



DIECI BUONI MOTIVI PER SCEGLIERE IL SISTEMA ELETTROPERMANENTE

- 1 **Nessun consumo di energia:** il piano assorbe corrente solo per qualche secondo durante la fase di magnetizzazione e nella fase di smagnetizzazione.
- 2 **Sicurezza sempre:** se durante la fase di lavoro dovesse mancare corrente, il piano rimane magnetizzato.
- 3 **Immediato carico e scarico del pezzo:** bastano pochi secondi per caricare o scaricare il pezzo dalla posizione di lavoro.
- 4 **Pratico e semplice:** attraverso una pulsantiera il comando è semplicissimo.
- 5 **Lavorazioni estremamente precise:** la forza di fissaggio è adeguatamente proporzionata alla lavorazione in esecuzione attraverso la regolazione della potenza magnetica in modo elettronico.
- 6 **Bloccaggio perfetto:** essendo uniforme su tutta la superficie permette una qualità di finitura senza deformazioni.
- 7 **Superficie di lavoro completamente libera:** le facce in lavorazione sono libere e sgombre da punti neutri utilizzati per il fissaggio meccanico.
- 8 **Flessibilità:** immediata perché il piano scaricato è subito pronto per un nuovo pezzo anche di forma differente.
- 9 **Riduzione di altri costi:** tutte le strutture e altri mascheragli dedicati vengono eliminati anche come voce di costo tradizionale.
- 10 **Sfruttamento completo della macchina:** tutta la superficie utile della macchina utensile viene utilizzata per la lavorazione.

TEN GOOD REASONS FOR CHOOSING THE ELECTRO-PERMANENT SYSTEM

- 1 **No energy consumption:** The chuck absorbs power only for a few seconds during the magnetizing and de-magnetizing phases.
- 2 **Always safe:** If during the working phase current is cut out, the chuck remains magnetized.
- 3 **Immediate work loading/unloading piece:** Only a few seconds for loading/unloading the piece from its working position.
- 4 **Simple and practical:** Very simple commands from the pushbutton panel.
- 5 **Extremely accurate machining:** The fixing force is electronically proportioned to the machining at hand by precisely adjusting the magnetic power.
- 6 **Perfect clamping:** Since it is uniformly distributed along the surface, it allows a finishing quality without deformations.
- 7 **Totally free working surface:** The working face are free and clear of neutral points used for mechanical fixing.
- 8 **Flexibility:** Prompt, since the discharged chuck is immediately ready to accept a new piece, even of a different size.
- 9 **Reduction of others costs:** All structures and other dedicated casings are eliminated even as a traditional cost items.
- 10 **Machine full exploitation:** during machining, all available working surface is used.

COME SCEGLIERE IL PIANO MAGNETICO

Molti clienti pensano che la scelta di un piano magnetico sia semplice e quasi esclusivamente legata alla potenza che esso può generare in senso assoluto durante la fase di lavoro. In realtà la nostra esperienza dice che non è così. Spesso succede che il piano magnetico di grande potenza si riveli inadeguato a lavorazioni di basse asportazioni perché effettuate su pezzi molto piccoli o sottili. Il fatto è che il campo magnetico è performante solo quando il flusso si concentra il più possibile nel pezzo da trattenere. Se la potenza magnetica, per ragioni di profondità di campo, supera lo spessore del pezzo, si riduce e può diventare insufficiente ai fini della lavorazione.

IL SEGRETO STA NEL PASSO POLARE

Il vero motivo che deve portare a scegliere un piano magnetico piuttosto che un altro è rappresentato dal passo polare ideale per la lavorazione in questione. Individuare insieme, in una analisi semplice ma efficace, il piano ideale per eseguire una gamma di lavorazioni richieste, è sicuramente l'approccio vincente per un giusto acquisto.

HOW TO CHOOSE THE MAGNETIC CHUCK

Many customers think that choosing a magnetic chuck is simple and almost exclusively tied to the absolute power that it can generate during the working phase. Our experience says that really it is not so. Often a power magnetic chuck is inadequate for machining with little removals because they are made on very tiny and thin pieces. The fact is that the magnetic field performs only when the flux is concentrated on the piece to be held. If the magnetic power, for reasons of field depth, exceeds the thickness of the piece, it will decrease and may become inadequate for machining.

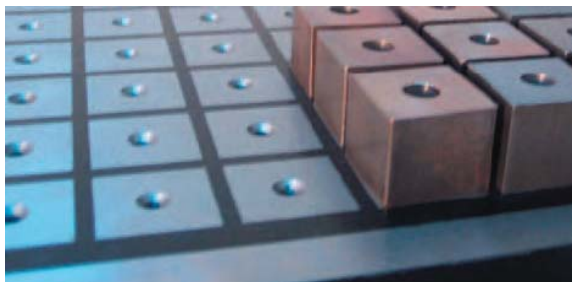
THE SECRET LIES IN THE POLE PITCH

The true reason why we must come to the choice of one magnetic chuck rather than another is represented by the ideal pole pitch for the machining at hand. The winning approach to the right buy is to determine together and with a simple and efficient analysis the ideal chuck for executing a range of required machining operations.

Art. 88 *Tipo 1*

Polo magnetico / Magnetic chuck
32 x 32 mm

Passo polare - Pole pitch
37 mm



Art. 88 *Tipo 3*

Polo magnetico / Magnetic chuck
70 x 70 mm

Passo polare - Pole pitch
80 mm

Art. 88 *Tipo 2*

Polo magnetico / Magnetic chuck
50 x 55 mm

Passo polare - Pole pitch
60 mm

Art. 88 *Tipo 4*

Polo magnetico / Magnetic chuck
70 x 70 mm

Passo polare - Pole pitch
80 mm

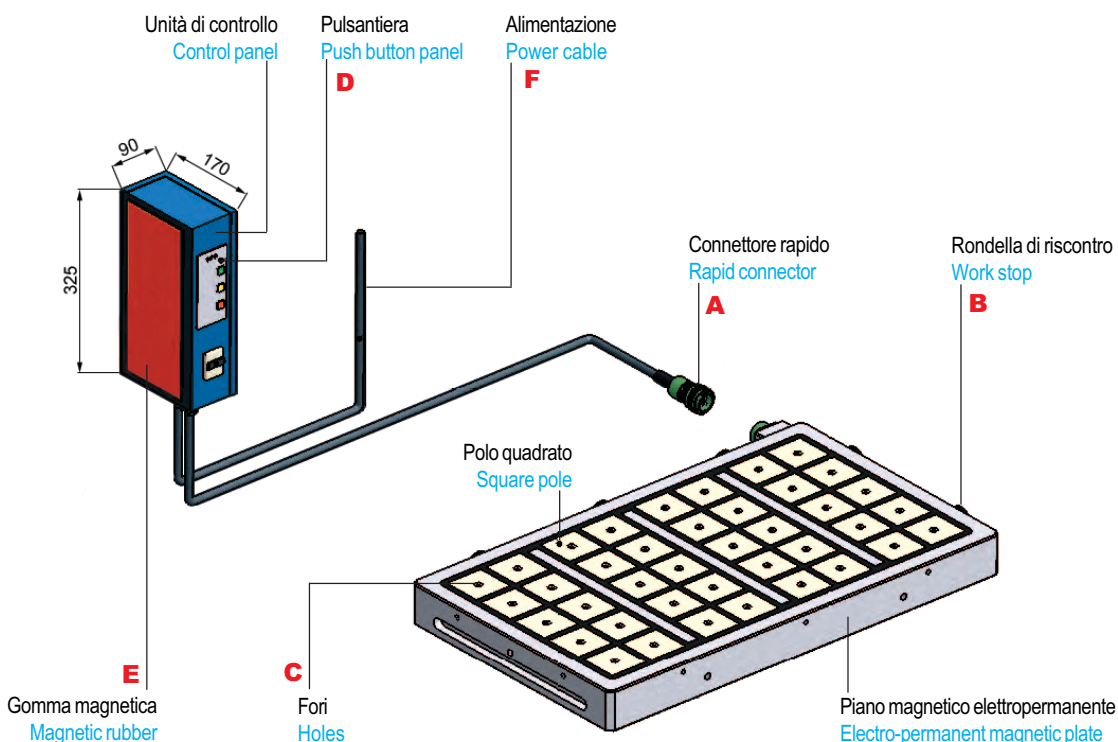


IL PIANO MAGNETICO

La struttura del piano è realizzata interamente in monoblocco (scavato nel piano) mentre le parti magnetiche e di sbobinatura vengono assemblate sotto un controllo di processo evoluto ed automatizzato. L'operazione di resinatura viene eseguita con procedimento sottovuoto, garantendo così un isolamento ed un vita magnetica al prodotto che non ha pari sul mercato attuale. Viene fornito con un connettore rapido a tenuta stagna **A** e tappo di chiusura per la fase di lavoro, rondelle di riscontro **B** per la battuta del pezzo, fori nei poli **C** per il montaggio delle espansioni polari fisse o mobili. Per il fissaggio del piano magnetico esistono delle cave laterali con eventuali fori passanti nelle zone non magnetiche, che la GERARDI esegue su richiesta del cliente.

THE MAGNETIC CHUCK

The chuck structure is a whole monoblock (dug from a solid) while the magnetic and reeling parts are assembled under the supervision of an advanced and automated process. The resin treatment operation is done under vacuum to guarantee an insulation and a magnetic life of the product that is unmatched in today's market. A quick waterproof connector **A** is supplied with a closing cap for the working plates, work-stop **B** for the part's ledge, holes in the poles **C** for mounting the fixed or mobile shoes. On request, GERARDI will bore internal lateral slots with possible through holes to the non-magnetic zones to fix the magnetic chuck.



