MAGNET- AND PRECISION-WORK-HOLDING SYSTEMS

CUSTOMISED · EFFICIENT · QUALITY-ORIENTED

just experts.

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GENERAL INFORMATION

USING THE CATALOGUE AND EXPLANATION OF ICONS

Search options

1. Product-specific selection, e.g. controllable permanent magnets or electro magnets, but also demagnetising or pole plates: see table of contents.
2. Properties-based selection: see page 35, 40 – 41, 60, 80 – 82.

Selecting the right magnetic chuck in three steps

1. Which type of processing? For example, only certain types are suitable for milling (also refer to the introduction of the individual chapters or to the icons for suitable machining methods on the individual product pages).
2. Workpiece dimensions, most common, especially smallest, thinnest.
   This provides the selection of the pole pitch (see individual chapters and data sheets).
3. Magnet size, accuracy, power supply and cycle length (also refer to chapter 1.1).

Other influences on magnetic forces can be found in chapter 1.4.

Icons for suitable machining methods


Drilling

Demagnetising


Grinding


Wire-cut EDM


Milling


Die-sinking EDM


Turning

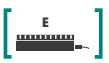

Measuring


Laser welding

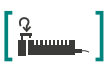
Icons for magnet and precision systems


Standard magnet systems


Sine tables without magnet



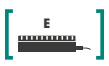
Electro holding magnets


Magnetic combined solutions/ special solutions

Controllable permanent magnetic chucks


Lifting magnets

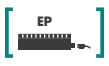
Technical information



Electro magnetic chucks

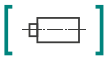

Chuck blocks, magnetic chuck blocks & prisms


Grinding wheel dressing units



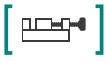
Electro permanent magnetic chucks


Magnetic welding aids


Cylindrical grinding units


Demagnetisers

Holding magnets


Toolmakers vices


Sine tables with magnet

Some chapters start with technical information and application examples. A summary of the fundamentals of magnet technology and practical experiences can be found in chapter 1.4, offering additional information on effective use.

In chapters 1.2.2, 1.2.3 and 1.2.5, the magnet sizes are allocated to the suitable control types and control units. This are not included in the scope of delivery of the magnets and must be ordered separately.

General tolerances, unless stated otherwise

- Length dimensions as per DIN ISO 2768-1-m
- Shape and position as per DIN ISO 2768-2-K
- Metric ISO thread as per medium tolerance class

Holding force, unless stated otherwise

The specific holding force data in the chapters as holding force per workpiece area in N/cm^2 are rated values! They refer to a 100 mm long, 100 mm wide and 40 mm high test workpiece made of steel 1.0037 with polished surface or measurement with holding force tester SAV 486.40. If other conditions apply to the use case, the stated rated holding forces no longer apply.

The rated holding forces in N for electro holding magnets and permanent electro holding magnets apply for 100 % loading of the contact surface and for optimum holding thickness for a polished workpiece made of steel 1.0037. As the material of your products is also very important, please contact us for advice. Other influences on magnetic holding forces are summarised in chapter 1.4.

Information about electrical equipment

- The relative duty cycle (ED) in % refers to a cycle time of 10 min, unless stated otherwise.
- Electro magnetic chucks (chapter 1.2.2) are designed for a 100 % duty cycle.
- Electropermanent magnetic units are designed for a minimum cycle time of three minutes. If you require shorter cycle times, please contact us for advice.

Technical information

Further technical development reserved.
No liability is accepted for misprints and errors. We are grateful for any information about these.

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Last updated

October 2020

CONTENTS

ABOUT SAV


[SAV]
rust experts

PREFACE BY DR. STEFAN HAMM

Dear customers

Magnet systems, rotary and stationary workholding as well as automation – our areas of competence show what SAV is capable of and what we stand for: **customer-focused, fully developed and future-proof solutions.** We develop, we manufacture, we deliver workholding and automation systems and we are focused on solutions. This becomes evident in our tried and tested standard systems and in the special solutions, which we tailor to customer requirements.

To ensure that you can find the right solution from us for your requirements, we merged our competences under the umbrella of SAV GmbH in 2016, efficiently bundling our know-how. This allows us to supply everything from a single source, no matter for which area of competence, no matter for which industry. Trained and experienced SAV experts ensure the highest quality standards at our three German sites – **"made in Germany"**. Our motto is: We deliver on our promises!

Especially in the times of Industry 4.0 and the networking of production chains, we need solutions with a vision and the highest level of expertise for processes. With our **35 years of experience in the manufacturing of intelligent workholding systems and automation solutions**, we are the right partner for optimising your industrial manufacturing processes with the use of workholding systems.

Let SAV convince you!

DR. STEFAN HAMM
CEO OF SAV GMBH

WHAT WE STAND FOR

Our customers' success is the absolute priority in everything we do. With our long-standing experience in terms of material properties, different workpiece geometries and handling applications, we can guarantee the following:

- Quality, operational reliability and economic efficiency
- Application-based capacity for maximum performance
- Flexibility based on in-house development and manufacturing competence
- Minimal chucking and set-up times
- Automation and efficient combined solutions

"WE HAVE HIGH REQUIREMENTS. FOR OURSELVES.

OUR VALUES

CREATING GRIPPING SOLUTIONS TOGETHER.

Our daily actions are based on values which shape our corporate culture and the way we interact with one another: The relationships with our customers are based on cooperation. At SAV, we build our partnerships for the long term. When we negotiate contracts and prices, we are open, objective and fair. One thing is particularly important to us: Of course these values also apply to our employees and suppliers!

OUR OBJECTIVES

FOCUSED ON IDEAL RESULTS

We concentrate on the essential aspects. Therefore, we at SAV set ourselves objectives which ensure efficient processes and maximum customer benefit.

SAV ...

... reduces complexity.

Because we are your contact for all workholding and handling tasks.

... increases efficiency.

Because we are your solution provider for all workholding technology and process requirements, including automated system solutions.

... reduces costs.

Because we offer you intelligently combined workholding fixtures and individual system solutions.

... increases safety.

Because we are your one-stop provider for the complete workpiece handling process.

OUR HISTORY

1984 Robert Feustel lays the cornerstone for SAV in his private garage

1985 Formation of SAV Spann-Automations-Normteiletechnik GmbH by Johannes Leikauf with Ingrid Leikauf and Betty Feustel

1986 Robert Feustel manages the business together with Johannes Leikauf to implement the joint project

1991 Specialisation in engineering of precision magnets and sine tables

1992 Production of the first hydraulic fixtures

1993 Development of the world's first magnets for hard turning

1994 Formation of SAV Mittweida GmbH as the largest production site

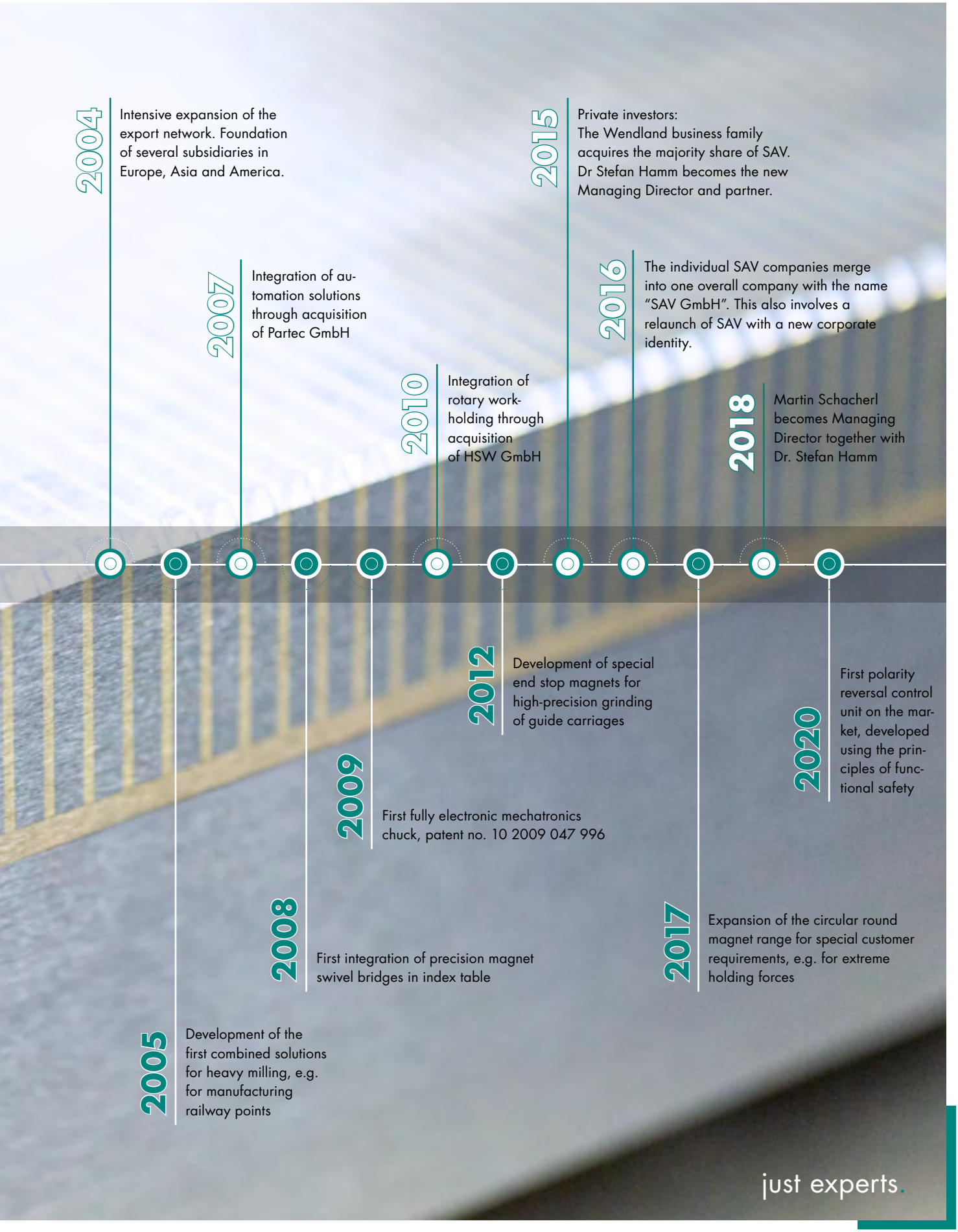
1996 Revolution of the worldwide manufacturing methods for high-precision linear guideways using special magnets

1998 Development of the world's first combination (hybrid) chuck

2000 SAV Spann- Automations-Normteiletechnik GmbH becomes the first industrial supplier of large magnets

2002 Development of the milling magnet range with special designs for a variety of different application profiles, with maximum adhesion forces

OUR PRODUCT DEVELOPMENTS


2004
Intensive expansion of the export network. Foundation of several subsidiaries in Europe, Asia and America.
2005
Development of the first combined solutions for heavy milling, e.g. for manufacturing railway points
2007
Integration of automation solutions through acquisition of Partec GmbH
2008
First integration of precision magnet swivel bridges in index table
2009
First fully electronic mechatronics chuck, patent no. 10 2009 047 996
2010
Integration of rotary work-holding through acquisition of HSW GmbH
2012
Development of special end stop magnets for high-precision grinding of guide carriages
2015
Private investors:
The Wendland business family acquires the majority share of SAV.
Dr Stefan Hamm becomes the new Managing Director and partner.
2016
The individual SAV companies merge into one overall company with the name "SAV GmbH". This also involves a relaunch of SAV with a new corporate identity.
2017
Expansion of the circular round magnet range for special customer requirements, e.g. for extreme holding forces
2018
Martin Schacherl becomes Managing Director together with Dr. Stefan Hamm
2020
First polarity reversal control unit on the market, developed using the principles of functional safety
just experts.

SAV stands for quality “made in Germany”

In Germany, our manufacturing sites are located in Nuremberg, Mittweida and Göppingen.

SAV GmbH | Nuremberg
Gundelfinger Straße 8
90451 Nuremberg
Germany

SAV GmbH | Göppingen
Toräcker 5
73035 Göppingen
Germany

SAV GmbH | Mittweida
Leipziger Straße 29-31
09648 Mittweida
Germany

Hotline: +49 911 94 83 – 0

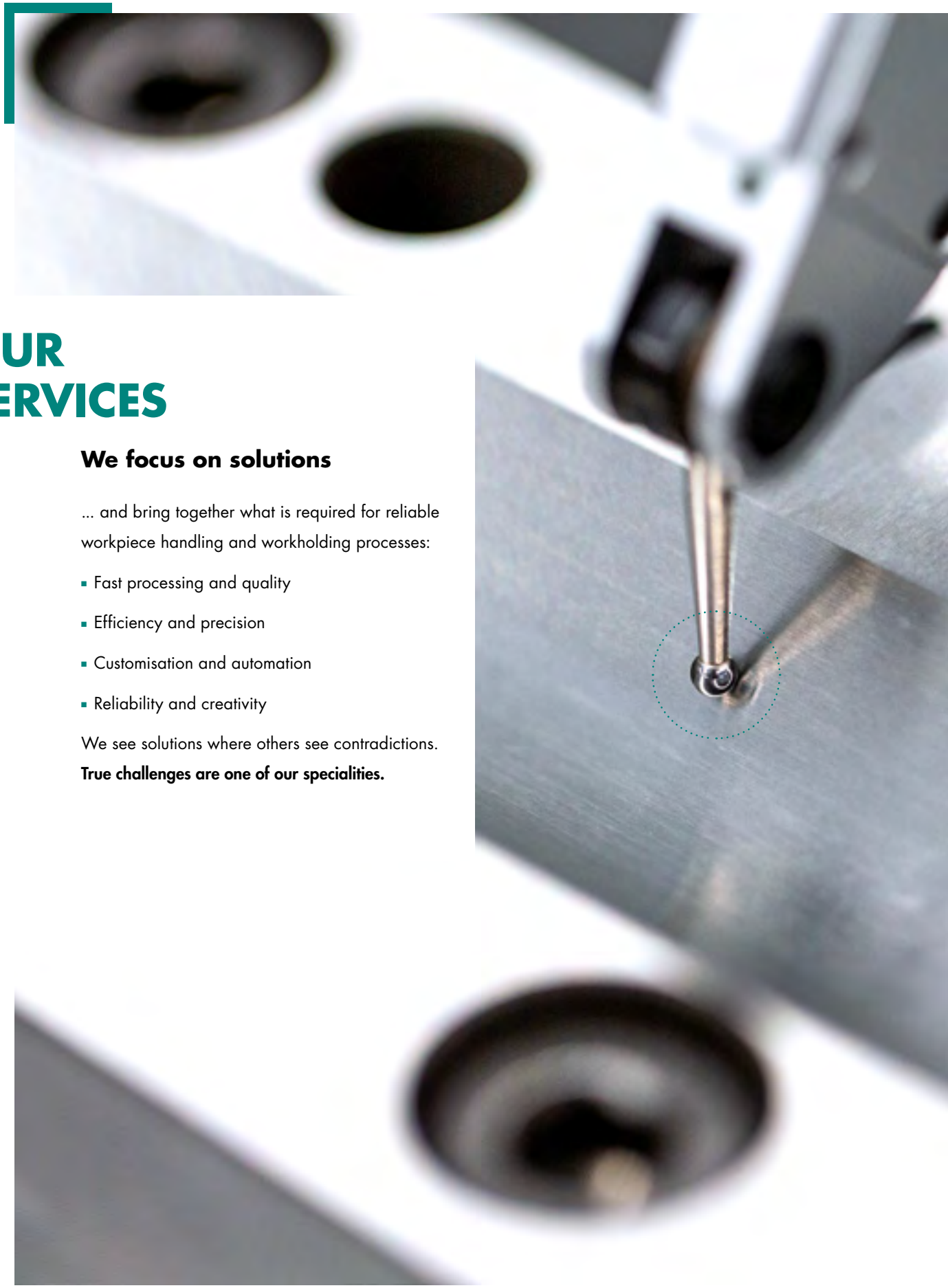
Email: info@sav.de

Homepage: www.sav.de

OUR SITES

International SAV subsidiaries

Czech Republic, Poland, France, Netherlands and China



OUR SERVICES

We focus on solutions

... and bring together what is required for reliable workpiece handling and workholding processes:

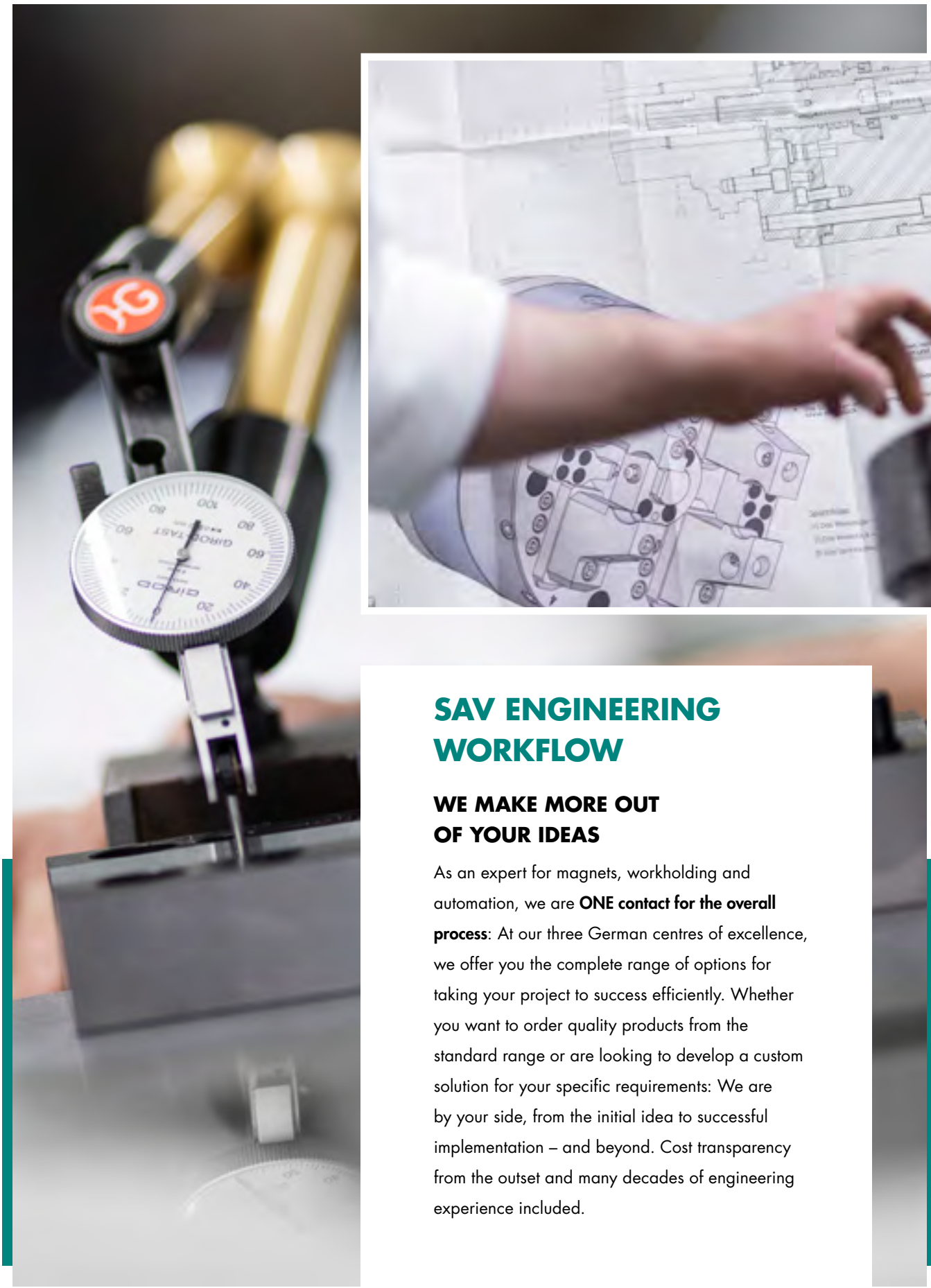
- Fast processing and quality
- Efficiency and precision
- Customisation and automation
- Reliability and creativity

We see solutions where others see contradictions.
True challenges are one of our specialities.

OUTSTANDING

WHAT MAKES US STAND OUT

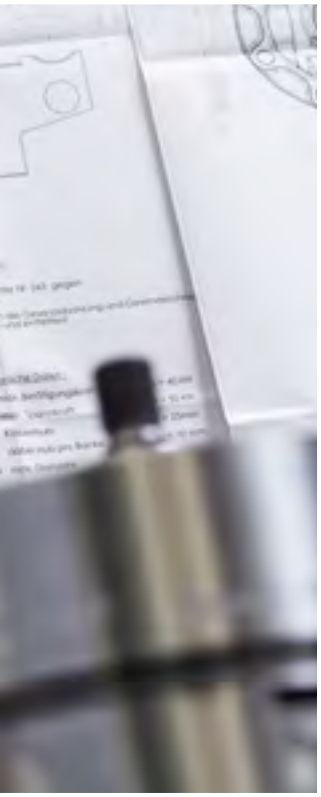
- Workholding systems using magnetic, hydraulic, mechanical and vacuum principles
- Combinations for stationary and rotary workholding
- Solutions including automation
- Proven standard systems and individually customised solutions
- Highest quality standards
- Products “made in Germany”
- Cross-industry competence
- Solutions for virtually any machining process
- Development and manufacturing competence under one roof
- Support during the entire product development phase – from the initial idea to after sales service



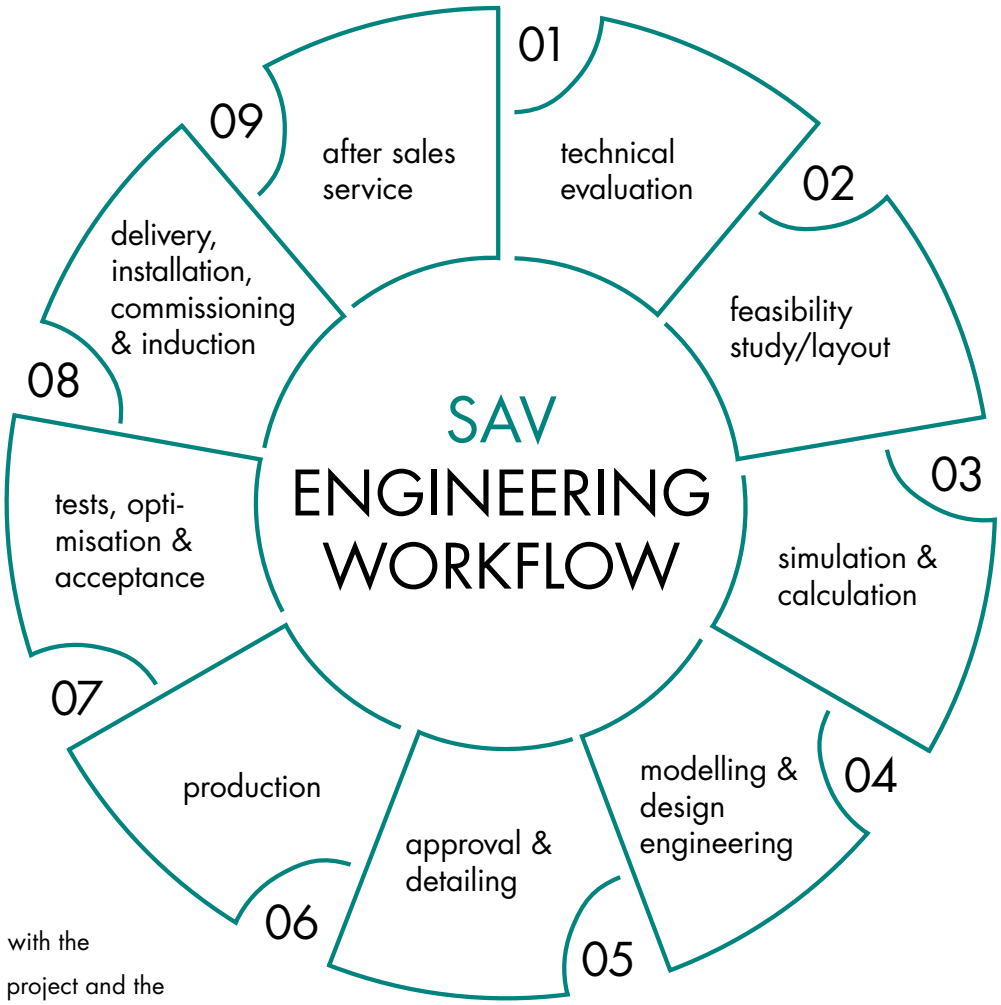
SAV ENGINEERING WORKFLOW

WE MAKE MORE OUT OF YOUR IDEAS

As an expert for magnets, workholding and automation, we are **ONE contact for the overall process**: At our three German centres of excellence, we offer you the complete range of options for taking your project to success efficiently. Whether you want to order quality products from the standard range or are looking to develop a custom solution for your specific requirements: We are by your side, from the initial idea to successful implementation – and beyond. Cost transparency from the outset and many decades of engineering experience included.



OUR WORKFLOW



Every planning phase starts with the **technical evaluation** of your project and the **Sales department**. During the subsequent **design engineering phase**, our experts turn theory into practice and work out all relevant details until your solution finally becomes reality in **manufacturing**. For us, the engineering process does not end with successful commissioning and induction: Our extensive **after sales service** offers customers long-term added value.

“ ONE CONTACT FOR THE ENTIRE PROCESS!

Through continuous exchange with our customers, we have developed our competences over a period of 35 years – with new challenges around every corner.

Our motivation: just experts.

OUR FIELDS OF WORK

MAGNET SYSTEMS

ROTARY WORKHOLDING

STATIONARY WORKHOLDING

AUTOMATION

OUR APPLICATIONS ARE AS VARIED AS WE ARE

Our **expert knowledge** is **broad as well as deep**: Magnet and precision systems, stationary and rotary workholding as well as automation solutions are among the core competences of SAV, which we offer as **standard versions** and as **customised special solutions.**

CUSTOMISED SPECIAL SOLUTIONS

OUR SOLUTIONS FOR MACHINING PROCESSES

PRECISE, RELIABLE, FLEXIBLE – FOR ALL MACHINING PROCESSES

We stand for variety, which is why SAV high-performance magnets are used in all areas of workholding. Because we combine our **development and manufacturing competence under one roof**, we can react flexibly to our customers' individual requirements and offer standard versions as well as customised special products. This allows us to always find the ideal solution for your application – no matter which machining process is involved, from grinding, milling, turning and hard turning to demagnetising.


Drilling

Demagnetising


Grinding


Wire-cut EDM


Milling


Die-sinking EDM


Turning


Measuring


Laser welding

INDUSTRY-WIDE SUCCESS

Thanks to our comprehensive product portfolio and our extensive know-how, SAV solutions are used in a variety of different areas: **from machine tables to fully automated production**. Whether in automotive, mechanical engineering, medical technology, aerospace, steel construction or in die and mould making – **we are in our element in all industries and in all disciplines of workholding**. Because we understand exactly which requirements matter in modern manufacturing today.

AUTOMOTIVE

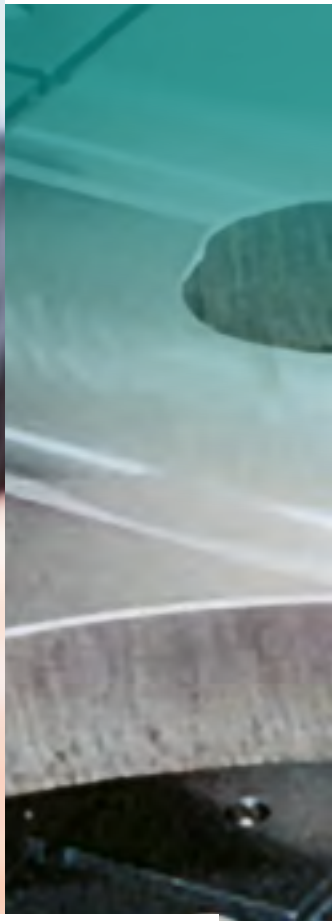
MACHINE TOOL MANUFACTURERS

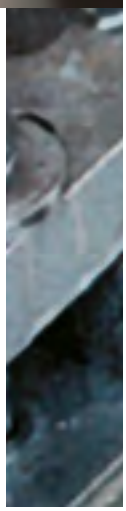
STEEL CONSTRUCTION INFRASTRUCTURE

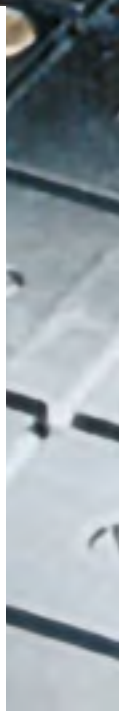
MEDICAL TECHNOLOGY

AEROSPACE

DIE & MOULD MAKING WAREHOUSE INDUSTRY







FULLY FOCUSED ON SOLUTIONS

Anything but standard: **Every idea is unique** and requires a special procedure. That is why we at SAV specialise in meeting your ideas and requests with individual product solutions – completely without compromises. This takes more than just theoretical design engineering knowledge: It requires **a feeling for different materials** and their properties, **an understanding of the complexity of processes and creativity for finding the most reliable solution.**


WE THINK IN TERMS OF SOLUTIONS –
WE COMBINE EXPERTISE
MAGNET SYSTEMS
STATIONARY WORKHOLDING
ROTARY WORKHOLDING
AUTOMATION

PREFACE BY MARTIN SCHACHERL

Dear customers

We bring together what is required for correct workpiece handling processes: **Fast processing and quality. Efficiency and precision. Customisation and automation**. Because true challenges are one of our specialities.

Our workholding and automation experts implement a variety of different requirements with a focus on process optimisation. We combine all possible workholding and handling disciplines in an intelligent, forward-looking and individually tailored process.

Have a browse of our comprehensive range!

MARTIN SCHACHERL
MANAGING DIRECTOR OF SAV GMBH

CHAPTER 1
MAGNET SYSTEMS

Magnetic workholding solutions are everything but a standard for us. The manufacturing of our high-performance magnets uses our full range of experience in the areas of material properties, design engineering and machine integration.

Our product range in the area of magnet systems comprises permanent, electromagnetic and electro permanent magnetic workholding products, as standard and special solutions.

In addition to the classic magnetic chucks, we also offer sine tables, demagnetisers, pole plates and a variety of different auxiliary magnetic tools.

The development of magnetic chucks for milling revolutionised manufacturing technology:

- Minimal chucking and set-up times
- Active magnetic workpiece positioning
- Machining from 5 sides
- Universal and flexible
- Wear-free
- Reliable process and chucking
- High efficiency
- Extreme holding forces
- Optimum workpiece damping

Magnet technology:

- Two-dimensional holding force
- High damping
- Pulling down of uneven parts
- High level or operating and process reliability
- Also suitable for larger air gaps
- High level of flexibility at low acquisition costs
- For very large parts
- Full or partial use of the machine table
- Modular design
- For palletising

“ WE DEVELOP AND MANUFACTURE MAGNET SYSTEMS, ALSO CUSTOMISED TO YOUR WORKPIECES AND MACHINING REQUIREMENTS

JUST CONTACT US

DIETER LEIKAUF
BUSINESS UNIT MANAGER
MAGNET SYSTEMS

CHAPTER 1.1

SELECTION CRITERIA BY MAGNETIC PRINCIPLES

▸ THE RIGHT PRODUCT FOR ANY APPLICATION

PERMANENT MAGNETIC CHUCKS

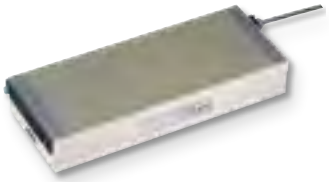
PROPERTIES

- Mechanical, manually operated control
- Very low magnetic field, no adhesion of swarf
- No heat distortion caused by electricity input
- Suitable for palletising
- Size with one circuit up to 600 x 300 mm
- Cost-efficient
- Note information on maximum speed for round magnets
- For technical reasons, the holding force is slightly lower on the area of the activation mechanism

ELECTRO MAGNETIC CHUCKS

PROPERTIES

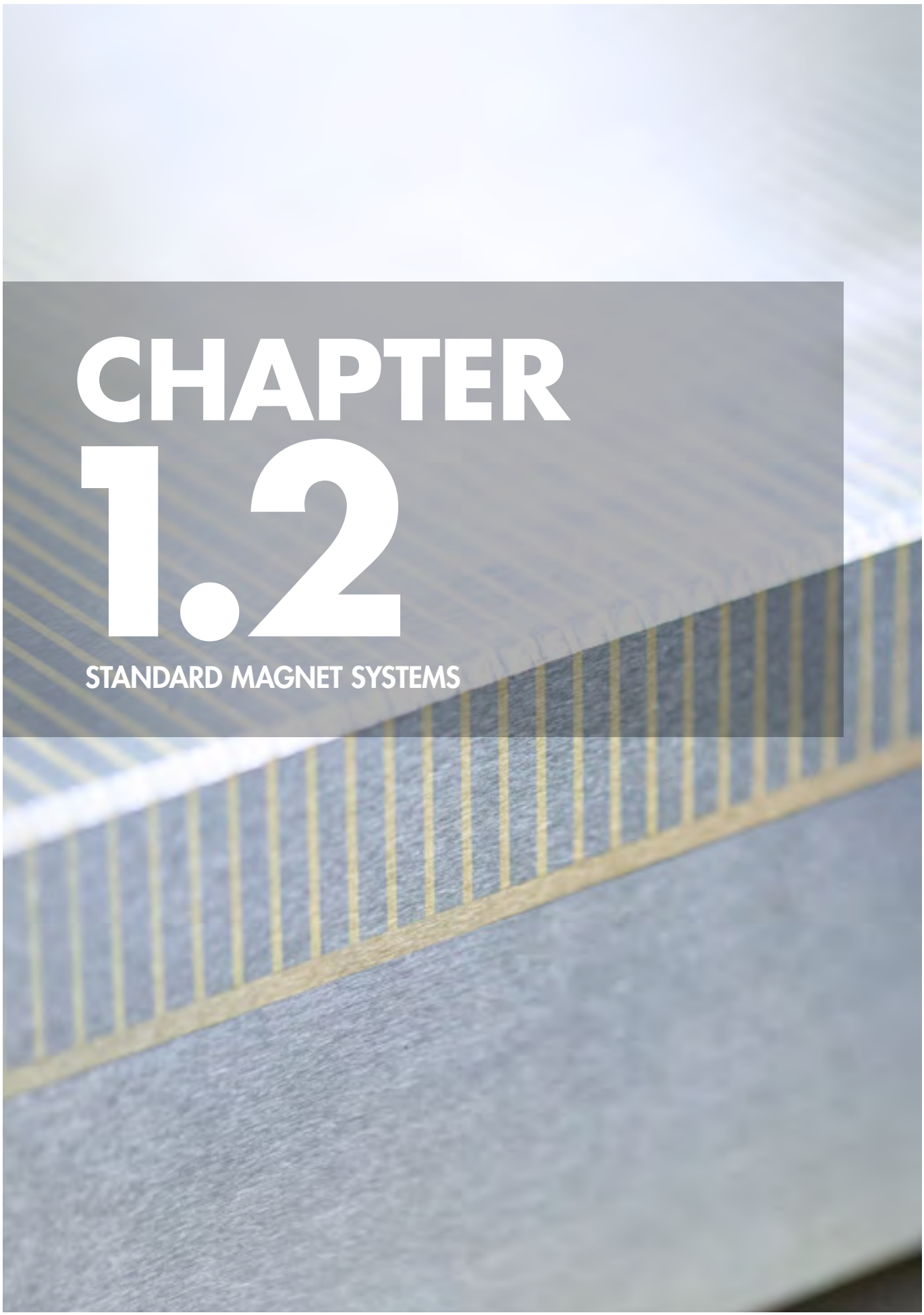
- Force generated by permanent power supply
- Deep magnetic fields for larger air gaps
- Not suitable for palletising
- Note max. speed for round magnets (chapter 1.4)
- Thermal expansion of a few 0.01 mm depending on duty cycle
- Designed for 100 % duty cycle
- Stable holding forces even for relatively deep machining on thin sheet metal
- Also with water cooling, depending on the design
- Good demagnetising quality and reproducibility of the holding forces
- Holding force and demagnetising can be controlled with a control unit



ELECTRO PERMANENT MAGNETIC CHUCKS

PROPERTIES

- Force generated by a current pulse with a duration of 800 ms
- No continuous energy consumption
- No thermal expansion, highest precision during grinding
- Suitable for palletising with connector
- Also with demagnetising cycle, depending on the design
- Maximum operational reliability
- Extreme holding forces for magnetic chucks for milling
- Designed for shortest cycle duration of 3 min (time from part to part), shorter cycle durations possible on request
- Holding force and demagnetising can be controlled with a control unit
- Note information on maximum speed for round magnets (chapter 1.4)
- On request, power supply also with connector for easy spindle integration
- Spindle flange possible on request

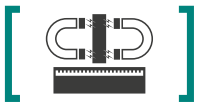


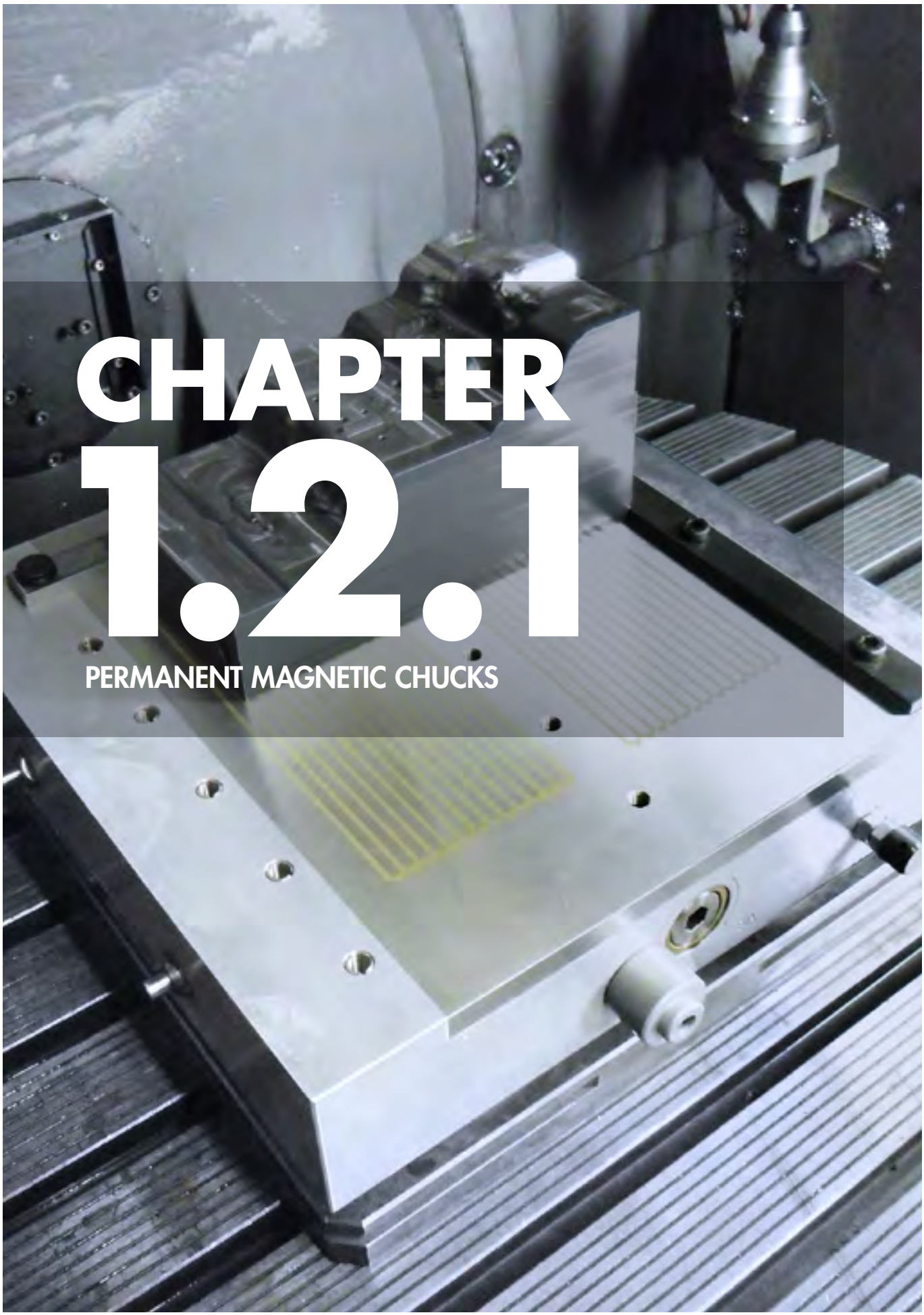
CHAPTER 1.2

STANDARD MAGNET SYSTEMS

1. MAGNET SYSTEMS

1.2 STANDARD MAGNET SYSTEMS





CHAPTER 1.2.1

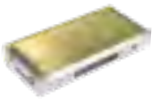
PERMANENT MAGNETIC CHUCKS

1.2. STANDARD MAGNET SYSTEMS

1.2.1 PERMANENT MAGNETIC CHUCKS

PERM

PAGES 44 – 56

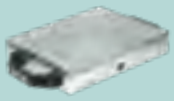
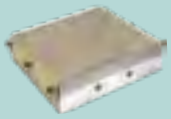
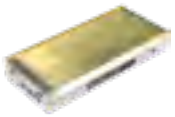
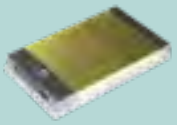
	SAV ART. NO.	COMMENTS	POLE PITCH	MACHINING PROCESS*	PAGE
PERMANENT MAGNETIC PALLETS					
	220.30	Precision pallet chuck	1.9 mm		44
	220.31	Precision pallet chuck	6 mm		45
	220.32	Standard pallet chuck	15 mm		45
MAGNETIC CHUCK TOWERS AND UPRIGHT MAGNETIC CHUCKS					
	242.90	Upright magnetic chuck	1.9 mm		46
	242.91	Magnetic chuck tower	15 mm		46
PERMANENT MAGNETIC CHUCKS, RECTANGULAR					
	243.01	Standard	1.9 mm		47
	243.07	Flat design	1.9 mm		47
	243.10	For parts which are difficult to chuck	6 mm		48
	243.11	For milling	15 mm		49
ROUND PERMANENT MAGNETS, NEODYMIUM MAGNETIC CIRCULAR CHUCKS AND LAMINATED TOP PLATES					
	244.01	For chucking small and thin workpieces	1.9 mm		50
	248.01	For chucking contoured workpieces	St 3 mm Ms 1 mm		50
	244.03	For small and medium workpieces	7 mm		51
	244.06	For round, ring-shaped workpieces	Radial pole pitch		52
	248.05	For chucking contoured workpieces	Radial pole pitch		52
	244.07	For small parts which are difficult to chuck	6 mm		53
	244.10	Switchable	13 mm		54
	244.11	With amplified magnet	15 mm		54
FLANGES					
	248.90	Short tapered flanges, mount with chuck	–		55
	248.91	Short tapered flanges, mount with chuck, with stud bolts	–		55
	248.92	Short tapered flanges, mount with chuck, with cam lock fastening	–		56
	248.94	Short tapered flanges, mount with chuck Morse taper fitting	–		56

* Explanation of the icons on page 4

just experts.

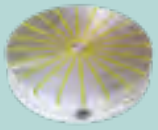
SELECTION CRITERIA

PERMANENT MAGNETIC CHUCKS

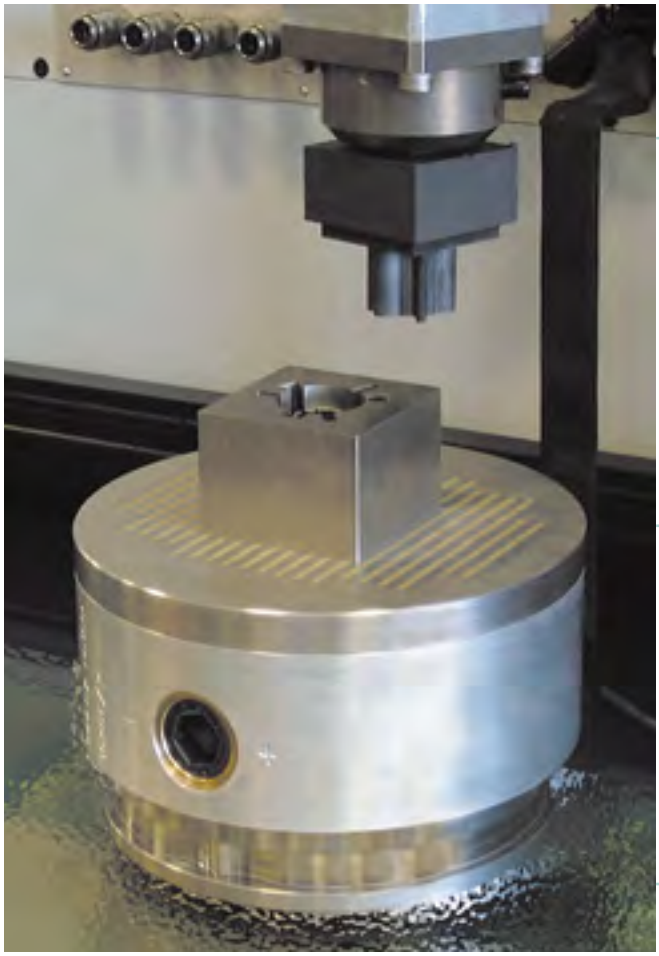
				GRINDING	MILLING/DRILLING	HARD MILLING	DIE-SINKING EDM
SAV 220.30		Universal pallet chuck	page 44	✔	–	–	✔
SAV 220.31		Pallet chuck for small workpieces and workpieces which are difficult to chuck	page 45	✔	✔	✔	✔
SAV 220.32		For chucking medium and large parts, can be adapted to most zero-point work-holding systems	page 45	✔	✔	–	✔
SAV 242.90		Upright magnetic chuck	page 46	✔	–	–	✔
SAV 242.91		Design at customer request	page 46	–	✔	✔	–
SAV 243.01		Universal standard grinding magnet, suitable for palletising	page 47	✔	–	–	✔
SAV 243.07		Low height, suitable for palletising	page 47	✔	–	–	✔
SAV 243.10		For small workpieces which are difficult to chuck	page 48	✔	✔	✔	✔
SAV 243.11		Universal milling magnet, suitable for palletising	page 49	✔	✔	✔	–

SELECTION CRITERIA

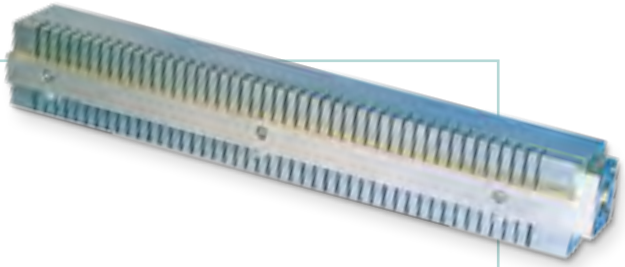
PERMANENT MAGNETIC CIRCULAR CHUCKS

				CYLINDRICAL GRINDING	TURNING	HARD TURNING	DIE-SINKING EDM
SAV 244.01		Narrow pole pitch, low field, for thin parts	page 50	✔	✔	–	✔
SAV 244.03		Low weight, for thin parts	page 51	✔	–	–	–
SAV 244.06		Magnet with high holding force for ring-shaped parts, also for hard turning	page 52	✔	✔	✔	–
SAV 244.07		Narrow pole pitch with high holding force, for small parts and parts which are difficult to chuck	page 53	✔	✔	✔	✔
SAV 244.10		Auxiliary magnet with small diameter, for small workpieces	page 54	✔	–	–	–
SAV 244.11		Magnet with high holding force for flat parts	page 54	✔	✔	✔	–

APPLICATIONS



Die-sinking EDM
with neodymium
magnetic circular chuck
SAV 244.07



Permanent magnetic clamping strip
with high-energy magnet system.
Magnetically insulated stop bar for
grinding parts below 20°.

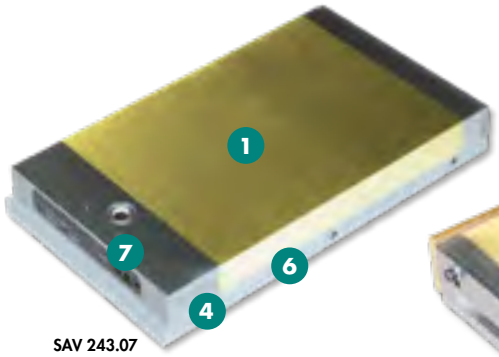
SAV PALLETISING SYSTEMS

Permanent magnetic chucks with reference system and flushing holes. We supply workholding fixtures for electrical discharge machining (EDM) with any adaptations on request.

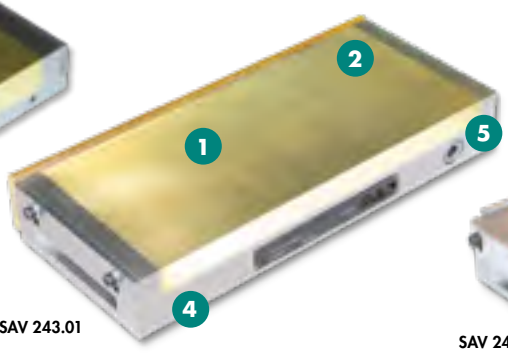
Permanent magnetic chucks with reference system for use in the dielectric fluid. The workpieces are loaded outside of the machine and the position is measured.

▸ CUSTOMER BENEFIT

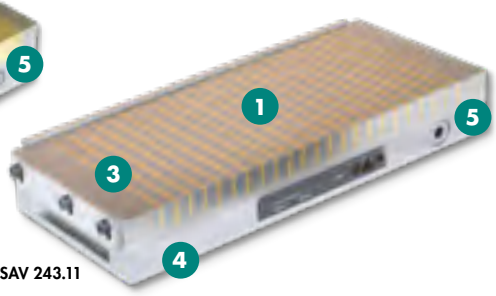
PERMANENT MAGNETIC CHUCKS FOR GRINDING/EDM



SAV 243.07



SAV 243.01



SAV 243.11

1

- Magnet with high "even" holding force; performance, accuracy
- Large magnetically active area; flexibility
- Low magnetic field; accuracy, safety

2

- Stop bar with groove; accuracy
- Stops integrated into the housing; safety

3

- Low-strength opposite field during switch-off facilitates removal of workpieces; safety, flexibility
- Double neodymium magnet system for very high holding force; performance, safety

4

- Full steel housing; high accuracy, high stability
- Fully leak-tested; safety

5

- Easy control; safety
- Unique control system, no deformation; accuracy

6

- Steel housing can be machined; flexibility

7

- Control from above, ideal for die-sinking EDM; flexibility
- Unique control system, no deformation; accuracy
- Easy control; safety
- Flat design; flexibility

SAV 220.30 PERMANENT MAGNETIC PALLETS

Transverse pole pitch P = 1.9 mm

APPLICATION

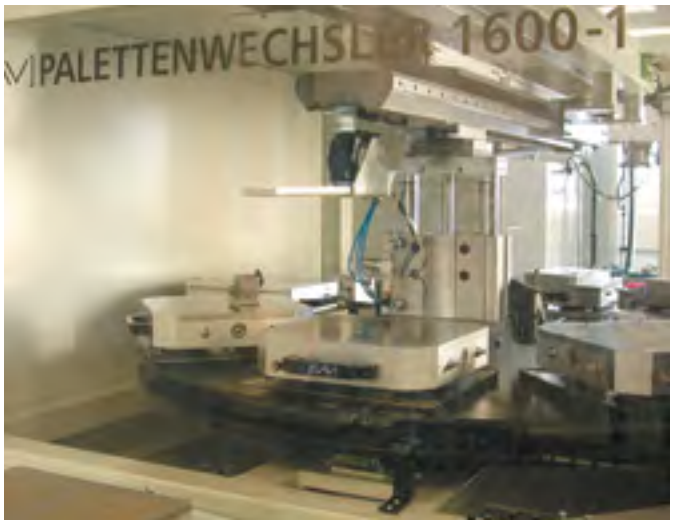
In conjunction with zero-point workholding systems. Can be adapted to most systems.

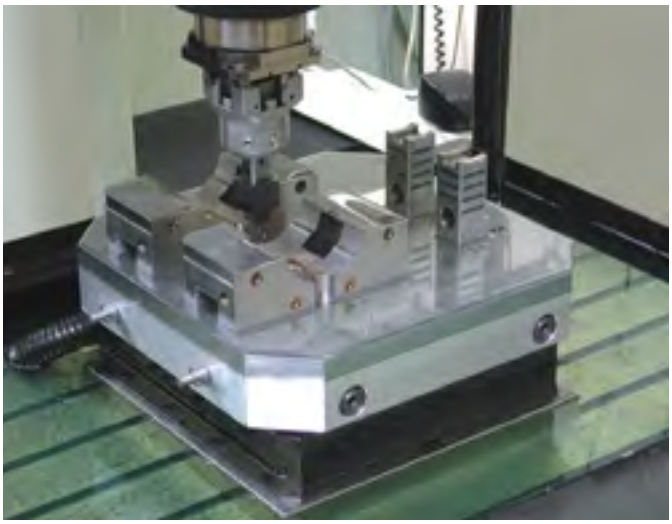
MATERIAL

Aluminium main body with steel 1.0037/1.4571 pole plate

TECHNICAL DATA

- Tapped holes for stop bars and stop brackets possible.
- Magnetic field height: 4 mm
- Wear layer of the pole plate: 3 mm
- Rated holding force: 80 N/cm²
- Pole pitch: 1.9 mm

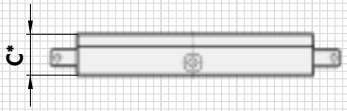


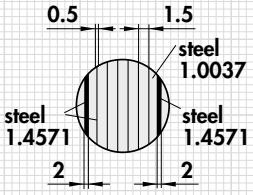


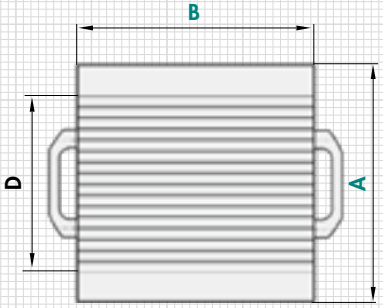
mm				Qty.	kg
A	B	C*	D	Control points	Weight
240	240	46	204	1	19.0
280	280	67	230	2	25.0
320[1)]	320	60	250	1/2	32.0

* Exact dimension is determined through the reference system.
[1)] With 45° chamfers on the corners for pallet changer

* Dimension **C** is a guide value and is determined exactly through the reference system.







ORDERING EXAMPLE

Designation	SAV no. - A x B - control points - reference system - adaptation
Permanent magnetic pallet	SAV 220.30 - 320 x 320 - 1 - reference system - adaptation

SAV 220.31

PERMANENT MAGNETIC PALLETS

True transverse pole pitch P = 6 mm

APPLICATION

In conjunction with zero-point workholding systems.
Can be adapted to most systems.

MATERIAL

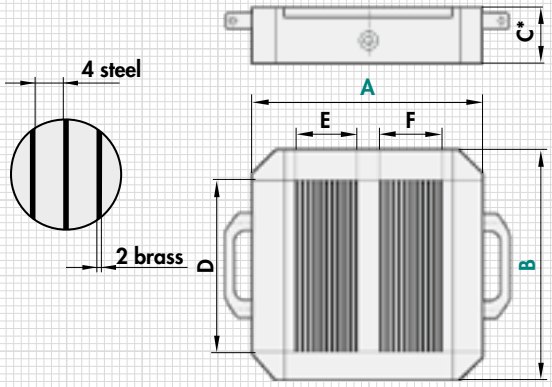
Aluminium main body with steel 1.0037/1.4571 pole plate

TECHNICAL DATA

- Low weight and high rated holding force
- Wear layer of the pole plate: 2 mm
- Rated holding force: 120 N/cm²
- Tapped holes for stop bars and stop brackets possible
- Low magnetic field
- Clamping holes on the top surface on request

mm						Qty.	kg
A	B	C*	D	E	F	Control points	Weight
240	240	60	126.0	-	-	1	18.0
280	280	66	166.0	80.0	80.0	2	21.5
320[1)]	320	65	206.0	80.0	80.0	1	25.0/36.0
320[1)]	320	65	234.0	123.0	123.0	2	36.0

* Exact dimension is determined through the reference system.
[1)] With 45° chamfers on the corners for pallet changer



ORDERING EXAMPLE

Designation	SAV no. - A x B - control points - reference system - adaptation
Permanent magnetic pallet	SAV 220.31 - 320 x 320 - 2 - reference system - adaptation

SAV 220.32

PERMANENT MAGNETIC PALLETS

Transverse pole pitch P = 15 mm

APPLICATION

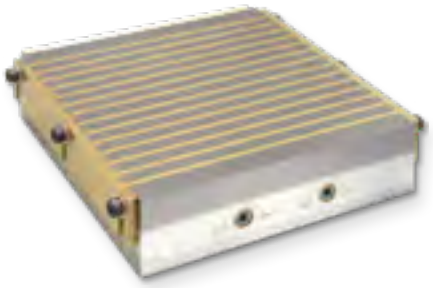
For chucking medium to large parts for grinding, milling and EDM.
Can be adapted to most zero-point workholding systems.

MATERIAL

Aluminium main body with steel 1.0037/1.4571 pole plate

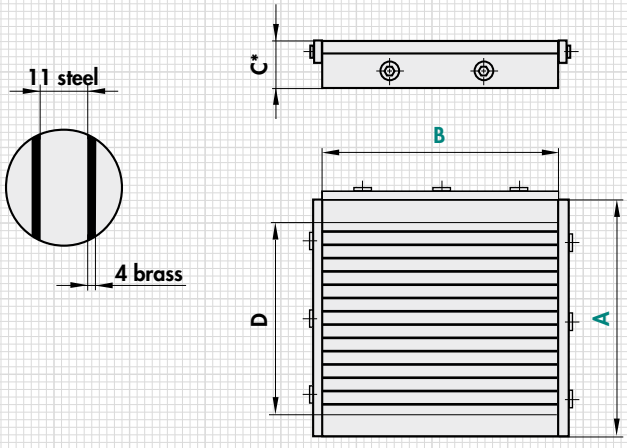
TECHNICAL DATA

- Aluminium housing, for top-mounting or integration
- Stop bar on 3 sides
- 2 control points
- Hex key
- Operating instructions
- Fine-milled version
- Pole pitch steel/brass: 12/3 mm
- Rated holding force: 130 N/cm²
- Magnetic field height: 6 mm
- Wear layer of the pole plate: 6 mm
- Rework on underside: up to 12 mm



mm				kg
A	B	C*	D	Weight
240	240	63.5	198	21.5
280	280	63.5	228	29.0
320[1]	320	68.5	258	38.0

* Exact dimension is determined through the reference system.
[1] With 45° chamfers on the corners for pallet changer



ORDERING EXAMPLE

Designation	SAV no. - A x B - adaptation
Permanent magnetic pallet	SAV 220.32 - 320 x 320 - adaptation

SAV 242.90

PERMANENT MAGNETIC VERTICAL CHUCKS

With fine transverse pole pitch P = 1.9 mm, for horizontal machining

APPLICATION

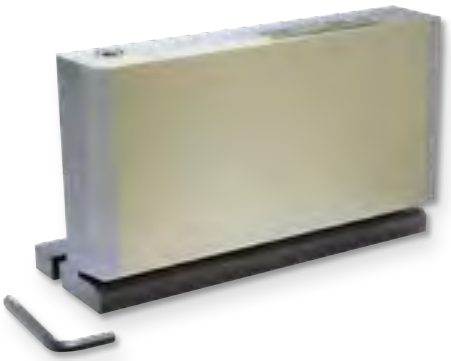
Primarily for horizontal machining of workpieces.

DESIGN

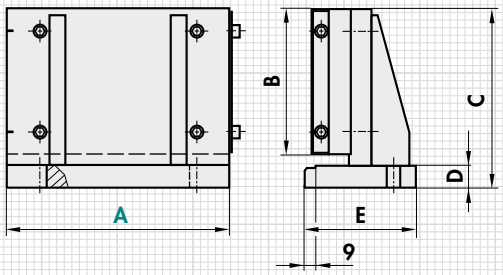
Upright chuck made of St 52-3. Supplied with permanent magnetic chuck SAV 243.01. Pole divisions made of 0.5 mm brass/1.4 mm steel. The upright chuck can also be manufactured with other controllable permanent magnetic, electromagnet or electro permanent magnetic chucks. Clamping grooves (N).

TECHNICAL DATA

- Parallelism and angularity: 0.005/100 mm
- Rated holding force: 90 N/cm²
- Magnetic field height: 6 mm
- Wear layer of the pole plate: 8 mm



mm					kg
A	B	C	D	E	Weight
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

Designation	SAV no. - A
Permanent magnetic vertical chuck	SAV 242.90 - 500

SAV 242.91

PERMANENT MAGNETIC CHUCK TOWERS

Chuck towers, precision-milled

APPLICATION

For horizontal milling and drilling processes.

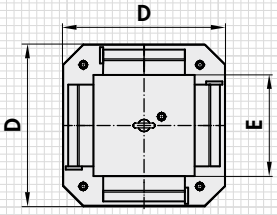
DESIGN

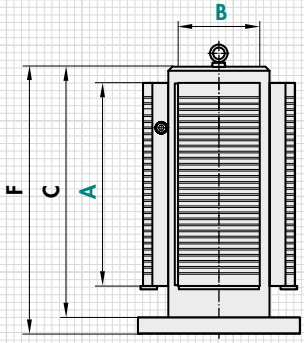
Chuck tower made of St 52-3, precision-milled. With 4 permanent magnetic chucks SAV 243.11, amplified high-energy system, 15 mm pole pitch, fastening holes as required.

TECHNICAL DATA

- Perpendicularity: 0.03/1000 mm
- Parallelism: 0.04/1000 mm
- Rated holding force: 150 N/cm²
- Magnetic field height: 12 mm
- Wear layer of the pole plate: 5 mm

mm						kg
A	B	C	D	E	F	Weight
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

Designation	SAV no. - A x B
Permanent magnetic chuck tower	SAV 242.91 - 600 x 300

SAV 243.01

PERMANENT MAGNETIC CHUCKS

With fine transverse pole pitch P = 1.9 mm

APPLICATION

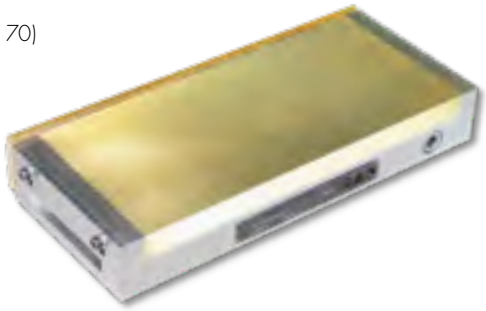
Suitable for chucking thin, small, medium and large workpieces.

DESIGN

Continuous transverse pole pitch, even holding force over the entire width. Pole divisions made of 0.5 mm brass/1.4 mm steel.
Available with adaptation for zero-point workholding system.

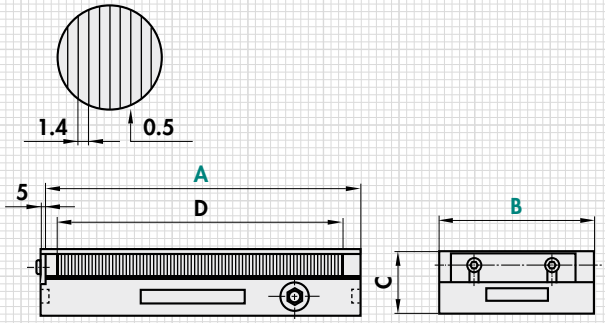
TECHNICAL DATA

- Rated holding force: 80 N/cm² (140 x 70)
  90 N/cm²
  (from 175 x 100)
- Magnetic field height: 6 mm
- Wear layer of the pole plate: 8 mm



mm				kg	mm				kg
A	B	C +0.5 -2	D	Weight	A	B	C +0.5 -2	D	Weight
140*	70	49	103	3.7	450	150	51	417	30.0
175	100	49	147	7.0	300	200	51	267	26.2
200	100	49	177	8.1	400	200	51	373	35.0
255	130	49	223	14.5	500	200	51	466	43.7
150	150	51	118	9.8	600	200	51	566	52.4
250	150	51	223	16.4	500	250	56	464	58.5
300	150	51	267	19.7	500	300	56	462	70.2
350	150	51	316	23.0	600	300	56	557	84.2

* Control on face side with pull bar



Design with flushing holes for EDM available.

ORDERING EXAMPLE

Designation	SAV no. - A x B
Permanent magnetic chuck	SAV 243.01 - 500 x 200

SAV 243.07

PERMANENT MAGNETIC CHUCKS

With fine transverse pole pitch P = 1.9 mm, low version

APPLICATION

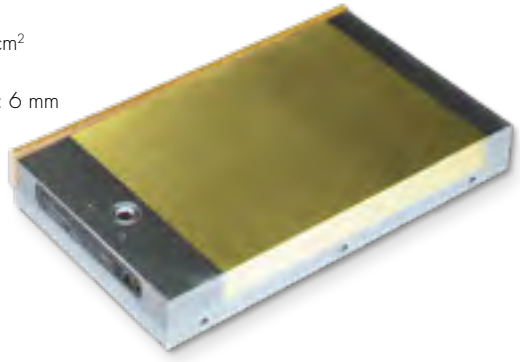
Primarily for EDM and grinding.
Suitable for thin parts.

DESIGN

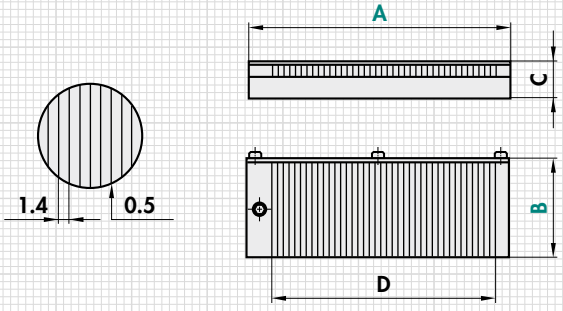
Extremely low height and weight-optimised. ON/OFF control from above. Standard version without flushing hole. Pole divisions made of 0.5 mm brass/1.4 mm steel. Available with flushing hole(s) (surcharge applies). Available with adaptation for zero-point workholding system. Crosswise and lengthwise stop bar. Attached with clamps.

TECHNICAL DATA

- Rated holding force: 80 N/cm²
- Magnetic field height: 6 mm
- Wear layer of the pole plate: 6 mm



mm				kg
A	B	C +0.5 -2	D	Weight
175	100	32,0	120	4.5
250	150	34,5	194	10.0
300	150	34,5	245	12.5
350	150	34,5	295	14.0
400	200	35,0	344	23.0



ORDERING EXAMPLE

Designation	SAV no. - A x B
Permanent magnetic chuck	SAV 243.07 - 350 x 150

SAV 243.10

NEODYMIUM MAGNETIC CHUCK

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

APPLICATION

For workpieces which are difficult to chuck, e.g. Ferro-Tic, tungsten carbide with cobalt content, very small workpieces. For grinding workpieces which are difficult to chuck magnetically, and for hard turning.

DESIGN

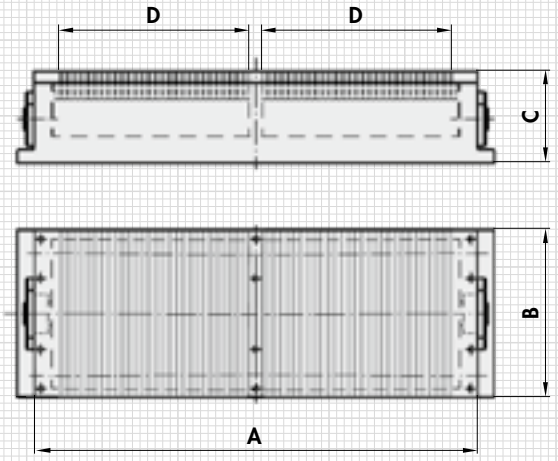
Extremely high holding force using a specially developed process. Sturdy solid steel body. Separate ON/OFF control possible on the 2 face sides. Pole divisions made of 4 mm steel and 2 mm epoxy resin with NdFeB magnets in the pole gap.

TECHNICAL DATA

- Rated holding force: 120 N/cm²
  (on inducible steel surface: 180 N/cm²)
- Magnetic field height: approx. 4 mm
- Wear layer of the pole plate: 3 mm

mm | kg

A	B	C +0.5 -2	D	Weight
430	150	87	167	35.0



ORDERING EXAMPLE

Designation	SAV no.
Neodymium magnetic chuck	SAV 243.10

SAV 243.11

PERMANENT MAGNETIC CHUCKS

With continuous transverse pole pitch P = 15 mm, with neodymium magnets, amplified system

APPLICATION

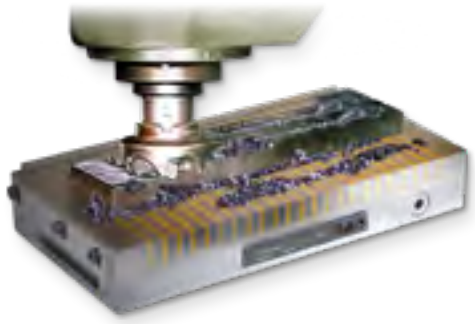
Suitable for heavy and rough machining. The dense magnetic field with maximum concentration opens up areas of application for small, medium and large workpieces, even with rough or uneven surfaces.

DESIGN

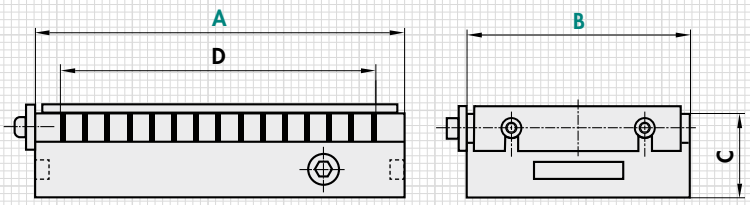
Neodymium magnet system with high holding force. ON/OFF control using a manual lever. In the OFF position, a low-strength opposite field facilitates removing of the workpieces. The magnets are equipped with lengthwise and crosswise stops. Pole divisions made of 3 mm brass/ 12 mm steel.

TECHNICAL DATA

- Rated holding force: 150 N/cm²
- Magnetic field height: approx. 12 mm
- Wear layer of the pole plate: 5 mm



mm				kg
A	B	C $^{+0.5}_{-2}$	D	Weight
250	150	56	199	17.0
300	150	56	244	20.0
350	150	56	289	24.0
400	200	59	349	35.0
500	200	59	439	44.0
600	200	59	544	52.0
600	300	62	544	87.0



ORDERING EXAMPLE

Designation	SAV no. - A x B
Permanent magnetic chuck	SAV 243.11 - 500 x 200

SAV 244.01 PERMANENT MAGNETIC CIRCULAR CHUCKS

With very fine parallel pole pitch P = 1.9 mm

APPLICATION

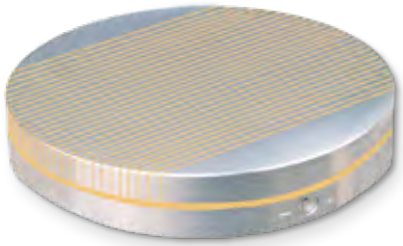
For chucking small and thin to medium workpieces.

DESIGN

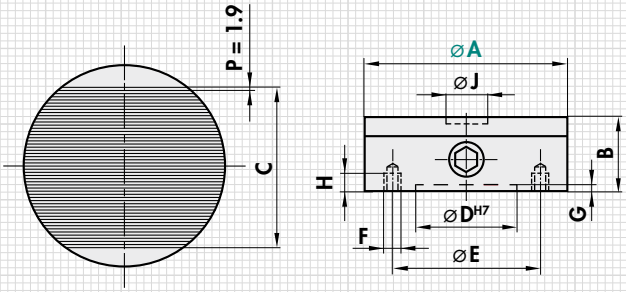
Powerful magnet system with neodymium magnets and low magnetic field height. Magnetic force continuously adjustable. Available with flange on request (see SAV 248.90 to 248.94).
Size J (diameter and depth) machining is possible at the centre of the pole plate. For the other sizes, a 5 mm wearing thickness applies across the entire surface. Concentric lines facilitate visual alignment of the workpieces.

TECHNICAL DATA

- Rated holding force: up to ø 160: 60 N/cm²
  from ø 200: 90 N/cm²
- Magnetic field height: 8 mm
- Wear thickness of the top surface: 5 mm
- Geometrically balanced: Quality G 6.3



mm									kg
A	B $^{+0.5}_{-2}$	C	D	E	F	G	H	J	Weight
100	50	71	60	85	4 x M8	4	10	20x14	3.0
130	50	99	90	115	4 x M8	4	10	20x14	5.0
150	50	105	110	132	4 x M8	4	10	24x5	7.0
160	57	116	125	142	4 x M8	4	16	24x5	9.0
200	57	153	150	180	4 x M8	4	16	200x5	15.0
250	57	192	200	232	4 x M8	4	16	250x5	20.0
300	62	227	250	285	4 x M8	4	16	300x5	31.0



ORDERING EXAMPLE

Designation	SAV no. - A
Permanent magnetic circular chuck	SAV 244.01 - 150

SAV 248.01 LAMINATED TOP PLATES

For placing on circular magnets with parallel pole pitch

APPLICATION

For chucking profiled workpieces on magnets with parallel pole pitch. Suitable for round magnets SAV 244.01 and SAV 244.11.

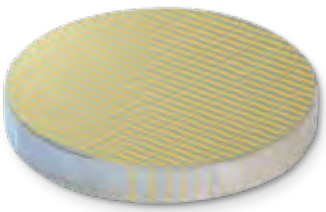
DESIGN

Any type and form of profiles can be machined into the chuck blocks (can also be provided by us). The max. integration depth must be noted. Attaching to a magnet upon agreement. The pole division must run parallel to the base magnet.

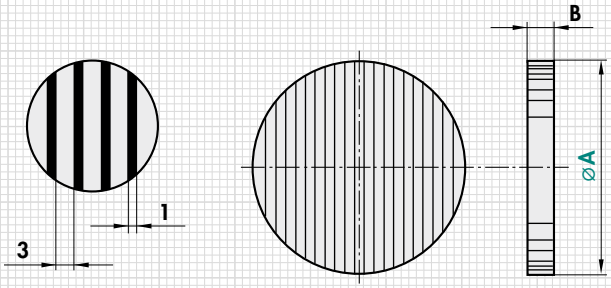
TECHNICAL DATA

- Pole pitch: 3 mm steel, 1 mm brass
- Maximum integration depth: 8 mm

The machining process can cause discolourations. However, these do not constitute a technical defect.



mm		kg	mm		kg
A	B	Weight	A	B	Weight
160	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

Designation	SAV no. - A
Laminated top plate	SAV 248.01 - 400

SAV 244.03 PERMANENT MAGNETIC CIRCULAR CHUCKS

With parallel pole pitch P = 7 mm

APPLICATION

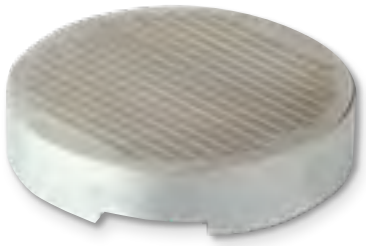
For small and medium workpieces.

DESIGN

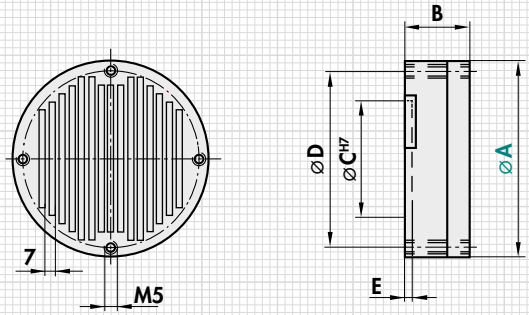
The special magnet system allows chucking of parts as thin as 1 mm with maximum holding force. ON/OFF control with removable key (radial adjustment). The machine spindle should be lockable for ON/OFF.
Available with flange on request (see SAV 248.90 to 248.94).

TECHNICAL DATA

- Rated holding force: 100 N/cm²
- Magnetic field height: 6 mm
- Wear layer of the pole plate: 3 mm



mm					rpm	kg
A	B $^{+0.5}_{-2}$	C	D	E	Max. speed	Weight
100	32	80	87.5	3	350	1.1
150	32	130	137.5	3	230	2.6



ORDERING EXAMPLE

Designation	SAV no. - A
Permanent magnetic circular chuck	SAV 244.03 - 150

CYLINDRICAL GRINDING ON PERMANENT MAGNETIC CIRCULAR CHUCK

Application example for SAV 244.06 with customised pole shoes for up to 300 different workpieces.

SAV 244.06 PERMANENT MAGNETIC CIRCULAR CHUCKS

With radial pole pitch

APPLICATION

For round and ring-shaped workpieces.

DESIGN

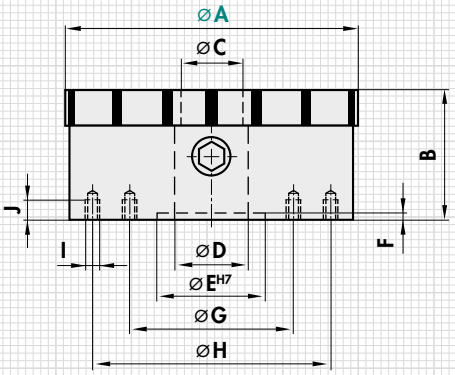
High magnetic force. Concentric rings allow easy alignment of workpieces. Magnetic field continuously adjustable up to ø 300 mm. Through hole possible up to max. diameter **D**. Standard version without through hole at the centre. Diameter **C** is magnetically not active. Available with flange on request (see SAV 248.90 to 248.95).

Larger diameters with T-grooves on request. Pole gap with brass pigment.

TECHNICAL DATA

- Rated holding force: 100 N/cm²
- Wear thickness of the top surface:
  5 mm (for A = 100 to 300 mm)
  10 mm (for A = 350 to 400 mm)
- Geometrically balanced: G 6.3

mm										Qty.	kg	N/cm²
A	B $^{+0.5}_{-2}$	C	D_{-2}	E	F	G	H	I	J	Poles	Weight	Nom. hold.f.
100	48	14	-	51	6	76	-	M6	8	6	2.6	80
130	57	16	20	50	5	100	-	M6	10	10	5.7	90
150	57	20	24	50	5	80	120	M6	8	10	6.5	90
200	57	28	30	60	5	110	180	M6	8	12	13.0	115
250	70	30	50	80	5	140	220	M6	8	16	20.0	135
300	73	40	58	150	6	180	260	M8	10	16	30.0	150
350	73	40	58	170	6	220	300	M8	12	20	49.0	150
400	75	40	58	200	8	260	340	M8	12	20	75.0	150
500	92	60	58	200	8	360	440	M8	12	26	144.0	150



4 fastening holes per pitch circle

ORDERING EXAMPLE

Designation	SAV no. - A
Permanent magnetic circular chuck	SAV 244.06 - 400

SAV 248.05 LAMINATED TOP PLATES

For placing on circular magnet SAV 244.06 with radial pole pitch

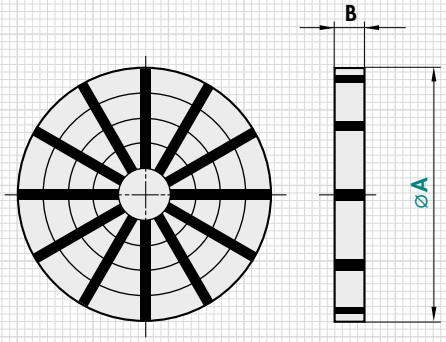
DESIGN

For chucking profiled workpieces on permanent magnetic circular chuck SAV 244.06. Attaching to a magnet upon agreement.

TECHNICAL DATA

- Permitted profile depth: Max. 8 mm

mm		Qty.	kg
A	B	Poles	Weight
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



ORDERING EXAMPLE

Designation	SAV no. - A
Laminated top plate	SAV 248.05 - 150

SAV 244.07

NEODYMIUM MAGNETIC CIRCULAR CHUCKS

With parallel pole pitch P = 6 mm, neodymium magnets with extremely high holding force

APPLICATION

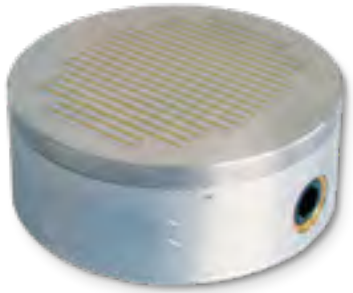
For workpieces which are difficult to chuck, e.g. Ferro-Tic and tungsten carbide with cobalt content. For small and very small workpieces.

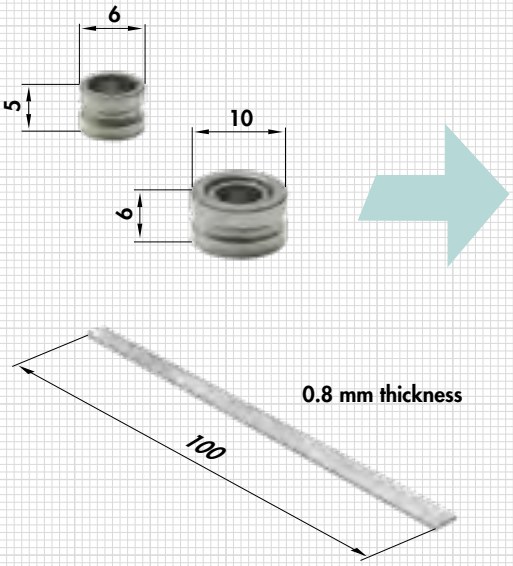
DESIGN

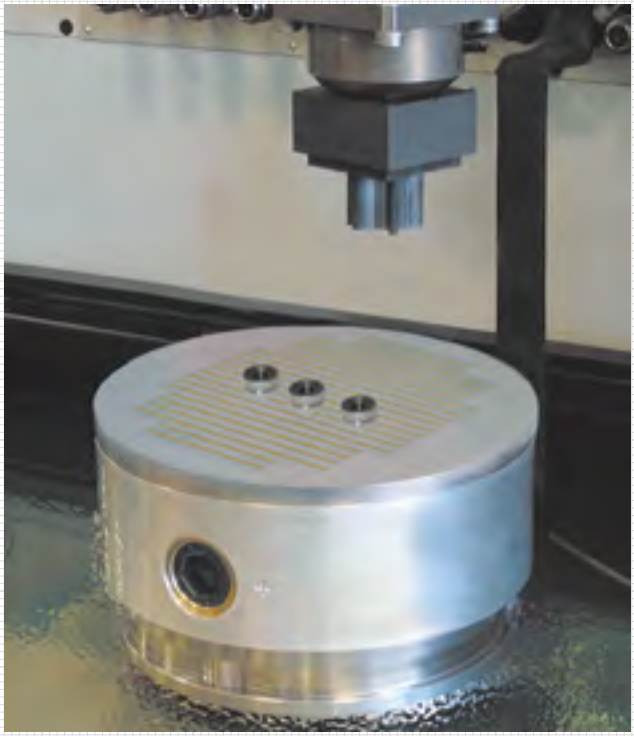
Aluminium housing, stainless steel pole plate. Extremely high holding force through use of neodymium iron boron magnet materials and a specially developed process. Available with flange on request (see SAV 248.90 to 248.94). Pole gap with brass pigment. Available with adaptation for zero-point workholding system.

TECHNICAL DATA

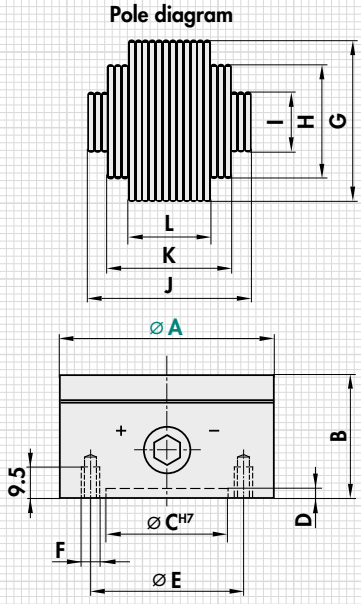
- Rated holding force: 120 N/cm²
  (On inducible steel surface: 180 N/cm²)
- Magnetic field height: 4 mm
- Wear layer of the pole plate: 3 mm







Pole diagram



mm												kg
A	B +0.5 -2	C	D	E	F	G	H	I	J	K	L	Weight
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
200	65	125	4	180	M 10 (4x)	134	104	74	158	110	73	8.5

ORDERING EXAMPLE

Designation	SAV no. - A
Neodymium magnetic circular chuck	SAV 244.07 - 160

SAV 244.10 PERMANENT MAGNETIC CIRCULAR CHUCKS

Controllable

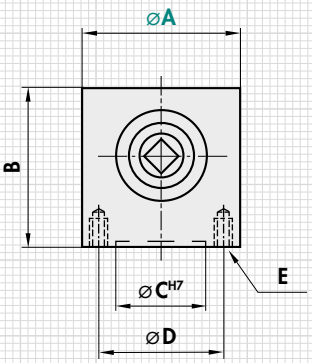
APPLICATION

For manual collet chucks as an auxiliary magnet for chucking small, delicate workpieces. Also suitable for fixtures and as a holding magnet.

DESIGN

Controllable permanent magnet, chucking areas at the top.

mm					kg	rpm	kg
A	B $^{+0.5}_{-2}$	C	D	E	Rated force	Max. speed	Weight
50	50	25	35	4 x M5	85	450	0.7
80	65	50	60	4 x M6	500	400	2.2



ORDERING EXAMPLE

Designation	SAV no. - A
Permanent magnetic circular chuck	SAV 244.10 - 80

SAV 244.11 PERMANENT MAGNETIC CIRCULAR CHUCKS

With parallel pole pitch, reinforced magnet system

APPLICATION

For chucking small to large workpieces for grinding and turning.

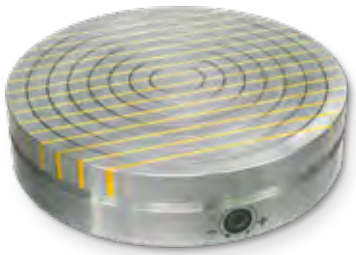
DESIGN

Powerful magnet system with neodymium magnets and low magnetic field height. All sizes with 1 control point. Magnetic force continuously adjustable. Option for integrating a central hole "H". Available with flange on request (see SAV 248.90 to 248.94).

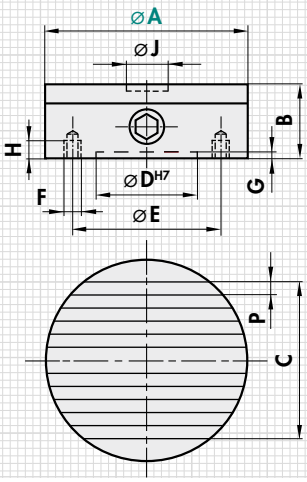
Concentric rings facilitate visual alignment of the workpieces. Pole gap with solid brass.

TECHNICAL DATA

- Rated holding force:
  Diameter A = 160 and 200 mm: 100 N/cm²
  Diameter A = 250 to 500 mm: 150 N/cm²
- Magnetic field height: 10 mm
- Wear layer of the pole plate: 6 mm
- Geometrically balanced: G 6.3



mm										kg
A	B $^{+0.5}_{-2}$	C	D	E	F	G	H	J	P	Weight
160	57	102	125	142	4 x M8	4	12	D15x6	8+3	8.0
200	57	146	150	180	4 x M8	4	12	D20x6	8+3	13.0
250	57	198	200	232	4 x M8	4	12	D25x20	12+3	20.0
300	62	228	250	285	4 x M8	4	12	D25x20	12+3	31.0
350	62	288	300	334	4 x M8	5	12	D25x20	12+3	43.0
400	67	318	300	350	6 x M10	5	20	D25x20	12+3	60.0
450	67	378	350	400	6 x M10	5	20	D25x20	12+3	76.0



ORDERING EXAMPLE

Designation	SAV no. - A
Permanent magnetic circular chuck	SAV 244.11 - 250

SAV 248.90 SHORT TAPERED FLANGES

For adapting to machine and workholding fixture

APPLICATION

For flanging on round magnets or other workholding fixtures. For spindle heads as per DIN 55026 (55021) shape A and B, ISO 702/I A1 and A2, ASA B5.9 A1 and A2.

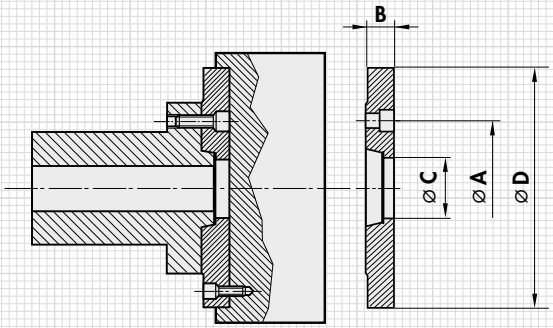
DESIGN

Soft steel flanges as per DIN, ISO and ASA standards. Machined on the spindle side. The magnet-side/chuck-side adaptation is carried out as required (please state diameter and hole pattern when ordering). On customer request, we supply our round magnets already fully flanged.

Spindle head size	A [mm]
4*	82.6
4**	85.0
5	104.8
6	133.4
8	171.4
11	235.0
15	330.0

Dimensions **B, C** and **D** as well as the fastening hole circle as per requirements or your specifications.

* For spindle head size DIN 55026
** For spindle head size DIN 55021



ORDERING EXAMPLE

Designation	SAV no. - spindle head size - standard
Short tapered flange without fastening screws	SAV 248.90 - 4 - DIN 55026 and dimensions

SAV 248.91 SHORT TAPERED FLANGES

With stud bolts and bayonet disc

APPLICATION

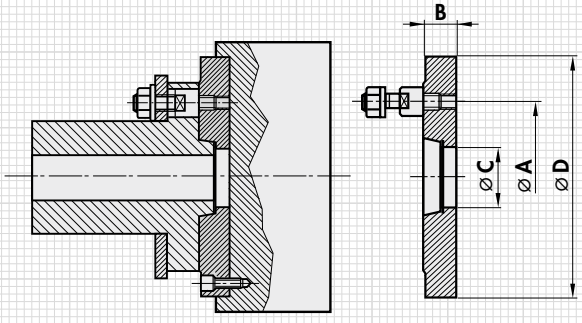
For flanging on round magnets or other workholding fixtures. For spindle heads as per DIN 55027 and ISO 702/III.

DESIGN

Soft steel flanges as per DIN and ISO standards. Machined on the spindle side. With stud bolts and collar nuts. The magnet-side/chuck-side adaptation is carried out as required (please state diameter and hole pattern when ordering). On customer request, we supply our round magnets already fully flanged.

Spindle head size	A [mm]	No. of stud bolts [Qty.]
4	85.0	3
5	104.8	4
6	133.4	4
8	171.4	4
11	235.0	6
15	330.2	6

Dimensions **B, C** and **D** as well as the fastening hole circle as per requirements or your specifications.



ORDERING EXAMPLE

Designation	SAV no. - spindle head size - standard
Short tapered flange with bayonet fastening	SAV 248.91 - 15 - DIN 55027 and dimensions

SAV 248.92 SHORT TAPERED FLANGES

With cam lock fastening

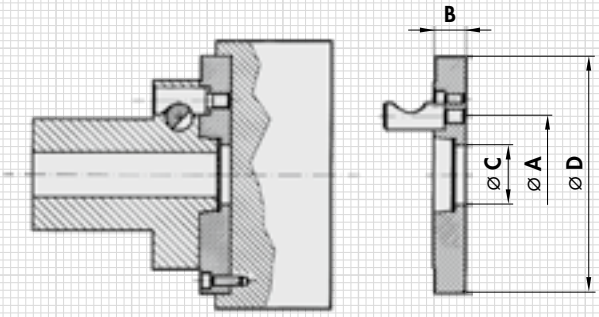
APPLICATION

For flanging on round magnets or other workholding fixtures. For spindle heads as per DIN 55029, ISO 702/II, ASA b 5.9 D1.

DESIGN

Soft steel flanges as per DIN, ISO and ASA standards. Machined on the spindle side. The magnet-side/chuck-side adaptation is carried out as required (please state diameter and hole pattern when ordering). On customer request, we supply our round magnets already fully flanged.

	mm	Qty.
Spindle head size	A	No. of clamping cams
4	82.6	3
5	104.8	6
6	133.4	6
8	171.4	6
11	235.0	6
15	330.2	6



Dimensions **B, C** and **D** as well as the fastening hole circle as per requirements or your specifications.

ORDERING EXAMPLE

Designation	SAV no. - spindle head size
Short tapered flange with cam lock fastening	SAV 248.92 - 15

SAV 248.94 MORSE TAPER FITTINGS

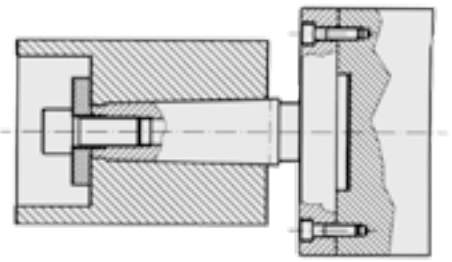
For adapting to machine and workholding fixture

APPLICATION

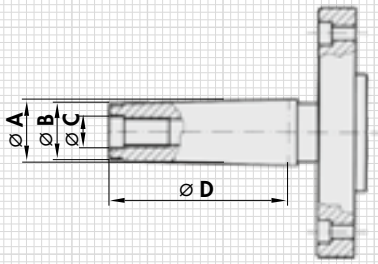
For flanging on round magnets or other workholding fixtures. For fittings as per DIN 228.

