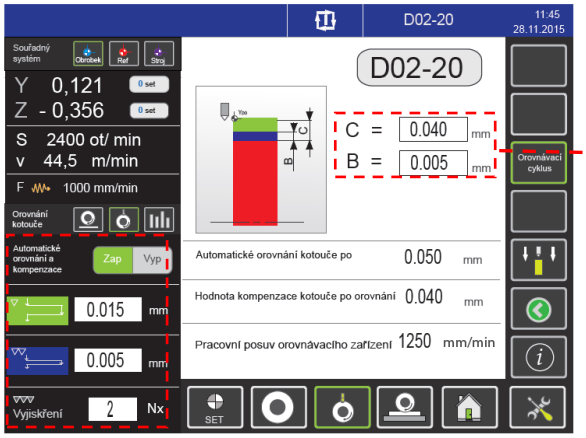
Type EM



Type AUTO

DR. KAISER

Example of dressing cycle D02-20.



Dressing cycle is consists of rought and fine dressing + travels to clean wheel

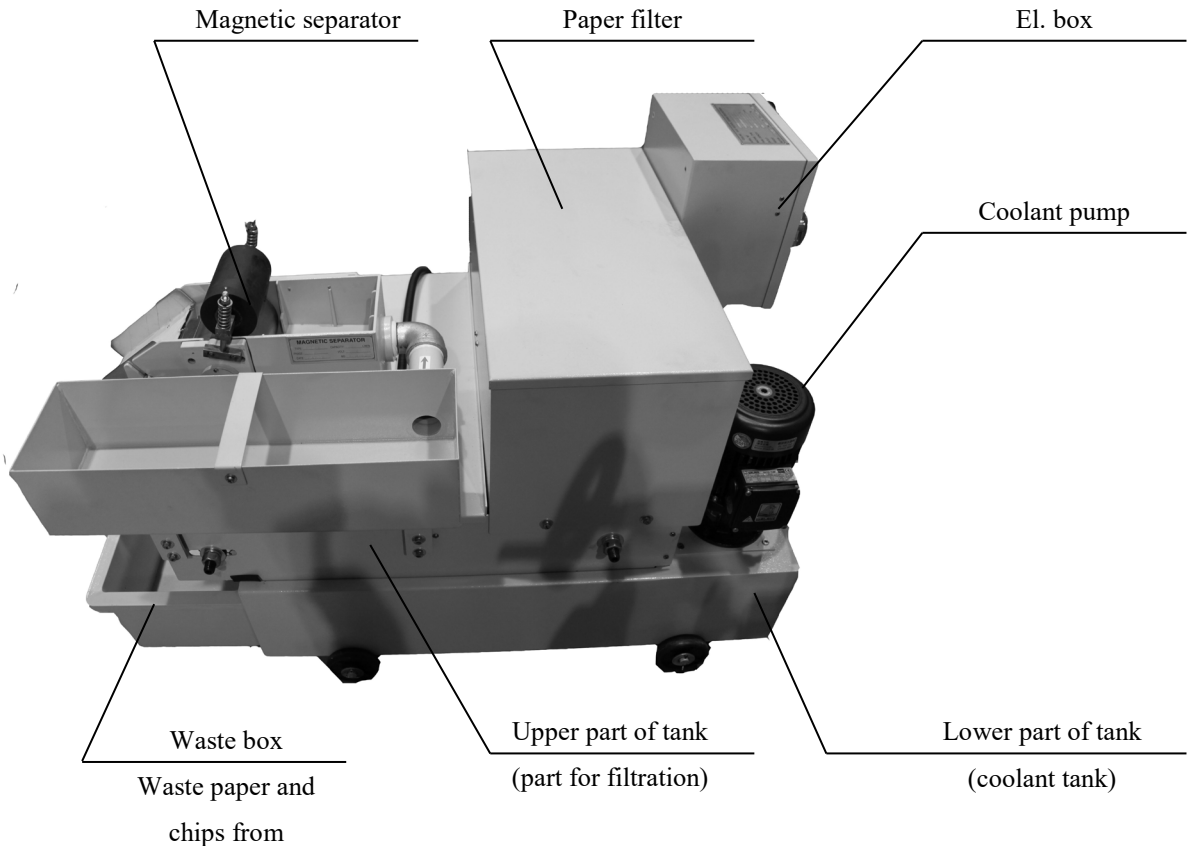
C = total removal of the wheel when dressing. Enters the removal mm in radius value. E.g. 0.040 mm - diameter of the wheel is thus reduced by 0.080 mm

