MAPAL PCD end mills and PCD face milling heads

Perfect for you.

The standard programme of PCD milling tools at a glance

PCD end mills
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PCD end mills

Whether for milling intricate contours from plastic in mould making or large volume cutting of integral aluminium components in the aircraft industry, the new MAPAL PCD end mills from the HP-EndMill series are designed for high performance cutting in the widest range of applications.

PCD face milling cutters
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PCD face milling cutter

High stock removal rates, defined surface uniformity or special requirements for the flat surface of the component - irrespective of what requirements are set for face milling on the tool, MAPAL face milling cutters offer the solution.

End mills – pure performance

End mills with PCD blades are currently still attracting little attention for use on modern machining equipments. The large range of standard end mills in solid carbide is probably the explanation for this. However, it is in this particular area that there are numerous arguments for using PCD end mills. Costly eroding forms, such as those produced from graphite, or large dimensioned integral components for aircraft production, require long tool life and reliability from the milling cutters used.

Particularly highly abrasive materials cause uncontrollable wear on the blades of solid carbide milling cutters. The result is that distortions in geometry occur on forms or the required corner radii are not produced.

It is in these cases that the enormous potential of PCD end mills can be demonstrated.
The recognised advantage of long tool life for PCD cutting material can be directly applied. Time-consuming reworking on formed parts or preparation of sister tools is no longer required. The specifically adapted standard programme of PCD end mills is designed directly for these application areas.

The standard end mill programme
It is the intention with this product series to restrict it to the most important elements. Tables which are hard to follow sometimes stretching over several pages of the catalogue, confuse and cause uncertainty in selecting the appropriate tool.
For MAPAL it is quality and not the quantity which takes centre stage. The standard programme HP-End-Mill is divided into five sections. Milling cutters designed specifically for an application can also be supplied in the shortest possible time.

Symbols for quick reference to find the right end mill:

Type


Single and multi-bladed


Blade over centre


Full radius; blade over centre


Spiral blade arrangement

Coolant


External coolant


Internal coolant

Tool holder

Cylindrical shank

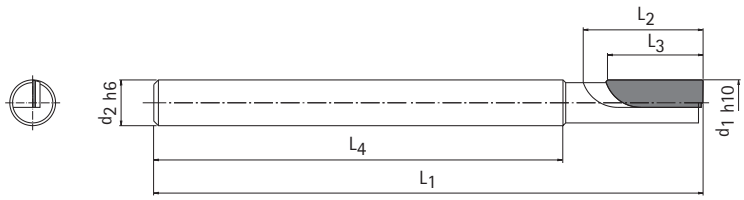

HSK-A

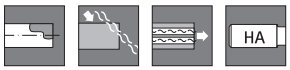

ISO/BT

MAPAL HP-EndMill

Type 50

The smallest PCD milling cutters ø 4 and 5 mm, designed for intricate milling tasks, e.g. in precision mechanics or for manufacturing printed circuit boards.





Design:

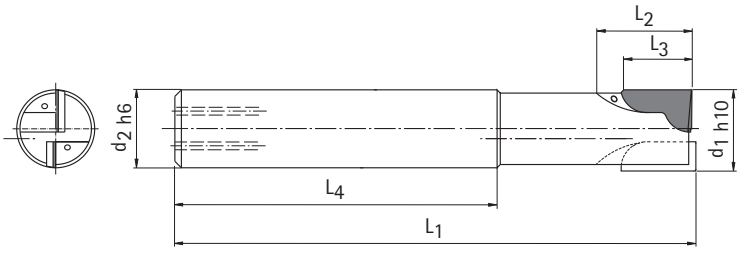
Milling cutter diameter:	4,0 – 5,0 mm
No. of blades:	1 (cutting over centre)
Shank form:	HA (DIN 6536)
Axial angle:	neutral
Coolant supply:	external (standard), internal (on request)

Milling cutter diameter d_1 h10	Shank diameter d_2 h6	Overall length L_1	Chip groove length L_2	Blade length L_3	Shank length L_4	Cutting lead	Axial angle	Order No.	Avail-ability	
4,0	4,0	60	12	10	45	0,1x45°	0°	**7-50041-10**	●	
5,0	5,0	60	13	10	45	0,1x45°	0°	**7-50051-10**	●	

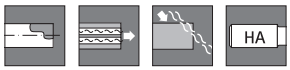
● available ex stock Germany
Dimensions in mm.
Special designs, designs with internal coolant on request.

MAPAL HP-EndMill

Type 51



This series from ø 6 to 12 mm with various cutting edge lengths is the universal genius in the end mill programme. All tools have a blade up to the centre, which means that it can also be used for drilling. The application range extends from contour milling work on GRP and CRP components to slot milling work and deburring on cast aluminium parts.



Design:

Milling cutter diameter:	6,0 – 12,0 mm
No. of blades:	2 (cutting over centre)
Shank form:	HA (DIN 6535)
Axial angle:	neutral, negative or positive
Coolant supply:	internal (standard), external (on request)

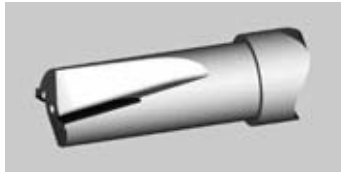
Order example for HP-EndMill
with d_1 = 6,0 mm, blade length L_3 = 10 mm, neutral axial angle , through blade.
Order No.: 7–51061–10

Milling cutter diameter d_1 h10	Shank diameter d_2 h6	Overall length L_1	Chip groove length L_2	Blade length	Shank length L_3	Cutting lead L_4	Axial angle	Order No.	Availability	
6,0	6,0	60	12	10	45	0,1x45°	0°/2°	**7-51061-__***	●	
6,0	6,0	60	17	15	40	0,1x45°	0°/2°	**7-51062-__***	●	
6,0	6,0	80	22	20	55	0,1x45°	0°/2°	**7-51063-__***	●	
8,0	8,0	80	12	10	60	0,1x45°	0°/4°	**7-51081-__***	●	
8,0	8,0	80	18	15	60	0,1x45°	0°/4°	**7-51082-__***	●	
8,0	8,0	80	22	20	50	0,1x45°	0°/4°	**7-51083-__***	●	
10,0	10,0	80	12	10	50	0,1x45°	0°/4°	**7-51101-__***	●	
10,0	10,0	80	18	15	50	0,1x45°	0°/4°	**7-51102-__***	●	
10,0	10,0	80	22	20	50	0,1x45°	0°/4°	**7-51103-__***	●	
12,0	12,0	100	15	10	70	0,1x45°	0°/4°	**7-51121-__***	●	
12,0	12,0	100	20	15	70	0,1x45°	0°/4°	**7-51122-__***	●	
12,0	12,0	100	24	20	70	0,1x45°	0°/4°	**7-51123-__***	●	

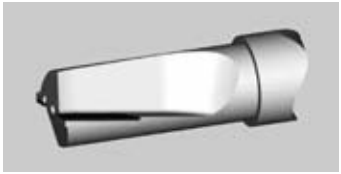
*Order number plus required blade form (see table below and order example).

Blade form	Through blade
Axial angle neutral	**–10**
Axial angle negative	**–20**
Axial angle positive	**–30**

Axial angle neutral



Axial angle negative



Axial angle positive

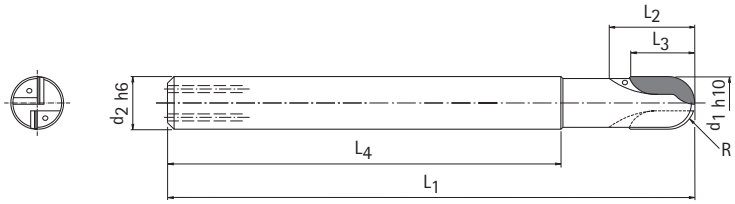
Special designs, designs with external coolant on request.

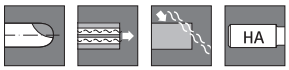
● available ex stock Germany
Dimensions in mm.

MAPAL HP-EndMill

Type 52

Not just of interest to mould makers. These ball-head end mills are characterised by the high accuracy of form of the full radius. The tools with numbers of teeth from Z 1 to Z 2, according to diameter range, are notable for their quiet running – not just in the HSC area.





Design:

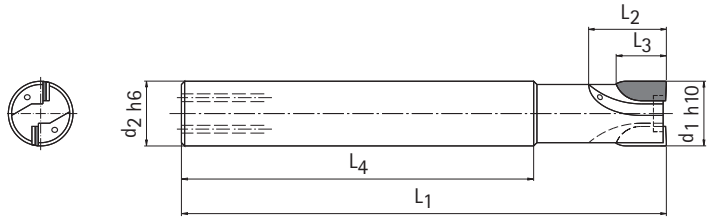
Milling cutter diameter:	4,0 – 10,0 mm
No. of blades:	1 or 2 (cutting over centre, with full radius)
Shank form:	HA (DIN 6535)
Axial angle:	neutral
Coolant supply:	internal (standard), external (on request)

Milling cutter diameter d_1 h10	Shank diameter d_2 h6	Overall length L_1	Chip groove length L_2	Blade length L_3	Shank length L_4	Radius R	Axial angle	No. of blades Z	Order No.	Availability	
4,0	4,0	60	12	10	45	2,0	0°	1	**7-52041-10**	●	
6,0	6,0	80	12	10	65	3,0	0°	1	**7-52061-10**	●	
8,0	8,0	80	12	10	60	4,0	0°	2	**7-52081-10**	●	
10,0	10,0	80	12	10	50	5,0	0°	2	**7-52101-10**	●	

● available ex stock Germany
Dimensions in mm.
Special designs, designs with external coolant on request.