DESIGN

Soft steel flanges as per DIN. Machined on the spindle side. The magnet-side/chuck-side adaptation is carried out as required (please state diameter and hole pattern when ordering). On customer request, we supply our round magnets already fully flanged.
Hardened, polished version made of case-hardened steel available on request.



	mm			
Morse taper size	A	B	C	D
MK 0	9.045	6.4	–	50.0
MK 1	12.065	9.4	M 6	53.5
MK 2	17.78	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



Dimensions as per requirements or your specifications.

ORDERING EXAMPLE

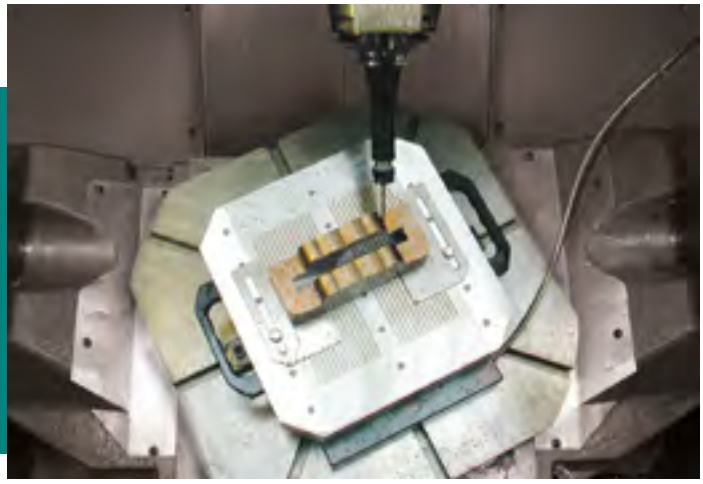
Designation	SAV no. - Morse taper size
Morse taper fitting	SAV 248.94 - MK 6 and dimensions

▸ APPLICATIONS

SAV PALLETISING SYSTEMS

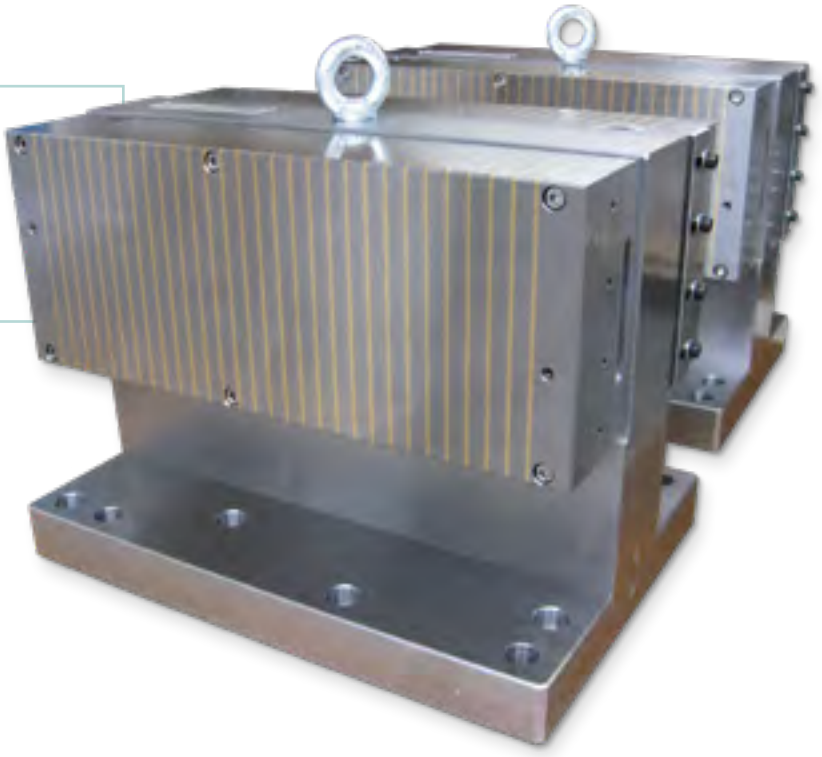
We palletise all our magnets on zero-point workholding systems, as available on the market.

We can send you the corresponding information as required.



HSC machining with SAV 220.31 pallet

permanent magnetic vertical chuck
in special execution
for milling and drilling



CHAPTER 1.2.2

ELECTRO MAGNETIC CHUCKS

1.2. STANDARD MAGNET SYSTEMS

1.2.2 ELECTRO MAGNETIC CHUCKS

E
PAGES 62 – 77

	SAV ART. NO.	COMMENTS	POLE PITCH	MACHINING PROCESS*	PAGE
ELECTRO MAGNETIC CHUCKS					
	243.40	For thin parts, place lengthwise	4 mm		62
	243.41	For thin parts, place crosswise	4 mm		64
	243.42	Universal model	13/18/25 mm		66
ELECTRO MAGNETIC CIRCULAR CHUCKS					
	244.40	For ring-shaped parts	Radial pole pitch		68
	244.41	For thin parts, for multiple parts	Circular pole pitch		70
	244.43	For thin parts, magnetically active centre	Parallel pole pitch		72
ELECTRO MAGNETIC CIRCULAR CHUCKS FOR CENTELESS SHOE GRINDING					
	244.45	For slide shoe grinding of small, thin rings	Circular pole pitch		73
ELECTRONIC POLARITY REVERSAL DEVICE, HAND REMOTE UNITS AND RECTIFIERS					
	876.10	For electronic control	–	–	74
	876.02	For manual operation	–	–	76
SEPARATE SLIP RING ASSEMBLIES AND CARBON BRUSH HOLDERS					
	248.81	Slip ring assembly	–	–	77
	248.83	Carbon brush holder	–	–	77

* Explanation of the icons on page 4

SELECTION CRITERIA

ELECTRO MAGNETIC CHUCKS AND CIRCULAR CHUCKS

PROPERTIES

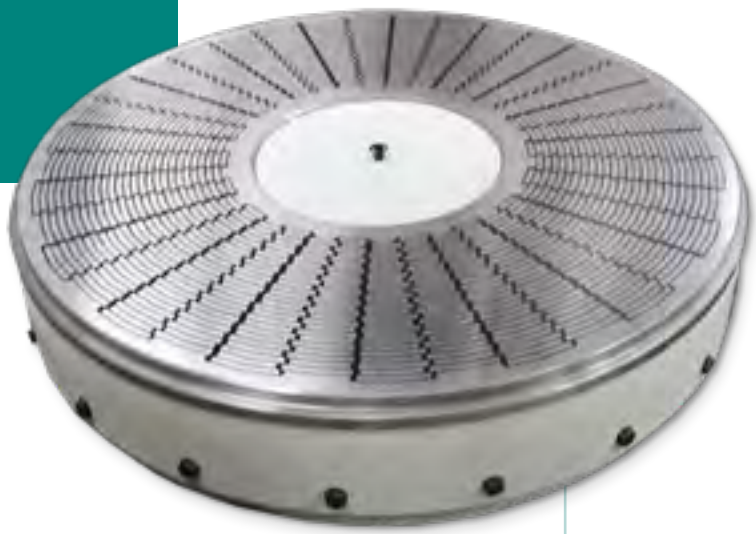
- Force generated by permanent power supply
- Deep magnetic fields for larger air gaps
- Not suitable for palletising
- Note max. speed for round magnets as per chapter 1.4
- Thermal expansion of a few 0.01 mm depending on duty cycle
- Designed for 100 % duty cycle
- Stable holding forces even for relatively deep machining on thin sheet metal
- Also with water cooling, depending on the design
- Good demagnetising quality and reproducibility of the holding forces
- Holding force and demagnetising can be controlled with a control unit

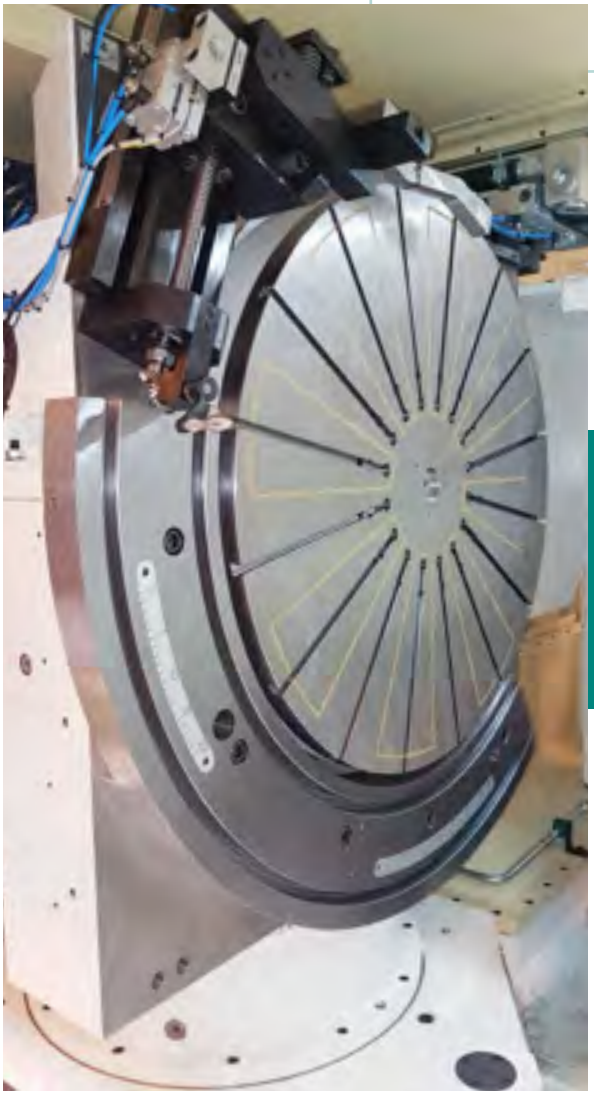
				GRINDING	MILLING/ DRILLING	HARD MILLING	CYLINDRICAL GRINDING	TURNING
SAV 243.40		Transverse fine pole pitch for thin workpieces 40 x 40 mm, lengthwise workpiece orientation	page 62	✔	–	–	–	–
SAV 243.41		Longitudinal fine pole pitch for thin workpieces 40 x 40 mm, crosswise workpiece orientation	page 64	✔	–	–	–	–
SAV 243.42		Low magnetic field with narrow, real pole pitch	page 66	✔	–	–	–	–
SAV 244.40		For ring-shaped workpieces, use of pole shoes possible to create free space for tools	page 68	–	–	–	✔	✔
SAV 244.41		For multiple workpieces on dividing circle and thin plates, centre is not magnetic	page 70	–	–	–	✔	✔
SAV 244.43		For thin plates, centre is magnetic	page 72	–	–	–	✔	–
SAV 244.45		For slide shoe grinding of thin rings (rolling bearing rings)	page 73	–	–	–	✔	–

APPLICATIONS

ELECTRO MAGNETIC CIRCULAR CHUCK

For automated grinding of ferritic cores





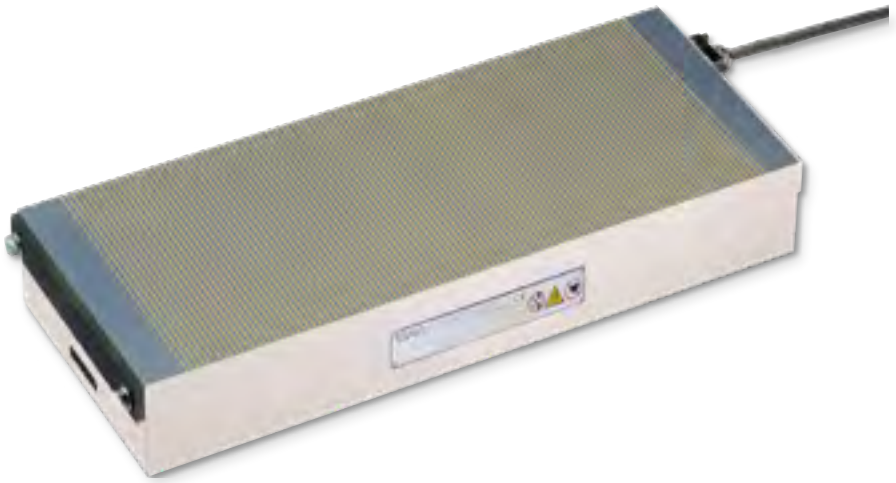
ELECTRO MAGNETIC CIRCULAR CHUCK

For slide shoe grinding of rolling bearing rings > 400 mm

SAV 243.40 ELECTRO MAGNETIC CHUCKS

With continuous fine transverse pole pitch P = 4 mm

Electromagnet systems with very narrow pole pitch. Especially suitable for thin parts. Main workpiece axis parallel to the magnet length.



DESIGN

- Pole plate with particularly narrow, continuous transverse pole pitch, 3 mm steel and 1 mm brass.
- Pole divisions bonded and additionally bolted together solidly with tie rods lengthwise
- Pole plates bolted in a narrow grid
- 8 mm wear layer on the pole plate
- Low magnetic field height of 4 mm
- Chucking slots on both face sides
- Length over 1000 mm with through holes for fastening upon agreement
- Robust and water-tight
- Protection rating IP 65
- 100 % duty cycle
- Suitable for connecting to the SAV 876.10 control unit

RATED HOLDING FORCE

100 N/cm², controllable with control unit using holding force coding switch

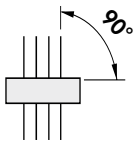
RATED VOLTAGE, RECOMMENDED

24 V DC up to and including 118 W
110 V DC for all other sizes

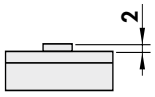
APPLICATION

For chucking thin, plate-shape workpieces with shape and position tolerances of 0.01 to 0.02 mm.

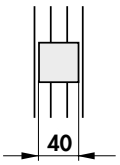
- For main workpiece axis perpendicular to the pole pitch



- For thin workpieces up to: min. thickness = 2 mm

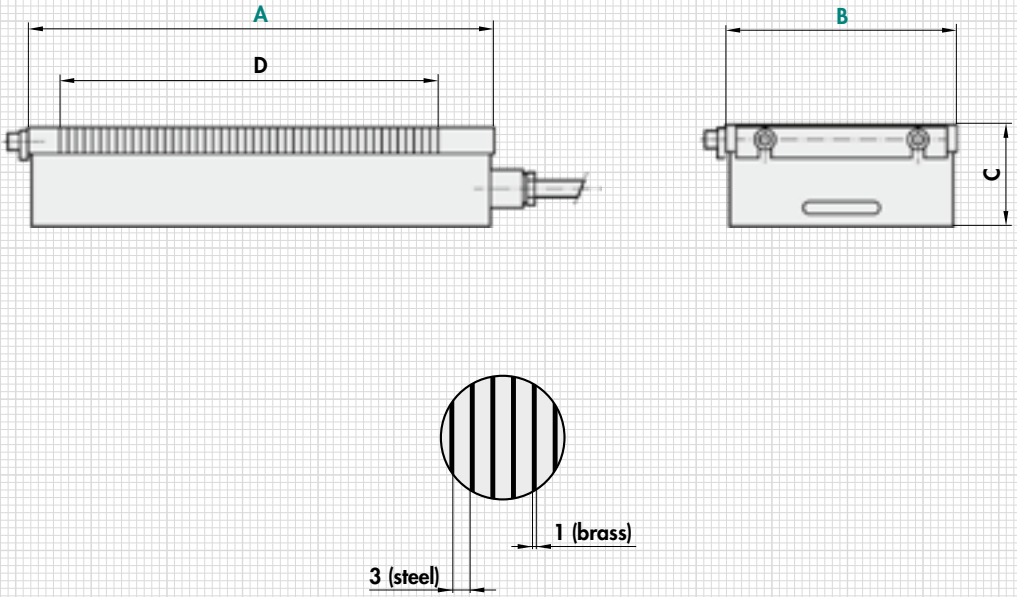


- For flat workpieces: min. length = 40 mm



SCOPE OF DELIVERY

- Stop bar on one short and one long side
- 3 m connecting cable on right short side, rear
- Larger magnetic chucks are provided with lifting lugs for transport
- Control and hand remote unit not in the scope of delivery
- Clamps



mm				W	kg	Type
A	B	C^{0}_{-1}	D	Power	Weight	Control
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

mm				W	kg	Type
A	B	C^{0}_{-1}	D	Power	Weight	Control
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	649	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 rated voltages on request. Larger chucking areas can be implemented by joining several blocks without gaps.

RECOMMENDED CONTROL AND CONTROL UNIT

Type	Control	Hand remote 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

Installation control units or for combinations as per page 74.

ORDERING EXAMPLE

Designation	SAV no. - A x B - rated voltage
Electro magnetic chuck	SAV 243.40 - 1200 x 500 - 110 V

SAV 243.41 ELECTRO MAGNETIC CHUCKS

With continuous fine longitudinal pole pitch P = 4 mm

Electromagnet systems with very narrow pole pitch. Especially suitable for thin parts. Main workpiece axis at right angle to the magnet length.

DESIGN

- Pole plate with particularly narrow, continuous longitudinal pole pitch, 3 mm steel and 1 mm brass
- Pole divisions bonded and additionally bolted together solidly with tie rods
- Pole plates bolted in a narrow grid
- 8 mm wear layer on the pole plate
- Low magnetic field height of 4 mm
- Chucking slots on both face sides
- Length over 1000 mm with through holes for fastening upon agreement
- Robust and water-tight
- Protection rating IP 65
- 100 % duty cycle
- Suitable for connecting to the SAV 876.10 control unit

RATED HOLDING FORCE

100 N/cm², controllable with control unit using holding force coding switch

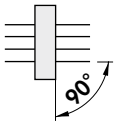
RATED VOLTAGE, RECOMMENDED

24 V DC up to and including 106 W
110 V DC for all other sizes

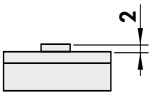
APPLICATION

For chucking thin, plate-shape workpieces with shape and position tolerances of 0.01 to 0.02 mm.

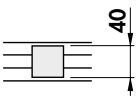
- For main workpiece axis perpendicular to the pole pitch



- For thin workpieces up to: min. thickness = 2 mm

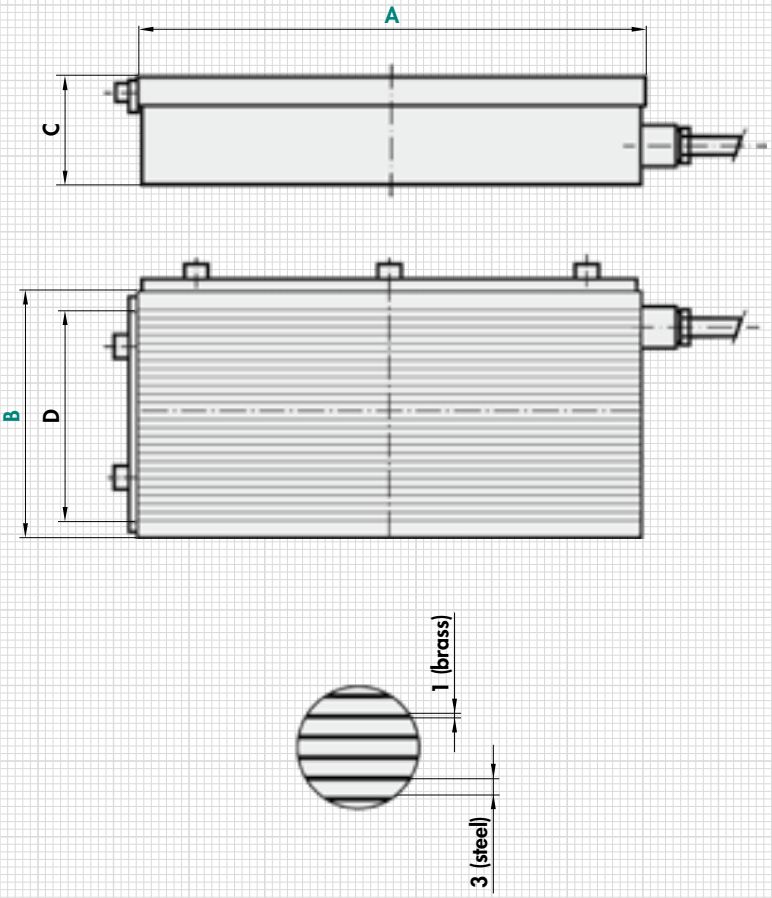


- For flat workpieces: min. width = 40 mm



SCOPE OF DELIVERY

- Stop bar on one short and one long side
- 3 m connecting cable on right short side, rear
- Larger magnetic chucks are provided with lifting lugs for transport
- Control and hand remote unit not in the scope of delivery
- Clamps



mm				W	kg	Type
A	B	C^{0}_{-1}	D	Power	Weight	Control
200	100	87	61	30	13.0	E 1
300	100	87	61	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	257	175	97.0	E 4
600	300	87	257	206	116.0	E 4
800	300	87	257	268	155.0	E 4
1000	300	87	257	330	193.0	E 4

mm				W	kg	Type
A	B	C^{0}_{-1}	D	Power	Weight	Control
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	345	265	155.0	E 4
700	400	87	345	305	180.0	E 4
800	400	87	345	345	206.0	E 4
1000	400	87	345	425	258.0	E 4
1200	400	87	345	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

Other sizes and rated voltages on request. Larger chucking areas can be implemented by joining several blocks without gaps.

RECOMMENDED CONTROL AND CONTROL UNIT

Type	Control	Hand remote 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

Installation control units or for combinations as per page 74.

ORDERING EXAMPLE

Designation	SAV no. - A x B - rated voltage
Electro magnetic chuck	SAV 243.41 - 1200 x 500 - 110 V

SAV 243.42 ELECTRO MAGNETIC CHUCKS

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

The magnetic chuck features a high magnetic power, sturdy design and a long service life.
The pole pitch forms "true" N and S poles.

DESIGN

- Solid pole plate with 13 mm, 18 mm or 25 mm transverse pole pitch
- "True" N/S pole spacing
- With water cooling for increased accuracy on request
- With compressed air holes for easier removal of large parts (adhesion) for P = 18 mm or 25 mm on request
- Pole plates bolted in a narrow grid
- 8 mm wear layer on the pole plate
- Chucking slots on both face sides
- Length over 1000 mm with through holes for fastening upon agreement
- Robust and water-tight
- Protection rating IP 65
- 100 % duty cycle
- Suitable for connecting to the SAV 876.10 control unit

RATED HOLDING FORCE

90 N/cm², with P = 13 mm pole pitch
110 N/cm², with P = 18 mm pole pitch
115 N/cm², with P = 25 mm pole
control unit using holding force coding switch

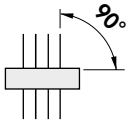
RATED VOLTAGE, RECOMMENDED

24 V DC up to and including 64 W
110 V DC for all other sizes

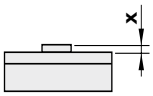
APPLICATION

For universal chucking of workpieces with shape and position tolerances of 0.01 to 0.02 mm.

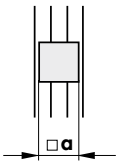
- For main workpiece axis perpendicular to the pole pitch



- For workpieces up to min. thickness x:
  4.5 mm with P = 13 mm
  6.0 mm with P = 18 mm
  8.5 mm with P = 25 mm

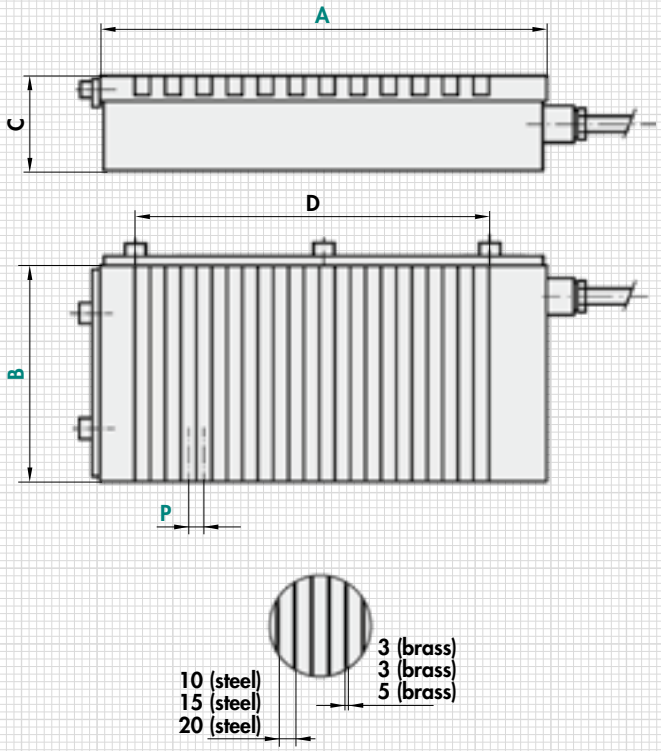


- For flat workpieces min. a:
  25 mm x 25 mm with P = 13 mm
  32 mm x 32 mm with P = 18 mm
  45 mm x 45 mm with P = 25 mm



SCOPE OF DELIVERY

- Stop bar on one short and one long side
- 3 m connecting cable on right short side, rear
- Larger magnetic chucks are provided with lifting lugs for transport
- Control and hand remote unit not in the scope of delivery
- Clamps



mm					W	kg	Type
A	B	C^{0}_{-1}	D	P	Power	Weight	Control
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	380	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

mm					W	kg	Type
A	B	C^{0}_{-1}	D	P	Power	Weight	Control
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	926	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 rated voltages on request. Larger chucking areas can be implemented by joining several blocks without gaps.

RECOMMENDED CONTROL AND CONTROL UNIT

Type	Control	Hand remote 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

Installation control units or for combinations as per page 74.

ORDERING EXAMPLE

Designation	SAV no. - A x B x P - rated voltage
Electro magnetic chuck	SAV 243.42 - 2000 x 800 - 25 - 110 V

SAV 244.40 ELECTRO MAGNETIC CIRCULAR CHUCKS

With radial pole pitch

The electro magnetic circular chucks feature high holding forces. Radial T-slots can be machined into the pole plate for universal use or for use of pole shoes.

DESIGN

- Solid pole plate
- The radial pole positioning is particularly suitable for using pole shoes. This prerequisite is absolutely required for the runout of the tool or the grinding wheel in case of 3-sides machining. Version with T-slot (T) as per DIN 650-10^{H10} are available for this.
- 8 mm wear layer on the pole plate
- Protection rating IP 65
- 100 % duty cycle
- Suitable for connecting to the SAV 876.10 control unit
- Available with flange on request (see SAV 248.90 to 248.94).

RATED HOLDING FORCE

120 N/cm², controllable with control unit using holding force coding switch

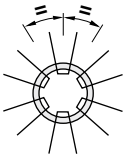
RATED VOLTAGE, RECOMMENDED

24 V DC up to and including 90 W power
110 V DC for all other sizes

APPLICATION

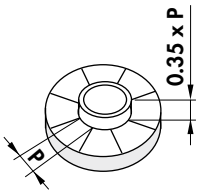
For grinding of cylindrical and ring-shaped workpieces on carousel-type internal and external grinding machines. Also suitable for turning with shape and position tolerances of 0.01 to 0.02 mm.

- Same pole pitch on the circumference, therefore suitable for ring-shaped workpieces

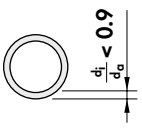


- For workpieces up to min. width equivalent to 35 % pole pitch on the pitch circle diameter

$$P = \frac{\pi}{4} \cdot \frac{d_i + d_a}{P_p} \quad ; B_{WKPC} > 0.35 \times P$$

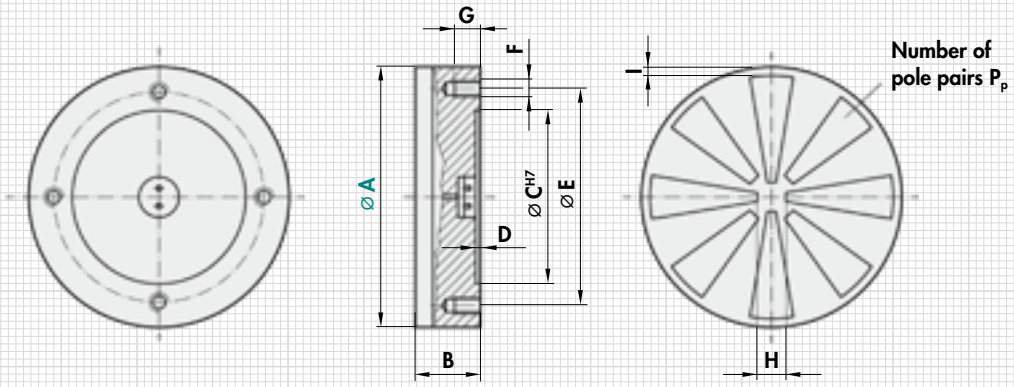


- Also for thin rings



SCOPE OF DELIVERY

- Larger round magnets are provided with threads for transport
- Standard version without T-slots and pole shoes
- Standard electrical connection centrally on the rear side using terminals
- Optionally available with integrated flat slip ring assembly for diameters from 1000 mm
- Control and hand remote unit not in the scope of delivery



mm									Pair	W	kg	Type
A	B $^{0}_{-1}$	C	D	E	F	G	H	I	P_P	Power	Weight	Control
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 side upon agreement					300	25	18	960	990.0	E 5
1400	110	Rear side upon agreement					300	25	18	1100	1350.0	E 5
1500	120	Rear side upon agreement					300	25	18	1440	1550.0	E 5
1600	120	Rear side upon agreement					300	25	18	1630	1760.0	E 5

* On versions with T-slots, the height increases by 10 mm

Larger diameters, e.g. 5.5 m, available on request.

RECOMMENDED CONTROL AND CONTROL UNIT

Type	Control	Hand remote unitt
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

Installation control units as per page 74.

ORDERING EXAMPLE

Designation	SAV no. - A - version - rated voltage
Electro magnetic circular chuck	SAV 244.40 - 800 - T - 110 V

SAV 244.41 ELECTRO MAGNETIC CIRCULAR CHUCKS

With circular pole pitch

Thanks to the circular pole pitch, the electro magnetic circular chuck has a strong, low magnetic field for thin plates.

DESIGN

- Pole pitch manufactured "gap-free"
- Pole plates bolted in a narrow grid
- 8 mm wear layer on the pole plate
- Protection rating IP 65
- 100 % duty cycle
- Suitable for connecting to the SAV 876.10 control unit
- Available with flange on request (see SAV 248.90 to 248.94).

RATED HOLDING FORCE

80 N/cm², controllable with control unit using holding force coding switch

RATED VOLTAGE, RECOMMENDED

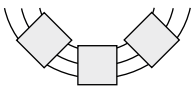
24 V DC up to and including 90 W
110 V DC for all sizes

APPLICATION

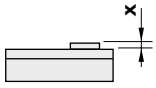
Primarily for grinding of disc-shaped workpieces on internal and external grinding machines with rotary table. Not for thin rings. The circular pole pitch also allows machining of multiple parts which are not placed centrally. Also suitable for turning with shape and position tolerances of 0.01 to 0.02 mm.

- Circular pole pitch ensures even distribution of holding force on the circumference. This makes it suitable for thin, flat parts (e.g. saw blades).

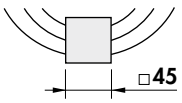
- Placement of multiple parts on pitch circle diameter possible



- For workpieces up to min. thickness:
  2 mm with P = 5.5 mm
  4 mm with P = 9 mm
  8 mm with P = 18 mm



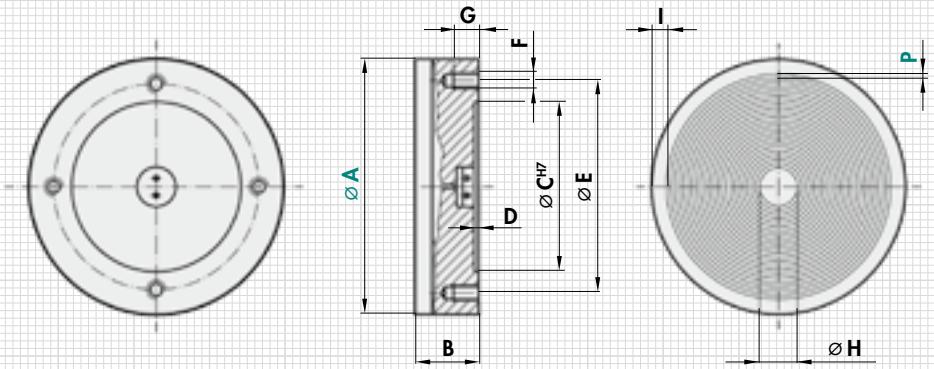
- For flat workpieces:
  Min. size = 45 mm x 45 mm



- Not suitable for thin rings

SCOPE OF DELIVERY

- Larger round magnets are provided with threads for transport
- Standard electrical connection centrally on the rear side using terminals
- Optionally available with integrated flat slip ring assembly for diameters from 1000 mm
- Control and hand remote unit not in the scope of delivery



mm										W	kg	Type
A	B $^{0}_{-1}$	C	D	E	F	G	H	I	P	Power	Weight	Control
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	13,5	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	26	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	26	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 side upon agreement				22	131	23	9	960	989.0	E 5
1400	110	Rear side upon agreement				22	136	26	9	1100	1346.0	E 5
1500	120	Rear side upon agreement				22	101	26	9	1440	1545.0	E 5
1600	120	Rear side upon agreement				22	129	26	9	1630	1760.0	E 5
1200	110	Rear side upon agreement				22	140	23	18	960	989.0	E 5
1400	110	Rear side upon agreement				22	136	26	18	1100	1346.0	E 5
1500	120	Rear side upon agreement				22	128	26	18	1440	1545.0	E 5
1600	120	Rear side upon agreement				22	138	26	18	1630	1760.0	E 5

RECOMMENDED CONTROL AND CONTROL UNIT

Type	Control	Hand remote 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

Installation control units as per page 74.

ORDERING EXAMPLE

Designation	SAV no. - A - P - rated voltage
Electro magnetic circular chuck	SAV 244.41 - 800 - 18 - 110 V

SAV 244.43 ELECTRO MAGNETIC CIRCULAR CHUCKS

With parallel pole pitch P = 4 mm

Round magnet with fine pole pitch for thin workpieces.
Centre magnetically active.

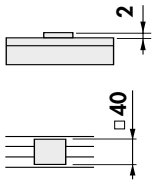
DESIGN

- Pole plate with particularly narrow, continuous pole pitch, 3 mm steel and 1 mm brass
- Low height
- Pole divisions bonded and reinforced with tie rods
- High accuracy thanks to pole plates bolted in a narrow grid
- Low field height of 4 mm
- Switch-off using demagnetising cycle
- Fastening hole pattern with threads at the rear or through holes upon agreement
- 8 mm wear layer on the pole plate
- Robust and water-tight
- Protection rating IP 65
- Suitable for connecting to the SAV 876.10 control unit

APPLICATION

For grinding thin, flat workpieces.

- Grinding thin plates, wide rings with low height and min. contact widths of 40 mm
- For workpieces up to: min. thickness = 2 mm
- For flat workpieces: min. length = 40 mm



RATED HOLDING FORCE

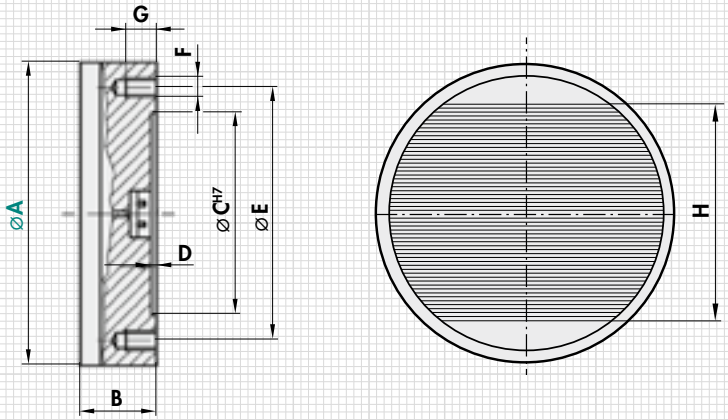
100 N/cm², controllable with control unit using holding force coding switch

RATED VOLTAGE, RECOMMENDED

110 V DC

SCOPE OF DELIVERY

- Larger round magnets are provided with threads for transport
- Standard electrical connection centrally on the rear side using terminals
- Control and manual operation not in the scope of delivery



mm								W	kg	Type
A	B^{0}_{-1}	C	D	E	F	G	H	Power	Weight	Control
300	100	160	4	190	M12 (4x)	16	213	110	55.0	E 4
400	100	210	4	250	M12 (6x)	16	301	180	98.0	E 4
500	100	280	4	320	M12 (6x)	16	401	230	153.0	E 4
600	100	350	4	390	M12 (6x)	18	481	410	220.0	E 4
700	100	400	4	450	M12 (6x)	18	581	430	300.0	E 4
800	100	450	4	500	M16 (6x)	18	681	540	392.0	E 4

RECOMMENDED CONTROL AND CONTROL UNIT

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

Installation control units as per page 74.

ORDERING EXAMPLE

Designation	SAV no. - A - rated voltage
Electro magnetic circular chuck	SAV 244.43 - 300 - 110 V

SAV 244.45

ELECTRO MAGNETIC CIRCULAR CHUCKS FOR CENTELESS SHOE GRINDING

With pot magnet system for large range of workpieces

Special round magnet for thin rings (rolling bearings).

DESIGN

- Extreme magnetic field for grinding a large range of workpieces
- Delivery with drivers upon agreement or adapted to existing drivers
- Spindle adaptation upon agreement
- On request with exchangeable pole plates for large chucking area
- For easy workpiece handling, easy to automate
- Internal cooling water feed possible
- Control and hand remote unit not in the scope of delivery

APPLICATION

- For grinding small rings with small workpiece contact area
- Eccentric workpiece chucking and positioning using stationary slide shoes for extremely low wall thickness fluctuation
- Easy changeover with universal workpiece drivers
- Universally suitable for large range of diameters
- For chucking workpieces up to 500 mm diameter
- Workpiece eccentric to the spindle
- Magnet for rotation, slide shoes (provided by customer) for precision

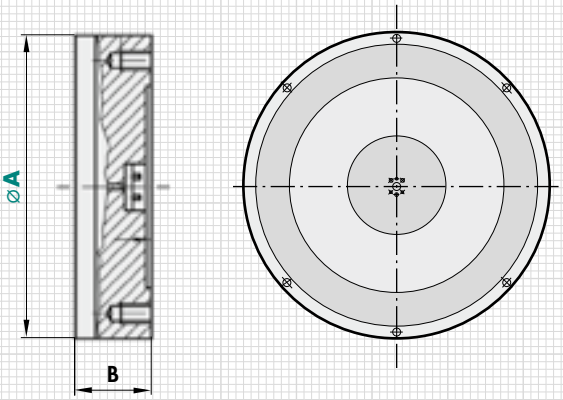
RATED VOLTAGE, RECOMMENDED

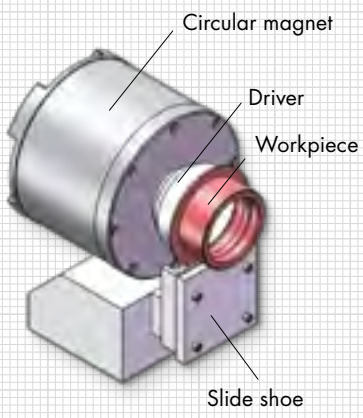
24 V DC up to 250 mm diameter
110 V DC over 250 mm diameter

SCOPE OF DELIVERY

- Larger round magnets are provided with threads for transport
- Standard electrical connection centrally on the rear side using terminals
- Control and hand remote unit not in the scope of delivery

mm		kg	W	Type
A	B^{0}_{-1}	Weight	Power	Control
150	130	23.0	25	E 1
200	130	40.0	40	E 1
250	160	80.0	62	E 1
300	160	113.0	90	E 4
400	180	225.0	140	E 4
450	180	285.0	180	E 4
500	200	390.0	250	E 4





RECOMMENDED CONTROL AND CONTROL UNIT

Type	Control	Hand remote 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

Installation control units as per page 74.

ORDERING EXAMPLE

Designation	SAV no. - A - rated voltage
Electro magnetic circular chuck for centeless shoe grinding	SAV 244.45 - 500 - 110 V

SAV 876.10 ELECTRONIC POLARITY-REVERSING CONTROL UNITS

With integrated microcontroller and holding force control

DESIGN

The device complies with the standards:

- 2014/35/EU – Low Voltage Directive
- 2014/30/EU – Electromagnetic Compatibility Directive
- 2011/65/EU – RoHS

A safety contact in the control unit can be used to prevent machining of the workpiece if the voltage unit is not switched on.
Manually actuated with illuminated push-buttons. The optional connection to a CNC control uses a 24 V signal voltage.
A stepped holding force control is integrated as a standard. It can be controlled with a coding switch.
When using the lower levels of the holding force control, it must be noted that safety as per the accident prevention regulations is no longer ensured. The enabling level can be adjusted, however, and must be adapted to the workpiece.

Ambient temperature max.: 45 °C
Power supply: 230/400 V DC
Frequency: 50/60 Hz
Duty cycle for electromagnets: 100 %

APPLICATION

For electromagnetic workholding devices. Also suitable for retrofitting.

FUNCTION

Electronic polarity reversal control units supply electromagnetic workholding devices with direct current. In addition, the integrated polarity reversal device and microcontroller reduce the residual holding force between the magnetically held workpieces and the workholding device caused by remanence. This makes it easier to remove the workpieces from the magnetic chuck and to remove any swarf generated. At the same time, the residual field strength in the workpiece is dissipated almost completely.

For parts which are particularly difficult to magnetise, the controller offers a number of advanced polarity reversal programs. When ordering a magnetic chuck and polarity reversal control unit together, you will of course receive optimised settings for time and magnetic action.
For your safety, the device permanently monitors the power source, its own power components and all connecting cables including the magnetic coil. An LCD display acts as a signal generator.

PERFORMANCE CHARACTERISTICS

- Small and compact
- Can be integrated into any machine control cabinet
- User-friendly with LCD plain text display and film keypad
- Universal for all magnet types and voltages
- Reliable and safe operation

ELECTRICAL DATA

	Type	DC in V	max. in A	AC in V	DC in kW	A	
Order number	Control	Magnet voltage	Magnet current	Power supply	max. magnetic power	Fuse	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)

Magnet connection

Control signal connection

Power supply connection

LCD display:
For displaying operating states and error messages in plain text.

Film keypad:
For easy adjustment of operating parameters:

- Magnet voltage
- Demagnetising program, rough
- Demagnetising program, fine
- Characteristics of the holding force curve (levels 1 – 16)
- Number of clamping impulses
- Clamping impulse period
- Holding force level for machine enable

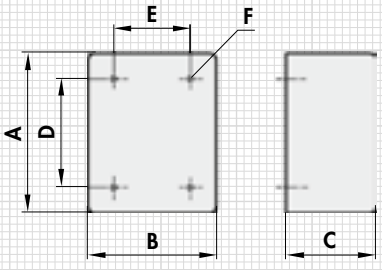
GEOMETRIC DATA

Control cabinet version (S) protection rating IP 54

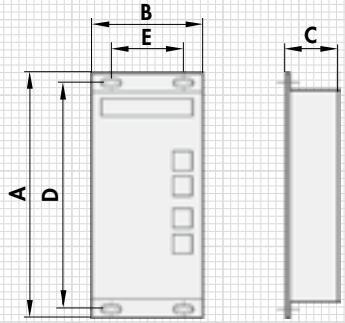
Order number	Type Contr.	mm A	B	C	D	E	F	kg Weight
876.10-S-T-24/7/230	E 1	250	400	150	205	355	ø10	14.0
876.10-S-T-24/15/230	E 2	250	500	150	205	455	ø10	20.0
876.10-S-T-24/25/230	E 3	500	400	250	455	355	ø10	32.0
876.10-S-O-110/6/230	E 4	300	250	155	260	210	ø8	10.0
876.10-S-O-110/16/230	E 5	250	400	150	205	355	ø10	14.0
876.10-S-O-110/30/230	E 6	250	400	150	205	355	ø10	16.0
876.10-S-T-110/6/400	E 7	500	400	250	455	355	ø10	28.0
876.10-S-T-110/16/400	E 8	500	400	250	455	355	ø10	38.0
876.10-S-T-110/30/400	E 9	600	400	250	555	355	ø10	54.0

Installation version (E) protection rating IP 00

Order number	Type Contr.	mm A	B	C	D	E	F	kg Weight
876.10-E-T-24/7/230	E 10	220	120	95	210	85	ø5	2.0
876.10-E-T-24/15/230	E 11	260	120	95	250	85	ø5	3.0
876.10-E-T-24/25/230	E 12	320	120	95	310	85	ø5	6.0
876.10-E-O-110/6/230	E 13	220	160	95	210	85	ø5	2.0
876.10-E-O-110/16/230	E 14	260	160	95	250	85	ø5	3.0
876.10-E-O-110/30/230	E 15	350	160	100	325	225	ø8	8.0
876.10-E-T-110/6/400	E 16	220	160	95	210	85	ø5	2.0
876.10-E-T-110/16/400	E 17	260	160	95	250	85	ø5	3.0
876.10-E-T-110/30/400	E 18	350	160	100	325	225	ø8	6.0



Dimensional drawing for control cabinet version (S)



Dimensional drawing for installation version (E)

ORDERING EXAMPLE

Designation	SAV no. - version - mains transformer - rated magnet voltage/max. magnet current/power supply
Electronic polarity-reversing control unit	SAV 876.10 - E - O - 110/6/230

SAV 876.02 - SE3

HAND REMOTE UNITS

For actuating polarity reversal control units SAV 876.10

DESIGN

To comply with accident prevention regulations on machine tools, it must be ensured that the machine feed is only enabled when the chucking magnet is activated (using auxiliary contacts) and that the activation is monitored with an indicator light. The control units comply with these regulations.
The indicator light is integrated into the keys of the control unit.
The auxiliary contacts for the machine feed are located in the polarity reversal control unit.

hand remote unit SE3

APPLICATION

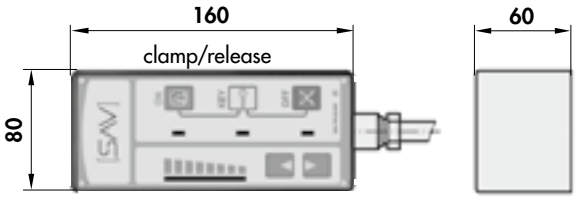
For switching DC magnets in conjunction with the electronic polarity reversal control units SAV 876.10.
The yellow and green keys are used for switching on. The yellow and red keys are used to initiate the polarity reversal process. Any malfunctions detected by the polarity reversal control units are also indicated by a coded flashing signal in the red key.
The holding force can be selected in 8 levels.

HAND REMOTE UNIT TYPE SE3

For holding force control at 8 levels for inverse BCD coding, with integrated indicator lights and a 2 m numbered cable, 9-pole.
Additional numbered cable available (surcharge applies).

TECHNICAL DATA

- Housing size (LxWxH): 160 x 80 x 60 mm
- Operating voltage: 24 V
- Protection rating: IP 63
- Protection class: III



Holding force adjustment

SE3

SAV 876.02 - SE2

CONTROL ELEMENTS FOR INSTALLATION

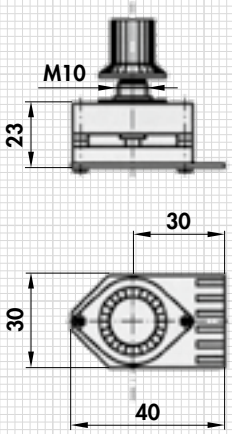
CONTROL ELEMENTS TYPE SE2-1 TO SE2-3

2 illuminated push-buttons and coding switch with 8 levels for holding force adjustment with inverse BCD coding Complete set available as type **SE2-S**.

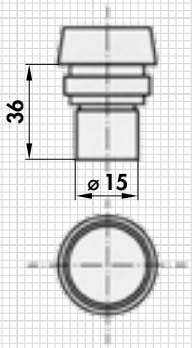
Coding switch SE2-1

Illuminated push button, red SE2-3

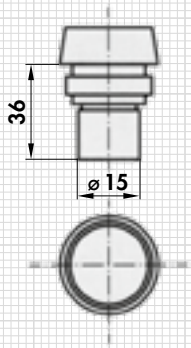
Illuminated push button, green SE2-2



SE2-1



SE2-3



SE2-2

ORDERING EXAMPLE

Designation	SAV no. - type
Hand remote unit	SAV 876.02 - SE3

SAV 248.81 SEPARATE SLIP RING ASSEMBLIES

For power supply to electro magnetic circular chucks

APPLICATION

Used to supply power to rotating electro magnetic circular chucks. For separate installation on the hollow machine spindle. The insulation parts must not be wetted with any liquids. A contact protection for the live parts on the machine must be provided. Electrical connection with cable lugs against support nut.

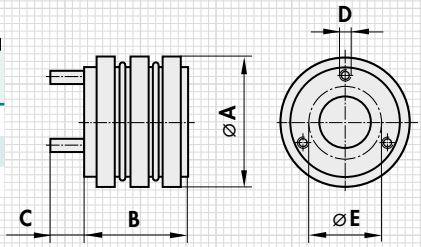
FASTENING

- Shrinking at 130 °C
- Pressing with 0.5 mm interference
- Adhesive bonding

DESIGN

Delivery with only one small hole. The locating hole (or thread) must be subsequently machined according to the machine spindle, taking into account maximum dimension E.

mm	V	Qty.	mm					rpm	kg
max. magnet diameter ø	Magnet voltage	Rings	A	B	C	D	E	Max. speed	Weight
up to 300	24	2	80	40	20	M5	28 - 38	3600	1.1
up to 900	110	3	90	61.5	22	M6	30 - 45	3200	2.0
up to 1600	110	3	120	84	22	M8	40 - 65	2500	3.5



ORDERING EXAMPLE

Designation	SAV no. - max. round magnet diameter - magnet voltage
Separate slip ring assembly	SAV 248.81 - 1600 - 110 V

SAV 248.83 CARBON BRUSH HOLDERS

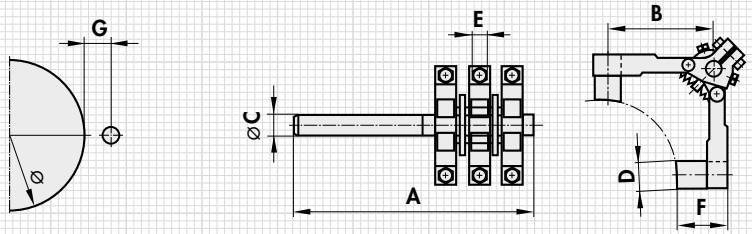
For power supply to round electro magnetic circular chucks

APPLICATION

For transferring current to the slip ring assemblies.

DESIGN

Bronze grades, spring-loaded. Attached at distance G from the slip ring assembly.



mm	V	Qty.	mm							kg
max. magnet diameter ø	Magnet voltage	Rings	A	B	C	D	E	F	G	Weight
up to 300	24	2	140	40	M8	12.5	6.3	20	27	0.1
up to 900	110	3	140	40	M8	12.5	6.3	20	25	0.17
up to 1600	110	3	140	60	M8	20	8	25	33	0.2

ORDERING EXAMPLE

Designation	SAV no. - max. magnet diameter - magnet voltage
Carbon brush holder	SAV 248.83 - 1600 - 110 V

CHAPTER 1.2.3

ELECTRO PERMANENT MAGNETIC CHUCKS

1.2. STANDARD MAGNET SYSTEMS

1.2.3 ELECTRO PERMANENT MAGNETIC CHUCKS

EP

PAGES 84 – 126

	SAV ART. NO.	COMMENTS	POLE PITCH	MACHINING PROCESS*	PAGE
ELECTRO PERMANENT MAGNETIC CHUCKS					
	243.70	For universal use	13/18/25 mm		84
	243.71	For thin parts, place crosswise	4 mm		86
	243.72	With magnetically active stops	4 mm		88
	243.73	For thin parts, place lengthwise	4 mm		90
	243.76	With demagnetising, for hard milling	35/65/85 mm		94
	220.76	With demagnetising, for hard milling	35/65 mm		94
	243.77	For thinner parts, softer workpieces	27.5 mm		97
	243.77	For universal use with pole shoes, soft workpieces	55 mm		98
	243.77	For thick workpieces with pole shoes, soft workpieces	85 mm		99
	243.77-RAIL	For machining railway rails	–		100
	243.78	Universal, with demagnetising, hard milling	Round pole		102
	243.79	For universal machining, HSC milling, for soft workpieces	Hexagonal pole		104
	243.80	Universal, fully metallic pole surface	Square pole		105
	242.92	Electro permanent magnetic chuck towers	–		106
	248.70	Pole raiser rectangular/round	–		108
ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCKS					
	244.70	For thin rings	Radial pole pitch		110
	244.71	For thin rings, for hard milling	Radial pole pitch		112
	244.72	For thin parts, for multiple parts	Circular pole pitch		116
	244.73	For thin parts	Parallel pole pitch		118
	244.74	High holding forces for thin parts	Parallel pole pitch		119
	244.76	Combination chuck	Radial pole pitch		120
ELECTRONIC POLARITY-REVERSING CONTROL UNIT/CURRENT TRANSMITTERS					
	876.17	For electronic actuation on ep chucks		–	122
	876.02	For manual operation		–	124
CARBON BRUSH HOLDER/SLIP RING ASSEMBLIES					
	248.84	Carbon brush holder		–	125
	248.85	Slip ring body		–	125
	248.86	Rotating connector		–	126

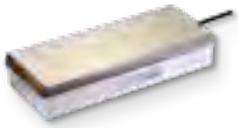
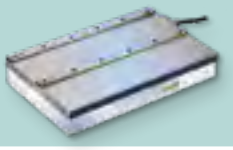
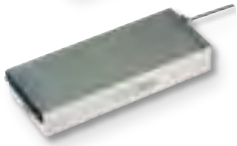
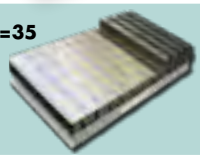
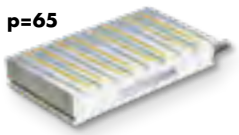
* Explanation of the icons on page 4

SELECTION CRITERIA

ELECTRO PERMANENT MAGNETIC CHUCKS

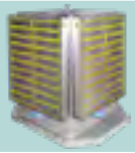
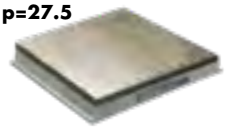
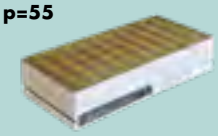
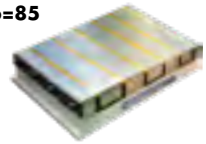
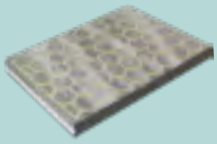
PROPERTIES

- Force generated by a current pulse with a duration of 800 ms
- Environmentally friendly, no continuous energy consumption
- No thermal expansion, highest precision during grinding
- Suitable for palletising with connector
- Also with demagnetising cycle, depending on the design – for hard milling
- Maximum operational reliability
- Extreme holding forces for magnetic chucks for milling
- Designed for shortest cycle duration of 3 min (time from part to part), shorter cycle durations possible on request
- Holding force and demagnetising can be controlled with a control unit

				GRINDING	MILLING/DRILLING IN UNIVERSAL APPLICATION	POCKET AND WINDOW MILLING	MILLING FROM 5 SIDES	FACE MILLING AND CONTOUR MILLING WELD SEAM PREPARATION	PALLETISING HSC MILLING	RAIL MILLING	HARD MILLING
SAV 243.70		Low magnetic field with narrow, true transverse pole pitch	page 84	✔	–	–	–	–	–	–	–
SAV 243.71		For thin workpieces with min. contact length of 40 mm, workpiece orientation perpendicular to the pole division direction	page 86	✔	–	–	–	–	–	–	–
SAV 243.72		With magnetically active stops for automatic workpiece alignment for thin parts	page 88	✔	–	–	–	✔	–	–	–
SAV 243.73		For thin workpieces with min. contact length of 40 mm, workpiece orientation parallel to the pole division direction	page 90	✔	–	–	–	–	–	–	–
SAV 243.76 SAV 220.76	p=35 	With demagnetising cycle, for thin workpieces	page 94	–	–	✔	–	✔	✔	–	✔
SAV 243.76 SAV 220.76	p=65 	With demagnetising cycle, for universal use, pole shoes possible	page 94	–	✔	✔	✔	✔	✔	–	✔
SAV 243.76 SAV 220.76	p=85 	With demagnetising cycle, for thicker and larger workpieces, pole shoes possible	page 94	–	✔	–	✔	–	✔	–	✔

SELECTION CRITERIA

ELECTRO PERMANENT MAGNETIC CHUCKS

				GRINDING	MILLING/DRILLING IN UNIVERSAL APPLICATION	POCKET AND WINDOW MILLING	MILLING FROM 5 SIDES	FACE MILLING AND CONTOUR MILLING WELD SEAM PREPARATION	PALLETISING HSC MILLING	RAIL MILLING
SAV 242.92		Universal transverse pole pitch	page 106	–	✔	✔	✔	–	–	–
SAV 243.77	p=27.5 	Low magnetic field with extreme holding force and very good air gap characteristics	page 97	–	–	✔	✔	✔	–	–
SAV 243.77	p=55 	Extreme holding force, for universal use, pole shoes possible	page 98	–	✔	✔	✔	–	–	–
SAV 243.77	p=85 	Extreme holding force for thicker and larger workpieces, very good air gap characteristics for chucking blanks, pole shoes possible	page 99	–	–	–	✔	–	–	–
SAV 243.77-Rail		With magnetically active stops for workpiece alignment, for rail machining, for manufacturing railway points	page 100	–	–	–	–	–	–	✔
SAV 243.78		Universal application for different part geometries, for thin plates, use of pole shoes (mobile and fixed) possible	page 102	–	✔	✔	✔	–	✔	–
SAV 243.79		Universal use with even pole division, pole shoes possible	page 104	–	✔	✔	✔	–	✔	–
SAV 243.80		Universal use with high output at low costs, square pole pitch	page 105	–	✔	–	✔	–	–	–

SELECTION CRITERIA

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCKS

NOTE

- Note information on maximum speed for circular magnets (chapter 1.4.7)
- On request, power supply also with connector and parking station for easy spindle integration
- Spindle flange possible on request

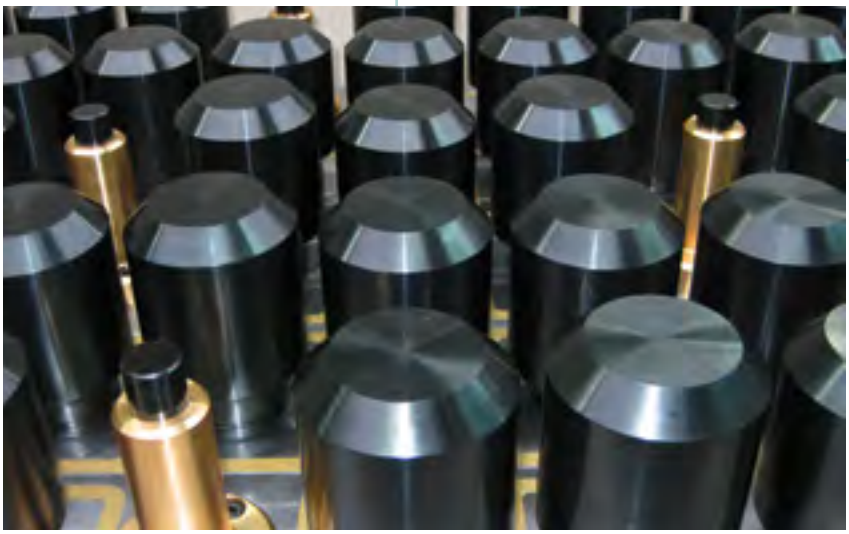
				CYLINDRICAL GRINDING	TURNING	HARD TURNING
SAV 244.70		For ring-shaped workpieces, use of pole shoes possible to create free space for tools	page 110	✔	✔	–
SAV 244.71		Increased holding force, also for hard turning of ring-shaped workpieces, use of pole shoes possible to create free space for tools	page 112	✔	✔	✔
SAV 244.72		For multiple workpieces on dividing circle and thin plates, centre is not magnetic	page 116	✔	✔	–
SAV 244.73		For thin plates, centre is magnetic	page 118	✔	–	–
SAV 244.74		For thin plates, for extreme machining	page 119	✔	✔	–
SAV 244.76		For plates from 8 mm thickness, for extreme machining capacity	page 120	✔	✔	–

▸ APPLICATIONS

ELECTRO PERMANENT MAGNETIC SYSTEM

With hydraulic support elements for milling of thin nickel plates

SAV electro permanent magnetic systems for applications at limit load



SAV 243.70 ELECTRO PERMANENT MAGNETIC CHUCKS

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

The magnetic force is generated by the permanent magnets which are magnetised and demagnetised with short current pulses. The block magnet features a sturdy design and a long service life. The pole pitch forms "true" N and S poles.

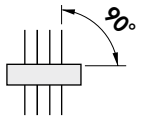
DESIGN

- Solid pole plate with 13 mm, 18 mm or 25 mm transverse pole pitch
- "True" N/S pole spacing
- Switch-off using demagnetising cycle
- Electro permanent magnetic system for absolute safety in case of power failure.
- On request available with compressed air holes for P = 18/25 mm for easier removal of larger parts (adhesion)
- High accuracy thanks to pole plates bolted in a narrow grid
- Reinforced systems for high wear possible on request
- 8 mm wear layer on the pole plate
- Pole plate can be replaced when worn
- Chucking slots on both face sides
- Length over 1000 mm with through holes for fastening upon agreement or machine table
- Robust and water-tight
- Protection rating IP 65

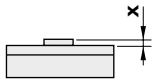
APPLICATION

For universal chucking of workpieces with high precision.

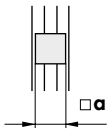
- For main workpiece axis perpendicular to the pole pitch



- For workpieces up to min. thickness x:
  4.5 mm with P = 13 mm
  6.0 mm with P = 18 mm
  8.5 mm with P = 25 mm



- For flat workpieces min. a:
  25 mm x 25 mm with P = 13 mm
  32 mm x 32 mm with P = 18 mm
  45 mm x 45 mm with P = 25 mm



RATED HOLDING FORCE

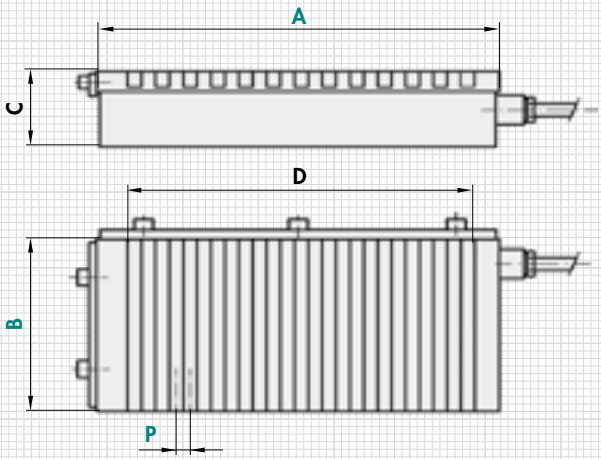
90 N/cm², with P = 13 mm pole pitch
110 N/cm², with P = 18 mm pole pitch
115 N/cm², with P = 25 mm pole pitch
Controllable with control unit.

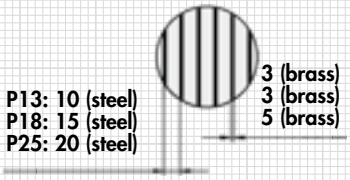
RATED VOLTAGE, RECOMMENDED

210 V IMP up to size A x B = 600 x 400
360 V IMP above size A x B = 600 x 400

SCOPE OF DELIVERY

- Stop bar on one short and one long side
- 3 m connecting cable on right short side, rear
- On request with water-tight heavy-duty power connector
- Larger magnetic chucks from 25 kg are provided with lifting lugs for transport
- Control and hand remote unit not in the scope of delivery
- Clamps





mm					kg	V	A
A	B	C^{0}_{-1}	D	P	Weight	Rated voltage	Control max. pul. Current
200	100	80	120	13	11.0	210	30
300	100	80	224	13	17.0	210	30
300	150	80	224	13	25.0	210	30
400	150	80	328	13	34.0	210	30
450	175	80	381	18	44.0	210/360	30
400	200	80	345	18	45.0	210/360	30
500	200	80	417	18	56.0	210/360	30
600	200	80	525	18	67.0	210/360	30
800	200	80	705	18	90.0	210/360	30
500	250	80	417	18	70.0	210/360	30
600	250	80	525	18	84.0	210/360	30
800	250	80	705	18	112.0	210/360	30
500	300	80	417	18	90.0	210/360	30
600	300	80	525	18	108.0	210/360	30
800	300	80	705	18	145.0	210/360	30
1000	300	80	930	18	180.0	210/360	30
600	350	80	525	18	126.0	210/360	30
800	350	80	705	18	168.0	210/360	30
1000	350	80	921	18	210.0	210/360	30

mm					kg	V	A
A	B	C^{0}_{-1}	D	P	Weight	Rated voltage	Control max. pul. Current
600	400	80	525	18	145.0	210/360	30
700	400	80	633	18	169.0	360	30
800	400	80	705	18	193.0	360	30
1000	400	80	921	18	240.0	360	30
1200	400	90	1137	18	289.0	360	30
800	500	80	730	25	241.0	360	30
1000	500	80	930	25	301.0	360	30
1200	500	90	1130	25	361.0	360	30
1250	500	90	1180	25	376.0	360	30
1500	500	90	1430	25	450.0	360	30
1600	500	90	1520	25	480.0	360	60
2000	500	90	1930	25	602.0	360	60
1000	600	80	930	25	361.0	360	30
1200	600	90	1130	25	433.0	360	30
1250	600	90	1180	25	451.0	360	30
1500	600	90	1430	25	542.0	360	30
1600	600	90	1520	25	578.0	360	60
2000	600	90	1930	25	722.0	360	60
1500	800	90	1430	25	723.0	360	60
1600	800	90	1520	25	771.0	360	60
2000	800	90	1930	25	963.0	360	60

Other sizes and rated voltages on request.
Larger chucking areas can be implemented by joining several blocks without gaps.
Allocation to the correct control unit is based on the max. power consumption/magnet voltage.

ORDERING EXAMPLE

Designation	**SAV no. - A x B - pole pitch - rated voltage**
Electro permanent magnetic chuck	SAV 243.70 - 2000 x 800 - 25 - 360 V

SAV 243.71 ELECTRO PERMANENT MAGNETIC CHUCKS

With continuous fine longitudinal pole pitch P = 4 mm

Electro permanent magnetic systems with very narrow pole pitch. The magnetic force is generated by the permanent magnets which are magnetised and demagnetised with short current pulses. Especially suitable for thin parts. Main workpiece axis at right angle to the magnet length.

DESIGN

- Pole plate with particularly narrow, continuous longitudinal pole pitch, 3 mm steel and 1 mm brass
- Pole divisions bonded and additionally bolted together solidly with tie rods
- High accuracy thanks to pole plates bolted in a narrow grid
- Switch-off using demagnetising cycle
- 8 mm wear layer on the pole plate
- Low magnetic field height of 4 mm
- Electro permanent magnetic system for absolute safety in case of power failure
- Chucking slots on both face sides
- Reinforced systems for high wear possible on request
- Length over 1000 mm with through holes for fastening upon agreement
- Robust and water-tight
- Protection rating IP 65

RATED HOLDING FORCE

100 N/cm^2,
Controllable with control unit

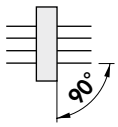
RATED VOLTAGE, RECOMMENDED

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

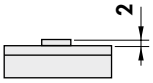
APPLICATION

For chucking thin, flat workpieces with high precision.

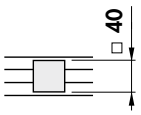
- For main workpiece axis perpendicular to the pole pitch



- For thin workpieces up to: min. thickness = 2 mm

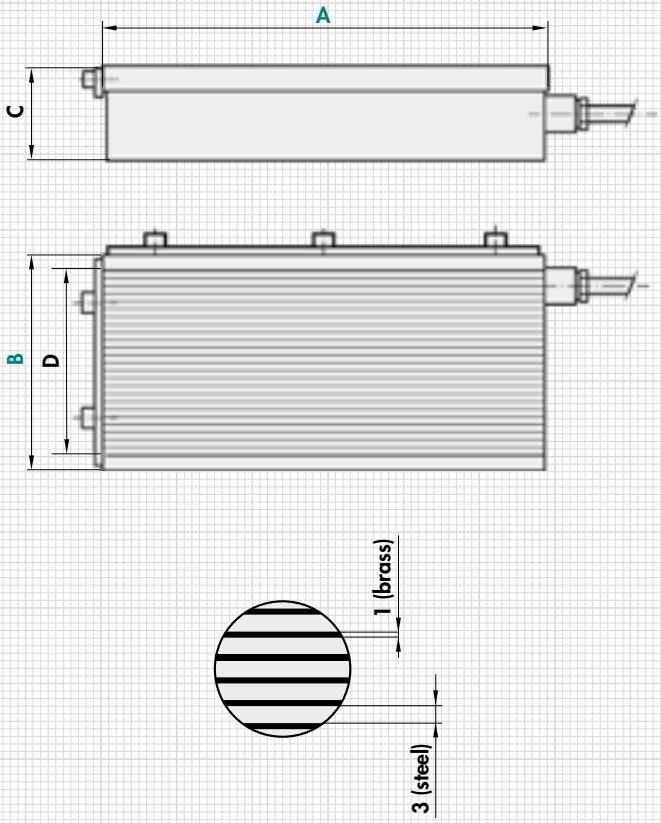


- For flat workpieces: min. width = 40 mm



SCOPE OF DELIVERY

- Stop bar on one short and one long side
- 3 m connecting cable on right short side, rear
- On request with water-tight heavy-duty power connector
- Larger magnetic chucks are provided with lifting lugs for transport
- Control and hand remote unit not in the scope of delivery
- Clamps



mm				kg	V	A
A	B	C^{0}_{-1}	D	Weight	Rated voltage	Control max. pul. Current
200	100	77	53	12.0	210	30
300	100	77	53	18.0	210	30
300	150	77	101	26.0	210	30
400	150	77	101	34.0	210	30
450	175	77	125	44.0	210/360	30
400	200	77	149	45.0	210/360	30
500	200	77	149	56.0	210/360	30
600	200	77	149	67.0	210/360	30
800	200	77	149	90.0	210/360	30
500	250	77	201	70.0	210/360	30
600	250	77	201	84.0	210/360	30
800	250	77	201	112.0	360	30

mm				kg	V	A
A	B	C^{0}_{-1}	D	Weight	Rated voltage	Control max. pul. Current
500	300	77	245	86.0	360	30
600	300	77	245	103.0	360	30
800	300	77	245	137.0	360	60
1000	300	77	245	172.0	360	60
600	350	77	293	120.0	360	30
800	350	77	293	160.0	360	60
1000	350	77	293	200.0	360	60
600	400	77	349	137.0	360	30
700	400	77	349	160.0	360	30
800	400	77	349	183.0	360	60
1000	400	77	349	229.0	360	60
1200	400	87	349	275.0	360	60
800	500	77	453	229.0	360	60
1000	500	77	453	286.0	360	60
800	500	87	453	344.0	360	60

Other sizes and rated voltages on request. Larger chucking areas can be implemented by joining several blocks without gaps. Allocation to the correct control unit is based on the max. power consumption/magnet voltage.

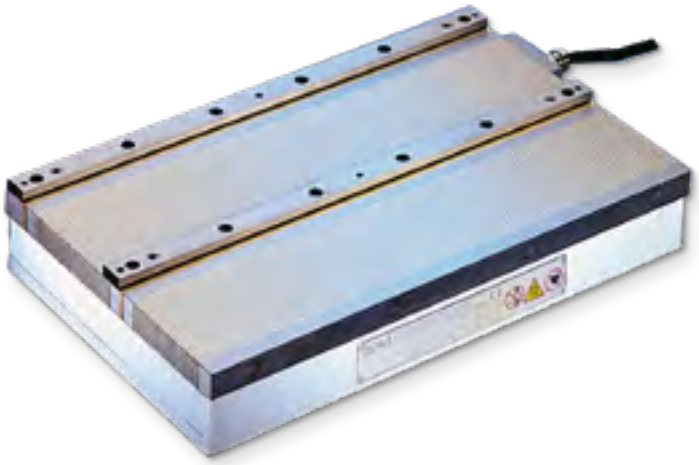
ORDERING EXAMPLE

Designation	SAV no. - A x B - rated voltage
Electro permanent magnetic chuck	SAV 243.71 - 1200 x 400 - 360 V

SAV 243.72 ELECTRO PERMANENT MAGNETIC CHUCKS

With fine longitudinal pole pitch P = 4 mm and magnetisable stop bars

The newly developed workholding system allows workpieces to be reliably pulled against the stop using magnetisable stops. Insertion errors can be prevented with this, particularly in shift operation. Electro permanent magnetic systems with very narrow pole pitch.
The magnetic force is generated by the permanent magnets which are magnetised and demagnetised with short current pulses. Especially suitable for thin parts.



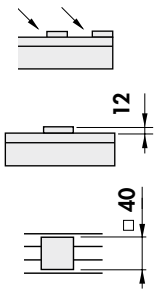
DESIGN

- Design with 2 strong bipolar systems for the stop bar, for reliable alignment of the parts. The stop magnet works at a time offset to the base magnet
- The stop bars are magnetised before the main chucking area. This reliably pulls the workpiece into the lower corner of the stop.
- Pole plate with particularly narrow, continuous longitudinal pole pitch, 3 mm steel and 1 mm brass
- Pole divisions bonded and additionally bolted together solidly with tie rods
- High accuracy thanks to pole plates bolted in a narrow grid
- Switch-off using demagnetising cycle
- 8 mm wear layer on the pole plate
- Low magnetic field height of 4 mm
- Electro-permanent magnetic system for absolute safety in case of power failure
- Chucking slots on both face sides
- Reinforced systems for high wear possible on request
- Length over 1000 mm with through holes for fastening upon agreement
- Robust and water-tight
- Protection rating IP 65

APPLICATION

Primarily for precise grinding of mass-produced parts, especially in shift operation. For toolmaking, the system allows precision machining to the µm relative to the reference edge against the stop.

- Magnetically active stops automatically controlled in sequence
- For thin workpieces up to:
  min. thickness = 12 mm
  (depending on stop height)
- For flat workpieces:
  min. width = 40 mm



RATED HOLDING FORCE

100 N/cm^2,
Controllable with control unit

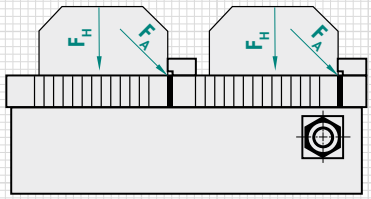
RATED VOLTAGE, RECOMMENDED

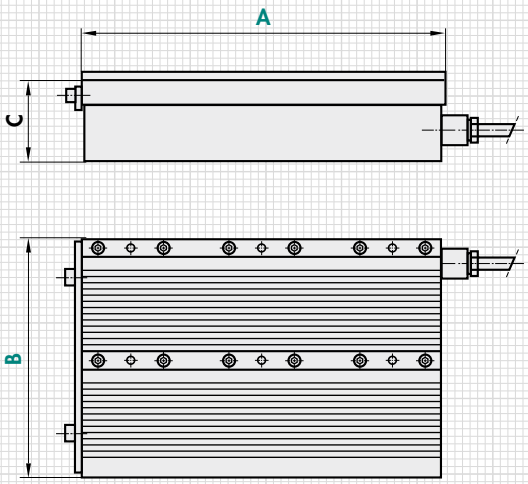
360 V IMP

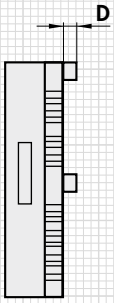
SCOPE OF DELIVERY

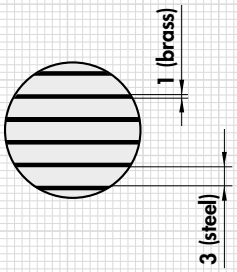
- 1 or 2 magnetic stop bars
- 3 m connecting cable on right short side, rear
- On request with water-tight heavy-duty power connector
- Larger magnetic chucks are provided with lifting lugs for transport
- Control and hand remote unit not in the scope of delivery
- Clamps

Controlled by the electronic polarity reversal control unit, the stop bars are magnetised in the first step, causing the workpiece to be reliably pulled into the corner of the stop bar at a 45° angle with force F_A.
In the second step, the main chucking area is activated after approx. 1 s, generating the two-dimensional main holding force F_H.









mm				Qty.	kg	A
A	**B**	**C** $^{0}_{-1}$	**D***	**Number of stops**	**Weight**	**Control max. pulse current**
400	200	77	12	1	45.0	30x2
500	200	77	12	1	56.0	30x2
600	200	77	12	1	67.0	30x2
400	300	77	12	2	68.0	30x2
500	300	77	12	2	86.0	30x2
600	300	77	12	2	103.0	30x2
600	400	77	12	2	137.0	30x2
800	400	77	12	2	183.0	30x2

* Other stop heights on request.
The table provides an overview of the possible sizes. Custom designs and dimensions are always possible. Suitable polarity reversal control units can be found under SAV 876.17.

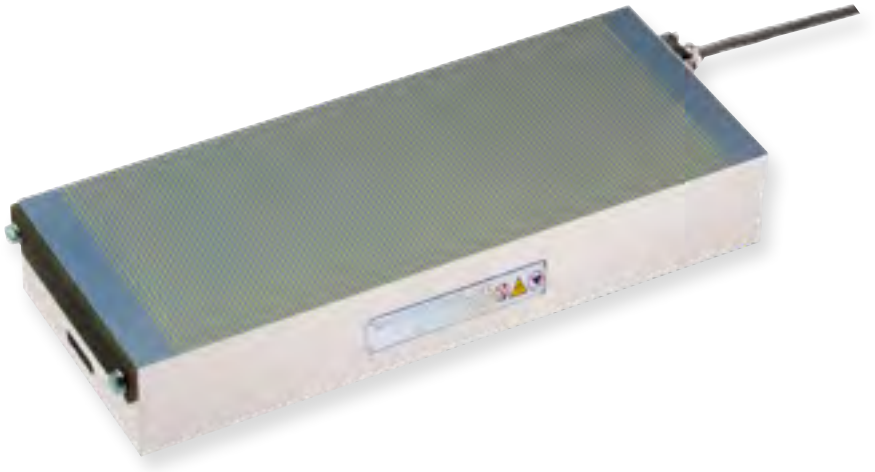
ORDERING EXAMPLE

Designation	SAV no. - A x B - rated voltage
Electro permanent magnetic chuck	SAV 243.72 - 800 x 400 - 360 V

SAV 243.73 ELECTRO PERMANENT MAGNETIC CHUCKS

With continuous fine transverse pole pitch P = 4 mm

Precision grinding magnet with very narrow pole pitch. The magnetic force is generated by the permanent magnets which are magnetised and demagnetised with short current pulses.



DESIGN

- Pole plate with particularly narrow, continuous transverse pole pitch, 3 mm steel and 1 mm brass.
- Pole divisions bonded and additionally bolted together solidly with tie rods lengthwise
- High accuracy thanks to pole plates bolted in a narrow grid
- Switch-off using demagnetising cycle
- 8 mm wear layer on the pole plate
- Low magnetic field height of 4 mm
- Electro-permanent magnetic system for absolute safety in case of power failure
- Chucking slots on both face sides
- Reinforced systems for high wear possible on request
- Length over 1000 mm with through holes for fastening upon agreement
- Robust and water-tight
- Protection rating IP 65

RATED HOLDING FORCE

100 N/cm^2,
Controllable with control unit

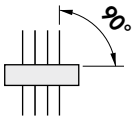
RATED VOLTAGE, RECOMMENDED

210 V IMP up to size A x B = 600 x 300
360 V IMP above size A x B = 600 x 300

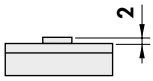
APPLICATION

For chucking thin, flat workpieces with high precision.

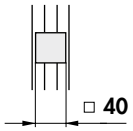
- For main workpiece axis perpendicular to the pole pitch



- For thin workpieces up to:
  min. thickness = 2 mm

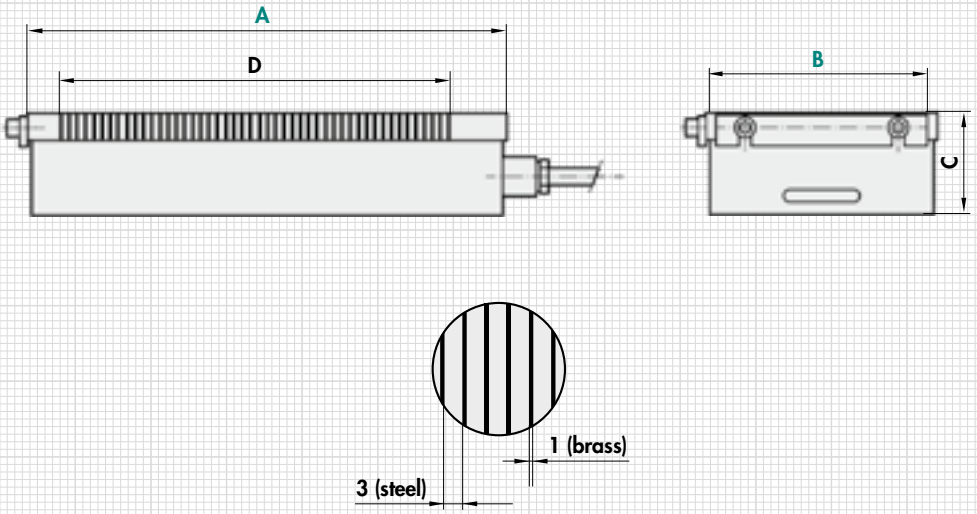


- For flat workpieces:
  min. length = 40 mm



SCOPE OF DELIVERY

- Stop bar on one short and one long side
- 3 m connecting cable on right short side, rear
- On request with water-tight heavy-duty power connector
- Larger magnetic chucks are provided with lifting lugs for transport
- Control and hand remote unitn not in the scope of delivery
- Clamps



mm				kg	V	A
A	B	C^{0}_{-1}	D	Weight	Rated voltage	Control max. pul. Current
450	175	77	397	44.0	210/360	30
400	200	77	349	45.0	210/360	30
500	200	77	445	56.0	210/360	30
600	200	77	549	67.0	210/360	30
800	200	77	749	90.0	360	30
500	250	77	453	70.0	210/360	30
600	250	77	549	84.0	210/360	30
800	250	77	749	112.0	360	30
500	300	77	453	90.0	210/360	30
600	300	77	549	108.0	210/360	30
800	300	77	749	145.0	360	30
1000	300	77	949	180.0	360	30

mm				kg	V	A
A	B	C^{0}_{-1}	D	Weight	Rated voltage	Control max. pul. Current
600	350	77	549	126.0	360	30
800	350	77	749	168.0	360	30
1000	350	77	949	210.0	360	60
600	400	77	549	145.0	360	30
700	400	77	645	169.0	360	30
800	400	77	749	193.0	360	30
1000	400	77	949	240.0	360	60
1200	400	87	1149	289.0	360	60
800	500	77	749	241.0	360	60
1000	500	77	949	300.0	360	60
1200	500	87	1149	361.0	360	60

Other sizes and rated voltages on request. Larger chucking areas can be implemented by joining several blocks without gaps. Allocation to the correct control unit is based on the max. power consumption/magnet voltage.

ORDERING EXAMPLE

Designation	SAV no. - A x B - rated voltage
Electro permanent magnetic chuck	SAV 243.73 - 1200 x 500 - 360 V

▸ APPLICATION OVERVIEW FOR SAV MILLING MAGNETS

UNIVERSAL APPLICATION

SELECTION CRITERIA
- Uniform pole division
- Flexible workpiece dimensions and arrangement

MACHINING EXAMPLE
- Workpiece: 500 x 500 x 50 mm
- Material: C 45
- Feed rate: 1100 mm/min
- Cutting depth: 6 mm
- No. of teeth: 3
- Feed: 10 mm
- Machining volume: 360 cm^3/min

PRODUCTS
- SAV 243.11
- SAV 243.76
- SAV 243.77
- SAV 243.78
- SAV 243.79
- SAV 243.80

POCKET AND WINDOW MILLING

SELECTION CRITERIA
- Low magnetic field
- High holding forces
- Good swarf discharge

MACHINING EXAMPLE
- Workpiece: 400 x 400 x 80 mm
- Material: 16 MnCr5
- Feed rate: 800 mm/min
- Cutting depth: 15 mm
- No. of teeth: 6
- Machining volume: 530 cm^3/min

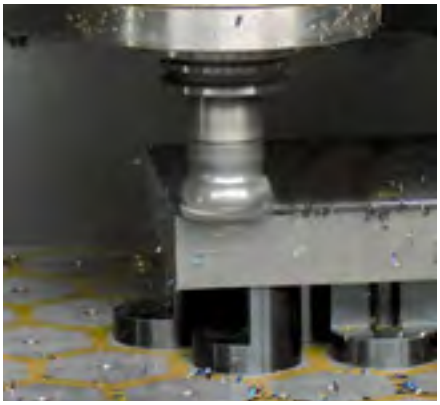
PRODUCTS
- SAV 243.76-35
- SAV 243.76-60
- SAV 243.77-27.5
- SAV 243.78
- SAV 243.79

MACHINING FROM 5 SIDES

SELECTION CRITERIA
- High holding forces
- Access from 5 sides
- Low-deformation chucking

MACHINING EXAMPLE
- Workpiece: 500 x 500 x 60 mm
- Material: 16 MnCr5
- Feed rate: 2000 mm/min
- Cutting depth: 6 mm
- No. of teeth: 6
- Feed: 10 mm
- Machining volume: 650 cm^3/min

PRODUCTS
- SAV 243.76
- SAV 243.77
- SAV 243.79
- SAV 243.80



Please contact us. We ensure optimum productivity for your application.

FACE AND CONTOUR MACHINING OF THIN WORKPIECES, WELD SEAM PREPARATION

SELECTION CRITERIA
- Low field height with high holding forces for pulling down thin parts

MACHINING EXAMPLE
- Workpiece: 200 x 80 x 15 mm
- Material: St 52-3
- Feed rate: 1400 mm/min
- Cutting depth: 15 mm
- No. of teeth: 4
- Machining volume: 135 cm³/min

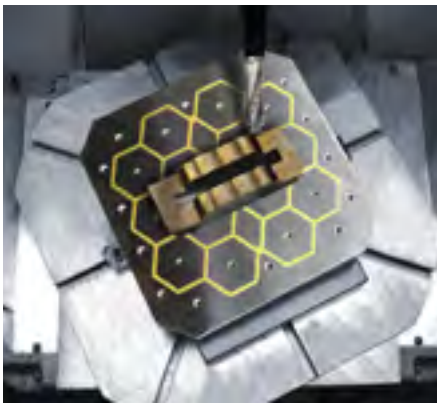
PRODUCTS
- SAV 243.11
- SAV 243.76-35
- SAV 243.77-27.5
- SAV 243.78

PALLETISING HSC MACHINING

SELECTION CRITERIA
- Energy-independent
- Low field height
- Operational safety
- Precision

MACHINING EXAMPLE
- Workpiece: 150 x 150 mm
- Material: 16 MnCr45,HRC 52
- Feed rate: 2500 mm/min
- Cutting depth: 1 mm
- No. of teeth: 4
- Machining volume: 50 cm³/min

PRODUCTS
- SAV 220.79
- SAV 220.31
- SAV 243.76

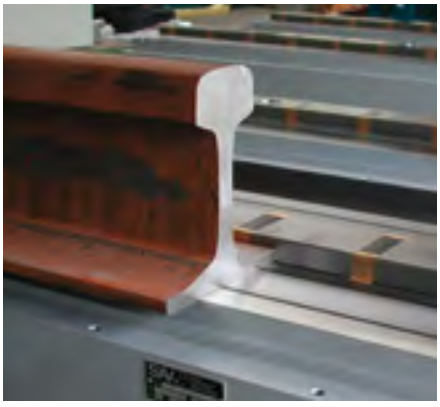


RAIL MILLING

SELECTION CRITERIA
- Extreme air gap characteristics
- High holding forces
- Extremely robust and wear-resistant

MACHINING EXAMPLE
- Workpiece: UIC 60
- Material: Rail steel
- Machining cross-section: 40 x 35 mm
- Machine output: up to 130 kW

PRODUCTS
- SAV 243.77-Rail



SAV 243.76 / SAV 220.76 ELECTRO PERMANENT MAGNETIC CHUCKS

With transverse pole pitch P = 35, 65, 85 mm

Milling magnet also for hard machining.
Amplified magnet system with demagnetising cycle.
Optimised system for high holding forces.
Magnetically fully saturated system thanks to flux concentration.
Design **SAV 220.76** square (pallet),
Design **SAV 243.76** rectangular.

SAV 220.76
Pole pitch 35, 65

SAV 243.76
Pole pitch 35, 65, 85

DESIGN

- System for optimised holding force with demagnetising cycle
- Complete surface magnetically active, no "dead zones"
- Solid monoblock design
- Electro-permanent magnetic system for absolute safety in case of power failure.
- With heavy-duty power connector at front right
- Pole gap with brass, wear-protected
- 8 mm wear layer on the pole plate
- Optionally with grid thread drilling template for pole bars or pole shoes possible (**M**)
- Pole pitch 65 mm and 85 mm optionally with T-slots DIN 650-10H10 (**T**)
- Chucking slots on the short sides
- Square versions **SAV 220.76** optionally with zero point workholding system upon agreement
- Robust and water-tight
- Protection rating IP65

RATED HOLDING FORCE

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

Controllable with control unit

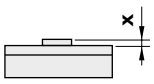
RATED VOLTAGE, RECOMMENDED

360 V IMP

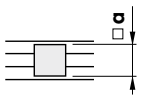
APPLICATION

Heavy machining also on pallet changing systems. With demagnetising cycle, therefore also suitable for higher alloy materials or hardened materials.

- For workpieces up to min. thickness x:
  8 mm with P = 35 mm
  20 mm with P = 65 mm
  32 mm with P = 85 mm



- For flat workpieces min. a:
  70 mm x 70 mm with P = 35 mm
  130 mm x 130 mm with P = 65 mm
  180 mm x 180 mm with P = 85 mm



SCOPE OF DELIVERY

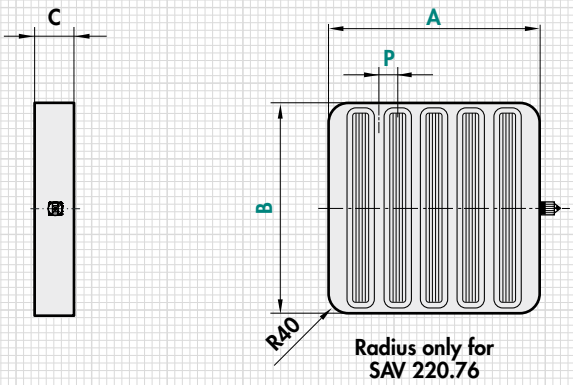
- With heavy-duty power connector as an option
- Adaptation for zero-point system upon agreement (surcharge applies)
- Larger magnets are provided with lifting lugs for transport
- Robot flanges on request
- Clamps

SAV 220.76-35

mm				kg	A
A	B	C $^{0}_{-1}$	P	Weight	Control unit max. pul. Current
320	320	90	35	72	30
400	400	90	35	113	30

SAV 243.76-35

mm				kg	A
A	B	C $^{0}_{-1}$	P	Weight	Control unit max. pul. Current
600	400	90	35	170	60
800	500	90	35	283	60 x 2
1000	500	90	35	354	60 x 2

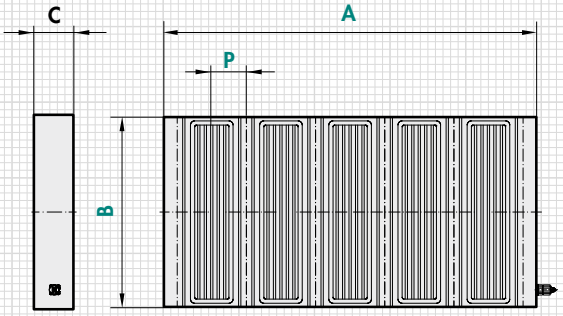


SAV 220.76-65

mm				kg	A
A	B	C $^{0}_{-1}$	P	Weight	Control unit max. pul. Current
320	320	90	65	72	30
400	400	90	65	113	30

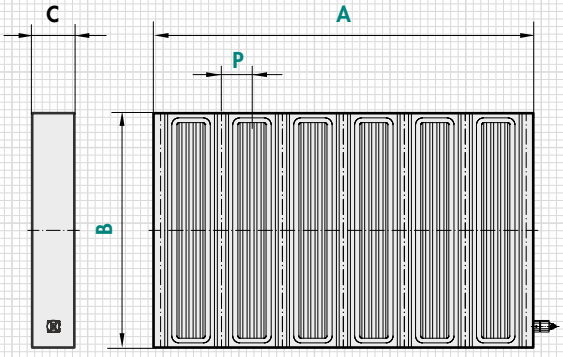
SAV 243.76-65

mm				kg	A
A	B	C $^{0}_{-1}$	P	Weight	Control unit max. pul. Current
580	400	90	65	164	30
815	500	90	65	288	60
960	500	90	65	340	60



SAV 243.76-85

mm				kg	A
A	B	C $^{0}_{-1}$	P	Weight	Control unit max. pul. Current
610	400	100	85	192	30
800	500	100	85	314	60
980	500	100	85	385	60



Suitable for control unit SAV 876.17

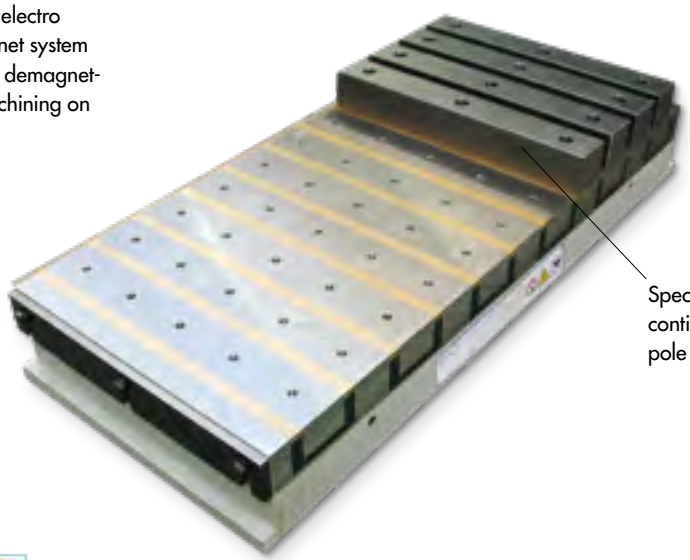
ORDERING EXAMPLE

Designation	SAV no. - A x B - pole pitch - rated voltage - option
Electro permanent magnetic chuck	243.76 - 980 x 500 - 85 - 360 - T

SAV 243.77 ELECTRO PERMANENT MAGNETIC CHUCKS

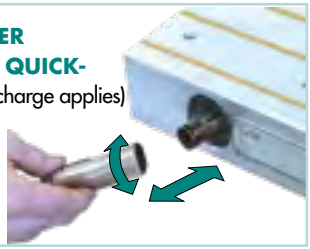
With transverse pole pitch P = 27.5, 55, 85 mm

Milling magnet with holding forces in the high-end range.
The workholding system with NdFeB high-energy magnets was optimised to the state of the art in magnet technology. The electro permanent magnetic switching of the AlNiCo/NdFeB magnet system generates extremely high holding forces. Magnetising and demagnetising are achieved with short current pulses. For heavy machining on non-hardened and low alloy workpieces.



