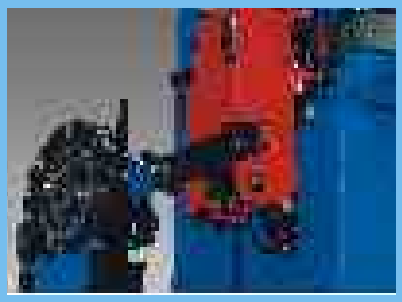
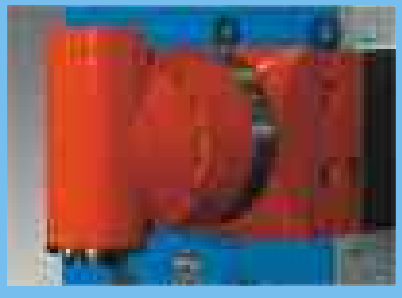
ŠKODA MACHINE TOOL

HORIZONTAL-BORING AND MILLING MACHINES ŠKODA FCW



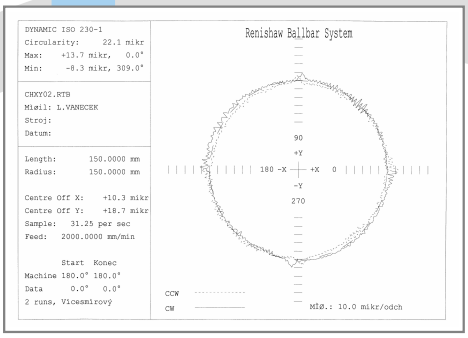


HORIZONTAL MILLING AND BORING MACHINE

Škoda's more than 90-year experience with the production of machine tools, and its top-class research, development, design and manufacturing capabilities guarantee supreme technical parameters of its products:

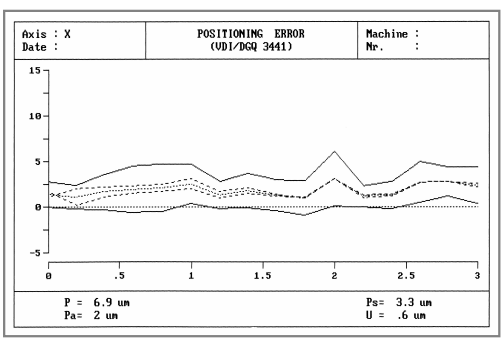
1 HIGH GEOMETRICAL PRECISION

- High rigidity
- Precision machining of all machine parts



2 HIGH-PRECISION POSITIONING

- Compact roller-contact guides
- Backlash-free feed mechanisms
- Direct linear measuring in axes X, Y, Z; W axis (rotating)
- Electronic compensation of mechanical inaccuracies



3 HIGH OPERATIONAL RELIABILITY

- Simple machine construction, well-proven design methods, easily accessible servicing points on the machine
- Machine components supplied by leading world manufacturers
- Minimum maintenance requirements
- Electronic fault-diagnostic system

4 HIGH DIMENSIONAL STABILITY OF THE MACHINE IN TRANSIENT TEMPERATURE CONDITIONS

- Application of original patent-protected solutions

5 STRAIGHT TRAVEL OF TOOL-HOLDING SLIDE

- Straight travel of the tool-holding slide within the full travel range, irrespective of the slide loading is ensured by the operation of a special compensation system

Model	Boring spindle		Slide		Total extension
	Diam. D	Extens. W	Dimensions	Extens. Z	
ŠKODA FCW 140	140	800	360 x 400	900	1 700
ŠKODA FCW 150	150	800	360 x 400	900	1 700

A HORIZONTAL MILLING AND BORING MACHINE OF MODERN DESIGN AND HIGH RIGIDITY FOR HIGH OPERATIONAL PRODUCTIVITY AND PRECISION MACHINING

BED
grey iron casting, the column travel alongside the bed: two utually pre-loaded pinions and a rack

BOTTOM PART OF COLUMN - GREY IRON CASTING
- Column bottom guide on bed - rolling units to absorb all forces; compact design including hardened guide gibs, greased with fat - on request, hydrostatic guide system for the column bottom guide on bed

COLUMN
box-type grey iron casting bolted to the bottom part of column
- Rolling guides of compact design for travel of the milling head along the column, absorbing all forces
- Ball screw with pre-loaded nut and gearbox for the milling head feed along the column
- Milling head balancing by means of a counterweight inside the column