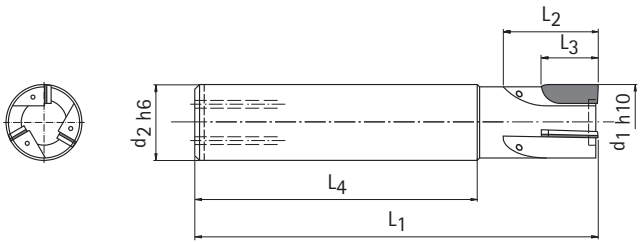
MAPAL HP-EndMill

Type 53

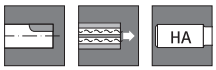


HP-EndMill type 53 – Z 2

The high performance product group in the standard range. Specially designed for high settings and tooth feeds. In principle these tools are designed with internal coolant. Machining of closed pockets is carried out with these milling cutters by plunge milling into the workpiece. This is readily achieved without reducing the feed rate even where there is no central blade.



HP-EndMill type 53 – Z 3



Design:

Milling cutter diameter:	6,0 – 20,0 mm
No. of blades:	2 or 3
Shank form:	HA (DIN 6535)
Axial angle:	positive
Coolant supply:	internal

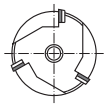
Milling cutter diameter d_1 h10	Shank diameter d_2 h6	Overall length L_1	Chip groove length L_2	Blade length L_3	Shank length L_4	Cutting lead	Axial angle	No. of blades Z	Order No.	Availability	
6,0	8,0	55	10	5	40	R 0,2	2°	2	**7-53065-30**	●	
8,0	8,0	60	12	5	40	R 0,2	4°	2	**7-53085-30**	●	
10,0	10,0	75	12	5	55	R 0,2	4°	2	**7-53105-30**	●	
12,0	12,0	85	12	10	60	R 0,2	6°	2	**7-53121-30**	●	
14,0	16,0	85	12	10	60	R 0,2	6°	3	**7-53141-30**	●	
16,0	16,0	85	12	10	60	R 0,2	6°	3	**7-53161-30**	●	
20,0	20,0	100	12	10	50	R 0,2	6°	3	**7-53201-30**	●	

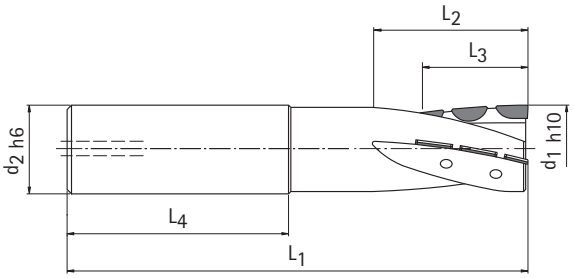
● available ex stock Germany
Dimensions in mm.
Special designs, designs with external coolant on request.

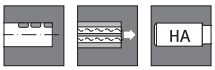
MAPAL HP-EndMill

Type 57

High removal rates in cutting are easily produced with this type of end mill. The spirally arranged rows of blades are best suited to high volume cutting, for example for integral components. The available drive power can then be perfectly applied for cutting large volumes. Closed pockets can also be accessed with this type of milling cutter by plunge milling. A high performance end mill programme with which long tool life can be expected.







Design:

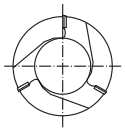
Milling cutter diameter:	16,0 – 25,0 mm
No. of blades:	3
Shank form:	HA (DIN 6535)
Axial angle:	positive
Coolant supply:	internal

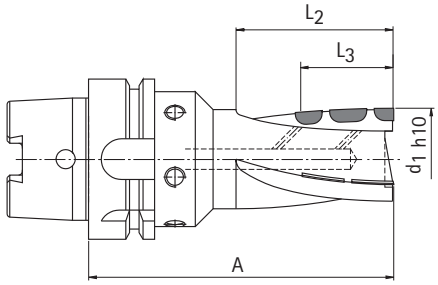
Milling cutter diameter d_1 h10	Shank diameter d_2 h6	Overall length L_1	Chip groove length L_2	Blade length L_3	Shank length L_4	Cutting lead	Axial angle	No. of blades Z	Order No.	Availability	
16,0	16,0	100	50	30	50	0,1x45°	15°	3	**7-57083-00**	●	
20,0	20,0	100	50	30	50	0,1x45°	15°	3	**7-57103-00**	●	
25,0	25,0	110	50	30	50	0,1x45°	15°	3	**7-57123-00**	●	

● available ex stock Germany
Dimensions in mm.
Special designs on request.

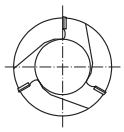
MAPAL HP-EndMill

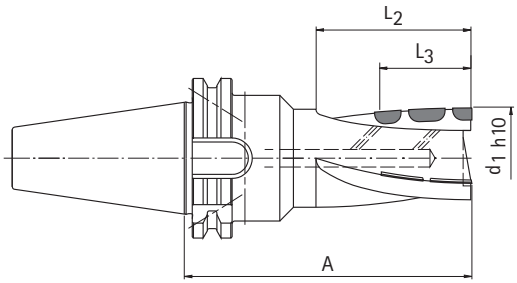
Type 57



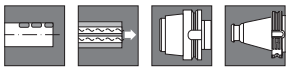


HP-EndMill type 57 – HSK-A 63





HP-EndMill type 57 – ISO 40



Design:

Milling cutter diameter:	32,0 – 63,0 mm
No. of blades:	3 or 4
Shank form:	HSK-A 63, ISO 40 (DIN 69871 AD/B), BT 40
Axial angle:	positive
Coolant supply:	internal

Milling cutter diameter d_1 h10	Dimension A ±0,02	Chip groove length L_2	Blade length L_3	Shank form	Cutting lead	Axial angle	No. of blades Z	Order No.	Avail-ability	
32,0	100	50	30	HSK-A 63	0,1x45°	15°	3	**7-57163-04**	●	
40,0	100	60	40	HSK-A 63	0,1x45°	15°	3	**7-57204-04**	●	
50,0	100	60	40	HSK-A 63	0,1x45°	15°	4	**7-57254-04**	●	
63,0	100	60	40	HSK-A 63	0,1x45°	15°	4	**7-57314-04**	●	
32,0	100	50	30	ISO 40	0,1x45°	15°	3	**7-57163-01**	●	
40,0	100	60	40	ISO 40	0,1x45°	15°	3	**7-57204-01**	●	
50,0	100	60	40	ISO 40	0,1x45°	15°	4	**7-57254-01**	●	
63,0	100	60	40	ISO 40	0,1x45°	15°	4	**7-57314-01**	●	
32,0	100	50	30	BT 40	0,1x45°	15°	3	**7-57163-02**	●	
40,0	100	60	40	BT 40	0,1x45°	15°	3	**7-57204-02**	●	
50,0	100	60	40	BT 40	0,1x45°	15°	4	**7-57254-02**	●	
63,0	100	60	40	BT 40	0,1x45°	15°	4	**7-57314-02**	●	

● available ex stock Germany
Dimensions in mm.
Special designs on request.

From experience – guidelines and cutting values in practice

Material	Cutting speed v_c (m/min)	Feed/tooth f_z (mm)	Cutting depth (mm)
Al < 4%Si	500 – 5,000	0.05 – 0.2	0.1 – 5.0
Al 4–8%Si	500 – 4,000	0.05 – 0.2	0.1 – 5.0
Al 9–13%Si	400 – 3,800	0.05 – 0.2	0.1 – 5.0
Al > 13% Si	250 – 3,000	0.03 – 0.15	0.1 – 3.0
Magnesium alloys	300 – 6,000	0.05 – 0.3	0.1 – 4.0
Copper alloys	300 – 6,000	0.05 – 0.4	0.1 – 3.0
Brass alloys	300 – 5,000	0.05 – 0.25	0.1 – 4.0
Graphite	250 – 2,500	0.05 – 0.2	0.1 – 3.0
GRP - CRP	250 – 4,000	0.08 – 1.0	0.1 – 5.0

For end milling with high chip volume the cutting values are adjusted to the potential performance of the machine. Because of the significantly lower cutting forces with PCD milling cutters compared to solid carbide tools, settings or teeth feed rates can be increased to reach the limits of the machine's performance. Selection of the appropriate setting should of course be made at a sensible level for the task.

Small milling cutter diameters with large settings would be debatable, just as roughing with a tool diameter of 20 mm in conjunction with a low cutting depth. MAPAL specialists are happy to be of assistance with their knowledge and experience in solving special requirements.

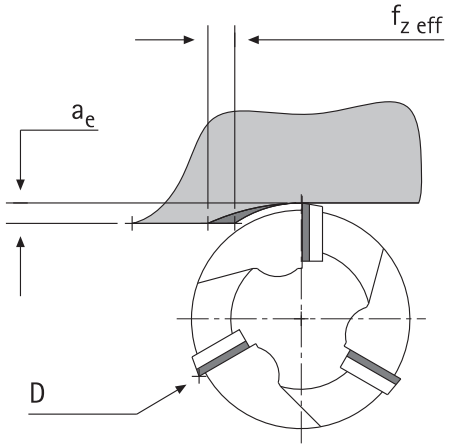
The PCD HP-EndMill is characterised by high multiple cutting performance. Production tolerances of 5 µm for radial and axial run-out ensure the actual multiple cutting performance. Thermal expanding chucks or mechanical pneumatic chucks are the best means of clamping these tools. One further important point for use, particularly under HSC conditions, is balance. Optimum conditions are achieved if the milling cutter and the tool holder are balanced together.