UNITA' DI CONTROLLO A MICROPROCESSORE

È fornita nella versione semplice e prevede una pulsantiera **D** per la magnetizzazione e smagnetizzazione del piano magnetico montata direttamente sull'unità. Il fissaggio dell'unità è facilitato dalla gomma magnetica **E** applicata su un lato del box esterno. Prevede un cavo di alimentazione di 5 mt. **F** senza presa verso la rete e un cavo di scarica con guaina metallica lungo 5 mt. verso il piano magnetico. È predisposta per il collegamento di un segnale di sicurezza (consenso macchina) che non permette l'avviamento della macchina se il piano non è stato magnetizzato.

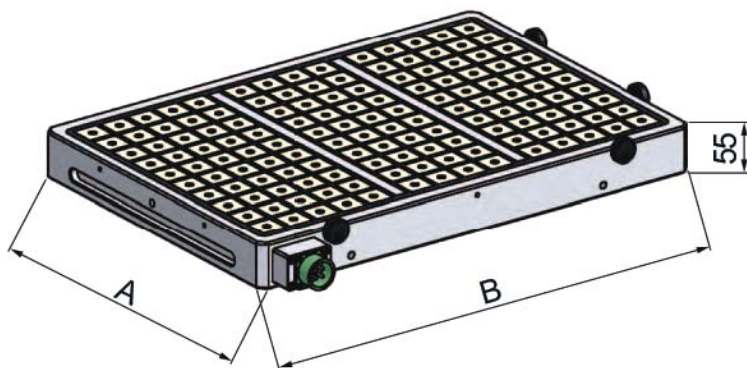
THE MICROPROCESSOR CONTROLLER

Comes in the basic version and includes a push-button panel **D** directly installed on the unit for magnetizing and demagnetizing the magnetic chuck. The mounting of the unit is made easy by the magnetic rubber **E** applied on one side of the external box. Includes a 5 m supply cable without a plug **F** to the supply and a 5 m earth cable with a metallic cladding towards the magnetic chuck. The unit is preset for connecting a safety signal (machine enabling device) which prevents the machine from running when the chuck is not magnetized.

Art. 89A		UNITA' DI CONTROLLO MONOCANALE SINGLE CHANNEL UNIT	COD. 8.89.A00000	€ 1.000
Art. 89B		UNITA' DI CONTROLLO MULTICANALE MULTI CHANNEL UNIT	COD. 8.89.B00000	€ 1.400

Art. 88 Tipo **1** *Il più recente* The most recent!

Massima performance a 8 mm di altezza
Max performance at 8 mm height



**PIANO ELETTROPERMANENTE
 PER ASPORTAZIONI IN FRESATURA
 CON PEZZI DI BASSO SPESSORE**

Un piano magnetico particolarmente consigliato per lavorazioni di fresatura non pesanti che si effettuano su pezzi di piccole dimensioni o basso spessore. Il grip elevato nei primi millimetri del pezzo rappresentano la grande novità del prodotto unica sul nostro mercato.

**ELECTRO-PERMANENT CHUCK
 FOR MILLING WITH
 LOW THICKNESS WORK-PIECES**

This is a magnetic chuck especially recommended for non-heavy milling operations done on small or low thickness parts. The high grip on the first millimetres of the part represent the big novelty of the product that is unique in our market

Tipo Type	A	B	Nr Poli Poles	Traverse Traverses	Peso Kg Weight Kg	COD.	€
1	150	150	9		9	8.88.11515	612
	150	300	21		17	8.88.11530	1.092
	150	410	30		24	8.88.11540	1.560
	150	520	36	1	31	8.88.11550	1.872
	150	620	42	2	36	8.88.11560	1.932
1	195	195	16		15	8.88.12020	1.088
	195	300	28		23	8.88.12030	1.456
	195	410	40		31	8.88.12040	1.840
	195	520	48	1	39	8.88.12050	2.208
	195	620	56	2	47	8.88.12060	2.576
1	260	260	36		26	8.88.12525	1.872
	260	300	42		30	8.88.12530	1.932
	260	410	60		42	8.88.12540	2.520
	260	520	72	1	54	8.88.12550	3.024
	260	620	84	2	62	8.88.12560	3.192
1	300	300	49		35	8.88.13030	2.254
	300	410	70		48	8.88.13040	2.940
	300	520	84	1	61	8.88.13050	3.192
	300	620	98	2	72	8.88.13060	3.724
1	410	410	100		65	8.88.14040	3.600
	410	520	120	1	84	8.88.14050	4.320
	410	620	140	2	98	8.88.14060	5.040

**CARATTERISTICHE TECNICHE
 TECHNICAL CHARACTERISTICS**

Polo magnetico / Magnetic chuck
32 x 32 mm

Passo polare - Pole pitch
37 mm

Foro nel polo / Hole in the chuck
M6 x 10 mm utili

Forza in Gauss / Gauss force
5000 gap 1.5 mm

Forza polare verticale / Vertical chuck force
daN 80

Forza polare in strisciamento
 Sliding chuck force
daN 20

Forza combinata / Combined force = **180**

Spessore minimo consigliato
 Minimum suggested thickness
4 mm

Massima performance altezza:
 Maximum performance height:
8 mm

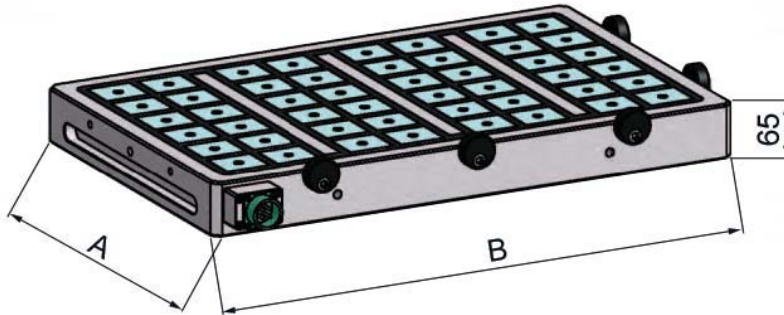
Dimensione pezzo minimo
 Min. piece size
16 cm²
(4 cm x 4 cm)

Perdita di forza in lavoro con espansioni fisse
 Loss of match. force fixed shoes
 H = 20 mm
25%

Tutti gli Art. 88-1 da utilizzarsi solo con unità di controllo monocanale Art. 89A
 Each Art. 88-1 to be used only with single channel unit Art. 89A

Art. 88 Tipo 2 *Il più versatile The most versatile!*

Massima performance a 40 mm di altezza
Max performance at 40 mm height



Tipo Type	A	B	Nr Poli Poles	Traverse Traverses	Peso Kg Weight Kg	COD.	€
2	230	240	9		25	8.88.22020	918
	230	320	12		33	8.88.22030	1.128
	230	385	15		40	8.88.22040	1.410
	230	510	18	2	53	8.88.22050	1.692
	230	670	24	3	70	8.88.22060	1.920
	230	830	30	4	87	8.88.22800	2.400
	230	1000	36	5	105	8.88.22010	2880
2	300	320	16		44	8.88.23030	1.504
	300	385	20		53	8.88.23040	1.600
	300	510	24	2	70	8.88.23050	1.920
	300	670	32	3	91	8.88.23060	2.560
	300	830	40	4	113	8.88.23080	3.120
	300	1000	48	5	137	8.88.23010	3.744
2	420	385	30		74	8.88.24040	2.400
	420	510	36	2	97	8.88.24050	2.880
	420	670	48	3	128	8.88.24060	3.744
	420	830	60	4	159	8.88.24080	4.440
	420	1000	72	5	191	8.88.24010	5.328
	420	1160	84	6	222	8.88.24012	5.880
2	480	510	42	2	111	8.88.25050	3.276
	480	670	56	3	146	8.88.25060	4.368
	480	830	70	4	181	8.88.25080	5.180
	480	1000	84	5	218	8.88.25010	5.880
	480	1160	98	6	253	8.88.25012	6.860 *
2	600	670	72	3	183	8.88.26060	5.328
	600	830	90	4	227	8.88.26080	6.300 *
	600	1000	108	5	273	8.88.26010	7.560 *
	600	1160	126	6	317	8.88.26012	8.820 *

Da utilizzarsi solo con unità di controllo a doppio canale Art. 89B
*To be used only with multi channel unit Art. 89B **

PIANO ELETTROPERMANENTE PER ASPORTAZIONI IN FRESATURA CON PEZZI DI SPESSORE MEDIO-BASSO

Il piano magnetico più versatile della gamma GERARDI. Produce un ottimo rapporto tra la forza espressa e le condizioni di spessore e dimensione pezzo particolari. Lavora benissimo anche con espansioni a distanza ed il grip in fase di contornatura sotto alcuni punti di vista è addirittura eccezionale.

ELECTRO-PERMANENT CHUCK FOR MILLING WITH MEDIUM-LOW THICKNESS WORK-PIECES

This is the most versatile magnetic chuck of the GERARDI range. It produces an optimum ratio between the expressed force and the particular thicknesses and size of the piece.

It works well even with remote shoes, and the grip during the countouring phase is excellent.

