

# HORIZONTAL MILLING AND BORING MACHINES ŠKODA HCW



## TRADITION AND EXPERIENCE

The ŠKODA machine tools of different types and design have been present in the world market since the 1920s. Škoda Works actually started this product line in 1911. Among the machine tools designed and manufactured by the Works are many machines of unique concept, high precision and outstanding operational reliability.

The present ŠKODA HCW type-series machines represent the most sophisticated and technically advanced boring machines of the ŠKODA brand. The customers use them in applications where their high technology and labour productivity bring the best benefits. In consideration of the high installed power and work precision the HCW machines are best suited for milling, drilling and boring operations on heavy workpieces of large dimensions. If incorporated into special workstations, the machines can be used for machining of turbine and generator rotor shafts, heavy crankshafts and other large workpieces of complex shape.



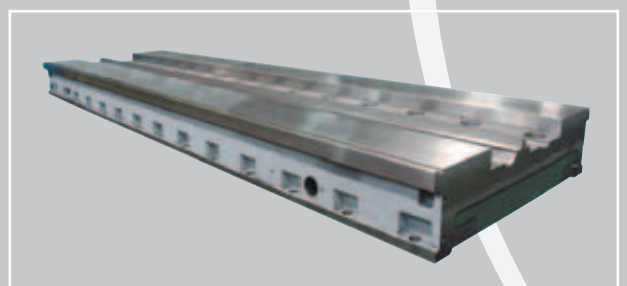
## DESCRIPTION

### MACHINE FRAME

All frame component parts are stiff grey-iron castings with precision-machined guideways facilitating precise movement of machine parts and retention of all forces originating during the machining process. Inseparable part of the machine frame is rigid concrete foundation block onto which the machine bed is anchored by means of anchoring bolts. The pre-stressed hydrostatic guideways for the carriage on the machine bed, the headstock on the column and quill in the headstock are characterised by high rigidity and low passive friction resistance ensuring perfect guidance of all moving machine parts.

High-quality stiff and clearance-free feed mechanisms in combination with direct linear position measuring in all machine axes ensure precise and smooth machine part movements.

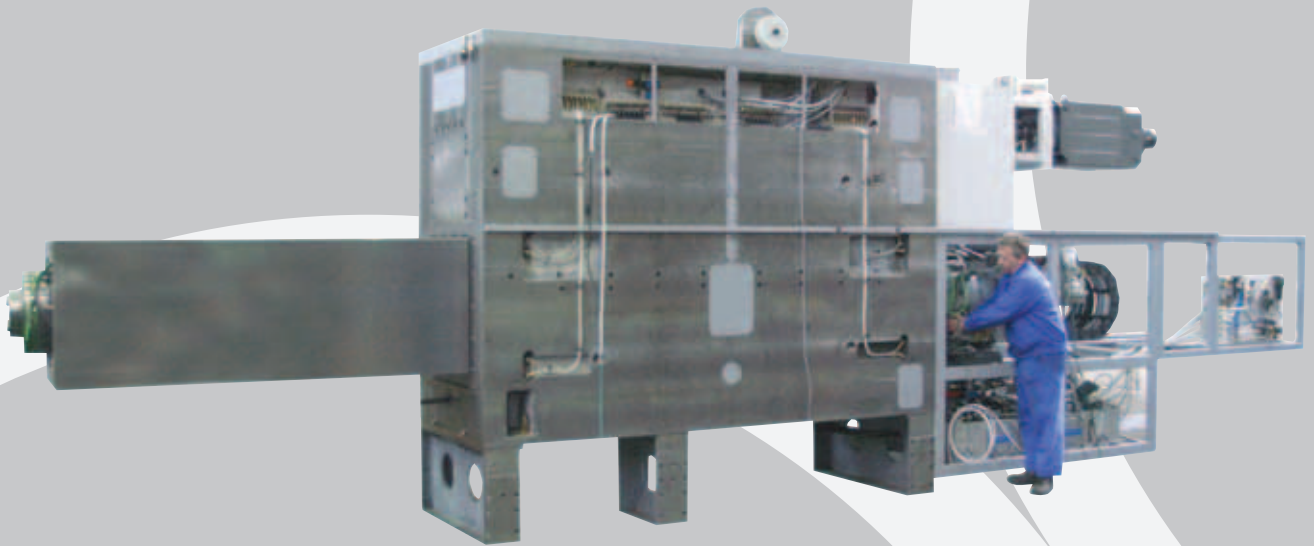
Among the other machine features are telescopic guideway covers, operator cabin including a machine control panel and access platforms.