MILLING HEAD
designed as a sliding head, plate-shaped grey iron casting
- Combined rolling guides of compact design for the sliding head
- Equipment for compensation of positioning inaccuracies at horizontal travel of the sliding head:
  - automated compensation of the drop during extension of unloaded head
  - automated compensation of the drop during extension of the sliding head including technological accessories
- Ball screw drive for the sliding head feed

SLIDING HEAD
malleable iron casting
- Cross-section 360x 400 mm, automatic deflection compensation at extension from the milling head
- Extendable spindle
- Cooling liquid supplied through a hole inside the spindle; on request additional feeding of cooling liquid from outside
- Front part of the milling head designed for automatic clamping of technological accessories
- Main drive in combination with a two-speed gearbox with a closed-circuit oil lubrication
- Air cooler to control the temperatures of the oil baths in the gearboxes
- Stop at the anguldi spindle position using a rotating sensor
- Mechanised tool clamping
- Permanent-magnet operated disc brake of the main drive
- A proprietary system of linear measurement of the milling head extension eliminating inaccuracies due to longitudinal temperature dilatations

MACHINE CONTROL STATION
- Operator control platform attached to the bottom part of the column. Swivel-mounted control panel including all machine control and indication elements located on the platform.
- Portable control panel with selected control functions and manual crank
- On request, independent travelling control platform for higher operator comfort

HYDRAULIC AND PNEUMATIC SYSTEMS
- Separate lubrication circuit for drive equipment
- Cooling circuit to control the temperature of the cooling oil in the milling head
- Lubrication circuit for auxiliary parts and functions of the machine
- Hydrostatic circuit for axis X - hydrostatic control of the contact surfaces between the bed and the bottom part of the column
- Pressure air distribution systems for:
  - air-blowing of tools
  - on request, the spindle seating protected by pressure air against ingress of cooling liquid
  - sealing of the measuring systems by pressure air

GUIDE SURFACE GUARDS
- Steel telescopic guards to protect the guide surfaces of the milling head vs. column and the column bottom vs. bed, with incline in the direction towards the chip conveyer

ELECTRICAL ACCESSORIES
- The complete wiring and installation of electrical equipment on the machine in compliance with

equipment on the machine in compliance with ČSN EN 60204-1 and IEC 204-1, for power supply from AC network 3x400 V / 50/60 Hz, TN, max. voltage fluctuations ± 10 %, frequency fluctuations ±2 % (other voltages and voltage systems to be connected across a matching transformer)
- control voltage system 24 VDC
- Main drive: AC-motor Siemens, protection class IP 54, in combination with a frequency converter
- Maintenance-free AC motors, protection class IP 64, for travel drivers in all axes
- Dustproof switchboards including CNC electronic systems
- PLC and regulators, with compressor cooling, protection class IP 54, mounted onto the machine foundation

