

# KUNZMANN®

## FRÄSMASCHINEN

WF 650 FK  
WF 650 MS  
WF 650 5AX

UNIVERSAL MILLING MACHINE



## CONCEPT

- ▶ State-of-the art universal milling machine based on a modular construction, which allows optimum machine customization. Universal use in precision single and batch production of small and medium lot sizes
- ▶ Easily accessible working area despite compact machine dimension
- ▶ Minor machine height despite large Z axis

## CONSTRUCTION

- ▶ FEM-optimized massive block design with upper cross slide table that carries the vertical main spindle
- ▶ Clamping table with rugged, finished surface
- ▶ Modern machine concept with high stability and inherent rigidity and highly dynamic axis movements
- ▶ Large and clearance-free profile roller guideways and ball screws in all axes

## MACHINE ACCURACY

- ▶ Thermically stable machine geometry due to symmetric machine construction
- ▶ Ground ball screws in all axes provide high-precision positioning and repeatability.
- ▶ Linear path measurement systems and direct path measurement in all axes

## ERGONOMICS

- ▶ The working area is perfectly accessible due to wide slide doors on the front and the side.
- ▶ The table can be accessed by crane directly.
- ▶ The clamping table, which travels on the vertical axis, can be driven into an ergonomically convenient position.
- ▶ The movable control desk and the electronic handwheel facilitate machine setup and retooling.
- ▶ The smooth, inclined interior surfaces facilitate chip drain and cleaning.
- ▶ Components that require frequent maintenance are easy to approach.

## SAFETY TECHNOLOGY

- ▶ Compliance with European standards
- ▶ Direct monitoring of all safety components and functions by safety-related control

- ▶ KUNZMANN uses:

### HEIDENHAIN: Functional Safety

### SIEMENS: Safety Integrated

- ▶ Access to working area is secured by diversity safety switches
- ▶ Electrical overload monitoring of axis and spindle overload
- ▶ In compliance with Machine Directive 2006/42/EC



## ENERGY EFFICIENCY

- ▶ Time-controlled standby for idle units and functions
- ▶ The operator can configure the individual switch-off times for specific functions.
- ▶ Highly efficient and energy-saving coolant pumps and cooling units
- ▶ Energy-efficient LED lamps provide optimum machine illumination.
- ▶ Temperature-regulated ventilators reduce noise exposure and energy consumption.

## OPERATING MODES

- ▶ You can choose between up to four operating modes using key switches. Your key management guarantees that only qualified operators can call the respective operating modes:

- ▶ **Automatic:** full CPC functions with closed cabin doors
- ▶ **Setup:** axes can be moved separately and milling spindle can be activated (with doors open, if enabling switch is pressed)
- ▶ **Intervening:** Several axes (interpolant moving) and the milling spindle can be moved simultaneously (with doors open, if enabling switch is pressed). Thus, you can intervene with the program run.
- ▶ **Manually driven (for HEIDENHAIN milling heads only):** You can operate the machine like a manual milling machine.
  - Axis direction buttons
  - Incremental jog function
  - Electronic handwheel
  - KUNZMANN positioning function: You can set a positioning block and travel according to this block with incremental or absolute dimensions, or with radius compensation respectively. Furthermore, you can use the quill for manual drilling operations.



↑ WF 650 FK with HEIDENHAIN TNC 620 control

WF 650 MS with SIEMENS 840D sl control ↓



## SPINDLE TYPES

### ► MILLING HEAD:

Rugged allround spindle with integrated collision absorber in the Z axis and a quill you can extend up to 60 mm for manual drilling. The rotary movement is redirected from the horizontal main spindle drive via a bevel gear drive to the spindle within the milling head.

- Max. spindle speed: 6,500 rpm
- SK 40 tool taper

### ► MOTOR SPINDLE (MS):

Especially smooth running at relatively high torque; higher rpms as for milling head spindles. Ideal for operations with large chip volumes at low infeed depth and high traversing speeds.

- Max. spindle speed: 12,000 rpm or 18,000 rpm
- SK 40/HSK 63-A tool taper

## CONVENIENCE FUNCTIONS

### ► MONITORING OF MAINTENANCE TIMES:

The machine control monitors and reports coming due maintenance services. Important maintenance services are reported early to avoid malfunctions. This guarantees a high machine availability.

### ► AFR – AUTOMATIC FEED REDUCTION\*

The control constantly monitors the spindle load during operating. If the set load is exceeded, the AFR automatically and gradually adjusts the feed rate.

Advantages of AFR:

- The maximum spindle load can be set for each tool individually.
- The tools are monitored, which conserves the spindle and machine mechanics.
- Damage to the tool, the work piece, and the machine/spindle due to an overload is avoided. This ensures machine availability.