Machining factor	Mathematical symbol used	Unit	Formula
Spindle speed	n	(min^{-1})	$n = \frac{v_c \cdot 1000}{D \cdot \pi}$
Cutting speed	v_c	(m/min)	$v_c = \frac{D \cdot \pi \cdot n}{1000}$
Feed per tooth	f_z	(mm)	$f_z = \frac{v_f}{Z \cdot n} = \frac{f}{Z}$
Feed per revolution	f_u	(mm)	$f = f_z \cdot Z$
Feed rate	v_f	(mm/min)	$v_f = f_z \cdot Z \cdot n$
Chip-to-chip volume	Q	(cm^3/min)	$Q = \frac{a_e \cdot a_p \cdot v_f}{1000}$

a_e	effective cutting width	(mm)
a_p	cutting depth	(mm)
D	tool diameter	(mm)
π	3.14159...	
Z	number of teeth	

Calculation $f_{z\,eff}$ for peripheral milling with small a_e (up to approx. 0.25 x D)

$$f_{z\,eff} = f_z \sqrt{D/a_e}$$



PCD face milling cutters from MAPAL – The perfect standard tools

Simple but sturdy construction combined with the facility to change and adjust milling cartridges at extremely low cost makes this product a classic among PCD tools. Numerous applications provide daily proof of the reliability of the milling head systems.

Logically developed, adapted to the needs of modern cutting, the range of uses stretch from conventional milling operations to high speed cutting. The intelligent directing of the coolant through the tool also allows successful use of minimum quantity lubrication.

Because of the high diversity of geometry in the standard range of milling cutters, the user is always able to use the prefect blade for different component materials. The milling cartridges, which can be set axially to high precision, along with the appropriate tool holder, achieve surface finishes and tool life which speak for themselves.

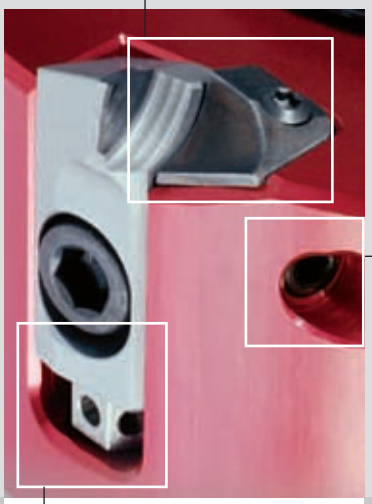
With the PowerMill and EcoMill series, this product family, which is designed to suit every imaginable requirement for face milling operations, is impressive in numerous areas. The components, which are reduced to a sensible minimum, together with the simple but sturdy construction, ensure uncomplicated and extremely fast tool setting. Different numbers of teeth allow the best possible tool to be selected so that maximum economy can be achieved with the milling process.

A low cost 24-hour regrinding service with the PowerMill series or use of replaceable milling cartridges with the EcoMill series offer a choice of two versions.

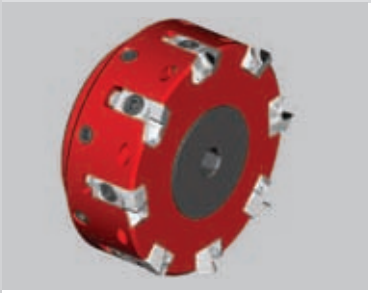
The PowerMill series

The PowerMill series, the classic amongst the milling heads, has been constantly adapted to meet the growing demands of cutting operations. The main difference to the EcoMill series lies in the milling cartridge. With the PowerMill series the milling cartridges are designed with larger PCD blades. In addition to the greater cutting depth up to a maximum of 4 mm, this also allows regrinding. Because of accurate production to fit the aluminium body, the high precision milling cartridge guarantees perfect circular movement of the blades.

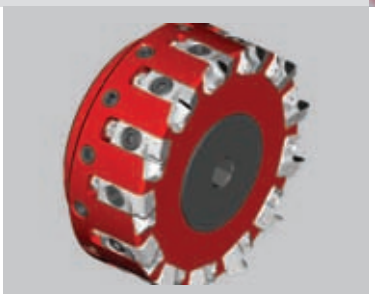
Swarf protection plates
Replaceable swarf protection plates incorporated into the milling head ensure the aluminium body has a long life.



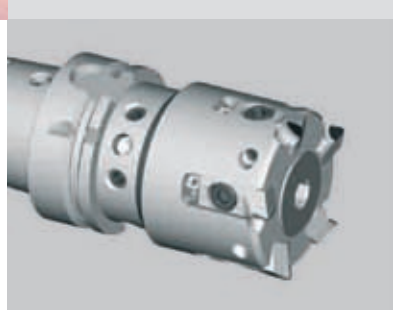
Locking screw
Additional locking screws allow reliable use in HSC operations.



PowerSpeed face milling head



PowerFeed face milling head



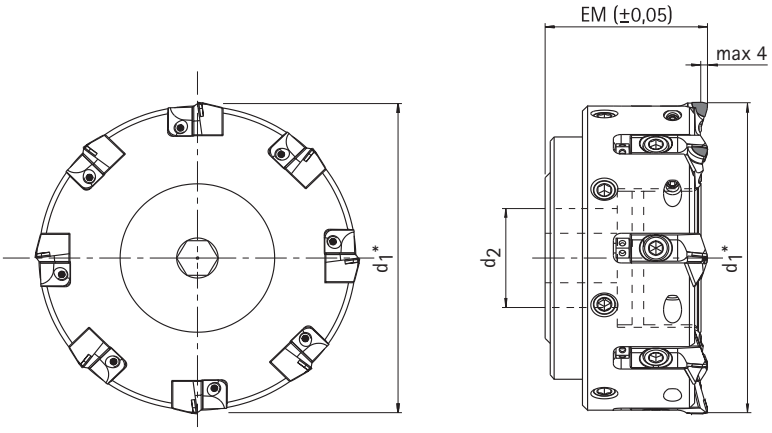
PowerFix face milling cutter

Programme summary and selection guide

	PowerMill series		
	PowerFeed	PowerSpeed	PowerFix
Cutting depth max. 4 mm	•	•	•
High feed rates	•		•
Finish machining on unstable parts		•	
Milling cartridges can be reground	•	•	•
Special milling cartridges possible	•	•	•

Adjustment screw
Easy setting for the milling cartridge is achieved with an adjustment screw which together with the additional locking screw ensures perfect seating for the blade in the tool body. This means there are no problems when used under HSC conditions. The enormously high balancing quality (G2.5 under ISO 1940/1) is achieved by means of lateral balancing screws. A particularly innovative feature is the coolant screw which, in addition to holding the head on the milling arbor, also enables coolant to be passed from the centre.

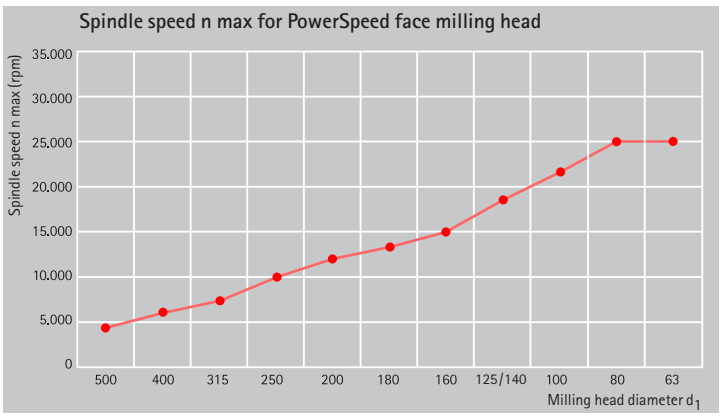
MAPAL face milling head – PowerSpeed



Design:

Milling cutter diameter:	63 – 500 mm
No. of blades:	3 – 30
Coolant supply:	internal

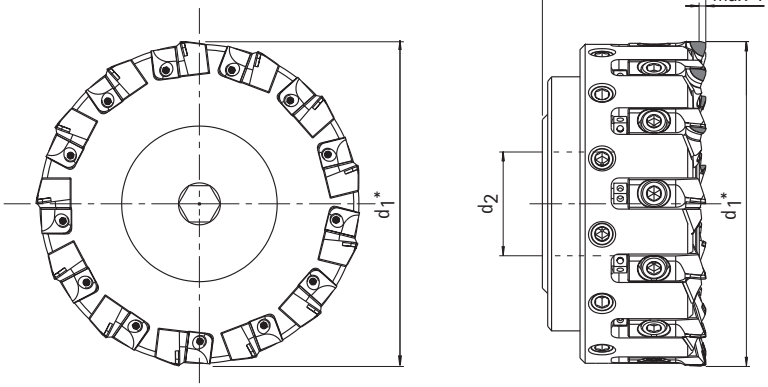
Milling head diameter d_1*	No. of blades Z	Setting dimension EM (±0,05)	Tool holder diameter d_2	Material tool body	Spindle speed n max (rpm)	Weight incl. milling cartridges kg	Order No. tool body R.H.	Avail-ability	
63	3	48	22	Steel	25.000	0,85	**7-01063-01**	●	
63	5	48	22	Steel	25.000	0,80	**7-21063-01**	●	
80	5	50	27	Aluminium	25.000	0,75	**7-01080-01**	●	
80	6	50	27	Aluminium	25.000	0,75	**7-11080-01**	●	
80	7	50	27	Aluminium	25.000	0,80	**7-21080-01**	●	
100	6	50	32	Aluminium	21.650	1,08	**7-01100-01**	●	
100	8	50	32	Aluminium	21.650	1,20	**7-21100-01**	●	
125	8	63	40	Aluminium	18.550	2,20	**7-01125-01**	●	
125	10	63	40	Aluminium	18.550	2,20	**7-21125-01**	●	
125	12	63	40	Aluminium	18.550	2,25	**7-41125-01**	●	
140	10	63	40	Aluminium	18.550	2,40	**7-01140-01**	●	
160	10	63	40	Aluminium	14.990	2,75	**7-01160-01**	●	
160	12	63	40	Aluminium	14.990	2,80	**7-21160-01**	●	
180	10	63	40	Aluminium	13.500	3,40	**7-01180-01**	●	
200	12	63	60	Aluminium	12.200	4,15	**7-012 00-01**	●	
250	15	63	60	Aluminium	9.760	6,70	**7-01250-01**	●	
315	18	80	60	Aluminium	7.750	13,35	**7-01315-01**	●	
400	24	80	60	Aluminium	6.100	21,40	**7-01400-01**	●	
500	30	80	60	Aluminium	4.880	34,50	**7-01500-01**	●	



● available ex stock Germany
● available ex stock Germany within 4 weeks

Dimensions in mm.
*d_1 depends on type of milling cartridge, see page 18.
Supplied as follows: Face milling head with all accessory parts. Milling cartridges and milling cutter arbor not included.
For milling cartridges see page 18.
For accessories and spare parts see page 26.
For milling cutter arbors see page 27 and 28.
L.H. version available on request.