Special design with continuous transverse pole bars

HEAVY-DUTY POWER CONNECTOR WITH QUICK-RELEASE Optional (surcharge applies)



Easy handling of the plug-in connection

DESIGN

- Optimised high-energy magnet system
- Holding forces in the physically possible maximum range
- The magnet system with great depth action bridges even larger air gaps
- Complete surface magnetically active, no "dead zones"
- 8 mm wear layer on the pole plate
- Solid monoblock design
- "True" N/S pole spacing
- Electro permanent magnetic system for absolute safety in case of power failure
- Pole gap with brass, wear-protected
- Optionally with tapped hole drilling template (**M**) for any top tooling
- Pole pitch 85 mm can optionally also be supplied with T-slots (**T**) as per DIN 650-10H10

RATED HOLDING FORCE

195 N/cm² on inducible steel surface
110 N/cm² with P = 27.5 mm pole pitch
150 N/cm² with P = 55 mm pole pitch
170 N/cm² with P = 85 mm pole pitch
controllable with control unit using holding force coding switch

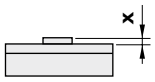
RATED VOLTAGE, RECOMMENDED

360 V IMP

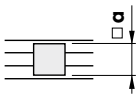
APPLICATION

For heavy milling with high level of material removal.
Ideal for use on pallet changing systems.

- For workpieces up to min. thickness x:
  8 mm with P = 27.5 mm
  18 mm with P = 55 mm
  38 mm with P = 85 mm



- For flat workpieces min. a:
  45 mm x 45 mm with P = 27.5 mm
  95 mm x 95 mm with P = 55 mm
  150 mm x 150 mm with P = 85 mm



SCOPE OF DELIVERY

- 3 m connecting cable on right short side, rear
- On request with water-tight heavy-duty power connector
- Larger magnetic chucks are provided with lifting lugs for transport
- Control and hand remote unit not in the scope of delivery
- Clamps

SAV 243.77 - 27.5

Narrow pole pitch

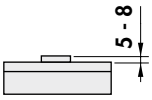
RATED HOLDING FORCE

110 N/cm²

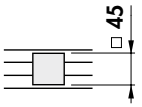
APPLICATION

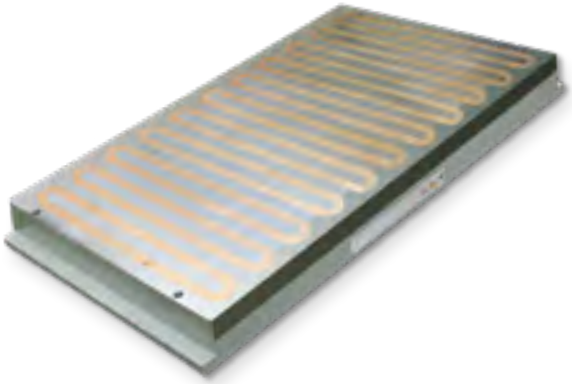
Milling of thin plates

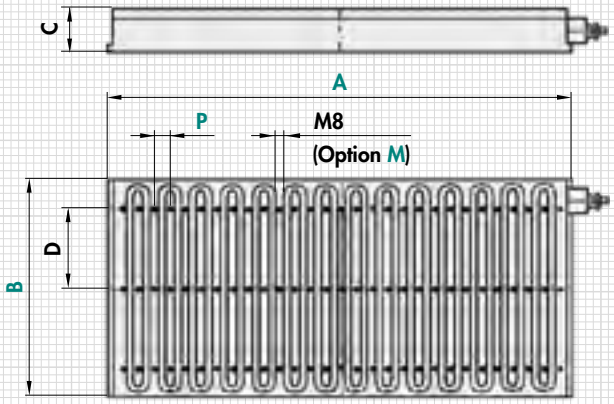
- For workpieces:
  Min. thickness = 5 – 8 mm

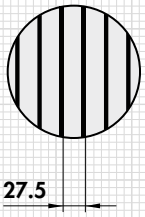


- For workpieces:
  Min. size = 45 x 45 mm









mm					daN	Qty.			kg	A
A	B	C^{0}_{-1}	D	P	Rated holding force fully applied	Number of threads per pole row M	Number of pole rows M	Number of threads version M	Weight	Control max. pul. Current
410	200	80	100	27.5	9,020	2	15	30	46.0	30
520	200	80	100	27.5	11,440	2	19	38	58.0	30
630	200	80	100	27.5	13,860	2	23	46	71.0	30
520	300	80	100	27.5	17,160	3	19	57	87.0	60
630	300	80	100	27.5	20,790	3	23	69	107.0	60
800	300	80	100	27.5	26,400	3	29	87	135.0	60
630	400	80	150	27.5	27,720	3	23	69	143.0	60x2
800	400	80	150	27.5	35,200	3	29	87	180.0	60x2
1015	400	80	150	27.5	44,660	3	37	111	228.0	60x2
800	500	80	200	27.5	44,000	3	29	87	225.0	60x2
1015	500	80	200	27.5	55,825	3	37	111	285.0	60x2
1180	500	80	200	27.5	64,300	3	43	129	331.0	60x3

ORDERING EXAMPLE

Designation	SAV no. - A x B - pole pitch - rated voltage - option
Electro permanent magnetic chuck	SAV 243.77 - 1180 x 500 - 27,5 - 360 V - M

SAV 243.77 - 55

Universal pole pitch

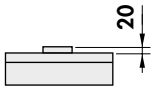
RATED HOLDING FORCE

150 N/cm²

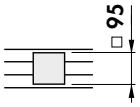
APPLICATION

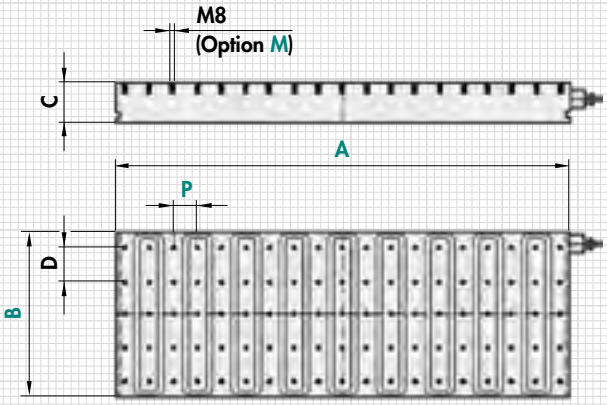
For heavy milling.

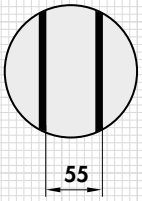
- For workpieces:
  Min. thickness = 20 mm



- For workpieces:
  Min. size = 95 x 95 mm







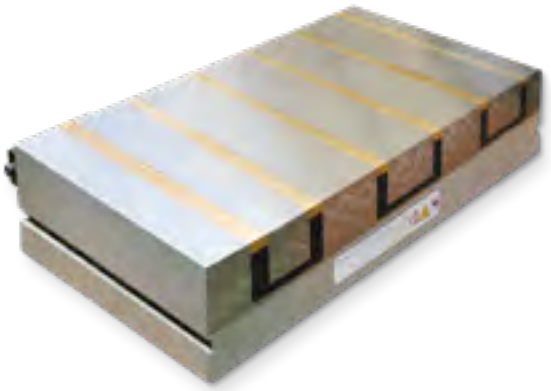
mm					daN	Qty.			kg	A
A	B	C^{0}_{-1}	D	P	Rated holding force fully applied	Number of threads per pole row M	Number of pole rows M	Number of threads version M	Weight	Control max. pul. Current
480	300	97	60	55	21,600	4	9	36	94.0	30
590	300	97	60	55	26,550	4	11	44	116.0	30
810	300	97	60	55	36,450	4	15	60	159.0	30
1030	300	97	60	55	46,350	4	19	76	202.0	30
1140	300	97	60	55	51,300	4	23	92	224.0	60
810	400	97	80	55	48,600	5	15	75	212.0	30
1030	400	97	80	55	61,800	5	19	95	270.0	60
1140	400	97	80	55	68,400	5	23	115	299.0	60
1580	400	97	80	55	94,900	5	29	145	414.0	60
2020	400	97	80	55	121,200	5	37	185	529.0	60x2
1030	500	97	70	55	77,250	7	19	133	337.0	60
1140	500	97	70	55	85,500	7	23	161	373.0	60
1580	500	97	70	55	118,500	7	29	203	517.0	60x2
2020	500	97	70	55	151,500	7	37	259	661.0	60x2

ORDERING EXAMPLE

Designation	SAV no. - A x B - P - rated voltage - option
Electro permanent magnetic chuck	SAV 243.77 - 1580 x 500 - 55 - 360 V - M

SAV 243.77 - 85

Large transverse pole pitch



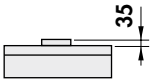
RATED HOLDING FORCE

170 N/cm²

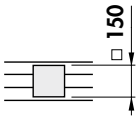
APPLICATION

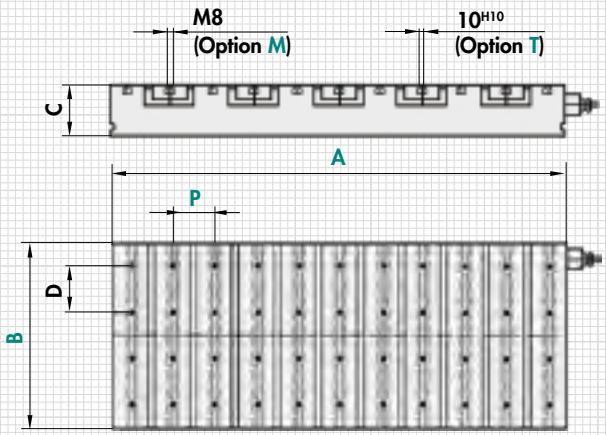
For heavy milling of very large and heavy workpieces. For large air gaps.

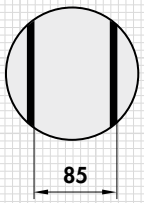
- For workpieces:
  Min. thickness = 35 mm



- For workpieces:
  Min. size = 150 x 150 mm







mm					daN	Qty.			kg	A
A	B	C $^{0}_{-1}$	D	P	Rated holding force fully applied	Number of threads per pole row M	Number of pole rows M	Number of threads version M	Weight	Control max. pul. Current
580	300	110	90	85	29,500	3	7	21	129.0	30
750	300	110	90	85	38,250	3	9	27	167.0	30
750	400	100	90	85	51,000	4	9	36	203.0	60
1090	400	100	90	85	74,120	4	13	52	294.0	60
1430	400	100	90	85	97,240	4	17	68	386.0	60
1600	400	100	90	85	108,800	4	19	76	432.0	60
750	500	110	90	85	63,750	5	9	45	278.0	60
1090	500	110	90	85	92,650	5	13	65	405.0	60
1430	500	110	90	85	121,550	5	17	85	531.0	60
1600	500	110	90	85	136,000	5	19	95	594.0	60x2
1090	600	110	90	85	111,180	6	13	78	486.0	60
1430	600	110	90	85	145,860	6	17	102	637.0	60x2
1600	600	110	90	85	163,200	6	19	114	713.0	60x2

ORDERING EXAMPLE

Designation	SAV no. - A x B - P - rated voltage - option
Electro permanent magnetic chuck	SAV 243.77 - 1600 x 600 - 85 - 360 V - T

SAV 243.77-RAIL

ELECTRO PERMANENT MAGNETIC SYSTEM

Chucking at bridge and base, on one side – for machining rails and railway points

APPLICATION OPTIONS

For heavy machining of the running faces, feet and fishplate seating of rails. The one-part or two-part magnet system allows lateral alignment in the first step (F_A). Then the main magnet is activated in the base (F_H).

DESIGN

- Dual high-energy magnet system
- Holding forces in the physically possible maximum range
- The magnet system with great depth action bridges even larger air gaps up to 10 mm
- Solid monoblock design
- Pole gap with brass, wear-protected

RATED VOLTAGE, RECOMMENDED

360 V IMP

RATED HOLDING FORCE

195 N/cm² on inducible steel surface

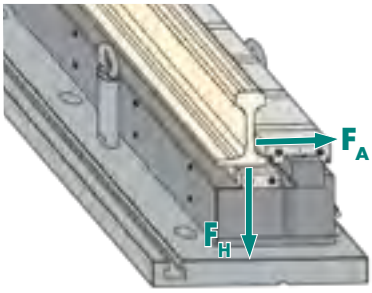
For machines with very high spindle capacity, e.g. 130 kW, we also offer special solutions in conjunction with hydraulics (see chapter 1.3)

LATERAL CHUCKING ON THE WEB

1 row

DESIGN

- Milling of running faces and feet
- 1-row version
- Side stop also as exchangeable pole bar for alternative head/web stop



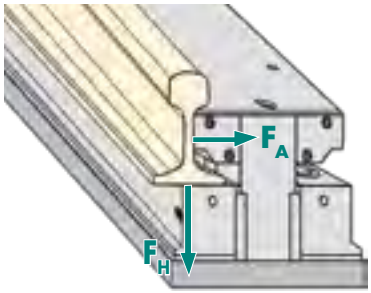
F_A for lateral alignment of the workpieces.
F_H generated by base magnet in the second step.

LATERAL CHUCKING ON THE WEB

2 row

DESIGN

- Milling of running faces and feet
- 2-row version



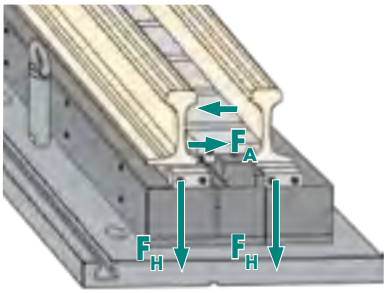
F_A for lateral alignment of the workpieces.
F_H generated by base magnet in the second step.

LATERAL CHUCKING ON THE FOOT

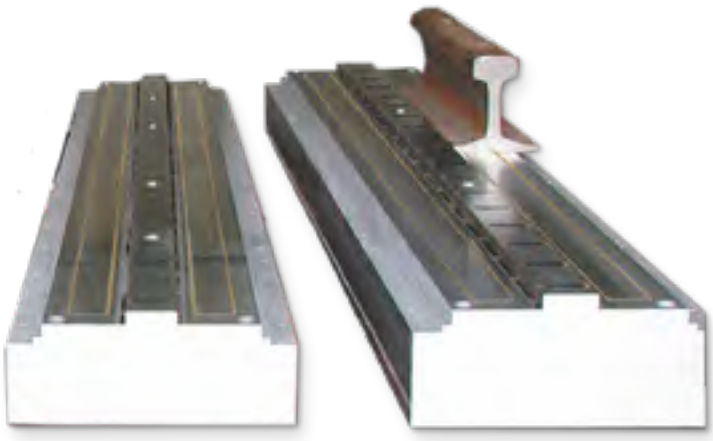
2 row

DESIGN

- Compact design suitable tongue and regular profiles
- Pole gap with brass, wear-protected



F_A for lateral alignment of the workpieces.
F_H generated by base magnet in the second step.



SAV 243.78 ELECTRO PERMANENT MAGNETIC CHUCKS

With universal round pole pitch

For large-area, thin parts, e.g. for widening weld seams.

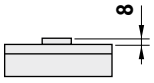
DESIGN

- Steel pole diameter 60 mm
- Design with linear (A) or offset (B) pole grid
- Larger systems as combination of several magnets
- Complete surface magnetically active also for direct placement
- Solid monoblock design with demagnetising cycle
- Robust and water-tight
- Protection rating IP 65
- Electro-permanent magnetic system for absolute safety in case of power failure
- System on the underside of the machine table magnetically isolated to protect drive and measuring systems
- Pole gap also available in solid brass on request (surcharge applies)
- Tapped hole grid M8 for optional pole shoes
- 12 mm wear layer on the pole plate
- Table fastening size 600 x 300 with 2 clamps on the edge
- Table fastening size 600 x 400 to 1000 x 500 with 4 clamps on the edge
- Table fastening size 1000 x 500 with through holes on request
- Electrical connection up to size 1000 x 500 with heavy-duty power connector, permanent connection for larger sizes
- Fastening with through holes on request

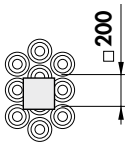
APPLICATION

- For chucking thinner plates, e.g. weld seam preparation and for milling of hard parts and higher alloyed materials. Please contact us for more information
- Amplified magnet system with demagnetising cycle, also suitable for hard milling
- Universal for a variety of different part geometries 5-side machining possible when using pole shoes (mobile and fixed) to create free space for tools
- Suitable for medium and large-surface systems
- Round version available on request

- For workpieces:
  Min. thickness = 8 mm



- For flat workpieces:
  Min. size = 200 x 200 mm



RATED HOLDING FORCE

- When using pole raisers: 3200 N/pole
- For direct placement: 900 kN/m²

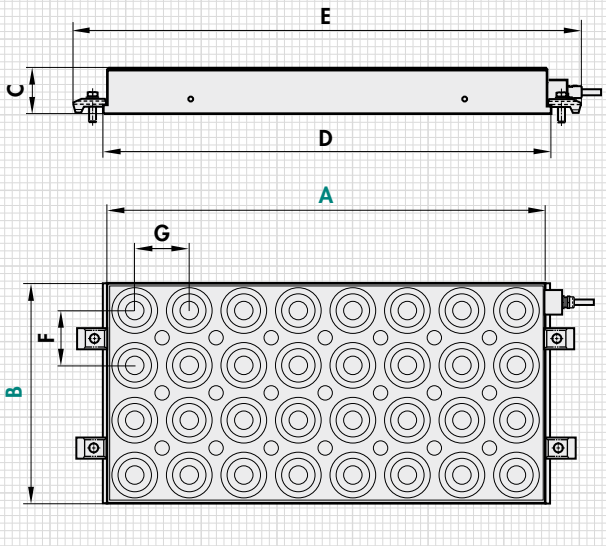
RATED VOLTAGE

360 V IMP

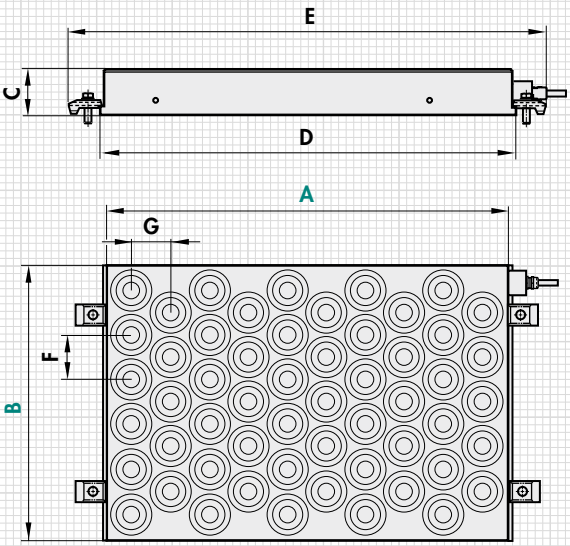
SCOPE OF DELIVERY

- Up to 400 mm width with 2 clamps, with 4 clamps for larger widths
- 5 m connecting cable, protective hose optionally possible
- Includes lifting plates
- Control and control unit not included (see SAV 876.17)
- Clamps

Version A – linear pole pattern



Version B – offset pole pattern



Dimensions for version A – linear pole pattern:

mm							Qty.	daN	kg	A
A	B	C	D	E	F	G	No. of poles	Total holding force on pole rounds	Weight	Control max. pul. Current
600	300	80	616	720	100	100	18	5760	113.0	30
600	400	80	616	720	100	100	24	7680	151.0	30
800	400	80	816	920	100	100	32	10240	201.0	30
1000	500	80	1016	1120	100	100	50	16000	314.0	60
1200	600	80	1200		100	100	72	23040	453.0	60
1600	600	80	1600		100	100	96	30720	604.0	60
2000	600	80	2000		100	100	120	38400	755.0	60x2
2000	800	80	2000		100	100	160	51200	1006.0	60x2

Dimensions for version B – offset pole pattern:

mm							Qty.	daN	kg	A
A	B	C	D	E	F	G	No. of poles	Total holding force on pole rounds	Weight	Control max. pul. Current
600	350	80	616	720	100	85	22	7040	132.0	30
600	440	80	616	720	100	85	27	8640	166.0	30
800	440	80	816	920	100	85	37	11840	221.0	30
1000	525	80	1016	1120	100	85	57	18240	330.0	60
1200	610	80	1200		100	85	80	25600	460.0	60x2
1600	610	80	1600		100	85	108	34560	614.0	60x2
2000	610	80	2000		100	85	136	43520	767.0	60x2
2000	800	80	2000		100	85	175	56000	1006.0	60x3

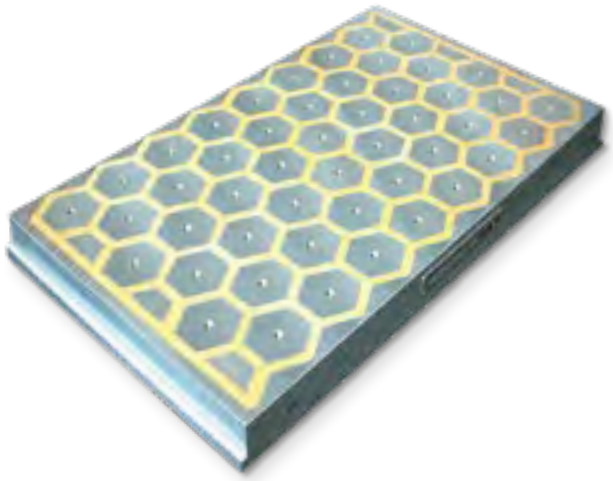
ORDERING EXAMPLE

Designation	SAV no. - A x B - version - number of poles - rated voltage
Electro permanent magnetic chuck	SAV 243.78 - 2000 x 800 - A - 160 - 360 V

SAV 243.79 ELECTRO PERMANENT MAGNETIC CHUCKS

Universally suitable system with hexagonal pole pitch

Milling magnet for flexible use with high holding force.



DESIGN

- Optimised high-energy magnet system
- Low height
- Electro permanent magnetic system for absolute safety in case of power failure.
- Tapped hole grid M8 for optional pole shoes
- Protection rating IP 65
- 8 mm wear layer of the pole plate

RATED HOLDING FORCE

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

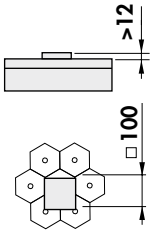
RATED VOLTAGE

360 V IMP

APPLICATION

For milling, especially for universal machining with high level of material removal

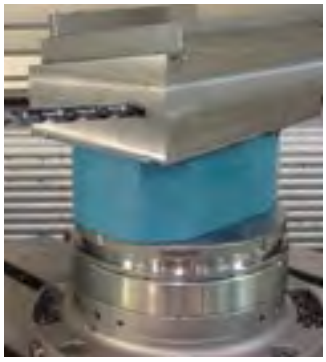
- HSC milling
- Also suitable for larger air gaps
- Min. thickness of the workpiece: 12 mm
- Min. workpiece size: 100 x 100 mm



The magnetic chucking and the free side access allow 5-sided machining with pole shoes SAV 248.70.

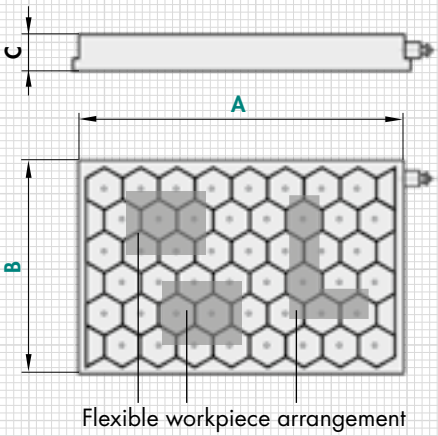
SCOPE OF DELIVERY

- Up to 400 mm width with 2 clamps, with 4 clamps for larger widths
- 5 m connecting cable, protective hose optionally possible
- Includes lifting plates
- Control and control unit not included (see SAV 876.17)
- Clamps



Special version for pallets on 5-axis machine

mm			Qty.	kg	A
A	B	C^{0}_{-1}	No. of poles	Weight	Control max. pul. Current
360	250	74	12	49.0	30
360	350	74	20	68.0	30
500	350	74	30	96.0	30
630	450	74	48	155.0	60
770	500	80	56	211.0	60x2
920	500	80	84	252.0	60x2



Flexible workpiece arrangement

HEAVY-DUTY POWER CONNECTOR WITH QUICK-RELEASE

Optional
(surcharge applies)

Easy handling of the plug-in connection

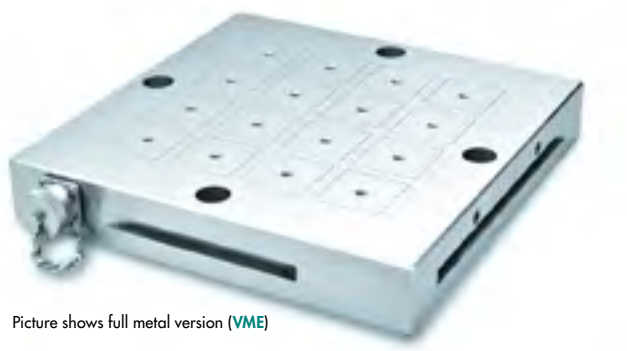
ORDERING EXAMPLE

Designation	SAV no. - A x B - number of poles - rated voltage
Electro permanent magnetic chuck	SAV 243.79 - 770 x 500 - 56 - 360 V

SAV 243.80 ELECTRO PERMANENT MAGNETIC CHUCKS

With square pole pitch

Milling magnet for universal use.
Full metal pole surface with high capacity at low cost.



Picture shows full metal version (VME)

DESIGN

- Pole plate with 50 mm square pole size
- Full metal pole plate without epoxy resin as an option (VME) for optimum sealing. Wear protection even for hot swarf.
- Version with epoxy resin (EPX)
- Wear layer on the pole plate:
  1 mm to steel insulation
  5 mm to functional barrier in the epoxy
- Available with tapped hole grid M8 for using pole shoes SAV 248.70
- Electrical connection with heavy-duty power connector
- Table fastening with through holes or with clamps

RATED HOLDING FORCE

- Epoxy: 3500 N/pole (VME)
- Full metal: 3150 N/pole (EPX)

RATED VOLTAGE

360 V IMP

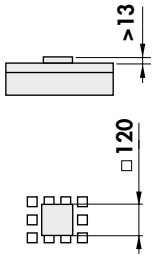
SCOPE OF DELIVERY

- Always supplied with cable and polarity reversal control unit
- Clamps and fastening screws included

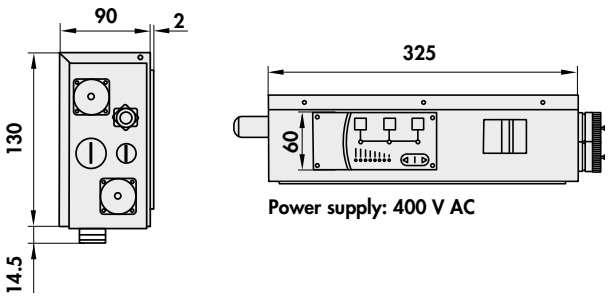
APPLICATION

For milling, universal applications

- Min. thickness of the workpiece:
  13 mm
- Min. workpiece size:
  120 x 120 mm

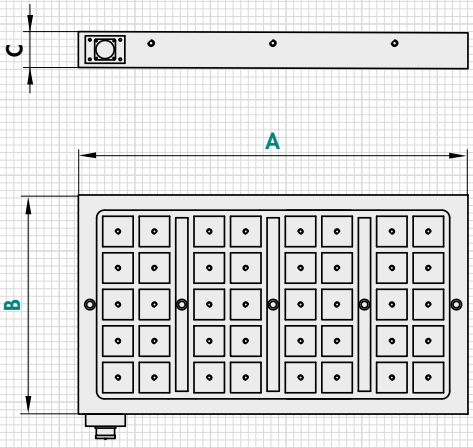


Dimensions of control unit



Power supply: 400 V AC

mm			Qty.	kg	A
A	B	C	No. of poles	Weight	Current consumption
340	360	59	20	54	19
490	360	59	30	77	25
640	360	59	40	106	27
790	360	59	50	131	50
790	480	59	70	175	55



ORDERING EXAMPLE

Designation	SAV no. - A x B - number of poles - version - rated voltage
Electro permanent magnetic chuck	SAV 243.80 - 640 x 360 - 50 - EPX - 360 V

SAV 242.92 ELECTRO PERMANENT MAGNETIC CHUCK TOWERS

Chuck towers, precision-milled

APPLICATION
For horizontal milling and drilling processes.

DESIGN
Chuck tower made of St 52-3, precision-milled. With electro permanent magnetic chucks SAV 243.77.

Fastening holes upon agreements.

TECHNICAL DATA
- Perpendicularity: 0.03/1000 mm
- Parallelism: 0.04/1000 mm
- Rated holding force: 150 N/cm²
- Magnetic field height: 12 mm
- Wear layer of the pole plate: 5 mm

Technical data for magnets as for SAV 243.77.

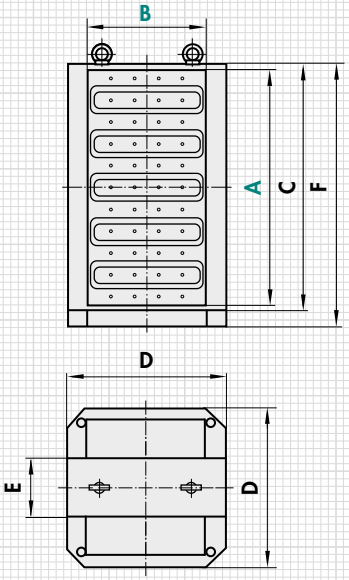
RATED VOLTAGE
360V DC IMP

SCOPE OF DELIVERY
- Chuck tower with heavy-duty power connector
- Suitable for connecting to the SAV 876.17 control unit
- Control unit not included

UPRIGHT CHUCK SAV 242.92-2 WITH 2 MAGNETS TYPE SAV 243.77

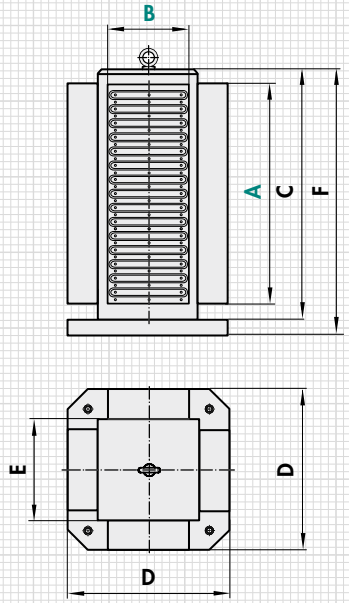
mm							kg
A	B	C	D	E	F	Pole pitch	Weight
630	400	660	500	150	700	27.5	859.0
590	400	620	400	150	660	55	812.0
580	400	620	400	150	660	85	728.0

Other designs and dimensions on request.



CHUCK TOWERS SAV 242.92-4 WITH 4 MAGNETS TYPE SAV 243.77

mm							kg
A	B	C	D	E	F	Pole pitch	Weight
400	200	415	320	200	455	27.5	287.0
520	200	620	400	256	660	27.5	437.0
630	300	660	500	356	700	27.5	776.0
590	300	660	500	356	700	55	812.0
810	400	815	630	454	860	55	1408.0
580	300	660	500	356	700	85	864.0
750	400	660	500	454	700	85	1372.0



ORDERING EXAMPLE

Designation	SAV no. - A x B - number of magnets - pole pitch - magnet voltage
Electro permanent magnetic chuck tower	SAV 242.92-4 - 810 x 400 - 55 - 360 V

APPLICATIONS

We design and manufacture electro permanent magnetic vertical chuck individually and in any size.

Also as a pallet solution and with top tooling adapted to your workpiece.

Ask us about your application. We examine the possible machining parameters. Also with individual and customised written calculation tools for each case.

PROGRAM FOR EVALUATION OF NUMBER OF POLE SHOES

magnetic system	in N/cm²
nominal specific force of magnetic chuck (FH/A)	165

factor alloying contribution (not Fe/Co/Ni)	value	force factor
non magnetic alloying contribution	2.5 %	86 %

factor heat treatment	decision 1/0	force factor
hardened	0	100 %
annealed	0	100 %

factor air gap (0-0,7 mm)	in mm	force factor
between work piece and pole shoe	0.2	87 %

factor thickness work piece	in mm	force factor
reduction at thin parts	53	100 %

application	in N/cm²
calculated specific force (FH/A)	104

dimensions of work piece	in mm
length (L)	1770
width (W)	280
heigth (H)	53

parameters of machining (face milling)	dim.	unit
diameter of tool (D)	200	mm
number of teeth (z)	10	pce
cutting depth (ap)	5	mm
infeed of tool (ae)	160	mm
rpm (n)	240	1/min
feed (f)	750	mm/min
spec. base cutting force (kc 1.1)	1500	N/mm²
exponent for cutting force calculation (z)	0.29	-
tool angle (Kappa)	45	-

parameters of top tooling	dim.	unit
calculated hoding force (FH/A)	104	N/cm²
contact surface of pole shoe (A)	19.2	cm²
friction factor (μ0)	0.2	-

calculated values	dim.	unit
cutting speed (vc)	151	N/cm²
feed per tooth (fz)	0	mm
cutting angle (phi)	106	-
middle depth of cut (hm)	0	mm
width of cutting (b)	7	mm
spec. cutting force (kc)	2426	N/mm²

evaluated results	dim.	unit
cutting force (Fc)	3270	N
cutting power (Pc)	8	kW
cutting volume (Q)	600	cm³/min
min. needed no. of pole shoes at safety 2.5	63	pcs min.
min. needed contact surface at safety 2.5	1203	cm²
max. possible no. of pole shoes	120	pcs max
covering relation of surface	52	%

[SAV] just experts.

SAV 248.70 POLE RAISERS – RECTANGULAR

For adaptation to the workpiece geometry

APPLICATION

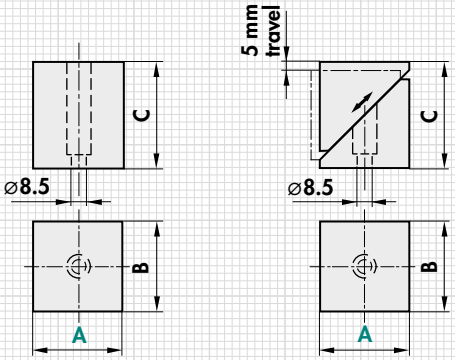
As add-on elements for magnets.
Can only be used in conjunction with magnetic chuck SAV 243.77-55 and SAV 243.77-85 or SAV 243.76-65, SAV 243.76-85 and SAV 243.80.

DESIGN

Bright steel, pole raiser can be machined in the desired shape.
The table shows an excerpt of the pole shoes manufactured by us as a standard. Can be provided with machining for specific processes and workpieces. Custom versions available.

	mm				kg
Type	A	B	C	Design	Weight
PVS 3	48	40	53.5	Rigid	0.8
PVF 3	48	40	56	spring-loaded	0.8

	mm				kg
Type	A	B	C	Design	Weight
PVS 4	70	70	86.5	Rigid	3.3
PVF 4	70	70	89	spring-loaded	3.5



ORDERING EXAMPLE

Designation	SAV no. - A - type
Pole raiser	SAV 248.70 - 70 - PVS 3

SAV 248.70 POLE RAISERS – ROUND

For adaptation to the workpiece geometry

APPLICATION

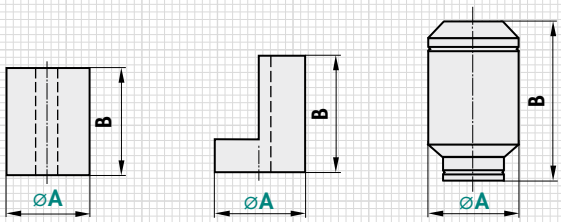
As add-on elements for magnets. Can only be used in conjunction with magnetic chuck SAV 243.78 and SAV 243.79.

DESIGN

Bright steel, pole raiser can be machined in the desired shape. The table shows an excerpt of the pole shoes manufactured by us as a standard. Can be provided with machining for specific processes and workpieces. Custom versions available.

Pole shoe, full | **Pole shoe, half** | **Pole shoe, movable**

	mm			kg
Type	A	B	Design	Weight
PVS-RV	55	75	rigid, full	1.8
PVS-RH	55	75	rigid, half	1.4
PVF-RV	60	70 - 80	spring-loaded, full	1.5



PVS-RV | PVS-RH | PVF-RV

ORDERING EXAMPLE

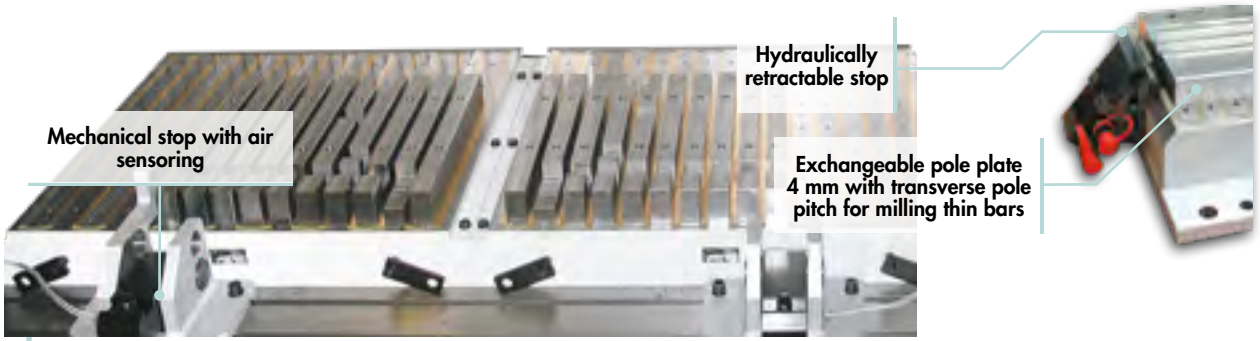
Designation	SAV no. - A - type
Pole raiser	SAV 248.70 - 60 - PVF-RV

SAV POLE BAR EQUIPMENT/TOP TOOLING

Special versions for parallel pole pitch

MECHANICAL OR HYDRAULIC STOPS

- Can be moved out for machining from 5 sides
- Can be automated
- With position monitoring
- For mechanical part positioning

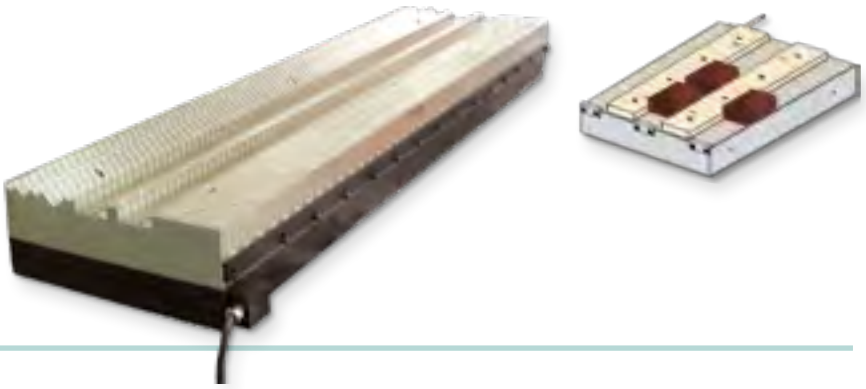


LAMINATED TOP PLATES

- Clearance possible for through holes
- Wear protection
- Easy removal of swarf for automation
- No magnetic short circuit from swarf
- Parts positioning and large-scale machining using mechanical/magnetic stops

ELECTRO-PERMANENT MAGNET

With profiled special add-on pole plate

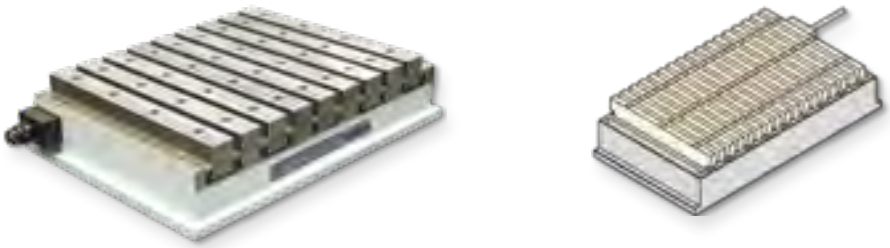


POLE BEAMS

- Machining from 5 sides possible
- Clearance for through holes
- Design with magnetically active stop
- Wear protection
- Simple and cost-efficient
- Easy cleaning
- Short changeover times

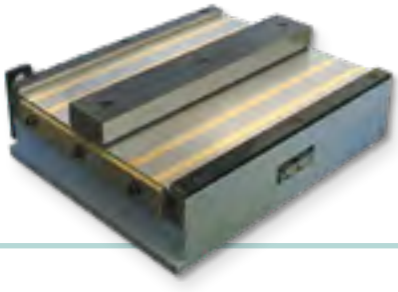
ELECTRO-PERMANENT MAGNET

With wearing pole bars



ELECTRO-PERMANENT MAGNET

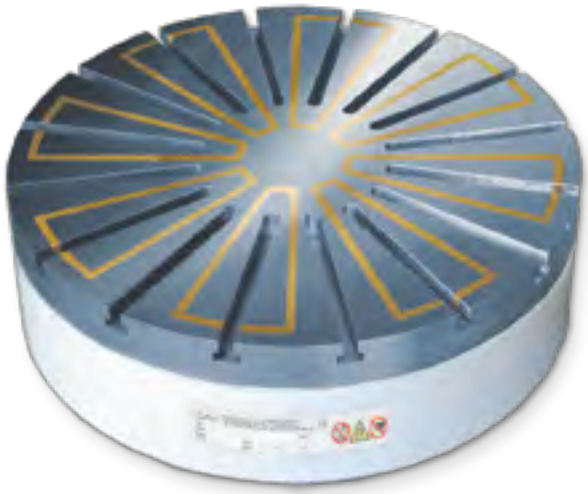
With magnetically active stop bars for small parts



SAV 244.70 ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCKS

With radial pole pitch

A strong magnetic field is the special feature of our circular magnets. The magnetic force is generated by the permanent magnets which are magnetised and demagnetised with short current pulses.



DESIGN

- Solid pole plate
- Switch-off using demagnetising cycle
- Electro permanent magnetic system for absolute safety in case of power failure
- High accuracy thanks to pole plates bolted in a narrow grid
- Pole plate with brass, wear-protected
- Pole plate can be replaced when worn
- The radial pole positioning is particularly suitable for using pole raisers. This prerequisite is absolutely required for the runout of the tool or the grinding wheel in case of 3-sides machining. Version with T-slots (T) as per DIN 650-10^{H10} are available for this
- 8 mm wear layer on the pole plate
- Protection rating IP 65
- Available with flange on request (see SAV 248.90 to 248.94, chapter 1.2.1)

RATED HOLDING FORCE

- 120 N/cm^2, controllable with control unit

RATED VOLTAGE, RECOMMENDED

210 V IMP up to size A = 400
360 V IMP above size A = 400

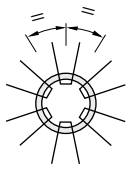
HEAVY-DUTY POWER CONNECTOR WITH QUICK-RELEASE Optional (surcharge applies)

Easy handling of the plug-in connection

APPLICATION

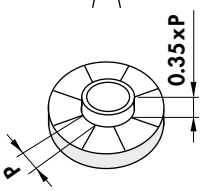
Primarily for precise grinding of small to large workpieces on rotary table and cylindrical grinding machines.
Also suitable for turning applications.

- Same pole pitch on the circumference, therefore suitable for ring-shaped workpieces

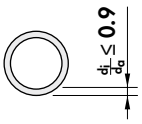


- For workpieces up to min. width equivalent to 35 % pole pitch on the pitch circle diameter

$$P = \frac{\pi}{4} \cdot \frac{d_i + d_a}{P_p} \quad ; B_{WKPC} > 0.35 \times P$$

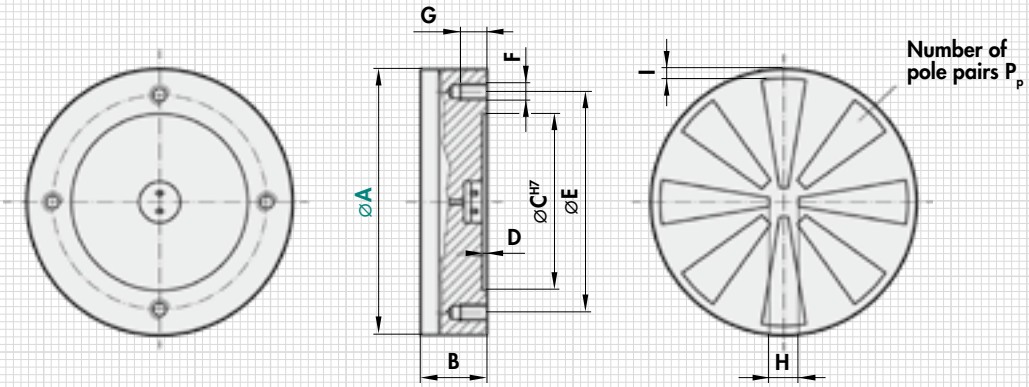


- Also for thin rings



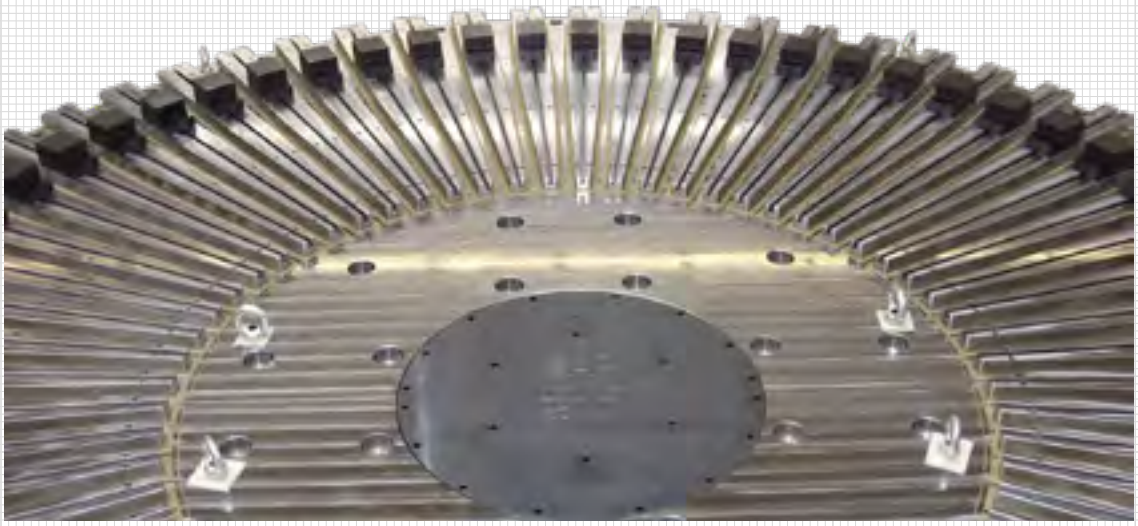
SCOPE OF DELIVERY

- Larger circular magnets are provided with threads for transport
- Standard version without T-slots and pole raisers
- Standard electrical connection centrally on the rear side using terminals
- Alternatively with integrated flat slip ring assembly for larger diameters from 1000 mm
- Available with water-tight heavy-duty power connector on the outer circumference on request
- Control and hand remote unit not in the scope of delivery



mm									Pair	kg	V	A
A	B_{-1}^{0}*	C	D	E	F	G	H	I	P_p	Weight	Rated voltage	Control max. pul. Current
100	90	60	3	80	M8 (3x)	12	35	10	3	4.0	210	30
150	90	90	3	120	M10 (3x)	14	35	10	3	9.0	210	30
200	90	110	3	140	M10 (4x)	14	45	10	4	18.0	210	30
250	90	140	3	170	M12 (4x)	16	45	10	4	29.0	210	30
300	90	160	3	190	M12 (4x)	16	60	10	6	42.0	210/360	30
400	90	210	4	250	M12 (6x)	16	70	15	6	76.0	210/360	30
500	90	280	4	320	M12 (6x)	16	100	15	8	120.0	360	30
600	100	350	4	390	M16 (6x)	18	100	15	8	195.0	360	30
700	100	400	4	450	M16 (6x)	18	120	15	8	265.0	360	30
800	100	450	4	500	M16 (6x)	18	150	18	12	365.0	360	30
1000	100	550	4	620	M16 (8x)	18	200	18	12	550.0	360	60
1200	110	Rear side upon agreement					300	25	18	990.0	360	60x2
1400	110	Rear side upon agreement					300	25	18	1350.0	360	60x2
1500	120	Rear side upon agreement					300	25	18	1550.0	360	60x2
1600	120	Rear side upon agreement					300	25	18	1760.0	360	60x2

* On versions with T-grooves, the height increases by 10 mm.



Larger diameters, e.g. 5.5 m, available on request.
Allocation to the correct control unit is based on the max. power consumption, SAV 876.17.

ORDERING EXAMPLE

Designation	SAV no. - A - version - rated voltage
Electro permanent magnetic circular chuck	SAV 244.70 - 1600 - T - 360 V

SAV 244.71 ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCKS

Amplified magnet system with radial pole pitch and extra high holding force

Thanks to the use of special magnet materials, this new type of circular magnets develops an extremely high holding force. Magnetising and demagnetising is achieved with a short direct current pulse. The homogeneous and precise design of the circular magnet allows hard turning and extreme material removal during turning.

DESIGN

- Uniform, strong magnetic field
- Solid pole plate
- Switch-off using demagnetising cycle
- Electro permanent magnetic system for absolute safety in case of power failure
- High accuracy thanks to pole plates bolted in a narrow grid
- Pole plate with brass, wear-protected
- Pole plate can be replaced when worn
- The radial pole positioning is particularly suitable for using pole raisers. This prerequisite is absolutely required for the runout of the tool or the grinding wheel in case of 3-sides machining. Version with T-slots (T) as per DIN 650-10^{H10} are available for this
- 8 mm wear layer on the pole plate
- Protection rating IP 65
- Available with flange on request (see SAV 248.90 to 248.94, chapter 1.2.1)

RATED HOLDING FORCE:

170 N/cm^2, controllable with control unit

RATED VOLTAGE, RECOMMENDED:

360 V IMP

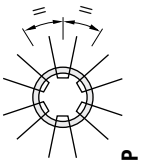
HEAVY-DUTY POWER CONNECTOR WITH QUICK-RELEASE Optional (surcharge applies)

Easy handling of the plug-in connection

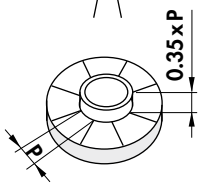
APPLICATION

Hard turning and extreme material removal for turning applications on small and large workpieces.
Grinding with maximum precision.

- Same pole pitch on the circumference, therefore suitable for ring-shaped workpieces

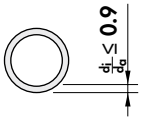


- For workpieces up to min. width equivalent to 35 % pole pitch on the pitch circle diameter



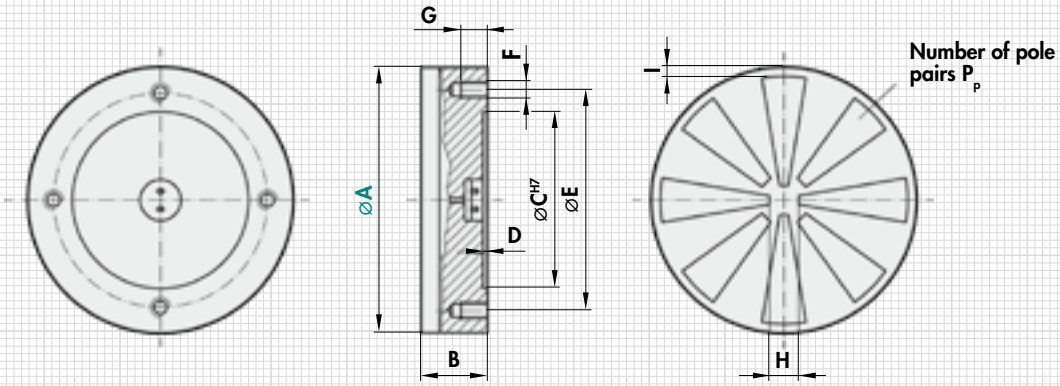
$$P = \frac{\pi}{4} \cdot \frac{d_i + d_a}{P_p} \quad ; B_{WKPC} > 0.35 \times P$$

- Also for thin rings



SCOPE OF DELIVERY:

- Larger circular magnets from 25 kg upwards are provided with threads for transport
- Standard version without T-slots and pole raisers
- Standard electrical connection centrally on the rear side using terminals
- Alternatively with integrated flat slip ring assembly for larger diameters from 1000 mm
- Available with water-tight heavy-duty power connector on the outer circumference on request
- Control and hand remote unit not in the scope of delivery



mm									Pair	kg	V	A
A	B_{-1}^{0}*	C	D	E	F	G	H	I	P_p	Weight	Rated voltage	Control max. pul. Current
200	100	110	3	140	M10 (4x)	14	45	10	4	24.0	360	30
250	100	140	3	170	M12 (4x)	16	45	10	4	39.0	360	30
300	100	160	3	190	M12 (4x)	16	60	10	6	54.0	360	30
400	100	210	4	250	M12 (6x)	16	70	15	6	85.0	360	30
500	110	280	4	320	M12 (6x)	16	100	15	8	150.0	360	30
600	110	350	4	390	M16 (6x)	18	100	15	8	210.0	360	30
700	110	400	4	450	M16 (6x)	18	120	15	8	280.0	360	30
800	110	450	4	500	M16 (6x)	18	150	18	12	380.0	360	30
1000	125	550	4	620	M16 (8x)	18	200	18	12	680.0	360	60
1200	125	Rear side upon agreement					300	25	18	975.0	360	60x2
1400	135	Rear side upon agreement					300	25	18	1600.0	360	60x2
1500	135	Rear side upon agreement					300	25	18	1850.0	360	60x2
1600	135	Rear side upon agreement					300	25	18	2105.0	360	60x2

* On versions with T-grooves, the height increases by 10 mm.

Larger diameters, e.g. 5.5 m, available on request.
Allocation to the correct control unit is based on the max. power consumption, SAV 876.17.

ORDERING EXAMPLE

Designation	SAV no. - A - version - rated voltage
Electro permanent magnetic circular chuck	SAV 244.71 - 1600 - T - 360 V

SAV TOP TOOLING – CIRCULAR MAGNETS

Special version

POLE RAISERS

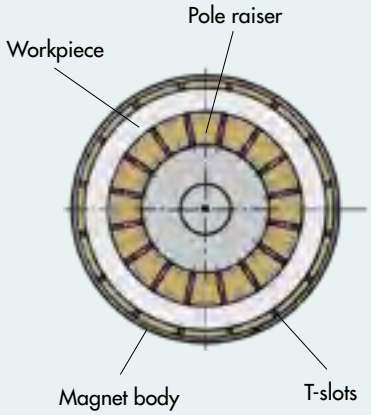
APPLICATION

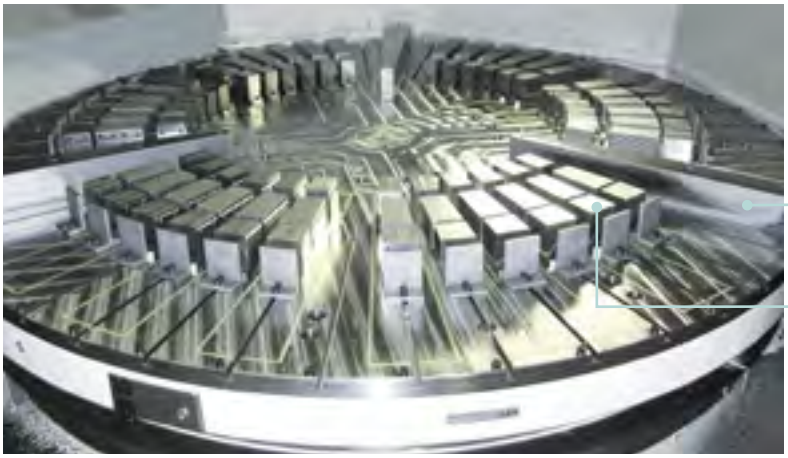
Hard turning of thin rolling bearing rings on 3 sides with fixed and movable pole raisers.

DESIGN

- Pole raisers in segmented design offer the option of a free-running tool for 3-sided machining of thin rings
- The radial adjustment option covers a larger diameter range
- Can be provided with machining for uneven workpieces or for through holes
- Depending on the rigidity of the workpiece, spring-loaded pole shoes for uneven contact surfaces are also possible
- The pole shoes for circular magnets have to be adapted individually
- We can dimension and manufacture pole raisers for customised solutions on request

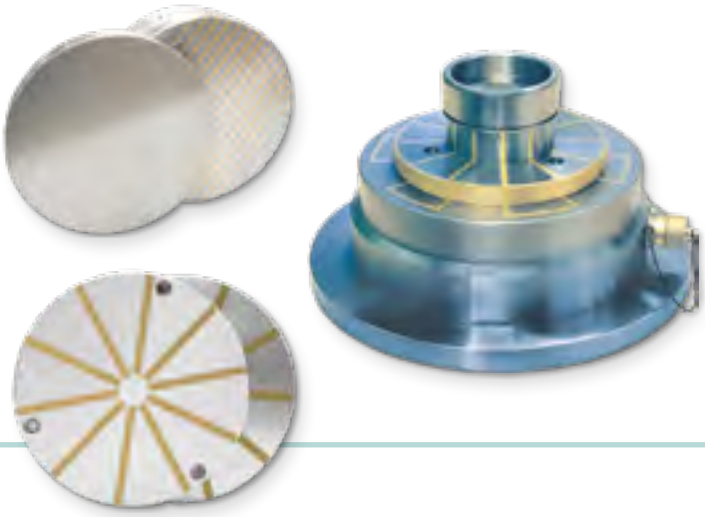
Rigid pole raisers with alignment collar





LAMINATED TOP PLATE

- No loss of workpiece contact surfaces
- Good holding forces even for smaller diameters
- Easy to exchange
- Good swarf discharge, easy to clean
- Mounting of pole shoes outside of the machine
- Pole plate change can be automated
- Also with T-slots for pole raisers

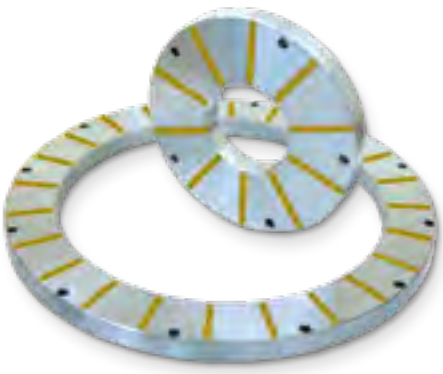


POLE BEAMS

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

LAMINATED TOP RINGS

- Up to 650 mm diameter
- No loss of workpiece contact surfaces
- Good holding forces even for smaller diameters
- Easy to exchange
- Cost-efficient



SAV 244.72 ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCKS

With circular pole pitch

The circular magnets with circular pole pitch allow several workpieces to be chucked off-centre.
The strong magnetic field is distributed evenly across the pole plate.

DESIGN

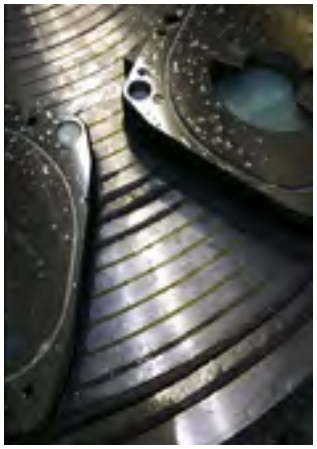
- Pole pitch manufactured "gap-free"
- Uniform, strong magnetic field
- Solid pole plate
- Switch-off using demagnetising cycle
- Electro permanent magnetic system for absolute safety in case of power failure
- High accuracy thanks to pole plates bolted in a narrow grid
- Pole plate with brass, wear-protected
- Pole plate can be replaced when worn
- 8 mm wear layer on the pole plate
- Protection rating IP 65
- Available with flange on request (see SAV 248.90 to 248.94, chapter 1.2.1)

RATED HOLDING FORCE

100 N/cm^2, controllable with control unit

RATED VOLTAGE, RECOMMENDED

210 V IMP up to size A = 500
360 V IMP above size A = 500

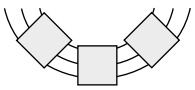


APPLICATION

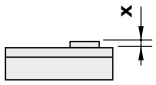
Primarily for precise grinding of small to large workpieces on rotary table and cylindrical grinding machines. The circular pole pitch also allows machining of multiple parts which are not placed centrally.

- Circular pole pitch ensures even distribution of holding force on the circumference.
  This makes it suitable for thin, flat parts (e.g. saw blades).

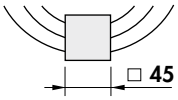
- Placement of multiple parts on pitch circle diameter possible



- For workpieces up to min. thickness x:
  2 mm with P = 4.5 mm
  4 mm with P = 9 mm
  8 mm with P = 18 mm



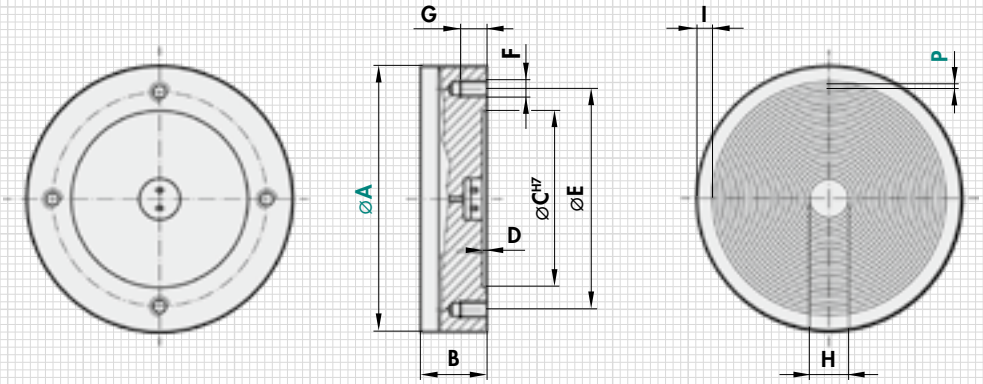
- For flat workpieces:
  Min. size = 45 mm x 45 mm



- Not suitable for thin rings

SCOPE OF DELIVERY

- Larger circular magnets are provided with threads for transport
- Standard electrical connection centrally on the rear side using terminals
- Alternatively with integrated flat slip ring assembly for larger diameters from 1000 mm
- Available with water-tight heavy-duty power connector on the outer circumference on request
- Control and hand remote unit not in the scope of delivery



mm										kg	V	A
A	B^{0}_{-1}	C	D	E	F	G	H	I	P	Weight	Rated voltage	Control max. pul. Current
300	105	160	3	190	M12 (4x)	16	76	16	5,5	52.0	210	30
400	105	210	4	250	M12 (6x)	16	90	21	9	89.0	210	30
500	105	280	4	320	M12 (6x)	16	96	21	9	141.0	210	30
600	105	350	4	390	M12 (6x)	18	80	21	9	204.0	360	30
700	105	400	4	450	M12 (6x)	18	96	21	9	278.0	360	30
800	105	450	4	500	M16 (6x)	18	96	22	9	383.0	360	30
1000	105	550	4	620	M16 (8x)	18	96	22	9	578.0	360	60
400	105	210	4	250	M12 (6x)	16	66	21	18	89.0	210	30
500	105	280	4	320	M12 (6x)	16	92	21	18	141.0	210	30
600	105	350	4	390	M12 (6x)	18	70	21	18	204.0	360	30
700	105	400	4	450	M12 (6x)	18	92	21	18	278.0	360	30
800	105	450	4	500	M16 (6x)	18	92	22	18	383.0	360	30
1000	105	550	4	620	M16 (8x)	18	92	22	18	578.0	360	60
1200	110	Rear side upon agreement				22	80	23	9	990.0	360	60x2
1400	110	Rear side upon agreement				22	166	26	9	1350.0	360	60x2
1500	120	Rear side upon agreement				22	166	26	9	1550.0	360	60x2
1600	120	Rear side upon agreement				22	166	26	9	1765.0	360	60x2
1200	110	Rear side upon agreement				22	70	23	18	990.0	360	60x2
1400	110	Rear side upon agreement				22	166	26	18	1350.0	360	60x2
1500	120	Rear side upon agreement				22	166	26	18	1550.0	360	60x2
1600	120	Rear side upon agreement				22	166	26	18	1765.0	360	60x2

Larger diameters, e.g. 5.5 m, available on request.
Allocation to the correct control unit is based on the max. power consumption, SAV 876.17.

ORDERING EXAMPLE

Designation	SAV no. - A - P - rated voltage
Electro permanent magnetic circular chuck	SAV 244.72 - 1600 - 18 - 360 V

SAV 244.73 ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCKS

With parallel pole pitch 4 mm

Circular magnet with fine pole pitch for thin parts.
Centre also magnetically active.

DESIGN

- Pole plate with particularly narrow, continuous pole pitch, 3 mm steel and 1 mm brass
- Low height
- Pole divisions bonded and reinforced with tie rods
- High accuracy thanks to pole plates bolted in a narrow grid
- Low field height of 4 mm
- Switch-off using demagnetising cycle
- Housing annealed without stress
- Fastening hole pattern with threads at the rear or through holes upon agreement
- Electro permanent magnetic system for absolute safety in case of power failure
- 8 mm wear layer on the pole plate
- Protection rating IP 65

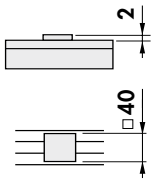
RATED HOLDING FORCE

- 100 N/cm², controllable with control unit using holding force coding switch

APPLICATION

Grinding thin plates, wide rings with low thickness and min. widths of 40 mm.

- Suitable for placement of several small parts
- For workpieces up to: min. thickness = 2 mm
- For flat workpieces: Min. size = 40 x 40 mm



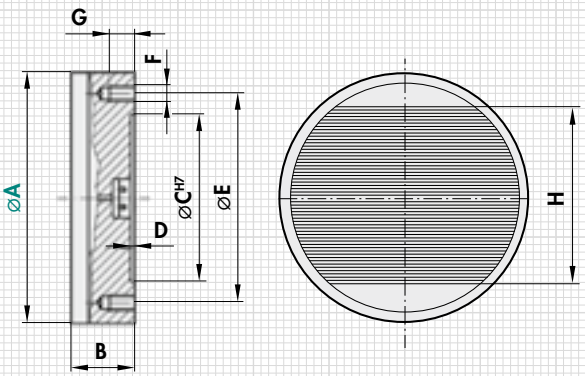
SCOPE OF DELIVERY

- Larger circular magnets are provided with threads for transport
- Standard electrical connection centrally on the rear side using terminals
- On request with water-tight heavy-duty power connector
- Control and hand remote unit not in the scope of delivery

RATED VOLTAGE, RECOMMENDED

360 V IMP

mm								kg	A
A	B^{0}_{-1}	C	D	E	F	G	H	Weight	Control max. pul. Current
300	100	160	4	190	M12 (4x)	16	213	55.0	30
400	100	210	4	250	M12 (6x)	16	301	98.0	30
500	100	280	4	320	M12 (6x)	16	401	153.0	30
600	100	350	4	390	M12 (6x)	18	481	220.0	60
700	100	400	4	450	M12 (6x)	18	581	300.0	60
800	100	450	4	500	M16 (6x)	18	681	392.0	60



ORDERING EXAMPLE

Designation	SAV no. - A - rated voltage
Electro permanent magnetic circular chuck	SAV 244.73 - 300 - 360 V

SAV 244.74 ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCKS

With parallel pole pitch 28 mm, extremely high holding force

Extremely high holding forces through high-energy systems with low field heights. Magnetising and deactivation are achieved with short current pulses.

DESIGN

- Even, extremely strong magnetic field through dual high-energy system
- Solid pole plate
- Pole gap with full brass
- Electro permanent magnetic system for absolute safety in case of power failure
- Also for thinner, disc-shaped workpieces
- Centre fully magnetically active
- 8 mm wear layer on the pole plate
- Protection rating IP 65
- Available with flange on request (see SAV 248.90 to 248.94, chapter 1.2.1).

RATED HOLDING FORCE

- 150 N/cm², controllable with control unit

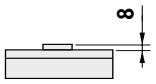
RATED VOLTAGE, RECOMMENDED

360 V IMP

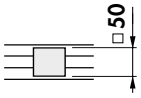
APPLICATION

Turning of thinner plates with high level of material removal

- Also suitable for flat workpieces thanks to parallel pole pitch; note magnetically active length H
- For workpieces with: min. thickness = 8 mm



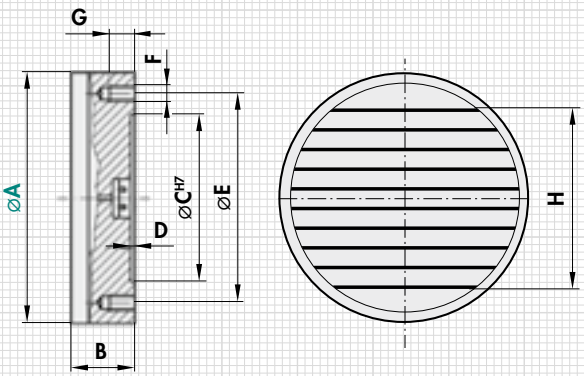
- For flat workpieces: Min. size = 50 x 50 mm



SCOPE OF DELIVERY

- Larger circular magnets are provided with threads for transport
- Standard electrical connection centrally on the rear side using terminals
- Available with water-tight connector on the outer circumference on request
- Control and hand remote unit not in the scope of delivery

mm								kg	A
A	B_{-1}^{0}	C	D	E	F	G	H	Weight	Control max. pul. Current
400	108	210	4	250	M12 (6x)	16	336	104.0	60
500	108	280	4	320	M12 (6x)	16	392	162.0	60
600	108	350	4	390	M12 (6x)	18	448	232.0	60
700	108	400	4	450	M12 (6x)	18	560	318.0	60x2
800	108	450	4	500	M16 (6x)	18	672	415.0	60x2
1000	108	550	4	620	M16 (8x)	18	896	648.0	60x2



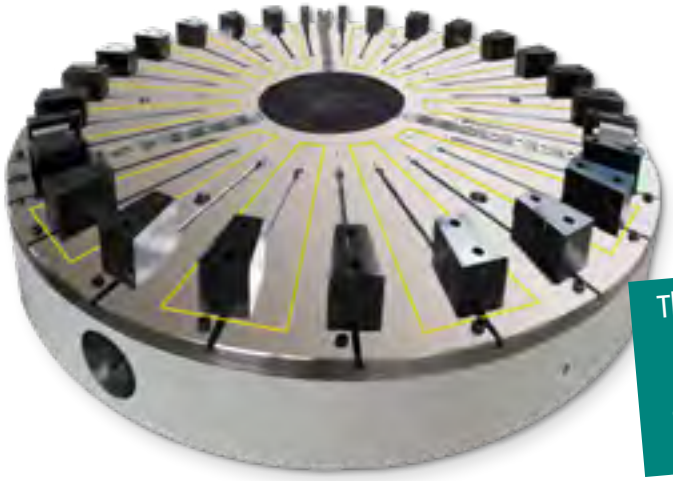
ORDERING EXAMPLE

Designation	SAV no. - A - rated voltage
Electro permanent magnetic circular chuck	SAV 244.74 - 500 - 360 V

SAV 244.76 COMBINED CIRCULAR CHUCKS

Radial pole pitch and integrated jaw chuck

Combination of magnetic and mechanical workholding



The innovative combination of magnetic workholding with a centring chuck – a complete system solution from a single source

ADVANTAGES

- Reproducible centring
- Reliable process
- Option for combining first and second chucking
- Compact design (height from 170 mm)

DESIGN OF MAGNET SYSTEM

- Combination/hybrid magnet chuck type **SAV 224.76** with electro permanent magnetic principle, magnet system with amplified design, holding forces on inducible area up to 170 N/cm²
- Full metal pole plate with brass insulation and T-slots as per DIN 650-10^{H10} for mounting fixed and movable pole raisers
- 8 mm wear layer on the pole plate, can be replaced after many years of use and wear
- On request with heavy-duty power connector integrated into the circumference and as a quick-release coupling

RATED HOLDING FORCE

170 N/cm², controllable with control unit

RATED VOLTAGE, RECOMMENDED

360 V IMP

DESIGN EXAMPLE FOR CENTRING CHUCK

- Power chuck SAV 260.20
- Centring accuracy of the chuck: 0.02 mm, centring range from: 450 – 1200 mm, magnetic chucking range from: 500 – 1100 mm
- Chuck equipped with brushed long-size base jaws, a chucking range of 500 – 1200 mm can be centred without gaps
- Holding force of the chuck: 180 kN at 210 Nm
- Travel per jaw: 9.6 mm
- Actuation of the jaw unlocking on the centring chuck with a control rod
- Spindle with precision bearing and sealing

SPECIAL FEATURE

- Resistant to emulsions as per IP 65
- Can be controlled with machine spindle using rotary transmitter
- Control with demagnetising cycle and eight holding force levels for pre-selection
- System with potential-free switching to the enable signals, complete integration into the machine controller possible; plug-in version with parking station for connector check and enable

mm	Pair	Qty.	mm		kg	A
Diameter	Pole pairs	No. of jaws	Height	Active diameter	Weight	Control max. pul. Current
500	6	3	170	250 - 464	260.0	30
600	9	3	170	300 - 564	378.0	30
800	9	3	170	300 - 764	670.0	30
1000	12	6	180	450 - 950	1100.0	60
1200	12	6	180	450 - 1150	1600.0	60x2
1400	12	6	180	450 - 1350	2180.0	60x2
1600	12	6	180	500 - 1430	3160.0	60x2
1800	18	6	180	600 - 1750	4000.0	60x2

Other designs upon request, force actuation possible upon clarification of spindle integration.

ORDERING EXAMPLE

Designation	SAV no. - diameter x pole pairs - no. of jaws - magnet voltage
Combined circular chuck	SAV 244.76 - 1800 x 18 - 6 - 360 V

▸ APPLICATIONS

We manufacture large magnets for rolling bearing machining with grinding and hard turning. For example 4.3 m diameter consisting of 2 segments. Flat slip ring assembly integrated into the centre.

SAV 876.17 ELECTRONIC POLARITY-REVERSING CONTROL UNIT

With integrated microcontroller and holding force control

APPLICATION

For electro permanent magnetic systems with 210 V or 360 V magnet voltage 30 A IMP max. magnetic voltage. Also suitable for retrofitting. Control with hand remote unit SAV 876.02-SE3, control elements integrated or machine-side PLC signals.

FUNCTION

- As pulse control for magnetising electro permanent magnetic chucks
- Control of the demagnetising cycle
- Optimised for all SAV electro permanent magnetic chucks
- Monitoring of the mains voltage, the own power components and all cables, including the magnet coil. Some internal components with redundant design
- Machine enable with dual-channel safety contact
- Chucking and releasing using redundant input signals with feedback after completed magnetising and demagnetising
- Holding force regulations using inverse BCD coding, 8 or 16 levels

PERFORMANCE CHARACTERISTICS

- Small and compact
- Easy to integrate into any machine
- User-friendly with LCD plain text display in English/German
- Easy menu selection using film keypad
- Chokes and filters are integrated
- Signal inputs and outputs indicated by LEDs
- Connectors for signal inputs and outputs
- Magnet connection with potential-free switching
- Reliable and safe operation
- Version in box with main switch, terminal strip and circuit breaker

ADVANTAGES

- Short-circuit resistant
- Fully electronic control and power board
- Additional potential-free switching relay for magnetic connection
- Extended diagnostics
- Earth connection test
- Very compact design
- Pre-programmed settings
- Individual programming options
- Short demagnetising period
- High demagnetising quality for single magnet systems
- Automatic supply frequency detection
- Function design and user guidance
- Developed based on TÜV criteria regarding electrical and functional safety as well as operational stability and EMC

CONFORMITY AS PER DIRECTIVES

- 2014/35/EU Low Voltage Directive
- 2014/30/EU Electromagnetic Compatibility Directive
- 2011/65/EU RoHS

OPERATIONAL SAFETY

- Category 2
- Performance level c
- MTBF is 30.45 years

HEAVY-DUTY POWER CONNECTOR WITH QUICK-RELEASE Optional (surcharge applies)

Easy handling of the plug-in connection

OPTIONAL

The control unit in the control box can be equipped with a heavy-duty power connector. Socket with cap on the magnet, 5 m cable with connector on the control unit. Cables and connectors are 8-pin, suitable for control unit sizes of max. 60 A x 2.
Ordering designation: SAV 876.12-SS9

OPTIONAL

If control unit and magnet are used for palletising, an optional parking station prevents movement of the pallet while the connector is inserted.
Ordering designation: SAV 876.12-PS9

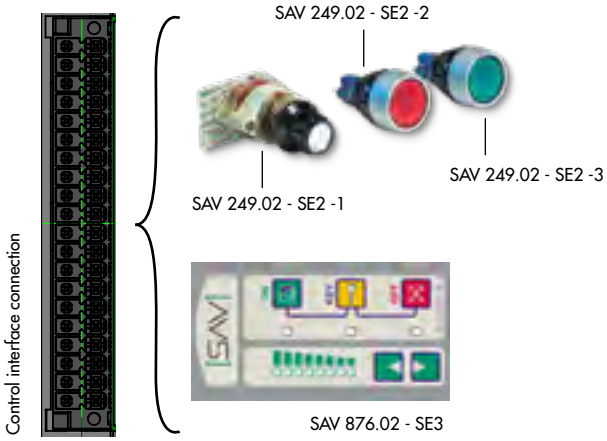
DESIGN

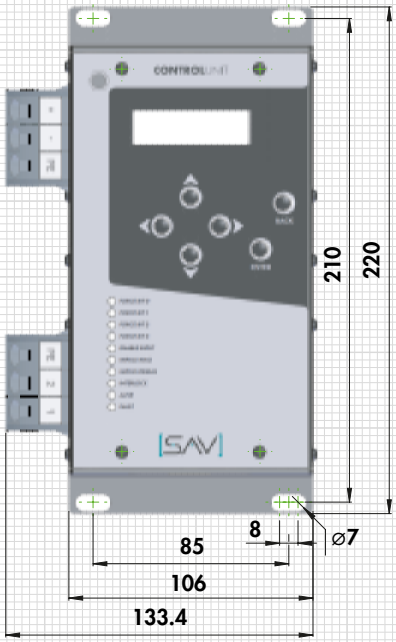
The control units are available in 2 designs:

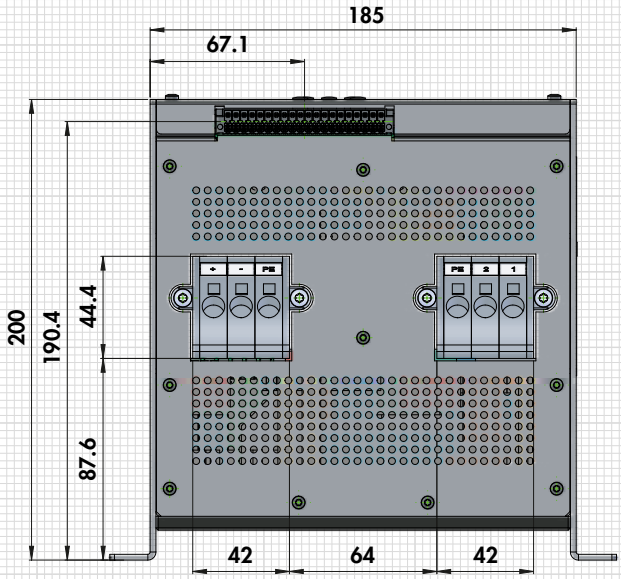
- Installation version (**E**) for use in a customer control cabinet
- In the control box (**S**) for use as a separate device together with the control unit **SAV 876.02-SE3**

If mains voltages deviate from the voltage listed in the technical data, a series transformer (**T**) may be required. Please contact us for more information.

ACCESSORIES







Dimensions and weight	
Width (housing/with terminals)	110/135 mm
Height (basic device/overall)	185/220 mm
Depth	200 mm
Weight	4000 g

Electric characteristics	
Supply voltage	200 VAC ± 10 %, 50 Hz/60 Hz 230 VAC ± 10 %, 50 Hz/60 Hz 400 VAC ± 10 %, 50 Hz/60 Hz
Output voltage on the magnet connection	180 VDC ± 10 % 210 VDC ± 10 % 360 VDC ± 10 %
Max. magnet current	30 A, pulse
Voltage on the control interface	24 VDC ± 10 %

The control unit is designed for the following application and ambient conditions:	
Place of use	Installation in the control cabinet
Protection rating of the device	IP20
Level of soiling	2
Max. rel. humidity during operation	50 %
Ambient temperature at place of use	0 – 40 °C
Ambient temperature during storage	-20 °C to +70 °C at max. 90 % humidity, non-condensing
Altitude during operation	max. 2000 m above sea level

ORDERING EXAMPLE

Designation	SAV no. - version - mains transformer - max. magnet current
Electronic polarity reversing control unit	SAV 876-17-E-O-30

SAV 876.02 - SE3

HAND REMOTE UNITS

For actuating polarity reversal control units SAV 876.17

DESIGN

To comply with accident prevention regulations on machine tools, it must be ensured that the machine feed is only enabled when the chucking magnet is activated (using auxiliary contacts) and that the activation is monitored with an indicator light. The control units comply with these regulations. The indicator light is integrated into the keys of the control unit. The auxiliary contacts for the machine feed are located in the polarity reversal control unit.

APPLICATION

For switching workholding magnets in conjunction with the electronic polarity reversal control units SAV 876.10 or SAV 876.17.
The yellow and green keys are used for switching on. The yellow and red keys are used to initiate the polarity reversal process. Any malfunctions detected by the polarity reversal control units are also indicated by a coded flashing signal in the red key.
The holding force can be selected in 8 levels.

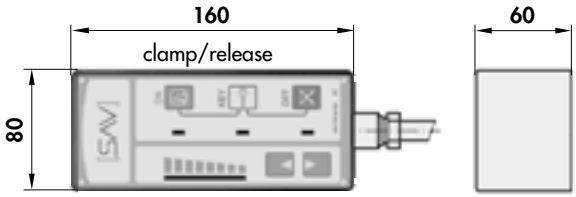
HAND REMOTE UNIT TYPE SE3

For holding force control at 8 levels for inverse BCD coding, with integrated indicator lights and a 2 m numbered cable.
Additional numbered cable available (surcharge applies).

TECHNICAL DATA

- Housing size (LxWxH): 160 x 80 x 60 mm
- Operating voltage: 24 V
- Protection rating: IP 63
- Protection class: III

Hand remote unit SE3



Holding force adjustment SE3

SAV 876.02 - SE2

CONTROL ELEMENTS FOR INSTALLATION

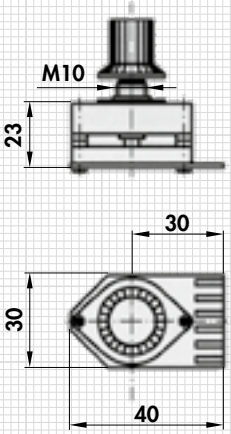
CONTROL ELEMENTS TYPE SE2-1 TO SE2-3, INSTALLATION TYPE

Consisting of:
2 illuminated push-buttons and coding switch with 8 levels for holding force adjustment with inverse BCD coding Complete set available as type **SE2-S**.

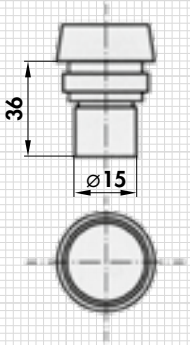
Coding switch SE2-1

Illuminated push button, red SE2-3

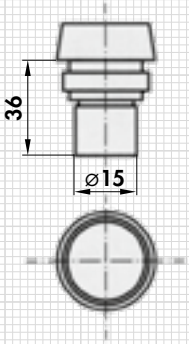
Illuminated push button, green SE2-2



SE2-1



SE2-2



SE2-3

ORDERING EXAMPLE

Designation	SAV no. - type
Hand remote unit	SAV 876.02 - SE3

SAV 248.84 CARBON BRUSH HOLDERS

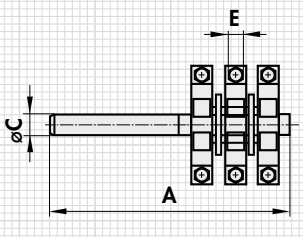
For power supply to electro permanent magnetic circular chucks

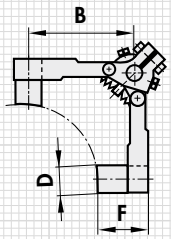
APPLICATION

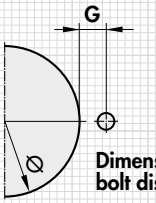
The carbon brush holders shown are used for transferring current to the slip ring assemblies. They are supplied in 3 sizes including fastening bolts.

DESIGN

Bronze grades, spring-loaded.
Attached at distance G from the slip ring assembly.







Dimension G:
bolt distance to slip ring assembly

mm		V	A	Qty.	mm							kg
max. Magnet diameter		Magnet voltage	Control unit max. pul. Current	Rings	A	B	C	D	E	F	G	Weight
up to	800	210/360	30	3	140	40	M8	12.5	6.3	20	27	0.17
up to	1000	360	60	3	140	40	M8	12.5	6.3	20	25	0.17
up to	1600	360	60 x 2	4	140	50	M8	20	8	25	33.5	0.23

ORDERING EXAMPLE

Designation	SAV no. - max. round magnet diameter
Carbon brush holder	SAV 248.84 - 1600

SAV 248.85 SLIP RING BODIES

For power supply to electro permanent magnetic circular chucks

APPLICATION

Slip ring bodies are used in conjunction with carbon brush holders for power supply to rotating electro permanent magnetic circular chucks. The slip ring body is used for separate installation on the hollow machine spindle.
During mounting, it must be ensured that insulation parts are not wetted with liquids. A contact protection for the live parts on the machine must be provided. Electrical connection with cable lugs against support nut.