### ► RINSING GUN FOR CLEANING

Coolant rinsing gun for cleaning work pieces and machine interior from chips and milling dust

## TABLE TYPES

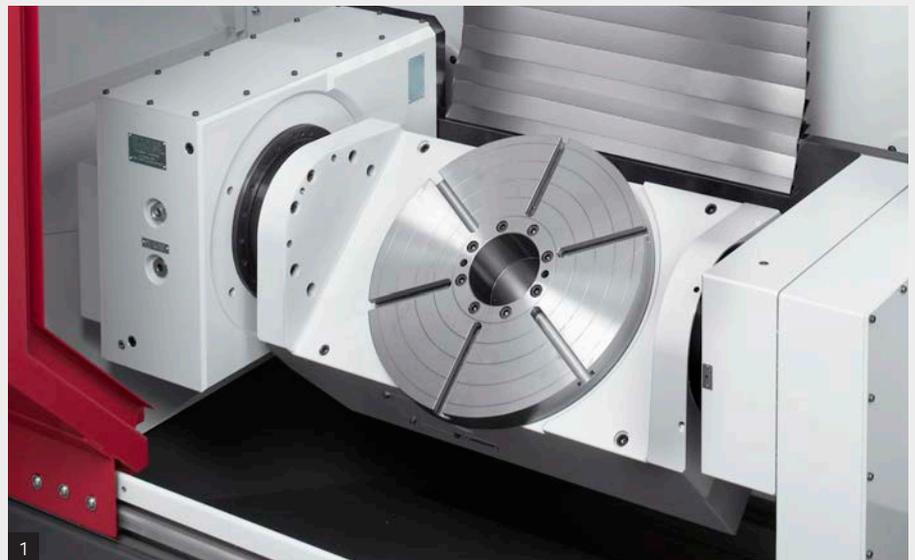
### ► RIGID ANGULAR TABLE: fig. 2

- Dimension: 1100 x 600 mm
- 14 H7 T-grooves (9 pieces)
- Max. table load: 450 kg

### ► SWIVELING/ROTARY CNC TABLE (A / C AXIS): fig. 1

Rotary table with Ø 400 mm, integrated in swing arm

- Table center hole: Ø 102 H7
- 14 H12 T-grooves (6 pieces)
- Max. table load: 300 kg
- Media connection in table center possible



\* In connection with Heidenhain control

## ADDITIONAL AXES

### ► MANUAL SWIVEL HEAD (B AXIS): fig. 2

All standard spindles can be swiveled in the B axis between  $-5^{\circ}$  und  $+95^{\circ}$ . The swiveling angle is displayed by a scale ring (in  $1^{\circ}$  steps)

### ► MANUAL SWIVELING HEAD WITH DIGITAL DISPLAY (B AXIS)

Control displays swiveling angle of manual B axis

### ► CNC SWIVELING/ROTARY TABLE (A / C AXIS), fig. 3

The swing arm guarantees an ideal working area-workpiece size relation for 5 axis simultaneous operations. The clamping area of the rotary table is positioned on the pivot axis.

- Table diameter: 400 mm
- Swiveling area:  $-95^{\circ}$  to  $+120^{\circ}$
- Max. work piece size: 300 x 300 x 300 mm

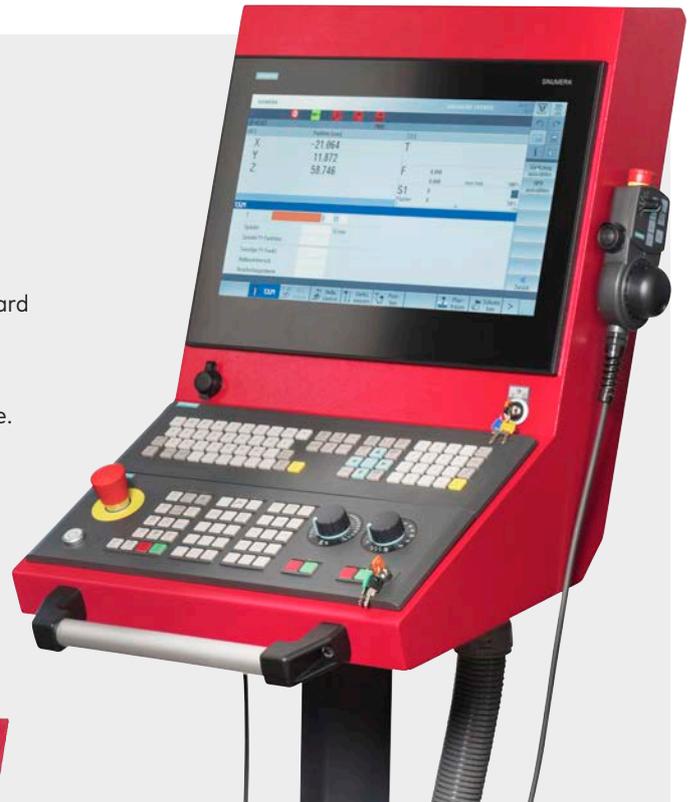
### ► CNC DIVIDING UNIT (A OR C AXIS) fig. 4

You can flexibly use dividing units of different sizes and types for various operations. The operator can install a dividing unit operation-dependent on the angular table and demount it as required.



