

CAST ALNICO

Cast Alnico Magnets

Definitions

- Using patterns and simple moulding techniques, Alnico magnets can be cast to form a vast range of complex shapes and sizes at an economical cost
- Eclipse Magnetics Alnico magnets are ideal for high temperature applications up to 550°C
- Alnico is very stable, has good corrosion resistance and a typical hardness of 50 Rockwell C. Once cast, the material is so hard that the only machining possible is grinding
- Cast Alnico represents the most versatile magnet material available. The range of properties can be accurately designed for specific applications by changes to element analysis and heat treatment



Typical applications

- ABS braking system magnets
- Reed switch operating magnets
- Electricity meter damping magnets
- Holding/clamping applications
- Microwave applications
- Weighing scale damping magnets
- Electropermanent systems
- Calibration magnets
- Heat treatment jigs and fixtures

Eclipse Magnetics are continually improving their capability to extend the range from traditional Alnico magnets



Eclipse Magnetics on site casting foundry

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Horseshoe Magnets and Related Types



Definition

One-piece magnets with both poles in the same plane.

Scope

The tables list standard varieties of horseshoe magnets, bridge magnets and channel magnets.

Dimensions

Only the leading dimensions are quoted in the tables, without detail and tolerances. Further information will be provided on request.

Most of the types listed are supplied as-cast except that the pole faces are ground.

Performances

Indicated on Pull Gap Curves of Magnetic Attraction, which can be provided for many of the designs.

Materials

In various grades of Alcomax and Alnico, as stated in the tables. Ax = Alcomax, Ao = Alnico. For characteristic properties of the materials see pages 05.

Effects of high temperature

It can be stated categorically that there is no finer material than Alcomax for service at high temperatures.

Further, as all these magnets are one-piece there are no adverse effects such as differential expansion and contraction. The benefits of their fine high temperature performances are therefore available in full.

Summarizing, the magnets are not harmed up to 550°C and can be used at still higher temperatures if deterioration is acceptable. Up to 400°C the negative temperature coefficient is of the order of 0.02% per °C.

Finish

Pole faces ground; elsewhere either natural finish or painted.

Magnetic State

Supplied demagnetized or magnetized as required, In the latter case either in pairs mutually 'keeping' one another or with individual keepers.

Warning

Some types have grip and depth of field so high as to be dangerous in trapping fingers. Great care is necessary to avoid injury.

Conventional Horseshoes with converging poles

Drg. No.						Material	Weight (g)	Pull (kg)
M 2904	28.6	22.2	25.4	7.9	6.4	A=Alnico	28.1	2.4
	1.13"	0.88"	1.00"	0.31"	0.25"	D=AxIII		
M 14672	27.0	18.5	28.5	8.0	11.0	Ax III	25	3.0
	1.06"	0.73"	1.13"	0.32"	0.43"			
M 4181A	33.3	27.0	35.0	15.9	7.9	Alnico	91	4.0
	1.31"	1.06"	1.38	0.63"	0.31"			

For magnets similar to M 2904A but with a hole through the crown, see BUTTON MAGNETS on page 02

Bridge Magnets

Drg. No.					Material	Weight (g)	Pull (kg)
M 4144	22.2	11.1	7.9	6.4	A=Alnico	13	0.9
	0.88"	0.44"	0.31"	0.25"	{ C=AxIV		

Dimensions not otherwise marked are mm. Where inch (") dimensions are given, mm values are conversions. Please note that non-standard sizes are also available on request

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Horseshoes with parallel poles and rounded back

Drg. No.					Material	Weight (g)	Notes
M 15306	127.0 5.0"	98.4 3.88"	47.6 1.88"	63.5 2.50"	Ax III	2650	
M 16694	76.0 3.00"	63.5 2.50"	24.0 0.94"	38.0 1.50"	Ax III	472	Hole 0.25" diameter
M 17022	55.5 2.19"	46.0 1.81"	24.0 0.94"	30.0 1.19"	Ax III	228	Hole 0.25" diameter

Large Vee-shaped Magnets (diverging poles)

Drg. No.					Material	Weight (kg)
M 3574/1C	113.0 4.46"	81.0 3.18"	124.0 4.88"	62.5 2.46"	Ax II	4.53

