

MAGNETIC WORKHOLDING

WORKHOLDING WITH PRECISION
AND PERFORMANCE



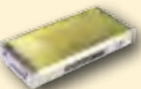
CHAPTER OVERVIEW

CHAPTER 1

Page 17 - 32

	SAV-ART.-No.	POLE PITCH	COMMENTS	MACHINING OPERATION*	PAGE
PERMANENT MAGNETIC CHUCKS					
	220.30	1,9 mm	magnet pallet	   	20
	220.31	6 mm	power magnet pallet	   	20
	220.32	15 mm	standard pallet	  	21
	220.33	19 mm	standard pallet	 	21

MAGNETIC TOMBSTONES AND MAGNETIC VERTICAL CHUCKS					
	242.90	1,9 mm	permanent magnetic vertical chuck	  for horizontal machining	22
	242.91	15 mm	magnetic tombstone	  for horizontal machining	22

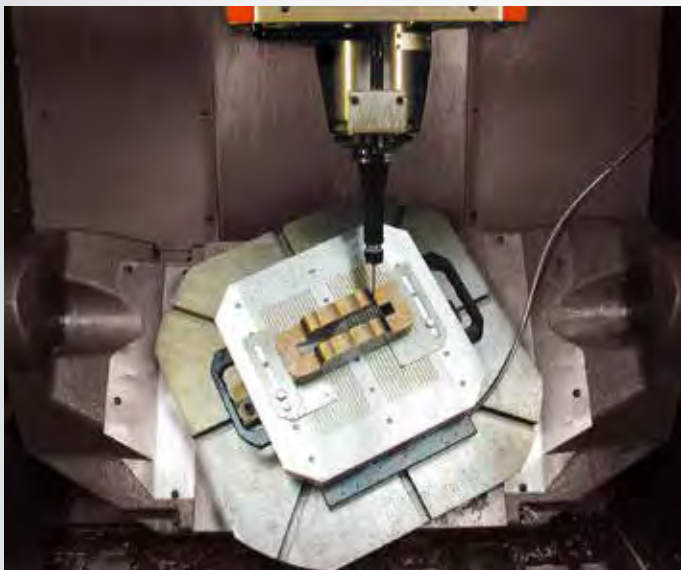
PERMANENT MAGNET CHUCKS, RECTANGULAR					
	243.01	1,9 mm	standard	 	23
	243.07	1,9 mm	fine transverse poles	 	23
	243.10	6 mm	extreme high holding force	   	24
	243.11	15 mm	enhanced holding force	  	25

PERMANENT CIRCULAR MAGNETS, NEODYMIUM CIRCULAR MAGNETS AND LAMINATED TOP PLATES					
	244.02	parallel poles	with enhanced magnet system	 	26
	248.01	St 3 mm Ms 1 mm	for circular magnetic chucks	 	26
	244.03	7 mm	parallel poles		27
	244.04	2,5 mm	parallel poles	 	27
	244.05	5/11 mm	parallel poles	 	28
	244.10	13 mm	parallel poles	 	28
	244.06	radial poles	radial poles	 	29
	248.05	radial poles	for circular magnetic chucks	 	29
	244.07	6 mm	extreme high holding force	   	30

FLANSCH					
	248.90	–	without mounting bolts	 	31
	248.91	–	with bayonet ring fixing	 	31
	248.92	–	with camlock fixing	 	32
	248.94	–	–	 	32

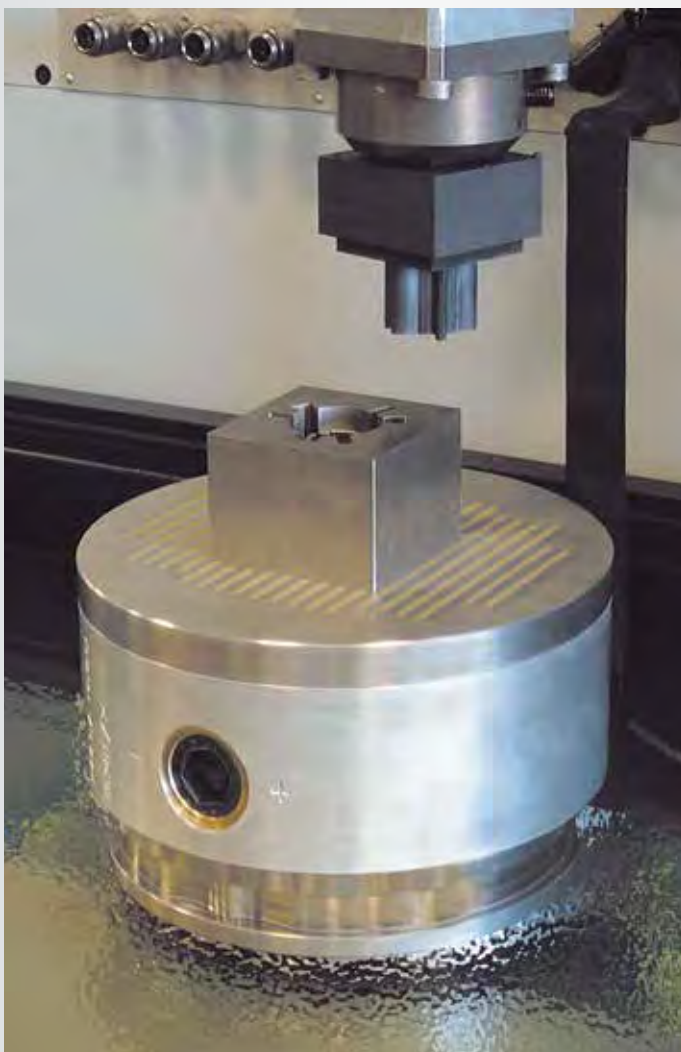
* Explanation of the icons on page 9

PRODUCT APPLICATIONS



HSC machining with magnetic pallet SAV 220.31

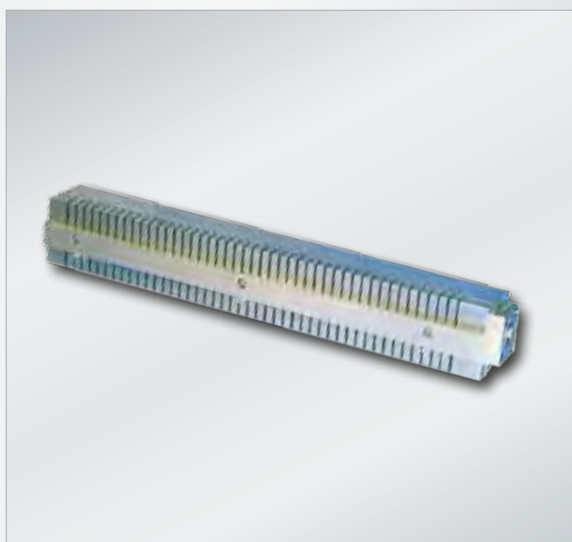
Spark-erosion with Neodymium circular magnet.



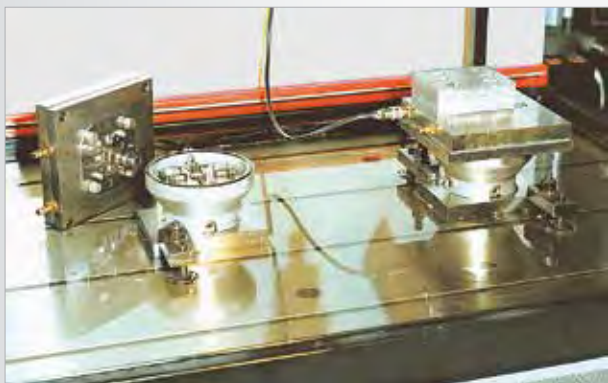
Circular grinding with permanent circular magnetic chuck. In this application upto 300 different workpieces can be machined using 4 sets of pole raisers.

PERMANENT MAGNETS DEVELOPED WITH THEIR APPLICATION IN MIND

Permanent magnetic beam with high-energy magnetic system and mechanical actuation with roller bearings. With magnetic isolated stop for grinding of workpieces and 20° angle.



PRODUCT APPLICATIONS



► SAV-PALLET SYSTEMS

Permanent magnet chucks

With reference system and flushing channels.
We supply clamping devices for EDM operations with all required adaptations.



Permanent magnet chucks

With reference system for use in a dielectric.
The workpieces are set down away from the machine and the position measured.

► SAV-AUTOMATION SOLUTIONS



MAGNET PALLET

Transverse pole pitch $P = 2 \text{ mm}$

Use:

For use with zero point clamping systems.
Adaptable to the majority of systems.

Material:

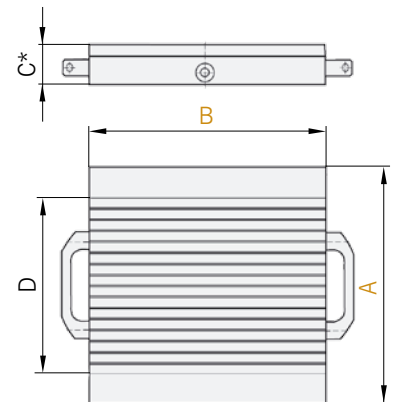
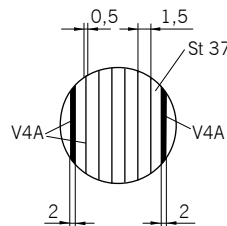
Aluminium base with St 37 /
stainless steel (V4A) Pole plate

Technical Specifications:

- Parallelism: $< 0.01 \text{ mm}$
- Can be executed with threaded holes
for side or angled stops
- Magnetic field height: 4 mm
- Pole plate wearing limit: 3 mm
- Holding force: 80 N/cm^2
- Pole pitch: 1.9 mm

Dimensions in mm				Switchable sections	Weight in kg
A	B	C*	D		
240	240	46	204	1 / 2	19,0
280	280	67	230	2	25,0
320	320	60	250	1 / 2	32,0
320	160	60	250	1	16,0

* Dimension C is a guideline value and can be determined exactly using the reference system.



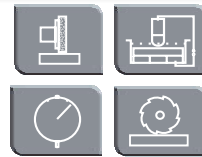
Ordering example:

Magnet Pallet

Ordering key

SAV 220.30 - 320 x 160 - 1 - Reference system - Adaption - P

SAV - No. - A x B - Switchable sections - Reference system - Adaption - Accuracy



SAV 220.30



POWER MAGNET PALLET

Transverse pole pitch $P = 6 \text{ mm}$

Use:

For use with zero point clamping systems.
Adaptable to the majority of systems.

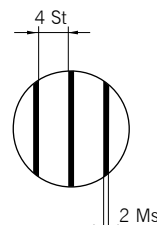
Material:

Aluminium base with St 37 / stainless steel
(V4A) Pole plate

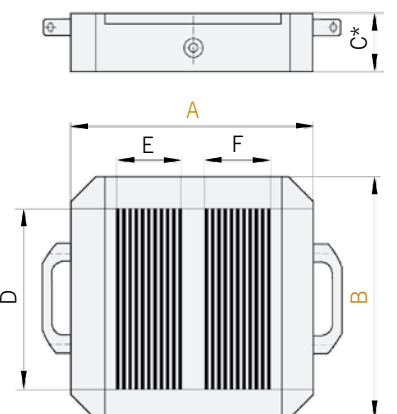
Technical Specifications:

- Low weight with high holding force
- Parallelism: $< 0.01 \text{ mm}$
- Pole plate wearing limit: 2 mm
- Holding force: 140 N/cm^2
- Also available in stainless steel
- Can be executed with threaded holes
for side or angled stops
- Low magnetic field height

Dimensions in mm						Switchable sections	Weight in kg
A	B	C*	D	E	F		
240	240	60	126,0	-	-	1	18,0
280	280	66	166,0	80,0	80,0	2	21,5
320	320	65	206,0	80,0	80,0	1/2	25,0/36,0



* Dimension C is a guideline value and can be determined exactly using the reference system.



Ordering example:

Power Magnet Pallet

Ordering key

SAV 220.31 - 320 x 320 - 2 - Reference system - Adaption - P

SAV - No. - A x B - Switchable sections - Reference system - Adaption - Accuracy



SAV 220.31



PERMANENT MAGNET PALLET


SAV 220.32
1
Transverse pole P = 15 mm
Use:

To clamp medium-size and large parts in grinding, milling and EDM operations. Adaptable to the majority of zero point clamping systems.

Technical Specifications:

- Aluminium housing, for attachment or installation
- Stops on 3 sides
- 2 Switching positions
- Hexagon key
- Operating instructions
- Finely milled execution

Pole pitch steel/brass: 11 / 4 mm
 Nominal holding force: 130 N/cm²
 Magnetic field height: 6 mm
 Pole plate wear limit: 6 mm
 Re-machining of the bottom face: up to 12 mm
 Parallelism: 0.03 mm

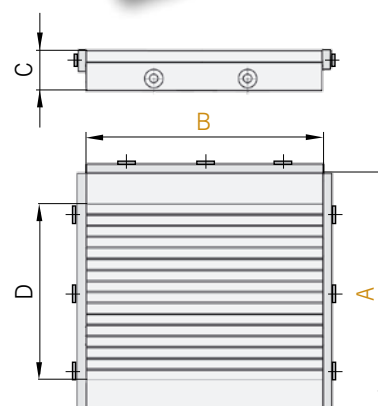
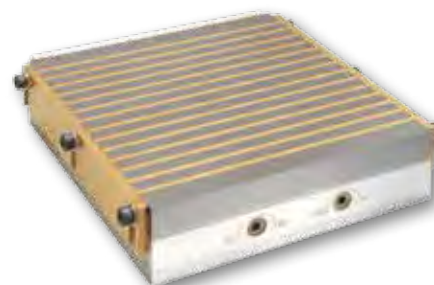
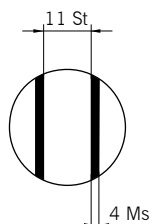
Dimensions in mm			D	Weight in kg
A	B	C*		
240	240	63,5	200	21,5
280	280	63,5	230	29
320	320	63,5	290	38

* Exact dimension is determined using the reference system.

Ordering example:

Permanent Magnet Pallet SAV 220.32 - 320 x 320 - Adaption

Ordering key SAV - No. - A x B - Adaption



PERMANENT MAGNET PALLET


SAV 220.33
Transverse pole pitch P = 19 mm
Use:

5-face machining operations possible through the use of pole beams.

Technical Specifications:

- Steel body, for attachment or installation
- Stops on 3 sides
- 2 Switching positions
- Threaded bores on all sides
- Hexagon key and instructions
- Finely milled execution

Pole pitch steel/brass: 15 / 4 mm
 Nominal holding force: 140 N/cm²
 Magnetic field height: 8 mm
 Pole plate wear limit: 6 mm
 Re-machining of the bottom face: up to 4 mm
 Parallelism: 0.03 mm

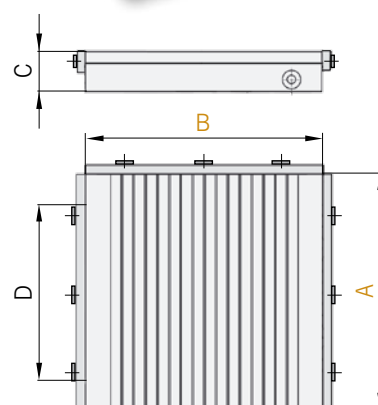
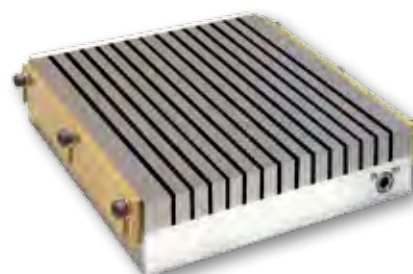
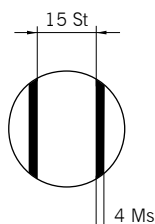
Dimensions in mm			D	Weight in kg
A	B	C*		
240	240	63	200	25
280	280	63	240	37
320	320	63	280	50

* Exact dimension is determined using the reference system.

Ordering example:

Permanent Magnet Pallet SAV 220.33 - 320 x 320 - Adaption

Ordering key SAV - No. - A x B - Adaption



PERMANENT MAGNETIC VERTICAL CHUCK



SAV 242.90

With fine transverse pole pitch $P = 1.9 \text{ mm}$

Use:

Primarily for horizontal machining of workpieces.

Features:

T-section block made from St 52-3 and supplied complete with permanent magnetic chuck SAV 243.01.

Laminations 0.5 mm brass / 1.4 mm steel.

The T-section can also be supplied with other permanent, electro or electro-permanent chucks.

Parallelism and angularity: $0.005 / 100 \text{ mm}$

Nominal holding force: 80 N/cm^2

Magnetic field height: 6 mm

Pole plate wearing limit: 8 mm

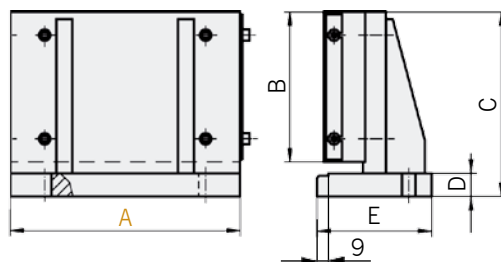


Other sizes available on request.

Dimensions in mm					Weight in kg
A	B	C	D	E	
250	150	190	30	156	38,0
350	150	190	30	156	52,0
400	200	240	30	175	75,0
500	200	240	30	175	93,5

Ordering example:

Permanent Magnetic Vertical Chuck SAV 242.90 - 500 - B
Ordering key SAV - No. - A - Type of fixing



MAGNETIC TOMBSTONES



SAV 242.91

Precision milled workholding tombstones

Use:

For horizontal milling and drilling operations.

Features:

Tombstone made from St 52-3. Precision milled. Complete with 4 permanent magnet chucks SAV 243.11. Enhanced high energy system, 15 mm pole pitch. Mounting holes available upon agreement.

Rectangularity: $0.03 / 1000 \text{ mm}$

Parallelism and angularity: $0.04 / 1000 \text{ mm}$

Nominal holding force: 150 N/cm^2

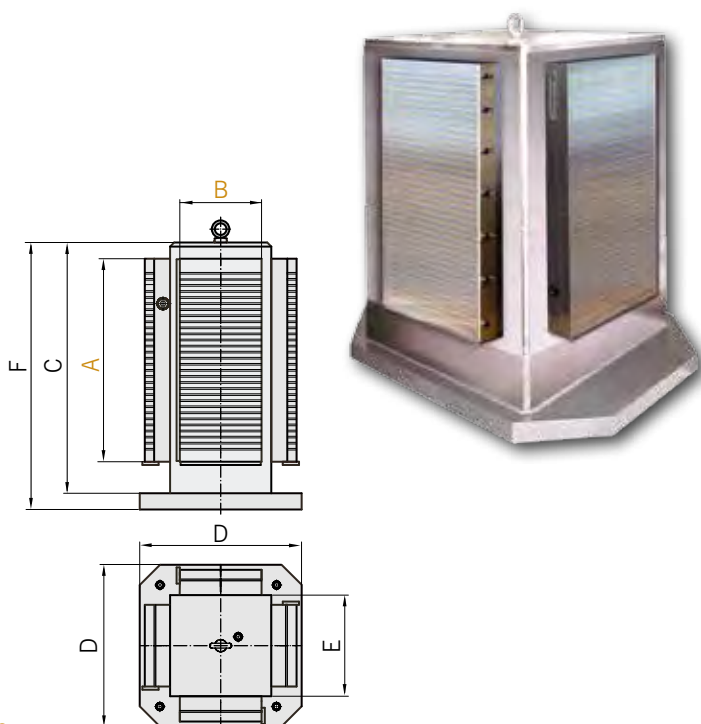
Magnetic field height: 12 mm

Pole plate wear limit: 5 mm

Dimensions in mm						Weight in kg
A	B	C	D	E	F	
300	150	415	320	200	455	183,0
500	200	620	400	256	660	395,0
600	300	660	500	356	700	616,0

Ordering example:

Permanent Magnet Tombstone SAV 242.91 - 600 x 300
Ordering key SAV - No. - A x B



PERMANENT MAGNETIC CHUCK


SAV 243.01

With fine transverse pole pitch $P = 1.9 \text{ mm}$

Use:

For small, medium and large workpieces.

Features:

Uninterrupted transverse pole arrangement.

Constant holding force over the entire polesurface area and along the side faces.

Laminations 0.5 mm brass / 1.4 mm steel.

Nominal holding force: 80 N/cm²

Magnetic field height: 6 mm

Pole plate wearing limit: 8 mm



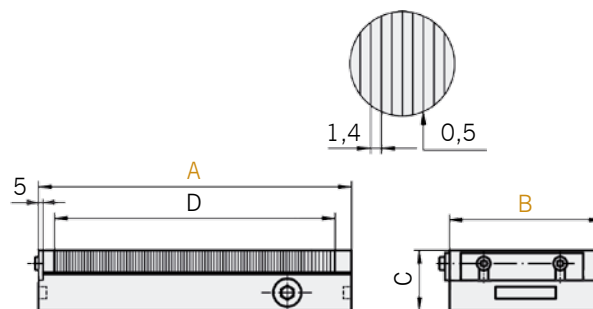
Dimensions in mm				Weight in kg	Dimensions in mm				Weight in kg
A	B	C ^{+0.5} ₋₂	D		A	B	C ^{+0.5} ₋₂	D	
140	70	49	103	3,7	400	150	51	365	26,2
175	100	49	147	7,0	450	150	51	415	30,0
200	100	49	172	8,1	300	200	51	267	26,2
250	100	49	220	13,2	400	200	51	367	35,0
255	130	49	222	14,5	500	200	51	466	43,7
150	150	51	115	9,8	600	200	51	566	52,4
250	150	51	215	16,4	500	250	56	464	58,5
300	150	51	265	19,7	500	300	56	456	70,2
350	150	51	315	23,0	600	300	56	557	84,2

Available with flushing channels for spark erosion applications.

Ordering example:

Permanent Magnetic Chuck SAV 243.01 - 500 x 200

Ordering key SAV - No. - A x B



PERMANENT MAGNETIC CHUCK


SAV 243.07

With fine transverse pole pitch $P = 1.9 \text{ mm}$

Use:

Very suitable for thin parts.

Features:

Extremely low height. ON-OFF switching from above.

Laminations 0.5 mm brass / 1.4 mm steel.

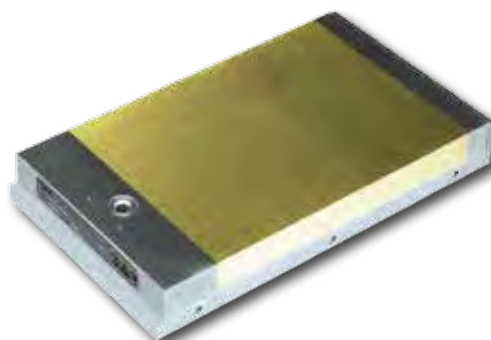
Flushing channel(s) available at a surcharge.

Suitable for adaption on zero reference system on request.

Nominal holding force: 80 N/cm²

Magnetic field height: 6 mm

Pole plate wearing limit: 6 mm

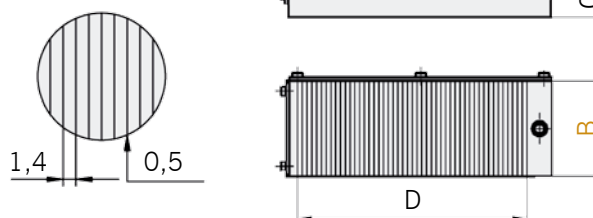


Dimensions in mm				Weight in kg
A	B	C ^{+0.5} ₋₂	D	
175	100	32,0	122	4,5
255	130	32,0	200	8,5
150	150	34,5	96	6,0
250	150	34,5	194	10,0
300	150	34,5	246	12,5
350	150	34,5	295	14,0
450	150	34,5	396	18,0
400	200	35,0	344	23,0

Ordering example:

Permanent Magnetic Chuck SAV 243.07 - 450 x 150

SAV - No. - A x B



NEODYMIUM MAGNETIC CHUCK

With transverse pole pitch $P=6$ mm neodymium-iron-boron magnets, extremely high holding force

Use:

For workpieces that are particularly difficult to clamp, such as ferrotic and hard metals containing cobalt, as well as very small workpieces.

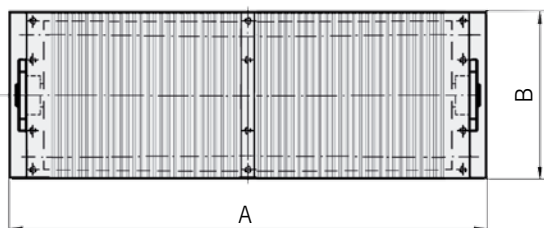
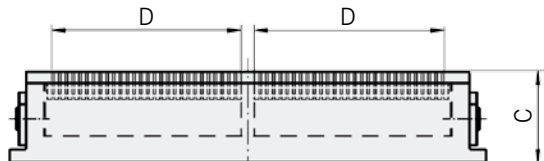
Application:

Suitable for grinding of workpieces that are particularly difficult to clamp magnetically and for hard milling.

Features:

developed construction. Stable all-steel body.
ON-OFF control on both end faces.
Larger models - with power-operated switching mechanism - available on request.
Laminations 4 mm St and 2 mm cast resin with NdFeB magnets in the pole gaps.

Nominal holding force: 180 N/cm²
Magnetic field height: ca. 10 mm
Pole plate wearing limit: 3 mm



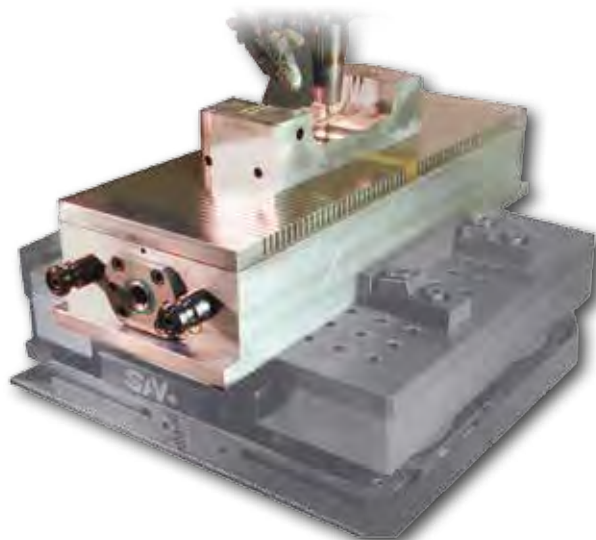
Dimensions in mm				Weight in kg
A	B	C ^{+0,5 -2}	D	
400	150	82	171	35,0

Ordering example:

Neodymium Magnetic Chuck SAV 243.10
Ordering key SAV - No.



SAV 243.10



PERMANENT MAGNETIC CHUCK


SAV 243.11
1

With transverse pole pitch, $P = 15 \text{ mm}$, neodymium-magnets, enhanced holding force

Use:

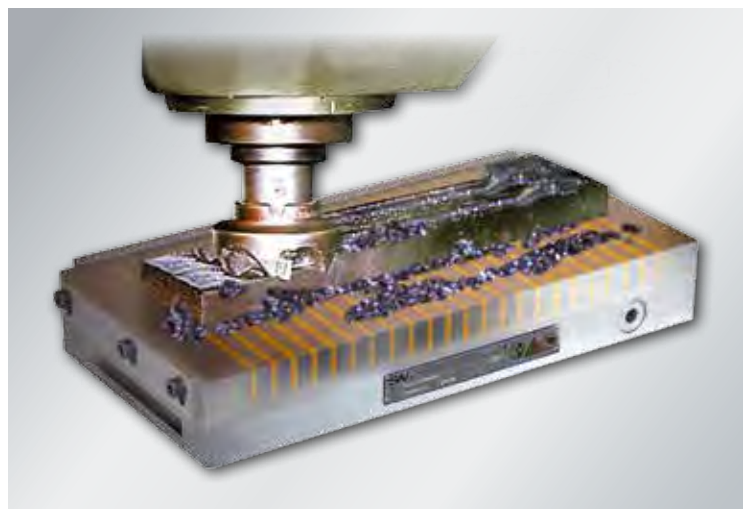
Heavy machining, such as milling and planing. The dense, concentrated magnetic field enables it to be used for small, medium and large workpieces, including those with rough or uneven surfaces. The magnetic field is without any stray fields, preventing magnetization of the tool.

Features:

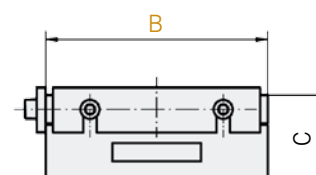
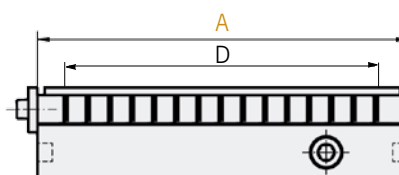
Exceptionally strong neodymium magnetic system. ON-OFF control by means of hand lever. In the OFF position, a weak opposing field eases the removal of the workpiece. The magnets are equipped with longitudinal and transverse stop rails.

Laminations 3 mm brass / 12 mm steel.
Suitable for use with laminated topplates:
SAV 248.02 and SAV 248.03

Nominal holding force: 150 N/cm^2
Magnetic field height: ca. 12 mm
Pole plate wearing limit: 5 mm



Dimensions in mm				Weight in kg
A	B	C _{+0,5 -2}	D	
250	150	56	199	17,0
300	150	56	244	20,0
350	150	56	289	24,0
400	200	56	349	35,0
500	200	56	439	44,0
600	200	56	544	52,0
600	300	56	544	67,0



Ordering example:

Permanent Magnetic Chuck SAV 243.11 - 600 x 300
Ordering key SAV - No. - A x B

PERMANENT MAGNETIC CIRCULAR CHUCK



SAV 244.02

With parallel pole arrangement, enhanced magnetic system

Use:

Sizes A = 200 to 500 mm for turning and grinding, sizes 100 to 160 for grinding.

Features:

Exceptional strong magnetic field. Concentric grooves simplify the centring of the workpiece. A centre drilling of up to diameter E is permissible, depth of drilling must not exceed 8 mm for A = 100 to 200 mm and 15 mm for A = 250 to 500 mm. Also available with flange (see SAV 248.90 to 248.94).

Nominal holding force:

140 N/cm²

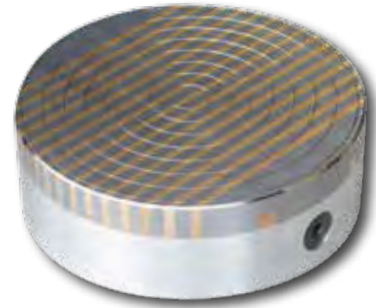
(A = 200 to 500 mm)

70 N/cm²

(A = 100 to 160 mm)

Magnetic field height:
10 mm

Pole plate wearing limit:
8 mm

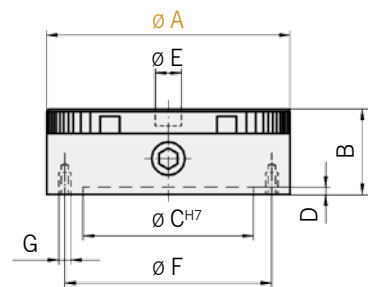


Dimensions in mm							Pole pitch steel / brass	Switching positions	Weight in kg
A	B ^{+0.5 -2}	C	D	E	F	G			
100	62	70	2,5	-	91	3 x M 5	4/1,5 2/1,5	1	3,0
130	62	90	2,5	-	120	4 x M 6	4/1,5 2/1,5	1	5,0
160	75	125	3,0	-	142	4 x M 8	6/1,5 2/1,5	1	8,0
200	80	150	4,5	-	182	4 x M 8	8 / 5	1	13,0
250	80	200	4,5	20	232	4 x M 8	8 / 5	1	20,0
300	85	250	4,5	20	285	4 x M 8	8 / 5	1	29,0
350	85	300	4,5	20	334	4 x M 8	8 / 5	1	40,0
400	100	300	5,0	20	350	6 x M 10	8 / 5	1	59,0
450	100	350	5,0	20	400	6 x M 10	8 / 5	2	70,0
500	100	400	5,0	20	450	6 x M 10	8 / 5	2	90,0

Ordering example:

Permanent Magnetic Circular Chuck SAV 244.02 - 500

Ordering key SAV - No. - A



LAMINATED CIRCULAR TOP



SAV 248.01

For use on circular chucks with parallel pole arrangement

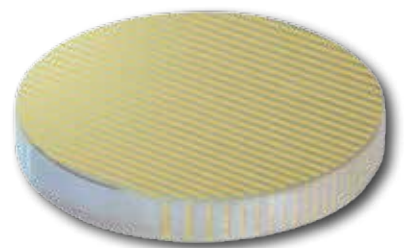
Use:

Clamping of profiled workpieces on circular chucks with parallel pole arrangement.

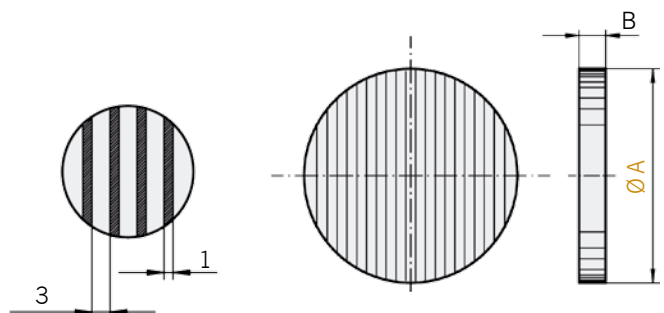
Features:

Silver brazed steel/brass construction. Can be machined to any required shape, or custom machined during manufacture. Connection to magnet to be agreed upon. Lamination must be parallel to magnetic chuck.

Pole pitch: steel 3 mm, brass 1 mm



Dimensions in mm		Weight in kg	Dimensions in mm		Weight in kg
A	B		A	B	
155	25	4,0	300	25	14,0
200	25	6,0	350	25	19,0
250	25	10,0	400	30	30,0



Ordering example:

Laminated Circular Top Plate SAV 248.01 - 400

Ordering key SAV - No. - A

PERMANENT MAGNETIC CIRCULAR CHUCK


SAV 244.03
1

With parallel pole pitch $P = 7$ mm, flat edition

Use:

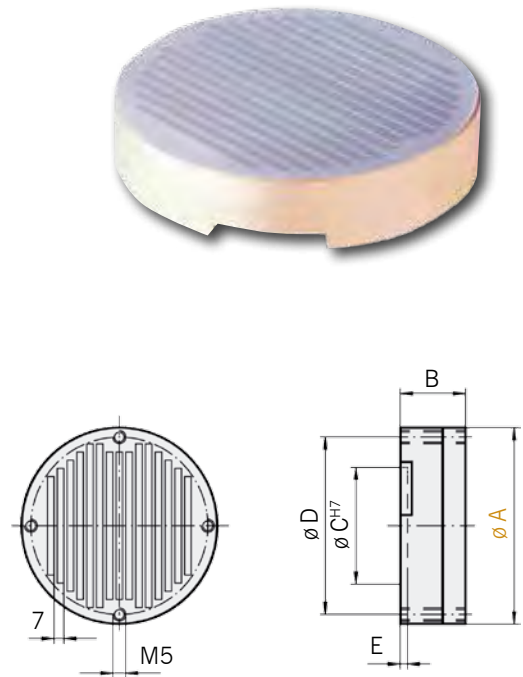
Small and medium-sized workpieces.

Features:

Special magnetic configuration enabling the maximum holding force to be reached with workpieces as thin as 1 mm. ON-OFF control by means of a detachable socket wrench (radial adjustment). Available with flange on request (see SAV 248.90 to 248.94).

Nominal holding force: 100 N/cm²
Magnetic field height: 6 mm
Pole plate wearing limit: 3 mm

Dimensions in mm					max. Drehzahl in 1/min	Weight in kg
A	B ^{+0,5 -2}	C	D	E		
100	32	80	87,5	3	350	1,1
150	32	130	137,5	3	230	2,6


Ordering example:

Permanent Magnetic Circular Chuck SAV 244.03 - 150
Ordering key SAV - No. - A

PERMANENT MAGNETIC CIRCULAR CHUCK


SAV 244.04

With fine parallel pole pitch $P = 2.5$ mm

Use:

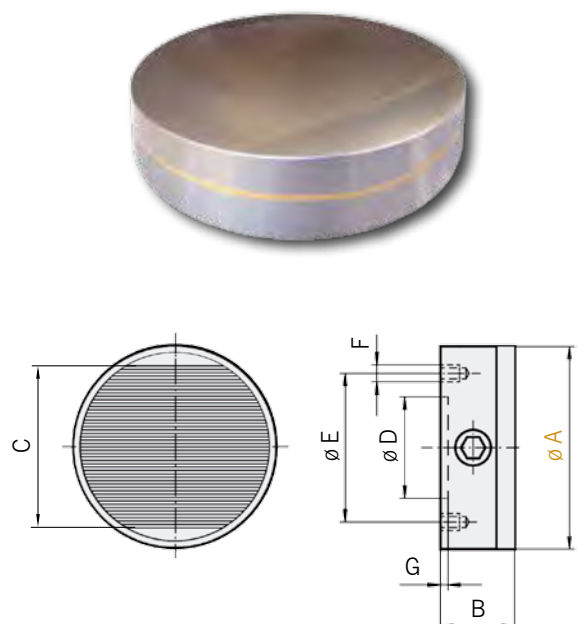
Clamping of small and thin to medium-sized workpieces.

Features:

Extremely low height due to use of neodymiumiron-boron magnets. Pole pitch $P = 2.5$ mm. Holding force continuously variable. Available with flange on request (see SAV 248.90 to 248.94).

Nominal holding force: 80 N/cm²
Magnetic field height: 8 mm
Pole plate wearing limit: 5 mm

Dimensions in mm							Weight in kg
A	B ^{+0,5 -2}	C	D	E	F	G	
100	50	76,5	60	85	4	4	3,0
130	50	100	90	115	4	4	5,0
150	50	117	110	132	4	4	7,0
160	50	129	120	140	4	4	8,0
200	52	169	160	180	4	4	12,0
250	52	213	200	230	4	4	19,0
300	54	265	250	280	4	4	28,0
400	58	360	320	360	6	4	57,0
600	50	553	500	540	6	5	137,0


Ordering example:

Permanent Magnetic Circular Chuck SAV 244.04 - 300
Ordering key SAV - No. - A

PERMANENT MAGNETIC CIRCULAR CHUCK



SAV 244.05

With parallel pole arrangement $P = 5 / 10$ mm, enhanced magnet system

Use:

For workpieces that are difficult to clamp.

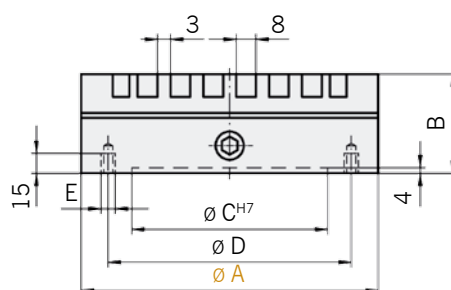
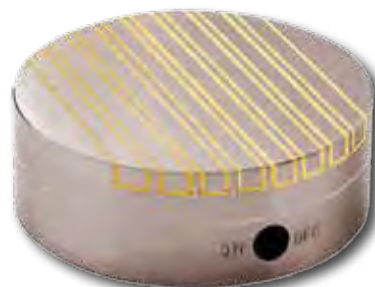
Features:

Extremely high holding force combined with slim construction. Available with flange on request (see SAV 248.90 to 248.94).

Laminations 3 mm steel / 2 mm brass / 8 mm steel.

Nominal holding force: 120 N/cm²
Magnetic field height: 15 mm
Top plate wearing limit: 10 mm

Dimensions in mm					Weight in kg
A	B ^{+0,5/-2}	C	D	E	
125	55	100	112	M6 (4x)	4,5
160	55	125	140	M8 (4x)	7,5
200	55	160	180	M8 (4x)	12,0
250	55	200	224	M10 (4x)	18,0
315	55	250	280	M10 (4x)	29,0
400	55	315	355	M10 (4x)	47,0



Ordering example:

Permanent Magnetic Circular Chuck SAV 244.05 - 400
Ordering key SAV - No. - A

PERMANENT MAGNETIC CIRCULAR CHUCK



SAV 244.10

Switchable

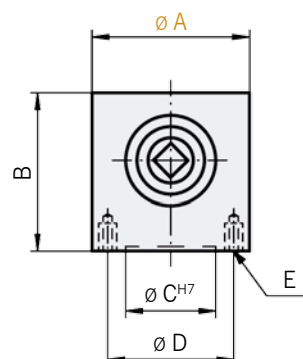
Use:

As an auxiliary magnet to be used on a circular chuck for holding smaller, delicate workpieces. Also suitable for fixtures and as a holding magnet.

Features:

Switchable permanent magnet, holding surface on the upper face.

Dimensions in mm					Nominal holding force in N	max. RPM	Weight in kg
A	B ^{+0,5/-2}	C	D	E			
50	50	25	35	4 x M5	85	450	0,7
80	65	50	60	4 x M6	500	400	2,2



Ordering example:

Permanent Magnetic Circular Chuck SAV 244.10 - 80
Ordering key SAV - No. - A

PERMANENT MAGNETIC CIRCULAR CHUCK


SAV 244.06
1

With radial pole arrangement

Use:

For cylindrical and ring-shaped workpieces.

Features:

High holding force. Concentric grooves to simplify workpiece alignment. Through hole possible up to maximum diameter D. Supplied as standard without through hole in centre.

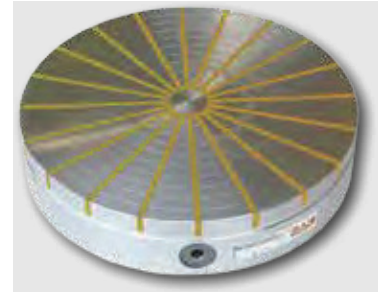
Central region (diameter C) not magnetically active. Available with flange on request (see SAV 248.90 to 248.94). For additional top plates see 248.05 Bigger diameters available with T-slots on request.

Nominal holding force: 100 N/cm²

Pole plate wearing limit:

5 mm (for A = 150 to 300 mm)

10 mm (for A = 350 to 400 mm)

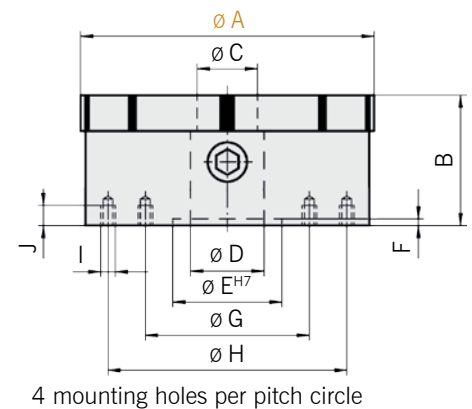


Dimensions in mm										Number of poles	Weight in kg
A	B ^{+0,5} ₋₂	C	D	E	F	G	H	I	J		
100	48	14	-	50	6	76	-	M 6	8	6	2,6
130	57	16	14	50	5	100	-	M 6	10	10	5,7
150	57	20	18	50	5	80	120	M 6	8	10	6,5
200	57	28	30	60	5	110	180	M 6	8	12	13,0
250	70	30	50	80	5	140	220	M 6	8	16	20,0
300	73	40	58	150	6	180	260	M 8	10	16	30,0
350	73	40	58	170	6	220	300	M 8	12	20	49,0
400	75	40	58	200	8	260	340	M 8	12	20	75,0
500	92	60	58	200	8	360	440	M 8	12	26	144,0

Ordering example:

Permanent Magnetic Circular Chuck SAV 244.06 - 400

Ordering key SAV - No. - A



LAMINATED CIRCULAR TOP PLATE


SAV 248.05

For use on circular chuck 244.06 with radial poles

Features:

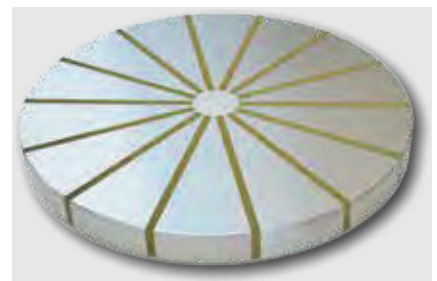
Can be machined to any required shape, or custom machined during manufacture.

Suitable for SAV 244.06.

Mounting to be agreed upon.

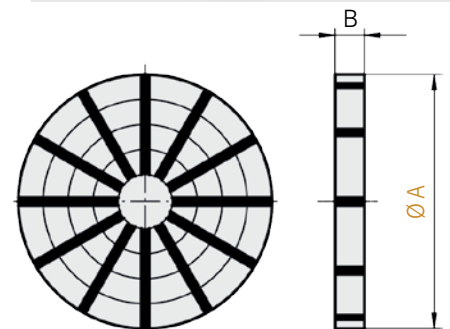
Machinable depth: max. 8 mm

For bigger profiling depth, available with size B up to 25 mm.



Dimensions in mm		Number of poles	Weight in kg
A	B		
150	20	10	3,0
200	20	12	5,0
250	20	16	8,0
300	25	16	14,0
350	25	20	19,0
400	25	20	24,5

Larger sizes available on request



Ordering example:

Laminated Circular Top Plate

SAV 248.05 - 150

Ordering key

SAV - No. - A

NEODYMIUM MAGNETIC CIRCULAR CHUCK

For difficult workpieces, with parallel pole arrangement, P=6 mm

Use:

For workpieces that are particularly difficult to clamp, such as ferrotic and hard metals containing cobalt, as well as very small workpieces.

Features:

Aluminium housing, pole plate made from tool steel. Extremely high holding force through a specially developed construction using neodymium-iron-boron magnets. Available with flange on request (see SAV 248.90 to 248.94).

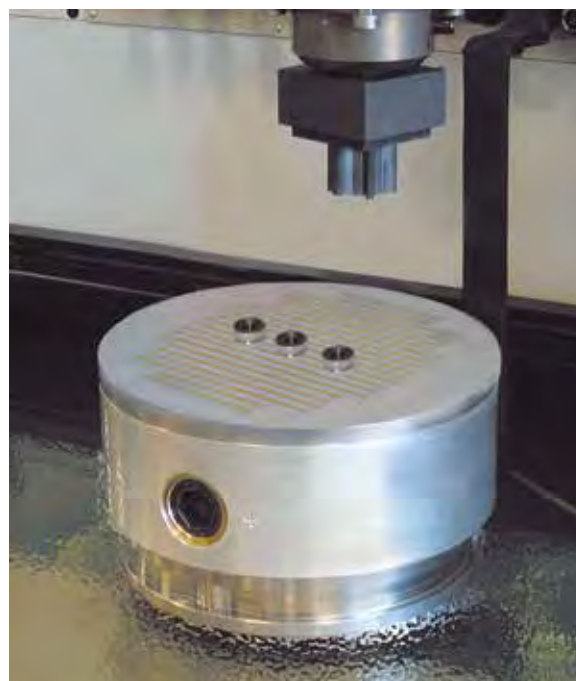
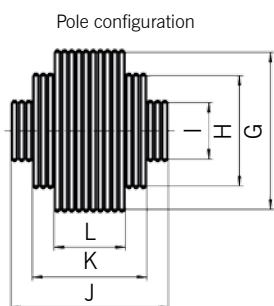
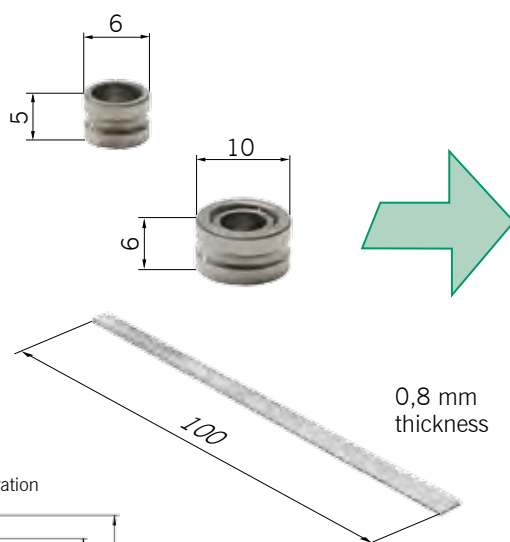
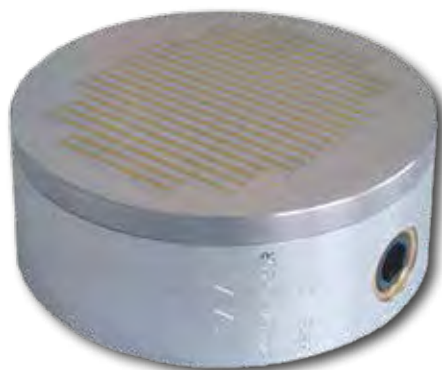
Nominal holding force on induced steel surface: 180 N/cm²
Magnetic field height: 4 mm
Pole plate wearing limit: 3 mm

Available with adapters for reference system.

Also suitable for small parts.



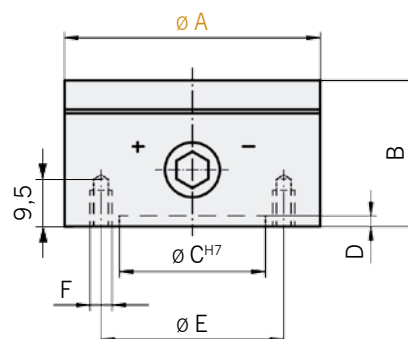
SAV 244.07



Dimensions in mm												Weight in kg
A	B ^{+0.5} ₋₂	C	D	E	F	G	H	I	J	K	L	
100	65	70	4	90	M 6 (4x)	-	-	48	-	-	74	2,0
125	65	95	4	110	M 8 (4x)	-	88	54	-	98	67	3,0
160	65	125	4	140	M 10 (4x)	-	104	54	-	134	61	4,5
180	65	125	4	160	M 10 (4x)	124	84	64	134	97	61	6,5
200	65	125	4	180	M 10 (4x)	134	104	74	158	110	73	8,5

Ordering example:

Neodymium Magnetic Circular Chuck SAV 244.07 - 160
Ordering key SAV - No. - A



SHORT TAPER ADAPTER


SAV 248.90
1

To fit circular magnetic chucks to spindle nose

Use:

Mounting of circular magnetic chucks or other clamping tools to short taper spindle noses of type **DIN 55026 (55021)** form A and B, ISO 702/I A1 and A2, ASA B5.9 A1 and A2.

Features:

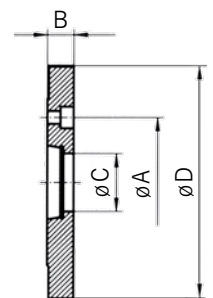
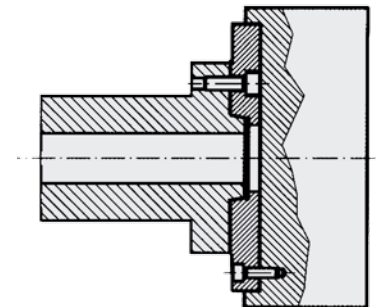
Mild steel adapter in accordance with DIN, ISO and ASA-standards.

Fully prepared on spindle-side. Preparations for chuck side carried out in accordance with customer's requirements (please supply suitable drawing). Rotary magnets can be supplied ready fitted with adapter.

Spindle nose size	A in mm
4*	82,6
4**	85,0
5	104,8
6	133,4
8	171,4
11	235,0
15	330,2

Sizes B, C, and D as well as mounting holes pitch circle according requirements or customer specification.

* For spindle nose type **DIN 55026**
** For spindle nose type **DIN 55021**



Ordering example:

Short Taper Adapter without mounting bolts
Ordering key

SAV 248.90 - 4 - DIN 55026 and dimensions
SAV - No. - Spindle nose size - Technical standard

SHORT TAPER ADAPTER


SAV 248.91

mit Stehbolzen und Bajonettsscheibe

Use:

Mounting of circular magnetic chucks or other clamping tools to short taper spindle noses of type **DIN 55027 (55022)** and ISO 702/III

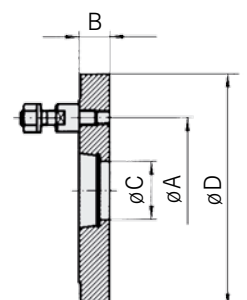
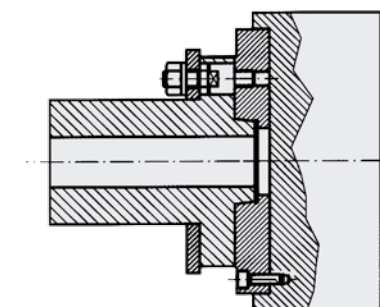
Features:

Mild steel adapter in accordance with DIN, ISO and ASA-standards with studs and bayonet ring fixing. Fully prepared on spindle-side. Preparations for chuck side carried out in accordance with customer's requirements (please supply suitable drawing). Circular chucks can be supplied ready fitted with adapter.

Spindel-kopfgröße	A in mm	Stehbolzen-anzahl
4*	82,6	3
4**	85,0	3
5	104,8	4
6	133,4	4
8	171,4	4
11	235,0	6
15	330,2	6

Sizes B, C, and D as well as mounting holes pitch circle according requirements or customer specification.

* For spindle nose type **DIN 55027**
** For spindle nose type **DIN 55022**



Ordering example:

Short Taper Adapter with Bayonet Ring Fixing
Ordering key

SAV 248.91 - 15 - DIN 55027 and dimensions
SAV - No. - Spindle nose size - Technical standard

SHORT TAPER ADAPTER



SAV 248.92

with camlock fixing

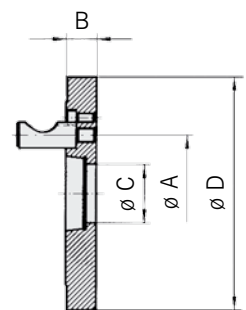
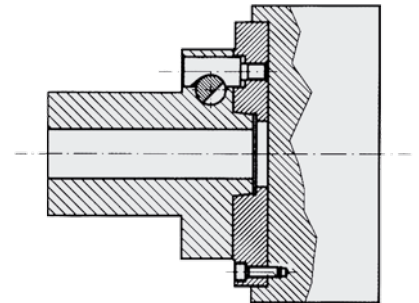
Use:

Mounting of circular magnetic chucks or other clamping tools to short taper spindle noses of type DIN 55029, ISO 702/II and ASA b5.9 D1.

Features:

Mild steel adapter in accordance with DIN, ISO and ASA-standards. Fully prepared on spindle-side. Preparations for chuck side carried out in accordance with customer's requirements (please supply suitable drawing). Circular chucks can be supplied ready fitted with adapter.

Spindle-nose size	A in mm	Number of studs
4	82,6	3
5	104,8	6
6	133,4	6
8	171,4	6
11	235,0	6
15	330,2	6



Sizes B, C, and D as well as mounting holes pitch circle according requirements or customer specification.

Ordering example:

Short Taper Adapter with camlock fixing SAV 248.92 - 15
Ordering key SAV - No. - Spindle nose size

MORSE TAPER ADAPTER



SAV 248.94

to fit circular magnetic chucks to morse taper sockets

Use:

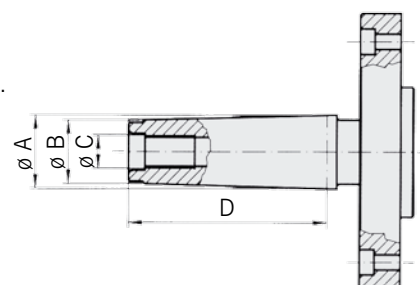
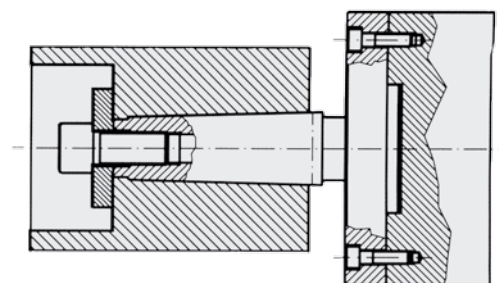
Mounting of circular magnetic chucks or other clamping tools to morse taper sockets of type DIN 228.

Features:

Mild steel adapter in accordance with DIN. Fully prepared on spindle-side. Preparations for chuck side carried out in accordance with customer's requirements (please supply suitable drawing). Circular chucks can be supplied ready fitted with adapter.

Hardened and ground version made from case hardening steel available on request.

Taper size	Dimensions in mm			
A	B	C	D	
MK 0	9,045	6,4	—	50,0
MK 1	12,065	9,4	M 6	53,5
MK 2	17,780	14,6	M 10	64,0
MK 3	23,825	19,8	M 12	81,0
MK 4	31,267	25,9	M 16	102,5
MK 5	44,399	37,6	M 20	129,5
MK 6	63,348	53,9	M 24	182,0



Sizes according requirements or customer application.

Ordering example:

Morse Taper Adapter SAV 248.94 - MK 6 and dimensions
Ordering key SAV - No. - Morse taper size

CHAPTER OVERVIEW

CHAPTER 2

Page 33 - 52

	SAV-ART.-NO.	POLE PITCH	COMMENTS	MACHINING OPERATION*	PAGE
ELECTRO MAGNETIC RECTANGULAR CHUCKS					
	243.40	4 mm	fine transverse poles		36-37
	243.41	4 mm	fine longitudinal poles		38-39
	243.42	13/18/25 mm	transverse poles		40-41

ELECTRO MAGNETIC CIRCULAR CHUCKS					
	244.40	radial poles	for ring-shaped parts	 	42-43
	244.41	concentric poles	for thin parts, multiple part loading	 	44-45
	244.43	parallel poles	for thin parts, magnetically active centre		46

SLIDE SHOE MAGNETS					
	244.45	ring poles	for slide shoe grinding of small, thin rings		47

ELECTRONIC POLARITY-REVERSING CONTROL UNIT, HAND-HELD CONTROL UNIT AND RECTIFIER					
	876.10	—	for holding force regulation and demagnetizing	—	48-49
	876.02	—	for manual control	—	50
	876.06	—	for general purpose and clamping magnets	—	51

ELECTRICAL CONNECTIONS TO CIRCULAR CHUCKS					
	248.81	—	for circular magnetic chucks	—	52
	248.83	—	for circular magnetic chucks	—	52
	248.86	—	compact electrical adapter plug	—	52

* Explanation of the icons on page 9

APPLICATIONS

► ELECTRO MAGNETIC for automated grinding

Dimensions:

Diameter 740 mm

Workpiece:

Ferrite cores

Machining operation:

Automated parallel grinding

Description:

- Magnet with homogenous field for small workpieces
- Rotating magnet, 16 Magnet segments Stationary for automated loading and unloading as well as for machining on segment-grinding lathes
- Cooling water circulation in the centre



► ELECTRO MAGNETIC CIRCULAR CHUCK for soft turning operations

Large magnet construction:

- Solid mono-block design
- Wear-free solid-state design
- Machined from solid metal
- Long-term stability due to the stress-free annealed body
- Accuracy and stability due to the use of pole plate
- High quality level of parallelism and evenness to specification



ø 3500 mm, for soft turning operations with large takeoff of shavings

APPLICATIONS

► ELECTRO MAGNETIC BEAM

Dimensions:

450 x 70 mm

Workpiece:

V-blocks/prisms

Machining operation:

Grinding

Description:

Enhanced electro magnet system for

Workpieces which are difficult to magnetise



► ELECTRO MAGNETIC CIRCULAR CHUCK for slide shoe grinding

Dimensions:

Diameter 180 or 500 mm

Workpiece:

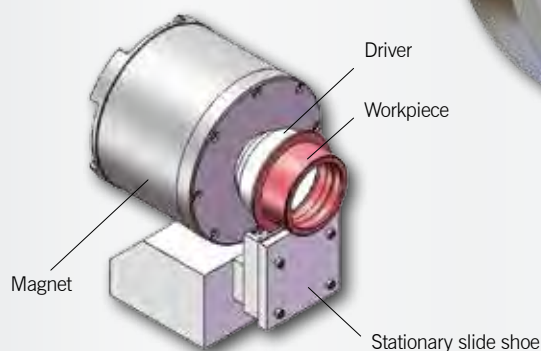
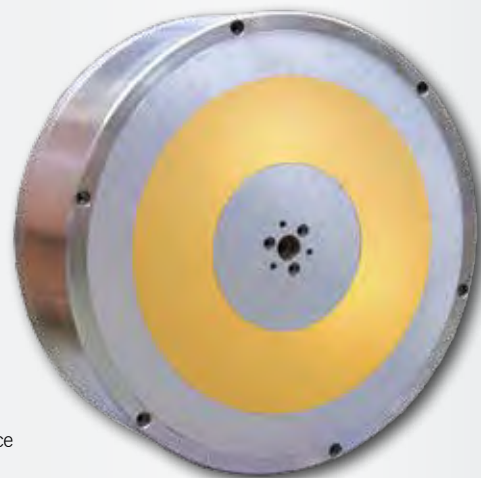
Rolling bearings with a small bearing face

Machining operation:

For high-precision slide shoe grinding

Description:

- axial workpiece clamping via the driver to transmit the rotary movement
- highly precise workpiece positioning eccentrically above the stationary slide shoe



ELECTRO MAGNETIC CHUCK



SAV 243.40

With fine transverse pole pitch $P = 4 \text{ mm}$

Electromagnetic system with very narrow pole pitch. Especially suitable for thin workpieces. Workpiece positioning in length direction of the chuck.



