

NEUE



Ultralift^{plus}+

Der sicherste Heber der Welt!



Magnetische Heber lassen sich schneller und leichter benutzen als Schlingen, Ketten oder mechanische Greifer und hinterlassen keine Markierungen oder Kratzer auf der Oberfläche der Last.

- Der Ultralift Plus (Patent anhängig) beinhaltet weiterhin den Safety Shim (patentierte Sicherheitscheibe)
- Der neue und einzigartige Hebeschlaufenmechanismus, der den Bedienhebel isoliert, während eine Last am Ultralift Plus hängt: **Sicher ist jetzt noch sicherer**

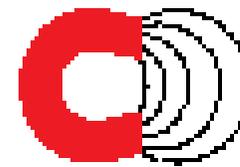
www.eclipse-magnetics.co.uk

Eclipse Magnetics Limited

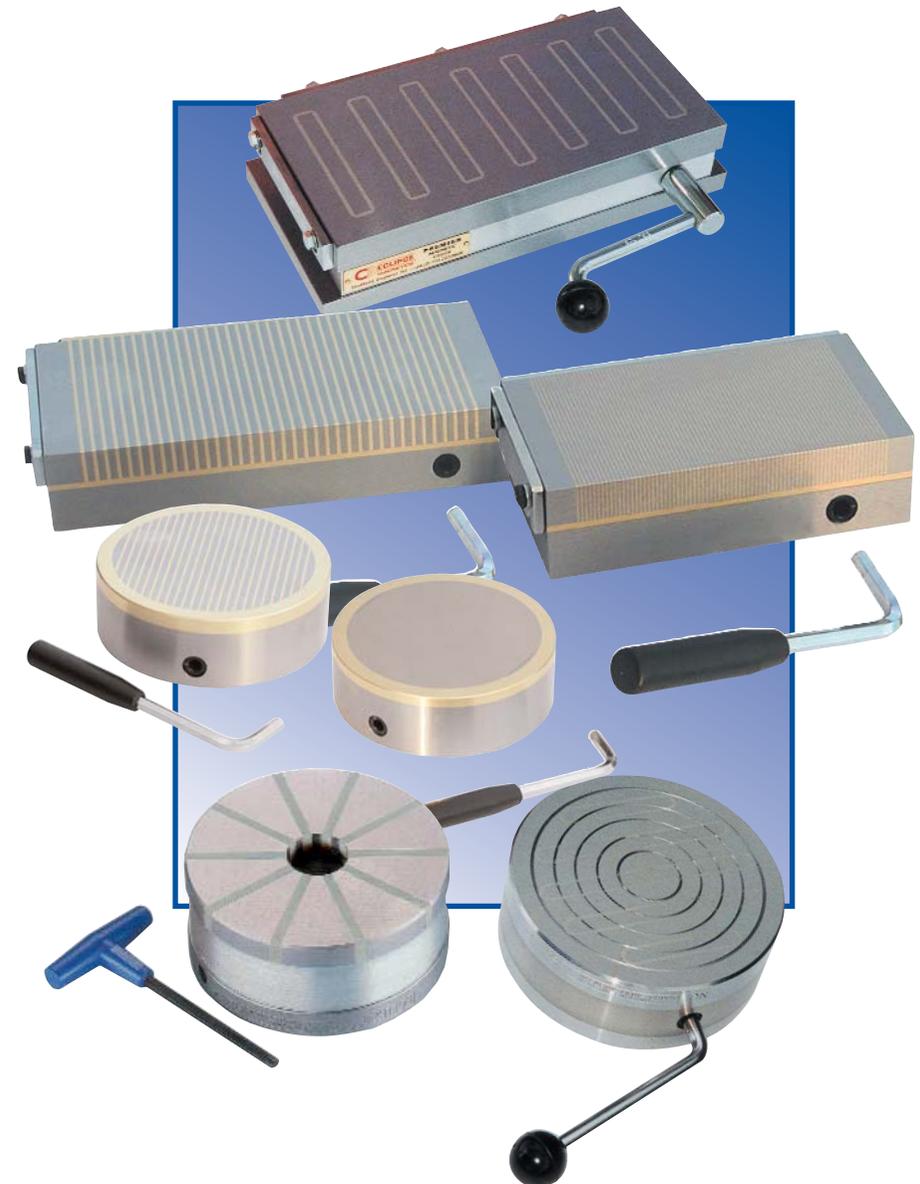
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ECLIPSE MAGNETICS



**A USERS HANDBOOK FOR MECHANICALLY
SWITCHED PERMANENT MAGNET CHUCKS**

HOW TO GET THE MOST FROM MAGNETIC WORKHOLDING

Permanent Magnet Chuck User's Handbook

INTRODUCTION

The aim of this booklet is to help you obtain the best service from your Eclipse Magnetic Chuck. It explains the basic principles of magnetic workholding and how an understanding of this can both increase the effective use of your chucks and the range of components which can be held on them.

PERMANENT MAGNET CHUCKS

Eclipse Permanent Magnet Chucks are renowned the world over for their outstanding features and are guaranteed not to lose their magnetism. The magnets used throughout the range are of superior materials which ensures the maximum grip, (Alcomax for AX Series and FP Fine Pole units).

The grid construction concentrates the magnetic flux to the top plate for optimum holding power and reduces the possibility of leakage of magnetic flux within the chuck and with carefully selected pole spacing the most effective use of the workholding area is achieved.

Rigid assembly ensures a lasting reliable performance, the extra thick top plate facilitates frequent re-grinds without the loss of power or accuracy.

Standardisation of the sizes allows similar rectangular chucks to be mounted in multiple, side by side or end to end to cover an increased working area.

CIRCULAR CHUCKS

Eclipse Circular Chucks will hold work during turning operations on lathes and for grinding on internal, cylindrical or rotary grinders. Like standard rectangular chucks they are energised by a removable handle. The chuck can be partially energised to simplify the correct positioning of the workpiece. Circular chucks are capable of gripping both heavy and light workpieces. The top plate can be machined within limits to any required shape.

TECHNICAL ADVICE & FREE TECHNICAL SERVICE

We give a full workholding advice service to engineers throughout the world. Please contact our Sales Office if you have any queries.

The principles outline in this booklet will help you to solve many everyday workholding problems. Where the workpieces present a greater problem our technical department with over 50 years of experience will be only too pleased to advise on the best solution. Appendix 1 page 21 shows the information we require to give you technical assistance.

12 FOR YOUR RECORDS

Eclipse magnetic chucks are guaranteed free from any fault due to craftsmanship or materials for a period of 12 months from the date of purchase.

Servicing

Each unit is sealed for life and should require little or no maintenance. On no account dismantle the unit. However, servicing may be required due to accidental damage or misuse, to maintain magnetic performance this must be done by a competent repairer.

Great Britain and Northern Ireland

Return direct to factory, address shown below or via your local ECLIPSE agent. Eclipse offer a loan service whilst repairs are undertaken.

**The Magnet Repair Department,
Eclipse Magnetics Ltd,
Units 1-4 Vulcan Road, Sheffield, S9 1EW, England
Tel 0114 225 0600. Fax 0114 225 0610**

Other Countries

Some local repair facilities are available, for details contact your local ECLIPSE agent.