B = The removal of the wheel for fine dressing. Enters the removal mm in radius value. E.g. 0.005 mm - diameter of the wheel is thus reduced by 0.01 mm

Removal during roughing = C-B = 0.040- 0.005 = 0.035. It is automatically calculated by the system

Coolant system

As standard, the workpiece cooling system comprises the pump, a nozzle and atank for the coolant with capacity 100 liters. For advanced filtration, there is a paper filter and magnetic separator. This ensures optimal filtering and roughness of the ground surface is not affected by impurities in the liquid. It also significantly extends the life of the fluid.



Coolant tank capacity	100 l/min
Flow	50 l/min
Papipr filter and magnetic separator capcity	20 l/min
Size filtered parts	50µ, 30µ, 15µ

Capacity of tank can be extended to 200 or 300 liters

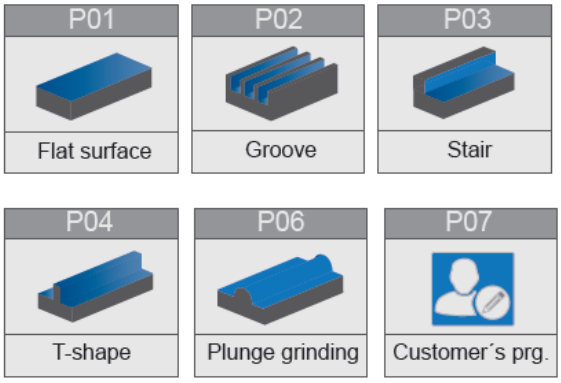
Coolant also provides cleaning channels. Also included is the pistol to clean the workpiece and working area.Pistol could be changed for a flow brush quickly by coupler. Control is via a solenoid valve and each function can be run separately using the buttons on the control panel

6 Control system

6.1 Control system X-Solution

This 3rd generation of our own control system comes from the previous systems developed for the purpose of modernization of grinding machines for automatic production. X-Solution means a lot of new options, which is reflected in the standard equipment of the whole system. It is based on a touch screen, intuitive interface and dialog type program making sophisticated grinding cycles for different workpieces

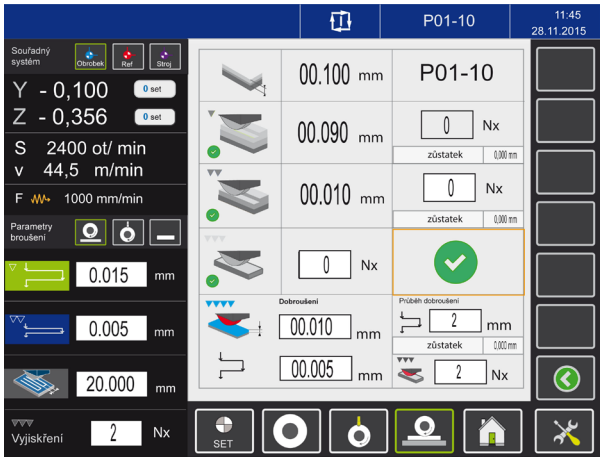
+ Intuitive and easy operation
+ Reduction of the time delays
+ Faster program creation in a few steps
+ Possibility to add a new customer´s cycles
+ Reliable system with on-line diagnostic
+ Sophisticated system management



