

**MACHINING CENTER**  
**type BUMOTEC s191 CNC, 50mm Version**

**1. Basic machine description**

- All base and structural components utilize seasoned ribbed cast iron designs, ensuring high rigidity
- Pre-loaded linear roller guide ways driven by high precision 20mm pitch ball screws and AC motors on X and Y axis
- The main spindle (axis C1) and subspindle ( axis A ) are identical high dynamic electro spindles
- Direct drive on swiveling axis (B axis), carrying the milling spindle
- High precision milling spindle, HSK 40 , 30.000 rpm, watercooled, hybrid bearings, oil/air-mist-lubrication swivelling on B-axis  
Used for turning or broaching, the hybrid bearings are discharged, eliminating possible shock  
Through-spindel-coolant up to 80 bar (1160 psi )
- FANUC series 31iB5 CNC control
- Fully encapsulated machine enclosure with internal lighting, designed to provide maximum accessibility, optimized chip recovery (precious metals) and easy cleaning  
Workzone separated from technical compartment by stainless steel gills
- Coolant tank with coolant distribution, output ring and coolant lines  
160-liter tank, 40-liter/min- pump, 3 bar pressure ( 43 gallon tank, 10 gallon/min flow at 45 psi )  
Coolant nozzle with 6 exits at spindle-nose
- 4 kW chiller system for thermal stabilization of  
spindles, rotary axis, hydraulic system and cutting oil  
8 kW chiller system for M/C's with option 1.2 "linear drives"
- Air conditioned electrical cabinet
- Automatic central lubrication system controlled by the CNC unit  
(*Note: use only oils recommended by BUMOTEC SA*)
- Diagnostic system and error messages to assist in trouble shooting
- Three (3) colors light column

**Technical characteristics of basic machine**

<b>X axis ( Vertical axis milling spindle )</b>
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Travel :	mm	410	Power :	4.5Kw
			Feed Force	550 DaN

<b>Y axis ( Transversal axis milling spindle)</b>
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Travel :	mm	200	Power	2.5Kw
			Feed Force	550 DaN

<b>Z axis ( Longitudinal axis milling spindle)</b>
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Travel :	mm	400	Power	2.5Kw
			Feed Force	550 DaN
Resolution X-Y-Z:	mm			0.0001
Rapid feed on X Y Z axis	m/min			40
Acceleration	m/s <sup>2</sup>			10
Measuring type				High resolution glass scales (0.0001 mm)

<b>Main spindle C1 = Horizontal indexing / turning spindle</b>
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Power	Kw	15		
Torque / max	Nm	22/28		
Measuring type		direct		
Resolution:	°	0.0001		
Precision:	°	0.001		
Bar diameter	mm	32	option 2.5:	50mm
Rotation speed (C axis)	°min	72,000		
Clamping force	N at 6 bar	4,900		
	N at 45 bar	43,000		

## Technical characteristics of basic machine (continued)

B axis (milling spindle swiveling axis)		
Power S1 / S6	Kw	4.3
Torque / max	Nm	119/226
Angular travel	°	+115 / -25
Measuring type		direct
Resolution	°	0.0001
Precision	°	0.001
Rotation speed max.	°/min	36,000
Holding torque	Nm	200

Milling spindle		
Power S1 / S6	Kw	8.0 / 9.6
Torque S1 / S6	Nm	9.5 / 11.5
Max. speed	rpm	30,000
Tool holder type		HSK 40 (A or E)
Tool holder clamping force	DaN	1000
Through Spindle coolant	bar	30 to 100

### **Remark:**

*Machine accuracy is greatly influenced by the ambient air temperature*

*Best results are achieved if the ambient temperature is maintained at 20° C +/- 2°*

*Never have the machine exposed to direct sun light or air flow from air condition!*

## Technical characteristics of basic machine (continued)

### Tool changer

- Vertical mounted transfer arm (electro mechanical)

Tools are always returned to the initial magazine position on carousel

- Tool change is performed in a protected area outside of the machining area

30 positions for HSK 40 Accessible during machining

*Upgradeable to 60 pos ( see options list)*

Free choice of position and number of turning tool/milling tools

Angular drilling heads can be integrated

Tool changing time

Tool to tool                      sec.                      1.2

Chip to chip (average)              sec.                      4.4 (from vertical mill tool to vertical mill tool)

Max. tool diameter                      mm                      40  
80 with reduced Ø on adjacent positions

Max. tool length                      mm                      150 on the 1st plate and 130 on the 2nd and 3rd one  
(from spindle nose):