Date of Purchase _____
Name of Supplier _____
Type of Chuck _____
Size of Chuck _____
Supervisor's Name _____
Department _____
Company Name _____
Street _____
Town _____
County _____
Tel No _____

Our objective is to help you maximise the cost savings Eclipse magnetic workholding offers. Users are invited to consult the Technical Department at Sheffield for solution of problems. When referring problems to this department it is helpful to provide all relevant information in the first instance. Anything short of fullest information may necessitate correspondence and delays, or making assumptions which may not be correct. The detail below indicates what information might be appropriate. It is not essential to complete this form but if a letter is preferred please ensure that it states all the facts that are relevant.

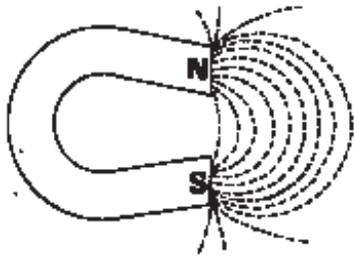
Send to: Technical Advisor, Workholding, Eclipse Magnetics Ltd, Units 1-4 Vulcan Road, SHEFFIELD S9 1EW.

From: _____
 Name: _____ Department: _____
 Company: _____
 Street: _____ Town: _____
 Area: _____ Country: _____
 Tel. No: _____ Telex No: _____
 Please indicate supplier: _____

<p>THE MACHINE (Indicate by a tick)</p> <p>Surface Finish: Peripheral Wheel: <input type="checkbox"/> Solid Wheel: <input type="checkbox"/> Segmental Wheel: <input type="checkbox"/> Internal: <input type="checkbox"/> External: <input type="checkbox"/> Left: <input type="checkbox"/> Right: <input type="checkbox"/> Working Corner: <input type="checkbox"/> Other: _____</p> <p>Make and Type: _____ Worktable Size: _____ Worktable HP: _____ Type of Cutter: _____ Feeds & Speeds: _____</p>	<p>THE WORKPIECE</p> <p>Relevant Drawings: _____ If NOT shown on drawings, please state: Material: _____ Spec. No: _____ Annotated: _____ Hardened: _____</p> <p>Dimensions Dia. Length _____ Width Thickness Weight _____ Which is the contact face? _____</p> <p>Quality of surface finish: Ground <input type="checkbox"/> Machined <input type="checkbox"/> As Rolled <input type="checkbox"/> As Cast <input type="checkbox"/></p> <p>Delivery: _____ What operator: _____ Required rate of stock removal: _____ Amount of stock to be removed: _____ Quantity to be machined: _____ Production rate: _____</p> <p>If practicable, please provide specimens for trial, in the state in which offered to the magnetic chuck before machining.</p> <p>Specimens provided: _____</p>
<p>THE MAGNETIC CHUCK OR OTHER MAGNETIC TOOL.</p> <p>Type or Cat. No: _____ Serial No: _____ Accessories in use or considered: _____</p> <p>If a Permanent-Electro chuck, Controller Mfg. Type: _____ Serial No: _____</p>	

1	THE BASIC PRINCIPLES OF MAGNETIC WORKHOLDING	3
2	HOW ECLIPSE PERMANENT MAGNET CHUCKS WORK	3
	Typical Chuck Operation	4
	Radial Pole NR Series Circular Chucks	5
3	FACTORS DETERMINING THE EFFECTIVENESS OF MAGNETIC WORKHOLDING	6
	Magnetic Flux Flow	6
	Contact Area	7
	Surface Finish	7
	Workpiece Material	8
	Condition of Material	8
	Workpiece Thickness	9
	Fine Pole Chucks	9
4	HOLDING AWKWARD WORKPIECES	10
	Toolroom/One-off Work	10
	Production/Repetitive Work	11
	Small components	12
	Flat or Thin Parts	13
	Irregular Workpieces on Radial Pole Chucks	13
5	MILLING ON MACHINE CHUCKS	14
	Machining Forces Upcut Milling	15
	Downcut Milling	15
	Face Milling	15
6	INSTALLING PERMANENT MAGNET CHUCKS	15
	Installing Chucks on Machines	16
	Regrinding	16
	Rectifying Damage	16
	Mounting Chucks in Multiple	16
7	MACHINING OF MAGNETIC CHUCKS	18
8	CHOOSING THE CORRECT CHUCK FOR THE JOB	19
9	PROBLEM SOLVING	19
10	ECLIPSE GUARANTEE	20
11	TECHNICAL INFORMATION REQUIRED TO ASSIST IN ADVISING ON MAGNETIC WORKHOLDING	21
12	FOR YOUR RECORDS	22

1 THE BASIC PRINCIPLES OF MAGNETIC WORKHOLDING

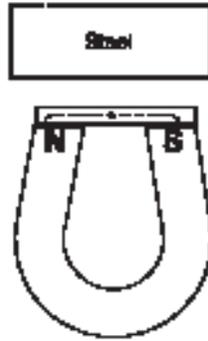
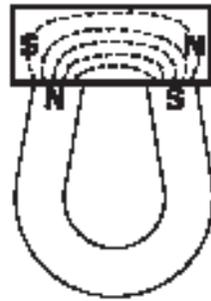
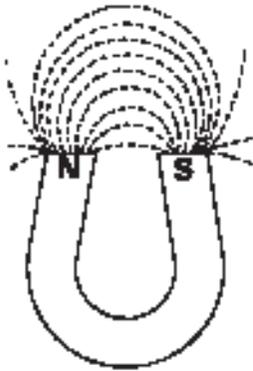


Magnetic lines of force (flux) exist between the North & South poles of a permanent magnet.

This flux can be used to attract and hold ferrous components. Steel components placed in a flux field have poles induced in them of opposite polarity to the magnet and these are attracted to the magnet until contact occurs.

(Unkept the magnetic field will attract ferrous material).

When kept the flux is contained within the keeper and ferrous material is not attracted.



The pull available depends upon the square of the magnetic flux density in the workpiece. The flux induced in the steel depends on the magnetic material, its size and quality of contact between the steel and magnet and how easily the flux can flow through the steel. The way in which each of these factors affects the pull can be seen in Section 4.

2 HOW ECLIPSE PERMANENT MAGNET CHUCKS WORK

A permanent magnet chuck is an assembly of magnets and steel designed to pass magnetic flux to the workpiece as efficiently as possible.

Eclipse manufacture three basic styles of mechanical permanent magnet chucks which, although operating slightly differently, follow the same principle. Switching is achieved by diverting the magnetic flux away from the workpiece giving it an easier path within the chuck. The simplest example of flux diversion is the use of a keeper to make the handling of magnets easy.

10 ECLIPSE GUARANTEE

This document covers the range of Eclipse magnetic chucks. Eclipse chucks are designed to give you long trouble free service and are produced to the highest standards of workmanship and quality. Before leaving the factory they are individually inspected for magnetic performance and physical accuracy.

Eclipse magnetic chucks are guaranteed free from any fault due to craftsmanship or materials for a period of 12 months from the date of purchase.

Servicing - Each unit is sealed for life and should require little or no maintenance. On no account dismantle the unit as this will result in a loss of magnetic performance, restored only by re-magnetisation. However, servicing may be required due to accidental damage or misuse, to maintain magnetic performance this must be done by a competent repairer.

Great Britain and Northern Ireland - Return direct to factory, address shown below or via your local ECLIPSE agent. Eclipse offer a loan service whilst repairs are undertaken.