Program screen menu

Standard functions

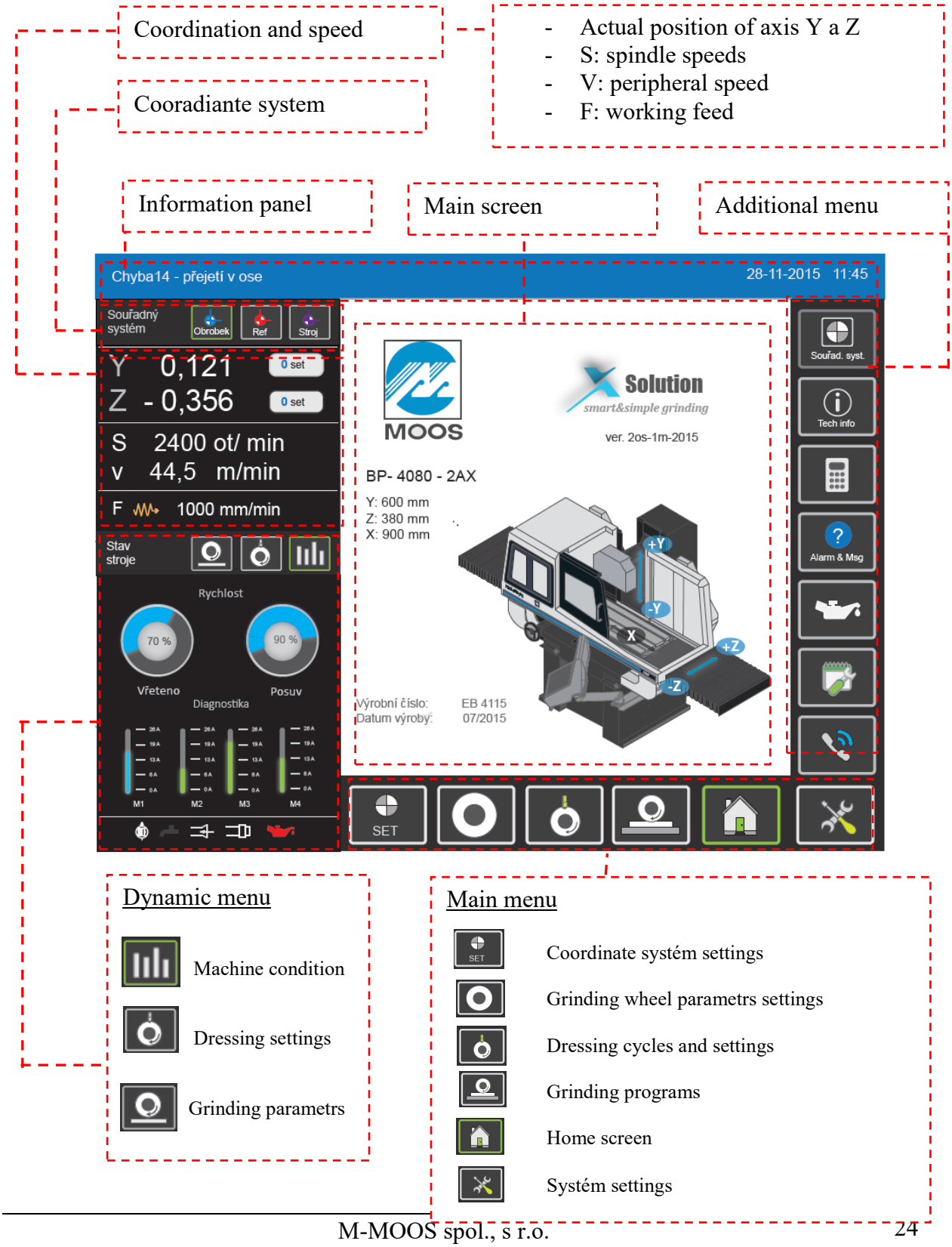
Dialog type program making
10“ touch screen
2 base grinding cycles for surface
4 base cycles for grooves grinding
3 cycles for grinding of stairs type workpieces
3 grinding cycles for T - shapes
Rough grinding
Fine grinding
Wheel spark-out
Re-grinding function to final precize dimension
Cycles for grinding wheel dressing
Automatic compensation after dressing
Tabular visualization during grinding
Displaying of speed, feed rate and cutting speed
Tool table with a direct selection and edit
3 operating modes: Jog, Manual, Auto
2 higher-level modes: operation and adjustment
Time and Date
Alarms and user reports
Technological information
Program control buttom CYKL START, HOLD, RESET



Informative screen about grinding process

6.2 Basic information about operation

The main element of communication between the operator and the machine is 10 " touch screen that is displayed when the machine is turned on. Below mentioned screen and procedures introduce you the procedure for programming elements and possibilities of the system.