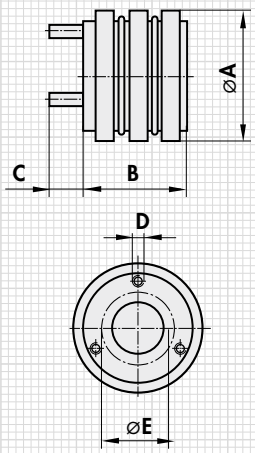
FASTENING

- Shrinking at 130 °C
- Pressing with 0.5 mm interference
- Adhesive bonding

DESIGN

Delivery with only one small hole. The locating hole (or thread) must be subsequently machined according to the machine spindle, taking into account maximum dimension E.

mm		V	A	Qty.	mm					rpm	kg
max. Magnet diameter		Magnet voltage	Control unit max. pul. Current	Rings	A	B	C	D	E	Max. speed	Weight
up to	800	210/360	30	3	70	61.5	20	M5	25 - 34	4100	1.1
up to	1000	360	60	3	100	65.5	25	M8	30 - 52	3000	2.5
up to	1600	360	60 x 2	4	100	79	25	M8	42 - 55	3000	3.0



ORDERING EXAMPLE

Designation	SAV no. - max. round magnet diameter
Slip ring body	SAV 248.85 - 1600

SAV 248.86 ROTATING CONNECTOR

For power supply to electro permanent magnetic circular chucks

APPLICATION

- For integration at the spindle end
- Alternatively in the magnet centre for special versions

DESIGN

- Compact design
- Encapsulated version
- Maintenance-free

TECHNICAL DATA

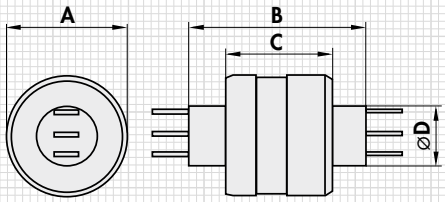
- Protection rating IP 51
- Low contact resistance

FASTENING

- With radial clamping on diameter D

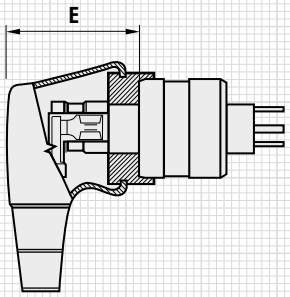
ROTATING CONNECTOR

Qty.	A	V (AC/DC)	rpm	mm			
No. of contacts	Max. continuous current	Voltage	Max. speed	A	B	C	D
3	30	0 - 250	1200	31.6	46.2	27.9	15.87
4	30	0 - 500	300	45.0	69.1	29.0	31.70



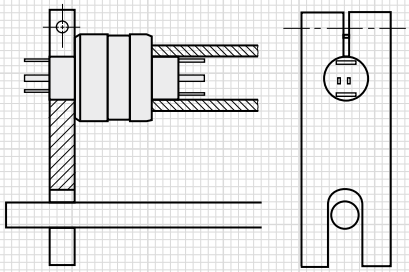
PLUG

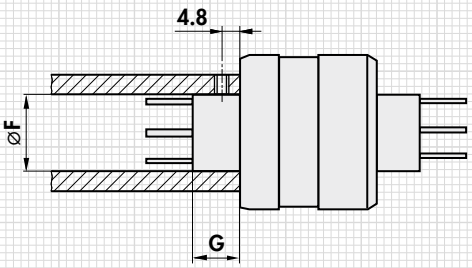
Qty.	mm
No. of contacts	E
3-S	46.2
4-S	65.8



INSTALLATION DIMENSIONS

Qty.	mm	
No. of contacts	F	G
3	15.87	10.2
4	31.75	20.3





ORDERING EXAMPLE

Designation	SAV no. - no. of contacts
Rotating connector	SAV 248.86 - 4

ORDERING EXAMPLE

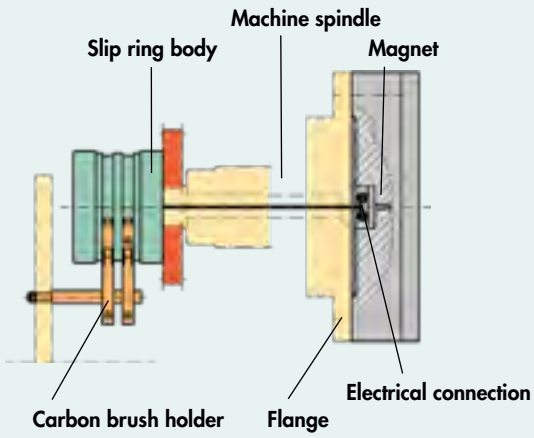
Designation	SAV no. - no. of contacts
Plug	SAV 248.86 - 4-S

▸ APPLICATIONS

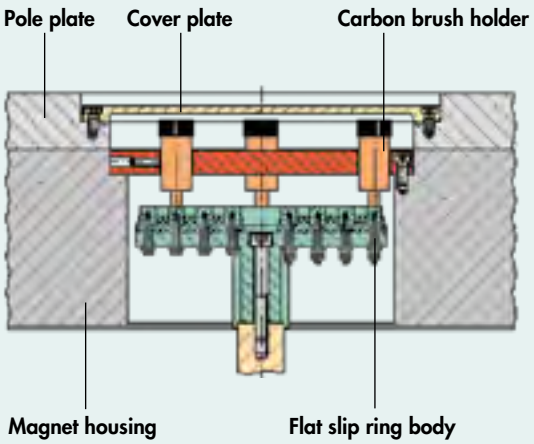
ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCKS

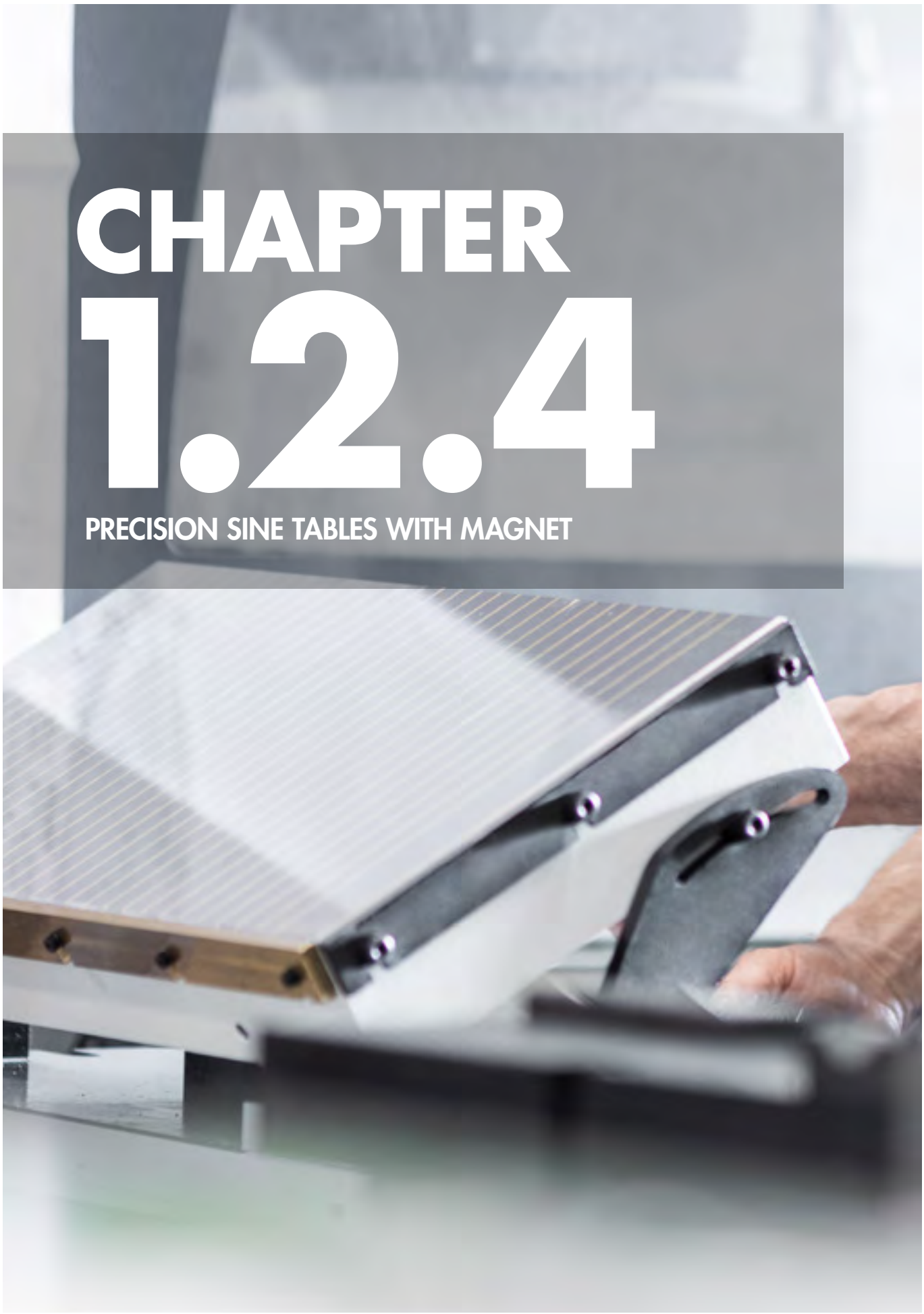
Electrical power supply

CURRENT TRANSMISSION WITH SEPARATE SLIP RING BODY AT THE SPINDLE END



CURRENT TRANSMISSION FOR LARGE CIRCULAR MAGNETS, IN SEGMENTED DESIGN WITH INTEGRATED FLAT SLIP RING BODY



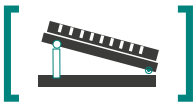


CHAPTER 1.2.4

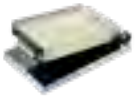
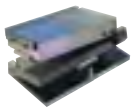
PRECISION SINE TABLES WITH MAGNET

1.2. STANDARD MAGNET SYSTEMS

1.2.4 PRECISION SINE TABLES WITH MAGNET



PAGES 131 – 142

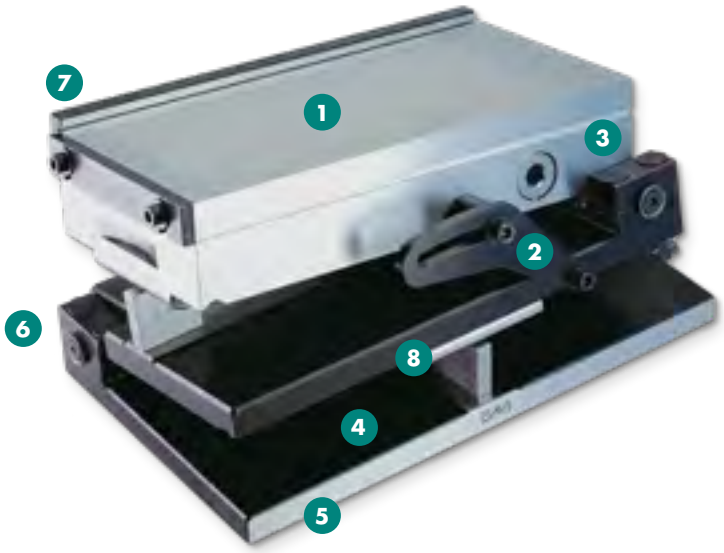
	SAV ART. NO.	COMMENTS	POLE PITCH	MACHINING PROCESSES*	PAGE
	245.01	Swivelling around longitudinal axis	P = 1.9 mm		131
	245.02	Swivelling around longitudinal/ transverse axis	P = 1.9 mm		132
	245.03	Swivelling around transverse axis	P = 1.9 mm		133
	245.04	Swivelling around longitudinal axis, low design	P = 1.9 mm		134
	245.05	Swivelling around transverse axis, low design	P = 1.9 mm		135
	245.06	Swivelling around centre axis to both sides	P = 1.9 mm		136
	245.07	Swivelling around longitudinal axis, with amplified holding force	P = 15 mm		137
	245.08	Swivelling around longitudinal/ transverse axis, with amplified holding force	P = 15 mm		138
	245.09	Swivelling around longitudinal axis, permanently installed on machine table	P = 4; 18 mm		139
	245.10	Swivelling around longitudinal axis, permanently installed on machine table	P = 13; 18; 25 mm		140
	245.40	Swivelling around longitudinal axis, with controllable permanent magnetic chuck block SAV 242.11	P = 4 mm		141
	245.41	Swivelling around longitudinal axis, with controllable permanent magnetic chuck block SAV 242.11	P = 4 mm		141
	245.44	Swivelling around the centre axis with degree scale	P = 1.9 mm		142

* Explanation of the icons on page 4

just experts.

▸ CUSTOMER BENEFIT

PRECISION SINE TABLES FOR GRINDING/EDM



1

- Magnet with high "even" holding force performance
- Large magnetically active area
- Plane parallelism ±0.005 / 100 mm

2

- Additional fastening brace for attachment when positioning the gauge blocks

3

- Fully tightness-tested
- Very flat design

4

- Small angles can also be set with 3 mm gauge block at 0°
- From 300 mm length with 2 gauge block supports for maximum precision

5

- Base plate milled from solid material
- Base plate hardened for rigidity and long-term accuracy

6

- Angle accuracy ±5 arc sec
- Axes made of stainless steel
- Precision-ground prism bearing for long-term accuracy
- Low-distortion clamping with the upper bearing shell

7

- Long stop bar, precision-ground

8

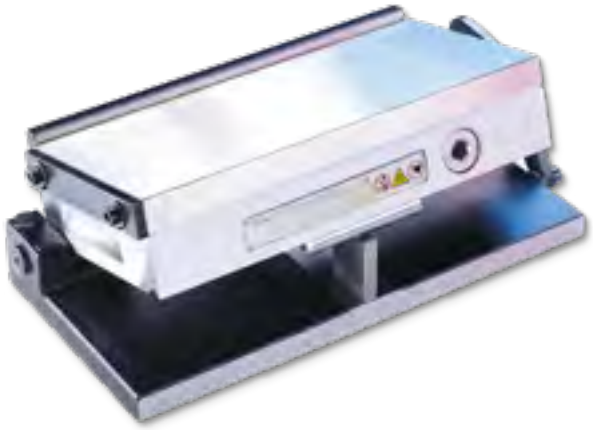
- Stainless steel measuring rollers

SAV 245.01 PRECISION SINE TABLES

Swivelling around the longitudinal axis

DESIGN

With sine table base unit made of steel. Hardened, burnished and precision-ground. Base plate alignment edge parallel to the stop bar. Maximum precision with flat design. Standard design with permanent magnetic chuck.
The sine tables are delivered in a wooden storage box, up to and including size 400 x 200 mm.
With sine table with degrees/minutes in mm, precision length stop and transverse stop bar.

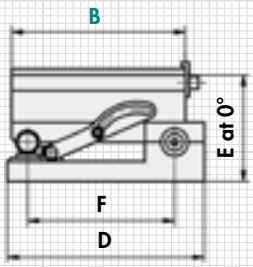


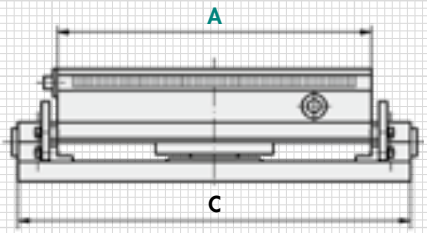
APPLICATION

The angles are determined using the gauge blocks using the sinusoidal principle.
Clamping is achieved with the upper bearing shell halves.

TECHNICAL DATA

- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Gauge block at 0°: 3 mm
- Swivelling range: 0° to 45°
- Rated holding force: 90 N/cm²
- Pole pitch: 1.9 mm
- Magnetic field height: 6 mm
- Wear layer of the pole plate: 8 mm





mm						kg
A	B	C	D	E^{0}_{-2}	F	Weight
150	150	190	165	85	135	12.0
175	100	215	115	80	85	10.0
250	100	290	115	80	85	16.0
255	130	295	145	80	115	19.0
250	150	290	165	83	135	20.5
300	150	340	165	86	135	26.5
300	200	340	215	86	185	35.0
350	150	390	165	85	135	35.0
400	200	440	215	85	185	52.0
500	250	540	265	96	235	84.0
600	300	660	317	117	275	121.0

Other designs and dimensions on request. Also available with electro permanent magnet or other magnet systems.
All standard sized of the permanent magnetic chucks SAV 243.01 (chapter 1.2.1) are available as a sine table.

Design with flushing holes for EDM available (surcharge applies).

ORDERING EXAMPLE

Designation	SAV no. - A x B
Precision sine table	SAV 245.01 - 300 x 150

SAV 245.02 PRECISION SINE TABLES

Swivelling around longitudinal and transverse axis

DESIGN

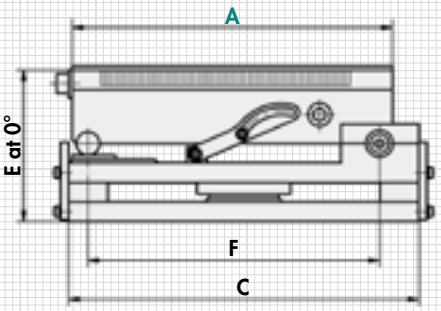
With sine table base units made of steel. Hardened, burnished and precision-ground. Maximum precision with flat design. Standard design with permanent magnetic chuck.
Delivered in a wooden storage box.
With 2 sine tables with degrees/minutes in mm, precision length stop and transverse stop bar.

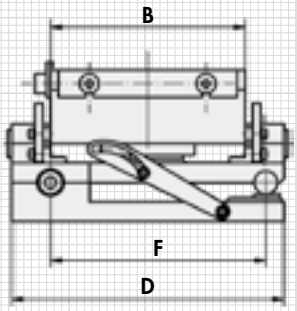
APPLICATION

The angles are determined using the gauge blocks using the sinusoidal principle.
Clamping is achieved with a fastening brace at the side and the upper bearing shells.

TECHNICAL DATA

- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Gauge block at 0°: 3 mm
- Swivelling range, long axis: 0° to 45°
- Swivelling range, short axis: 0° to 30°
- Rated holding force: 90 N/cm²
- Pole pitch: 1.9 mm
- Magnetic field height: 6 mm
- Wear layer of the pole plate: 8 mm





mm						kg
A	B	C	D	E_{-2}^{0}	F	Weight
175	100	210	140	108	160 / 115	15.0
255	130	290	175	112	240 / 145	32.0
300	150	335	190	117	285 / 160	43.5
350	150	385	190	117	335 / 160	49.5
400	200	435	240	117	385 / 210	73.0

Other designs and dimensions on request. Also available with electro permanent magnet or other magnet systems.
All standard sized of the permanent magnetic chucks SAV 243.01 (chapter 1.2.1) are available as a sine table.

Available with flushing hole for EDM on request (surcharge applies).

ORDERING EXAMPLE

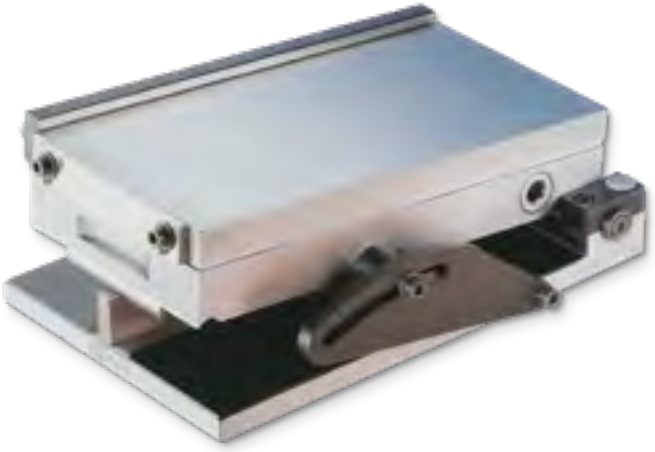
Designation	SAV no. - A
Precision sine table	SAV 245.02 - 400

SAV 245.03 PRECISION SINE TABLES

Swivelling around the transverse axis

DESIGN

With sine table base unit made of steel. Hardened, burnished and precision-ground. Maximum precision with flat design. Standard design with permanent magnetic chuck.
Delivered in a wooden storage box.
With sine table with degrees/minutes in mm, precision length stop and transverse stop bar.

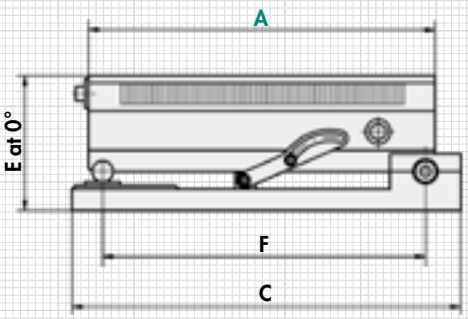


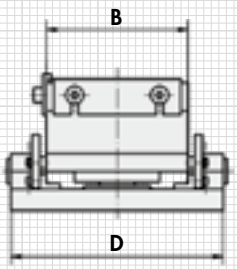
APPLICATION

The angles are determined using the gauge blocks using the sinusoidal principle.
Clamping is achieved with the upper bearing shell halves.

TECHNICAL DATA

- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Gauge block at 0°: 3 mm
- Swivelling range: 0° to 30°
- Rated holding force: 90 N/cm²
- Pole pitch: 1.9 mm
- Magnetic field height: 6 mm
- Wear layer of the pole plate: < 8 mm





mm						kg
A	B	C	D	E^{0}_{-2}	F	Weight
140	70	160	110	81	125	8.5
175	100	190	140	81	160	10.0
255	130	270	170	81	240	22.0
300	150	315	190	86	285	28.0
400	200	415	240	86	385	55.5
450	150	465	190	86	435	48.0

Other designs and dimensions on request. Also available with electro permanent magnet or other magnet systems.
All standard sized of the permanent magnetic chucks SAV 243.01 (chapter 1.2.1) are available as a sine table.

Design with flushing holes available (surcharge applies).

ORDERING EXAMPLE

Designation	SAV no. - A
Precision sine table	SAV 245.03 - 450

SAV 245.04 PRECISION SINE TABLES

Swivelling around longitudinal axis, low design

DESIGN

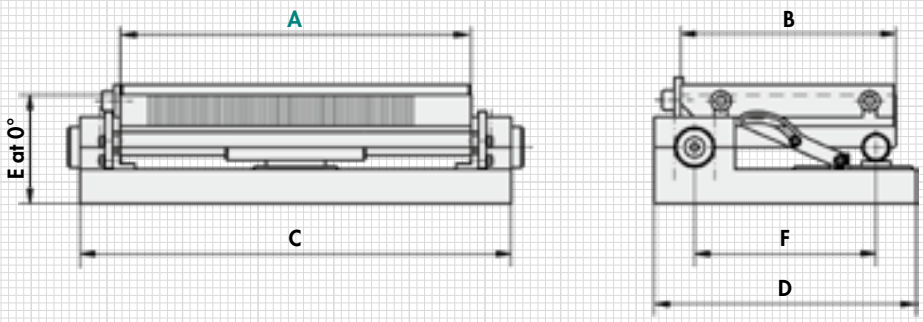
With sine table base unit made of steel. Hardened, burnished and precision-ground. Maximum precision with extremely flat design. Standard design with permanent magnetic chuck, switching on/off from above. Delivered in a wooden storage box.
With sine table with degrees/minutes in mm, precision length stop and transverse stop bar.

APPLICATION

The angles are determined using the gauge blocks using the sinusoidal principle.
Clamping is achieved with the upper bearing shell halves.

TECHNICAL DATA

- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Gauge block at 0°: 3 mm
- Swivelling range: 0° to 45°
- Rated holding force: 80 N/cm²
- Pole pitch: 1.9 mm
- Magnetic field height: 6 mm
- Wear layer of the pole plate: 6 mm



mm						kg
A	B	C	D	E^{0}_{-2}	F	Weight
175	100	215	115	67	85	8.5
150	150	190	165	69	135	10.0
255	130	295	145	67	115	14.0
300	150	340	165	69	135	20.0
350	150	390	165	69	135	26.5
400	200	440	215	69	185	41.0
450	150	490	165	69	135	33.5

Design with flushing holes available (surcharge applies).

ORDERING EXAMPLE

Designation	SAV no. - A
Precision sine table	SAV 245.04 - 450

SAV 245.05 PRECISION SINE TABLES

Swivelling around transverse axis, low design

DESIGN

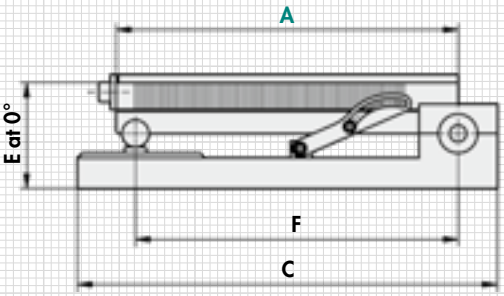
With sine table base unit made of steel. Hardened, burnished and precision-ground. Maximum precision with extremely flat design.
Standard design with permanent magnetic chuck.
On/off control from above.
Sine tables are delivered in a wooden storage box.
With sine table with degrees/minutes in mm, precision length stop and transverse stop bar.

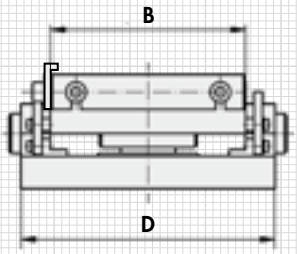
APPLICATION

The angles are determined using the gauge blocks using the sinusoidal principle.
Clamping is achieved with the upper bearing shell halves.

TECHNICAL DATA

- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Gauge block at 0°: 3 mm
- Swivelling range: 0° to 30°
- Rated holding force: 80 N/cm²
- Pole pitch: 1.9 mm
- Wear layer of the pole plate: 6 mm





mm						kg
A	B	C	D	E^{0}_{-2}	F	Weight
175	100	190	140	67	160	8.5
255	130	270	170	66	240	14.0
300	150	315	190	69	285	20.5
350	150	365	190	69	335	27.5
400	200	415	240	68	385	42.0
450	150	465	190	69	435	35.0

Design with flushing holes available (surcharge applies).

ORDERING EXAMPLE

Designation	SAV no. - A
Precision sine table	SAV 245.05 - 450

SAV 245.06 PRECISION SINE TABLES

Swivelling around centre axis to both sides

For grinding and measuring precision workpieces in each angle position without rechucking the parts.

DESIGN

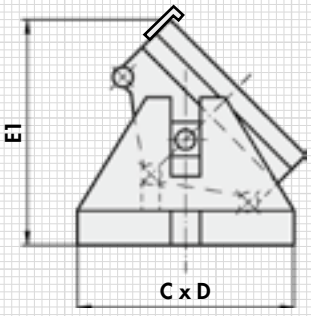
With sine base unit and all components and guide systems made of tool steel. Hardened, burnished and precision-ground. Standard version with permanent magnetic chuck SAV 243.01.
Maximum precision and inherent stability in each rotation position.
Delivered in a wooden storage box, up to and including size 350 x 150 mm.
With sine table with degrees/minutes in mm, precision length stop and transverse stop bar.

APPLICATION

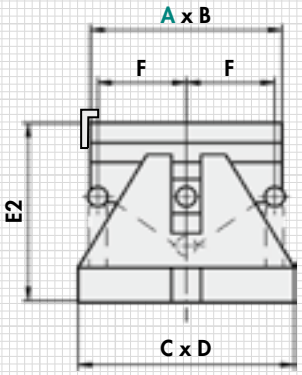
The angles are determined using the gauge blocks using the sine principle up to 90°.

TECHNICAL DATA

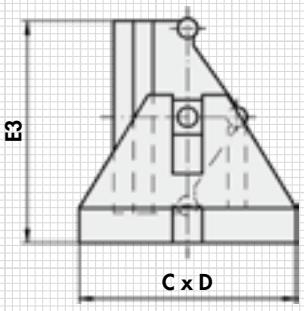
- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Swivelling range: -90° to +90°
- Rated holding force: 90 N/cm²
- Pole pitch: 1.9 mm
- Magnetic field height: 6 mm
- Wear layer of the pole plate: 8 mm



Swivelling right 45°



0° position



Swivelling left 90°

mm								kg
A	B	C	D	E1	E2	E3	F	Weight
255	130	365	150	160	114	174	60	30.0
350	150	460	160	175	122	188	70	46.0
400	200	510	200	220	137	220	100	64.0
500	200	610	200	220	137	220	100	78.0
600	200	710	200	220	137	220	100	92.0

Other dimensions and versions also available with electro permanent magnet or other magnet systems.

ORDERING EXAMPLE

Designation	SAV no. - A
Precision sine table	SAV 245.06 - 600

SAV 245.07 PRECISION SINE TABLES with amplified holding force

Swivelling around the longitudinal axis

DESIGN

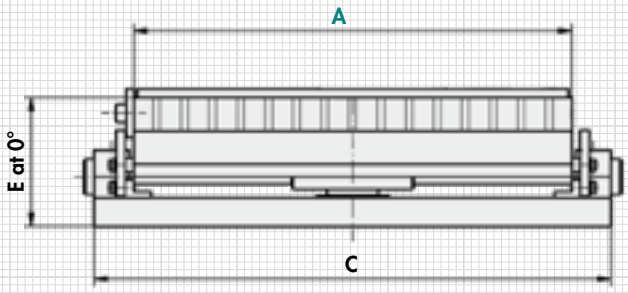
With sine table base unit made of steel. Hardened, burnished and precision-ground. Maximum precision with flat design.
Standard design with permanent magnetic chuck SAV 243.11.
Delivered in a wooden storage box.
With sine table with degrees/minutes in mm, precision length stop and transverse stop bar.

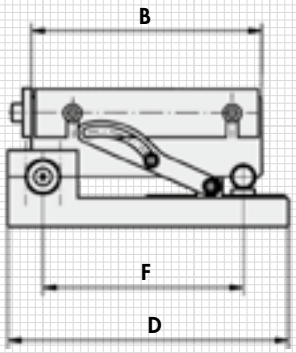
APPLICATION

The angles are determined using the gauge blocks using the sinusoidal principle.
Clamping is achieved with a fastening brace at the side and the upper bearing shells.

TECHNICAL DATA

- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Gauge block at 0°: 3 mm
- Swivelling range: 0° to 45°
- Rated holding force: 150 N/cm²
- Pole pitch: 15 mm
- Magnetic field height: 12 mm
- Wear layer of the pole plate: 5 mm





mm						kg
A	B	C	D	E_{-2}^{0}	F	Weight
250	150	290	165	88	135	20.5
300	150	340	165	90	135	27.0
350	150	390	165	90	135	36.0
400	200	440	215	93	185	52.0

Other designs and dimensions on request.
Also available with electro permanent magnet or other magnet systems.
All standard sized of the permanent magnetic chucks SAV 243.11 (chapter 1.2.1) are available as a sine table.

ORDERING EXAMPLE

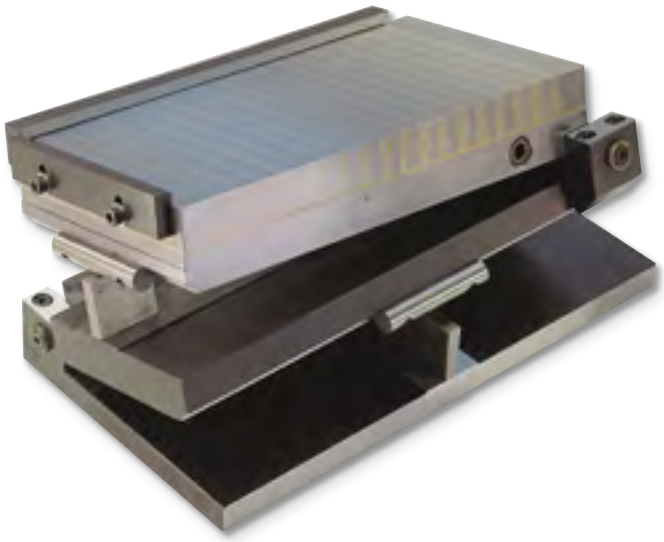
Designation	SAV no. - A
Precision sine table	SAV 245.07 - 400

SAV 245.08 PRECISION SINE TABLES with amplified holding force

Swivelling around longitudinal and transverse axis

DESIGN

Swivelling around longitudinal and transverse axis. With sine table base unit made of steel. Hardened, burnished and precision-ground. Maximum precision with flat design. Standard version with permanent magnetic chuck SAV 243.11.
Delivered in a wooden storage box.
With sine table with degrees/minutes in mm, precision length stop and transverse stop bar.

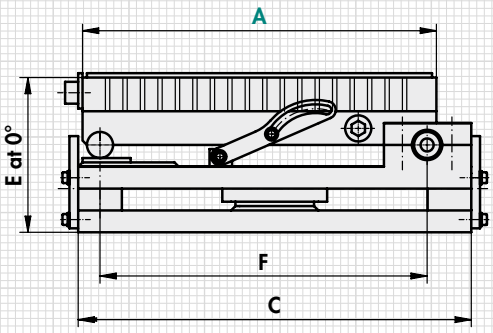


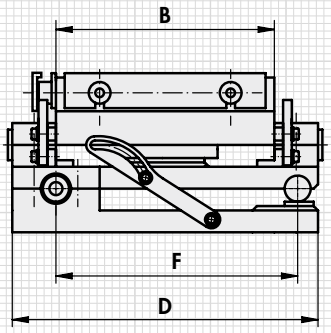
APPLICATION

The angles are determined using the gauge blocks using the sinusoidal principle.
Clamping is achieved with a fastening brace at the side and the upper bearing shells.

TECHNICAL DATA

- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Gauge block at 0°: 3 mm
- Swivelling range, long axis: 0° to 45°
- Swivelling range, short axis: 0° to 30°
- Rated holding force: 150 N/cm²
- Pole pitch: 15 mm
- Magnetic field height: 12 mm
- Wear layer of the pole plate: 5 mm





mm						kg
A	B	C	D	E^{0}_{-2}	F	Weight
250	150	285	205	154	235/175	20.5
300	150	333	190	122	285/160	27.0
350	150	383	190	122	335/160	36.0
400	200	435	240	126	385/210	52.0

Other designs and dimensions on request. Also available with electro-permanent magnet or other magnet systems. All standard sized of the permanent magnetic chucks SAV 243.11 (chapter 1.2.1) are available as a sine table.

ORDERING EXAMPLE

Designation	SAV no. - A
Precision sine table	SAV 245.08 - 400

SAV 245.09 PRECISION SINE TABLES

Swivelling around longitudinal axis, for the highest requirements

DESIGN

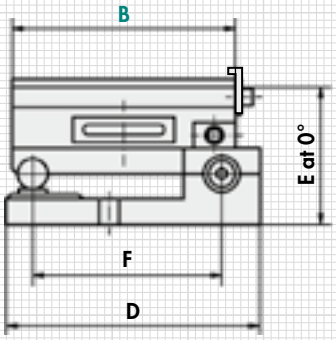
With sine table base unit made of steel. Hardened, burnished and precision-ground. Magnet housing annealed without stress.
Maximum precision with flat design.
4-point contact for optimum precision.
Delivered with a lifting aid, rod and sine table with degrees/minutes in mm.
Precision longitudinal stop with transverse stop bar, 3 m connecting cable, painted magnet housing.
Available alternatively with electrical chucks and integrated water cooling for P = 13 (EM) or electro-permanent magnetic chucks for P = 4 (EP).

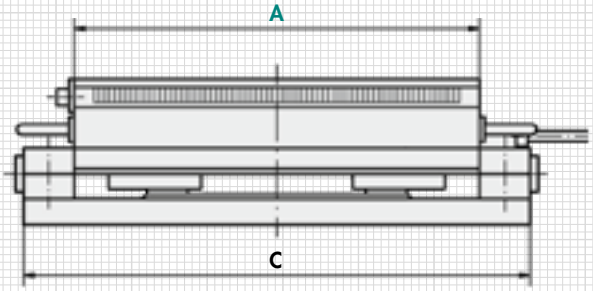
APPLICATION

The angles are determined using the gauge blocks using the sinusoidal principle.

TECHNICAL DATA

- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Gauge block at 0°: 0/5 mm
- Swivelling range: 0° to 45°
- Rated holding force: 100 N/cm²
- Pole pitch:
  4 mm for EP magnet as per SAV 243.73
  13 mm for EM magnet as per SAV 243.42
- Magnet voltage:
  210 V for EP
  24 V or 110 V for EM





With electro-permanent magnet P = 4 (EP)

mm						kg	A
A	B	C	D	E_{-2}^{0}	F	Weight	Magnet current
450	175	448	203	125.5	175	55.0	30
500	175	498	203	125.5	175	61.0	30
500	200	498	228	125.5	200	70.0	30

With electromagnet P = 13 (EM)

mm						kg	Type
A	B	C	D	E_{-2}^{0}	F	Weight	Control
450	175	448	203	125.5	175	55.0	E4
500	175	498	203	125.5	175	61.0	E4
500	200	498	228	125.5	200	70.0	E4

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

ORDERING EXAMPLE

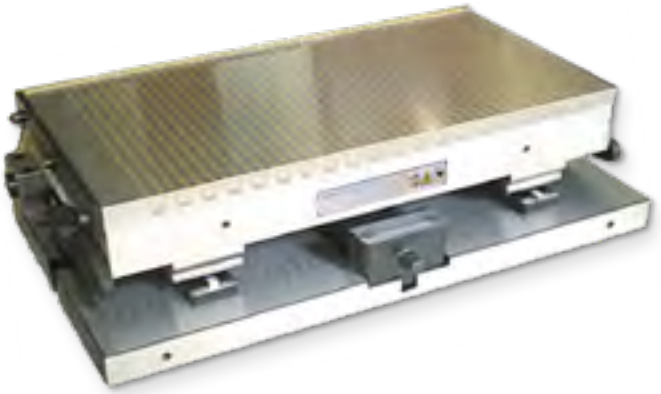
Designation	SAV no. - A x B - pole pitch - version - magnet voltage
Precision sine table	SAV 245.09 - 500 x 200 - 4 - EP - 210 V

SAV 245.10 PRECISION SINE TABLES

Swivelling around longitudinal axis, permanently installed on machine table

DESIGN

With sine table base plate made of steel.
Annealed without stress.
All structural elements made of steel. Hardened and precision-ground. Sturdy design with high precision. With mechanical adjustment gear or hydraulic swivelling aid, depending on size. Maximum precision with flat design.
4-point contact for optimum safety.
Standard version with electro permanent magnetic chuck as per SAV 243.70. Pole pitch 13, 18 or 25 mm.
Delivered with sine table with degrees/minutes in mm, precision longitudinal stop with transverse stop bar, 3 m connecting cable, painted magnet housing, ratchet and socket.

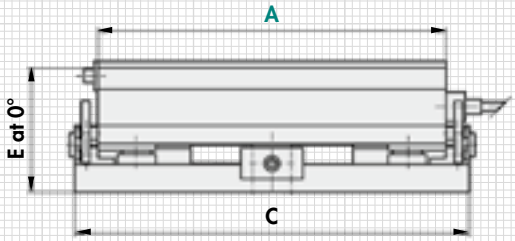


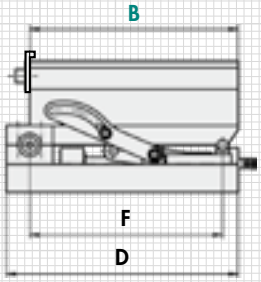
APPLICATION

The angles are determined using the gauge blocks using the sinusoidal principle.

TECHNICAL DATA

- Gauge block at 0°: 5 mm
- Swivelling range: 0° to 45°
- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Pole pitch: 13/18/25 mm
- Rated holding force: 90/110/115 N/cm²
- Magnet voltage: 360 V





mm						kg	A
A	B	C	D	E $^{0°}_{-2}$	F	Weight	Magnet current
400	200	460	280	165	175	90.0	30
500	200	560	280	176	175	120.0	30
500	250	560	315	146	225	138.0	30
600	200	660	280	165	175	170.0	30
600	300	660	370	146	275	200.0	30
800	300	860	370	186	275	250.0	30
800	400	860	455	186	375	320.0	30

*Depending on magnet type.
The stated heights refer to the electro permanent magnetic chucks SAV 243.70.

Other designs and dimensions on request. Also available with electromagnet or other magnet systems. Please state the required magnet when ordering (see chapters 1.2.1, 1.2.2 and 1.2.3).

ORDERING EXAMPLE

Designation	SAV no. - A x B - pole pitch - voltage
Precision sine table	SAV 245.10 - 800 x 300 - 18 - 360 V

SAV 245.40 PRECISION SINE TABLE

[also stainless version] swivelling around the longitudinal axis

DESIGN

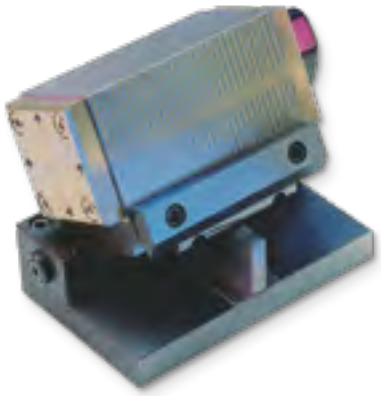
With switchable permanent magnetic chuck block SAV 242.11. With sine table base unit made of steel. Hardened, burnished and precision-ground. Delivered in a wooden storage box with sine table with degrees/minutes in mm. Stainless version (RF) available.

APPLICATION

The angles are determined using the gauge blocks using the sinusoidal principle. The switchable magnetic chuck block can be removed and can therefore also be used without a sine table.
All four chucking areas of the chuck block are magnetically active.

TECHNICAL DATA

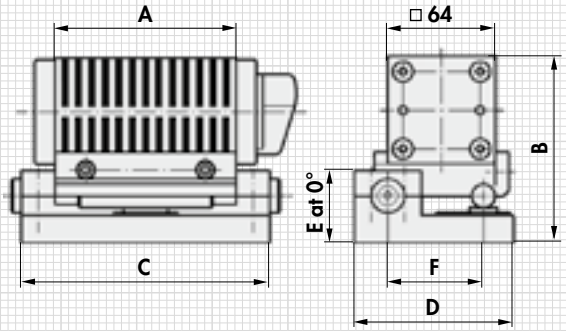
- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Gauge block at 0°: 3 mm
- Swivelling range: 0° to 45°
- Rated holding force: 50 N/cm²
- Rated holding force, stainless: 30 N/cm²



mm						kg
A	B	C	D	E_2^0	F	Weight
140	118.5	150	95	54	65	7.2

ORDERING EXAMPLE

Designation	SAV no. - version
Precision sine table	SAV 245.40 - RF



SAV 245.41 PRECISION SINE TABLE

[also stainless version] Swivelling around the transverse axis

DESIGN

With switchable permanent magnetic chuck block SAV 242.11. With sine table base unit made of steel. Hardened, burnished and precision-ground. Delivered in a wooden storage box with sine table with degrees/minutes in mm. Stainless version (RF) available.

APPLICATION

The angles are determined using the gauge blocks using the sinusoidal principle. The switchable magnetic chuck block can be removed and can therefore also be used without a sine table.
All four chucking areas of the chuck block are magnetically active.

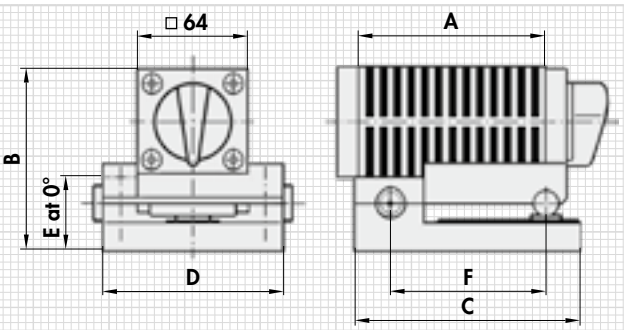
TECHNICAL DATA

- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Gauge block at 0°: 3 mm
- Swivelling range: 0° to 45°
- Rated holding force: 50 N/cm²
- Rated holding force, stainless: 30 N/cm²

mm						kg
A	B	C	D	E_2^0	F	Weight
140	118.5	130	95	54	100	7.8

ORDERING EXAMPLE

Designation	SAV no. - version
Precision sine table	SAV 245.41 - RF



SAV 245.44 MAGNETIC BLOCKS with scale

Swivelling around centre axis to both sides

DESIGN

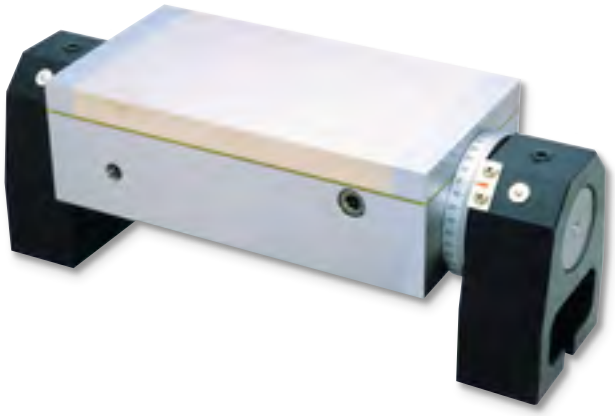
Sturdy design. Readout from degree scale. Swivelling with manual lever. Switchable permanent magnet with fine pole pitch P = 1.9 mm, swivelling through.

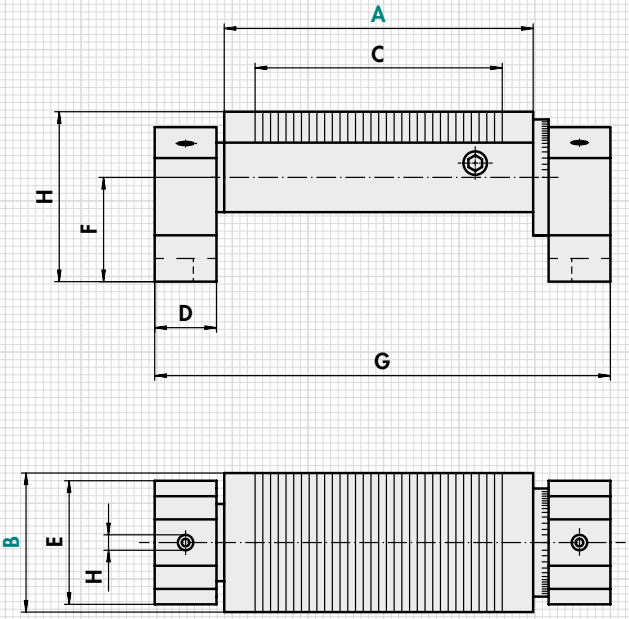
APPLICATION

Easy alignment using degree scale or a sine bar.

TECHNICAL DATA

- Swivelling range: -90° to +90°
- Plane parallelism: ±0.005/100 mm
- Rated holding force: 90 N/cm²
- Magnetic field height: 6 mm
- Wear layer of the pole plate: 8 mm





mm | kg

A	B	C	D	E	F	G	H	Weight
175	100	146	50	100	95	293	145	18.0
250	100	206	50	100	95	365	125	23.0
300	150	256	50	100	95	418	128	36.0
350	150	306	50	100	95	468	145	40.0
450	150	406	50	100	95	568	145	50.0

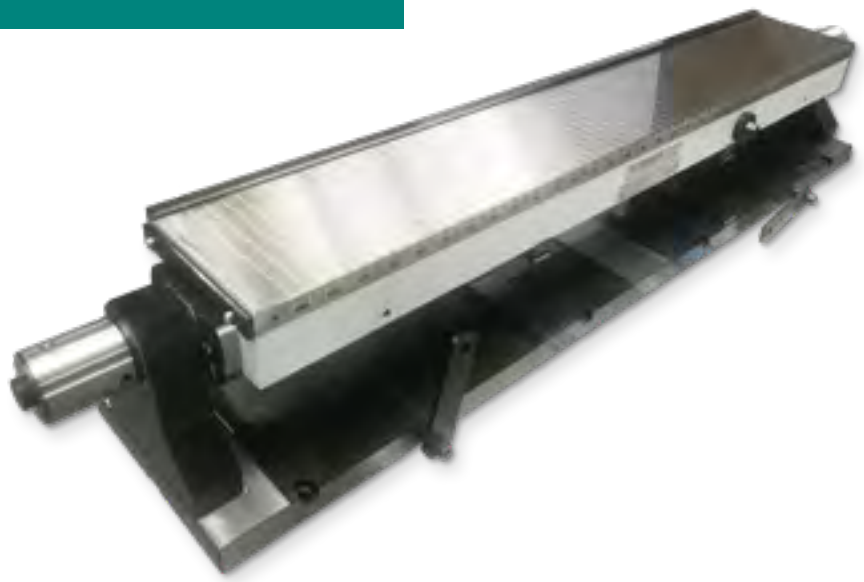
ORDERING EXAMPLE

Designation	SAV no. - A x B
Magnetic block, swivelling	SAV 245.44 - 450x150

▸ APPLICATIONS

PRECISION SINE TABLE

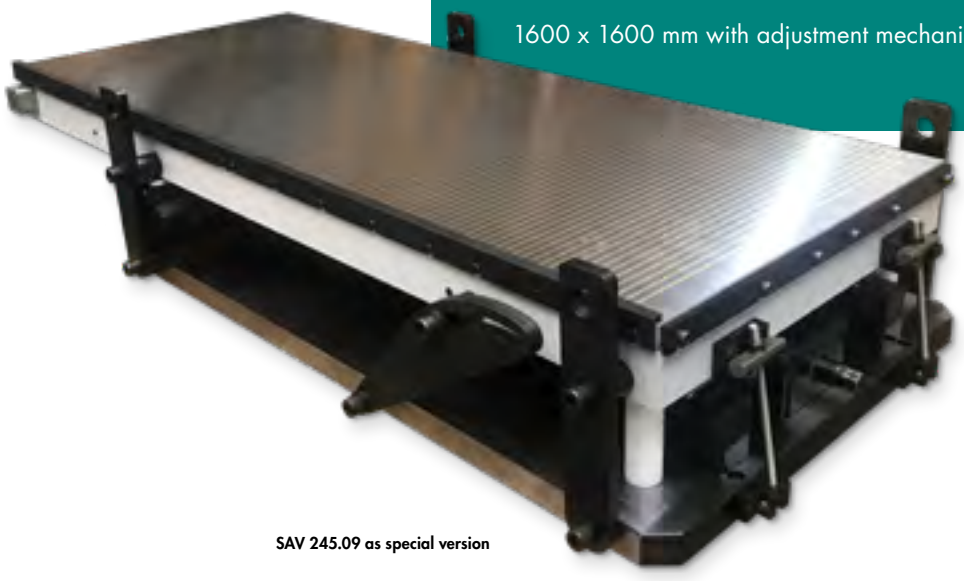
For blade grinder L = 1.4 m,
distortion-free clamping with Spieth sleeves



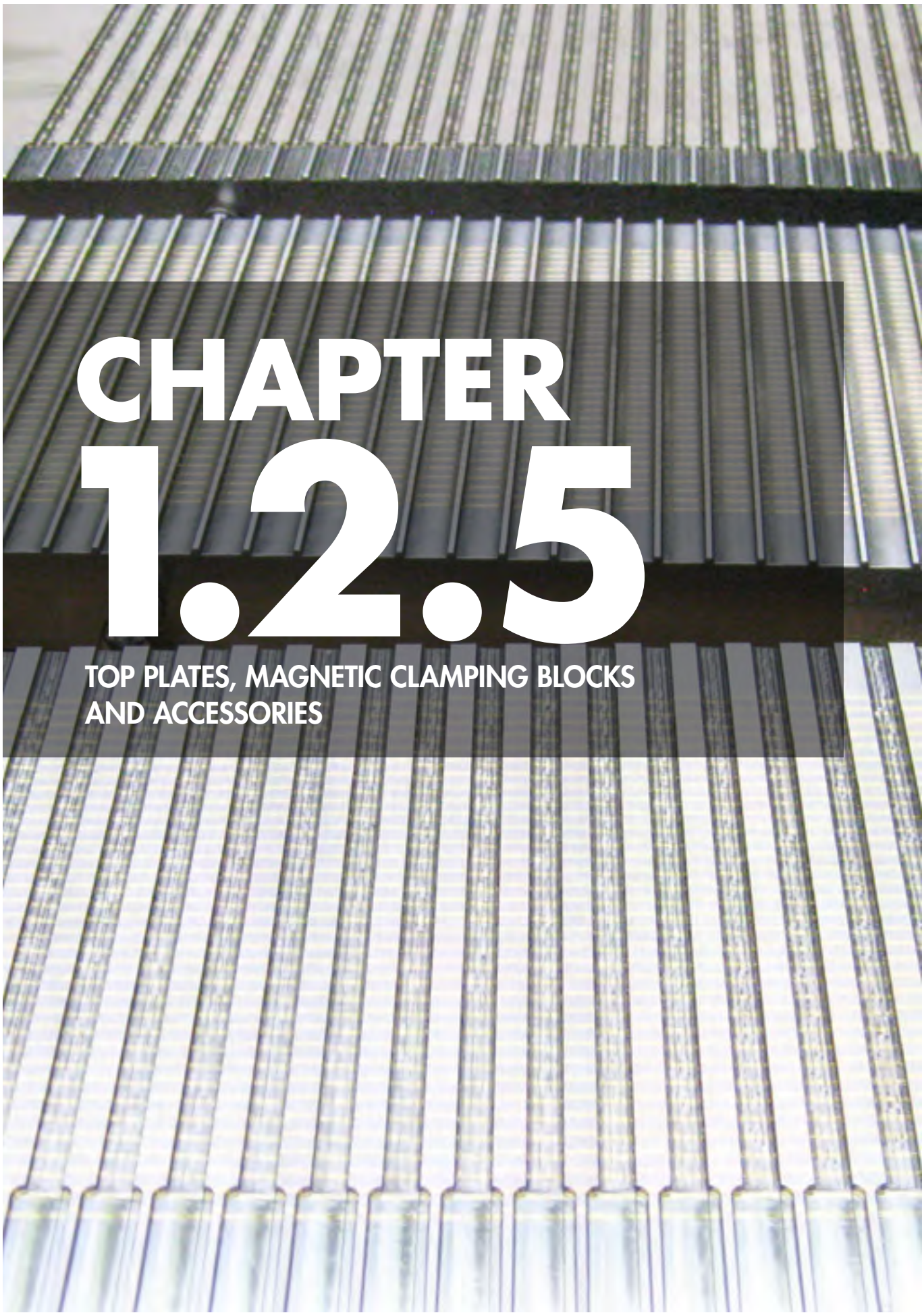
SAV 245.06 as special version

PRECISION SINE TABLE

1600 x 1600 mm with adjustment mechanism



SAV 245.09 as special version



CHAPTER 1.2.5

TOP PLATES, MAGNETIC CLAMPING BLOCKS AND ACCESSORIES

1.2 STANDARD MAGNET SYSTEMS

1.2.5 TOP PLATES, MAGNETIC CLAMPING BLOCKS AND ACCESSORIES

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	SAV ART. NO.	COMMENTS	POLE PITCH	PAGE
LAMINATED TOP PLATES/TOP STRIPS LAMINATED BLOCKS				
	248.01	For placing on round magnets with transverse pole pitch	4 mm	147
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	248.40	For chucking non-magnetic workpieces	–	148
	248.60	For placing on magnetic chucks	4 mm	149
	248.61	Laminated block (set) in plastic case	4 mm	149
PERMANENT MAGNETIC CLAMPING BLOCKS				
	242.01	2 or 3 magnetic chucking areas	1.3 – 4 mm	150
	242.02	With 3 magnetic chucking areas, can be switched on and off	1.5 mm	150
	242.07	1 magnetic chucking area, controllable	–	151
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NEODYMIUM MAGNETIC BLOCKS				
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PERMANENT MAGNETIC BEAMS				
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	242.25	2 magnetic contact surfaces, switched on and off together	Bipolar	154
	242.29	3 magnetic contact surfaces, sealed design	–	155
	242.31	4 magnetic contact surfaces; prism with strong holding force, controllable	Bipolar	155

▸ APPLICATIONS

ELECTRO PERMANENT MAGNETIC SYSTEM

With active longitudinal stops on exchangeable top plates for milling of small notched impact test bending samples

SAV 248.01 LAMINATED TOP PLATES

For placing on circular magnets with parallel pole pitch

APPLICATION

For chucking profiled workpieces on magnets with parallel pole pitch.

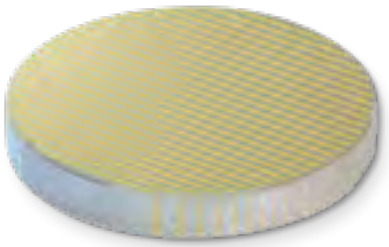
DESIGN

Any type and form of profiles can be machined into the chuck blocks (can also be provided by us). Note maximum machining dimension for this. Attaching to a magnet upon agreement. The pole division must run parallel to the base magnet.

TECHNICAL DATA

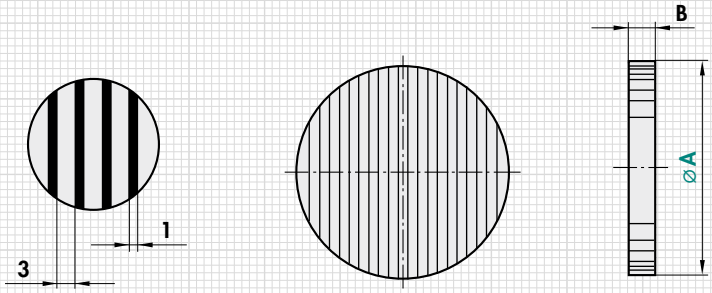
- Pole pitch: 3 mm steel, 1 mm brass
- Maximum integration depth: 8 mm

The machining process can cause discolourations. However, these do not constitute a technical defect.



mm		kg
A	B	Weight
160	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

Designation	SAV no. - A
Laminated top plate	SAV 248.01 - 400

SAV 248.02 LAMINATED TOP PLATES

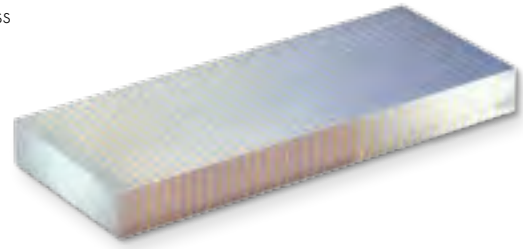
For placing on magnetic chucks with transverse pole pitch

APPLICATION

As top plate for magnets with transverse pole pitch. Can only be used in conjunction with magnetic chuck with parallel divisions. Especially suitable in conjunction with magnetic chuck SAV 243.11 (chuck 1.2.1).

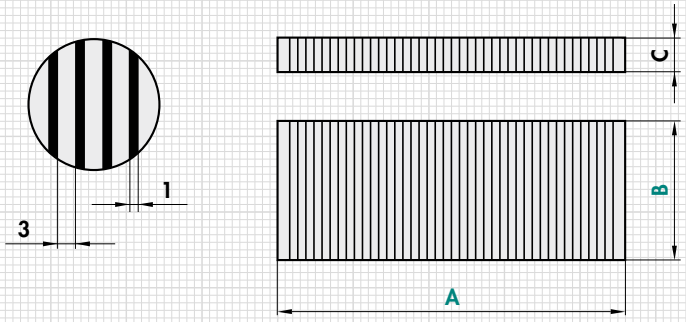
TECHNICAL DATA

- Pole pitch: 3 mm steel, 1 mm brass
- Profile depth: Max. 8 mm



mm			kg
A	B	C	Weight
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 available



ORDERING EXAMPLE

Designation	SAV no. - A x B
Laminated top plate	SAV 248.02 - 250 x 150

SAV 248.03 LAMINATED TOP PLATES

For placing on magnetic chucks with parallel pole pitch

APPLICATION

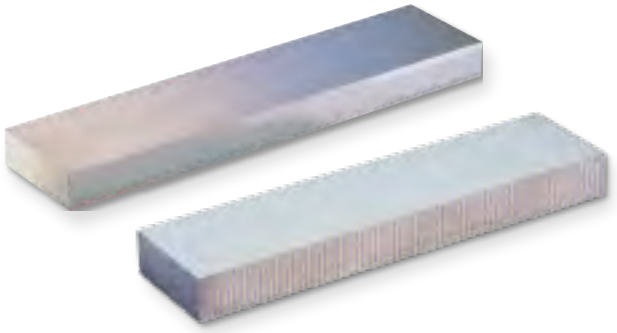
For placing on magnetic chucks with parallel divisions to conduct the magnetic field into the workpiece.

DESIGN

Attaching to a magnet upon agreement.

TECHNICAL DATA

- Pole pitch: 3 mm steel, 1 mm brass
- Profile depth: Max. 8 mm

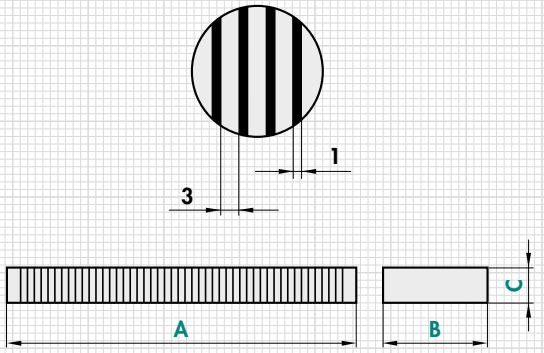


mm			kg
A	B	C	Weight
320	75	25	4.8
650	75	25	9.8
320	100	40	10.1
650	100	40	20.5

Design with longitudinal pole pitch

mm			kg
A	B	C	Weight
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

Version with transverse pole pitch



ORDERING EXAMPLE

Designation	SAV no. - A x B x C
Laminated top plate	SAV 248.03 - 400 x 100 x 40

SAV 248.40 CLAMPING STRIPS

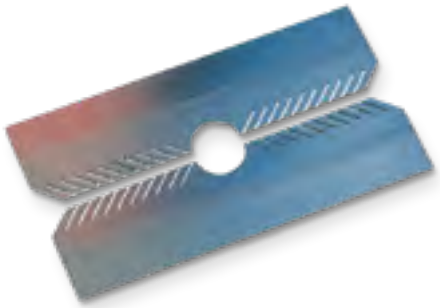
For chucking non-magnetic workpieces

APPLICATION

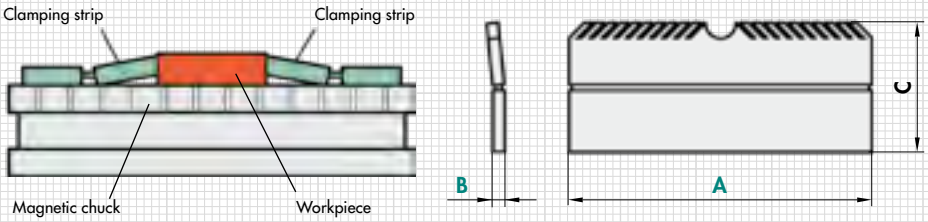
For secure chucking of non-magnetic materials on magnets.

DESIGN

The clamping strips are made of ferromagnetic metal and have a spring-loaded strip on the long side which presses the workpiece onto the contact surface when the magnet is activated (hold-down effect).
Delivered in pairs. Size 100 x 4 without workpiece stop, all other sizes with workpiece stop.



mm			kg
A	B	C	Weight
100	4.0	45	0.3
150	1.0	40	0.1
150	1.6	43	0.2
150	2.8	43	0.35
250	3.7	52	0.7



ORDERING EXAMPLE

Designation	SAV no. - A x B
Clamping strip	SAV 248.40 - 250 x 3.7

SAV 248.60 LAMINATED BLOCKS

For placing on magnetic chucks with parallel pole pitch

APPLICATION

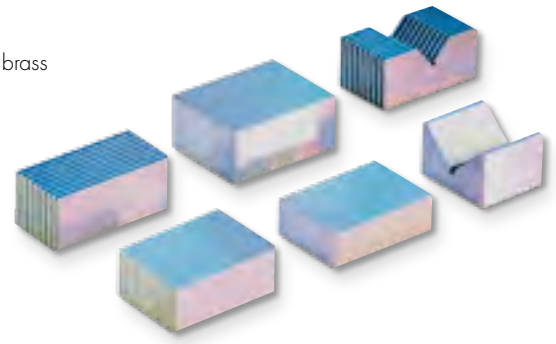
In conjunction with magnetic chucks for parallel pole division direction for machining irregular workpieces.

DESIGN

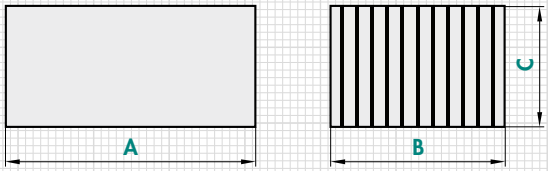
Longitudinal and transverse pole pitch and prisms.

TECHNICAL DATA

- Pole pitch: 3 mm steel, 1 mm brass
- Profile depth: Max. 8 mm



mm					kg
A	B	C	Pole direction	Design	Weight
65	60	40	Transverse pole (Q)	Prism (P)	0.8
72	45	22	Transverse pole (Q)	Flat (E)	0.5
75	60	30	Longitudinal pole (L)	Flat (E)	0.7
80	60	30	Transverse pole (Q)	Flat (E)	0.7
80	80	50	Transverse pole (Q)	Flat (E)	2.5
90	62	33	Longitudinal pole (L)	Flat (E)	0.8
100	50	40	Longitudinal pole (L)	Flat (E)	1.7
100	50	40	Longitudinal pole (L)	Prism (P)	1.0
100	70	41	Transverse pole (Q)	Flat (E)	2.1
100	70	48	Longitudinal pole (L)	Flat (E)	2.7
120	80	50	Transverse pole (Q)	Flat (E)	3.8



ORDERING EXAMPLE

Designation	SAV no. - A x B x C - pole direction - version
Laminated block	SAV 248.60 - 75 x 60 x 30 - L - E

SAV 248.61 LAMINATED BLOCK (SET)

In plastic case

APPLICATION

In conjunction with magnetic chucks for machining irregular workpieces.

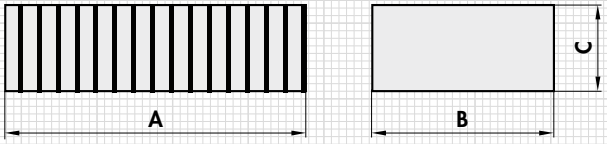
DESIGN

Chuck block set with longitudinal and transverse pole pitch and prisms in a case.

TECHNICAL DATA

- Pole pitch: 3 mm steel, 1 mm brass
- Profile depth: Max. 8 mm
- Total weight: 7.6 kg

mm				
A	B	C	Design	Number of pole blocks
56	32	15	Transverse pole	2 x
96	57	26	Transverse pole	2 x
96	53	22	Longitudinal pole	2 x
56	68	47	With prism	2 x



ORDERING EXAMPLE

Designation	SAV no.
Laminated block (set)	SAV 248.61

SAV 242.01 PERMANENT MAGNETIC CLAMPING BLOCKS

With fine and extra-fine pole pitch

APPLICATION

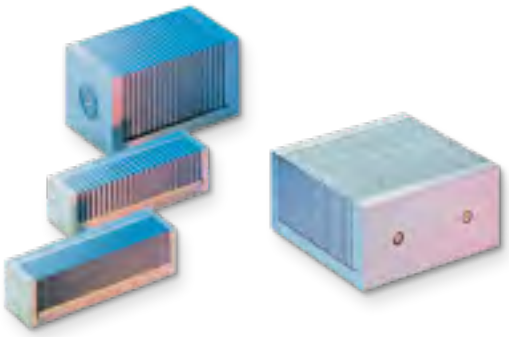
For profiling and machining small workpieces, e.g. dies. For chucking thin parts, we recommend chuck MH 204 with extra-fine pole pitch.

DESIGN

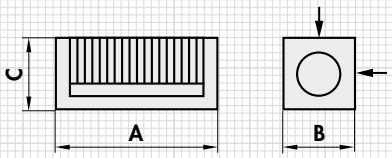
Two or three magnetic chucking areas, pole pitch 4 mm, for MH 204 pole pitch 1.3 mm. Chuck blocks MH 201S to MH 203S made of $SmCo_5$ magnets with extremely high holding force for materials which are difficult to chuck.

TECHNICAL DATA

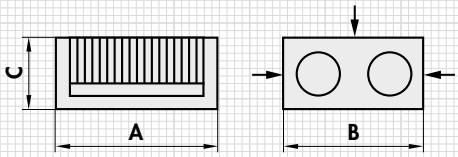
- Rated holding force:
  80 N/cm² for MH 201 to MH 204
  180 N/cm² for MH 201S to MH 203S
- Magnetic field height: 6 mm
- Wear layer of the pole plate:
  14 mm for MH 201 and MH 202
  6 mm for MH 203 and MH 204



Type	mm A	B	C	max. Angle deviation	Qty. Contact surfaces	kg Weight
MH 201 MH 201S	100	100	50	5′	1 area 100 x 100 2 areas 100 x 50	3.6
MH 202 MH 202S	100	50	50	5′	3 areas 100 x 50	1.7
MH 203 MH 203S	100	25	25	5′	2 areas 100 x 25	0.5
MH 204 -	100	25	25	5′	2 areas 100 x 25	0.5



Type MH 203 with MH 202/2 contact surfaces



Type MH 201 with MH 202/3 contact surfaces

ORDERING EXAMPLE

Designation	SAV no. - type
Permanent magnetic clamping block	SAV 242.01 - MH 201

SAV 242.02 PERMANENT MAGNETIC CLAMPING BLOCKS

With three magnetic chucking areas

APPLICATION

For angled and parallel grinding of small and medium workpieces. Suitable as an add-on block for the base magnet on the machine.

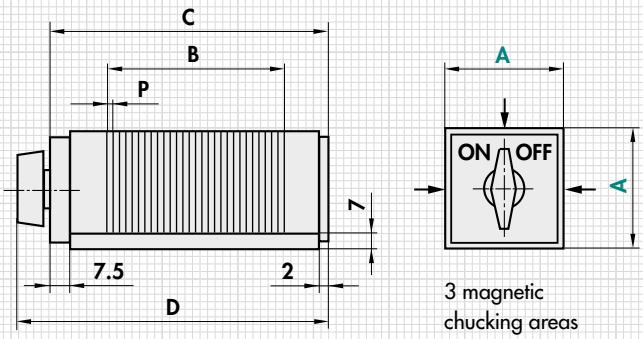
DESIGN

Switched on and off with a rotary knob.
3 magnetic contact surfaces.

TECHNICAL DATA

- Rated holding force: 60 N/cm²
- Magnetic field height: 2 mm
- Pole divisions: 0.5 mm brass/1.0 mm steel

mm A	B	C	D	P	kg Weight
55	90.5	125.5	146	0.5 +1	2.8
70	90.5	125.5	151	0.5 +1	4.0



3 magnetic chucking areas

ORDERING EXAMPLE

Designation	SAV no. - A
Permanent magnetic clamping block	SAV 242.02 - 55

SAV 242.07 PERMANENT MAGNETIC CLAMPING BLOCKS

Switchable

APPLICATION

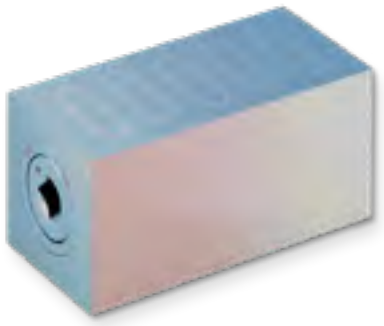
In conjunction with magnetic chucks for grinding workpieces with protruding sections, narrow sides, gauges, etc.

DESIGN

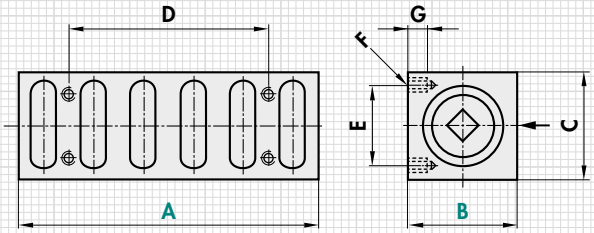
Switchable permanent magnet with chucking area at the top.
Side surfaces ground at an angle to one another.

TECHNICAL DATA

- Rated holding force:
  A = 115: 2.5 N/cm²
  A = 135: 6.0 N/cm²



mm							kg
A	B	C	D	E	F	G	Weight
115	40	40	75	30	M 5	7	1.3
135	50	60	80	40	M 6	10	2.9



ORDERING EXAMPLE

Designation	SAV no. - A x B
Permanent magnetic clamping block	SAV 242.07 - 135 x 50

SAV 242.11 PERMANENT MAGNETIC CLAMPING BLOCKS

With four magnetic chucking areas, also as a stainless version

APPLICATION

For angled and parallel grinding of small and medium workpieces.

DESIGN

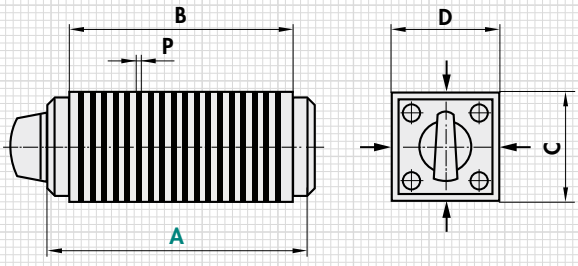
Sturdy design with good magnetic force.
Pole divisions made of 2 mm brass/
2 mm steel.

TECHNICAL DATA

- Standard rated holding force: 50 N/cm²
- Rated holding force, stainless (RF): 30 N/cm²
- Magnetic field height: 2 mm
- Wear layer of the pole plate: 4 mm

SAV 242.11 - RF consisting of stainless, high-alloy chrome steel poles. Primarily suitable for use on EDM machines.

mm					kg
A	B	C	D	P	Weight
140	115	65	65	2 + 2	3.1
160	135	65	65	2 + 2	4.0



4 magnetic chucking areas

ORDERING EXAMPLE

Designation	SAV no. - A - version
Permanent magnetic clamping block	SAV 242.11 - 140 - RF

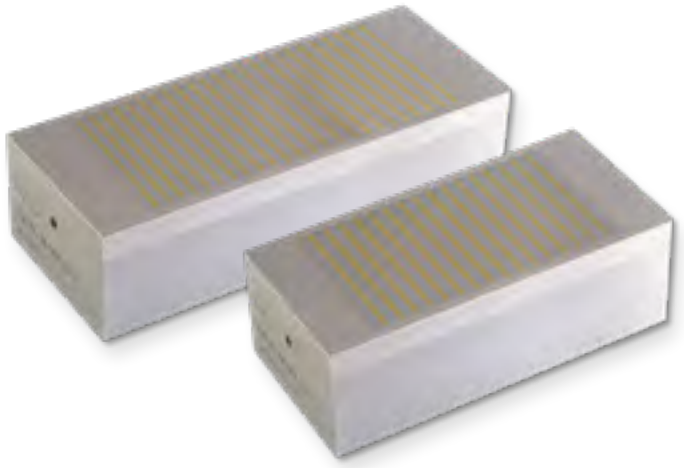
SAV 242.05
SAV 242.12

NEODYMIUM MAGNETIC BLOCKS

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

APPLICATION

For workpieces which are difficult to chuck, e.g. Ferro-Tic, tungsten carbide with cobalt content, very small workpieces. For fast and easy chucking – also for workpieces with complicated EDM contours or workpieces which are difficult to chuck.



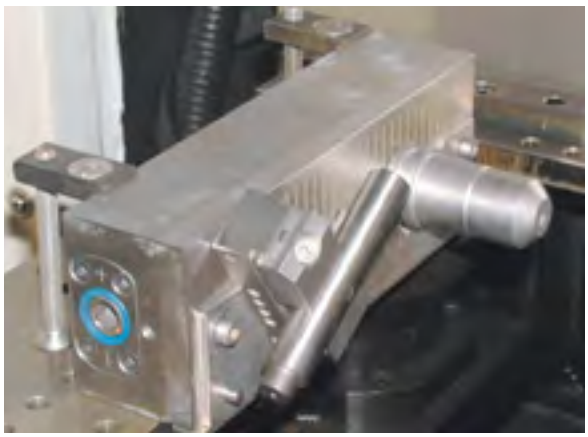
DESIGN

Extremely high holding force using a specially developed process. Sturdy solid steel body. ON/OFF control on the face side. Larger versions also available with force-actuated control mechanism on request. Pole divisions made of 4 mm steel and 2 mm brass with NdFeB magnets in the pole gap.

AS STAINLESS VERSION SAV 242.12

High holding force due to specially developed process. Sturdy solid steel body. ON/OFF control on the face side. Precision-ground version.

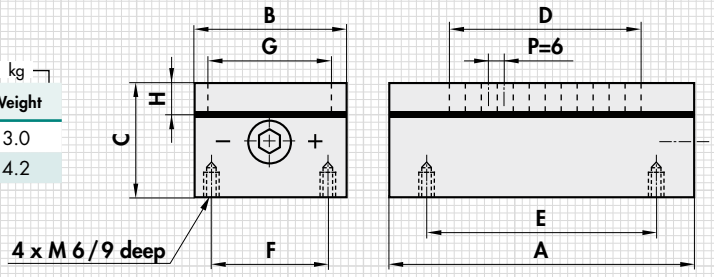
Housing, ON-switch and pole grid stainless, poles made of steel.



TECHNICAL DATA

- Rated holding force on inducible steel surface: 180 N/cm²
- Rated holding force: 120 N/cm²
- Magnetic field height: approx. 4 mm
- Wear layer of the pole plate: 3 mm
- Available with adaptation for zero-point workholding system

	mm								kg
Type	A	B	C $^{+0.5}_{-2}$	D	E	F	G	H	Weight
ND 100	140	70	51	102	118	35	62	12	3.0
ND 200	200	70	51	157	178	36	62	12	4.2



1 magnetic chucking area

ORDERING EXAMPLE

Designation	SAV no. - type
Neodymium magnetic block	SAV 242.05 - ND 100

ORDERING EXAMPLE

Designation	SAV no. - type
Neodymium magnetic block, stainless	SAV 242.12 - ND 100

SAV 243.15 PERMANENT MAGNETIC BEAMS

With transverse pole pitch top and bottom

APPLICATION

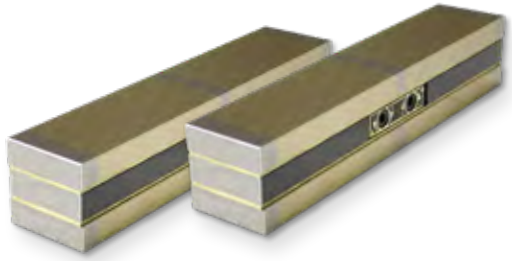
As a workholding fixture for holding workpieces on EDM machines and machine tools, for jigs, etc.

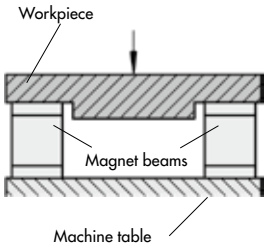
DESIGN

Two opposite chucking areas, separate switching. Only available in pairs. Low magnetic field due to fine pole pitch.

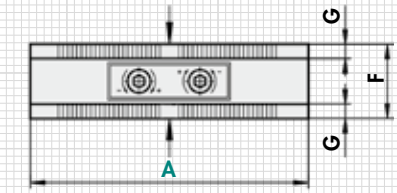
TECHNICAL DATA

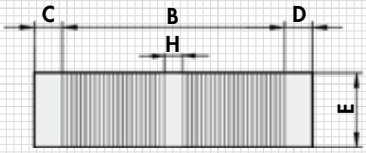
- Parallelism: 0.02 mm
- Pole pitch: 1.3 mm
- Magnetic field height: 6 mm
- Wear layer of the pole plate: 6 mm





mm								N	kg
A	B	C	D	E	F	G	H	Rated force	Weight
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





2 magnetic chucking areas

ORDERING EXAMPLE

Designation	SAV no. - A
Permanent magnetic beam	SAV 243.15 - 125

SAV 242.21 PERMANENT MAGNETIC V BLOCKS

Four magnetic contact surfaces

APPLICATION

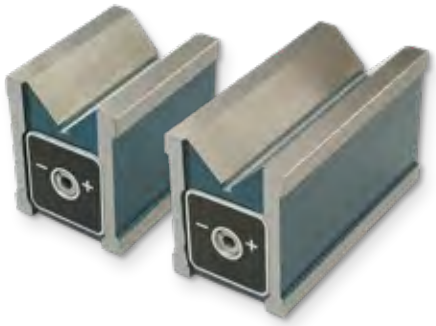
Positioning

DESIGN

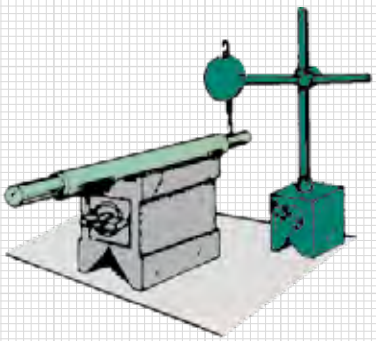
4 magnetic contact surfaces (top and bottom and 2 face sides) which are switched on and off together.
2 opposite control points including removable key. Wooden storage box SAV 539.02 - HK2 available (surcharge applies).
Available individually (**S**) and in pairs (**P**). The prism pair is ground to the same height.

TECHNICAL DATA

- Plane parallelism: < 0.01 mm
- Prism angle: 90°



mm					daN	kg
Length	Width	Height	Workpiece diameter	Width of large prism	Rated holding force	Weight
80	60	73	6 - 50	38	30	2.0
125	60	73	6 - 50	38	45	3.3



ORDERING EXAMPLE

Designation	SAV no. - length
Permanent magnetic V block	SAV 242.21 - 125

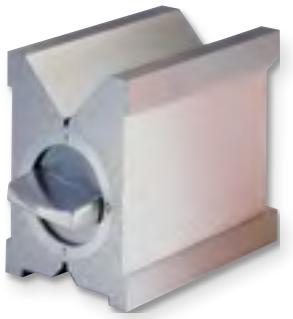
SAV 242.22 PERMANENT MAGNETIC V BLOCKS

Individually and in pairs

APPLICATION
Positioning

DESIGN
2 magnetic contact surfaces which are switched on and off together (large prism and opposite prism). Available individually (**S**) and in pairs (**P**). Wooden storage box SAV 539.02-HK2 (for S) and SAV 539.04-HK4 (for P) (surcharge applies).

TECHNICAL DATA
- Perpendicularity: 0.004 mm
- Parallelism: 0.004 mm
- Prism angle: 90°



mm				daN	daN	kg
Length	Width	Height	Workpiece diameter	Rated holding force, prism	Rated holding force, surface	Weight
80	67	96	6 - 66	40	90	2.9
100	70	96	6 - 70	40	120	3.8

ORDERING EXAMPLE

Designation	SAV no. - length - individual or pair
Permanent magnetic V block	SAV 242.22 - 100 - S

SAV 242.25 PERMANENT MAGNETIC V BLOCKS

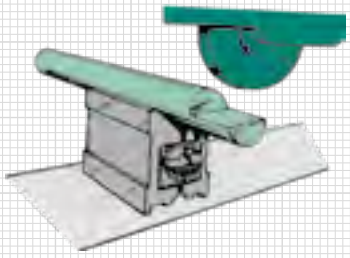
With two magnetic chucking areas

APPLICATION
Positioning

DESIGN
2 magnetic contact surfaces which are switched on and off together (large prism and opposite prism). Measuring surface and prism hardened. Available individually (**S**) and in pairs (**P**). Wooden storage box SAV 539.04 - HK4 available (surcharge applies).

TECHNICAL DATA
- Perpendicularity 0.004 mm
- Parallelism: 0.004 mm
- Prism angle: 90°

mm				kg
Length	Width	Height	Workpiece diameter	Weight
80	67	96	6 - 66	2.85
100	70	96	6 - 70	3.80



ORDERING EXAMPLE

Designation	SAV no. - length - individual or pair
Permanent magnetic V block	SAV 242.25 - 100 - S

SAV 242.29 PERMANENT MAGNETIC V BLOCKS

Sealed version

DESIGN

3 magnetic contact surfaces (top surface with prism and 2 faces).
Including removable key. Strong, switchable permanent magnet.
2 prisms ground together at the same height
Fully sealed.
Wooden storage box available (surcharge applies). Supplied in pairs.

TECHNICAL DATA

- Prism angle: 90°

mm					daN	kg	
Length	Width	Height	Width of prism	Workpiece diameter	Rated holding force	Weight	Wooden box order no.
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

Designation	SAV no. - length
Permanent magnetic V block	SAV 242.29 - 100

SAV 242.31 PERMANENT MAGNETIC CLAMPING BLOCKS

With strong prism

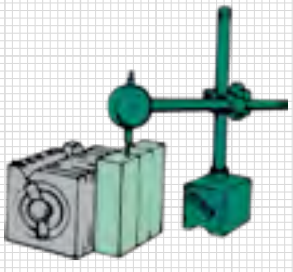
DESIGN

4 magnetic contact surfaces (top surface, bottom surface prism and 2 sides).
Including removable key. Strong, switchable permanent magnet.

TECHNICAL DATA

- Perpendicularity: 0.025/100 mm
- Parallelism: 0.015/100 mm
- Prism angle: 90°

mm			Workpiece diameter in mm		Rated holding force in daN		kg
Length	Width	Height	Main prism	Secondary prism	Main prism	Secondary prism	Weight
80	80	80	10 - 25	8 - 15	12	10	3.5
125	125	125	10 - 40	10 - 26	30	12,5	14.0
180	180	180	14 - 50	14 - 50	40	30	37.0



ORDERING EXAMPLE

Designation	SAV no. - length
Permanent magnetic clamping block	SAV 242.31 - 180

CHAPTER 1.2.6

ELECTRO HOLDING MAGNETS

1.2 STANDARD MAGNET SYSTEMS

1.2.6 ELECTRO HOLDING MAGNETS

E
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ELECTRO HOLDING MAGNETS			
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▸ APPLICATIONS

Electro magnetic chucks SAV 241.31 as special version with tapered pole for bulk materials.

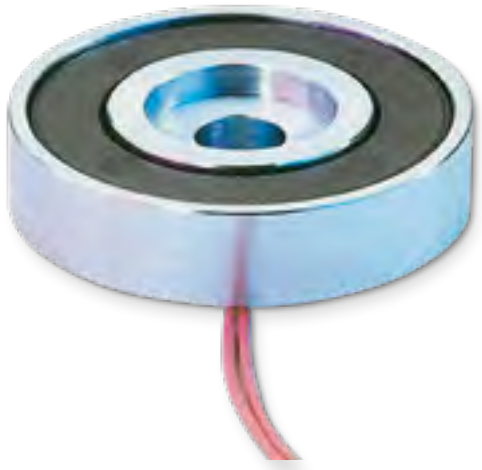
just experts.

SAV 241.29 ELECTRO HOLDING MAGNETS

Flat design

APPLICATION

Due to the extremely low height, these chucks are primarily used in handling applications. The magnet is active when switched on and is used for holding ferromagnetic workpieces. To achieve the rated holding force, the steel surfaces of the contact side must be fully covered by the workpiece.



DESIGN

The chucks consist of an electro magnetic holding system.
Depending on the area of application, the applicable accident prevention regulations must be observed. For devices of protection class 1, the user must ensure the PE connection as per VDE 0100 par. 6.

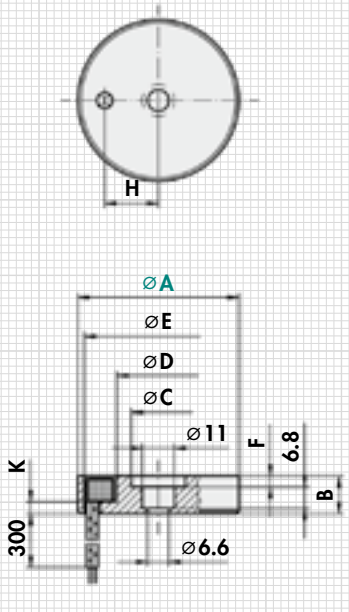
TECHNICAL DATA

The technical information (chapter 1.4) must be observed when using the devices.

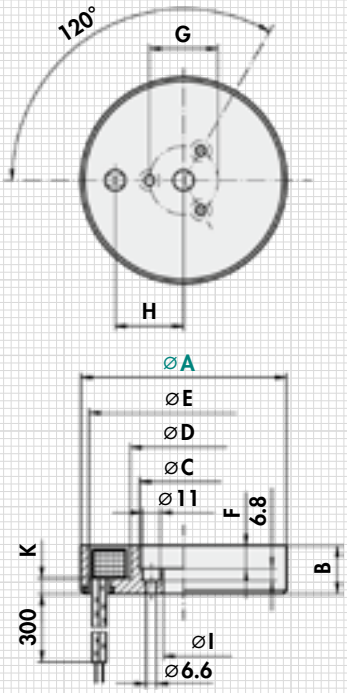
- Rated voltage: 24 V DC
- Duty cycle: 100 % duty cycle
- Protection rating: IP 65 (as per DIN 40050)
- Insulation material class: E

INFORMATION ON TECHNICAL DATA:

The max. holding forces are stated for steel 1.0037 and refer to the optimum workpiece thickness with an air gap of δL = 0 mm and 100 % coverage of the contact surface. The values are listed for 90 % rated voltage and at operating temperature (approx. 60 K overtemperature without additional heat dissipation).
If different conditions apply to the application, the rated holding force is reduced (see Technical information, chapter 1.4). For safety reasons, a safety factor should be used depending on the application.
The table values for the rated capacity are maximum values for determining the electrical accessory parts and refer to 20 °C excitation winding temperature at rated voltage (VDE 0580/10.70 § 9.1). During operation, the rated power reduces depending on the proportional duty cycle.
The chuck is fastened from the front using cheese-head screws.



SAV 241.29 - 56



SAV 241.29 - 110 and -170

mm										N	mm	W	kg
A $^{+0,1}_{-0,3}$	B	C	D	E	F	G	H	I	K	Rated holding force	Optimum coverage thickness	Power	Weight
56	13	23	32	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	19	76	76.4	60	9.0	5000	>10.0	31.4	3.00

ORDERING EXAMPLE

Designation	SAV no. - A
Electro holding magnet	SAV 241.29 - 170

SAV 241.31 ELECTRO HOLDING MAGNETS

In two connection types

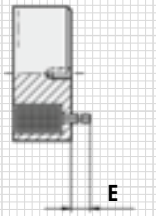
APPLICATION

Electro holding magnets provide workholding of ferromagnetic workpieces. Their use can offer substantial benefits in toolmaking, in production and in the turnaround of small and large bulk parts. To achieve the rated holding force, the steel surfaces of the contact side must be fully covered by the workpiece.

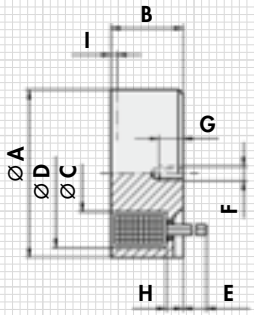
TECHNICAL DATA

The max. holding forces FH are provided for steel 1.0037 and refer to the optimum workpiece density with an air gap δL = 0 mm and 100 % coverage of the contact surface at 90 % of the rated voltage and at operating temperature (approx. 70 K overtemperature without additional heat dissipation).
If different conditions apply to the application, the holding force will be lower.

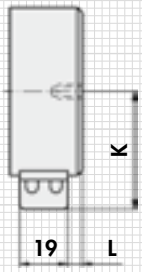
- Rated voltage: 24 V DC
- Duty cycle: 100 % duty cycle
- Insulation material class: E



SAV 241.31
- A 01 with free wire ends and straight cable outlet



SAV 241.31
Type A with free wire ends



SAV 241.31
Type B with terminal

	mm											N	mm	W	kg
Type and size	A ±0.1	B	C	D	E	F	G	H	I	K	L	Rated holding force	Optimum coverage thickness	Rated power	Weight
A 01	18	11.0	8.0	16.1	200	M 3	5	2.5	1	-	-	45	>2.0	1.4	0.02
A/B 02	25	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	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	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	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	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	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	43.0	42.8	91.3	300	M 10	15	10.0	3	-	-	3400	>10.5	20.5	2.10
A 15	150	56.0	67.9	134.0	300	M 16	24	16.5	3	-	-	9300	>17.0	37.0	6.40
A 18	180	63.0	84.8	161.0	300	M 24	36	20.5	3	-	-	15000	>21.0	50.0	10.50
A 25	250	80.0	117.5	223.0	300	M 24	36	28.5	3	-	-	30000	>29.0	90.0	25.90

ORDERING EXAMPLE

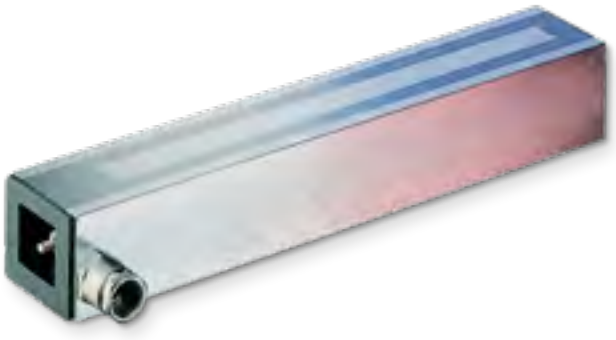
Designation	SAV no. - type and size
Electro holding magnet	SAV 241.31 - A 01

SAV 241.32 ELECTRO MAGNETIC BARS

With high holding forces

APPLICATION

Type C devices are suitable for holding parts with flat surfaces, while type D devices can be used for parts with uneven or scaled surfaces. To achieve the rated holding force, the steel surfaces of the contact side must be fully covered by the workpiece.



DESIGN

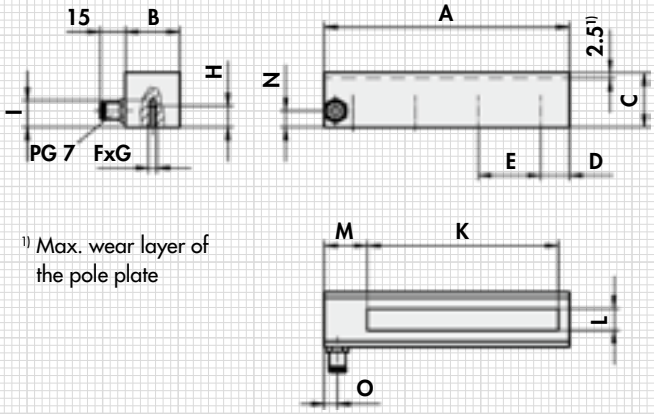
The electro magnetic bar chucks are direct-current workholding systems. The magnet is active when switched on and is used for holding ferro-magnetic workpieces. Tapped holes are provided on the underside for fastening. 2 easily accessible screws inside the device are provided for the electrical connection. In addition, a PG gland is provided for attaching a strain-relieved cable. This gland can be screwed in either from the side or from underneath. When working with electromagnetic bar chucks, the corresponding accident prevention regulations must be observed depending on the application.

TECHNICAL DATA

- Rated voltage: 24 V DC
- Insulation material class: E
- Protection rating: Device IP 53 (as per DIN 40050 connection IP 00)
- Duty cycle: 100 % duty cycle

INFORMATION ON TECHNICAL DATA:

The table values for the rated capacity are maximum values for determining the electrical accessory parts and refer to 20 °C excitation winding temperature at rated voltage (VDE 0580/10.70 § 9.1). During operation, the rated power reduces depending on the proportional duty cycle. The pole pitch and its influence on the action principle is described in the technical information. The max. holding forces FH are provided for steel 1.0037 and refer to a plate thickness of > 8 mm for type C and > 10 mm for type D. The forces are listed for an air gap δL = 0 mm and 100 % coverage of the contact surface, 90 % of the rated voltage and at operating temperature (approx. 50 K overtemperature without additional heat dissipation).
If different conditions apply to the application, the rated holding force is reduced (see Technical information, chapter 1.4).
For safety reasons, a safety factor should be used depending on the application.



¹⁾ Max. wear layer of the pole plate

	mm															N	W	kg
Type and size	A	B	C	D	E	F	G	H	I	K	L	M	N	O	Pole step	Rated holding force	Rated power	Weight
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	0.65
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	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	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	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	3.75
D 07	151.5	60	49	30	75	2	M 8	12	15.0	93.5	12	36.5	18	10.0	30	2600	22	2.35
D 08	201.5	60	49	35	120	2	M 8	12	15.0	143.5	12	36.5	18	10.0	30	3750	31	3.20
D 09	501.5	60	49	35	140	4	M 8	12	15.0	443.5	12	36.5	18	10.0	30	10400	70	9.20

ORDERING EXAMPLE

Designation	SAV no. - type and size
Electro magnetic bar	SAV 241.32 - D 09

SAV 241.40 PERMANENT ELECTRO HOLDING MAGNETS

Electrically deactivated permanent magnets

APPLICATION

Because the permanent electro magnetic workholding system is active when the device is de-energised, these chucks are preferably used where long holding times are required and no holding force is required only for short periods or occasionally. They are also used as safety magnets in transport systems and lifting gear, as the load is reliably held during a power failure. To achieve the rated holding force, the steel surfaces of the contact side must be fully covered by the workpiece.

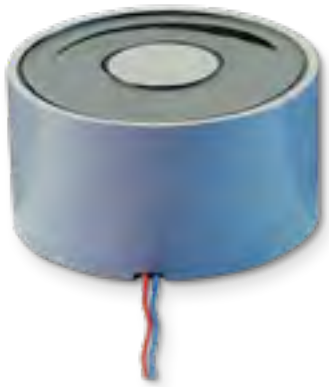
DESIGN

The chucks consist of a permanent magnet system for holding ferromagnetic workpieces and an excitation winding which neutralises the magnetic field on the contact surface when activated, allowing the workpiece to be removed or the load to be released.
Depending on the application, the applicable accident prevention regulations must be observed.

TECHNICAL DATA

The technical information (chapter 1.4) must be observed when using the devices.