► **SIEMENS 840D sl**

High-end control with 19" multitouch display and large keyboard and control panel. The bent and pivotable control desk allows ergonomic working. The electronic Mini-BHG handwheel supports the operator in setting up and retooling the machine.



► **HEIDENHAIN TNC 640**

High-end control with 19" multitouch display and large keyboard as well as integrated control panel. The bent and pivotable control desk allows ergonomic working. The electronic HR 510 FS handwheel supports the operator in setting up and retooling the machine.

► **HEIDENHAIN TNC 620**

Compact control with various functions. The operator works on a large multitouch display and a machine control panel in the front. The handling is easy due to well-structured and context-sensitive user interfaces and softkeys for frequently used functions. The electronic HR 510 FS handwheel supports the operator in setting up and retooling the machine.



## OPTIONS

### TOOL CHANGER fig. 1

Rapid double-arm changer with short tool change times. A special feature is the variable tool pocket coding and the cleaning of the tool taper with air every time a tool is changed.

- ▶ **38 positions (standard)**
- ▶ **60 positions**

### CHIP MANAGEMENT fig. 2

#### ▶ **Coolant tank with chip box (standard)**

Space-saving option to collect chips and coolant underneath the machine

#### ▶ **Worm Conveyor**

For short to medium-sized metal chips

#### ▶ **Slat Band Conveyor**

For long steel chips, balls of chips, and wool chips as well as short, dry chips at high chip volumes

#### ▶ **Chip Trolley**

Can be emptied on ground-level (0.4 m<sup>3</sup>); wheeled, with forklift slots and coolant outlet

### INTERNAL COOLING fig. 3

#### ▶ **Coolant through spindle – 25 bar**

Low-maintenance edge split filter included

#### ▶ **Coolant through spindle – 40 bar**

Tool-specific setting of pressure from 25 to 40 bar; low-maintenance edge split filter included

#### ▶ **Internal air cooling**

Air blown through tool

### SUCTION fig. 4

- **Low-maintenance filter system**
- **Connection to central system**

### PROBE SYSTEMS fig. 5

- **Workpiece measuring (infrared probe)**
- **Tool measuring and wear control**

### AUTOMATION

#### ▶ **Automatic slide doors**

Opening of front doors at program end, by M function, or by pressing the open button.