Features:

- especially fine, uninterrupted transverse pole pitch, 3 mm steel and 1 mm brass
- glued lamination with additional pull anchors cross to lamination
- fine grid pole plate to body connection
- 8 mm pole plate wearing limit
- low magnetic field height of only 4 mm
- mounting slots in both short faces
- through holes in sizes over 1000 mm length on specification
- robust and waterproof
- sealed to IP 65
- suitable for continuous (100%) operation
- for use with control unit type SAV 876.10

Nominal holding force:

100 N/cm²,
adjustable with control unit with
encoded switch

Nominal operating voltage:

24 V DC up to 118 W
110 V DC for all sizes

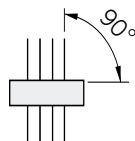
Auxiliary equipment:

- sidestop rail on short and long face
- connecting cable, 3 m, on the right-hand, short face
- lifting bolts on larger models

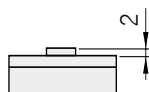
Use:

Clamping of thin, plate shaped workpieces with form and positional tolerances of 0.01 to 0.02 mm.

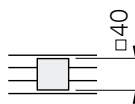
- for workpiece positioning cross to pole pitch



- for thin workpieces of min. 2 mm thick



- for flat workpieces with min. dimensions 40 x 40 mm

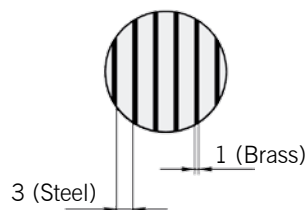
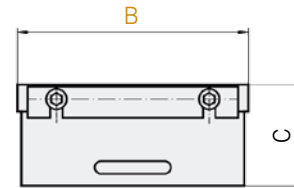


ELECTRO MAGNETIC CHUCK



SAV 243.40

With fine transverse pole pitch $P = 4 \text{ mm}$



Dimensions in mm				Power rating in W	Weight in kg	Type of control
A	B	C	D			
450	175	87	397	106	51,0	E 1
400	200	87	349	118	52,0	E 1
500	200	87	453	140	64,0	E 4
600	200	87	549	162	77,0	E 4
800	200	87	749	206	103,0	E 4
500	250	87	453	150	81,0	E 4
600	250	87	549	180	97,0	E 4
800	250	87	749	233	129,0	E 4
500	300	87	453	175	97,0	E 4
600	300	87	549	206	116,0	E 4
800	300	87	749	268	155,0	E 4
1000	300	87	949	330	193,0	E 4

Dimensions in mm				Power rating in W	Weight in kg	Type of control
A	B	C	D			
600	350	87	549	235	135,0	E 4
800	350	87	749	305	180,0	E 4
1000	350	87	949	375	225,0	E 4
600	400	87	549	265	155,0	E 4
700	400	87	653	310	181,0	E 4
800	400	87	749	345	206,0	E 4
1000	400	87	949	425	258,0	E 4
1200	400	87	1149	510	310,0	E 4
800	500	87	749	422	257,0	E 4
1000	500	87	949	510	322,0	E 4
1200	500	87	1149	605	386,0	E 4

Other sizes and operating voltages available on request.
Larger clamping surfaces can be made by flush mounting several units.

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
E 1	SAV 876.10-S-T-24/7/230	SAV 876.02-SE3
E 4	SAV 876.10-S-O-110/6/230	SAV 876.02-SE3

For built-in or combination control unit see page 48.

Ordering example:

Electro Magnetic Chuck SAV 243.40 - 1200 x 500 - 110 V
Ordering key SAV - No. - A x B - Nominal voltage

Ordering example control unit:

Electronic polarity-reversing control unit SAV 876.10 - S-O-110/6/230
Hand-held control unit SAV 876.02 - SE3
Ordering key SAV - No.

ELECTRO MAGNETIC CHUCK



SAV 243.41

With fine longitudinal pole pitch $P = 4 \text{ mm}$

Electromagnetic system with very narrow pole pitch. Especially suitable for thin workpieces. Workpiece positioning in cross direction of the chuck.



Features:

- especially fine, uninterrupted longitudinal pole pitch, 3 mm steel and 1 mm brass
- glued lamination with additional pull anchors cross to lamination
- fine grid pole plate to body connection
- 8 mm pole plate wearing limit
- low magnetic field height
- mounting slots in both short faces
- through holes for mounting in sizes over 1000 mm length on specification
- robust and waterproof
- sealed to IP 65
- suitable for continuous (100%) operation
- for use with control unit type SAV 876.10

Nominal holding force:

100 N/cm²,
adjustable with control unit
with encoded switch

Nominal operating voltage:

24 V DC up to 118 W
110 V DC for all sizes

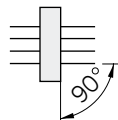
Auxiliary equipment:

- sidestop rail on short and long face
- connecting cable, 3 m, on the right-hand, short face
- lifting bolts on larger models

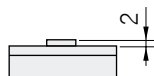
Use:

Clamping of thin, plate shaped workpieces with form and positional tolerances of 0.01 to 0.02 mm.

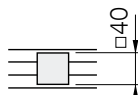
- for workpiece positioning cross to pole pitch



- for thin workpieces of min. 2 mm thick



- for flat workpieces with min. dimensions 40 x 40 mm

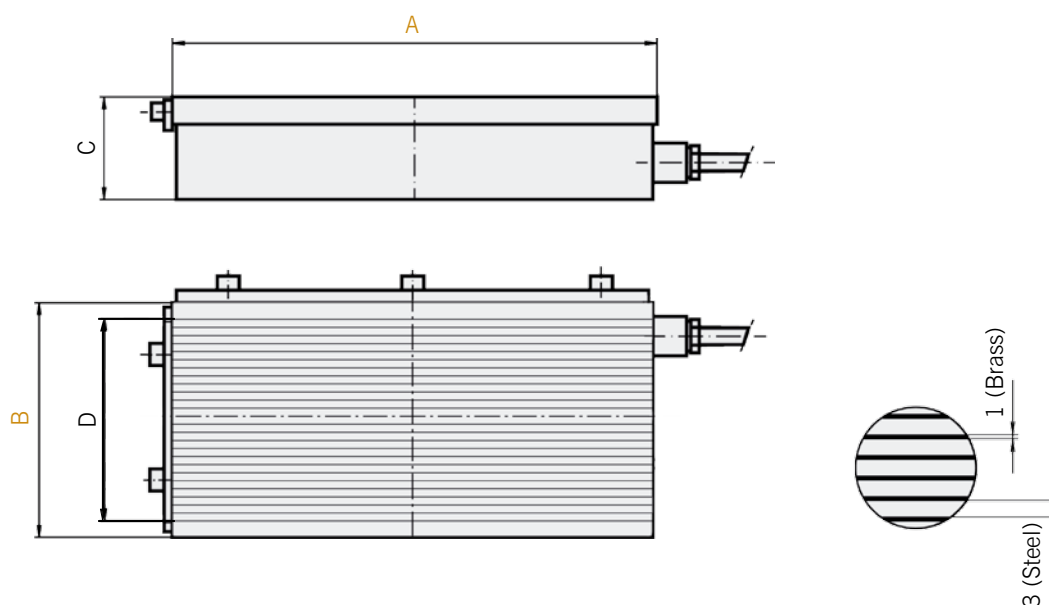


ELECTRO MAGNETIC CHUCK



SAV 243.41

With fine longitudinal pole pitch $P = 4 \text{ mm}$



Dimensions in mm				Power in W	Weight in kg	Type of control
A	B	C	D			
200	100	87	53	30	13,0	E 1
300	100	87	53	45	20,0	E 1
300	150	87	101	65	29,0	E 1
400	150	87	101	90	39,0	E 1
450	175	87	125	106	51,0	E 1
400	200	87	149	118	52,0	E 4
500	200	87	149	140	64,0	E 4
600	200	87	149	162	77,0	E 4
800	200	87	149	206	103,0	E 4
500	250	87	197	150	81,0	E 4
600	250	87	197	180	97,0	E 4
800	250	87	197	233	129,0	E 4
500	300	87	253	175	97,0	E 4
600	300	87	253	206	116,0	E 4
800	300	87	253	268	155,0	E 4
1000	300	87	253	330	193,0	E 4

Dimensions in mm				Power in W	Weight in kg	Type of control
A	B	C	D			
600	350	87	301	235	135,0	E 4
800	350	87	301	305	180,0	E 4
1000	350	87	301	375	225,0	E 4
600	400	87	349	265	155,0	E 4
700	400	87	349	305	180,0	E 4
800	400	87	349	345	206,0	E 4
1000	400	87	349	425	258,0	E 4
1200	400	87	349	510	310,0	E 4
800	500	87	453	420	257,0	E 4
1000	500	87	453	510	322,0	E 4
1200	500	87	453	612	386,0	E 4

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
E 1	SAV 876.10-S-T-24/7/230	SAV 876.02-SE3
E 4	SAV 876.10-S-O-110/6/230	SAV 876.02-SE3

Other sizes and operating voltages available on request.
Larger clamping surfaces can be made by flush mounting
several units.

For built-in or combination control unit see page 48.

Ordering example:

Electro Magnetic Chuck SAV 243.41 - 1200 x 500 - 110 V
Ordering key SAV - No. - A x B - Nominal voltage

Ordering example Steuerung:

Electronic polarity-reversing control unit SAV 876.10 - S-O-110/6/230
Hand-held control unit SAV 876.02 - SE3
Ordering key SAV - No.

ELECTRO MAGNETIC CHUCK



SAV 243.42

With transverse pole pitch $P = 13 \text{ mm}$, 18 mm and 25 mm

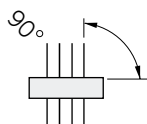
This chuck is particularly notable for its high power, robust construction and long-life. The pole pitch gives real N and S-poles.



Use:

For universal clamping of workpieces with form and positional tolerances of 0.01 to 0.02 mm.

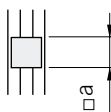
- for workpiece positioning cross to pole pitch



- for workpieces with min. thickness = x :
4.5 mm at $P = 13 \text{ mm}$
6.0 mm at $P = 18 \text{ mm}$
8.5 mm at $P = 25 \text{ mm}$



- for flat workpieces with min. dimensions = a :
25 mm x 25 mm at $P = 13 \text{ mm}$
32 mm x 32 mm at $P = 18 \text{ mm}$
45 mm x 45 mm at $P = 25 \text{ mm}$



Nominal holding force:

90 N/cm², at pole pitch $P = 13 \text{ mm}$
110 N/cm², at pole pitch $P = 18 \text{ mm}$
115 N/cm², at pole pitch $P = 25 \text{ mm}$
adjustable with control unit with encoded switch

Nominal operating voltage:

24 V DC up to 120 W
110 V DC for all sizes

Features:

- solid constructed pole plate with either 13 mm, 18 mm or 25 mm pole pitch
- real magnetic (N/S) poles
- water cooling system on request
- air pressure release system on request for $P = 18$ or 25 mm
- gap free construction of pole plate
- fine grid pole plate to body connection
- 8 mm pole plate wearing limit
- mounting slots in both short faces
- through holes in sizes over 1000 mm length on specification
- robust and waterproof
- sealed to IP 65
- suitable for continuous (100%) operation
- for use with control unit type SAV 876.10

Auxiliary equipment:

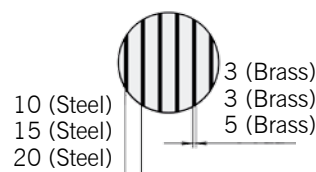
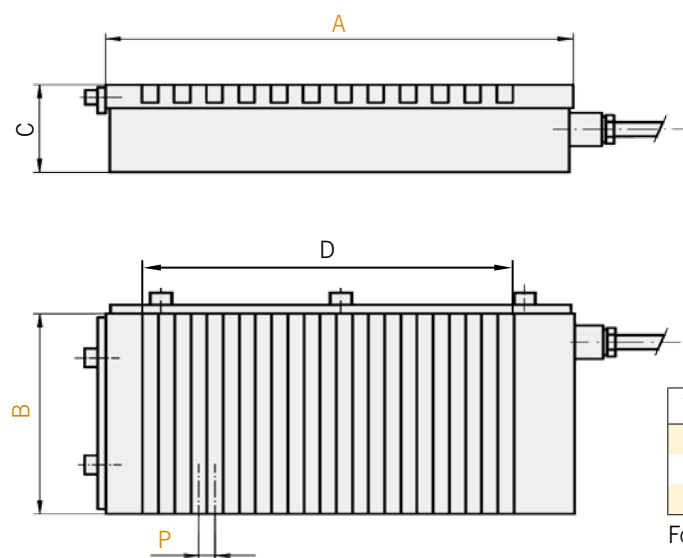
- sidestop rail on short and long face
- connecting cable, 3 m, on the right-hand, short face
- lifting bolts on larger models

ELECTRO MAGNETIC CHUCK



SAV 243.42

With transverse pole pitch $P = 13 \text{ mm}$, 18 mm and 25 mm



Recommended controller and control unit:

Type	Control unit	Hand-held control unit
E 1	SAV 876.10-S-T-24/7/230	SAV 876.02-SE3
E 4	SAV 876.10-S-O-110/6/230	SAV 876.02-SE3
E 5	SAV 876.10-S-O-110/16/230	SAV 876.02-SE3

For built-in or combination control unit see page 48.

Dimensions in mm					Power in W	Weight in kg	Type of control
A	B	C	D	P			
200	100	90	120	13	19	11,0	E 1
300	100	90	224	13	31	17,0	E 1
300	150	90	224	13	42	25,0	E 1
400	150	90	328	13	52	34,0	E 1
450	175	90	381	18	64	44,0	E 1
400	200	90	309	18	66	45,0	E 4
500	200	90	417	18	83	56,0	E 4
600	200	90	525	18	89	67,0	E 4
800	200	90	741	18	120	90,0	E 4
500	250	90	417	18	94	70,0	E 4
600	250	90	525	18	109	84,0	E 4
800	250	90	741	18	127	112,0	E 4
500	300	90	417	18	110	84,0	E 4
600	300	90	525	18	128	101,0	E 4
800	300	90	741	18	171	134,0	E 4
1000	300	90	921	18	209	168,0	E 4
600	350	90	525	18	148	118,0	E 4
800	350	90	741	18	191	157,0	E 4
1000	350	90	921	18	239	196,0	E 4

Dimensions in mm					Power in W	Weight in kg	Type of control
A	B	C	D	P			
600	400	90	525	18	166	134,0	E 4
700	400	90	697	18	187	156,0	E 4
800	400	90	741	18	208	179,0	E 4
1000	400	90	921	18	255	224,0	E 4
1200	400	90	1101	18	329	269,0	E 4
800	500	90	730	25	254	224,0	E 4
1000	500	90	930	25	341	280,0	E 4
1200	500	90	1130	25	374	336,0	E 4
1250	500	90	1180	25	390	350,0	E 4
1500	500	90	1430	25	458	420,0	E 4
1600	500	90	1530	25	489	438,0	E 4
2000	500	90	1930	25	576	560,0	E 4
1000	600	90	930	25	361	382,0	E 4
1200	600	90	1130	25	441	459,0	E 4
1250	600	90	1180	25	459	478,0	E 4
1500	600	90	1430	25	487	573,0	E 4
1600	600	90	1530	25	520	611,0	E 4
2000	600	90	1930	25	607	764,0	E 4
1500	800	90	1430	25	730	764,0	E 5
1600	800	90	1530	25	693	815,0	E 5
2000	800	90	1930	25	810	1018,0	E 5

Other sizes and operating voltages available on request.
Larger clamping surfaces can be made by flush mounting several units.

Ordering example:

Electro Magnetic Chuck SAV 243.42 - 2000 x 800 - 25 - 110 V
Ordering key SAV - No. - A x B - P - Nominal voltage

Ordering example control unit:

Electronic polarity-reversing control unit SAV 876.10 - S-O-110/16/230
Hand-held control unit SAV 876.02 - SE3
Ordering key SAV - No.

ELECTRO MAGNETIC CIRCULAR CHUCK



SAV 244.40

With radial pole arrangement

These circular electro magnets are notable for their very high holding force. Radial T-slots can be provided in the pole plates for added flexibility.



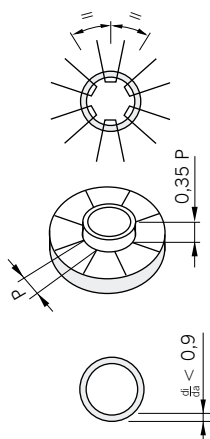
Use:

Grinding of circular and ring-shaped workpieces on carrousel internal and external grinding machines. Also suitable for turning with form and position tolerances of 0.01 to 0.02 mm.

- equal pole pitch within circle range; therefore very suitable for circular and ring shaped workpieces

- for ring-shaped workpieces the minimum height is 35% of the pole pitch at the given circle segment

- also for thin rings



Nominal holding force:

120 N/cm²,
adjustable by control unit with encoded switch

Nominal operating voltage:

24 V DC up to 90 W
110 V DC all sizes

Features:

- solid designed pole plate
- radial pole arrangement, especially suitable for the use of pole raisers. This is absolutely essential for the runout of the tool or the grinding wheel at three side operation. Therefore available with T-slots (T) according DIN 650-10H10 on request.
- pole plate wearing limit 8 mm
- sealed to IP 65
- suitable for continuous (100%) operation
- for use with control unit type 876.10
- available with adapter flange on request (SAV 248.90 to 248.94)

Auxiliary equipment:

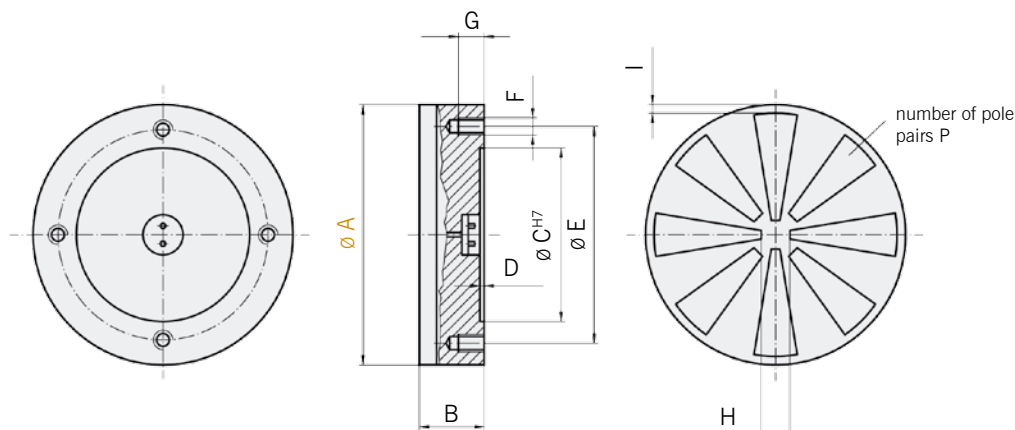
- Lifting bolts for transportation on larger models.
- T-slots and pole extensions *not* included as standard.
- Terminals for electrical connection in middle of back side in standard execution.
- Optional with integrated slip ring body for the bigger diameters.

ELECTRO MAGNETIC CIRCULAR CHUCK



SAV 244.40

With radial pole arrangement



Dimensions in mm										Power in W	Weight in kg	Type of control
A	B ₁ [*]	C	D	E	F	G	H	I	P			
100	90	60	3	80	M8 (3x)	12	30	10	3	16	4,0	E 1
150	90	90	3	120	M10 (3x)	14	30	10	3	30	9,0	E 1
200	90	110	3	140	M10 (4x)	14	40	10	4	48	18,0	E 1
250	90	140	3	170	M12 (4x)	16	50	10	4	66	29,0	E 1
300	90	160	3	190	M12 (4x)	16	60	10	6	90	42,0	E 1
400	90	210	4	250	M12 (6x)	16	70	15	6	150	76,0	E 4
500	90	280	4	320	M12 (6x)	16	100	15	8	190	120,0	E 4
600	100	350	4	390	M16 (6x)	18	100	15	8	265	195,0	E 4
700	100	400	4	450	M16 (6x)	18	120	15	8	350	265,0	E 4
800	100	450	4	500	M16 (6x)	18	150	18	12	440	365,0	E 4
1000	100	550	4	620	M16 (8x)	18	200	18	12	660	550,0	E 4
1200	110	Rear detail as required					300	25	18	960	990,0	E 5
1400	110	Rear detail as required					300	25	18	1100	1350,0	E 5
1500	120	Rear detail as required					300	25	18	1440	1550,0	E 5
1600	120	Rear detail as required					300	25	18	1630	1760,0	E 5

Other sizes up to diameter A = 5,5 mm available on request.

* in execution with T-slots the height increases with 10 mm

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
E 1	SAV 876.10-S-T-24/7/230	SAV 876.02-SE3
E 4	SAV 876.10-S-O-110/6/230	SAV 876.02-SE3
E 5	SAV 876.10-S-O-110/16/230	SAV 876.02-SE3

For built-in or combination control unit see page 48.

Ordering example:

Electro Magnetic Circular Chuck SAV 244.40 - 800 - T - 110 V

Ordering key SAV - No. - A - Execution - Nominal voltage

Ordering example control unit:

Electronic polarity-reversing control unit SAV 876.10 - S-O-110/6/230

Hand-held control unit SAV 876.02 - SE3

Ordering key SAV - No.

ELECTRO MAGNETIC CIRCULAR CHUCK



SAV 244.41

With concentric pole arrangement

These circular electro magnets generate a strong, ring-shaped and low magnetic field.



Use:

Mainly for grinding of disc shaped work pieces on internal and external grinders with rotary tables.

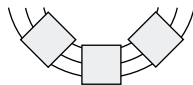
Not suitable for thin rings. Because of the concentric pole arrangement it is also suitable for holding groups of randomly placed workpieces. Also suitable for turning with form and position tolerances of 0.01 to 0.02 mm.

- for circular grinding

- uniform holding force distribution due to concentric pole arrangement; therefore suitable for thin and flat workpieces (e.g. saw blades)



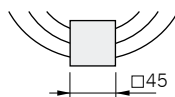
- multiple workpiece operation on segments possible



- for workpieces with min. thickness = x:
2 mm at P = 4.5 mm
4 mm at P = 9.0 mm
8 mm at P = 18.0 mm



- for flat workpieces with min. dimensions 45 mm x 45 mm



Nominal holding force:

P = 4.5 mm: 80 N/cm²
P = 9 mm: 100 N/cm²
P = 18 mm: 110 N/cm²

adjustable by control unit with encoded switch

Features:

- gap free construction of pole plate
- fine grid poleplate to body connection
- pole plate wearing limit 8 mm
- sealed to IP 65
- suitable for continuous (100%) operation
- for use with control unit type 876.10
- available with adapter flange on request (SAV 248.90 to 248.94)

Auxiliary equipment:

- Lifting bolts for transportation on larger models.
- Terminals for electrical connection in middle of rear side in standard execution.
- Optionally with integrated flat, slip ring body for diameters of 1000 mm and greater.
- Controller and hand-held control unit not included in delivery.

Nominal operating voltage:

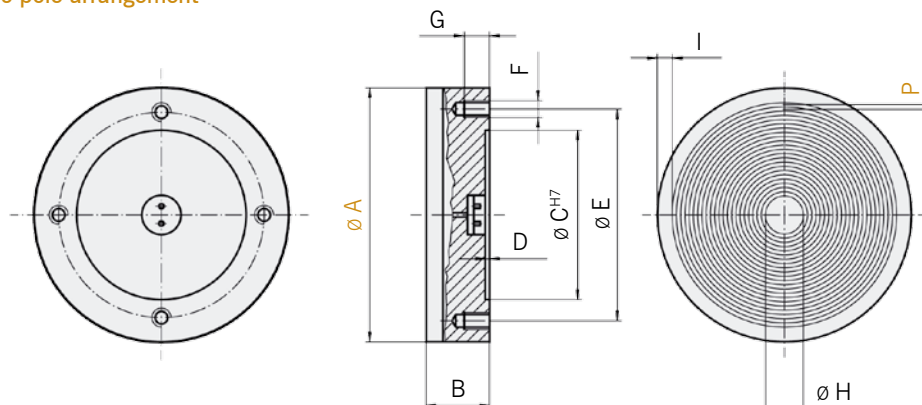
24 V DC up to 90 W
110 V DC all sizes

ELECTRO MAGNETIC CIRCULAR CHUCK



SAV 244.41

With concentric pole arrangement



Dimensions in mm										Power in W	Weight in kg	Type of control
A	B	C	D	E	F	G	H	I	P			
100	100	60	3	80	M8 (3x)	12	22	9	5,5	16	4,0	E 1
150	100	90	3	120	M10 (3x)	14	30	12	5,5	30	9,0	E 1
200	100	110	3	140	M10 (4x)	14	40	16	5,5	48	18,0	E 1
250	100	140	3	170	M12 (4x)	16	45	16	5,5	66	29,0	E 1
300	100	160	3	190	M12 (4x)	16	55	16	5,5	90	42,0	E 1
400	100	210	4	250	M12 (6x)	16	46	21	9	150	92,0	E 4
500	100	280	4	320	M12 (6x)	16	74	21	9	190	144,0	E 4
600	100	350	4	390	M12 (6x)	18	66	21	9	264	208,0	E 4
700	100	400	4	450	M12 (6x)	18	76	21	9	350	283,0	E 4
800	100	450	4	500	M16 (6x)	18	129	22	9	440	369,0	E 4
1000	100	550	4	620	M16 (8x)	18	131	22	9	660	577,0	E 4
400	100	210	4	250	M12 (6x)	16	46	21	18	150	92,0	E 4
500	100	280	4	320	M12 (6x)	16	74	21	18	190	144,0	E 4
600	100	350	4	390	M12 (6x)	18	66	21	18	264	208,0	E 4
700	100	400	4	450	M12 (6x)	18	76	21	18	350	283,0	E 4
800	100	450	4	500	M16 (6x)	18	138	22	18	440	369,0	E 4
1000	100	550	4	620	M16 (8x)	18	140	22	18	660	577,0	E 4
1200	110	Rear detail as required				22	131	23	9	960	989,0	E 5
1400	110	Rear detail as required				22	136	26	9	1100	1346,0	E 5
1500	120	Rear detail as required				22	101	26	9	1440	1545,0	E 5
1600	120	Rear detail as required				22	129	26	9	1630	1760,0	E 5
1200	110	Rear detail as required				22	140	23	18	960	989,0	E 5
1400	110	Rear detail as required				22	136	26	18	1100	1346,0	E 5
1500	120	Rear detail as required				22	128	26	18	1440	1545,0	E 5
1600	120	Rear detail as required				22	138	26	18	1630	1760,0	E 5

Recommended controller and control unit:

Other sizes up to diameter A = 5,5 mm available on request.

Type	Control unit	Hand-held control unit
E 1	SAV 876.10-S-T-24/7/230	SAV 876.02-SE3
E 4	SAV 876.10-S-O-110/6/230	SAV 876.02-SE3
E 5	SAV 876.10-S-O-110/16/230	SAV 876.02-SE3

For built-in or combination control unit see page 48.

Ordering example:

Electro Magnetic Circular Chuck

SAV 244.41 - 800 - 18 - 110 V

Ordering key

SAV - No. - A - Pole pitch - Nominal voltage

Ordering example Steuerung:

Electronic polarity-reversing control unit

SAV 876.10 - S-O-110/6/230

Hand-held control unit

SAV 876.02 - SE3

Ordering key

SAV - No.

ELECTRO MAGNETIC CIRCULAR CHUCKS

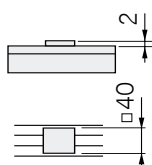


SAV 244.43

With parallel pole pitch $P=4$ mm

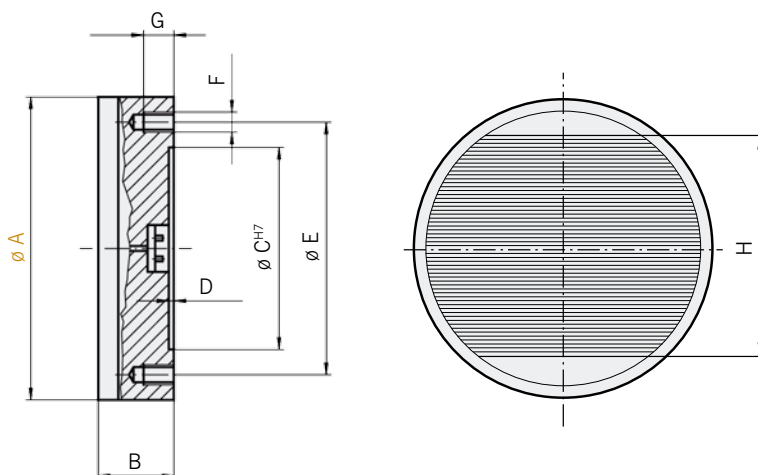
Use:

- Grinding of thin plates and thin, broad rings with a min. width of 40 mm
- For workpieces of 2 mm and above
- For flat workpieces with a min. surface area of 40 x 40 mm²



Features:

- Pole plate especially fine, uninterrupted pole pitch, 3 mm steel and 1 mm brass
- Low build height
- Glued laminations reinforced with additional pull anchors
- High precision due to fine grid pole plate to body connection
- Low field height of 4 mm
- De-activation via the demagnetizing cycle
- Fixing hole template for tapped holes on the rear or through holes upon agreement
- 8 mm pole plate wear limit
- Robust and waterproof
- Protection classification IP 65
- Suitable for use with control unit SAV 876.10



Nominal operating voltage:

110 V DC

Nominal holding force:

100 N/cm²,

Adjustable using the holding force coding switch on the control unit

Auxiliary equipment:

- Lifting bolts for transportation on larger models.
- In the standard format the electrical connector is on the rear side, centred with clamps.
- Controller and hand-held control unit not included in delivery.

Dimensions in mm								Power rating in W	Weight in kg	Type of control
A	B	C	D	E	F	G	H			
300	100	160	4	190	M12 (4x)	16	213	110	55	E 4
400	100	210	4	250	M12 (6x)	16	301	180	98	E 4
500	100	280	4	320	M12 (6x)	16	401	230	153	E 4
600	100	350	4	390	M12 (6x)	18	481	410	220	E 4
700	100	400	4	450	M12 (6x)	18	581	430	300	E 4
800	100	450	4	500	M16 (6x)	18	681	540	392	E 4

Ordering example:

Electro magnetic circular chuck SAV 244.43 - 300 - 110 V

Ordering key SAV - No. - A - Voltage

Ordering example control unit:

Electr.polarity-reversing control unit SAV 876.10 - S-O-110/6/230

Hand-held control unit SAV 876.02 - SE3

Ordering key SAV - No.

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
E 4	SAV 876.10-S-O-110/6/230	SAV 876.02-SE3

For built-in control unit see page 48.

SLIDE SHOE MAGNETIC CHUCK



SAV 244.45

With pot magnet system for a larger workpiece spectrum

Use:

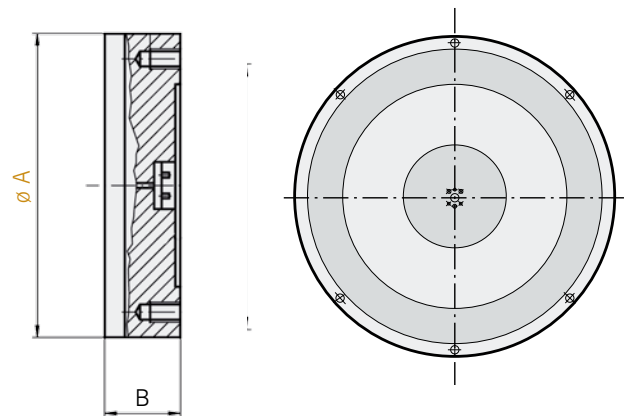
- To grind small rings with a small workpiece contact area
- Extremely low wall thickness deviations due to eccentric clamping and positioning of workpiece over the stationary slide shoe
- Easy changeovers due to the universal workpiece driver
- Universally applicable for large diameter workpieces
- To clamp workpieces of up to 500 mm diameter
- Workpiece positioned eccentrically to the spindle
- Magnet for rotary movement, precision through working-side slide shoes

Features:

- Extreme magnetic field for grinding of a large workpiece spectrum
- Supplied with drivers or adaptation to existing drivers upon agreement
- Spindle adaptation upon agreement
- Supplied with polarity-reversing pole plate for a large clamping range on request
- Simple to automate for easy workpiece handling
- Internal cooling water supply available
- Controller and hand-held control unit not included in delivery.

Nominal operating voltage:

- 24 V DC up to 250 mm diameter
- 110 V DC above 250 mm diameter



Dimensions in mm		Weight in kg	Power rating in W	Type of control
A	B			
150	130	23	25	E 1
200	130	40	40	E 1
250	160	80	62	E 1
300	160	113	90	E 4
400	180	225	140	E 4
450	180	285	180	E 4
500	200	390	250	E 4

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
E 1	SAV 876.10-S-T-24/7/230	SAV 876.02-SE3
E 4	SAV 876.10-S-O-110/6/230	SAV 876.02-SE3

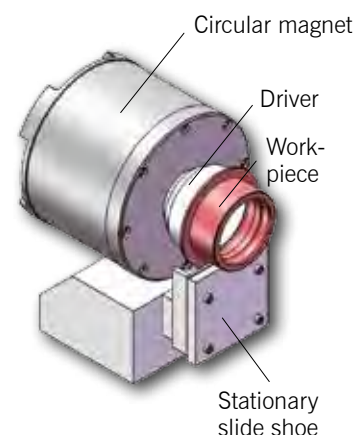
For built-in control unit see page 48.

Ordering example:

Slide shoe magnetic chuck SAV 244.45 - 500 - 110 V
Ordering key SAV - No. - A - Voltage

Ordering example control unit:

Electronic polarity-reversing control unit SAV 876.10 - S-O-110/6/230
Hand-held control unit SAV 876.02 - SE3
Ordering key SAV - No.



ELECTRONIC POLARITY-REVERSING CONTROL UNIT

SAV 876.10

With integrated microprocessor and holding force control

Use:

For electro magnetic clamping systems. Also suitable for subsequent installation.

Application:

Electronic polarity-reversing control units supply continuous DC-current to electro-magnetic chucks. For electro-permanent magnetic chucks this control unit is supplying the current impulse for switching the chuck on and off. The integrated, microprocessor controlled, pole reversing function demagnetizes the magnetic system and also eliminates the remanence magnetism in the workpiece. Due to this the workpieces can easily be released from the chuck, any chips are easy to remove, and, even more important, separate demagnetization of the workpiece is no longer required. Additional pole reversing programs are available for workpieces which are extremely difficult to (de)magnetize. When control unit and magnetic chuck are ordered as a set, it will be programmed with the most optimum settings in time and function. The control unit continuously monitors the main supply voltage / current, its outputs, all connecting cables and magnet coils. Status indications are presented on the LCD-display.

Features:

This device complies with the following regulations:

- Machinery Directive 93/68/EEC ABI No. L220
- Low Voltage Directive 93/68/EEC ABI No. L220126220
- EMC Directive 92/31/EEC ABI No. L126

A safety contact can be used in the control unit to prevent the machining of workpieces when the clamping device is not activated. Manual operation via illuminated push buttons. The optional connection to a CNC controller is achieved using a 24 Volt signal voltage.

A stepped-level, holding force regulator is installed as standard. It is adjusted by means of a coding switch. When using the lower step levels of the holding force regulator, it should be noted that the operational safety level may not comply with local accident prevention regulations e.g. German UUV. The clearance level can be altered and should be adjusted for each workpiece accordingly.

Maximum ambient temperature: 45°C
 Input voltage: 230 / 400 Vac
 Frequency: 50 / 60 Hz
 Duty cycle for electro magnets: 100 %

Power rating characteristics:

- small and compact
- fully closed (IP 54 with Box version S) and shock-proof
- operator-friendly LCD display, indicating operation status and fault messages in text
- foil covered keys for simple and easy setting of parameters
- universal use for all magnet types and voltages
- safe and reliable



ELECTRICAL DETAILS

For Electro Magnetic Chucks

Ordering no.	Type of control	Magnet voltage DC in V	Magnet current max. in A	Mains voltage AC in V	Max. magnet rating DC in W	Fuse in A	Mains transformer required
876.10 - - T-24 / 7 /230	E 1	24	7	230	168	4	yes (T)
876.10 - - T-24 /15/230	E 2	24	15	230	360	6,3	yes (T)
876.10 - - T-24 /25/230	E 3	24	25	230	600	6,3	yes (T)
876.10 - - O-110/ 6 /230	E 4	110	6	230	660	4	no (O)
876.10 - - O-110/16/230	E 5	110	16	230	1760	16	no (O)
876.10 - - O-110/30/230	E 6	110	30	230	3300	25	no (O)
876.10 - - T-110/ 6 /400	E 7	110	6	400	660	4	yes (T)
876.10 - - T-110/16/400	E 8	110	16	400	1760	16	yes (T)
876.10 - - T-110/30/400	E 9	110	30	400	3300	25	yes (T)

ELECTRONIC POLARITY-REVERSING CONTROL UNIT

SAV 876.10

With integrated microprocessor and holding force control

Magnet terminals

Control signal
Terminals

Mains terminals



LCD-Display:

Indicates operation status and fault messages in text.

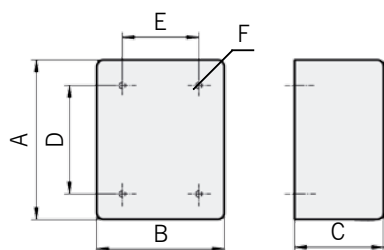
Foil covered keys:

For simple setting of parameters

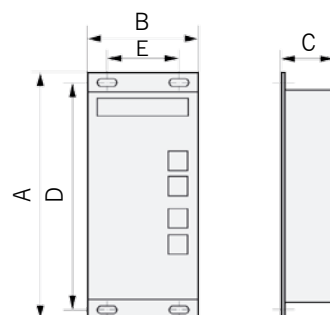
- Magnet type and voltage
- Demagnetizing cycle (coarse)
- Demagnetizing cycle (fine)
- Holding force characteristic (1-16 steps)
- Number of voltage impulses
- Impulse length
- Holding force value for machine clearance

D I M E N S I O N S

Box version (S) with protection IP54									Build-in version (E) with protection IP00								
Ordering no.	Type of control	A	B	C	D	E	F	Weight in kg	Ordering no.	Type of control	A	B	C	D	E	F	Weight in kg
876.10-S-T-24 / 7 / 230	E 1	250	400	150	205	355	ø10	14,0	876.10-E-T-24 / 7 / 230	E 10	220	120	95	210	85	ø 5	2,0
876.10-S-T-24 / 15 / 230	E 2	250	500	150	205	455	ø10	20,0	876.10-E-T-24 / 15 / 230	E 11	260	120	95	250	85	ø 5	3,0
876.10-S-T-24 / 25 / 230	E 3	500	400	250	455	355	ø10	32,0	876.10-E-T-24 / 25 / 230	E 12	320	120	95	310	85	ø 5	6,0
876.10-S-O-110 / 6 / 230	E 4	300	250	155	260	210	ø 8	10,0	876.10-E-O-110 / 6 / 230	E 13	220	120	95	210	85	ø 5	2,0
876.10-S-O-110 / 16 / 230	E 5	250	400	150	205	355	ø10	14,0	876.10-E-O-110 / 16 / 230	E 14	260	120	95	250	85	ø 5	3,0
876.10-S-O-110 / 30 / 230	E 6	250	400	150	205	355	ø10	16,0	876.10-E-O-110 / 30 / 230	E 15	350	250	100	325	225	ø 8	8,0
876.10-S-T-110 / 6 / 400	E 7	500	400	250	455	355	ø10	28,0	876.10-E-T-110 / 6 / 400	E 16	220	120	95	210	85	ø 5	2,0
876.10-S-T-110 / 16 / 400	E 8	500	400	250	455	355	ø10	38,0	876.10-E-T-110 / 16 / 400	E 17	260	120	95	250	85	ø 5	3,0
876.10-S-T-110 / 30 / 400	E 9	600	400	250	555	355	ø10	54,0	876.10-E-T-110 / 30 / 400	E 18	350	120	100	325	225	ø 8	6,0



Dimensional
diagram for
switching box
version (S)



Dimensional
diagram for
built-in
version (E)

Ordering example:

Electronic Polarity-Reversing Control Unit SAV 876.10 - E - O - 110 / 6 / 230

Ordering key SAV No. - Version - Transformer - Magn. nom. voltage / Max. current / Mains voltage

CONTROL UNIT

SAV 876.02

For switching of direct current magnets in connection with polarity reversing unit type SAV 876.10

Application:

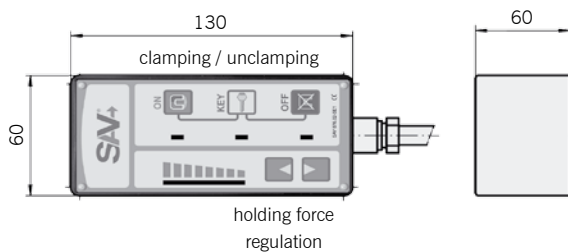
For switching of direct current magnets in connection with electronic polarity-reversing control unit SAV 876.10. The control unit is switched on by pushing the green and yellow keys. The polarity-reversing process is initiated by a red and yellow key. Possible fault indications as monitored by the polarity-reversing unit are also presented to the red illuminated key by means of a coded blinking signal. Required holding force can set to 8 levels. (16 levels on request).

Execution:

In order to comply with accident prevention regulations for machine tools, the release of the machine feed through auxiliary contacts can only be authorised when magnet is switched on and when the "on" position is indicated by a signal light. This control unit complies with these regulations. The signal lamp is integrated into the foil covered keys of the control unit. The auxiliary contacts (interlock) for the machine feed are integrated in the polarity-reversing control unit. Coding switch SE2-1.

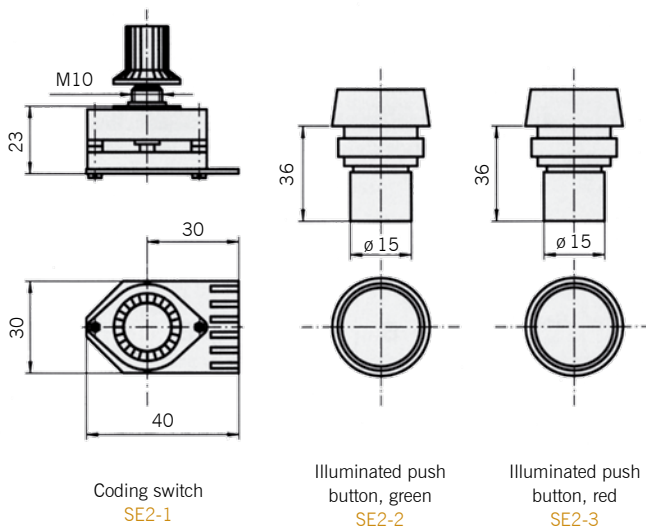
Technical data:

Housing dimensions (LxWxH): 130 x 60 x 60 mm
Operating voltage: 24 V
Protection classification: IP 63
Protection class: III



Control unit type SE3

With coding switch for holding force setting in 8 levels using inverse BCD-coding, including 2 integrated signal lamps and 2 m coded cable, 9 pole. Additional coded cable against price adder.



Build-in version type SE2-1 to SE2-3

Consisting of 2 signal push buttons and coding switch for holding force setting in 8 levels using inverse BCD coding. Complete set can be ordered under type SE2-S.

Ordering example:

Control Unit SAV 876.02 - SE3
Ordering key SAV No. - Type

RECTIFIER UNIT

SAV 876.06

For general purpose and clamping magnets

Use:

For power supply of general purpose and clamping magnets. For electro magnets as low-cost alternative for polarity-reversing controls in case holding force control and demagnetizing are not required.

Execution:

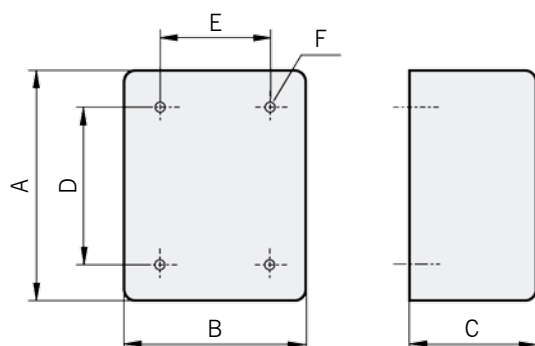
With silicon bridge rectifier and transformer with insulated separate windings. Version in switching box for wall assembly (S) protection class IP54. Also available in build-in version (E) protection class IP00. In standard version switching by mains supply. Optional available with control element in box door (B). The dimensions for build-in version differ slightly from table.

Ambient temp. max: 35 °C

Power supply,

switchable: 230 V AC / 400 V AC

Frequency: 50 / 60 Hz



build-in version (E)



box version (S)

Magnetic nom. voltage DC in V	Max. magnet current in A	Mains voltage in AC	Max. power at the magnet DC in W	Weight in kg	Dimensions in mm					
					A	B	C	D	E	F
24	4,5	230 / 400	108	4,0	210	140	144	150	120	9
24	7	230 / 400	168	9,0	318	140	218	187	194	9
24	15	230 / 400	360	17,0	418	210	318	287	294	9
24	30	230 / 400	720	34,0	618	210	418	487	394	9
110	1,5	230 / 400	165	9,0	318	140	218	187	194	9
110	6	230 / 400	660	22,0	418	210	318	287	294	9
110	16	230 / 400	1760	34,0	618	210	418	487	394	9
110	30	230 / 400	3300	65,0	818	260	618	687	594	9

Ordering example:

Rectifier Unit SAV 876.06 - E - 110 V / 30 A / 230 V - B

Ordering key SAV No. - Box. / Nom. Magnet voltage / Max. current / Mains voltage

SLIP-RING BODY

For electric power supply to circular electromagnetic chucks

Use:

To supply electrical current to rotating, circular electro magnetic chucks. For separate installation to the lathe's hollow spindle. The electrically insulated parts must not come into contact with fluids. It should be ensured that the electrically conducting parts are protected by a shock-proof cover. The power supply is connected to the support nuts using cable eyes.

Mounting:

shrinking at 130°C, pressing with 0.5 mm oversize, glueing.

Execution:

The slip-ring body is supplied with a small through hole only. The required adapter through-bore is to be machined in accordance with the machine spindle dimensions and taking the maximum size E into account.

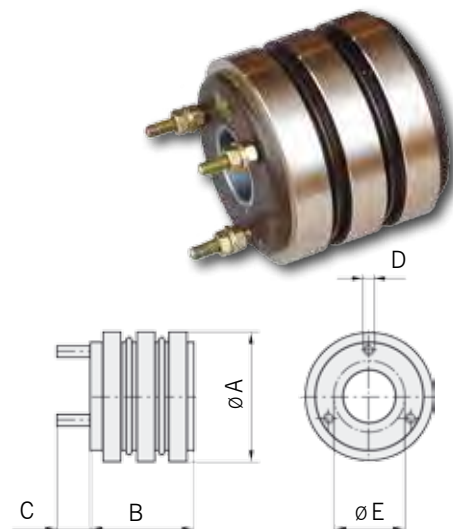
For circular magnet - Ø	Chuck voltage in V	Number of contacts	Dimensions in mm					Max. r.p.m.	Weight in kg
			A	B	C	D	E		
to 300	24	2	80	40,0	20	M5	28 - 38	3600	1,1
to 900	110	3	90	61,5	22	M6	30 - 45	3200	2,0
to 1600	110	3	120	84,0	25	M8	40 - 65	2500	3,5

Ordering example:

Slip Ring Body SAV 248.81 - 1600 - 110 V

Ordering key SAV - No. - Max. circular chuck diameter

SAV 248.81



CARBON BRUSH HOLDER

For electric power supply to circular electromagnetic chucks

Use:

Transmits the electrical current to the slip ring body.

Execution:

Carbon contacts, spring-loaded. It is fixed at a distance G from the mounting rod.

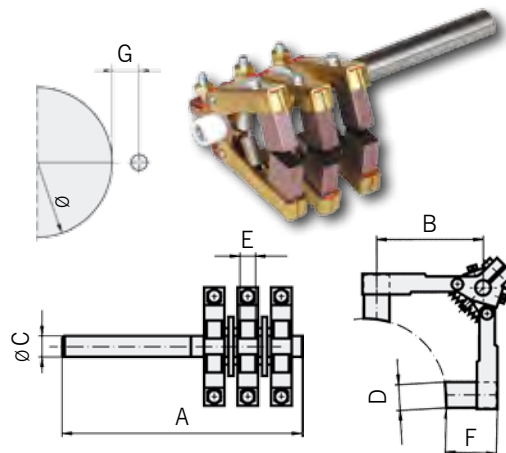
For circular magnet - Ø	Chuck voltage in V	Number of contacts	Dimensions in mm							Weight in kg
			A	B	C	D	E	F	G	
to 300	24	2	140	40	M8	12,5	6,3	20	27,0	0,10
to 900	110	3	140	40	M8	12,5	6,3	20	25,0	0,17
to 1600	110	3	140	60	M8	20	8,0	25	36,5	0,20

Ordering example:

Carbon Brush Holder SAV 248.83 - 1600 - 110 V

Ordering key SAV - No. - Max. chuck size - Operating voltage

SAV 248.83



COMPACT ELECTRICAL ADAPTER PLUG

For use in electro magnetic circular chuck power supplies

Use:

For fitting to the spindle end. Alternatively in the magnet centre for custom designs.

Technical Specifications:

- Protection rating IP 51
- Low transfer resistance

Features:

Compact design, encapsulated, maintenance-free.

Fixing:

By radial clamping around Diameter D.

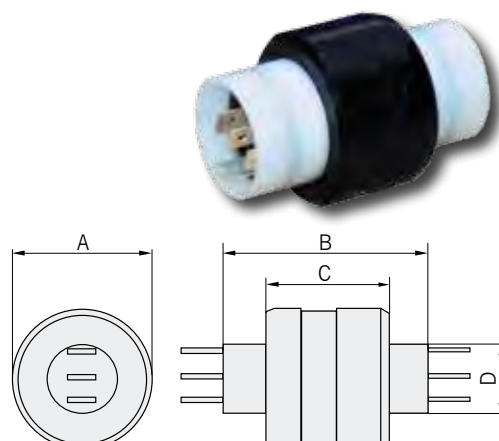
No. of contacts	max. continuous current in A	Voltage in V (AC/DC)	max. RPM	Dimensions in mm			
				A	B	C	D
3	30	0 - 250	1200	31,6	46,2	27,9	15,87
4	30	0 - 500	300	45	69,1	29	31,70

Ordering example: Ordering example for plug see chapter 3, page 93

Compact electrical adapter plug SAV 248.86 - 4

Ordering key SAV - No. - No. of contacts

SAV 248.86

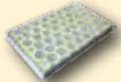


CHAPTER OVERVIEW

CHAPTER 3

Page 53 - 94

	SAV-ART.-NO.	POLE PITCH	COMMENTS	MACHINING OPERATION*	PAGE
ELECTRO-PERMANENT MAGNETIC RECTANGULAR CHUCKS					
	243.70	13/18/25 mm	Transverse poles		58-59
	243.71	4 mm	Fine longitudinal poles		60-61
	243.72	4 mm	With magnetically active stops		62-63
	243.73	4 mm	Fine transverse poles		64-65
	243.76	35/65/85 mm	With demagnetisation, for hard milling	 	66-67
	220.76	35/65 mm	With demagnetisation, for hard milling	 	66-67
	243.77	27,5 mm	Fine transverse poles	 	68-69
	243.77	55 mm	For univ. applications with poles shoes	 	70
	243.77	85 mm	For thick workpieces with poles shoes	 	71
	248.70	–	Pole extensions cubic / round	 	73
	243.77-RAIL	–	For machining of rails	 	74

ELECTRO PERMANENT MAGNETIC CHUCKS / PALLETS					
	243.79	Hexagonalpol	for univ. use, with pole shoes		75
	220.79	Hexagonalpol	for univ. machining, HSC-milling		76

TOMBSTONES WITH ELECTRO PERMANENT MAGNETIC CHUCKS					
	242.92	Tombstone	for horizontal machining operations	 	77

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCKS					
	244.70	Radial pole arra.	for thin rings	 	78-79
	244.71	Radial pole arra.	for hard turning of thin rings	 	80-81
	244.72	Conc.pole arra.	for thin parts, multiple part loading	 	84-85
	244.73	Parall. pole pitch	for thin parts, magnetically active centre		86

ELECTRONIC POLARITY-REVERSING CONTROL UNITS / POWER SWITCHING UNITS					
	876.12	For the electronic control of EP-chucks	–		88-89
	876.02	To switch DC magnets	–		91

CARBON CONTACT HOLDER / SLIP RING BODY					
	248.84	Carbon contact holder	–		92
	248.85	Separate slip ring body	–		92
	248.86	Compact electrical adapter plug	–		93

* Explanation of the icons on page 9

PRODUCT APPLICATIONS

► ELECTRO PERMANENT MAGNET CUBE

Dimensions:

1400 x 1400 mm

Workpiece:

Castings for crankshafts

Machining operation:

Hard milling of mould cavities

Description:

- 4 Magnet sides, each with 2 active magnets
- Wear protection with pole beams
- Electrical connection with industrial plug for index tables



► ELECTRO PERMANENT MAGNETIC PALLET

Dimensions:

1000 x 1000 mm

Workpiece:

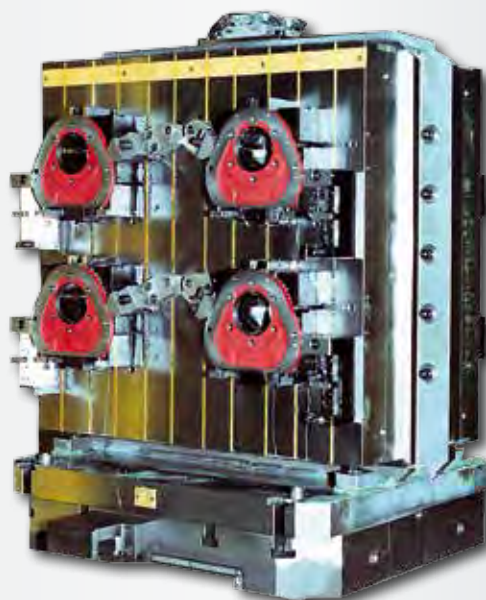
Castings for gear box covers

Machining operation:

Drilling and milling of the sealing faces

Description:

- Initial clamping using movable pole shoes and support elements
- Second clamping using fixed pole beams to achieve exact parallelism



PRODUCT APPLICATIONS

► HIGH ENERGY MAGNET MILLING CHUCK

Dimensions:

1900 x 750 mm

Workpiece:

Front plates for forklift trucks

Machining operation:

Milling operations on 5 sides
incl. the apertures

Description:

- Powerful neodymium magnet system
- Full workpiece access with pole beams
- Retractable side stops with position monitoring



3

► ELECTRO PERMANENT MAGNETIC FIXTURE

Dimensions:

Length 1000 mm

Workpiece:

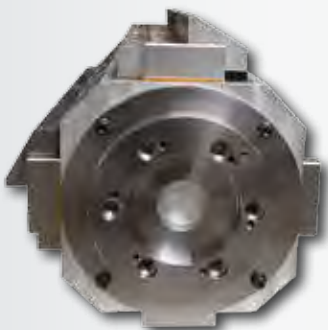
Moulds/tools for hydraulic press brakes

Machining operation:

Grinding of contours and feet

Description:

- Bridge on indexer with rotational parallelism of 0.01/1000 mm
- Workpiece holding using pole blocks with either longitudinal or transverse poles



PRODUCT APPLICATIONS

► ELECTRO PERMANENT MAGNETIC CHUCK with adapter pole beams

Dimensions:

4000 x 180 mm

Workpiece:

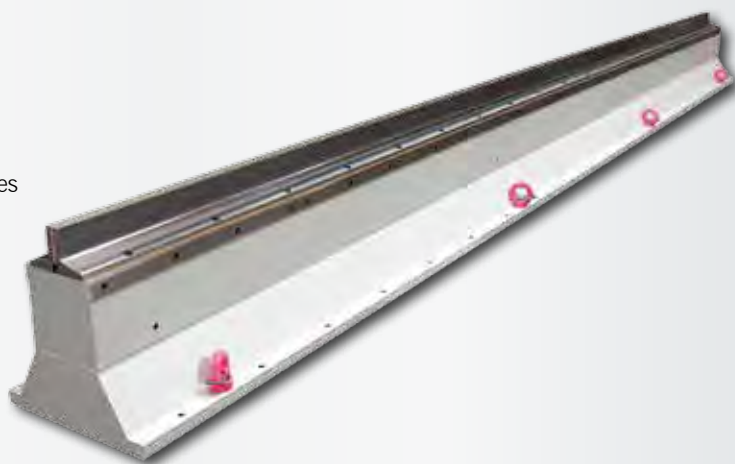
Linear guides

Machining operation:

Grinding of the guide surfaces

Description:

- With longitudinal poles for a homogenous magnetic field over the full length
- Made from a single piece
- High energy system
- Full workpiece access with adapter pole plates



► ELECTRO PERMANENT MAGNETIC PALLETS

Dimensions:

2310 x 260 mm

Workpiece:

Linear guides

Machining operation:

Grinding of the guide surfaces

Description:

- 2 magnets in pallet operation per machine
- Automatic docking of electrical connection



PRODUCT APPLICATIONS

► ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCKS

Magnets for large component machining:

- 3-face machining operations
- Minimal clamping and set-up times
- Universal and precise
- Extremely high holding forces even for heavy machining operations
- Chuck surface completely active
- High accuracy and damping through surface proportional force transfer
- Large magnetically active areas in the circumferential direction
- Very small inactive range in the centre
- Individual spindle adaption
- Produced from a single piece
- High RPM
- Extremely large diameters e.g. 12 m in segment design



ø 4000 mm, 2-part execution

3

► SAV LARGE MAGNET CONSTRUCTION



ø 2800 mm, produced from a single piece

ELECTRO-PERMANENT MAGNETIC CHUCK



SAV 243.70

With continuous transverse pole arrangement $P = 13, 18$ and 25 mm

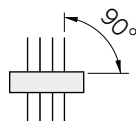
This range of magnetic chucks belongs to the new generation of electro-permanent magnetic chucks and is notable for its very robust, homogeneous design and its precision. The magnetic force is produced by permanent magnets that are magnetized and demagnetized by short electric current pulses. This chuck is particularly notable for its high power and longlife. The pole pitch gives real N and S-poles.



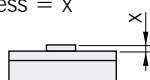
Use:

For universal clamping of precision workpieces.

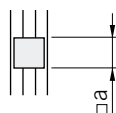
- for workpiece positioning cross to pole pitch



- for workpiece with min. thickness = x
 4.5 mm at $P = 13$ mm
 6.0 mm at $P = 18$ mm
 8.5 mm at $P = 25$ mm



- for flat workpieces with min. dimensions = a :
 25 mm x 25 mm at $P = 13$ mm
 32 mm x 32 mm at $P = 18$ mm
 45 mm x 45 mm at $P = 25$ mm



Nominal holding force:

90 N/cm², at pole pitch $P = 13$ mm
 110 N/cm², at pole pitch $P = 18$ mm
 115 N/cm², at pole pitch $P = 25$ mm
 adjustable with control unit with encoded switch

Nominal operating voltage:

210 V DC up to size $A \times B = 600 \times 400$
 360 V DC above size $A \times B = 450 \times 175$

Features:

- solid constructed pole plate with either 13 mm, 18 mm or 25 mm transverse pole pitch
- real magnetic (N/S) poles
- switching off through demagnetizing cycle
- heat treated tension free body
- electro-permanent system, guaranteeing safe operation during power failure
- air pressure release system on request for $P = 18$ or 25 mm
- gap free construction of pole plate
- fine grid pole plate to body connection
- extra enhanced systems available on request
- pole plate wearing limit 8 mm
- pole plate exchangeable
- mounting slots in both short faces
- through holes for mounting in sizes over 1000 mm length on specification
- robust and waterproof
- sealed to IP 65
- for use with control unit type SAV 876.03 / SAV 876.10

Auxiliary equipment:

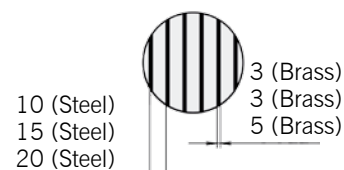
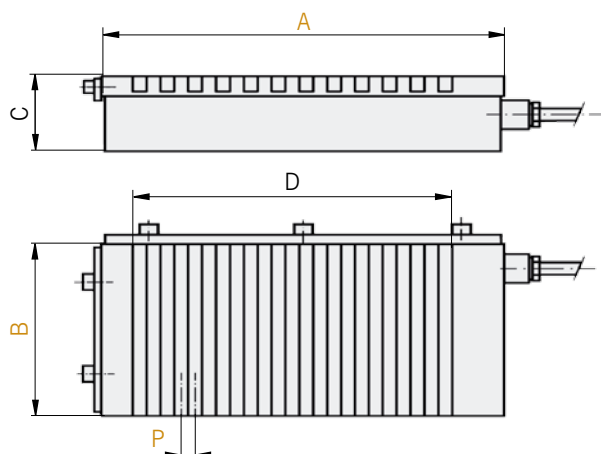
- Sidestop rail on a short and long face.
- Connecting cable, 3 m, on the right-hand, short face at the rear.
- With industrial watertight plug-in type connector on request
- Lifting bolts for transportation on larger models.
- Controller and hand-held control unit not included in delivery.