CARATTERISTICHE TECNICHE TECHNICAL CHARACTERISTICS

Polo magnetico / Magnetic chuck
50 x 55 mm

Passo polare - Pole pitch
60 mm

Foro nel polo / Hole in the chuck
M8 x 12 mm utili / untill

Forza in Gauss / Gauss force
6800 gap 1.5 mm

Forza polare verticale / Vertical chuck force
daN 325

Forza polare in strisciamento
Sliding chuck force
daN 80

Forza combinata / Combined force = 725

Spessore minimo consigliato
Minimum suggested thickness
10 mm

Massima performance altezza:
Maximum performance height:
40 mm

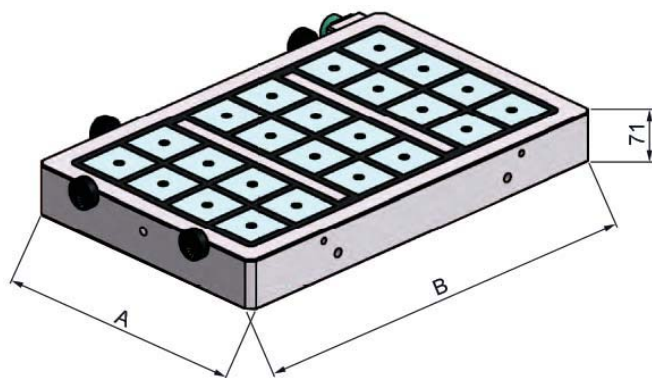
Dimensione pezzo minimo
Min. piece size
100 cm²
(10 cm x 10 cm)

Perdita di forza in lavoro con espansioni fisse
Loss of match. force fixed shoes
H = 30 mm
25%

Art. 88 Tipo **3** *Il più utilizzato* **The most popular!**

Massima performance a 40 mm di altezza
 (Forza polare di strisciamento: daN 180)

Max performance at 40 mm height
 (Sliding chuck force: daN 180)



Tipo Type	A	B	Nr Poli Poles	Traverse Traverses	Peso Kg Weight Kg	COD.	€
3	230	230	4		26	8.88.32020	1.088
	230	310	6		35	8.88.32030	1.632
	230	420	8	1	48	8.88.32040	1.632
	230	470	10	1	54	8.88.32050	1.660
	230	610	12	2	70	8.88.32060	1.992
	230	800	16	3	91	8.88.32080	2.368
	230	1000	20	4	114	8.88.32010	2.640
3	310	310	9		48	8.88.33030	1.836
	310	420	12	1	65	8.88.33040	1.992
	310	470	15		72	8.88.33050	2.220
	310	610	18	2	94	8.88.33060	2.664
	310	800	24	3	123	8.88.33080	3.168
	310	1000	30	4	154	8.88.33010	3.660
3	390	420	16	1	81	8.88.34040	2.368
	390	610	24	2	118	8.88.34060	3.168
	390	800	32	3	155	8.88.34080	3.904
	390	1000	40	4	194	8.88.34010	4.720
	390	1200	48	5	233	8.88.34012	5.664
3	470	610	30	2	142	8.88.35060	3.660
	470	800	40	3	187	8.88.35080	4.720
	470	1000	50	4	234	8.88.35010	5.900
	470	1200	60	5	280	8.88.35012	7.080 *
3	630	610	42	2	191	8.88.36060	4.956
	630	800	56	3	250	8.88.36080	6.608
	630	1000	70	4	313	8.88.36010	8.260 *
	630	1200	84	5	376	8.88.36012	9.912 *

Da utilizzarsi solo con unità di controllo a doppio canale Art. 89B
*To be used only with multi channel unit Art. 89B **

PIANO ELETTROPERMANENTE PER ASPORTAZIONI IN FRESATURA CON PEZZI DI SPESSORE MEDIO-ALTO

Il piano magnetico più utilizzato.
 La grande forza magnetica che esercita soprattutto nella fase di lavoro con appoggio del pezzo direttamente sul piano magnetico ci permette di affermare che ogni potenza della macchina in uso riesce ad esprimersi al massimo senza alcun problema di spostamento del pezzo.

ELECTRO-PERMANENT CHUCK FOR MILLING WITH MEDIUM-HIGH THICKNESS WORK-PIECES

This is the most used magnetic chuck.
 The great magnetic force exercised during the working phase laying the part directly on the magnetic chuck allows us to state that every machine power being used is expressing its maximum without any problem of moving the part.

CARATTERISTICHE TECNICHE
TECHNICAL CHARACTERISTICS

Polo magnetico / Magnetic chuck
70 x 70 mm

Passo polare - Pole pitch
80 mm

Foro nel polo / Hole in the chuck
M10 x 12 mm utili / unti

Forza in Gauss / Gauss force
7500 gap 1.5 mm

Forza polare verticale / Vertical chuck force
daN 600

Forza polare in strisciamento
 Sliding chuck force
daN 180

Forza combinata / Combined force = **1500**

Spessore minimo consigliato
 Minimum suggested thickness
16 mm

Spessore massima prestazione
 Maximum performance thickness
40 mm

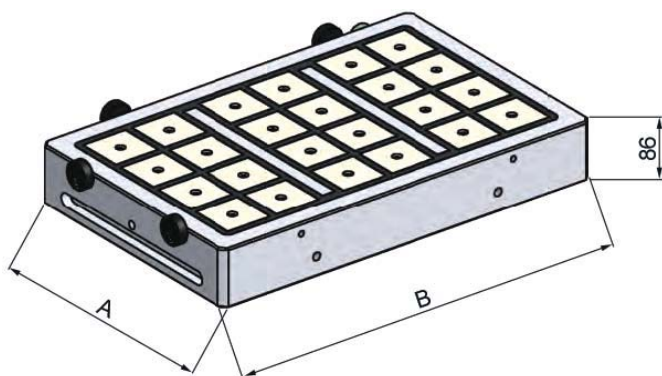
Dimensione pezzo minimo
 Min. piece size
200 cm²
(14 cm x 14 cm)

Perdita di forza in lavoro con espansioni fisse
 Loss of match. force fixed shoes
H = 30 mm
15%

Art. 88 Tipo **4** *Il più potente* *The most powerful!*

Massima performance a 65 mm di altezza
(Ideale per espansioni polari)

Max performance at 65 mm height
(Ideal for remote chuck shoes)



**PIANO ELETTROPERMANENTE
PER GRANDI ASPORTAZIONI
IN FRESATURA
CON UTILIZZO DI ESPANSIONI POLARI**

Il piano magnetico più potente sul mercato. Una grande forza magnetica che si esprime in modo particolare quando le lavorazioni vengono eseguite con espansioni polari a distanza. Il unico piano magnetico che non perde forza quando il pezzo viene lavorato a distanza dal piano magnetico.

**ELECTRO-PERMANENT CHUCK
FOR MILLING THICK PARTS
USING POLE SHOES**

This is the most powerful magnetic chuck in the market. A great magnetic force that manifests itself particularly when machining operations are done with remote chuck shoes. This is the only magnetic chuck that will not loose force when the part is machined at a distance from the magnetic chuck.

Tipo Type	A	B	Nr Poli Poles	Traverse Traverses	Peso Kg Weight Kg	COD.	€
4	230	230	4		32	8.88.42020	1.360
	230	310	6		43	8.88.42030	2.040
	230	420	8	1	58	8.88.42040	1.904
	230	470	10	1	65	8.88.42050	1.860
	230	610	12	2	84	8.88.42060	2.232
	230	800	16	3	111	8.88.42080	2.976
	230	1000	20	4	138	8.88.42010	3.200
4	310	310	9		58	8.88.43030	2.142
	310	420	12	1	78	8.88.43040	2.232
	310	470	15		88	8.88.43050	2.790
	310	610	18	2	114	8.88.43060	3.348
	310	800	24	3	149	8.88.43080	3.840
	310	1000	30	4	187	8.88.43010	4.680
4	390	420	16	1	99	8.88.44040	2.976
	390	610	24	2	143	8.88.44060	3.840
	390	800	32	3	188	8.88.44080	4.992
	390	1000	40	4	235	8.88.44010	6.080
	390	1200	48	5	282	8.88.44012	7.296
4	470	610	30	2	173	8.88.45060	4.680
	470	800	40	3	226	8.88.45080	6.080
	470	1000	50	4	283	8.88.45010	7.600
	470	1200	60	5	340	8.88.45012	8.880 *
4	630	610	42	2	231	8.88.46060	6.384
	630	800	56	3	303	8.88.46080	8.288 *
	630	1000	70	4	379	8.88.46010	10.360 *
	630	1200	84	5	455	8.88.46012	12.432 *

Da utilizzarsi solo con unità di controllo a doppio canale **Art. 89B**
To be used only with multi channel unit **Art. 89B** *

**CARATTERISTICHE TECNICHE
TECHNICAL CHARACTERISTICS**

Polo magnetico / Magnetic chuck
70 x 70 mm

Passo polare - Pole pitch
80 mm

Foro nel polo / Hole in the chuck
M10 x 12 mm utili / utilit

Forza in Gauss / Gauss force
10500 gap 1.5 mm

Forza polare verticale / Vertical chuck force
daN 620

Forza polare in strisciamento
Sliding chuck force
daN 200

Forza combinata / Combined force = **1620**

Spessore minimo consigliato
Minimum suggested thickness
20 mm

Massima performance altezza:
Maximum performance height:
65 mm

Dimensione pezzo minimo
Min. piece size
**200 cm²
(14 cm x 14 cm)**

Perdita di forza in lavoro con espansioni fisse
Loss of match. force fixed shoes
H = 30 mm
15%