THE MACHINE SAFETY CONCEPT COMPLYING WITH THE CE CONDITIONS

EXAMPLES OF TYPICAL TECHNOLOGICAL OPERATIONS

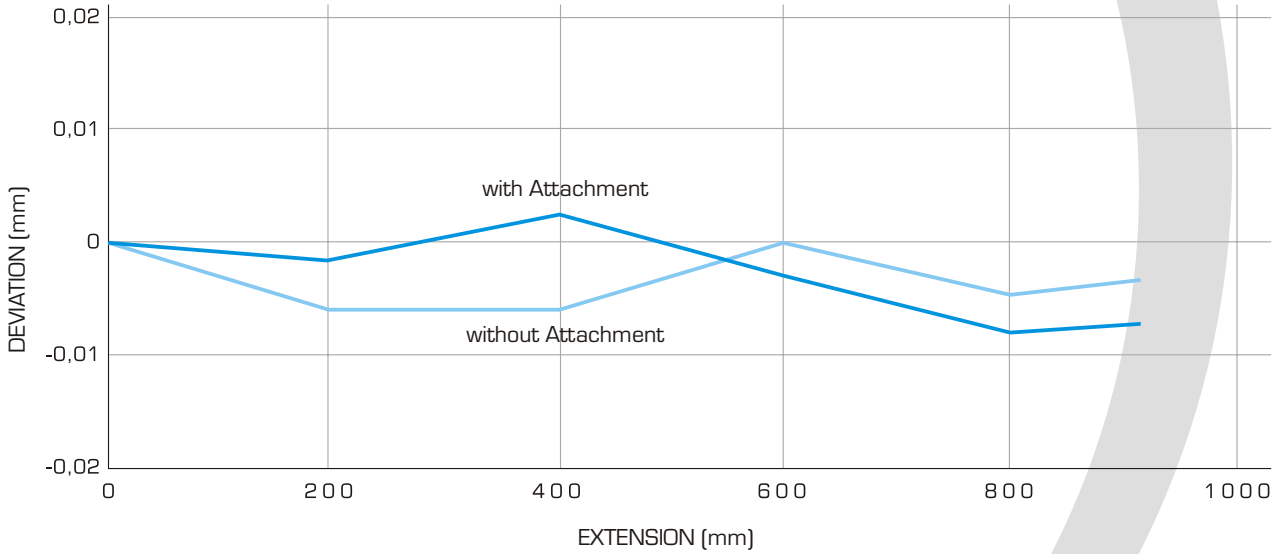
Flat surface milling		Slot milling	
Material	steel	Material	cast iron
Tool	MILL 2 000	Tool	HELIMILL
Tool dimensions, mm	diameter 125	Tool dimensions, mm	diameter 315, width 125
Cutting speed, m/min	180	Cutting speed, m/min	250
Feed, mm/min	1 080	Feed, mm/min	624
Cut width, mm	125	Cut width, mm	25
Cut depth, mm	25	Cut depth, mm	65
Volume of machined - off material, cm^3/min	3 150	Volume of machined - off material, cm^3/min	1 014

COMPENSATION SYSTEM

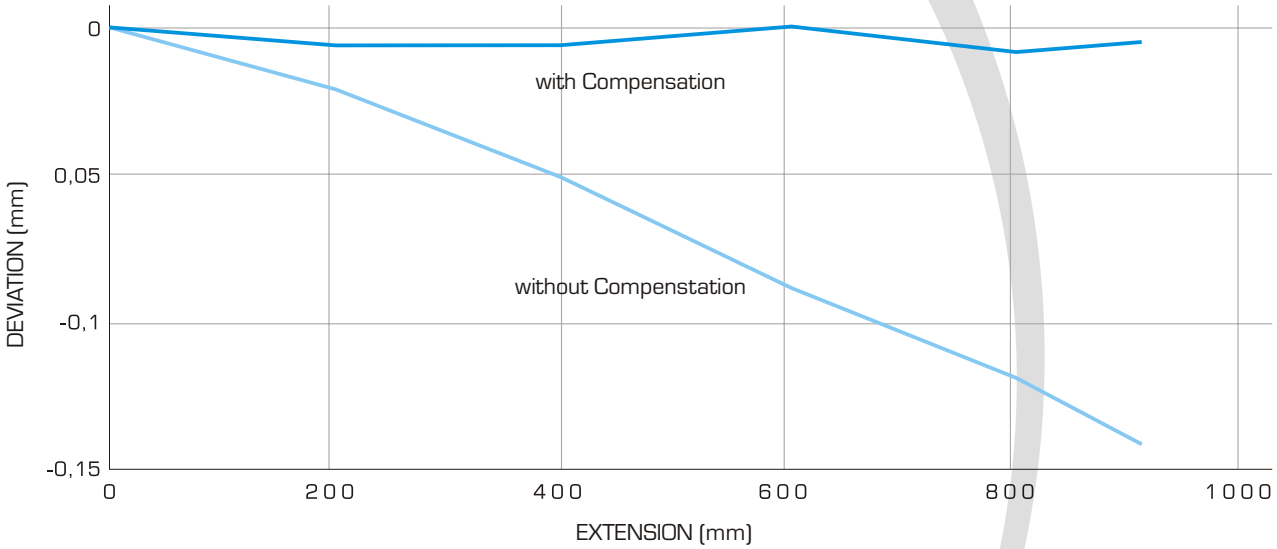
GUARANTEED PRECISION 0.015/1000 MM OVER THE FULL RANGE OF THE MILLING HEAD EXTENSION POSITIONS