Max. tool weight                      gr.                      1,500

### Miscellaneous

Power                      25 kVA

Electrical supply                      3/N/PE/400V/230V 50 HZ

Pneumatic supply                      6 bars (dry air)

Color                      Grey black RAL7021 and white RAL9003 (other colour upon request)

Machine weight                      Kg                      ~4'200

Dimensions:                      Length      mm      2,200                      (without bar feeder)

Width      mm      1,900

Height      mm      1,990

mm      2,500                      (with mist extractor)

## Technical characteristics of basic machine (continued)

<b>CNC unit configuration</b>
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### ***Numerical control unit type FANUC 31iB5, main characteristics***

- 15" LCD color screen
- Alphanumeric keypad
- Machine functions panel including:
  - 1 mode locking selector
  - 1 potentiometer for programmed feed from 0 to 120%
  - 1 potentiometer for programmed spindle speed from 50 to 120%
  - Machine function soft keys
  - Inbuilt electronic hand wheel
- Fast Ethernet Board 100 Base-TX, ATA                      A02B-0303-J146

### ***Main CNC options.***

- Data server with ATA Flash volume 1GB
- J947    1 MB Ram memory
- S677    TCPC (tool center point control for 5 axis machining)
- S808    AI Nano HPCC (AI high precision contour control II)
- J930    Tool nose radius compensation
- J893    Coordinate system rotation
- J819    Helical interpolation
- J953    1000 programmes storage capacity
- J828    Rigid tapping
- S615    Optional chamfering and corner R
- J894    Workpiece coordinate system
- S993    Workpiece setting error

### ***Interfaces***

- Bumotec specific programming to prevent from collisions as far as possible
- Simplified tool-management to avoid errors through data transfer
- Twin tools management, choosing number of parts or machining time
- Simplified tool handling through automated tool measuring on machine
- Parts counter and production management

**OPTION "linear drives"**

***Y axis ( Transversal axis milling spindle )***

Travel: 200 mm 7.8 inch	Power : 4.8 Kw	Feed force : 240 daN
Resolution	mm	0.0001
Rapid feed G0 Rapid feed G0	m/min	50
Max. feed G1 Max. feed G1	m/min	20
Measuring type		glass scales (10 Nano m)

***Z axis ( longitudinal axis milling spindle )***

Travel: 400 mm	Power : 7,2 Kw	Feed force: 360 daN
Resolution	mm	0.0001
Rapid feed G0	m/min	50
Max. feed G1	m/min	20
Measuring type		glass scales (10 Nano m)

***Also included***

Power-increase at recooling unit from 4 kW to 8 kW

Integration of emergency stop system

Necessary CNC options to manage linear drives

<b>1.1</b>	Price for standard machine with "linear drives" option as described in pages 1 / 2 / 3 / 4 / 5 / 6
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**1 x**

## 2. OPTIONNAL EQUIPMENT

<b>2.1</b>	<b>Turn-mill function</b>	<i>Option T</i>	<b>1</b>	<b>x</b>
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Spindle rpm (C1) increase to 6'000rpm

1 x

Positioning accuracy and locking ensured by a high precision coupling system

Modification of the tool changer carousel for HSK A 40 tool holders

Extensive tool management sub-routines

Integration of CNC options for turning operations into CNC control synchronization and offset table for turning tools

<b>2.2</b>	<b>Sub Spindle A</b>	<i>Option R</i>	<b>1</b>	<b>x</b>
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**(Horizontal-Vertical Sub spindle for turn mill mode)**

Full Turn-Mill capable sub-spindle moving on Axis "W"

1 x

Sub spindle mounted in line with main spindle "C1", moving on axis "W"

Rotary hydraulic motor drive in combination with a high-precision HIRTH coupling guarantee long term positioning accuracy

- Power	Kw	7,5	
- Torque / max. torque	Nm	22/28	
- Measuring type		direct	
- Resolution	°	0.0001	
- Spindle speed	min-1	5500	
- Bar passage	mm	32	option 50mm
- C mode max. feed	°min	72,000	
- Clamping force	N a 6 bars	4,900	
Rapid feed on W-axis	m/min	40	
Stroke on W-axis	mm	290	

## 2. OPTIONNAL EQUIPMENT (next)

<b>2.4</b>	<b>Spindle passage increase</b>	<b>1</b>	<b>x</b>	
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- |   |   |   |
|---|---|---|
| 2.4.1 Increase of spindle 1 to 50 mm (main spindle) | 1 | x |
| 2.4.2 Increase of spindle 2 to 50 mm (sub spindle)  | 1 | x |