#### ▶ **Handling systems**

### COOLANT PROCESSING

#### ▶ **External band filter system**

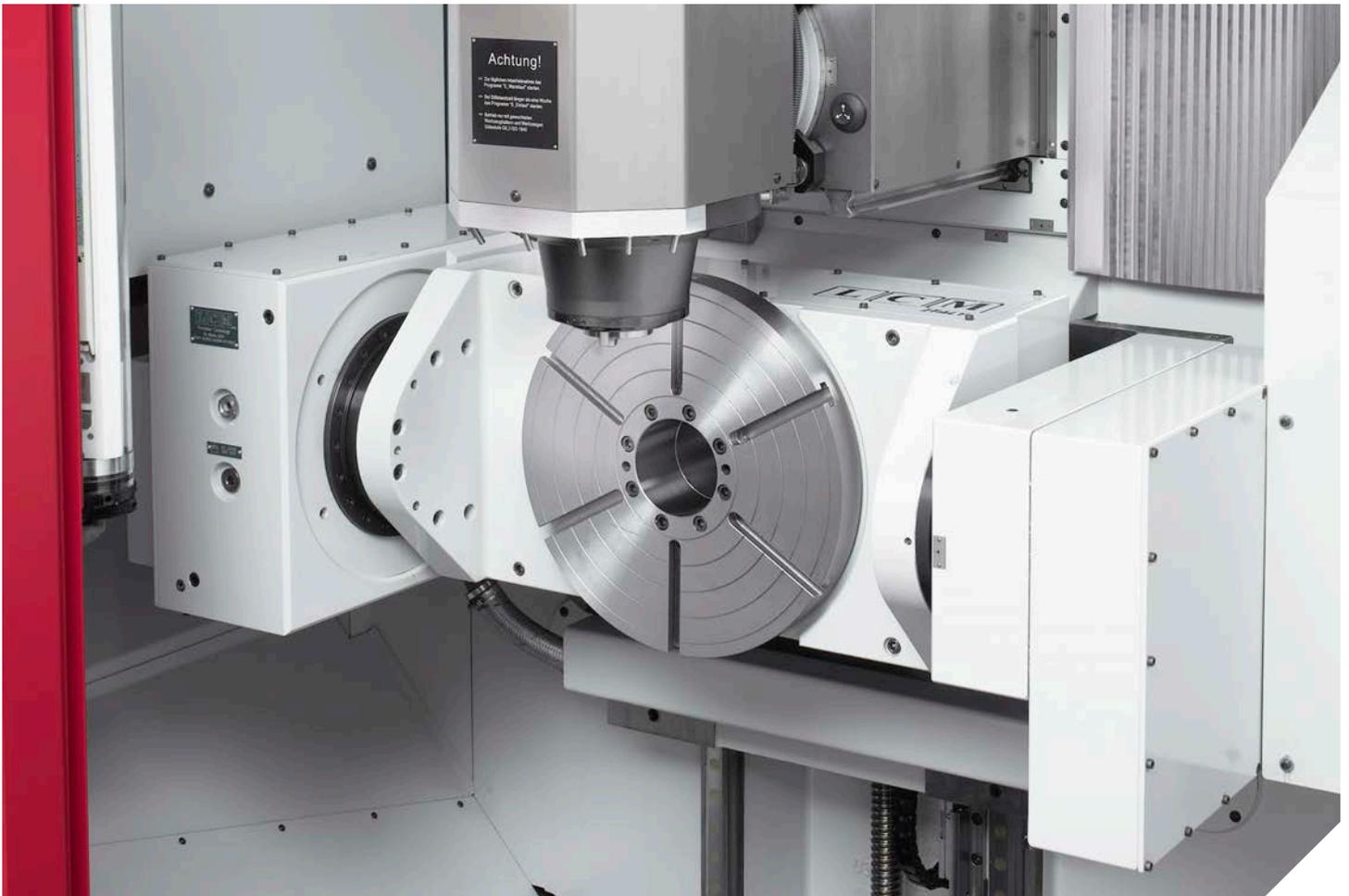
Fully automatic separation of gray water into particles (milling dust/chips/...) and pure coolant. The full flow filter increases the durability of the coolant by exfiltrating dirt and chips and ensures machine availability.

#### ▶ **Oil skimmer**

### SUPPORT SERVICE

Hotline/remote maintenance





↑ WF 650 5AX with motor spindle

## WF 650 5AX

### ► FEATURES

The 5 axis simultaneous milling machine WF 650 5AX has a double bearing CNC swiveling/rotary table with a diameter of 400 mm. Due to the position of the table on the moveable Z axis, chips can easily fall downwards. The operator can easily imagine the solid dimensions since the workpiece moves in the rotary and swiveling direction, and because the table surface lies within the swiveling axis.

As a standard feature, the WF 650 5AX machine with HEIDENHAIN control is equipped with a Dynamic Collision Monitoring (DCM). It interrupts the axis movements before a collision with any contours known to the control can occur, e.g. clamping tools, tools, or main spindle. Especially in the 5 axis mode, machine operation involves unpredictable axis movements and high travelling speeds. This machine system thus helps the operator to avoid machine malfunctions. Expensive machine downtimes due to machine malfunctions can be avoided. The optimization of the rotary and swiveling axis of each 5 axis machine is based on the high precision and reproduction requirements. With the KinematicsOpt cycle, geometric

divergences are captured, recorded, and revised. For this, the machine must have an electronic probe system and a calibration ball.

### ► EQUIPMENT OPTIONS

In addition, it is possible to install media wires in the middle of the CNC swiveling/rotary table to actuate chip rinsing, e.g.

