

Processing information  
**Machining**

**DILLIMAX**

## Machining

High strength DILLIMAX is highly suitable for processing due to its exceptional homogeneity as well as its cleanness. Increasing yield strength and plate thickness requires increased amounts of alloy components and careful treatment of the plate.

The information on DILLIMAX machining has been developed in accordance with Dillinger's best knowledge and experience. It is intended to support manufacturers in developing their own processing procedure for DILLIDUR.



Despite their high degree of strength, DILLIMAX steels are easy to machine. However, some basic rules have to be observed when machining these high strength steels. Vibrations should be avoided. It is therefore advisable to work on a machine that is as rigid as possible and to keep the gap between the workpiece and the machine (support) to a minimum. Similarly, it is advisable to fix the workpiece firmly to the workbench. Depending on the type of machining work, sufficient cooling should be ensured. An interruption of the coolant supply or insufficient coolants and lubricants may lead to overheating of the cutting edge which may cause increased tool wear and in extreme cases lead to its breakage.

Please note the relevant information given by the tool manufacturer.

The recommendations given in the following tables for the selection of tools and the machining of DILLIMAX steels are guidelines which may lead to different results for different machines. The validity of these recommendations should be checked by the processing specialist on site.

Detailed information about machining and tool selection can be obtained by consulting tool manufacturers.

## Sawing

When using a band saw to saw high strength DILLIMAX steels we recommend grinding the flame cutting edge 1-2 mm deep in the area to be sawn and sawing the smallest cross-section. Cobalt-alloyed or carbide-tipped saw blades have proved themselves here. Attention should be paid to good cooling.

## Milling

DILLIMAX steels can be machined using tools made of high-speed steel (HSS, TiN, TiCN) and tools with indexable inserts. Please note that flame cutting edges may show a considerably higher degree of hardness. The initial cut should thus be at least 2 mm deep i.e. sufficiently far below the hardened heat-affected zone.

Indexable inserts are sensitive to vibrations. Therefore, all possible measures must be adopted to reduce vibrations e.g. firm clamping of the workpiece. If large surfaces need to be processed it is advisable to machine the plate alternately on both sides since this helps reduce the distortion of the workpiece while milling.

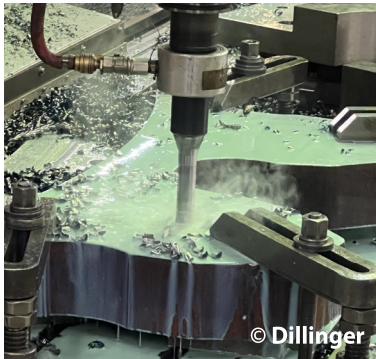
Recommendations for cutting speed and feed rate for face and edge milling

	Tool type (Cutting type)	Cutting speed Vc [m/min]	Feed per Tooth fz [mm]
<b>DILLIMAX 690</b>	Face milling-/ Roughing cutter (FC 220 N) <sup>1)</sup> (HC-P20 + TiN)	130- 190	0.12 - 0.20
<b>DILLIMAX 890</b>	Face milling- /Roughing cutter (FC 220 N) <sup>1)</sup> (HC-P20 + TiN)	130 - 190	0.12 - 0.20
<b>DILLIMAX 965</b>	Face milling- /Roughing cutter (FC 220 N) <sup>1)</sup> (HC-P20 + TiN)	120 – 180	0.10 - 0.18
<b>DILLIMAX 1100</b>	Face milling- /Roughing cutter (FC 220 N) <sup>1)</sup> (HC-P20 + TiN)	120 – 180	0.10 - 0.18

<sup>1)</sup> Without coolant/tubricant



## Drilling



DILLIMAX steels are easy to drill. Suitable tools are cobalt-alloyed HSS twist drills, twist drills with brazed carbide cutting tips, solid carbide twist drills (with internal coolant where appropriate) and drills with indexable inserts. The use of short drills is recommended. For stable drills the feed rate should be set rather higher when machining begins to ensure that the tool engages firmly. This helps reduce vibrations. Before the drill is completely through the material feed should be interrupted briefly. This reduces the tension on both machine and tool and avoids breaking of the cutting edges.

	Tool type (Cutting material)	Cutting speed Vc [m/min]	Feed f [mm/rev.] Depending on diameter [mm]		
			5 - 15	20 - 30	30 - 40
<b>DILLIMAX 690</b>	Cobalt-alloyed HSS- twist drill (TiN, TiCN)	10 - 15	0.05 - 0.15	0.15 - 0.25	0.20 - 0.25
	Drill with indexable inserts	80 - 100	-	0.10 - 0.12	0.12
<b>DILLIMAX 890</b>	Twist drill with brazed carbide cutting or solid carbide twist drill	35 - 50 <sup>1)</sup>	0.05 - 0.15	0.15 - 0.25	0.20 - 0.25
	Cobalt-alloyed HSS- twist drill	8 - 12	0.05 - 0.16	0.20 - 0.25	-
	Drill with indexable inserts	70 - 90	-	0.10 - 0.12	0.12
<b>DILLIMAX 965</b>	Solid carbide heavy duty drill (TiN)	35 - 50 <sup>1)</sup>	0.10 - 0.20	0.15 - 0.25	-
		40 - 70 <sup>2)</sup>			
	Drill with indexable inserts	60 - 80	-	0.10 - 0.12	0.12
<b>DILLIMAX 1100</b>	Solid carbide heavy duty drill (TiN)	35 - 50 <sup>1)</sup>	0.10 - 0.20	0.18 - 0.25	-
		40 - 70 <sup>2)</sup>			
	Drill with indexable inserts	50 - 70	-	0.10	0.10

1) Without internal cooling

2) With internal cooling

## Countersinking

Cylindrical and conical countersinking in high strength DILLIMAX plates can best be performed if the tool has a pilot as this helps avoid vibrations. The use of three edged countersinkers can also help reduce vibrations.

Recommendations for cutting speed and feed rate

	Tool type (Cutting material)	Cutting speed Vc [m/min]	Feed f [mm/rev.] Depending on diameter [mm]	
			15 - 30	30 - 60
<b>DILLIMAX 690</b>	Countersinker made of VHM or Indexable inserts	30 - 40	0.10 - 0.20	0.15 - 0.25
<b>DILLIMAX 890</b>				
<b>DILLIMAX 965</b>				
<b>DILLIMAX 1100</b>				

*Emulsion as coolant/lubricant*

## Tapping

Screw-threads can generally be cut by machine.

Information on selection of tools, cutting speeds and speeds

	Tool type (Cutting material)	Cutting speed Vc [m/min]	Speed f [mm/rev.] Depending on diameter [mm]				
			M10	M16	M20	M30	M42
<b>DILLIMAX 690</b>	Manual or machine tap HSS-Co (HSS, TIN, TICN)	3 - 8	60 - 120	50 - 100	40 - 80	30 - 60	20 - 50
<b>DILLIMAX 890</b>							
<b>DILLIMAX 965</b>							
<b>DILLIMAX 1100</b>							

*Emulsion as coolant/lubricant*



## Disclaimer:

The information and data provided concerning the quality and/or applicability of materials and/or products constitute descriptions only. Any and all promises concerning the presence of specific properties and/or suitability for a particular application shall in all cases be deemed to require separate written agreements.

This information is updated at irregular intervals. The current version is relevant. The latest version is available from the mill or as download at [www.dillinger.de](http://www.dillinger.de).

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