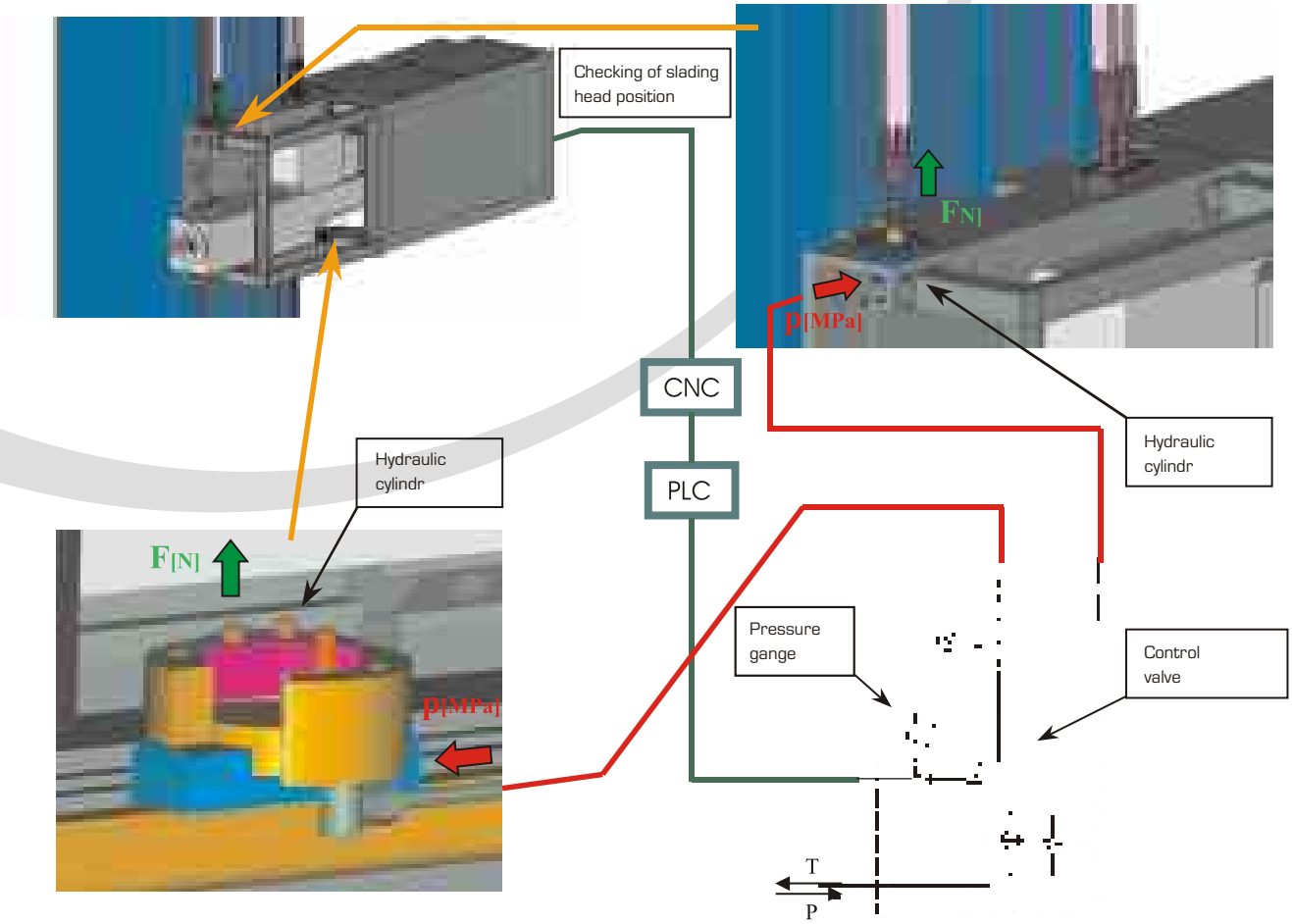
The compensation system is simple, well-proven and effective, and therefore very reliable in operation. Straight travel of the sliding head is guaranteed over the full range of extension irrespective of the head loading.