MAPAL face milling head – PowerFeed



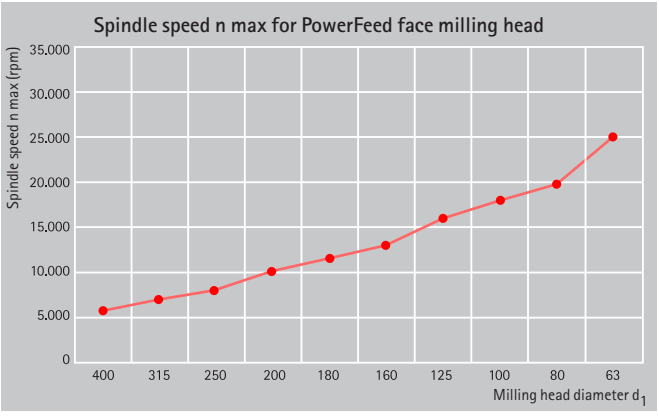
Design:
Milling cutter diameter: 63 – 400 mm
No. of blades: 8 – 50 (standard)
Coolant supply: internal

Milling head diameter d_1*	No. of blades Z	Setting dimension EM (±0,05)	Tool holder diameter d_2	Material tool body	Spindle speed n max (rpm)	Weight incl. milling cartridges kg	Order No. tool body R.H.	Avail-ability	
63	8	48	22	Steel	25.000	0,80	**7-04063-01**	●	
80	8	50	27	Aluminium	20.000	0,75	**7-04080-01**	●	
100	10	50	32	Aluminium	18.000	1,20	**7-04100-01**	●	
125	13	63	40	Aluminium	16.000	2,20	**7-04125-01**	●	
160	18	63	40	Aluminium	13.000	2,15	**7-04160-01**	●	
180	20	63	40	Aluminium	11.500	2,60	**7-04180-01**	●	
200	24	63	60	Aluminium	10.000	4,40	**7-04200-01**	●	
250	30	63	60	Aluminium	8.000	7,00	**7-04250-01**	●	
315	38	80	60	Aluminium	7.000	14,10	**7-04315-01**	●	
400	50	80	60	Aluminium	6.100	22,10	**7-04400-01**	●	

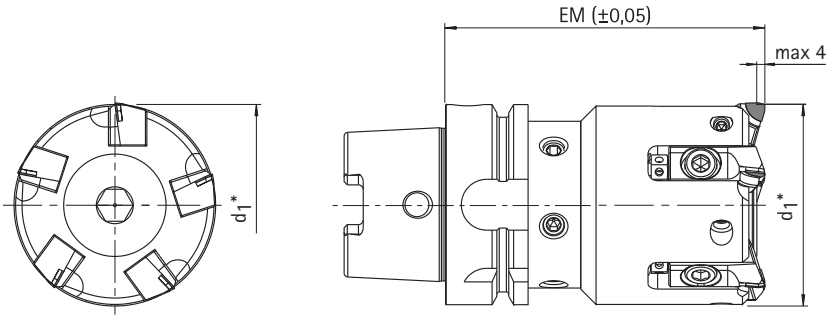
Millling head diameter d_1	No. of teeth Standard version Z	No. of teeth Special design Z	Material tool body
63	8	6	Steel
80	8	max. 10	Aluminium or steel
100	10	max. 15	Aluminium or steel
125	13	max. 20	Aluminium or steel
160	18	max. 28	Aluminium

● available ex stock Germany
● available ex stock Germany within 3 weeks

Dimensions in mm.
*d_1 depends on type of milling cartridge, see page 18.
Supplied as follows: Face milling head with all accessory parts. Milling cartridges and milling cutter arbor not included. For milling cartridges see page 18.
For accessories and spare parts see page 26.
For milling cutter arbors see page 27 and 28.
Special version with greater number of teeth available on request. L.H. version available on request.



MAPAL face milling cutter – PowerFix



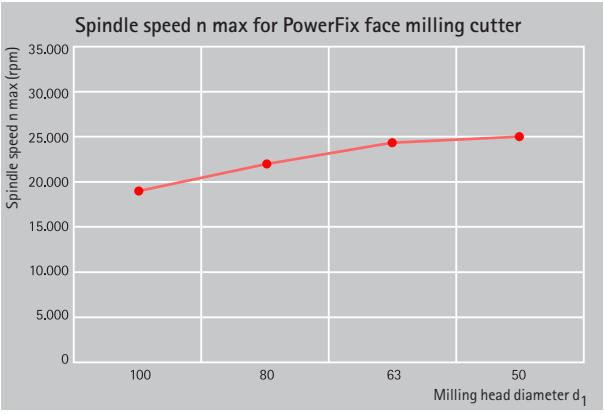
PowerFix face milling cutter – HSK-A 63

Design:

Milling cutter diameter:	50 – 100 mm
No. of blades:	4 – 6 (standard)
Shank form:	HSK-A 63, ISO 40 (DIN 69871 AD/B)
Coolant supply:	internal

Milling head diameter d_1*	No. of blades Z	Setting dimension EM (±0,05)	Shank form	Material tool body	Spindle speed n max (rpm)	Weight incl. milling cartridges kg	Order No. basic body R.H.	Avail-ability	
50	4	100	HSK-A 63	Steel	25.000	1,55 kg	**7-44050-01**	●	
63	5	100	HSK-A 63	Steel	24.360	2,0 kg	**7-54063-01**	●	
80	5	100	HSK-A 63	Steel	22.000	2,65 kg	**7-54080-01**	●	
100	6	100	HSK-A 63	Steel	19.000	3,7 kg	**7-64100-01**	●	
50	4	100	ISO 40	Steel	25.000	1,75 kg	**7-45050-01**	●	
63	5	100	ISO 40	Steel	24.360	2,2 kg	**7-55063-01**	●	

Milling head diameter d_1	No. of teeth Standard version Z	No. of teeth Special design Z	Material tool body
50	4	max. 6	Steel
63	5	max. 8	Steel
80	5	max. 10	Steel
100	6	max. 15	Steel



● available ex stock Germany

Dimensions in mm.
*d_1 depends on type of milling cartridge, see page 18.
Supplied as follows: Face milling head with all accessory parts. Milling cartridges not included.
For milling cartridges see page 18.
For accessories and spare parts see page 26.
Special version with greater no. of teeth available on request. L.H. version available on request.

Milling cartridges for MAPAL face milling heads from the PowerMill series

- Max. cutting depth: 4 mm
- Regrindable

7 – 02 6 1 1 – 0 2

a) Series
b) Type
c) Top rake
d) Blade form
e) Running direction
f) Cutting material

Order sample:	No.
Series PowerMill	7-02
Type corner blade	6
Top rake 6°	1
Blade form ≤ 5 µm	1
Running direction R.H.	0
Cutting material PCD	2

Order number: 7-02611-02

a) Series

No.	Series
02	PowerMill

b) Type

No.	Type
6	Corner blade
7	Facing blade
8	Wide face milling blade
9	PT blade[1)]

c) Top rake

No.	Top rake
1	6°
2	3°
3	0°

d) Blade form

No.	Type No. 6 (corner blade) Type No. 7 (facing blade) Required R_z value (on part)	Type No. 8 (wide face milling blade) Radius	Type No. 9 (PT blade) Required R_z value (on part)
1	≤ 5 µm	•	≤ 5 µm
2	≤ 10 µm		
3	≤ 20 µm		
4	> 20 µm		

e) Running direction

No.	Running direction
0	R.H.
1	L.H.

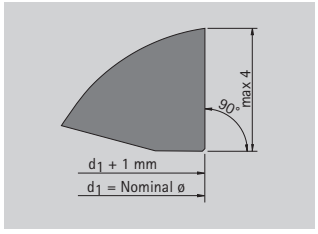
f) Cutting material

No.	Cutting material
2	PCD
5	carbide

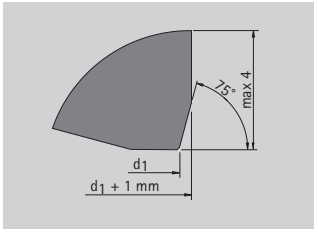
Order No.	Material-group	Type	Cutting material	Avail-ability	
7-026..-..*	25	No. 6 Corner blade	PCD	●	
7-027..-..*	25	No. 7 Facing blade	PCD	●	
7-028..-..*	25	No. 8 Wide face milling blade	PCD	●	
7-029..-..*	25	No. 9 PT blade	PCD	●	
7-026..-..*	25	No. 6 Corner blade	Carbide	●	
7-027..-..*	25	No. 7 Facing blade	Carbide	●	
7-028..-..*	25	No. 8 Wide face milling blade	Carbide	●	
7-029..-..*	25	No. 9 PT blade	Carbide	●	

Order number plus no. for top rake, blade form, running direction and cutting material (see order example).