### ► ADDITIONAL SPINDLE PROTECTION SYSTEM

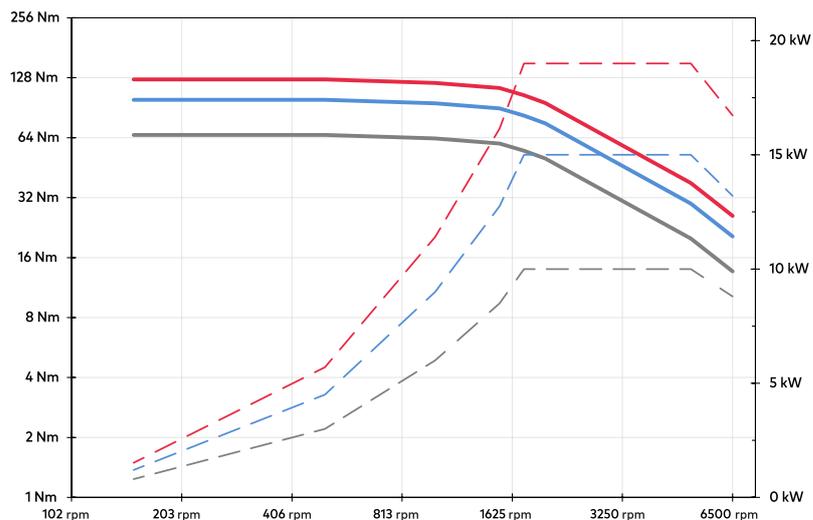
If required, we deliver a spindle protection that recognizes unknown contours and stops movements to avoid machine damage.

# PERFORMANCE CHARTS

## MILLING HEAD 6,500 RPM

- ▶ Performance
  - 10 kW (100% of duty cycle)\*
  - 19 kW (25% of duty cycle)\*
- ▶ Torque
  - 55 Nm (100% of duty cycle)\*
  - 105 Nm (25% of duty cycle)\*

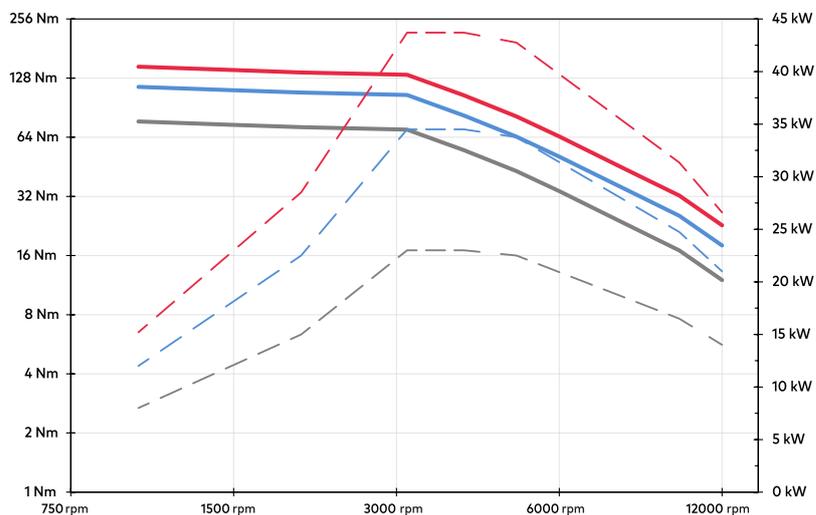
\*(at 1,750 rpm)



## MOTOR SPINDLE 12,000 RPM

- ▶ Performance
  - 10 kW (100% of duty cycle)\*
  - 19 kW (25% of duty cycle)\*
- ▶ Torque
  - 77 Nm (100% of duty cycle)\*
  - 99 Nm (25% of duty cycle)\*

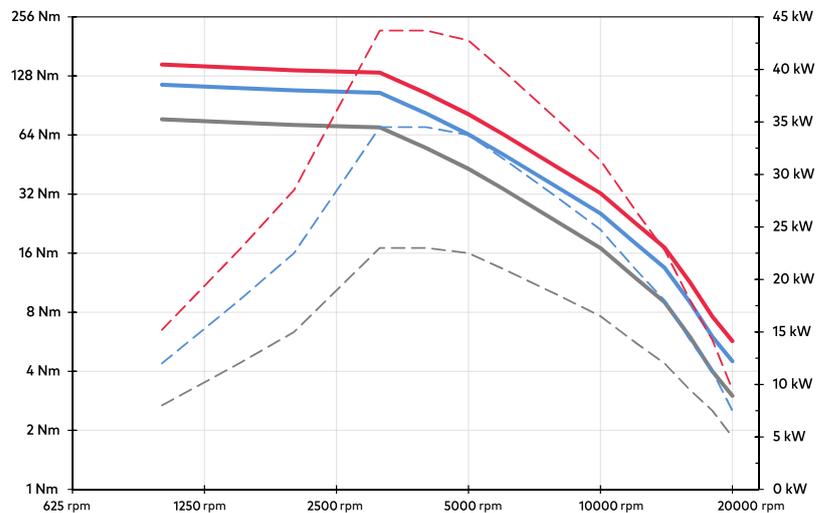
\*(at 1,250 rpm)