**The Magnet Repair Department,
Eclipse Magnetics, Units 1-4 Vulcan Road, Sheffield, S9 1EW, England
Tel 0114 225 0600. Fax 0114 225 0610**

Other Countries

Some local repair facilities are available, for details contact your local ECLIPSE agent.

Guarantee Registration

Return to The Manager, The Magnet Repair Department,
Eclipse Magnetics, Vulcan Road, SHEFFIELD, S9 1EW.

PLEASE COMPLETE IN BLOCK CAPITALS.

Date of Purchase _____

Name of Supplier _____

Type of Chuck _____

Size of Chuck _____

Supervisor's Name _____

Department _____

Company Name _____

Street _____

Town _____

County _____

Tel No _____

Please send details of other Eclipse Magnetic cost cutting products

NB This does not affect your statutory rights.

8

CHOOSING THE CORRECT CHUCK FOR THE JOB

The range of Eclipse Permanent Chucks is constantly being updated to meet the current demands of industry. Our large range of types and sizes means we have a chuck to suit most of your applications.

Rectangular (PM Series)	Toolroom	Jobbing	Production	Suitable for
AXS	☒	☒		Grinding, spark erosion, light milling.
AXM	☒	☒	☒	Grinding, spark erosion, light / medium milling of simple workpieces.
AX	☒	☒	☒	Grinding - smaller & thinner workpieces, Spark Erosion.
Fine Pole (EFP Series)				
	☒	☒	☒	Grinding - smaller & thinner workpieces, Spark Erosion.
Circular AX Series				
	☒	☒	☒	Centre lathe, cylindrical grinding, surface grinding.
Circular Radial Pole (NR Series)				
	☒	☒	☒	Turning & heavy grinding. Particularly good for rings, Rotary tables.
Supergrind				
		☒	☒	Large Tools, Grinding & Spark Erosion, Machine Interlocks, Special Applications Etc.
Supermill				
	☒	☒	☒	Milling - All Types of Workpieces - Including thick bar & cold chaps.

9

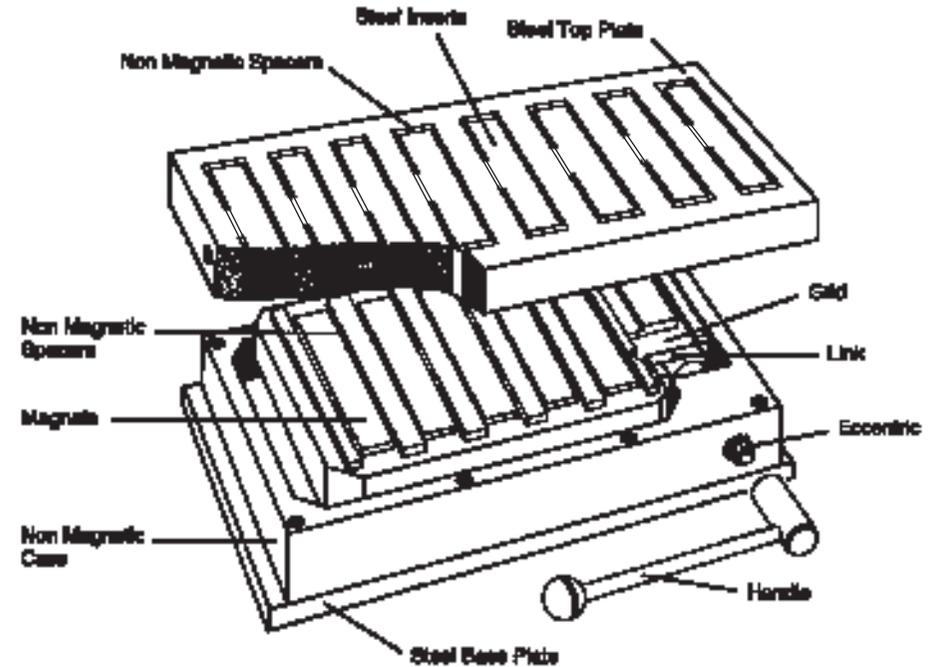
PROBLEM SOLVING

The information below gives a simple cross-check to possible problems, if difficulties are still experienced please contact our technical department.

Problem	Possible Cause	Action
Installing chucks.	Correct installation procedure has not been followed.	Refer to correct installation procedure and correct any errors (p 15-16).
Chuck will not switch on/off FP/AX.	Surface has been damaged, preventing movement inside the chuck.	Check for damage, if any found return for repair.
Workpiece will not hold on chuck.	Workpiece is not magnetic.	Check magnetic properties of workpiece (p 8).
	Material is not thick enough to absorb the available magnetism.	Ensure the correct chuck is being used (p 9).
	Workpiece is not positioned over a minimum of two poles (ie North & South).	Check correct position of the workpiece (p 11).
	Side and end stops are incorrectly positioned to counteract sliding along the chuck.	Position side and end stops correctly (p 15).
	There are air gaps between the workpiece and chuck.	Check cleanliness of chuck & workpiece. Check surface finish of workpiece (p 7).
Workpiece will not hold on accessories/jigs used with the chuck.	Accessories/jigs are positioned incorrectly on the chuck.	Ensure there is no alternative magnetic path which bypasses the workpiece (p 13).
	The accessory/jig is incorrectly made or designed so that flux is short circuited.	

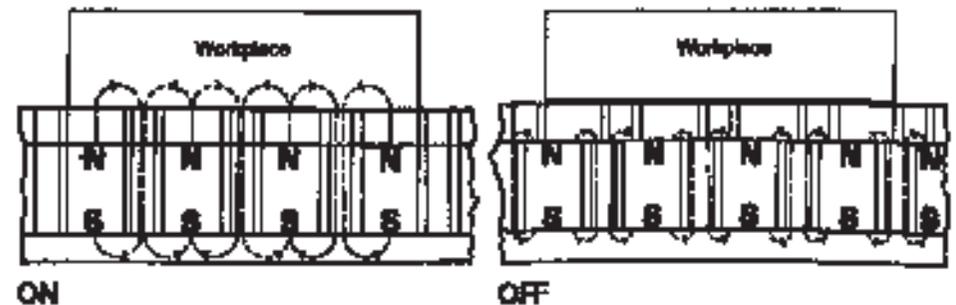
2

TYPICAL CHUCK OPERATION



In the **on** position the magnets are lined up with the top plate and the grid sections with the inserts. The two rows of non-magnetic spacers are in line. The easiest path for the magnetic flux is through the workpiece holding it in position.

To release, the handle is thrown moving the grid such that the magnetic flux now has an easier path within the chuck and no longer passes through the workpiece.