Icon Color meaning

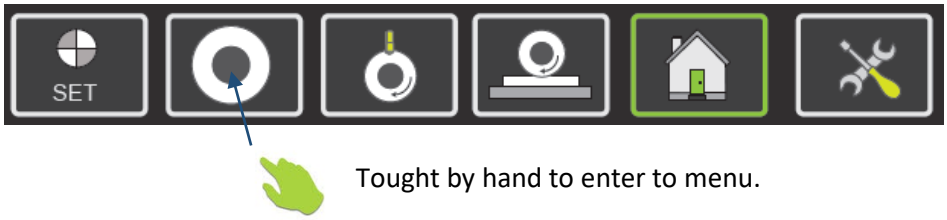
Example of **active** menu and icon  = green frame;

Example of **inactive** menu and icon  = gray frame

Some icons and menu are blocked when machine is running in automatic mode.

Example of **blocked** menu and icon  dný rámeček

How to enter to menu – operation of touch display



Tought by hand to enter to menu.

Information panel

Alarm and operator´s massage

It displays a number or user´s error messages and description of the fault or message. The list of instructions for removing you can find in manual or directly on the machine menu „Alarm a MSG“

Active program

Displays the currently selected program for grinding or dressing.

In handwheel mode is displayed elected jogging.

Mode selection

Displays the currently selected working mode.

JOG – perform a each travel, control by buttom

 - MPG mode – operation by manual hand wheel

 - automatic mode– program is performed

 - Upper right corner - detection hydraulic running , achieving the right or left dogs

Date and time

Displays current time and date

Example of additional menu in home screen

Software key	Function
	Viewing all three coordinate systems - the screen is only for a better view, there can not be adjusted coordinates
	Displays screen with technical data for grinding
	Calculator
	Displays history of alarms and error messages for the operator
	Displays the screen describing lube hubs
	Displays service intervals
	Displays contact and service information

6.3 Optional functions

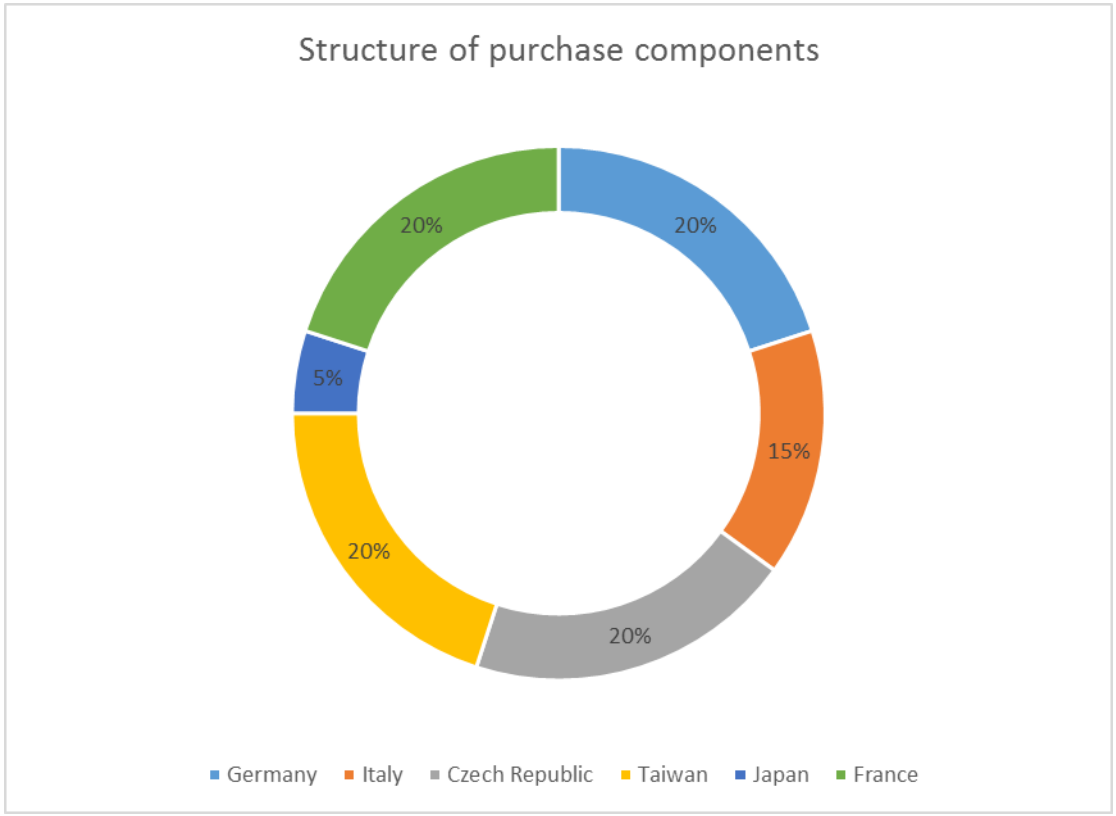
- remote diagnostics tools
- 12“ tough display
- production management
- customer´s macro
- tough probe and measuring cycles
- 4-th axis – totary table