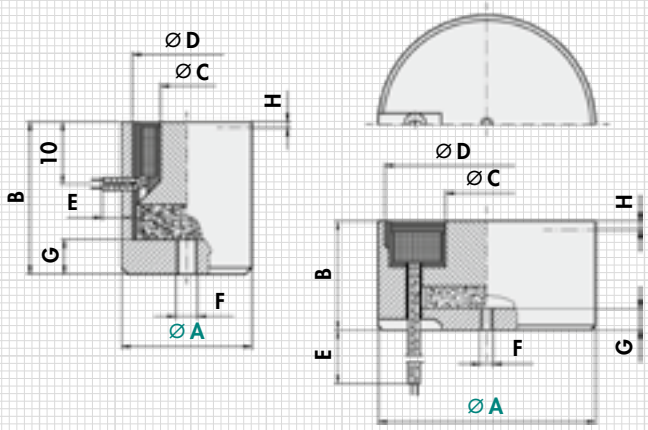
- Rated voltage: 24 V DC
- Insulation material class: E
- Protection rating: Device IP 65 (as per DIN 40050)
- Duty cycle: 25 % duty cycle with a cycle time of < 2 min or 40 % duty cycle with a cycle time of < 0.5 min



The relative duty cycle is:

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

A reliable deactivation of the permanent magnet system is achieved if the stated values for the duty cycle and cycle time are observed and at a rated voltage of +5 % or -10 %. This ensures reliable releasing of the magnetically held parts. The occurring residual force is then max. 3 % of the rated holding force. During continuous operation, this chuck is not thermally overloaded. The overtemperature of the excitation winding occurring during this process, however, increases the residual holding force.



mm								N	mm	W	H	H	kg
A	B	C	D	E	F	G	H	Rated holding force*	Optimum coverage thickness	Rated power	Inductance, occupied	Inductance, unoccupied	Weight
20	22	9.0	18.0	200	M 4	5	1	40	>2.5	3.6	0.11	0.80	0.04
35	28	11.2	33.0	200	M 4	5	2	160	>3.0	4.6	1.12	4.90	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 rated holding forces stated refer to 100 % coverage of the contact surface with a workpiece made of steel 1.0037, polished, and optimum coverage thickness.

ORDERING EXAMPLE

Designation	SAV no. - A
Permanent electro holding magnet	SAV 241.40 - 150

SAV 241.41 PERMANENT ELECTRO HOLDING MAGNET

Electrically deactivated permanent magnet

APPLICATION

Because the permanent electro magnetic workholding system is active when the device is de-energised, these chucks are preferably used where long holding times are required and no holding force is required only for short periods or occasionally. They are also used as safety magnets in transport systems and lifting gear, as the load is reliably held during a power failure. To achieve the rated holding force, the steel surfaces of the contact side must be fully covered by the workpiece.

DESIGN

The chucks consist of a permanent magnet system for holding ferromagnetic workpieces and an excitation winding. When activated, the excitation winding neutralises the magnetic field on the contact surface and the workpieces can be removed/released. If the excitation winding is switched concordantly, the rated force increases.
Depending on the area of application, the applicable accident prevention regulations must be observed.

TECHNICAL DATA

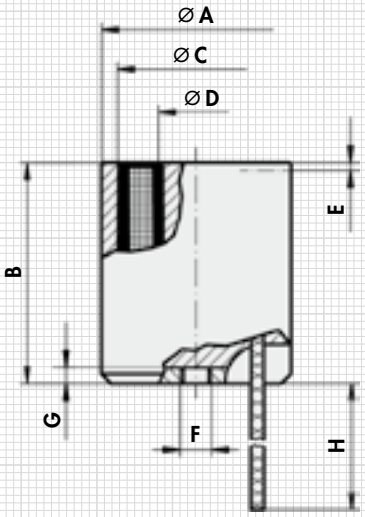
The technical information (chapter 1.4) must be observed when using the devices.

- Rated voltage: 24 V DC
- Insulation material class: E
- Protection rating: Device IP 65 (as per DIN 40050)
- Duty cycle: 100 % duty cycle

INFORMATION ON TECHNICAL DATA:

The max. holding forces are stated for steel 1.0037 and refer to the optimum workpiece thickness with an air gap of δL = 0 mm and 100 % coverage of the contact surface. The values are listed for operating temperature. No thermal overload occurs with continuous operation. The occurring overtemperature, however, increases the residual holding force.

If different conditions apply to the application, the rated holding force is reduced (see Technical information, chapter 1.4).
For safety reasons, a safety factor should be used depending on the application.
The table values for the rated capacity are maximum values for determining the electrical accessory parts and refer to 20 °C excitation winding temperature at rated voltage (VDE 0580/10.70 § 9.1). During operation, the rated power reduces depending on the proportional duty cycle.



mm								N	mm	V	W	kg
A	B	C	D	E	F	G	H	Rated holding force	Optimum coverage thickness	Deactivation voltage	Power	Weight
32.2	40	28	15.5	2	M 4	5	200	260	>10.0	24	6	0.2

ORDERING EXAMPLE

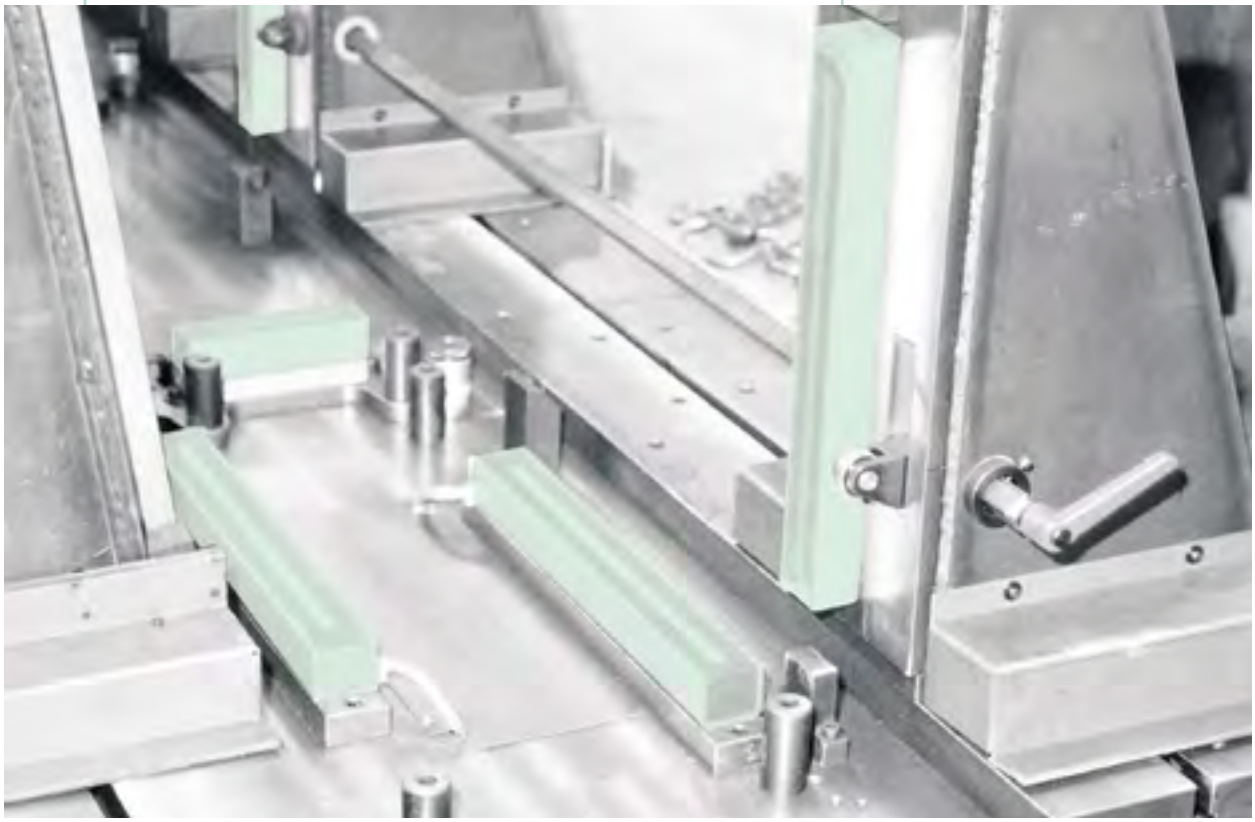
Designation	SAV no.
Permanent electro holding magnet	SAV 241.41

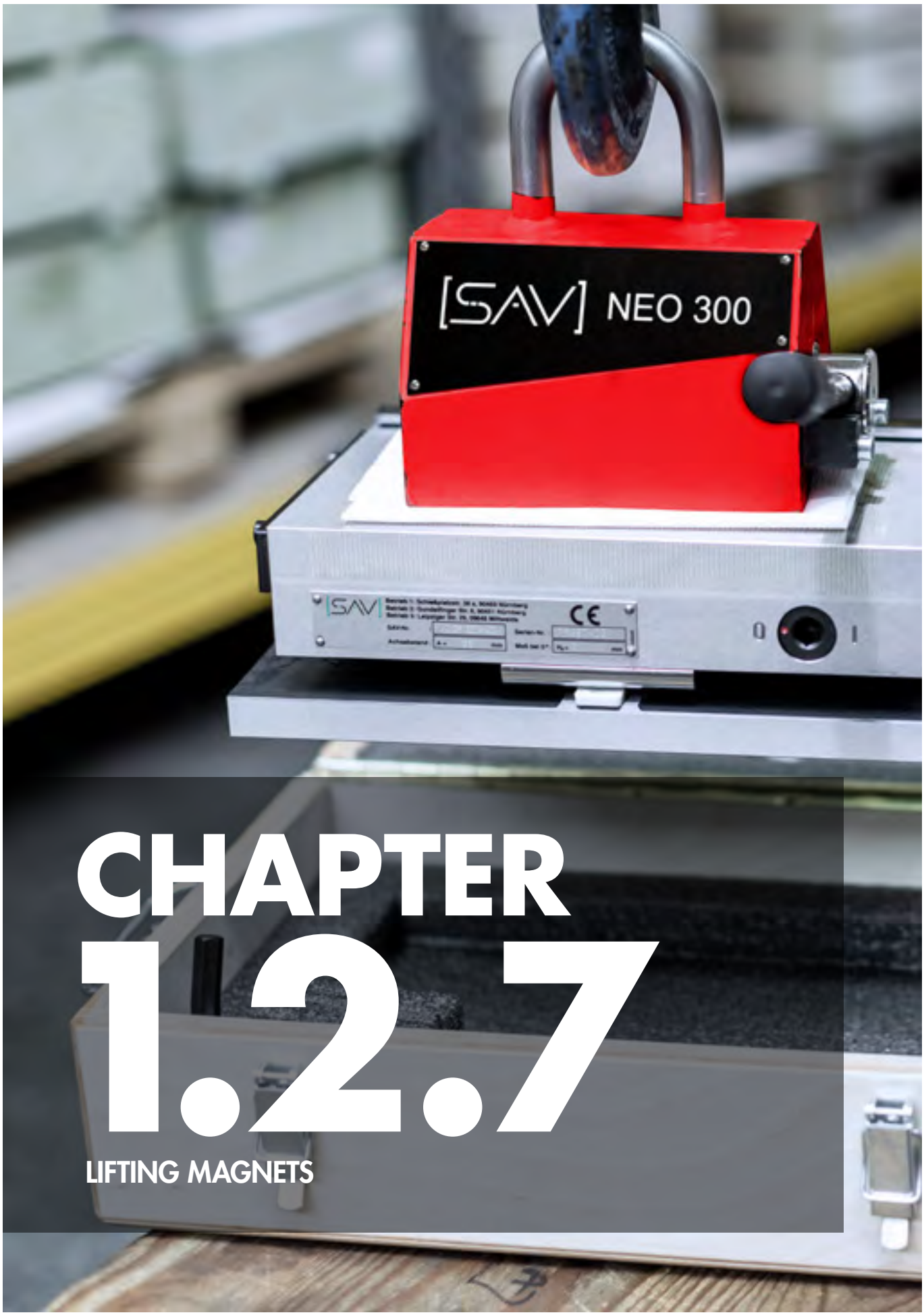
APPLICATIONS

Magnetic welding fixture,
special version.
Details see below.

Detail: Positioning with mechanical stops.

Chucking is achieved with electro magnetic bars SAV 241.32, type D.





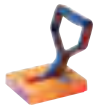
CHAPTER 1.2.7

LIFTING MAGNETS

1.2 STANDARD MAGNET SYSTEMS

1.2.7 LIFTING MAGNETS

PAGES 166 – 169

	SAV ART. NO.	COMMENTS	PAGE
LIFTING MAGNETS			
	531.01	Permanent lifting magnets	166
	531.42	Battery lifting magnets	167
	531.20	Permanent magnetic claws	168
	531.92	Permanent magnet transport lifters	168

▸ APPLICATION

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SAV 531.01 PERMANENT LIFTING MAGNETS

APPLICATION

For lifting and transporting loads up to 2000 kg. Manually actuated magnets for individual use.

SPECIAL FEATURES

- Powerful neodymium magnets offer maximum carrying capacity on uneven and rough contact surfaces.
- SAV lifting magnets are tested individually and delivered with a test certificate.
- The pull-off force is at least triple the carrying capacity
- The carrying capacity for round materials is at least 50 % of the load bearing capacity for flat materials
- Easy-to-operate lever with safety interlock
- Compact, robust and reliable

APPLICATIONS

- Loading and unloading of machine tools
- Handling of bars and profiles in the warehouse
- Handling of panels, tubes, bars and profiles in steel construction

Model 150:
Milling machine loading and unloading

Model 300:
Cast part on machining centre

Model 1200:
Solid round material

Model 2000:
Heavy component

Model		150	300	600	1200	2000
Rated carrying capacity*						
▪ Flat materials	kg	150	300	600	1200	2000
▪ Round materials	kg	65	150	300	600	1000
Minimum thickness	mm	2	4	6	10	15
Min./max. diameter	mm	40/100	60/200	65/270	100/300	150/350
Length x width	mm	93 x 60	152 x 100	246 x 120	306 x 146	480 x 165
Height to crane hook	mm	110	164	164	216	253
Weight	kg	2.6	10.0	20.0	40.0	90.0

* Rated carrying capacity:
Maximum weight for parts made of steel S235JR with polished contact surface, sufficient size and thickness.
The carrying capacity varies with the material, strength, size and surface quality.

ORDERING EXAMPLE

Designation	SAV no. - model
Permanent lifting magnet	SAV 531.01 - 150

SAV 531.42 BATTERY LIFTING MAGNETS

APPLICATION

For lifting and transporting loads up to 5000 kg without power supply. Autonomous electro magnet for individual use with infrared control.

SPECIAL FEATURES

- Robust steel housing with control and charging unit and maintenance-free 12 V battery.
- A switch on the lifting eye prevents switching off during the lifting process
- Loading level indicator, optical/acoustic alarm signal for undercurrent and low battery capacity
- Activation is blocked if the battery voltage is low
- Operation with infrared control with 10 m range or on the magnet
- Modern electronics with short reaction time
- Delivery includes battery, infrared transmitter, operating instructions and test certificate
- Complies with European directives and standards
- With variable holding force and function for dropping thin plates so the rest can be transported safely; operated with infrared remote control
- **BM model** – flat version with one or two magnets for lifting flat materials. BM model designed for sheet metal up to 6000 x 3000 mm.
- **BMP model** – with prism and deep magnetic field for lifting profiles, tubes and round materials

BM 2500

APPLICATIONS

- In steel construction and at shipyards for transporting sheet metal and profiles:
  - Loading and clearing flame cutting or laser cutting machines
  - Loading and unloading of machine tools
- For material handling in the steel trade
- Transport of heavy moulds, cast and forged parts

BMP 1800

Model		BM 1350	BM 2500	BM 3600	BM 5000	BMP 1800	BMP 3600
Design		Flat 1 magnet	Flat 1 magnet	Flat 1 magnet	Flat 2 magnets	Prismatic 1 magnet	Prismatic 1 magnet
Rated carrying capacity*							
▪ Flat materials	kg	1350	2500	3600	5000	1800	3600
▪ Round materials	kg	-	-	-	-	1130	2200
Min./max. diameter	mm					45/440	45/500
Length x width	mm	272 x 242	400 x 242	1050 x 240	1200 x 300	470 x 242	760 x 262
Height to crane hook	mm	460	460	460	460	610	630
12 V battery	Ah	35	75	75	75	75	75
50 % duty cycle	h	8	8	8	8	8	8
Charging voltage	VAC	230	230	230	230	230	230
Weight	kg	54.0	105.0	180.0	230.0	144.0	395.0

* Rated carrying capacity:
Maximum weight for parts made of steel S235JR with polished contact surface, sufficient size and thickness.
The carrying capacity varies with the material, strength, size and surface quality.

ORDERING EXAMPLE

Designation	SAV no. - model
Battery lifting magnet	SAV 531.42 - BM 1350

SAV 531.20 PERMANENT MAGNETIC CLAWS

APPLICATION
For crane lifting of workpieces which can no longer be transported by hand

DESIGN
Sturdy design with hand lever for easy releasing of the workpieces (sheet metal, etc.).
Both types are suitable for horizontal and vertical lifting.
Particularly suitable for lifting sheet metal from 4 mm thickness.

Rated holding force	daN	250	300
Rated drag force	daN	100	125
Release force, max.	daN	750	900
Length	mm	290	290
Width	mm	125	180
Weight	kg	7.5	10.5

ORDERING EXAMPLE

Designation	SAV no. - rated holding force
Permanent magnetic claw	SAV 531.20 - 250

SAV 531.92 PERMANENT MAGNET TRANSPORT LIFTERS

APPLICATION
For transporting and lifting sheet metal.

DESIGN
High magnetic force, sturdy design. GS-tested safety. With very high holding force, approx. 85 times of its own weight.

Rec. holding force*	daN	120*	170*	300*
Release force	daN	240*	340*	600*
Drag force	daN	70	100	180
Length	mm	140	140	160
Width	mm	84	116	180
Weight	kg	1.4	1.8	3.5

* measured on drawn material steel 1.0037 K, 25 mm thick

ORDERING EXAMPLE

Designation	SAV no. - holding force
Permanent magnet transport lifter	SAV 531.92 - 300

ELECTRO LIFTING MAGNETS – SPECIAL VERSION

SIZE
540 x 430 mm

WORKPIECE
Railway rails

APPLICATION
Lifting

DESCRIPTION
- Special version
- Strong magnet system for large air gaps
- Version for open-air operation

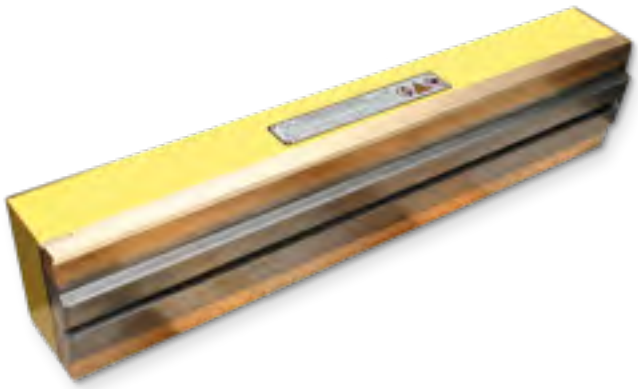
SPECIAL ELECTRO PERMANENT HANDLING MAGNETS

SIZE
500 x 160 mm

WORKPIECES
Linear guideways

APPLICATION
Handling

DESCRIPTION
- Special version
- Low volume and weight
- Version with optimised holding force



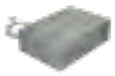
CHAPTER 1.2.8

DEMAGNETISERS AND ACCESSORIES

1.2 STANDARD MAGNET SYSTEMS

1.2.8 DEMAGNETISERS AND ACCESSORIES

PAGES 172 – 175

	SAV ART. NO.	COMMENTS	MACHINING PROCESS*	PAGE
TABLE DEMAGNETIZERS				
	890.02	For use in measuring rooms, workshops and production lines		172
TUNNEL DEMAGNETISERS				
	890.42	For demagnetising large-area, thin-walled production workpieces		172
	890.43	For automatic demagnetising of workpieces on the production line		173
MANUAL DEMAGNETISERS				
	890.70	For demagnetising the surface of large workpieces, mobile use		173
	890.71	For demagnetising workpieces, tools, dies, milling heads, etc.		174
TESTING INSTRUMENTS				
	486.04	Gauss pocket magnetometer		174
	878.05	Teslameter		175
	486.40	Holding force tester		175

* Explanation of the icons on page 4

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SAV 890.02 TABLE DEMAGNETIZERS

Standard device

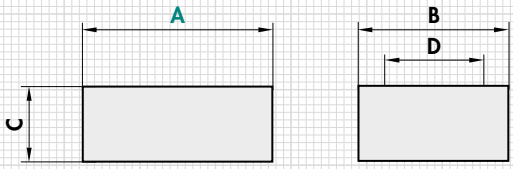
APPLICATION

The demagnetisers are suitable for use in measuring rooms, workshops and production lines and have a strong action for demagnetising bearing rings, dies, swages and other tools.

TECHNICAL DATA

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

mm				kg	VA
A	B	C	D	Weight	Power
250	180	87	150	11.0	920
280	266	87	220	18.0	920
400	306	87	260	24.0	920



D = active width

ORDERING EXAMPLE

Designation	SAV no. - A
Table demagnetizer	SAV 890.02 - 250

SAV 890.42 TUNNEL DEMAGNETISER

For demagnetising large-area, thin-walled parts

APPLICATION

An interfering residual magnetism can remain in steel and cast workpieces after machining. If these parts have to be demagnetised for other purposes, this can usually be easily achieved with the tunnel demagnetisers.

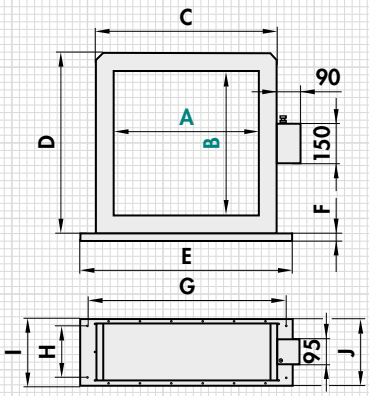
DESIGN

Demagnetising coil cast in polyurethane, optionally with low-frequency generator for workpieces which are difficult to demagnetise.

TECHNICAL DATA

- Protection rating: IP 55
- Power supply: 400 VAC
- Supply frequency: 50 to 60 Hz
- Other voltages on request

mm										VA	kg
A	B	C	D	E	F	G	H	I	J	Power	Weight
150	100	290	240	410	15	360	200	250	180	2300	32.0
250	250	390	390	510	15	460	200	250	180	3500	65.0
350	300	490	440	610	15	560	200	250	230	4800	90.0
400	200	540	340	660	15	610	200	250	230	5200	87.0
400	400	540	540	660	15	610	200	250	230	6500	110.0
550	550	690	690	810	15	760	200	250	230	6950	132.0



ORDERING EXAMPLE

Designation	SAV no. - A x B - line voltage
Tunnel demagnetiser	SAV 890.42 - 400 x 400 - 400 V

SAV 890.43 TUNNEL DEMAGNETIZER WITH BELT DRIVE

For automatically demagnetising large-area, thin-walled parts

APPLICATION

For automatic demagnetising on the production line with continuous plastic transport belt and drive motor.
The workpieces are moved through the tunnel with a speed of approx. 0.2 m/s. A low-frequency generator can be used as a ballast unit for parts which are difficult to demagnetise.

DESIGN

Demagnetising coil cast in polyurethane, optionally with low-frequency generator for workpieces which are difficult to demagnetise. Belt and table versions upon agreement or workpiece weights and weights.

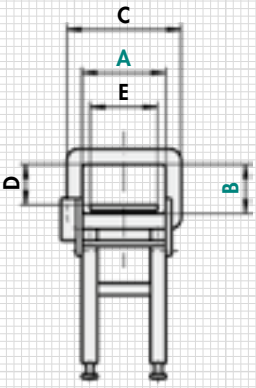
TECHNICAL DATA

- Protection rating: IP 65
- Power supply: 400 V
- Supply frequency: 50 to 60 Hz
- Other voltages on request

mm					VA
A	B	C	D	E	Power
250	200	290	140	200	3500
350	300	490	240	300	4800
400	400	540	340	350	6500
550	550	690	490	500	6950

NOTE

Table lengths and design depending on the workpieces to be demagnetised.
Min. length 2.5 m



ORDERING EXAMPLE

Designation	SAV no. - A x B - line voltage
Tunnel demagnetiser with belt	SAV 890.43 - 550 x 550 - 400 V

SAV 890.70 MANUAL DEMAGNETIZERS

For universal use

APPLICATION

For demagnetising the surfaces of larger workpieces. Mobile use.

DESIGN

Lightweight housing for easy handling. 3 m cable with connector.

TECHNICAL DATA

- Rated voltage: 230 V/50 Hz
- Power consumption: 220 VA
- Protection rating: IP 42
- Automatic shutdown: at > 50 °C
- Duty cycle: 30 %

Type	Size of the active zone	Power supply	Depth of the magnetic field	kg Weight
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

Designation	SAV no. - type
Manual demagnetiser	SAV 890.70 - HD 2

SAV 890.71 MANUAL DEMAGNETISER

For bar materials and tools

APPLICATION

For demagnetising workpieces, tools, dies, milling heads, etc.

DESIGN

Robust plastic housing, with high capacity. Also suitable for heavy-duty operation. Not suitable for continuous operation!
Includes thermal fuse and LED as operating indicator.

TECHNICAL DATA

- Hole diameter: 40 mm
- Rated voltage: 230 V/50 Hz
- Duty cycle: 10 % duty cycle
- Max. operating period: 10 s

ORDERING EXAMPLE

Designation	SAV no.
Manual demagnetiser	SAV 890.71

SAV 486.04 GAUSS POCKET MAGNETOMETER

For fields with low flux density

APPLICATION

For detecting remanence on workpieces and tools as a pole indicator.

CAUTION

The device is only intended for identifying residual fields and must not be exposed to a concentrated magnetic field.

TECHNICAL DATA

- Measuring range: ±50 G (±5 mT)
- Diameter: 65 mm
- Weight: 0.14 kg

ORDERING EXAMPLE

Designation	SAV no.
Gauss pocket magnetometer	SAV 486.04

SAV 878.05 TESLAMETER

Compact device with large measuring range

APPLICATION

For measuring residual remanence on workpieces and tools, in holes and gaps. Suitable for micro magnetic fields and very strong fields. For measuring magnetic flux densities and the field distribution on magnetic chucks.

DESIGN

Lightweight and compact design. Housing protected against dirt. Energy-saving function for long battery life. Liquid crystal display (LCD) with digital measured value output. If the sensor is worn, it can easily be reordered and replaced (SAV 878.05 - S).

TECHNICAL DATA

- Automatic measuring range selection
- Display either in Tesla (T) or Gauss (G)
- Static and dynamic measurements
- Maximum value display for dynamic measurements
- Magnetic pole indicator N/S
- Zero-point adjustment
- Measuring range for static fields: 0 – 1500 mT
- Measuring range for dynamic fields: 0 – 750 mT
- Measuring accuracy: ±5 %
- service temperature: 0 – 40 °C
- Dimensions: 150 x 150 x 25 mm
- Weight: 0.25 kg

ORDERING EXAMPLE

Designation	SAV no.
Teslameter	SAV 878.05

SAV 486.40 HOLDING FORCE TESTER

For comparing magnetic workholding systems

APPLICATION

For measuring the holding force on:

- Permanent magnetic chucks
- Electro magnetic chucks
- Electro permanent magnetic chucks

APPLICATION

The required pressure can be generated by turning the screw clockwise with an Allen key. The integrated pressure piston is moved far enough so that the measuring cylinder is lifted off the magnet plate when the holding force limit is reached. More application information in chapter 1.4.

TECHNICAL DATA

- The displayed pressure in bar corresponds to the comparison pull-off force in daN/cm²: 0 – 25 bar according to 0 – 25 daN/cm².
- Weight: 2.0 kg
- Outer diameter: 50 mm

ORDERING EXAMPLE

Designation	SAV no.
Holding force tester	SAV 486.40

CHAPTER 1.2.9

MAGNETIC WELDING AIDS

1.2 STANDARD MAGNET SYSTEMS

1.2.9 MAGNETIC WELDING AIDS

PAGES 178 – 184

	SAV ART. NO.	COMMENTS	PAGE
	246.40	Permanent magnetic articulated block	178
	246.41	Permanent magnetic joint	178
	246.42	Permanent magnetic joint	179
	246.50	Permanent magnet multi-angle setter	179
	246.53	Permanent magnet multi-angle setter	180
	246.54	Permanent magnet multi-angle setter	180
	246.60	Permanent magnet welding bracket	181
	246.61	Permanent magnet welding bracket	182
	532.03	Permanent magnetic sheet fanners	183
	482.70	Permanent magnetic bases	184
	532.11	Hand destacker with belt	184

SAV 246.40 PERMANENT MAGNETIC ARTICULATED BLOCK

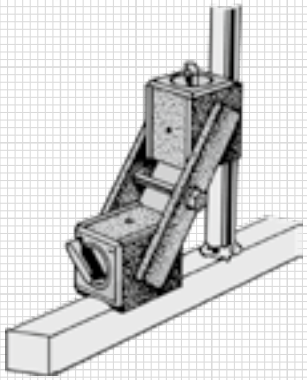
Magnetic aid for welding and assembly

APPLICATION

Indispensable welding aid for sheet metal, round materials and flat materials. For any desired angle.
To avoid overloading the prism joint thermally, we recommend using the magnetic aid only for the tack welds and then removing it.

DESIGN

Two prisms which can be switched on and off individually. Delivered individually (S) or in a pair as a joint (G).



mm			daN	kg
Length	Width	Height	Rated holding force per block	Weight
60	50	55	70	2.5

ORDERING EXAMPLE

Designation	SAV no. - individual or joint
Permanent magnetic articulated block	SAV 246.40 - G

SAV 246.41 PERMANENT MAGNETIC JOINT

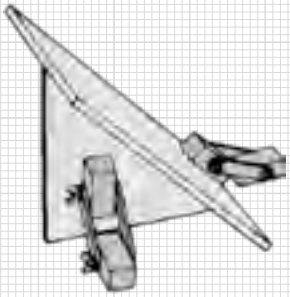
Magnetic aid for welding and assembly

APPLICATION

As a welding aid for holding sheets, flat iron, etc.
To avoid overloading the magnetic joint thermally, we recommend using the magnetic aid only for the tack welds and then removing it.

DESIGN

Two permanent magnet chucks connected with struts. Any angle can be set. Can be clamped with two wing nuts. Delivered individually (S) or as a joint (G).



mm			daN	kg
Length	Width	Height	Rated holding force per block	Weight
60	26	25	20	0.7

ORDERING EXAMPLE

Designation	SAV no. - individual or joint
Permanent magnetic joint	SAV 246.41 - G

SAV 246.42

PERMANENT MAGNETIC JOINT

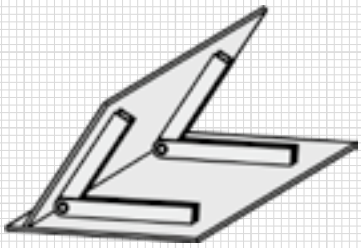
Magnetic aid for welding and assembly with different angles

APPLICATION

As a welding and assembly aid for frame processing at any angle from 25° to 280°. With markings for 90°, 60°, 45° and 30°.
If higher holding forces are required, several magnetic joints can be stacked. The maximum application temperature of 120 °C should not be exceeded. We therefore recommend using the magnetic joints for the tack welds and then removing them.

DESIGN

All edges are magnetic.



mm			daN	kg
Length	Width	Height	Rated holding force per bar	Weight
194+105	11	24	20	0.49

ORDERING EXAMPLE

Designation	SAV no.
Permanent magnetic joint	SAV 246.42

SAV 246.50

PERMANENT MAGNET MULTI-ANGLE SETTER

Magnetic aid for welding and assembly with defined angles

APPLICATION

As a welding and assembly aid for frame processing with angles of 180°, 90°, 75°, 60°, 45° and 30°.
If higher holding forces are required, several mitre holders can be stacked. The maximum application temperature of 120 °C should not be exceeded. We therefore recommend using the mitre holders for the tack welds and then removing them.

DESIGN

All edges are magnetic. Provided holes allow easy and fast positioning.

mm				daN	kg
Length	Width	Thick-ness	Holes	Rated holding force	Weight
100	64	14	2 x ø5	30	0.26

ORDERING EXAMPLE

Designation	SAV no.
Permanent magnet multi-angle setter	SAV 246.50

SAV 246.53

PERMANENT MAGNET MULTI-ANGLE SETTERS

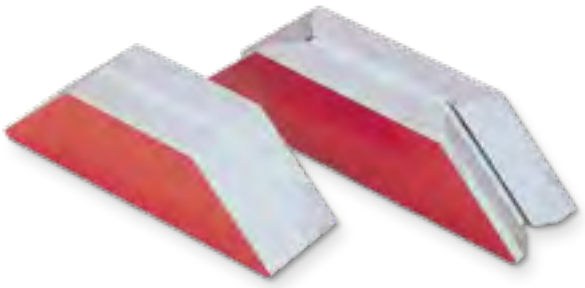
Magnetic aid for welding and assembly with 45° and 90°

APPLICATION

As a welding and assembly aid for frame processing at 45° and 90° angles. To avoid overloading the mitre holders thermally, we recommend using the magnetic aids only for the tack welds and then removing it.

DESIGN

All faces including prisms are magnetic.
SAV 246.53 - 145 without prism.



mm			kg
Length	Width	Height	Weight
145	44,5	41	1.36
178	44,5	41	1.65

ORDERING EXAMPLE

Designation	SAV no. - length
Permanent magnet multi-angle setter	SAV 246.53 - 178

SAV 246.54

PERMANENT MAGNET MULTI-ANGLE SETTERS

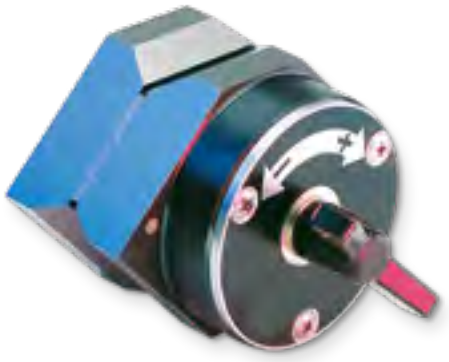
Magnetic aid for welding and assembly with 45°, 90° and 135°

APPLICATION

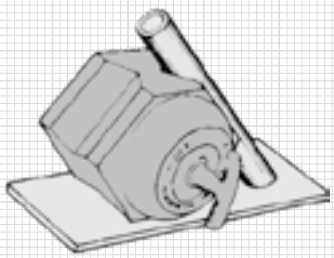
As a welding aid for tubes, round materials, flat iron and profiled iron.
As a chucking tool for drilling fixtures.
To avoid overloading the mitre holders thermally, we recommend using the magnetic aids only for the tack welds and then removing it.

DESIGN

Strong magnetic force, with continuous adjustment for aligning the workpieces.



mm			daN	kg
Length	Width	Height	Rated holding force, surface	Weight
60	60	42	10	0.85
112	112	94	40	6.0



ORDERING EXAMPLE

Designation	SAV no. - length
Permanent magnet multi-angle setter	SAV 246.54 - 108

SAV 246.60 PERMANENT MAGNET WELDING BRACKETS

Magnetic aid for welding and assembly with 90°

APPLICATION

For efficient holding of welding parts at a 90° angle. Used for small, lightweight parts to heavy sheets, depending in size.
To avoid overloading the welding brackets thermally, we recommend using the magnetic aids only for the tack welds and then removing it.

DESIGN

Sturdy design, both faces are magnetic, easily released by applying pressure from the side. The normal version (**N**) is intended for workpieces with bright surfaces.
The amplified version (**V**) is also suitable for workpieces with scaled or dirty surfaces.
The tube version (**R**) welding brackets are equipped with prism-shaped pole shoes and are therefore particularly suitable for processing round materials and tubes.
The 2-pole (**2**) magnetic brackets with 2 protruding magnetic bars are designed for the construction of large machinery, steel construction, shipyards, crane construction, etc. A stake attached to both sides facilitates alignment using a hammer. The welding brackets – starting with SAV 246.60 - 116 – are suitable for small, lightweight parts to applications in the construction of large machinery, shipyards, crane construction, etc. – finishing with SAV 246.60 - 450.

Design			Dimensions						
N (normal)	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
	Rated holding force*	in daN	32	38	58	88/95	-	-	-
	Displacement force*	in daN	14	16	26	42/44	-	-	-
	Weight	in kg	0.7	1.1	1.6	2.1	3.1	4.3	5.0
V (reinforced)	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
	Rated holding force*	in daN	48	52	79	132/142	-	-	-
	Displacement force*	in daN	21	24	35	63	-	-	-
	Weight	in kg	0.75	1.15	1.7	2.2	3.3	4.5	5.15
R (tube)	Side length	in mm	120/120	150/150	180/180	265/180	235/235	-	-
	Width	in mm	38	45	48	48	60	-	-
	Rated holding force*	in daN	-	38	50	88/95	-	-	-
	Displacement force*	in daN	-	16	22	42	-	-	-
	Weight	in kg	0.85	1.25	1.8	2.45	3.05	-	-
2-pole	Side length	in mm	350/350	450/450	-	-	-	-	-
	Width	in mm	60	60	-	-	-	-	-
	Rated holding force*	in daN	-	-	-	-	-	-	-
	Displacement force*	in daN	-	-	-	-	-	-	-
	Weight	in kg	8.4	11.5	-	-	-	-	-

* The rated holding force and displacement force stated refer to a sheet metal thickness of 4 mm. More detailed influencing parameters can be found in the technical information (chapter 1.4).

ORDERING EXAMPLE

Designation	SAV no. - max. side length - version
Permanent magnet welding bracket	SAV 246.60 - 450 - 2

SAV 246.61 PERMANENT MAGNETIC WELDING BRACKETS

Magnetic aid for welding and assembly with different angles

APPLICATION

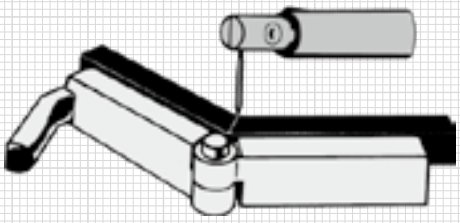
For efficient holding of welding parts with different angles. With scale for angles from 45° to 225°. Used for small, lightweight parts to heavy sheets, depending in size.
To avoid overloading the welding brackets thermally, we recommend using the magnetic aids only for the tack welds and then removing it.

DESIGN

Sturdy design, both faces are magnetic, easily released by applying pressure from the side. The normal version (**N**) is intended for workpieces with bright surfaces.
The amplified version (**V**) is also suitable for workpieces with scaled or dirty surfaces.
The tube version (**R**) welding brackets are equipped with prism-shaped pole shoes and are therefore particularly suitable for processing round materials and tubes.

Design			Dimensions		
N (normal)	Side length	in mm	130/130	180/180	260/180
	Width	in mm	38	45	45
	Rated holding force*	in daN	32	58	95/88
	Displacement force*	in daN	14	38	44/42
	Weight	in kg	0.75	1.5	2.0
V (reinforced)	Side length	in mm	130/130	180/180	260/180
	Width	in mm	38	45	45
	Rated holding force*	in daN	48	87	142/132
	Displacement force*	in daN	21	57	65
	Weight	in kg	0.8	1.55	2.1
R (tube)	Side length	in mm	130/130	180/180	260/180
	Width	in mm	38	45	45
	Rated holding force*	in daN	-	48	-
	Displacement force*	in daN	-	22	-
	Weight	in kg	0.9	1.7	2.2

* The rated holding force and displacement force stated refer to a sheet metal thickness of 4 mm.
More detailed influencing parameters can be found in the technical information (chapter 1.4).



ORDERING EXAMPLE

Designation	SAV no. - max. side length - version
Permanent magnet welding bracket	SAV 246.61 - 260 - V

SAV 532.03 PERMANENT MAGNETIC SHEET FANNERS

For separating sheets

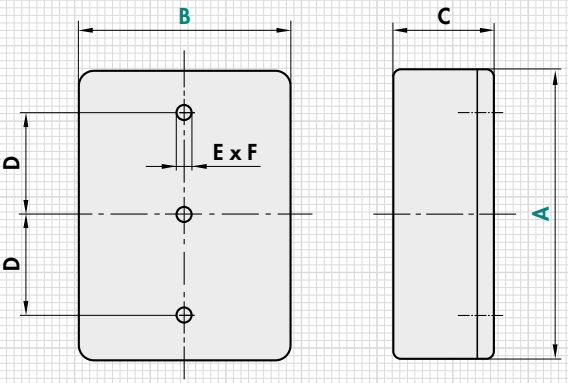
APPLICATION

For separating stacked iron and steel sheets during insertion tasks into metal processing machines. The sheets are placed between the magnetic floaters and magnetised with the same poles. This causes the sheets to repel each other and float freely, which makes them easy to grip.
To prevent jamming of the sheets, the magnet floaters must be positioned so that an air gap of 1 to 2 mm is created.

DESIGN

The strong permanent magnets are installed in a robust steel housing. The tapped holes provided allow the unit to be fastened to fixtures. Delivered individually.

mm							kg
A	B	C	D	E	F	For sheet thickness up to	Weight
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
208	103	28	100	2	M 8	1	5.0
308	103	28	200	2	M 8	1	7.0
342	103	28	250	2	M 8	1	8.0
143	104	49	100	2	M 8	2	6.0
277	104	49	200	2	M 8	2	11.0
310	104	49	200	2	M 8	2	12.0
143	155	47	100	2	M 8	3	8.0
210	155	47	150	2	M 8	3	12.0
310	155	47	200	2	M 8	3	18.0
411	155	47	150	3	M 8	3	24.0
511	155	47	200	3	M 8	3	29.0
277	179	88	200	2	M 12	4	34.0
400	179	88	150	3	M 12	4	50.0
344	279	94	100	3	M 12	6	71.0
545	279	94	150	4	M 12	6	112.0
612	279	94	150	4	M 12	6	126.0
813	279	94	200	4	M 12	6	168.0



The floater height is selected so that the sheet stacking height is approx. half of the floater height.
If using the stated maximum sheet thickness, a sheet area of approx. 30 dm² can be spread per floater. The plate area is reduced to approx 15 dm² for thick, oily sheets and several floaters are required.

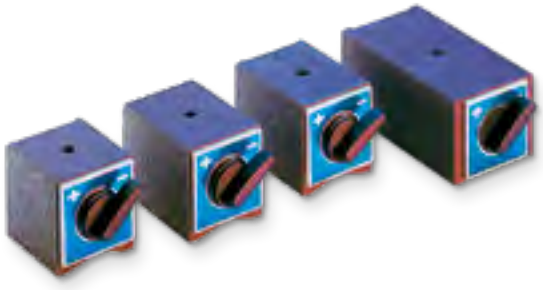
ORDERING EXAMPLE

Designation	SAV no. - A x B
Permanent magnetic sheet fanner	SAV 532.03 - 813 x 279

SAV 482.70 PERMANENT MAGNETIC BASES
Controllable

APPLICATION
For fixtures, dressers, measuring tripods.

DESIGN
Permanent magnet with ON/OFF switching.
Magnetic contact surfaces on underside and rear side. Additional prism-shaped accommodationon the underside. SAV 482.70 - M 10 x 120 has no prism.



mm				daN	kg
Thread	Length	Width	Height	Rated holding force	Weight
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	120	60	55	40	2.0

ORDERING EXAMPLE

Designation	SAV no. - thread - length
Permanent magnetic base	SAV 482.70 - M 10 - 120

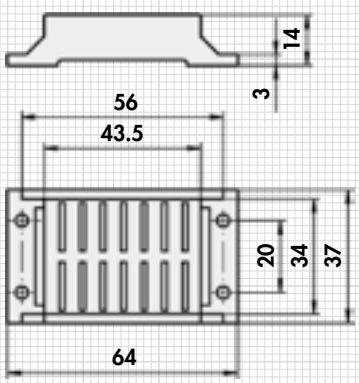
SAV 532.11 HAND DESTACKER WITH BELT
For separating sheets

APPLICATION
For destacking and lifting sheet metal up to 2 mm thickness. For wearing on the right or left palm. Can also be used on the outside of the hand for holding screws/bolts or similar small parts.

DESIGN
The permanent magnet system, which is housed in a sturdy cast housing, guarantees high holding forces. Replacement strap available on request.

mm			daN	kg
Length	Width	Height	Rated holding force*	Weight
64	37	14	20	0.1

* measuring for vertical pull-off

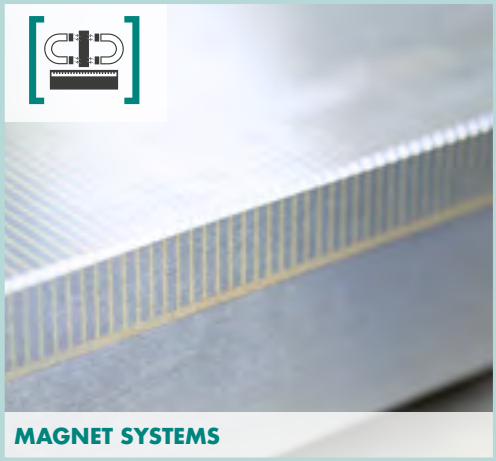


ORDERING EXAMPLE

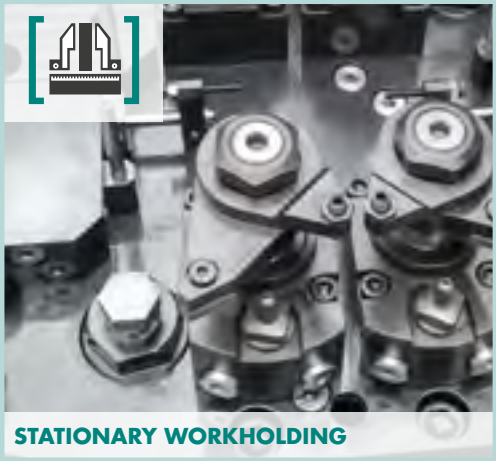
Designation	SAV no.
Hand destacker with belt	SAV 532.11

DID YOU KNOW?

We are not only experts for magnet systems, but also the ideal partner for rotary and stationary workholding, for automation and for individual customised solutions.

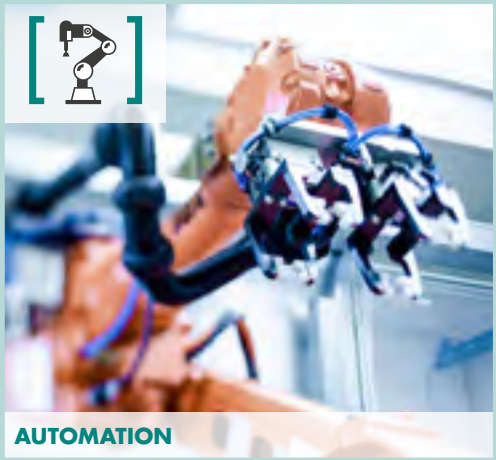


MAGNET SYSTEMS



STATIONARY WORKHOLDING

ROTARY WORKHOLDING



AUTOMATION

To ensure that you will find the right solution with us, we combine our expert knowledge and the different areas of application – for virtually any machining process.

just experts.

CHAPTER 1.2.10

SMALL MAGNETS

1.2 STANDARD MAGNET SYSTEMS

1.2.10 SMALL MAGNETS

PAGES 190 – 215

	SAV ART. NO.	DESIGNATION	COMMENTS	PAGE
HARD FERRITE HOLDING MAGNETS				
	240.01	Flat pot magnet	Hole with counterbore/cylindrical hole	190
	240.02	Flat pot magnet	Stud with internal thread	191
	240.03	Flat pot magnet	Without threaded bush	191
	240.08	Flat pot magnet	With threaded bush	192
	240.23	Flat pot magnet	With internal thread	192
NEODYMIUM HOLDING MAGNETS (NdFeB)				
	240.14	Bar magnet	With internal thread, also available as stainless version RF	193
	240.16	Bar magnet	With smooth stud	193
	240.17	Bar magnet	High-energy magnets, also available as stainless version RF	194
	240.18	Flat pot magnet	Smooth without stud	194
	240.19	Bar magnet	Also with seat	195
	240.33	Flat pot magnet	With threaded bush	195
	240.36	Flat pot magnet	Stud with internal thread	196
	240.38	Flat pot magnet	With hole and counterbore	196
	240.41	Holding magnet with rubber coating	Rectangular with threaded bush	197
	240.42	Holding magnet with rubber coating	With threaded bush	197
SAMARIUM COBALT HOLDING MAGNETS (SmCo)				
	240.09	Bar magnet	Also with seat	198
	240.10	Flat pot magnet	Smooth without stud	198
	240.34	Flat pot magnet	Hole with counterbore	199
	240.35	Flat pot magnet	Stud with internal thread	199

1.2. STANDARD MAGNET SYSTEMS

1.2.10 SMALL MAGNETS

PAGES 190 – 215

	SAV ART. NO.	DESIGNATION	COMMENTS	PAGE
ALUMINIUM NICKEL COBALT HOLDING MAGNETS (AlNiCo)				
	240.04	Bar magnet	With internal thread	200
	240.05	Bar magnet	With smooth stud without seat	200
	240.06	Bar magnet	Smooth without stud with seat	201
	240.07	Bar magnet	Smooth without stud	201
POT, HORSESHOE, ROD AND STRONG MAGNETS WITH WRINKLE PAINT FINISH				
	240.11	Pot magnets, wrinkle paint finish	With internal thread	202
	240.12	Flat pot magnets, wrinkle paint finish	Hole with counterbore	202
	240.13	Button magnets, wrinkle paint finish	With through hole	203
	240.15	Pot magnets, wrinkle paint finish	With forcing screw	203
	241.06	Bar magnets, wrinkle paint finish	Made from AlNiCo, rectangular and round	204
	241.14	Horseshoe magnets, wrinkle paint finish	Made from AlNiCo with through hole	204
MAGNETIC CORES				
	240.45	Magnetic cores, AlNiCo	Machining: grinding only	205
	240.46	Magnetic cores, AlNiCo	In freely selectable lengths	205
	240.50	Magnetic cores, $SmCo_5$	With high rated holding force	206
	240.55	Magnetic cores, NdFeB	High-energy magnet	207
	240.56	Magnetic cores, NdFeB	With extremely high rated holding force	208

1.2. STANDARD MAGNET SYSTEMS

1.2.10 SMALL MAGNETS

S N S
PAGES 190 – 215

	SAV ART. NO.	DESIGNATION	COMMENTS	PAGE
FLEXIBLE MAGNETS, MAGNETIC TAPES, LABELS, MAGNETIC FILM				
	240.70	Flexible permanent magnets	Easy to machine	209
	240.72	Magnetic tapes	Self-adhesive	209
	240.71	Magnetic tapes	Can be cut with scissors	210
	240.73	Magnetic film	In different colours	211
	240.74	Magnetic film	Blank brown	211
OFFICE MAGNETS				
	240.80	Office magnets	With plastic housing	212
	240.83	Office magnets	With steel housing	212
	240.84	Office magnets	With steel casing	213
	240.85	Office magnets	With plastic casing	213
	240.88	Office magnets	Suitable for printing	214
	240.89	Office magnets	Suitable for printing	214
	240.90	Office magnets	With raised pattern	215

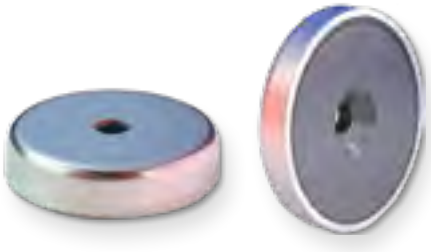
SAV 240.01 HOLDING MAGNETS

Hole with 90° counterbore (flat pot magnet)

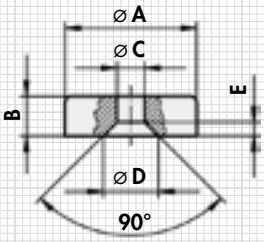
DESIGN
Shielded system, galvanised surface.
Max. service temperature: 200 °C.

MAGNET MATERIAL
Hard ferrite (oxide 380)

FASTENING OPTION
Screws from the contact surface. The screws must be made of non-magnetic material.



	mm						N	kg
Type	A ±0.2	B ±0.2	C	D	E	Counter-bore	Rated holding force	Weight
MH 1 - 16	16	4.5	3.3	7	1.6	90°	14	0.004
MH 1 - 20	20	6	4.2	9	2.1	90°	27	0.009
MH 1 - 25	25	7	5.5	11	2.5	90°	36	0.016
MH 1 - 32	32	7	5.5	11	2.5	90°	72	0.027
MH 1 - 40	40	8	5.5	11	2.5	90°	90	0.052



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.01 - MH 1 - 40

SAV 240.01 HOLDING MAGNETS

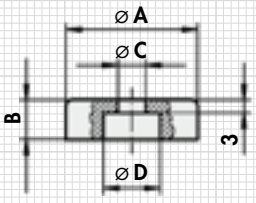
Hole with head counterbore

DESIGN
Shielded system, galvanised surface.
Max. service temperature: 200 °C.

MAGNET MATERIAL
Hard ferrite (oxide 380)

FASTENING OPTION
Screws from the contact surface. The screws must be made of non-magnetic material.

	mm						N	kg
Type	A ±0.2	B ±0.2	C	D	E	Counter-bore	Rated holding force	Weight
MH 1 - 50	50	10	8.5	22	-	-	180	0.085
MH 1 - 63	63	14	6.5	24	-	-	290	0.195
MH 1 - 80	80	18	6.5	11.5	-	-	540	0.458
MH 1 - 83	83	18	10.5	32	-	-	600	0.444
MH 1 - 100	100	22	10.5	34	-	-	680	0.815



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.01 - MH 1 - 50

SAV 240.02 HOLDING MAGNETS

Stud with internal thread (flat pot magnet)

DESIGN

Flat pot magnet with threaded bush. Shielded system, galvanised surface. Version (RF) available for sizes with stated holding force. Max. service temperature: 200 °C.

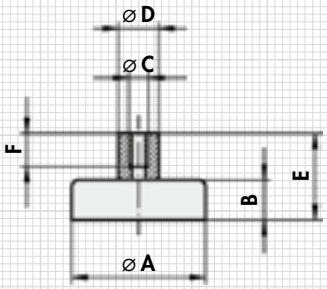
MAGNET MATERIAL

Hard ferrite (oxide 380)

FASTENING OPTION

Screws

	mm						N	kg	N	
Type	A ±0.2	B ±0.2	C	D ±0.2	E ±0.2	F ±0.2	Rated holding force	Weight	RF Rated holding force	RF C
MH 2 - 01	10	4.5	M 3	6	11.5	7	4	0.003	-	-
MH 2 - 02	13	4.5	M 3	6	11.5	7	10	0.004	-	-
MH 2 - 03	16	4.5	M 3	6	11.5	7	18	0.006	-	-
MH 2 - 04	20	6	M 3	6	13	7	30	0.011	-	-
MH 2 - 05	25	7	M 4	8	15	8	40	0.020	32	M 5
MH 2 - 06	32	7	M 4	8	15	8	80	0.031	64	M 5
MH 2 - 36	36	7.7	M 4	8	16	8	100	0.042	-	-
MH 2 - 07	40	8	M 5	10	18	10	125	0.059	100	M 5
MH 2 - 47	47	9	M 6	12	21	12	180	0.091	-	-
MH 2 - 08	50	10	M 6	12	22	12	220	0.110	175	M 5
MH 2 - 57	57	10.5	M 6	12	22.5	12	280	0.153	-	-
MH 2 - 09	63	14	M 8	15	30	16	350	0.245	280	M 5
MH 2 - 10	80	18	M 10	20	34	16	600	0.499	-	-
MH 2 - 11	100	22	M 12	22	43	21	900	0.956	-	-
MH 2 - 12	125	26	M 14	25	50	20	1300	1.720	-	-



ORDERING EXAMPLE

Designation	SAV no. - type - stainless version
Holding magnet	SAV 240.02 - MH 2 - 12 - RF

SAV 240.03 HOLDING MAGNETS

Flat pot magnet without threaded bush

DESIGN

Flat pot magnet without threaded bush. Shielded system, galvanised surface. Max. service temperature: 200 °C.

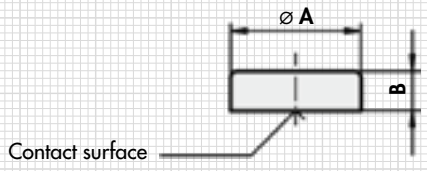
MAGNET MATERIAL

Hard ferrite (oxide 380)

FASTENING OPTION

Pressing, glueing.

	mm		N	kg
Type	A ±0.2	B ±0.2	Rated holding force	Weight
MH 3 - 01	10	4.5	4	0.002
MH 3 - 02	13	4.5	10	0.003
MH 3 - 03	16	4.5	20	0.005
MH 3 - 04	20	6	30	0.010
MH 3 - 05	25	7	40	0.018
MH 3 - 06	32	7	80	0.029
MH 3 - 36	36	7.7	100	0.040
MH 3 - 07	40	8	110	0.055
MH 3 - 47	47	9	180	0.084
MH 3 - 08	50	10	200	0.100
MH 3 - 57	57	10.5	280	0.140
MH 3 - 09	63	14	320	0.230
MH 3 - 10	80	18	600	0.468
MH 3 - 11	100	22	900	0.915
MH 3 - 12	125	26	1300	1.680



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.03 - MH 3 - 36

NOTE

The following applies to all holding magnets type MH 3: Hairline cracks on the contact surface of the integrated magnetic material and a central offset are unavoidable due to manufacturing. This does not affect the function in any way.

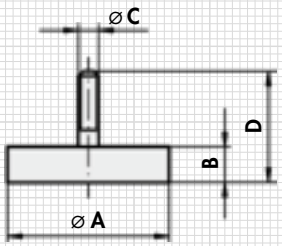
SAV 240.08 HOLDING MAGNETS
With threaded stud

DESIGN
Flat pot magnet with threaded stud, galvanised surface, shielded system.
Max. service temperature: 200 °C.

FASTENING OPTION
Screwing in

MAGNET MATERIAL
Hard ferrite (oxide 380)

	mm				N	kg
Type	A ±0.2	B ±0.2	C	D	Rated holding force	Weight
MH 8 - 10	10	4.5	M 3	11.5	4	0.002
MH 8 - 13	13	4.5	M 3	11.5	10	0.003
MH 8 - 16 - 1	16	4.5	M 3	11.5	18	0.005
MH 8 - 16 - 2	16	4.5	M 4	11.5	18	0.005
MH 8 - 20 - 1	20	6	M 3	12	30	0.01
MH 8 - 20 - 2	20	6	M 6	36	30	0.015
MH 8 - 25 - 1	25	7	M 4	15	40	0.019
MH 8 - 25 - 2	25	7	M 5	22	40	0.02
MH 8 - 25 - 3	25	7	M 6	27	40	0.022
MH 8 - 32 - 1	32	7	M 4	15	80	0.03
MH 8 - 32 - 3	32	7	M 6	19	80	0.031
MH 8 - 32 - 4	32	7	M 8	17	80	0.032
MH 8 - 47	47	9	M 6	17	180	0.085
MH 8 - 57 - 2	57	10.5	M 6	18.5	280	0.146
MH 8 - 63	63	14	M 6	29	350	0.233



NOTE
Flat pot magnet with threaded stud, amplified version, see SAV 240.33 - MH 33

ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.08 - MH 8 - 32 - 1

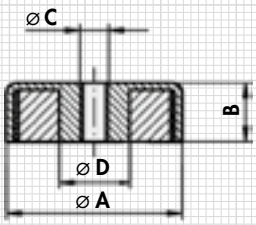
SAV 240.23 HOLDING MAGNETS
With internal thread

DESIGN
Shielded system, galvanised surface.
Max. service temperature: 200 °C.

FASTENING OPTION
Screws

MAGNET MATERIAL
Hard ferrite (oxide 380)

	mm				kg	N
Type	A ±0.2	B ±0.2	C	D	Weight	Rated holding force
MH 23 - 25 - 07	25	7	M 4	5.2	0.018	36
MH 23 - 32 - 07	32	7	M 4	5.2	0.029	75
MH 23 - 40 - 08	40	8	M 4	5.2	0.053	90
MH 23 - 50 - 10	50	10	M 6	12	0.094	170
MH 23 - 50 - 10	50	10	M 8	12	0.094	170
MH 23 - 63 - 14	63	14	M 8	13	0.206	290
MH 23 - 80 - 08	80	18	M 8	14.5	0.472	550
MH 23 - 80 - 10	80	18	M 10	14.5	0.466	550



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.23 - MH 23 - 40 - 08

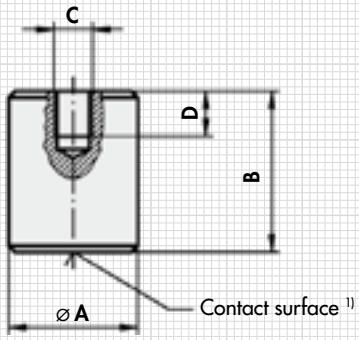
SAV 240.14 HOLDING MAGNETS
With internal thread (bar magnet)

DESIGN
Bar magnet, smooth without fitting tolerance. NdFeB magnets have an up to approx. 50 % greater holding force than SmCo flat pot magnets. Shielded system.
Seawater-resistant version (**RF**) available.
Max. service temperature: 80 °C.

MAGNET MATERIAL
NdFeB

FASTENING OPTION
Screws

	mm				N	N	kg
Type	A ±0.2	B ±0.2	C	D	Rated holding force	RF Holding force	Weight
MH 14 - 06	6	20	M 3	5	6	1	0.003
MH 14 - 08	8	20	M 3	5	12	4	0.006
MH 14 - 10	10	20	M 4	7	24	8	0.010
MH 14 - 13	13	20	M 4	7	60	16	0.016
MH 14 - 16	16	20	M 4	7	90	18	0.025
MH 14 - 20	20	25	M 6	9	135	32	0.055
MH 14 - 25	25	35	M 6	9	190	73	0.135
MH 14 - 32	32	40	M 8	12	340	115	0.230



ORDERING EXAMPLE

Designation	SAV no. - type - stainless version
Holding magnet	SAV 240.14 - MH 14 - 32 - RF

NOTE
1) In case of profiling or removing the contact surface, no more than 2 mm may be removed, as otherwise the holding force decreases greatly.

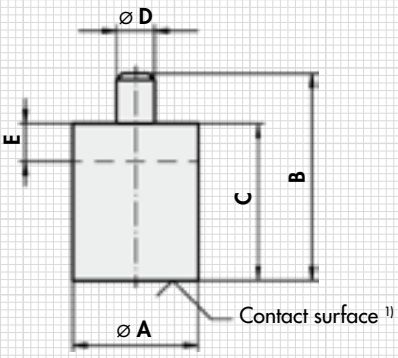
SAV 240.16 HOLDING MAGNETS
With smooth stud (bar magnet)

DESIGN
Bar magnet with smooth stud.
Shielded system.
Max. service temperature: 80 °C.

MAGNET MATERIAL
NdFeB

FASTENING OPTION
Riveting in the stud or screwing in after machining a thread.

	mm					N	kg
Type	A ±0.2	B ±0.2	C	D	E2)	Rated holding force	Weight
MH 16 - 01	6	28	20	3	2	6	0.004
MH 16 - 02	8	28	20	3	3	12	0.007
MH 16 - 03	10	28	20	4	6	24	0.013
MH 16 - 04	13	28	20	4	7	60	0.021
MH 16 - 05	16	28	20	5	5	90	0.032
MH 16 - 06	20	33	25	6	6	135	0.062
MH 16 - 07	25	45	35	8	5	190	0.137
MH 16 - 08	32	50	40	10	3	340	0.245



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.16 - MH 16 - 08

NOTE
1) In case of changes to the contact surface, no more than 2 mm may be removed, as otherwise the holding force decreases greatly.
2) The stud can be extended by dimension E without reducing the holding force.

SAV 240.17 HOLDING MAGNETS

With h6 seat (bar magnet)

DESIGN

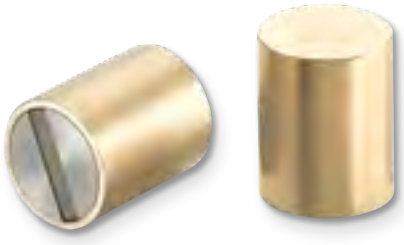
Brass magnet housing with integrated sandwich magnet system.
Max. service temperature: 80 °C.

FASTENING OPTION

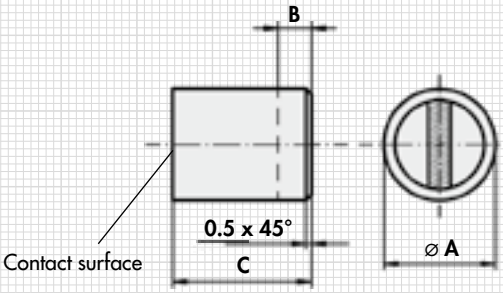
Pressing, glueing.

MAGNET MATERIAL

NdFeB



	mm				N	kg
Type	A_{h6}	B[1]	C	D[2]	Rated holding force	Weight
MH 17 - 01	6	10	20	1.5	10	0.004
MH 17 - 02	8	10	20	1.5	22	0.008
MH 17 - 03	10	8	20	2	45	0.012
MH 17 - 04	13	6	20	2.5	70	0.020
MH 17 - 05	16	2	20	3	150	0.032
MH 17 - 06	20	5	25	4	300	0.060
MH 17 - 07	25	7	35	5	500	0.140
MH 17 - 08	32	5	40	6	720	0.265



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.17 - MH 17 - 04

NOTE

[1] Bar magnets can be shortened at the rear end by dimension B without reducing the holding force.
[2] In case of changes to the contact surface, no more than dimension B may be removed, as otherwise the holding force decreases greatly.

SAV 240.18 HOLDING MAGNETS

High-energy magnets (flat pot magnets)

DESIGN

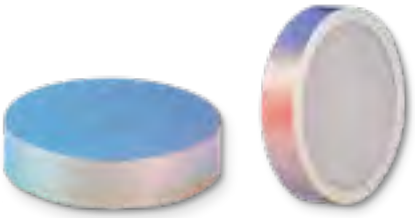
Max. service temperature: 80 °C

FASTENING OPTION

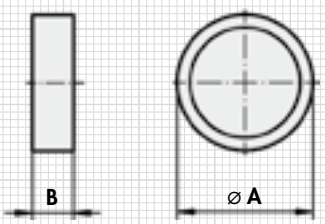
Pressing, glueing, casting

MAGNET MATERIAL

Neodymium iron boron (NdFeB)



	mm		N	kg
Type	A ±0.15	B ±0.15	Rated holding force	Weight
MH 18 - 01	6	4.5	5	0.001
MH 18 - 02	8	4.5	13	0.002
MH 18 - 03	10	4.5	25	0.003
MH 18 - 04	13	4.5	60	0.005
MH 18 - 05	16	4.5	95	0.007
MH 18 - 06	20	6	140	0.015
MH 18 - 07	25	7	200	0.022
MH 18 - 08	32	7	350	0.040



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.18 - MH 18 - 05

SAV 240.19 HOLDING MAGNETS

High-energy magnets, also with fitting tolerance (bar magnets)

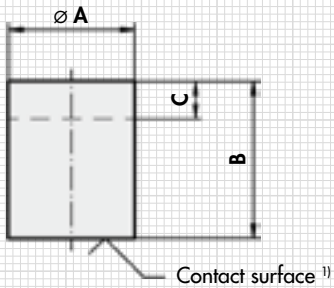
DESIGN

Bar magnet, smooth without fitting tolerance.
Shielded system. Version with fitting tolerance h6 (**P**) available.
Attach P when ordering.
Max. service temperature: 80 °C.

MAGNET MATERIAL

NdFeB

	mm			N	kg
Type	A ±0.2	B ±0.2	C[2]	Rated holding force	Weight
MH 19 - 001	4	10	5	2.5	0.001
MH 19 - 002	5	10	5	4.5	0.003
MH 19 - 01	6	10	5	6	0.004
MH 19 - 02	8	12	7	12	0.007
MH 19 - 03	10	16	11	24	0.011
MH 19 - 04	13	18	13	60	0.019
MH 19 - 05	16	20	15	90	0.029
MH 19 - 06	20	25	18	135	0.061
MH 19 - 07	25	30	22	190	0.140
MH 19 - 08	32	35	27	340	0.240



ORDERING EXAMPLE

Designation	SAV no. - type - version
Holding magnet	SAV 240.19 - MH 19 - 08 - P

NOTE

1) In case of changes to the contact surface, no more than 2 mm may be removed, as otherwise the holding force decreases greatly.
2) Bar magnets can be shortened at the rear end by dimension C without reducing the holding force.

SAV 240.33 HOLDING MAGNETS

High-energy magnets with threaded stud

DESIGN

Flat pot magnet with threaded stud, galvanised surface, shielded system.
Max. service temperature: 80 °C.

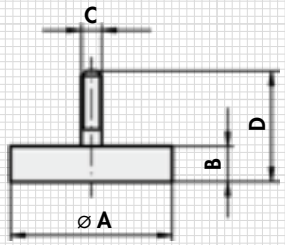
MAGNET MATERIAL

NdFeB

FASTENING OPTION

Screwing in

	mm				N	kg
Type	A	B	C	D	Rated holding force	Weight
MH 33 - 10	10	4.5	M 4	12.5	25	0.003
MH 33 - 13	13	4.5	M 5	12.5	60	0.005
MH 33 - 16	16	4.5	M 6	12.5	95	0.008
MH 33 - 20	20	6	M 6	16	140	0.016
MH 33 - 25	25	7	M 6	17	200	0.025
MH 33 - 32	32	7	M 6	17	350	0.048



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.33 - MH 33 - 32

SAV 240.36

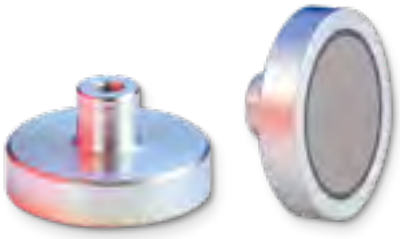
HOLDING MAGNETS

High-energy magnets, stud with internal thread (flat pot magnet)

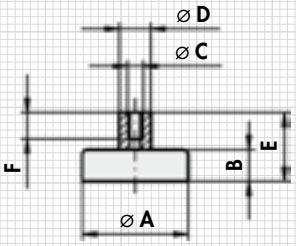
DESIGN
Shielded system, galvanised surface.
Max. service temperature: 80 °C.

FASTENING OPTION
Screwing in

MAGNET MATERIAL
NdFeB



	mm						N	kg
Type	A ±0.2	B ±0.2	C	D	E	F	Rated holding force	Weight
MH 36 - 06	6	4.5	M 3	6	11.5	7	5	0.002
MH 36 - 08	8	4.5	M 3	6	11.5	7	13	0.003
MH 36 - 10	10	4.5	M 3	6	11.5	7	25	0.004
MH 36 - 13	13	4.5	M 3	6	11.5	7	60	0.005
MH 36 - 16	16	4.5	M 4	6	11.5	7	95	0.007
MH 36 - 20	20	6	M 4	8	13	7	140	0.016
MH 36 - 25	25	7	M 4	8	14	7	200	0.027
MH 36 - 32	32	7	M 5	10	15.5	8.5	350	0.045



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.36 - MH 36 - 32

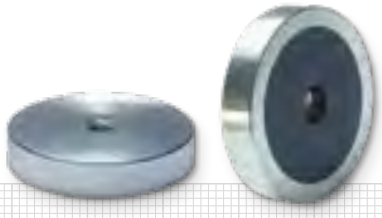
SAV 240.38

HOLDING MAGNETS

High-energy magnets, hole and counterbore

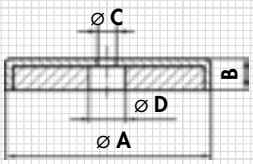
DESIGN
Shielded system, galvanised surface.
Anisotropic magnetising.
Max. service temperature: 80 °C.

MAGNET MATERIAL
NdFeB



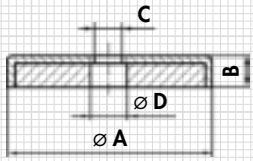
With hole and counterbore:

	mm				N	kg
Type	A ±0.2	B ±0.2	C	D	Rated holding force	Weight
MH 38 - 216	16	4.5	3.5	6.6	75	0.006
MH 38 - 220	20	6	4.5	9	105	0.013
MH 38 - 225	25	7	4.5	9	160	0.024
MH 38 - 232	32	7	5.5	11	310	0.039
MH 38 - 240	40	8	5.5	10.6	500	0.073



With internal thread:

	mm				N	kg
Type	A ±0.2	B ±0.2	C	D	Rated holding force	Weight
MH 38 - 332	32	7	M 5	5.5	330	0.04
MH 38 - 340	40	8	M 5	10.5	500	0.074
MH 38 - 350	50	10	M 8	9.5	800	0.140
MH 38 - 363	63	14	M 10	11.7	1100	0.315
MH 38 - 375	75	15	M 10	13	1750	0.479



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.38 - MH 38 - 332

SAV 240.41 HOLDING MAGNETS WITH RUBBER COATING

With threaded bush

DESIGN

Rubber-coated holding magnets, disc-shaped. Rectangular version with 1 or 2 threaded bushes. The Santoprene© rubber coating has a very long useful life and is sufficiently resistant to all weather conditions and UV radiation.
Max. service temperature: 60 °C.

APPLICATION

The rubber-coated holding magnets are ideal for attaching items such as advertising displays, safety lamps on car roofs, but also for scratch-free attaching of signs or sample parts to mirror-polished, chrome-plated or painted steel surfaces.

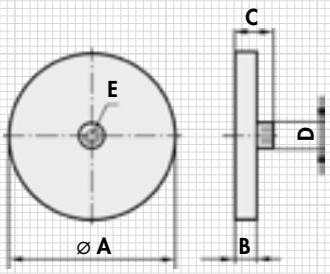
MAGNET MATERIAL

NdFeB

FASTENING OPTION

Screws

	mm					N	kg
Type	A	B	C	D	E	Rated holding force	Weight
MG 12	12	7	14.8	8	M 4	10	0.006
MG 22	22	6	11.5	8	M 4	50	0.013
MG 31	31	6	11.5	8	M 4	75	0.022
MG 43	43	6	10.5	8	M 4	85	0.030
MG 66	66	8.5	15	10	M 5	180	0.105
MG 88	88	8.5	17	12	M 8	420	0.192



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.41 - MG 12

SAV 240.42 HOLDING MAGNETS WITH RUBBER COATING

With threaded stud

DESIGN

Rubber-coated holding magnets, disc-shaped, with threaded studs on the rear. The Santoprene© rubber coating has a very long useful life and is sufficiently resistant to all weather conditions and UV radiation.
Max. service temperature: 60 °C.

APPLICATION

The rubber-coated holding magnets are ideal for attaching items such as advertising displays, safety lamps on car roofs, but also for scratch-free attaching of signs or sample parts to mirror-polished, chrome-plated or painted steel surfaces.

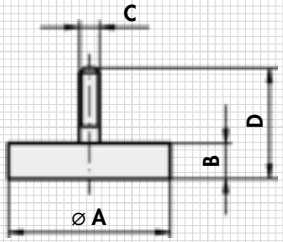
MAGNET MATERIAL

NdFeB

FASTENING OPTION

Screws

	mm				N	kg
Type	A	B	C	D	Rated holding force	Weight
MG22-M4x6	22	6	M 4x6	8	50	0.011
MG43-M6x15	22	6	M 6x15	8	85	0.032
MG66-M8x15	66	8.5	M 8x15	10	180	0.107
MG88-M8x15	88	8.5	M 8x15	12	420	0.193



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.42 - MG 22-M4x6

SAV 240.09 HOLDING MAGNETS

With h6 seat (bar magnet)

DESIGN

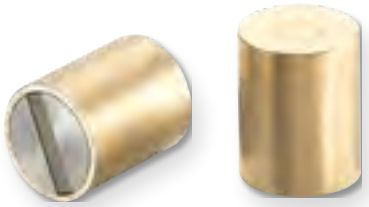
Brass magnet housing with integrated sandwich magnet system.
Max. service temperature: 200 °C.

MAGNET MATERIAL

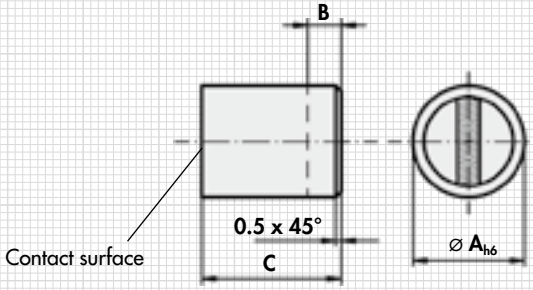
$SmCo_5$

FASTENING OPTION

Pressing, glueing.



	mm				N	kg
Type	A_{h6}	B[1]	C	D[2]	Rated holding force	Weight
MH 9 - 01	6	10	20	1.5	8	0.004
MH 9 - 02	8	10	20	1.5	22	0.008
MH 9 - 03	10	8	20	2	40	0.012
MH 9 - 04	13	6	20	2.5	60	0.020
MH 9 - 05	16	2	20	3	125	0.032
MH 9 - 06	20	5	25	4	230	0.060
MH 9 - 07	25	7	35	5	400	0.140
MH 9 - 08	32	5	40	6	600	0.265



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.09 - MH 9 - 04

NOTE

[1] Bar magnets can be shortened at the rear end by dimension B without reducing the holding force.
[2] In case of changes to the contact surface, no more than dimension B may be removed, as otherwise the holding force decreases greatly.

SAV 240.10 HOLDING MAGNETS

High-energy magnets (flat pot magnets)

DESIGN

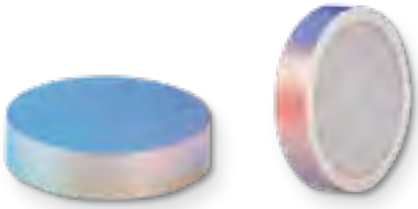
SmCo5 magnets have a 3 to 5 times higher holding force compared to conventional flat pot magnets. The magnets have a steel casing (shielded).
Max. service temperature: 200 °C.

MAGNET MATERIAL

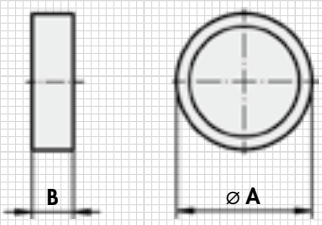
$SmCo_5$

FASTENING OPTION

Pressing, glueing, casting



	mm		N	kg
Type	A ±0.15	B ±0.15	Rated holding force	Weight
MH 10 - 01	6	4.5	5	0.001
MH 10 - 02	8	4.5	11	0.002
MH 10 - 03	10	4.5	20	0.003
MH 10 - 04	13	4.5	40	0.005
MH 10 - 05	16	4.5	60	0.007
MH 10 - 06	20	6	90	0.015
MH 10 - 07	25	7	150	0.027
MH 10 - 08	32	7	220	0.044



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.10 - MH 10 - 08

SAV 240.34 HOLDING MAGNETS

High-energy magnets, SmCo flat pot magnets, anisotropic, with cylindrical hole

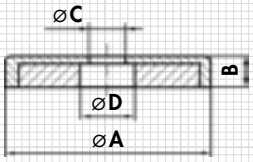
DESIGN

Shielded system, galvanised surface.
Anisotropic magnetising.
Max. service temperature: 350 °C.

MAGNET MATERIAL

$SmCo_5$

Type	A ±0.15 (mm)	B ±0.15 (mm)	C (mm)	D (mm)	Rated holding force (N)	Weight (kg)
MH 34 - 120	20	6	4.5	8	60	0.013
MH 34 - 125	25	7	4.5	8	80	0.024
MH 34 - 132	32	7	5.5	11	200	0.039
MH 34 - 140	40	8	5.5	10	420	0.075



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.34 - MH 34 - 120

SAV 240.35 HOLDING MAGNETS

Stud with internal thread (flat pot magnet), extremely high rated holding force

DESIGN

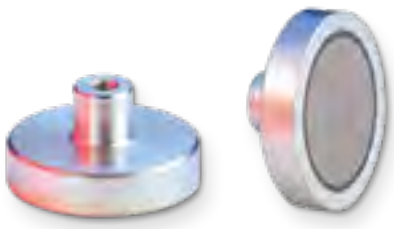
Shielded system, galvanised surface.
Max. service temperature: 200 °C.

MAGNET MATERIAL

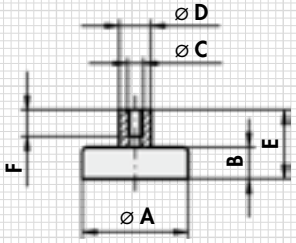
$SmCo_5$

FASTENING OPTION

Screws



Type	A ±0.2 (mm)	B ±0.2 (mm)	C (mm)	D (mm)	E (mm)	F (mm)	Rated holding force (N)	Weight (kg)
MH 35 - 06	6	4.5	M 3	6	11.5	7	5	0.002
MH 35 - 08	8	4.5	M 3	6	11.5	7	11	0.002
MH 35 - 10	10	4.5	M 3	6	11.5	7	20	0.003
MH 35 - 13	13	4.5	M 3	6	11.5	7	40	0.005
MH 35 - 16	16	4.5	M 4	8	11.5	7	60	0.008
MH 35 - 20	20	6	M 4	8	13	7	90	0.016
MH 35 - 25	25	7	M 4	8	14	7	150	0.022
MH 35 - 32	32	7	M 5	10	15.5	8.5	220	0.040



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.35 - MH 35 - 20

SAV 240.04 HOLDING MAGNETS

With internal thread (bar magnet)

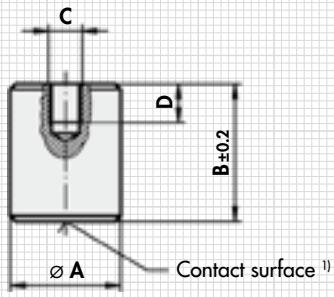
DESIGN
Bar magnet, smooth without fitting tolerance.
Shielded system.
Max. service temperature: 450 °C.

MAGNET MATERIAL
AlNiCo 500

FASTENING OPTION
Screws

NOTE
Amplified version, see SAV 240.14 NdFeB.
For use in injection moulds with high injection pressure please contact us.

	mm				N	kg
Type	A ±0.2	B ±0.2	C	D	Rated holding force	Weight
MH 11 - 06	6	20	M 3	5	1.7	0.003
MH 11 - 08	8	20	M 3	5	4	0.006
MH 11 - 10	10	20	M 4	7	8.5	0.010
MH 11 - 13	13	20	M 4	7	12	0.016
MH 11 - 16	16	20	M 4	5	20	0.025
MH 11 - 20	20	25	M 6	7	45	0.055
MH 11 - 25	25	35	M 6	9	100	0.135
MH 11 - 32	32	40	M 8	9	190	0.230



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.04 - MH 11 - 32

NOTE
1) In case of changes to the contact surface, no more than 2 mm may be removed, as otherwise the holding force decreases greatly.

SAV 240.05 HOLDING MAGNETS

With smooth stud (bar magnet)

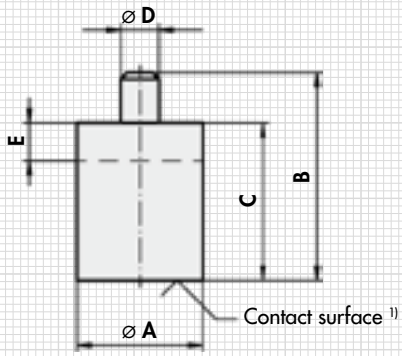
DESIGN
Bar magnet with smooth stud.
Shielded system.
Max. service temperature: 450 °C

MAGNET MATERIAL
AlNiCo 500

FASTENING OPTION
Riveting in the stud or screwing in after machining a thread.

NOTE
For use in injection moulds with high injection pressure please contact us.

	mm					N	kg
Type	A ±0.2	B ±0.2	C	D	E 2)	Rated holding force	Weight
MH 5 - 01	6	28	20	3	2	1.7	0.004
MH 5 - 02	8	28	20	3	3	4	0.007
MH 5 - 03	10	28	20	4	6	8.5	0.013
MH 5 - 04	13	28	20	4	7	12	0.021
MH 5 - 05	16	28	20	5	5	20	0.032
MH 5 - 06	20	33	25	6	6	45	0.062
MH 5 - 07	25	45	35	8	5	100	0.137
MH 5 - 08	32	50	40	10	3	190	0.245
MH 5 - 09	40	70	50	15	5	240	0.520
MH 5 - 10	50	85	60	18	2	420	0.961
MH 5 - 11	63	95	65	20	5	660	1.580



ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.05 - MH 5 - 10

NOTE
1) In case of changes to the contact surface, no more than 2 mm may be removed, as otherwise the holding force decreases greatly.
2) The stud can be extended by dimension E without reducing the holding force.

SAV 240.06 HOLDING MAGNETS

Bar magnets without fitting tolerance

DESIGN
Bar magnet, smooth without fitting tolerance.
Shielded system.
Max. service temperature: 450 °C.

MAGNET MATERIAL
AlNiCo 500

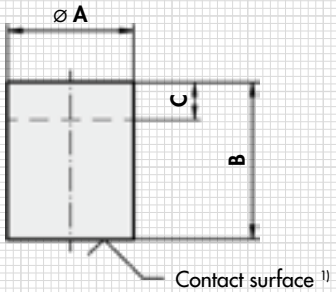
FASTENING OPTION
Pressing, shrinking, glueing

NOTE
For use in injection moulds with high injection pressure please contact us.

	mm			N	kg
Type	A ±0.2	B ±0.2	C[2]	Rated holding force	Weight
MH 6 - 01	6	20	12	1.7	0.004
MH 6 - 02	8	20	11	4	0.007
MH 6 - 03	10	20	10	8.5	0.011
MH 6 - 04	13	20	8	12	0.019
MH 6 - 05	16	20	6	20	0.029
MH 6 - 06	20	25	5	45	0.061
MH 6 - 07	25	35	13	100	0.140
MH 6 - 08	32	40	9	190	0.240
MH 6 - 09	40	50	10	240	0.500
MH 6 - 10	50	60	10	420	0.900
MH 6 - 11	63	65	10	660	1.500

ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.06 - MH 6 - 08



NOTE
1) In case of changes to the contact surface, no more than 2 mm may be removed, as otherwise the holding force decreases greatly.
2) Bar magnets can be shortened at the rear end by dimension C without reducing the holding force.

SAV 240.07 HOLDING MAGNETS

Bar magnets with fitting tolerance

DESIGN
Bar magnet, smooth with fitting tolerance h6 in the diameter. Shielded system.
Max. service temperature: 450 °C.

MAGNET MATERIAL
AlNiCo 500

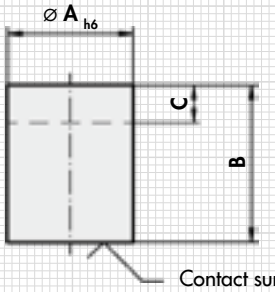
FASTENING OPTION
Pressing, shrinking, glueing

NOTE
For use in injection moulds with high injection pressure please contact us.

	mm			N	kg
Type	A h6	B ±0.2	C[2]	Rated holding force	Weight
MH 7 - 01	6	10	2	1.5	0.002
MH 7 - 02	8	12	3	3.5	0.004
MH 7 - 03	10	16	6	7	0.009
MH 7 - 04	13	18	7	10	0.017
MH 7 - 05	16	20	5	18	0.029
MH 7 - 06	20	25	6	42	0.057
MH 7 - 07	25	30	5	96	0.110
MH 7 - 08	32	35	3	180	0.200
MH 7 - 09	40	45	5	240	0.420
MH 7 - 10	50	50	2	420	0.720
MH 7 - 11	63	60	5	660	1.340

ORDERING EXAMPLE

Designation	SAV no. - type
Holding magnet	SAV 240.07 - MH 7 - 08



NOTE
1) In case of changes to the contact surface, no more than 2 mm may be removed, as otherwise the holding force decreases greatly.
2) Bar magnets can be shortened at the rear end by dimension C without reducing the holding force.

SAV 240.11 POT MAGNETS

With internal thread

DESIGN

Strong magnet with steel casing and threaded blind hole. Surface with wrinkle paint finish, red.
Max. service temperature:
- 100 °C for paint
- 400 °C for magnet material

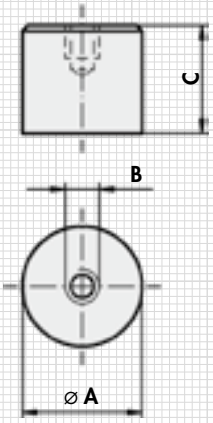
MAGNET MATERIAL

AlNiCo

FASTENING OPTION

Screws

	mm			N	kg
Type	A	B	C	Rated holding force	Weight
MH 11 - 12	12.7	M 4	16	20	0.016
MH 11 - 17	17	M 6	16	20	0.025
MH 11 - 21	21	M 6	19	28	0.050
MH 11 - 27	27	M 6	25.4	68	0.110
MH 11 - 35	35	M 6	30	150	0.220
MH 11 - 35-2	35	M 6	20	100	0.160
MH 11 - 45	45	M 8	30	280	0.380
MH 11 - 50	50	M 8	40	350	0.630
MH 11 - 65	65	M 12	43	400	1.080



ORDERING EXAMPLE

Designation	SAV no. - type
Pot magnet	SAV 240.11 - MH 11 - 65

SAV 240.12 FLAT POT MAGNETS

Hole with counterbore

DESIGN

Strong magnet with hole and counterbore.
Surface with wrinkle paint finish, red.
Max. service temperature:
- 100 °C for paint
- 400 °C for magnet material

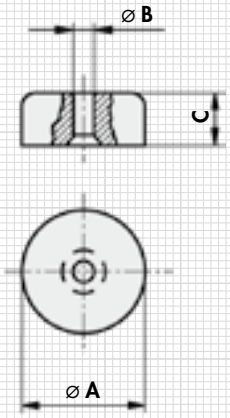
MAGNET MATERIAL

AlNiCo

FASTENING OPTION

Screws

	mm			N	kg
Type	A	B	C	Rated holding force	Weight
MH 12 - 19	19	3.5	8	25	0.017
MH 12 - 29	29	4.7	9	50	0.044
MH 12 - 38	38	4.7	11.1	80	0.105



ORDERING EXAMPLE

Designation	SAV no. - type
Flat pot magnet	SAV 240.12 - MH 12 - 38

SAV 240.13 BUTTON MAGNETS

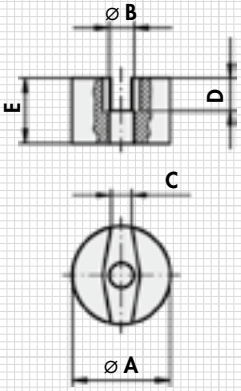
Divided contact surface, with through hole

DESIGN
Divided contact surface, through hole.
Surface with wrinkle paint finish, red.
Max. service temperature:
- 100 °C for paint
- 400 °C for magnet material

MAGNET MATERIAL
AlNiCo

FASTENING OPTION
Screws from the contact surface side

	mm					N	kg
Type	A	B	C	D	E	Rated holding force	Weight
MH 13 - 13	12.7	4.7	4	4.8	9.5	7	0.006
MH 13 - 19	19	5.2	5.5	6.4	12.7	19	0.019
MH 13 - 25	25.4	5.2	5.5	8	19.5	29	0.063
MH 13 - 32	32.5	7	8	12	25	66	0.105



ORDERING EXAMPLE

Designation	SAV no. - type
Button magnet	SAV 240.13 - MH 13 - 32

SAV 240.15 POT MAGNETS

With forcing screw[1)]

DESIGN
Strong rated holding force, the handle facilitates removal from the material. Surface with wrinkle paint finish, red.
Max. service temperature:
- 100 °C for paint
- 400 °C for magnet material

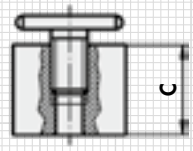
MAGNET MATERIAL
AlNiCo/hard ferrite

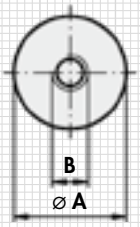
FASTENING OPTION
Screws

APPLICATION
As a holding magnet, for light to medium transport work.

NOTE
[1)] MH 15 - 1 without forcing screw, but only with T-bolt.

	mm			N		kg
Type	A	B	C	Rated holding force	Permanent magnet material	Weight
MH 15 - 1[1)]	50	M 8	40	270	AlNiCo	0.60
MH 15 - 2	70	M 8	63	650	AlNiCo	2.02
MH 15 - 3	75	M 12	45	400	Hard ferrite	2.20
MH 15 - 4	44	M 8	44	200	AlNiCo	0.52
MH 15 - 5	102	M 8	75	1700	AlNiCo	6.40
MH 15 - 6	95	M 8	95	2200	AlNiCo	7.70





Shown without T-bolt

ORDERING EXAMPLE

Designation	SAV no. - type
Pot magnet	SAV 240.15 - MH 15 - 4

SAV 241.06 BAR MAGNETS

Pairs, rectangular and round cross-section

DESIGN

Surface with wrinkle paint finish, red, unshielded.
Max. service temperature:
- 100 °C for paint
- 400 °C for magnet material

MAGNET MATERIAL

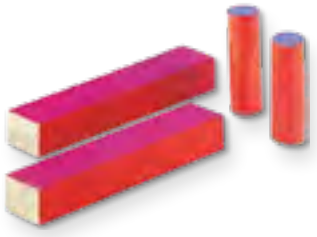
AlNiCo 500

FASTENING OPTION

Pressing, glueing.

NOTE

Supplied in pairs. Machining: grinding only.