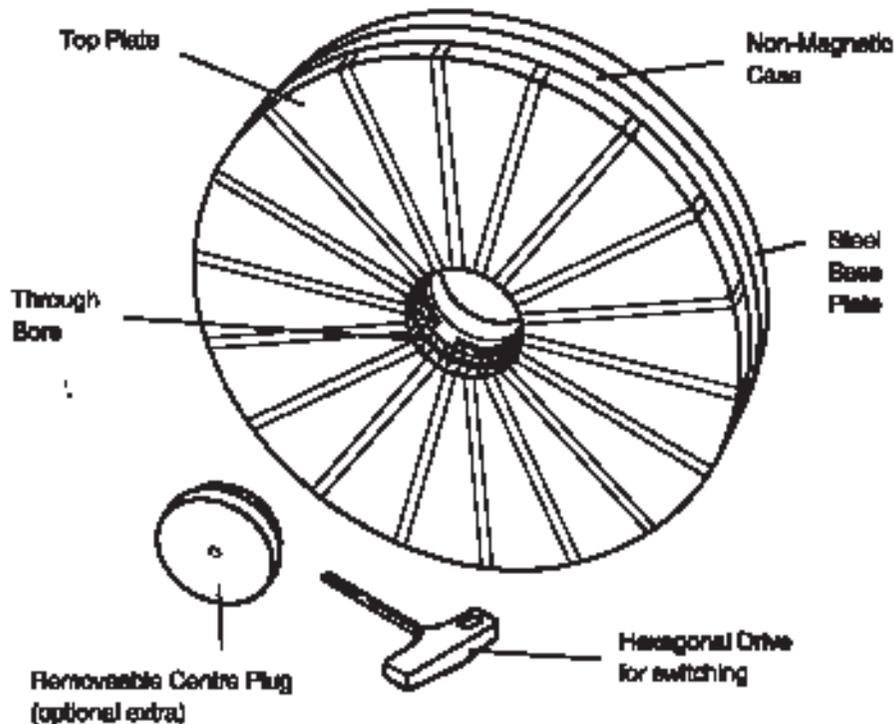


2 RADIAL POLE

(ii) Radial Pole Circular Chuck (NR)

These chucks are mechanically switched by means of a geared activation system. The magnetic principle is the same as for AX chucks but switching is effected by rotating a magnetic grid inside the chuck.

Each segment of the chuck is an individual magnetic pole and each pole is magnetic over its full area. The removable centre plug, supplied as an optional extra, locates on a step and is secured with a cap screw. When used without the centre plug the chuck allows coolant to be fed down the centre of the workpiece.



6 MOUNTING DETAILS TO SUIT BOTH AX & NR CIRCULAR CHUCKS

AX Circular Chucks*

Type	A	B	C	D	G	H	I	J	K	L	
AX18C	18"	3 1/4"	7 3/4"	7/8"	1 1/2"	Ø 1/2"	Ø 3/4"	M12	3 1/2"	10 1/2"	M8
AX30C	12"	3"	5"	5/8"	1 1/2"		7/8"	M12	4 1/4"	10 1/4"	10"
AX30D	Ø"	2 1/2"	3 1/4"	5/8"	1 1/2"		4 1/2"	M10	3 1/2"	8 1/2"	7 1/2"
AX57C	Ø"	3 1/4"	5"	5/8"	1 1/2"		4"	M10	3 1/2"	8 1/2"	8 1/2"
AX75C	4 1/2"	1 1/2"	2"	1/2"	7/8"		3"	M 8	1 1/2"	3 1/2"	4"

Approximate equivalents in millimetres.

Type	A	B	C	D	G	H	I	J	K	L
AX18C	381	83	197	8	40	305	M12	89	268	M8
AX30C	305	76	127	5	37	180	M12	105	267	254
AX30D	229	63	86	5	38	114	M10	79	187	181
AX57C	152	57	76	4	38	102	M10	79	190	140
AX75C	114	45	51	6	32	76	M 8	48	79	102

NR Radial Pole chucks

Type	A	B	C	D	G	H	I	L
NR100C	100	45	57	6	18	79	M 8	M8
NR150C	150	63	76	4	11	102	M10	M8
NR225C	225	71	86	5	11	114	M10	121
NR300C	300	71	152	5	11	154	M12	254

A = Outside diameter
B = Flange height

H = Height
H = P.C.D.1

C = Recess diameter
I = Thread size

D = Recess depth
L = P.C.D. 2

7 PERMISSIBLE MACHINING OF PERMANENT MAGNET CHUCKS

The most important rule is the machining, whether drilling or otherwise, must NOT penetrate to the interior of any chuck. Drilling must not be so deep as to cause a projection inside a chuck. Penetration to the interior of a chuck could cause a loss of lubricant and admit coolant and dirt. Projections could interfere with the moving magnet system. Holes drilled should be at least 5mm less in depth than the thickness of the top plate or base plate. Holes should not be drilled in mild steel inserts or non-magnetic spacers, but in solid parts of the top plates.

Fine Pole chucks have a laminated top plate secured by tie-rods. These top plates can be drilled in any location OTHER than through these tie-rods. Tie-rod locations are easily visible from the chuck ends. Again, drilled holes should be at least 5mm less in depth than the thickness of the top plate. Within these limitations there is considerable freedom for simple machining in the top plate and base plate of any Eclipse chuck. For example, locating pegs and driving pegs can easily be fitted. More complex machining may be contemplated to accommodate workpieces that cannot be held directly on the normal chuck surface. It is wise to give careful consideration of additional top plates and other magnetic fixtures to hold awkward shaped workpieces, before deciding on any but the simplest machining.

The machining of grooves, slots or recesses in top plates might be practicable and permissible, and ideal for the operation immediately ahead, but can spoil the chuck for other workpieces in the future. When an additional top plate is used, the basic chuck is unspoil.

If machining other than the simplest kind seems unavoidable, the problem should be referred to our Technical Department. If machining of the chuck is then considered to be the best course, a check will be made for possible interference with assembly screws and dowel pins, and for any other possible adverse effects, and the customer advised accordingly.

Heavy duty chucks AX1018 and AX1218 are available either for independent mounting or multiple mounting, in the latter case without projection of the base plate for clamps, and with a counterbored hole for a cap screw in each corner.

(v) Rectangular chucks installed vertically

Eclipse rectangular chucks can be mounted on edge. A large angle plate may be used as a mounting, or alternatively, any device convenient to the user and sufficiently strong mechanically. Precautions should be taken to prevent the edges of the top plate and base plate from touching ferrous matter simultaneously, as that would short-circuit the magnetic flux and reduce the gripping potential. The introduction of a non-magnetic spacer between chuck and table will prevent short-circuiting. The non-magnetic spacer should be at least 3mm (1/8" thick). Suitable materials are brass and austenitic stainless steel.

(vi) Mounting smaller chucks on permanent magnet chucks

Sometimes it may be desired to mount other chucks and magnetic tools on chucks that are already installed on machines. The objects may be:

To apply a finer pole spacing to small workpieces;

To reduce the area to be re-ground when re-surfacing a top plate.

To gain the advantages of the special shape of a magnetic veeblock or the particular directions of gripping of a magnetic vice.

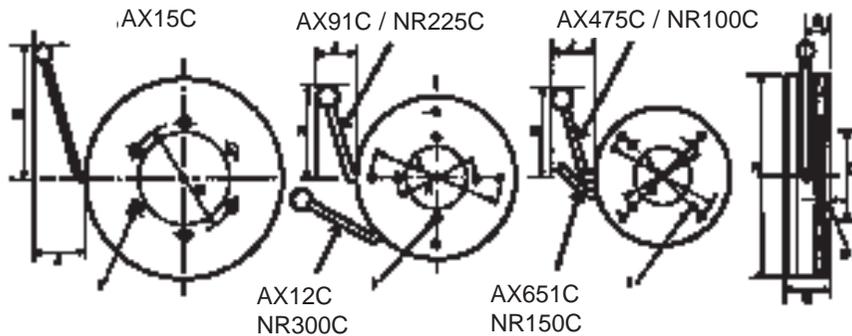
Such arrangements (as pictured) are normal. Small permanent magnet chucks, magnetic vee blocks, magnetic vices and similar tools should not be used on permanent-electro or on electromagnetic chucks.