## HEADSTOCK

The headstock body is a rigid closed casing incorporating the following subassemblies:

- Complete ram with spindle seating
- Drive box including the main drive motor and emergency brake
- Ram and spindle feed mechanisms
- Mechanism facilitating headstock traverse along the machine column
- Combined guideways on the column
- Hydraulic and electric ram accessories



## SPINDLE SEATING

The spindle is seated in special angular-contact bearing needing very little lubrication oil. This solution allows for long periods of spindle run at maximum speed with low bearing temperature rise. The bearing temperatures are continuously measured and displayed on the machine control panel. The spindle seating is maintenance-free throughout the machine lifetime.

## TECHNICAL ADVANTAGES

- High geometric precision
- High positioning precision
- High operational reliability
- Excellent machine dimension stability even in transient temperature conditions
- Ram extension straightness compensation
- Axial power connections to the ram head
- Patent-protected equipment for automated clamping of technological accessories
- Design solution with main drive motor attached to the spindlestock body



## HYDRAULIC ACCESSORIES

The hydraulic accessories of the machine include:

- High-pressure hydraulic system for auxiliary machine functions
- Medium-pressure hydraulic system for hydro-static guideways
- Low-pressure hydraulic system for lubrication circuits
- Cooling system for temperature stabilisation of the machine
- Tool cooling equipment
- Pressure-air distribution system

The hydraulic systems installed on the machine are supplied by leading companies in the respective fields of technology. The same applies to the tool-cooling system incorporating the cooling fluid filtration and regeneration devices.



## CONTROL SYSTEM

Machine control systems

All control and indication elements necessary for the machine operation control are installed within the main control panel located on the operator platform. The overall machine control system has been designed to facilitate easy and efficient machine control in both automated and manual modes of operation, taking into account the requirements concerning labour safety. Apart from the main control panel, there is a portable remote-control panel intended for the machine setting and servicing operations.

Machines equipped with automatic tool changer have an additional control panel located near the tool changer by means of which the operator controls the tool loading and unloading into the tool magazine with all tool management data readily available.



Main control panel SIEMENS Sinumerik 840D



Main control panel GE FANUC 31i

## ELECTRONIC EQUIPMENT

The electrical equipment accessories on the ŠKODA horizontal machines are made of components supplied by leading world manufacturers. In its basic configuration, the machine is equipped with a Siemens SINUMERIK NC system and digital Siemens drives power units controlling movements in all machine axes and spindle auxiliary functions. The system software allows for easy control of all technological operations and extensive diagnostics of internal machine functions including remote error diagnostics (Teleservice) by the machine manufacturer. On request, the machines can be equipped with control systems by other suppliers (e.g. GE Fanuc or Heidenhain). The electric accessories of the machine comply with international standards IEC 204-1 and EN 60-204-1 with the power supply network 3x400 V, 50 Hz, TN. On customer's request, the machine can be modified to work at other supply voltages and frequencies and to meet non-European standards such as CSA or others.

## AUTOMATIC TOOL CHANGE

Horizontal machines of the ŠKODA HCW type series can be supplied with automatic tool changer. The systems makes tool change in the machine spindle and in the milling heads with the spindle axis either in the vertical or in the horizontal position. The number of tools in the tool magazine can be delivered to meet the customer requirements or those of the machining technology implemented.