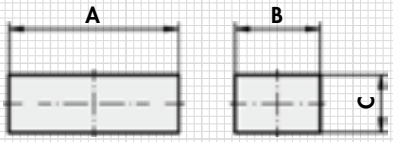


Rectangular bar magnets:

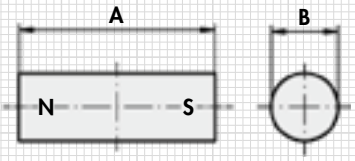
Type	A (mm)	B (mm)	C (mm)	Weight (kg)
MH 630	20	10	5	0.005
MH 631	60	15	5	0.055
MH 632	50	15	10	0.063
MH 633	75	15	10	0.118
MH 634	101	15	10	0.174
MH 635	40	12.5	5	0.030
MH 636	60	12.5	5	0.036

Round bar magnets:

Type	A (mm)	B (mm)	Weight (kg)
MH 620	10	4	0.001
MH 621	10	5	0.001
MH 622	10	6	0.001
MH 623	20	5	0.002
MH 624	20	6	0.003
MH 625	24	8	0.007
MH 626	30	10	0.018



Type MH 630 to type MH 636



Type MH 620 to type MH 626

ORDERING EXAMPLE

Designation	SAV no. - type
Bar magnet	SAV 241.06 - MH 635

SAV 241.14 STRONG MAGNETS

U-shaped with fastening holes

DESIGN

U-shaped magnet with high rated holding force, through hole for fastening from type MH 14-17. Contact surfaces polished.
To prevent demagnetising, an iron plate must be provided across both poles. Surface with wrinkle paint finish, red.
Max. service temperature:
- 100 °C for paint
- 400 °C for magnet material

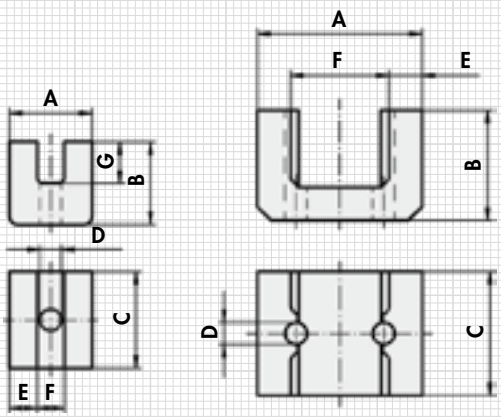
MAGNET MATERIAL

AlNiCo, cast

FASTENING OPTION

Screws, glueing

Type	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	Rated holding force (N)	Weight (kg)
MH 14 - 05	21.4	11.3	8	-	7.8	6.5	3.3	20	0.012
MH 14 - 10	28.5	25.3	7.4	-	8	7	15	35	0.026
MH 14 - 17	22	22	25	7	7	8	9	45	0.010
MH 14 - 20	30.4	20.3	20.3	5	8	15	11	40	0.063
MH 14 - 25	38.1	25.4	25.4	5	9.5	19.1	14.5	90	0.133
MH 14 - 29	44.4	29.5	28.6	5.8	11.1	22.2	17	120	0.197
MH 14 - 35	58	35	44	8	11	28	23	230	0.500
MH 14 - 39	60	39.2	61.5	7	14	32	26	250	0.830
MH 14 - 41	70	41	57	8	15	40	26	320	1.000
MH 14 - 54	78	54	82	10.5	15	48	36	470	2.200



ORDERING EXAMPLE

Designation	SAV no. - type
Strong magnet	SAV 241.14 - MH 14 - 29

SAV 240.45 MAGNETIC CORES
Made of AlNiCo 500

DESIGN
Improved magnetic capacity through lengthwise alignment of the crystals.
Unshielded magnetic system. Circumference rough, face side polished.
Max. service temperature: 400 °C.

MAGNET MATERIAL
AlNiCo 500

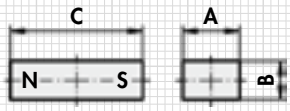
FASTENING OPTION
Glueing, pressing

Round bar magnets MK 20:

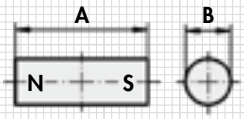
Type	A ±0.2 mm	B ±0.2 mm	Weight kg
MK 20 - 15	3	15	0.001
MK 20 - 20 - 4	4	20	0.002
MK 20 - 20 - 5	5	20	0.003
MK 20 - 25	6	25	0.005
MK 20 - 32	8	32	0.012
MK 20 - 45	10	45	0.026
MK 20 - 60	15	60	0.078
MK 20 - 120	20	120	0.150

Rectangular bar magnets MK 21:

Type	A ±0.3 mm	B ±0.2 mm	C ±0.3 mm	Weight kg
MK 21 - 25	4.8	4.8	25.4	0.004
MK 21 - 32	6.3	6.3	32	0.009
MK 21 - 20	10	5	20	0.007
MK 21 - 60	15	5	60	0.033



Rectangular bar magnets MK 21



Round bar magnets made of AlNiCo 500 – precision casting MK 20

NOTE
Due to the high remanence and low coercive field strength of the AlNiCo, demagnetising can occur in case of same-pole (repelling force) storage.
Machining: grinding only.

ORDERING EXAMPLE

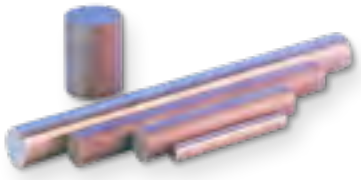
Designation	SAV no. - type
Magnetic core	SAV 240.45 - MH 21 - 60

SAV 240.46 MAGNETIC CORES
Made of AlNiCo 500 in specific lengths

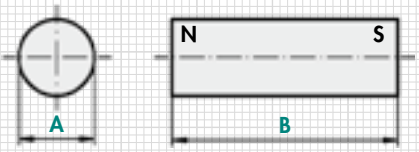
DESIGN
Polished face sides, unshielded magnet.
Max. service temperature: 450 °C.

MAGNET MATERIAL
AlNiCo 500

FASTENING OPTION
Pressing, glueing.



Type	A ±0.2 mm	B ±0.2 mm Standard
MK 30 - 03	3	10 / 12
MK 30 - 04	4	10 / 16 / 20
MK 30 - 05	5	10 / 20 / 30
MK 30 - 06	6	15 / 20 / 24 / 30
MK 30 - 08	8	10 / 25
MK 30 - 10	10	20 / 30 / 40
MK 30 - 12	12	40
MK 30 - 15	15	30 / 60
MK 30 - 20	20	40 / 60 / 80
MK 30 - 34	34	80



NOTE
Rated holding forces cannot be stated for open magnet systems.
Machining: grinding only.
Intermediate sizes are available if dimensions are provided.
For cost reasons, a minimum quantity of 25 units always applies.

ORDERING EXAMPLE

Designation	SAV no. - type x length
Magnetic core	SAV 240.46 - MK 30 - 12 x 50

SAV 240.50 MAGNETIC CORES MADE OF $SmCo_5$

With high rated holding force

DESIGN

The holding magnets are manufactured by sintering. The magnets are hard and brittle and can only be machined while demagnetised.

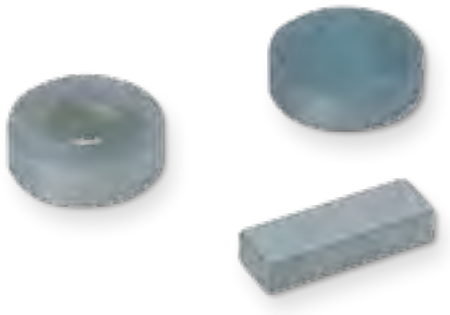
Max. service temperature: 200 °C
Remanence: approx. 850 mT to 930 mT

MAGNET MATERIAL

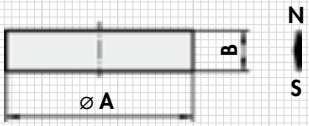
Samarium cobalt, $SmCo_5$, unshielded, anisotropic

FASTENING OPTION

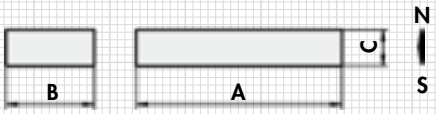
Glueing, pressing



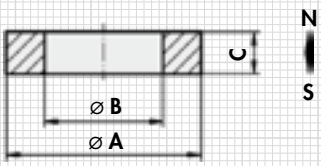
Disc magnets MK 40:



Cuboid magnets MK 41:



Ring magnets MK 42:



Disc magnets MK 40:

Type	A (mm)	B (mm)	Weight (kg)
MK 40 - 01 - 03	1.5	3	1
MK 40 - 02 - 04	1.8	4	1
MK 40 - 02 - 02	2	2	1
MK 40 - 02 - 10	2	10	0.3
MK 40 - 03 - 02	3	2	0.1
MK 40 - 04 - 02	4	1.5	0.2
MK 40 - 04 - 05	4	5	0.5
MK 40 - 05 - 02	5	2	0.3
MK 40 - 05 - 03	5	3	0.5
MK 40 - 05 - 05	5	5	0.8
MK 40 - 06 - 02	6	2	0.5
MK 40 - 06 - 04	6	4	1.0
MK 40 - 06 - 10	6	10	2.0
MK 40 - 07 - 03	7	3	1.0
MK 40 - 08 - 05	8	5	2.0
MK 40 - 10 - 03	10	3	2.0
MK 40 - 10 - 05	10	5	3.0
MK 40 - 10 - 10	10	10	7.0
MK 40 - 15 - 05	15	5	7.0
MK 40 - 15 - 10	15	10	15.0
MK 40 - 20 - 05	20	5	13.0
MK 40 - 25 - 08	25	8	33.0
MK 40 - 25 - 15	25	15	62.0

Cuboid magnets MK 41:

Type	A (mm)	B (mm)	C (mm)	Weight (kg)
MK 41 - 02 - 02 - 01	2	2	1	0.1
MK 41 - 03 - 03 - 02	3	3	2	0.2
MK 41 - 04 - 04 - 02	4	4	2	0.3
MK 41 - 05 - 05 - 03	5	5	3	0.6
MK 41 - 05 - 05 - 02	5	4.5	1.5	0.3
MK 41 - 06 - 03 - 01	6	3	1	0.2
MK 41 - 10 - 07 - 02	10	7	2	1.0
MK 41 - 10 - 10 - 03	10	10	3	3.0
MK 41 - 12 - 09 - 03	12	9	2.5	2.0
MK 41 - 15 - 15 - 06	15	15	6	11.0
MK 41 - 16 - 12 - 03	16	12	3	5.0
MK 41 - 18 - 16 - 04	18	16	4	10.0
MK 41 - 26 - 21 - 05	26	21	5	23.0
MK 41 - 30 - 10 - 06	30	10	6	15.0
MK 41 - 30 - 20 - 10	30	20	10	50.0
MK 41 - 32 - 27 - 06	32	27	6	44.0

Ring magnets MK 42:

Type	A (mm)	B (mm)	C (mm)	Weight (kg)
MK 42 - 20 - 10 - 05	20	10	5	0.4
MK 42 - 25 - 12 - 08	25	12	8	0.4
MK 42 - 30 - 10 - 10	30	10	10	0.5
MK 42 - 40 - 15 - 10	40	15	10	0.9

ORDERING EXAMPLE

Designation	SAV no. - type
Magnetic core	SAV 240.50 - MK 40 - 01 - 03

SAV 240.55 MAGNETIC CORES MADE OF NdFeB

High-energy magnet

DESIGN

Neodymium iron boron is the strongest magnet material available. Compared to samarium cobalt, the energy product is approx. 40% higher, while the density is approx. 12% lower and the base materials are more easily available. The magnets are manufactured by sintering.

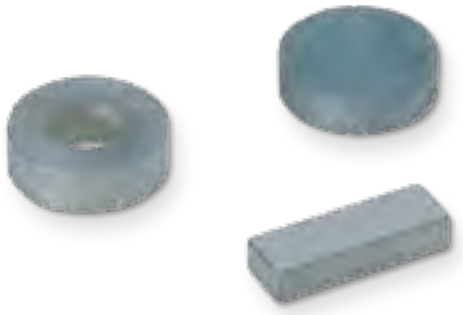
Max. service temperature: 80 °C
Remanence: 1000 mT to 1250 mT

MAGNET MATERIAL

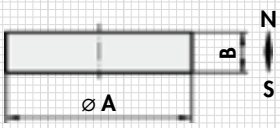
Neodymium iron boron, $Nd_2Fe_{14}B$
unshielded

FASTENING OPTION

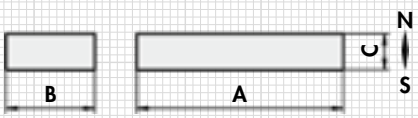
Glueing, pressing



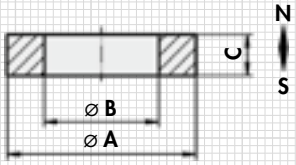
Disc magnets MK 50:



Cuboid magnets MK 51:



Ring magnets MK 52:



Disc magnets MK 50:

Type	A (mm)	B (mm)	Weight (kg)
MK 50 - 02 - 02	1.5	2	0.1
MK 50 - 02 - 04	2	4	0.1
MK 50 - 02 - 10	2	10	0.2
MK 50 - 03 - 03	3	3	0.2
MK 50 - 04 - 01	4	1.2	0.1
MK 50 - 04 - 02	4	1.5	0.1
MK 50 - 04 - 05	4	5	0.5
MK 50 - 05 - 03	5	3	0.4
MK 50 - 05 - 10	5	10	2.0
MK 50 - 06 - 02	6	2	0.4
MK 50 - 06 - 05	6	5	1.0
MK 50 - 08 - 06	8	6	2.0
MK 50 - 09 - 05	9	5	2.0
MK 50 - 10 - 03	10	3	2.0
MK 50 - 10 - 05	10	5	2.0
MK 50 - 14 - 04	13.5	3.5	4.0
MK 50 - 15 - 03	15	3	4.0
MK 50 - 15 - 05	15	5	4.0
MK 50 - 20 - 05	20	5	7.0
MK 50 - 20 - 10	20	10	23.0
MK 50 - 25 - 07	25	7	25.0

Cuboid magnets MK 51:

Type	A (mm)	B (mm)	C (mm)	Weight (kg)
MK 51 - 02 - 02 - 01	2	2	1	0.1
MK 51 - 03 - 03 - 01	3	3	1	0.1
MK 51 - 04 - 04 - 02	4	4	2	0.2
MK 51 - 04 - 05 - 05	4.8	4.8	4.5	0.8
MK 51 - 05 - 05 - 02	5	5	2	0.4
MK 51 - 05 - 05 - 01	5	4.5	1.5	0.2
MK 51 - 06 - 03 - 01	6	3	1	0.1
MK 51 - 06 - 06 - 05	6	6	5	1.0
MK 51 - 08 - 08 - 06	8	8	6	1.0
MK 51 - 10 - 07 - 02	10	7	2	3.0
MK 51 - 10 - 10 - 03	10	10	3	2.0
MK 51 - 10 - 10 - 06	10	10	6	4.0
MK 51 - 12 - 09 - 03	12	9	2.5	2.0
MK 51 - 15 - 15 - 05	15	15	5	8.0
MK 51 - 18 - 16 - 04	18	16	4	9.0
MK 51 - 20 - 10 - 05	20	10	5	7.0
MK 51 - 20 - 20 - 08	20	20	8	24.0
MK 51 - 30 - 10 - 06	30	10	6	13.0
MK 51 - 30 - 30 - 06	30	30	6	40.0
MK 51 - 50 - 20 - 08	50	20	8	59.0
MK 51 - 75 - 50 - 10	75	50	10	278.0

Ring magnets MK 52:

Type	A (mm)	B (mm)	C (mm)	Weight (kg)
MK 52 - 15 - 05 - 06	15	5	6	7.0
MK 52 - 20 - 04 - 05	20	4.2	5	11.0
MK 52 - 20 - 10 - 06	20	10	6	10.0
MK 52 - 25 - 12 - 08	25	12	8	22.0
MK 52 - 40 - 23 - 06	40	23	6	37.0

NOTE:

The magnetic capacity is not weakened even in case of strong opposing fields.
The magnets are subject to corrosion in the presence of high humidity and are not resistant against acid, lye and salt. Custom dimensions to your specifications available.

ORDERING EXAMPLE

Designation	SAV no. - type
Magnetic core	SAV 240.55 - MK 50 - 02 - 02

SAV 240.56 MAGNETIC CORES MADE OF NdFeB

Polymer-bonded, with high rated holding force

DESIGN

Polymer-bonded neodymium iron boron magnets are not sintered like other magnets, but the magnetic powder is mixed with epoxy resin and hot-pressed in moulds.
We can machine the compression-moulded standard magnets to customer specifications while demagnetised.

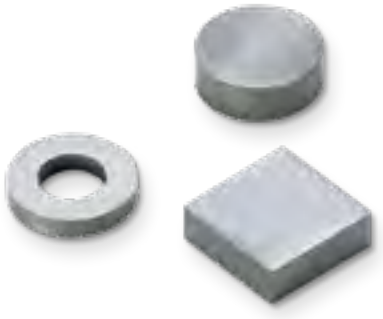
Max. service temperature: 80 °C
Remanence: approx. 680 mT
Tolerance range: ±0.1 to 0.2 mm

MAGNET MATERIAL

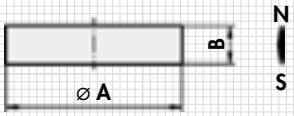
Neodymium iron boron, $Nd_2Fe_{14}B$
Polymer-bonded, isotropic magnetising

FASTENING OPTION

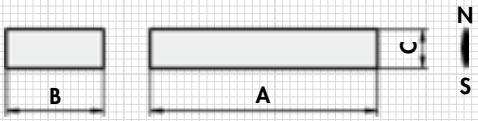
Glueing, pressing



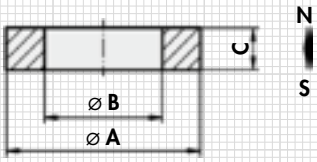
Disc magnets MK 60



Cuboid magnets MK 61



Ring magnets MK 62



Disc magnets MK 60:

	mm		kg
Type	A	B	Weight
MK 60 - 02 - 05	2	5	0.1
MK 60 - 03 - 10	3	10	0.4
MK 60 - 04 - 10	4	10	0.8
MK 60 - 05 - 10	5	10	1.2
MK 60 - 06 - 02	6	2	0.3
MK 60 - 06 - 10	6	10	1.7
MK 60 - 08 - 03	8.5	3	1.0
MK 60 - 10 - 05	10	5	2.0
MK 60 - 10 - 10	10	10	5.0
MK 60 - 13 - 05	12.5	5	4.0
MK 60 - 13 - 10	12.5	10	7.0
MK 60 - 15 - 03	15	3	3.0
MK 60 - 20 - 08	20	7.7	15.0
MK 60 - 25 - 05	25	5	15.0

Cuboid magnets MK 61:

	mm			kg
Type	A	B	C	Weight
MK 61 - 05 - 05 - 02	5	5	2	0.3
MK 61 - 10 - 05 - 05	10	5	5	2.0
MK 61 - 24 - 12 - 10	24	12	10	18.0
MK 61 - 50 - 10 - 10	50	10	10	30.0
MK 61 - 50 - 12 - 10	50	12	10	36.0
MK 61 - 30 - 30 - 10	30	30	10	54.0

Ring magnets MK 62:

	mm			kg
Type	A	B	C	Weight
MK 62 - 26 - 22 - 05	26	22	5	5.0
MK 62 - 30 - 16 - 05	30	16	5	15.0
MK 62 - 35 - 21 - 05	35	21	5	18.0
MK 62 - 35 - 21 - 10	35	21	10	37.0

NOTE:

The magnetic capacity is not weakened even in case of strong opposing fields.
Can be used without surface protection under normal ambient temperatures at a relative humidity of up to 50% (no condensation).
Custom dimensions not possible.

ORDERING EXAMPLE

Designation	SAV no. - type
Magnetic core	SAV 240.56 - MK 60 - 02 - 05

SAV 240.70 FLEXIBLE PERMANENT MAGNETS

Easy to machine

APPLICATION

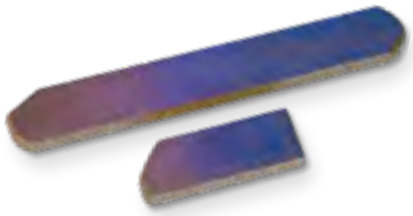
Bending produces ring magnets which are used for small DC motors by inserting them into the stator sleeve. Axially magnetised rings or discs can be punched out of strips. Holding magnet bars can be manufactured with excellent holding forces in any length. To achieve this, flexible magnet strips are placed between two flat pieces of iron (sandwich system, see drawing). They are attached using glueing or pressing. Easy to machine with normal tools.

DESIGN

Improved magnetic capacity through length-wise alignment of the crystals in the magnetic field (anisotropy). Resistant to demagnetising, ageing-resistant.

MAGNET MATERIAL

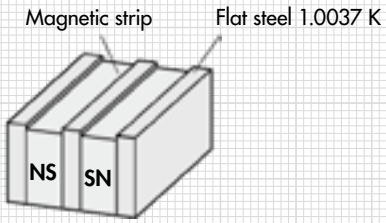
- Hard ferrite, polymer-bonded
- Max. service temperature: 85 °C
- Max. bending radius: 8 x thickness
- Hardness: 90 – 100 Shore
- Density: 3.7 g/cm³



CHEMICAL RESISTANCE

Excellent – to air, ozone, steam. **Not affected** by mineral oil, weak acid and lye, kerosene and glycol. **Slightly affected** by nitric acid. **Swelling** caused by petrol, acetone, alcohol (90%). **Dissolved** by benzene, chlorinated solvents.

	mm		
Type	Thickness ±0.15	Width ±0.25	Length ±0.50
MF 10 - 03	3	25	200
MF 10 - 05	5	25	200
MF 10 - 06	6	30	200
MF 10 - 08 - 30	8	30	200
MF 10 - 08 - 09	8	9	250
MF 10 - 08 - 24	8	24	500



ORDERING EXAMPLE

Designation	SAV no. - type
Flexible permanent magnet	SAV 240.70 - MF 10 - 06

SAV 240.72 MAGNETIC TAPES

Self-adhesive

DESIGN

Improved rated holding force through alignment of the crystals, magnetised on one side, dark brown with smooth surface, can be cut with scissors. The displacement force is approx. 1/3 of the rated holding force.

Max. service temperature: 75 °C
Rated holding force: 0.8 N/cm²

FASTENING OPTION

Almost non-magnetic rear side with self-adhesive coating.

NOTE

Excellent adhesion on thin metal sheets through multi-pole magnetising.

	mm			m
Type	Width	Thickness	Width tolerance	Length per roll
MB 60 - 12*	12.7	1.5	±0.3	10 / 30
MB 60 - 20	20	1.5	±0.3	10 / 30
MB 60 - 25*	25.4	1.6	±0.3	10 / 30

*Also available in a version where the magnetic tape is magnetised in such a way that 2 tapes can be stacked exactly. In this case, a set of 2 rolls is supplied, one as version A and one as version B.

ORDERING EXAMPLE

Designation	SAV no. - type
Magnetic tape	SAV 240.72 - MB 60 - 12

SAV 240.71 MAGNETIC TAPES

Can be cut with scissors, adhesive on one side

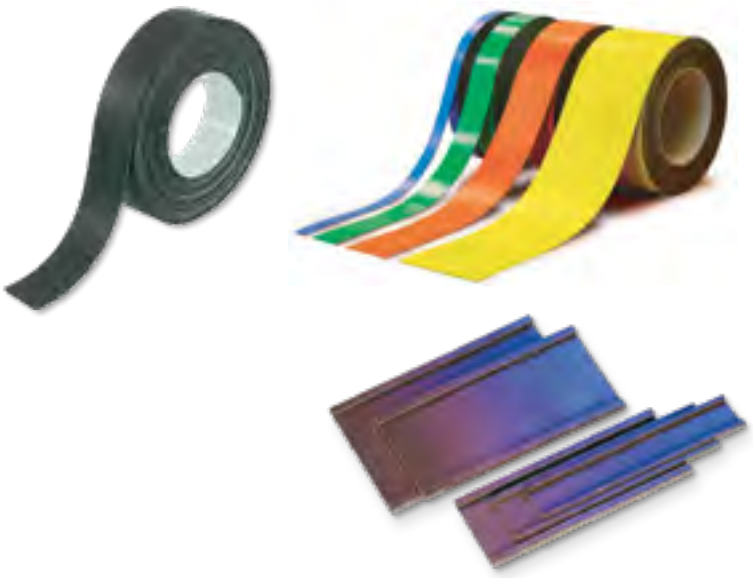
DESIGN

Polymer-bonded magnet, can be cut with scissors.

FASTENING OPTION

Magnetic tapes. Type MB 51 with almost non-magnetic rear side and self-adhesive coating.

Permaflex 424 holding force:
Thickness 1.0 mm: 0.55 N/cm²
Thickness 1.5 mm: 0.57 N/cm²
Thickness 2.0 mm: 0.58 N/cm²



Magnetic tape, coloured MB 50:
black (SW), white (WS), red (RT), blue (BL), green (GR), yellow (GB)

Type	Width mm	Thick-ness mm	Length per roll m
MB 50 - 10	10	0.8	10
MB 50 - 15	15	0.8	10
MB 50 - 20	20	0.8	10
MB 50 - 25	25	0.8	10
MB 50 - 30	30	0.8	10
MB 50 - 35	35	0.8	10
MB 50 - 40	40	0.8	10
MB 50 - 50	50	0.8	10
MB 50 - 60	60	0.8	10
MB 50 - 70	70	0.8	10
MB 50 - 80	80	0.8	10
MB 50 - 90	90	0.8	10
MB 50 - 100	100	0.8	10

Magnetic tape, self-adhesive, anisotropic MB 51:
Permaflex, colour: blank brown
Rear side with self-adhesive coating

Type	Width mm	Thick-ness mm	Length per roll m
MB 51 - 10	10	0.6	10
MB 51 - 15	15	0.6	10
MB 51 - 20	20	0.6	30
MB 51 - 25	25	0.6	30
MB 51 - 30	30	0.6	10
MB 51 - 35	35	0.6	10
MB 51 - 40	40	0.6	10
MB 51 - 50	50	0.6	10

ORDERING EXAMPLE

Designation	SAV no. - type - colour
Magnetic tape	SAV 240.71 - MB 50 - 10 - SW

Magnetic tape, C-profile MB 54:
Flexible magnetic label strips

Type	Width mm	Length per roll m
MB 54 - 10	10	50
MB 54 - 15	15	50
MB 54 - 20	20	50
MB 54 - 25	25	50
MB 54 - 30	30	50
MB 54 - 40	40	50
MB 54 - 50	50	50

Magnetic tape, anisotropic MB 52 and MB 53:
Permaflex, colour: blank brown
Rear side with self-adhesive coating

Type	Width mm	Thick-ness mm	Length per roll m
MB 52 - 10	10	1	10
MB 52 - 15	15	1	10
MB 52 - 20	20	1	10
MB 52 - 25	25	1	10
MB 52 - 30	30	1	10
MB 52 - 35	35	1	10
MB 52 - 40	40	1	10
MB 52 - 50	50	1	10
MB 53 - 10	10	1.5	10
MB 53 - 15	15	1.5	10
MB 53 - 20	20	1.5	10
MB 53 - 25	25	1.5	10
MB 53 - 30	30	1.5	10
MB 53 - 35	35	1.5	10
MB 53 - 40	40	1.5	10
MB 53 - 50	50	1.5	10

SAV 240.73 MAGNETIC FILMS
In different colours

DESIGN
Plain; with coloured vinyl layer (A) or with self-adhesive (SK). On request, magnetic film can be cut as required or punched out in the desired shape.

COLOURS
White (WS), black (SW), grey(GR), red (TR), yellow (GB), green (GN), blue (BL)

Quality	Width (mm)	Thickness (mm)	Type no. 10 m roll	Type no. 1 m roll
Semi-anisotropic	615	0.6	SAV 240.73-615-6-SA	SAV 240.73-615-6-SA-M
Semi-anisotropic		0.85	SAV 240.73-615-85-SA	SAV 240.73-615-85-SA-M
Semi-anisotropic		1	SAV 240.73-615-10-SA	SAV 240.73-615-10-SA-M
Semi-anisotropic		1.6	SAV 240.73-615-16-SA	SAV 240.73-615-16-SA-M
Anisotropic		0.6	SAV 240.73-615-6-A	SAV 240.73-615-6-A-M
Anisotropic		0.8	SAV 240.73-615-8-A	SAV 240.73-615-8-A-M
Anisotropic		1.1	SAV 240.73-615-11-A	SAV 240.73-615-11-A-M
Anisotropic		1.6	SAV 240.73-615-16-A	SAV 240.73-615-16-A-M
Anisotropic	350	2.1	SAV 240.73-350-21-A	SAV 240.73-350-21-A-M

ORDERING EXAMPLE

Designation	SAV no. - width x thickness - version - colour - length
Magnetic film	SAV 240.73 - 615 x 16 - A - WS - M

SAV 240.74 MAGNETIC FILMS
In blank brown

DESIGN
Plain; without vinyl (A), without self-adhesive (SK). Magnetic film is also available by the metre.

COLOUR
Blank brown

Quality	Width (mm)	Thickness (mm)	Type no. 10 m roll	Type no. 1 m roll
Semi-anisotropic	615	0.5	SAV 240.74-615-5-SA	SAV 240.74-615-5-SA-M
Semi-anisotropic		0.75	SAV 240.74-615-75-SA	SAV 240.74-615-75-SA-M
Semi-anisotropic		0.9	SAV 240.74-615-9-SA	SAV 240.74-615-9-SA-M
Semi-anisotropic		1.5	SAV 240.74-615-15-SA	SAV 240.74-615-15-SA-M
Anisotropic		0.5	SAV 240.74-615-5-A	SAV 240.74-615-5-A-M
Anisotropic		0.75	SAV 240.74-615-7-A	SAV 240.74-615-7-A-M
Anisotropic		0.9	SAV 240.74-615-1-A	SAV 240.74-615-1-A-M
Anisotropic		1.5	SAV 240.74-615-15-A	SAV 240.74-615-15-A-M
Anisotropic	350	2.1	SAV 240.74-350-21-A	SAV 240.73-350-21-A-M

ORDERING EXAMPLE

Designation	SAV no. - width x thickness - version
Magnetic film	SAV 240.74 - 615 x 15 - A

SAV 240.80 OFFICE MAGNETS
With plastic housing

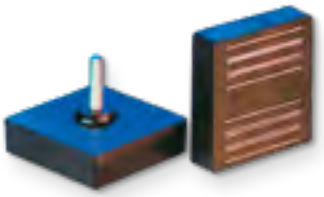
DESIGN
Strong layered magnet with plastic housing, max. service temperature: 50 °C.

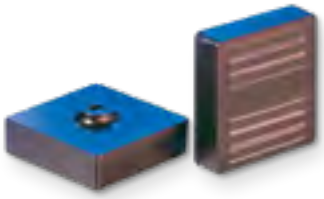
MAGNET MATERIAL
Hard ferrite, anisotropic

Available in 4 versions:
Type MO 10 - 01 with eyebolt, white.
Type MO 10 - 02 with hook, white.
Type MO 10 - 03 with threaded stud M6, black.
Type MO 10 - 04 with internal thread M6, black.


Type MO 10 - 01


Type MO 10 - 02


Type MO 10 - 03


Type MO 10 - 04

Type	Length (mm)	Width (mm)	Height (mm)	Total height approx. (mm)	Rated holding force (N)	Weight (kg)
MO 10 - 01	58	58	15	41.5	300	0.130
MO 10 - 02	53	27.5	12.5	28	150	0.053
MO 10 - 03	58	58	19.5	42	300	0.125
MO 10 - 04	58	58	15	19.5	300	0.119

ORDERING EXAMPLE

Designation	SAV no. - type
Office magnet	SAV 240.80 - MO 10 - 01

SAV 240.83 OFFICE MAGNETS
With steel housing

DESIGN
Flat pot magnet with eye bolt or hook (MO 20 – 80). Steel housing, painted white. Custom colours available from 1000 units without surcharge.

APPLICATION
As a decorative magnet

MAGNET MATERIAL
Hard ferrite, anisotropic

Type	Diameter (mm)	Hook	Rated holding force (N)	Weight (kg)
MO 20 - 16	16	M 3	18	0.007
MO 20 - 20	20	M 3	30	0.012
MO 20 - 25	25	M 4	40	0.023
MO 20 - 32	32	M 4	80	0.034
MO 20 - 36	36	M 4	100	0.045
MO 20 - 40	40	M 4	125	0.059
MO 20 - 47	47	M 4	180	0.089
MO 20 - 50	50	M 4	220	0.107
MO 20 - 57	57	M 4	280	0.149
MO 20 - 63	63	M 4	350	0.233
MO 20 - 80	80	Eyebolt M6	600	0.485

ORDERING EXAMPLE

Designation	SAV no. - type
Office magnet	SAV 240.83 - MO 20 - 47

SAV 240.84 OFFICE MAGNETS

With steel casing

APPLICATION

Flat pot magnet with handle, galvanised and painted white. For holding paper, drawings, plans, etc.

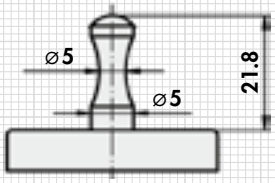
DESIGN

Strong holding magnets with steel housing, painted white. With handle for easy removal. Custom colours available from 1000 units without surcharge.

MAGNET MATERIAL

Hard ferrite, anisotropic

	mm		N	kg
Type	Diameter	Height	Rated holding force	Weight
MO 30 - 25	25	29.5	40	0.025
MO 30 - 32	32	29.5	80	0.035
MO 30 - 36	36	29.5	100	0.045
MO 30 - 40	40	30.0	125	0.062



ORDERING EXAMPLE

Designation	SAV no. - type
Office magnet	SAV 240.84 - MO 30 - 32

SAV 240.85 OFFICE MAGNETS

With plastic casing – type MO 40

DESIGN

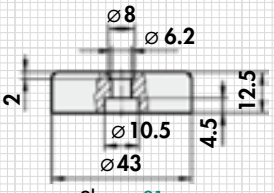
Decorative magnet with white plastic casing, in different shapes.
Rated holding force: 120 N
Service temperature: max. 50 °C

APPLICATION

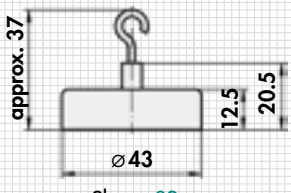
As a decorative magnet, for drawing boards etc.

MAGNET MATERIAL

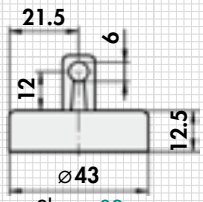
Hard ferrite (oxide 380), anisotropic.
*Shape also available in M5.



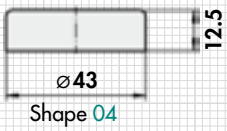
Shape 01



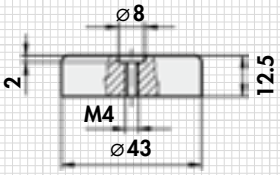
Shape 02



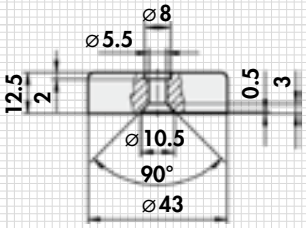
Shape 03



Shape 04



Shape 05*



Shape 06

ORDERING EXAMPLE

Designation	SAV no. - type - shape
Office magnet	SAV 240.85 - MO 40 - 01

SAV 240.88 OFFICE MAGNETS

Suitable for printing

APPLICATION
For holding paper, drawings, plans. For marking, e.g. on planning boards and noticeboards.

DESIGN
Strong holding magnets with an attractive plastic cap. Round versions with contoured edge for easy removal. The flat surface of the plastic housing can be screen-printed for advertising purposes.
Please send us your request.

MAGNET MATERIAL
Hard ferrite, isotropic/anisotropic

AVAILABLE COLOURS
Red (RT), blue (BL), green (GN), yellow (GB), black (SW), white (WS), orange (OR), grey (GR), brown (BR), light blue (HB)

	mm		N
Type	Diameter	Height	Rated holding force
MO 50 - 10 - 1	ø 10	6.5	0.7
MO 50 - 10 - 2	ø 10	6.5	1.5
MO 50 - 16	ø 16	7	1.3
MO 50 - 20	ø 20	7.5	1.5
MO 50 - 25	ø 25	7.5	3
MO 50 - 30	ø 30	8	6
MO 50 - 36*	ø 36	8.5	9.5
MO 50 - 11	11 x 11	6.5	1.5
MO 50 - 35	35 x 35	9	6
MO 50 - 21	21 x 12.5	6.5	1.5
MO 50 - 37	37 x 22	7.5	4.5
MO 50 - 55	55 x 22.5	8.5	7

* Preferred drawing magnet, available with high holding force, blue, 12 mm high

ORDERING EXAMPLE

Designation	SAV no. - type - colour
Office magnet	SAV 240.88 - MO 50 - 36 - BL

SAV 240.89 OFFICE MAGNETS

Suitable for printing

APPLICATION
For holding paper, drawings, plans, etc.
For marking, e.g. on planning boards and noticeboards.

DESIGN
Strong holding magnets with an attractive plastic cap. Body made of high-quality ABS with slightly curved surface. Profiled edge for easy removal.
The flat surface of the plastic housing can be screen-printed for advertising purposes. Please send us your request.

MAGNET MATERIAL
Hard ferrite, isotropic/anisotropic

AVAILABLE COLOURS
Red (RT), blue (BL), green (GN), yellow (GB), black (SW), white (WS), orange (OR), mustard (SN)

NOTE
Minimum order quantity with print: 300 units
Packaging unit per colour: 10 units

	mm		N
Type	Diameter	Height	Rated holding force
MO 60 - 20	20	10	2
MO 60 - 30	30	10	5
MO 60 - 40	40	10	8

ORDERING EXAMPLE

Designation	SAV no. - type - colour
Office magnet	SAV 240.89 - MO 60 - 20 - RT

SAV 240.90 OFFICE MAGNETS

With raised pattern – type MO 70 (customised)

APPLICATION
For holding paper, drawings, plans, etc.
For marking, e.g. on planning boards and noticeboards.

DESIGN
Strong holding magnets with plastic housing.
The print can be your company logo or a design of your choice.
Please state the desired design when ordering.
The following versions are available:
Height: 13 mm
Holding force: 36 N at ø 36 mm
Weight: 0.040 kg

MAGNET MATERIAL
Hard ferrite (oxide 380)

NOTE
Minimum order quantity with print: 300 units
Packaging unit per colour: 10 units

SHAPE
A: round, ø 36 mm
B: square, 36 mm

DESIGN
1: smooth, without print
2: with printed adhesive label
3: with direct printing
4: with raised printed design

AVAILABLE COLOURS
Red (**RT**), blue (**BL**), green (**GN**), yellow (**GB**), white (**WS**)

ORDERING EXAMPLE

Designation	SAV no. - type - shape - design - colour
Office magnet	SAV 240.90 - MO 70 - A - 3 - WS

OFFICE MAGNETS

TO KEEP YOUR ADVERTISING IN VIEW AT ALL TIMES...
Our office magnets can help you to keep your company visible everywhere. The magnets are versatile and attractive. Attach drawings, notifications and plans quickly and reliably, at the office, workshop, public institutions etc.

ALWAYS FIRMLY ATTACHED...
The holding magnets consist of strong magnetic elements in attractive plastic or steel housings. Some of the plastic housings are available printed or with a raised design, to your specifications. You will be sure to find the right version – whether with eye bolt, hook, threaded stud or a simple smooth print.

FREE DESIGN CHOICES...
Prints and raised designs can be implemented based on your design ideas, from a template or with support from SAV. Attractive packaging types and sizes are possible.

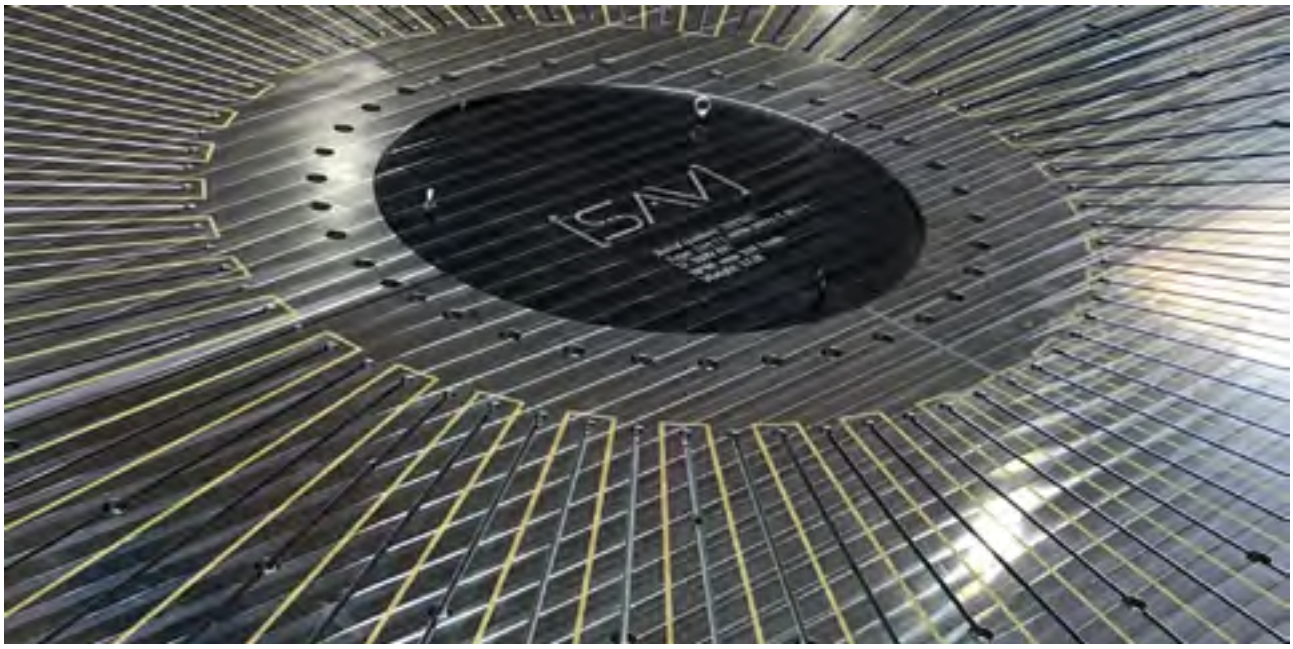
CHAPTER 1.3

SPECIAL MAGNET SOLUTIONS

1. MAGNET SYSTEMS

1.3 SPECIAL MAGNET SOLUTIONS

PAGES 218 – 270

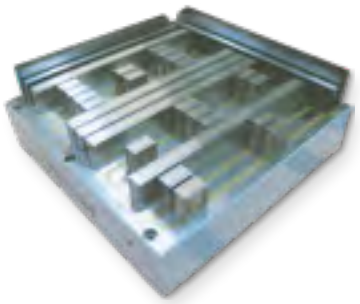


1.3.1 CRITERIA FOR COMBINED SOLUTIONS

Different workholding principles have different advantages and disadvantages. Different combinations can be used to find solutions even for difficult workholding problems, expand machining options and extend the range of workpieces that can be processed.

MAGNETIC CHARACTERISTICS

- Only for ferromagnetic workpieces
- The holding force is (physically) limited
- High normal force, low tangential force
- Two-dimensional force transmission
- Holding down of thin, uneven workpieces
- High damping
- Good accessibility, easy to clean, easy to automate
- Large range of workpieces
- Chucking without distortion
- Complete support for the workpiece (high damping, high precision)
- Machining from several sides in one chucking position
- Compact design
- Short changeover times
- Ergonomic and reliable, wear-free
- Cost-efficient compared to force-actuated workholding

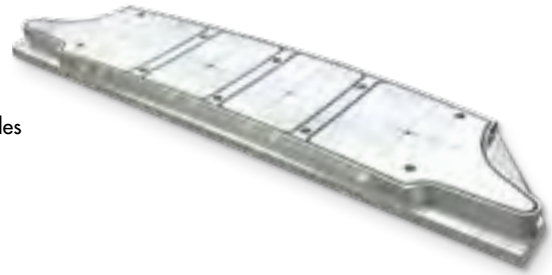


HYDRAULIC/MECHANICAL CHARACTERISTICS

- Suitable for all workpieces
- High to very high force density
- Concentrated force transmission
- High force density
- Low-distortion chucking of blanks
- Also for non-magnetic workpieces
- Low damping
- Limited accessibility and cleaning
- Risk of workpiece deformation and damage
- Limited range of workpieces
- More complex systems, including with corresponding power supply

VACUUM SYSTEM CHARACTERISTICS

- Also for non-magnetic workpieces
- Two-dimensional force transmission
- Low force density, holding force physically limited
- Good damping
- Also for machining from several sides
- Easy to clean
- Reliable and wear-free



PNEUMATIC CHARACTERISTICS

- Concentrated force transmission
- Lower force density compared to hydraulics
- Low-distortion chucking of blanks
- Also for non-magnetic workpieces
- Low damping
- Limited accessibility and cleaning
- Limited range of workpieces
- Large workholding elements
- More complex systems
- Energy supply simpler compared to hydraulics
- More cost efficient compared to hydraulics

ELECTRICAL CHARACTERISTICS

- Very flexible and comfortable control
- Can be largely automated
- No second media supply in combination with magnet

1.3.2 COMBINED SOLUTIONS

MAGNETIC-PNEUMATIC FIXTURE

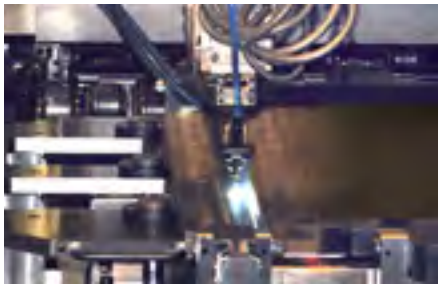
For laser welding

SIZE
1320 x 1100 mm

WORKPIECE
Heat exchanger

APPLICATION
Laser welding

DESCRIPTION
- Amplified electro magnet system
- With compressed air release
- Pneumatic clamps on the circumference
- On movable base structure



ELECTRO PERMANENT MAGNETIC WELDING FIXTURE

For laser welding

SIZE
1500 x 1500 mm

WORKPIECE
Passenger car tailgate

APPLICATION
Laser cutting and welding of tailored blanks

DESCRIPTION
Pneumatically opening magnetic fixture, cutting of the welding edge and welding in one chucking process

MULTIFUNCTION WORKHOLDING FIXTURE

Combination of all workholding principles

SIZE
2800 x 1030 mm

WORKPIECE
Workpieces for packaging machines

APPLICATION
Milling

DESCRIPTION
- Combination magnetic – hydraulic – mechanical – vacuum technology
- Electro permanent high-energy magnets with pole raisers
- Hydro vices with large front area
- Grid workholding system for modular fixture system
- Vacuum workholding plate with grid
- Control with multifunction operating panel

HIGH-ENERGY MILLING MAGNET

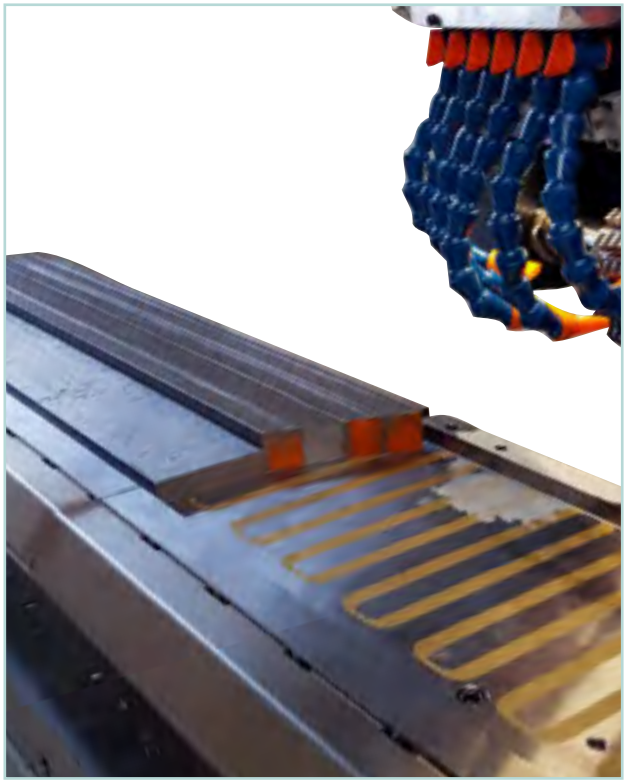
With hydraulic workholding elements

SIZE
2400 x 530 mm

WORKPIECE
Racks

APPLICATION
Milling of the toothing

DESCRIPTION
- High-energy magnet system
- In combination with stops and hydraulic chucking elements



MAGNETIC-HYDRAULIC WORKHOLDING SYSTEM

Flexibility for heavy machining

SIZE
1000 x 1000 mm

WORKPIECE
Precision plates

APPLICATION
Surface milling and face milling

DESCRIPTION
- Magnetic/hydraulic combination
- High-energy magnetic chucks, height-adjustable, hydraulic clamping
- Additional hydraulic support elements and side tension
- Bar structure, longitudinal adjustment

HIGH-PERFORMANCE MILLING MAGNETS

Workpiece-based for high productivity

SIZE
4260 x 753 mm

WORKPIECE
Racks

APPLICATION
5-sided milling in 2 chucking processes

DESCRIPTION
- First chucking in two rows in conjunction with individually activated hydro chucks. Magnetic base chucking using rigid and movable pole shoes
- Second chucking with direct contact with magnetically active side stops

COMBINED FIXTURE

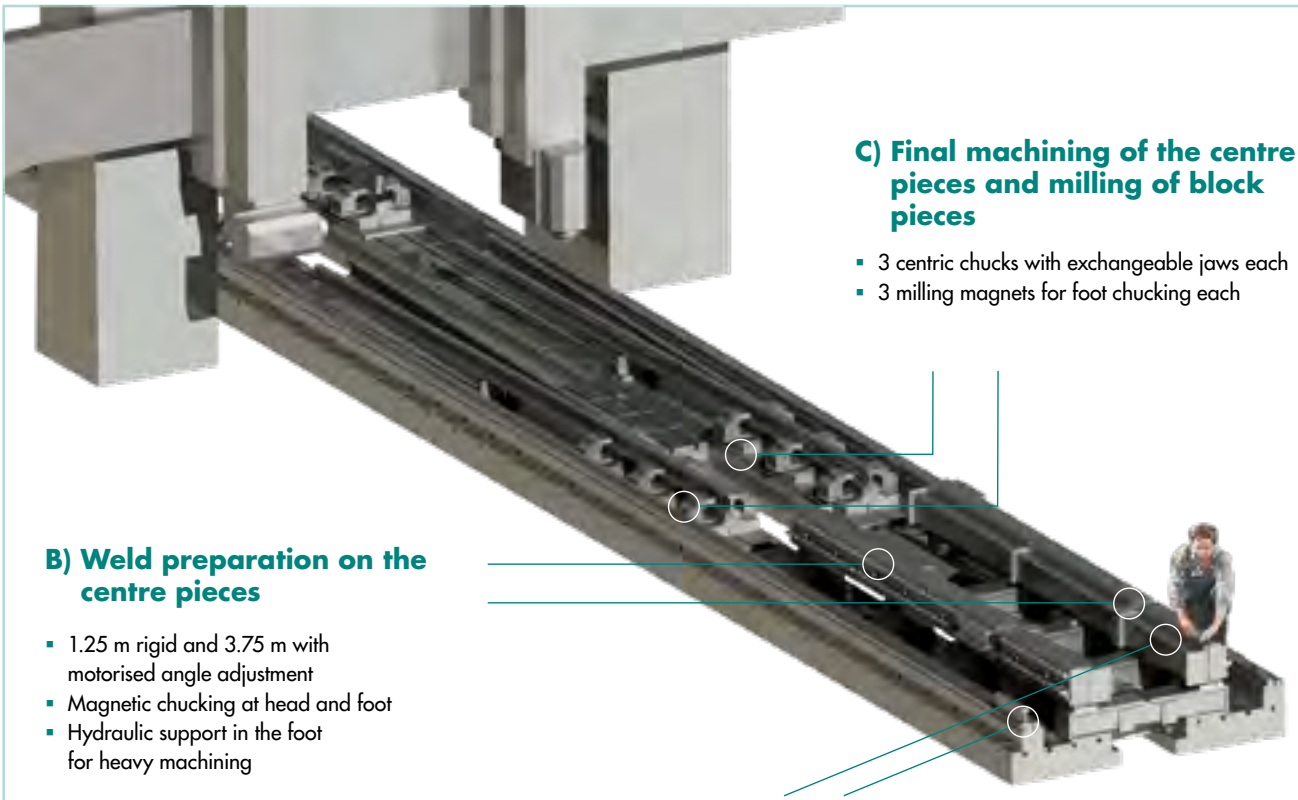
For magnetic – hydraulic – electromotor chucking of railway rails

SIZE
Length 24 m

WORKPIECES
- Tongue rails and stock rails
- Centre pieces
- Block pieces

APPLICATION
Milling for railway rail manufacturing

DESCRIPTION
- Designed for extreme machining
- Combination of magnetic, hydraulic and electro-motor principles
- Touch screen operation, radio remote controlled
- Machine power 2 x 100 kW for workpiece positioning
- Exchangeable pole bars to create free space for tools



C) Final machining of the centre pieces and milling of block pieces

- 3 centric chucks with exchangeable jaws each
- 3 milling magnets for foot chucking each

B) Weld preparation on the centre pieces

- 1.25 m rigid and 3.75 m with motorised angle adjustment
- Magnetic chucking at head and foot
- Hydraulic support in the foot for heavy machining

A) Milling the tongue rails and stock rails

- 24 m magnet voltage each
- Stop and base
- Separately controlled

A) MILLING OF TONGUE RAILS AND STOCK RAILS TO 2 X 24 M LENGTH

- Amplified high-energy system
- Plug-in pole bars
- Pole blocks for contact with the head
- Head and foot machining and drilling



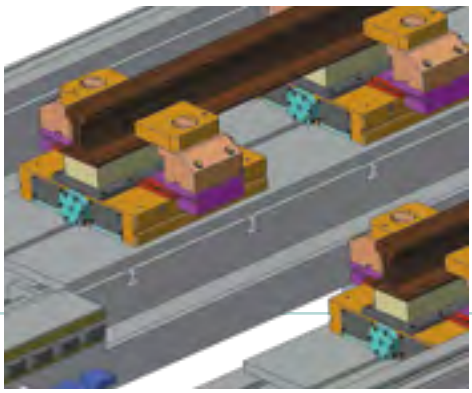
B) WELD PREPARATION ON THE CENTRE PIECES TO 2 X 5 M LENGTH

- Electric angle adjustment
- High-energy system for extreme machining (half rail profile)
- Hydraulic support elements as special version for contact with the foot



C) FINAL MACHINING OF THE CENTRE PIECES

- Hydro vices as special version with large projection
- Stocks with quick-change system
- Magnet system for chucking on the foot



MAGNETIC-HYDRAULIC FIXTURE

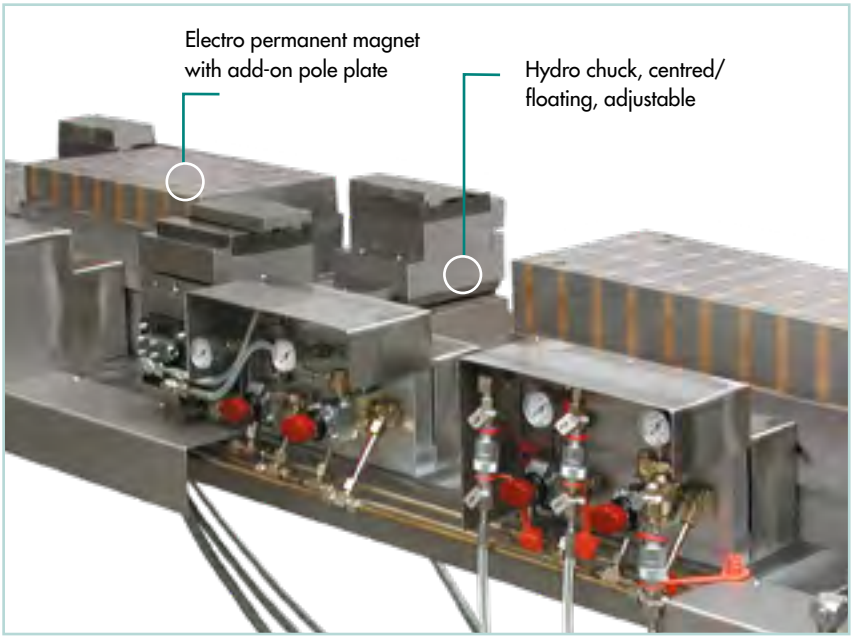
Flexible for large chucking areas/extreme machining

SIZE
System length 12 m

WORKPIECE
Block ends

APPLICATION
Extreme machining

DESCRIPTION
- Chucking and damping using high-energy magnets
- Centring and chucking of the thin sections with hydro chuck, centred and floating



MAGNETIC-HYDRAULIC MILLING FIXTURE

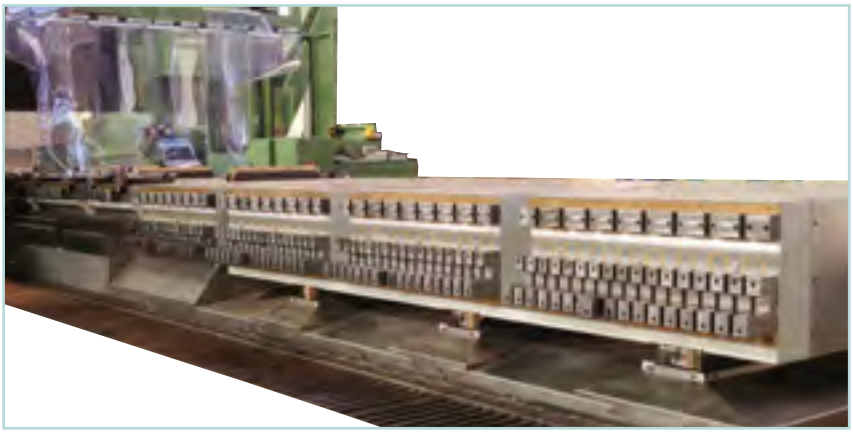
For flexible railway point manufacturing

SIZE
8000 x 1200 mm

WORKPIECE
Railway rails

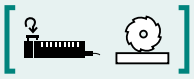
APPLICATION
Heavy milling

DESCRIPTION
- Magnetic/hydraulic combination
- For different rail profiles on 2 levels and on 2 lines
- 3 m adjustable angle with electric motor



MAGNETIC-HYDRAULIC FIXTURE

For chucking rail profiles sensitive to bending



SIZE
System length 8.5 m

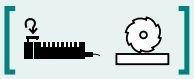
WORKPIECE
Tongue rails and stock rails

APPLICATION
Extreme milling

DESCRIPTION
- Magnetic chucking on the foot downwards and to the side
- Optional chucking on the web at the side with exchangeable pole bar
- Solid hydraulic swivel chucks as special version for chucking on foot or web
- Machining in one cut with diameter 60 x 35 mm
- Machine power 2 x 75 kW

HIGH-ENERGY MILLING MAGNET

With pole plate for thin parts



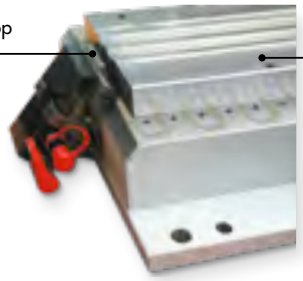
SIZE
1725 x 300 mm

WORKPIECE
Doctor blades for printing machines

APPLICATION
Milling of thin parts

DESCRIPTION
- High-energy magnet with 33 mm transverse pole pitch
- Profiled chuck blocks with fine divisions for low field heights
- Lowering hydraulic stop

Hydraulically retractable stop



Exchangeable pole plate
4 mm transverse pole pitch
For milling thin strips

ELECTRO PERMANENT MAGNETIC SYSTEM

With hydraulic stops

SIZE
2000 x 157 mm
Total system 2 x 6 m on swivel bridge

WORKPIECE
Linear guideways

APPLICATION
Grinding of the guide tracks

DESCRIPTION
- 2 x 3 magnets on horizontal swivel bridge
- With hydraulic swivel chucks for workpiece positioning
- Exchangeable pole bars to create free space for tools

ELECTRO PERMANENT MAGNETIC CHUCK WITH ZERO-POINT SYSTEM

Exchangeable pole plates

SIZE
400 x 230 mm

WORKPIECE
Lamella-shaped slides for textile machines

APPLICATION
Profile grinding

DESCRIPTION
- Magnet system with integrated zero-point workholding system
- Workpiece held in profiled exchangeable pole plate
- Weight-optimised pallet can be loaded outside of the machine

MAGNET VACUUM CLAMPING STRIP

For blade machining

SIZE
750 x 100 mm

WORKPIECE
Tungsten carbide blades

APPLICATION
Grinding

DESCRIPTION
- High-energy magnet system with longitudinal pole pitch
- Vacuum system in the pole gap

MAGNETIC-PNEUMATIC-HYDRAULIC FIXTURE

Individual for our customers

SIZE
Length 800 mm

WORKPIECE
Thin blades

APPLICATION
Grinding

DESCRIPTION
- Damping with fine pole magnet
- Pneumatic actuation
- Hydraulic chucking and locking

MECHATRONIC CHUCK

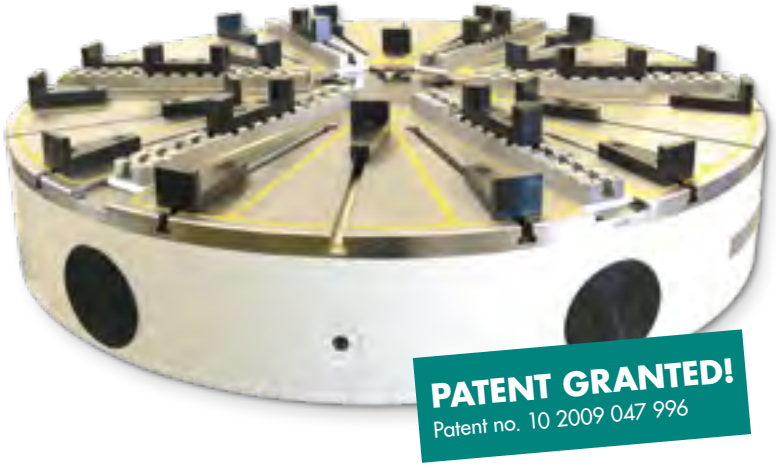
Fully electric workholding fixture

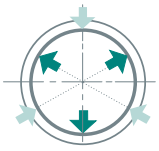
APPLICATION

- For automation
- Precise centring, reproducible with high accuracy
- High-performance machining and finishing
- Combination of first and second chucking
- Radial and/or axial chucking
- Chucking of eccentric parts

COMBINATION OF ROUND MAGNET AND ELECTRIC LINEAR AXES

- Servo drive with integrated brakes
- 300 daN holding force per actuator at D 1000 mm
- Direct measuring system with 0.001 mm resolution
- 50 mm chucking travel with quick-change jaws
- Electronic compensation of centrifugal force
- Amplified magnet system with optimised pole division
- Magnet material under each pole for minimum field heights
- 350 mm minimum magnetic range
- Smallest possible chuck diameter 800 mm at 100 daN holding force per jaw
- With 165 mm minimum height



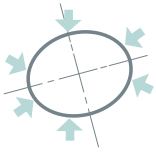


VARIANT A

- 3 axes centric
- 3 axes applied inside or outside

VARIANT B

- 6 axes centric
- Applied inside or outside

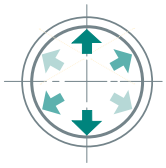


VARIANT C

- Chucking of out-of-round parts

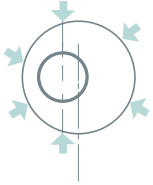
VARIANT D

- Manual workpiece alignment with dial gauge
- Magnetic pre-clamping
- 6 axes applied and clamped individually



VARIANT E

- 2 opposite axes each, centric



VARIANT F

- Chucking of eccentric and clampable parts for alternating alignment with the spindle

ELECTRO PERMANENT COMBINATION CHUCK

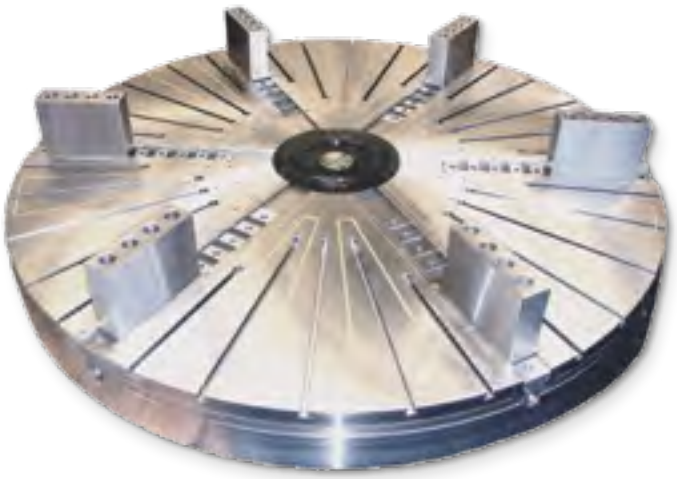
Mechanical and magnetic chucking

SIZE
1500 mm diameter

WORKPIECE
Rings and plates

APPLICATION
Turning

DESCRIPTION
- Amplified electro permanent magnetic system
- With 6 individually adjustable Wescott jaw systems
- Electrical connection integrated with slip ring assembly



COMBINATION CHUCK

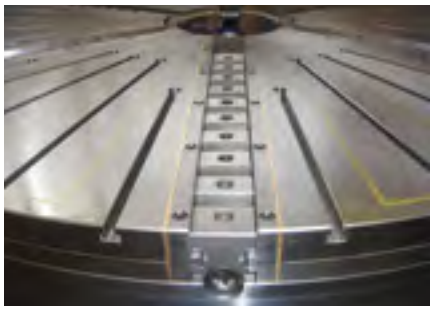
Mechanical centring, magnetic chucking

SIZE
1500 mm diameter

WORKPIECE
Rolling bearing rings

APPLICATION
Turning

DESCRIPTION
- Amplified electro permanent magnetic system
- With integrated centring chuck and additional adjustable jaws
- Electrical connection with heavy-duty power connector



SPECIAL COMBINATION CHUCK

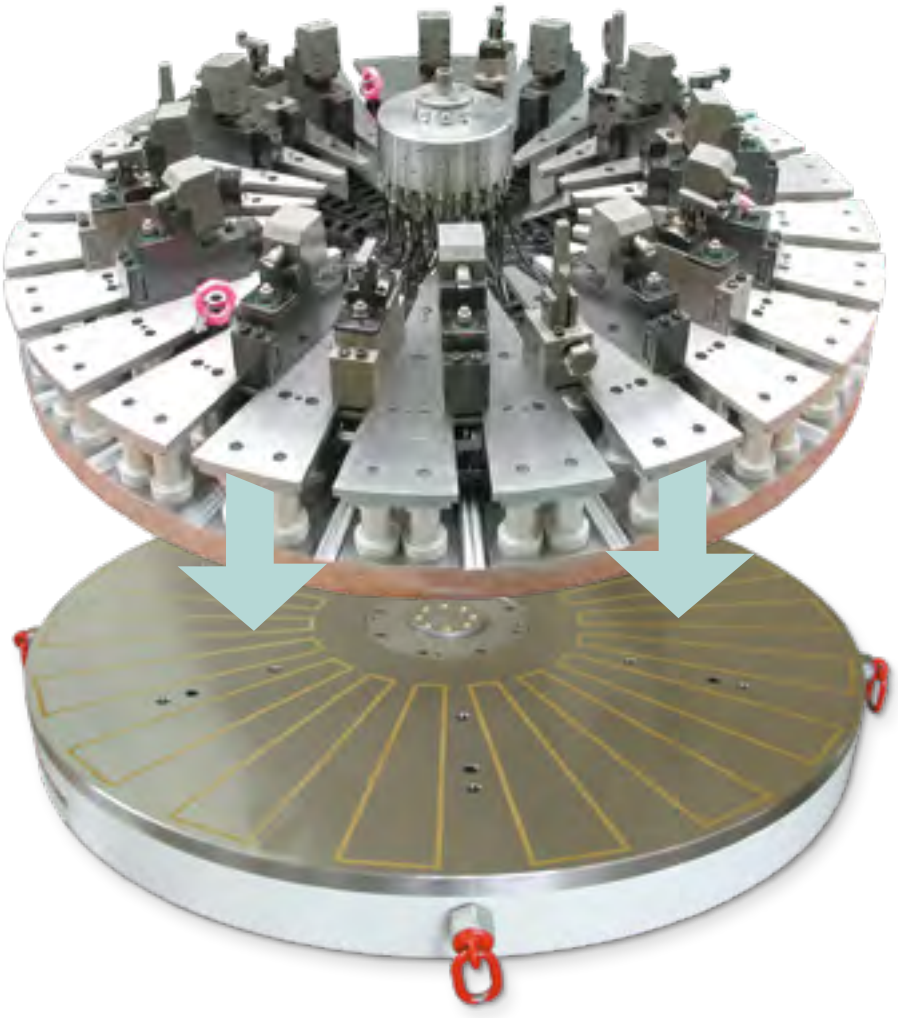
The magnet as a machine table

SIZE
1500 mm diameter

WORKPIECE
Mechanical seals

APPLICATION
Grinding

DESCRIPTION
- Electro permanent round magnet with hydro couplings as a table
- Hydraulic top-mounted fixture with large adjustment range
- Combination chucking axial and/or radial
- Sensitive axial support
- 64-fold oil distributor



COMBINATION CHUCK

For precise and extremely thin-walled parts

SIZE
350 mm diameter

WORKPIECE
Passenger car gearbox parts

APPLICATION
Cylindrical grinding

DESCRIPTION
- Sensitive centring in the centroid
- Chucking with electro permanent circular magnet
- Pole raisers to create free space for tools

ELECTRO PERMANENT COMBINATION CHUCK

With centring device

SIZE
640 mm diameter

WORKPIECE
Rings for high-precision aerospace bearings

APPLICATION
Hard turning

DESCRIPTION
- 3-point centring device
- Height compensation using sensitive, movable pole shoes, individually chucked
- Model year 1998: first combination (hybrid) chuck on the market

1.3.3 SPECIAL SOLUTIONS FOR MILLING

ELECTRO PERMANENT MAGNETIC CUBE

For hard milling

SIZE
1400 x 1400 mm

WORKPIECE
Dies for crankshafts

APPLICATION
Hard milling of the mould cavities

DESCRIPTION
- 4 magnet sides with 2 active magnets each
- Wear protection with pole bars
- Electrical connection with heavy-duty power connector for rotary table

ELECTRO PERMANENT MAGNETIC PALLET

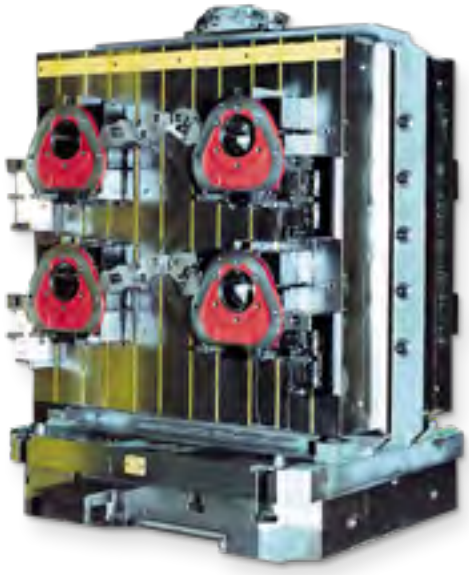
For milling sealing surfaces

SIZE
1000 x 1000 mm

WORKPIECE
Gearbox cover made of grey-cast iron

APPLICATION
Drilling and milling of sealing edges

DESCRIPTION
- First chucking with movable pole shoes and support elements
- Second chucking on rigid pole bars for generating exact parallelism



HIGH-ENERGY MILLING MAGNET

For machining from 5 sides

SIZE
1900 x 750 mm

WORKPIECE
Front plates for forklifts

APPLICATION
Milling from 5 sides
Including the openings

DESCRIPTION
- Powerful neodymium magnet system
- Pole bars to create free space for tools
- Folding stops with position monitoring

ELECTRO PERMANENT MAGNETIC SYSTEM

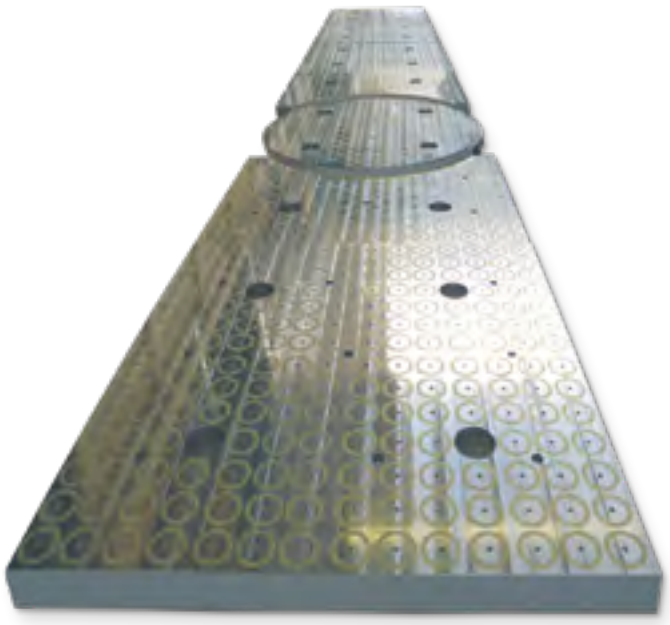
Efficient workholding fixture for large machines

SIZE
7000 x 1200 mm

WORKPIECE
Steel plates

APPLICATION
Weld preparation with a variety
of different contours

DESCRIPTION
- Amplified magnet system with demagnetising
- Rotary table integrated
- Through holes for zero point workholding system
- Pole rounds to create free space for tools



ELECTRO PERMANENT MILLING MAGNET

With integrated rotary table

SIZE
5000 x 800 mm

WORKPIECE
Plates with 20 mm thickness

APPLICATION
Weld preparation and contour milling

DESCRIPTION
- High-energy magnet system 55 mm transverse pole pitch
- Integrated rotary table
- With integrated zero point workholding system

ELECTRO PERMANENT MAGNETIC CHUCK

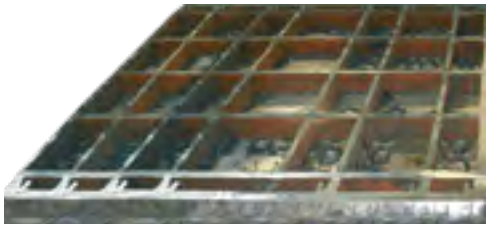
With circular pole pitch

SIZE
1800 x 1470 mm

WORKPIECE
Variety of different contours
From grates to thin plates

APPLICATION
Milling from 5 sides

DESCRIPTION
The low magnetic field and the universal pole pitch allow machining of a variety of different workpiece contours



Flexibility also for difficult workpiece contours

ELECTRO PERMANENT MAGNETIC PALLET

With top tooling

SIZE
2000 x 1400 mm

WORKPIECE
Machine side parts

APPLICATION
Face milling and contour milling

DESCRIPTION
- Amplified magnet system with demagnetising cycle
- Chucking bracket with 2 chucking sides
- First chucking with movable pole shoes
- Second chucking with rigid pole bars

ELECTRO MAGNETIC SYSTEM

For extreme material removal

SIZE
7800 x 1200 mm

WORKPIECE
Slabs

APPLICATION
Heavy milling with 2 heads simultaneously

DESCRIPTION
- Electromagnet system for extreme air gaps up to 15 mm
- Cutting depth ap = 7 mm
- Combination with hydr. stops

ELECTRO PERMANENT MAGNETIC CHUCK

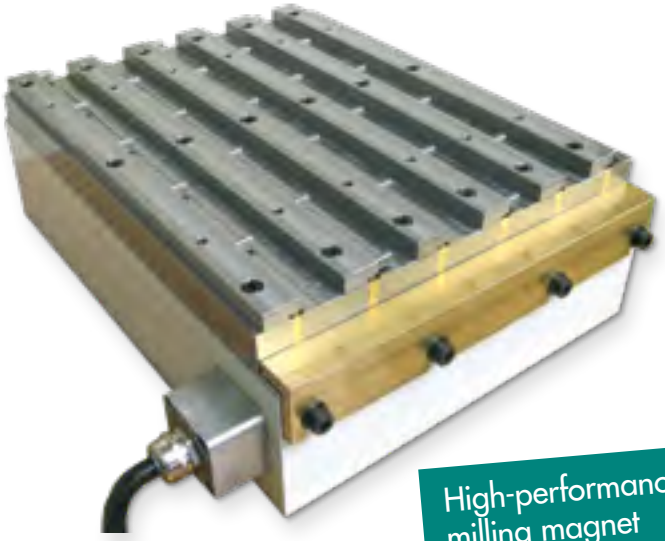
For small workpieces

SIZE
400 x 300 mm

WORKPIECE
Notched impact samples

APPLICATION
Milling of 4 sides

DESCRIPTION
- Amplified electro permanent magnetic system
- Magnetically active stops
- Exchangeable pole plate for chucking different cross-sections



High-performance milling magnet

ELECTRO PERMANENT MAGNET

Pole bars to create free space for tools

SIZE
630 x 430 mm

WORKPIECE
Small plates with openings

APPLICATION
Milling of flat surfaces and openings

DESCRIPTION
- High-energy magnet with narrow pole pitch for high forces and small contact surface
- Pole bars with stops to create free space for tools and for positioning

ELECTRO PERMANENT CIRCULAR MAGNET

For heavy 5-axis machining

SIZE
600 mm diameter

WORKPIECE
Plate materials

APPLICATION
5-axis machining

DESCRIPTION
- Amplified high-energy system
- 55 mm transverse pole pitch
- Electrical connection with heavy-duty power connector

ELECTRO PERMANENT MAGNETIC PALLET

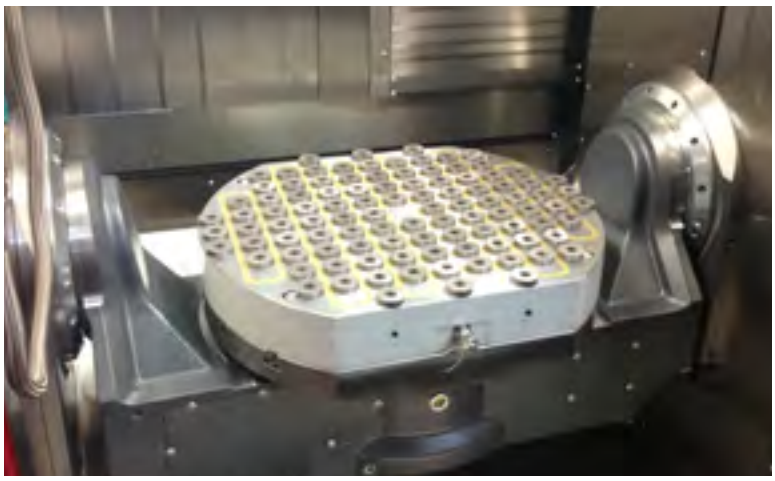
For 5-axis machining

SIZE
680 mm diameter

WORKPIECE
Plates with 15 mm thickness

APPLICATION
5-axis machining

DESCRIPTION
- High-energy system with 55 mm parallel pole pitch
- Electrical connection with connector
- Pole rounds to create free space for tools



ELECTRO PERMANENT MILLING MAGNET

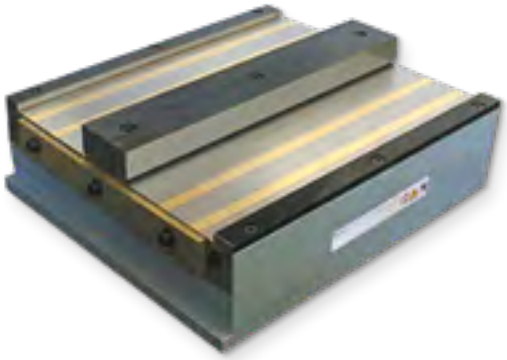
For very small parts

SIZE
400 x 355 mm

WORKPIECE
Small cubes

APPLICATION
Face milling on both sides

DESCRIPTION
- Neodymium magnet system with maximum magnetic workpiece contact surfaces
- Workpiece positioning and holding force increase with magnetically active stops



HIGH-ENERGY MAGNETIC CHUCK

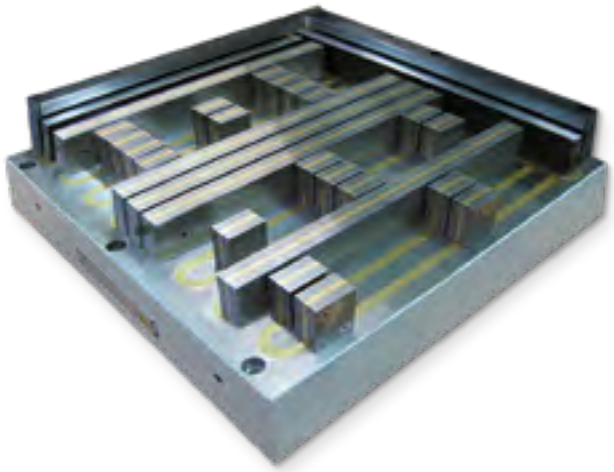
With active workpiece positioning in 3 directions

SIZE
630 x 430 mm

WORKPIECE
Tool base plates with openings

APPLICATION
Milling of flat surfaces and openings

DESCRIPTION
- High-energy magnet with narrow pole pitch for high forces and small contact surface
- Workpiece positioning using 2 magnetically active stops in X and Y
- Flexibly movable pole bars and pole blocks to create free space for tools



ELECTRO PERMANENT MAGNETIC CHUCK

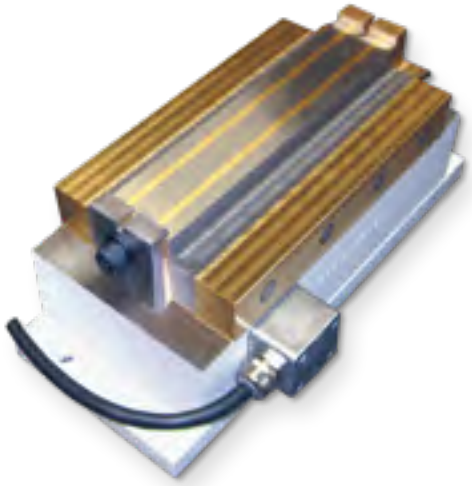
Amplified system

SIZE
300 x 150 mm

WORKPIECE
Notched impact samples

APPLICATION
Milling of the sample notch

DESCRIPTION
Strong electro permanent magnet with solid stops



ELECTRO PERMANENT MAGNETIC CHUCKS

With extreme field strength for large air gaps

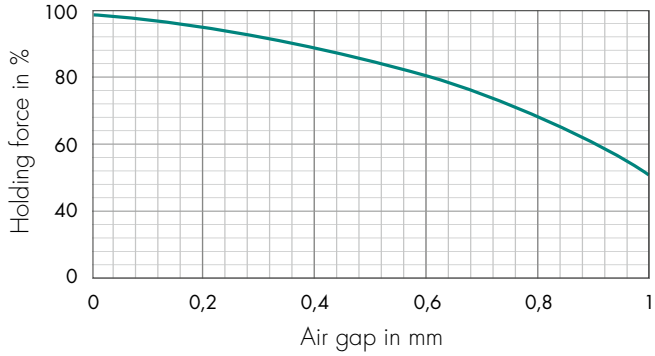
SIZE
900 x 600 mm each

WORKPIECE
Pole plates for presses

APPLICATION
Heavy milling with extreme air gaps

DESCRIPTION
- Amplified magnet system with demagnetising cycle
- Heavy-duty stops can be folded down for 5-sided machining

Air gap diagram for full contact



ELECTRO PERMANENT MAGNETIC CHUCK

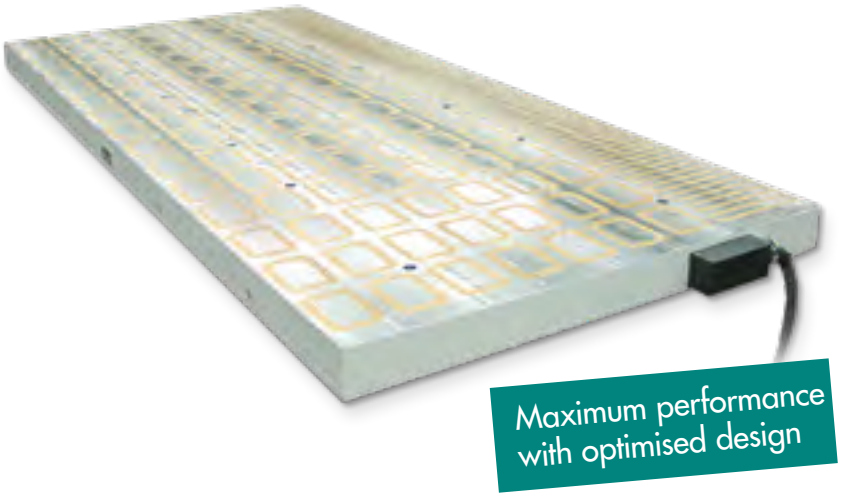
With combined pole pitch

SIZE
2100 x 940 mm

WORKPIECE
Precision plates and bars

APPLICATION
Face milling

DESCRIPTION
- Amplified high-energy system
- Module pole pitch 140 x 105 mm for large plates
- Parallel pole pitch 27.5 mm for thin bars



Maximum performance with optimised design

ELECTRO PERMANENT MAGNETIC PALLET

Completely automated

SIZE
500 x 300 mm

WORKPIECE
Leaf springs for vibration dampers

APPLICATION
Milling of the leaf profile in unmanned 3-shift operation

DESCRIPTION
- 4 magnets on cube pallet
- Low, concentrated magnetic field for thin parts
- Magnetically active stops for workpiece alignment

ELECTRO PERMANENT MAGNETIC INDEX TABLE

With extreme holding forces

SIZE
800 x 590 mm

WORKPIECE
Side plates for special-purpose vehicles

APPLICATION
Milling with high workpiece projection and drilling

DESCRIPTION
- High-energy system with 55 mm transverse pole pitch
- With exchangeable grates as add-on element for free tool running when drilling for thin bars

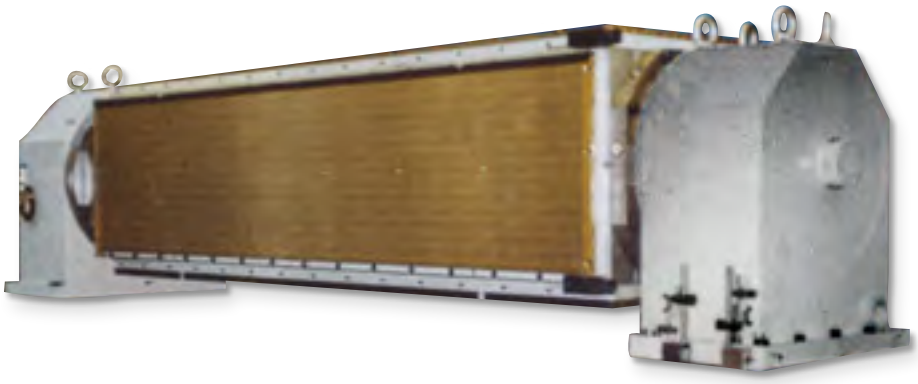
ELECTRO PERMANENT MAGNETIC BRIDGE

SIZE
3000 x 900 mm

WORKPIECE
Machine part

APPLICATION
Milling grooves

DESCRIPTION
- Swivel bridge with 4 electro permanent magnets
- As amplified system with longitudinal pole pitch

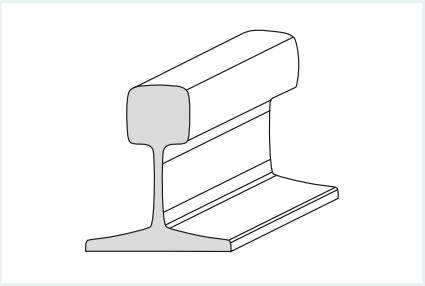


1.3.4 SPECIAL SOLUTIONS FOR MILLING RAILWAY POINTS

RAIL PROFILES

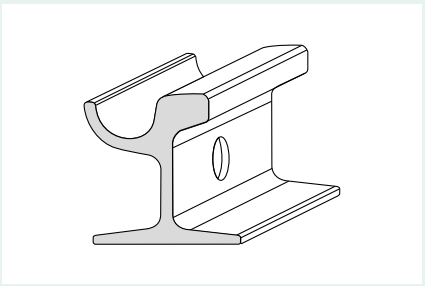
VIGNOLES RAIL
Railway

REGULAR PROFILE
- NP46; S49; UIC54; S54; UIC60 and other types



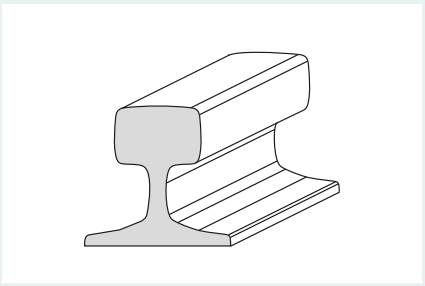
GROOVED RAIL
Tram

GROOVED RAIL
- RiPh37A, VICRI60, 75C1 and other types



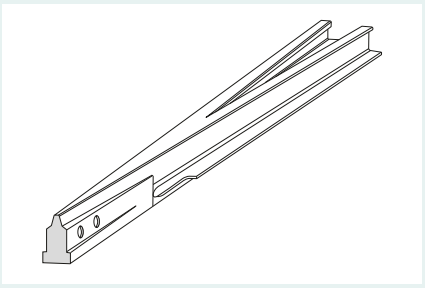
SPECIAL PROFILES
Crane track

CRANE PROFILE
- KSA all types, CR, PRI85R



BLOCK POINT
Railway

BLOCK POINTS
- Customer-specific



SAV DEVELOPMENT PROCESS

THE KEY TO JOINT SUCCESS: RESEARCH AND DEVELOPMENT/CUSTOMER AND WORKPIECE ORIENTATION

New markets, fast innovation cycles, competitiveness and the pressure to deliver unique selling points make it necessary to develop customised solutions.