(vii) Mounting circular chucks

When fitted on lathes, it is necessary to make a back plate. The diagrams below and schedule over the page provide all the necessary dimensional information.

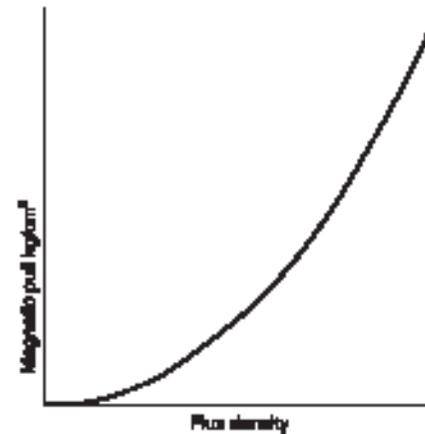
It is particularly important not to insert into a base plate, screws so long that they project inside the chuck, such projections can interfere with the moving magnet system and cause a seizure. If this happens, the chuck must be returned to the works for attention.



Magnetic Flux

As stated in Section 1 it is the amount of magnetic flux induced in the workpiece which determines how well it can be held magnetically. For maximum hold, as much magnetic flux as possible must be induced in the workpiece. On a simple workpiece this means positioning it evenly over the North and South poles of the chuck.

The pull is proportional to (i) the square of the magnetic flux density in the contact face of the workpiece and (ii) to the area of workpiece in contact with the chuck, up to the point of saturation of the workpiece.



(i) The square law relationship between magnetic pull and flux density.

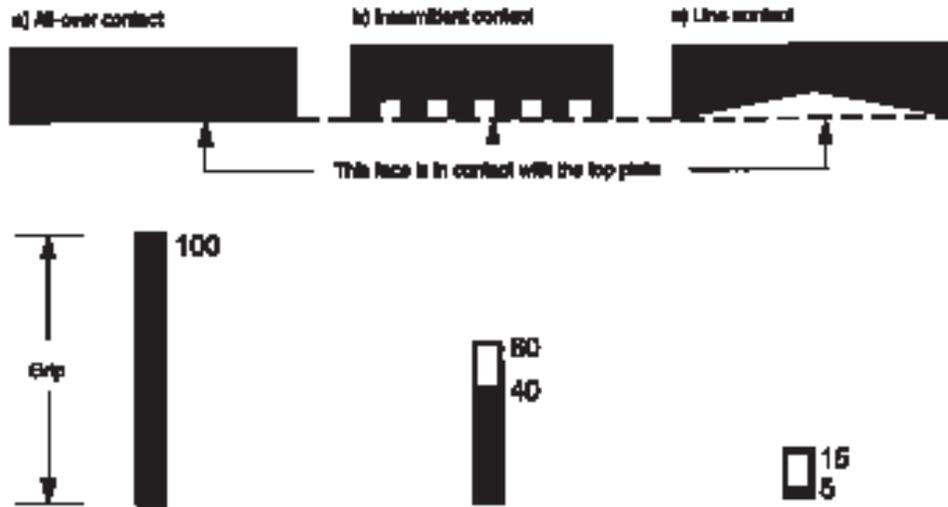


(ii) The proportional relationship between magnetic pull and workpiece area.

Doubling the contact area doubles the magnetic pull. Reducing the flux density by 10% reduces the pull by 19%. If the flux density is halved the pull is reduced by 75%. Reductions in the flux density can occur when the flux encounters a magnetic resistance (reluctance). Simple examples are air gaps (which are non-magnetic and therefore of high reluctance) and by workpiece materials factors. There are five main factors which affect the flux density and hold on any given size of workpiece.

(i) Contact Area

The ideal condition, offering the highest resistance to machining forces is where air gaps are kept to a minimum and there is a large continuous contact area. The poorest results are obtained where there is a large air gap and very limited (line) contact.

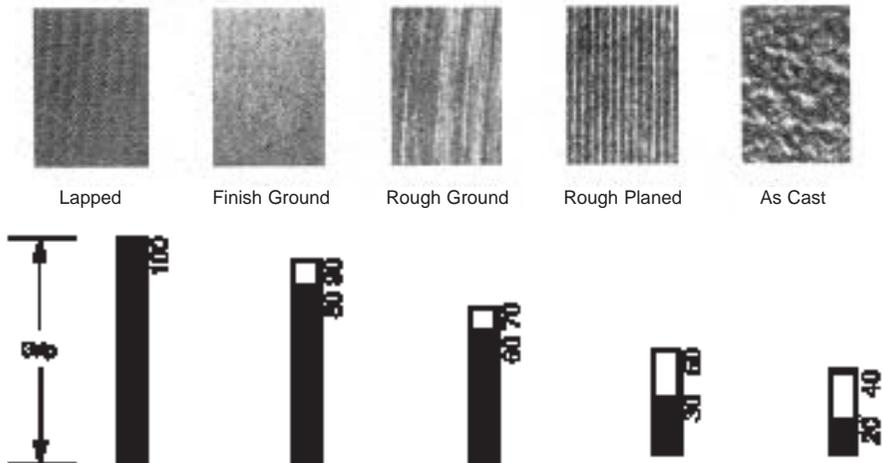


100 = represents an excellent grip
 60 = represents a very good grip
 40 = is very satisfactory for many operations
 20 = may be satisfactory for light grinding

The ways in which contact area can be increased on 'poor' magnetic workpieces are shown in section 4.

(ii) Surface Finish

A lapped finish which has no air gaps presents the best magnetic workholding condition, a course surface with many air gaps the worst.



(i) Installing chucks on machines

The vitally important requirements for high-precision machining apply to the installation of magnetic chucks of all types and not only those for high-precision work. The normal installation procedure is as follows:

Check the machine table for possible damage. It must be perfectly flat before the chuck is mounted on it. Ensure that the base plate of the chuck is truly flat. Remove any blemishes that may have occurred in transport or handling, with a flat, smooth stone.

Remove any flash on the top or base plate by light stoning. Scoring marks and other damage should be removed by re-grinding, preferably on the machine where the chuck is to be installed.

Any distortion should be eliminated by grinding, using the procedure given below. Absolute cleanliness is essential. In particular, there must be a complete absence of solid dirt particles between the machine table and the chuck base plate.

The chuck can now be fitted to the table and fastened down. Ensure that the chuck top plate is flat and parallel to the base plate. When installed on a grinding machine, the top plate should, as a final precaution, always be ground on that particular machine.

Instead of removing circular chucks from lathes for grinding, they may be re-surfaced by turning, using the lightest cut and the finest feed practicable, followed by light stoning.

(ii) Regrinding

Never be afraid to re-grind a top plate because it will reduce the thickness. The top plates of Eclipse chucks are thick enough to cope with many years of re-grinding before renewal is necessary. The most suitable grinding wheel for the operation is a medium-hard type with open grit grading.

Deviations from the desired precision are generally caused by insufficient care in installation and maintenance.