### Standard specifications of automatic tool change for ŠKODA HCW machines

Tool magazine capacity (number of tools)	40 - 160
Spindle taper Sk	50, 60
Tool shank diameter (mm)	360, 420
Tool length (mm)	500, 600
Tool weight (kg)	50, 60



## AUTOMATED CLAMPING OF TECHNOLOGICAL ACCESSORIES

The patent-protected proprietary design of the equipment for automated clamping of technological accessories onto the face part of the machine ram provides for supply of all types of energy for operation and control of the milling or boring head installed; with some types of milling heads, the systems provides for cooling-liquid supply too. The replacement heads are parked on palettes or in special pick-up magazine holders from where they can be automatically collected and clamped onto the ram.





## SINGLE-PURPOSE WORKSTATIONS

The company specialists are prepared to assist you in designing and setting up special workstations with respect to your specifications or the technological requirements associated with the machining of particular workpieces. Extensive experience of the company project designers is the best guaranty for finding the optimum solution for most complex technological problems and ensuring high labour productivity with acceptable investment costs.

The ŠKODA horizontal machines can be the core component part of workstations ranging in complexity from the basic machine configuration and clamping-plate area to universal machining centre equipped with clamping plates or single-purpose workstation utilising special machining processes. Examples of customised workstations including horizontal milling and boring machines as operated by various customers all over the world are listed below.



Workstation including a rotary table



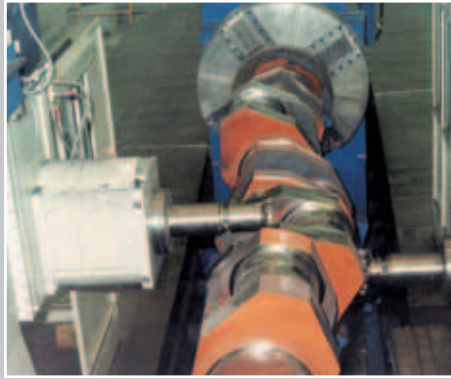
Special movable horizon



Workstation equipped with special milling accessory to machine turbogenerator rotor slots.



tal workstation



Workstation intended for machining of large crankshaft forgings.



Workstation equipped with rotary manipulator for machining of steam-turbine rotor shafts.



Workstation including a special headstock and manipulator for milling of turbogenerator rotor slots.



Workstation for machining of large workpieces clamped onto a clamping-plate area.



## WORKSTATION EQUIPMENT

### TECHNOLOGICAL ACCESSORIES

With their machines, the company ŠKODA Machine Tool supplies a wide range of technological accessories extending the machining capabilities of the standard machines. Different types and sizes of milling and boring heads will meet the requirements of a greater part of the company customers. In the cases of special machine application, we are prepared to design and manufacture technological accessories tailor-made to your particular requirements. Basic information on selected types of standard heads is shown below.

<b>IFVW 206</b>		
Output	kW	25
Torque	Nm	1000
Rated speed	min <sup>-1</sup>	240
Maximum speed	min <sup>-1</sup>	2000
Speed ratio	i	1 : 1
Spindle taper	ISO	50
Tool shank	DIN	69871
Turning of 1. axis	°	0 - 360
Turning of 2. axis	°	0 - 360
Weight	kg	765

<b>UFK 1000 NC</b>		
Output	kW	42
Torque	Nm	1 000
Rated speed	min <sup>-1</sup>	400
Maximum speed	min <sup>-1</sup>	1 200
Speed ratio	i	1 : 1
Spindle taper	ISO	50
Tool shank	DIN	69871
Turning of 1. axis	°	0 - 360
Turning of 2. axis	°	± 95
Weight	kg	1 200

<b>IFVW 112</b>		
Output	kW	25
Torque	Nm	600
Rated speed	min <sup>-1</sup>	400
Maximum speed	min <sup>-1</sup>	2000
Speed ratio	i	1 : 2
Spindle taper	ISO	40, 50
Tool shank	DIN	69871
Head turning	°	0 - 360
Weight	kg	990

<b>IWD 700</b>		
Head body diameter	mm	700
Transmission betw. W feed and slide	i	1 : 1
Maximum speed	min <sup>-1</sup>	100
Slide stroke	mm	150
Maximum torque	Nm	12500
Maximum cutting force by boring	N	20000
Maximum cutting force by facing	N	14000
Feed of slide	mm/min	0,75-1000
Number of tool holders		6
Machining ranges	mm	150-1765
Weight (incl. of tool holders)	kg	640-690