STRAIGHTNESS OF THE SLIDING HEAD MOVEMENT WITH/WITHOUT ATTACHMENT



STRAIGHTNESS OF THE SLIDING HEAD MOVEMENT WITH/WITHOUT COMPENSATION





A WIDE RANGE OF OPTIONAL ACCESSORIES FACILITATES FULL AUTOMATION OF VARIOUS MACHINE FUNCTIONS AND HIGH LABOUR PRODUCTIVITY

AUTOMATIC TOOL EXCHANGE SYSTEM

- Customised solutions for tool and technological accessory requirements
- Capacity up to 80 tools, on request up to 100-150 tools
  Chain-type tool magazine attached to the rear part of the machine column
- Tool replacement action by two-armed grip travelling along a fixed horizontal guide on the column
- Tools replacement cycle controlled by the machine control system
- Auxiliary control panel for tools placement into the magazine, located near the insertion position
- To ensure the operator safety, tool magazine is locked inside a protective cover. Upon opening the electric lock, the magazine movement will be blocked.

TECHNICAL SPECIFICATIONS

Clamping tool taper (standard)		ISO 50
Spacing of tool positions in magazine	mm	130
Maximum tool diameter	mm	360
Maximum tool lengh (from flange)	mm	450
Maximum tool weight	kg	30
Total weight (depending on particular magazine configuration)	kg	2 000-2 500

AUTOMATIC EXCHANGE OF TECHNOLOGICAL ACCESSORIES

The required technological accessories can either be parked on a rack (for more than one head) or each head separately in a palette. When needed, the accessory is automatically clamped onto the front part of the milling head using a collet mechanism (a Škoda patent). This concept makes it possible to achieve high rigidity with a relatively small cross-section of the milling head.

WORK PIECE MEASUREMENT PROBE

Measurement probe, interface system, wireless data communication system, set of contacts, connections to machine and extension of the existing NC system. Measurement cycles.

TOOL MEASUREMENT PROBE WITH RADIO-WAVE DATA TRANSFER

Tool clamped in the machine spindle, measurements are done in the working space of the machine. The probe complete with contacts and interface unit.

OPTIONAL ACCESSORIES MAY EXTEND THE MACHINE CAPABILITIES

Customised versions of the machine are available where the machine design and functions are modified to suit the customer requirements.

INTERCHANGEABLE MILLING HEAD IFVW 101

Automated tool clamping using a collet system, automated angle indexing (2,5°, 144 positions), cooling liquid supplied through a hole in the spindle axis

Input/output ratio		1:1
Maximum speed	r.p.m.	3 000
Maximum torque	Nm	1 000
Maximum power	kW	25
Range of rational positioning		0 - 360°

INTERCHANGEABLE MILLING HEAD IFVW 206

Automated tool clamping (a collet system), automated angle indexing (2,5°, 144 positions), cooling liquid supplied through a hole in the spindle axis

Input/output ratio		1:1
Maximum speed	r.p.m.	3 000
Maximum torque	Nm	1 000
Maximum power	kW	25
Range of rational positioning in both axes		0 - 360°
Angle formed by the axes		90°

INTERCHANGEABLE MILLING HEAD IFVW 211

Automated tool clamping (a collet system), cooling liquid supplied both through the spindle and from outside

Input/output ratio		1:1
Maximum speed	r.p.m.	3 000
Maximum torque	Nm	1 000
Maximum power	kW	25

Automated continual indexing in two axes

Range of rational positioning: axis 1	± 185°
axis 2	± 95°

INTERCHANGEABLE MILLING HEAD HSC

Maximum speed	r.p.m.	18 000
Maximum torque	Nm	65
Maximum power	kW	38

BORING EQUIPMENT UP TO SIZE IWD 320 A

Shank diameter	mm	320
Ratio between W extension and slide		1:1
Maximum speed	min^{-1}	100
Slide extension	mm	90
Maximum torque	Nm	4 000
Maximum cutting force, boring	N	8 000
Maximum cutting force, turning	N	6 300
Slide feed	mm/min	0,75 - 1 000
Number of tool holders		3
Range of machined diameters	mm	0 - 810

ROTATING TABLES

To increase the labour productivity, horizontal milling and boring machines of model series FCW can be equipped with rotating tables.