Square Horseshoes

Drg. No.					Material	Weight (g)	Pull (kg)	Notes
M 6770 A	30.0 1.18"	20.0 0.79"	20.0 0.79"	15.0 0.59"	Ax II	55	4.5	Hole 4mm clearance
M 6770 B	40.0 1.57"	25.0 1.00"	25.0 1.00"	20.0 0.79"	Ax II	120	9.0	Hole 5mm clearance
M 6770 C	45.0 1.77"	30.0 1.18"	30.0 1.18"	23.0 0.90"	Ax II	182	11.8	Hole 5mm clearance
M 5750	60.0 2.36"	40.0 1.57"	62.0 2.44"	31.8 1.25"	Ax III	652	35.0	No Hole
M 10208	57.0 2.25"	35.0 1.38"	44.5 1.75"	27.8 1.09"	Ax III	368	23.5	} 2 holes for bolts
M 10209	70.0 2.76"	41.0 1.61"	57.0 2.25"	34.0 1.34"	Ax III	709	37.0	
M 10210	79.0 3.11"	54.0 2.13"	82.5 3.25"	38.0 1.50"	Ax III	1446	47.0	

Channel Magnets

Drg. No.					Material	Weight (g)
M 9113	22.2 0.88"	22.2 0.88"	{ A=140.0 B=108.0 A=5.51" B=4.25"	10.3 0.41"	Ax IV	A=426 B=335
M 19276	12.7 0.50"	7.9 0.31"	127.0 5.00"	4.7 0.19"	Ax III	93
M 19278	19.0 0.75"	12.7 0.50"	152.0 5.98"	6.35 0.25"	Ax III	132
M 19281	38.1 1.50"	22.2 0.88"	152.0 5.98"	12.7 0.50"	Ax III	820

Dimensions not otherwise marked are mm. Where inch (") dimensions are given, mm values are conversions. Please note that non-standard sizes are also available on request

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Button Magnets



Definition

Magnets of cylindrical shape but of 'horseshoe' type, with both poles in the same plane at one end of the cylinder. There is a groove between the poles, and a hole through the crown, unless otherwise stated.

Dimensions

Only the leading dimensions are quoted in the tables, without detail and tolerances. Further information will be provided on request.

Most of the types listed are supplied as-cast except that the pole faces are ground.

Performances

Indicated on Pull Gap Curves of Magnetic Attraction.

Material

Alnico, unless otherwise stated. For characteristic properties, see pages 05.

Effects of high temperatures

As these magnets are one-piece, there are no adverse effects such as differential expansion and contraction. The benefits of the high temperature performance of Alnico are therefore available in full.

Summarising, the magnets are not seriously affected magnetically up to 550°C. If the magnets are used at higher temperatures than 550°C deterioration will take place over time. Up to 200°C the negative temperature coefficient is of the order of 0.02% per °C.

Finish

Button magnets are ground on the pole faces and the crown. They are supplied either natural finish or painted.





Magnetic state

Supplied demagnetised or magnetised as required. The magnets are supplied either in pairs mutually 'keeping' one another or with individual keepers.




Special note

Distinguish carefully between Pot Magnets and Button Magnets as both are cylindrical. The overall dimensions are similar, but they are entirely different in principle and performance.

Button Magnets

Drg. No.					Weight (g)	Pull (kg)	Notes
M 4776A	12.7 0.50"	9.5 0.38"	4.0 0.16"	7.0 0.28"	4.0 0.16"	6.3	0.7
M 4776B	19.1 0.75"	12.7 0.50"	5.5 0.22"	8.7 0.34"	4.8 0.19"	20	1.9
M 4776C	25.4 1.00"	15.9 0.63"	5.5 0.22"	8.7 0.34"	4.8 0.19"	49	3.4
M 4776D	31.8 1.25"	25.4 1.00"	7.9 0.31"	12.7 0.50"	7.1 0.28"	113	4.8

Button Magnets with straight slots

Drg. No.					Weight (g)	Pull (kg)
M 4140	22.2 0.88"	19.1 0.75"	6.4 0.25"	4.8 0.19"	41	3.0
M 14331	9.8 0.386"	6.0 0.250"	3.7 0.145"		2.3	No hole Centreless Ground

Dimensions not otherwise marked are mm. Where inch (") dimensions are given, mm values are conversions. Please note that non-standard sizes are also available on request

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Pot Magnets



Definition

A pot magnet comprises a cylindrical permanent magnet assembled concentrically in a steel pot. The pot is an essential part of the magnetic circuit, providing the return path for the flux. The two poles are concentric, in the same plane, on an end face.