1. INQUIRY, TECHNICAL CLARIFICATION AND EVALUATION
- Machining operations
- Specification of the performance parameters
- Definition of the quality criteria
- Verification of the chucking points and areas
- Table adaptation and energy supply

2. FEASIBILITY STUDY/LAYOUT/QUOTATION
- Evaluation of different function principles
- Magnetic – hydraulic – mechanical – vacuum or combinations

3. ENSURING FEASIBILITY, FUNCTION AND CALCULATION
- Tool and protrusion contour examinations
- FEM calculations, mechanical, magnetic, thermal, static and dynamic

4. MODELLING AND DESIGN ENGINEERING
- Design engineering on 25 networked CAD workstations, primarily in 3D
- Executed in Solid Works, Auto-CAD, Mechanical-Desktop and Euklid

5. DESIGN APPROVAL AND DETAILING
- Manufacturing approval after presentation to the customer
- Information exchange using IGES, DXF, DWG, STEP, VDA, PARASOLID, UNIGRAPHIC, VRML, STL

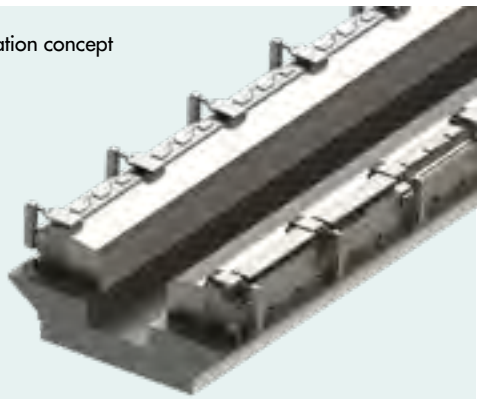
6. PRODUCTION
- Production and quality control exclusively at German sites
- Manufacturing linked with CAD/CAM workstations

7. TESTS, OPTIMISATION AND ACCEPTANCE
- Validated and optimised product quality before delivery for minimum machine downtime during commissioning and best production results

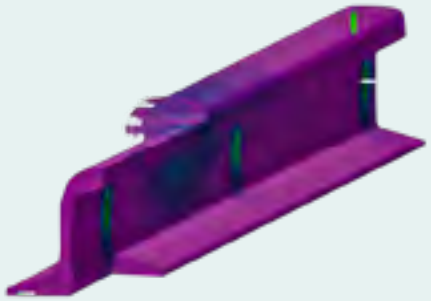
8. DELIVERY, INSTALLATION, COMMISSIONING AND INDUCTION
- Responsibility for function and precision until the first sample

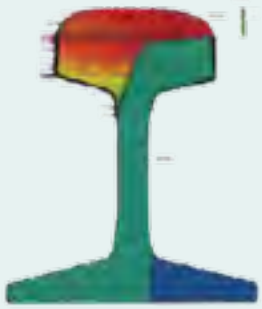
9. AFTER SALES SERVICE
- Preventive maintenance, repair and spare parts service, minimum machine downtime during commissioning and best production results

Quotation concept



Deformation analysis





Tool examination

ELECTRO PERMANENT MAGNETIC SYSTEM

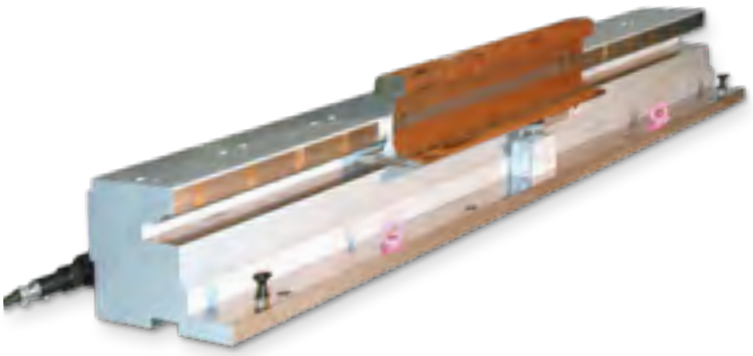
For manufacturing railway points, web chucking/mono line

SIZE
System length 6 m

WORKPIECE
Rails for manufacturing points

APPLICATION
Milling of running faces and feet

DESCRIPTION
- Amplified high-energy system
- Magnetically active alignment with 120 mm transverse pole pitch on the side of the web for extreme machining
- Basic chucking with longitudinal pole pitch



ELECTRO PERMANENT MAGNETIC SYSTEM

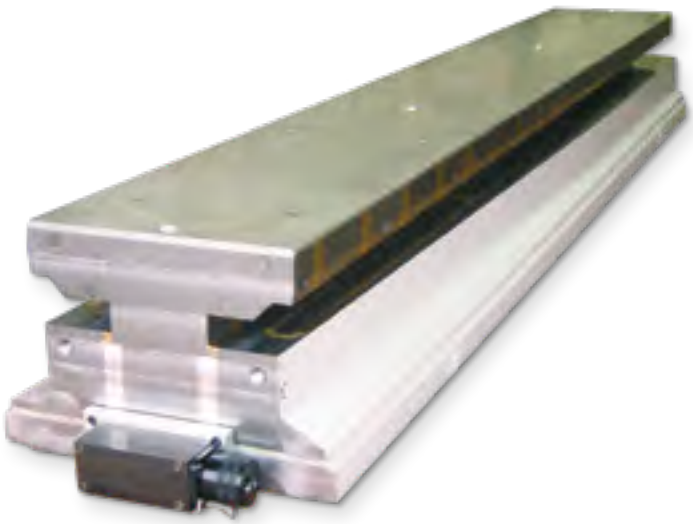
For manufacturing railway points, web chucking/twin line

SIZE
System length 4 m

WORKPIECE
Rails for manufacturing points

APPLICATION
Milling of running faces and feet

DESCRIPTION
2-row version



ELECTRO PERMANENT MAGNETIC SYSTEM

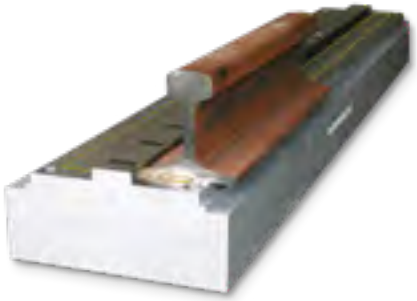
For manufacturing railway points, foot chucking/twin line

SIZE
10 m x 340 mm

WORKPIECE
Railway rails

APPLICATION
Heavy milling

DESCRIPTION
- High-energy system
- Active side stop on the foot to 2 sides
- 2-rows basic chucking



ELECTRO PERMANENT MAGNETIC SYSTEM

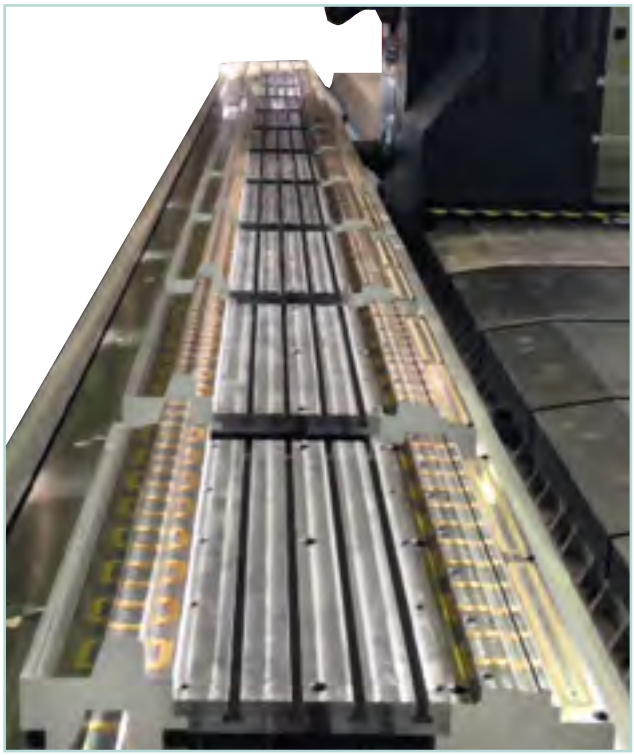
For manufacturing tram profiles

SIZE
Length 18 m

WORKPIECE
Rails for manufacturing points

APPLICATION
Heavy milling of running faces and feet on rail profile and Z-profiles

DESCRIPTION
- Magnetic chucking on the foot
- Magnetic chucking alternatively on the web and on the side of the foot
- One row for regular and tongue profiles, second row for Z-profiles
- T-slot field for mechanical chucking



1.3.5 SPECIAL SOLUTIONS FOR PRECISION MILLING

ELECTRO MAGNETIC BAR

For alloys which are difficult to chuck

SIZE
450 x 70 mm

WORKPIECE
Prisms

APPLICATION
Grinding

DESCRIPTION
Amplified electro magnet system for workpieces which are difficult to magnetise

Special magnets for grinding

ELECTRO PERMANENT MAGNETIC GRINDING FIXTURE

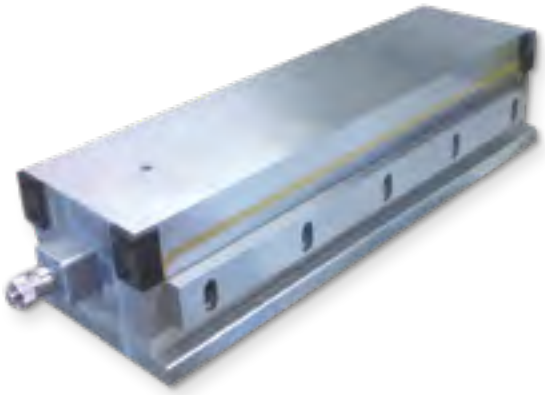
For precise grinding of cubes on both sides

SIZE
630 x 220 mm

WORKPIECE
Small cubes

APPLICATION
Grinding on 4 sides on both sides

DESCRIPTION
- Loading on 2 sides
- Magnetically active stops, height-adjustable



STRENGTHENED ELECTRO PERMANENT MAGNETIC CHUCK

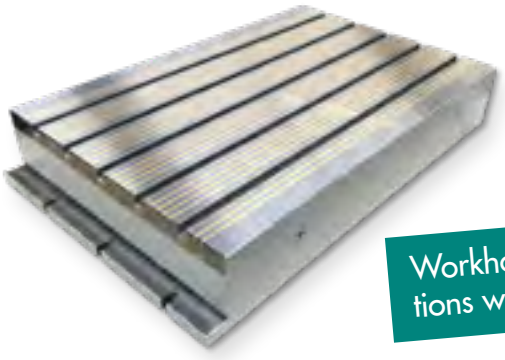
With mechanical chucking grooves

SIZE
800 x 550 mm

WORKPIECE
Gearbox parts

APPLICATION
Precision groove grinding

DESCRIPTION
- Amplified magnet system with demagnetising
- Hard inserts for mechanical wedge positioning system



Workholding solutions with precision

ELECTRO PERMANENT MAGNETIC CHUCK

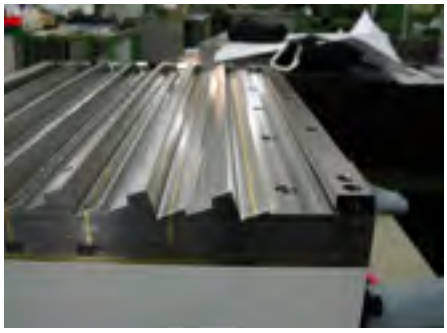
With exchangeable pole plate

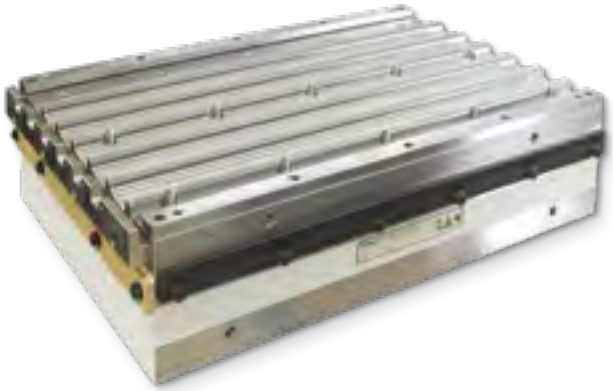
SIZE
600 x 400 mm

WORKPIECE
Guide carriages

APPLICATION
Grinding of faces and sides

DESCRIPTION
- Accommodation in the prism
- With stops and magnetically active alignment
- Exchangeable pole plate





ELECTRO PERMANENT MAGNETIC SYSTEM

As large pallet

SIZE
3300 x 415 mm

WORKPIECE
Bars

APPLICATION
Milling chamfers

DESCRIPTION
- Precision magnet system with 18 mm transverse pole pitch
- Made from one piece for flexible use
- With prisms for workpiece holding

1.3.6 SPECIAL SOLUTIONS FOR LINEAR GUIDEWAYS

ELECTRO PERMANENT MAGNETIC SYSTEM

For guide rails

SIZE
4000 x 150 mm

WORKPIECE
Linear guideways

APPLICATION
Grinding of the guide tracks

DESCRIPTION
- 85 mm transverse pole pitch
- Made from one piece

ELECTRO PERMANENT MAGNETIC PALLET

As pallet for linear guideways

SIZE
2310 x 260 mm

WORKPIECE
Linear guideways

APPLICATION
Grinding of the guide tracks

DESCRIPTION
Electrical connection automatically docked

ELECTRO PERMANENT MAGNETIC SYSTEM

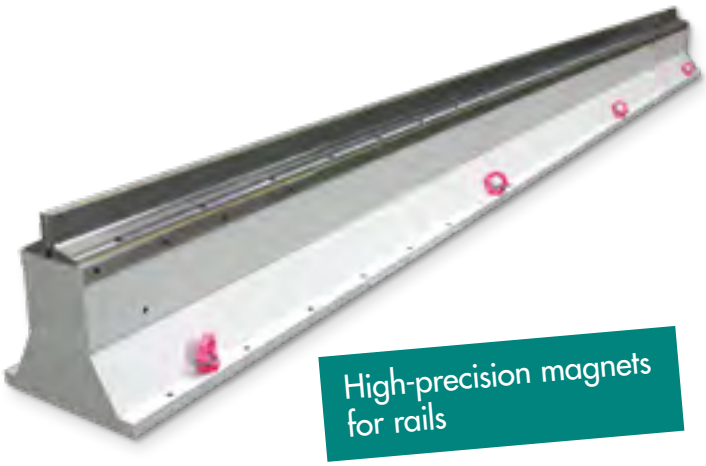
With exchangeable pole bars

SIZE
4000 x 180 mm

WORKPIECE
Linear guideways

APPLICATION
Grinding of the guide tracks
with 4 µm/4000 mm accuracy

DESCRIPTION
- With longitudinal pole pitch for homogeneous magnetic field along the entire length
- Made completely from one piece
- High-energy system
- Exchangeable pole plates to create free space for tools



High-precision magnets for rails

ELECTRO PERMANENT MAGNETIC BAR

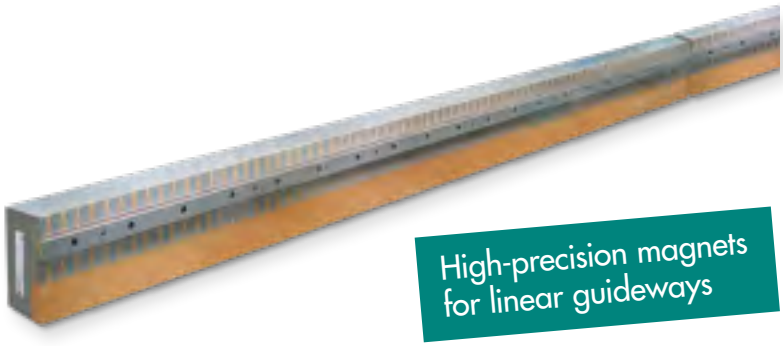
For angled grinding

SIZE
3 magnets 2000 x 150 mm each

WORKPIECE
Linear guideways

APPLICATION
Grinding the sides

DESCRIPTION
- With non-magnetic stop bars
- For angled machining



High-precision magnets for linear guideways

HIGH-ENERGY PERMANENT MAGNET BAR

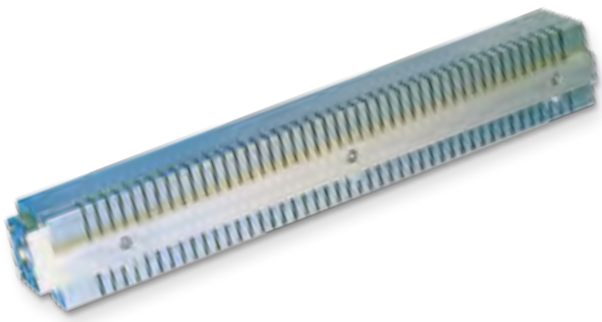
For miniature rails

SIZE
500 x 70 mm

WORKPIECE
Linear guideways

APPLICATION
Grinding the sides under 20°

DESCRIPTION
- Permanent magnet with high-energy system
- Manually operated, with rolling bearings



ELECTRO PERMANENT MAGNETIC PALLET

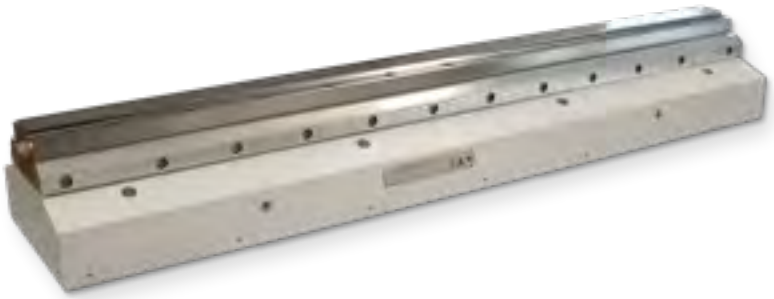
With exchangeable pole plates

SIZE
1200 x 320 mm

WORKPIECE
Mini rails

APPLICATION
Precision grinding

DESCRIPTION
- Longitudinal pole pitch for maximum precision
- With exchangeable pole plates
- Version on zero-point workholding system



ELECTRO PERMANENT MAGNETIC CHUCK

Adapted to the machine concept

SIZE
1300 x 260 mm

WORKPIECE
Guide carriages

APPLICATION
Grinding

DESCRIPTION
- Longitudinal pole pitch with amplified magnet system
- Magnetically active stops, movable

HIGH-ENERGY ELECTRO PERMANENT MAGNETIC CHUCK

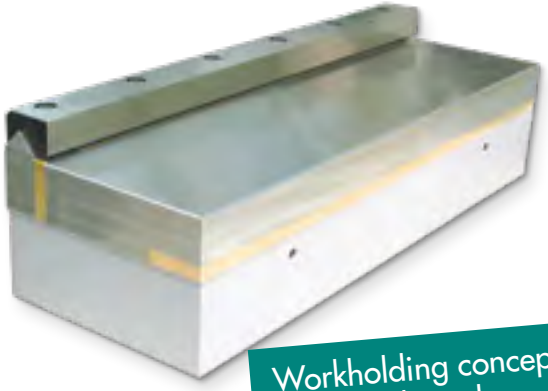
For high holding force on difficult workpieces

SIZE
500 x 175 mm

WORKPIECE
Guide carriages

APPLICATION
Grinding the bolt-on surface

DESCRIPTION
- Force-optimised system
- Magnetically active stop bar
- For small workpiece contact surfaces
- Exchangeable precision stop



Workholding concepts – quality-based

1.3.7 SPECIAL SOLUTIONS WITH SWIVEL BRIDGE AND INDEX TABLE

ELECTRO PERMANENT MAGNETIC INDEX TABLE

For grinding with large workpiece projection

SIZE
1730 x 230 mm

WORKPIECE
Bottom bending tools

APPLICATION
Grinding

DESCRIPTION
Reinforced magnet system for on-the-fly grinding of bottom bending tools

ELECTRO PERMANENT MAGNETIC BRIDGE

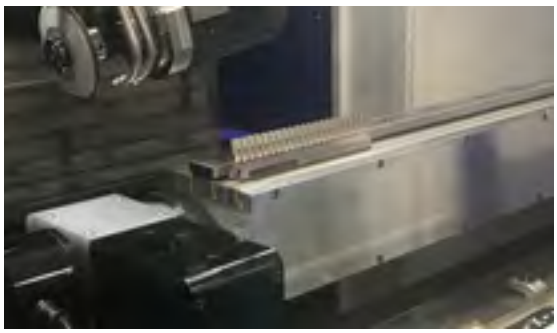
With index table

SIZE
1100 x 200 mm

WORKPIECE
Broaching tools

APPLICATION
Grinding

DESCRIPTION
- 4 workpieces on swivel bridge
- With magnetically active stops
- With precision index table



1.3.8 SPECIAL SOLUTIONS FOR PRECISION SINE TABLES

PRECISION MEASURING TABLE

For angle adjustment in 3 axes

SIZE
600 x 150 mm

WORKPIECE
Turbine blades

APPLICATION
Measuring

DESCRIPTION
- 3 swivel axes with adjustment gear
- High axis with degree scale and vernier
- Transverse axis using the sinusoidal principle

Precision – individually manufactured

PRECISION SINE TABLE

With solid hydraulic attachment and clamping

SIZE
1000 x 500 mm

WORKPIECE
Forming

APPLICATION
Roughing on segment grinding machine

DESCRIPTION
- Sine table with electro permanent magnetic chuck
- With hydraulic swivel drive
- With rotary encoder and display unit
- All axes can be hydraulically clamped

PRECISION SINE TABLE

With special sealing

SIZE
1200 x 200 mm

WORKPIECE
Plates

APPLICATION
Grinding

DESCRIPTION
- Swivelling around the short axis up to 15°
- Adjustment mechanism and bearing sealed
- With solid clamping
- Inherently rigid design, bending-optimised
- All axes can be hydraulically clamped

HIGH-PRECISION SINE TABLE
Hydraulic clamping

SIZE
1000 x 600 mm

WORKPIECE
Thin plates

APPLICATION
Grinding

DESCRIPTION
- Swivelling around the short axis
- With mechanical adjustment gear
- Distortion-free hydraulic clamping
- Flatness and parallelism 0.01 mm
- Integrated length measurement system with 1 µm resolution

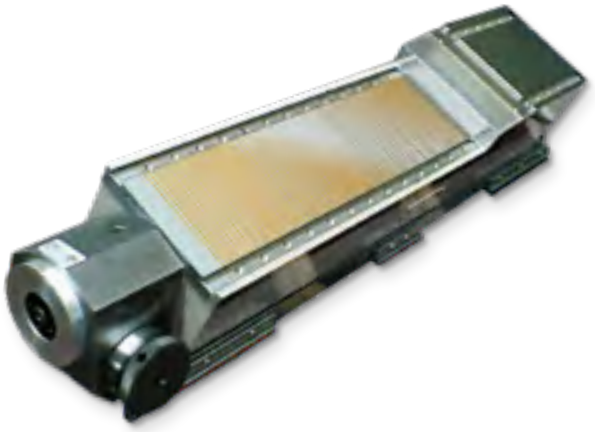
PRECISION SINE TABLE
With special magnet

SIZE
655 x 150 mm

WORKPIECE
Turbine blades

APPLICATION
Grinding

DESCRIPTION
- Swivelling around the central axis to both sides
- Adjustment with worm gear
- Angle set with degree scale and vernier or alternatively using the sinusoidal principle



PRECISION VACUUM SINE TABLE
For chucking glass

SIZE
800 mm diameter

WORKPIECE
Glass prisms for military applications

APPLICATION
Grinding

DESCRIPTION
- Adjustment on both sides ±20°
- Suction plate made of Ferrozell
- Reinforced with support elements

PRECISION SINE TABLE

With milling magnet

SIZE
300 x 150 mm

WORKPIECE
Hard boards

APPLICATION
Precision grinding

DESCRIPTION
- Swivelling around the central axis to both sides
- Angle adjustment using gauge blocks
- Clamping with threaded rods

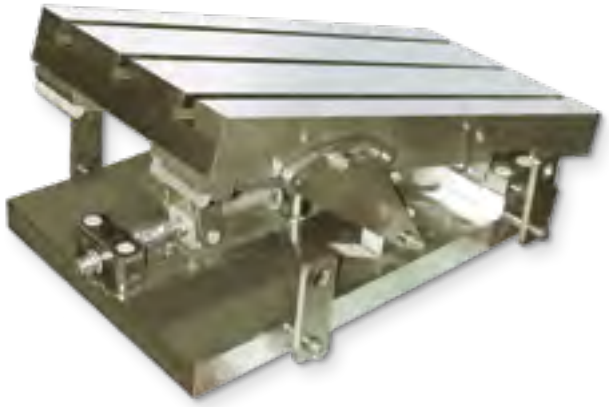
PRECISION SINE MEASURING TABLE

Stainless version

SIZE
650 x 300 mm

APPLICATION
For measuring tasks

DESCRIPTION
- Solid design, precision-optimised
- With adjustment gear
- Flatness and parallelism 3 µm/100 mm



PRECISION SINE TABLE

Swivelling to both sides

SIZE
1000 x 150 mm

WORKPIECE
Blades

APPLICATION
Grinding

DESCRIPTION
- Swivelling around the central axis ± 20°
- Distortion-free clamping using Spieth sleeves on both sides

PRECISION SINE TABLE

Special version

SIZE
Length 1200 mm

WORKPIECE
Blades

APPLICATION
Grinding

DESCRIPTION
- Adjustment gear can be latched at the front
- Precision version with 4-fold support and 2 gauge block supports

PRECISION SWIVEL DEVICE

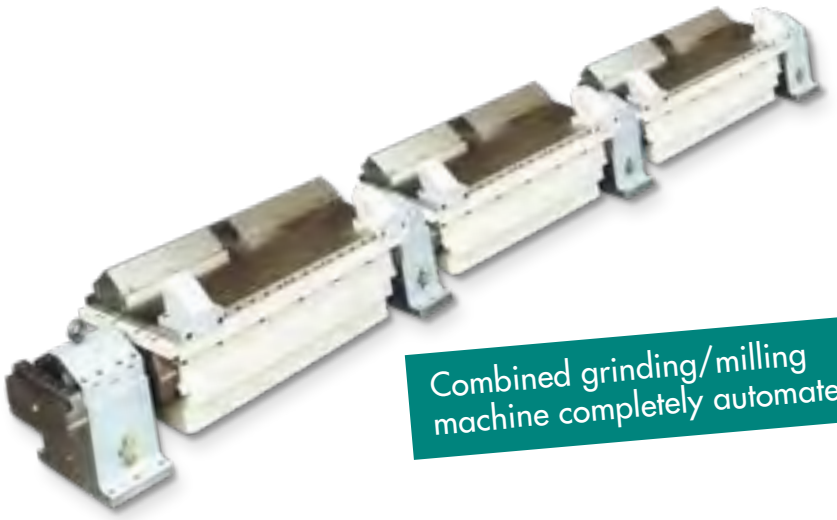
High accuracy for extremely long parts

SIZE
Length 12 m

WORKPIECE
Swap body trailers

APPLICATION
Milling and grinding on combined machine

DESCRIPTION
- Swivel device with electro permanent magnet and pole blocks, motor driven, with rotary encoder
- Direct measuring system
- Axes with hydrostatic bearing
- With hydraulic clamping



Combined grinding/milling machine completely automated

ELECTRO PERMANENT MAGNETIC INDEXING TABLE

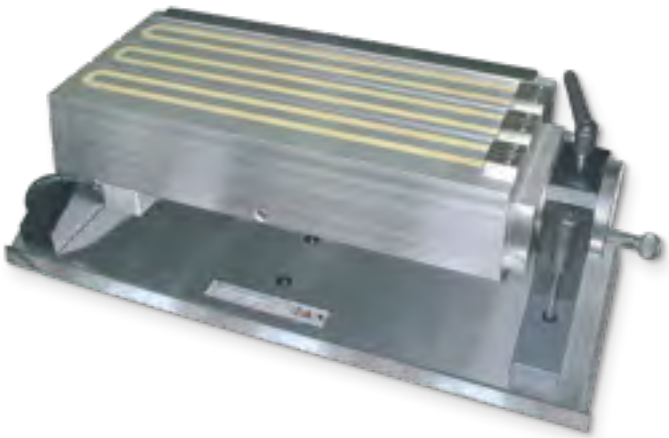
For milling small parts

SIZE
500 x 220 mm

WORKPIECE
Notched impact samples

APPLICATION
Milling the notches and side faces

DESCRIPTION
- Amplified electro permanent magnetic system
- Creating free space for tools for manufacturing 3 workpiece rows from one plate
- Swivelling and indexing -90°/0°/+90°



1.3.9 SPECIAL ROUND MAGNETS FOR GRINDING AND HARD TURNING

ELECTRO MAGNETIC CIRCULAR CHUCK

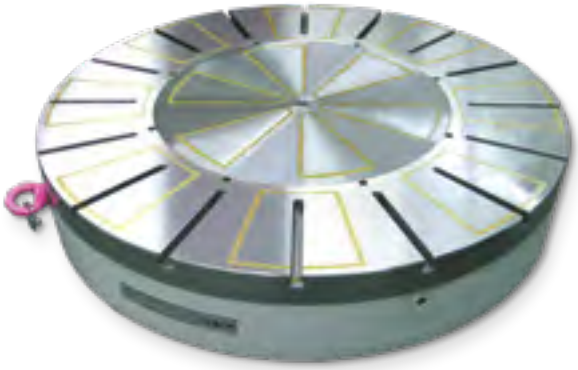
With combined pole pitch

SIZE
700 mm diameter

WORKPIECE
Rings

APPLICATION
- Sliding shoe grinding of small rings up to 400 mm
- Centric grinding for rings up to 700 mm

DESCRIPTION
- Optimised system for low height
- T-slots for pole shoes to create free space for tools



ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

With combined pole pitch

SIZE
325 mm diameter

WORKPIECE
Small bushings and discs

APPLICATION
Grinding

DESCRIPTION
- Circular pole pitch in the inner diameter for small bushings
- Outer pole pitch for thin plates
- Centric bushings for exchangeable pole plates

All-around precision with high performance

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

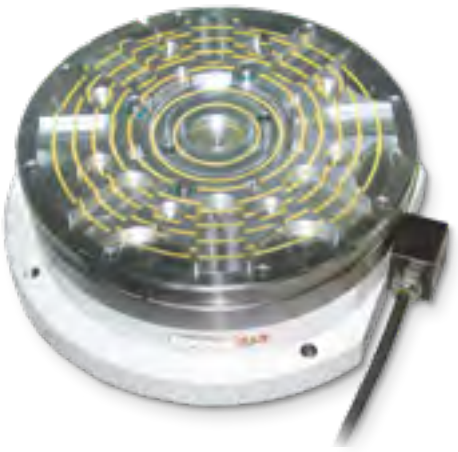
With exchangeable pole plate

SIZE
300 mm diameter

WORKPIECE
Parts for Geneva drives

APPLICATION
- Coordinate grinding of drilled holes and contours
- Stationary chucking

DESCRIPTION
- Exchangeable pole plates for different workpieces, precise changing
- Workpiece positioning using conical bolts, spring-loaded



ELECTRO MAGNETIC CIRCULAR CHUCK

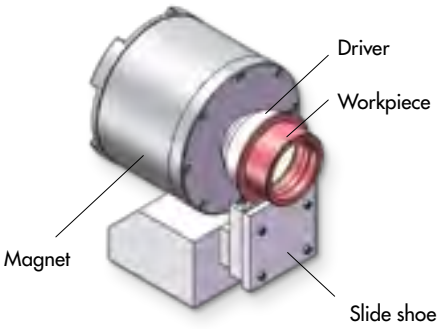
For centreless shoe grinding

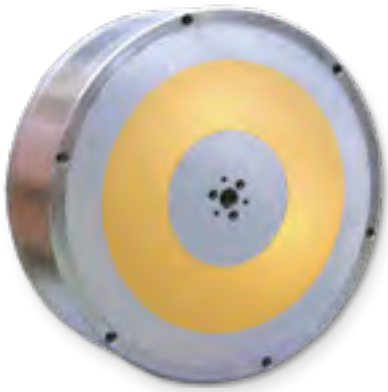
SIZE
Diameter 180 to 500 mm

WORKPIECE
Rolling bearings with small contact surfaces

APPLICATION
For high-precision sliding shoe grinding

DESCRIPTION
- Workpieces held axially using drivers for initiating the rotating motion
- High-precision workpiece positioning eccentric using stationary sliding shoes





ELECTRO MAGNETIC CIRCULAR CHUCK

For sliding shoe grinding of large rings

SIZE
650 mm diameter

WORKPIECE
Bearing rings

APPLICATION
Sliding shoe grinding

DESCRIPTION
- Electric magnet with radial pole pitch
- T-slots for pole raisers to create free space for tools

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

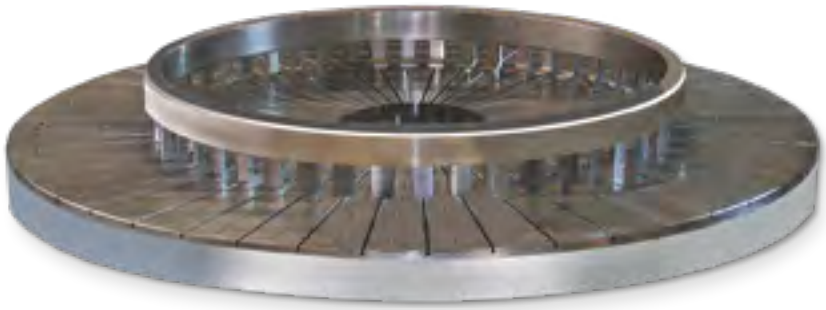
For manufacturing large bearings

SIZE
3100 mm diameter

WORKPIECE
Rings

APPLICATION
Grinding

DESCRIPTION
- Amplified magnet system with demagnetising cycle for low residual remanence
- Pole raisers to create free space for tools



ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

With narrow, direct pole pitch

SIZE
1200 mm diameter

WORKPIECE
Wide rings and discs

APPLICATION
Grinding on rotary table machines

DESCRIPTION
- Amplified magnet system
- 28 mm parallel pole pitch
- Housing annealed without stress

ELECTRO MAGNETIC CIRCULAR CHUCK WITH SEGMENT SWITCHING

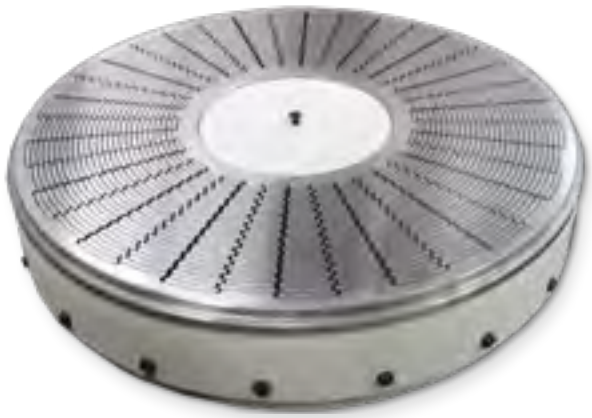
For automatic grinding of very small parts

SIZE
740 mm diameter

WORKPIECE
Ferrite cores

APPLICATION
Automated parallel grinding

DESCRIPTION
- Magnet with homogeneous field for small workpieces
- Rotating magnet, 16 upright magnet segments for automated loading and unloading as well as processing on segment grinding machines
- Cooling water draining at the centre



DRIVEN LAMINATED TOP PLATE - SPECIAL EXECUTION

For automatic segment switching

SIZE
830 mm diameter

WORKPIECE
Rolling bearing

APPLICATION
Parallel grinding on segment grinding machine

DESCRIPTION
- Pole plate driven through ring gear
- Upright magnet system for automatic grinding
- 24 individually activated segments

All-around precision with high performance

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

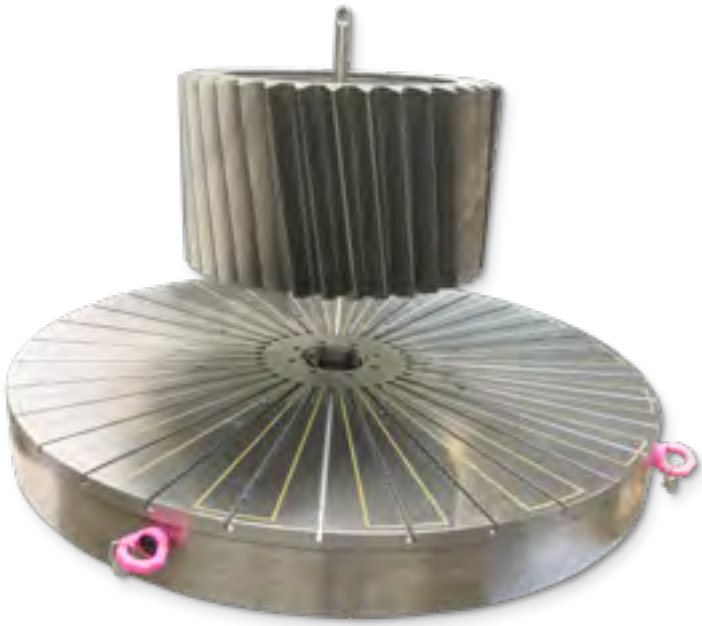
For planetary gears

SIZE
1600 mm diameter

WORKPIECE
Gearwheels

APPLICATION
Cylindrical grinding

DESIGN
- Amplified system with demagnetising
- T-slots for optional pole shoes



ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

Magnets for machining large parts

SIZE
4300 mm diameter

WORKPIECE
Bearing rings

APPLICATION
Machining from 3 sides

DESCRIPTION
- Minimal chucking and set-up times
- Extreme forces also for heavy machining
- Complete table surface usable
- High accuracy and damping from two-dimensional force transmission
- Large magnetically active areas in circumference direction
- Very small non-magnetic zones at the centre
- Individual spindle adaptation
- High circumferential speeds
- Extremely large diameters, e.g. 12 m in segment version

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

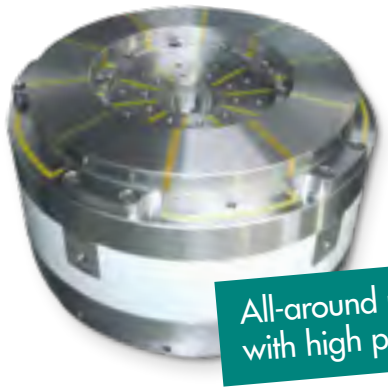
For precision turning

SIZE
400 mm diameter

WORKPIECE
Grinding wheel blanks

APPLICATION
Turning finishing

DESCRIPTION
- Exchangeable pole rings to create free space for tools
- Precision version for manufacturing in the range of a few µm
- Exchangeable precision centring pin at the centre



ELECTRO PERMANENT CIRCULAR MAGNET

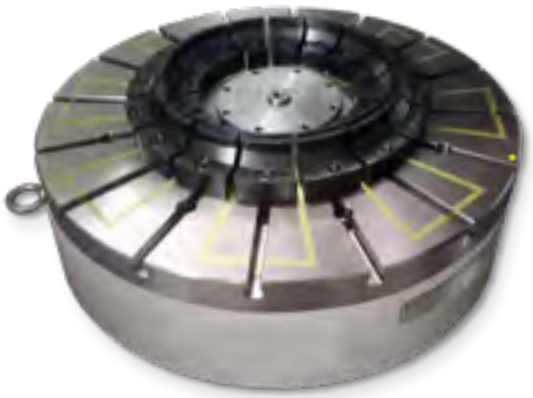
With zero point system

SIZE
500 mm diameter

WORKPIECE
Bearing rings

APPLICATION
Hard turning

DESCRIPTION
- Amplified system with demagnetising
- Centric zero point system
- For centring templates for workpiece alignment



ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCKS

For automatic pallet changes

SIZE
Diameter 800 and 900 mm

WORKPIECE
Ring gears

APPLICATION
Hard turning

DESCRIPTION
- Electro permanent magnetic pallets
- With heavy-duty power connector on the circumference

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

With special spindle integration

SIZE
200 mm diameter

WORKPIECE
Rings

APPLICATION
- Hard turning on magnet
- Turning on jaw chuck

DESCRIPTION
- Magnet using spring-loaded contact pieces, exchangeable
- Spindle integration in the draw tube with hollow clamping cylinder for optional jaw chuck
- Electrical supply, hydraulics and internal cooling water supply for alternating use

Spring-loaded contact pieces with cooling water supply

Contact flange

Electro permanent circular magnet with radial pole pitch, exchangeable

POLE RAISERS AND POLE BEAMS

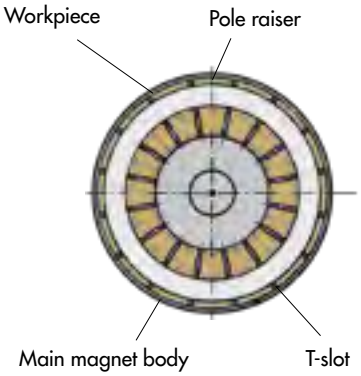
To create free space for tools

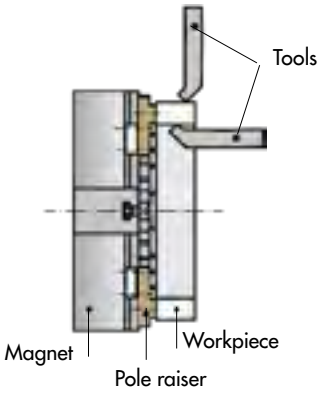
POLE RAISERS

- To create free space for tools for machining from 3 sides
- Rigid version or spring-loaded live version
- Radially adjustable using T-slots
- Workpiece-specific design

POLE BARS

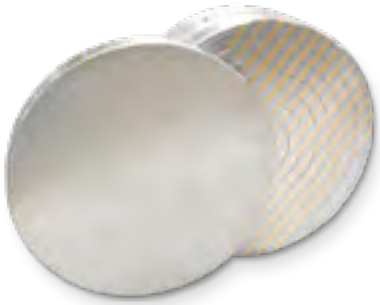
- As wear protection
- With and without T-slots
- Easy to clean





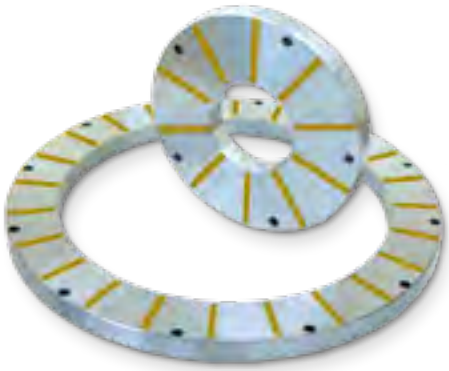
LAMINATED TOP PLATES AND RINGS

For adapting to your workpiece



ADD-ON POLE PLATES

- No loss of workpiece contact surface
- Easy to exchange
- Good swarf discharge and cleaning



ADD-ON POLE RINGS

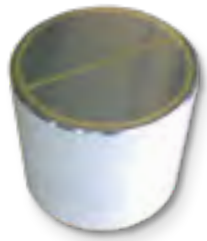
- Up to 650 mm diameter
- Easy to exchange
- Cost-efficient

ADD-ON POLE PLATES

- For creating free space for tools
- For machining from 3 sides

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

For extreme rotational speeds



HIGH-PERFORMANCE EP CIRCULAR MAGNET

SIZE
ø 230 mm

DESCRIPTION
- 3000 rpm

EP RING MAGNET

SIZE
ø 1000 mm

APPLICATION
Hard turning

EP CIRCULAR MAGNET

SIZE
ø 200 mm

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

Large magnets

SIZE
3600 mm diameter

WORKPIECE
Bearing rings

APPLICATION
Hard turning of rolling bearing rings

DESCRIPTION
- Solid monoblock design
- Wear-free solid-state design
- Machining from solid material
- High magnetic fill level and efficiency
- Long-term stability thanks to stress-free annealed housing

- Accuracy and stiffness from pole plate
- High quality on parallelism and flatness upon agreement

ELECTRO MAGNETIC CIRCULAR CHUCK

With segment design

SIZE
3500 mm diameter

WORKPIECE
Bearing rings

APPLICATION
For soft turning with high level of material removal

DESCRIPTION
Extremely low height, with pole bars and rigid pole shoes

Precision "made in Germany"

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

For heavy turning

SIZE
3600 mm diameter

WORKPIECE
Hollow wheels for wind turbine gears

APPLICATION
Turning and drilling

DESCRIPTION
- First and second chucking with rigid and movable pole raisers
- Design for heavy machining and extreme speeds
- Workpiece positioning with centring crossbeam

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

Magnets for wind turbine bearings

SIZE
2800 m diameter

WORKPIECE
Bearing rings

APPLICATION
Machining from 3 sides

DESCRIPTION
- Made from one piece
- Minimal chucking and set-up times
- Extreme forces also for heavy machining
- Complete table surface usable
- High accuracy and damping from two-dimensional force transmission
- Large magnetically active areas in circumference direction
- Very small non-magnetic zones at the centre
- Individual spindle adaptation
- High circumferential speeds
- Extremely large diameters, e.g. 12 m in segment version

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCKS

For hard turning

SIZE
1200 mm diameter

WORKPIECE
Bearing rings

APPLICATION
For hard turning

Round magnets for hard turning

MANUFACTURING BENEFITS OF MAGNETIC CHUCKING

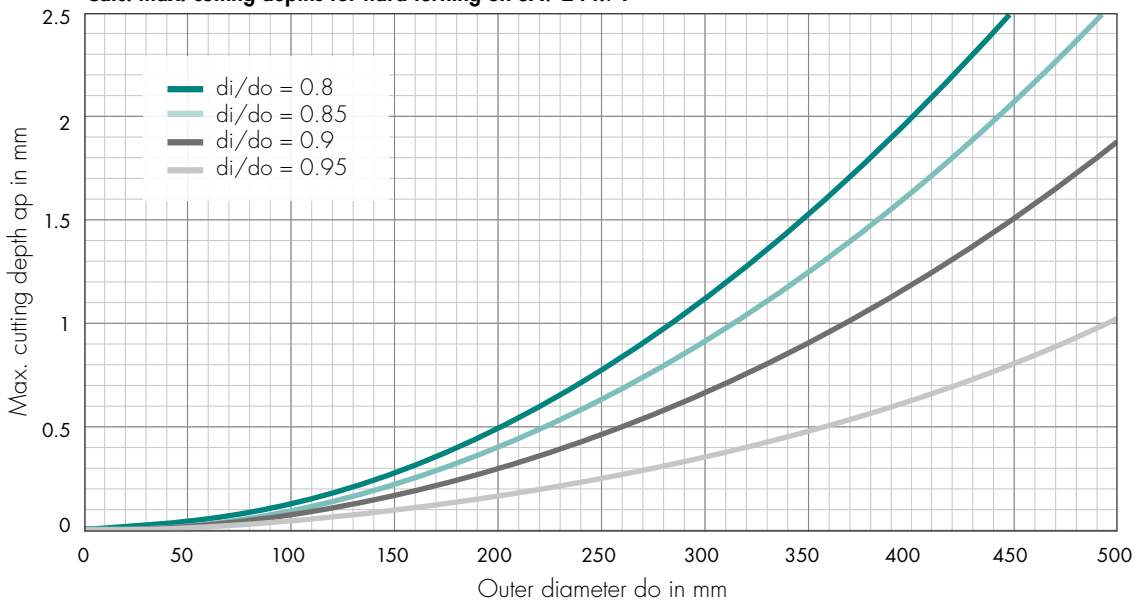
- Precision machining from 3 sides in one chucking process
- Levelling of the reference surface
- Two-dimensional holding force with high damping for excellent surface qualities
- Cost-efficient workholding fixture with low effort for machine integration
- Flexibility thanks to large workpiece holding area
- Releasing of internal workpiece holding during production

TEST RESULTS FOR HARD TURNING RING Ø 600 MM

Shape or surface quality	Reproduced quality of magnetic chuck	Improvement potential*
Arithmet. average roughness	0.3 µm	0 % to 25 %
Circle format deviation	0.5 µm	75 % to 90 %
Cylinder irregularity	10 µm	80 % to 85 %
Wall thickness fluctuation	25 µm	60 % to 80 %

* Improvement potential compared to conventional methods

Calc. max. cutting depths for hard turning on SAV 244.71



Ring width = 3 x wall thickness
di/do = diameter ratio

Feed 0.15 mm

Material: 100 Cr6

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

For wind turbine bearings

SIZE
3000 mm diameter

WORKPIECE
Bearing rings

APPLICATION
High-precision hard turning

DESCRIPTION
- Made from one piece
- Model year 1993:
  Development of the first hard turning magnet in the market

Manufacturing benefits – implemented consistently! SAV – pioneer for innovative technologies.

ELECTRO PERMANENT MAGNETIC CIRCULAR CHUCK

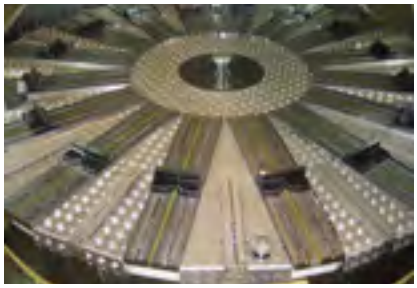
Modular for large rings

SIZE
3600 mm diameter

WORKPIECE
Large bearings

APPLICATION
Turning and drilling

DESCRIPTION
- Amplified magnet system
- Bar structure design
- Workpiece holding on rigid pole shoes



1.3.10 SPECIAL SOLUTIONS FOR NON-SUBTRACTIVE PROCESSES

ELECTRO PERMANENT MEASURING DEVICE

Customer-specific

SIZE
642 x 642 mm

APPLICATION
Precision measuring

DESCRIPTION
Module magnet for integration in granite plate.
Integrated features for creating free space
for tools, positioning and referencing.

PERMANENT MAGNETIC WORKPIECE CARRIER

For easy operation

SIZE
300 x 60 mm

WORKPIECE
Cutting inserts

APPLICATION
PVD coating

DESCRIPTION
Magnetically optimised system for
high-temperature application

ELECTRO PERMANENT MAGNET BARS

For workholding

SIZE
2000 x 140 mm

WORKPIECE
Bottom bending tools

APPLICATION
Workholding

DESCRIPTION
- Amplified magnet system
- Optimum safety with electro permanent magnets
- Bipolar system with a longitudinal pole gap

1.3.11 DEMAGNETISERS – SPECIAL VERSIONS

DEMAGNETISING BELT FOR ROLLING BEARINGS

For wide rings

SIZE
Belt width 800 mm

WORKPIECE
Rolling bearing rings

APPLICATION
Demagnetising

DESCRIPTION
- Two table demagnetizers with opposite poles, stacked
- Upper device height-adjustable
- Belt drive with light barrier control
- Low-frequency generator for low residual remanence

High quality – for downstream processes and application

DEMAGNETISING TABLE

For long shafts

SIZE
Opening width 400 x 350 mm each

WORKPIECE
Cylinders

APPLICATION
Demagnetising

DESCRIPTION
- Workpiece holding with prisms
- Tunnel demagnetiser, moving longitudinally

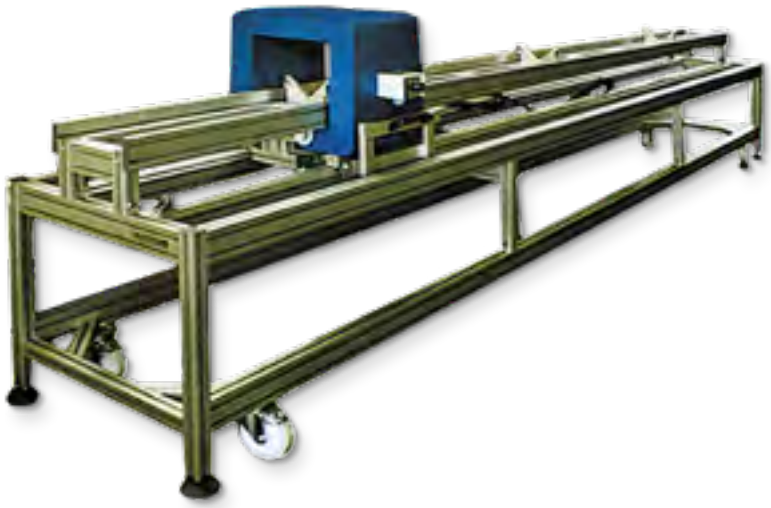


PLATE DEMAGNETISING BELT

For small bulk parts

SIZE
Belt width 250 mm

WORKPIECE
Automotive parts

APPLICATION
Demagnetising

DESCRIPTION
- Table adjustable in angle and height
- High power with low-frequency generator for low residual remanence

TUNNEL DEMAGNETISING TABLE

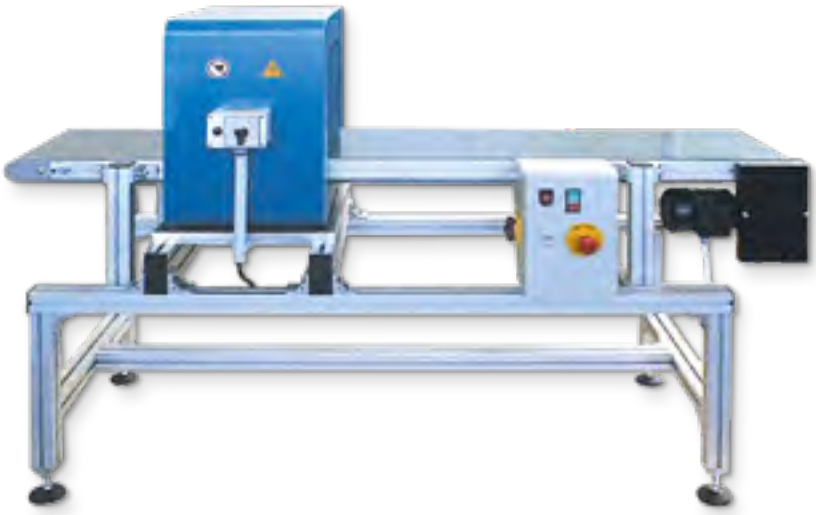
For full automation

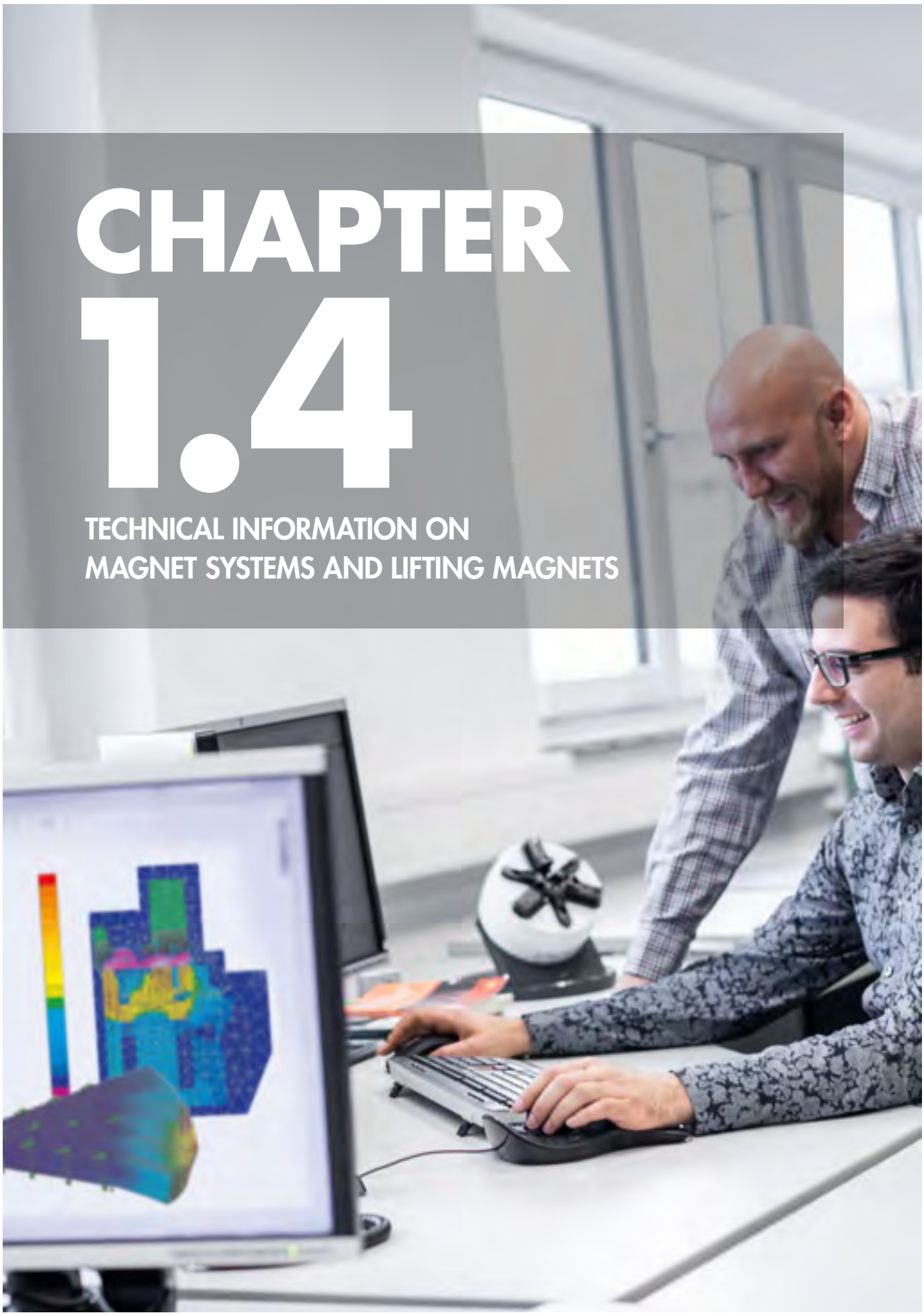
SIZE
Belt width 500 mm

WORKPIECE
Automotive parts

APPLICATION
Demagnetising

DESCRIPTION
- Large tunnel opening for large parts
- Horizontal and vertical demagnetising





CHAPTER 1.4

TECHNICAL INFORMATION ON MAGNET SYSTEMS AND LIFTING MAGNETS

1. MAGNET SYSTEMS

1.4 TECHNICAL INFORMATION ON MAGNET SYSTEMS AND LIFTING MAGNETS

PAGES 274 – 314

1.4.1 FUNDAMENTAL PHYSICS OF MAGNETIC WORKHOLDING TECHNOLOGY

Influences on the magnetic holding force

The magnetic holding forces depend on several influences – which may be difficult to assess in practical application – so that the design of magnet systems requires a high level of experience. The following criteria have an impact:

GEOMETRIC WORKPIECE CHARACTERISTICS
Contact area, roughness, workpiece density, friction coefficient

TEMPERATURE AND ENVIRONMENTAL INFLUENCES
Application temperature, Curie temperature, opposing fields, radioactivity

MAGNET TYPE
Permanent magnet, electro magnet, electro permanent magnet

WORKPIECE MATERIAL
Alloy, heat treatment

TYPE OF POLE PLATE COVERAGE
Level of coverage, direction of coverage, stops, pole raisers

PERMANENT MAGNET CHARACTERISTICS
Magnet material, geometry, manufacturing process

STRESS COLLECTIVE
Standard force, displacement force, conversion to standard stress

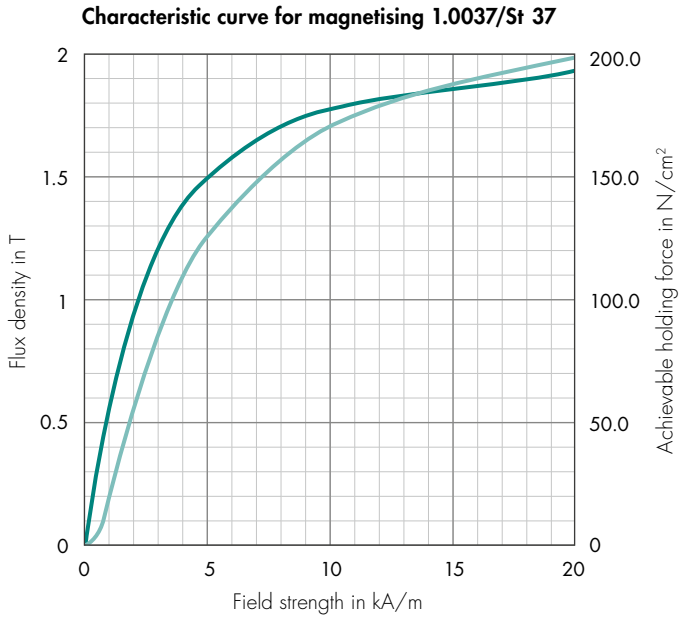
Rated holding force in N/cm^2

$>$

Stress in N/cm^2

Influences on the magnetic holding forces

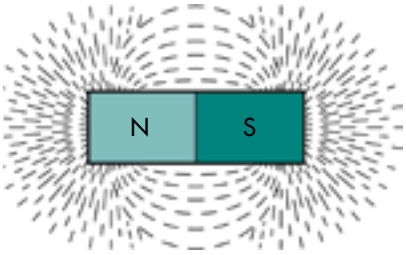
Maximum possible holding forces



Ferromagnetic materials can conduct magnetic flux only in limited density. This result in a saturation effect, after which no further significant increase in holding force is possible with reasonable effort. For St 37, this is approx. 180 to 200 N/m^2, taking into account scattered flux and resistance factors.

The magnetic field

The space in which magnetic fields are active is referred to as a magnetic field. The magnetic effect depends on location and direction. A magnetic field is generated between two or more poles, whereby identical poles will repel and opposing poles will attract. The magnetic field can easily be illustrated with iron powder sprinkled onto a separating layer on the magnetic field, e.g. paper or glass.



Field lines pattern of a two-pole bar magnet

If a bar magnet is stored in a suitable manner, it will adapt to the magnetic field of the earth.
The pole facing towards the geographical north is referred to as the “north pole” of the magnet.
Bending a bar magnet into a U-shape already creates a two-pole magnet system (horseshoe magnet).

Magnetic force lines

Magnetic force lines run from the north pole to the south pole of a magnet. The magnetic field tries to close itself across the air gap using its scatter flux and usable flux. If this causes the magnetic field to be emitted from the soft iron, this almost always occurs perpendicular to the surface. The force line progression strives for the the shortest possible distance between the poles.

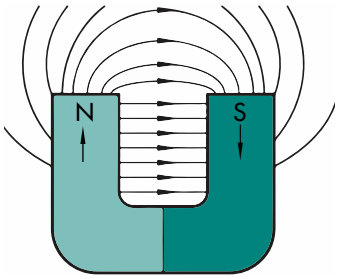
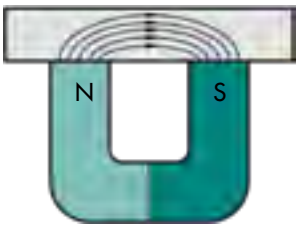


Illustration of the magnetic force lines of a horseshoe magnet

Air, however, poses a very high magnetic resistance to the magnetic field, so that the magnetic force lines preferably run in ferromagnetic material (e.g. iron).
The force lines illustrate the magnetic flux Φ in Wb (Weber). The concentration of the force lines per area, i.e. the magnetic flux density B in mT (1 Tesla = 1 Wb/m^2) or G (1 Gauss = 0.1 mT) is decisive for the effect of the magnetic field, e.g. the achievable holding force.
The cause for the magnetic field with its force lines is the magnetic field strength H in A/m or Oe (Oersted) (1 kA/m = 12.56 Oe). The connections between field strength and flux density can be considered as similar to the ratios between voltage and current.

Iron workpieces in the magnetic field

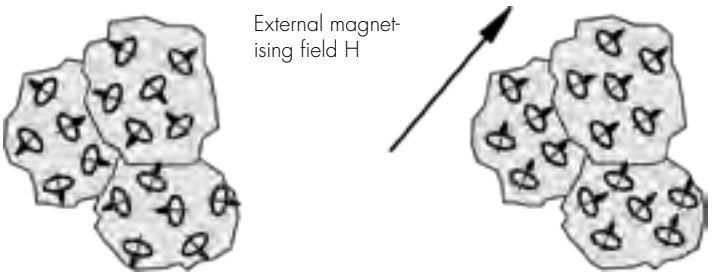
Positioned iron workpieces offer only a low resistance to the magnetic field and therefore shorten the path of the force lines. The magnetic field then no longer has to take the complicated path through the air.
The magnetic conductivity (permeability) of steel 1.0037 is e.g. 2000 times better compared to air.
If the positioned iron part is removed from the magnet, the force of the magnetic field resists an increase in magnetic resistance and therefore a change of the magnetic energy.
As the magnetic energy is linked directly to the work required for pulling a ferromagnetic workpiece from the magnet, the workpiece resists by increasing the air gap and the magnetic energy. This is why materials containing iron are attracted and held.
To magnetically hold a workpiece, at least one north and south pole have to be bridged with it.



Magnetic flux and resulting active holding forces when bridging a north and south pole

Interpretation of magnetism at atomic level

Tiny magnetic fields, so-called "molecular magnets", exist in magnetisable (ferromagnetic) materials.
Within the atoms, electrons as the smallest electrical charges orbit around the nucleus and around their own axis and generate a magnetic moment and a magnetic dipole, following the concept first observed by Oersted.
Without influence from an external field, these magnetic dipoles have a completely random arrangement in ferromagnetic materials and their effect is largely cancelled out. When an external magnetic field is applied, the dipoles are precisely aligned. A larger number of aligned dipoles in small partial areas – the "Weiss fields" – represent the smallest ferromagnetic bodies. These molecular magnets align under the influence of external magnetic fields and, depending on the material, remain more or less in the forced formation after the external field has been removed. The arrangement of the molecular magnets also illustrates the demagnetising effect of heat, impact, radioactive radiation or external magnetic fields.
The affected object, which contains areas aligned in such a way, then acts as a magnet as a whole.
When the molecular magnets are fully aligned, no further magnetising is possible. The material is then "saturated".



Alignment of the molecular magnets in the Weiss fields by an applied magnetic field

1.4.2 PERMANENT MAGNET MATERIALS

Magnetic characteristics of materials

Examining the behaviour of different materials in the magnetic field shows that there are three different materials in terms of magnetic characteristics:

- non-magnetic materials
- soft magnetic materials
- hard magnetic materials

Non-magnetic materials

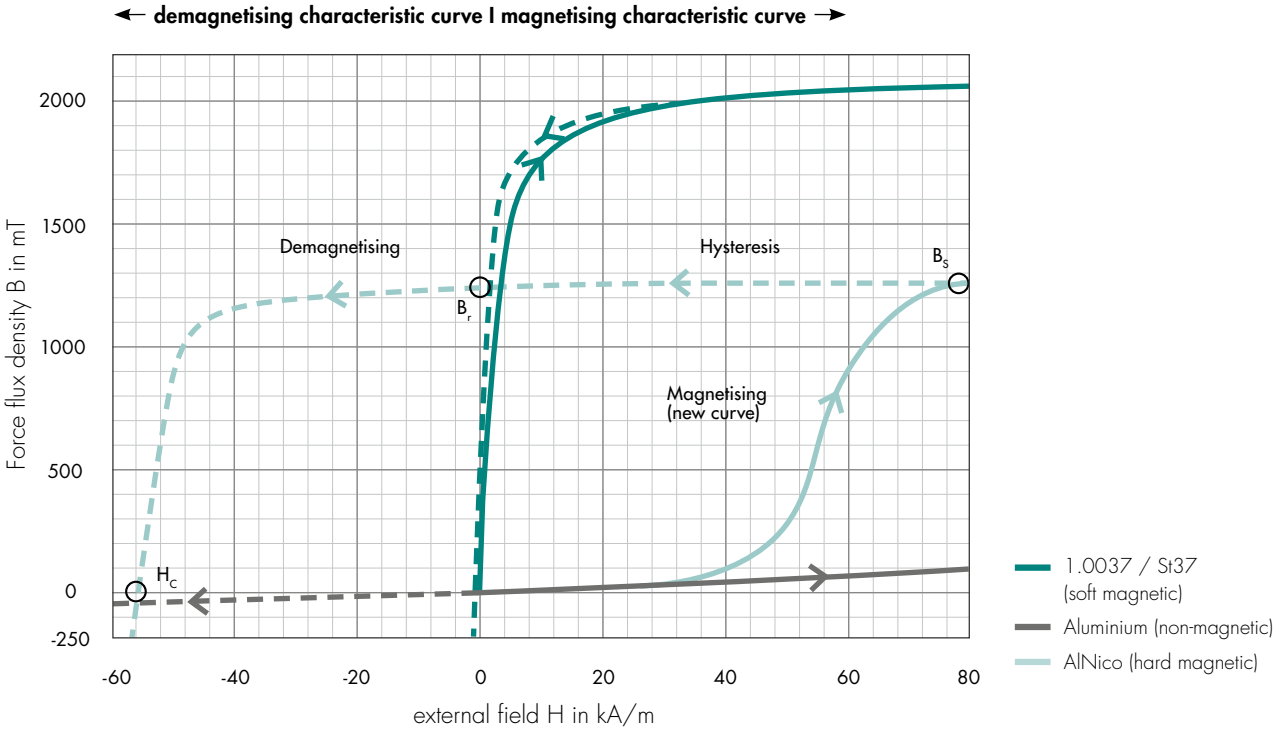
This includes materials such as brass, copper, aluminium, wood, glass, plastic and other metals which react only insignificantly to a magnetic field or not at all. Magnetic fields flow through these materials like through air or a vacuum. There is consequently no interaction (attraction) between magnetic field and material. These materials cannot be magnetically chucked.

Soft magnetic materials

This group includes mainly iron, low-alloy steel, nickel and cobalt. Magnetic fields concentrate and amplify in these materials. When the magnetic field is deactivated, they mostly lose their effect.
A small residual magnetism can remain, however, depending on the alloy content.

Hard magnetic materials

These are permanent magnet materials. After magnetising, they have their own magnetic field with a high energy density, which can be used for technical purposes in statically or dynamically stressed magnetic circuits, i.e. in magnetic circuits with a constant or variable air gap.
A permanent magnet material therefore has to have two characteristics. Firstly, it has to absorb sufficient magnetism (high remanence B_r or saturation B_s). Secondly, the stored magnetism must remain in the material (high coercive field strength H_C). Permanent magnet materials are used for holding and workholding systems such as motors, speakers, measuring instruments. Hard ferrites, AlNiCo and SmCo are used for permanent magnets. In addition to SmCo, NdFeB is used today with further increase coercive field strength and remanence.



Permanent magnet materials

Hard ferrite magnets

as per DIN 17 410:

They consist of approx. 80 % iron oxide and 20 % barium or strontium carbonate. These raw materials are available in large quantities and are therefore relatively cheap. As all ceramic materials, these magnets are very hard and brittle. They can therefore only be machined with diamond-tipped tools. Hard ferrite magnets are manufactured anisotropic or isotropic, i.e. with or without preferred direction.

Isotropic magnets have only a low energy density after magnetising.

Anisotropic magnets have a high coercive field strength relative to the remanence. A large magnetic pole area is therefore required. The max. service temperature is +200 °C.

Metal permanent magnets

made of AlNiCo:

The main alloy components are aluminium, nickel, cobalt, iron, copper and titanium. This hard material is manufactured using sintering or casting and can only be machined with grinding. AlNiCo magnets are now manufactured almost exclusively anisotropic. This means they are provided with a preferred direction for magnetising which results in better alignment of the molecular magnets and therefore in better magnetic values. The anisotropy is achieved by generating columnar crystals during casting and through heat treatment with a magnet field applied.

The dimensional ratio of length to diameter L : D should be 4 : 1 in an open magnetic circuit to have good demagnetising resistance. The highest holding forces for a given magnet volume can be achieved for AlNiCo with this ratio. The more the magnetic circuit is closed, the shorter the length can be.

AlNiCo magnets have a high remanence, but a low coercive field strength. This allows these magnets to absorb a strong magnetic field, but also to be demagnetised again easily. They are therefore used in electrically controlled electro-permanent magnetic chucks.

AlNiCo magnets can be used in a relatively high temperature range up to approx. +400 °C and irreversibly lose their magnetisation at the so-called "Curie temperature".

High-energy "rare earth magnets"

made of samarium cobalt ($SmCo_5$ / $SmCo_{17}$) or neodymium iron boron ($Nd_2Fe_{14}B$)

These are sintered metal permanent magnets with a very high energy product from the group of rare earth elements. Rare earth elements are 15 elements with atomic numbers 57 – 71 in the periodic table of elements.

The complex processing and the expensive raw materials result in a relatively high price. These magnets are always given a preferred magnetic direction (anisotropy) during manufacturing. Even strong opposing fields have no influence on the magnetic field.

a) Samarium cobalt

This magnetic material with excellent magnetic values is very hard and brittle and can only be machined by grinding or with diamond-tipped tools. The max. service temperature is approx. +200 °C.

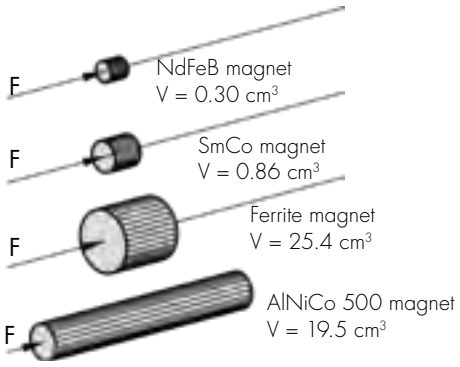
b) Neodymium iron boron

This is currently the strongest magnet material and achieves the highest magnetic values which can be manufactured at an economically viable scale. The energy product is approximately twice that of samarium cobalt. The energy product represents the quality of the magnets and is the product of flux density and field strength (B x H). The max. service temperature is approx. +80 °C.

Comparison of the permanent magnet materials

The example shows the reduction in volume to only 4.4 % and 1.6 % of the initial volume when using the high-energy magnet materials SmCo and NdFeB, respectively.

An equally strong magnetic field of B = 100 mT results at a distance of 5 mm, resulting in the same holding forces in each case.



Magnet volume for different magnet materials with the same magnetic energy content.

Physical characteristics

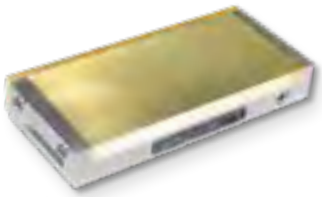
of permanent magnet materials

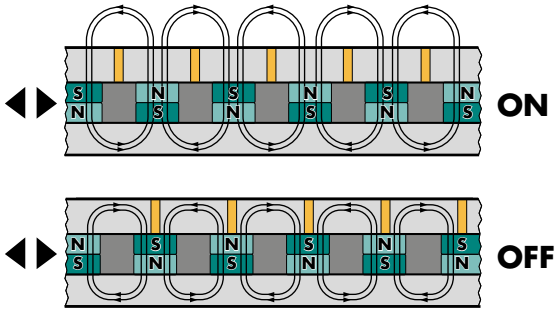
Magnet material	Energy product (B x H) max		Remanence Br		Coercive field strength (T = 20 °C) $_BH_C$		$_JH_C$		Relative remanent permeability	Temperature coefficient of remanence	Max. service temperature	Density	Curie temperature
	kJ/m³	MGOe	mT	G	kA/m	Oe	kA/m	Oe	mT/kAm	per °K	°C	g/cm³	°C
Hard ferrite (BaFe) plastic-bonded anisotropic	12	1.5	245	2450	175	2200	207	2600	1.40	-0.20 %	- 40 + 85	3.7	450
Hard ferrite (SrFe)	27 - 32	3.4 - 4.0	380 - 400	3800 - 4000	230 - 275	2891 - 3457	235 - 290	2954 - 3645	1.45 – 1.65	-0.20 %	approx. 200	5.0	450
AlNiCo 500 Precision casting	35	4.4	1120	11200	47	590	48	603	23.80	-0.02 %	450	7.4	860
Samarium cobalt plastic-bonded	56 - 64	7.0 - 8.0	550 - 590	5500 - 5900	360 - 416	4500 - 5900	600	7500	1.05 – 1.10	-0.04 %	80	5.1	725
Neodymium iron boron, plastic-bonded	80 - 96	10.0 - 12.0	700 - 800	7000 - 8000 -	416 - 480	5230 - 6033	640 - 880	8045 - 11060	~1.70	-0.10 % (25–90°)	120	~6.0	310
Samarium cobalt $SmCo_5$	143 - 159	18.0 - 20.0	850	8500	620	7800	1193	15000	1.37	-0.04 % (20-100°)	approx. 250	8.2	725
Samarium cobalt $SmCo_{17}$	159 - 175	20.0 - 22.0	900	9000	636	8000	1193	15000	1.42	-0.03 % (20-100°)	approx. 300	8.2	750 - 800
Neodymium iron boron, NdFeB	223 - 239	28.0 - 30.0	1080 - 1120	10800 - 11200	780- 836	9800 - 10500	>1350	>1600	1.33 – 1.38	-0.10 %	100 - 120	7.4	310

1.4.3 MAGNETIC WORKHOLDING DEVICES

Permanent magnetic chucks

- Switching on and off by magnetic displacement of magnet cores, separating and linking of field lines
- For grinding, milling and EDM
- Observe max. speed for turning
- No thermal expansion
- Low elasticity of the pole plate possible

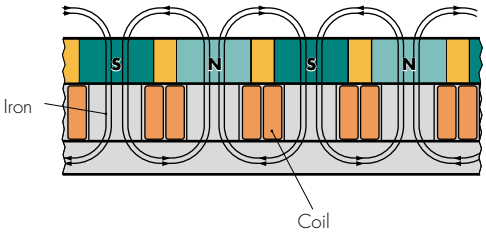




Permanent magnetic chucks

Electro magnetic chucks

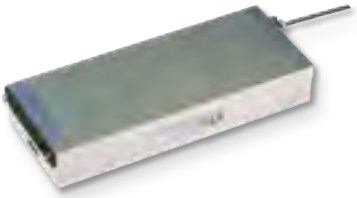
- Holding force generated by continuous energising of the coil in the iron core
- For grinding work with subordinate precision
- Permanent current flow required
- Heat expansions occur
- Deep magnetic field possible, e.g. for lifting magnets

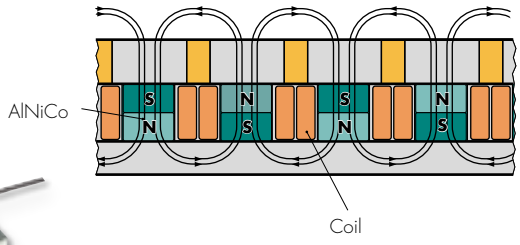


Electro magnet with iron core

Electro permanent magnetic chucks, single system

- Switching on and off with defined magnetising and demagnetising of AlNiCo cores
- For grinding, milling and EDM
- No thermal expansion
- Maximum safety
- Electrical connection can be disconnected for automation

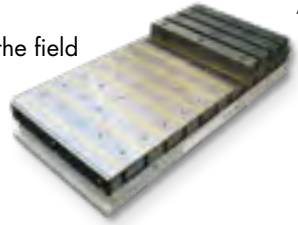


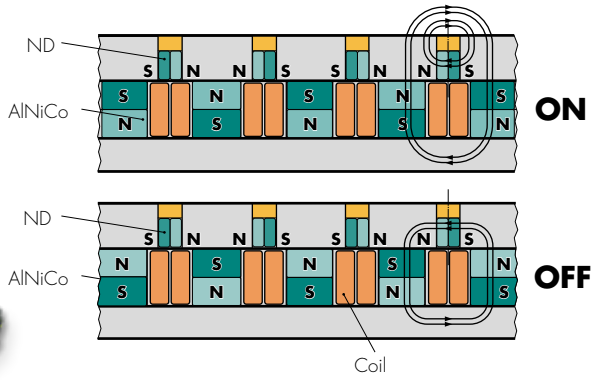


Electro permanent magnet with AlNiCo core (single system)

Electro permanent magnetic chucks, dual system

- Milling magnets with high-energy systems have neodymium magnets in the pole gap in addition to the AlNiCo. This allows extreme holding forces to be achieved.
- Switching on and off by pole reversal of the AlNiCo cores using a pulse
- No demagnetising, only neutralisation of the field
- No thermal expansion
- Maximum safety
- Electrical connection possible with connector





Electro permanent magnet with AlNiCo core and ND in the pole gap (dual system)

1.4.4 RATED HOLDING FORCE, DISPLACEMENT FORCE, POLE PITCH

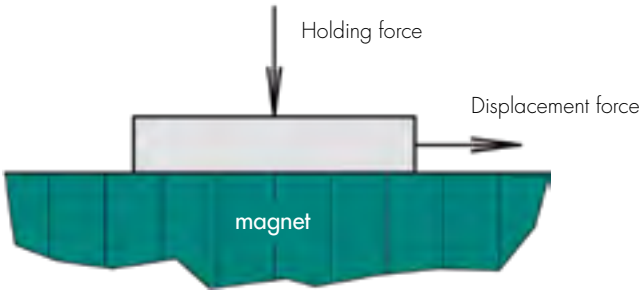
Holding and displacement forces in magnet technology

Pole pitch, shape of the workpiece, surface quality and material have a great influence on the holding and displacement force of a workpiece.

a) The **holding force** is the pull-off force of a chucked workpiece perpendicular to the chucking surface.

b) The **displacement force** is the force required for displacing a workpiece parallel to the chucking surface.
The displacement force is approx. 15 to 30 % of the holding force depending on the surface quality. It depends on surface roughness and adhesion.

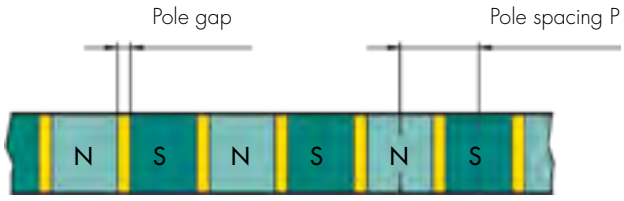
Where no further details are provided, the rated holding forces stated for our products apply to a test workpiece made of steel 1.0037, polished, with the dimensions 100 x 100 x 40 mm.



Holding and displacement forces on magnetic chucks

Definition of pole pitch

To achieve a uniform holding force across the entire chucking area and also chuck small workpieces, chucking magnets are manufactured with different pole pitches and pole spacing. The chucking area is consequently designed with alternating north and south poles. The pole gap consists of non-magnetic materials such as brass or plastic.



Definition of pole gap and pole spacing for magnetic chucks

Holding force tester SAV 486.40

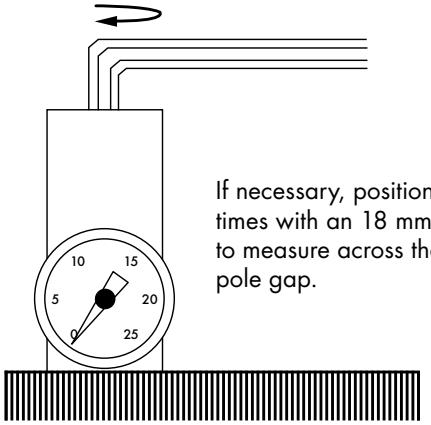
General information

This holding force tester is used to measure the holding force on magnetic chucks.
The tester operates with hydraulic pressure generation. The display on the 0 – 25 bar scale corresponds to the holding force in 0 – 25 daN/cm² (kg).

Function

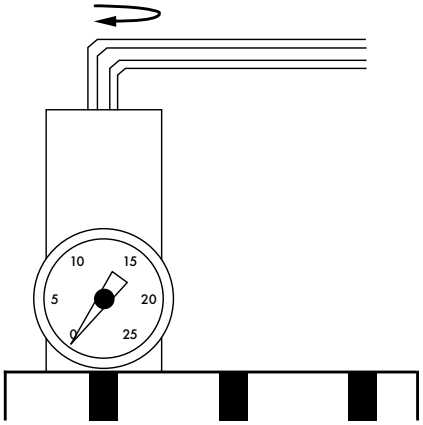
Place the holding force tester on the magnetic chuck as shown in the diagrams below. For magnetic chucks with larger pole pitch, at least 2 poles should be covered equally.

On fine pole magnets:



If necessary, position multiple times with an 18 mm offset to measure across the primary pole gap.

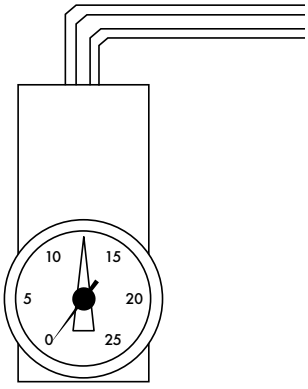
On magnets with larger poles:



Operation

The brass bolt on the underside of the device must be retracted. Then magnetise. The required pressure can be generated by turning the screw clockwise with an Allen key. The integrated pressure piston is moved far enough so that the measuring cylinder is lifted off the magnet plate when the holding force limit is reached.

The black pointer goes to 0 after pull-off and the red drag pointer indicates the rated pull-off force in daN/cm². In the example on the right: 12.5 daN/cm² = 125 N/cm²
To avoid damage, do not force the Allen key further to the stop.



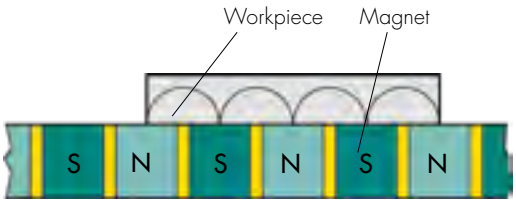
Servicing

Store in a clean and undamaged condition. If the black pointer does not return upon pull-off, top up oil. Normal hydraulic oil can be used for this.

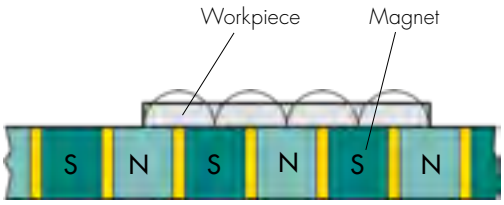
1.4.5 INFLUENCES ON THE MAGNETIC HOLDING FORCE

Holding force and workpiece thickness

The magnetic field in the positioned workpiece roughly forms semicircles from one pole to the next.



Force line progression for workpiece thickness > pole spacing



Force line progression for workpiece thickness < pole spacing

If the workpiece is significantly thinner than the pole spacing, the workpiece does not fully absorb the magnetic field. This reduces the holding force. The best holding forces are achieved if all force lines run within the workpiece. A guide value can be that the holding force is not reduced if the workpiece thickness is > 40 % of the true pole pitch.

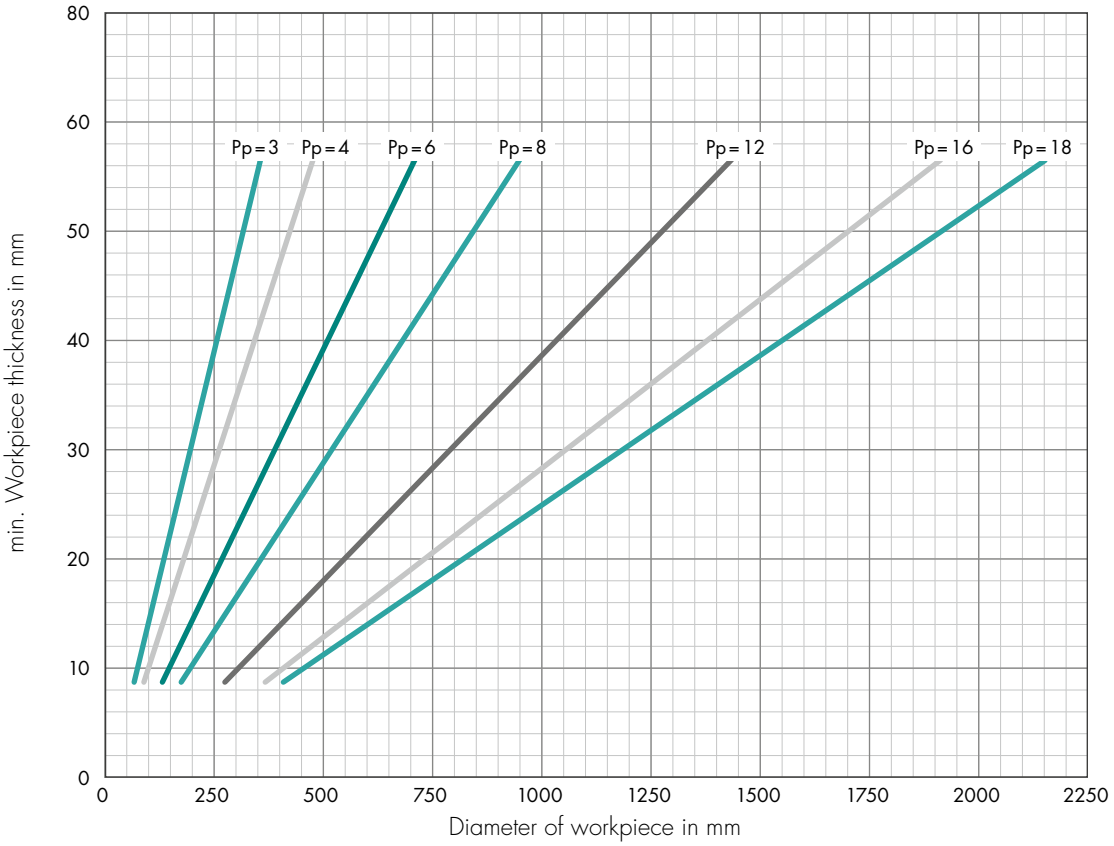
For thicker and blank workpieces, larger pole spacings can achieve a greater penetration of the magnetic field and therefore a greater holding force for these parts. Take attention to the minimum thickness or workpiece

Workpiece thickness behaviour electro permanent circular magnets with radial pole pitch

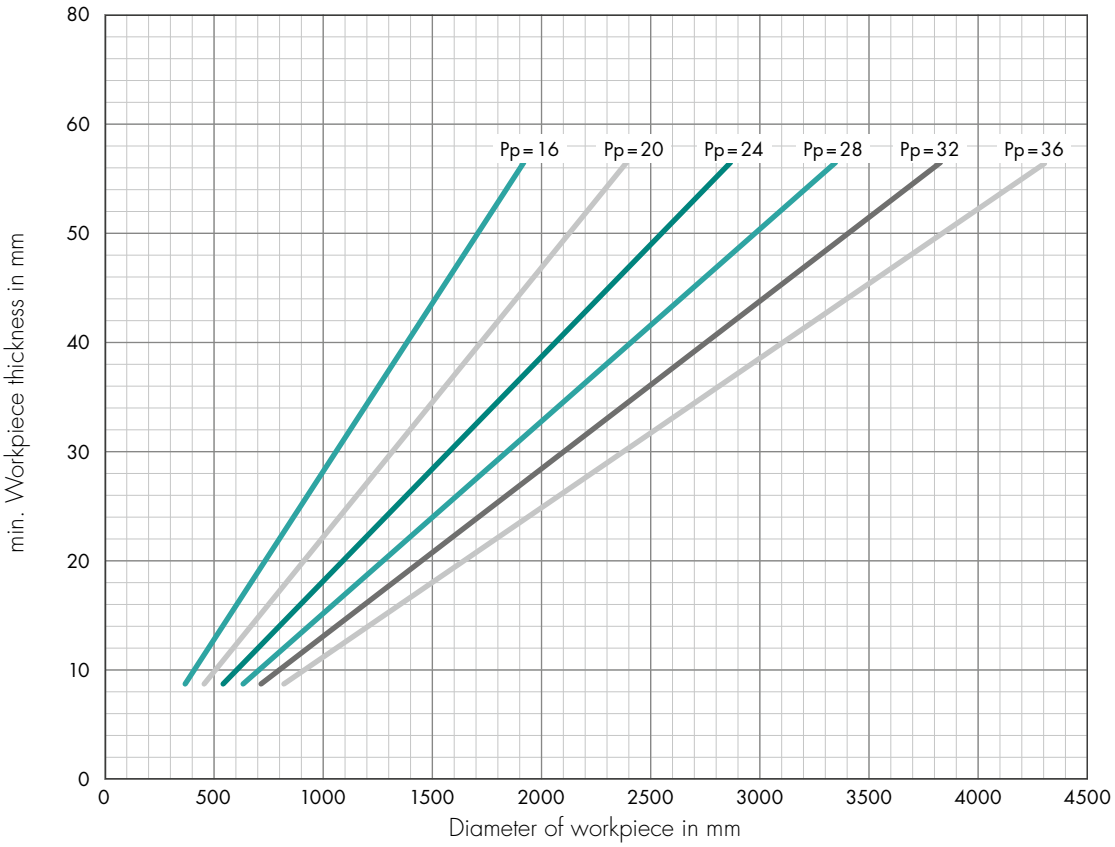
EP

For circular magnets with radial pole pitch, the minimum thickness of workpiece is depending from the number of pole pairs Pp and diameter of workpiece. The minimum thickness can be read from the following diagrams.