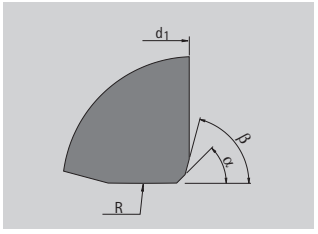
Milling cartridges



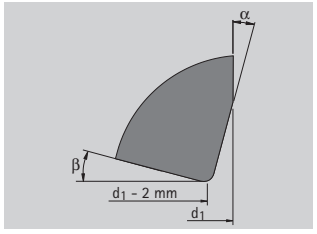
Type No. 6 Corner blade



Type No. 7 Facing blade



Type No. 8 Wide face milling blade



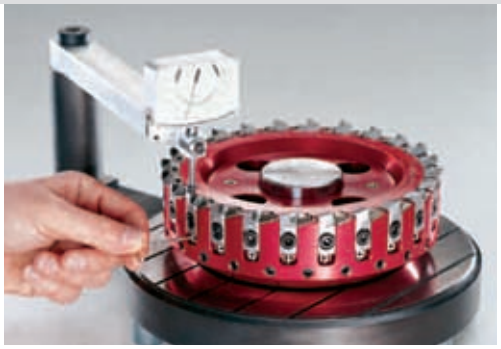
Type No. 9 PT blade

Special designs available on request.
● available ex stock Germany
● available ex stock Germany within 3 weeks
[1)]PT blade: Only top rake No. 3 (0°) can be selected

Face milling heads PowerMill – easy handling for high precision results

The efficiency of a milling head system is not just demonstrated by the classic assessment factors. Cutting results, tool life or surface finish achieved and even tool planning are of prime importance. A further important factor for a successful system, however, is handling. A minimum of extremely simple hand movements must be achieved to prepare the milling head at the tool setting stage for use on the machine. It is not unusual, particularly in large companies, to also recondition the face milling heads at the end of their life within the customer's own tool management system. A decisive factor here is that high precision blade setting can be carried out with the least possible amount of work. It is only in this way that reliable batch production can be obtained even with reground milling cartridges.

Fine adjustment with adjusting screw



- Locate the face milling head in the setting fixture
- Fit the milling cartridge on the tool body using holding screws
- Pre-adjust the milling cartridge with adjusting screws

- Tighten holding screws with 14 Nm

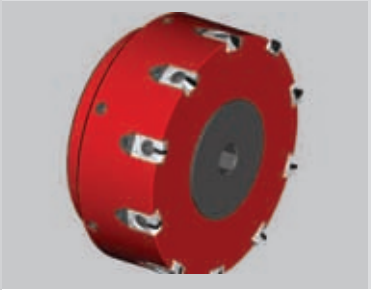
- Finely adjust the milling cartridge with adjusting screw

With the PowerMill series fine adjustment is carried out after the milling cartridge has been finally fitted and the appropriate torque applied. The adjustment screws which have been specially developed for this series allow the blades to be perfectly adjusted. The design of the milling cartridge allows an adjustment range of at least 1 mm.

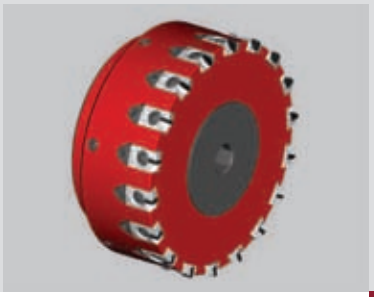
The EcoMill series

The EcoMill series, with the EcoSpeed, EcoFeed and EcoFix systems, represent a new dimension in face milling for HSC operations. The series includes numerous innovations. By using replaceable milling cartridges the reduction in logistics costs from handling is impressive, likewise the positioning of the milling blade in the aluminium tool body. Centrifugal forces which occur during machining are compensated for by a precision dovetail guide.

The new arrangement of the milling blades with integral swarf protection plate clearly increases the life of the milling cutter body. Perfect surface finish is achieved with this milling cutter as a result of the sensitive and effective wedge adjustment on the blades in the Z direction. Mainly designed for finishing operations, this milling head is notable for extremely quiet running which it easily achieves despite the high feed rates.



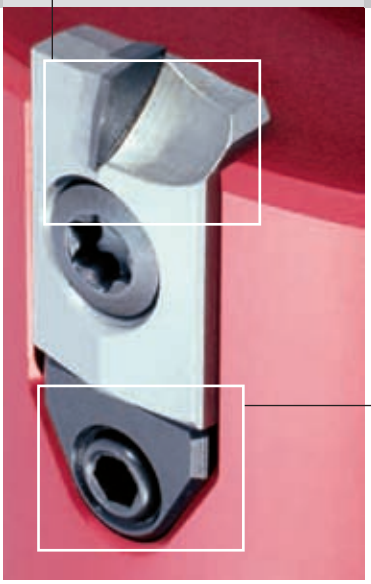
EcoSpeed face milling head



EcoFeed face milling head

Swarf protection plates
The new arrangement of the milling blades with integral swarf protection plate clearly increases the life of the milling cutter body.

EcoFix face milling cutter

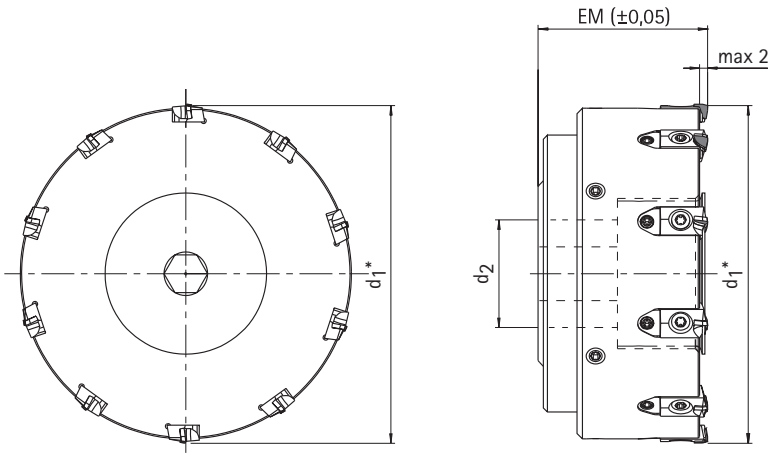


Setting
Sensitive wedge adjustment allows the blades to be set with maximum precision for axial running.

Programme summary and selection guide

	EcoMill series		
	EcoFeed	EcoSpeed	EcoFix
Cutting depth max. 2 mm	•	•	•
High feed rates	•		•
Finish machining on unstable parts		•	•
Replaceable milling cartridges	•	•	•

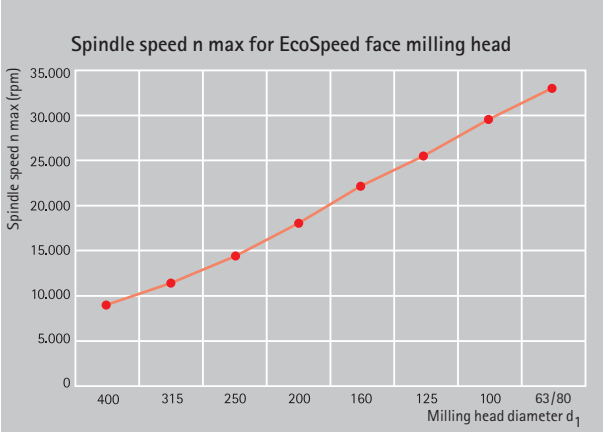
MAPAL face milling head – EcoSpeed



Design:

Milling cutter diameter:	63 – 400 mm
No. of blades:	5 – 28
Coolant supply:	internal

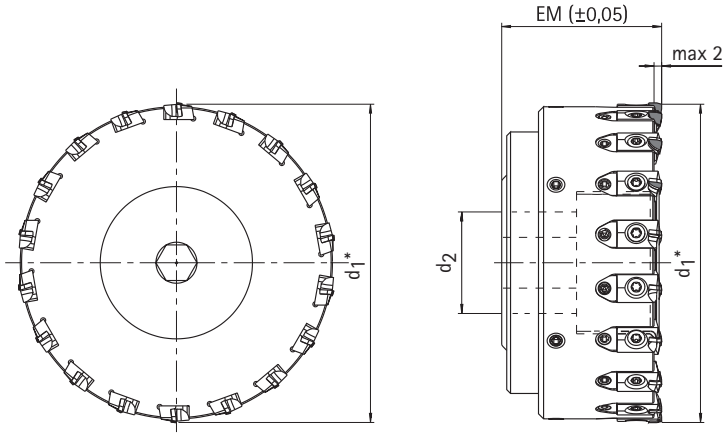
Milling head diameter d_1*	No. of blades Z	Setting dimension EM (±0,05)	Tool holder diameter d_2	Material tool body	Spindle speed n max (rpm)	Weight incl. milling cartridges kg	Order No. tool body R.H.	Avail-ability	
63	5	48	22	Aluminium	33.000	0,40	**7-05063-01**	●	
80	6	50	27	Aluminium	33.000	0,70	**7-05080-01**	●	
100	8	50	32	Aluminium	29.500	1,10	**7-05100-01**	●	
125	10	63	40	Aluminium	25.500	2,20	**7-05125-01**	●	
160	12	63	40	Aluminium	22.200	2,80	**7-05160-01**	●	
200	16	63	60	Aluminium	18.100	4,20	**7-05200-01**	●	
250	20	63	60	Aluminium	14.500	6,70	**7-05250-01**	●	
315	24	80	60	Aluminium	11.500	12,90	**7-05315-01**	●	
400	28	80	60	Aluminium	9.000	21,30	**7-05400-01**	●	



● available ex stock Germany
● available ex stock Germany within 3 weeks

Dimensions in mm.
*d_1 depends on type of milling cartridge, see page 24.
Supplied as follows: Face milling head with all accessory parts.
Milling cartridges and milling cutter arbor not included.
For milling cartridges see page 24.
For accessories and spare parts see page 26.
For milling cutter arbors see page 27 and 28.
Special designs on request.