ELECTRO-PERMANENT MAGNETIC CHUCK



SAV 243.70

With continuous transverse pole arrangement P = 13, 18 and 25 mm



Other sizes and operating voltages available on request. Larger clamping surfaces can be made by flush mounting several units. Please refer to SAV 876.10 to SAV 876.03, for details regarding suitable control units, based on max. current or control voltage

3

Dimensions in mm					Weight in kg	Chuck voltage in V	Type of control
A	B	C ₁	D	P			
200	100	80	120	13	11,0	210	EP 1
300	100	80	224	13	17,0	210	EP 1
300	150	80	224	13	25,0	210	EP 1
400	150	80	328	13	34,0	210	EP 1
450	175	80	381	18	44,0	210 / 360	EP 1
400	200	80	309	18	45,0	210 / 360	EP 1
500	200	80	417	18	56,0	210 / 360	EP 1
600	200	80	525	18	67,0	210 / 360	EP 1
800	200	80	741	18	90,0	210 / 360	EP 1
500	250	80	417	18	70,0	210 / 360	EP 1
600	250	80	525	18	84,0	210 / 360	EP 1
800	250	80	741	18	112,0	210 / 360	EP 1
500	300	80	417	18	90,0	210 / 360	EP 1
600	300	80	525	18	108,0	210 / 360	EP 1
800	300	80	741	18	145,0	210 / 360	EP 1
1000	300	80	921	18	180,0	210 / 360	EP 1
600	350	80	525	18	126,0	210 / 360	EP 1
800	350	80	741	18	168,0	210 / 360	EP 1
1000	350	80	921	18	210,0	210 / 360	EP 1

Dimensions in mm					Weight in kg	Chuck voltage in V	Type of control
A	B	C ₁	D	P			
600	400	80	525	18	145,0	210 / 360	EP 1
700	400	80	697	18	169,0	360	EP 2
800	400	80	741	18	193,0	360	EP 2
1000	400	80	921	18	240,0	360	EP 2
1200	400	90	1101	18	289,0	360	EP 2
800	500	80	730	25	241,0	360	EP 2
1000	500	80	930	25	301,0	360	EP 2
1200	500	90	1130	25	361,0	360	EP 2
1250	500	90	1180	25	376,0	360	EP 2
1500	500	90	1430	25	450,0	360	EP 2
1600	500	90	1530	25	480,0	360	EP 3
2000	500	90	1930	25	602,0	360	EP 3
1000	600	80	930	25	361,0	360	EP 2
1200	600	90	1130	25	433,0	360	EP 2
1250	600	90	1180	25	451,0	360	EP 2
1500	600	90	1430	25	542,0	360	EP 2
1600	600	90	1530	25	578,0	360	EP 3
2000	600	90	1930	25	722,0	360	EP 3
1500	800	90	1430	25	723,0	360	EP 3
1600	800	90	1530	25	771,0	360	EP 3
2000	800	90	1930	25	963,0	360	EP 3

Recommended controller and control unit:

Type	Control unit	Hand-held contr. unit
EP 1	SAV 876.12-S-O-210/30/230	SAV 876.02-SE3
EP 2	SAV 876.12-S-O-360/30/400	SAV 876.02-SE3
EP 3	SAV 876.12-S-O-360/60/400	SAV 876.02-SE3

For built-in or combination control unit see page 88.

Ordering example:

Electro-Permanent Magnetic Chuck
Ordering key

SAV 243.70 - 2000 x 800 - 25 - 360 V
SAV - No. - A x B - Pole pitch - Chuck voltage

Ordering example Steuerung:

Electronic polarity-reversing control unit
Hand-held control unit
Ordering key

SAV 876.12 - S-O-360/60/400
SAV 876.02 - SE3
SAV - No.

ELECTRO-PERMANENT MAGNETIC CHUCK



SAV 243.71

With fine longitudinal pole pitch $P = 4 \text{ mm}$

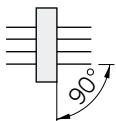
Electro-permanent magnetic system with very small pole pitch. The magnetic force is produced by permanent magnets that are magnetized and demagnetized by short electric current pulses. This chuck is particularly notable for its high power, robust construction and long-life. Especially suitable for thin parts; workpieces cross to length of chuck.



Use:

For clamping of thin and flat high precision workpieces.

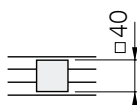
- for workpiece positioning cross to pole pitch



- for thin workpieces of min. 2 mm thick



- for flat workpieces with min. dimensions of 40 mm x 40 mm



Nominal holding force:

100 N/cm²,
adjustable with control unit
with encoded switch

Nominal operating voltage:

210 V DC up to size A x B = 600 x 250
360 V DC above to size A x B = 600 x 250

Features:

- pole plate with very small longitudinal pole pitch of 3 mm steel and 1 mm brass
- glued lamination with additional pull anchors in length direction of chuck
- gap free construction of pole plate

- high precision due to fine grid poleplate to body connection
- switching off through demagnetizing cycle
- pole plate wearing limit 8 mm
- low magnetic field height
- heat treated tension-free body
- electro-permanent system, guaranteeing safe operation during power failure
- mounting slots in both short faces
- extra enhanced systems available on request
- through holes for mounting in sizes over 1000 mm length on specification
- robust and waterproof
- sealed to IP 65
- for use with control unit type SAV 876.03-SF0-EP up to size A x B = 400 x 150 / SAV 876.10 above size A x B = 400 x 150

Auxiliary equipment:

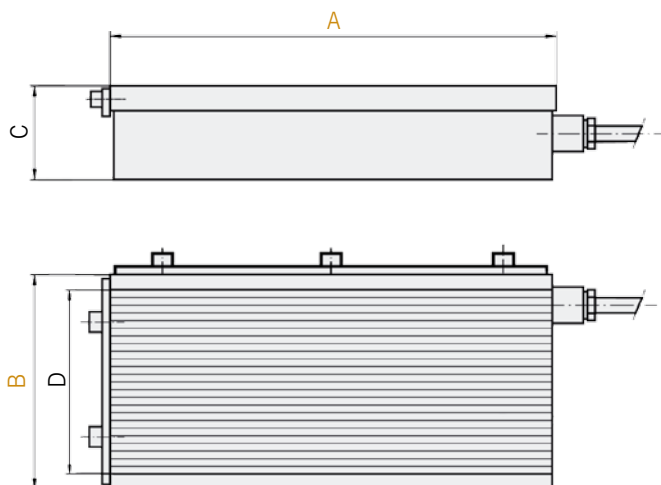
- side stop rail on short and long face
- connecting cable, 3 m, on the right-hand, short face
- with industrial watertight plug-in type connector on request
- lifting bolts on larger models

ELECTRO-PERMANENT MAGNETIC CHUCK

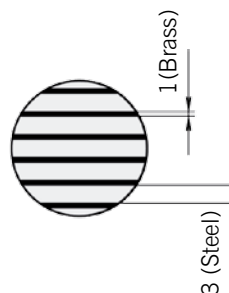


SAV 243.71

With fine longitudinal pole pitch $P = 4 \text{ mm}$



Other sizes and operating voltages available on request. Larger clamping surfaces can be made by flush mounting several units.
Please refer to SAV 876.10 to SAV 876.03, for details regarding suitable control units, based on max. current or control voltage.



Dimensions in mm				Weight in kg	Chuck voltage in V	Type of control
A	B	C	D			
200	100	77	53	12,0	210	EP 2
300	100	77	53	18,0	210	EP 2
300	150	77	101	26,0	210	EP 3
400	150	77	101	34,0	210	EP 3
450	175	77	125	44,0	210/360	EP 2
400	200	77	149	45,0	210/360	EP 3
500	200	77	149	56,0	210/360	EP 3
600	200	77	149	67,0	210/360	EP 2
800	200	77	149	90,0	210/360	EP 2
500	250	77	197	70,0	210/360	EP 3
600	250	77	197	84,0	210/360	EP 3
800	250	77	197	112,0	360	EP 3

Dimensions in mm				Weight in kg	Chuck voltage in V	Type of control
A	B	C	D			
500	300	77	253	86,0	360	EP 2
600	300	77	253	103,0	360	EP 2
800	300	77	253	137,0	360	EP 3
1000	300	77	253	172,0	360	EP 3
600	350	77	301	120,0	360	EP 2
800	350	77	301	160,0	360	EP 3
1000	350	77	301	200,0	360	EP 3
600	400	77	349	137,0	360	EP 2
700	400	77	349	160,0	360	EP 2
800	400	77	349	183,0	360	EP 3
1000	400	77	349	229,0	360	EP 3
1200	400	87	349	275,0	360	EP 3
800	500	77	453	229,0	360	EP 3
1000	500	77	453	286,0	360	EP 3
1200	500	87	453	344,0	360	EP 3

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
EP 1	SAV 876.12-S-O-210/30/230	SAV 876.02-SE3
EP 2	SAV 876.12-S-O-360/30/400	SAV 876.02-SE3
EP 3	SAV 876.12-S-O-360/60/400	SAV 876.02-SE3

For built-in or combination control unit see page 88.

Ordering example:

Electro-Permanent Magnetic Chuck SAV 243.71 - 1200 x 500 - 360 V
Ordering key SAV - No. - A x B - Chuck voltage

Ordering example Steuerung:

Electronic polarity-reversing control unit SAV 876.12 - S-O-260/60/400
Hand-held control unit SAV 876.02 - SE3
Ordering key SAV - No.

ELECTRO-PERMANENT MAGNETIC CHUCK



SAV 243.72

With fine longitudinal pole pitch $P = 4 \text{ mm}$ and magnetizable stop rails

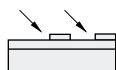
This newly developed clamping system with magnetic stop rails provides a simple, reliable and secure method for positioning and clamping workpieces for machining.

This helps to avoid positioning errors, particularly when used in multi-shift operation. The magnetic force is produced by permanent magnets that are magnetized and demagnetized by short electric current pulses. Especially suitable for thin parts.

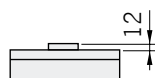
Use:

Best suited for precision grinding of mass production components. For toolmaking, the system facilitates μm -precise machining with respect to the datum edge. Also for light milling.

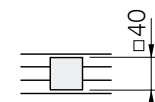
- control of magnetizable side stops can be operated in time sequence



- for thin workpieces of up to 12 mm thick.
(depends on height of stoppers)



- for flat workpieces with min. dimensions 40 mm x 40 mm.



Nominal holding force:

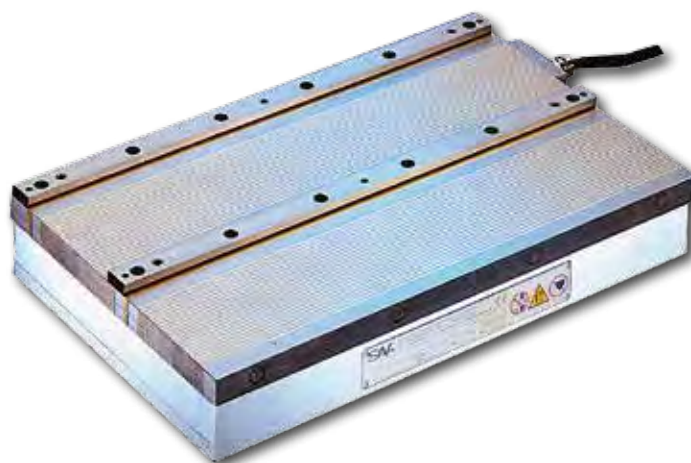
100 N/cm²,
adjustable with control unit
with encoded switch

Nominal operating voltage:

360 V DC

Features:

- 2 strong bipolar magnets for the stop rails and 2 longitudinal pole magnets to provide accurate and secure alignment of the workpieces
- the magnetization of the stop rails takes place prior to that of the main clamping surface, using a special control routine.
The workpiece is thus pulled firmly into the lower edge of the stop rail
- especially fine, uninterrupted longitudinal pole arrangement
- glued lamination with additional pull anchors in length direction of chuck
- gap free construction of pole plate
- high precision due to fine grid pole plate to body connection



- switching off through demagnetizing cycle
- pole plate wearing limit 8 mm
- low magnetic field height
- heat treated tension free body
- electro-permanent system, guaranteeing safe operation during power failure
- mounting slots in both short faces
- extra enhanced systems available on request
- robust and waterproof
- sealed to IP 65
- for use with control unit type SAV 876.10

Standard equipment:

- 1 or 2 magnetizable stop rails
- connecting cable, 3 m, on the right-hand, short face
- with industrial watertight plug-in type connector on request
- lifting bolts on larger models

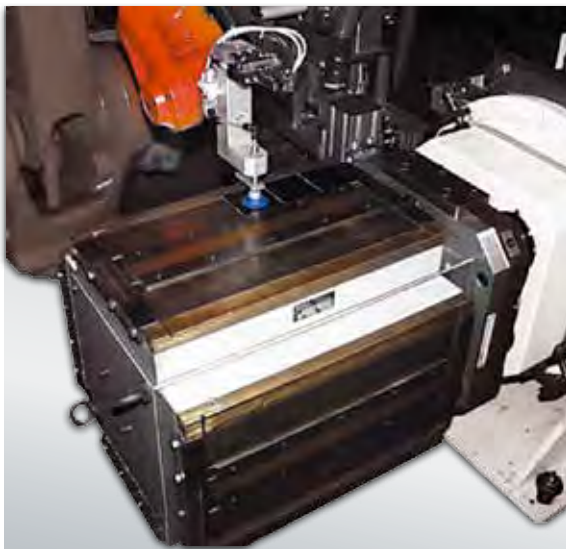
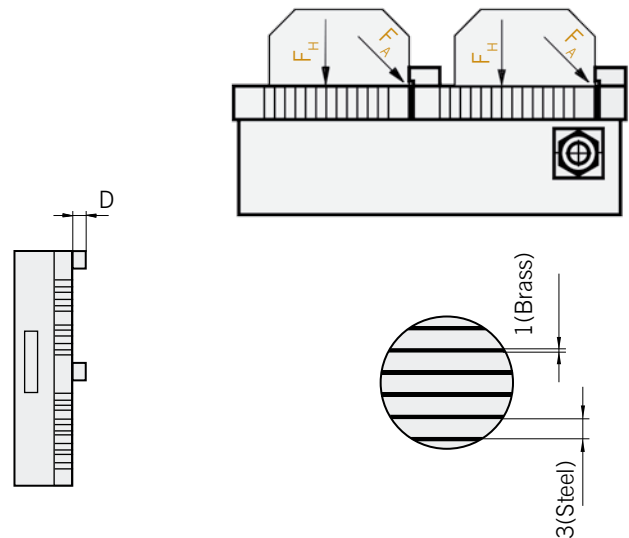
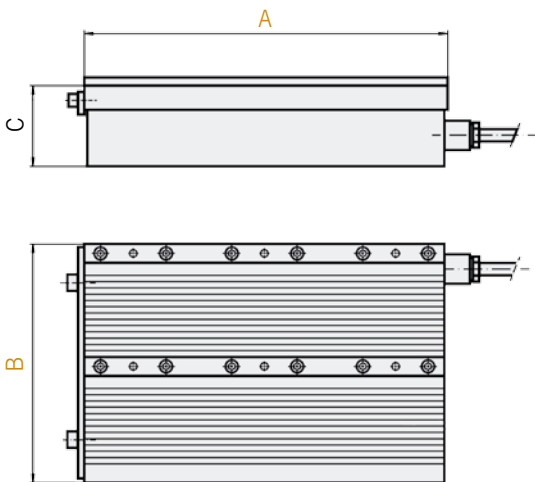
ELECTRO-PERMANENT MAGNETIC CHUCK



SAV 243.72

With fine longitudinal pole pitch $P = 4 \text{ mm}$ and magnetizable stop rails

The magnetizing cycle starts with magnetizing just the stop rails. The workpiece is thus pulled with a force F_A , at an angle of 45° , into the corner between the stop rail and the chuck surface. Approximately 1 second later, the main chuck surface is switched on to generate the main clamping force F_H .



Dimensions in mm				Number of stop rails	Weight in kg	Type of control
A	B	C	D*			
400	200	77	12	1	45,0	EP 4
500	200	77	12	1	56,0	EP 4
600	200	77	12	1	67,0	EP 4
400	300	77	12	2	68,0	EP 4
500	300	77	12	2	86,0	EP 4
600	300	77	12	2	103,0	EP 4
600	400	77	12	2	137,0	EP 4
800	400	77	12	2	183,0	EP 4

* Other heights on request. The table gives a summary of the standard sizes available. Custom-made versions are available on request. Please refer to SAV 876.10 for control unit details.

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
EP 4	SAV 876.12-S-O-360/30x2/400	SAV 876.02-SE3

For built-in or combination control unit see page 88.

Ordering example:

Electro-Permanent Magnetic Chuck

Ordering key

Ordering example control unit:

Electronic polarity-reversing control unit

Hand-held control unit

Ordering key

SAV 243.72 - 800 x 400 - 360 V

SAV - No. - A x B - Chuck voltage

SAV 876.12 - S-O-300/30x2/400

SAV 876.02 - SE3

SAV - No.

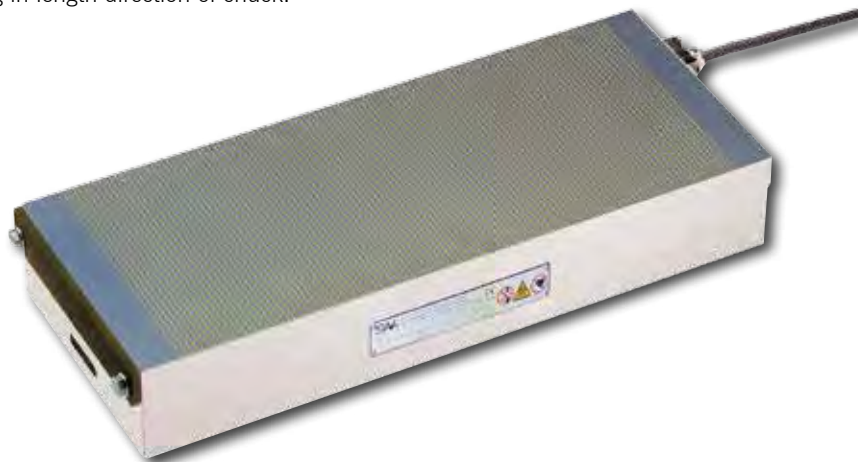
ELECTRO-PERMANENT MAGNETIC CHUCK



SAV 243.73

With fine transverse pole pitch $P = 4 \text{ mm}$

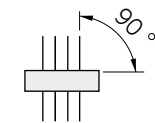
Electro-permanent magnetic system with very small pole pitch. The magnetic force is produced by permanent magnets that are magnetized and demagnetized by short electric current pulses. Especially suitable for thin parts; workpiece positioning in length direction of chuck.



Use:

For clamping of thin and flat high precision workpieces.

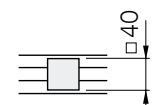
- for workpiece positioning cross to pole pitch



- for thin workpieces of min. 2 mm thick.



- for flat workpieces with min. dimensions of 40 mm x 40 mm.



Nominal holding force:

100 N/cm²,
adjustable with control unit with encoded switch

Nominal operating voltage:

210 V DC up to size A x B = 600 x 250

360 V DC above size A x B = 600 x 250

Features:

- pole plate with very small longitudinal pole pitch of 3 mm steel and 1 mm brass
- glued lamination with additional pull anchors in length direction of chuck

- gap free construction of pole plate
- high precision due to fine grid pole plate to body connection
- switching off through demagnetizing cycle
- pole plate wearing limit 8 mm
- low magnetic field height
- heat treated tension free body
- electro-permanent system, guaranteeing safe operation during power failure
- mounting slots in both short faces
- extra enhanced systems available on request
- through holes for mounting in sizes over 1000 mm length on specification
- robust and waterproof
- sealed to IP 65
- for use with control unit type
SAV 876.03-SF0-EP up to size A x B = 600 x 300
SAV 876.10 above size A x B = 600 x 300

Auxiliary equipment:

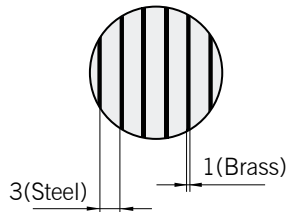
- side stop rail on short and long face
- connecting cable, 3 m, on the right-hand, short face
- with industrial watertight plug-in type connector on request
- lifting bolts on larger models

ELECTRO-PERMANENT MAGNETIC CHUCK

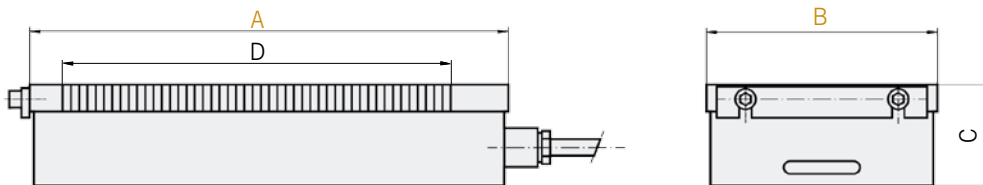


SAV 243.73

With fine transverse pole pitch $P = 4 \text{ mm}$



Other sizes and operating voltages available on request. Larger clamping surfaces can be made by flush mounting several units. Please refer to SAV 876.10 to SAV 876.03, for details regarding suitable control units, based on max. current or control voltage



Dimensions in mm				Weight in kg	Chuck voltage in V	Type of control
A	B	C	D			
450	175	77	397	44,0	210 / 360	EP 1
400	200	77	349	45,0	210 / 360	EP 1
500	200	77	453	56,0	210 / 360	EP 1
600	200	77	549	67,0	210 / 360	EP 1
800	200	77	749	90,0	360	EP 1
500	250	77	453	70,0	210 / 360	EP 1
600	250	77	549	84,0	210 / 360	EP 1
800	250	77	749	112,0	360	EP 1
500	300	77	453	90,0	210 / 360	EP 1
600	300	77	549	108,0	210 / 360	EP 1
800	300	77	749	145,0	360	EP 2
1000	300	77	949	180,0	360	EP 3

Dimensions in mm				Weight in kg	Chuck voltage in V	Type of control
A	B	C	D			
600	350	77	549	126,0	360	EP 2
800	350	77	749	168,0	360	EP 2
1000	350	77	949	210,0	360	EP 3
600	400	77	549	145,0	360	EP 2
700	400	77	653	169,0	360	EP 2
800	400	77	749	193,0	360	EP 2
1000	400	77	949	240,0	360	EP 3
1200	400	87	1149	289,0	360	EP 3
800	500	77	749	241,0	360	EP 2
1000	500	77	949	300,0	360	EP 3
1200	500	87	1149	361,0	360	EP 3

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
EP 1	SAV 876.12-S-O-210/30/230	SAV 876.02-SE3
EP 2	SAV 876.12-S-O-360/30/400	SAV 876.02-SE3
EP 3	SAV 876.12-S-O-360/60/400	SAV 876.02-SE3

For built-in or combination control unit see page 88.

Ordering example:

Electro-Permanent Magnetic Chuck SAV 243.73 - 1200 x 500 - 360 V
Ordering key SAV - No. - A x B - Chuck voltage

Ordering example control unit:

Electronic polarity-reversing control unit SAV 876.12 - S-O-360/60/400
Hand-held control unit SAV 876.02 - SE3
Ordering key SAV - No.

ELECTRO PERMANENT MAGNETIC CHUCKS



SAV 243.76
SAV 220.76

with continuous transverse pole pitch $P=35, 65, 85$

Enhanced magnet system with demagnetisation cycle.
Optimised system for high holding forces.
Fully magnetically saturated system through flux concentration.
Version 220.76 quadratic (Pallet), Version 243.76 rectangular.



SAV 220.76
Pole pitch 35, 65



SAV 243.76
Pole pitch 35, 65, 85

Use:

Heavy machining operations also on adapter pallet systems.

With demagnetisation cycle, therefore also for high alloy materials or hardened materials.

- for workpieces to a min. thickness x:
8.0 mm at $P=35$ mm
20.0 mm at $P=65$ mm
32.0 mm at $P=85$ mm
- for flat workpieces min. area:
70 mm x 70 mm at $P=35$ mm
130 mm x 130 mm at $P=65$ mm
180 mm x 180 mm at $P=85$ mm

Nominal holding force:

80 N/cm² at $P=35$ mm
100 N/cm² at $P=65$ mm
160 N/cm² at $P=85$ mm

regulated by use of the holding force coding switch on the control unit

Nominal operating voltage:

210 V

Features:

- Optimised holding force system with demagnetisation cycle
- Complete surface is magnetically active, no "dead zones"

- Solid monoblock design
- "True" pole spacings N/S
- Electro permanent system for absolute safety in the case of a power cut
- Electrical connection with industrial plug on front right side
- Pole gap with brass, wear protected
- 8 mm pole plate wear limit
- Optionally with grid tapped-hole pattern for pole beams or pole shoes possible (M)
- Pole pitches 65 mm and 85 mm optionally available with T-slots DIN 650-10H10 (T)
- Mounting slots on the short faces
- The quadratic design SAV 220.76 optionally available with zero point clamping system upon agreement
- Robust and waterproof
- Protection rating IP65
- Suitable for use with control unit SAV 876.12

Scope of delivery:

- Electrical connection with industrial plug
- Adaption for zero point reference system upon agreement at a surcharge
- Lifting bolts for transportation on larger models.
- Robot flange on request

ELECTRO PERMANENT MAGNETIC CHUCKS

with continuous transverse pole pitch for hard milling



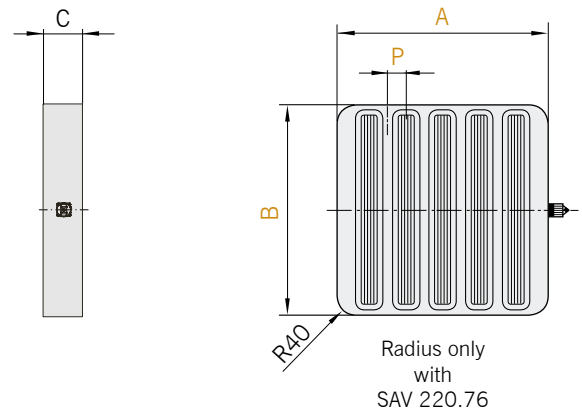
SAV 243.76
SAV 220.76

SAV 220.76-35

Dimensions in mm				Weight in kg	Control unit max. imp. current in A
A	B	C	P		
320	320	90	35	72	30
400	400	90	35	113	30

SAV 243.76-35

Dimensions in mm				Weight in kg	Control unit max. imp. current in A
A	B	C	P		
600	400	90	35	170	60
800	500	90	35	283	60 x 2
1000	500	90	35	354	60 x 2

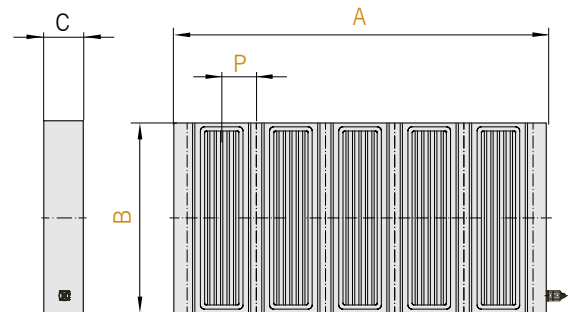


SAV 220.76-65

Dimensions in mm				Weight in kg	Control unit max. imp. current in A
A	B	C	P		
320	320	90	65	72	30
400	400	90	65	113	30

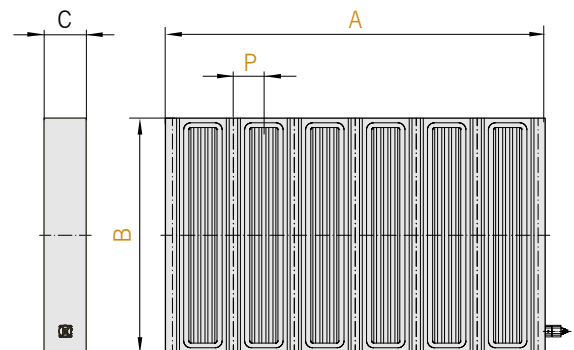
SAV 243.76-65

Dimensions in mm				Weight in kg	Control unit max. imp. current in A
A	B	C	P		
580	400	90	65	164	30
815	500	90	65	288	60
960	500	90	65	340	60



SAV 243.76-85

Dimensions in mm				Weight in kg	Control unit max. imp. current in A
A	B	C	P		
610	400	100	85	192	30
800	500	100	85	314	60
980	500	100	85	385	60



For use with control unit SAV 876.12

Ordering example:

Electro Permanent Magnetic Chuck SAV 243.76 - 980 x 500 - 85 - 210 V - T

Ordering key SAV - No. - A x B - Pole pitch - Nominal voltage - Option

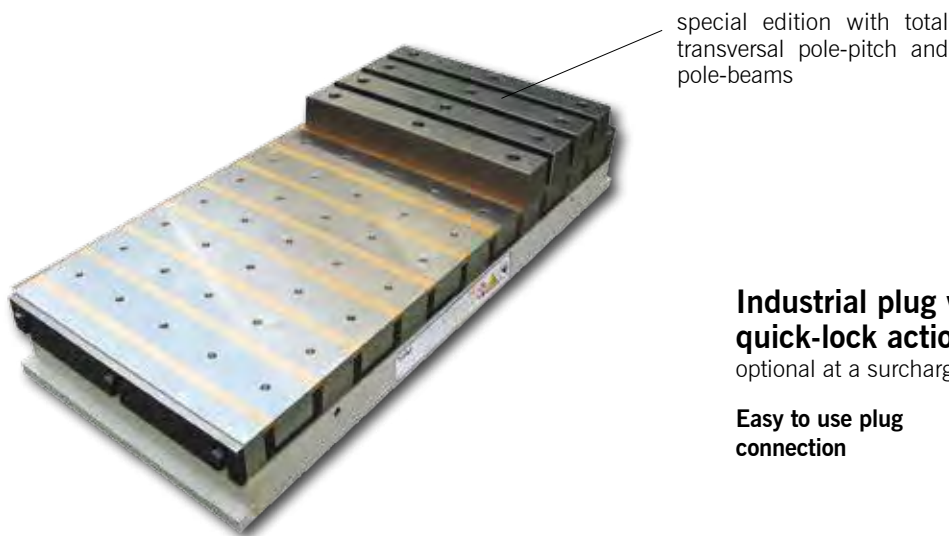
ELECTRO-PERMANENT MAGNETIC CHUCK



SAV 243.77

With transverse pole arrangement, suitable for milling work

This clamping system with neodymium-iron-boron magnets was developed in accordance with the most modern standards in magnet technology. Exceptionally high holding forces arise through the use of AlNiCo/ Neodymium magnets in an electro-permanent magnetic configuration. Magnetization and demagnetization are achieved through short electric current pulses.



Industrial plug with quick-lock action

optional at a surcharge

Easy to use plug connection



Use:

For heavy milling work with coarse chip removal. Ideal for use on indexing palette systems

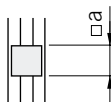
- for workpiece with min. thickness = x:



8.0 mm at P = 27.5 mm
20.0 mm at P = 55.0 mm
35.0 mm at P = 85.0 mm

- for flat workpieces with min. dimensions a:

45 x 45 mm² at P = 27.5 mm
95 x 95 mm² at P = 55.0 mm
150 x 150 mm² at P = 85.0 mm



Nominal holding force:

195 N/cm² on full inducible steel load
110 N/cm² at P = 27.5 mm
150 N/cm² at P = 55.0 mm
170 N/cm² at P = 85.0 mm
adjustable with control unit with encoded switch

Nominal operating voltage:

360 V DC

Features:

- Optimised high energy magnet system
- Holding forces at maximum physically possible level
- The deep field magnet system even bridges large air gaps

- Complete surface is magnetically active, no "dead zones"
- Solid monoblock design
- "True" pole spacings N/S
- Electro permanent system for absolute safety in the case of a power cut
- Pole gap with brass in-lays for optimal wear protection
- 8 mm pole plate wear limit
- Optionally with grid tapped-hole pattern for pole beams or movable pole shoes possible (M)
- Mounting slots on both short faces
- For lengths greater than 1000 mm with drilled through holes for fixing, upon agreement
- Robust and waterproof
- Protection rating IP65
- Suitable for use with control unit SAV 876.12

Scope of delivery:

- connecting cable, 3 m, on the right-hand, short face
- with industrial watertight plug-in type connector on request
- lifting bolts on larger models

ELECTRO-PERMANENT MAGNETIC CHUCK



SAV 243.77

with continuous transverse pole pitch for milling

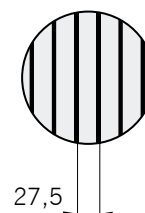
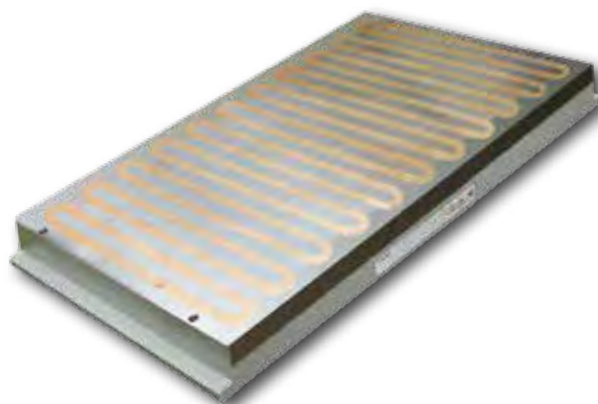
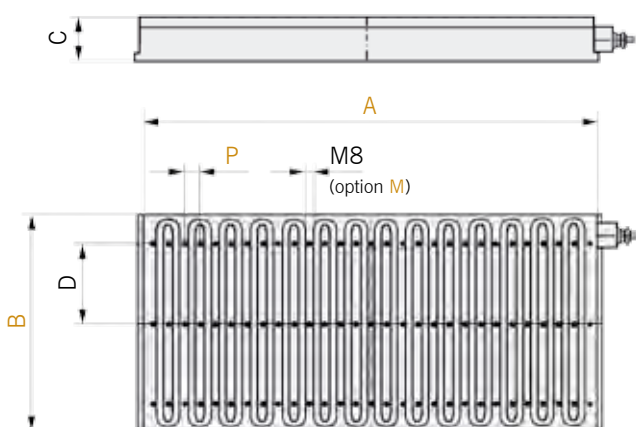
SAV 243.77 - 27,5

Small transverse pole arrangement

Use:

Heavy milling of thin plates

- min. thickness of workpiece: 5 - 8 mm
- min. size of workpiece: 45 x 45 mm²
- nominal holding force: 110 N/cm²



Dimensions in mm					Nom. holding force fully loaded in daN	Optional number of threads per pole M	Number of poles M	Number of threads total M	Weight in kg	Type of control
A	B	C	D	P						
410	200	80	100	27,5	9.020	2	15	30	46,0	EP 2
520	200	80	100	27,5	11.440	2	19	38	58,0	EP 2
630	200	80	100	27,5	13.860	2	23	46	71,0	EP 2
520	300	80	100	27,5	17.160	3	19	57	87,0	EP 3
630	300	80	100	27,5	20.790	3	23	69	107,0	EP 3
800	300	80	100	27,5	26.400	3	29	87	135,0	EP 3
630	400	80	150	27,5	27.720	3	23	69	143,0	EP 5
800	400	80	150	27,5	35.200	3	29	87	180,0	EP 5
1015	400	80	150	27,5	44.660	3	37	111	228,0	EP 5
800	500	80	200	27,5	44.000	3	29	87	225,0	EP 5
1015	500	80	200	27,5	55.825	3	37	111	285,0	EP 5
1180	500	80	200	27,5	64.300	3	43	129	331,0	EP 6

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
EP 2	SAV 876.12-S-O-360/30/400	SAV 876.02-SE3
EP 3	SAV 876.12-S-O-360/60/400	SAV 876.02-SE3
EP 5	SAV 876.12-S-O-360/60x2/400	SAV 876.02-SE3
EP 6	SAV 876.12-S-O-360/60x3/400	SAV 876.02-SE3

For built-in or combination control unit see page 88.

Ordering example:

Electro-Permanent Magnetic Chuck

Ordering key

SAV 243.77 - 1180 x 500 - 27,5 - 360 V - M

SAV - No. - A x B - Pole pitch - Chuck voltage - Option

Ordering example Steuerung:

Electronic polarity-reversing control unit

Hand-held control unit

Ordering key

SAV 876.12 - S-O-360/60x3/400

SAV 876.02 - SE3

SAV - No.

ELECTRO-PERMANENT MAGNETIC CHUCK



SAV 243.77

with continuous transverse pole pitch for milling

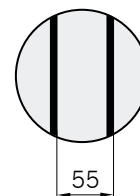
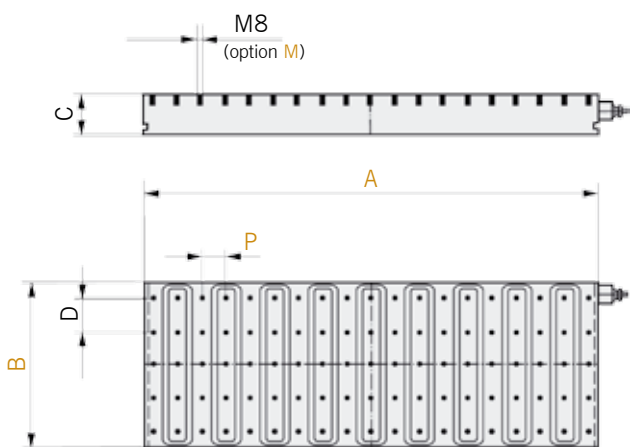
SAV 243.77 - 55

Middle transverse pole arrangement

Use:

For universal machining and heavy milling.

- min. thickness of workpiece: 20 mm
- min. size of workpiece: 95 x 95 mm²
- nominal holding force: 150 N/cm²



Dimensions in mm					Nom. holding force fully loaded in daN	Optional number of threads per pole M	Number of poles M	Number of threads total M	Weight in Kg	Type of control
A	B	C	D	P						
480	300	97	60	55	21.600	4	9	36	94,0	EP 2
590	300	97	60	55	26.550	4	11	44	116,0	EP 2
810	300	97	60	55	36.450	4	15	60	159,0	EP 2
1030	300	97	60	55	46.350	4	19	76	202,0	EP 2
1140	300	97	60	55	51.300	4	23	92	224,0	EP 3
810	400	97	80	55	48.600	5	15	75	212,0	EP 2
1030	400	97	80	55	61.800	5	19	95	270,0	EP 3
1140	400	97	80	55	68.400	5	23	115	299,0	EP 3
1580	400	97	80	55	94.900	5	29	145	414,0	EP 3
2020	400	97	80	55	121.200	5	37	185	529,0	EP 5
1030	500	97	70	55	77.250	7	19	133	337,0	EP 3
1140	500	97	70	55	85.500	7	23	161	373,0	EP 3
1580	500	97	70	55	118.500	7	29	203	517,0	EP 5
2020	500	97	70	55	151.500	7	37	259	661,0	EP 5

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
EP 2	SAV 876.12-S-O-360/30/400	SAV 876.02-SE3
EP 3	SAV 876.12-S-O-360/60/400	SAV 876.02-SE3
EP 5	SAV 876.12-S-O-360/60x2/400	SAV 876.02-SE3
EP 6	SAV 876.12-S-O-360/60x3/400	SAV 876.02-SE3

For built-in or combination control unit see page 88.

Ordering example:

Electro-Permanent Magnetic Chuck SAV 243.77 - 1580 x 500 - 55 - 360 V - M
Ordering key SAV - No. - A x B - Pole pitch - Chuck voltage - Option

Ordering example Steuerung:

Electronic polarity-reversing control unit SAV 876.12 - S-O-360/60x3/400
Hand-held control unit SAV 876.02 - SE3
Ordering key SAV - No.

ELECTRO-PERMANENT MAGNETIC CHUCK



SAV 243.77

with continuous transverse pole pitch for milling

SAV 243.77 - 85

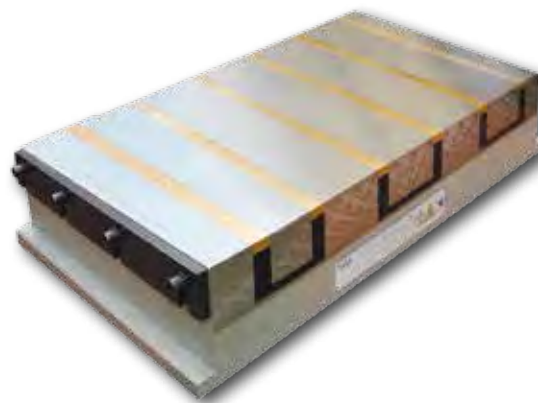
Large transverse pole arrangement

Use:

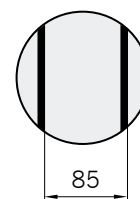
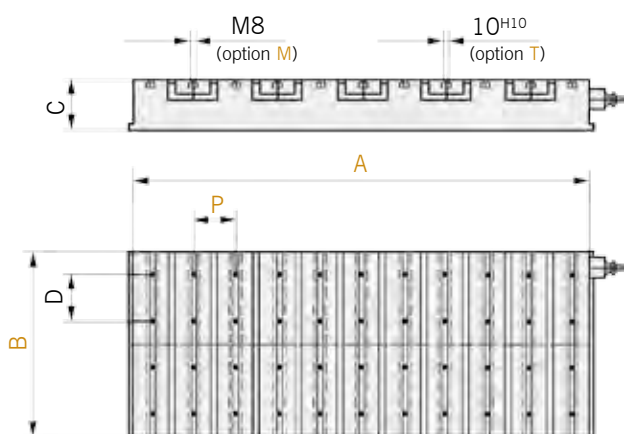
For heavy milling of large and thick workpieces.

For large air gaps.

- min. thickness of workpiece: 35 mm
- min. size of workpiece: 150 x 150 mm²
- nominal holding force: 170 N/cm²



3



Dimensions in mm					Nom. holding force fully loaded in daN	Optional number of threads per pole M	Number of poles M	Number of threads total M	Weight in kg	Type of control
A	B	C ⁰ ₁	D	P						
580	300	110	90	85	29.500	3	7	21	129,0	EP 2
750	300	110	90	85	38.250	3	9	27	167,0	EP 2
750	400	100	90	85	51.000	4	9	36	203,0	EP 3
1090	400	100	90	85	74.120	4	13	52	294,0	EP 3
1430	400	100	90	85	97.240	4	17	68	386,0	EP 3
1600	400	100	90	85	108.800	4	19	76	432,0	EP 3
750	500	110	90	85	63.750	5	9	45	278,0	EP 3
1090	500	110	90	85	92.650	5	13	65	405,0	EP 3
1430	500	110	90	85	121.550	5	17	85	531,0	EP 3
1600	500	110	90	85	136.000	5	19	95	594,0	EP 5
1090	600	110	90	85	111.180	6	13	78	486,0	EP 3
1430	600	110	90	85	145.860	6	17	102	637,0	EP 5
1600	600	110	90	85	163.200	6	19	114	713,0	EP 5

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
EP 2	SAV 876.12-S-O-360/30/400	SAV 876.02-SE3
EP 3	SAV 876.12-S-O-360/60/400	SAV 876.02-SE3
EP 5	SAV 876.12-S-O-360/60x2/400	SAV 876.02-SE3
EP 6	SAV 876.12-S-O-360/60x3/400	SAV 876.02-SE3

For built-in or combination control unit see page 88.

Ordering example:

Electro-Permanent Magnetic Chuck

Ordering key

SAV 243.77 - 1600 x 600 - 85 - 360 V - T

SAV - No. - A x B - Pole pitch - Chuck voltage - Option

Ordering example Steuerung:

Electronic polarity-reversing control unit SAV 876.12 - S-O-360/60x3/400

Hand-held control unit

SAV 876.02 - SE3

Ordering key

SAV - No.

SAV POLE BEAM TECHNOLOGY / TOP-TOOLING

for parallel poles

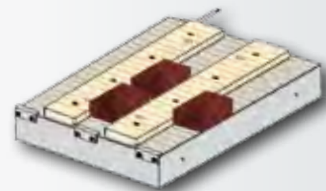
► Mechanical or hydraulic stops



- Movable for 5-face machining
- Automatable
- With positional monitoring
- For mechanical part positioning

► Adapter top plates

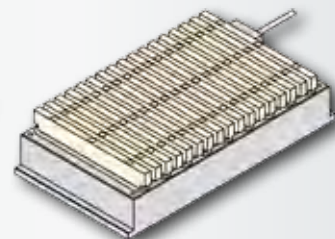
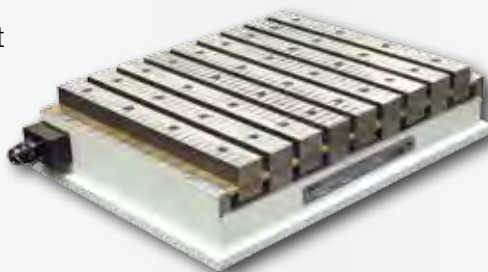
Electro permanent magnet
With profiled special adapter top plate



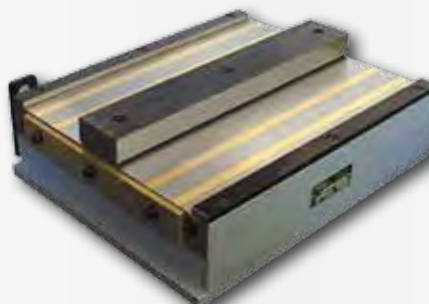
- Recesses to drill through-holes in the workpiece are possible
- Wear protection
- Easy cleaning of chips through automation
- No magnetic short-circuit through chips
- Positioning of parts and heavy machining through mechanical/magnetic stops

► Pole beams

Electro permanent magnet
With pole beams



Electro permanent magnet
With magnetically active stop rails for small parts



- 5-face machining possible
- Recesses to drill through-holes in the workpiece are possible
- Construction with magnetically active stop
- Wear protection
- Simple and low-cost
- Easy to clean
- Short set-up times

POLE EXTENSIONS – CUBIC



SAV 248.70

for adjustment to the geometry of the workpiece

Use:

As a raised support for workpieces on a magnetic chuck. Only useable on magnetic chucks SAV 243.77-55 and SAV 243.77-85.

Features:

Made of cold-drawn steel, the pole raisers can be machined to any shape. The table shows an extract from our standard range.

Can be supplied with specific machined dimensions, prepared for customer's workpiece dimension.

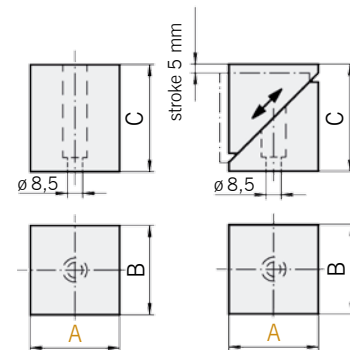
Custom designs available on request.

Type	Dimensions in mm			Execution	Weight in kg
	A	B	C		
PVS 3	48	40	53,5	Rigid	0,8
PVF 3	48	40	56,0	Flexible	0,8

Type	Dimensions in mm			Execution	Weight in kg
	A	B	C		
PVS 4	70	70	86,5	Rigid	3,3
PVF 4	70	70	89,0	Flexible	3,5

Ordering example:

Pole Raisers SAV 248.70 - 70 - PVS 3
Ordering key SAV - No. - A - Type



Type PVS 3 and PVS 4:
Rigid, for fixed support.

Type PVF 3 and PVF 4:
Mechanically flexible, for light components.

3

POLE EXTENSIONS – ROUND



SAV 248.70

for adjustment to the geometry of the workpiece

Use:

As a raised support for workpieces on a magnetic chuck. Only for use with magnetic chucks SAV 220.79 and SAV 243.79.

Features:

Made of cold-drawn steel, the pole extensions can be machined to any shape. The table shows an extract from our standard range.

Can be supplied with specific machined dimensions, prepared for customer's workpiece dimensions.

Custom designs available on request.

Typ	Dimensions in mm		Execution	Weight in kg
	A	B		
PVS-RV	55	75	Rigid, full	1.8
PVS-RH	55	75	Rigid, half	1.4
PVF-RV	60	70 - 80	Flexible, full	1.5

Ordering example:

Pole Raisers SAV 248.70 - 60 - PVF - RV
Ordering key SAV - No. - A - Type



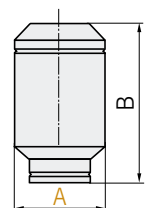
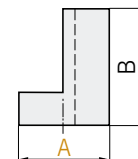
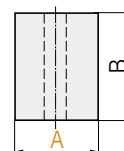
Pole raiser full



Pole raiser half



Pole raiser movable



ELECTRO PERMANENT MAGNETIC CHUCK

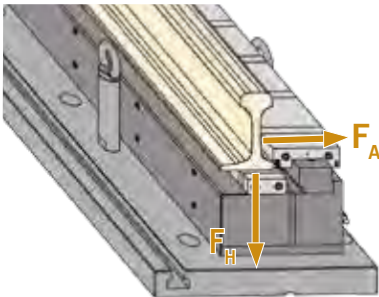


SAV 243.77-RAIL

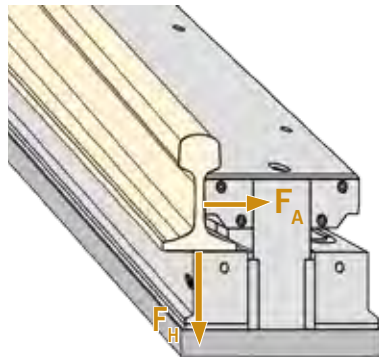
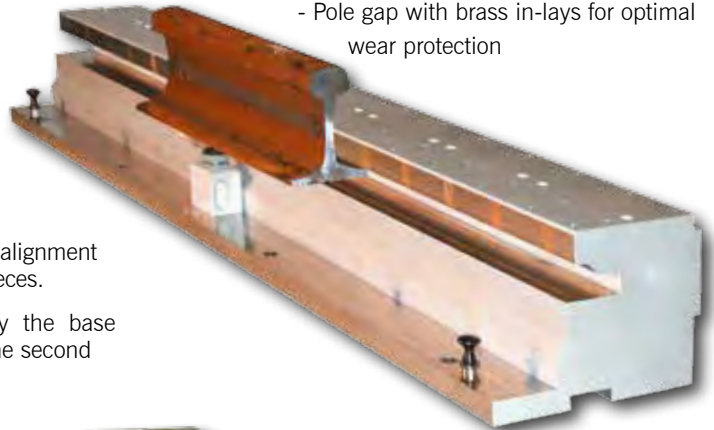
Clamping at the web and foot, single-side – for rail and switch machining

Applications:

For heavy chip removal of gauge line, feet and fishplate area of rail.
In the first stage the double acting magnetic system aligns in the transverse direction (F_A). After this the main magnet in the base is activated (F_H).

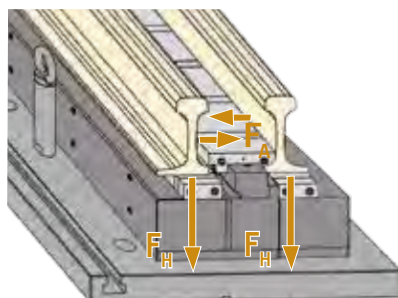


- F_A for transverse alignment of the workpieces.
- F_H produced by the base magnet in the second stage.



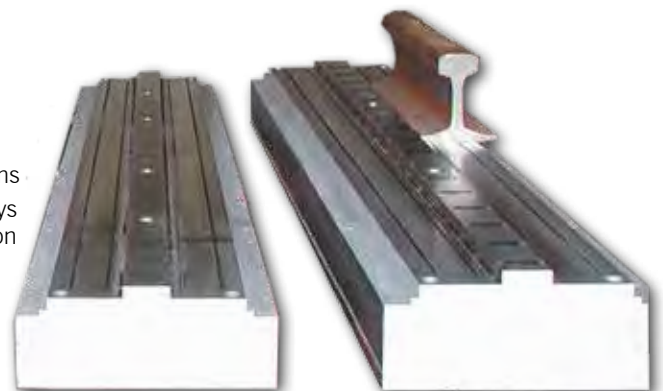
Features:

- For milling of the gauge line and feet
- In 2-row execution



Features:

- Compact design, suitable for tongue rails and standard rail cross-sections
- Pole gap with brass in-lays for optimal wear protection



Nominal operating voltage:

360 V DC

Nominal holding force:

195 N/cm² on inductive steel surfaces

ELECTRO-PERMANENT MAGNETIC CHUCK



SAV 243.79

With hexagonal poles for milling

Features:

- Optimised high energy magnet system
- Low build height
- Electro permanent system for absolute safety in the case of a power cut
- Optionally with Grid tapped-hole pattern for optional pole shoes
- Protection rating IP65
- 8 mm pole plate wear limit

Use:

- For milling operations, especially for universal machining with high level of chip removal
- HSC-milling
- Also for large air gaps
- Minimum workpiece thickness 15 mm
- Minimum workpiece size 100 x 100 mm

Technische Angaben:

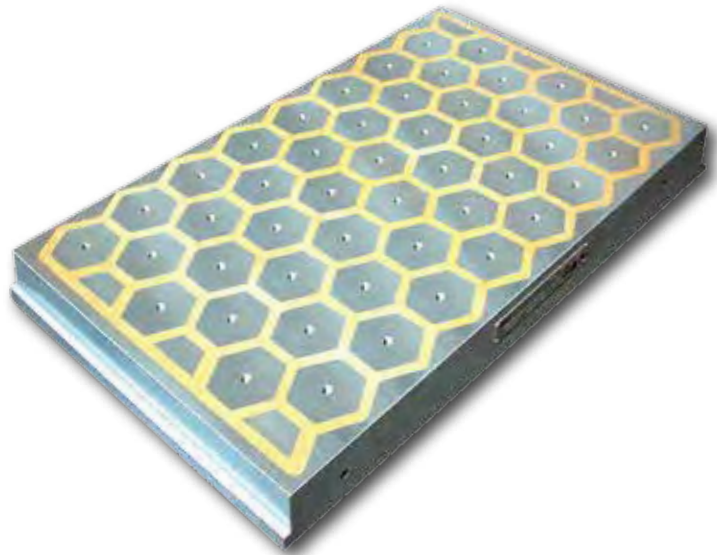
Nominal holding force:

- On the workpiece 150 N/cm²
- Per pole pair 900 daN

Chuck voltage:

- 360 V DC Magnet voltage
- 400 V AC Power supply

Due to the magnetic clamping and the free access from the sides, by using pole shoes it is possible to machine the workpiece on 5-sides. See also SAV 248.70; P. 73 bottom.



Industrial plug with quick-lock action

optional at a surcharge

Easy to use plug connection

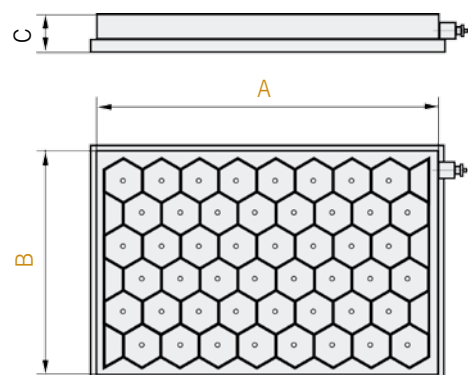


Dimensions in mm			No. of poles	Weight in kg	Type of control
A	B	C			
360	250	74	12	49	EP 1
360	350	74	20	68	EP 1
500	350	74	30	96	EP 2
630	450	74	48	155	EP 2
770	500	74	70	211	EP 3
920	500	74	84	252	EP 3

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
EP 2	SAV 876.12-S-O-360/30/400	SAV 876.02-SE3
EP 3	SAV 876.12-S-O-360/60/400	SAV 876.02-SE3
EP 5	SAV 876.12-S-O-360/60x2/400	SAV 876.02-SE3

For built-in or combination control unit see page 88.



Ordering example:

Electro Permanent Magnetic Chuck

Ordering key

SAV 243.79 - 770 x 500 - 70 - 360

SAV - No. - A x B - No. of poles - Nominal voltage

Ordering example control unit:

Electronic polarity-reversing control unit

Hand-held control unit

Ordering key

SAV 876.12 - S-O-360/60x2/400

SAV 876.02 - SE3

SAV - No.

ELECTRO PERMANENT MAGNETIC PALLET CHUCK



SAV 220.79

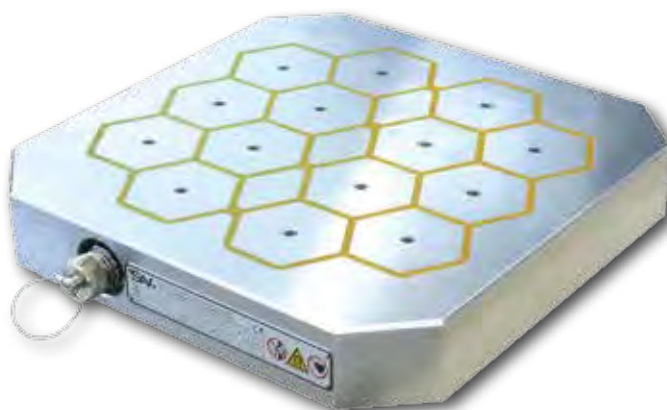
with hexagonal pole pitch

Use:

- For milling operations, especially for universal machining with high level of chip removal
- HSC-milling
- Also for large air gaps
- Minimum workpiece thickness 15 mm
- Minimum workpiece size 100 x 100 mm

Features:

- Optimised high energy magnet system
- Low build height
- Also bridges large air gaps
- Electro permanent system for absolute safety in the case of a power cut
- With grid tapped-hole pattern for optional pole shoes. See also SAV 248.70; P. 73 bottom.
- Electrical connection supplied with industrial plug



Technische Angaben:

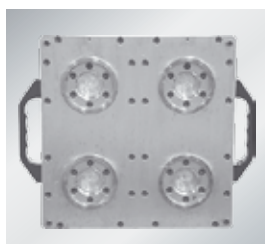
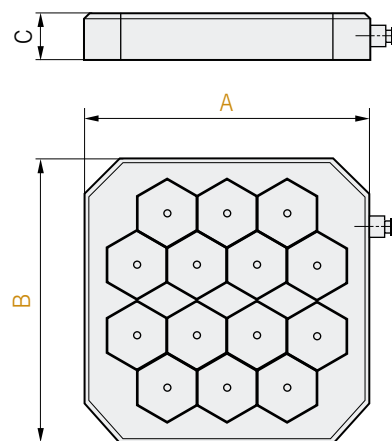
- Nominal holding force Per pole pair 800 daN
- Nominal holding force on the workpiece 140 N/cm²
- Pole plate wear limit: 6 mm
- Parallelism in the executions:
Standard (S): 0.03 fine milled
Precision (P): 0.01 ground

Chuck voltage empfohlen:

- 210 V DC Magnet voltage
- 230 V AC Power supply

Dimensions in mm			No. of poles	Weight in kg	Type of control
A	B	C *			
160	100	64	2	6,4	EP 1
240	240	64	6	29	EP 1
240	240	64	6	23	EP 1
320 ⁻¹ _{-1,3}	320 ⁻¹ _{-1,3}	64	10	52	EP 1
400	400	64	20	84	EP 2
500	500	64	24	124	EP 3

* without reference system



Adaptation examples Zero point system

Ordering example:

Electro Permanent Magnetic Pallet SAV 220.79 - 400 x 400 - 20 - 210 V - Clamping system - Adaption - P
Ordering key SAV - No. - A x B - No. of poles - Nominal voltage - Clamping system - Adaption - Accuracy

PERMANENT MAGNET TOMBSTONES, ANGLE PLATES



SAV 242.92

Tombstones, precision milled

Use:

For horizontal milling and drilling operations

Features:

Tombstones made from St52-3, precision milled.

With electro permanent magnetic chucks

SAV 243.77.