<b>2.6</b>	<b>"Renishaw" tool setting probe</b>	<b>1</b>	<b>x</b>	
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Measuring system with touch probe	1	x
Used for tool length measurement on rotating tools		
Sub routines activated through M codes		
Also provides tool breakage detection		

<b>2.7</b>	<b>"Renishaw" OMP 400 measuring probe.</b>	<b>1</b>	<b>x</b>	
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Infrared communication system	1	x
OMP 400 unit is mounted on tool stake and stored into tool magazine		
Probe diam 1.00mm		
Sub routines for alignment and centering		

<b>2.8</b>	<b>Tool magazine extension</b>	<b>1</b>	<b>x</b>	
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Tool magazine extension from 30 to 60 pockets	1	x
		x
Max. tool length: 130 mm / max. tool dia: 80 mm		
Max. tool weight : 1300 gr.		

<b>2.9</b>	<b>Preparation Milling spindle for Through Spindle Coolant</b>	<b>1</b>	<b>x</b>	
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Mechanical integration of rotary coolant distributor	1	x
Addition of dedicated M codes		



## 2. OPTIONNAL EQUIPMENT (next)

<b>2.11</b>	<b>Spindle liner</b>	<b>1</b>	<b>x</b>	
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1	x	700.00		Ø 46	

<b>2.12</b>	<b>High Pressure unit and chip conveyor evacuation</b>	<b>1</b>	<b>x</b>	
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*to be used in continuous mode*

1	x
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Chip removal by chain

Ideal for turning and milling chip

Filtration by paper filter

Additional filter cartridge for filtering the oil

3-5 microns

Interchangeable cartridge

Filtration cartridge to be used only after the lapping/polishing machining operation

Pump BP

60 l/Min

Pump HP

40 bars

18.9 l/min

Adjustable pressure through code M

Pressure can be used with different cycles

Cooling of the cutting oil at +/- 1°

7 Kw

Capacity of the tank

650 l

<b>2.13</b>	<b>Diamond oil distribution system</b>	<b>1</b>	<b>x</b>	
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Diamond drop oil distribution system

1	x
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To be used before polishing operation

<b>2.15</b>	<b>Mist extractor</b>	<b>1</b>	<b>x</b>	
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Electrostatic extractor ELBARON RON / A 60 D-2V

1	x
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<b>2.16</b>	<b>Bar pushers</b>	<b>1</b>	<b>x</b>	
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Rotativ bar pushers

1	x
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Length and position controlled with stopper on Y axis

Max bar length            700 mm

Ø to be defined

### 3. CNC OPTIONS

<b>3.1</b>	<b>CNC options pack for turning functions</b> <i>(included with option 2.1)</i>	<b>1</b>	<b>x</b>	
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- J855 Constant surface speed control
- J875 Chamferin and corner R
- J877 Multiple repetitive cycles
- J930 Tool nose radius compensation
- S630 Diameter/Radius dyn. Settings

<b>3.2</b>	<b>CNC options for counter spindle</b> <i>(included with option option 2.2 if choosen)</i>	<b>1</b>	<b>x</b>	
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- J858 Spindle Synchronous Control
- S816 Synchronous/mixture control

### 4.10 GRINDING ACCESSORIES

<b>4.11</b>	<b>"Grinding" package</b>	<b>1</b>	<b>x</b>	
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- Including :
- Workzone covered in stainless
  - Special grinding cycles
  - Sealing air in rotational axes

1	x
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### 5. CLAMPING DEVICES AND ACCESSORIES

<b>5.4</b>	<b>Single part clamping device " OTTET "</b>	<b>1</b>	<b>x</b>	
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- Adaptation OTTET collets clamping system
- Integrated front / back stops
- Adjustable clamping force through pneumatic pressure.

1	x
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<b>5.5</b>	<b>SK52 bar clamping device</b>	<b>1</b>	<b>x</b>	
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- Adaptation for SK52 collets (Hainbuch, Marquart)
- Max Ø 50 mm

1	x
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*(Only with option bar passage increase 2.5.1)*

### 8. MISCELLANEOUS

<b>8.2</b>	<b>Preparation for Automation</b>			<b>1</b>		
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- Preparation for option 4.1 to be added in the field
- All Sheet metal modifications necessary
- All necessary cable, plugs, and interface
- Software