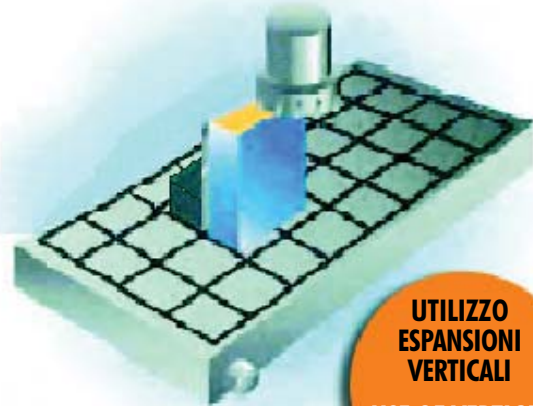
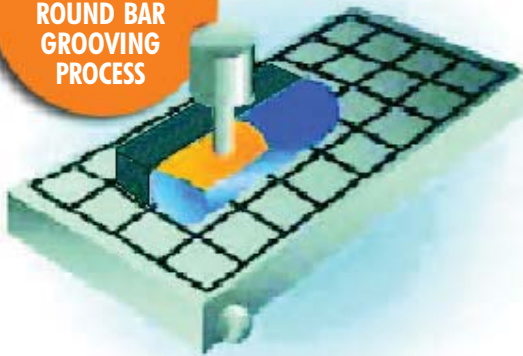
ESEMPI DI APPLICAZIONE EXAMPLES OF APPLICATION

**FRESATURA
FRONTALE**
**FRONT MILLING
PROCESS**



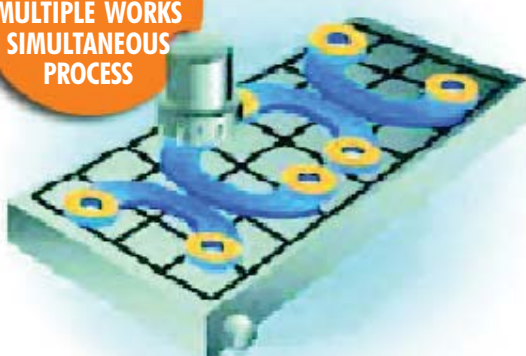
**LAVORAZIONI
A 5 FACCE**
**5 SIDE PROCESS
WITH SINGLE
CHUKING**

**FRESATURA
DI UN TONDO**
**ROUND BAR
GROOVING
PROCESS**



**UTILIZZO
ESPANSIONI
VERTICALI**
**USE OF VERTICAL
EXTENSION**

**LAVORAZIONI
SIMULTANEE**
**MULTIPLE WORKS
SIMULTANEOUS
PROCESS**



**LAVORAZIONI
SU CUBI A 5 FACCE**
**MACHINING
ON HORIZONTAL
M/C**

Edition: February 2005/Rev. 0

INSTRUCTIONS FOR INSTALLATION,
OPERATION
AND MAINTENANCE

**Square pole
electro-permanent
magnetic chucks**



CE

Dear Customer

*Thank you for choosing milling products from **GERARDI S.p.A.** We are pleased to provide you with this manual, which is intended to allow you to operate with maximum levels of security and productivity.*

Please read this technical publication carefully, making it available to the personnel who are to use our products, and to the person responsible for their installation and maintenance.

GERARDI S.p.A.'s focus is on our customers and their satisfaction. We are therefore available to provide any further essential information. GERARDI S.p.A. will consider any suggestions for improvement in order to bring the manual more into line with the safety and productivity requirements for which it was published.

This manual is an integral part of the equipment. If the equipment is sold, the old user must give this manual to the new user and communicate the address of the new owner to GERARDI S.p.A. so they may be contacted with any essential information or updates.

GERARDI S.p.A. declines any liability:

- a) for any accidents caused by lack of compliance with safety regulations;*
- b) due to lack of information and training of operators and installers;*
- c) due to incorrect installation on other equipment not supplied by us.*

With best wishes for success in your work.

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1.1 Contents – intended use

Square pole electro-permanent magnetic chucks are intended to lock any ferromagnetic material being worked on by machine tools, working centres etc. using magnetic power. This series of chucks assures a very strong magnetic hold power and allows heavy milling operations or high speed removals to be performed, allowing the machine tools to be used to their full potential. Ease of attachment and release of the piece being worked on also significantly increases the machines' productivity, avoiding bracket fixing and changing of the equipment.

The electro-permanent nature of the magnetic chuck also enables operation with complete safety in case of loss of power. The system only requires electric power when magnetisation and demagnetisation of the chuck is performed, then, in the event of power loss during production, the machine tool will stop, while the magnetic chuck will stay magnetised.

1.2 Intended users of the manual

This manual is aimed at:

- the plant, workshop or factory manager;
- the personnel, usually or occasionally responsible for the installation, maintenance, activation and de-activation of the product;

Ensure the manual is always kept in good condition and that it is readable, stored in a suitable location and by a responsible person, specially appointed for the purpose, so that it can easily be consulted.

In case of loss or deterioration, please request replacement documentation indicating the manual edition and revision number shown on the first page, directly from:

1.3 Warranty and technical assistance regulations

Original configuration of the product and warranty regulations

The original configuration of the product must not be changed for any reason whatsoever. Improper use of the equipment for operations not recommended by the manufacturer and not indicated in this manual may cause damage to the product and pose a risk to workers.

The term of the warranty is 12 (twelve) months from date of delivery subject to other written commercial agreements shown on the order. For components not directly manufactured by S.P.D. S.p.A. the manufacturer's warranty applies.

The warranty only covers the replacement of components and the repair of product failures causing incorrect functioning.

The product, under warranty, must be shipped **carriage paid** to our plants. The repaired device will be shipped **freight collect** to the customer. The warranty does not include sending our technicians to work at the client's premises or to the location where the device is installed. Plant disassembling is

not included. If, for practical reasons one of our employees is sent out, the labour provided, plus transfer and travel expenses, food and lodging will be invoiced at current prices or will be subject to negotiations.

In no circumstances shall the warranty give the right to claim compensation for any direct or indirect damage caused by our equipment to people, property or other machinery resulting from poor use, lack of maintenance or improper use.

Repairs under the warranty do not interrupt its term.

Warranty exclusions

The warranty does not include all defects entirely or partially resulting from:

- lack of attention to control and maintenance directions, or improper use;
- normal decay of the equipment caused by wear and tear;
- defects resulting from changes or repairs not provided by the manufacturer or authorised retailer;
- breakdowns caused by incorrect use, assembling and disassembling;
- damage caused by use of spare parts different from the originals;
- damage caused by accumulation of foreign bodies on magnetic surfaces.

The warranty expires automatically:

- in the event of non-payment or other breaches of the contract;
- if the serial number has been tampered with, obliterated or lost;
- if damage is caused by impact with foreign bodies, or shocks to mobile or fixed parts or other causes not attributable to normal working conditions;

For all disputes the place of jurisdiction shall be the Court of Bergamo.

1.4 Updates and adaptations

The product and this manual reflect the state of the art at the time of their launch onto the market and comply with all mandatory laws, directives and laws in force at that time. For this reason they shall not be considered inadequate merely because laws have been updated or construction technologies evolve following new experiences.

The manual is distributed in a *non controlled* way, which means that the manufacturer reserves the right to modify the manual without any obligation to notify those who have previously received it.

Any modifications and adaptations to the product or the manual, carried out after the date of delivery, shall not oblige the manufacturer to carry out work either on the device or on the manuals.

Note:

The manufacturer reserves the material and intellectual property rights over this publication and prohibits disclosure and reproduction, even partial, without its prior written consent.

1.5 Normative references

GERARDI S.p.A. electro-permanent square pole magnetic chucks are designed and manufactured in compliance with the following legal and regulatory framework:

EC directives:

Directive 89/392 EEC and subsequent amendments: 91/368 EEC, 93/44 EEC, 93/68 EEC, 98/37 EEC known as the "Machinery Directive".

Directive 73/23 EEC "Low voltage electric material".

Directive EEC2004/108 "Electromagnetic compatibility directive"

Applicable harmonised standards:

IEC EN 292 parts: 1st 2nd "Machinery safety".

IEC EN 60204- 1 "Electrical equipment safety".

Regulations and technical rules applied:

IEC EN 60529 "Degrees of protection of enclosures" (IP Code).

MMPA standard 0100-00 "Standard specifications for permanent magnet materials".

conditions for use:

Working temperature: minimum -10 °C, maximum + 40 °C.

Maximum relative humidity: 80%.

Protection and insulation of electric components.

Protection IP20 – Max. insulation voltage 500V.

Electronic control unit.

The square pole electro-permanent magnetic chucks are equipped with an electronic control unit which allows management of the magnetisation and demagnetisation cycle, management of alarms and battery recharging and any PLC connection of the machine tool.

Effects of magnetic fields on the human body.

Measurements of the static magnetic field with a frequency of 50 Hz carried out close to the electro-permanent magnetic chucks and the power cables of the electronic control unit have shown values far lower than the values specified by the regulation CENEL pr ENV 50166-1 (0÷10 kHz) which are 2T in continuous and 1.6m T at 50 Hz.

It should also be considered that magnetic fields of 50Hz are present only during the magnetisation and demagnetisation stages of the chucks and their duration varies according to type, ranging from 0.5 - 2 seconds while the regulation refers to an exposure time of 8 hours.

2.1 Installing the magnetic chuck and the control unit

To install the magnetic chuck we recommend carrying out the following procedure, bearing in mind that it represents a necessary but not exhaustive condition of all the operations to be carried out, as it is not possible to forecast all the possible particular situations which may happen in practice.

Unpacking the magnetic chuck

To avoid the risk of crushing the magnetic chuck, it must be handled by fixing eyebolts into the threaded holes at the sides. This operation does not involve risks related to magnetic fields. It is recommended not to damage the rectified polar surface.