Loading capacity (kN)	Clamping plate dimensions (mm)
250	2 500 x 2 500 x (1 600 x 1 600)
160	2 000 x 2 500

Loading capacity (kN)	Travel in taxis V (mm)	Table rotation in axis B (mm)
250	2 500	360°
160	1 400	360°

TOOL COOLING EQUIPMENT

includes the following functional units:

- Coolant pump, level sensors and control unit; piping connection to the coolant collection duct, or to the collection tank in the chip conveyer system
- Main coolant tank, capacity approx. 1,250 litres, complete with filters, pumps and piping
- Indication of minimum coolant level
- Low-pressure (p = 0.5 MPa) nozzle connection, capacity Q = 40 l/min
- High-pressure output for coolant supplied via a channel in the tool axis; Q = 25 l/min, p = 3 MPa
- High-pressure filter, trapping of particles in excess of 10 µm
- Filter for medium-sized particles (in excess of 60 µm) plus a control unitCooling liquid including oil additive (3-5%), viscosity not exceeding 2,8 cSt. A coolant flow-rate control system can be supplied on request (the scope of flow regulation: 60-100%).

HIGH OPERATOR COMFORT IN MACHINE CONTROL; CUSTOMISED SOLUTIONS

Some control system options may require machine design modification, and therefore need be specified in advance.

NC-SYSTEM SINUMERIK 840 D/DE

Control panel including 12.1" colour LC-TFT screen SVGA with integrated control functions
Portable control panel for machine setting including position indication and manual crank
Number of controlled co-ordinates: 4 + spindle for basic machine configuration (max. 30 co-ordinates per a machining centre)
Main drive and travel drive control units, digital feed-back, complete spindle control including control of the stop position, thread cutting, constant cutting speed, selection of speed steps

NC-SYSTEM HEIDENHAIN TNC430M

Number of controlled co-ordinates: up to 9, of which eight axes can be used for work piece geometry control and one axis is for manipulation purposes only.

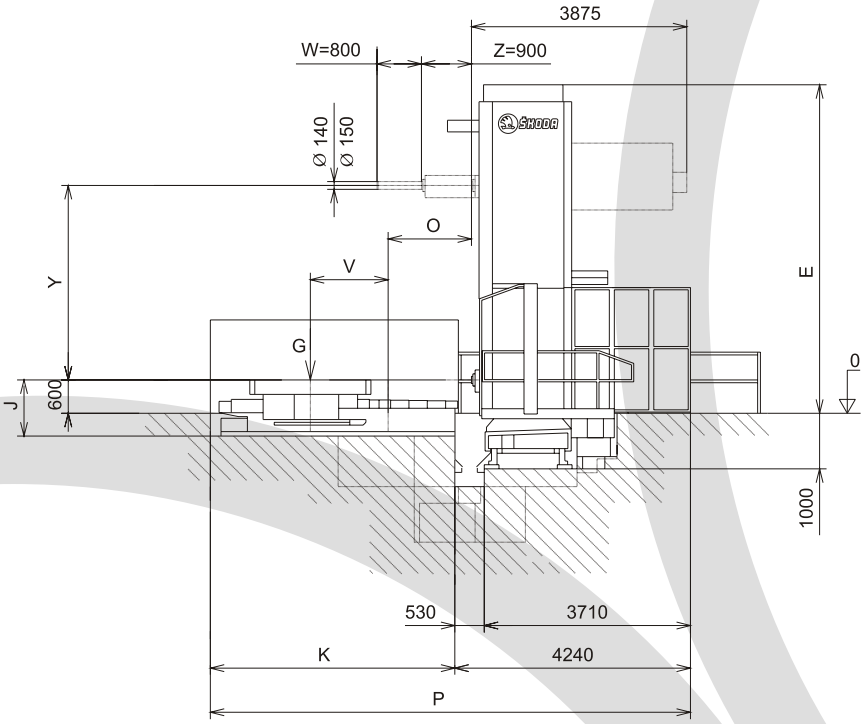
NC-SYSTEM GE FANUC 16I M-SERIES, MODEL B

Four-axis control system. In this configuration, the machine is equipped with travel-control motors and regulators (GE Fanuc), main drive motor and regulator (Siemens), linear measurement system (Heidenhain) and rotating sensors (Fanuc or Heidenhain). The drive regulator needs be equipped with a special positioning unit, which means additional costs. Maximum 7 controlled axes + 4 axes for tool replacement or manipulation.