The Control handle must be OFF when re-grinding.

(iii) Rectifying distortion (if damage has been suffered)

Take two parallel steel bars, each about twice as wide as a top plate insert. Place them over two inserts about a quarter of the length from each end of the chuck. Turn the control handle ON, to hold the parallel bars. Turn the chuck over, with the parallel bars on the machine table, and lightly grind the base. After rectification of the base, the top plate should be ground flat and parallel with it, preferably on the machine where the chuck is to be used.

(iv) Mounting chucks in multiple

For multiple mounting, chucks can be assembled on a common base plate which is, in turn, mounted on the machine table. AX 300mm and 250mm wide chucks have a cap screw in each corner which, for multiple mounting, should be removed and replaced with longer ones. The base plate is tapped and will require opening out to a clearance hole.

5

Machining Forces

(i) Up-cut Milling

The cutter tries to pull the work up and push it along the chuck. The machining force is F tangential to the cutter, as shown in Fig. 5.1 (a). Its horizontal component F_H is resisted by the end stop to the left, and the friction between the workpiece and chuck face.

The vertical component F_v is resisted by the downward pull of the chuck.

Fig. 5.1 (a) demonstrates two very important points.

The duty of the chuck is to hold the work down.

The duty of the end stop is to resist sliding and for this reason an end-stop should always be used.

(ii) Down-cut Milling (or climb milling)

The machining force F is downwards towards the chuck and to the bottom right-hand corner of the workpiece, so the end-stop is placed at the end where the cut starts, Fig. 5.1 (b) As the cut proceeds, the machining force helps to hold the workpiece down on to the chuckface, and this means the heavier cuts can be taken than in up-cut milling. Down-cut milling is always recommended, therefore, provided the machine has been designed for this type of work.

(iii) Face Milling

For on-centre face milling, Fig. 5.1 (c), the action of the cutter tends to push the work up to the left-hand end and to the side of the chuck, because the centre of the cutter is over the centre of the workpiece. This condition cannot always be met, however, and it is sometimes necessary to position the workpiece off-centre in relation to the cutter.

For off-centre milling of this kind, Fig. 5.1 (d), the workpiece is still pushed to the same side but towards the end-stop on the right.

It is therefore worthwhile to make a quick check before the feed is engaged to ensure that the workpiece, end-stop, side-stop, packings and thrust blocks are in the correct position to suit the particular cutting conditions.

For heavy milling and awkward shapes, Eclipse recommend the use of their 'Power Matrix' Square Pole Chucks. Please contact our Sales Office for full details.

6

INSTALLING PERMANENT MAGNET CHUCKS

All Eclipse chucks have their top plates and base plates accurately ground flat and parallel before despatch, and are ready for immediate use.

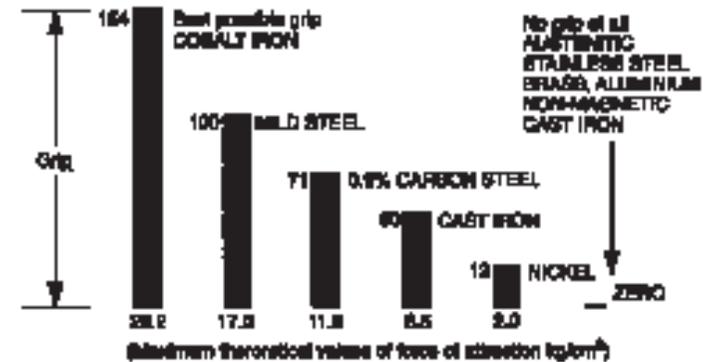
However, careful checking is recommended before the chucks are installed on machines as there is always the possibility of damage in transit, unpacking or subsequent handling.

3

(iii) Workpiece Material

It is possible to induce high values of flux and therefore to produce high attraction pulls in some materials e.g. mild steel. In others, e.g. brass, aluminum, no flux at all can be induced and these are known as non-magnetic materials.

In between these two extremes is a whole range of materials with varying magnetic properties.



(iv) Condition of Material

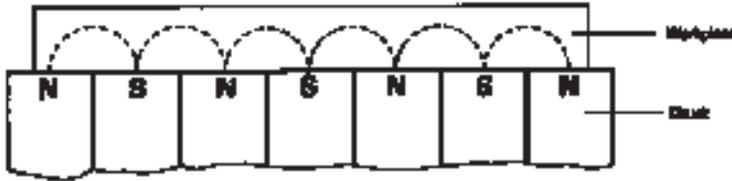
The heat treatment of a material affects its physical structure and its ability to absorb flux. Annealed materials are best. Hardened materials do not absorb flux as easily and tend to retain some magnetism when the chuck is switched off, sometimes making it difficult to remove the workpiece from the chuck.

Residual (or retained) magnetism can be removed from a workpiece by wiping the workpiece across an Eclipse De-magnetiser, once it has been removed from the chuck

Mild Steel (Reference standard)	Annealed	100
Super Eclipse Oil Hardening Tool Steel 1% C 1% Cr 1% Mn	Annealed	84
	Hardened	44
	Hardened and Tempered	48
Eclipse B1 A High Duty Die Steel 1.5% C 1.2% Cr 0.8% Mn 0.5% V	Annealed	80
	Hardened	29
	Hardened and Tempered	31
Solar Eclipse High Duty Die Steel 2% C 12% Cr	Annealed	28
	Hardened	28
	Hardened and Tempered	31

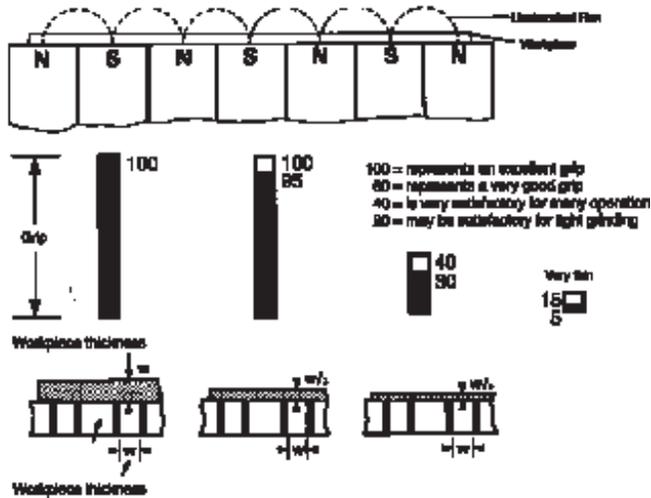
(v) Workpiece Thickness

The flux path within a workpiece is a semi-circle from the centre of one chuck pole to the centre of the next.



If the workpiece is thinner than this radius it cannot absorb all the flux and some passes through. The resultant pull is lower than that when all the flux is absorbed by a thick workpiece.

AX Chucks: Variation of pull with workpiece thickness:



To hold a thin workpiece securely the pole pitch and radius of the magnetic flux must be reduced. There are two main methods of achieving this.

- (a) Eclipse Fine Pole Chucks
- (b) Induced pole Chucks - please ask for details.

(a) Fine Pole Chucks

These chucks are ideally suited to small thin workpieces although they can also be used to hold larger workpieces for surface grinding applications.