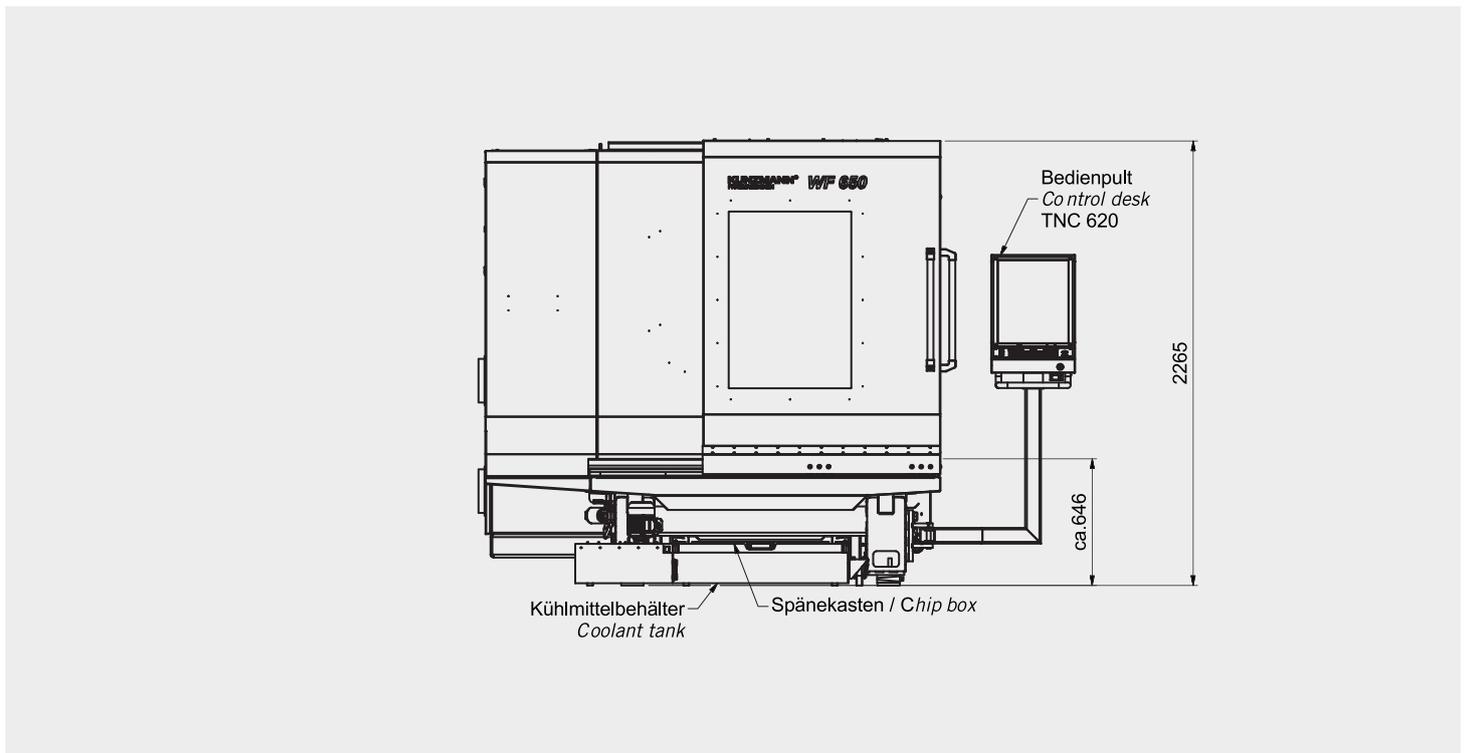
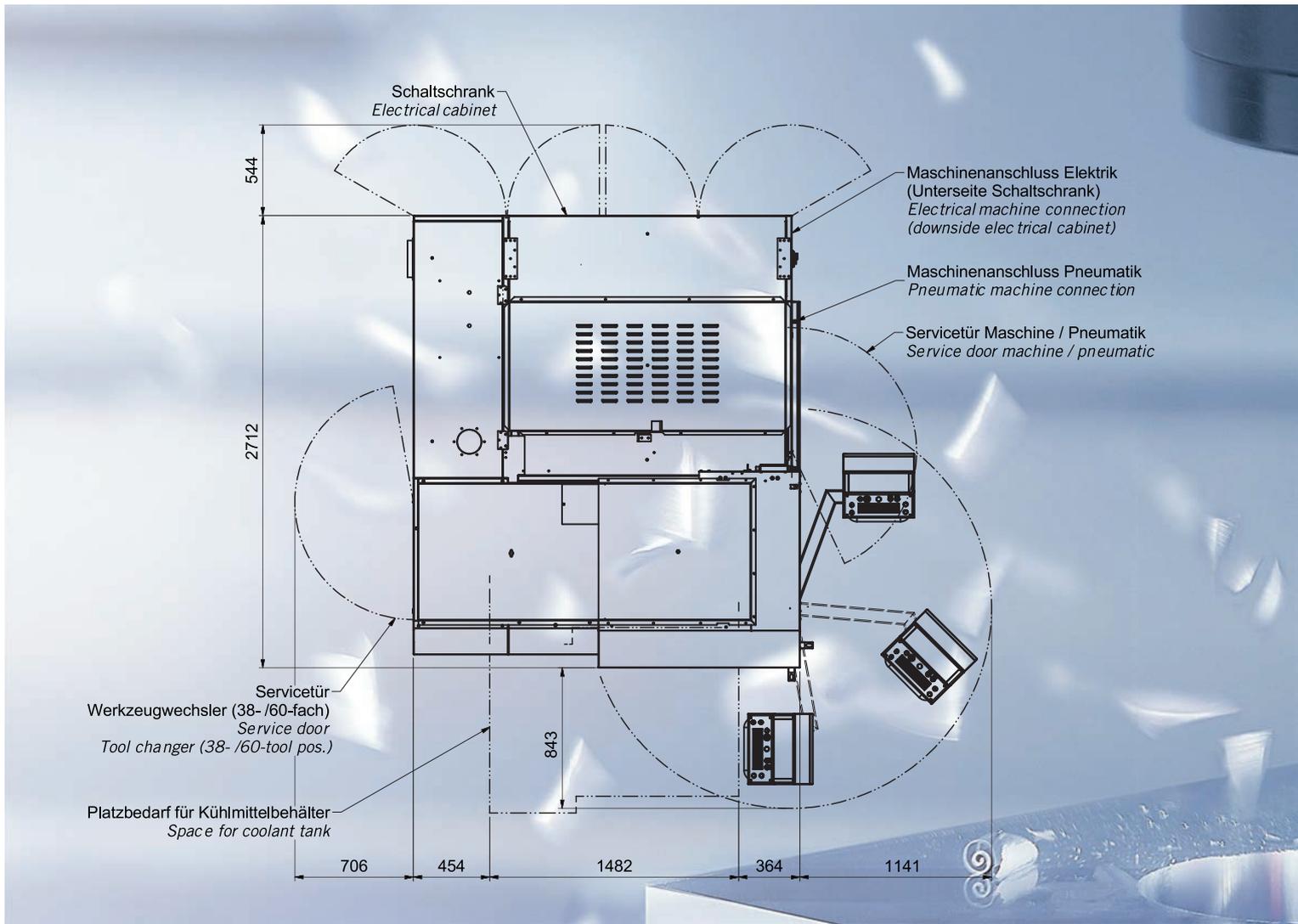
## MOTOR SPINDLE 18,000 RPM