Fixing the magnetic chuck

Fix the magnetic chuck on the work surface of the machine by using suitably sized screws or brackets depending on requirements. For those who requested holes in the magnetic chuck suitable for the machine slots, the chuck can simply be fixed in place by using suitable screws. For correct use of the work surface the visible holes should be plugged using plaster in polyester for metals. For long surfaces (> 600 mm.) it is recommended that the magnetic chuck is also centrally fixed in order to avoid that the chuck lifts up towards the piece instead of picking it up, due to the power developed.

If additional holes in the magnetic chuck are required, please contact GERARDI's technical department

Check of the positioning of the magnetic chuck

Check that the chuck is safely locked so that it cannot be moved in any direction (the machine must be turned off and secured during installation of the chuck). The magnetic chuck is supplied rectified with a flatness and parallelism guaranteed within two hundredths per metre, so there is no need to rectify it once it is positioned on the machine. In any case, it is a good idea to check the overall positioning of the magnetic chuck – machine tool.

Installing the magnetic chuck and the control unit

With regard to installing the control unit supplied by GERARDI together with the magnetic chuck, please read the relative equipment manual.

2.2 Initial operation and normal operability

Unpacking the magnetic chuck

- Connect the electro-permanent system control unit as indicated on the manual of the electronic equipment (if supplied along with the magnetic chuck).
- Connect the chuck magnetisation cable, by plugging it with a rotating movement and making sure it is perfectly plugged in (you hear a “clack” at the end of screwing).
- Turn on the electronic control unit by using the main switch. For customers who own an GERARDI control unit, the following items light up:
 - a) the security key LED (yellow) corresponding to the power supply;
 - b) the demagnetisation LED (red) corresponding to OFF status (magnetic field not present).

Positioning the piece to be worked on

Place one or more pieces on the magnetic chuck paying attention to the instructions given in the chapter relating to the characteristics and positioning of the piece to be worked on.

Magnetisation of the chuck

Power up the magnetic chuck by simultaneously pressing the security key button (yellow) and the magnetisation key (green). At the end of the magnetisation process:

- a) the green LED lights up;
- b) the red LED turns off;
- c) the yellow LED will remain on.

During the magnetisation process (variable from 0.5 to 2 secs) persons wearing Pace Makers or metallic prostheses must stay at a safe distance of at least one metre and the operators must not place tools or metallic parts close to the chuck to avoid the danger of crushing.

Piece/s locking test

Manually check that the piece/s are attached to the chuck in a stable position. For a reliable test on the attractive force of the magnetic chuck, it would be a good idea to use a mild steel plate (we recommend UNI Fe360 steel) with a thickness of over 30mm and of a suitable size to cover at least four adjacent square poles.

N.B. Do not test locking of the piece on the chuck by hitting it with a hammer. In this case the force would only be concentrated in one point instead of being uniformly distributed over the piece: the test is not reliable.

Demagnetisation of the chuck

Demagnetise the chuck by simultaneously pressing the security key button (yellow) and the demagnetisation button (red).

At the end of the demagnetisation process:

- d) the red LED lights up;
- e) the green LED turns off;
- f) the yellow LED will remain on.

During the demagnetisation process (variable from 0.5 to 2 seconds) persons wearing Pace Makers or metallic prostheses must stay at a safe distance of at least one metre.

Note: in case of ferromagnetic pieces made of alloy steel or with particular chemical characteristics, it may be difficult to detach the piece/s from the magnetic chuck, especially after long working periods. This is not a demagnetisation problem of the magnetic chuck but is due to magnetisation of the metallic piece worked on, which after a careful check will be full of very high magnetic residue (see chapter 2.3 relating to the characteristics of the piece in production).

Normal operation with the magnetic chuck

Repeat the stages described above following this sequence: **positioning, magnetisation, locking test.**

At this point, it is possible to disconnect the cable if it interferes with operations. The chuck remains magnetised due to the electro-permanent magnetic field.

When production is complete, reconnect the connector and proceed with the phase of **demagnetisation of the chuck.**

2.3 Characteristics of the piece to be worked on and recommendations on positioning

Chemical properties of the piece to be worked on

Electro-permanent magnetic chucks are able to lock all ferromagnetic materials.

The following materials are excluded:

- Aluminium and its alloys, Bronze and Brass
- Non-magnetic cast iron
- Some types of stainless steel (austenitic type even if slightly magnetizable after plastic deformation hardening)

Even inside the ferromagnetic materials, locking of the piece on the chuck depends on the reluctance of the piece to lock.

The value of reluctance depends on the chemical composition of the material. This composition may cause strong reductions (up to 20 - 30%) of the maximum value of the attractive force which can be reached with the mild steel.

Material	Efficiency
Standard steel (Fe 360 - C40)	100%
Crude ferromagnetic steel	90%
Magnetic stainless steel	80%
Cast iron	70%

Heat treatments performed on the piece to be worked on

Some heat treatments considerably reduce magnetic attraction properties. Special attention must therefore be given to materials which have undergone one of the following treatments:

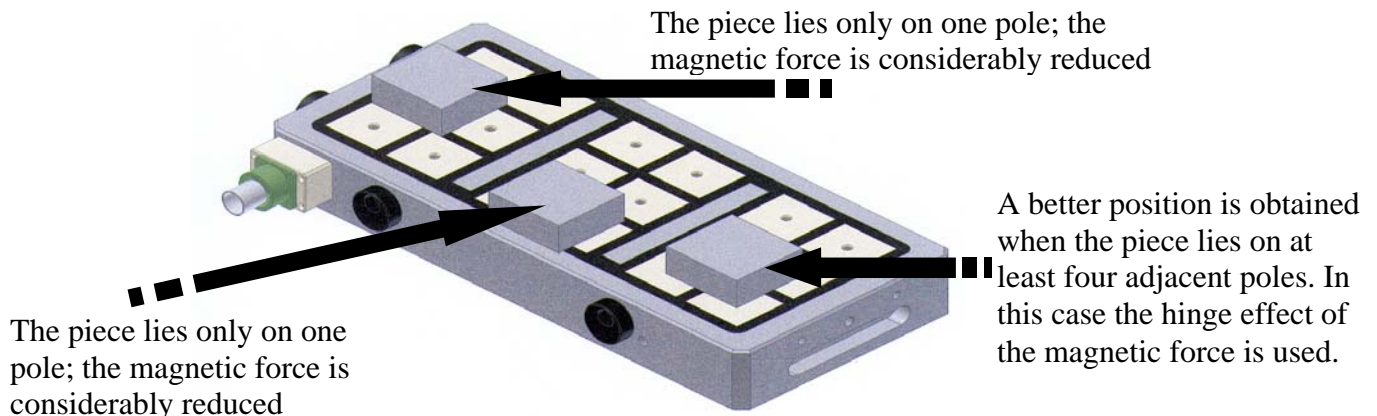
- Tempering in all possible variants
- Upgrading
- Cementation
- Nitriding.

Contact and positioning of the piece to be worked on

For optimal use of the magnetic force it is important to pay attention to:

- the position of the piece on the magnetic chuck;
- the contact surface between the piece to lock and the magnetic chuck;
- the value of the air gap (space between the chuck and the piece to attract).

Some examples are shown below.



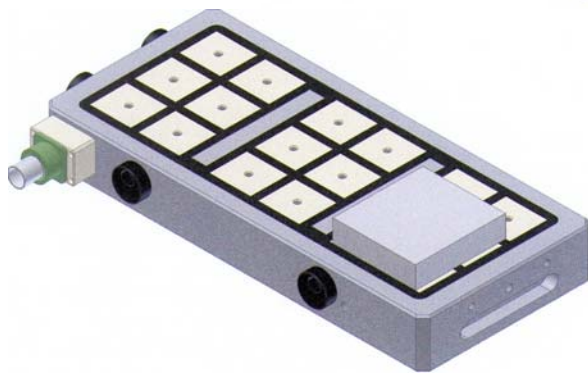
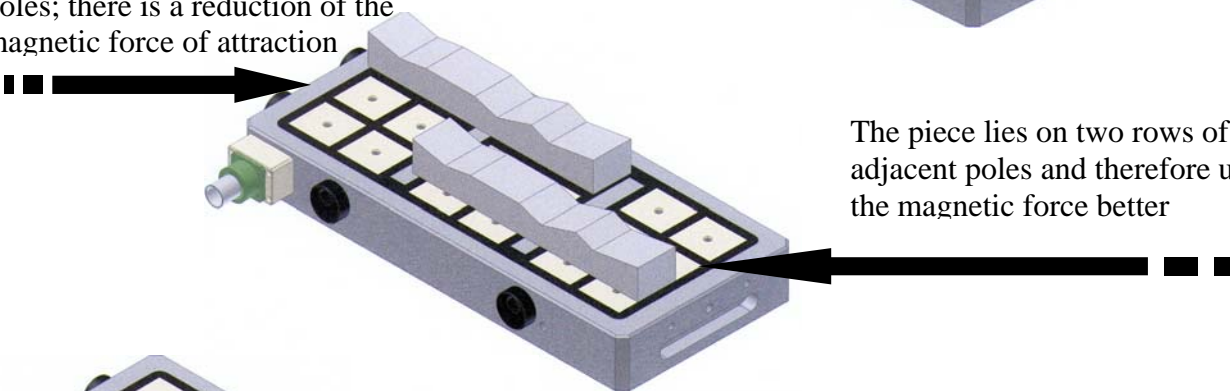
The piece lies on four adjacent poles; this is the recommended position

The piece lies on two poles; the magnetic force is reduced



The piece only lies on a row of poles; there is a reduction of the magnetic force of attraction

The piece lies on two rows of adjacent poles and therefore uses the magnetic force better



The optimal position is obtained when the piece covers the surface of at least four adjacent poles. In this case the magnetic force of attraction and its hinge effect is better used.

