Processing information

Machining

DILLIDUR

Machining

Wear resistant DILLIDUR is highly suitable for processing due to its exceptional homogeneity as well as its cleanness. Increasing hardness and plate thickness requires increased amounts of alloy components and careful treatment of the plate.

The information on DILLIDUR 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.

DILLIDUR steels are very well suited for machining in spite of their high strength and hardness. However, some basic rules must be observed when machining these hardened 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 can lead to overheating of the cutting edge, which can lead to increased wear of the cutting edge and, in extreme cases, to breakage of the tool. Please note the relevant information given by the tool manufacturer.

To minimize maintenance costs and increase the service life of the tools, they should regularly be checked for wear (wear band) and ground.

The recommendations given in the following tables for the selection of tools and the machining of DILLIDUR 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 DILLIDUR steels, we recommend grinding the flame cutting edge 1-2 mm deep in the area to be sawn and sawing the smallest cross-section. In practice, cobalt-alloyed or carbide-tipped saw blades have proved themselves there. We recommend a cutting speed of about 18 m/min with good cooling

DILLINGER

Milling

DILLIDUR steels can be processed with tools made of high-speed steel (HSS, TiN, TiCN-coated) and with tools equipped with indexable inserts. Please note that flame cut edges may show significantly higher hardness values than the rest of the material. Therefore, the first cut should be at least 2 mm deep, i.e. should go far enough below the heat affected zone. To mill DILLIDUR steels, it is advisable to use round inserts.

Experience has shown that this geometry is superior to a planar face milling geometry (with a 45° angle of incidence). The use of indexable inserts with a broad cutting edge chamfer also minimizes wear. Instead of cooling with emulsion, dry machining is recommended in this case. But the use of compressed air or minimal quantity lubrication can lead to further improvements in the service life. 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, as this enables distortion of the workpiece to be avoided.

Recommendations for cutting speed and feed rate for face milling

	Tool type (Cutting type)	Cutting speed Vc [m/min]	Feed per Tooth fz [mm]
DILLIDUR 325 L	Highfeed cutter FFQ4 D080-7-27-12[1)]	110- 130	0.6 - 0.9
DILLIDUR IMPACT	Highfeed cutter FFQ4 D080-7-27-12[1)]	100 - 120	0.1 - 0.17
DILLIDUR 400	Copy milling cutter / (FC 220N)[2)] (HC-P20+TiN)	130 – 150	0.10 – 0.12
DILLIDUR 450	Copy milling cutter / (FC 220N)[2)] (HC-P20+TiN)	100 – 130	0.10 – 0.12
DILLIDUR 500	Copy milling cutter / (FC 220N)[2)] (HC-P20+TiN)	80 – 90	0.10 – 0.12
DILLIDUR 550	Highfeed cutter FFQ4 D080-7-27-12[1)]	100 - 110	0.5 - 0.7
DILLIDUR 600	Highfeed cutter FFQ4 D080-7-27-12[1)]	90 - 100	0.5 - 0.6

[1)] Highfeed cutter FFQ4 D080-7-27-12: d=80mm, number of teeth: 7, without coolant/tubricant
[2)] TwinCut-profile milling cutter: d = 125 mm, number of teeth: z = 8, without coolant/tubricant

Recommendations for cutting speed and feed rate for edge milling

	Tool type (Cutting type)	Cutting speed Vc [m/min]	Feed per Tooth fz [mm]
DILLIDUR 325 L	HM390FTD D080-6-27-15[1)]	150 - 160	0.14 - 0.18
DILLIDUR IMPACT	HM390FTD D080-6-27-15[1)]	120 - 130	0.08 - 0.14
DILLIDUR 400	Roughing cutter/ (FC 220N)[2)] (HC-P20+TiN)	145 – 155	0.13 – 0.15
DILLIDUR 450	Roughing cutter/ / (FC 220N)[2)] (HC-P20+TiN)	100 – 140	0.15 – 0.17
DILLIDUR 500	Roughing cutter/ / (FC 220N)[2)] (HC-P20+TiN)	85 – 95	0.17 – 0.19
DILLIDUR 550	HM390FTD D080-6-27-15[1)]	60 - 80	0.1 - 0.2
DILLIDUR 600	HM390FTD D080-6-27-15[1)]	60 - 75	0.1 - 0.2

[1)] Cutter HM390FTD D080-6-27-15: d = 80 mm, number of teeth: 6, without coolant/tubricant (Tools from Iscar)
[2)] TwinCut roughing cutter: d = 80 mm, number of teeth: z = 6, without coolant/tubricant

Countersinking

Cylindrical and conical countersinking can best be made in hardened plates if the tool has a pilot. This prevents vibrations. The use of three-edged countersinkers can also contribute to a reduction of vibrations.
Recommendations for cutting speed and forward feed

	Tool type (Cutting material)	Cutting speed Vc [m/min]	Feed f [mm/U] depending on diameter [mm]	
			15 – 30	30 – 60
DILLIDUR 325 L	Countersinker made of solid carbide or indexable inserts	30 – 40	0.10 – 0.15	0.15 – 0.25
DILLIDUR Impact		20 - 30	0.10 - 0.15	0.15 - 0.25
DILLIDUR 400		30 – 40	0.10 – 0.15	0.15 – 0.25
DILLIDUR 450		20 – 30	0.10 – 0.15	0.15 – 0.25
DILLIDUR 500		10 - 20	0.10 – 0.15	0.15 – 0.25
DILLIDUR 550		8 - 15	0.10 - 0.15	0.15 - 0.25
DILLIDUR 600		7 - 10	0.10 - 0.15	0.15 - 0.25