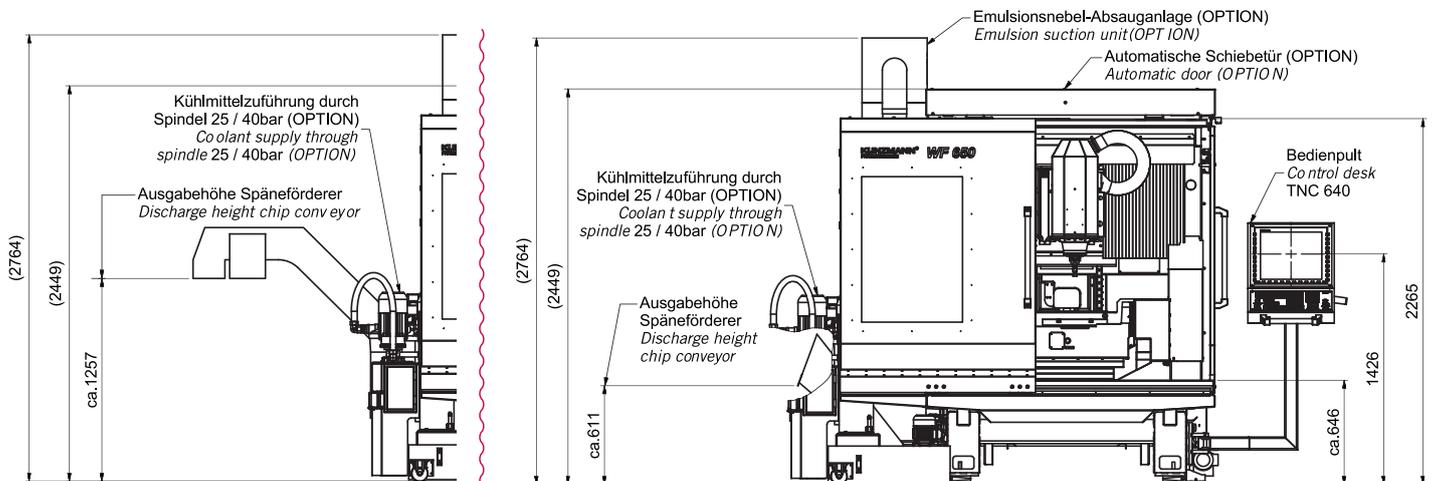
- ▶ Performance
  - 23 kW (100% of duty cycle)\*
  - 44 kW (25% of duty cycle)\*
- ▶ Torque
  - 70 Nm (100% of duty cycle)\*
  - 133 Nm (25% of duty cycle)\*