The use of magnetic workholding in milling or machining centre operations can give considerable savings in:

- (a) Jig and fixture cost
- (b) Changeover allowances
- (c) Load/unload times

It is recommended that the machining rates for each job are assessed and gradually built up to the optimum until sufficient data is achieved about materials, contact areas, workpiece thickness etc. To ensure maximum rigidity of the workpiece it is recommended that extra packaging/location pieces are used, when the full chuck area is not being utilised.

The mechanical forces to be resisted in milling are generally very much greater than in grinding, and the cutting action may be of an intermittent nature as each cutting edge strikes the workpieces. Furthermore, the direction of the forces varies from instant-to-instant during machine operations.

The purpose of a chuck is to hold work down. Resistance to sideways movement is approximately five times less than the downward pull and it is therefore important to use the side and end stops. Suitable blocks positioned between the side and end stops and the workpiece should be used to ensure the workpiece is over North and South pole. Climb milling is advised in preference to orthodox milling.

During vertical milling, the position of the table should be adjusted to control the directions of the mechanical forces so that the workpiece is pressed against the stops and not driven away from them. The centre of the milling cutter should move along the centre line of the workpiece whenever possible.

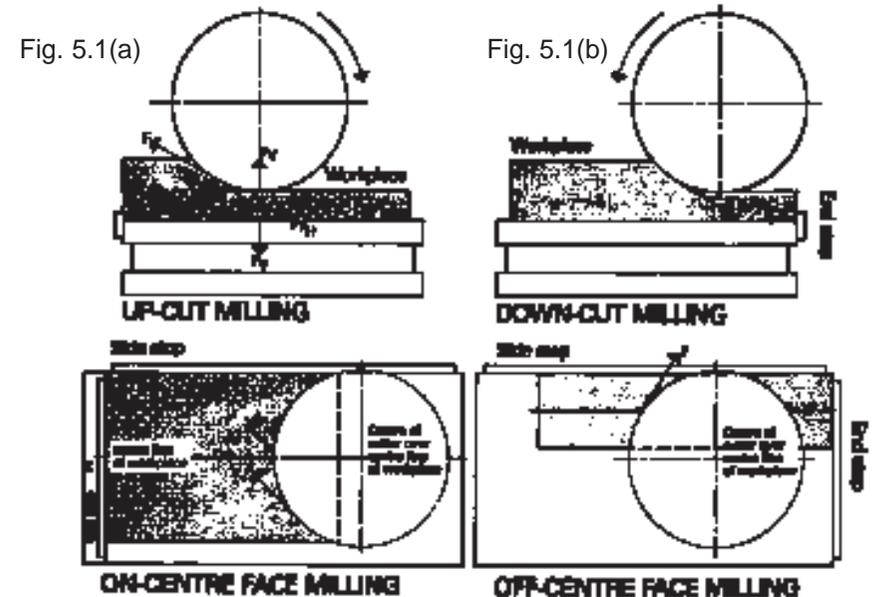
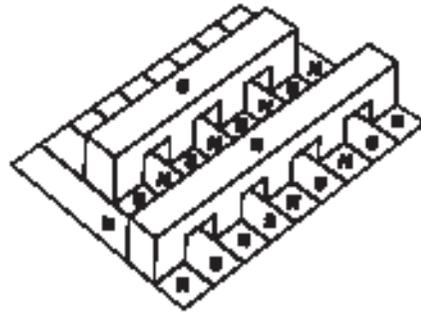


Fig. 5.1(c)

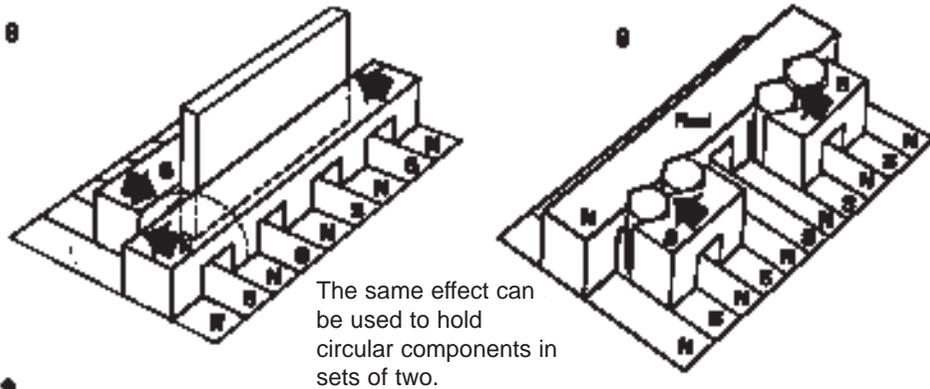
Fig. 5.1(d)

4

For flat or tall thin parts a magnetic vice effect can be easily achieved with one jaw sitting only on the North poles and the other on the South.

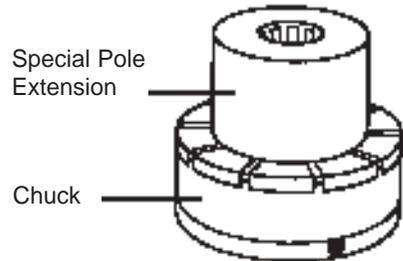


When a ferrous workpiece is positioned between the jaws the flux has a complete circuit back to the chuck and the workpiece is held without distortion, between the jaws. Alternatively an Eclipse Magnetic Vice (E927) can be used in conjunction with any chuck or on its own.



The same effect can be used to hold circular components in sets of two.

Radial Pole - Special Pole Extension



Such units can be designed and supplied to suit your workpiece. Please contact our Sales Office for details.