Electrical connection with industrial plug

Mounting holes available upon agreement.

Rectangularity: 0.03/1000 mm

Parallelism: 0.04/1000 mm

Nominal holding force: 150 N/cm²

Magnet field height: 12 mm

Pole plate wear limit: 5 mm

Technical data on magnets - see SAV 243.77

Chuck voltage:

- 360V DC Magnet voltage

- 400V AC Power supply

Auxiliary equipment:

- Tombstone with industrial connector plug

- For use with control unit SAV 876.12

- Control unit not included in delivery.



3

Angle plate SAV 242.92-2 with 2 magnets Type SAV 243.77

Dimensions in mm						Pole pitch	Weight in kg
A	B	C	D	E	F		
630	400	660	500	150	700	27.5	859
590	400	620	400	150	660	55	812
580	400	620	400	150	660	85	728

Other executions and dimensions on request.

Angle plate SAV 242.92-4 with 4 magnets Type SAV 243.77

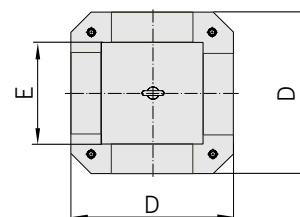
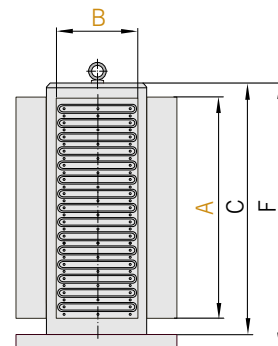
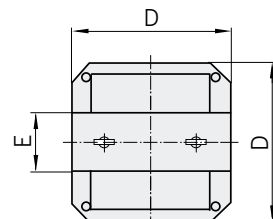
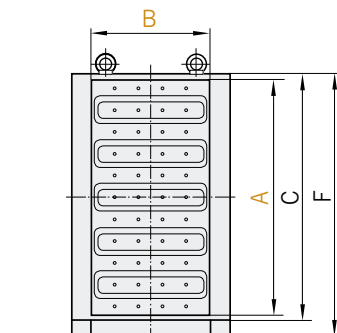
Dimensions in mm						Pole pitch	Weight in kg
A	B	C	D	E	F		
400	200	415	320	200	455	27.5	287
520	200	620	400	256	660	27.5	437
630	300	660	500	356	700	27.5	776
590	300	660	500	356	700	55	812
810	400	815	630	454	860	55	1408
580	300	660	500	356	700	85	864
750	400	660	500	454	700	85	1372

Ordering example:

Electro Permanent Magnetic Tombstone SAV 242.92-4 - 810 x 400 - 55 - 360V

Ordering key

SAV - No. - A x B - Pole pitch - Magnet voltage



ELECTRO-PERMANENT MAGNETIC CIRCULAR CHUCK

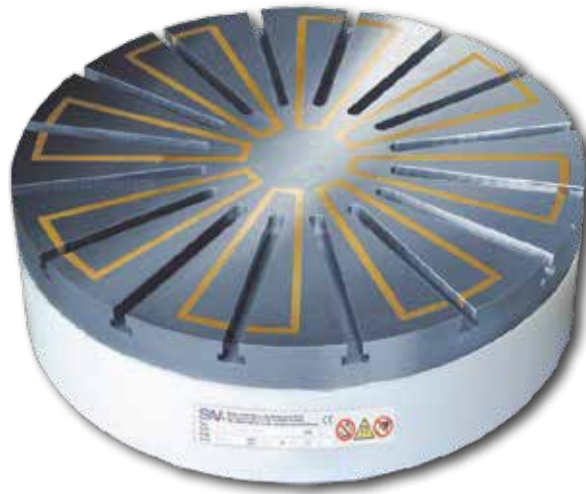


SAV 244.70

With radial pole arrangement

These circular electro magnets are not able for their very strong, evenly distributed holding force.

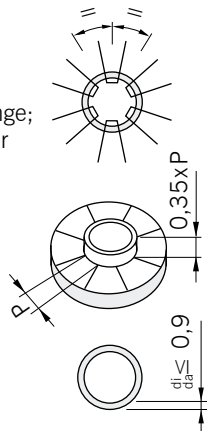
The magnetic force is produced by permanent magnets which are magnetized and demagnetized by short electric current pulses.



Use:

Mainly for precision grinding of small to large workpieces on rotary tables and circular grinders.

- for circular grinding and turning
- equal pole pitch within circle range; therefore very suitable for circular workpieces
- the minimum workpiece height; 35% of the pole pitch at the given circle segment
- also for thin rings



Nominal holding force:

120 N/cm²,
adjustable by control unit

Nominal operating voltage:

210 V DC up to 250 mm diameter
360 V DC above to 250 mm diameter

Features:

- solid designed pole plate
- switching off through demagnetizing cycle

- electro-permanent magnetic system, guaranteeing safe operation during power failure
- high precision due to fine grid pole-plate-to-body connection
- pole separation with brass in-lays for optimal wear behaviour
- pole plate exchangeable
- radial pole arrangement, especially suitable for the use of pole raisers. This is absolutely essential for the runout of the tool or the grinding wheel at three side operation. Therefore available with T-slots (T) according DIN 650-10H10 on request.
- pole plate wearing limit 8mm
- sealed to IP 65
- suitable for use with control unit type 876.10
- available with adapter flange on request (SAV 248.90 to 248.94, see chapter 01)

Scope of supply:

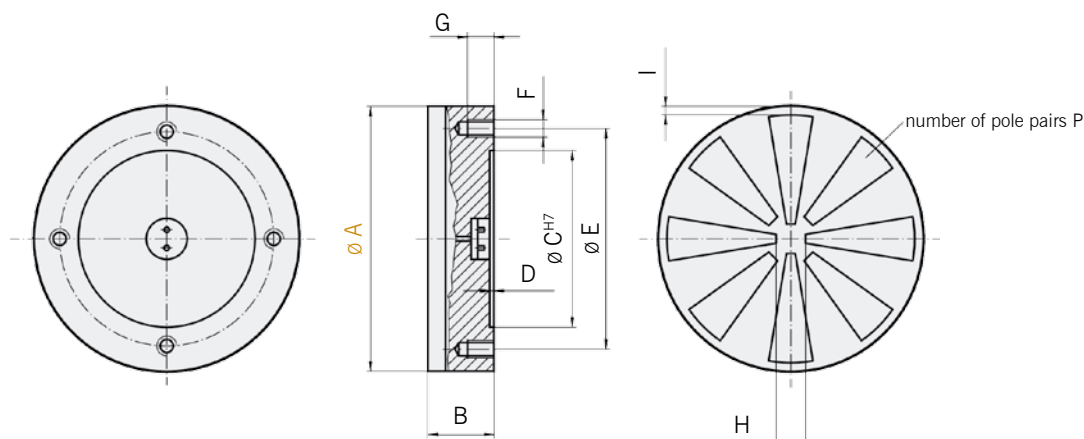
- Lifting bolts for transportation on larger models.
- Standard execution without T-slots and pole shoes.
- Terminals for electrical connection in middle of rear side in standard execution.
- Optionally with integrated flat, slip ring body for diameters of 1000 mm and greater.
- With industrial watertight plug-in type connector on request
- Controller and hand-held control unit not included in delivery.

ELECTRO-PERMANENT MAGNETIC CIRCULAR CHUCK



SAV 244.70

With radial pole arrangement



Dimensions in mm										Weight in kg	Chuck voltage in Vdc	Type of control
A	B ^{0*}	C	D	E	F	G	H	I	P			
100	90	60	3	80	M8 (3x)	12	35	10	3	4,0	210	EP 1
150	90	90	3	120	M10 (3x)	14	35	10	3	9,0	210	EP 1
200	90	110	3	140	M10 (4x)	14	45	10	4	18,0	210	EP 1
250	90	140	3	170	M12 (4x)	16	45	10	4	29,0	210	EP 1
300	90	160	3	190	M12 (4x)	16	60	10	6	42,0	210 / 360	EP 1
400	90	210	4	250	M12 (6x)	16	70	15	6	76,0	210 / 360	EP 1
500	90	280	4	320	M12 (6x)	16	100	15	8	120,0	360	EP 2
600	100	350	4	390	M16 (6x)	18	100	15	8	195,0	360	EP 2
700	100	400	4	450	M16 (6x)	18	120	15	8	265,0	360	EP 2
800	100	450	4	500	M16 (6x)	18	150	18	12	365,0	360	EP 2
1000	100	550	4	620	M16 (8x)	18	200	18	12	550,0	360	EP 3
1200	110	Rear detail as required					300	25	18	990,0	360	EP 4
1400	110	Rear detail as required					300	25	18	1350,0	360	EP 4
1500	120	Rear detail as required					300	25	18	1550,0	360	EP 4
1600	120	Rear detail as required					300	25	18	1760,0	360	EP 4

* For execution with T-slots, the height increases with 10 mm.

Bigger sizes up to A = 5,5 m available on request.

The assignment of the correct control unit depends upon the power consumption, SAV 876.12.

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
EP 1	SAV 876.12-S-O-210/30/230	SAV 876.02-SE3
EP 2	SAV 876.12-S-O-360/30/400	SAV 876.02-SE3
EP 3	SAV 876.12-S-O-360/60/400	SAV 876.02-SE3
EP 5	SAV 876.12-S-O-360/60x2/400	SAV 876.02-SE3

For built-in or combination control unit see page 88.

Ordering example:

Electro-Permanent Magnetic Circular Chuck SAV 244.70 - 1600 - T - 360 V
Ordering key SAV - No. - A - Execution - Chuck voltage

Ordering example control unit:

Electronic polarity-reversing control unit SAV 876.12 - S-O-360/60x2/400
Hand-held control unit SAV 876.02 - SE3
Ordering key SAV - No.

ELECTRO-PERMANENT MAGNETIC CIRCULAR CHUCK



SAV 244.71

Enhanced magnetic system with radial pole arrangement and exceptional holding force

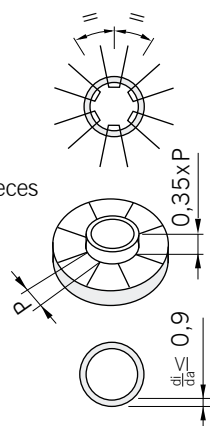
This new design of circular magnet, using high-energy magnetic materials, provides extremely high holding forces. Magnetization and demagnetization through a short electric direct current pulse. The homogeneous nature and precision of this circular magnet makes it suitable for turning hardened steels as well as general heavy cutting.



Use:

Turning of hardened steel and heavy cutting of small to large workpieces. Also for highest precision grinding.

- for turning and hard turning
- equal pole pitch within circle range; therefore very suitable for circular and ring-shaped workpieces
- the minimum workpiece height is 35% of the pole pitch at the given circle segment
- also for thin rings



Nominal holding force:

170 N/cm²,
adjustable by control unit with encoded switch.

Nominal operating voltage:

360 V

Features:

- evenly distributed strong magnetic field
- solid constructed pole plate
- switching off through demagnetizing cycle

- electro-permanent magnetic system, guaranteeing safe operation during power failure
- high precision due to fine grid pole-plate-to-body connection
- pole separation with brass in-lays for optimal wear behaviour
- pole plate exchangeable
- radial pole arrangement, especially suitable for the use of pole raisers. This is absolutely essential for the runout of the tool or the grinding wheel at three side operation. Therefore available with T-slots (T) according DIN 650-10H10 on request.
- pole plate wearing limit 8mm
- sealed to IP 65
- suitable for use with control unit type 876.10
- available with adapter flange on request (SAV 248.90 to 248.94, see chapter 01)

Scope of supply:

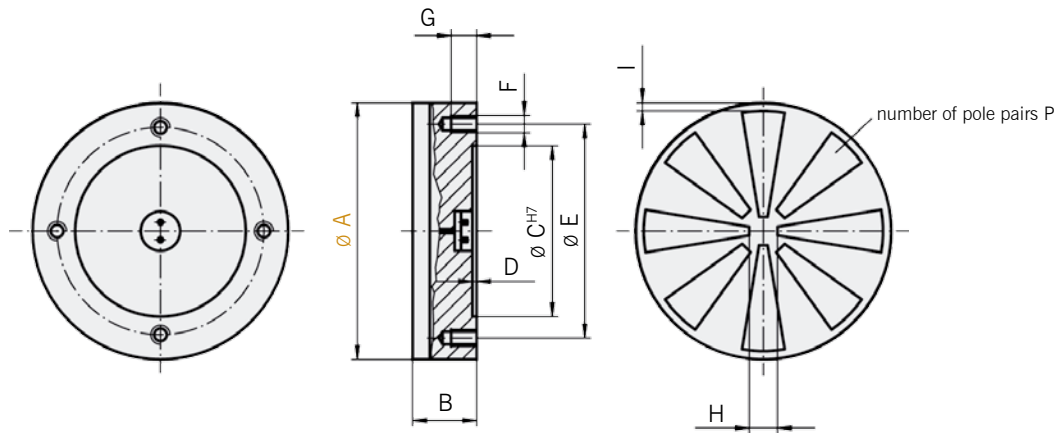
- Lifting bolts for transportation on larger models.
- T-slots and pole extensions not included as standard.
- Terminals for electrical connection in middle of back side in standard execution.
- Optional with integrated slip ring body for the bigger diameters.
- With industrial watertight plug-in type connector on request.

ELECTRO-PERMANENT MAGNETIC CIRCULAR CHUCK



SAV 244.71

Enhanced magnetic system with radial pole arrangement and exceptional holding force



Dimensions in mm										Weight in kg	Chuck voltage in V	Type of control
A	B ^{0*}	C	D	E	F	G	H	I	P			
200	100	110	3	140	M10 (4x)	14	45	10	4	24,0	360	EP 1
250	100	140	3	170	M12 (4x)	16	45	10	4	39,0	360	EP 1
300	100	160	3	190	M12 (4x)	16	60	10	6	54,0	360	EP 1
400	100	210	4	250	M12 (6x)	16	70	15	6	85,0	360	EP 1
500	110	280	4	320	M12 (6x)	16	100	15	8	150,0	360	EP 1
600	110	350	4	390	M16 (6x)	18	100	15	8	210,0	360	EP 1
700	110	400	4	450	M16 (6x)	18	120	15	8	280,0	360	EP 1
800	110	450	4	500	M16 (6x)	18	150	18	12	380,0	360	EP 1
1000	125	550	4	620	M16 (8x)	18	200	18	12	680,0	360	EP 2
1200	125	Rear detail as required					300	25	18	975,0	360	EP 3
1400	135	Rear detail as required					300	25	18	1600,0	360	EP 3
1500	135	Rear detail as required					300	25	18	1850,0	360	EP 3
1600	135	Rear detail as required					300	25	18	2105,0	360	EP 3

Bigger sizes up to A = 5,5 m available on request. Please refer to SAV 876.10, for details regarding suitable control units, based on the power rating.

* For execution with T-slots, the height increases with 10 mm.

Industrial plug with quick-lock action

optional at a surcharge

Easy to use plug connection



Recommended controller and control unit:

Typ	Control unit	Hand-held control unit
EP 2	SAV 876.12-S-O-360/30/400	SAV 876.02-SE3
EP 3	SAV 876.12-S-O-360/60/400	SAV 876.02-SE3
EP 5	SAV 876.12-S-O-360/60x2/400	SAV 876.02-SE3

For built-in or combination control unit see page 88.

Ordering example:

Electro permanent magnetic circular chuck SAV 244.71 - 1600 - T - 360 V
Ordering key SAV - No. - A - Execution - Nom. voltage

Ordering example control unit:

Electronic polarity-reversing control unit SAV 876.12 - S-O-360/60x2/400
Hand-held control unit SAV 876.02 - SE3
Ordering key SAV - No.

SAV TOP-TOOLING – CIRCULAR MAGNETS

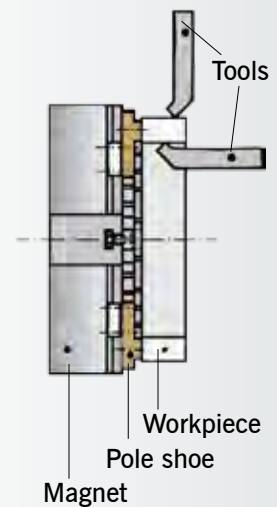
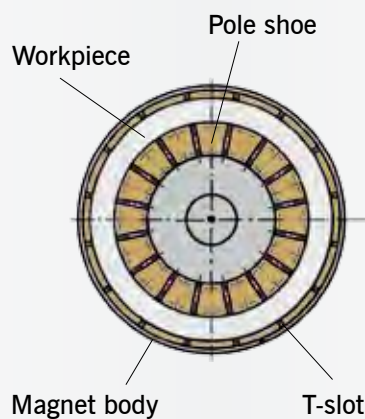
► POLE EXTENSIONS

Use:

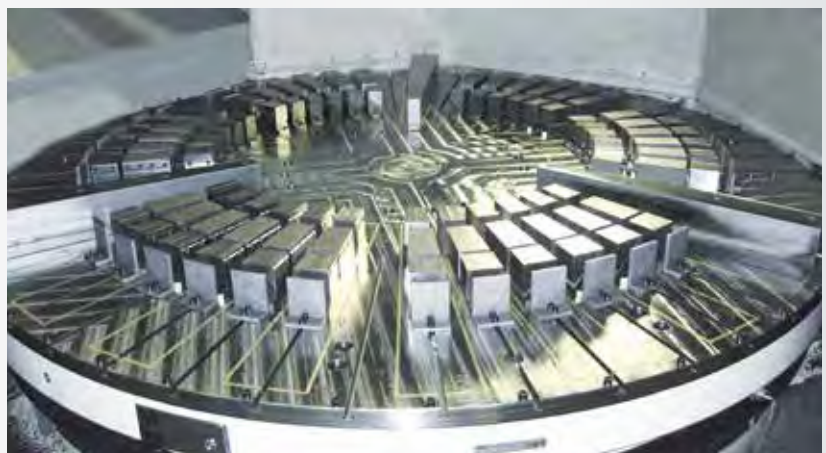
Hard turning of thin, rolling bearing rings on 3 sides with fixed and movable pole shoes.

Features:

- Pole extensions in segment design allow the free-running of the tool to enable thin rings to be machined on 3-faces.
- A larger diameter range can be covered due to the radial adjustability.
- Machined recesses for non-planar workpieces or for through holes are possible.
- Depending on the workpiece rigidity, flexible pole shoes available for uneven contact surfaces.
- The pole shoes for circular magnets must be individually adapted.
- We dimension and produce pole shoes for special applications on request.



Fixed pole shoes with positioning flange



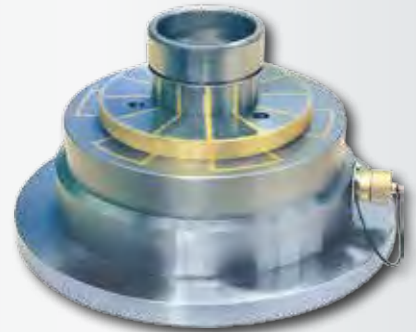
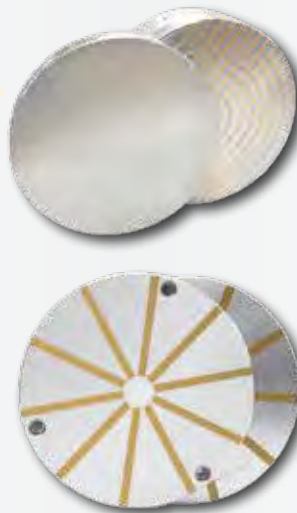
Spring-loaded, movable pole shoe for initial tensioning



SAV TOP-TOOLING – CIRCULAR MAGNETS

► ADAPTER TOP PLATES

- No loss of workpiece contact area
- Good holding forces even with small diameters
- Easy to exchange
- Good chip removal, easy to clean
- Preliminary set-up of pole shoes away from the machinery
- Exchange of pole plates can be automated
- Also with T-slots for pole extensions



3

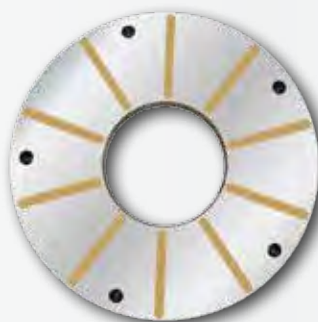
► POLE BEAMS

- As wear protection of the magnet pole plate
- Easy to clean
- With T-slots on request
- Toothing to aid the positioning of heavy rings possible



► ADAPTER POLE RINGS

- Up to diameter 650 mm
- No loss of workpiece contact area
- Good holding forces even with small diameters
- Easy to exchange
- Low cost



ELECTRO-PERMANENT MAGNETIC CIRCULAR CHUCK



SAV 244.72

With concentric pole arrangement

These circular magnets with concentric magnetic poles permit the clamping of several workpieces outside the central region. The strong magnetic field is distributed evenly over the entire surface.



Use:

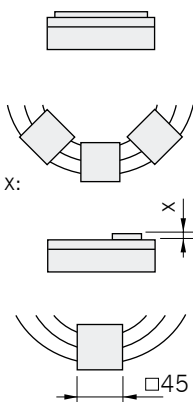
Mainly for precision grinding of small to large workpieces on rotary tables and cylindrical grinders. Because of the concentric pole arrangement it is also suitable for holding groups of randomly placed mass-production pieces.

- uniform holding force distribution due to concentric pole arrangement; therefore suitable for thin and flat workpieces (e.g. saw blades)

- multiple workpiece operation on segments possible

- for workpieces with min. thickness x:
2 mm at P = 4,5 mm
4 mm at P = 9,0 mm
8 mm at P = 18 mm

- for flat workpieces with min. dimensions
45 mm x 45 mm



Nominal holding force:

100 N/cm²,
adjustable by control unit with encoded switch

Nominal operating voltage:

210 V DC up to 500 mm diameter
360 V DC above to 500 mm diameter

Features:

- gap free construction of pole plate
- evenly distributed, strong magnetic field
- solid constructed pole plate
- switching off through demagnetizing cycle
- electro-permanent system, guaranteeing safe operation during power failure
- high precision due to fine grid pole-plate-to-body connection
- pole separation with brass in-lays for optimal wear behaviour
- pole plate exchangeable
- pole plate wearing limit 8 mm
- sealed to IP 65
- suitable for use with control unit type 876.10
- available with adapter flange on request (SAV 248.90 to 248.94, see chapter 01)

Scope of supply:

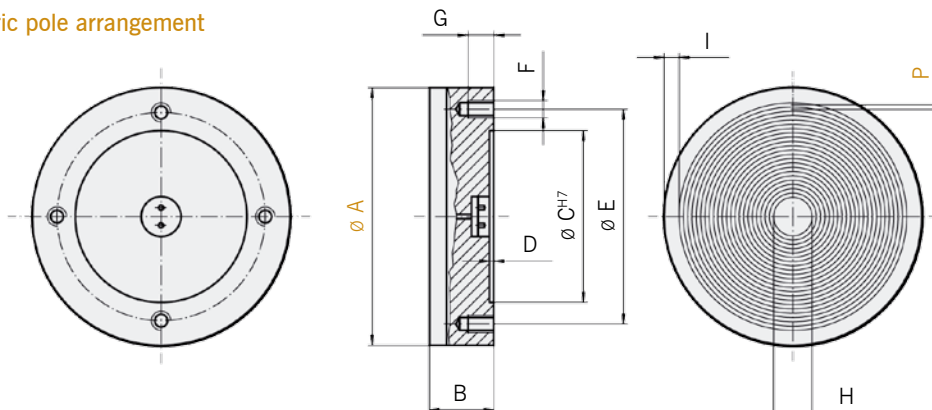
- Lifting bolts for transportation on larger models.
- Terminals for electrical connection in middle of backside in standard execution.
- Optional with integrated slip ring body for the bigger diameters.

ELECTRO-PERMANENT MAGNETIC CIRCULAR CHUCK



SAV 244.72

With concentric pole arrangement



Dimensions in mm										Weight in kg	Chuck voltage in V	Type of control
A	B	C	D	E	F	G	H	I	P			
300	105	160	3	190	M12 (4x)	16	76	16	5,5	52.0	210	EP 1
400	105	210	4	250	M12 (6x)	16	90	21	9	89.0	210	EP 1
500	105	280	4	320	M12 (6x)	16	96	21	9	141.0	210	EP 1
600	105	350	4	390	M12 (6x)	18	80	21	9	204.0	360	EP 2
700	105	400	4	450	M12 (6x)	18	96	21	9	278.0	360	EP 2
800	105	450	4	500	M16 (6x)	18	96	22	9	383.0	360	EP 2
1000	105	550	4	620	M16 (8x)	18	96	22	9	578.0	360	EP 3
400	105	210	4	250	M12 (6x)	16	66	21	18	89.0	210	EP 1
500	105	280	4	320	M12 (6x)	16	92	21	18	141.0	210	EP 1
600	105	350	4	390	M12 (6x)	18	70	21	18	204.0	360	EP 2
700	105	400	4	450	M12 (6x)	18	92	21	18	278.0	360	EP 2
800	105	450	4	500	M16 (6x)	18	92	22	18	383.0	360	EP 2
1000	105	550	4	620	M16 (8x)	18	92	22	18	578.0	360	EP 3
1200	110	Rear detail as required				22	80	23	9	990.0	360	EP 4
1400	110	Rear detail as required				22	166	26	9	1350.0	360	EP 4
1500	120	Rear detail as required				22	166	26	9	1550.0	360	EP 4
1600	120	Rear detail as required				22	166	26	9	1765.0	360	EP 4
1200	110	Rear detail as required				22	70	23	18	990.0	360	EP 4
1400	110	Rear detail as required				22	166	26	18	1350.0	360	EP 4
1500	120	Rear detail as required				22	166	26	18	1550.0	360	EP 4
1600	120	Rear detail as required				22	166	26	18	1765.0	360	EP 4

Larger sizes on request. Please refer to SAV 876.12, for details regarding suitable control units, based on the power rating.

Recommended controller and control unit:

Typ	Control unit	Hand-held control unit
EP 1	SAV 876.12-S-O-210/30/230	SAV 876.02-SE3
EP 2	SAV 876.12-S-O-360/30/400	SAV 876.02-SE3
EP 3	SAV 876.12-S-O-360/60/400	SAV 876.02-SE3
EP 5	SAV 876.12-S-O-360/60x2/400	SAV 876.02-SE3

For built-in or combination control unit see page 88.

Ordering example:

Electro permanent magnetic circular chuck SAV 244.72 - 1600 x 18 - 360 V
Ordering key SAV - No. - A x Pole pitch - Nom. voltage

Ordering example control unit:

Electronic polarity-reversing control unit SAV 876.12 - S-O-360/60x2/400
Hand-held control unit SAV 876.02 - SE3
Ordering key SAV - No.



ELECTRO-PERMANENT MAGNETIC CIRCULAR CHUCK



SAV 244.73

With parallel pole pitch $P=4$ mm

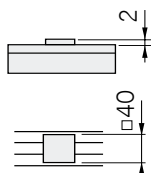
Use:

Grinding of thin plates, wide rings with small thickness and minimum width of 40 mm

- suitable for simultaneous loading with several small parts

- for workpieces with minimum thickness $X = 2$ mm

- for flat workpieces with min. dimensions of $a = 40 \times 40 \text{ mm}^2$

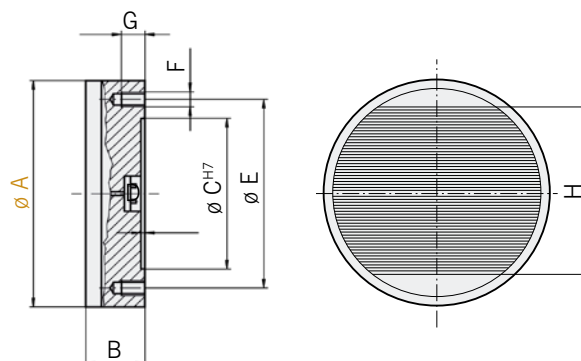


Execution:

- pole plate with very small pole pitch, 3 mm steel and 1 mm brass
- low height
- laminations glued and reinforced with tie bars
- high precision due to fine grid pole plate to body connection
- low magnetic field height
- switching off through demagnetizing cycle
- heat treated tension free body
- threaded mounting holes in backside.

Through holes on request.

- electro-permanent magnetic system for absolute safe operation during power failure
- pole plate surface wearing limit 8 mm
- robust und waterproof
- sealed to IP 65
- for use with control unit type SAV 876.10



Nominal operating voltage:

360 V DC

Nominal holding force:

100 N/cm², adjustable with control unit with encoded switch

Auxiliary equipment:

- Lifting bolts for transportation on larger models.
- Terminals for electrical connection in middle of rear side in standard execution.
- With industrial watertight plug-in type connector on request
- Controller and hand-held control unit not included in delivery.

Dimensions in mm								Weight in kg	Type of control
A	B	C	D	E	F	G	H		
300	100	160	4	190	M12 (4x)	16	213	55	EP 1
400	100	210	4	250	M12 (6x)	16	301	98	EP 1
500	100	280	4	320	M12 (6x)	16	401	153	EP 1
600	100	350	4	390	M12 (6x)	18	481	220	EP 2
700	100	400	4	450	M12 (6x)	18	581	300	EP 2
800	100	450	4	500	M16 (6x)	18	681	392	EP 2

Recommended controller and control unit:

Type	Control unit	Hand-held control unit
EP 2	SAV 876.12-S-O-360/30/400	SAV 876.02-SE3
EP 3	SAV 876.12-S-O-360/60/400	SAV 876.02-SE3

For built-in or combination control unit see page 88.

Ordering example:

Electro permanent magnetic circular chuck
Ordering key

SAV 244.73 - 300 - 360 V
SAV - No. - A - Magnet voltage

Ordering example Steuerung:

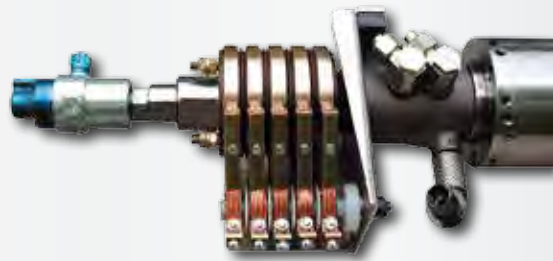
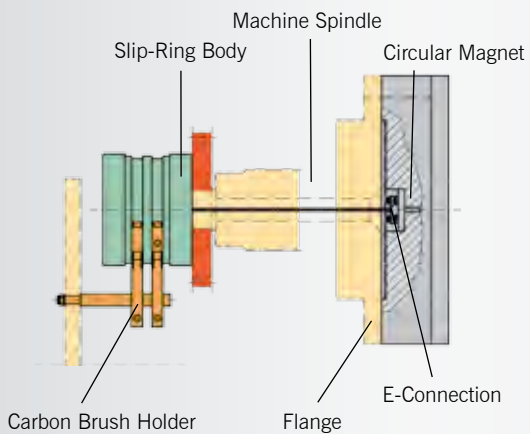
Electronic polarity-reversing control unit
Hand-held control unit
Ordering key

SAV 876.12 - S-O-360/30/400
SAV 876.02 - SE3
SAV - No.

ELECTRO-PERMANENT MAGNETIC CIRCULAR CHUCK

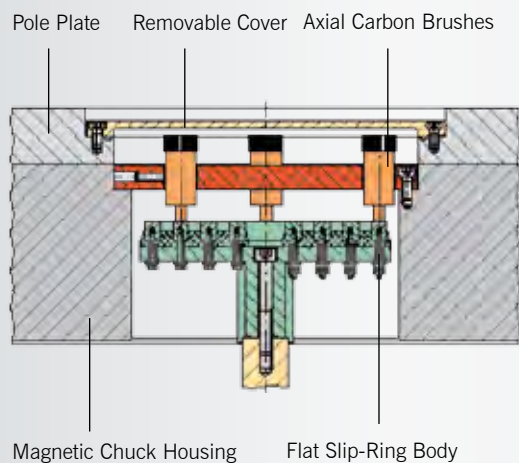
Possible electrical connections

► POWER SUPPLY TO CIRCULAR MAGNETS WITH EXTERNAL SLIP-RING BODY AND CARBON BRUSHES



3

► POWER SUPPLY TO CIRCULAR MAGNETS WITH INTEGRATED FLAT SLIP-RING BODY FOR VERTICAL SPINDLES



ELECTRONIC POLARITY-REVERSING CONTROL UNIT

SAV 876.12

With integrated microcontroller and holding force control

Use:

For electro permanent magnet systems with 210 V or 360 V magnet voltage.
Also suitable for subsequent installation.
Operation via hand held control unit SAV 876.02-SE3,
The operating controls are built-in or PLC signals to the machinery.

Funktion:

- As impulse control for the magnetisation of electro permanent magnetic chucks
- Control of the demagnetisation cycle
- Optimised for all SAV electro permanent magnetic chucks
- Monitoring of the mains voltage, the power components and all cables, including the magnet coil.
Some internal components are provided redundantly.
- Machinery enabling via two channel safety contact.
- Clamping and release via redundant input signals with feedback following magnetisation and demagnetisation.
- Holding force regulation according to inverse BCD-coding, 8- or 16-stage

Features:

- Small and compact
- Easily integrated into any machine
- User-friendly through LCD-plain text display German/English
- Foil keypad allows easy menu selection
- Signal input and outputs indicated via SMD-LED's
- Plug for signal input and outputs
- Magnet connection with potential-free switching
- Safe to operate and reliable
- The switching box version has an isolating switch, terminal block and automatic circuit breaker



Control unit in switching box



Benefits:

- Short-circuit proof
- Fully electronic control and power circuit boards
- Additional potential-free switching relays for magnet connection
- Extended diagnostics
- Earth short circuit test
- Very compact design
- Pre-programmed settings
- Individually programmable
- Short demagnetisation cycle
- High level of demagnetisation quality for single magnet systems
- Automatic mains frequency recognition
- Functional arrangement and user interface

CE-compliant

According to Machinery Directive	2006/42/EG
Low Voltage Directive	2006/95/EG
EMC-Directive	2004/108/EG

ROH- compliant

Industrial plug with quick-lock action

optional at a surcharge

Easy to use plug connection



Optional:

The control unit in the switching box can be supplied with an industrial plug. Socket with cover on the magnet, 5 m cable with plug on the control unit.
The cable assemblies are 8-poled, to fit the control unit sizes maximum 60Ax2.

Ordering key: SAV 876.12-SS9

Optional:

If the control unit and magnet are used for palleting operations, an optional park station prohibits the movement of pallets if the plug is plugged in.

Ordering key: SAV 876.12-PS9

ELECTRONIC POLARITY-REVERSING CONTROL UNIT

SAV 876.12

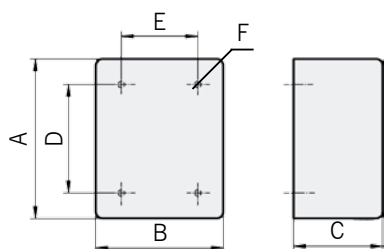
With integrated microcontroller and holding force control

ELECTRICAL DATA						
Order number	Magnet voltage DC in V	Magnet current max. in A	Input voltage AC in V	max. Magnet power DC in kW	Mains side line fuse in A (slow-blow)	Connecting cable cross section in mm
876.12-E-O-210/30/230	210	30	230 / L1 N PE	6.3	16	1.5
876.12-E-O-210/30/400	210	30	400 / L1 L2 PE	6.3	16	1.5
876.12-E-O-360/30/400	360	30	400 / L1 L2 PE	10.8	16	1.5
876.12-E-O-360/30x2/400	360	30x2	400 / L1 L2 PE	10.8x2	16	1.5
876.12-E-O-360/60/400	360	60	400 / L1 L2 PE	21.6	32	2.5
876.12-E-O-360/60x2/400	360	60x2	400 / L1 L2 PE	21.6x2	32	2.5
876.12-E-O-360/60x3/400	360	60x3	400 / L1 L2 PE	21.6x3	32	2.5

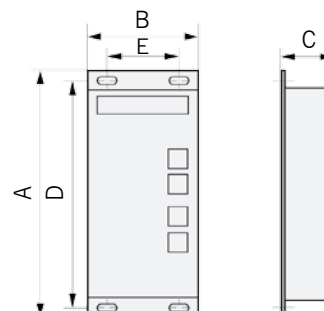
GEOMETR IC DATA										(Dimensions in mm)							
Switching box version (S)									Built-in version (E)								
Order number	Type of Control	A	B	C	D	E	F	Weight in kg	Order number	Type of Control	A	B	C	D	E	F	Weight in kg
876.12-S-O-210/30/230	EP1	600	400	200	558	355	10	15	876.12-E-O-210/30/230	EP1	220	120	95	210	85	5	2.0
876.12-S-O-210/30/400	–	600	400	200	558	355	10	15	876.12-E-O-210/30/400	EP2	220	120	95	210	85	5	2.0
876.12-S-O-360/30/400	EP2	600	400	200	558	355	10	15	876.12-E-O-360/30/400	EP2	220	120	95	210	85	5	2.0
876.12-S-O-360/30x2/400	EP4	600	400	200	558	355	10	16	876.12-E-O-360/30x2/400	EP4	280	120	95	270	85	5	3.5
876.12-S-O-360/60/400	EP3	600	400	200	558	355	10	16	876.12-E-O-360/60/400	EP3	280	120	95	270	85	5	3.5
876.12-S-O-360/60x2/400	EP5	600	400	200	558	355	10	19	876.12-E-O-360/60x2/400	EP5	360	120	95	350	85	5	4.5
876.12-S-O-360/60x3/400	EP6	600	400	200	558	355	10	21	876.12-E-O-360/60x3/400	EP6	440	120	95	430	85	5	5.5

Dimensional diagram for switching box version (S)

Dimensional diagram for built-in version (E)



Dimensional diagram for switching box version (S)



Dimensional diagram for built-in version (E)

To comply with European standards, a mains filter must be installed in the power supply:

Order number	Magnet voltage DC in V	Magnet current max. in A	Input voltage AC in V	ca. Dimensions in mm		
				Length	Width	Height
876.12-EPF-210/30/230	210	30	230 / L1 N PE	250	300	150
876.12-EPF-210/30/400	210	30	400 / L1 L2 PE	250	300	150
876.12-EPF-360/30/400	360	30	400 / L1 L2 PE	250	300	150
876.12-EPF-360/60/400	360	60	400 / L1 L2 PE	250	300	150

Ordering example:

Electronic polarity-reversing control unit SAV 876.12-S-O-360/60x2/400

Ordering key SAV - Np. - Version - Transformer - Magnet voltage - max. Magnet current - Mains voltage

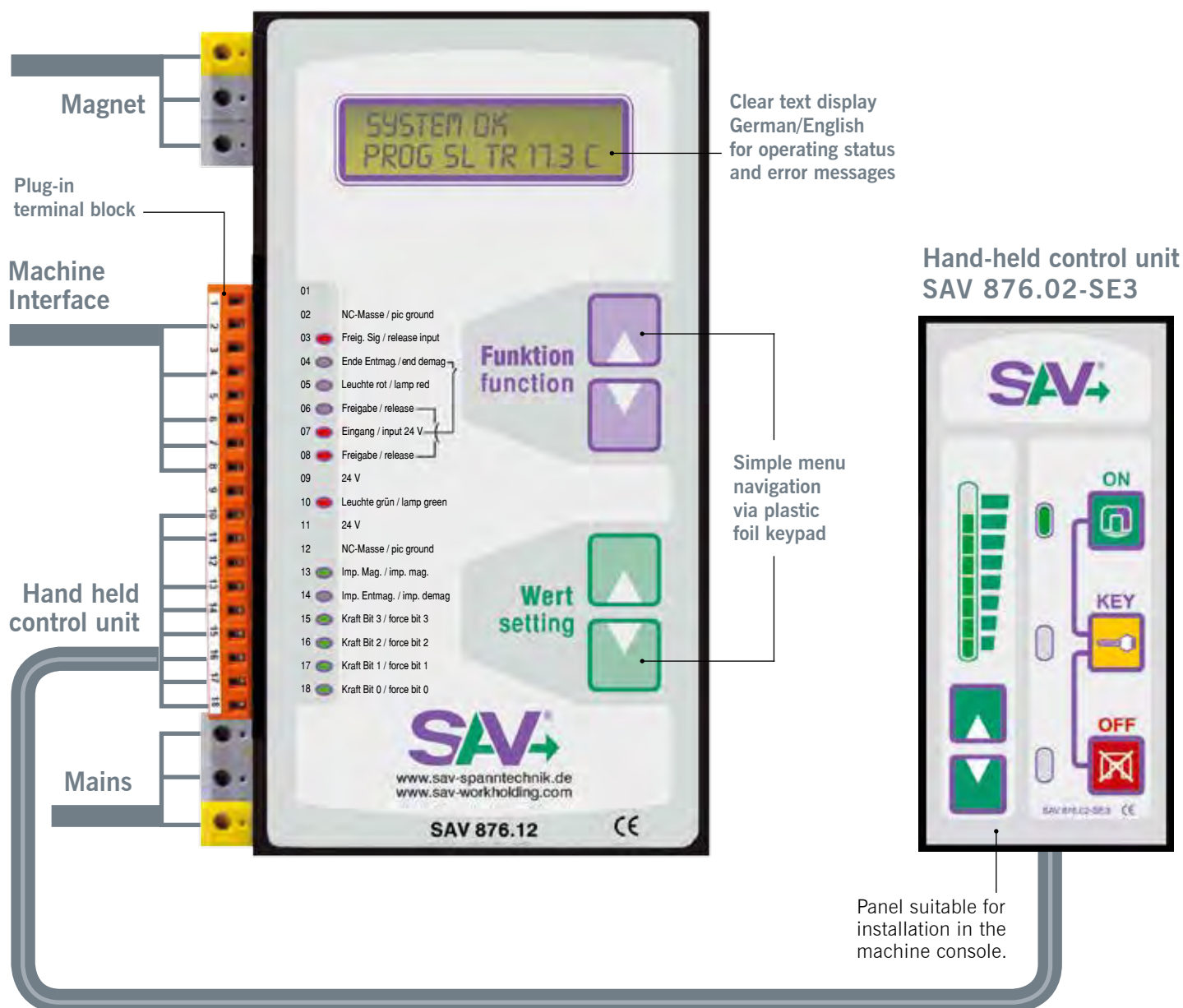
Ordering example:

Mains filter SAV 876.12-EPF-360/60/400

Ordering key SAV - No. - Execution - Magnet voltage - max. Magnet current - Mains voltage

ELECTRONIC POLARITY-REVERSING CONTROL UNIT

With integrated microcontroller and holding force control



CE-compliant

According to Machinery Directive 2006/42/EG
Low Voltage Directive 2006/95/EG
EMC-Directive 2004/108/EG

ROH- compliant

- Short-circuit proof
- Earth short-circuit test

CONTROL UNIT

SAV 876.02

For switching of direct current magnets in connection with polarity reversing unit type SAV 876.10

Application:

For switching of direct current magnets in connection with electronic polarity-reversing control unit SAV 876.10.

The control unit is switched on by pushing the green and yellow keys. The polarity-reversing process is initiated by a red and yellow key.

Possible fault indications as monitored by the polarity-reversing unit are also presented to the red illuminated key by means of a coded blinking signal. Required holding force can set to 8 levels. (16 levels on request).

Execution:

In order to comply with accident prevention regulations for machine tools, the release of the machine feed through auxiliary contacts can only be authorised when magnet is switched on and when the "on" position is indicated by a signal light. This control unit complies with these regulations. The signal lamp is integrated into the foil covered keys of the control unit. The auxiliary contacts (interlock) for the machine feed are integrated in the polarity-reversing control unit. Coding switch SE2-1.

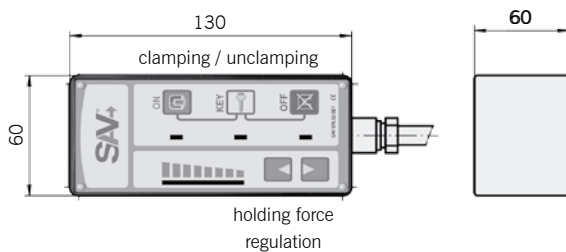
Technical data:

Housing dimensions (LxWxH): 130 x 60 x 60 mm

Operating voltage: 24 V

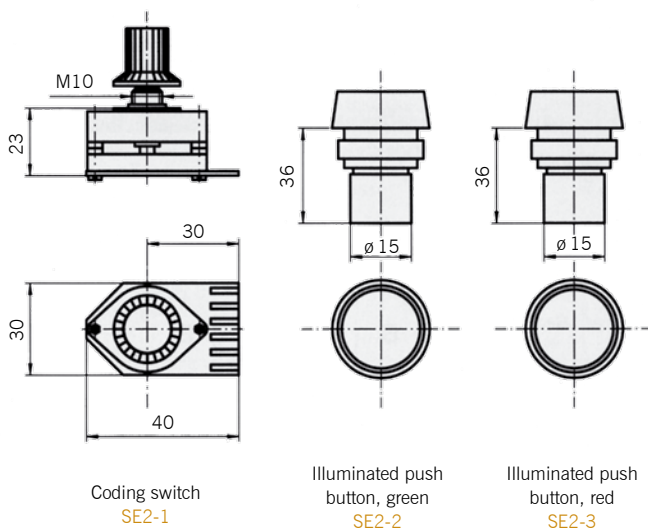
Protection classification: IP 63

Protection class: III



Control unit type SE3

With coding switch for holding force setting in 8 levels using inverse BCD-coding, including 2 integrated signal lamps and 2 m coded cable, 9 pole. Additional coded cable against price adder.



Build-in version type SE2-1 to SE2-3

Consisting of 2 signal push buttons and coding switch for holding force setting in 8 levels using inverse BCD coding. Complete set can be ordered under type SE2-S.

Ordering example:

Control Unit SAV 876.02 - SE3
Ordering key SAV - No. - Type

CARBON BRUSH HOLDER

SAV 248.84

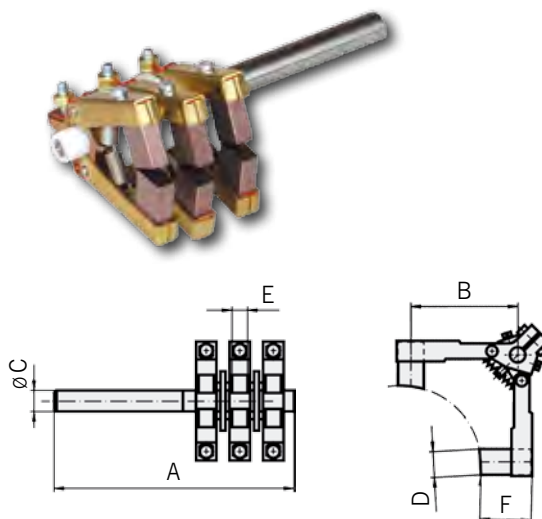
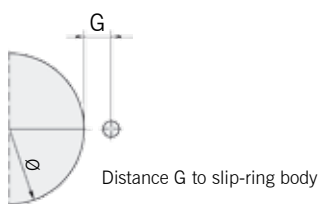
For electric power supply to Electro-Magnetic Circular Chucks

Use:

The illustrated carbon contacts transmit the electrical current to the slip ring body used with electro permanent circular magnetic chucks. They are available in 3 sizes, including fixing bolts.

Features:

Carbon contacts, spring-loaded.
Fixing is by means of threaded pins.



For circular magnet- $\varnothing$	Chuck voltage in V	Control unit max. current in A	Number of contacts	Dimensions in mm								Weight in kg
				A	B	C	D	E	F	G		
to 800	210 / 360	30	3	140	40	M8	12.5	6.3	20	27.0	0.17	
to 1000	360	60	3	140	40	M8	12.5	6.3	20	25.0	0.17	
to 1600	360	60 x 2	4	140	50	M8	20.0	8.0	25	33.5	0.23	

Ordering example:

Carbon Brush Holder SAV 248.84 - 1600

Ordering key SAV - No. - Max. circular chuck diameter

SLIP-RING BODY

SAV 248.85

For electric power supply to Electro-Magnetic Circular Chucks

Use:

Slip-ring bodies are used in connection with carbon brushes to supply power to circular electro-permanent magnets. The slip-ring body can be mounted separately to the hollow machine spindle. While installing it must be assured that the insulation components do not come into contact with coolant or other fluids. Suitable protection must be provided to prevent contact with live components.

Mounting method:

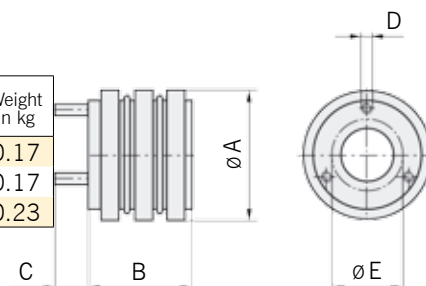
- shrinking at 130 °C
- pressing with 0.5 mm oversize
- gluing

Features:

The slip-ring bodies are delivered with only one small centre-drilling. This has to be machined to suit the spindle of the machine, within range E.



For circular magnet- $\varnothing$	Chuck voltage in V	Control unit max. current in A	Number of contacts	Dimensions in mm								Weight in kg
				A	B	C	D	E	F	G		
to 800	210 / 360	30	3	70	61.5	20	M5	25 - 34	4100	1.1	0.17	
to 1000	360	60	3	100	65.5	25	M8	30 - 52	3000	2.5	0.17	
to 1600	360	60 x 2	4	100	79.0	25	M8	42 - 55	3000	3.0	0.23	



Ordering example:

Slip Ring Holder SAV 248.85 - 1600

Ordering key SAV - No. - Max. circular chuck diameter

COMPACT ELECTRICAL ADAPTER PLUG

SAV 248.86

For use in electro permanent magnetic circular chuck power supplies

Features:

- Compact design
- Encapsulated
- Maintenance-free

Use:

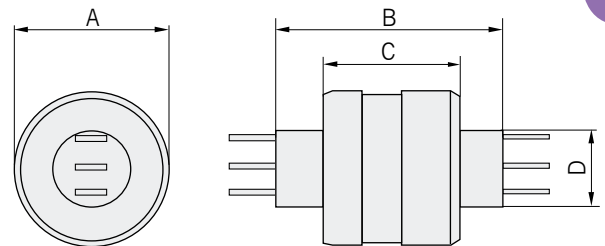
- For fitting to the spindle end.
- Alternatively in the magnet centre for custom designs.

Technical data:

- Protection rating IP 51
- Low transfer resistance

Fixing:

- By radial clamping around diameter D.

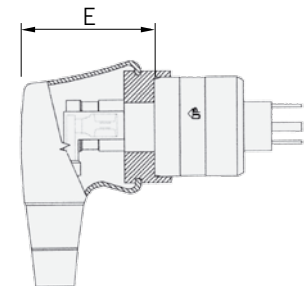


Electrical adapter plug

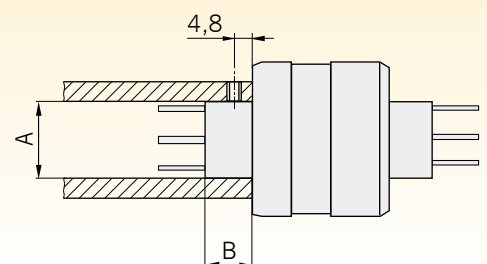
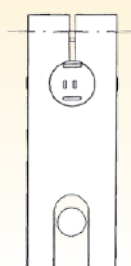
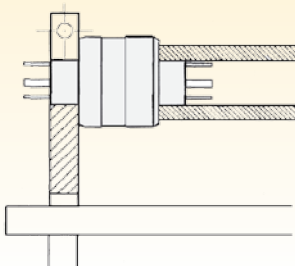
No. of contacts	max. continuous current in A	Voltage in V (AC/DC)	max. RPM	Dimensions in mm			
				A	B	C	D
3	30	0 - 250	1200	31.6	46.2	27.9	15.87
4	30	0 - 500	300	45	69.1	29	31.70

Plug

No. of contacts	Dimensions in mm
	E
3-S	46.2
4-S	65.8



Installation examples:



Ordering example:

Compact electrical adapter plug SAV 248.86 - 4
Ordering key SAV - No. - No. of contacts

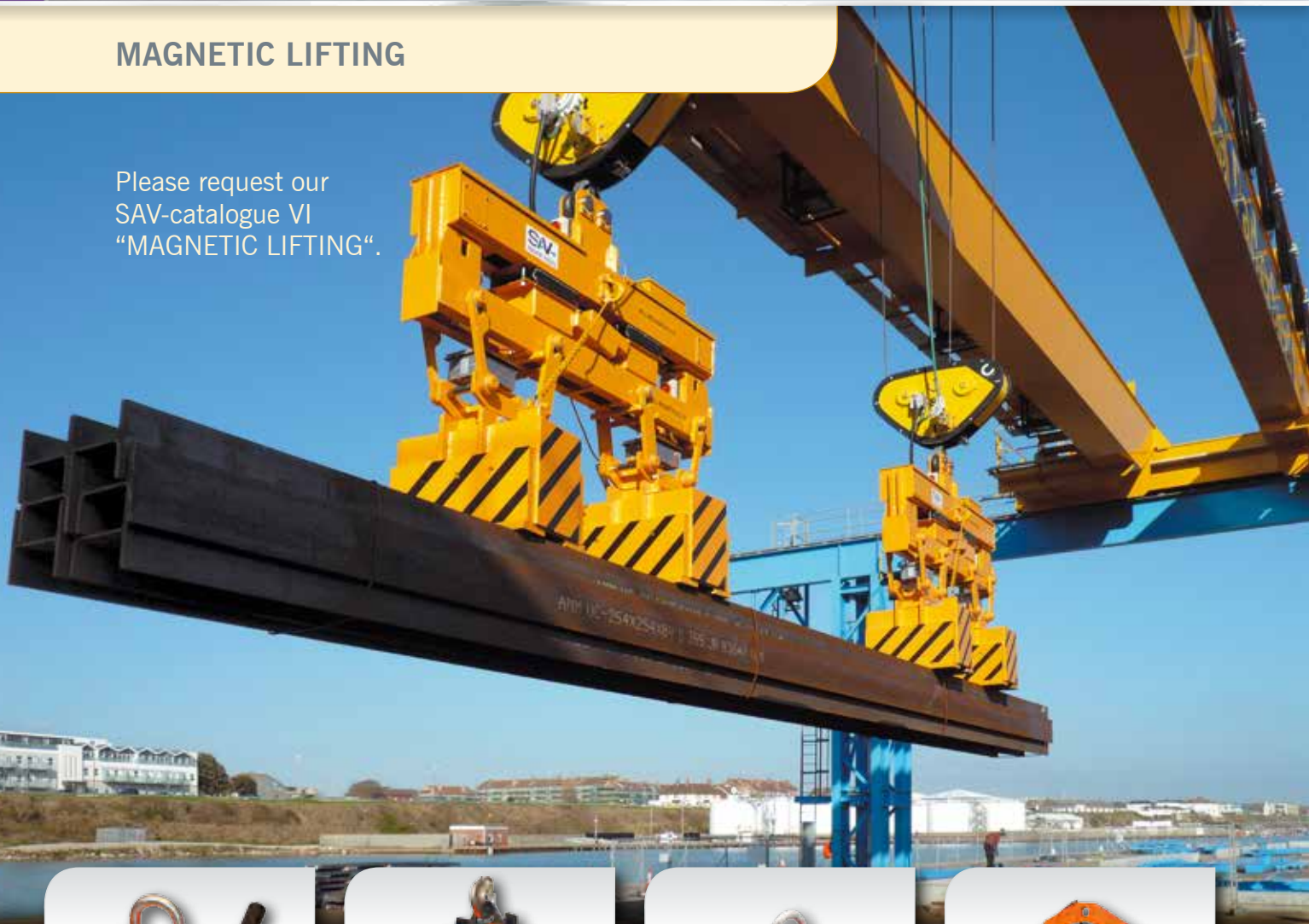
Ordering example Stecker:

Plug SAV 248.86 - 4-S
Ordering key SAV - No. - Type

No. of contacts	Dimensions in mm	
	A	B
3	15.87	10.2
4	31.75	20.3

MAGNETIC LIFTING

Please request our
SAV-catalogue VI
“MAGNETIC LIFTING”.



SAV-Lifting

The product spectrum covers the comprehensive area of magnetic lifting, workholding and handling. Our main focus is on standard and specific, individual customer solutions.

The area of **SAV-Lifting** covers:

- Heavy lifting systems, electro- and electro-permanent
- Battery-powered lifting systems, electro- and electro-permanent
- Pneumatic, switchable permanent-lifting systems
- Manual, switchable permanent-lifting systems
- Magnetic handling aids

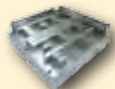
Our product overview offers you a wide range of application examples to promote ideas and highlight the range of possibilities available to you. These specific solutions help you to find a concept for your lifting operations.

We will be happy to assess your requirements. We will naturally take into account and calculate all the technical parameters required to supply you with a detailed offer.

CHAPTER OVERVIEW

CHAPTER 4

Page 95 - 108

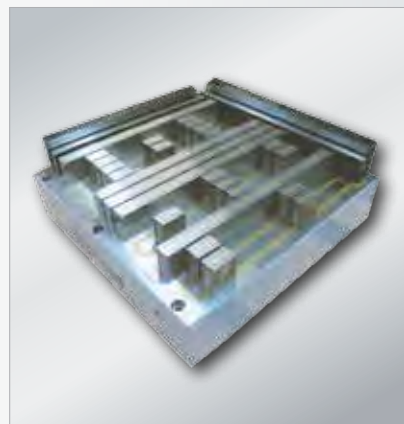
	COMBINED SOLUTIONS	PAGE
	Criteria for combined solutions	96
	Electro permanent magnetic fixture with pneumatic clamps	97
	Electro permanent magnetic system with hydraulic stops	98
	High energy milling magnet with hydraulic stop	98
	Multi-function clamping fixture	99
	Magnetic – hydraulic clamping system	100
	Electro permanent magnetic chuck with zero point system	100
	Magnetic – vacuum pole beam	101
	Magnetic – pneumatic – hydraulic fixture	101
	Combination fixture for clamping rail tracks	102
	Magnetic – hydraulic fixture	104
	Mechatronic chucks	106
	Special combination chuck	107
	Combined chucks	108
	Electro permanent circular chuck with centring fixture	108

CRITERIA FOR COMBINED SOLUTIONS

Different clamping methods have different advantages and disadvantages. Through differentiated combinations even difficult workholding problems can be solved, the range of possible machining operations broadened the spectrum of workpieces that can be machined extended.