\*(at 3,100 rpm)



- Torque [M] S1 (100% of duty cycle)
- Torque [M] S6 (40% of duty cycle)
- Torque [M] S6 (25% of duty cycle)
- - - Performance [P] S1 (100% of duty cycle)
- - - Performance [P] S6 (40% of duty cycle)
- - - Performance [P] S6 (25% of duty cycle)





↑ WF650 with slat band chip conveyor and internal cooling

↑ WF650 MS with spiral chip conveyor and internal cooling

**STANDARD EQUIPMENT**

- ▶ Milling head 6,500 rpm
- ▶ Motor spindle 12,000 rpm (MS, 5AX)
- ▶ SK 40 tool taper
- ▶ Angular table (milling head, MS)
- ▶ CNC swiveling/rotary table (5AX)
- ▶ Tool changer with 38 positions
- ▶ Full protective cabin
- ▶ Electric handwheel
- ▶ Coolant system including chip rinsing gun
- ▶ AFR Automatic Feed Reduction
- ▶ Linear path measurement systems
- ▶ Direct measurement of rotary (C axis) and swiveling axis (A axis) (5AX)
- ▶ Software option DCM and KinematicsOpt (5AX)

**OPTIONS**

- ▶ HSK 63-A tool taper (MS, 5AX)
- ▶ Tool changer with 60 positions
- ▶ Motor spindle 18,000 rpm
- ▶ Digital display for manual swiveling of milling head/motor spindle
- ▶ Worm chip conveyor
- ▶ Slat band chip conveyor
- ▶ Internal cooling system 25 / 40 bar
- ▶ Suction system
- ▶ Paper band filter system
- ▶ Probe systems
- ▶ Dividing unit



Visit our website

**KUNZMANN**<sup>®</sup>  
FRÄSMASCHINEN

KUNZMANN Maschinenbau GmbH  
Tullastraße 29-31, 75196 Remchingen, GERMANY  
Phone: +49 (0) 7232/36 74-0  
Fax: +49 (0) 7232/36 74-74  
E-mail: [info@kunzmann-fraemaschinen.de](mailto:info@kunzmann-fraemaschinen.de)  
[www.kunzmann-fraemaschinen.de](http://www.kunzmann-fraemaschinen.de)

<b>Working range</b>	Longitudinal, X-axis	650 mm
	Cross, Y-axis	500 mm
	Vertical, Z-axis	450 mm
<b>Main spindle drive</b>	* at 1,750 rpm	Performance at 100% of duty cycle* 10 kW
	** at 3,100 rpm	Performance at 25% of duty cycle* 19 kW
<b>Spindle speed</b>	Milling Head	6,500 rpm
	Motor Spindle	12,000 rpm
	Motor Spindle	18,000 rpm
<b>Feed</b>	X- and Y-axis	25 m/min
	Z-axis	20 m/min
<b>Tool taper</b>	Milling Head 6,500 rpm	SK 40
	Motor Spindle 12,000 rpm	SK 40
	Motor Spindle 18,000 rpm	HSK 63-A
<b>Tool changer</b>	Positions	38/60 positions
	Tool change time	5 sec.
	Chip-to-chip time	10 sec.
<b>Clamping table</b>	WF 650 FK / WF 650 MS	1100 x 600 mm
	WF 650 5AX	Ø 400 mm
<b>Operating voltage</b>	Voltage/frequency	400 V / 50 Hz
<b>Controls</b>	WF 650 FK / WF 650 MS	TNC 620 / TNC 640 / 840D sl
	WF 650 5AX	TNC 640 / 840D sl
<b>Power consumption</b> (depending on equipment)	WF 650 FK / WF 650 MS	≥ 19 kVA
	WF 650 5AX	≥ 32 kVA
<b>Machine weight</b>		approx. 5,500 kg

- ▶ Manufacturer of universal milling machines and vertical machining centers
- ▶ Competent technological support
- ▶ Customer-specific application technology
- ▶ Individual programming trainings
- ▶ Prompt and convenient support service

Our strong partner