SPECIFICATIONS OF THE MACHINES

		ŠKODA FCW 140	ŠKODA FCW 150
Boring spindle diameter	mm	140	150
Spindle taper	ISO	50	50
Spindle speed	r. p. m.	10 - 3 000	10 - 3 000
Spindle travel (W)	mm	800	800
Slide travel (Z)	mm	900	900
Spindle + slide travel (W + Z)	mm	1 700	1 700
Slide cross - section	mm	360 x 400	360 x 400
Main motor output	kW	40	40
Torque			
Boring spindle	Nm	2 200	2 200
Milling spindle	Nm	2 200	2 200
Column travel (X)			
Basic	mm	1 500	1 500
Extended by 500 mm		2 000 - 3 000	2 000 - 3 000
Extended by 1 000 mm		4 000 - 20 000	4 000 - 20 000
Spindle travel (Y)			
Basic	mm	1 000	1 000
Extended by 500 mm		1 500 - 4 000	1 500 - 4 000
Feed rate			
Axes X, Y	mm/min	1 - 20 000	1 - 20 000
Axes Z, W	mm/min	1 - 10 000	1 - 10 000
Feeding forces in all axes	kN	30	30
Machine weight, basic configuration	kg	26 000	26 500

MACHINE DIMENSIONS AND FLOOR PLAN



X	A*	B	C
1500	3500	4680	9800
2000	4000	5180	10300
2500	4500	5680	10800
3000	5000	6180	11300
4000	6000	8000	12300
5000	7000	9170	13300
6000	8000	10340	14300
7000	9000	10550	15300
8000	10000	12680	16300
9000	11000	13850	17300
10000	12000	15070	18300
11000	13000	16240	19300
12000	14000	17410	20300
13000	15000	18580	21300
14000	16000	19750	22300
15000	17000	20920	23300
16000	18000	22090	24300
17000	19000	23260	25300
18000	20000	24430	26300
19000	21000	25600	27300
20000	22000	26770	28300

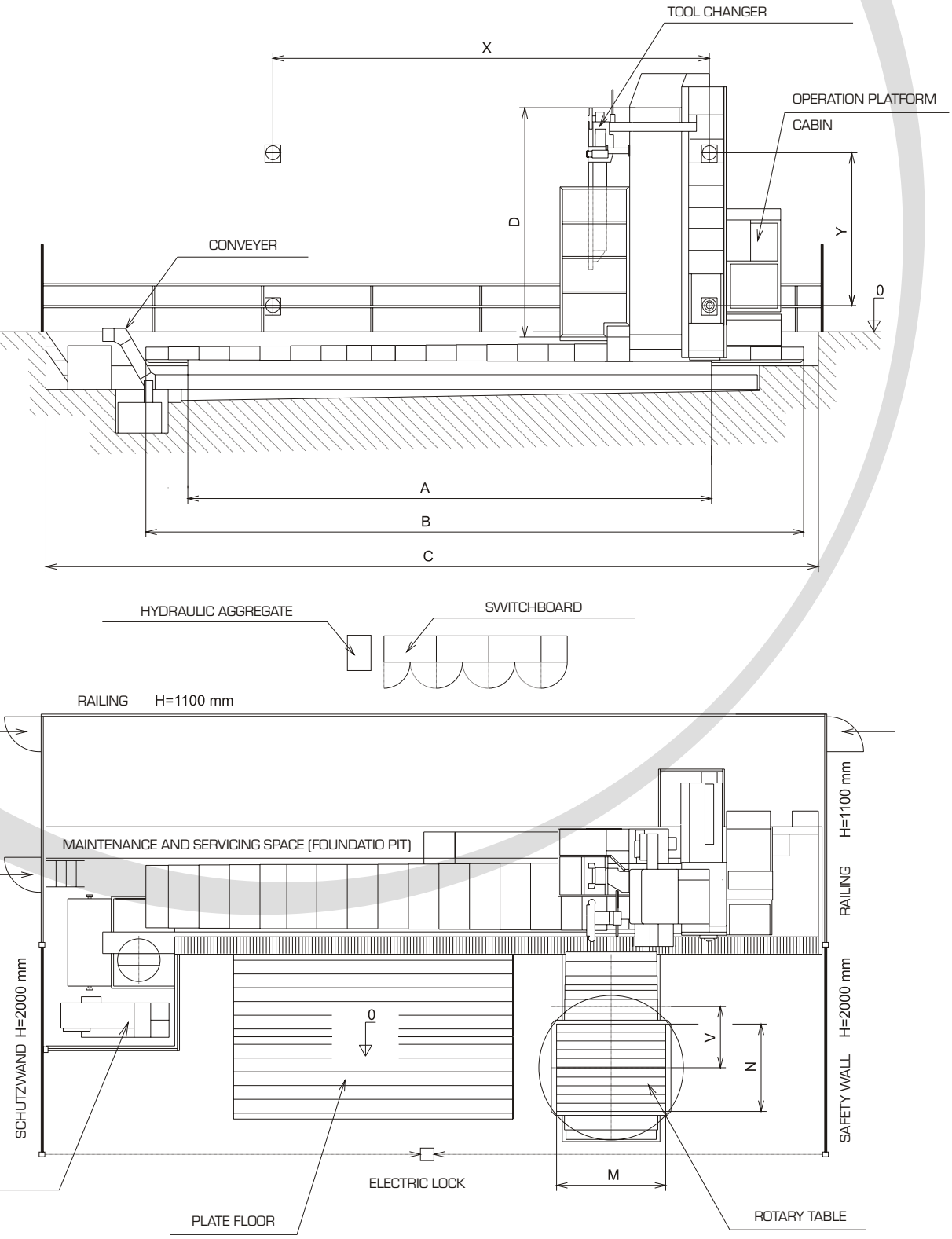
Y	D	E
1000	2750	3415
1500	3250	3915
2000	3750	4415
2500	4250	4915
3000	4750	5415
3500	5250	5915