Characteristics - magnetic:

- only for ferro-magnetic workpieces
- the holding force is limited (physically limited)
- high normal force, low tangential force
- force transmission across the whole surface
- holding of thin, uneven workpieces
- high damping level
- good access, cleanability and automation
- large workpiece spectrum
- distortion-free workholding
- complete support of the workpiece (high damping, high precision)
- residual magnetism in the workpiece
- multi-sided machining in one clamping operation
- compact build design
- short set-up times
- ergonomic and safe to operate, wear-free
- economical in comparison to power actuated clamping



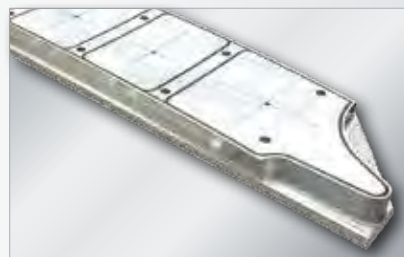
Characteristics – hydraulic / mechanical:

- suitable for all workpieces
- high to very high energy density
- point transmission of force
- high energy density
- low distortion clamping of blanks
- also suitable for non-magnetic workpieces
- low damping levels
- access and cleanability restricted
- risk of workpiece deformation / damage
- limited workpiece spectrum
- more complex systems with the corresponding energy supply



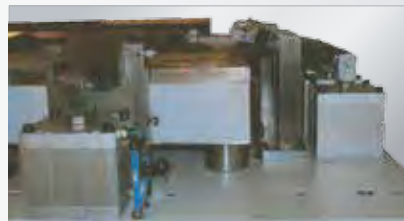
Characteristics – vacuum:

- also suitable for non-magnetic workpieces
- force transmission across the whole surface
- lower energy density, holding force physically limited
- good damping
- multi-sided machining possible
- easy to clean
- safe to operate, wear-free



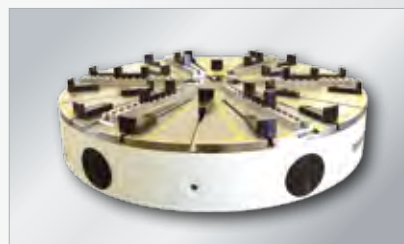
Characteristics - pneumatic::

- point transmission of force
- lower energy density compared to hydraulic systems
- low distortion clamping of blanks
- also suitable for non-magnetic workpieces
- low damping levels
- access and cleanability restricted
- limited workpiece spectrum
- large clamping elements
- more complex systems, simpler power supply compared to hydraulic systems
- lower cost than hydraulic systems



Characteristics - electrical:

- very flexible and easy to control
- wide range of automation possibilities
- no second media supply in combination with magnet



APPLICATIONS

► MAGNETIC PNEUMATIC FIXTURE for laser welding

Dimensions:

1320 x 1100 mm

Workpiece:

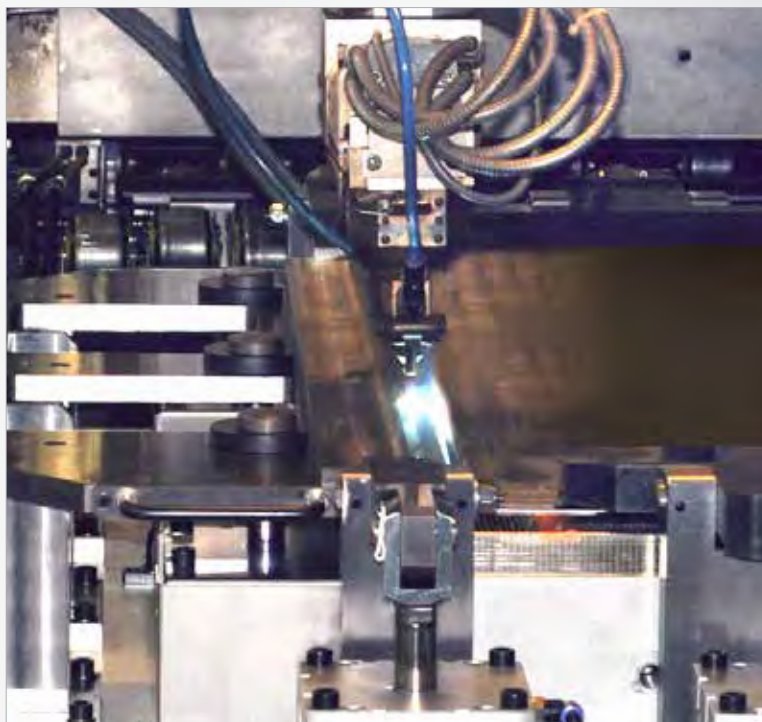
Thin sheets

Machining operation:

Laser welding

Description:

- enhanced electro-magnet system
- with compressed air lifting
- pneumatic clamping jaws around the circumference
- on a mobile base fixture



4



APPLICATIONS

► ELECTRO PERMANENT MAGNETIC SYSTEM with hydraulic stops

Dimensions:

2000 x 157 mm

Workpiece:

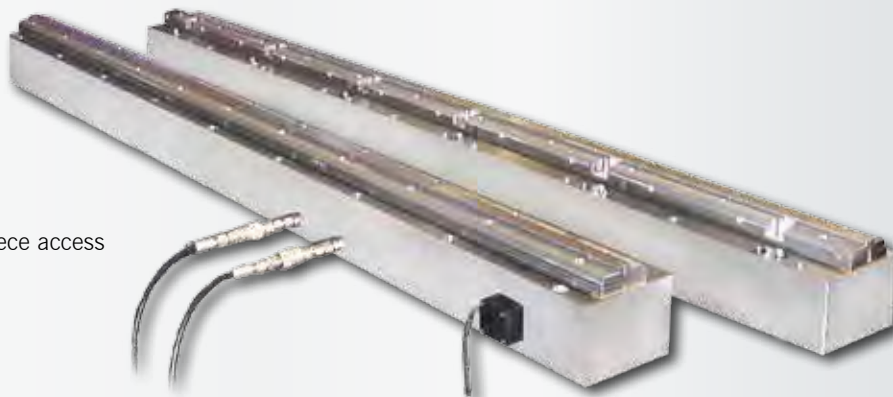
Linear guides

Machining operation:

Grinding of the rail guide surfaces

Description:

- 2 x 3 magnets on the horizontal indexer
- with hydraulic swing clamps for workpiece positioning
- adapter pole beams for full workpiece access



► HIGH ENERGY MILLING MAGNET with pole plate and hydraulic stop

Dimensions:

1725 x 300 mm

Workpiece:

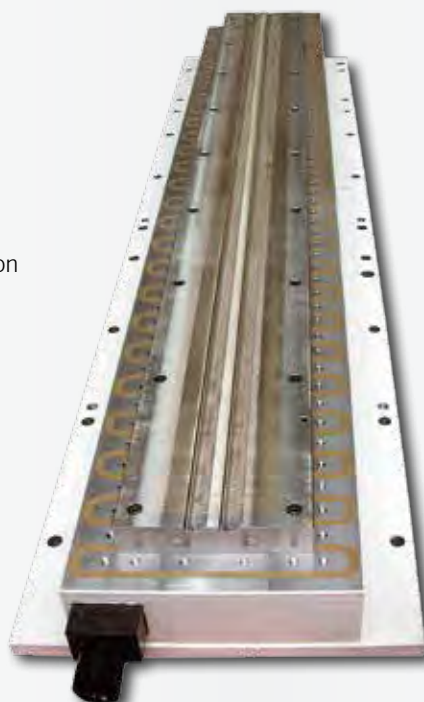
Scrapers for printing machines

Machining operation:

Milling of thin parts

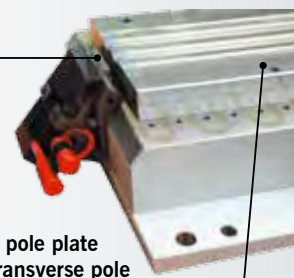
Description:

- High energy magnet with 33 mm transverse pole pitch
- profiled top plate with fine lamination for low field heights
- hydraulic retractable stop



Hydraulic retractable side stop

Adapter pole plate
4 mm transverse pole pitch for milling thin parts



APPLICATIONS

► MULTI-FUNCTION CLAMPING FIXTURE

Dimensions:

2800 x 1030 mm

Workpiece:

Workpieces for packaging machines

Machining operation:

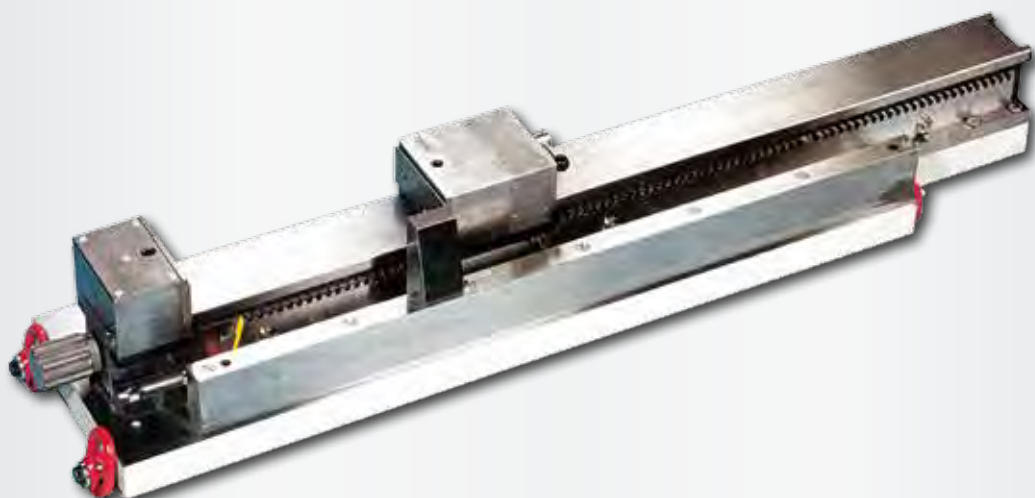
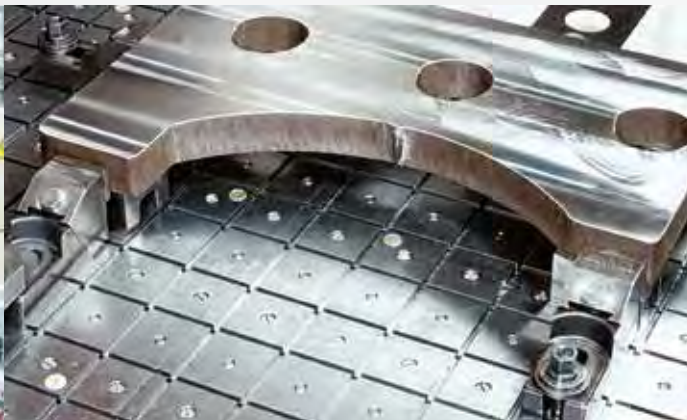
Milling

Description:

- Magnetic – hydraulic – mechanical – vacuum combination
- Hydraulic vices with a large clamping stroke
- Grid clamping system for fixture blocks
- Grid vacuum chuck
- Multi-function control panel



4



APPLICATIONS

► MAGNETIC – HYDRAULIC CLAMPING SYSTEM

Dimensions:

1000 x 1000 mm

Workpiece:

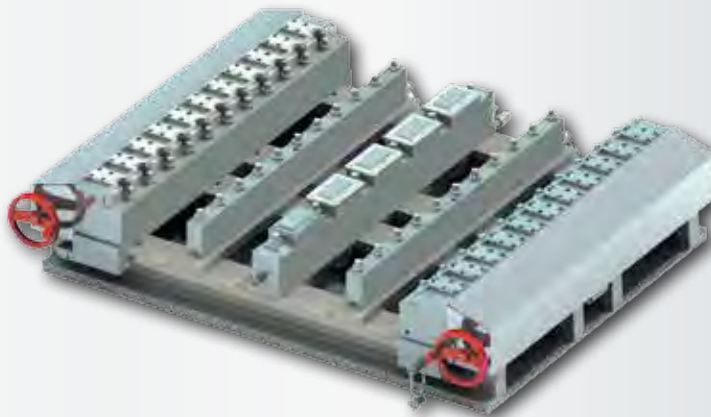
P-Plates

Machining operation:

Surface and face heavy milling in chip removal

Description:

- Magnetic – hydraulic combination
- High energy magnetic blocks, height adjustable, hydraulically clamped
- Additional hydraulic supports and side clamping
- Beam design, adjustable longitudinally



► ELECTRO PERMANENT CHUCK WITH ZERO POINT SYSTEM

Dimensions:

400 x 230 mm

Workpiece:

Rib-shaped pushers for textile machines

Machining operation:

Grinding of needle contours

Description:

- Magnetic system with integrated zero point reference system
- Workpiece support in profiled adapter pole plate
- Weight optimised pallet, can be loaded away from the machine



APPLICATIONS

► MAGNETIC VACUUM POLE BEAMS

Dimensions:

750 x 100 mm

Workpiece:

Hard metal knives

Machining operation:

Grinding

Description:

- High energy magnetic system with longitudinal poles
- Vacuum in pole gap



4

► MAGNETIC – PNEUMATIC – HYDRAULIC FIXTURE

Dimensions:

Length 800 mm

Workpiece:

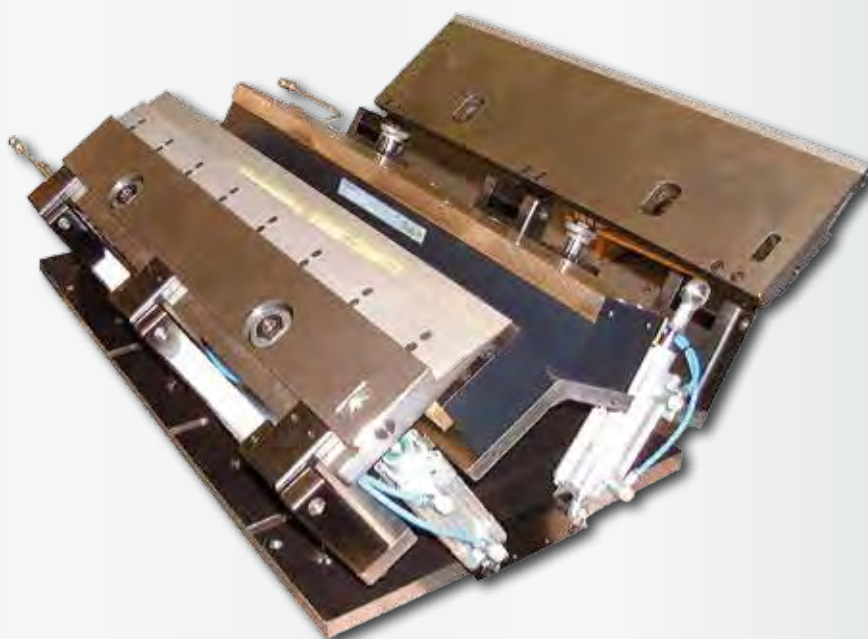
Thin knives

Machining operation:

Grinding

Description:

- Damping with fine pole magnet
- Pneumatic actuation
- Hydraulic clamping and locking



APPLICATIONS

► COMBINATION FIXTURE magnetic - hydraulic – electro actuated

Dimensions:

Length 24 m

Workpiece:

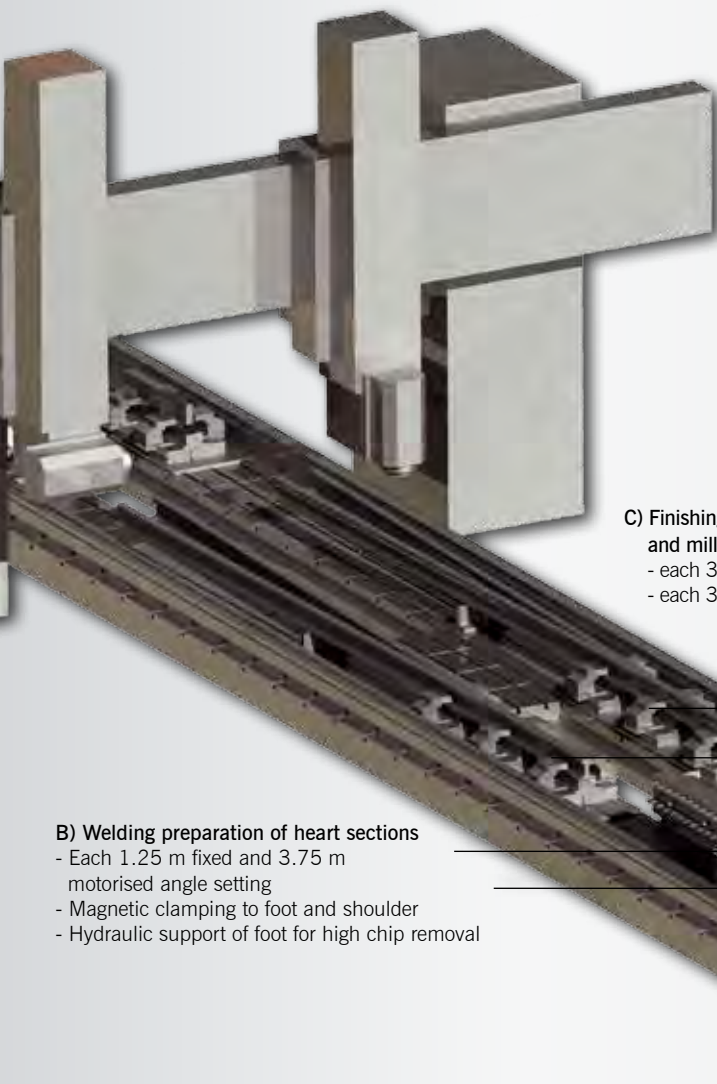
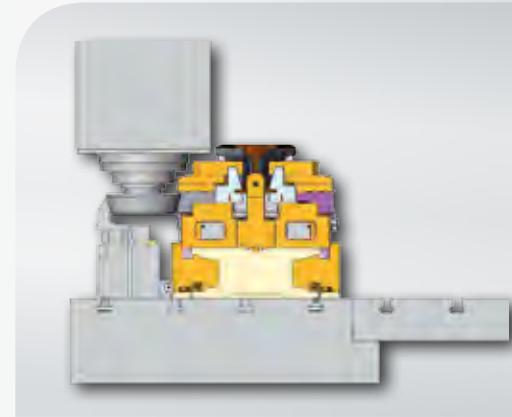
- Switch and stock rails
- Heart sections
- Block sections

Machining operation:

Milling for switch manufacture

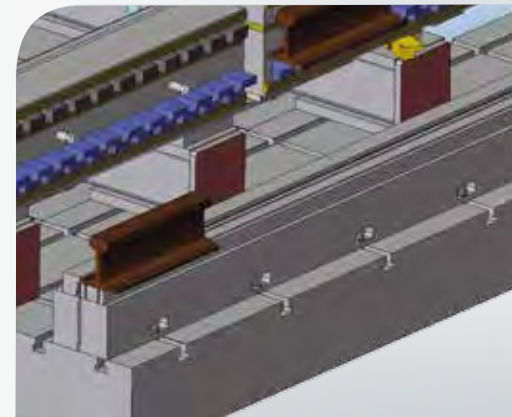
Description:

- Set up for extreme chip removal
- Combination of magnetic, hydraulic and electro actuated principles
- Remote, touch-screen control
- Machine power 2x 100kW



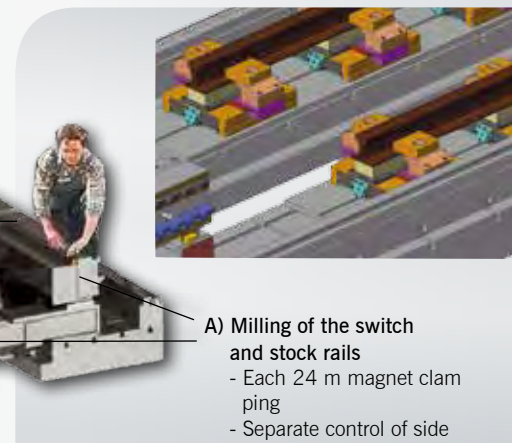
C) Finishing of the heart sections and milling of block sections

- each 3 centric clamps with exchangeable jaws
- each 3 milling magnets for rail foot clamping



B) Welding preparation of heart sections

- Each 1.25 m fixed and 3.75 m motorised angle setting
- Magnetic clamping to foot and shoulder
- Hydraulic support of foot for high chip removal



A) Milling of the switch and stock rails

- Each 24 m magnet clamping
- Separate control of side stop and base

APPLICATIONS

A) Milling of the switch and stock rails to length 2 x 24 m



- Enhanced high-energy system
- Exchangeable pole beams
- Pole blocks for head support
- Head, foot and drilling operations

4

B) Welding preparation of heart sections to length 2 x 5 m



- Electrical angle setting
- High-energy system for extreme chip removal (half of rail section)
- Hydraulic supports in special execution to support the rail foot

C) Finishing of the heart sections



- Hydraulic vices in special execution with high throat depth
- Jaws with quick-exchange system
- Magnetic system for clamping at the foot

APPLICATIONS

► MAGNETIC – HYDRAULIC FIXTURE with pole plate for thin parts

Dimensions:

System length 12 m

Workpiece:

V-Block sections

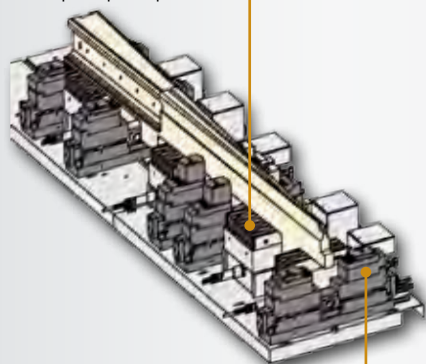
Machining operation:

Very heavy milling operations

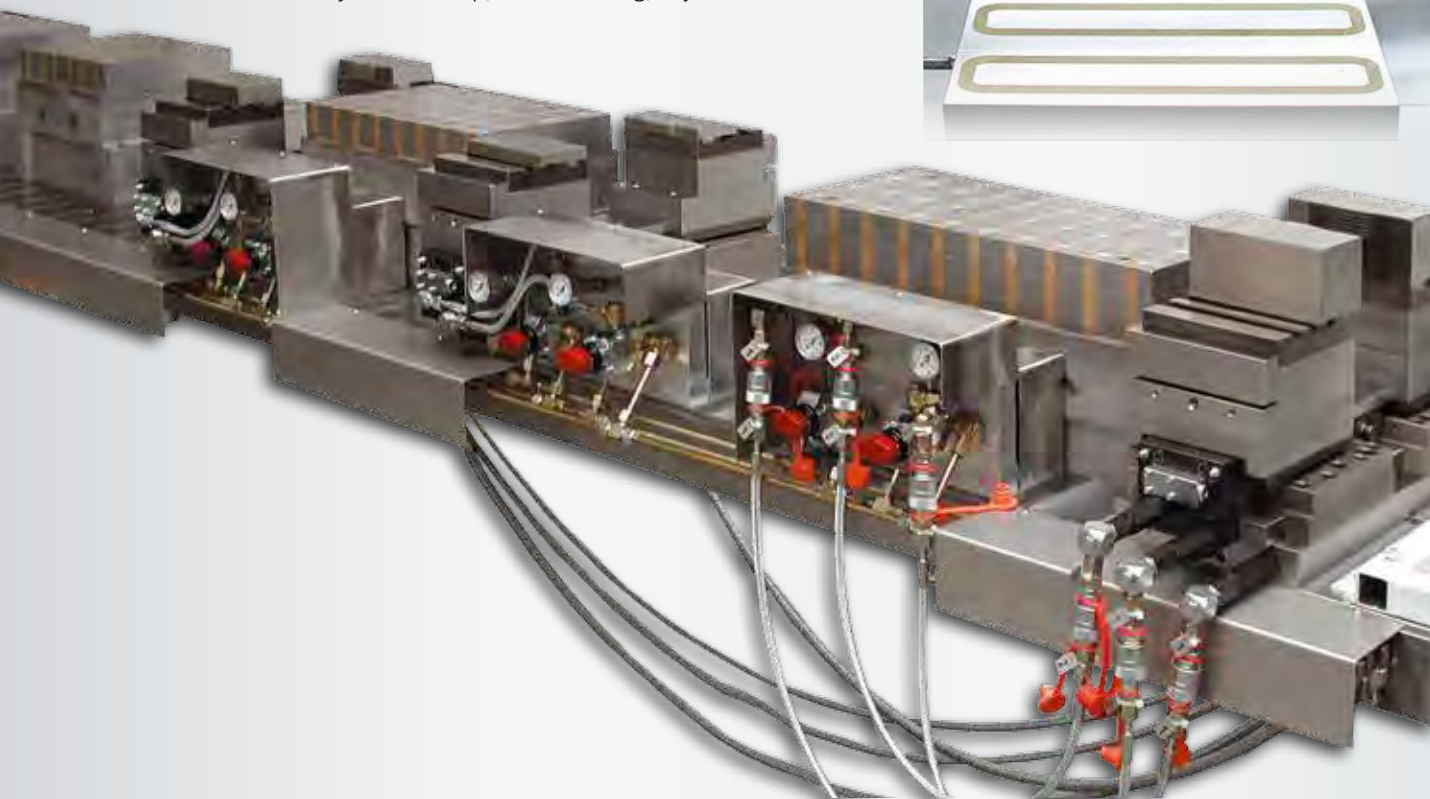
Description:

- Clamping and damping with high-energy magnets
- Centring and clamping of thin sections with hydraulic vices, centred and floating

Electro permanent magnet
with adapter pole plate



Hydraulic clamp, centric/floating, adjustable



APPLICATIONS

► MAGNETIC – HYDRAULIC FIXTURE

Dimensions:

System length 8.5 m

Workpiece:

Switch and stock rails

Machining operation:

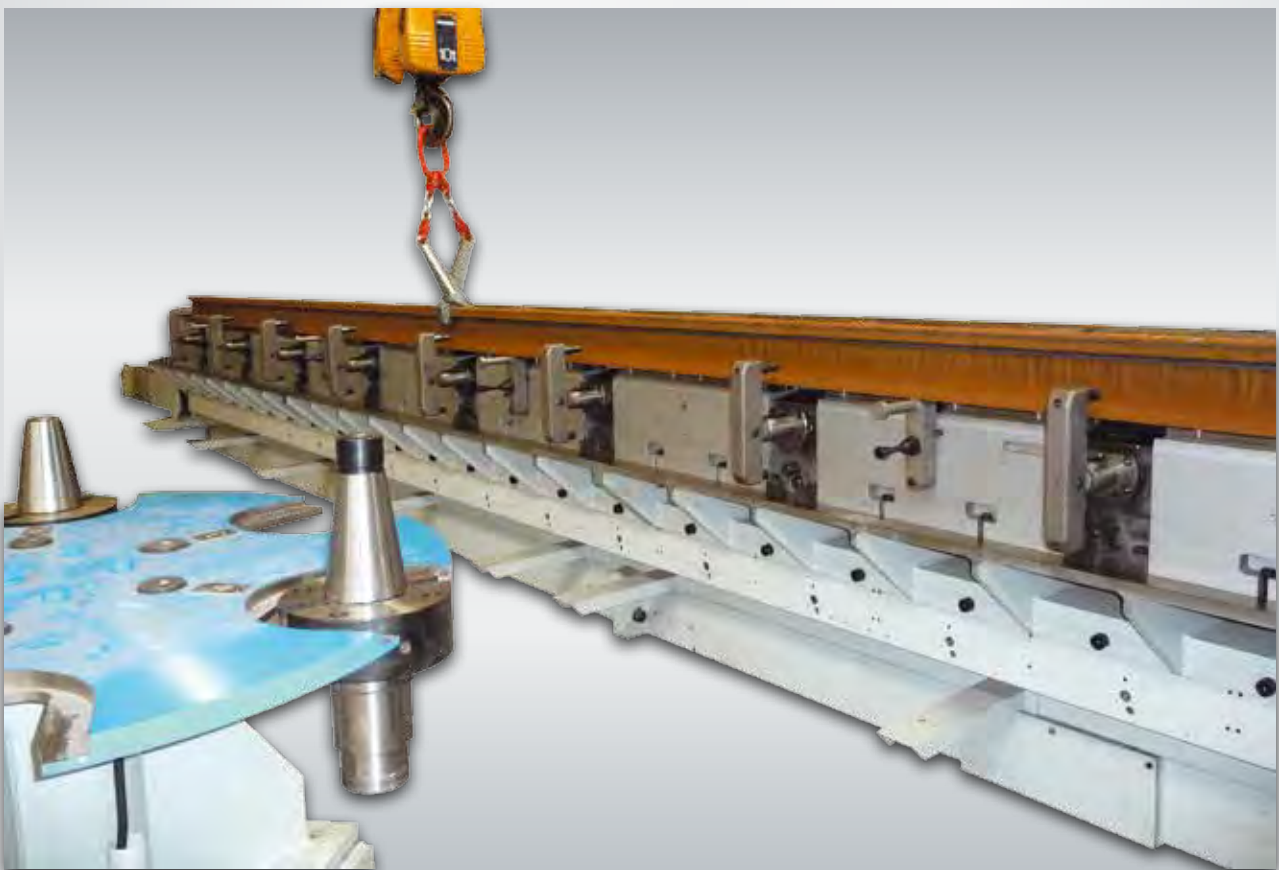
Extreme milling operations

Description:

- Magnetic clamping at the foot, downward and sideways
- Optional sideways clamping at the web with adapter pole beam
- Solid hydraulic swing clamp in special execution for clamping at the foot or web
- Chip removal in one cut with a
- Cross-section 60 x 35 mm
- Machine power 2 x 75 kW



4



APPLICATIONS

► MECHATRONIC CHUCKS SAV 244.75

Use:

- For automation
- Precise centering, reproducible with high accuracy
- High power chip removal and finishing
- Combination of first and second clamping set-up
- Radial and/or axial clamping
- Clamping of eccentric parts



Patent granted!
Patent-No. 10 2009 047 996

Combination circular magnet – electric linear axes:

- Servo drive with integrated brakes
- 300 daN clamping force per actuator at D 1000 mm
- Direct measurement system with a 0.001mm resolution
- 50 mm clamping stroke with quick-change jaws
- Electronic centrifugal force compensation
- Enhanced magnetic system with optimized pole division
- Magnetic material under each pole for minimal field heights
- 350 mm minimal magnetic area
- Smallest available chuck diameter 800 mm at 100 daN clamping force per jaw
- With 165 mm minimum height



Variant A

- 3 axis centred
- 3 axes engage internally or externally

Variant B

- 6 axis centred
- Internal or external engagement

Variant C

Clamping of oval parts



Variant D

- Manual workpiece positioning with dial gauge
- Magnetic pre-clamping
- 6 axis independent engagement and clamping

Variant E

Centred per 2 opposing axes

Variant F

Clamping of eccentric parts at changing orientations to the spindle

APPLICATIONS

► SPECIAL COMBINATION CHUCK

Dimensions:

ø 1500 mm

Workpiece:

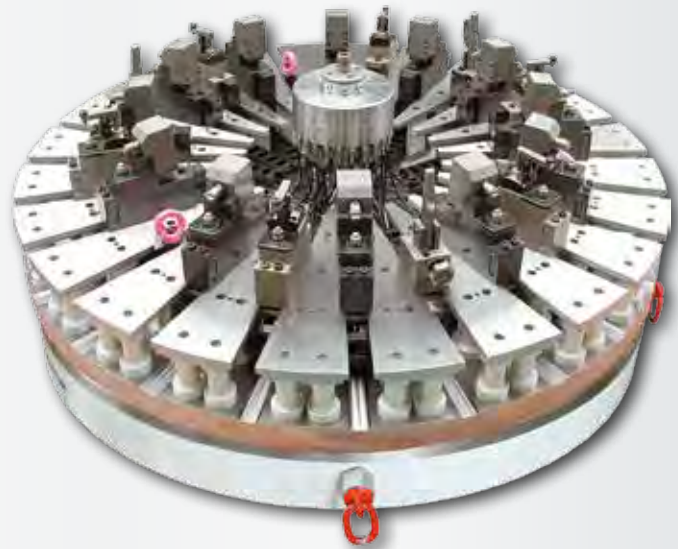
Seal ring bushings

Machining operation:

Grinding

Description:

- Electro permanent circular chuck with hydraulic couplers as table
- Hydraulic support fixture with large setting range
- Combination clamping axial and/or radial
- Sensitive axial supports
- 64 channel oil distribution



APPLICATIONS

► COMBINATION CHUCKS

Dimensions:

Diameter 350 mm

Workpiece:

Truck gearbox parts

Machining operation:

Circular grinding

Description:

- Sensitive centring at the centre of area
- Clamping via electro permanent circular chuck
- Free workpiece access with pole shoes



► ELECTRO PERMANENT CIRCULAR CHUCK with centring fixture

Dimensions:

Diameter 640 mm

Workpiece:

Rings for high-precision aircraft bearings

Machining operation:

Hard turning

Description:

- 3 point centring fixture
- Levelling via sensitive, movable pole shoes, individually clampable



CHAPTER OVERVIEW

CHAPTER 5

Page 109 - 114

	SAV-ART.-NO.	COMMENTS	MACHINING OPERATION*	PAGE
PLATE DEMAGNETISERS				
	890.02	for use in measuring rooms, workshops and production lines		111
	878.05	Tesla meter		111
TUNNEL-ENTMAGNETISIERGERÄTE				
	890.42	for demagnetising of thin-walled batch workpieces with a large surface area		112
	890.43	for automatic demagnetising of workpieces on the production lines		112
HAND-ENTMAGNETISIERGERÄTE				
	890.70	for demagnetising the surface of large workpieces, mobile use		113
	890.71	for demagnetising of workpieces, tools, stamps, milling tools etc.		113
PRÜFGERÄTE				
	486.04	Mini-Gauss meter		114
	486.40	Holding force tester		114

* Explanation of the icons on page 9

APPLICATIONS

► DEMAGNETISER WITH BELT FOR ROLLING BEARINGS

Dimensions:

Belt width 800 mm

Workpiece:

Rolling bearing rings

Machining operation:

Demagnetising

Description:

- Demagnetiser with two vertically opposing plates
- Variable height top plate
- Conveyor belt with optical barrier control
- Low frequency generator for low residual remanence



► DEMAGNETISING TABLE

Dimensions:

Width of opening 400 x 350 mm

Workpiece:

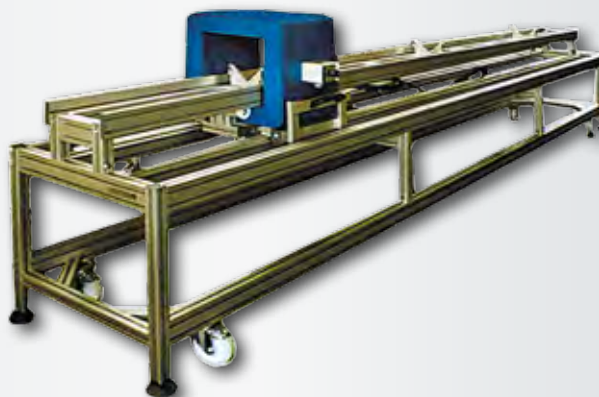
Cylinders

Machining operation:

Demagnetising

Description:

- Workpiece positioning on V-blocks
- Tunnel demagnetiser, lengthwise travelling carriage



► TABLE DEMAGNETISER WITH BELT

Dimensions:

Belt width 250 mm

Workpiece:

Automotive parts

Machining operation:

Demagnetising

Description:

- Adjustable table height and angle
- High energy level with a low frequency generator for low residual remanence levels



DEMAGNETISING UNITS



SAV 890.02

Standard Unit

Use:

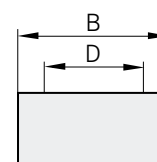
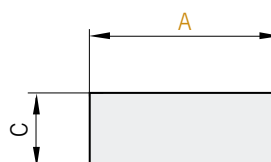
The demagnetising units are suitable for use in measuring rooms, workshops and production lines and exhibit a strong effect in the demagnetising of bearing rings, punches, dies and other tools.

Features:

Power supply:	230 V/50 Hz AC
Protection rating:	IP 20
Duty cycle:	100 ED
Power consumption:	max. 920 W
Penetration depth:	ca. 50 mm



A	Dimensions in mm				Weight in kg	Power in VA
	B	C	D			
250	180	87	150		11	920
280	266	87	220		18	920
400	306	87	260		24	920



D=active width

Ordering example:

Demagnetising unit SAV 890.02 - 250
Ordering key SAV - No. - A

TESLA METER



SAV 878.05

Compact device with large measurement range

Use:

For residual remanence measurement on workpieces and tools, in drillings and fixtures. Suitable for both micro-magnetic and very strong magnetic fields. Also for measuring magnetic flux and field structure on magnetic chucks.

Design:

Light and compact design. Dirt protective housing. Economized energy use for long battery life. Liquid-crystal display with digital reading. Sensor can easily be exchanged and ordered separately (SAV 878.05 - S)

Features:

- automatic ranging
- display is either Tesla (T) or Gauss (G)
- static and dynamic measurement
- max. indication for dynamic measurement
- pole indication (N/S)
- zero setting

Ordering example:

Tesla Meter SAV 878.05
Ordering key SAV - No.



Measurement range static fields:	0 - 1500 mT
Measurement range dynamic fields:	0 - 750 mT
Measurement accuracy:	± 5 %
Operating temperature:	0 - 40 °C
Dimensions:	150 x 150 x 25 mm ³
Weight:	0.25 kg

TUNNEL DEMAGNETISER



SAV 890.42

To demagnetise thin-walled parts with large surface areas

Use:

An unwanted residual magnetism can remain after machining in steel and cast workpieces. If these parts must be demagnetised before being used for other purposes, in most cases this can be achieved without any problems by using the tunnel demagnetiser.

Features:

The demagnetising coil is cast in polyurethane. Optionally with low frequency generator for workpieces which are difficult to demagnetise.

Protection rating: IP 55

Mains voltage: 230VAC

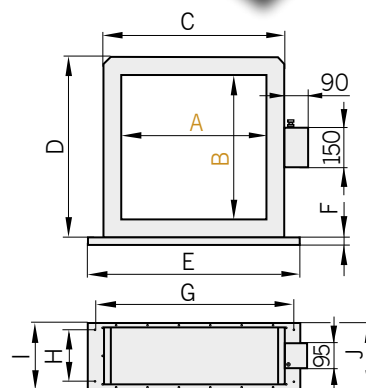
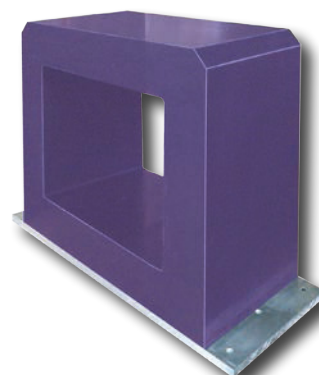
Mains frequency: 50 to 60 Hz

Other voltages available on request.

Dimensions in mm										Power in VA	Weight in kg
A	B	C	D	E	F	G	H	I	J		
150	100	320	270	408	12	358	110	170	150	1600	38
260	130	430	300	520	15	475	115	185	165	4000	52
250	250	390	390	510	15	460	150	200	180	4100	65
350	300	490	440	610	15	560	200	250	230	4800	80
400	200	540	340	660	15	595	150	250	230	6000	90
420	300	560	440	680	15	615	200	250	230	6200	96
400	400	540	540	660	15	580	150	250	230	6700	110
560	350	700	490	820	15	770	200	250	230	6000	100
550	550	690	690	810	15	760	200	250	230	6950	132

Ordering example:

Tunnel demagnetiser SAV 890.42 - 400 x 300 - 230VAC
Ordering key SAV - No. - A x B - Mains voltage



TUNNEL DEMAGNETISER WITH CONVEYOR BELT

SAV 890.43



To demagnetise thin-walled parts with large surface areas

Use:

For automatic demagnetising on the production line through a continuously running plastic conveyor belt and drive motor. The workpieces are transported through the tunnel at a speed of ca. 0.2 m/sec. A low frequency generator can be positioned in series for workpieces which are difficult to demagnetise.

Features:

The demagnetising coil is cast in polyurethane. Optionally With low frequency generator for workpieces which are difficult to demagnetise. Conveyor belt and table versions upon agreement or according to workpiece dimensions and weights.

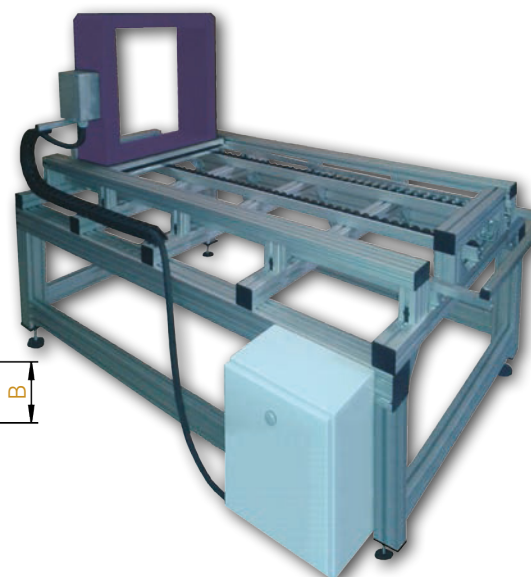
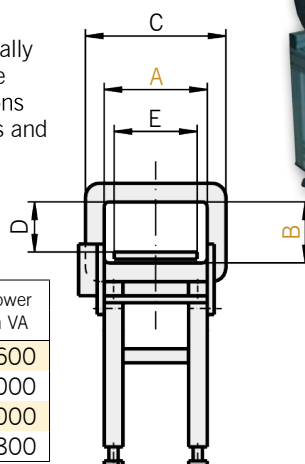
Protection rating: IP 65

Mains voltage: 400V

Mains frequency: 50 to 60 Hz

Other voltages available on request.

Dimensions in mm						Power in VA
A	B	C	D	E	F	
250	200	550	140	170	200	3600
350	200	650	140	170	300	5000
400	300	700	260	170	350	9000
500	300	800	260	170	350	9800



Ordering example:

Tunnel demagnetiser with belt SAV 890.43 - 500 x 300 - 400V
Ordering key SAV No. - A x B - Mains voltage

MANUAL DEMAGNETIZER

For individual use

Use:

For demagnetizing the surfaces of bigger workpieces. Mobile use.

Execution:

Light-weight housing for easy use.
3 m cable with plug.

Nom. voltage: 230 V / 50 Hz
Rating: 220 VA
Protection rating: IP 42
Automatic shut-down at: > 50 °C
Duty cycle: 30%



Type	Size of the active zone	Power consumption	Depth of the magnetic field	Weight in kg
HD 1	105 x 75 mm	220 - 240 V / 50Hz	20 mm	1.9 kg
HD 2	150 x 95 mm	220 - 240 V / 50Hz	40 mm	2.2 kg

Ordering example:

Manual demagnetizer SAV 890.70 - HD 2
Ordering key SAV No. - Type

5

MANUAL DEMAGNETIZER

For bar material and tools

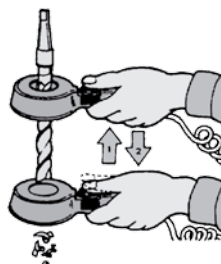
Use:

For demagnetizing of workpieces, tools, punches, cutters, etc.

Execution:

Stable, plastic housing, with high power. Usage also in rough environment. Not suitable for continuous duty!
Including thermo-fuse and LED for operation mode.

Hole diameter: 40 mm
Nominal voltage: 230V / 50Hz
Duty cycle: 10 % ED
Max. operation time: 10 seconds



Ordering example:

Manual demagnetizer SAV 890.71
Ordering key SAV No.



SAV 890.71

MINI GAUSS-METER



SAV 486.04

For measurement of fields with small flux density

Use:

For residual remanence measurement on workpieces and tools.

Attention:

The device is only to be used for residual field measurement and not for concentrated magnetic fields.

Measurement range: ± 50 Gauss (± 5 mT)

Diameter: 65 mm

Weight: 0,14 kg

Other measurement ranges available on request.



Ordering example:

Mini Gauss-Meter SAV 486.04

Ordering key SAV No.

HOLDING FORCE TESTER



SAV 486.40

For comparison of magnetic clamping systems

Use:

For measuring the holding force of:

- permanent magnetic chucks
- electro magnetic chucks
- electro permanent magnetic chucks

Application:

By turning the screw clockwise with an Allen key, the necessary pressure is built up. The built-in piston is displaced until the holding force limit is reached and the measuring cylinder is lifted from the magnetic plate. The indicated pressure given in Bar corresponds to the comparative break-away force in daN/cm².

Measurement range:

0 – 25 Bar equals 0 – 25 daN/cm²

Weight: 2.0 kg



Ordering example:

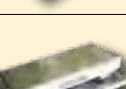
Holding Force Tester SAV 486.40

Ordering key SAV No.

CHAPTER OVERVIEW

CHAPTER 6

Page 115 - 126

	SAV-ART.-NO.	POLE PITCH	COMMENTS	MACHINING OPERATION*	PAGE
PRECISION SINE TABLES					
	245.01	P = 1,9 mm	Swivel on longitudinal axis	  	118
	245.02	P = 1,9 mm	Swivel on long./transv. axis	  	119
	245.03	P = 1,9 mm	Swivel on transv. axis	  	120
	245.04	P = 1,9 mm	Swivel on longitudinal axis	  	121
	245.05	P = 1,9 mm	Swivel on transv. axis	  	122
	245.06	P = 1,9 mm	Swivels about the centre axis to both sides	  	123
	245.09	P = 4; 13 mm	Swivels about the longitudinal axis, fixed to the machining table		124
	245.10	P = 13;18;25mm	Swivels about the longitudinal axis, fixed to the machining table	 	125
	245.40	P = 4 mm	Swivels about the longitudinal axis, with switchable permanent magnet block SAV 242.11	   	126
	245.41	P = 4 mm	Swivels about the longitudinal axis, with switchable permanent magnet block SAV 242.11	   	126

* Explanation of the icons on page 9

APPLICATIONS

► HIGH PRECISION SINE TABLE

Dimensions:

1000 x 600 mm

Workpiece:

Thin plates

Machining operation:

Grinding

Description:

- Swivels about the short axis
- With mechanical adjustment mechanism
- Distortion-free clamping, hydraulic
- Levelness and parallelism $1\mu\text{m}/100\text{mm}$
- Integrated length measuring system with resolution $1\mu\text{m}$



► PRECISION MEASUREMENT TABLE

Dimensions:

600 x 150 mm

Workpiece:

Turbine blades

Machining operation:

Measuring

Description:

- 3 swivel axes with adjustment mechanism
- Rotation axis with angle scale and vernier
- Transversal axis according to sine principle



APPLICATIONS

► PRECISION SINE TABLE

Dimensions:

1000 x 150 mm

Workpiece:

Knives

Machining operation:

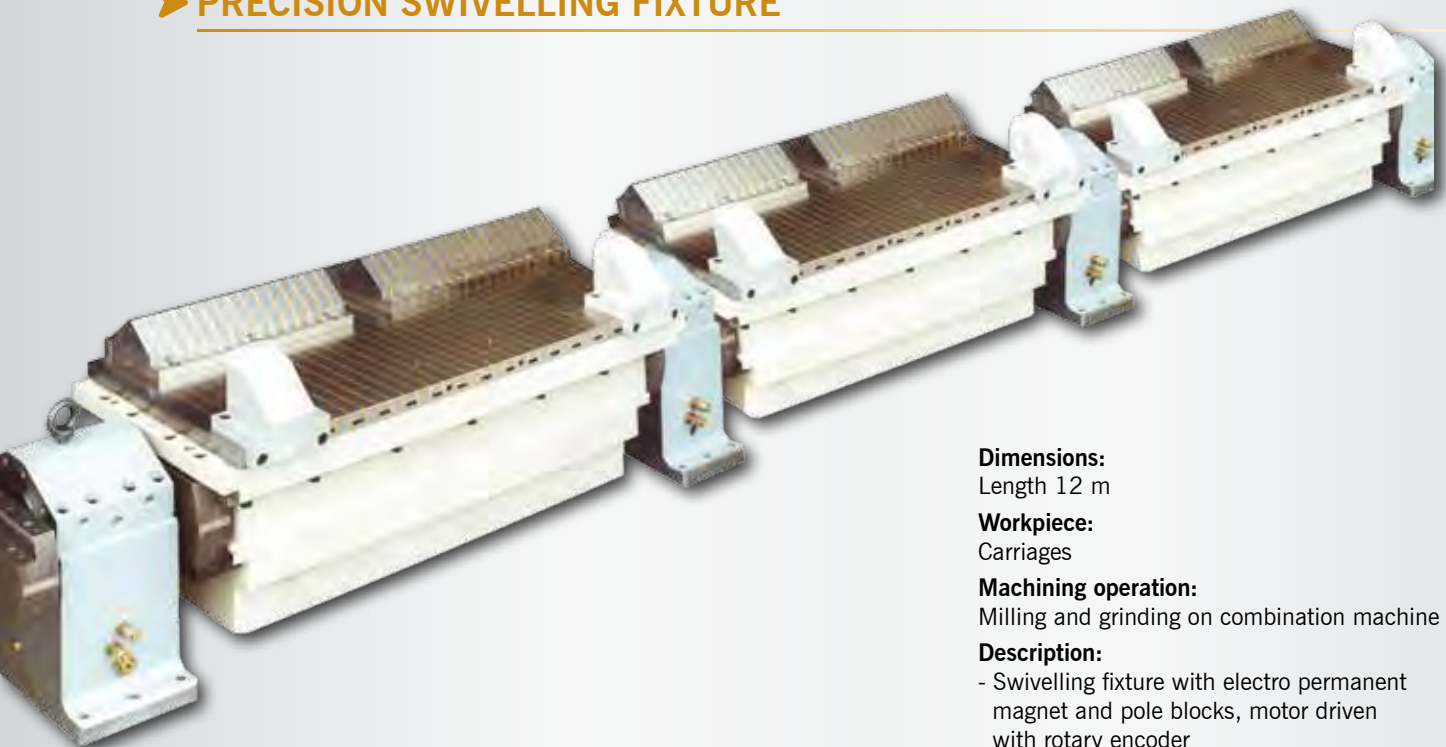
Grinding

Description:

- Swivels about the centre axis $\pm 20^\circ$
- Distortion-free clamping using Spieth-sleeves, both sides



► PRECISION SWIVELLING FIXTURE



Dimensions:

Length 12 m

Workpiece:

Carriages

Machining operation:

Milling and grinding on combination machine

Description:

- Swivelling fixture with electro permanent magnet and pole blocks, motor driven with rotary encoder
- Direct measuring system
- Axes with hydrostatic bearings
- With hydraulic clamping

PRECISION SINE TABLE



SAV 245.01

Swivels on the longitudinal axis

Design:

Swivel on the longitudinal axis. The base plate of the sine table is made of hardened steel (HRC 60), black-finished and precision ground. High accuracy due to extreme flat construction. Standard execution with permanent magnetic chuck. The sine tables are supplied in wooden storage cases up to and including size 450 x 150.

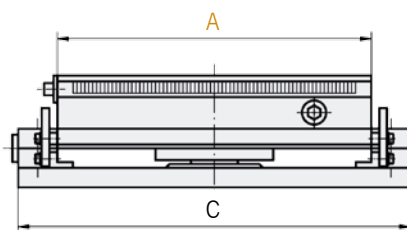
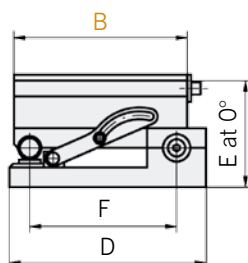
With sine chart degrees / minutes in mm, precision long side stop and short side stop.

Angle precision:	± 5 sec.
Planar parallelism:	± 0.005 / 100 mm
Shimming measure at 0°:	3 mm
Angle range:	0° to 45°
Nominal holding force:	80 N/cm ²
Pole pitch:	1.9 mm
Magnetic field height:	6 mm
Pole plate wearing limit:	8 mm

Application:

The angle is set according the sine principle, using an end-gauge.

Fixation is achieved by side mounted pincers and by tightening the upper bearing clamps.



Dimensions in mm						Weight in kg
A	B	C	D	E _g	F	
140	70	170	100	68	55	5.5
150	150	190	165	79	135	12.0
175	100	215	115	77	85	10.0
250	100	290	115	77	85	16.0
255	130	295	145	77	115	19.0
250	150	290	165	79	135	20.5
300	150	340	165	79	135	26.5
300	200	340	215	79	185	35.0
350	150	390	165	87	135	35.0
400	200	440	215	87	185	52.0
450	150	490	165	87	135	44.0
500	250	560	270	94	235	84.0
600	300	660	320	94	275	121.0

Other dimensions and executions – also with electro magnetic or other magnetic system – and all sizes of permanent magnetic chucks SAV 243.01 are available as sine table.

Execution with flushing channel(s) available at a surcharge.

Ordering example:

Precision Sine Table SAV 245.01 - 300 x 150
Ordering key SAV - No. - A x B

PRECISION SINE TABLE



SAV 245.02

Swivel about longitudinal and transverse axis, with fine pole chuck

Design:

Swivel about the longitudinal and transverse axis. The base plate of the sine table is made of hardened steel (HRC 60), black-finished and precision ground.

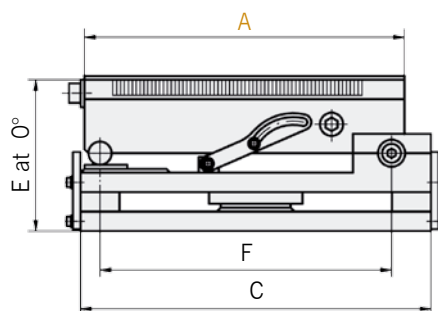
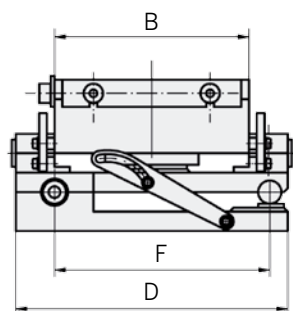
High accuracy due to extreme flat type construction. Standard execution with permanent magnetic chuck. The sine tables are supplied in wooden storage cases with 2 sine charts degrees / minutes in mm, precision long side stop and short side stop.

Angle precision:	± 5 sec.
Planar parallelism:	$\pm 0.005 / 100$ mm
Shimming measure at 0°:	3 mm
Angle range longitudinal axis:	0° to 45°
Angle range transversal axis:	0° to 30°
Nominal holding force:	80 N/cm ²
Pole pitch:	1.9 mm
Magnetic field height:	6 mm
Pole plate wearing limit:	8 mm

Application:

The angle is set according the sine principle, using an end-gauge.

Fixation is achieved by side mounted pincers and by tightening the upper bearing clamps.



Dimensions in mm						Weight in kg
A	B	C	D	E ₂	F	
175	100	210	140	108	160 / 115	15,0
255	130	290	170	119	240 / 145	32,0
300	150	335	190	121	285 / 160	43,5
350	150	385	190	121	335 / 160	49,5
400	200	435	240	117	385 / 210	73,0

Execution with flushing holes available against price adder.

Other dimensions and executions – also with electro magnetic or other magnetic system – and all sizes of permanent magnetic chucks SAV 243.01 are available as sine table.

Ordering example:

Precision Sine Table SAV 245.02 - 400
Ordering key SAV - No. - A

PRECISION SINE TABLE



SAV 245.03

Swivels about the transverse axis

Design:

Swivels about the transverse axis. The base plate of the sine table is made of hardened steel (HRC 60), black-finished and precision ground. High accuracy due to extremely flat construction. Standard execution with permanent magnetic chuck.

Delivery in wooden storage case.

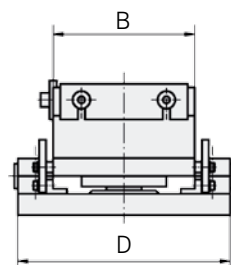
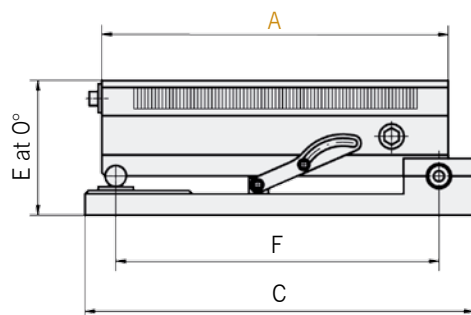
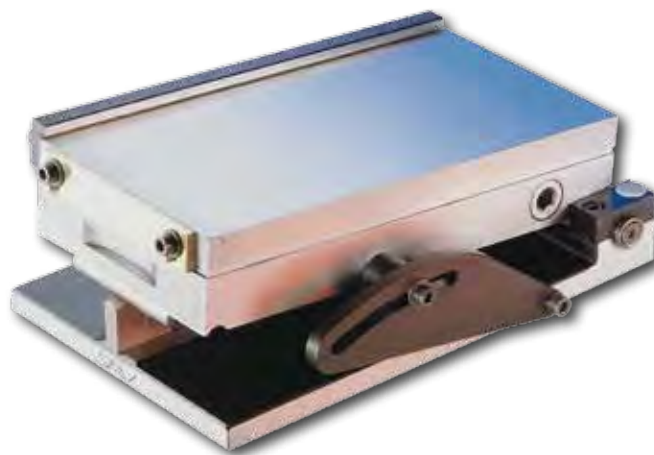
With sine table in degrees / minutes in mm, precision long-side stop and transverse side stop.

Angle precision:	± 5 sec.
Planar parallelism:	$\pm 0.005 / 100$ mm
Shimming measure at 0° :	3 mm
Angle range:	0° to 30°
Nominal holding force:	80 N/cm ²
Pole pitch:	1.9 mm
Magnetic field height:	6 mm
Pole plate wearing limit:	8 mm

Application:

The angle is set according the sine principle, using an end-gauge.

Fixation is achieved by side mounted pincers and by tightening the upper bearing clamps.



Dimensions in mm						Weight in kg
A	B	C	D	E ₂	F	
140	70	145	110	76	125	8.5
175	100	190	140	73	160	10.0
255	130	270	170	78	240	22.0
300	150	315	190	81	285	28.0
400	200	415	240	94	385	55.5
450	150	465	190	89	435	48.0

Other dimensions and executions – also with electro magnetic or other magnet systems – and all standard sizes of the permanent magnet chuck SAV 243.01 (chapter 1) can be supplied as a sine table.

Execution with flushing channel(s) available at a surcharge.

Ordering example:

Precision Sine Table SAV 245.03 - 450
Ordering key SAV - No. - A

PRECISION SINE TABLE



SAV 245.04

Swivel about longitudinal axis, with extreme low height

Design:

Swivel about the longitudinal axis. The base plate of the sine table is made of hardened steel (HRC 60), black-finished and precision ground.

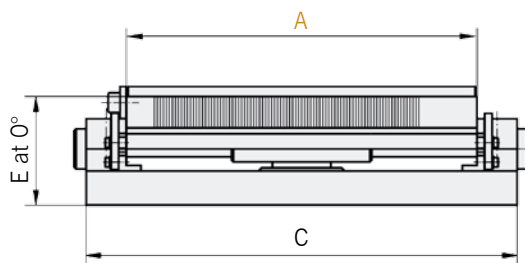
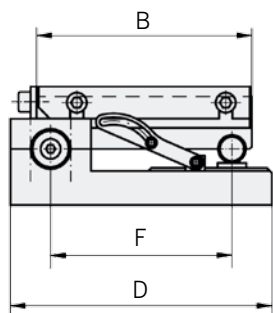
High accuracy due to extreme flat construction. Standard execution with permanent magnetic chuck. ON/OFF-switching on top. The sine tables are supplied in wooden storage cases, with sine chart degrees / minutes in mm, precision long side stop and short side stop.

Angle precision:	± 5 sec.
Planar parallelism:	$\pm 0.005 / 100$ mm
Shimming measure at 0°:	3 mm
Angle range:	0° to 45°
Nominal holding force:	80 N/cm ²
Pole pitch:	1.9 mm
Magnetic field height:	6 mm
Pole plate wearing limit:	6 mm

Application:

The angle is set according the sine principle, using an end-gauge.

Fixation is achieved by side mounted pincers and by tightening the upper bearing clamps.



Dimensions in mm						Weight in kg
A	B	C	D	E ₀	F	
175	100	215	115	60.0	85	8.5
150	150	190	165	62.5	135	10.0
255	130	295	145	60.0	115	14.0
300	150	340	165	62.5	135	20.0
350	150	390	165	70.5	135	26.5
400	200	440	215	71.0	185	41.0
450	150	490	165	70.5	135	33.5

Execution with flushing holes available against price adder.

Ordering example:

Precision Sine Table SAV 245.04 - 450
Ordering key SAV No. - A

PRECISION SINE TABLE



SAV 245.05

Swivels about the transverse axis

Design:

Swivels about the transverse axis. The base plate of the sine table is made of hardened steel (HRC 60), black-finished and precision ground. High accuracy due to extremely flat construction. Standard execution with permanent magnetic chuck.

On/off switch on the top.

Delivery in wooden storage case.

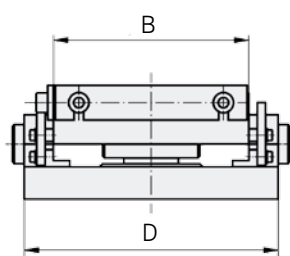
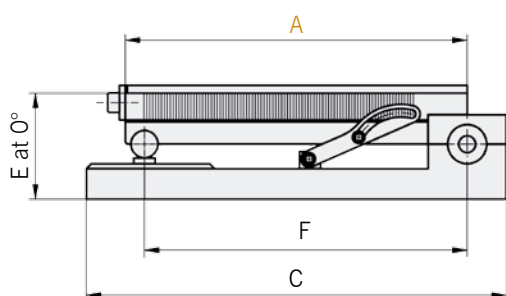
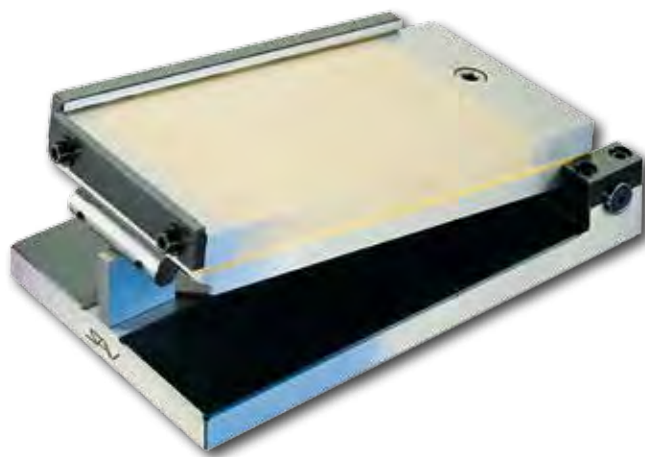
With sine table in degrees / minutes in mm, precision long-side stop and transverse side stop.

Angle precision: ± 5 sec.
Planar parallelism: $\pm 0.005 / 100$ mm
Shimming measure at 0° : 3 mm
Angle range: 0° to 30°
Nominal holding force: 80 N/cm^2
Pole pitch: 1.9 mm
Pole plate wearing limit: 6 mm

Application:

The angle is set according the sine principle, using an end-gauge.

Fixation is achieved by side mounted pincers and by tightening the upper bearing clamps.