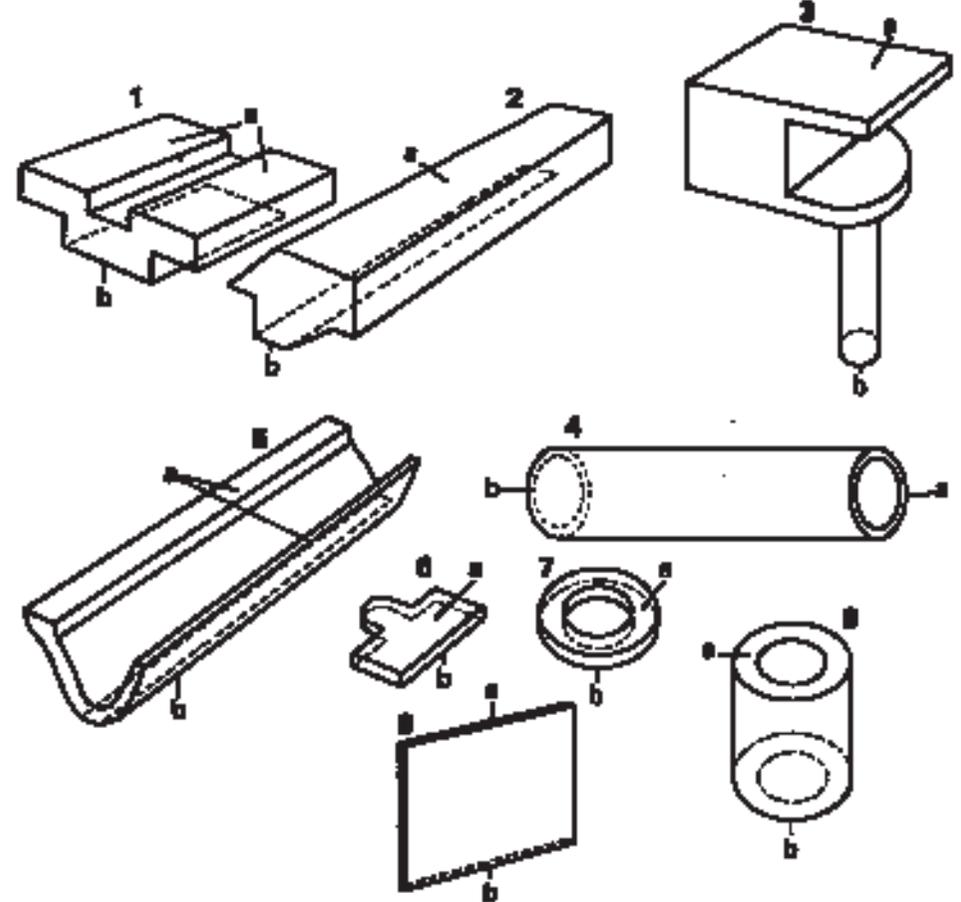
4

HOLDING AWKWARD WORKPIECES

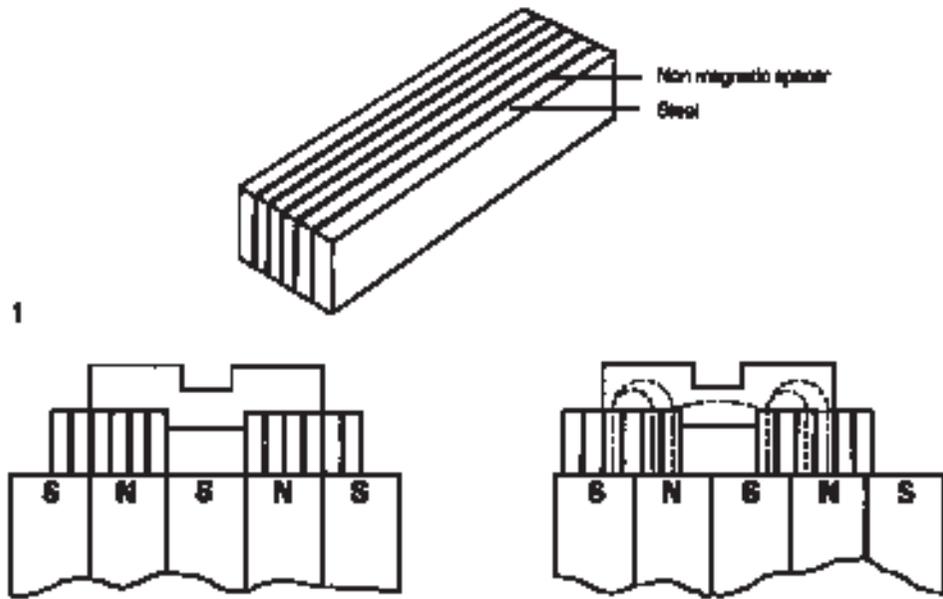
Most workpieces which are difficult to hold have the common problem of small surface area in contact with the chuck top plate. Each of the workpieces below can be held magnetically using the techniques shown on the following pages.

Surface to be machined (a)

Contact face/edge (b)



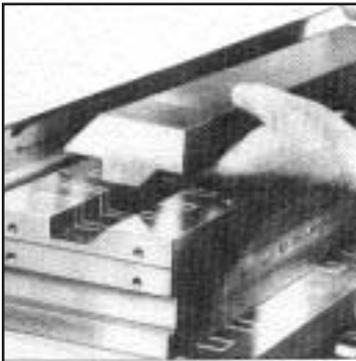
Simple jigs made from mild steel and non-magnetic material make the holding of such workpieces easy and give positive location time after time. For toolroom and 'one-off' applications the simplest of these jigs are Eclipse Chuck blocks, of laminated mild steel and resin construction. They can be machined with Vee's etc if necessary. Chuck blocks extend the lines of magnetism from the chuck's North and South poles. Correct positioning on the chuck is therefore important to obtain the best workholding.



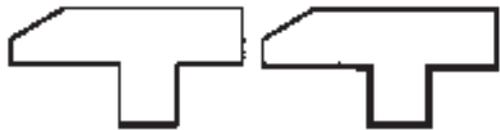
No hold - the workpiece is only in contact with the North poles of the chuck through the chuck blocks and there is no complete circuit from North to South.

Very good hold by moving the chuck blocks half a pole along the chuck. The flux now has 3 good paths through the workpiece.

2. For repetitive or production work an additional top plate can be purchased and profiled to suit the workpiece.



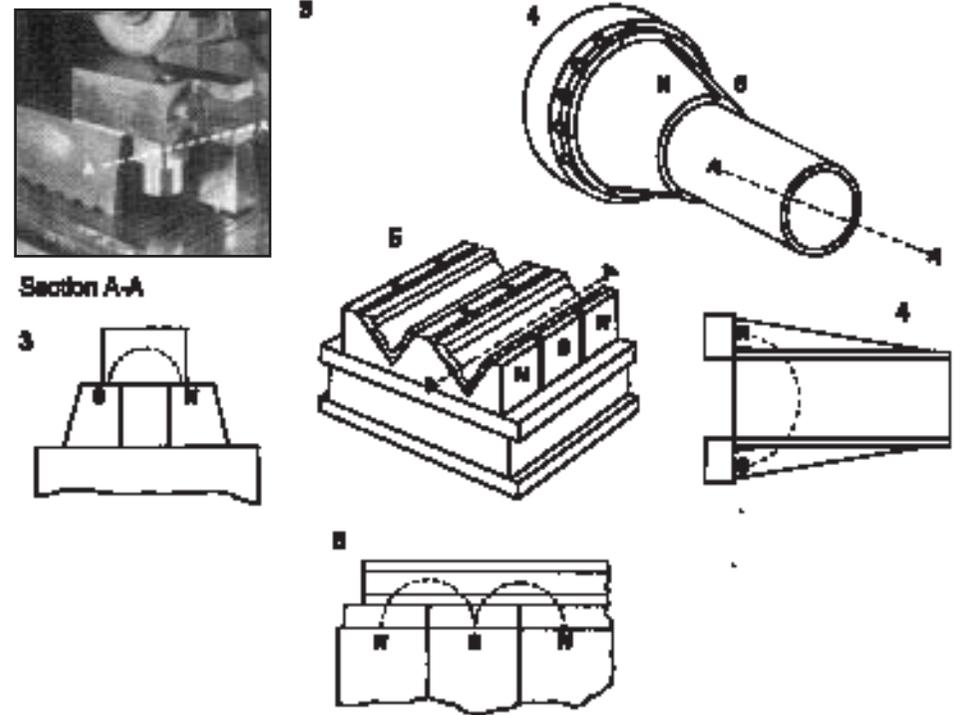
In this case the surface area is increased considerably and the pull is increased by 250%



Contact area without top plate

Contact area with additional top plate

For deeper workpieces a simple jig is made from mild steel and a non-magnetic material. This makes their holding and positioning simple giving accurate location time after time.



6. For small components the effective contact area can be increased by multiple loading and packing around the sides and ends to give additional support.



7. For one off machining of small, thin components a Fine Pole Chuck should be used. The component being placed across a brass lamination to achieve maximum hold.