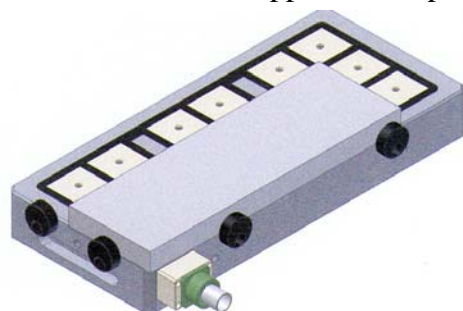
The piece has a limited surface and only lies on some points; the force of attraction is considerably limited

The piece which is being worked on can also be placed using the support provided by the back-up washers already placed on the magnetic chuck, other than using the magnetic force.

Simple support of the piece



Double support of the piece

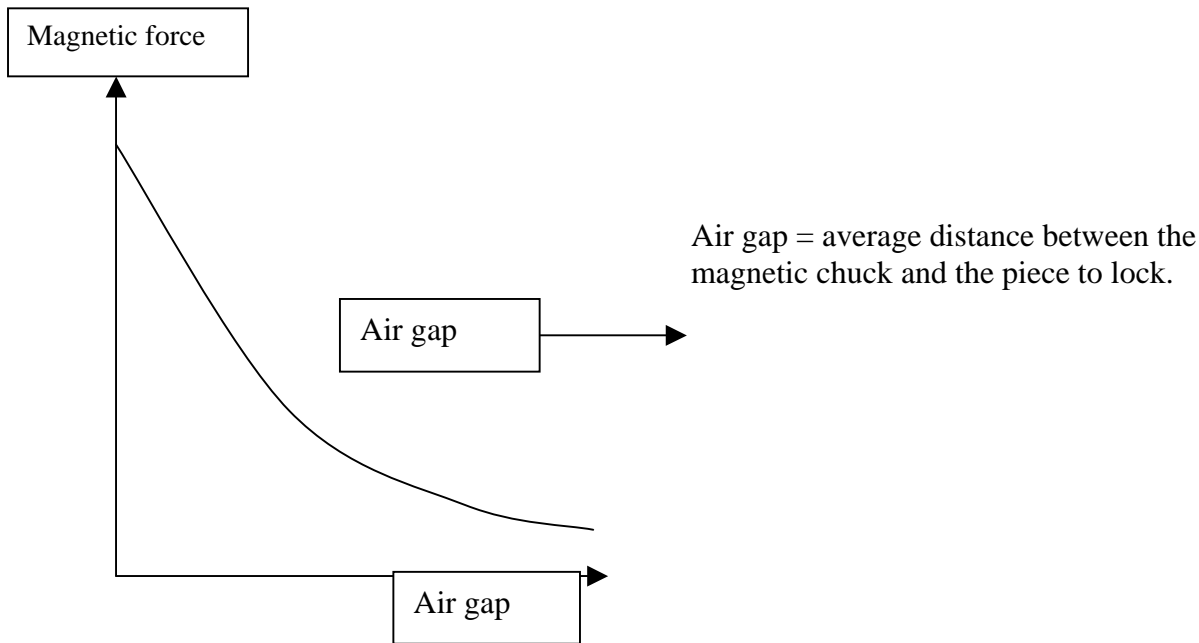


Shape of the piece and minimum thickness.

In addition to that explained previously, for optimal attraction the piece must have a good uniformity of section and a suitable thickness. For minimum thickness refer to the table below.

Type of steel	Minimum thickness with positioning on at least 4 adjacent poles			
	Type 1	Type 2	Type 3	Type4
Mild (mm)	6	8	12	18
Alloy (mm)	8	10	15	20
Cast Iron (mm)	12	15	20	25

Trend of the magnetic attraction force depending on the air gap (the diagram is intended as an example only)



Section 3	Magnetic chuck protection and protection provided by the control unit (GERARDI Model)
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3.1 Protection of the magnetic chuck

Thanks to its special magnetic circuit, the electro-permanent system allows operation in complete safety because:

- it is not restricted by electricity. The demand for current is limited to the magnetisation and demagnetisation phases only, which last from 0.5 to 2 seconds on average.
- it does not have external or internal moving parts and therefore the chuck is not subject to

wear and tear;

- it does not have time limitations. Magnetisation is permanent and the magnetic force does not reduce over time.

3.2 Control unit protection (GERARDI Model)

- If the electrical device in the control unit is connected it prevents the machine tool from starting IF the chuck is not magnetised. This device is installed in any control unit but its activation depends exclusively on the customer.
- If malfunctions are detected in the magnetic chuck, affecting its full magnetisation, the SPD control unit does not perform the magnetisation cycle. See the chapter covering UC signals for malfunctions of the magnetic chuck in the control unit manual.

Section 4	Maintenance
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4.1 Periodic maintenance

Maintenance must be performed by trained and instructed staff only. Maintenance staff must have read this manual. Good and constant maintenance is a decisive factor for best performance in optimal operating conditions and for increased duration of operations over time.

Periodically it is recommended to:

- Check the condition of the connector, removing chips, condenses or water that may be present.
- Check the condition of the power cables eliminating any breaking, crushing or other malfunctions. Do not splice cables. The power cable must be intact; avoid repairs using insulating tape or other splicing methods.

4.2 Technical assistance

For any queries or further information, please contact the GERARDI technical assistance service

4.3 Spare parts recommended

The customer can replace the following spare parts:

Description	Code	Manufacturer
Block for E 37 connector	08.03.020	
CIR 22 male connector	284.01.007	
CIR 22 connector cap	284.01.006	

These parts can be replaced without the assistance of GERARDI personnel. Please perform the operation carefully so as not to jeopardise the correct operation of the magnetic chuck.

As regards the internal parts of the magnetic chuck it is essential to send the product to the manufacturer.

Section 5	Initial diagnostic operations – finding malfunctions of the electro-permanent chuck
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Malfunction detected	Likely cause	Suggested operation
The piece moves on the magnetic chuck.	The chuck has not performed the magnetisation phase correctly.	<ul style="list-style-type: none"> • Check that the supply voltage of the control unit is correct. • Check the power cable. • Verify the chuck's resistance. <p>Repeat the magnetisation phase after the above operations have been checked .</p>
The circuit-breaker for over-current protection of the GERARDI control unit activates.	There is an abnormal absorption of current.	<ul style="list-style-type: none"> • Check the resistance of the cable connecting the unit to the chuck. • Verify the chuck's resistance. (See diagram below)
The residual current operated circuit breaker for protection of the power line activates.	There is a discharge to earth.	<ul style="list-style-type: none"> • Check the insulation of the cable conductors connecting the unit to the chuck.. • Verify that there is no discharge to earth from the chuck. (See diagram below)
After activation of the circuit-breaker for over-current protection, the control unit LEDS remain off.	<ul style="list-style-type: none"> • The power cable is not connected. • The plug is not connected correctly. 	Turn off the control unit and check the connections.
Disturbance to other equipment nearby is detected.	Electromagnetic interference.	Check that the instructions of the control unit manual regarding electromagnetic compatibility are observed.

For any other malfunctions, please contact the GERARDI technical department

Single chuck standard connection diagram

Check resistance between (A) and (B).

In order to check for discharge to earth, connect the Insulation Tester between (A) and the iron body of the chuck or between (B) and the iron body of the chuck.

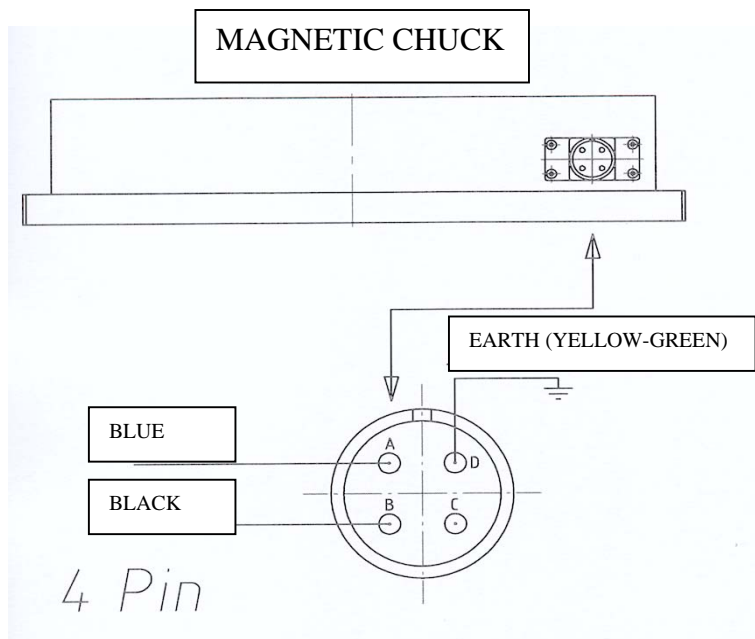
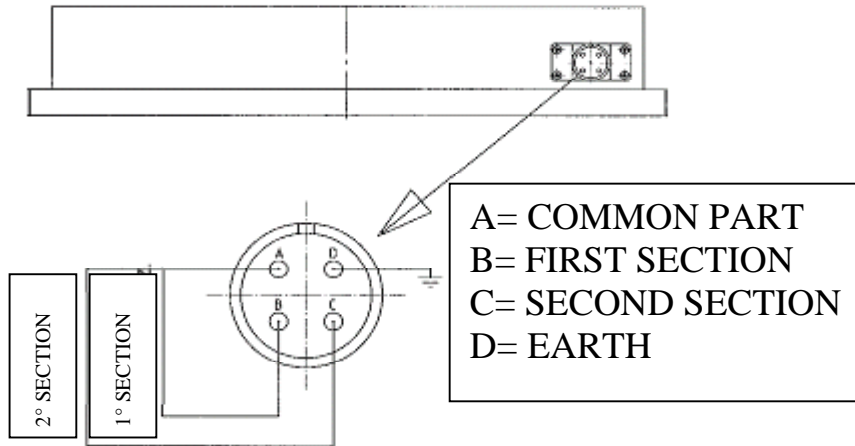


Diagram for large magnetic chuck connection divided into two sections



Check resistance between (A) and (B).