Dimensions in mm						Weight in kg
A	B	C	D	E _g	F	
175	100	190	140	57	160	8.5
255	130	270	170	57	240	14.0
300	150	315	190	60	285	20.5
350	150	365	190	68	335	27.5
400	200	415	240	68	385	42.0
450	150	465	190	68	435	35.0

Execution with flushing channel(s) available at a surcharge.

Ordering example:

Precision Sine Table SAV 245.05 - 450

Ordering key SAV - No. - A

PRECISION SINE TABLE



SAV 245.06

Swivel about middle-axis to both sides

For grinding and measuring precision workpieces in every angle position without the need to reclamp the parts.

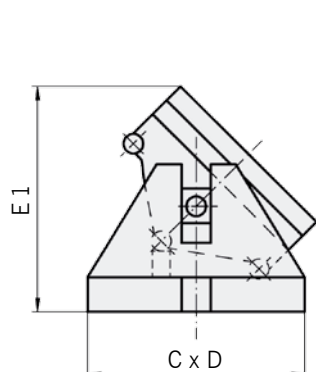
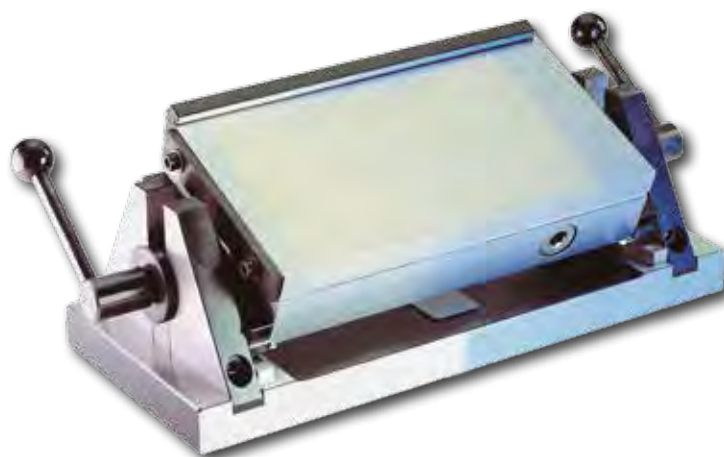
Design:

Swivel about longitudinal axis. Sine table base plate and other parts made from tool steel. Hardened to HRC 60, black finished and precision ground. Standard execution with permanent magnetic chuck 243.01. Highest accuracy and stability in every position. Delivery in wooden storage case up to dimension 350 x 150 mm. With sine table in of degrees / minutes in mm, precision long side stop and transverse side stop.

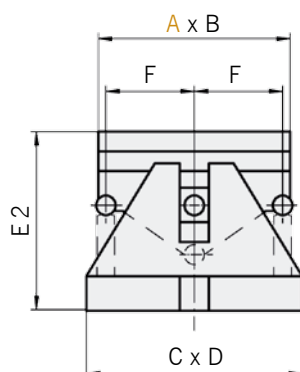
Angle precision: ± 5 sec.
Planar parallelism: $\pm 0.005 / 100$ mm
Angle range: -90° to $+90^\circ$
Nom. holding force: 80 N/cm^2
Pole pitch: 1.9 mm
Magnetic field height: 6 mm
Pole plate wearing limit: 8 mm

Application:

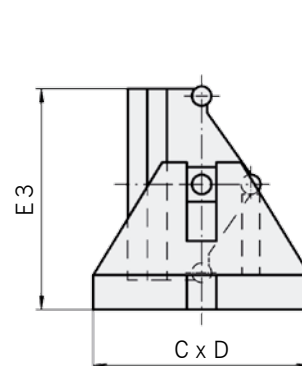
Setting of angles according sine principle, using an end-gauge up to 90° .



Swivel 45° right



0° - position



Swivel 90° left

Dimensions in mm								Weight in kg
A	B	C	D	E1	E2	E3	F	
255	130	365	150	160	125	160	60	30.0
350	150	460	160	175	130	175	70	46.0
400	200	500	200	220	150	220	95	64.0
500	200	600	200	220	150	220	95	78.0
600	200	700	200	220	150	220	95	92.0

Other dimensions and executions also available with electro-magnet or other magnetic systems.

Ordering example:

High precision sine table SAV 245.06 - 600
Ordering key SAV - No. - A

PRECISION SINE TABLE



SAV 245.09

Swivel about longitudinal axis, with electro or electro-permanent chuck

Design:

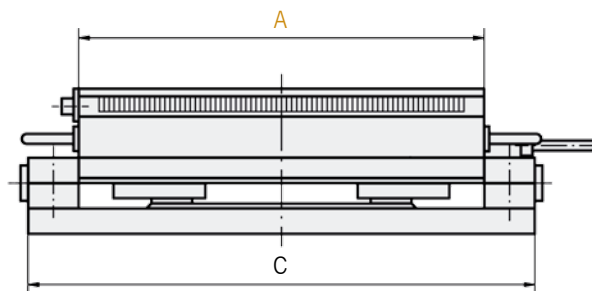
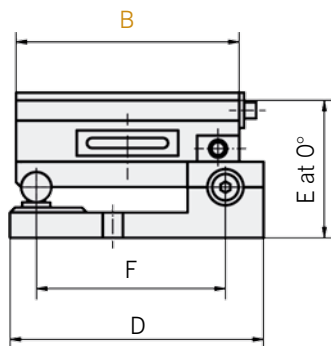
Swivel about the longitudinal axis. The base plate of the sine table is made of hardened steel (HRC 60), black-finished and precision ground. Magnetic chuck housing stress-free annealed. High accuracy due to extreme flat construction. 4-point support for optimal security. The delivery includes a lifting support and setting table degrees / minutes in mm. Fluting stones for fixing on the machine table on bottom side of base plate. Side stops on back and side face sides. This sine table is executed either with electro-magnetic with integrated water cooling (EM) or electro-permanent chuck (EP).

Angle precision: ± 5 sec.
 Planar parallelism: $\pm 0.005 / 100$ mm
 Shimming measure at 0° : 3 mm
 Angle range: 0° to 45°
 Nominal holding force: 100 N/cm^2
 Pole pitch:
 4 mm for Electro Permanent Chuck
 SAV 243.73

13 mm for Electro Magnetic Chuck
 SAV 243.42

Application:

The angle is set according the sine principle, using an end-gauge.



Dimensions in mm						Weight in kg
A	B	C	D	E ₀	F	
450	175	448	203	125,5	175	55,0
500	175	498	203	125,5	175	61,0
500	200	498	228	125,5	200	70,0

Other dimensions on request.
 Also available with other magnet systems.

The assignment of the correct control unit according to page 48 or 90.

Ordering example:

Precision Sine Table SAV 245.09 - 500 x 200 - EP
 Ordering key SAV No. - A x B - Execution

PRECISION SINE TABLE



SAV 245.10

Swivel about longitudinal axis, firmly attached on the machine table

Design:

The base plate of the sine table is made of steel, stress-free annealed. All built-on parts are hardened (HRC 60) and precision ground. Stable construction with high accuracy. Depending on size fitted with mechanical adjusting gear or hydraulic swivel support. High accuracy due to extreme flat construction.

4-point support for optimal security.

Available with angle gauge and additional fixation on request. This sine table is standard executed with electro-permanent chuck SAV 243.70.

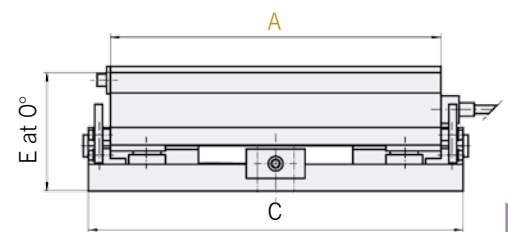
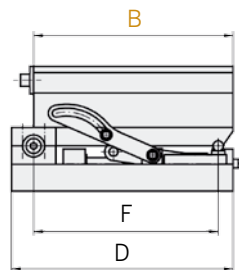
Delivery with sine chart with degrees / minutes in mm, precision long side stop and short side stop, 3 m connecting cable, lacquered magnet body.



Shimming measure at 0°: 5 mm
 Angle range: 0° bis 45°
 Angle precision: ± 5 sec.
 Planar parallelism: ± 0,005 / 100 mm
 Pole Pitch: 13 / 18 / 25 mm
 Nominal holding force: 90 / 110 / 115 N/cm²
 Magnet voltage: 360V

Application:

The angle is set according the sine principle, using an end-gauge.



Dimensions in mm						Weight in kg	Control unit
A	B	C	D	E ₁ * mm	F		
400	200	460	280	165	175	90	EP 2
500	200	560	280	176	175	120	EP 2
500	250	560	315	165	225	138	EP 2
600	200	660	280	165	175	170	EP 2
600	300	660	370	170	275	200	EP 2
800	300	860	370	186	375	250	EP 2
800	400	860	455	186	375	320	EP 2

*Depending on magnet type.
 The given heights refer to electro-permanent (EP) magnetic chuck SAV 243.70.

Other sizes and executions on request. Also available with electro-magnet (E) or other magnetic systems.

Please specify type of magnet when ordering.
 (see chapter 1, 2, 3)

The assignment of the correct control unit according to page 48 or 90.

Ordering example:

Precision Sine Table SAV 245.10 - 800 x 300 - 18 - 360 V
 Ordering key SAV No. - A x B - Pole Pitch - Voltage

PRECISION SINE TABLE

Also in tool-steel execution

Swivels about the longitudinal axis,
with switchable Permanent magnet block SAV 242.11

Design:

Swivels about the longitudinal axis. The base plate of the sine table is made of hardened steel (HRC 60), black-finished and precision ground.

Delivery in wooden storage case.

With sine table in degrees / minutes in mm,

Tool steel execution (RF) can be supplied.

Angle precision: ± 5 sec.

Planar parallelism: $\pm 0,005 / 100$ mm

Shimming measure at 0°: 3 mm

Angle range: 0° bis 45°

Nominal holding force: 50 N/cm²

Nominal holding force tool steel: 30 N/cm²

Application:

The angle is set according the sine principle. The switchable magnet block is detachable and can be used without the sine table. All four clamping surfaces of the magnet block are magnetically active.

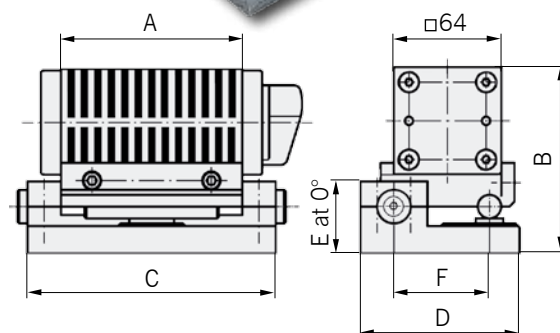
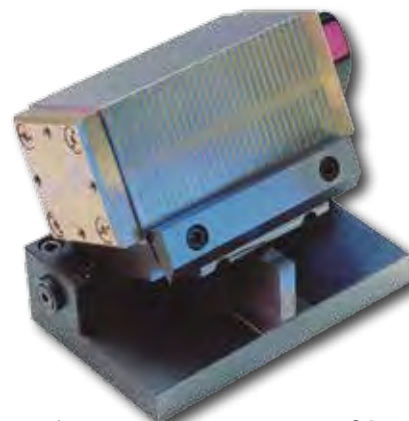
Dimensions in mm						Weight in kg
A	B	C	D	E ₂	F	
140	118.5	150	95	54	65	7.2

Ordering example:

Precision Sine Table SAV 245.40 - RF
Ordering key SAV - No. - Execution



SAV 245.40



PRECISION SINE TABLE

Also in tool-steel execution

Swivels about the transverse axis,
with switchable Permanent magnet block SAV 242.11

Design:

Swivels about the transverse axis. The base plate of the sine table is made of hardened steel (HRC 60), black-finished and precision ground.

Delivery in wooden storage case.

With sine table in degrees / minutes in mm, Tool steel execution (RF) can be supplied.

Angle precision: ± 5 sec.

Planar parallelism: $\pm 0,005 / 100$ mm

Shimming measure at 0°: 3 mm

Angle range: 0° bis 45°

Nominal holding force: 50 N/cm²

Nominal holding force tool steel: 30 N/cm²

Application:

The angle is set according the sine principle. The switchable magnet block is detachable and can be used without the sine table. All four clamping surfaces of the magnet block are magnetically active.

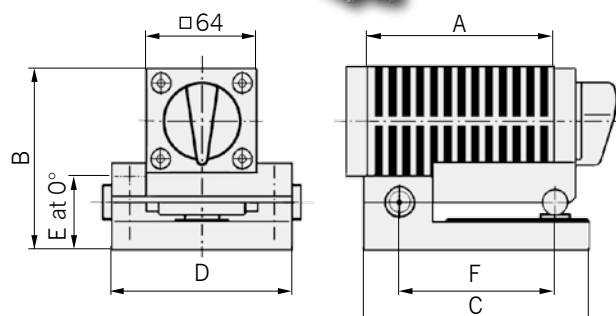
Dimensions in mm						Weight in kg
A	B	C	D	E ₂	F	
140	118.5	130	95	54	100	7.8

Ordering example:

Precision Sine Table SAV 245.41 - RF
Ordering key SAV - No. - Execution



SAV 245.41



CHAPTER OVERVIEW

CHAPTER 7

Page 127 - 138

	SAV-ART.-NO.	COMMENTS	PAGE
ELECTRO HOLDING MAGNETS			
	241.29	Flat design, used primarily in handling applications	129
	241.31	With 2 types of electrical connection, Applications in fixtures and the production process	130
	241.32	Electro-magnetic holding beams with high holding forces	131
	241.40	Electrically deactivated permanent magnets	132
	241.41	Electrically deactivated permanent magnets	133

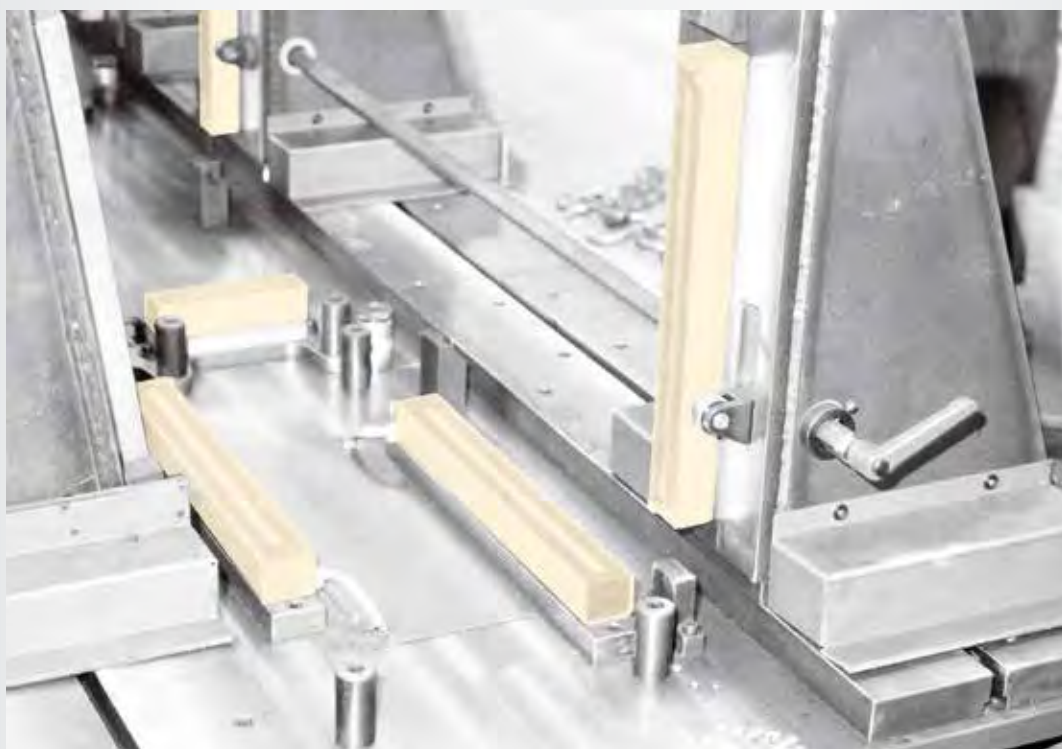
STROKE MAGNETS			
	241.50	High power single stroke magnets	134
	241.51	Single stroke magnets	135
	241.52	Locking magnets	136
	241.53	Locking magnets	137
	241.90	Accessories	138

APPLICATIONS

► **HOLDING MAGNET SYSTEMS** Special solutions



Magnetic welding fixture in a special execution. For details, see below.



Detail: Positioning using mechanical stops.
The holding force is exerted by the electro magnetic holding beams **SAV 241.32**, Type D.

ELECTRO HOLDING MAGNETS

SAV 241.29

Flat design

Use:

Due to the extremely low construction design, these Holding magnets are used primarily in handling applications. When switched on, the active magnet enables the holding of ferro-magnetic workpieces. To reach the nominal holding force, the steel poles of the holding surface must be completely covered by the workpiece.

Features:

The holding magnets consist of an electromagnetic holding system.

Depending upon the area of application, the corresponding accident prevention regulations must be complied with.

For devices in safety class 1, the user must ensure that the equipment grounding conductor corresponds with the provisions of VDE 0100 § 6.

When using the devices, the technical notes (chapter 10) should be noted.

Nominal Voltage: 24 V DC
Duty cycle: 100 % ED
Protection rating: IP 65
according to DIN 40050
Isolation class: E

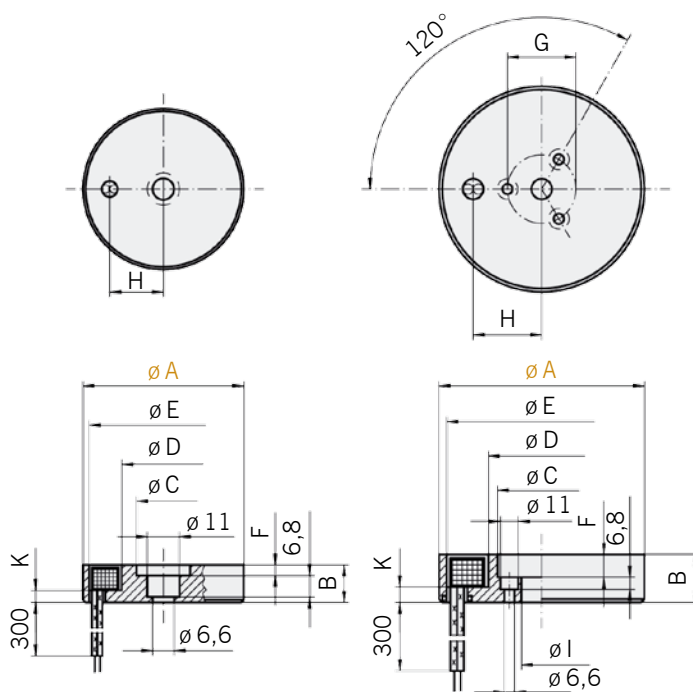
Notes to technical data:

The maximum holding forces are given for St 37 and are based on optimal workpiece thickness, at an air gap $\partial L = 0$ and 100% coverage of clamping surface.

The values are given for 90% nominal voltage and at an operating state temperature (approx. 60 °C over-temperature without additional heat transfer).

If the application is based on other conditions, the holding force is reduced (see technical notes, chapter 10). For safety reasons and depending on the application, a safety factor is to be taken into account.

The nominal power values in the table are intended to determine the correct electronic accessories and are based on 20°C excitation winding temperature at nominal voltage (VDE 0580/ 10.70 § 9.1). During operation the power decreases in relation to the length of the duty cycle. The holding magnets are fixed from the front using cylinder screws.



SAV 241.29 - 56

SAV 241.29 - 110 and -170

Dimensions in mm										Nominal Force in N	Optimum work-piece thickness in mm	Power in W	Weight in kg
A ±0.3	B	C	D	E	F	G	H	I	K				
56	13	23.0	32.0	51.5	4	-	23.5	-	3.7	750	>4.0	7.1	0.17
110	21	53.5	65.3	103.5	10	40	49.2	26	5.5	2050	>6.0	14.7	0.90
170	29	90.7	110.3	158.0	19	76	76.4	60	9.0	5000	>10.0	31.4	3.00

Ordering example:

Electro Holding Magnet SAV 241.29 - 170
Ordering key SAV - No. - A

ELECTRO HOLDING MAGNET

SAV 241.31

with 2 types of electrical connection

Use:

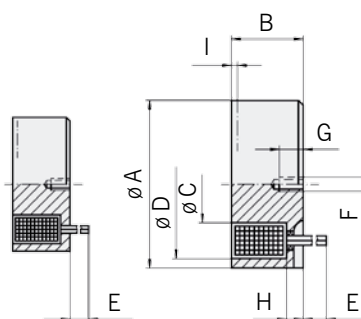
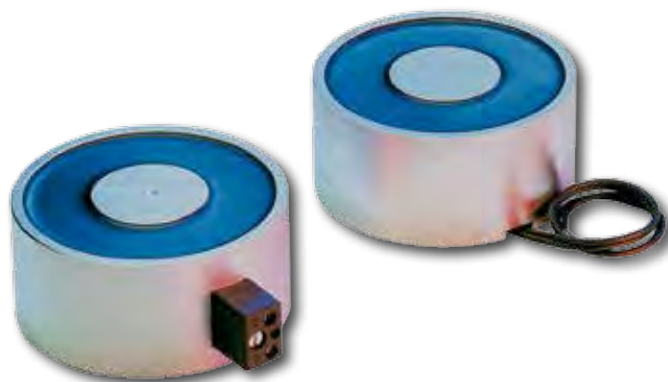
Electro holding magnets can hold ferrous magnetic workpieces. Their application is found in steel construction, production and have significant advantages in handling small and medium mass products. To reach the nominal holding force, the steel poles of the holding surface must be completely covered by the workpiece.

Notes to technical data:

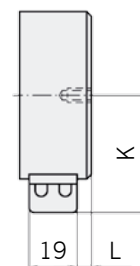
The maximum holding forces are given for St 37 and are based on optimal workpiece-thickness, at airgap $dL = 0$ and 100% coverage of clamping surface.

The values are given for 90% nominal voltage and warmed condition (approx. 60 K over-temperature without additional heat transfer). If the application is based on other conditions, the holding force is reduced.

Nominal Voltage: 24 V DC
Duty: 100 %
Isolation class: E



SAV 241.31
- A 01
with connecting wire



SAV 241.31,
Type A
with stripped
connecting wire

SAV 241.31,
Type B with
connection terminals

Type and Dimensions	Dimensions in mm											Nominal Force in N	optimum work-piece thickness in mm	Power in W	Weight in kg
	A	B	C	D	E	F	G	H	I	K	L				
A 01	18±0.1	11.0	8.0	16.1	200	M 3	5	2.5	1	-	-	45	>2.0	1.4	0.02
A/B 02	25±0.1	20.0	11.1	22.3	200	M 4	6	3.5	1	28.5	0.5	140	>3.0	3.2	0.06
A/B 03	32±0.1	22.0	14.3	28.6	200	M 4	6	5.0	3	32.5	0.5	230	>3.6	3.6	0.11
A/B 04	40±0.1	25.5	17.9	35.8	200	M 5	8	5.0	3	37.0	0.5	475	>4.5	5.2	0.20
A/B 05	50±0.1	27.0	20.4	44.7	200	M 5	8	5.5	3	42.0	4.5	750	>6.0	6.5	0.30
A/B 06	63±0.1	30.0	28.2	56.3	200	M 8	12	6.0	3	49.0	6.5	1000	>7.0	9.0	0.55
A/B 08	80±0.1	38.0	34.0	72.8	200	M 8	12	8.5	3	57.5	7.5	1800	>9.0	15.0	1.20
A 10	100±0.1	43.0	42.8	91.3	300	M 10	15	10.0	3	-	-	3400	>10.5	20.5	2.10
A 15	150±0.1	56.0	67.9	134.0	300	M 16	24	16.5	3	-	-	9300	>17.0	37.0	6.40
A 18	180±0.1	63.0	84.8	161.0	300	M 24	36	20.5	3	-	-	15000	>21.0	50.0	10.5
A 25	250±0.1	80.0	117.5	223.0	300	M 24	36	28.5	3	-	-	30000	>29.0	90.0	25.9

Ordering example:

Electro Holding Magnet SAV 241.31 - A 01
Ordering key SAV - No. - Type and Dimensions

ELECTRO MAGNETIC HOLDING BEAM

SAV 241.32

with high holding forces

Application:

The apparatus type C is suitable for holding parts with straight surfaces, while Type D can be used for parts with rough or scaled surface. To reach the nominal holding force, the steel poles of the holding surface must be completely covered by the workpiece.

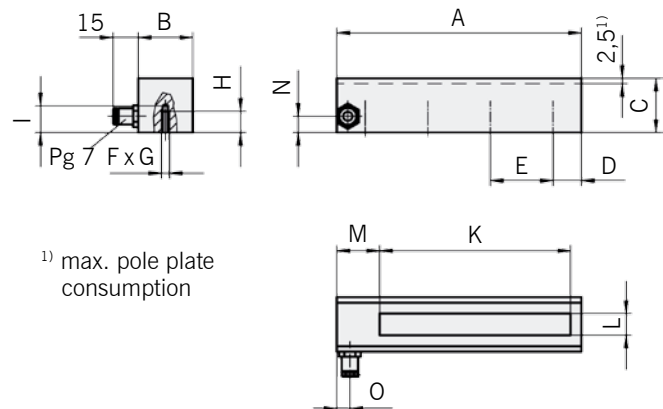
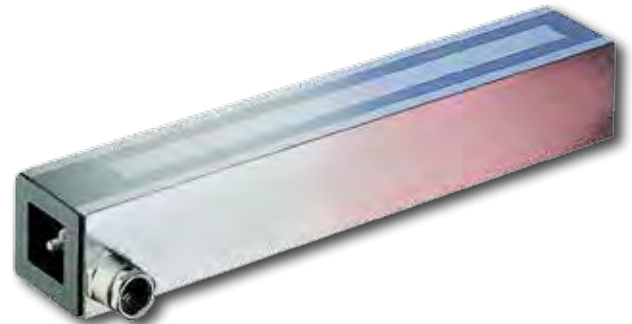
Design:

The electro magnetic holding beams are direct current holding systems. The magnetic circuit is open in switched-on position and makes it possible to hold ferrous magnetic workpieces.

For mounting the magnets are provided with threaded holes in the bottom of the housing. Electrical connection through 2 connection bolts, which are fitted in the housing of the magnet and have easy access. Further a stud is available for mounting of a steel wire as stress release.

These studs can be screwed on the side or bottom. When working with electromagnetic holding beams, one should follow the appropriate rules for the prevention of accidents.

Nominal voltage: 24 V DC
Protection: Housing IP 53 according
DIN 40 050 connection IP 00
Isolation class: E
Duty: 100 %



Notes to technical data:

The nominal power values in the table above are intended to determine the correct electronic accessories and are based on 20°C winding temperature at nominal voltage (VDE 0580/ 10.70 § 9.1).

During operation the power decreases, depending on the duty. The pole pitch as well as their influence on the operation is described in the technical notes. The maximum holding forces FH are given for St 37 and are based on a plate thickness of > 8 mm for Type C and > 10 mm for Type D.

The forces are for an airgap dL=0 and 100% coverage of clamping surface, 90% Nominal voltage and warmed condition (approx. 50 K over-temperature) without additional heat transfer. If the application is based on other conditions, the holding force is reduced. Due to safety reasons and depending on the application a safety factor is to be taken into account.

Type and Dimensions	Dimensions in mm															Pole pitch	Nominal force in N	Nominal Power in W	Weight in kg
	A	B	C	D	E	F	G	H	I	K	L	M	N	O					
C 01	101.5	32	31	20	50	2	M 6	10	13.5	68.0	10	23.5	12	8.5	16	880	7.0	0.65	
C 02	151.5	32	31	20	50	3	M 6	10	13.5	118.0	10	23.5	12	8.5	16	1500	10.5	0.88	
C 03	201.5	32	31	20	50	4	M 6	10	13.5	168.0	10	23.5	12	8.5	16	2100	14.0	1.22	
C 04	401.5	32	31	20	50	8	M 6	10	13.5	368.0	10	23.5	12	8.5	16	4700	25.0	2.48	
C 05	501.5	32	31	20	50	10	M 6	10	13.5	468.0	10	23.5	12	8.5	16	6000	35.0	3.15	
C 06	601.5	32	31	20	50	12	M 6	10	13.5	568.0	10	23.5	12	8.5	16	7200	42.0	3.75	
D 07	151.5	60	49	30	75	2	M 8	12	15.0	93.5	12	36.5	18	10	30	2600	22.0	2.35	
D 08	201.5	60	49	35	120	2	M 8	12	15.0	143.5	12	36.5	18	10	30	3750	31.0	3.20	
D 09	501.5	60	49	35	140	4	M 8	12	15.0	443.5	12	36.5	18	10	30	10400	70.0	9.20	

Ordering example:

Electro Magnetic Holding Beam
Ordering key

SAV 241.32 - D 09
SAV - No. - Type and Dimensions

PERMANENT ELECTRO HOLDING MAGNETS

SAV 241.40

Electrically deactivated permanent magnets

Use:

Due to the permanent magnetic holding system, which is effective in a de-energized state, these holding magnets are used primarily in applications where long holding periods are required and only for short periods or occasionally no holding force is required. Additionally, they are used as safety magnets in transport equipment and lifting gear as the load is reliably held in the case of a power failure. To reach the nominal holding force, the steel poles of the holding surface must be completely covered by the workpiece.

Features:

The holding magnets consist of a permanent magnetic holding system to hold ferro-magnetic workpieces and an excitation winding, which neutralises the magnetic field on the holding surface when activated and allows the removal or setting down of loads. Depending upon the area of application, the corresponding accident prevention regulations must be complied with.

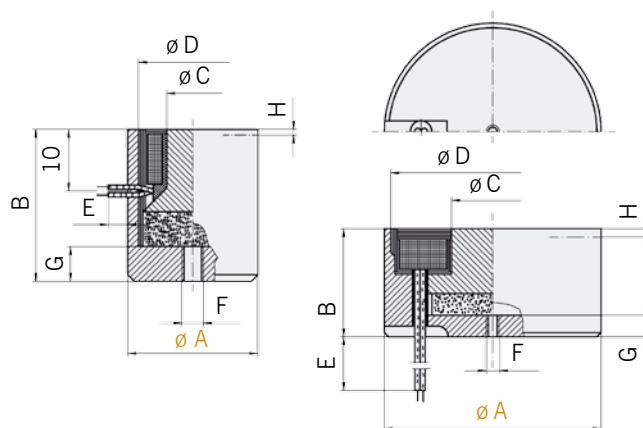
When using the devices, the technical notes (chapter 10) should be noted.

Nominal Voltage: 24 V DC
Isolation class: E
Protection rating: Housing IP 65 according to DIN 40050

Duty cycle:
25% at a cycle time of < 2 min or
40% at a cycle time of < 0.5 min
The relative duty cycle is:

$$\text{rel. duty cycle} = \frac{\text{duty cycle}}{\text{cycle time}} \cdot 100 \%$$

Adherence to the specified values for the duty cycle and cycle time and a nominal voltage of +5% or -10%, ensures that a reliable deactivation of the permanent magnetic system is achieved. This ensures the safe release of the load. The prevailing residual force then represents max. 3% of the nominal holding force. The holding magnet is not thermally overloaded during continuous operation. The thereby resulting over-temperature of the excitation winding however causes an increase in the residual force.



SAV 241.40 - 20

SAV 241.40 - 35
to SAV 241.40 - 150

Dimensions in mm								Nominal Force in N*	Optimum work-piece thickness in mm	Nominal power in W	Inductivity unloaded in H	Inductivity loaded in H	Weight in kg
A	B	C	D	E	F	G	H						
20	22	9.0	18.0	200	M 4	5	1	40	>2.5	3.6	0.11	0.8	0.04
35	28	11.2	33.0	200	M 4	5	2	160	>3.0	4.6	1.12	4.9	0.20
55	36	18.0	52.0	200	M 5	6	2	420	>4.5	9.0	0.82	4.65	0.50
70	45	24.0	65.6	200	M 8	8	2	720	>6.0	13.3	0.72	4.42	0.90
90	48	30.0	84.7	200	M 8	8	2	1200	>7.5	21.8	0.60	4.12	1.70
105	56	37.0	98.0	300	M 10	10	3	1600	>9.0	28.0	0.52	3.13	2.60
150	63	55.0	140.0	300	M 16	16	3	3500	>12.5	44.0	0.46	3.04	6.40

* The nominal holding force values are based upon a 100 % loading of the contact surface with a St 37 workpiece, ground and of optimal loading thickness.

Ordering example:

Permanent Electro Holding Magnet SAV 241.40 - 150
Ordering key SAV - No. - A

PERMANENT ELECTRO HOLDING MAGNETS

SAV 241.41

Electrically deactivated permanent magnets

Use:

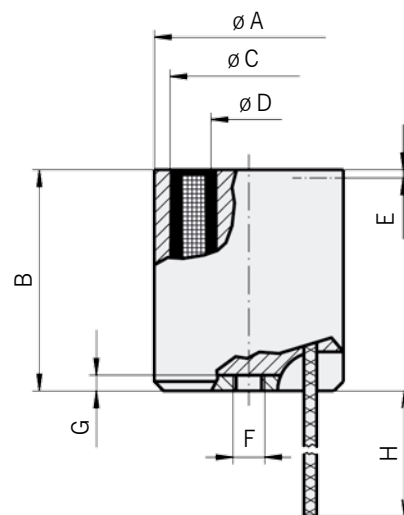
Due to the permanent magnetic holding system, which is effective in a de-energized state, these holding magnets are used primarily in applications where long holding periods are required and only for short periods or occasionally no holding force is required. Additionally, they are used as safety magnets in transport equipment and lifting gear as the load is reliably held in the case of a power failure. To reach the nominal holding force, the steel poles of the holding surface must be completely covered by the workpiece.

Features:

The holding magnets consist of a permanent magnetic holding system to hold ferro-magnetic workpieces and an excitation winding, which neutralises the magnetic field on the holding surface when activated and allows the removal or setting down of loads. If the winding is switched in the same direction, this increases the nominal force. Depending upon the area of application, the corresponding accident prevention regulations must be complied with.

When using the devices, the technical notes (chapter 10) should be noted.

Nominal Voltage:	24 V DC
Isolation class:	E
Protection rating:	Housing IP 65 according to DIN 40050
Duty cycle:	100 % ED



Notes to technical data:

The maximum holding forces are given for St 37 and are based on optimal workpiece thickness, at an air gap $\Delta L = 0$ and 100% coverage of clamping surface. The values are given for an operating state temperature.

There is no thermal overloading during continuous operation. However the thereby resulting over-temperature causes an increase in the residual force. If the application is based on other conditions, the nominal holding force is reduced (see technical notes, chapter 10).

For safety reasons and depending on the application, a safety factor is to be taken into account. The nominal power values in the table are intended to determine the correct electronic accessories and are based on 20°C excitation winding temperature at nominal voltage (VDE 0580/ 10.70 § 9.1). During operation the power decreases in relation to the length of the duty cycle.

Dimensions in mm								Nominal Force in N	Optimum work-piece thickness in mm	Switch off voltage in V	Power in W	Weight in kg
A	B	C	D	E	F	G	H					
32.2	40	28	15.5	2	M 4	5	200	260	>10.0	24	6	0.2

Ordering example:

Permanent Electro Holding Magnet SAV 241.41
Ordering key SAV - No.

HIGH POWER SINGLE STROKE MAGNETS

SAV 241.50

High power design

Features:

The quadratic magnets (solenoids) are particularly notable due to their enormous stroke work density and modular design. They are used in applications where large forces are required in a restricted space, such as:

- High power circuit breakers
- Locking of train doors
- Automation technologies
- General types of actuating functions
- Park systems
- Modular construction

Executions: Wires or DIN-plug

Options: see accessories

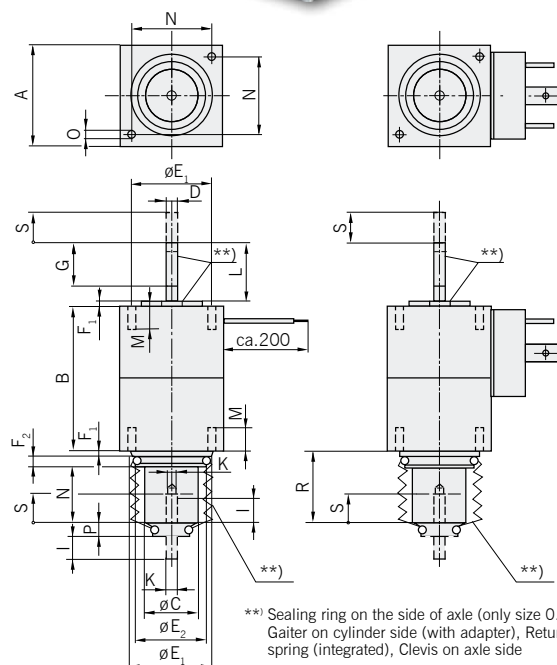
- The anchor is moved through the whole length of the stroke travel by electro magnetic force
- Return from the stroke end position to the start position through external forces or by an internal return spring
- Maximum stroke work through optimal magnetic circuit design
- Can be installed in any position, axial force reduction (transversal forces lead to increased bearing wear)
- Devices can be used in push or pull executions
- Stroke limitation to stroke start and end positions (adjustable through optional screw nuts)

The products and devices are constructed and tested according to DIN VDE 0580/07.2000.

Standard voltage: 24 V DC

Other non-standard values available at a surcharge.

Thermal class: F (Limit temperature 155 °C)



Stroke s in mm	Dimensions in mm																		Standard stroke	Optional stroke lengths	s _{max}	Weights in g	
	A	B	C	D	E ₁	E ₂	F ₁	F ₂	G	H	I	K	L	M	N	O	P	R				Anchor	Total
5	25	55	11.5	M4	20	18	2	2	11.5	10.5	8	M4	11.5	6	19.8	M3	4	14.5	5	10	42	92.5	46.4
10	35	53	18	M6	28	24	2	3	17.6	20.5	12	M6	17.6	8	27	M4	5.5	25.5	10	5.15.20	47.5	107	58.5
20	70	110	35	M10					20			M10	25	10	54	M6		26	20	10. 30	54	177	85

Technical data without over-excitation																	
Stroke s in mm	Lifting power P ₂₀ in W	100 % Duty cycle				40 % Duty cycle				25 % Duty cycle				5 % Duty cycle			
		Nom. power P ₂₀ in W	Stroke work W in Ncm	Pick-up time t ₁ in ms	Release time t ₂ in ms	Nom. power P ₂₀ in W	Stroke work W in Ncm	Pick-up time t ₁ in ms	Release time t ₂ in ms	Nom. power P ₂₀ in W	Stroke work W in Ncm	Pick-up time t ₁ in ms	Release time t ₂ in ms	Nom. power P ₂₀ in W	Stroke work W in Ncm	Pick-up time t ₁ in ms	Release time t ₂ in ms
05	-	20	13	107	49	39.5	20	90.5	40.2	57.5	23	99	39	173.5	42	92.5	46.4
10	-	20	11	109.5	64	39.5	20	107.2	56.4	57.5	23.5	107	58.5	173.5	47.5	107	58.5
20	-	20	9	143.5	93	39.5	19	141	88	57.5	25	177	85	173.5	54	177	85
Technical data with over-excitation																	
05	12.5	-	-	-	-	40	27	56	38.2	62	31.5	60.2	32.6	173	54	48.6	37.8
10	12.5	-	-	-	-	40	28.4	72	45.4	62	34.7	71.4	46.4	173	63.9	67.6	52.2
20	12.5	-	-	-	-	40	36	91.2	80.2	62	41.4	98.8	75.2	173	80	86	65.2

Ordering example:

High Power Single Stroke Magnet SAV 241.50 - 10

Ordering key SAV - No. - Hub

SINGLE STROKE MAGNETS

SAV 241.51

Compact design

Features:

In these single stroke magnets, the stroke travel from the stroke end position to the start position is by means of electro magnetic force and the return through external forces.

With increasing magnetic force progression.

These magnets do not include a stroke limiter for the anchor. The limitation must be provided by the device that is to be attached.

Can be installed in any position, the force reduction is only intended in the axial direction.

For devices in safety class 1, the user must ensure that the equipment grounding conductor corresponds with the provisions of DIN VDE 0100.

The products and devices are constructed and tested according to DIN VDE 0580/07.2000.

Standard voltage: 24 V DC

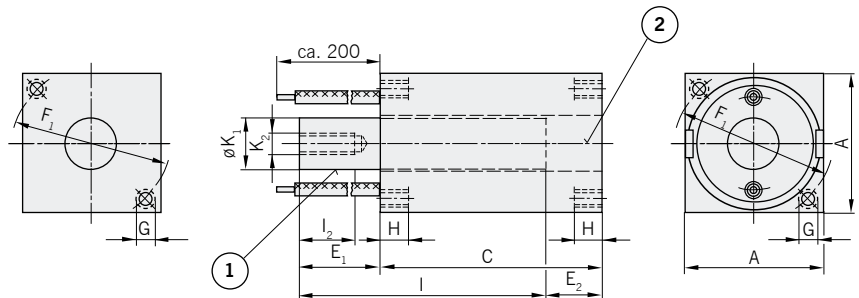
Other voltages up to max. 60 V DC and duty cycles not listed in the table are available at a surcharge.

Protection rating: IP 20

Isolation class: F



- ① Anchor can be used in the opposite position (Winding K2 upwards).
- ② For pushing operations, insert plunger made of non-magnetic material (brass or similar).



Dimensions in mm										
A	C	E ₁	E ₂	F ₁	G	H	I ₂	K ₁	K ₂	I
16	28	12	10	18	M 2.5	4	10	7	M 3	30
20	32	15	13	22	M 2.5	5	10	8	M 3	34
25	40	22	17	28	M 3	5	10	9.5	M 4	45
30	46.5	20.5	17	33	M 3	5	10	11.5	M 4	50

Magnet force, switching times and input power														
Stroke s in mm	100 % Duty cycle			40 % Duty cycle			25 % Duty cycle			5 % Duty cycle			Weight	
	Nom. power P _N in W	Pick-up time t ₁ in ms	Release time t ₂ in ms	Nom. power P _N in W	Pick-up time t ₁ in ms	Release time t ₂ in ms	Nom. power P _N in W	Pick-up time t ₁ in ms	Release time t ₂ in ms	Nom. power P _N in W	Pick-up time t ₁ in ms	Release time t ₂ in ms	Anchor ca. m in g	Total ca. m in g
6	4	50	25	7.5	40	20	9.5	35	20	26	25	15	11	50
8	4.5	50	25	8	45	20	11	40	20	30	25	15	18	75
10	6	50	30	11	45	25	15	40	20	45	30	15	30	170
10	8	55	30	16	45	25	23	45	20	80	30	15	40	260

Ordering example:

Single Stroke Magnet SAV 241.51 - 8 - 4,5
Ordering key SAV - No. - Hub - Nominal power

LOCKING MAGNETS

SAV 241.52

für hohe Querkräfte, stromlos entriegelt

Use:

Electro-magnetic locking unit especially for use in safety mechanisms on all types of machinery and automation systems. During development, particular importance was placed on a compact construction, universal range of fastening options and the integrated feedback of the locking function. These devices reliably fulfil the requirements of the accident prevention regulations.

Features:

Magnet anchor and locking bolts are separately guided in maintenance-free bearings with a high resistance to wear. The built-in micro-switch signals the position of the locking bolt approx. 0.5 to 1mm after leaving the stroke start position and before reaching the stroke end position. The return of the locking bolt to the locked position is by means of an integrated return spring.

In order to ensure a quick and safe electrical connection to the magnet and for the feedback signal, a built-in plug according to DIN 43651 has been used.

For operation of the locking unit with a voltage of over 48 V DC, the magnet connection is via an additional plug, according to DIN EN 175301-803 (DIN 43650), mounted on the magnet housing.

The magnetic force values are achieved at 90% of the nominal voltage and at an operating state temperature in accordance with DIN VDE 0580/07.2000 and apply to a connection voltage of 24 V DC. Operating at 100% of the nominal voltage increases the magnetic forces by approx. 20%. For other connection voltages, the magnetic forces may lie above or below the stated values due to the differences in the copper fill factor. The release times apply to DC switching. In operation with an in-line rectifier and AC switching, the release times are a factor of 2-3 higher.

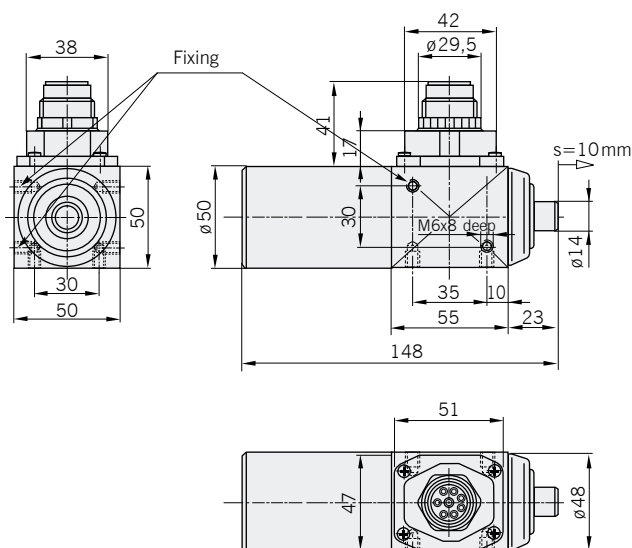
Device plug sockets are not supplied as standard and must be ordered separately.

Surface: Solenoid galvanized

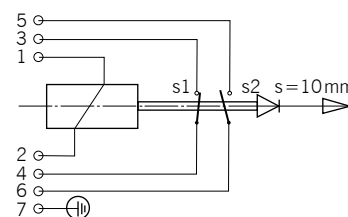
Housing: Aluminium

Technical data:

- Thermal class according to DIN VDE 0580/07.2000 (F)
- Duty cycle 100%
- Protection rating according to IEC 60529: IP 64
- Initial force / locking bolts $F_A = 7 \text{ N}$
- Holding force / locking bolts $F_H = 35 \text{ N}$
- Return force / locking bolts $F_R = 20 \text{ N}$
- Attraction time $t_1 = 120 \text{ msec}$
- Release time $t_2 = 100 \text{ msec}$
- Radial force / static 3000 N



Switching diagram and pin assignment on plug (Magnet - zero current)



Ordering key	Function (no current)	Stroke in mm	Power in W	Locking bolts ø in mm	Signaller H _A H _E	Weight in kg
SAV 241.52	Released	10	18.5	14	x x	1.4

Custom executions on request.

Ordering example:

Locking Magnet SAV 241.52
Ordering key SAV - No.

LOCKING MAGNETS

SAV 241.53

For high transversal forces, locked in a de-energized state

Use:

Electro-magnetic locking unit especially for use in safety mechanisms on all types of machinery and automation systems. During development, particular importance was placed on a compact construction, universal range of fastening options and the integrated feedback of the locking function. These devices reliably fulfil the requirements of the accident prevention regulations.

Features:

Magnet anchor and locking bolts are separately guided in maintenance-free bearings with a high resistance to wear. The built-in micro-switch signals the position of the locking bolt approx. 0.5 to 1mm after leaving the stroke start position and before reaching the stroke end position. The return of the locking bolt to the locked position is by means of an integrated return spring.

In order to ensure a quick and safe electrical connection to the magnet and for the feedback signal, a built-in plug according to DIN 43651 has been used.

For operation of the locking unit with a voltage of over 48 V DC, the magnet connection is via an additional plug, according to DIN EN 175301-803 (DIN 43650), mounted on the magnet housing.

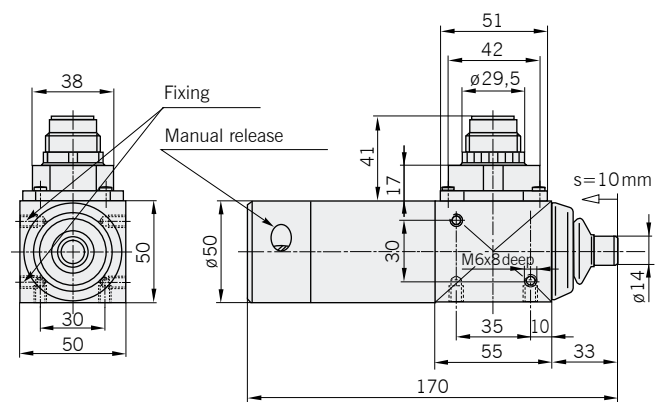
The magnetic force values are achieved at 90% of the nominal voltage and at an operating state temperature in accordance with DIN VDE 0580/07.2000 and apply to a connection voltage of 24 V DC. Operating at 100% of the nominal voltage increases the magnetic forces by approx. 20%. For other connection voltages, the magnetic forces may lie above or below the stated values due to the differences in the copper fill factor. The release times apply to DC switching. In operation with an in-line rectifier and AC switching, the release times are a factor of 2-3 higher.

Device plug sockets are not supplied as standard and must be ordered separately.

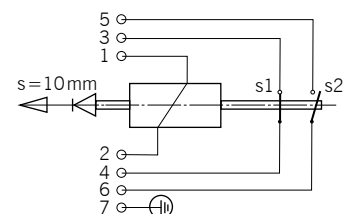
Surface: Solenoid galvanized
Housing: Aluminium

Technical data:

- Thermal class according to DIN VDE 0580/07.2000 (F)
- Duty cycle 100%
- Protection rating according to IEC 60529: IP 64
- Initial force / locking bolts $F_A = 7 \text{ N}$
- Holding force / locking bolts $F_H = 35 \text{ N}$
- Return force / locking bolts $F_R = 20 \text{ N}$
- Attraction time $t_1 = 120 \text{ msec}$
- Release time $t_2 = 100 \text{ msec}$
- Radial force / static 3000 N



Switching diagram and pin assignment on plug (Magnet - zero current)



Ordering key	Function (no current)	Stroke in mm	Power in W	Locking bolts ϕ in mm	Signaller H_A H_E	Weight in kg
SAV 241.53	Locked	10	18,5	14	x x	1,4

Custom executions on request.

Ordering example:

Locking Magnet SAV 241.53
Ordering key SAV - No.

ACCESSORIES – ROUND CONNECTOR PLUG

SAV 241.90

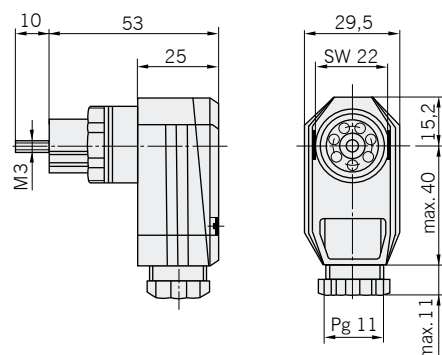
Round connector plug according to DIN 43651

Use:

Round connection sockets, according to DIN 43651, are used for electrical connections to locking units. The connection plug is supplied in a 6-pin design including ground connection. Fixing is via a cylinder screw (supplied). This ensures the effective sealing of the combination and prevents the unintentional disconnection of the plug connector.

Features:

A cable gland PG 11 is used to seal the cable connection. The wires are connected using crimps. The max. wire cross section is 1.5 mm². When plugged-in and secured, the connection has a protection rating of IP 65 according to IEC 60529. The permissible continuous limit temperature is 90°C. A limit of 120°C is permissible for short periods without damaging the plug connector.



Ordering example:

Round Connector Plug
Ordering key

SAV 241.90
SAV - No.

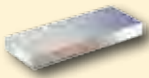
Accessories - quadratic	Standard	Special accessories on request	Limited application
Plug connector		✓	
Free wire ends 200 mm	✓		
Without gaiter	✓		
Gaiter pull-side/sealing ring push-side		✓	
Threaded bolt push-side	✓		
Threaded bolt pull-side*		✓	
Hexagon nut push-side	✓		
Without return spring	✓		
With return spring		✓	
Without clevis	✓		
Clevis with ES-bolts			
With clevis GKO M3 (with/without ES-bolts)		✓	
With clevis GKO M4 (with/without ES-bolts)		✓	
With clevis GKO M5 (with/without ES-bolts)		✓	
With clevis GKO M6 (with/without ES-bolts)		✓	
With clevis GKO M8 (with/without ES-bolts)		✓	
With clevis GKO M10 (with/without ES-bolts)		✓	
With clevis GKO M12 (with/without ES-bolts)		✓	
Plug connector with bridges-GR GDSB 211 2A		✓	
Plug connector with bridges -GR GDSB V211 4A		✓	
Plug connector without bridges -GR GD311 2A		✓	
Switching unit with over-excitation – Nom. power max. 48 W			✓

* only in connection with a gaiter on the pull-side/sealing ring push-side

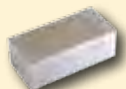
CHAPTER OVERVIEW

CHAPTER 8

Page 139 - 150

	SAV-ART.-NO.	POLE PITCH	COMMENTS	PAGE
LAMINATED TOP PLATES / CLAMPING BEAMS/ LAMINATED BLOCKS				
	248.01	4 mm	for use on circular magnetic chucks	141
	248.02	4 mm	for magnetic chucks with transverse poles	141
	248.03	4 mm	for use on magnetic chucks	142
	248.40	–	for clamping of non-magnetic workpieces	142
	248.60	4 mm	for use on magnetic chucks	143
	248.61	4 mm	in storage case	143

PERMANENT-MAGNET CLAMPING BLÖCKS				
	242.01	1,3 - 4 mm	with fine and super-fine pole pitch	144
	242.02	1,5 mm	with 3 magnetic sides, switchable	144
	242.07	–	with 1 magnetic sides, switchable	145
	242.11	4 mm	with 4 magnetic sides, also stainless	145

NEODYMIUM MAGNET CLAMPING BLÖCKS				
	242.05	6 mm	extreme high holding force	146
	242.12	6 mm	for wire erosion, rust-free, with extreme high holding forc	146

MAGNETIC BEAMS				
	240.62	–	for universal use	147
	243.15	1,3 mm	switchable, for EDM applications	147

PERMANENT MAGNET V-BLOCKS				
	242.21	bipol	with 4 magnetic surfaces, 2 opposite-facing switching points	148
	242.22	bipol	2 magnetic contact surfaces, switched on and off together	148
	242.25	bipol	2 magnetic contact surfaces, switched on and off together	149
	242.29	–	3 magnetic clamping surfaces, in sealed execution	149
	242.31	bipol	4 magnetic clamping surfaces; strongly holding V-block, switchable	150

PRECISION ANGLE-SETTING TOOL				
	487.40	–	easy to use due to its magnetic adhesion	150

APPLICATIONS

► ELECTRO PERMANENT MAGNET with adapter pole plate

Dimensions:

600 x 400 mm

Workpiece:

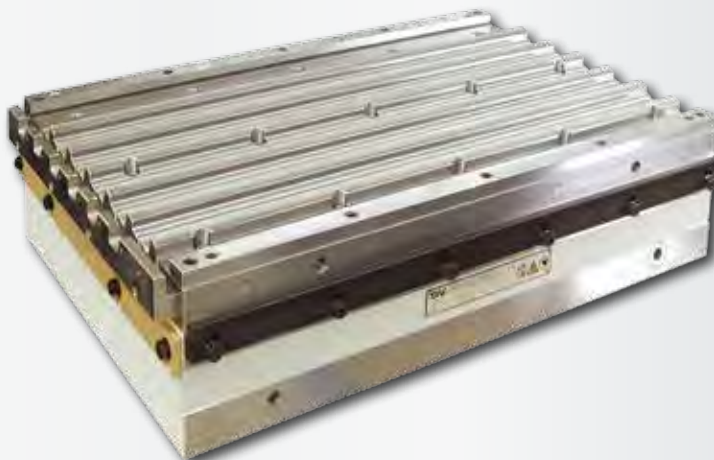
Runner blocks

Machining operation:

Grinding of head and side surfaces

Description:

- Loaded in V-block
- With stops and magnetically active positioning
- Exchangeable pole plate



► GEAR DRIVEN POLE PLATE in special execution

Dimensions:

Diameter 830 mm

Workpiece:

Rolling bearings

Machining operation:

Parallel grinding on segment lathes

Description:

- Pole plate driven via a geared rim
- Stationary magnet system for automated grinding
- 24 individually actuated segments



LAMINATED CIRCULAR TOP PLATE



SAV 248.01

For use on circular chucks with parallel pole arrangement

Use:

Clamping of profiled workpieces on circular chucks with parallel pole arrangement.

Features:

Any required profiled shape can be machined into the top plate by the user, or custom machined during manufacture. Connection to magnet to be agreed upon. Lamination must be parallel to magnetic chuck.

Pole pitch: steel 3 mm, brass 1 mm

Maximum profile depth: 8 mm

Discolourations can occur during the production process. These do not constitute a technical fault.

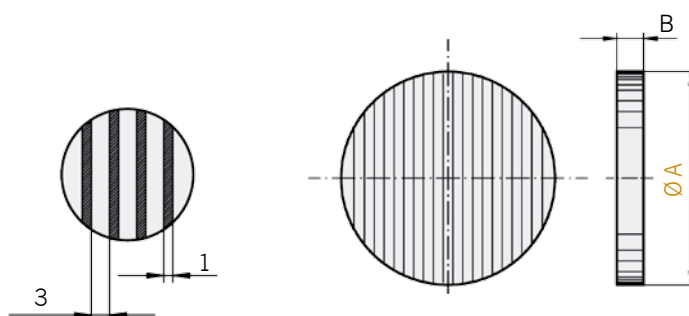
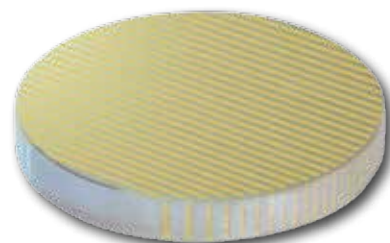
Dimensions in mm		Weight in kg
A	B	
155	25	4.0
200	25	6.0
250	25	10.0
300	25	14.0
350	25	19.0
400	30	30.0

Other dimensions on request.

Ordering example:

Laminated Circular Top Plate SAV 248.01 - 400

Ordering key SAV - No. - A



LAMINATED BARS



SAV 248.02

For use on magnetic chucks with transverse pole arrangement

Use:

To provide a suitable mounting surface for difficult workpieces. Only usable in conjunction with a magnetic chuck with a transverse pole arrangement. Especially suited for use with magnetic chuck SAV 243.11 (Chapter 1)

Features:

The silver brazed pole plates can be machined to any desired shape.

Pole pitch: steel 3 mm, brass 1 mm

Profile depth: max. 8 mm

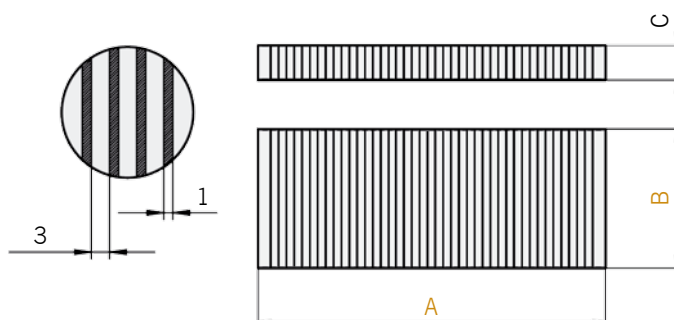
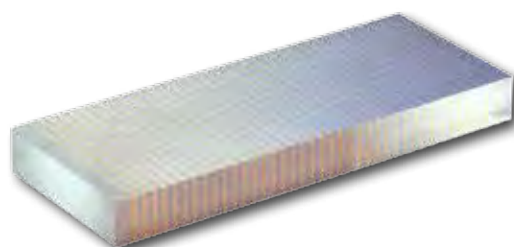
Dimensions in mm			Weight in kg
A	B	C	
250	150	25	7.5
300	150	25	9.0
400	150	25	12.0
300	200	25	12.0
400	200	25	16.0
250	250	25	12.5
400	250	25	19.5

Custom sizes can be supplied.

Ordering example:

Laminated Bars SAV 248.02 - 250 x 150

Ordering key SAV - No. - A x B



LAMINATED BARS



SAV 248.03

For use on magnetic chucks

Use:

In conjunction with magnetic chucks, to guide the magnetic field into the workpiece. Can be machined into any shape required.

Features:

Connection to magnet to be agreed upon.