<b>IFVW 102</b>		
Output	kW	55
Torque	Nm	2 600
Rated speed	min <sup>-1</sup>	200
Maximum speed	min <sup>-1</sup>	1 600
Speed ratio	i	1 : 1
Spindle taper	ISO	50
Tool shank	DIN	69871
Head turning	°	0 - 360
Weight	kg	650

<b>IFVW 203</b>		
Output	kW	30
Torque	Nm	1 500
Rated speed	min <sup>-1</sup>	200
Maximum speed	min <sup>-1</sup>	3 000
Speed ratio	i	1 : 2
Spindle taper	ISO	50
Tool shank	DIN	69871
Turning of 1. axis	°	0 - 360
Turning of 2. axis	°	0 - 360
Weight	kg	800



IFVW 206



UFK 1000 NC



IFVW 112



IWD 700



IFVW 102



IFVW 203



## WORKPLACE ARRANGEMENT

### TRAVELLING PLATFORM

In the standard configuration, the machine is provided with a platform attached to the machine headstock. A travelling platform with independent drive can be supplied on special request. The position of such platform is independent of the actual headstock elevation and permits the operator to assume the best position with respect to the workpiece or, if necessary, to easily and safely leave or board the control platform at any time. This advantage will be appreciated in the cases of machines with long headstock traverse length. The front part of the platform is occupied by a semi-enclosed operator cabin with control panel. The cabin can be extended towards the ram where it protects the operator against chips and cooling liquid and makes possible simple operations to be performed on the workpiece (measurements) or the tool (setting) in the testing mode of the machine operation.

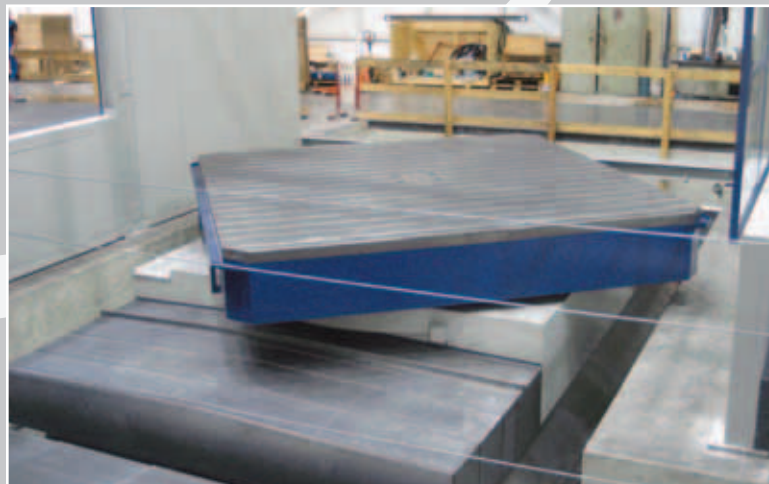


### TURNTABLES

Most frequently selected tables used at workstations including ŠKODA horizontal machines are those of rated loading between 25 and 250 tons.

### ROTARY AND TRAVERSABLE TABLES (TYPE TDV)

TYPE	TDV 4	TDV 5	TDV 6	TDV 7	TDV 8	TDV 9	TDV 10
V = Traverse in spindle direction mm	2500	2500 + incr.500	2500 + incr.500	2500 + incr.500	2500 + incr.500	3000 + incr.500	3000 + incr.500
Feed range (mm/min)	1 - 10 000	1 - 10 000	1 - 10 000	1 - 10 000	1 - 10 000	1 - 6 000	1 - 8 000
B = Lowest increment in rotary table axis (degrees/r.p.m.)	0,0001/3,3	0,0001/2,5	0,0001/1,66	0,0001/1,77	0,0001/1,77	0,0001/1,00	0,0001/1,00
Clamping area (mm)	1 600 x 2 500	2 500 x 3 000	3 000 x 3 500	4 000 x 4 000	4 000 x 4 000	4 500 x 4 500	4 500 x 5 600
Size of T - slots (mm)	28	28	28 (36)	36 (28)	36 (42)	36 (42)	36 (42)
Maximum load kg	25 000	40 000	65 000	100 000	120 000	160 000	250 000