Applications

Pot magnets are among the most efficient of all magnet designs for gripping. (Other designs are preferable for lifting and attractive duties across gaps).

General features

- (a) There is no stray flux as the magnetism is retained in a closed circuit.
- (b) The pot screens the magnet proper from demagnetising effects.
- (c) The pot is readily machinable.
- (d) Can be inserted into, or fitted to steel without adverse effect. (This cannot be done with unscreened magnets).

- (e) The magnet proper has the most efficient of all magnet shapes - a plain cylinder, magnetised lengthways.
- (f) Concentration of magnetic flux in the mild steel, possibly up to twice the density of the flux in the permanent magnet. Grip varies as the square of the flux density, so this is specially advantageous.
- (g) Depth of field small compared with that of magnets with poles farther apart (such as horseshoes), but grip in intimate contact vastly superior to that of non-composite magnets of similar weight.

Contact surfaces

Pot magnets are primarily for gripping applications, for which they are ideal. For the most efficient gripping, contact should be intimate. Contact surfaces should be maintained in good condition.

Finish

Ground all over. Supplied either natural finish or painted.

Magnetic material

Alcomax III - one of the most efficient of all commercially available materials.

Magnetic state

Normally supplied magnetised, individually each with a keeper, or (with the exception of Magnetic Holdfasts) in rows with a keeper at the open end of each row.

Deep Pot Magnets

The proportions combine excellent performance with a high degree of stability.

Assembly and correct spacing are achieved by means of a force-fitted aluminium ring.

Caution is necessary at temperatures above about 200°C because of possible mechanical loosening through expansion and contraction of the component parts.

Drg. No.						Weight (g)	Pull (kg)
M 5663 Y	9.5 0.38"	15.1 0.59"	8.0 0.31"	6.4 0.25"	M3	6.4	1.0
M 5663 Z	12.7 0.50"	15.9 0.63"	9.9 0.39"	8.1 0.32"	M4	12.9	2.0
M 5663 A	17.5 0.69"	16.0 0.63"	13.5 0.53"	10.0 0.39"	M6	22.7	2.6
M 5663 B	20.5 0.81"	19.0 0.75"	16.0 0.63"	12.0 0.47"	M6	38.7	4.0
M 5663 C	27.0 1.06"	25.0 0.98"	21.0 0.83"	15.0 0.59"	M6	85	6.1
M 5663 D	35.0 1.38"	30.0 1.18"	27.7 1.09"	22.9 0.90"	M6	184	14.7

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Shallow Pot Magnets



Designed to satisfy the demand for high grip magnets where height is too restricted for deep pots. Good grip in intimate contact, but not as stable as deep pots.

Shallow Pots suffer magnetic damage more easily if two should be opposed - this is unlikely to happen accidentally. With the exception of M9067A, assembly is by 3-point staking which minimises mechanical loosening by expansion and contraction. M9067A can withstand temperatures of up to 100°C, whereas M9067B, M9067C and M14659 can withstand temperatures of up to 550°C.

Drg. No.						Weight (g)	Pull (kg)	Notes
M 9067 A	19.1	7.6	16.3	14.7	M3	13	3.0	
	0.75"	0.30"	0.64"	0.58"	Csk			
M 9067 B	28.6	8.7	23.8	22.2	M4	35.5	5.0	
	1.13"	0.34"	0.94"	0.88"	Csk			
M 9067 C	38.1	10.6	32.8	31.0	M4	79.4	13.0	
	1.50"	0.42"	1.29"	1.22"	Csk			
M 14659	60.3	15.9	54.0	52.0	M6	300	50.0	Hycomax 2
	2.38"	0.63"	2.13"	2.05"	Csk			

Magnetic Holdfasts








A mild steel concentrator pole piece gives superior gripping ability. The grip in intimate contact sometimes necessitates a jacking screw for detachment from loads. This is supplied as standard.