Pole arrangement: 3 mm steel, 1 mm brass

Profile depth: max. 8 mm

With transverse pole arrangement

Dimensions in mm			Weight in kg
A	B	C	
250	75	25	3.8
500	75	25	7.5
250	100	25	5.0
500	100	25	10.0
400	75	25	6.0
250	75	40	6.0
500	75	40	12.0
200	100	40	6.4
400	100	40	12.8
500	100	40	16.0

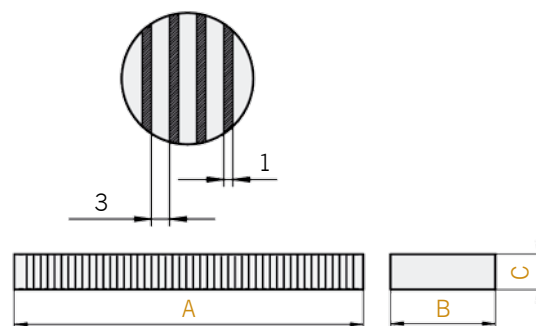
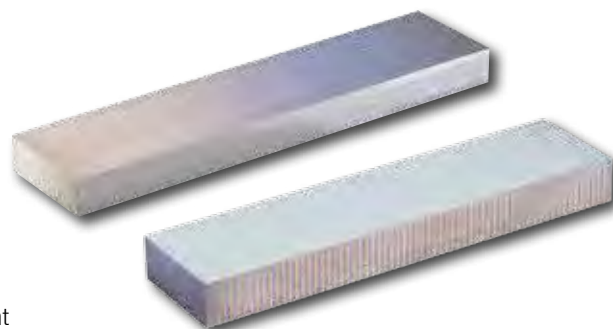
With longitudinal pole pitch

Dimensions in mm			Weight in kg
A	B	C	
320	75	25	4.8
650	75	25	9.8
320	100	40	10.1
650	100	40	20.5

Ordering example:

Laminated Bars SAV 248.03 - 400 x 100 x 40

Ordering key SAV - No. - A x B x C



CLAMPING BEAMS



SAV 248.40

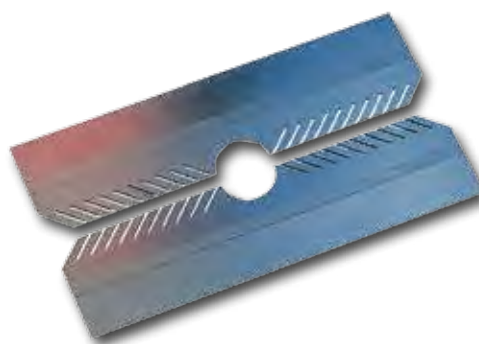
Used to clamp non-magnetic workpieces

Use:

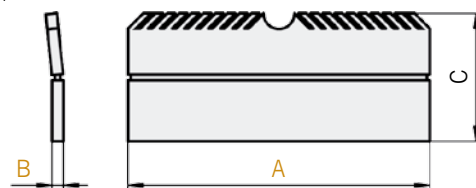
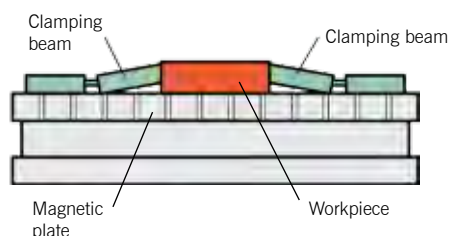
For the secure clamping of non-magnetic materials on magnets.

Features:

The clamping beams are produced from ferro-magnetic metal and have a spring-loaded strip on the long side. When the magnet is activated, this strip causes the workpiece to be pressed on to the support surface (pull-down effect). Supplied in pairs.



Dimensions in mm			Weight in kg
A	B	C	
100	4.0	45	0.30
150	1.0	40	0.10
150	1.6	43	0.20
150	2.8	43	0.35
250	3.7	52	0.70



Ordering example:

Clamping Beam SAV 248.40 - 250 x 3,7

Ordering key SAV - No. - A x B

LAMINATED BLOCK



SAV 248.60

For use on magnetic chucks

Use:

In conjunction with magnetic chucks for machining of irregularly shaped workpieces. Can be machined to any required shape.

Features:

Longitudinal and transverse pole arrangement, as well as prisms.

Pole arrangement: 3 mm steel, 1 mm brass

Profile depth: max. 8 mm

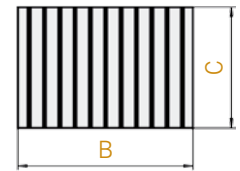
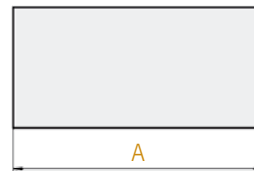
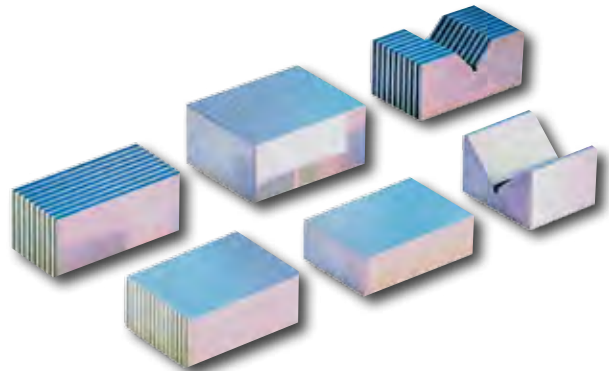
Dimensions in mm			Pole arrangement	Execution	Weight in kg
A	B	C			
65	60	40	trans. pole (Q)	prism (P)	0.8
72	45	22	trans. pole (Q)	flat (E)	0.5
75	60	30	long. pole (L)	flat (E)	0.7
80	60	30	trans. pole (Q)	flat (E)	0.7
80	80	50	trans. pole (Q)	flat (E)	2.5
90	62	33	long. pole (L)	flat (E)	0.8
100	50	40	long. pole (L)	flat (E)	1.7
100	50	40	long. pole (L)	prism (P)	1.0
100	70	41	trans. pole (Q)	flat (E)	2.1
100	70	48	long. pole (L)	flat (E)	2.7
120	80	50	trans. pole (Q)	flat (E)	3.8

Custom sizes on request.

Ordering example:

Laminated Block SAV 248.60 - 75 x 60 x 30 - L - E

Ordering key SAV No. - A x B x C - Pole arrangement - Execution



LAMINATED BLOCKS (SET)



SAV 248.61

In storage case

Use:

In conjunction with magnetic chucks for machining of irregularly shaped workpieces. Can be machined to any required shape.

Features:

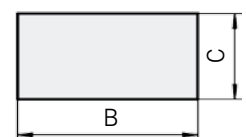
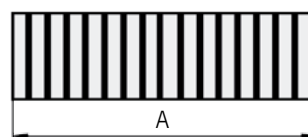
Longitudinal and transverse pole arrangement, as well as prisms.

Pole arrangement: 3 mm steel, 1 mm brass

Profile depth: max. 8 mm

Total weight: 7,6 kg

Dimensions in mm			Ausführung	Anzahl der Polblöcke
A	B	C		
56	32	15	trans. pole	2 x
96	57	26	trans. pole	2 x
96	53	22	long. pole	2 x
56	68	47	with prism	2 x



Ordering example:

Laminated Blocks (Set) SAV 248.61

Ordering key SAV - No.

PERMANENT MAGNETIC BLOCK

With fine and extra fine pole pitch, non-switchable

For machining and shaping of small workpieces, such as punches etc. For clamping of thin components type MH 204 is recommended which has an extra fine pole pitch.

Features:

Two or three magnetic clamping surfaces, pole pitch 4 mm, or 1.3 mm for type MH 204.

Types MH 201S to MH 203S use SmCo_5 -magnets with extremely high holding forces for materials that are difficult to magnetize.

Nominal holding force:

80 N/cm² for MH 201 to MH 204

180 N/cm² for MH 201-S to MH 204-S

Field height: 6 mm

Pole plate wearing limit:

14 mm for MH 201 and MH 202

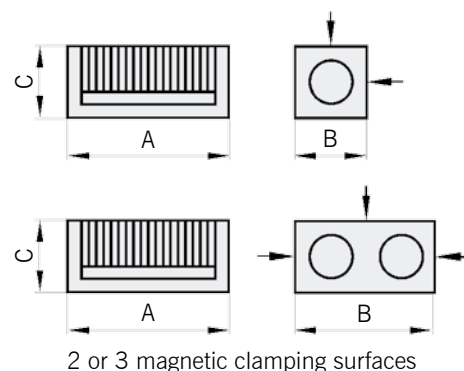
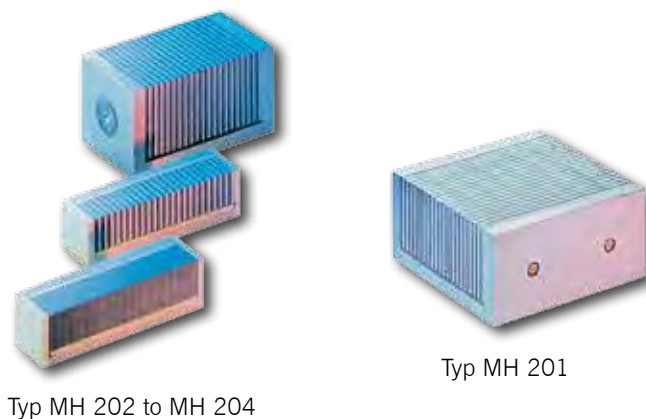
6 mm for MH 203 and MH 204

Type	Dimensions in mm			Max. angular deviation	Magnetic faces		Weight in kg
	A	B	C				
MH 201 MH 201S	100	100	50	5'	1 face 100 x 100		3,6
					2 faces 100 x 50		
MH 202 MH 202S	100	50	50	5'	3 faces 100 x 50		1,7
MH 203 MH 203S	100	25	25	5'	2 faces 100 x 25		0,5
MH 204 -	100	25	25	5'	2 faces 100 x 25		0,5

Ordering example:

Permanent Magnetic Block SAV 242.01 - MH 201

Ordering key SAV - No. - Type



PERMANENT MAGNETIC SWITCHABLE BLOCK

With 3 magnetic clamping surfaces

Use:

Angular and parallel grinding of small and medium-sized workpieces.

Features:

ON-OFF control with rotary switch.

Three magnetic faces.

Nominal holding force: 60 N/cm²

Magnetic field height: 2 mm

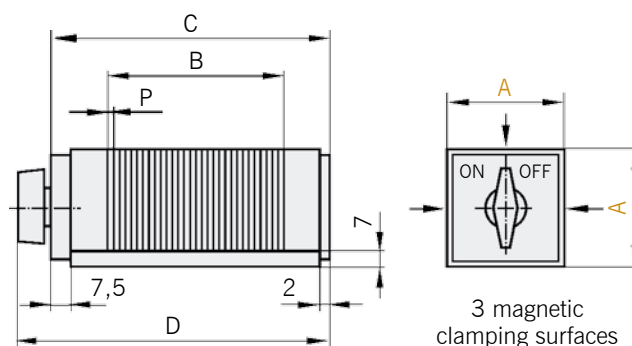
Laminations: 0,5 mm Ms/ 1,0 mm St

Dimensions in mm					Weight in kg
A	B	C	D	P	
55	90,5	125,5	146	0,5+1	2,8
70	90,5	125,5	151	0,5+1	4,0

Ordering example:

Permanent Magnetic Switchable Block SAV 242.02 - 55

Ordering key SAV - No. - A



PERMANENT MAGNETIC BLOCK



SAV 242.07

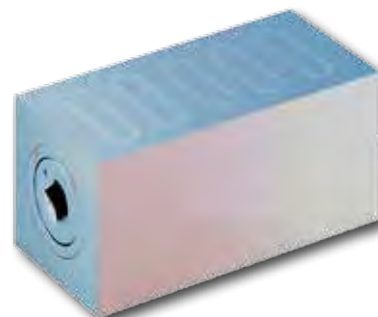
Switchable

Use:

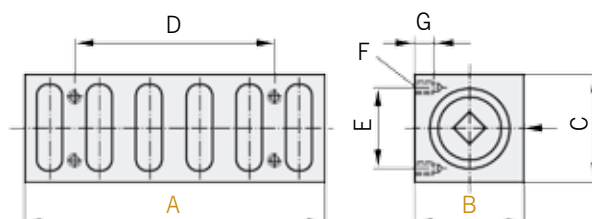
In combination with magnetic chucks, for grinding workpieces with protruding features, narrow sides, positioning templates etc.

Features:

Switchable permanent magnet with clamping face on the upper side. Side faces are ground square to one-another.



Dimensions in mm							Weight in kg
A	B	C	D	E	F	G	
115	40	40	75	30	M 5	7	1,3
135	50	60	80	40	M 6	10	2,9



1 magnetic clamping surface

Ordering example:

Permanent Magnetic Block SAV 242.07 - 135 x 50

Ordering key SAV - No. - A x B

PERMANENT MAGNETIC SWITCHABLE BLOCK



SAV 242.11

With 4 magnetic clamping surfaces, also in stainless execution

Use:

Angular and parallel grinding of small and medium-sized workpieces.

Features:

Robust construction with good holding force. Laminations 2 mm brass / 2 mm steel.

Nominal holding force standard: 50 N/cm²

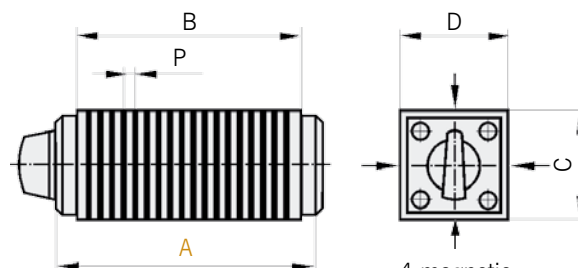
Nom. holding force stainless (RF): 30 N/cm²

Magnetic field height: 2 mm

Pole plate wearing limit: 4 mm

SAV 242.11 - RF Can be supplied with stainless, high-alloyed chrome steel pole plates. Best suited for use on wire erosion machines.

Dimensions in mm					Weight in kg
A	B	C	D	P	
140	115	64	64	2 + 2	3,1
160	135	64	64	2 + 2	4,0



4 magnetic clamping surfaces

Ordering example:

Permanent Magnetic Switchable Block SAV 242.11 - 140 - RF

Ordering key SAV - No. - A - Execution

NEODYMIUM MAGNETIC BLOCK

With $P = 6$ mm transverse pole pitch, Neodymium-iron-Boron magnets, extremely high holding force

Use:

For workpieces that are particularly difficult to clamp, such as **ferrotic** and **hard metals** containing cobalt (carbides), as well as **very small workpieces**. For quick and easy clamping – also for workpieces with complicated erosion contours or difficult to clamp workpieces.

Features:

Extremely high holding force due to a specially developed construction. Stable all-steel body. ON-OFF control on end face. Larger models - with optional power-operated switching mechanism - available on request. Laminations 4 mm steel and 2 mm brass with NdFeB magnets in the pole gaps.

Nominal holding force
on inductive steel surface: 180 N/cm²
Magnetic field height: ca. 4 mm
Pole plate wearing limit: 3 mm

Available with adaption for Zero-Reference-System.

In tool steel execution SAV 242.12:

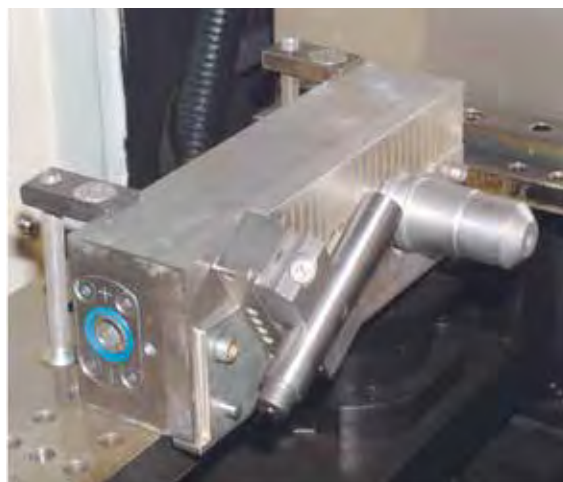
Extremely high holding force due to a specially developed construction. Stable all-steel body. ON-OFF control on end face. Precision-ground execution. Rust-free housing, activation switch and pole grid. Steel poles.



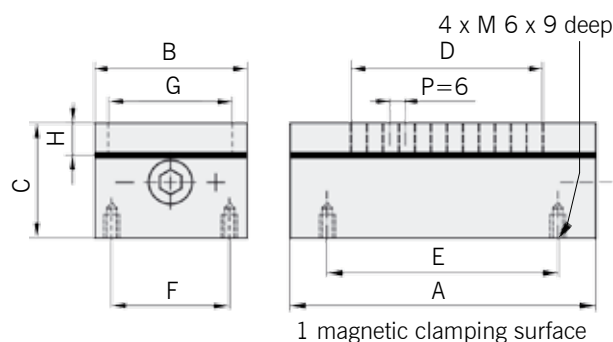
SAV 242.05
SAV 242.12



Multiple clamping of small parts
using a non-magnetic template



Type	Dimensions in mm								Weight in kg
	A	B	C ^{+0.5/-2}	D	E	F	G	H	
ND 100	140	70	51.0	102	118.0	35	62	12	3.0



Ordering example:

Neodymium Magnetic Block SAV 242.05 - ND 100
Ordering key SAV - No. - Type

Ordering example:

Neodymium Magnetic Block, Rust-free SAV 242.12 - ND 100
Ordering key SAV-No. - Type

HOLDING MAGNET BEAMS

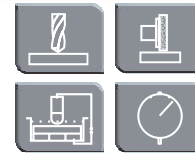
For universal use

Features:

Very strong holding force. Can be used with normal tools without any influence on the magnetic force.

Tapped fixing holes on the rear side, for M6 screw.

Maximum operating temperature: 85 °C



SAV 240.62



Length	Dimensions in mm			Nom. holding force in daN	No. fixing holes	Weight in kg
	Width	Height				
50	30	30		25	1	0.35
100	30	30		50	2	0.70
200	30	30		100	3	1.35

Ordering example:

Holding Magnet Beams SAV 240.62 - 200
Ordering key SAV - No. - Length

PERMANENT MAGNETIC BEAM



SAV 243.15

With transverse pole pitch

Use:

As a clamping device for holding workpieces securely on spark erosion (EDM) machines and other machining applications, or as part of a fixture.

Features:

Two clamping surfaces on opposite faces, individually switchable. Low magnetic field due to fine pole pitch. Supplied in pairs.

Planar parallelism:

0,02 mm

Pole pitch:

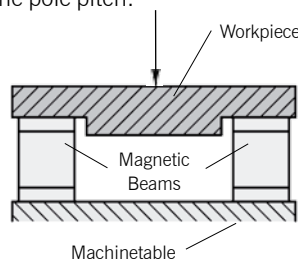
1,3 mm

Magnetic field height:

6 mm

Pole plate wearing limit:

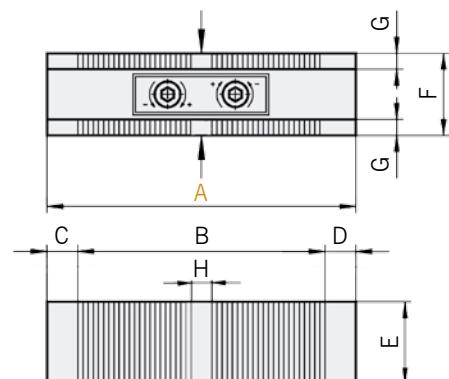
6 mm



Dimensions in mm								Nom. holding force in N	Weight in kg
A	B	C	D	E	F	G	H		
125	98	13.5	13.5	52	50	15	-	300	2.5
180	153	13.5	13.5	52	50	15	11	400	3.6
250	225	12.5	12.5	52	50	15	11	590	5.0

Ordering example:

Permanent Magnetic Beam SAV 243.15 - 125
Ordering key SAV - No. - A



2 magnetic clamping surfaces

PERMANENT MAGNET V-BLOCKS

With four magnetic contact surfaces

Use:

Positioning

Features:

4 magnetic contact surfaces (top and bottom sides and 2 shoulders), which are switched on and off simultaneously. 2 opposite-facing switching points incl. removable socket key. Available in wooden storage case SAV 539.02 - HK2 at a surcharge.

Available singly (S) or in pairs (P).

The V-block pair is ground to the same height.

Planar parallelism: < 0.01 mm

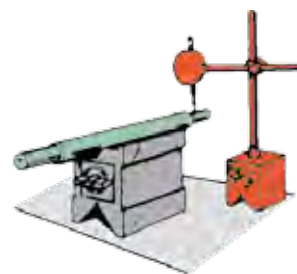
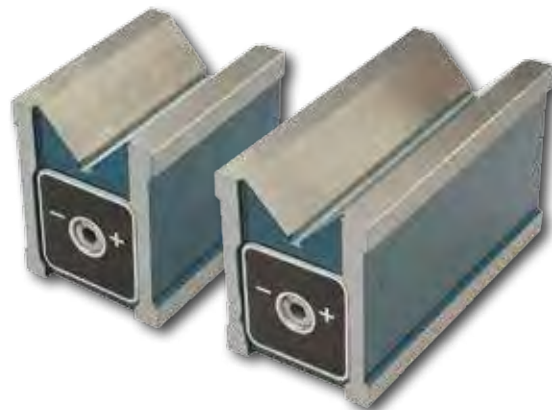
Length	Dimensions in mm				Nom. hold. force in daN	Weight in kg
	Width	Height	Workpiece diameter	Width large V-block		
80	60	73	6 - 50	38	30	2.0
125	60	73	6 - 50	38	45	3.3

Ordering example:

Permanent-Magnet-Prisma SAV 242.21 - 125
Ordering key SAV - No. - Length



SAV 242.21



PERMANENT MAGNET V-BLOCKS

Single or in pairs

Use:

Positioning

Features:

2 magnetic contact surfaces (large „V“-block and opposite face), which are switched on and off simultaneously.

Available single (S) or in pairs (P). Available in wooden storage case SAV 539.02 (for S) and SAV 539.04 (for P) against price adder.

Rectangularity: 0,004 mm

Planar parallelism: 0,004 mm

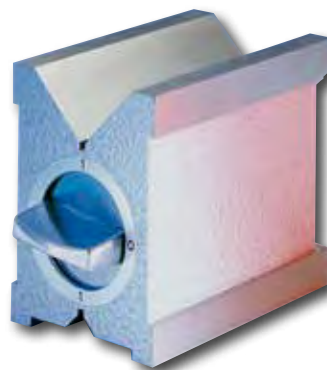
Length	Dimensions in mm			Nom. hold. force V-block in daN	Nom. hold. force to surface in daN	Weight in kg
	Width	Height	Workpiece diameter			
80	67	96	6 - 66	40	90	2.9
100	70	96	6 - 70	40	120	3.8

Ordering example:

Permanent Magnet V-Blocks SAV 242.22 - 100 - S
Ordering key SAV - No. - Length - Single or pair



SAV 242.22



PERMANENT MAGNET V-BLOCKS



SAV 242.25

Single or in pairs, hardened execution

Use:

Positioning

Features:

2 magnetic faces, which are switched on and off simultaneously (main and small prisms). Hardened contact surfaces and „V“-s. Available in single (S) or in pairs (P). Available in wooden storage case SAV 539.04-HK4 against price adder.

Rectangularity: 0,004 mm
Planar parallelism: 0,004 mm



Length	Dimensions in mm			Workpiece diameter	Weight in kg
	Width	Height			
80	67	96		6 - 66	2.85
100	70	96		6 - 70	3.8

Ordering example:

Permanent magnet V-block SAV 242.25 - 100 - S
Ordering key SAV - No. - Length - Single or pair

PERMANENT MAGNET V-BLOCKS



SAV 242.29

In sealed execution

Features:

3 magnetic contact surfaces (V-block top side and 2 shoulders). 2 opposite-facing switching points incl. removable socket key. Strong, switchable permanent magnet. Both V-blocks ground to match. Completely sealed. Available in wooden storage case SAV 539.02 - HK2 at a surcharge. Supplied in pairs.



Length	Dimensions in mm				Nom. holding force in daN	Weight in kg	Wooden storage case SAV No.
	Width	Height	Width V-block	Workpiece diameter			
70	40	50	36	50	15	1.0	SAV 539.01-HK1
100	50	80	60	80	20	2.3	SAV 539.02-HK2
150	50	100	90	125	23	4.5	SAV 539.05-HK5

Ordering example:

Permanent Magnet V-block SAV 242.29 - 100
Ordering key SAV - No. - Length

PERMANENT MAGNETIC CLAMPING BLOCK



SAV 242.31

With powerful cross prisms

Features:

4 magnetic contact surfaces (top and bottom sides and 2 shoulders). 2 opposite-facing switching points incl. removable socket key. Strong, switchable permanent magnet.

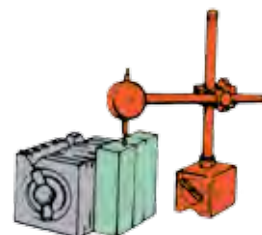
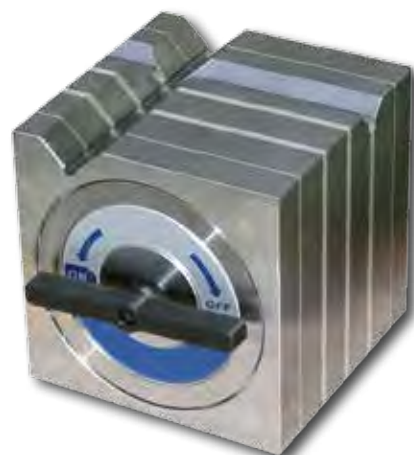
Rectangularity: 0,025 / 100 mm
Planar parallelism: 0,015 / 100 mm

Available in wooden storage case at a surcharge.

Length 80: SAV 539.04-HK4

Length 125: SAV 539.05-HK5

Length 180: SAV 539.17-HK17



Dimensions in mm			Workpiece diameter in mm		Nom. hold. force in daN		Weight in kg
Length	Width	Height	Main V-block	Auxiliary V-block	Main V-block	Auxiliary V-block	
80	80	80	10 - 25	8 - 15	12	10.0	3.5
125	125	125	10 - 40	10 - 26	30	12.5	14.0
180	180	180	14 - 50	14 - 50	40	30.0	37.0

Ordering example:

Permanent Magnetic Clamping Block SAV 242.31 - 180

Ordering key SAV - No. - Length

PRECISION ANGLE-SETTING TOOL

SAV 487.40

Easy to use due to its magnetic adhesion

Use:

For the precise setting of any angle between 0° and 45° on production machinery and for checking parts as well as to extend the adjustment range above 45° on sine tables.

Features:

The measuring arm can be removed and re-inserted so that it can be used in any position. The angles are determined according to the sine principle by using an end-gauge. All parts are made from alloyed steel, precision-ground and hardened to HRC 60.

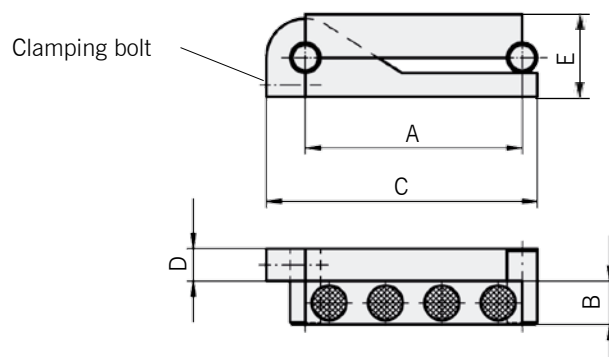
Axis spacing: 100 mm
Angle precision: 3 sec.
Planar parallelism: $\pm 0,005 / 100$ mm

Dimensions in mm					Weight ca. in kg
A	B	C	D	E	
100	20	125	15	38	0.7

Ordering example:

Precision Angle-Setting Tool SAV 487.40

Ordering key SAV - No.



CHAPTER OVERVIEW

CHAPTER 9

Page 151 - 158

	SAV-ART.-NO.	COMMENTS	PAGE
PERMANENT-MAGNETHILFEN			
	246.40	Permanent-Magnet jointed V-block clamp	152
	246.41	Permanent magnet jointed clamp	152
	246.42	Permanent magnet protractor	153
	246.50	Permanent magnet mitred holder	153
	246.53	Permanent magnet mitred holder	154
	246.54	Permanent magnet mitred holder	154
	246.60	Permanent magnet welding angle	155
	246.61	Permanent magnet welding angle	156
	532.03	Permanent magnet float system	157
	482.70	Permanent magnetic bases	158
	532.11	Hand plate lifter with belt	158

PERM. MAGNET JOINTED V-BLOCK CLAMP

SAV 246.40

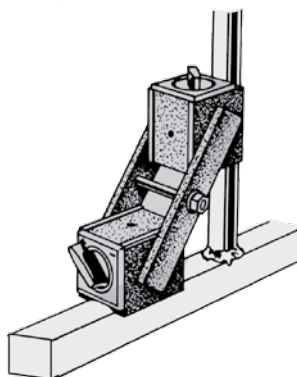
Magnetic aid for welding and mounting operations

Use:

Indispensable welding aid sheets/plates, round and flat materials. For any desired angle. In order that the magnetic clamps are not thermally overloaded, it is recommended that they should only be used for holding during the welding process and then removed.

Features:

2 single ON/OFF switchable V-blocks. Supplied singly (S) or in pairs as jointed clamps (G).



Dimensions in mm			Nom. holding force per block in daN	Weight in kg
Length	Width	Height		
60	50	55	70	2.5

Permanent Magnet Jointed V-Block Clamp
Ordering key

SAV 246.40 - G
SAV - No. - Piece or as jointed clamp

PERMANENT MAGNET JOINTED CLAMP

SAV 246.41

Magnetic aid for welding and mounting operations

Use:

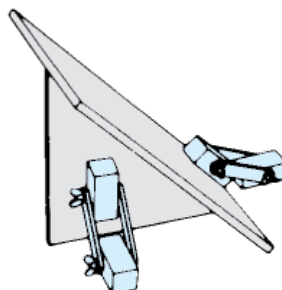
As a welding aid to hold sheets/plates, iron bars etc.

In order that the magnetic clamps are not thermally overloaded, it is recommended that they should only be used for holding during the welding process and then removed.

Features:

Two permanent magnetic clamping blocks connected by bracing arms. Allows clamping at any angle.

Tightened using two winged-nuts. Supplied singly (S) or as jointed clamp (G).



Dimensions in mm			Nom. holding force per block in daN	Weight in kg
Length	Width	Height		
60	26	25	20	0.7

Ordering example:

Permanent Magnet Jointed Clamp
Ordering key

SAV 246.41 - G
SAV - No. - Piece or as jointed clamp

PERMANENT MAGNET PROTRACTOR

SAV 246.42

Magnetic aid for welding and mounting operations at various angles

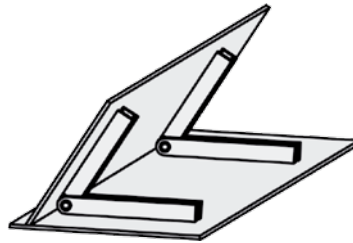
Use:

As a welding and mounting aid for frame processing at any angle between 25 degrees and 280 degrees. With markings for the angles 90 degrees, 60 degrees, 45 degrees and 30 degrees.

If increased holding forces are required, multiple magnetic protractors can be used. As the maximum application temperature of 120 °C should not be exceeded, it is recommended that the magnetic protractors should only be used for holding during the welding process and then removed.

Features:

All edges are magnetic.



Dimensions in mm			Nom. holding force per arm in daN	Weight in kg
Length	Width	Height		
194 + 105	11	24	20	0.49

Ordering example:

Permanent Magnet Protractor SAV 246.42
Ordering key SAV - No.

PERMANENT MAGNET MITRED HOLDER

SAV 246.50

Magnetic aid for welding and mounting operations at set angles

Use:

As a welding and mounting aid for frame processing at angles of 180 degrees, 90 degrees, 75 degrees, 60 degrees, 45 degrees and 30 degrees.

If increased holding forces are required, multiple magnetic protractors can be used. As the maximum application temperature of 120 °C should not be exceeded, it is recommended that the magnetic protractors should only be used for holding during the welding process and then removed.

Features:

All edges are magnetic. The pre-bored holes enable quick and easy positioning.



Dimensions in mm			Nom. holding force in daN	Weight in kg
Length	Width	Bore holes		
100	64	2 x ø 5	30	0.26

Ordering example:

Permanent magnet Mitred Holder SAV 246.50
Ordering key SAV - No.

PERMANENT MAGNET MITRED HOLDER

SAV 246.53

Magnetic aid for welding and mounting operations at 45° and 90°

Use:

As a welding and mounting aid for frame processing at angles of 45 degrees and 90 degrees. In order that the mitred holders are not thermally overloaded, it is recommended that they should only be used for holding during the welding process and then removed.

Features:

All contact surfaces including the V-block faces are magnetic. SAV 246.53 - 145 without V-profile.



Dimensions in mm			Weight in kg
Length	Width	Height	
145	44,5	41	1.36
178	44,5	41	1.65

Permanent Magnet Mitred Holder SAV 246.53 - 178
Ordering key SAV - No. - Length

PERMANENT MAGNET MITRED HOLDER

SAV 246.54

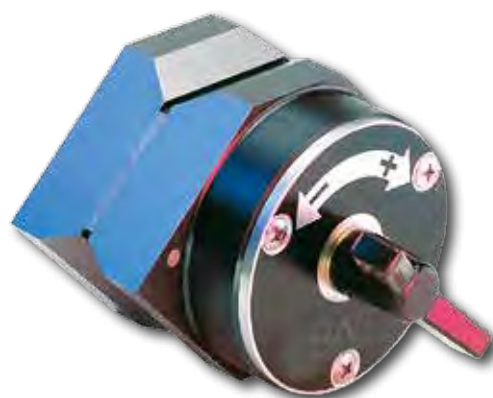
Magnetic aid for welding and mounting operations at 45°, 90° and 135°

Use:

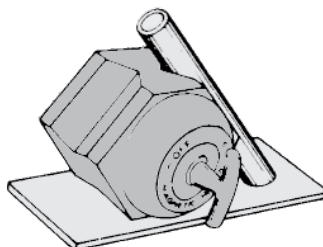
As a welding aid for pipes, round materials, flat and profiled iron. As a clamping aid for drilling jigs. In order that the mitred holders are not thermally overloaded, it is recommended that they should only be used for holding during the welding process and then removed.

Features:

Very strong magnetic forces. With variable angle settings for positioning of the workpieces.



Dimensions in mm			Nom. holding force / surface in daN	Weight in kg
Length	Width	Height		
60	60	42	10	0.85
108	108	94	40	6.00



Ordering example:

Permanent magnet Mitred Holder SAV 246.54 - 108
Ordering key SAV - No. - Length

PERM. MAGNET WELDING ANGLE

SAV 246.60

Magnetic aid for welding and mounting operations at 90°

Use:

For the efficient holding of welding parts at an angle of 90 degrees. Application dependent on size – from small, light parts to heavy plates. In order that the welding angles are not thermally overloaded, it is recommended that they should only be used for holding during the welding process and then removed.

Features:

Stable construction, both contact faces are magnetic, easily removed by exerting sideways pressure. The execution normal (N) is intended for workpieces with smooth surfaces.

The execution enhanced (V) is also suitable for workpieces with soiled or scale covered surfaces.

The welding angles in pipe execution (R) have V-shaped pole shoes and are therefore especially suited for working round materials and pipes. The 2-pole (2) welding angles have 2 protruding magnetic rails for use in heavy machinery construction, steel manufacture, ship building, crane construction etc. Both sides have an anvil to ease positioning using a hammer. The welding angles are suitable for – beginning with SAV 246.60 - 116 – small, light parts to applications in heavy machinery construction, ship building, crane construction etc. – and ending with SAV 246.60 - 450.



Execution	Dimensions in mm								
Normal (N)	Side length	in mm	116 / 116	145 / 145	175 / 175	260 / 175	230 / 230	330 / 240	320 / 320
	Width	in mm	38	45	48	48	60	60	60
	Nom. Holding force*	in daN	32	38	58	88 / 95	-	-	-
	Displacement force*	in daN	14	16	26	42 / 44	-	-	-
	Weight	in kg	0.70	1.10	1.60	2.10	3.10	4.30	5.00
Enhanced (V)	Side length	in mm	116 / 116	145 / 145	175 / 175	260 / 175	230 / 230	330 / 240	320 / 320
	Width	in mm	38	45	48	48	60	60	60
	Nom. Holding force*	in daN	48	52	79	132 / 142	-	-	-
	Displacement force*	in daN	21	24	35	63	-	-	-
	Weight	in kg	0.75	1.15	1.70	2.20	3.30	4.50	5.15
Pipe (R)	Side length	in mm	120 / 120	150 / 150	180 / 180	265 / 180	235 / 235	-	-
	Width	in mm	38	45	48	48	60	-	-
	Nom. Holding force*	in daN	-	38	50	88 / 95	-	-	-
	Displacement force*	in daN	-	16	22	42	-	-	-
	Weight	in kg	0.85	1.25	1.80	2.45	3.05	-	-
2-pole (2)	Side length	in mm	350 / 350	450 / 450	-	-	-	-	-
	Width	in mm	60	60	-	-	-	-	-
	Nom. Holding force*	in daN	-	-	-	-	-	-	-
	Displacement force*	in daN	-	-	-	-	-	-	-
	Weight	in kg	8.40	11.50	-	-	-	-	-

* The nominal holding force and displacement force values apply to a sheet thickness of 4 mm. Details of other influencing factors can be found in the technical notes (chapter 10).

Ordering example:

Permanent Magnet Welding Angle SAV 246.60 - 450 - 2

Ordering key SAV - No. - max. Side length - Execution

PERM. MAGNET WELDING ANGLE

SAV 246.61

Magnetic aid for welding and mounting operations at various angles

Use:

For the efficient holding of welding parts at various angles. With an angle scale from 45 degrees to 225 degrees.

Application dependent on size – from small, light parts to heavy plates.

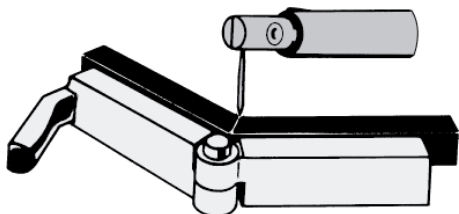
In order that the welding angles are not thermally overloaded, it is recommended that they should only be used for holding during the welding process and then removed.

Features:

Stable construction, both contact faces are magnetic, easily removed by exerting sideways pressure.

The execution normal (N) is intended for workpieces with smooth surfaces. The execution enhanced (V) is also suitable for workpieces with soiled or scale covered surfaces.

The welding angles in pipe execution (R) have V-shaped pole shoes and are therefore especially suited for working round materials and pipes.



Execution	Dimensions in mm				
Normal (N)	Side length	in mm	130 / 130	180 / 180	260 / 180
	Width	in mm	38	45	45
	Nom. Holding force*	in daN	32	58	95 / 88
	Displacement force*	in daN	14	38	44 / 42
	Weight	in kg	0.75	1.50	2.00
Enhanced (V)	Side length	in mm	130 / 130	180 / 180	260 / 180
	Width	in mm	38	45	45
	Nom. Holding force*	in daN	48	87	142 / 132
	Displacement force*	in daN	21	57	65
	Weight	in kg	0.80	1.55	2.10
Pipe (R)	Side length	in mm	130 / 130	180 / 180	260 / 180
	Width	in mm	38	45	45
	Nom. Holding force*	in daN	-	48	-
	Displacement force*	in daN	-	22	-
	Weight	in kg	0.90	1.70	2.20

* The nominal holding force and displacement force values apply to a sheet thickness of 4 mm. Details of other influencing factors can be found in the technical notes (chapter 10).

Ordering example:

Permanent Magnet Welding Angle SAV 246.61 - 260 - V

Ordering key SAV - No. - max. Side length - Execution

PERMANENT MAGNET FLOAT SYSTEM

SAV 532.03

To separate metal sheets/plates

Use:

To separate stacks of iron and steel sheets for insertion in sheet processing machines. The sheets are laid between the magnets and magnetised with the same polarity. The sheets repel each other and float in the air making them easy to grasp.

In order to prevent the sheets from jamming, the magnets should be positioned so that an air gap of 1 to 2 mm is ensured.

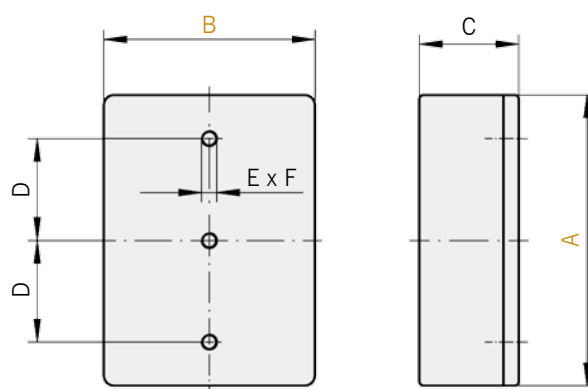
Features:

The strong permanent magnets have a stable, teel housing. The pre-bored holes enable the attachment to fixtures.

Supplied singly.



Dimensions in mm						For sheet thicknesses to	Weight ca. in kg
A	B	C	D	E	F		
75	73	28	50	2	M 8	0.7	1.0
275	73	28	200	2	M 8	0.7	4.0
342	73	28	250	2	M 8	0.7	5.0
104	103	28	50	2	M 8	1.0	2.0
208	103	28	100	2	M 8	1.0	5.0
308	103	28	200	2	M 8	1.0	7.0
342	103	28	250	2	M 8	1.0	8.0
143	104	49	100	2	M 8	2.0	6.0
277	104	49	200	2	M 8	2.0	11.0
310	104	49	200	2	M 8	2.0	12.0
104	155	47	50	2	M 8	3.0	6.0
143	155	47	100	2	M 8	3.0	8.0
210	155	47	150	2	M 8	3.0	12.0
277	155	47	200	2	M 8	3.0	16.0
310	155	47	200	2	M 8	3.0	18.0
411	155	47	150	3	M 8	3.0	24.0
444	155	47	250	3	M 8	3.0	25.0
511	155	47	200	3	M 8	3.0	29.0
277	179	88	200	2	M 12	4.0	34.0
400	179	88	150	3	M 12	4.0	50.0
344	279	94	100	3	M 12	6.0	71.0
545	279	94	150	4	M 12	6.0	112.0
612	279	94	150	4	M 12	6.0	126.0
813	279	94	200	4	M 12	6.0	168.0



The float magnet height should be selected so that the height of the sheet stack is approx. half the height of the float magnets.

If using the maximum stated plate thickness, a plate area of approx. 30 dm² can be separated per float magnet. The plate area for thick, oily sheets is reduced to approx. 15 dm² and more float magnets will be required.

Ordering example:

Permanent Magnet Float System SAV 532.03 - 813 x 279

Ordering key SAV - No. - A x B

PERMANENT MAGNETIC BASE

SAV 482.70

Switchable

Use:

For supports, truing device, dial gauge stands etc.

Features:

Permanent magnet with ON-OFF switch.
Magnetic holding surfaces on the rear and underside. Additional mitred contact surface on the underside. SAV 482.70 - M 10 x 117 does not have a mitred underside.



Thread	Dimensions in mm			Nom. clamping force in daN	Weight in kg
	Length	Width	Height		
M 8	58	50	55	20	1.0
M 8	73	50	55	30	1.3
M 10	73	50	55	30	1.3
M 8	120	60	52	50	1.8
M 10	117	60	55	40	2.0

Ordering example:

Permanent Magnetic Base SAV 482.70 - M 10 x 117
Ordering key SAV - No. - Thread x Length

HAND PLATE LIFTER WITH BELT

SAV 532.11

For separating sheets

Use:

For depiling and lifting of sheets up to 2mm thickness. For carrying on the right or left inner flat of the hand. Can also be put on the outer flat of the hand for holding of screws or similar small parts.

Features:

The permanent magnetic system, which is kept in a stable pressure casing, guarantees high holding forces. Spare belts are available on request.

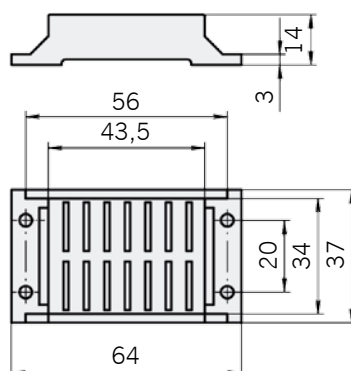


Dimensions in mm			Nom. Holding force in daN*	Weight in kg
Length	Width	Height		
64	37	14	20	0.1

* measured at vertical pull-off

Ordering example:

Hand Plate Lifter with belt SAV 532.11
Ordering key SAV - No.



CHAPTER OVERVIEW

CHAPTER 10

Page 159- 178

	PAGE
PHYSICAL PRINCIPLES OF MAGNETIC WORKHOLDING	
 Maximum holding forces	160
Magnetic field and magnetic lines of force	161
Workpieces in the Magnetic Field	162
Magnet materials	163-164
Magnetic clamping devices	165
Magnetic Clamping of Workpieces	166
Influence on holding forces	167, 168, 172
Air gap behaviour characteristics for milling magnets	169
Workpieces and holding forces	170-171
Maximum rotational speeds	173
Demagnetizing	174-175
Technical Explanations and Terms	176-177
Terms and conditions of sale and delivery	178

MAXIMUM HOLDING FORCES

1. Physical principles of magnetic workholding

1.1. Influences upon the magnetic holding force

The magnetic holding forces are dependent upon several influences which are sometimes difficult to assess in practice and therefore the design of magnetic systems requires great experience. The following criteria have an effect:

- **Workpiece geometric characteristics**
Contact surface, roughness, workpiece thickness, coefficient of friction
- **Temperature and environm. influences**
Application temperature, Curie temperature, opposing fields, radioactivity
- **Type of magnet**
Permanent magnet, electro-magnet, electro-permanent magnet
- **Workpiece material**
Alloying, heat treatments
- **Type of pole plate configuration**
Number of poles employed, pole orientation, stops, pole shoes
- **Permanent magnet characteristics**
Magnet material, geometry, manufacturing process

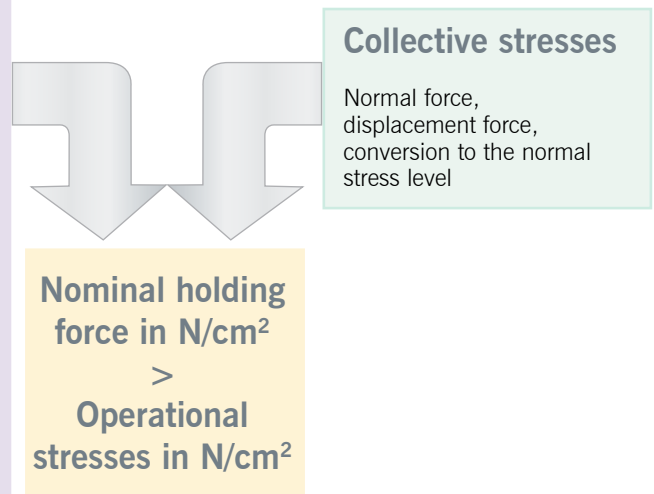


Fig. 1: Influences upon the magnetic holding forces

1.2. Maximum possible holding forces

Ferromagnetic materials can only conduct a limited density of magnetic flux. This results in a saturation effect after which it is impossible, within reasonable expense, to achieve further significant increases in the holding force. This lies in the region of 180 N/m² for St 37.

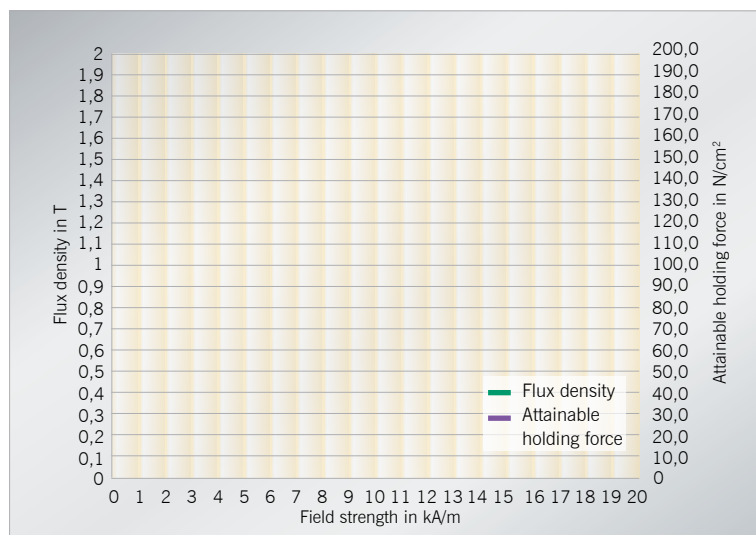


Fig. 2: Magnetisation characteristic St37

MAGNETIC FIELD AND MAGNETIC LINES OF FORCE

1.3. 2.1. The magnetic field

The space in which magnetic forces work is known as magnetic field. The magnetic effect is, at the same time, dependent on place and direction. A magnetic field develops between two or more poles, like poles repel each other and unlike poles attract each other. The clearest and easiest way to demonstrate a magnetic field is by sprinkling iron powder over a separating layer, e.g. paper or glass, that is lying within a magnetic field.

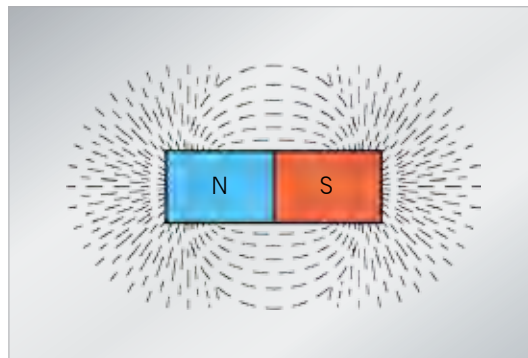


Fig. 3: Field line course of a bipolar rod magnet

By storing a rod magnet appropriately, it adjusts itself to the magnetic field of earth in known way. The pole which points in the geographically north direction is known as the "north pole" of the magnet. If a rod magnet is bent to a U-shape, a bipolar magnet system is created (horse shoe magnet Fig. 4).

1.4. Magnetic lines of force

Magnetic lines of force run from the north to the south pole of a magnet. The magnetic field tries with the help of its leakage and effective flux to close over the air gap (Fig. 3). If the magnetic field extends beyond the soft iron it always happens vertical to the surface. The lines of force course searches for the shortest occupiable distance between the poles.

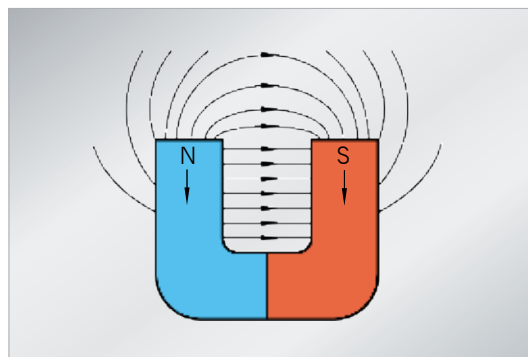


Fig. 4: Illustration of the magnetic lines of force of a horse shoe magnet

However, air offers the magnetic field a very high resistance, so that the magnetic lines of force prefer to proceed in ferro magnetic material (e.g. iron).

The lines of force stand for the illustration of the magnetic flux Φ in Wb (Weber). For the effect of the magnetic field, e.g. the achievable holding force, the concentration of the lines of force per surface, or rather the magnetic flux density B in mT (1 Tesla = 1 Wb/m²) or G (1 Gauss = 0.1 mT) is the deciding factor.

The cause of the magnetic field with its lines of force is the magnetic field strength H in A/m or Oe (1 kA/m = 12,56 Oersted).

The connections between field strength and flux density can be seen as similar to the conditions between the electric voltage and the electric current.

WORKPIECES IN THE MAGNETIC FIELD

1.5. Iron workpieces in the magnetic field

Resting iron workpieces offer the magnetic field just a low resistance and therefore shorten the path of the lines of force. Therefore the magnetic field does not need to take the awkward path through the air any more (fig. 5). In comparison to e.g. air, the magnetic conductivity (permeability) of steel (St 37, A570, 4360-40) is approx 2000 times better.

If the resting iron part is removed from the magnet, the force of the magnetic field opposes an enlargement of the magnetic resistance and therefore also a change in the magnetic energy.

As the magnetic energy is related directly to the work to be used, in order to remove a ferromagnetic workpiece from magnets, it opposes an enlargement of the air gap or, the magnetic energy. That is why materials containing iron are attracted and hold.

In order to keep a workpiece magnetic, at least a north and south pole must be overbridged with it.

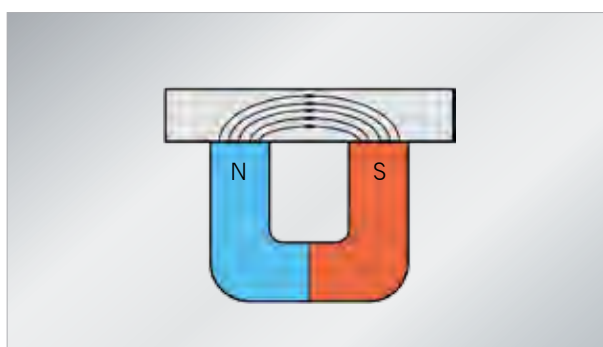


Fig. 5: Magnetic flux and the holding forces becoming effective while overbridging of a N- and a S-pole

1.6. Atomic interpretation of the magnetization

In magnetisable (ferromagnetic) materials, there are tiny magnetic fields, so called “molecular magnets”, available. Within the atoms, electrons circle the nucleus as tiniest electric charges, as well as also circling their own axis and generate - from the connection first observed by Oersted - a magnetic moment, or rather, a magnetic dipole.

Without the influence of an external field, these magnetic dipoles are arranged at random in ferromagnetic materials and neutralize themselves extensively in their effect. By feeding an external magnetic field, there follows an exact arrangement of the dipoles.

A large number of arranged dipoles in small areas, the so-called “Weiss domain”, figure the smallest magnetic bodies. These molecular magnets arrange themselves under the influence of external magnetic fields and remain more or less in the imposed formation, depending on material, even after being distanced from the external field. The arrangement of the “molecular magnets” illustrates over and above that the demagnetizing effect of heat, impact, radioactive radiation or magnetic foreign fields.

The relevant body, which areas arranged to such an extent contains, works together as one magnet. By complete arrangement of elementary magnets, further magnetizing is impossible. The material is “saturated”.

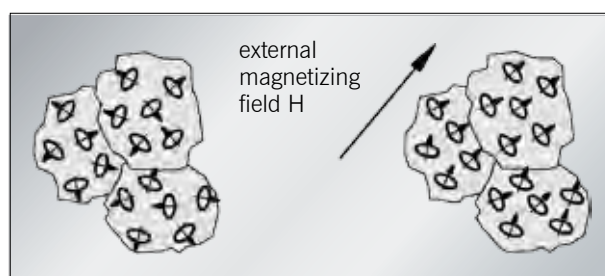


Fig. 6: Arrangement of the ‘molecular magnets’ in Weiss domains by an adjacent magnetic field

Also see Pt 1.4.

MAGNETIC MATERIALS

2. Magnetic properties of materials

If one investigates the behaviour of various substances in a magnetic field, it becomes clear that these substances fall into three categories;

Non-magnetic materials
Soft magnetic materials
Hard magnetic materials

2.1. Non-magnetic materials

These include materials such as brass, copper, aluminium, wood, glass, plastics and other metals which do not react at all to a magnetic field or in which the reaction is negligible.

The magnetic field can flow through such materials in exactly the same way as it does through air or a vacuum. Thus there is no interaction (attractive force) between the magnetic field and the material. These materials can not be held/clamped magnetically.

2.2. Soft magnetic materials

The main materials in this group include iron, low-alloy steels, nickel and cobalt. Magnetic fields are concentrated and intensified in these materials. After removal of the magnetic field they lose their effect to a large extent. A low level of residual magnetism can still remain however, depending upon the alloying components.

2.3. Hard magnetic materials

These are “permanent magnetic materials”. After being magnetised they exhibit their own magnetic field with a high energy density which, in static or dynamic magnetic circuits i.e. in magnetic circuits with a constant or variable air gap, can be used for technical applications.

A permanent magnetic material must therefore exhibit two properties. Firstly, it must absorb sufficient magnetism (high remanence B_r or saturation B_s) and secondly, the stored magnetism must remain in the material (high coercive field strength (coercivity) H_C).

Permanent magnetic materials are used for workholding and clamping systems as well as motors, loudspeakers, measuring instruments etc.

Today, hard ferrites, AlNiCo and SmCo are used for permanent magnets. In addition to SmCo, NdFeB – which has an even greater coercivity and remanence – is also used.

3. Permanent magnet materials

3.1. Hard ferrite magnets in accordance with German industrial Standard DIN 17 410

They are composed of ca. 80% iron oxide and 20% barium- or strontium carbonate. These raw materials are widely available and are therefore relatively cheap.

Like all ceramic materials, these magnets are very hard and brittle. This means that they can only be machined using diamond-tipped tools. Hard ferrite magnets are manufactured as either anisotropic or isotropic i.e. with or without a preferred magnetic direction.

After magnetisation, isotropic magnets exhibit only a low level of energy density.

In anisotropic magnets, the coercivity relative to the remanence is high. This necessitates a large magnet pole area.

The maximum operating temperature is +200 °C.

MAGNETIC MATERIALS

3.2. Metallic permanent magnets

Made from AlNiCo:

The main alloying components are aluminium, nickel, cobalt, iron, copper and titanium. This hard material is manufactured in a sinter or casting process and can only be machined by grinding. AlNiCo-magnets are almost exclusively manufactured as anisotropic. During the manufacturing process they acquire a preferred magnetic direction, which leads to an improved alignment of the “elementary magnets” and therefore to better magnetic values. The anisotropy is achieved by producing crystal columns during the casting process and through a heat treatment under the application of a magnetic field.

The dimensional ratio of length to diameter $L : D$ in an open magnetic circuit should be $4 : 1$, in order to exhibit a good level of demagnetisation resistance. This ratio permits the greatest possible holding forces per magnet volume to be achieved for AlNiCo. The more the magnetic circuit is closed, the shorter the chosen construction length possible.

AlNiCo magnets have a high remanence, but a low coercive force. Due to this property, these magnets can take up a strong magnetic field, but they are also easily demagnetized again. For this reason, they are used in electrically switchable permanent-magnetic chucks.

AlNiCo magnets can be used within a relatively high temperature range of up to ca. $+400\text{ }^{\circ}\text{C}$. At the so-called ‘Curie-temperature’ they irreversibly lose their magnetization.

3.3. High energy “rare earth magnets”

Made from samarium cobalt ($\text{SmCo}_5 / \text{SmCo}_{17}$) or neodymium-iron-boron ($\text{Nd}_2\text{Fe}_{14}\text{B}$)

These are sintered, metallic, permanent magnets with a very high energy product from the “rare earth” group of elements. The rare earths are 15 elements with the atomic numbers 57- 71 in the periodic table of elements.

The costly processing and the expensive raw materials result in a relatively high price. In the course of the production process, these magnets always acquire a preferred magnetic direction (anisotropy). Even strong retarding potentials have no influence on the magnetic field.

a) Samarium Cobalt

This magnetic material exhibits excellent magnetic values. It is very hard and brittle and can therefore only be machined by grinding or by using diamond-tipped tools. The maximum operating temperature is ca. $+200\text{ }^{\circ}\text{C}$.

b) Neodymium-iron-boron

Using this magnetic material, which is the strongest currently available, the highest possible magnetic values that can be economically produced are achieved. The energy product is approx. twice as high as the samarium-cobalt. The energy product indicates the quality of the magnets and is the product of the flux density and the field strength ($W \times H$). The maximum operating temperature is approx. $+80\text{ }^{\circ}\text{C}$.