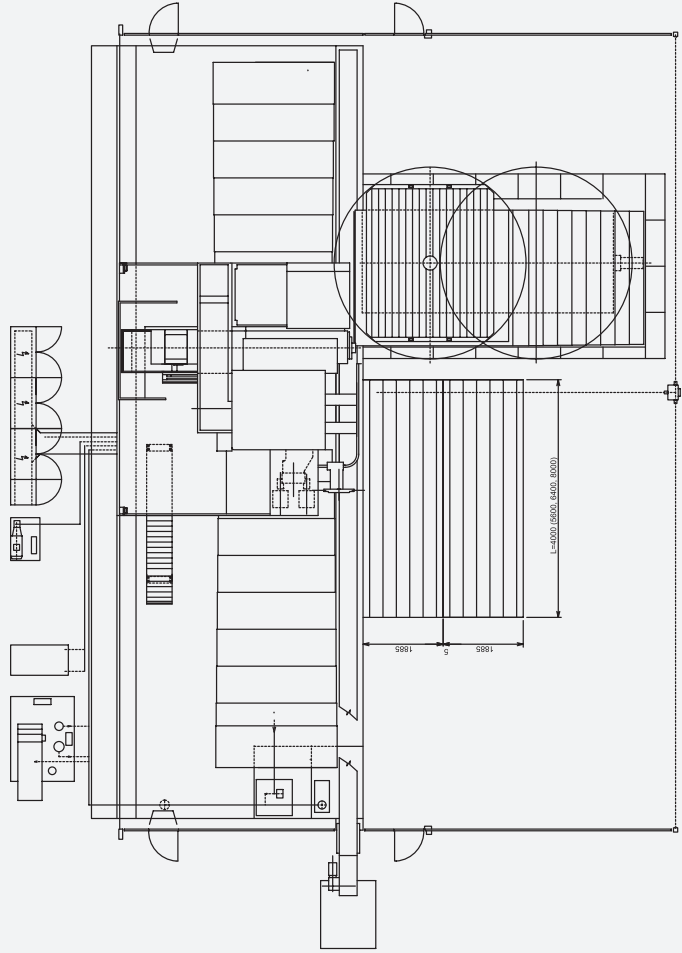
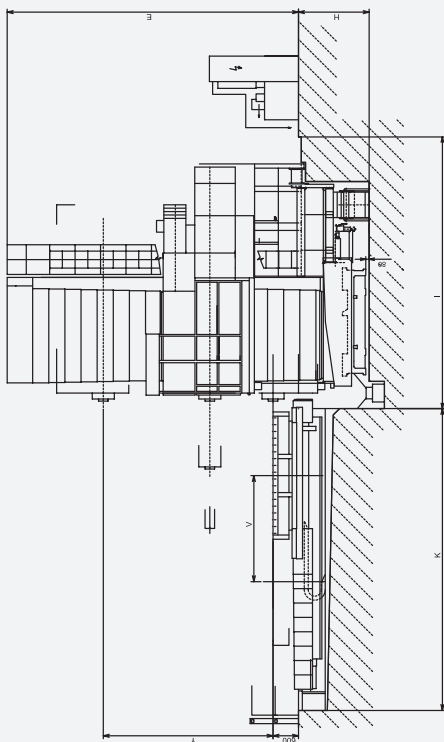
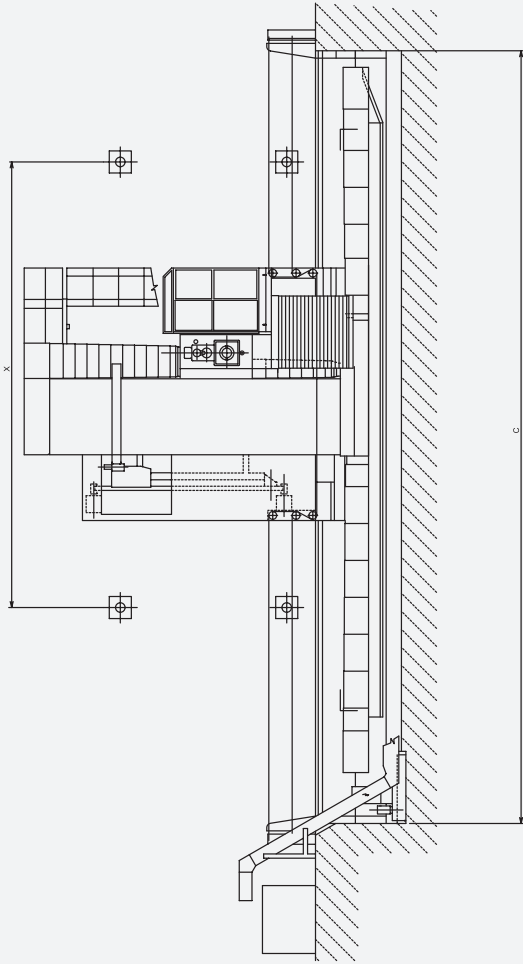