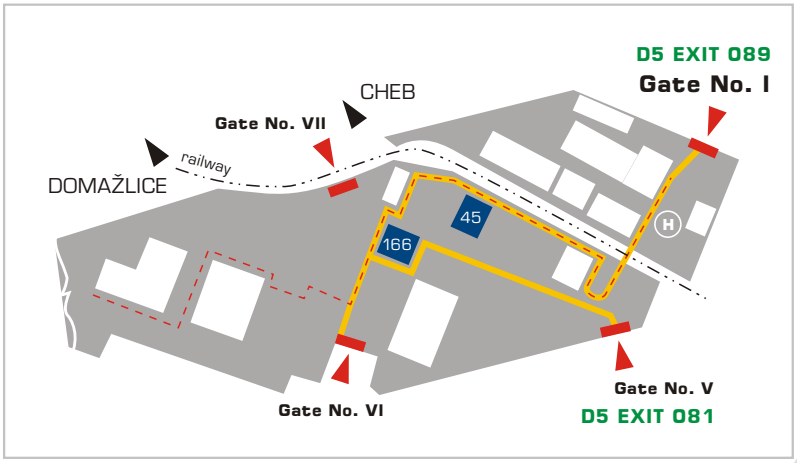
G (kH)	V	J	K	M	N	P	O
250	2500	1075	5800	2500	2000	10040	1280
160	1400	1010	4400	2500	2000	8640	1500

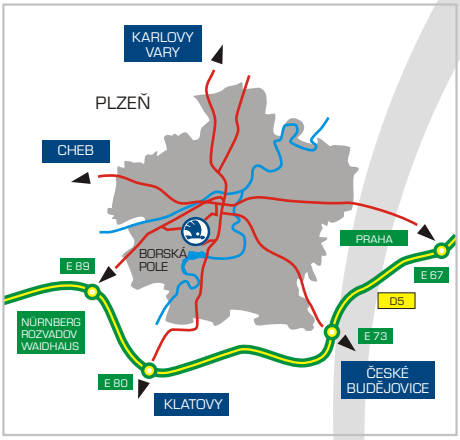
* STABLE CABIN (X+2m)

MOVABLE CABIN (X+3m)

COOLING AGGREGATE


TOOL CHANGER
X
OPERATION PLATFORM
CABIN
D
Y
CONVEYER
0
A
B
C
HYDRAULIC AGGREGATE
SWITCHBOARD
RAILING H=1100 mm
MAINTENANCE AND SERVICING SPACE (FOUNDATIO PIT)
RAILING H=1100 mm
SCHUTZWAND H=2000 mm
SAFETY WALL H=2000 mm
0
V
N
ELECTRIC LOCK
M
PLATE FLOOR
ROTARY TABLE





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