Check resistance between (A) and (C).

The use of a digital tester is recommended.

In order to check for discharge to earth, connect the Insulation Tester between (A) and the iron body of the chuck or between (B) and the iron body of the chuck or

between (C) and the iron body of the chuck.

Section 6 Working safely and avoiding risks

Improper actions or use of the product may cause damage to the working environment or serious risks to the safety of workers who carry out the operations or stand within the equipment's field of operation.

You must not, under any circumstances

- use the equipment for operations and services other than its intended use;
- allow the chuck to be used by unqualified or unsuitable personnel, particularly by those wearing PACE MAKERS or metallic prostheses who must stay at a safe distance. The magnetic field may prevent the PACEMAKER from operating;
- fail to pay proper attention during the manoeuvres of magnetisation and demagnetisation;
- place the parts incorrectly on the chuck;
- start the machine tool before the chuck is magnetised
- attempt to magnetise parts with a temperature higher than 80 °C.
- use the chuck if not wearing suitable work clothing and PPE;

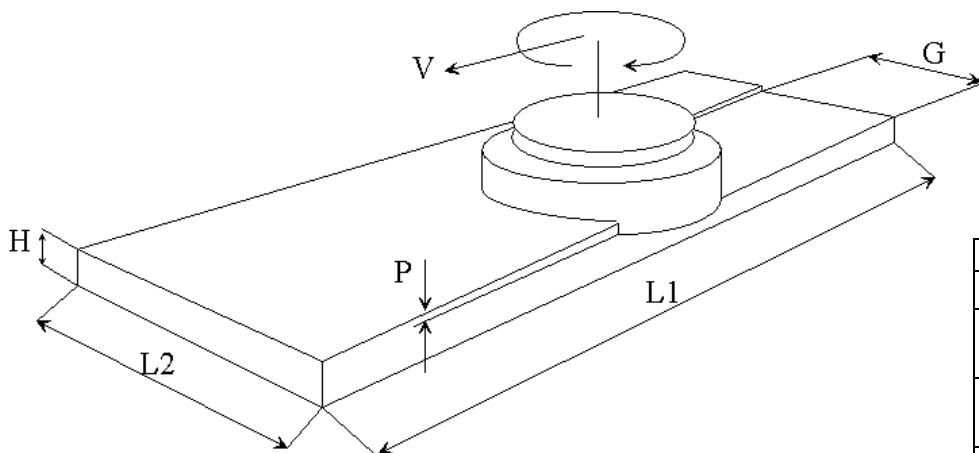
Code of conduct

- use appropriate tools and personal means of protection during working or maintenance;
- check the magnetic chuck and the control unit
- position the piece on the magnetic chuck so that so that it covers at least four poles. Otherwise the power of the chuck is limited;
- Clean the surface of the chuck and the part being worked on. Any chips or dirt increase the air gap and therefore the power of the magnetic chuck decreases;
- Install the following signs near the place where the equipment is being used:



Section 7

Performance of the milling chucks PM65 / PM70 /PM71 series



Good surface
Superficie lavorata
tol. 0.1 mm

Rough surface
Superficie grezza
tol. ≤ 1 mm

Stock Removal Chart Asportazione

$$TMAX = G \times P \times V \text{ mm}^3/\text{min}$$

Width of work Grandezza passata

G= in mm

Depth of cut Profondità passata

P= in mm

Feed rate Avanzamento

V = in mm/min

Parameter recalculation formulas

Formule di ricalcolo parametri

$$G_{mm} = TMAX / P \times V$$

$$P_{mm} = TMAX / G \times V$$

$$V_{mm/min} = TMAX / P \times G$$

Max volume of Stock Removal Totale asportazione massima	$TMAX = A \times \Delta$ (Tab. 1) = mm ³ /min
Length of the working piece Dimensione pezzo in senso longitudinale alla lavorazione	L1= mm
Width of the work piece Dimensione pezzo in senso trasversale alla lavorazione	L2= mm
Area of the work piece Superficie pezzo da lavorare	A = L1 x L2 = mm ²

Table (tabella) "1"

Coefficient/Coefficiente $\Delta = \text{mm}/\text{min}$		PM65		PM70		PM71	
Pos piece Pos. Pezzo	Type of steel Tipo Acciaio	Good Buono	Rough Grezza	Good Buono	Rough Grezza	Good Buono	Rough Grezza
With end stop A battuta	Mild dolce	12,6	7	14,4	10	15	12
	Black legato	9,6	5	11	7	11	9
	Cast iron ghisa	6	3	7,2	4	7,5	5,5
Libero Without end stop	Mild dolce	4,2	2,3	4,8	3,4	4,9	4,1
	Legato black	2,8	1,7	2,9	2,3	3,3	2,9
	Ghisa cast iron	2	1	2	1,3	2,4	1,8

N.B.: data shown in the table is intended as an example. The above mentioned values have been extrapolated from experimental tests carried out with generic parts of the following sizes: L1/L2 ≤ 2 ratio - H/L2 ≤ 1 ratio, and carefully positioning the part on the chuck. They are also related to parts with a minimum thickness as per table 2. In case of parts with inferior thickness reduce the removal values proportionally.

Calculation example

To flatten a UNI Fe 360 steel plate of the following dimensions:

- L1= 400mm L2= 200mm H= 30mm
- Roughness of the piece inferior to 0.1mm (good).
- Lay the piece on the magnetic chuck in the position that we have called “free”, which means without any end stop reference.

Choose certain working conditions related to the machine:

- Forward speed at 750mm / min. (V)
- Width of work of 100mm (G)

Choose the magnetic chuck model TYPE 4.

Which depth of cut (P) can we use without the piece moving on the magnetic chuck?

Experimental data (table 1) gives us the Δ coefficient which in the above mentioned conditions is equal to **4.9**.

The support area (A) is equal to L1 x L2 in mm²

The volume of chips removed in a unit of time (minute) is: $T_{MAX} = G \times P \times V$ (1)

from this we have: $P = T_{MAX} / G \times V$

If $T_{MAX} = A \times \Delta$

We have $P = A \times \Delta / G \times V$

And then: $P = (200 \times 400 \times 4.9) / 100 \times 750 = 5.22 \text{mm}$

Conclusion: the piece locked on the magnetic chuck does not move until the depth of cut exceeds 5.22mm. Higher running depths may cause the piece to slide on the magnetic chuck.

Section 8

Working with fixed and mobile expansions

8.1 Fixed expansions

Fixed expansions are used for the production of pieces and separating from the surface of the magnetic chuck. This allows the piece to be shape refined, plane bores, work on the five sides perpendicularly, without damaging the surface of the magnetic chuck. In addition, if suitably treated, they allow a negative indentation of the piece to be worked on which at this point can be locked using a highly shaped surface.

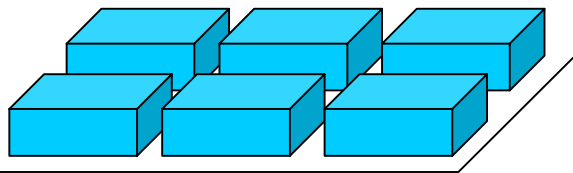


8.2 How to install fixed expansions

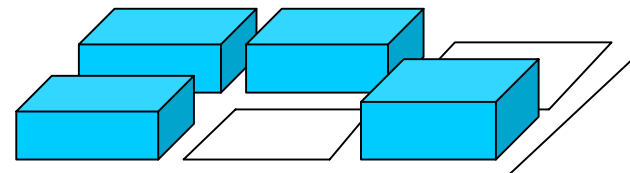
The correct use of the expansions is connected to their correct positioning. Each expansion must first be installed on a single pole using a TCE stay-bolt. It may cover it entirely or only partially: However, it is important that the expansion does not lie on two poles, as this would close the magnetic circuit and would not transfer it to the piece.

It is recommended that the area occupied by the piece be covered with the expansions as much as possible. It is not appropriate to use only a few randomly positioned expansions because the magnetic force would be considerably reduced due to the few poles used for magnetic transmission and, even worse, because there is the risk of unbalancing the quantity of positive poles with the negative poles with subsequent magnetic unbalancing.