MAPAL face milling head – EcoFeed

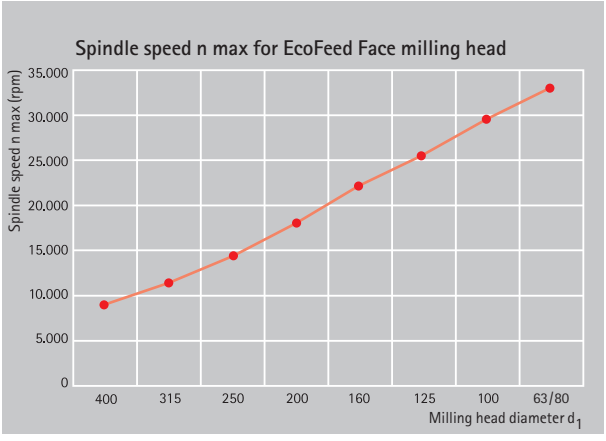


Design:
Milling cutter diameter: 63 – 400 mm
No. of blades: 8 – 58 (standard)
Coolant supply: internal

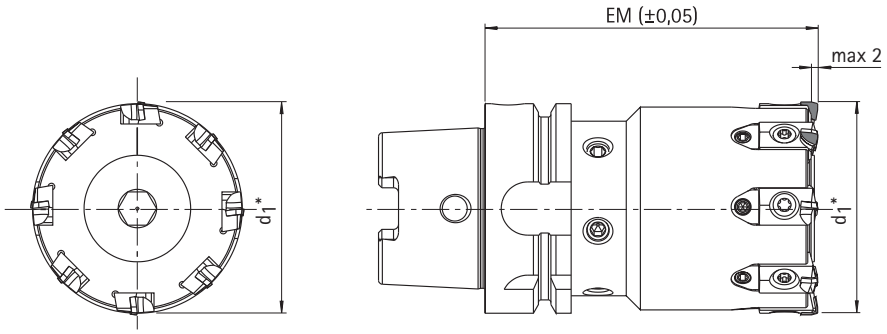
Milling head diameter d_1*	No. of blades Z	Setting dimension EM (±0,05)	Tool holder diameter d_2	Material tool body	Spindle speed n max (rpm)	Weight incl. milling cartridges kg	Order No. tool body R.H.	Avail-ability	
63	8	48	22	Aluminium	33.000	0,42	**7-06063-01**	●	
80	10	50	27	Aluminium	33.000	0,75	**7-06080-01**	●	
100	14	50	32	Aluminium	29.500	1,20	**7-06100-01**	●	
125	18	63	40	Aluminium	25.500	2,20	**7-06125-01**	●	
160	24	63	40	Aluminium	22.200	2,80	**7-06160-01**	●	
200	28	63	60	Aluminium	18.100	4,30	**7-06200-01**	●	
250	36	63	60	Aluminium	14.500	6,80	**7-06250-01**	●	
315	46	80	60	Aluminium	11.500	13,00	**7-06315-01**	●	
400	58	80	60	Aluminium	9.000	21,60	**7-06400-01**	●	

● available ex stock Germany
● available ex stock Germany within 3 weeks

Dimensions in mm.
*d_1 depends on type of milling cartridge, see page 24.
Supplied as follows: Face milling head with all accessory parts.
Milling cartridges and milling cutter arbor not included.
For milling cartridges see page 24.
For accessories and spare parts see page 26.
For milling cutter arbors see page 27 and 28.
Special version with greater number of teeth available on request.



MAPAL face milling cutter – EcoFix

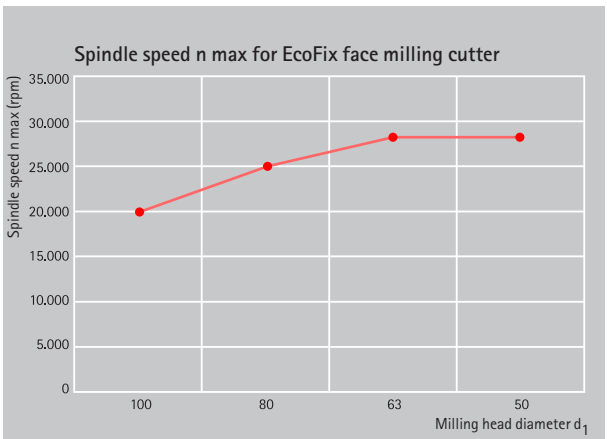


EcoFix face milling cutter – HSK-A 63

Design:

Milling cutter diameter:	50 – 100 mm
No. of blades:	6 – 14 (standard)
Shank form:	HSK-A 63, ISO 40 (DIN 69871 AD/B)
Coolant supply:	internal

Milling head diameter d_1*	No. of blades Z	Setting dimension EM (±0,05)	Shank form	Material tool body	Spindle speed n max (rpm)	Weight incl. milling cartridges kg	Order No. tool body R.H.	Avail-ability	
50	6	100	HSK-A 63	Steel	27.000	1,50	**7-08050-04**	●	
63	8	100	HSK-A 63	Steel	27.000	1,85	**7-08063-04**	●	
80	10	100	HSK-A 63	Steel	25.000	2,50	**7-08080-04**	●	
100	14	100	HSK-A 63	Steel	20.000	3,55	**7-08100-04**	●	
50	6	100	SK 40	Steel	27.000	1,65	**7-08050-05**	●	
63	8	100	SK 40	Steel	27.000	2,05	**7-08063-05**	●	



● available ex stock Germany

Dimensions given in mm.
*d_1 depends on type of milling cartridge, see page 24.
Supplied as follows: Face milling head with all accessory parts.
Milling cartridges not included.
For milling cartridges see page 24.
For accessories and spare parts see page 26.
Special version with greater number of teeth available on request.

Milling cartridges for MAPAL face milling heads from the EcoMill series

- Max. cutting depth: 2 mm
- Replaceable

7 – 07 7 1 2 – 0 2

a) Series
b) Type
c) Top rake
d) Blade form
e) Running direction
f) Cutting material

Order example:	No.
Series EcoMill	7-07
Type corner blade	7
Top rake 6°	1
Blade form ≤ 5 µm	2
Running direction R.H.	0
Cutting material PCD	2

Order number: 7-07712-02

a) Series

No.	Series
07	EcoMill

b) Type

No.	Type
6	Corner blade
7	Facing blade
8	Wide face milling blade
9	PT blade[1)]

c) Top rake

No.	Top rake
1	6°
2	3°
3	0°

d) Blade form

No.	Type No. 6 (corner blade) Type No. 7 (facing blade) Required R_z value (on part)	Type No. 8 (wide face milling blade) Radius	Type No. 9 (PT blade) Required R_z value (on part)
1	≤ 5 µm	•	≤ 5 µm
2	≤ 10 µm		
3	≤ 20 µm		
4	> 20 µm		

e) Running direction

No.	Running direction
0	R.H

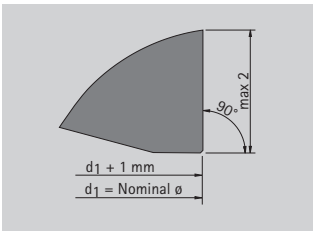
f) Cutting material

No.	Cutting material
2	PCD
5	carbide

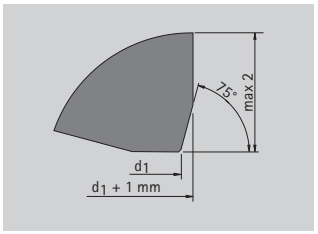
Order No.	Material-group	Type	Cutting material	Avail-ability	
7-076..-..*	WG	No. 6 Corner blade	PCD	●	
7-077..-..*	WG	No. 7 Facing blade	PCD	●	
7-078..-..*	WG	No. 8 Wide face milling blade	PCD	●	
7-079..-..*	WG	No. 9 PT blade	PCD	●	
7-076..-..*	WG	No. 6 Corner blade	Carbide	●	
7-077..-..*	WG	No. 7 Facing blade	Carbide	●	
7-078..-..*	WG	No. 8 Wide face milling blade	Carbide	●	
7-079..-..*	WG	No. 9 PT blade	Carbide	●	

* Order number plus no. for top rake, blade form, running direction and cutting material (see order example).

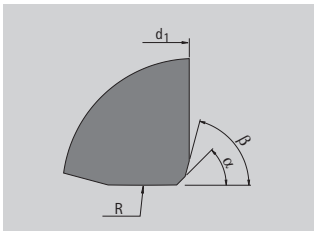
Milling cartridges



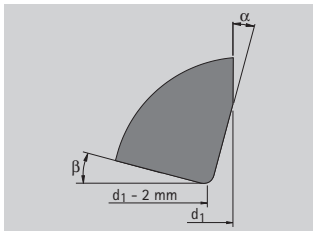
Type No. 6 Corner blade



Type No. 7 Facing blade



Type No. 8 Wide face milling blade



Type No. 9 PT blade

● available ex stock Germany
● available ex stock Germany within 3 weeks
[1)]PT blade: Only top rake No. 3 (0°) can be selected

Face milling heads EcoMill – high precision fine adjustment

The basis for perfect finish machining of a milled surface is the exact axial setting of all the blades to maximum precision. This factor was given particular attention when designing the PowerMill and EcoMill series. While with conventional face milling cutters, whose technology is often based on clamped blades, these have to be positioned in 3 planes in relation to each other, here setting in one direction is quite sufficient.

A decisive factor for this is the precision with which the milling tool body and also the milling cartridges are manufactured. Costly setting devices, time-consuming setting procedures and expensive setting equipment are not required. One setting fixture, whose construction is designed for the primary requirement, plus a precision indicator, is quite sufficient.

Setting with wedge adjustment

- Position face milling head in setting fixture
- Fit milling cartridge with holding screw onto tool body
- Adjust milling cartridge roughly with adjusting screw

- Tighten holding screw at 8 Nm

- Finely adjust milling cartridge with adjusting wedge

Based on this technology, a new type of wedge adjustment was developed for the EcoMill series. Here the adjusting element has a wedge-shaped surface which lies directly against the milling cartridge. By turning the right-hand and left-hand threaded spindle the axial run-out can be effortlessly set within the required high-precision range. Combined with the easy handling, the accuracy to be achieved surpasses all the previous results.