7 Machine components

Our business and trade policy is based on honest work and fair dealing. We likes the things, which are absolutely clear and tidy. Suppliers play an important role in the whole process and have a major impact on reliability. Therefore, as the only manufacturer understandable by openly declaring the production process machines and origin of the individual components of the first contact with the customer.

Clearly declared production proces

Besides its own development, our company focuses on assembling a cast-iron machine skeleton, which is supplied by company Proth. Cast iron casting is machined for assembly purposes. Consequently, there is to complete each part of the machine (bed, stand headstock spindle) and scraped gently guiding surfaces into geometric precision with achieving optimal pattern. After reaching the geometry are installed, ball screws, linear scales, servo motors and all electrical components including custom made-up electrical switchboards and control system. In conclusion, there is a dynamic optimization tools, geometric and functional tests.



Item	Supplie
Ball screws	KSK Precise Motion, a.s, Czech Republic
Drivers and servomotors	Schneider Electric, France
Belt and pulley	Bea Ingranaggi S.P.A. , Italy
Linear Scales	ESSA Praha, Czech Republic
Clutch of vertical gear	Japan
DA 400 air filtration	HEIDENHAIN, Germany
Elektric components	Schneider Electric, France
Main motor	Siemens, Germany
Hydraulic pump	Berarma - Italy
Propotional valve	ATOS - Italy
Control system	Schneider Electric, France, PLC and displays : M-MOOS, Czech Republic
Bearings for vertical and cross axis	FAG, Germany
MPG panel	EUCHNER, Germany
Část iron parts and sceleton	Taiwan
Elektromagnetic table	Guang Dar Magnet Industrial, Taiwan
Spindle	Zakázková výroba, Taiwan
Coolant tank	Zakázková výroba, Taiwan
Lubrication tank	Chen YING, Taiwan
Oil Pressure gauge	TRIBOTEC, Czech Republic
Safety switches off end stops	Schneider Electric, France
Safety door lock	Pizzato, Italy