3.4. Comparison between permanent magnetic materials

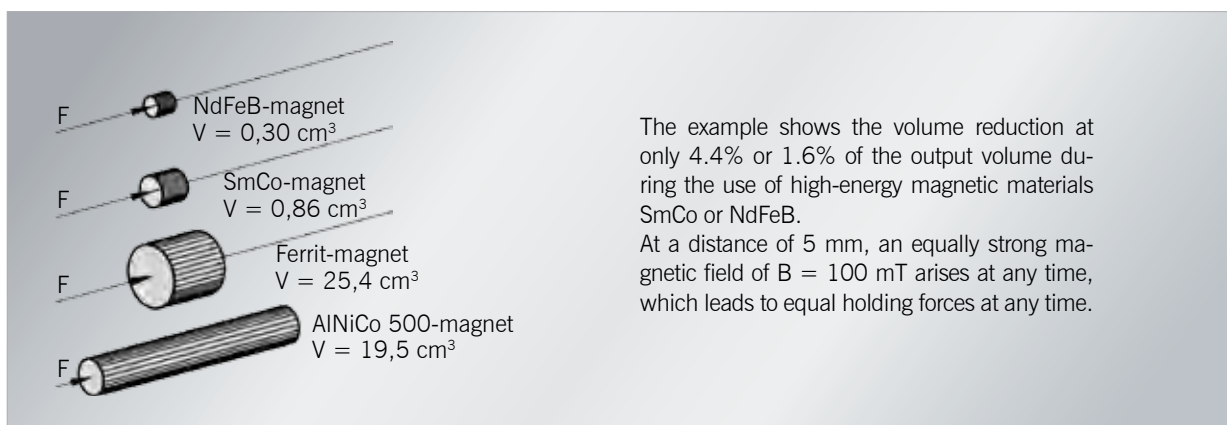


Fig. 7: Magnetic volumes for different magnetic materials with the same magnetic energy content

MAGNETIC CHUCKS

4. Magnetic chucks

4.1. Permanent Magnetic chucks

- Activation and de-activation by the mechanical switching of magnet cores and the separation and combination of field lines
- For grinding, milling and EDM operations
- For turning operations, the max. RPM should be noted
- No thermal expansion
- Low pole plate elasticity levels possible

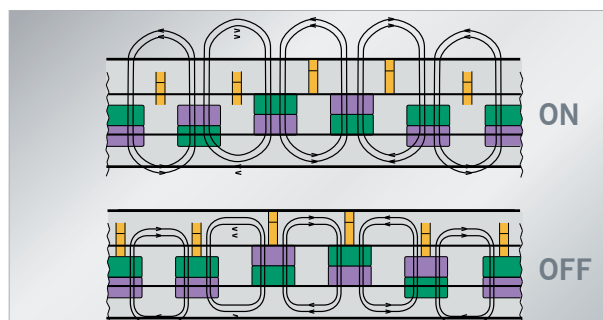


Fig. 8: Permanent magnetic chuck

4.2. Electro magnetic chucks

- The holding force is generated by supplying a continuous current to the coil in the iron core
- For grinding work requiring a lower degree of precision
- A permanent current supply is required
- Thermal expansions can occur
- A deep magnetic field is possible e.g. for lifting magnets

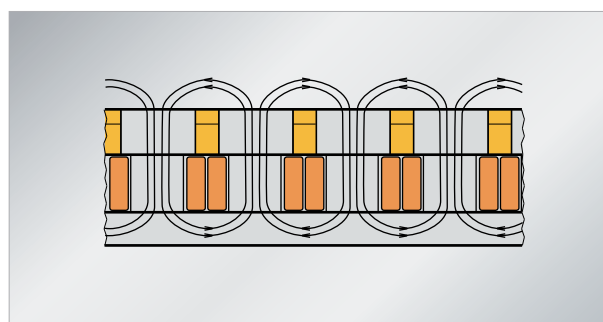


Fig. 9: Electro magnet with iron core

4.3. Electro permanent magnetic chucks, Single System

- Activation and de-activation by defined magnetisation and de-magnetisation of the AlNiCo cores
- For grinding, milling and EDM operations
- No thermal expansion
- Maximum safety levels
- Electrical connection can be disconnected from the automation system

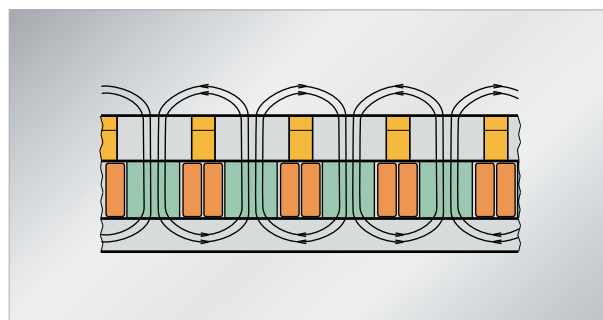


Fig. 10: Electro magnet with ALNiCO core (Single System)

4.4. Electro permanent magnetic chucks, Double system

- In addition to AlNiCo cores, milling magnets in high energy systems are equipped with neodymium magnets in the pole gap. This allows the generation of extreme holding forces.
- Activation and de-activation by reversing the polarity of the AlNiCo cores through impulses
- No de-magnetisation, just a neutralisation of the field
- No thermal expansion
- Maximum safety levels
- Electrical connection can be supplied with a connector plug

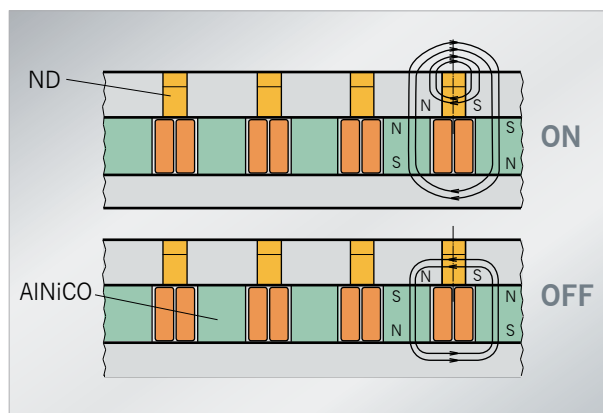


Fig. 11: Electro magnet with ALNiCO and ND in the pole gap (Double System)

MAGNETIC CLAMPING OF WORKPIECES

5. Magnetic clamping of workpieces

5.1. Holding and sliding forces in the magnet technology

Pole pitch, workpiece shape, surface quality and material have a large influence on the holding and sliding force of a workpiece.

- a) The **holding force** is the break-off force of a clamped workpiece vertical to the clamping surface.
- b) The **sliding force** is the force necessary to slide a workpiece parallel to the clamping surface. Depending on the surface quality, the sliding force comes to about ca. 15 to 30% of the holding force.

Unless specifically mentioned, the given nominal holding forces for our products, they are valid for a ground test specimen of St37, with the dimensions 100 x 100 x 40 mm.

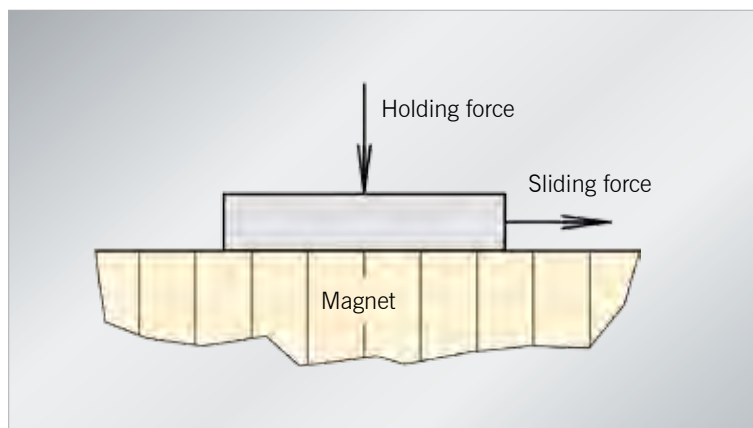


Fig. 12: Holding and sliding forces of magnetic chucks

5.2. Influence of the pole pitch and workpiece thickness

In order to achieve a consistent holding force over the entire clamping surface and also to clamp smaller workpieces, magnetic chucks are produced with various pole pitches and pole clearances. Therefore the clamping surface is designed with alternating north and south poles (Fig. 12). The pole gap consists of a non-magnetic material, like brass or epoxy.

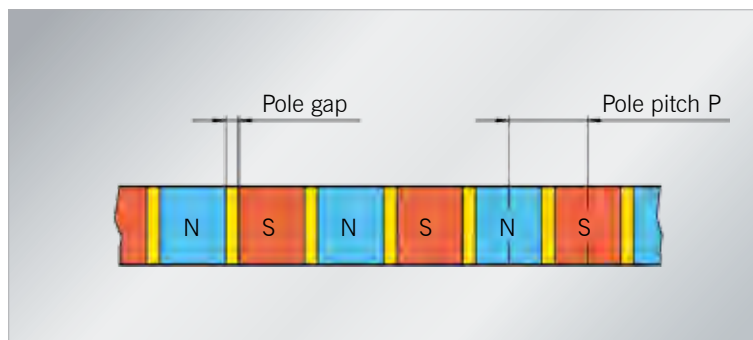


Fig. 13: Definition of pole gap and pole pitch in magnetic chucks

INFLUENCE ON HOLDING FORCES

The magnetic field of the rested workpiece goes from one pole to the next in half circles.

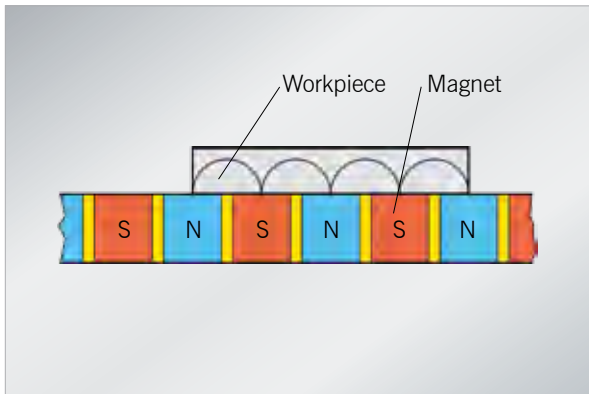


Fig. 14: Lines of force course in workpiece thickness > pole clearance

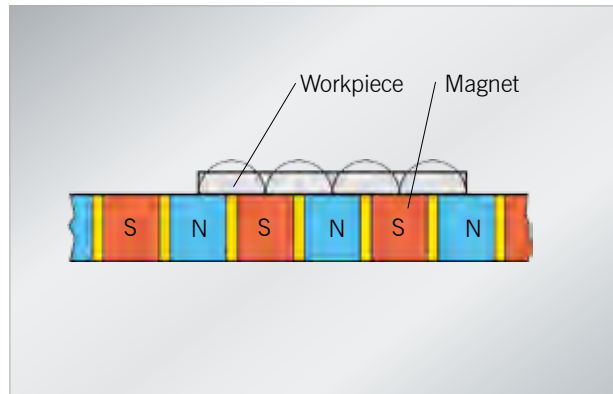


Fig. 15: Lines of force course in workpiece thickness < pole clearance

If the workpiece thickness is significantly smaller than the pole clearance, the workpiece will not entirely absorb the magnetic field. This results in a reduction of the holding force. When all lines of force are running within the workpiece, the best holding forces are attained.

When there are larger pole pitches, a larger penetration of the magnetic field can be attained for thicker and raw workpieces and therefore a larger holding force is attained.

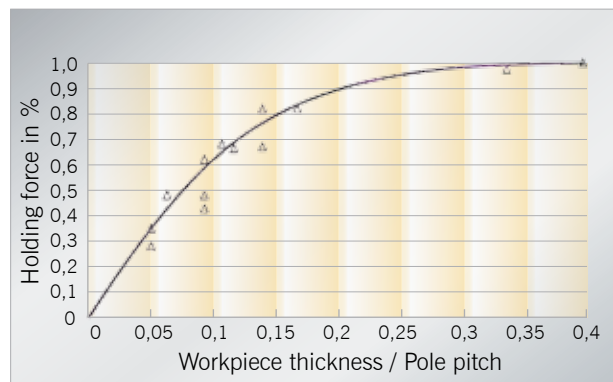


Fig. 16: Holding forces depending on pole pitch relation

5.3. Influence of contact surface and surface condition

Any surface of the workpiece which is actually touched by the magnet surface is to be seen as a contact surface (Fig. 17).

a) Dependence of holding force on the workpiece shape:

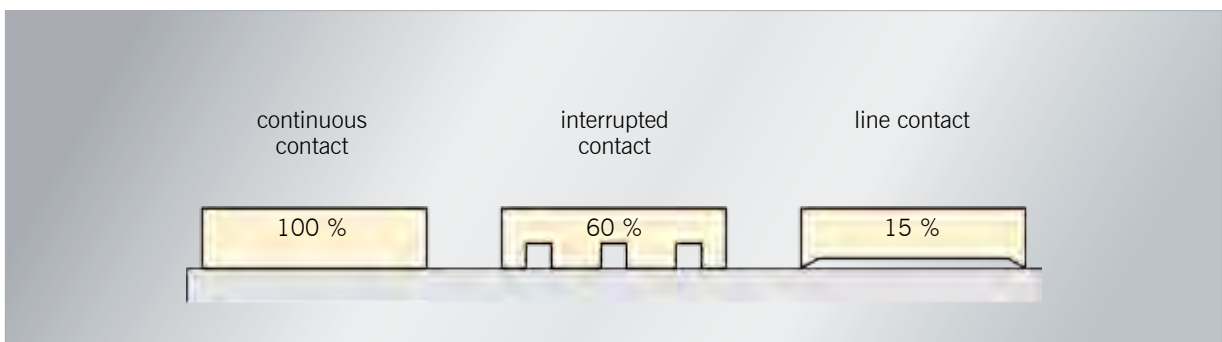


Fig. 17: Rough illustration of the reduction of holding force because of unfavourable workpiece shapes.

INFLUENCE ON HOLDING FORCES

b) Holding force dependence of surface quality

The surface quality is very important for the holding force of a workpiece, as it decreases rapidly with increasing roughness. The best values are achieved with a finely polished surface without air gap (Fig. 18).

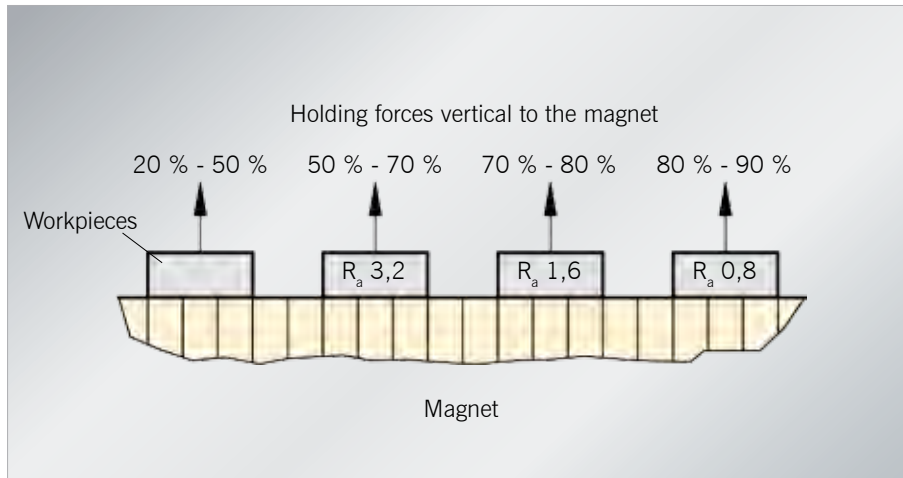


Fig. 18: Influence of workpiece surface on the attainable holding forces

c) Holding force dependence on air gap

Air gaps on workpieces can never be prevented. They are for instance caused by material deformation in the pre-manufacturing, shrink holes and unevenness on casted parts, roughness after mechanical machining, layers of paint and non-magnetic protection surfaces.

As air creates a very large magnetic resistance, fewer field lines can be built-up and the holding forces will reduce quickly. This can be seen in the example diagram below.

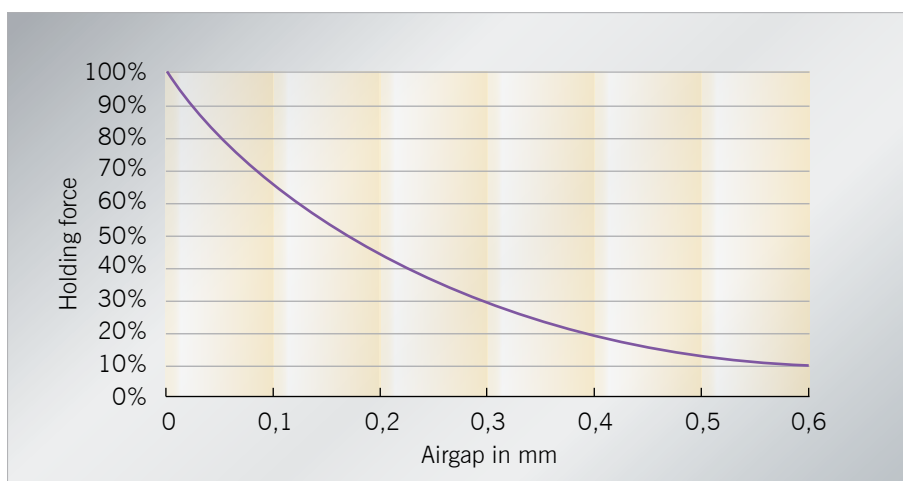


Fig. 19: Influence of air gap on the attainable holding forces SAV 243.70 / 243.73

The air gap sensitivity is mainly depending on the workpiece size in relation to the magnet size, the material properties and the pole pitch of the magnet. Generally speaking, magnetic systems with bigger primary pole pitch can easier bridge the air gaps. In comparison to electro-permanent magnetic chucks, the electromagnetic chucks create deeper magnetic fields and are therefore less sensitive to air gaps.

AIR GAP BEHAVIOUR CHARACTERISTICS

The following air gap behaviour characteristics apply to milling magnets:

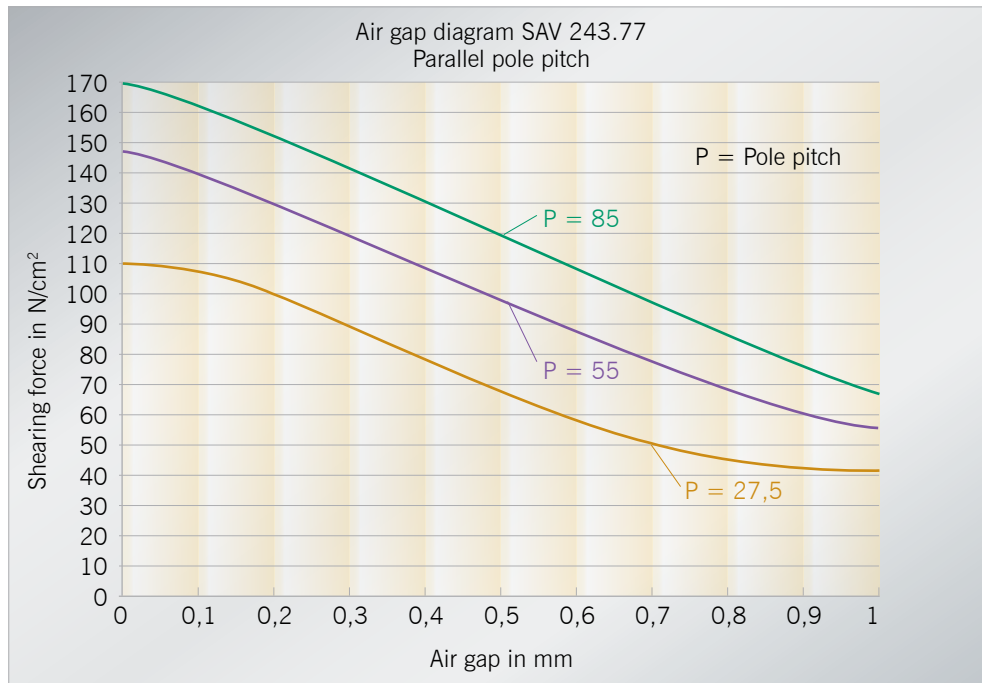


Fig. 20: Air gap diagram for electro permanent chucks SAV 243.77

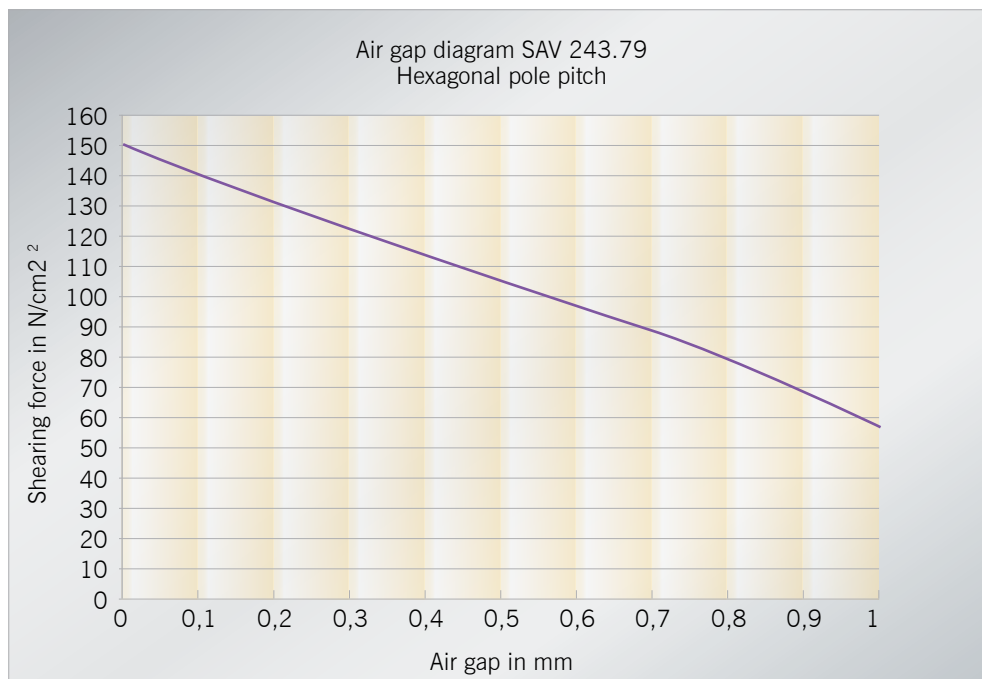


Fig. 21: Air gap diagram for electro permanent milling magnets SAV 243.79

MATERIALS AND HOLDING FORCES

5.4. Material composition of workpieces and heat treatments

In technically pure iron, high magnetic flux values can be achieved and thereby the highest holding forces. In practice, there are a number of materials with various magnetic properties.

In addition, heat treatments influence the magnetisation characteristics of materials as they alter the physical structure of the materials. Hardened workpieces conduct the magnetic flux worse.

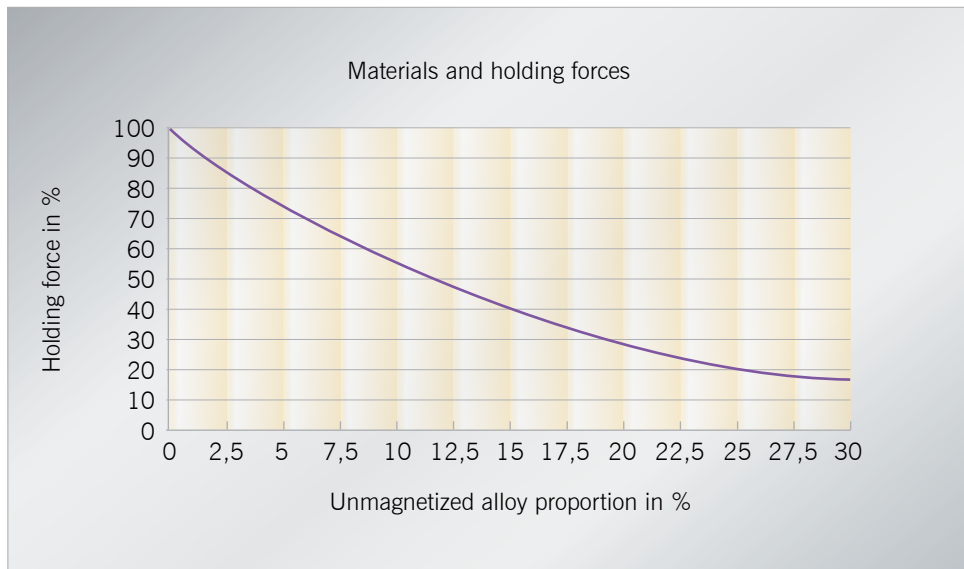


Fig. 22: Influence of the unmagnetized alloy proportion on the holding forces

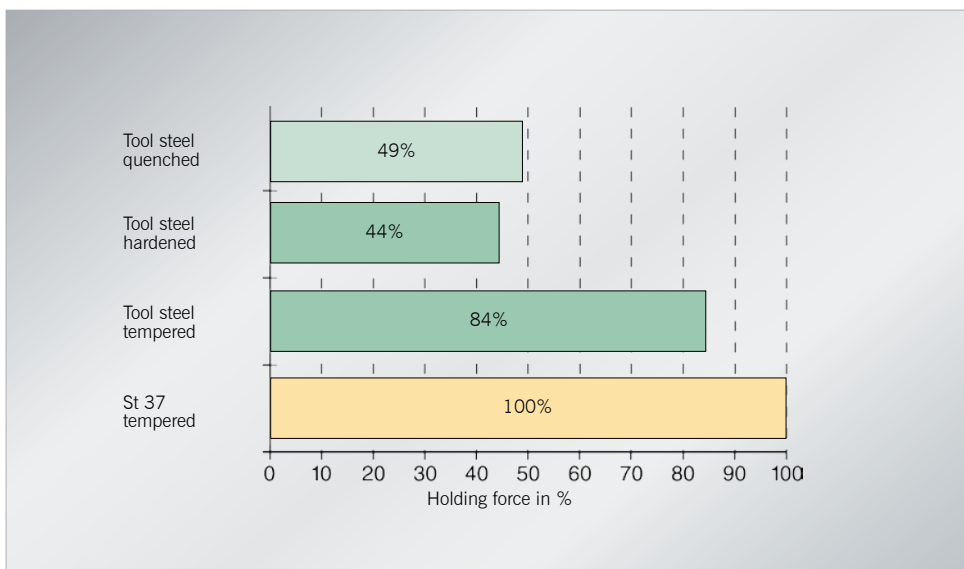


Fig. 23: Influence of heat treatment on the holding forces (example)

MATERIALS AND HOLDING FORCES

Description Abbreviation DIN	Material-No.	max. unmagnetized alloy proportion	Heat treatment	Holding force
Pure iron	—	0.00%	Soft	100%
Construction steels				
St37-2	1.0037	-	Soft	95%
St52-3 N	1.0570	-	Soft	93%
St50-2	1.0050	-	Soft	75%
Case-hardened steels				
C10	1.0301	1.22%	Soft	93%
C15	1.0401	1.27%	Soft	93%
17CrNiMo6	1.6587	5.43%	Soft	72%
16MnCr5	1.7131	3.06%	Soft	83%
20MnCr5	1.7149	3.40%	Soft	82%
C10	1.0301	1.22%	Case-hardened	48%
C15	1.0401	1.27%	Case-hardened	48%
17CrNiMo6	1.6587	5.43%	Case-hardened	38%
16MnCr5	1.7131	3.06%	Case-hardened	43%
20MnCr5	1.7149	3.40%	Case-hardened	42%
Nitrided steels				
34CrAl6	1.8504	4.29%	Untreated	77%
31CrMoV9	1.8519	4.65%	Untreated	76%
34CrAlNi7	1.8550	5.93%	Untreated	70%
39CrMoV13-9	1.8523	6.44%	Untreated	68%
34CrAl6	1.8504	4.29%	Nitrided	50%
31CrMoV9	1.8519	4.65%	Nitrided	49%
34CrAlNi7	1.8550	5.93%	Nitrided	46%
39CrMoV13-9	1.8523	6.44%	Nitrided	44%
Machining steels				
15S10	1.0710	1.77%	Untreated	90%
9SMn28	1.0715	1.92%	Untreated	89%
45S20	1.0727	2.21%	Untreated	88%
60SPb20	1.0758	2.71%	Untreated	85%
Quenched and tempered steels				
C22	1.0402	2.96%	Soft	84%
C45	1.0503	3.20%	Soft	83%
Ck45	1.1191	3.50%	Soft	81%
C60	1.0601	3.57%	Soft	81%
Ck60	1.1221	3.65%	Soft	80%
43CrMo4	1.3563	3.62%	Soft	80%
36CrNiMo4	1.6511	4.37%	Soft	77%
C22	1.0402	2.96%	Quenched	49%
C45	1.0503	3.20%	Quenched	48%
Ck45	1.1191	3.50%	Quenched	47%
C60	1.0601	3.57%	Quenched	47%
Ck60	1.1221	3.65%	Quenched	47%
43CrMo4	1.3563	3.62%	Quenched	47%
36CrNiMo4	1.6511	4.37%	Quenched	45%
Roller bearing steels				
100Cr6	1.3501	3.11%	Soft	83%
100CrMn6	1.3520	5.26%	Soft	73%
X102CrMo17	1.3543	22.72%	Soft	26%
X82WMoCrV6-5-4	1.3553	11.40%	Soft	44%
100Cr6	1.3501	3.11%	Hardened	43%
100CrMn6	1.3520	5.26%	Hardened	38%
X102CrMo17	1.3543	22.72%	Hardened	13%
X82WMoCrV6-5-4	1.3553	11.40%	Hardened	24%
Spring steels				
Ck67	1.1231	2.04%	Soft	88%
60SiMn5	1.5142	3.15%	Soft	83%
51MnV7	1.5225	2.87%	Soft	84%
Ck67	1.1231	2.04%	Hardened	46%
60SiMn5	1.5142	3.15%	Hardened	43%
51MnV7	1.5225	2.87%	Hardened	44%
Cold extrusion steels				
Cp15	1.1132	1.10%	Soft	94%
41Cr4	1.7035	3.55%	Soft	81%

INFLUENCE ON HOLDING FORCES

5.5. Influence of pole raisers

In case pole raisers are necessary for solving a workholding problem, these are not only effective as magnetic resistance but also increase the leakage flux simultaneously. It should therefore be observed that, for instance, pole raisers with a height up to 140 mm can have a drop in holding force of up to 20%.

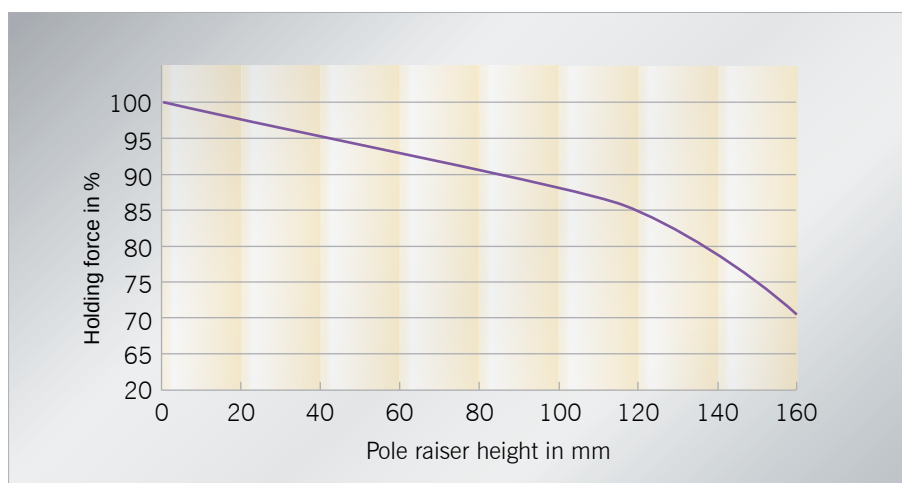


Fig. 24: Influence of the pole raiser height on the attainable holding forces

Due to the effects described in 6 e.) this loss of holding force is balanced out with suitable dimensioning, and can possibly even increase. Under all circumstances the pole raisers are not allowed to bridge the pole gap, because then there will be no magnetic flux available in the workpiece.

5.6. Influence of the application temperature

Temperature influences can significantly influence the qualities of a magnetic clamping system, so they are to be taken in consideration when choosing and constructing a magnetic clamping device. Increasing temperatures lead to reduction of the remanence and therefore the holding forces and to an increase of the coercive force. Above the Curie-temperature, the magnetic materials lose their magnetization irreversibly.

Material	Max. application temperature	Curie-temperature
Hard ferrite	200 °C	ca. 450 °C
AlNiCo	450 °C	ca. 850 °C
SmCo	350 °C	ca. 750 °C
NdFeB	80 °C	ca. 300 °C

MAXIMUM ROTATIONAL SPEEDS

6. Maximum rotational speeds for circular magnets

6.1. For circular permanent magnets

Magnet		 SAV 244.02	 SAV 244.03	 SAV 244.04	 SAV 244.05	 SAV 244.06	 SAV 244.07	 SAV 244.08	 SAV 244.10
max. rotational speed (RPM) for diameter	ø50	-	-	-	-	-	-	-	450
	ø80	-	-	-	-	-	-	-	400
	ø100	780	350	-	-	780	780	-	-
	ø125	-	-	-	740	-	740	-	-
	ø130	715	-	-	-	715	-	-	-
	ø150	-	230	-	-	680	-	680	-
	ø160	650	-	650	650	-	650	-	-
	ø180	-	-	-	-	-	625	625	-
	ø200	600	-	600	600	600	600	600	-
	ø250	500	-	500	500	500	-	500	-
	ø300	450	-	450	-	450	-	450	-
	ø315	-	-	-	430	-	-	-	-
	ø350	400	-	-	-	400	-	400	-
	ø400	350	-	-	350	350	-	350	-
	ø450	300	-	-	-	-	-	300	-
	ø500	250	-	-	-	-	-	250	-
	ø600	-	-	-	-	-	-	200	-

6.2. For electro- and electro permanent circular magnets

Magnet		 SAV 244.40	 SAV 244.41	 SAV 244.43	 SAV 244.45
max. rotational speed (RPM) for diameter	ø 100	3850			
	ø 150	2550			
	ø 200	2000			
	ø 250	1600			
	ø 300	1300			
	ø 400	1000			
	ø 500	800			
	ø 600	650			
	ø 700	550			
	ø 800	480			

Magnet		 SAV 244.70	 SAV 244.71	 SAV 244.72	 SAV 244.73
max. rotational speed (RPM) for diameter	ø 1000	400			
	ø 1200	320			
	ø 1400	280			
	ø 1500	260			
	ø 1600	240			
	ø 1800	220			
	ø 2000	200			
	ø 2500	160			
	ø 3000	130			
	ø 4000	100			

DEMAGNETIZING

7. Demagnetizing of materials

When ferromagnetic workpieces are magnetically clamped or held, they still retain a low residual magnetism (remanence) after the magnetic field has been switched off.

In practice, this side effect, which is often disturbing, can be removed with the following equipment:

7.1. Electronic polarity-reversing control units

The units serve both as a direct current supply and a demagnetizing fixture for all electro and electro-permanent magnets.

During polarity-reversing and demagnetizing, a process (excitation and counter excitation) occurs with progressively decreasing energy until the residual fields are eliminated. Therefore the magnetization created by the holding magnet can be mostly removed.

It is guaranteed thereby, that workpieces without residual force can be lifted from the holding magnet.

The use of equipment such as holding or transporting magnets guarantees an immediate and precise loosening of the parts.

If, however, a high demagnetization quality is required, an additional treatment of the workpieces with a demagnetizer must be carried out.

7.2. Demagnetizers

This equipment serves to remove the often disturbing residual magnetism in the workpieces. An extensive demagnetization is necessary for many products like cutting, punching and measuring tools or roller bearings.

The unorientated ground state of the molecular magnets is thereby achieved, by exposing the workpiece to a permanently alternating, strong magnetic field with a decaying amplitude. Therefore demagnetizers are operated with alternating current, where the polarity alternates in the mains frequency 50/60 Hz.

The decaying amplitude can be attained by leading the workpiece out of the alternating field slowly and steadily.

The part to be demagnetized should be moved through the alternating field at ca. 0.2 m/s. At a distance of 20-30 cm, the alternating amplitude is approx. 0.

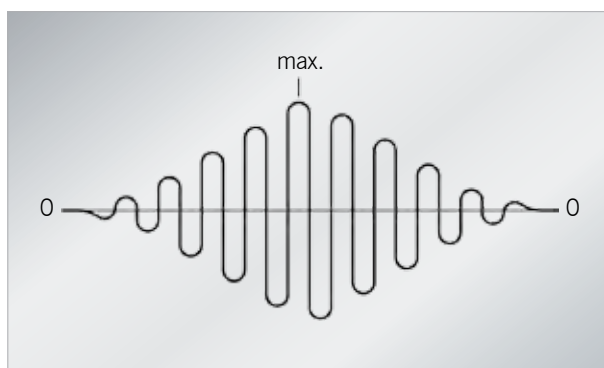


Fig. 25: Decreasing magnetic alternating field for demagnetization

DEMAGNETIZING

a) Table demagnetizers

With this equipment a laminated iron system leads the alternating field on to the plate surface. Thereby a very strong magnetic field with large penetration is achieved. The pole surface is halved by a non-magnetic gap. The workpiece must be led over this parting line.

Table devices are suitable for the demagnetizing of parts up to approx. 50 mm thickness. Thicker parts must be treated from both sides. The apparatus serve as table equipment or can be installed in automatic conveying devices.

If the parts are very heavy, it is possible to lead the demagnetizer over the workpiece. Mass production parts can also be led over the device in plastic containers.



Fig. 26 to 28: Use of table demagnetizers

b) Tunnel demagnetizers

Tunnel demagnetizers consist of a coil protected by non-magnetic material. The equipment is especially suited to the demagnetizing of parts with large surfaces like, e.g. tubes, bars, profiles - and to bundled and packaged parts. They can likewise be installed in conveying devices or be arranged ca. 30 degrees diagonally, so that the parts can slip through.

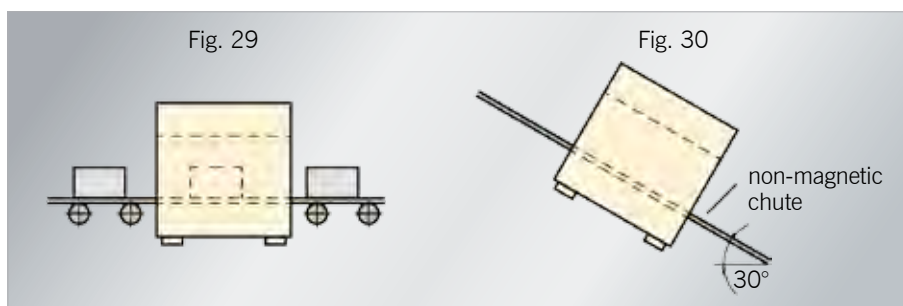


Fig. 29 and 30: Tunnel demagnetizers with band conveyor and chute

c) Low-frequency generators

As already described, table and tunnel demagnetizers operate with the normal mains frequency of 50/60 Hz. Better demagnetizing results can possibly be attained by using a lower frequency, especially on high alloyed and hardened materials. Low-frequency generators lower the mains frequency to 16 Hz.

Such devices can simply be connected before the table and tunnel demagnetizers.

TECHNICAL EXPLANATIONS AND TERMS

8. Technical explanations and terms from magnet technology

AlNiCo:

Aluminium-nickel-cobalt magnetic material. Metallic permanent magnet with high remanence and comparatively lower coercive force.

Air gap δ :

Clearance between magnet and counter pole (workpiece).

Anisotropy:

Anisotropic materials are described as preferential-directioned. During their production (casting, sintering and alloying-in) they are exposed to a magnetic field or particular layering process.

A/m:

Ampere per meter; unit of the magnetic field strength (1 A/m = 0,01256 Oersted)

$(B \times H)_{\max}$:

Biggest product from B and H on the demagnetization curve in kJ/m³ or GOe (1 GOe = 79,6 10 kJ/m³). The bigger the $(B \times H)_{\max}$ -value, the smaller the volume of the magnetic material for the same holding force can be, but under unchanged conditions.

Coercive force B_H :

Size of required retarding potential strength in kA/m or Oe, to bring a saturated magnetic material back to zero with the existing retarding potential.

Coercive force H_C :

Size of required retarding potential strength in kA/m or Oe, to bring a saturated magnetic material back to zero, even after the retarding potential has been switched off.

Curietemperature:

At this temperature magnetic materials irreversibly lose their magnetization.

Demagnetizer:

Equipment to remove the residual magnetism (see remanence) from workpieces which have been effected by a magnetic field.

Demagnetizing:

Reduction of magnetization by using a retarding potential or a decaying alternating field or also by using temperature influences.

Demagnetizing curve:

That part of a hysteresis loop, which runs in the second quadrant of a rightangled coordinate system. The course of the demagnetizing curve and its targets B_r (remanence) and H_C (coercive force) mark the significant magnetic qualities of a permanent magnet.

Diamagnetism:

Term for all materials who only react insignificantly to a magnetic field eg. plastics, fluids, organic materials etc.

Dimension ratio:

The ratio L/D = length/diameter of a rod magnet, has an optimal value for every magnetic material in the optimal work point.

Dispersion coefficient σ :

The dispersion coefficient takes into consideration that part of magnetic flux which is not available for, eg. clamping of the workpiece. It is heavily dependent on the clamping system and workpiece.

Ferromagnetism:

Generic term for all materials which shows a more or less large magnetization after the feeding of an external magnetic field.

Flux density:

Density of the lines of force of the induction field. Unit: 1 Tesla = 10 Gauss.

Gauss (G):

Old unit of magnetic induction.

Hard ferrite magnet:

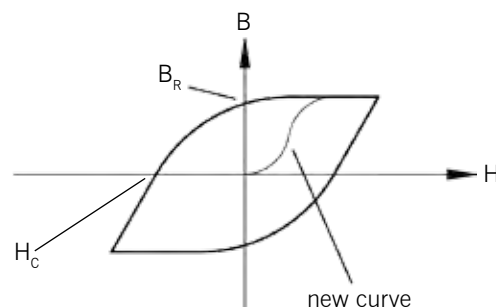
Oxide magnet made from iron oxide, barium or strontium carbonate with relatively low remanence and coercive force.

Holding force F_H :

Work force of a magnet or magnet system. The holding force refers to a vertical workpiece break-off and a precisely defined test specimen.

Hysteresis loop:

Graphic representation of the magnetizing and demagnetizing cycle.



Induction:

Induction is the change which is effected on a material by a feeded magnetic field.

TECHNICAL EXPLANATIONS AND TERMS

9. Technical explanations and terms from magnet technology

Isotropy:

The equality of magnetic characteristics in all directions of magnetic material.

Lines of force:

Grafic representation of the magnetic field.

Magnetic flux Φ :

The magnetic flux in Wb (Weber). Stands for the "number" of lines of force.

Magnetic system:

Magnet with one or more fastened pole shoes as well as two or more magnets which operate in a functional unit.

Magnetization M:

Value in kA/m. The magnetization by the aligned elementary magnets. For practical use it is considered by the relative permeability.

Magnetizing:

Alignment of elementary magnet ranges by feeding an external magnetic field.

NdFeB:

Neodymium-iron-boron magnetic material. High-energy magnet with the highest remanences at present. work-piece.

Oersted:

Old unit of the magnetic field strength.
1 Oersted = 79,6 Nm.

Operating temperature max:

A magnet can be used up to this temperature without losing its magnetization.

Permanence B_p :

The permanence gives the maximum flux density of the magnetic material by 0 kA/m field strength. The difference between this and remanence B_r is that permanence adjusts itself to continually changing air gaps. The permanence is always smaller than remanence.

Permeability μ_0 :

Also known as induction constant. "Conductivity" for magnetic lines of force in a vacuum. Ratio between magnetic induction B and magnetic field strength H in a vacuum.

Permeability, relative μ_r :

The relative permeability considers the magnetization of the material.

Permeability, absolute μ :

"Conductivity" for magnetic lines of force, ratio between magnetic induction B and magnetic field strength H.

$$\mu = \mu_0 \times \mu_r$$

Pole gap S:

Clearance between a north and a south pole which consists of non-magnetic materials – mostly brass, epoxy or stainless steel.

Pole pitch P:

Clearance from one north to one south pole. The pole pitch always contains a pole gap.

Pole shoes:

Also known as pole extensions or raisers. They are always used in connection with magnet systems to lead the magnetic field into the workpiece. Pole shoes facilitate a 5-sided machining and also allow complicated workpiece shapes to be clamped.

Remanence B_r :

Size of the remaining field strength of a magnet in a closed circuit.

Saturation:

The saturation flux density B_s is achieved, when the workpiece cannot absorb any more magnetization.

Screened magnet system:

Leading and concentration of the magnetic field through an iron pot around the back and lateral surfaces of a magnet.

SmCo:

Samarium-cobalt magnetic material. High energy magnet with large remanence and large coercive field strength.

Temperature coefficient of the remanence TK_{B_r} :

Value given in % which illustrates the lowering of the remanence during increasing ambient temperatures.

Temperature coefficient of the coercive force TK_{H_c} :

Value given in % which illustrates the increasing of the coercive force during increasing ambient temperature.

Tesla:

Unit of magnetism induction. 1 Tesla = 10^4 Gauss.

Sliding force:

Force of a magnetic clamping system which stands vertical to the holding force and therefore lies parallel to the pole plate.

Resistance factor τ :

Factor which considers the loss of field strength at the transmission point and in the workpiece.

CONDITIONS OF SALE AND DELIVERY

1. General and contract conclusion

a) all agreements and offers are based on our conditions; they apply as accepted through placement of order or acceptance of the supply. Deviating conditions of the customer, which we do not accept expressly in writing, are noncommittal for us, even if we do not contradict explicitly.

b) For the scope of supply our confirmation of order is determining. Verbal, telephonically, telegraphic and telefaxed special agreements and additional contract modifications have validity only if they are confirmed in writing by us. The same applies to assured properties of the supplied article. All data in our designs, illustrations, measurement tables, weight tables etc. are - so far not explicitly confirmed by us - only approximate values. The documents belonging to the offers remain our property, are subordinate to our copyright and may not be made accessible to third parties or only with our written approval.

c) The order acceptance by us takes place in writing. If we should deviate slightly in our order confirmation in relation to the order of the customer, then our order confirmation is obligatory, if within eight days - in urgent cases by telephone call, telegram or telefax - one does not contradict to these. Hereunder applies the principle that a wrong transmission always goes debited to the customer, and will not be borne by us.

d) Place of delivery for all obligations developing from the contractual relation is Nuremberg Germany. Area of jurisdiction for all from the contractual relation as well as law cases rising over its developing and its effectiveness is Nuremberg; after our choice also seat of the customer (with foreign contracts: also court of the capital of the country, in which the customer has his seat). The contractual relation is always subject to the German material right under exclusion of international purchase rights.

e) All written or oral offers are, unless no other agreements are made or confirmed by us, not binding.

2. Prices

The prices are in Euro. The prices apply, if not explicitly differently agreed, purely net ex works including loading, excluding packing, freight, insurance, assembly and other additional expenses. All increase of freight and tariffs, value added tax, material prices and wages are for the account of the customer. With supplementary orders the prices are newly agreed upon.

3. Delivery time.

The delivery time is specified after best discretion and is therefore to be understood as approximately, excluding explicitly firm designated agreements. The time for delivery starts only from the time, in which written agreement exists over the final supply and all questions necessary for the trouble-free execution of the order are clarified. The time for delivery does not begin before the time that all documents are made available to us, the necessary official and private explanations, permissions and releases etc. are available and the customer has fulfilled the agreed payments and other obligations.

The delivery time is considered as firm, if the shipment has left our works within the agreed delivery time. If the delivery is delayed for reasons not attributable to us, then the time for delivery is considered as firm with the message that goods are ready for dispatch within the agreed delivery time.

The time for delivery extends - also within a delivery delay appropriate at occurrence of foreseen events, which we could reasonably not prevent despite the circumstances of the case - equally to events in our work or at possible subcontractors - for example operational disturbances, wasting of an important working part, delays in the delivery of substantial raw materials and delivery parts, strike, lockout, mobilization, war and riot as well as in delay of the customer from this or another contract.

At later changes of the contract, which can affect the delivery time, the delivery time extends, unless special agreements concerning this can be made, to appropriate extent. Consequential loss or damage because of late supply with negligent behaviour by us or our personnel are explicitly excluded.

In any case we are responsible for such damage only up to the invoice amount excluding V.A.T., whose cause and extent could have been foreseen by us. Partial deliveries are permissible. For special and customer specific products a withdrawal is not possible.

4. Terms of payment

Our invoices are payable within eight days from invoice date with 2% discount or within 30 days net. Repair and spare part invoices are immediately payable without any deduction. The retention of payment due to whatever unrecognized or legally invalid counterclaims of the customer is just as inadmissible as the set-off with such counterclaims.

Cheques and discountable changes are accepted only after special agreement and only when all additional collection and discount charges are paid. When payment is received after the due date, interests according the usual bank interest on debit balances plus 2% as well as all arising additional fees or other costs can be charged.

With call-off orders we are entitled make our invoices payable at readiness for dispatch. With call-off delays, starting 14 days after announcement of readiness for dispatch, the additional charges for storage, care and shifting of the commodities can be charged.

With payments by instalments which were accepted by us the entire remainder becomes immediately due, if the customer with a due payment is over 10 days in delay or in his financial circumstances nature-due, if the customer with a due payment is over 10 days in delay or substantial degradations in his financial circumstances occurs.

In addition we are entitled to reject all pending supplies subject to payment, or to insist on acceptance and/or if necessary validate claims for damages in accordance with the condition of the previous paragraph.

5. Transfer of risk

The risk is passed-on to the customer, even if freight-free delivery was agreed:

a) At delivery of the supplies by us or one of our assigned transporters, however latest at leaving of our works or warehouse. The packing takes place with best care. The dispatch takes place after best discretion of the supplier. On request and for the account of the customer the delivery is insured by the supplier against breakage, transportation- and fire damage.

b) If the dispatch, the delivery or the acceptance are delayed for reasons, which are not attributable to us, then the risk is transferred to the customer on the day of readiness for dispatch; however we are prepared to take out a desired insurance on request and for the account of the customer.

6. Receipt

Delivered articles are to be received by the customer, even if they show insignificant defects. Partial deliveries are permissible.

7. Guarantee

If a commodity is defective, is missing assured characteristics or will loose characteristics during the guarantee period due to production or material failures or will it become defective during the guarantee period due to production or material failures, then we will, under exclusion of further guarantee claims of the customer, according our choice supply a replacement or have the commodity reworked.

If this is not possible, the rework fails or is refused by us or unreasonably delayed, then the customer has the right to a replacement or reduction. Damage claims because of non-fulfilment or consequential damage are explicitly not accepted, except for mandatory liability because of guilt.

For consequential damages we only take responsibility, if the customer should be secured by the warranty against such consequential damages. In these cases we are liable only up to expectation interest, maximum up to 2-times the value of the supply, excluding value added tax.

Determination of all defects must be announced immediately - with recognized defects at the latest within 8 days after receipt of the commodities, with non-recognized defects immediately after determination - in writing.

Costs of the rework are for our account up to the value of the defective part, beyond that it is for the account of the customer.

Wear or damages, which are due to careless or unsuitable use, excessive load, unsuitable equipment, inadequate construction work, is excluded, as far as unknown to us at completion of contract and the use was expressly assured.

When improper changes or repairs are made by the customer or a third party, our liability for the consequences caused by this is waived.

For improvement work and spare pieces we are liable to the same amount as for the original delivered commodity, and only up to the expiration of the guarantee period of the original delivery commodity.

For sub supplied commodities our total liability is limited to passing on the liability claims, which we have against the supplier of these commodities.

Only if these were claimed without result, our liability according paragraph 1 is revived again. In all cases only such damages, whose cause and extent were foreseeable for us, are replaced.

The guarantee claims expire 12 months after delivery.

8. Other claims for damages, resignation

Claims for damages from impossibility of the performance, delay, positive violation of contract, debts at completion contract or tortious liability are excluded, unless, these are based on intent or gross negligence of us. Claims for damages are limited in each case to the value of the supply.

When the performance becomes impossible to us or the customer, then general rights of law apply under the following condition:

If the impossibility is due to our fault, then the customer is entitled to require compensation of damages. This is limited to half of the value of the supply, excluding value added tax, of the part of the supply or performance, which cannot be taken in useful service because of the impossibility.

The right of the customer to the resignation remains unaffected. If unexpected events in the sense of number 3 of the economic meaning or the contents of the supply or performance change substantially or considerably affect on our company, the contract will be changed proportionally.

As far as this is economically not justifiable, a right of resignation is entitled to us. If we want to make use from this right, then we will communicate this to the customer immediately after determination of significance, and also then, when even at first with this an extension of the delivery time was agreed upon.

In all cases only such damages, whose origin and extent were foreseeable for us, are replaced.

9. Right of ownership

The supplied commodity remains our full property until full payment, also the future developing demands, indifferently from whatever argument this developed, even if payments for particularly designated demands were made. With open invoices the reserved property applies as security of our demand for balance.

a) By machining and processing of the reserved commodities, the customer does not acquire the property of the new item in accordance with. § 950 BGB. The processing is performed by the customer for us, without resulting in any obligations to us. If the reserved commodities are processed, connected, mixed or integrated with other items not belonging to us, we acquire the property of the new item in relationship to the value of the reserved commodity to the other finished items.

b) The allowances of the customer from resale or rental of the reserved commodities are directly assigned to us and without consideration, if the reserved commodities are without or after processing, connection, mixture or integration and if they are resold to one or multiple customers.

These demands serve as protection only upto the value of the already sold reserved commodities. In case that the reserved commodities are sold together with other items not belonging to us, with or without processing, the transfer of the demand for purchase price applies only to the amount of the reserved commodities, which is, together with other items, the subject of this contract.

Regardless of the transfer and our right to resignation, the customer is entitled for resignation in so far, when he fulfils his obligations to us and does not come into financial collapse. On request the customer has to give us the details necessary for the resignation of the resigned demands, and communicate the resignation to the debtors.

The customer has to inform us immediately about the execution measures of third parties in the reserved commodities or the in advance resigned demands, by handing over the documents necessary for an intervention. The customer bears the cost of our intervention.

c) The customer has the obligation to keep the commodities in proper condition during the duration of the right of ownership and will directly have the necessary repairs - apart from emergencies - performed by us or by one of our recognized repair workshop at own expense.

10. Transfer of the contract

The transfer of demands on us to third parties is impossible, if we do not agree in writing.

INDEX TO SAV-NUMBERS

SAV-No.	Page	SAV-No.	Page	SAV-No.	Page
220.30	20	243.70	58 / 59	246.50	157
220.31	20	243.71	60 / 61	246.53	158
220.32	21	243.72	62 / 63	246.54	158
220.33	21	243.73	64 / 65	246.60	159
220.76	66 / 67	243.76	66 / 67	246.61	160
220.79	77	243.77	68 - 71	248.01	26 / 145
240.62	151	243.77-RAIL-RSS	74	248.02	145
241.29	133	243.77-RAIL-RTWC	74	248.03	146
241.31	134	243.77-RAIL-RTWF	75	248.05	29
241.32	135	243.79	76	248.40	146
241.40	136	243.80	78	248.60	147
241.41	137	244.02	26	248.61	147
241.50	138	244.03	27	248.70	73
241.51	139	244.04	27	248.81	52
241.52	140	244.05	28	248.83	52
241.53	141	244.06	29	248.84	94
241.90	142	244.07	30	248.85	94
242.01	148	244.10	28	248.86	52 / 95
242.02	148	244.40	42 / 43	248.90	31
242.05	150	244.41	44 / 45	248.91	31
242.07	149	244.43	46	248.92	32
242.11	149	244.45	47	248.94	32
242.12	150	244.70	80 / 81	482.70	162
242.21	152	244.71	82 / 83	486.04	118
242.22	152	244.72	86 / 87	486.40	118
242.25	153	244.73	88	487.40	154
242.29	153	245.01	122	532.03	161
242.31	154	245.02	123	532.11	162
242.90	22	245.03	124	876.02	50 / 93
242.91	22	245.04	125	876.06	51
242.92	79	245.05	126	876.10	48 / 49
243.01	23	245.06	127	876.12	90 / 91
243.07	23	245.09	128	878.05	115
243.10	24	245.10	129	890.02	114
243.11	25	245.40	130	890.42	116
243.15	151	245.41	130	890.43	116
243.40	36 / 37	246.40	156	890.70	117
243.41	38 / 39	246.41	156	890.71	117
243.42	40 / 41	246.42	157		

THE SAV PRODUCT RANGE



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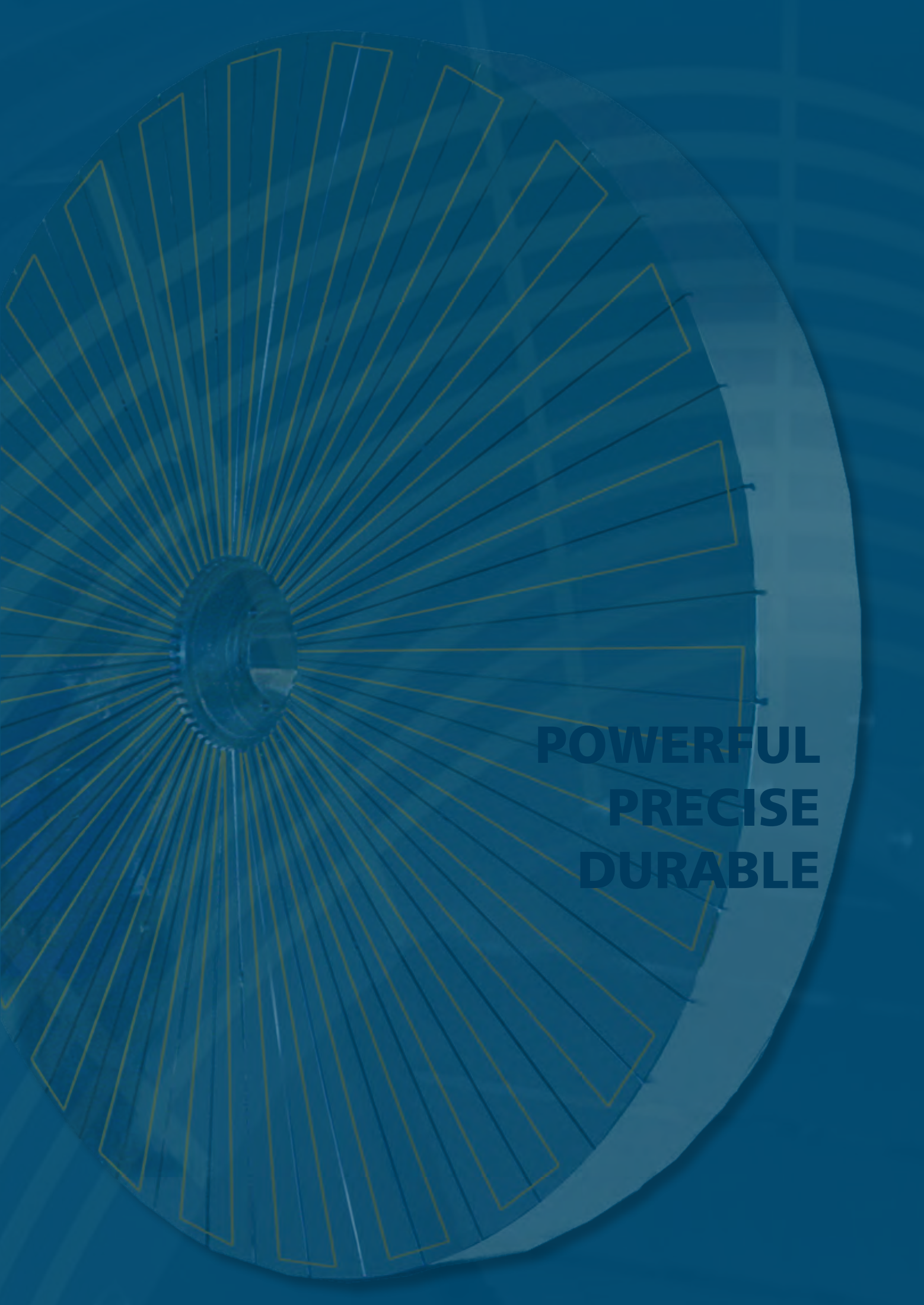
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Dressing, circular grinding, indexing tables

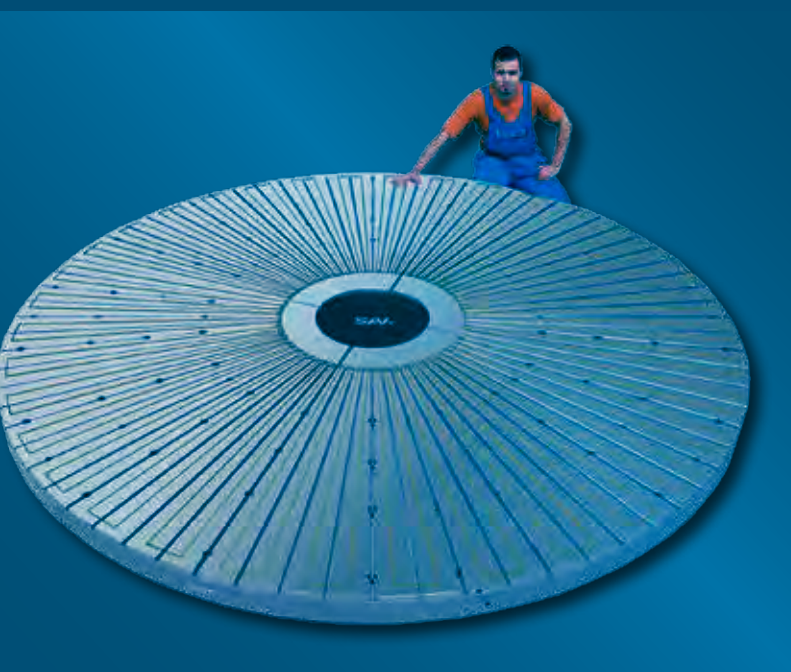


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