Assembled by filling the annular gap with epoxy resin.

Temperature limitation: 100°C.

In M 5866/2 and M6207 plain holes are provided: users can tap to their preferred screw thread.

Drg. No.						Weight (kg)	Pull (kg)	Notes
M 11345	44.5	44.5	34.9	26.2	M8	0.50	20	
	1.75"	1.75"	1.38"	1.03"				
M 8062	54.0	49.2	41.2	32.5	M8	0.83	40	
	2.13"	1.94"	1.62"	1.28"				
M 8063	69.9	63.5	53.3	42.9	M8	1.75	88	
	2.75"	2.50"	2.10"	1.69"				
M 5866/2	101.6	74.6	76.2	63.5	8.4mm	4.30	183	
	4.00"	2.94"	3.00"	2.50"	Plain (3)			
M 6207	100.0SQ	100.0	82.6	69.9	8.4mm	6.15	214	CUBE
	3.93SQ"	3.93"	3.25"	2.75"	Plain (8)			4 holes in top
	Square							4 holes in one side

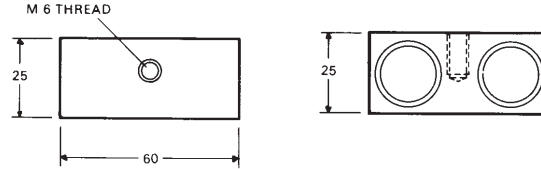
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Magnetic Foot M 5991/1



A rectangular assembly equivalent in performance to two Deep Pots. (Type M5663C) Weight: 240g



Rotor Magnets

Definition

These magnets have multiple poles. Each pole alternates in polarity.

Applications

Rotor magnets are ideal for anisotropic heat treatment. The cored hole is left as cast so that the rotor may be fitted to shafts. Typical applications for one-piece rotors are synchronous motors, dynamos and air turbine generators.

Finish and Tolerances

Supplied with a ground finish. Unless specified, the tolerance on the length is $\pm 0.1\text{mm}/\pm 0.004''$. Holes, when provided, are produced by coring and are to casting accuracy only. The periphery is unground, being fettled and shotblasted only except where otherwise indicated.

Material

Alcomax III unless otherwise specified.

Magnetisation

To gain the full benefits of these magnets, magnetisation after assembly is essential. They are tested magnetically and then normally demagnetised before despatch.

Magnetisation Service

Eclipse Magnetics Limited provide a magnetisation service for assemblies incorporating these magnets. It is generally possible to re-despatch assemblies within one working day of receipt (unless there are unusual complications necessitating the provision of special adaptors).

Notes on the Dimensions and Tolerances

Apart from lengths, the data in the table is generally nominal and should be regarded as average. The use of several significant figures does not imply any smaller tolerances.



Drg. No.				No. of Poles	Material	Weight (g)
M 16792	19.0 0.75"	25.0 0.98"	6.4 0.25"	4	Ax III	51
M 16555	19.0 0.75"	31.8 1.25"	6.4 0.25"	6	Ax III	18
M 19077	22.4 0.88"	38.0 1.50"	9.6 0.38"	6	Ax III	132
M 16473	31.8 1.25"	50.8 2.00"	12.7 0.50"	8	Ax III	333

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Cylindrical and Ring Magnets

Definition and scope

Cylindrical magnets with anisotropic preferred axis from one flat pole face to the other. Length and diameter are similar. Such magnets are sometimes known as “centrepoles” or “slugs”. Some products in this range are cone shaped.

Efficiency

Cylindrical magnets are ideal for anisotropic heat treatment because they are straight and have a constant cross section area and length. Thus, on the basis of stored magnetic energy per unit volume they are more efficient than other designs in the same materials. Consequently they offer the benefits of minimum weight, size and cost for many applications.

Application

These magnets are intended for assembly with soft magnetic components (mild steel is suitable) to form complete magnetic systems. Typical applications are loudspeakers, moving coil instruments, pot magnets (for gripping applications), conveyor rails/pulleys and jigs for the heat treatment of drills. These magnets are exceptionally versatile.