Emulsion as coolant/lubricant

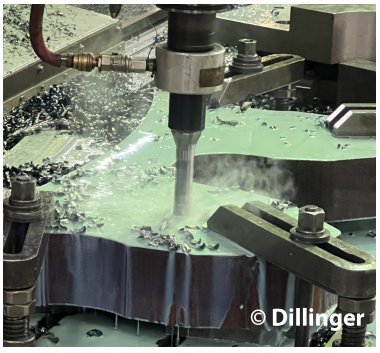
Tapping

Screw threads can generally be tapped by machine.
Information on selection of tools, cutting speeds and speeds

	Tool type (Cutting material)	Cutting speed Vc [m/min]	Speed n [1/min] depending on diameter				
			M10	M16	M20	M30	M42
DILLIDUR 325 L	Manual or machine tap HSS-Co	1.5 – 3.5	50 – 120	40 – 80	30 – 60	20 - 40	15 - 30
DILLIDUR Impact		1.5 – 3.5	50 – 120	40 - 80	30 - 60	20 - 40	15 - 30
DILLIDUR 400		1.5 – 3.5	50 – 120	40 – 80	30 – 60	20 – 40	15 – 30
DILLIDUR 450		1.5 – 3.5	50 – 120	40 – 80	30 – 60	20 – 40	15 – 30
DILLIDUR 500		1.5 – 3.5	50 – 120	40 – 80	30 – 60	20 – 40	15 – 30
DILLIDUR 550		1.5 – 3.5	50 – 120	40 – 80	30 – 60	20 – 40	15 – 30
DILLIDUR 600		1.5 – 3.5	50 – 120	40 – 80	30 – 60	20 – 40	15 – 30

Emulsion as coolant/lubricant

Drilling



DILLIDUR steels are well suited for drilling in spite of their high hardness. Suitable tools are cobalt-alloyed HSS twist drills, twist drills with brazed carbide cuttings, solid carbide twist drills (with internal cooling where appropriate) and drills with indexable inserts. For stable drills, the feed rate should be set rather higher when machining begins to ensure that the tool engages firmly. This helps to reduce vibrations. Before the drill is completely through the material, feed should be interrupted briefly. This reduces the tension on the machine and the tool and avoids breaking of the cutting edges.
Details on the selection of tools, cutting speeds and feed rates can be found in the following Table.

Recommendations for drilling DILLIDUR

	Tool type (Cutting material)	Cutting speed Vc [m/min]	Feed f [mm/rev.] Depending on diameter [mm] 5 – 15	20 – 30	30 – 40
DILLIDUR 325 L	Twist drill with brazed carbide cutting or solid carbide twist drill	8 – 12	0.02 – 0.12	0.10 – 0.20	0.15 – 0.25
	Drill with indexable inserts	90	0.06 – 0.075	0.10 – 0.11	0.11 – 0.12
DILLIDUR IMPACT	Solid carbide heavy duty drill (TIN)	35 – 50[1)]	0.06 – 0.16	0.18 – 0.25	–
		40 – 70[2)]			
	Cobalt-alloyed HSS-Twist drill	4 – 10	0.05 – 0.13	0.18 – 0.25	–
	Drill with indexable inserts	40 – 50	–	0.10	0.10
DILLIDUR 400	Solid carbide heavy duty drill (TIN)	35 – 50[1)]	0.06 – 0.16	0.18 – 0.25	–
		40 – 70[2)]			
	Cobalt-alloyed HSS-Twist drill	8 – 10	0.05 – 0.16	0.20 – 0.25	–
	Drill with indexable inserts	60 – 70	–	0.10 – 0.12	0.12
DILLIDUR 450	Solid carbide heavy duty drill (TIN)	35 – 50[1)]	0.06 – 0.16	0.18 – 0.25	–
		40 – 70[2)]			
	Cobalt-alloyed HSS-Twist drill	6 – 10	0.05 – 0.15	0.20 – 0.25	–
	Drill with indexable inserts	50 – 60	–	0.10 – 0.12	0.11
DILLIDUR 500	Solid carbide heavy duty drill (TIN)	35 – 50[1)]	0.06 – 0.16	0.18 – 0.25	–
		40 – 70[2)]			
	Cobalt-alloyed HSS-Twist drill	4 – 10	0.05 – 0.13	0.18 – 0.25	–
	Drill with indexable inserts	40 – 50	–	0.10	0.10
DILLIDUR 550	Solid carbide heavy duty drill (TIN)	35 – 50[1)]	0.06 – 0.16	0.18 – 0.25	–
		40 – 70[2)]			
	Cobalt-alloyed HSS-Twist drill	4 – 10	0.05 – 0.13	0.18 – 0.25	–
	Drill with indexable inserts	40 – 50	–	0.10	0.10
DILLIDUR 600	Solid carbide heavy duty drill (TIN)	35 – 50[1)]	0.06 – 0.16	0.18 – 0.25	–
		40 – 70[2)]			
	Cobalt-alloyed HSS-Twist drill	4 – 10	0.05 – 0.13	0.18 – 0.25	–
	Drill with indexable inserts	40 – 50	–	0.10	0.10

[1)] without internal cooling
[2)] with internal cooling

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.

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