### CLAMPING PLATES

Basic workstation equipment includes a clamping area of customised dimensions to be assembled from modular ŠKODA clamping plates.

TYPE DESIGNATION		D 18/40	D 18/56	D 18/64	D 18/80
Plate length	mm	400	5600	6400	8000
Plate width	mm	1885	1885	1885	1885
Plate thickness	mm	400	400	400	400
Number of T - slots		6	6	6	6
Size of T - slots	mm	36	36	36	36
Load capacity	kN/m <sup>2</sup>	350	350	350	350

# ŠKODA HCW



	HCW 1	HCW 2	HCW 3	HCW 4
$C_{max}$	X*7m	X*7,5m	X*8m	X*10m
$L_{max}$	5835	6480	6400	7600
$E_{max}$	Y*2875	Y*2890	Y*3120	Y*3550
$H_{max}$	1565	1590	1500	2630

	TDV 4	TDV 5	TDV 6	TDV 7	TDV 8	TDV 9	TDV 10
$K_{max}$	V*2300	V*2750	V*4600	V*5100	V*5100	V*6450	V*6100

## SECIFICATIONS OF ŠKODA HCW MACHINES

Designation		HCW 1	HCW 2	HCW 3	HCW 4
Spindle diameter	mm	150/160	160/180/20	200/225/250/260	260/280/300
Taper	ISO	50	50/60	60/50	60
Ram cross-section	mm	400 x 400	450 x 450	520 x 520	680 x 680
Bed guideways width	mm	1 500	1 800	2 400	3 000
Column guideways width	mm	1 250	1 350	1 350	2 000
Max. power S1 (S2)	kW	I	71 (114)	100 (140)	100 (140)
S1 - 100 %, S 2 - 30 min		II			129 (180)
Max. spindle speed	rpm	A	3 000	1 600	1 600
		B		2 000	2 000
		C		2 500	
Max. torque	Nm	I A	7 000 (11 000)	17 000 (20 000)	17 000 (24 000)
		I B		14 000 (19 000)	14 000 (19 000)
		I C		11 000 (15 000)	
		II A			24 000 (24 000)
Spindle gear ranges		3	3	3	3
Column travel – X axis	mm	from 2 000	from 2 500	from 3 000	from 4 000
Headstock travel – Y axis	mm	2 000 - 4 000	2 500 - 5 500	2 500 - 7 000	4 000 - 10 000
Spindle travel – W axis	mm	1 000	1 200	1 400	1 800
Ram travel – Z axis	mm	1 200	1 300	1 600	2 000
Spindle + ram travel W + Z axes	mm	2 200	2 500	3 000	3 800
Feed rate					
X and Y axes	mm/min	0.5 ÷ 20 000	0.5 ÷ 15 000	0.5 ÷ 15 000	0.5 ÷ 10 000
Z and W axes	mm/min	0.5 ÷ 15 000	0.5 ÷ 10 000	0.5 ÷ 10 000	0.5 ÷ 10 000
Feed forces X, Y, Z	kN	35	60	60	60
Feed force W	kN	30	50	50	60
Machine weight of standard version	kg	50 000	80 000	105 000	135 000





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