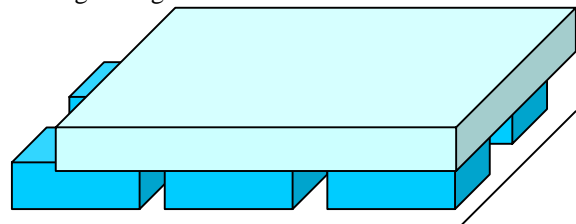
Correct position



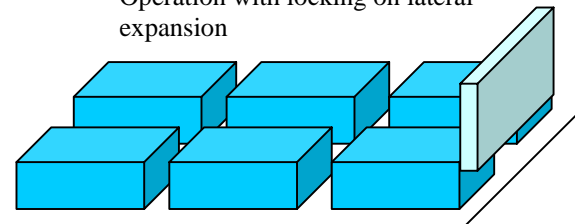
Incorrect position: polar unbalancing



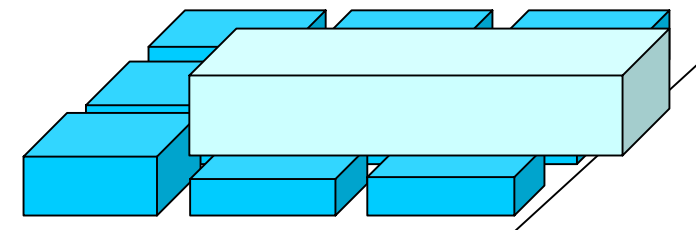
Lifted part: shape refining, drilling, working perpendicularly, making through slots



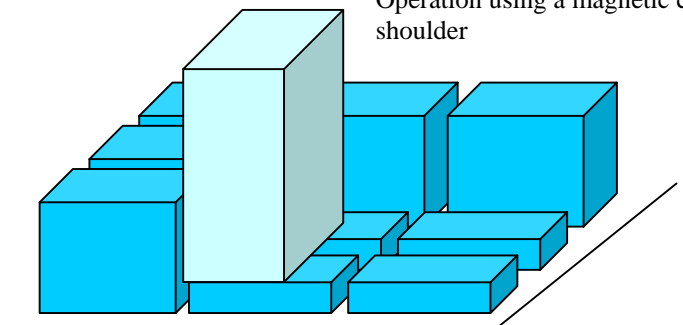
Operation with locking on lateral expansion



Operation using a magnetic counter shoulder

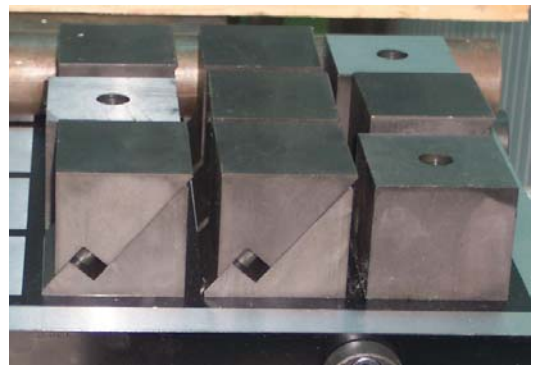


Operation using a magnetic counter shoulder



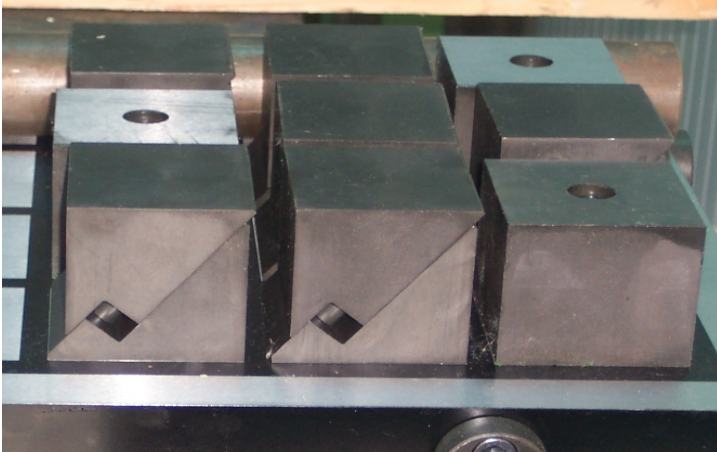
8.3 Mobile or self-levelling expansions

These expansions are used for levelling deformed and warped plates. In addition to the characteristics of the fixed expansions described above, they can adapt to the curve of the plate to be worked on, using their flexible self-levelling system and enabling the levelling of a surface by locking the other one which is still deformed and then obtaining a centesimal flatness without any thickening, by turning the plate.

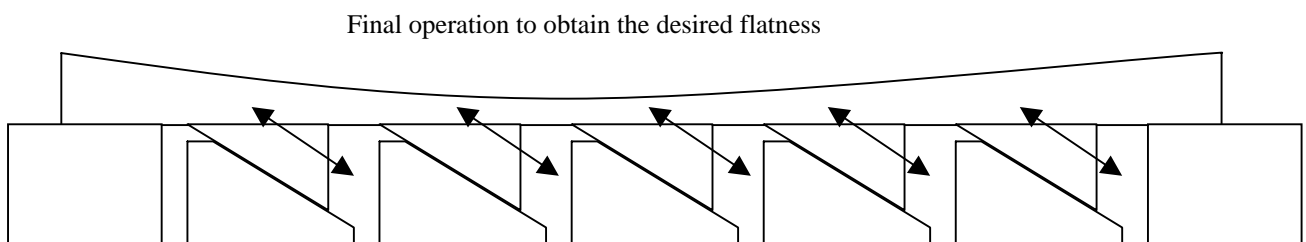
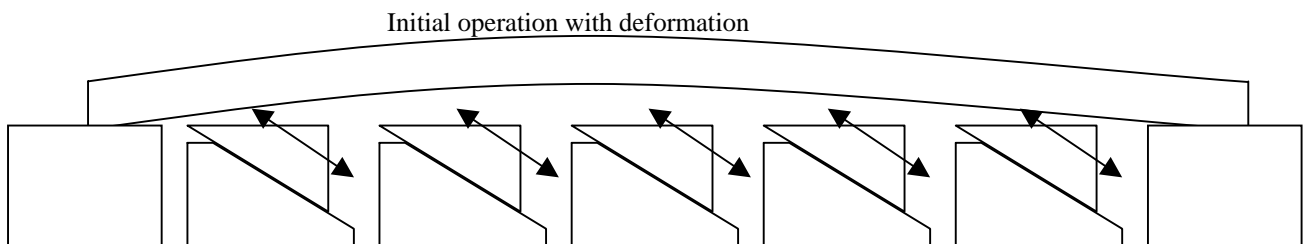
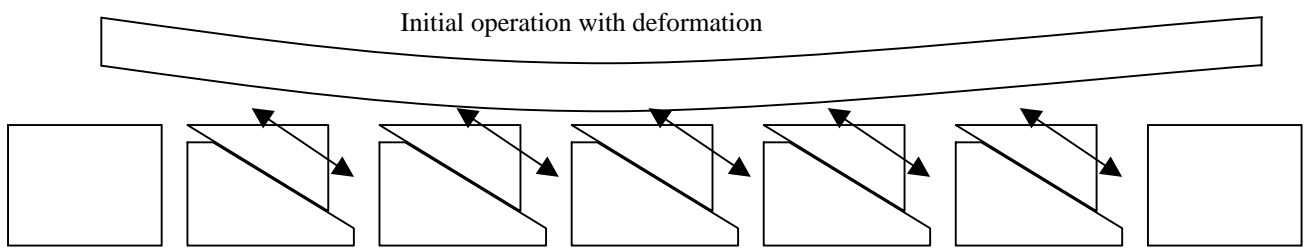
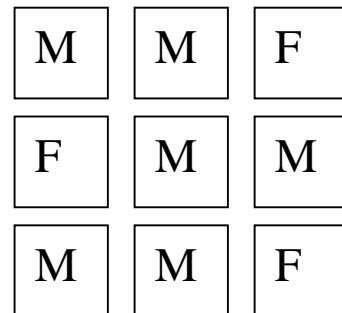


8.4 How to install mobile expansions

To obtain the results described above the mobile expansions must be installed correctly. First of all, as much of the surface area as possible of the plate which is being worked on must be covered by positioning three fixed expansions supporting the plate and all other possible mobile expansions which will adapt to deformation



Example of positioning as shown in the picture.
(3 fixed + 6 mobile expansions)



Section 9 | **Supplementary operations**

9.1 Packaging

The product is packaged with standard procedures. Packaging methods may be personalised at the customer's request, by negotiation.

– The standard packaging of the electro-permanent chucks includes the use of cardboard boxes or pallets according to the weight of the chuck to be packed and PULIRIBALL type polyethylene sheets. The control unit is packed into a separate box. Empty spaces between the products are filled with polyurethane foam, wrapped in a polyethylene sack

9.2 Transport and internal handling

During transport, internal handling and unpacking you must follow any directions shown on the packaging.

Equipment used for handling must be suitable and adequate to the weight to be lifted in order to work safely. There is no danger from magnetic fields or other risks related to operating conditions when the machine is being transported.

During the above mentioned operations avoid shocks or contact with corrosive materials.

Ensure that the surfaces are not damaged by impact with extraneous materials.

9.3 Conservation and installation after long storage

Before storing the product protect the surfaces using suitable means. Materials may be stored indoors for a maximum period of eight months with relative humidity not exceeding 80% (as specified by regulation IEC EN 60/204-1).

When storing, place wooden risers underneath the equipment and protect the parcels using barrier bags.

After long storage periods, before installation and starting operation, you must check the functioning of the product.

9.4 Disposing of the product and packaging

Take into account the different features of the chuck and the control unit's components when disposing of the equipment.

Packaging materials must also be disposed of according to type. The company responsible for disposal must comply with the laws regarding disposal in the country where such operation takes place. The company responsible for disposal or trading-in must be informed of the residual risks of permanent magnetism.

Disposal and trade-in are at the customer's expense and liability.