

### Sawing and milling:

#### Cutting speed:

The cutting speed (i.e. the circumferential speed) is determined by the diameter and speed (rpm) of the tool and is given by the formula:

$$V_c = \frac{D \cdot \pi \cdot n}{1000 \cdot 60} \left[ \frac{\text{m}}{\text{s}} \right]$$

D = cutting blade diameter [mm]

n = spindle speed [1 / min]

$\pi = 3.1416$

Optimum saw blade cutting performances and tool lives are achieved at cutting speeds of 65 – 70 [m / s]. Apart from the quality of the cutting material, the tooth form also has an influence on the quality and tool life. Preference should be given to saw blades with alternate tooth forms. Apart from the machine's influences, economic working is also determined by the accuracy of the tools.

The surface quality produced during milling and sawing is primarily determined by the size of the tooth feed (feed per tooth), the cutting blade diameter, the insert number and the depth of cut. This relationship is expressed by the following formula:

$$f_z = \frac{V_f \cdot 1000}{n \cdot z} [\text{mm}]$$

$f_z$  = feed per tooth [mm]

$V_f$  = table feed (Workpiece feed rate) [m / min]

n = speed [1 / min]

z = insert number

The following formula gives the workpiece feed rate:

$$u = \frac{f_z \cdot z \cdot n}{1000} \left[ \frac{\text{mm}}{\text{min}} \right]$$

In practice, feed rates of between 10 and 15 m / min should be selected.

In practice, the following tooth feed values result for milling:

$f_z =$  0.3 to 0.8 mm very fine cut

0.8 to 2.5 mm fine cut

2.5 to 5.0 mm rough-cut

Table of feed values per tooth or group of teeth:

Softwood – longitudinal	$f_z =$ 0.2 - 0.9 mm
Softwood - transverse	0.1 - 0.2 mm
Hardwood	0.05 - 0.15 mm
Particle/Chipboard	0.1 - 0.25 mm
Hard fibres	0.05 - 0.12 mm
Veneered boards	0.05 - 0.10 mm
Lightweight metals	0.02 - 0.05 mm
Plastic coated boards	0.02 - 0.05 mm

Phonotherm® 200 should be machined with the tooth feed values of material group 7 – 8. The guideline values given are for single saw blades without the additional use of scoring saw blades.

Permissible cutting blade height of moulding cutting blades:

In the case of clamped, radially arranged, one-piece cutting blades and / or compound cutting blades, the minimum cutting blade thickness  $a_{min}$  and the minimum clamping length  $L_{min}$  dependent on the cutting blade projection  $t$  can be determined using the following formula.

According to the draft standard prEN 847-1, the permissible cutting blade height for moulding cutting blades is:

Minimum cutting blade thickness  $a_{min}$

SP-Cutting blade	For $0 < t < 1$ → $a_{min} = 1$ For $1 < t < 5$ → $a_{min} = 0.25 \cdot t + 0.75$
HL-Cutting blade	
HSS-Cutting blade	
Compound cutting blade	
SP-Cutting blade	For $t > 5$ → $a_{min} = 0.170 \cdot t + 1.115$
HL-Cutting blade	For $t > 5$ → $a_{min} = 0.143 \cdot t + 1.285$
Compound cutting blade	
HSS-Cutting blade	For $t > 5$ → $a_{min} = 0.125 \cdot t + 1.4$
HM-Solid cutting blade	$a_{min} = 0.5 \cdot t + 0.5$

Minimum clamping length  $L_{min}$ :

For positive locking cutting blade fixing:  $L_{min} = 0.48 \cdot t + 3.8$

For non-positive cutting blade fixing:  $L_{min} = 15$  bei  $t \leq 15$  und  $L_{min} = t$  bei  $t > 15$

For HM-solid cutting blades, generally:  $L_{min} = t + 3$

### Grinding:

To prepare for further machining stages, we provide a rough-grinding service with a 60 or 40 grain. For the most common further processing, a rough-grind with a 40 or 60 grain is usually sufficient. Finer grinding grains (e.g. 240) should be used to give the Phonotherm® 200 a completely new coloration.

### Colorants, paints and varnishes:

This information gives recommendations produced in cooperation with the colorant manufacturers and does not provide a guarantee for the function of the individual components processed. Thus, we would like to point out that you should always carry out your own tests with the required primers, paints and varnishes first.

The preparatory painting treatments for Phonotherm® 200 and the painting itself depend on several criteria.