Accessories and spare parts for MAPAL face milling heads

Description	for face milling heads PowerSpeed PowerFeed	PowerFix	EcoSpeed EcoFeed	EcoFix	for milling head diameter d_1	Dimensions	Weight	Order No.	Availability
Coolant screw		•		•	50		23,6 g	7-03008-00	●
Coolant screw	•	•	•	•	63		82,3 g	7-03008-01	●
Coolant screw	•	•	•	•	80		176,2 g	7-03008-02	●
Coolant screw	•	•	•	•	100		263 g	7-03008-03	●
Coolant screw	•		•		125 and 140		595 g	7-03008-04	●
Coolant cover	•		•		160 and 180		0,2 kg	7-03009-01	●
Coolant cover	•		•		200		0,5 kg	7-03009-02	●
Coolant cover	•		•		250		0,7 kg	7-03009-03	●
Coolant cover	•		•		315		1,3 kg	7-03009-04	●
Coolant cover	•		•		400		2,3 kg	7-03009-05	●
Coolant cover	•				500		4,6 kg	7-03009-06	●
Holding screw	•		•		160 to 500	M6x20	4,3 g	7-03001-04	●
Insert nut	•		•		[1]	M6x8	2,3 g	7-03009-11	●
Insert nut			•		63 to 400	M5x10	1,9 g	7-03009-12	●
Shim adjuster	•	•			50 to 500	0,25	0,5 g	7-03004-00	●
Shim adjuster	•	•			50 to 500	0,5	0,9 g	7-03004-01	●
Shim adjuster	•	•			50 to 500	1,0	2,0 g	7-03004-02	●
Shim adjuster	•	•			50 to 500	1,5	3,0 g	7-03004-03	●
Shim adjuster	•	•			50 to 500	2,0	4,0 g	7-03004-04	●
Balancing screw	•	•	•	•	80 to 160	M6x10	1,4 g	7-03007-01	●
Balancing screw	•		•		200 to 500	M10x10	2,7 g	7-03007-02	●
Balancing screw	•	•	•	•	[2]	M8x10	2,2 g	7-03007-03	●
For milling cartridges									
Holding screw			•	•	63 to 400	M5x11 (Torx)	1,3 g	7-03002-03	●
Threaded spindle			•	•	63 to 400	M5x0,5LH/RHx17	1,9 g	7-03002-04	●
Adjustment wedge			•	•	63 to 400		1,6 g	7-03002-05	●
Holding screw	•	•			50 to 500	M6x12	5 g	7-03001-01	●
Holding screw	•	•			50 to 60	M6x12 (flat head)	3,9 g	7-03001-03	●
Adjusting screw	•	•			50 to 500	M5x8	2,5 g	7-03002-01	●
Locking screw	•[3]	•			50 to 500	M6x12	1,6 g	7-03003-03	●
For swarf protection plate									
Swarf protection plate (R.H.)	•				63 to 500		1,4 g	7-03005-01	●
Swarf protection plate (L.H.)	•				63 to 500		1,4 g	7-03005-02	●
Torx screw	•				63 to 500	M3x7	0,3 g	7-03006-01	●
For milling cutter arbor									
Holding screw	•		•		160	M12x40	46 g	7-03001-05	●
Holding screw	•		•		200 to 500	M16x50	104 g	7-03001-06	●
Holding screw[4]	•		•		315 to 500	M20x55	150 g	7-03001-07	●

Dimensions in mm.

[1] 80 to 500 (PowerSpeed and PowerFeed), 160 to 400 (EcoSpeed and EcoFeed)

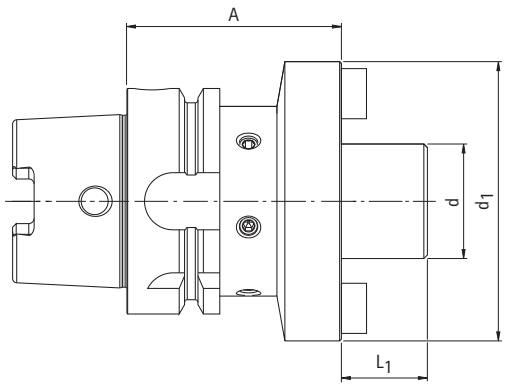
[2] for special milling heads

[3] for PowerSpeed only

[4] on external hole circle only

● available ex stock Germany

● available ex stock Germany within 2 weeks



Milling cutter arbors to DIN 69882-3

Location shank HSK-A to DIN 69893-1

Nominal size	Dimensions				Weight	Code	Order No.	Avail-ability	
HSK-A	d	d_1	A	L_1	kg				
63	22	50	50	19	1,1	MN5050-58-K	10066802	●	
63	27	60	60	21	1,3	MN5051-58-K	10066803	●	
63	32	78	60	24	1,4	MN5052-58-K	10066804	●	
63*	40	89	60	27	1,9	MN5053-58-K	10066805	●	
63*	60**	140	70	27	4,2	MN5055-58-K	10067153	●	
80	22	50	50	19	2,3	MN5050-59-K	10066806	●	
80	27	60	50	21	2,5	MN5051-59-K	10066808	●	
80	32	78	60	24	2,6	MN5052-59-K	10066810	●	
80*	40	89	60	27	3,6	MN5053-59-K	10066811	●	
100	22	50	50	19	2,5	MN5050-60-K	10066812	●	
100	27	60	50	21	2,7	MN5051-60-K	10066813	●	
100	32	78	50	24	2,8	MN5052-60-K	10066814	●	
100*	40	89	60	27	3,8	MN5053-60-K	10066815	●	
100*	60	140	70	40	5,5	MN5055-60-K	10066817	●	

Spare parts

Key block

Arbor diameter d	Code	Order No.	Avail-ability	
22	MT1013-01	10005640	●	
27	MT1215-01	10005165	●	
32	MT1422-01	10004063	●	
40	MT1623-01	10004064	●	
60	MT2625-01	10010103	●	

Holding screw ISO 4762 for key block

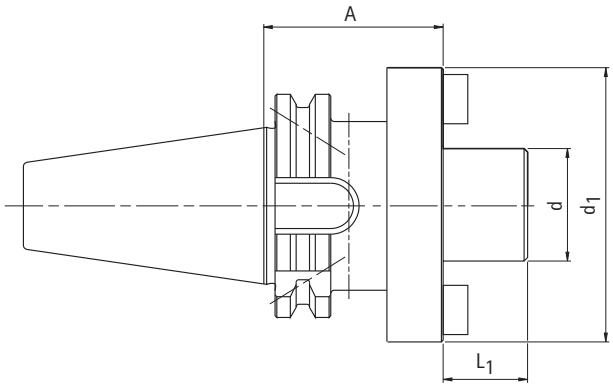
Arbor diameter d	Dimensions	Order No.	Avail-ability	
22	M4x10	10003583	●	
27	M4x16	10003586	●	
32	M5x16	10003601	●	
40	M12x25	10003675	●	

● available ex stock Germany
● available ex stock Germany within 2 weeks

Dimensions in mm.
Supplied as follows: with key blocks screwed on, coolant screw not included (coolant screw is included with supply of face milling head).
Design: permissible concentricity variation of hollow taper shank to arbor d = 0.01 mm. With 6 balancing bores on periphery.
Note: Sizes marked with * have an additional 4 threaded holes for cutting heads with tool holding to DIN 2079.
**d 60 mm with nominal size HSK-A 63: max. milling head diameter D 250 mm, no balancing holes on periphery.

Milling cutter arbors

ISO location shank to DIN 69871 AD/B



Nominal size ISO	Dimensions d	d_1	A	L_1	Weight kg	Code	Order No.	Availability	
40	22	50	35	19	1,05	MN1180-52	**10066837**	●	
40	27	50	35	21	1,1	MN1181-52	**10066838**	●	
40	32	78	50	24	1,65	MN1182-52	**10066839**	●	
40*	40	89	50	27	1,85	MN1183-52	**10066840**	●	
40*	60**	140	70	27	4,3	MN1185-52	**10011328**	○	

Spare parts

Kode Block

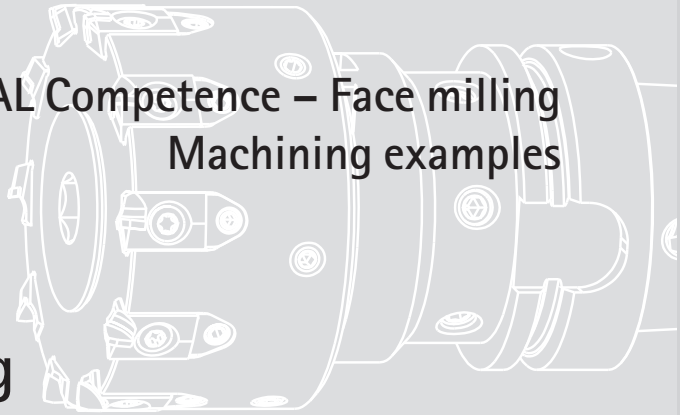
Arbor diameter d	Code	Order No.	Availability	
22	MT1013-01	**10005640**	●	
27	MT1215-01	**10005165**	●	
32	MT1422-01	**10004063**	●	
40	MT1623-01	**10004064**	●	
60	MT2625-01	**10010103**	●	

Holding screw ISO 4762 for key block

Arbor diameter d	Code	Order No.	Availability	
22	M4x10	**10003583**	●	
27	M4x16	**10003586**	●	
32	M5x16	**10003601**	●	
40	M12x25	**10003675**	●	