Finish and tolerances

Cylindrical magnets are supplied with a ground finish on the two flat surfaces. Unless otherwise specified the tolerance on the length is: $\pm 0.1\text{mm} / \pm 0.004''$. Holes, when provided, are produced by coring and are to casting accuracy only. The periphery is unground, being

fettled and shotblasted only, except where otherwise indicated.

Material

Alcomax III unless otherwise specified.

Magnetisation

To gain the full benefits of these magnets, magnetisation after assembly is essential. They are tested magnetically and then normally de-magnetised before despatch.



Magnetisation service

Eclipse Magnetics Ltd. provide a magnetisation service for assemblies incorporating these magnets. It is generally possible to re-despatch assemblies within one working day of receipt unless there are unusual complications necessitating provision of special adaptors.

Notes on the dimensions and tolerances

Apart from lengths, the data in the table is generally nominal and should be regarded as average. The use of several significant figures does not imply any smaller tolerances.

Solid Cylinders (no hole)

Drg. No.			Weight (g)	Notes
M 5663Z	8.1 0.32"	12.5 0.49"	4.5	Centreless ground
M 5664A	10.0 0.39"	12.9 0.51"	7.7	Centreless ground
M 5664B	12.0 0.47"	14.7 0.58"	13.2	Centreless ground
M 5664C	15.0 0.59"	20.9 0.82"	30.4	Centreless ground
M 4705B	21.3 0.84"	15.9 0.63"	41.7	
M 5664D	23.0 0.91"	21.8 0.86"	67.6	Centreless ground
M 4649A	25.4 1.00"	15.9 0.63"	59	
M 4649B	27.0 1.06"	19.1 0.75"	80	
M 4649C	29.0 1.14"	22.2 0.88"	107	



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Tapered Cylindrical Cones

Drg. No.				
M 11068	50.8 2.00"	44.5 1.75"	44.5 1.75"	15.9 0.63"

Plain Cylinders with Central Fixing Hole

Drg. No.				Weight (g)	Notes
M 4075/1	26.2 1.03"	7.9 0.31"	15.9 0.63"	57	Hole clears 6mm bolt
M 3012/2	27.0 1.06"	6.0 0.24"	22.9 0.90"	91	Hole clears 5mm bolt
M 4075/2	27.8 1.09"	7.9 0.31"	19.1 0.75"	78	Hole clears 6mm bolt
M 4075/3	29.7 1.17"	7.9 0.31"	22.2 0.88"	105	Hole clears 6mm bolt
M 4075/4	32.5 1.28"	8.7 0.34"	25.4 1.00"	144	Hole clears 6mm bolt
M 4075/5	34.9 1.38"	9.5 0.38"	28.6 1.13"	185	Hole clears 7mm bolt
M 4075/6	37.3 1.47"	9.5 0.38"	31.8 1.25"	238	Hole clears 7mm bolt
M 14639	52.0 2.05"	7.5 0.30"	13.0 0.51"	198	Csk one end Mod Hyc.



Ring Magnets

Anisotropic preferred axis from one flat face to the other unless otherwise stated.
Pole faces are ground. Otherwise ground as cast and fettled only.

Drg. No.				Material
M 14801	31.7 1.25"	25.4 1.00"	27.0 1.06"	Ax III
M 14802	61.0 2.40"	50.0 1.97"	27.0 1.06"	Ax III



CAST ALNICO

Rectangular Bar Magnets



Definition

One-piece magnets of high length/cross section ratio with two poles situated at opposite ends.

Scope

Cast cylindrical and rectangular bar magnets available as standard sizes and cut to length pieces.

Materials

Alnico (Ao) and various grades of Alcomax (Ax). For characteristic properties see pages XX.

Effects of high temperatures

Safe working limit 550°C. Can be used up to 700°C in certain circumstances: see page 22. Can be incorporated into die castings.

Finish

As cast and fettled only except on pole faces (ends) which are finish ground, unless otherwise specified. Supplied either natural finish or painted. Long cylindrical bars can be supplied unground to enable customers to grind and cut up the bars into individual magnets.

Magnetic state

Demagnetised or magnetised in pairs or rows.