#### 1. Use of Phonotherm® 200 outdoors:

Phonotherm® 200 plates and boards are open to diffusion. This means that when used outdoors, the paint must seal the sheet or board as otherwise the coating used can peel off after several months' exposure to the weather. Furthermore, where colourless paints or varnishes are applied, UV-protection should be used as otherwise Phonotherm® 200 can turn yellow. When treated with higher quality coloured glazes or varnishes such as Osmo (single coat varnish) or Sikkens (Cetol), no changes occur in, for example, garden furniture, after a year under full exposure to the weather and use. Other qualities achieved with PU based paints, e.g. 1K-PU sealant from RAMPS, which contains UV protection. Depending on the paint quality, a primer coat must be applied first. Brillux Epoxy Primer 855 and acrylic paints provide good support.

#### 2. Use of Phonotherm® 200 indoors:

Higher quality paints may possibly be dispensed with when Phonotherm® 200 is used indoors, as it is not necessary to completely seal the pores and so this is less expensive. However, it must be noted that its use in wet rooms, for example sanitary blocks or bathrooms is the same as outdoor use.

#### 3. Retention of characteristics (surface structure):

The following procedure can be used to retain the characteristics: With a fine grind up to a grain size of 240, the varnish is "washed over" with a sponge or similar and then wiped off to leave a thin coating. After drying, the surface is rubbed down with an abrasive cloth, so that the hard parts (metals, etc.) are clearly shown up. The soft and absorbent areas are coloured by the varnish's pigments. This treatment can be repeated several times to improve the effect.

Wood oils such as Danish Oil or Teak Oil can be used to highlight the colours and structure of the sheets or boards still further, and to maintain the surface.

### Gluing:

General information:

Phonotherm® 200 has an absorbent property, so that an emulsion primer must be used or not, depending on the make of adhesive. The areas to be bonded must be clean and dry. Furthermore, it is necessary to dewax the surface and to keep it free from grease. Old, remnants of glue, whether the same or different, should be removed as far as possible. If the Phonotherm® 200 plate or board has not been ground, the surface must be roughened first.

Only use glues and cleaning agents which do not contain solvents. In general, we recommend that you carry out your own tests with the required glues or bonding agents.

### Gluing to surfaces:

The upper surface must have been abraded and be free of dust, grease and oil. For surface gluing we recommend solvent-free two-component polyurethane adhesives. The adhesive can be applied by hand or machine. The adhesives listed below have already been proven in practice and may be obtained from us. For covering surfaces with Phonotherm® 200 laminates and PVC film/laminate materials of 0.8 mm minimum thickness are suitable. As a rule, we recommend that you carry out your own tests with the adhesives or laminates of your choice (particularly where gluing is with UFR)

Table: Proven surface adhesives

Product:	Density [g/cm <sup>3</sup> ]	Mixing ratio	Hardener	Viscosity [mPa·s]	Density [g/cm <sup>3</sup> ]	Pot life [min]	Shore D hardness	Combined tension and shear resistance [N / mm <sup>2</sup> ]	
								+ 20°C	+ 80°C
COSMOPUR 841	1.56	100:26 BW 3.0:1.0 BV	800	1800	1.48	80	85	22.0	6.5
			805	3000	1.48	40	85	22.0	6.5
COSMOPUR 849	1.44	100:30 BW 2.8:1.0 BV	800	1600	1.38	360	80	16.5	3.5
			805	2000	1.38	260	80	16.5	3.5
COSMOPUR 850	1.47	100:23 BW 3.6:1.0 BV	800	2000	1.42	270	70	18.0	6.0
			805	3000	1.42	240	70	18.0	6.0
COSMOPUR 859	1.47	100:20 BW 4.2:1.0 BV	800	2100	1.42	480	45	6.0	2.5
			805	3100	1.42	440	45	6.0	2.5
COSMOPUR 885	1.60	100:18 BW 4.2:1.0 BV	800	highly viscous/ pasty	1.54	240	55	12.5	3.5
			805		1.54	270	55	12.5	3.5
COSMOPUR 890	1.57	100:15 BW 100:19.5 BV	800	highly viscous/ pasty	1.52	75	60	13.0	5.0
			805		1.52	75	60	13.0	5.0

(BW = By weight, BV = By volume)

### Attention! Important Note:

Above information are based on best present knowledge of current technology, but do not guarantee faultless processing of our products. The information is based on practical results of our tests, but is not binding and does not constitute warranties of characteristics in terms of Federal Supreme Court jurisdiction. Our information does not constitute a legally binding assurance of certain properties or suitability for a specific purpose. Supplementary information by our specialists are merely recommendations, for which no liability is accepted.

Due to the many possible applications of our products, we recommend subjecting the project to a thorough suitability test on original materials before release for further application.

Since our information are non-binding we do not warranty their correctness. For this reason we accept no liability for possible improper processing based on information submitted by our employees.

This technical data sheet replaces all previous versions and is valid until a new version is issued, or until Dec. 31, 2019. Please request the latest version after Jan. 01, 2020.

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