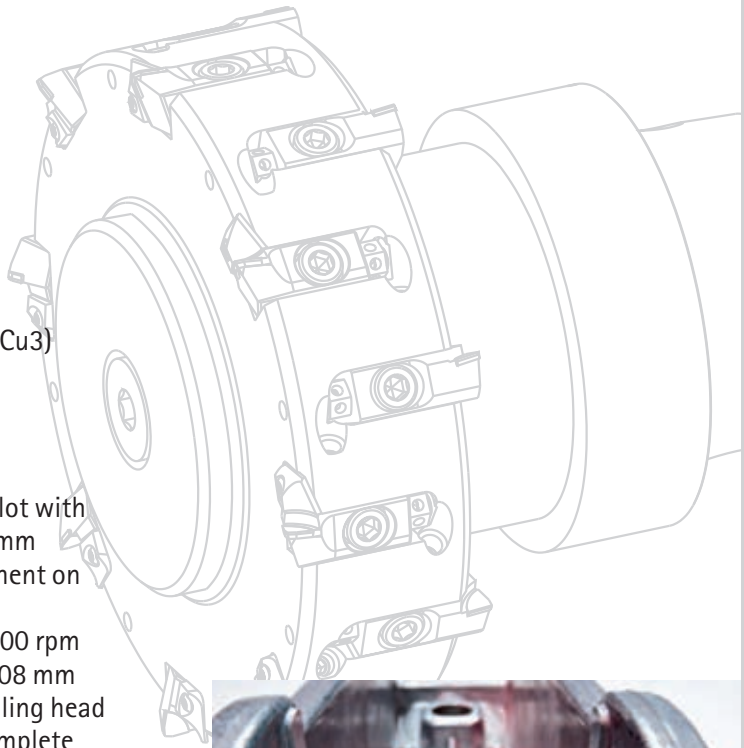
● available ex stock Germany
● available ex stock Germany within 2 weeks
○ available on request

Dimensions in mm.
Supplied as follows: with key blocks screwed on, coolant screw not included (coolant screw is included with supply of face milling head).
Design: permissible concentricity variation of ISO shank to arbor d = 0.01 mm.
Note: Sizes marked with * have an additional 4 threaded holes for cutting heads with tool holding to DIN 2079.
**d 60 mm: max. milling head diameter D 250 mm.



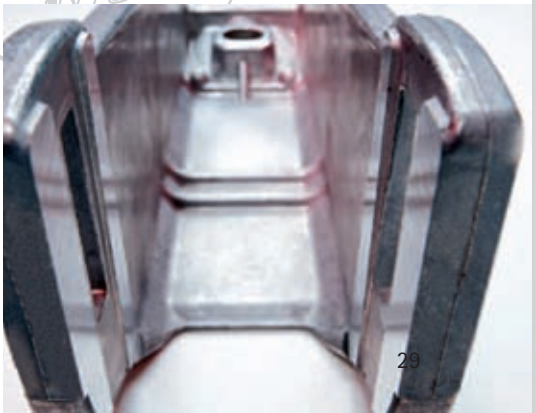
Hydraulic housing

Material:	• Cast iron (GG 25)
Tool:	• MAPAL facing head EcoFeed Z 10
	• D 80 mm
Cutting material:	• PCBN
Requirement:	• Surface quality for lateral seal surfaces R_a = 0.8 µm
Result:	• Surface quality R_a = 0.32 – 0.53 µm
	• Tool life 2,000 parts
Machining values:	• Spindle speed n = 2,800 rpm
	• Feed per tooth f_z = 0.05 mm
Special feature:	• As much as 13 times longer tool life compared to conventional face milling head

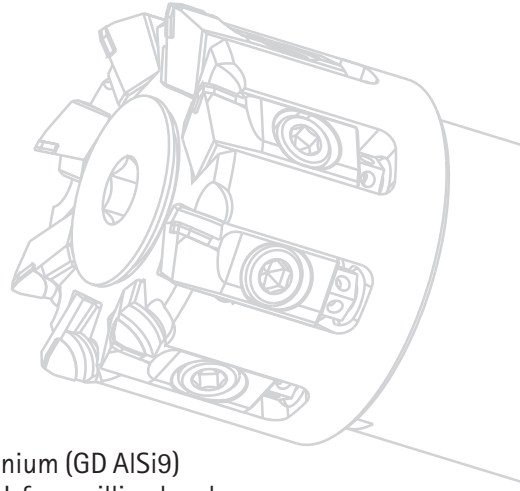


Console

Material:	• Aluminium (GD AlSi9Cu3)
Tool:	• MAPAL facing head PowerSpeed Z 8+8
	• D 250 mm
Cutting material:	• PCD
Requirement:	• Milling of a bearing slot with a width of $50.35^{\pm 0.02}$ mm
	• Machining of component on both edges
Machining values:	• Spindle speed n = 8,000 rpm
	• Feed per tooth f_z = 0.08 mm
Special feature:	• Double sided face milling head with Z 8+8 allows complete machining in one pass

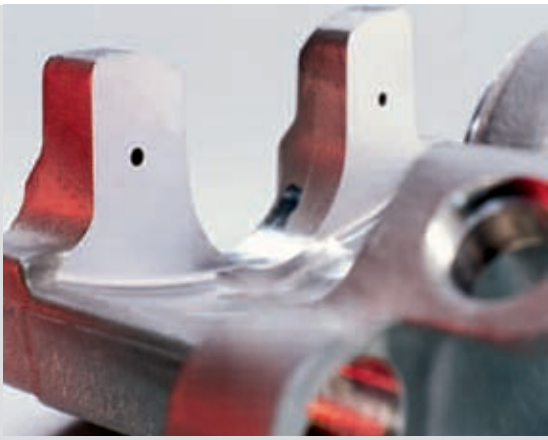


MAPAL Competence – Face milling
Machining examples



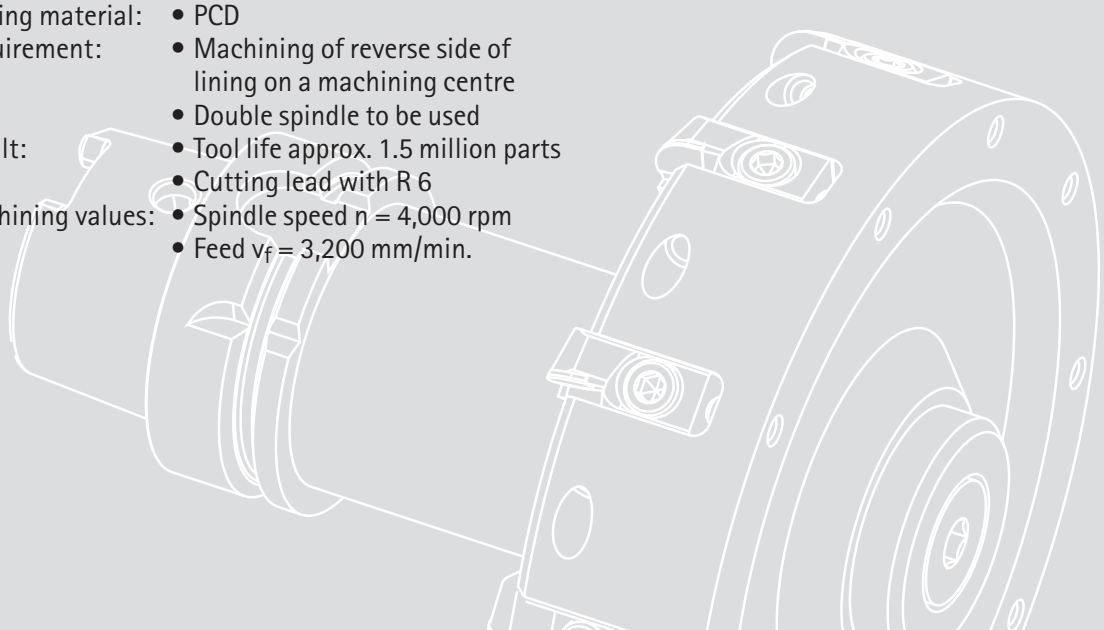
Timing housing

Material:	• Aluminium (GD AlSi9)
Tool:	• MAPAL face milling head PowerFeed Z 8 • D 63 mm
Cutting material:	• PCD
Requirement:	• Milling over whole component • Milling path per component approx. 5 m
Result:	• Tool life approx. 15,000 parts • Milling path approx. 75,000 m
Machining values:	• Spindle speed n = 15,000 rpm • Feed per tooth f_z = 0.08 mm
Special feature:	• Dimension A for face milling head and milling cutter arbor = 208 mm



Disc brake housing

Material:	• Aluminium (GK AlSi7Mg)
Tool:	• MAPAL face milling head PowerSpeed Z 10 • D 160 mm
Cutting material:	• PCD
Requirement:	• Machining of reverse side of lining on a machining centre • Double spindle to be used
Result:	• Tool life approx. 1.5 million parts • Cutting lead with R 6
Machining values:	• Spindle speed n = 4,000 rpm • Feed v_f = 3,200 mm/min.



Enquiry form for milling operations

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P.O. Box 1520
D-73405 Aalen
Phone +49 (73 61) 5 85-0
Fax +49 (73 61) 5 85-1 50
info@de.mapal.com
www.mapal.com

Company		Customer number (if available)
Contact partner	Department	
Address		
E-Mail	Tel./Fax	
Technical consultant	Enquiry No.	Date

Component

Description

Material

Cutting depth/allowance (mm)

☐ Face milling with feed
☐ Face milling against feed

Quality to be achieved
Surface quality

Flatness (µm)

Machine

Manufacturer/type/machining centre/transfer line

Type ☐ vertical ☐ horizontal ☐ multi-spindle/___ No.

Variable spindle speed ☐ yes ☐ no

Variable feed ☐ yes ☐ no

Max. spindle speed (rpm)

Power (kW)

Spindle accuracy (µm)

Spindle location

Coolant ☐ yes ☐ no

Coolant supply ☐ external ☐ through spindle

Type ☐ oil ☐ emulsion

Coolant pressure (bar)

Tool

Type

Tool No.

Diameter/tolerance (mm)

Blade length (mm)

Cutting over centre ☐ yes ☐ no

Coolant ☐ internal ☐ external

Shank (HSK, ABS/Weldon, etc.)
Size/form

Other adaptors/holders

Other notes (Drawing No., workpiece/tool)

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