Rectangular Bar Magnets

Drg. No.	Normal Material	Cross Section	Maximum Length ← M	Pull (kg)	Notes
M 8894/2A	Ax III	5 x 10	20	0.6	North Pole identified
M 8894/2B	Ax III	5 x 12.5	40	1.5	North Pole identified
M 8894/2C	Ax III	5 x 15	60	2.2	North Pole identified
M 4985/2	Ao	10 x 15	50	1.9	North Pole identified
M 4984/2	Ao	10 x 15	75	1.9	North Pole identified
M 18978	Ao	6 x 12	75	1.8	North pole identified
M 19690	Ao	6 x 12	50	1.8	North pole identified
M 19691	Ao	6 x 12	100	1.8	North pole identified
M 19087	Ax III	1/8" x 3/8"	4"	0.8	
M 19088	Ax III	3/16" x 3/8"	4"	0.8	
M 19089	Ax III	1/8" x 1/2"	4"	0.8	
M 19090	Ax III	1/2" x 1/2"	6"	2.7	

It is not usual to plot pull gap curves for bar magnets since bar magnets do not satisfy the basic condition for ideal gripping and pulling that both poles should be in the same plane.

Figures shown are only to be used as a performance guide.

Dimensions not otherwise marked are mm. Where inch (") dimensions are given, mm values are conversions. Please note that non-standard sizes are also available on request

CAST ALNICO

Cylindrical Bar Magnets

Individual Sand Cast Cylindrical Bar Magnets

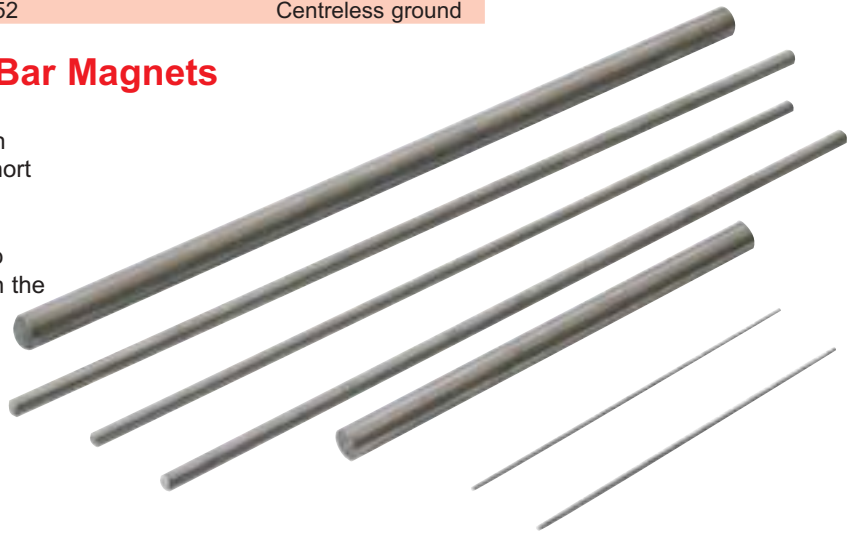
- Bar Size: 6 - 20mm diameters
- Cast tolerance: ± 0.3 mm diameter, 250mm length. Can be supplied as cut pieces to ± 0.2 mm. Vacuum and sand cast bars can be ground on diameter to 0.5mm



Drg. No.	Normal Material	Diameter	Minimum Length \leftarrow M	Pull (kg)	Notes
M 8731/1A	Ax III	6.0	20	0.6	Cast
M 8731/1B	Ax III	8.0	25	0.9	Cast
M 8731/1C	Ax III	10.0	30	1.5	Cast
M 4246B	Ao	12.7	52		Centreless ground

Vacuum Cast Cylindrical Bar Magnets

- Cast in long sticks and can be ground on diameter (± 0.025 mm) then cut up into short magnets (to ± 0.2 mm)
- Bar Size: 3 - 10mm diameter
- Cast tolerance: ± 0.3 mm diameter, 100 to 250mm length, minimal, dependant upon the diameters



Cutting Facilities

Eclipse Magnetics division company Magnacut are specialists in the processing of all types of magnets. with special abilities for cutting grooves in volume.



Dimensions not otherwise marked are mm. Where inch (") dimensions are given, mm values are conversions. Please note that non-standard sizes are also available on request