8 Foto and references of M - MOOS

Fotogalerie a reference brusek M - MOOS

BP-5010-2AX, zákazník: Honeywell Brno, instalation May 2016

BP-60120-2AX, zákazník: Kajometal Slovakia, instalation May 2018

BP-60120-2AX, zákazník: Purkert., instalation November 2018

BP-50100-2AX, zákazník: Antonín Joch. instalation January 2017

BP-4080-2AX, zákazník: AI LAB, Poland, instaltion September.2019

BP-4080-2AX, zákazník: ČZ a.s., , instalace 10.11.2019

BP-1020-2AX, zákazník: Soma Lanškroun, instalace 20.12.2018

BP-1020-2AX+APC zákazník: Schneider Electric, Slovakia instalation 20.12.2018

BP-60150-2AX with Fanuc zákazník: Panosonic CZ 20.12.2024

BP-4080-2AX, zákazník: ČZ a.s., , instalace 10.11.2019

BP-1020-2AX, zákazník: Soma Lanškroun, instalace 20.12.2018

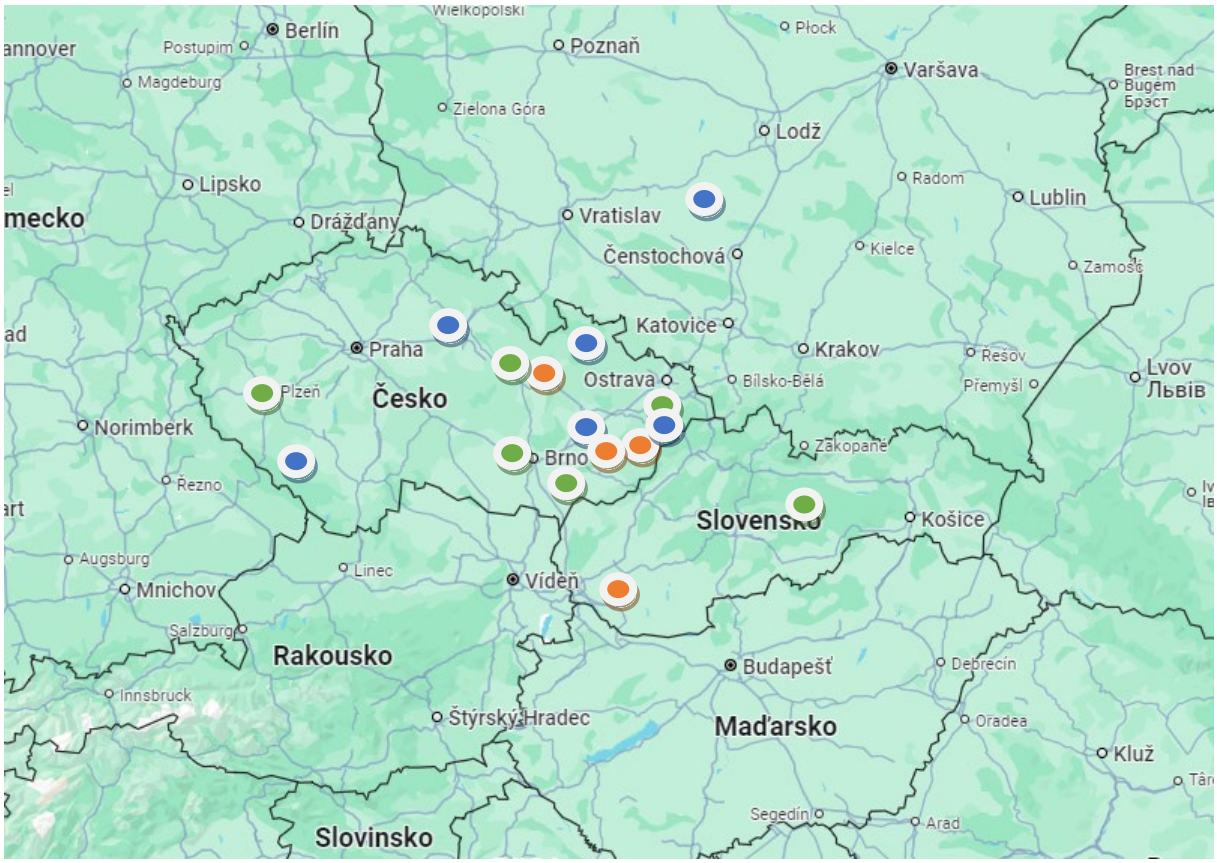
BP-1020-2AX+APC zákazník: Schneider Electric, Slovakia instalation 20.12.2018

BP-1520-2AX zákazník: TES Vsetiín a.s., instalation 07/2024

Customers reference FOR CNC version**: Czech Republic Slovakia, EU,**

In 2016 - 2024 : 15 instalací

Stolové BP 4080 Stojanové BP 50100-60200 Portálové BP



M-MOOS s.r.o. ,Svatopluka Čecha 519/28,751 31 Lipník nad Bečvou
Telefon: +420 581 701 605,Fax: +420 581 701 605
sales@m-moos.cz , www.m-moos.cz