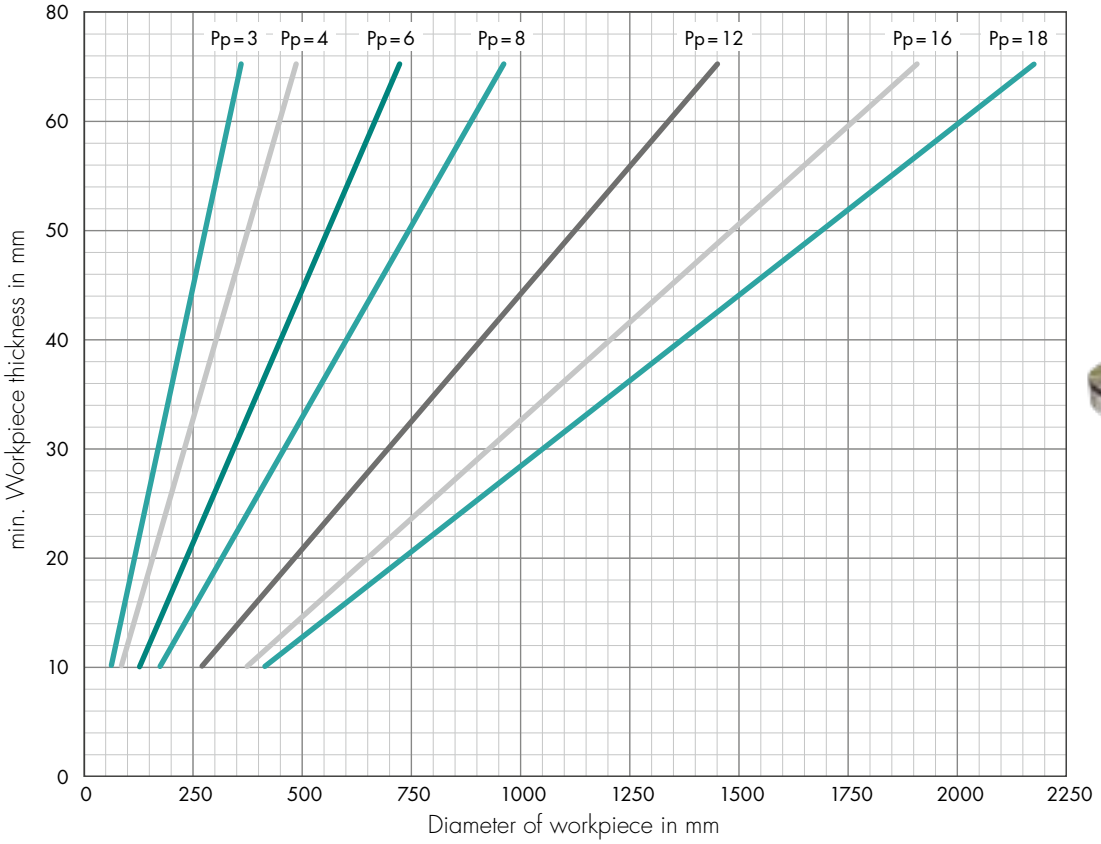
SAV 244.70 min. thickness of workpiece for circular magnets with radial pole pitch



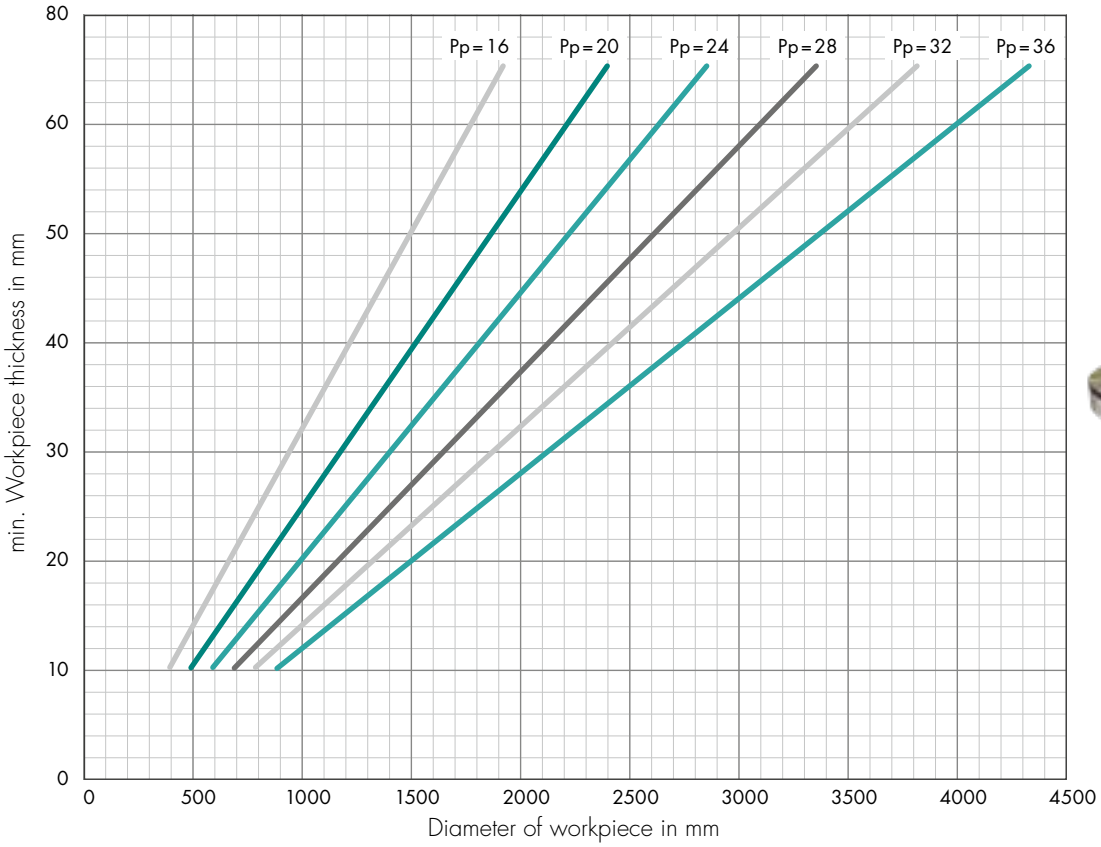
SAV 244.70 min. thickness of workpiece for circular magnets with radial pole pitch



SAV 244.71 / .76 min. thickness of workpiece for circular magnets with radial pole pitch



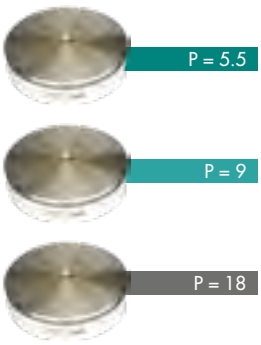
SAV 244.71 / .76 min. thickness of workpiece for circular magnets with radial pole pitch



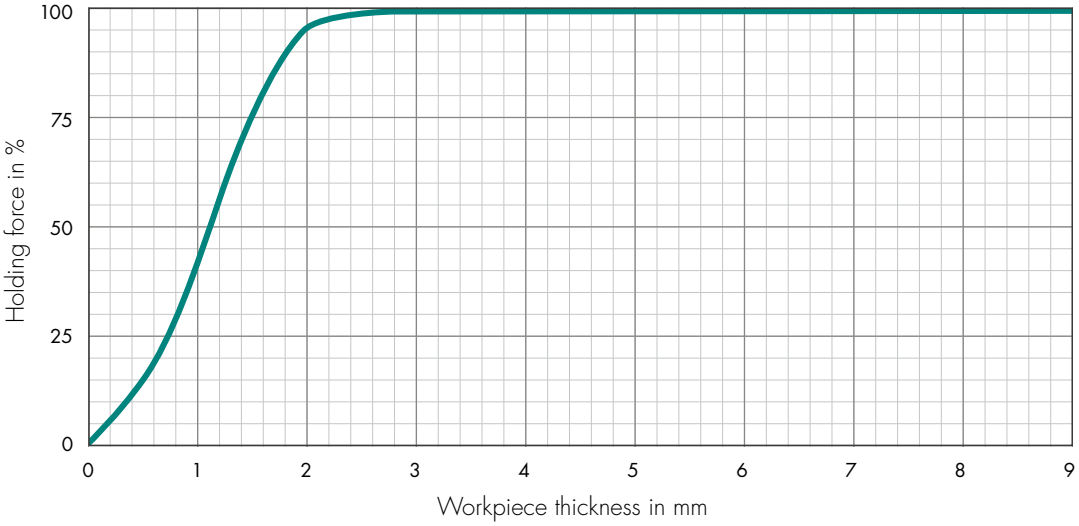
Workpiece thickness behaviour circular magnets with ring and parallel pole pitch

EP

SAV 244.72 min. thickness of workpiece for circular magnets with ring pole pitch 5.5/9/18 mm



SAV 244.73 min. thickness of workpiece for circular magnets with fine parallel pole pitch 4 mm



Workpiece thickness behaviour circular magnets with parallel pole pitch

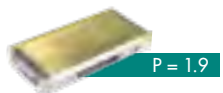
EP

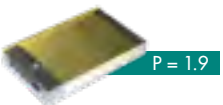
SAV 244.74 min. thickness of workpiece for circular magnets with parallel pole pitch 28 mm high energy system

Workpiece thickness behaviour of permanent grinding magnets

PERM

SAV 220.30 / 243.01 / 243.07 / 244.01 transverse pole pitch 1.9 mm

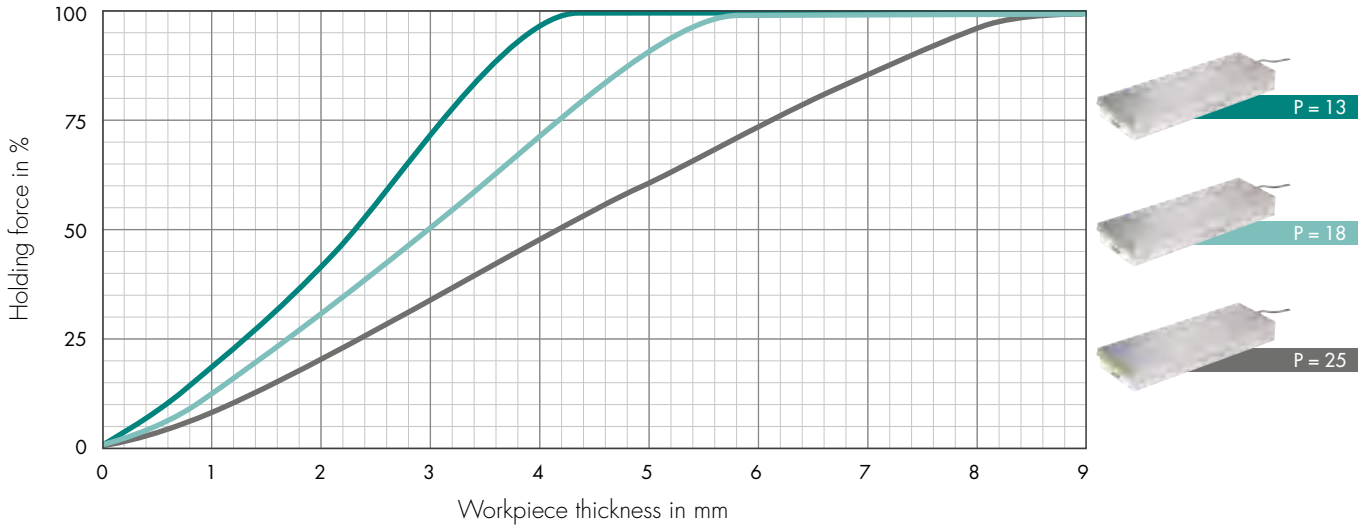




Workpiece thickness behaviour of electro permanent grinding magnets

EP

SAV 243.70 transverse pole pitch 13/18/25 mm

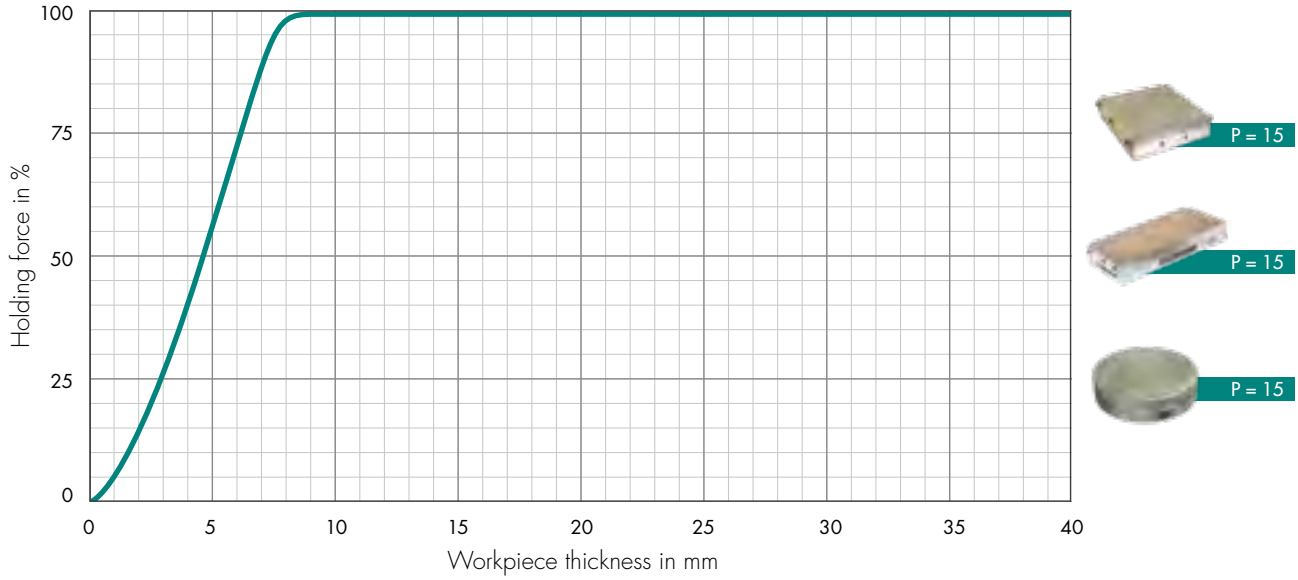


SAV 243.71 / .72 / .73 / 244.73 fine pole pitch 4 mm

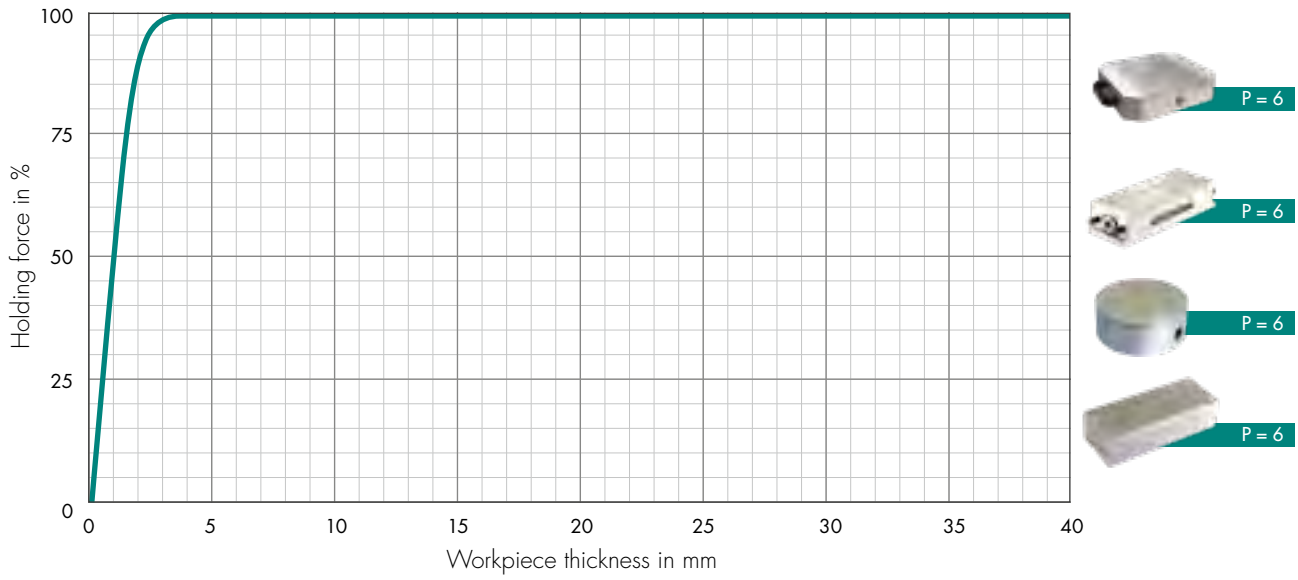
Workpiece thickness behaviour of permanent milling magnets

PERM

SAV 220.32 / 243.11 / 244.11 transverse pole pitch 15 mm



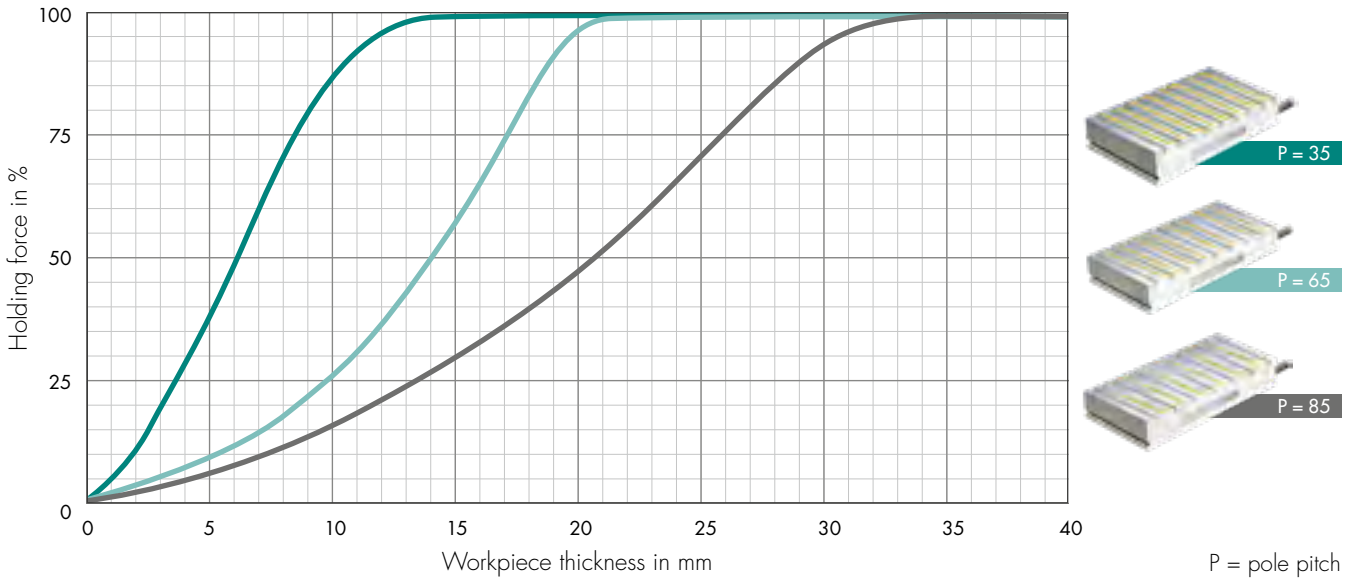
SAV 220.31 / 243.10 / 244.07 / 242.05 / 242.12 transverse pole pitch 6 mm



Workpiece thickness behaviour of electro permanent milling magnets

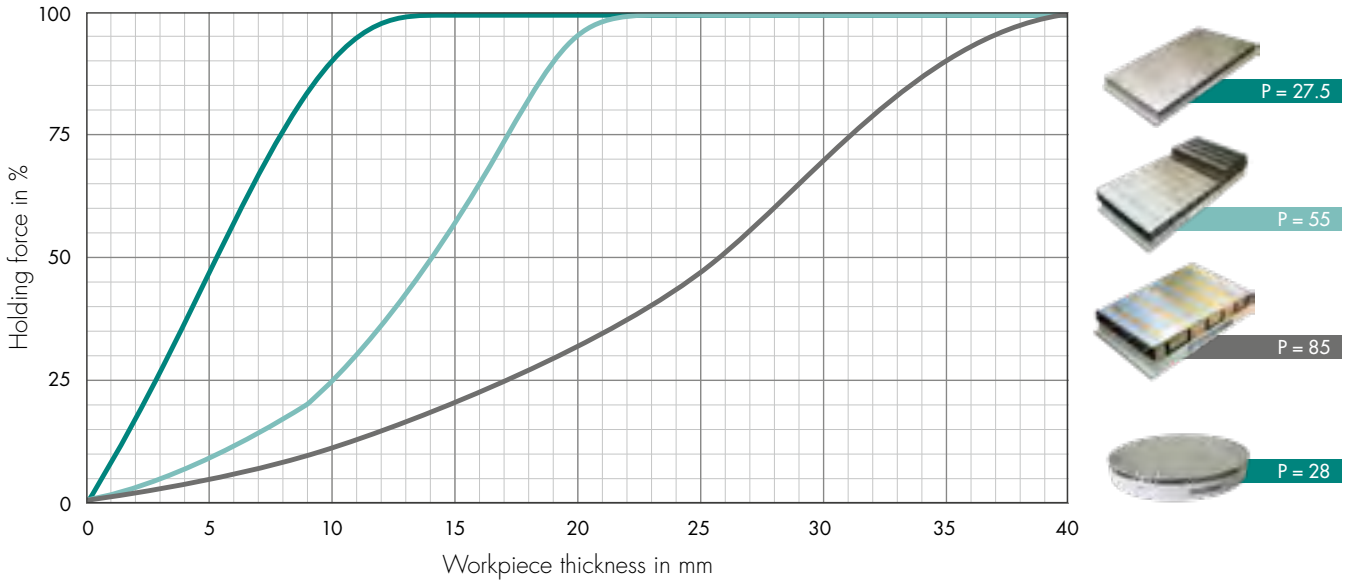
EP

SAV 243.76 parallel pole pitch with demagnetising 35/65/85 mm



P = pole pitch

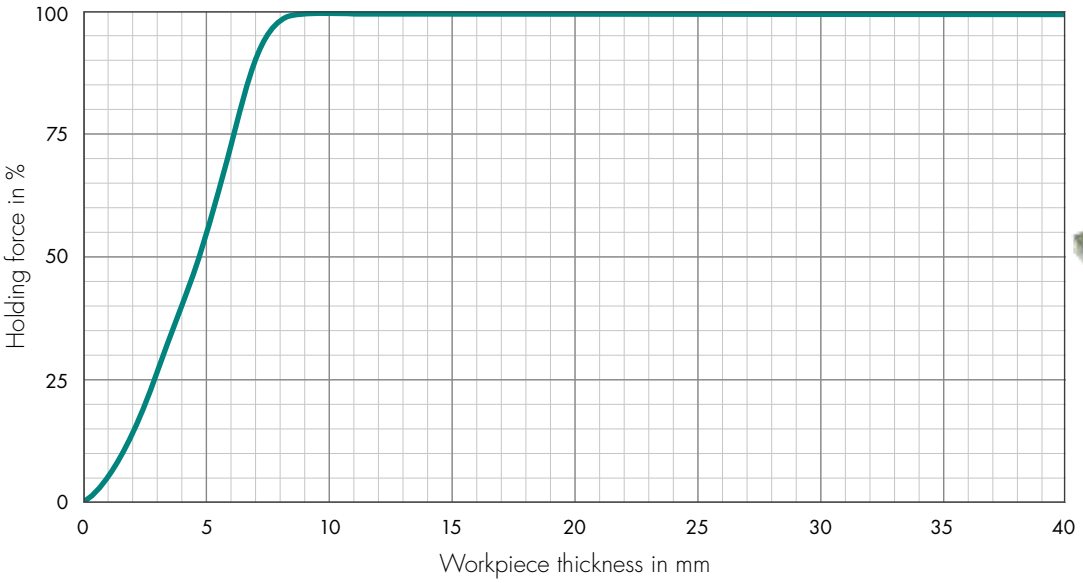
SAV 243.77 / 244.74 transverse pole pitch, high-energy system 27.5/28/55/85 mm



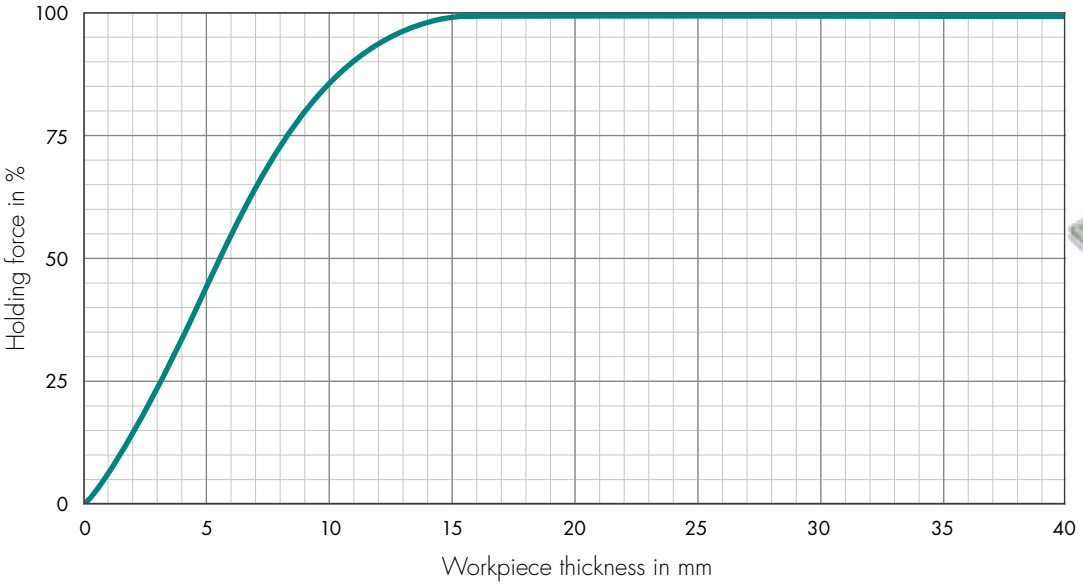
Workpiece thickness behaviour of electro permanent milling magnets

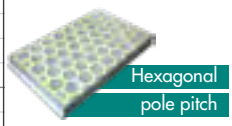
EP

SAV 243.78 round pole pitch, demagnetising



SAV 243.79 hexagonal pole pitch, with high-energy system

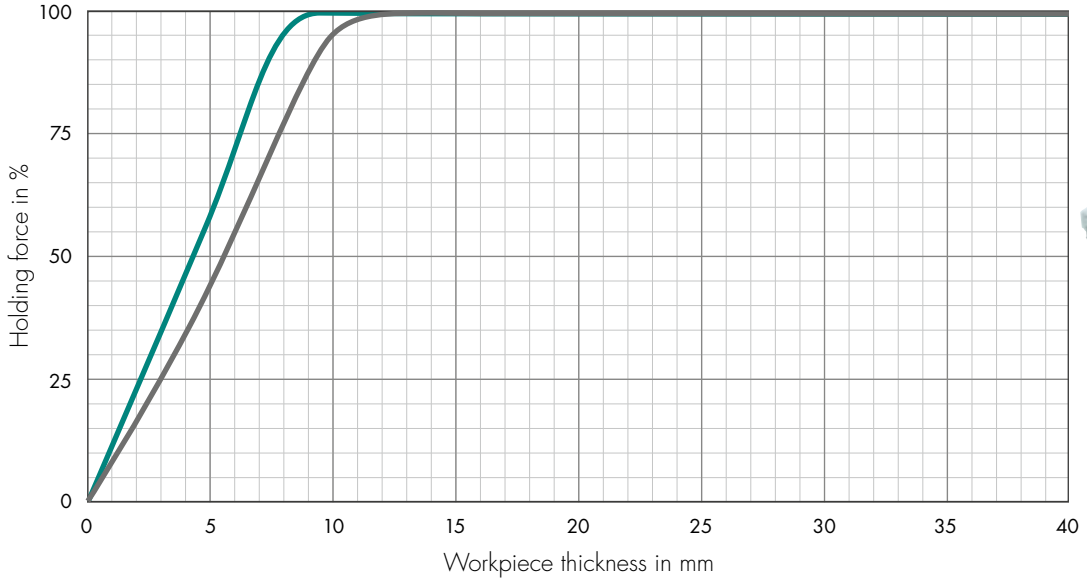


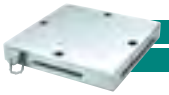


Workpiece thickness behaviour of electro permanent milling magnets

EP

SAV 243.80 square pole pitch pole size 50 mm





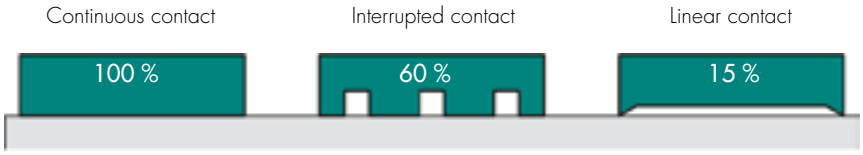
Square pole pitch

Option VME

Option EPX

Holding force and contact area

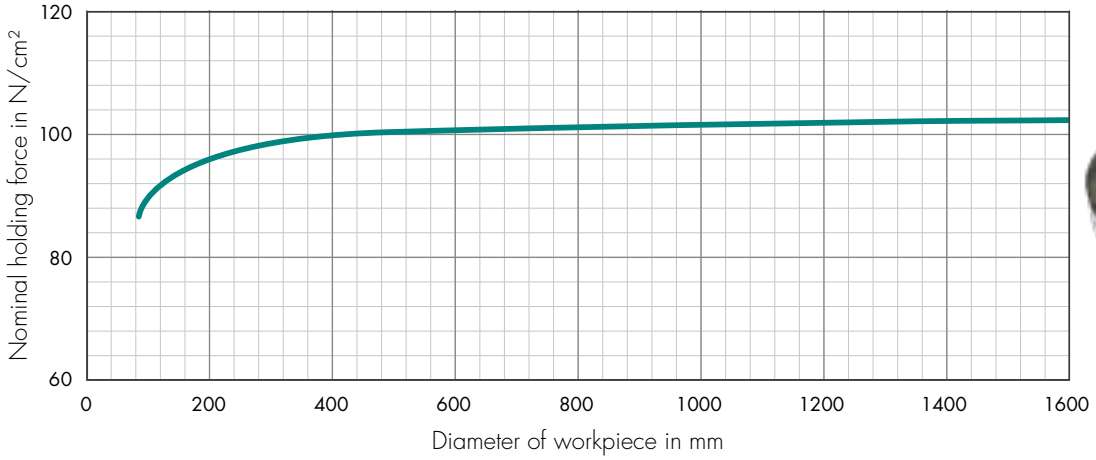
The contact area is the area of the workpiece which actually touches the magnet surface.



Rough illustration of holding force reduced by unfavourable workpiece shapes

Additionally, the holding force is related to the ferromagnetic contact surface to the workpiece. For circular magnets with radial pole pitch (SAV 244.70 / .71 and .76) the percentage of brass pole gap is increasing at smaller diameters. This effect is also depending on the number of pole pairs Pp. There is a similar effect for circular magnets with ring pole pitch. The nominal holding forces can be read depending from diameter of workpiece in following diagrams.

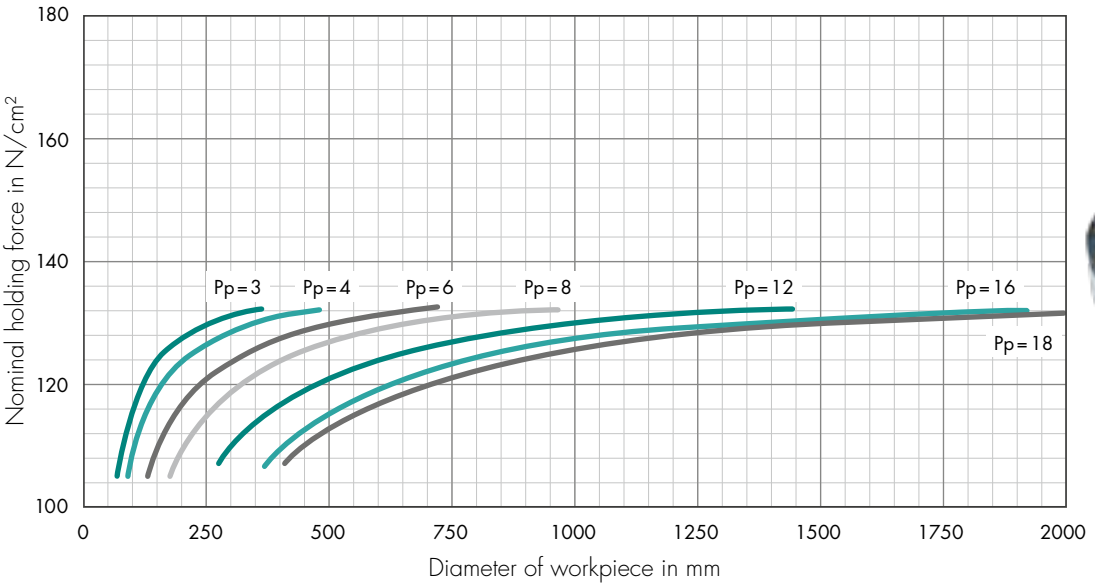
SAV 244.72 distribution of nominal holding force for circular magnetic chucks with ring pole pitch



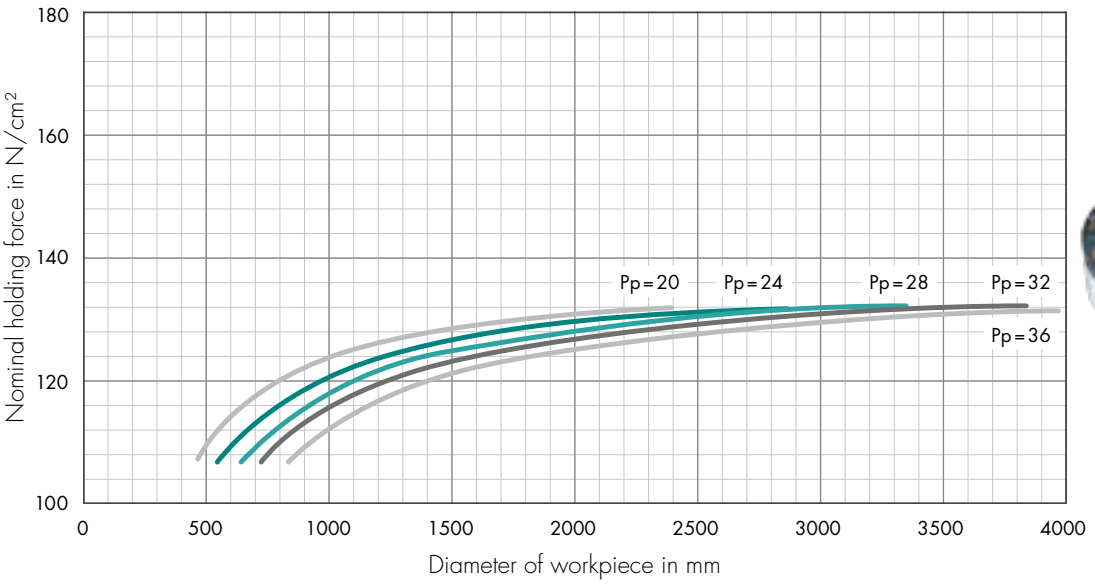
Nominal holding force for circular magnetic chucks with radial pole pitch

EP

SAV 244.70 distribution of nominal holding force for circular magnetic chucks with radial pole pitch without T-slots



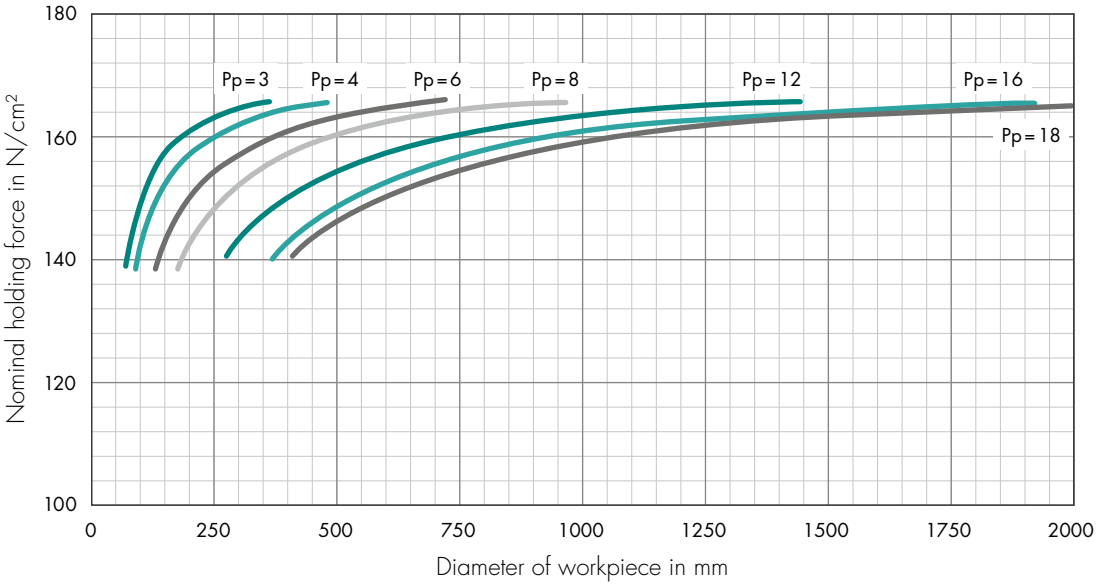
SAV 244.70 distribution of nominal holding force for circular magnetic chucks with radial pole pitch without T-slots



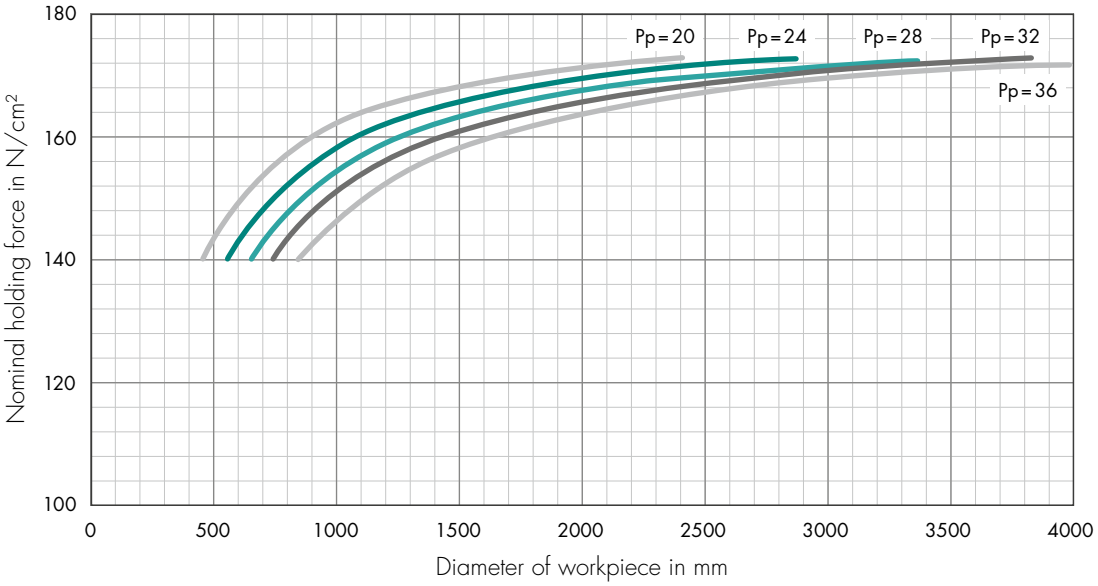
Nominal holding force for circular magnetic chucks with radial pole pitch

EP

SAV 244.71 / .76 distribution of nominal holding force for circular magnetic chucks with radial pole pitch without T-slots

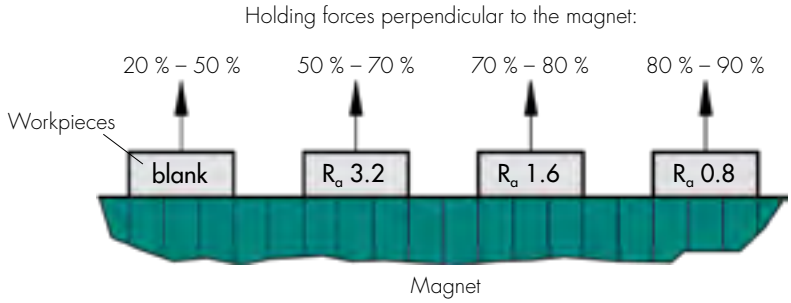


SAV 244.71 / .76 distribution of nominal holding force for circular magnetic chucks with radial pole pitch without T-slots



Holding force and surface quality

Surface quality is very important for the holding force of a workpiece as it rapidly decreases with increasing roughness. The best values are achieved with a finely polished surface without air gap.



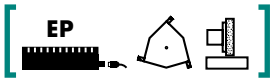
Influence of the workpiece surface on the achievable holding forces

Holding force and air gap

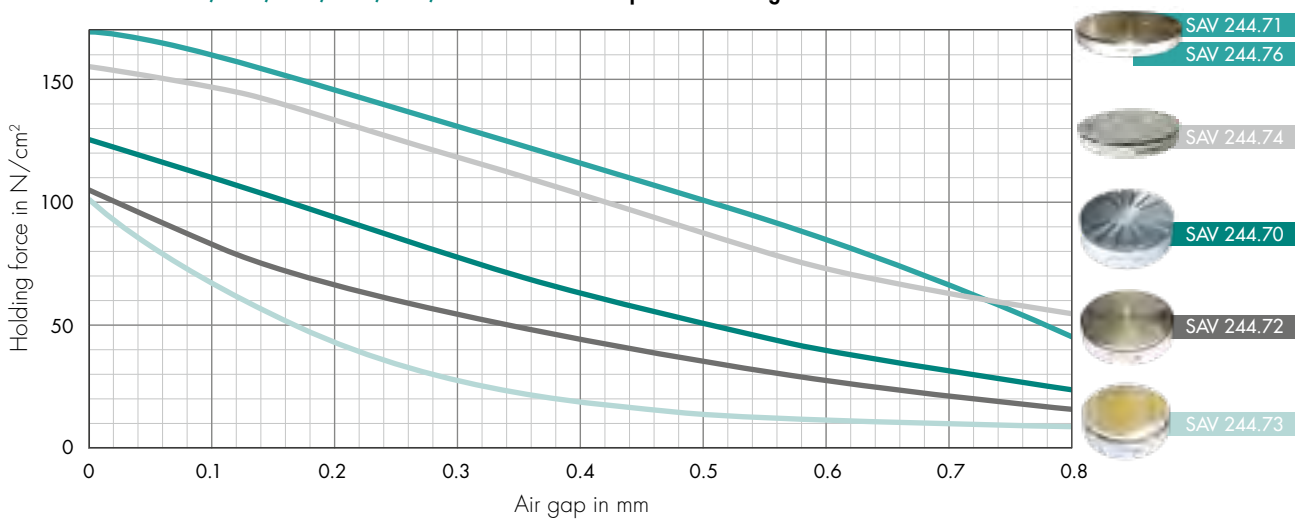
Air gaps cannot always be avoided on workpieces. The can be created, for example, during upstream processes, due to cavities and uneven areas on cast parts, roughness from machining, paint layers and non-magnetic surface layers. As air has a very high magnetic resistance, only few field lines can be generated with larger gaps and the holding forces decrease rapidly, as shown in the diagram as an example.

The air gap sensitivity is largely dependent on the workpiece size relative to the magnet size, on the material composition and on the pole pitch of the magnet. It can be generally stated that magnet systems with a larger primary pole pitch have a better bridging capacity. Compared to electro permanent magnets, deeper magnetic fields and therefore greater resistance can be achieved with electro magnets.

Air gap behaviour for circular magnets



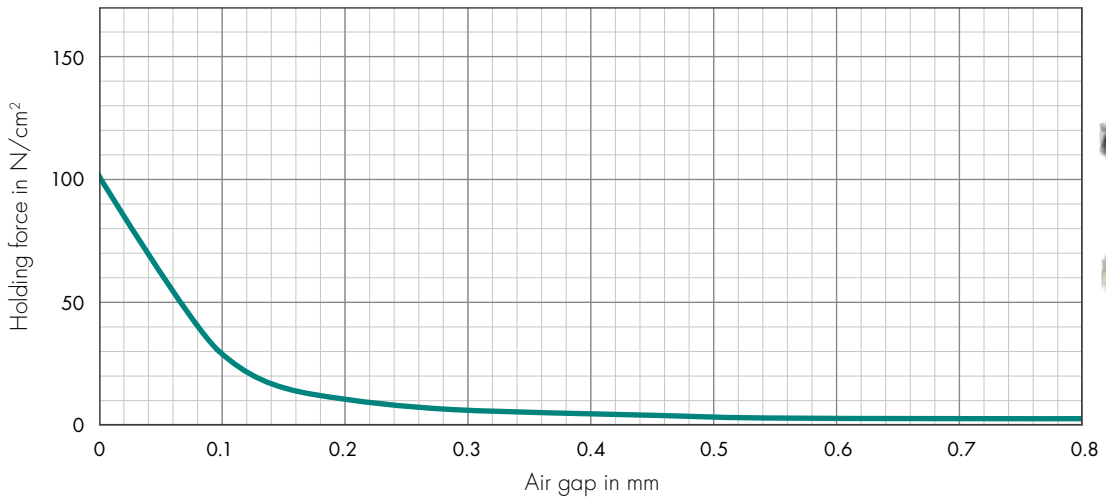
SAV 244.70 / .71 / .72 / .73 / .74 / .76 circular electro permanent magnets

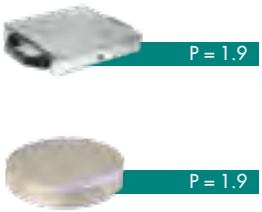


Air gap behaviour for permanent grinding magnets

PERM

SAV 220.30 / 244.01 transverse pole pitch 1,9 mm

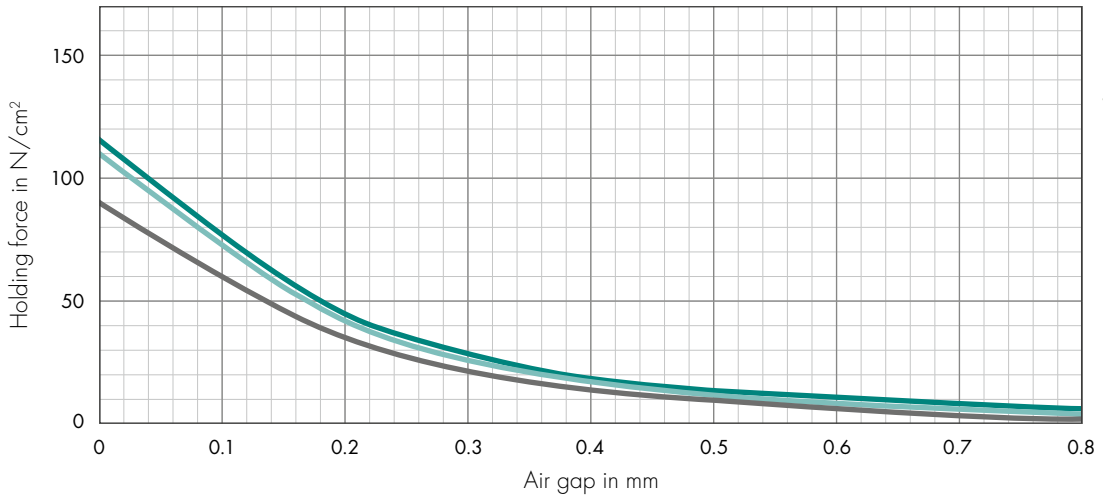


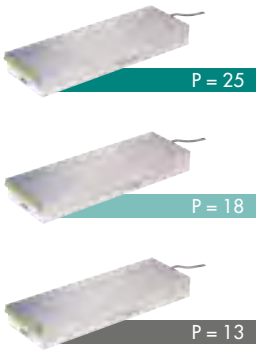


Air gap behaviour for electro permanent grinding magnets

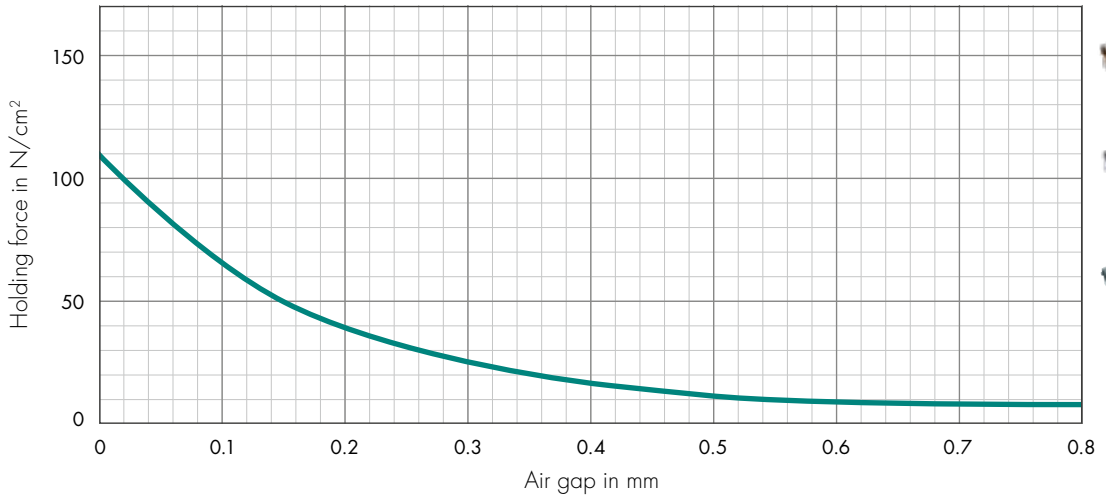
EP

SAV 243.70 transverse pole pitch 13/18/25 mm





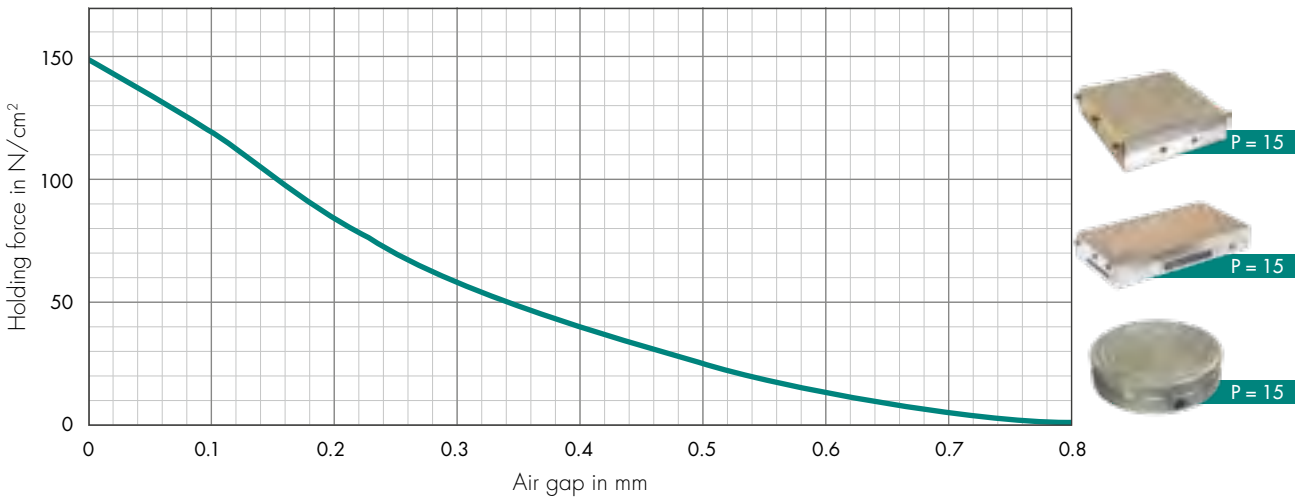
SAV 243.71 / .72. / .73 / 244.73 fine pole pitch 4 mm



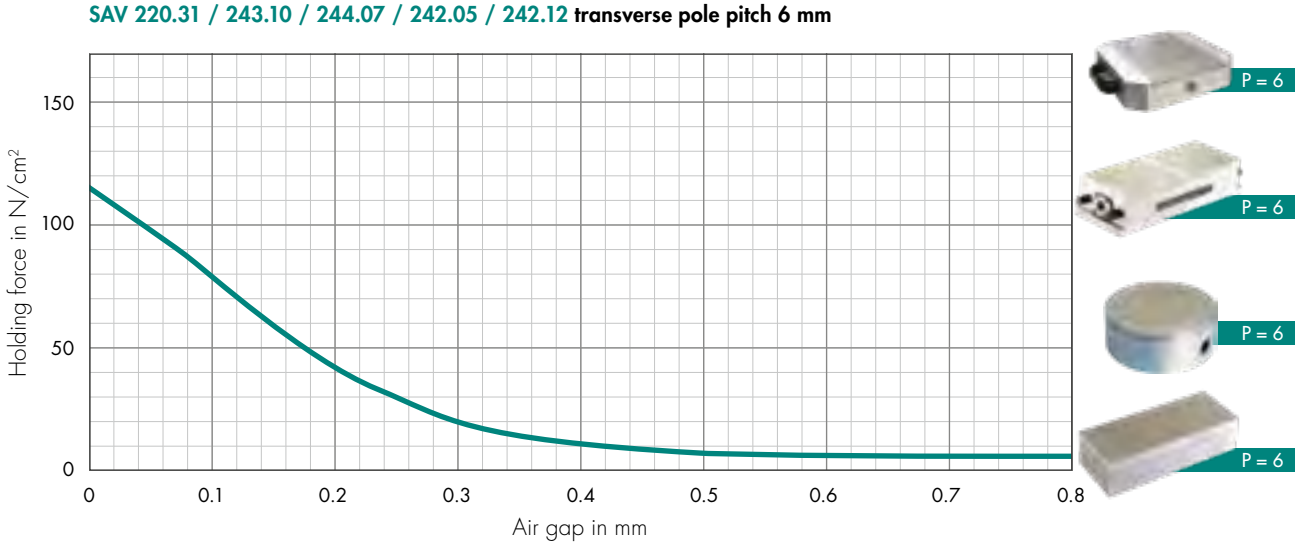
Air gap behaviour for permanent milling magnets

PERM

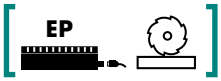
SAV 220.32 / 243.11 / 244.11 transverse pole pitch 15 mm



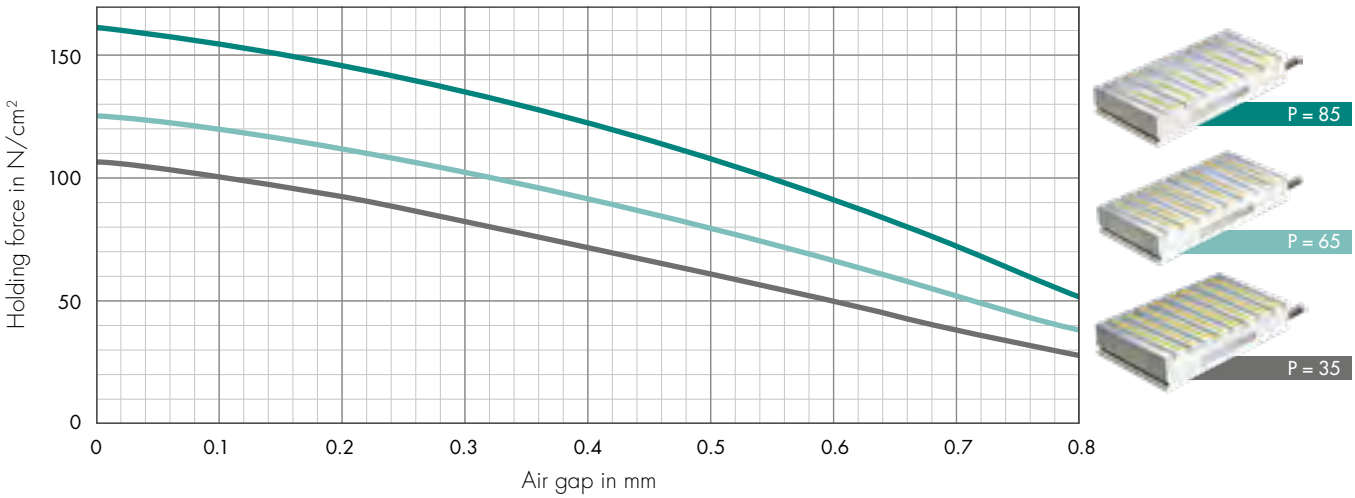
SAV 220.31 / 243.10 / 244.07 / 242.05 / 242.12 transverse pole pitch 6 mm



Air gap behaviour for electro permanent milling magnets

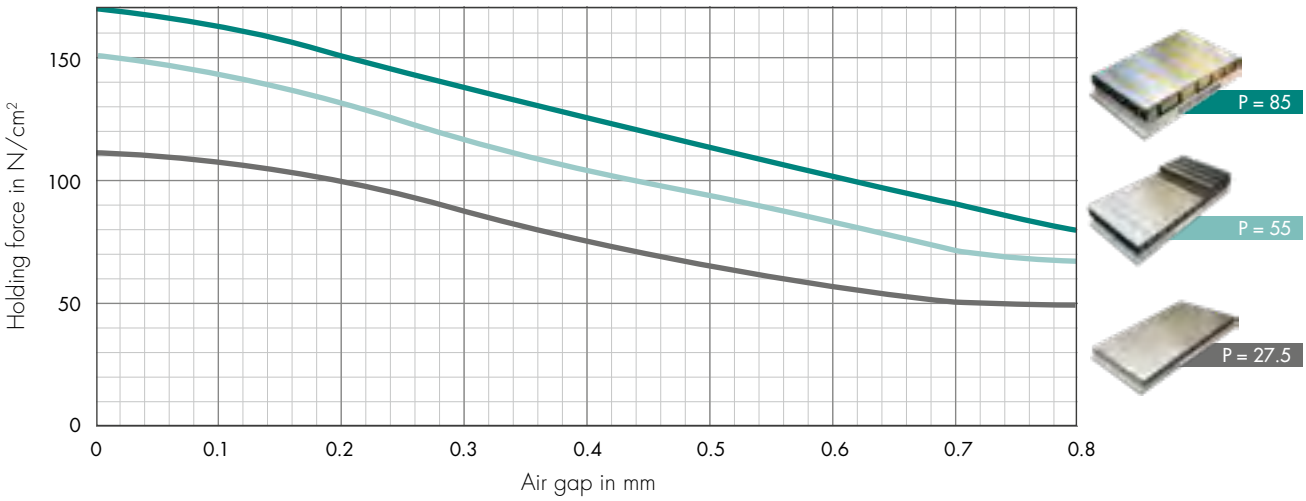


SAV 243.76 parallel pole pitch with demagnetising 35/65/85 mm



P = pole pitch

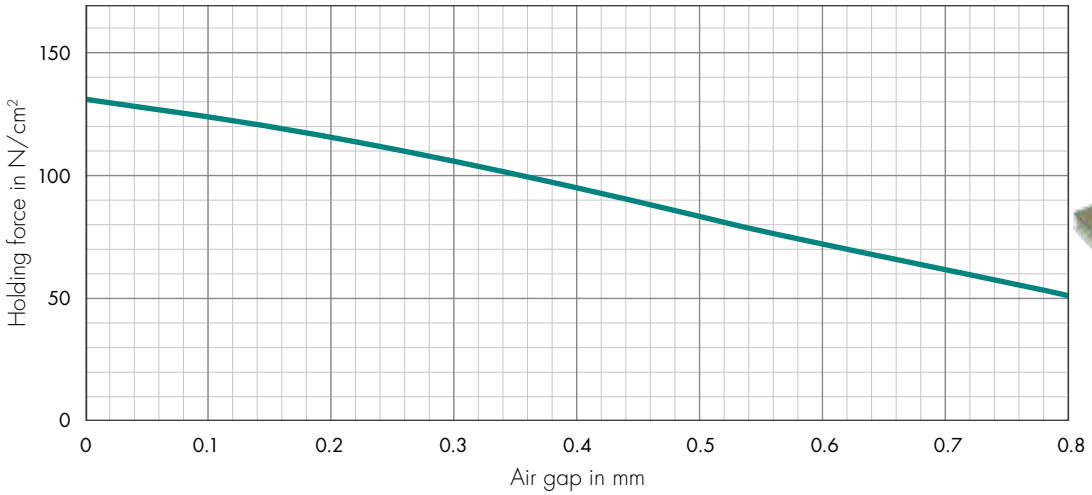
SAV 243.77 transverse pole pitch, with high-energy system 27.5/55/85 mm

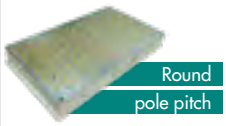


Air gap behaviour for electro permanent milling magnets

EP

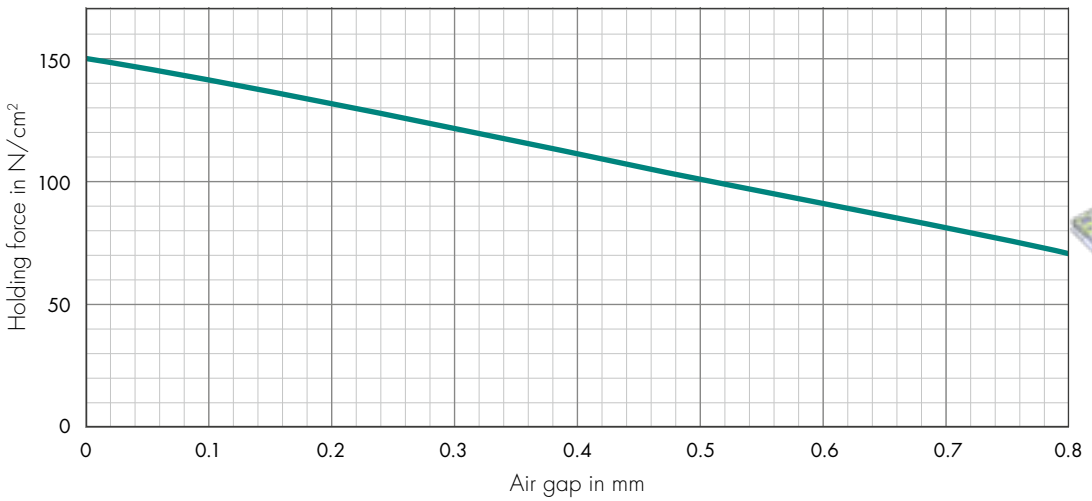
SAV 243.78 round pole pitch, demagnetising

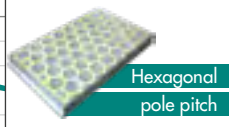




Round pole pitch

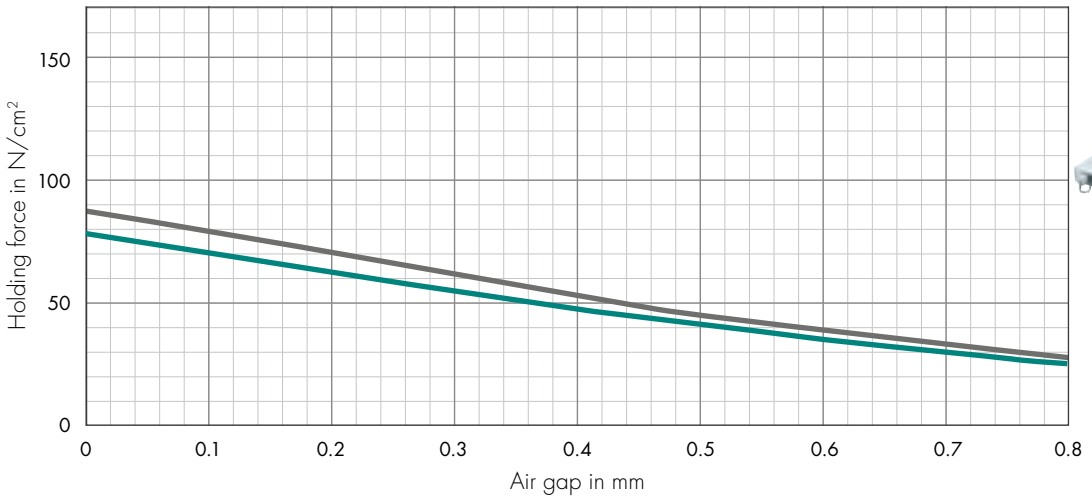
SAV 243.79 hexagonal pole pitch, with high-energy system





Hexagonal pole pitch

SAV 243.80 square pole pitch



Square pole pitch

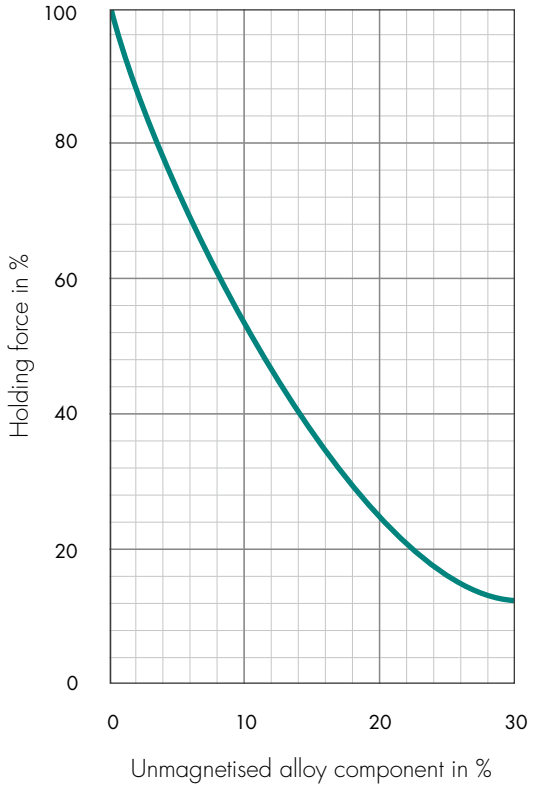
Option VME

Option EPX

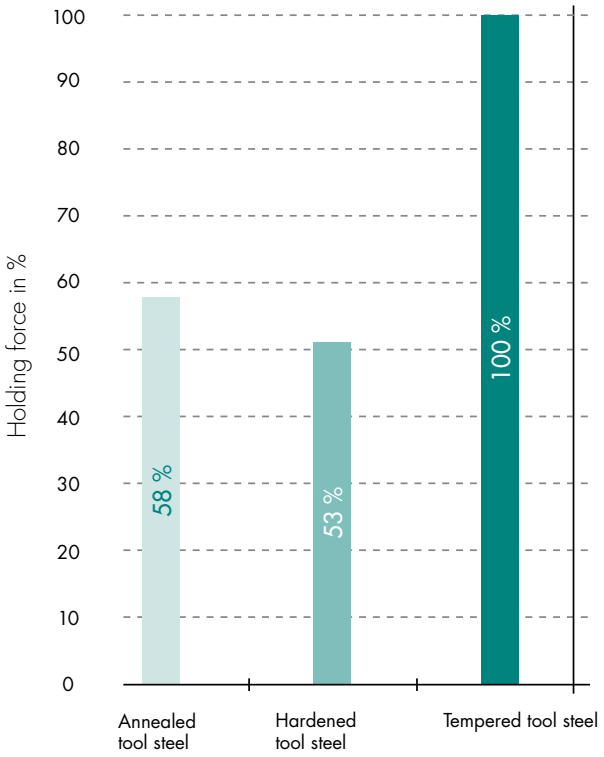
Holding force, alloy and heat treatment

High magnetic flux values and therefore the highest high levels can be achieved in technically pure iron. In practical application, a number of materials with different magnetic characteristics are used.
In addition to this, heat treatments influence the magnetising capacity of workpieces as this is altered by the physical structure of the materials. Hardened workpieces have poorer conduction of the magnetic flux.

Influence of the unmagnetised alloy component on the holding forces



Influence of the heat treatment condition on the holding forces (example)



Short designation as per DIN	Material no.	Max. non-magnetic alloy component	Heat treatment	Holding force
Pure iron				
Fe	–	0.00 %	soft	100 %
Construction steel				
St37-2	1.0037	-	soft	95 %
St52-3 N	1.0570	-	soft	93 %
St50-2	1.0050	-	soft	75 %
Case-hardened steel				
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 %

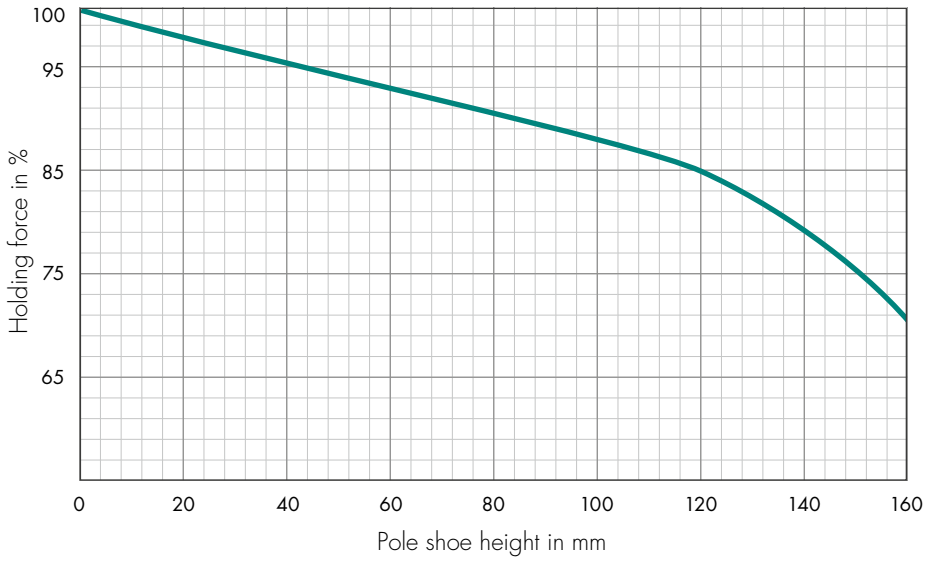
Short designation as per DIN	Material no.	Max. non-magnetic alloy component	Heat treatment	Holding force
Nitriding steel				
34CrAl6	1.8504	4.29 %	untreated	77 %
31CrMoV9	1.8519	4.65 %	untreated	76 %
34CrAlNi7	1.8550	5.93 %	untreated	70 %
39CrMoV13-9	1.8523	6.44 %	untreated	68 %
34CrAl6	1.8504	4.29 %	nitrided	50 %
31CrMoV9	1.8519	4.65 %	nitrided	49 %
34CrAlNi7	1.8550	5.93 %	nitrided	46 %
39CrMoV13-9	1.8523	6.44 %	nitrided	44 %
Free machining steel				
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 %
Q & T steel				
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 %	annealed	49 %
C45	1.0503	3.20 %	annealed	48 %
Ck45	1.1191	3.50 %	annealed	47 %
C60	1.0601	3.57 %	annealed	47 %
Ck60	1.1221	3.65 %	annealed	47 %
43CrMo4	1.3563	3.62 %	annealed	47 %
36CrNiMo4	1.6511	4.37 %	annealed	45 %
Ball bearing steel				
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 steel				
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 steel				
Cp15	1.1132	1.10 %	soft	94 %
41Cr4	1.7035	3.55 %	soft	81 %

Holding force influences

Holding force and pole raisers

If pole raisers are required for a workholding solution, these not only act as a magnetic resistance but also increase the scattered flux. For pole shoe heights up to 140 mm, for example, a decrease in holding force by up to 20 % can be observed.

Influence of the pole raisers height on the achievable holding forces



With suitable dimensions, however, this loss of holding force can be compensated with concentration effects. In certain circumstances, it can even be increased further.
For this, the pole raisers must not bridge the pole gap, as otherwise there would be no magnetic flux available in the workpiece.

Holding force and application temperature

Temperature influences can have a substantial impact on the properties of a magnetic workholding system, so that they have to be taken into account for the selection and design of a magnetic workholding fixture. Rising temperatures result in a lowering of the remanence – and therefore the holding forces – and an increase of the coercive field strength. From the Curie temperature upward, the magnet materials lose their magnetisation irreversibly.

MATERIAL	MAXIMUM SERVICE TEMPERATURE	CURIE TEMPERATURE
Hard ferrite	200 °C	approx. 450 °C
AlNiCo	450 °C	approx. 850 °C
SmCo	350 °C	approx. 750 °C
NdFeB	80 °C	approx. 300 °C

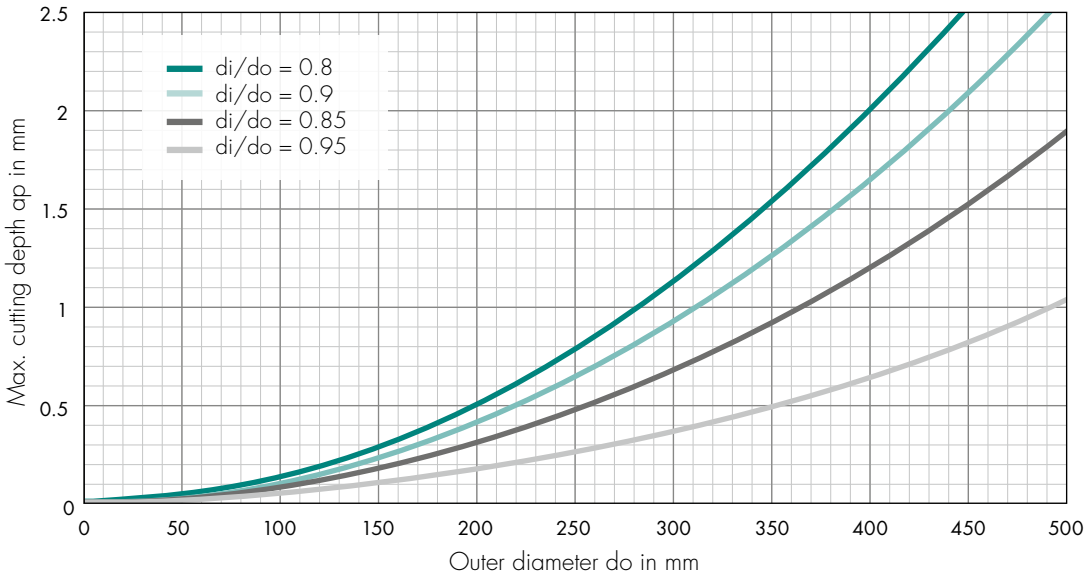
1.4.6 MAXIMUM CUTTING DEPTHS FOR HARD TURNING

Ring width = 3 x wall thickness
di/do = diameter ratio

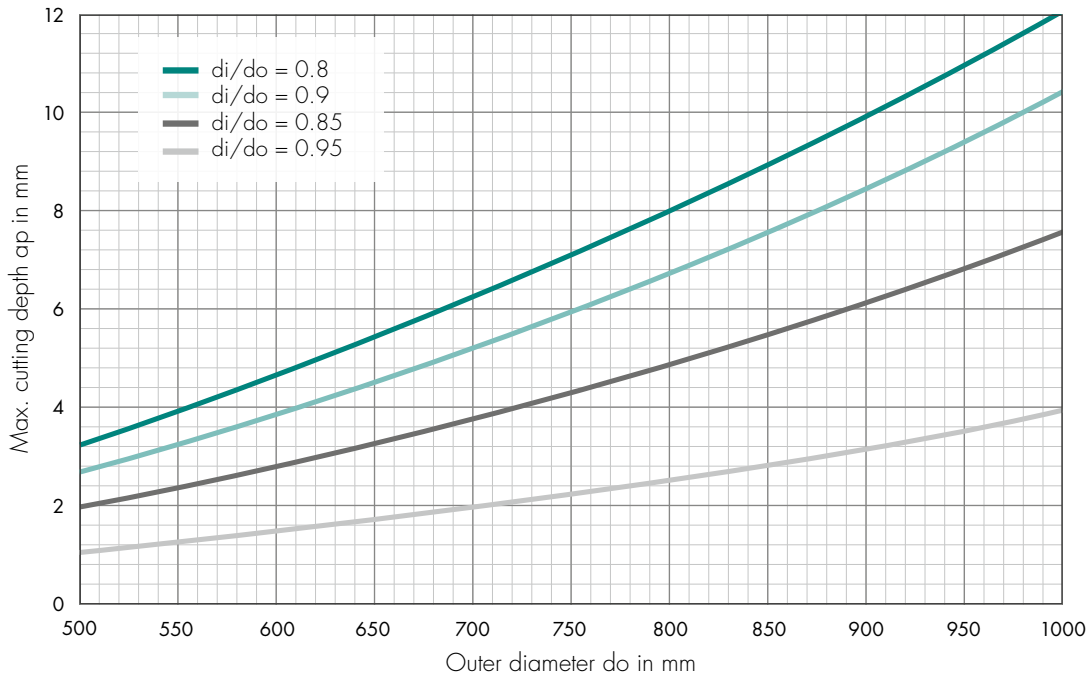
Feed 0.15 mm

Material: 100 Cr6

Calc. max. cutting depths for hard turning on SAV 244.71



Calc. max. cutting depths for hard turning on SAV 244.71



Note:
In case of an uninterrupted cut, the cutting depths are reduced to approx. 50 %.
- The calculations are theoretical. The number of pole raisers and their design have no influence.
- Negative influences of worn tools are not taken into account.
- The calculations are an estimation and must be evaluated with tests.
They do not provide a safety guarantee or basis for any claims for damages.

1.4.7 MAXIMUM ROTATIONAL SPEEDS FOR CIRCULAR MAGNETS

For permanent magnetic circular chucks

	 SAV 244.01	 SAV 244.03	 SAV 244.06	 SAV 244.07	 SAV 244.10	 SAV 244.11
Diameter	Max. rotational speed in rpm					
ø 50	-	-	-	-	450	-
ø 80	-	-	-	-	400	-
ø 100	800	350	2000	780	-	-
ø 125	-	-	-	740	-	-
ø 130	750	-	1950	-	-	-
ø 150	750	230	1950	-	-	-
ø 160	-	-	-	650	-	950
ø 180	-	-	-	-	-	-
ø 200	700	-	1900	600	-	900
ø 250	600	-	1400	-	-	750
ø 300	500	-	1100	-	-	650
ø 315	-	-	-	-	-	-
ø 350	-	-	860	-	-	500
ø 400	-	-	750	-	-	390
ø 450	-	-	-	-	-	350
ø 500	-	-	660	-	-	-
ø 600	-	-	-	-	-	-

For electro and electropermanent magnetic circular chucks

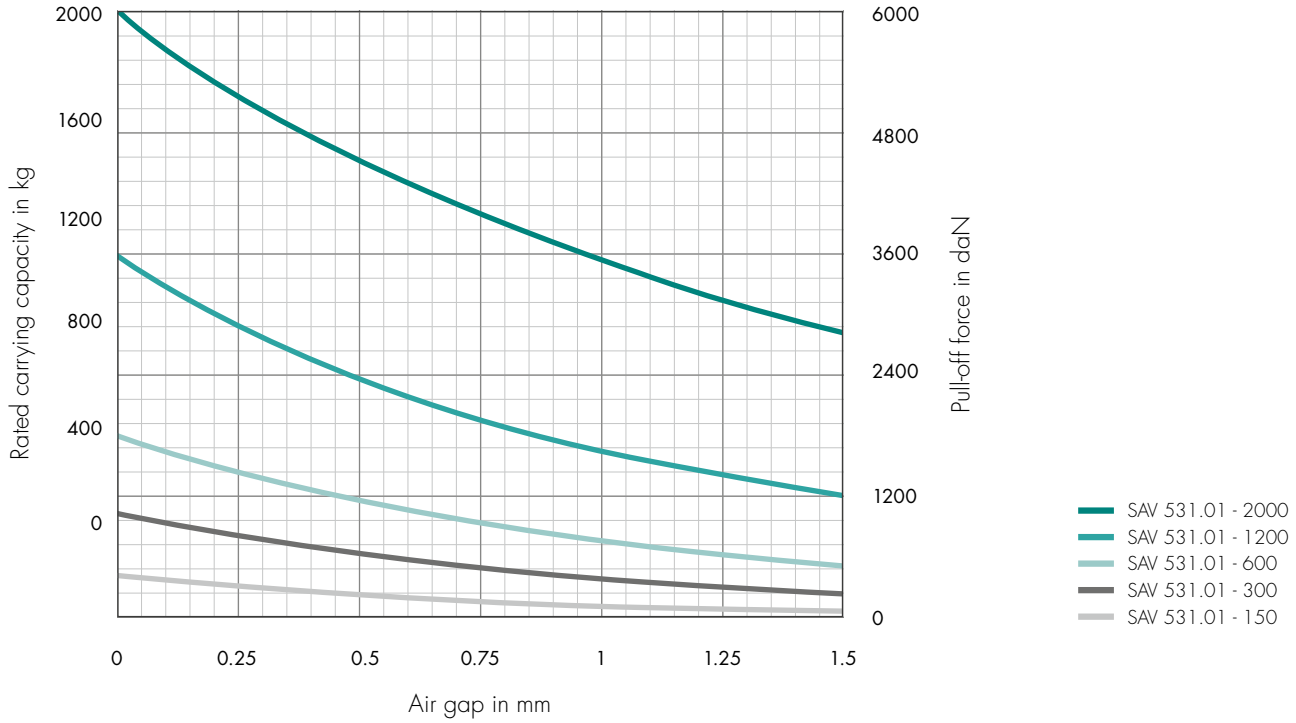
	 SAV 244.40	 SAV 244.41	 SAV 244.43	 SAV 244.45	 SAV 244.70	 SAV 244.71	 SAV 244.72	 SAV 244.73	 SAV 244.74	 SAV 244.76
Diameter	Max. rotational speed in rpm		Diameter	Max. rotational speed in rpm						
ø 100	5000		ø 1000	550						
ø 150	3800		ø 1200	450						
ø 200	2800		ø 1400	400						
ø 250	2200		ø 1500	360						
ø 300	1900		ø 1600	340						
ø 400	1400		ø 1800	300						
ø 500	1100		ø 2000	260						
ø 600	900		ø 2500	200						
ø 700	800		ø 3000	180						
ø 800	700		ø 4000	120						

1.4.8 LIFTING CAPACITY OF LIFTING MAGNETS/PERFORMANCE DIAGRAMS

Performance table SAV 531.01

	Surface texture									
	Material thickness in mm	Clean/polished surface air gap < 0.1 mm			Rusty, hot-rolled surface Air gap 0.1–0.3 mm			Uneven surface Air gap 0.3–0.5 mm		
		Max. dim. in mm	Rated carrying capacity in kg		Max. dim. in mm	Rated carrying capacity in kg		Max. dim. in mm	Rated carrying capacity in kg	
SAV 531.01 - 150			L>200 W>200	L>60 W>100		L>200 W>200	L>60 W>100		L>200 W>200	L>60 W>100
	25	-	150	120	-	85	75	-	60	55
	15	2000x500	130	110	1100x500	70	60	900x500	55	45
	10	2500x500	120	75	1500x500	65	50	1200x500	50	40
	4	2500x500	50	25	2300x500	40	17	1700x500	30	15
	2	1500x500	20	6	1300x500	14	4	1200x500	13	4
	ø 40-100	$L_{max.}$ 2500	65		$L_{max.}$ 2000	50		$L_{max.}$ 1500	35	
SAV 531.01 - 300			L>300 W>300	L>100 W>150		L>300 W>300	L>100 W>150		L>300 W>300	L>100 W>150
	≥ 30	-	300	250	-	190	160	-	115	100
	15	2000x1000	245	160	1400x1000	160	120	1000x1000	105	85
	10	2500x1000	200	95	1500x1000	130	65	1200x1000	95	55
	6	2200x1000	100	35	1800x1000	90	30	1500x1000	70	25
	4	1800x1000	55	20	1600x1000	50	15	1300x1000	40	14
	ø 60-200	$L_{max.}$ 3500	150		$L_{max.}$ 3000	120		$L_{max.}$ 2500	75	
SAV 531.01 - 600			L>400 W>400	L>120 W>245		L>400 W>400	L>120 W>245		L>400 W>400	L>120 W>245
	≥ 30	-	600	520	-	430	400	-	270	260
	20	2000x1500	465	380	2000x1250	390	310	1600x1000	250	210
	15	2500x1500	430	240	2300x1250	340	200	1800x1000	220	160
	10	2500x1500	285	120	2400x1250	240	100	2200x1000	185	85
	8	2400x1500	225	90	2300x1250	180	70	2000x1000	130	55
	6	2200x1500	155	60	2000x1250	120	45	2000x1000	100	35
	ø 60-200	$L_{max.}$ 3500	300		$L_{max.}$ 3000	240		$L_{max.}$ 2500	160	
SAV 531.01 - 1200			L>200 W>200	L>60 W>100		L>200 W>200	L>60 W>100		L>200 W>200	L>60 W>100
	≥ 60	-	1200	1120	-	910	870	-	750	710
	30	2850x1500	1032	740	2300x1500	820	650	2200x1250	650	560
	25	3000x1500	920	560	2500x1500	750	525	2450x1250	615	510
	20	3100x1500	750	380	2700x1500	650	370	2800x1250	570	360
	15	3300x1500	600	230	2900x1500	525	230	3000x1250	500	220
	10	3000x1500	400	110	3000x1500	380	110	3000x1250	340	105
	ø 100-300	$L_{max.}$ 4500	600		$L_{max.}$ 4000	500		$L_{max.}$ 3500	400	
SAV 531.01 - 2000			L>200 W>200	L>60 W>100		L>200 W>200	L>60 W>100		L>200 W>200	L>60 W>100
	≥ 80	-	2000	1950	-	1650	1600	-	1300	1250
	50	3250x1500	1950	1600	2500x1500	1600	1350	2000x1500	1250	1150
	30	3500x1500	1350	550	3250x1500	1150	500	2500x1500	1000	450
	20	3500x2000	1100	400	3000x2000	1000	375	2500x2000	900	350
	15	3000x1500	650	250	3000x1500	600	230	2000x1500	550	200
	ø 150-350	$L_{max.}$ 5000	1000		$L_{max.}$ 4500	900		$L_{max.}$ 4000	800	

Performance diagrams for lifting magnets SAV 531.01



1.4.9 DEMAGNETISING

Principle of demagnetising

For demagnetising, a workpiece has to be subjected to a decreasing alternating magnetic field. The sequential reversals of a regularly decreasing magnetic field allow the induction to be reduced and eventually to be practically cancelled completely. In this process, an aligned condition of the molecular magnets in the workpiece are transferred into an unordered condition.

Decreasing alternating magnetic fields

run nearly parallel to the hysteresis curve if magnetic field strength H in A/n is applied. With repeated reduction, a remanence B_r of nearly 0 mT (Gauss) can therefore be achieved.

The reduction of the field is achieved as follows

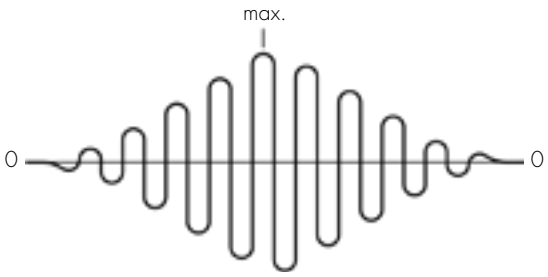
- Automatically with a polarity reversal control unit with degressive magnetic circuits.
- By slowly and constantly moving the workpiece across the pole surface of a table demagnetizer.
- By slowly passing the part through a tunnel demagnetiser with constant speed.
  At the end of the tunnel, the part still has to be moved far enough out of the alternating field.

Electronic polarity reversal devices

The devices also serve as a DC power source and demagnetiser for all electro magnets and electro permanent magnets. During polarity reversal and demagnetising, a process (excitation and counter-excitation) with continuously decreasing energy is active until the residual fields have been eliminated. This allows the magnetisation introduced by the magnetic chuck to be mostly removed. This also ensures that the workpieces can be lifted off the magnetic chuck without residual force. For holding and transport magnets, the use of these devices ensures immediate and exact releasing of the parts. If a high demagnetising quality is required, though, the workpieces have to be subsequently treated with a demagnetiser.

Demagnetisers

These devices are used to remove the often interfering residual magnetism in workpieces. Many products, e.g. cutting, punching and measuring tools or rolling bearings, require extensive demagnetising.
The unaligned basic status of the molecular magnets is achieved by exposing the workpiece to a strong, continuously alternating magnetic field with decaying amplitude. Demagnetisers are therefore operated with alternating current, whereby the polarity changes in the supply frequency 50/60 Hz.
The decaying amplitude is achieved by moving the workpiece out of the alternating field **slowly and evenly**. The part to be demagnetised should be moved through the alternating field with approx. 0.2 m/s.
At a distance of 20 – 30 cm, the alternating amplitude is approx. 0.



Alternating magnetic field when guiding a workpiece over/through a plate or tunnel demagnetiser.

a) Table demagnetizers

In these devices, a system of iron lamellae transmits the alternating field to the plate surface. This creates a very strong magnetic field with high penetration. The pole surface is halved by a non-magnetic gap. The workpiece has to be guided over this gap.
Plate devices are suitable for demagnetising parts up to max. 50 mm thickness. Thicker parts must be treated from both sides. The devices can be used as table-top units or installed in automatic transport systems.
For heavy parts, the demagnetiser can be guided across the workpiece.
Bulk parts can also be guided across the device in plastic containers.

Use of table demagnetizers

b) Tunnel demagnetisers

Tunnel demagnetisers consist of a coil protected by non-magnetic material. The devices are particularly suitable for demagnetising parts with large surfaces – e.g. tubes, bars, profiles – and for bundled and packeted parts. They can also be installed in transport systems or arranged diagonally at approx. 30° so the parts can slide through.

Tunnel demagnetisers with belt conveyor and slide

c) Low-frequency generators

As already described above, plate and tunnel demagnetisers work with the normal mains frequency of 50/60 Hz.
Under certain circumstances, a lower frequency may achieve better demagnetising results, in particular on high-alloy and hardened materials. Low-frequency generators lower the supply frequency to 16 Hz.
These devices can simply be connected upstream of the plate and tunnel demagnetisers.

Selecting a demagnetiser

It is generally necessary to clearly specify the problems to be resolved:
shape, dimensions and steel composition of the parts to be demagnetised as well as the required operating mode of the device.
The length of the workpieces is not a factor. It is sufficient if they are narrower than the table demagnetizer or if the part fits through the opening of the tunnel demagnetiser. Tables consist of several standard plates. Positioned next to one another on a base plate, they allow demagnetising of wide parts. Consideration has to be given to the occurring holding forces which have to be overcome during handling, which limits the feasible area. The thickness of the workpieces is very important for selecting between a plate tower and a tunnel tower. For demagnetising solid workpieces, we recommend tunnel demagnetisers which act all the way into the metal inner of the parts from all sides. The operating mode is expressed as a percentage of the total cycle time.

Example

Device in operation: t_{on} = 1 min **Device not in operation:** t_{off} = 3 min

Cycle duration: $t_{cycl.} = t_{on} + t_{off}$ = 4 min

Relative duty cycle: $D = 100\ \% \times t_{On} / t_{cycl.}$ = 25 %

Working principle

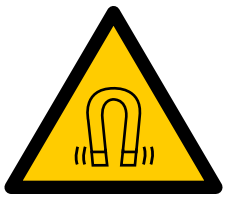
It is very important to carry out the demagnetising at slow and constant speed, moving the part perpendicular to the poles. After demagnetising, the workpiece has to be moved away from the device as far as possible as otherwise demagnetising will not be complete. In addition to this, the power supply must never be switched off during the cycle. For solid parts, the process has to be repeated several times in one direction. For version with degressive magnetic circuits, a single pass is sufficient.

1.4.10 ACCIDENT PREVENTION AND HEALTH AND SAFETY FOR MAGNETIC FIELDS

- Surface grinding machines with electro magnetic workholding fixture and machine feed must be set up in such a way that the feed drive can only be moved in after the magnetic current has been activated.
- The switched-on position must be indicated with a signal lamp for electro magnetic workholding fixtures and with a corresponding visual marker for permanent magnet workholding fixtures.
- The following exposure limits for high static magnetic fields apply for working in the exposed area as per BGV (Regulation issued by the German Social Accident Insurance Institutions) B11, Annex Z:

Peak value for head or torso	2.000 T
Mean value for 8 h full-body exposure	0.212 T
Peak value for extremities	5.000 T

  As the magnetic saturation for steel 1.0037 is 1.6 – 1.9 T and the magnetic field is concentrated in the area near the pole plate, the limits stated above are not exceeded in the range > 10 cm.
- For persons with active implants or ferromagnetic foreign bodies, decisions on usage must be taken for the individual cases ("no pacemaker" sign). For magnetic chucks, the basic exposure limit of 0.5 mT is not reached at a distance of 500 mm. For alternating fields of demagnetisers, please observe the operating instructions provided. In any case, consult a medical doctor. If needed, measurements has to be made.
- Personnel must be instructed in the specific effect of magnetic fields on electronic/medical devices, computers, clocks, data carriers or credit cards.
- The use of non-magnetic tools can exclude the risk of crushing or similar injuries.
- As per the Bavarian Environment Agency (LfU) and the German Federal Occupational Health and Safety Regulation (EMFV) of 15/11/2016, constant magnetic fields < 2 T have no adverse effect on health.



Warning – magnetic field

No access for persons with pace-makers or implanted defibrillators

No access for persons with metal implants

No metal parts or watches

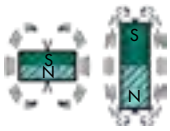
No magnetic and electric data carriers

1.4.11 TECHNICAL INFORMATION ON SMALL MAGNETS AND HOLDING MAGNETS

Influences on the type of installation and application on the magnetic holding forces

Magnetic impact of iron poles

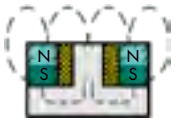
Iron poles can cause a higher force line density in the magnetic circuit. This results in a substantially improved holding effect as the magnetic flux can be guided around corners and concentrated on the contact surface. An approximate increase factor for the holding forces is provided with the arrangement shown below.

a) 

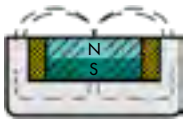
"Open" magnetic core as disc or bar without influence from iron poles:
Factor 1

b) 

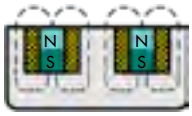
With iron backing plate:
Factor 1.3

c) 

With iron backing plate and centre pole:
Factor 4.5

d) 

Magnet disc in iron pot (disc magnet):
Factor 6

e) 

Ring magnet in iron pot with additional centre pole:
Factor 7

f) 

AlNiCo magnet bar in iron sleeve (pot magnets):
Factor 7.5

g) 

Magnet plate in U-shape iron profile:
Factor 5.5

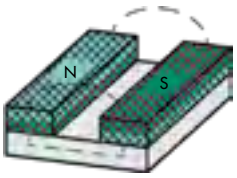
h) 

Sandwich arrangement consisting of a magnet plate between 2 flat iron poles
Factor 18

i) 

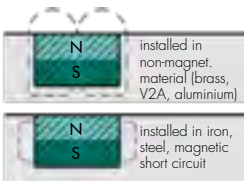
Parallel connection of multiple sandwich arrangements
Factor 18 x quantity

Magnetic effect of a backing plate:



Positioning two magnetic chucks on a backing plate with opposing poles creates a far-reaching, concentric magnetic field. This is required for magnetic separators.

Installing magnet cores



A "magnetic short circuit" occurs when the two magnet poles are connected with iron. Connections should therefore be made of non-magnetisable materials, e.g. brass, stainless steel (V2A).

Four-pole magnetising

Good holding action for thin iron sheets requires a high field line density just above the magnet surface, which can be achieved with four-pole magnetising.

Information on use and magnetising types

The following points must be observed for the use of holding magnets

Strong attraction forces, in particular on high-energy magnets, can result in crushing of fingers if handled improperly.

Persons wearing pacemakers have to avoid always strong magnetic fields!

The disruptive or destructive effect of magnetic fields must be taken into account when using electrical devices, data carriers, but also mechanical watches. Observe the safety distance!

During handling, the strong attraction forces can generate sparks which cause ignition in explosive atmospheres.

Radioactive radiation and higher temperature decrease the duration of magnetising.

A hard impact can cause the hard and brittle, sintered magnets to splinter into many sharp-edges particles.
To ensure the holding force is constant over time, it has to be ensured that AlNiCo magnets are not exposed to hard impacts and that they do not have to bridge large air gaps for an extended time without an anchor or workpiece.

When machining high-energy magnets made of rare earth elements and polymer-bonded magnets, the self-ignition risk of the dry grinding dust or the swarf must be taken into account. Wet machining should therefore always be used.

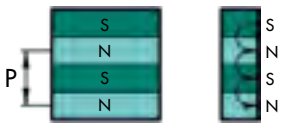
Small hairline cracks or chipping on sintered magnets are production-related and have no influence on the magnetic properties.

Magnetic fields – as generated by permanent magnets – have no known harmful effects on the human body.

It is not possible to state the holding force of an "open" permanent magnet.

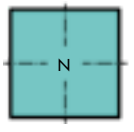
Magnetising options for permanent magnets

Axial

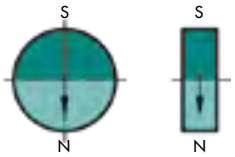


In lines
lateral on an area

P = pole spacing

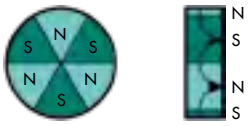


Magnetised through the height

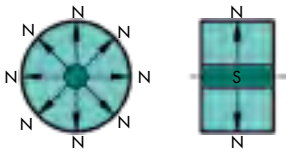


Diametrical

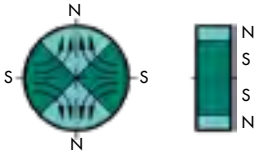
Axial
in sectors
magnetised through
e.g. 6-pole



In sectors*
lateral on an area
e.g. 6-pole



Radial*



lateral with several poles*
on the circumference
e.g. 4-pole

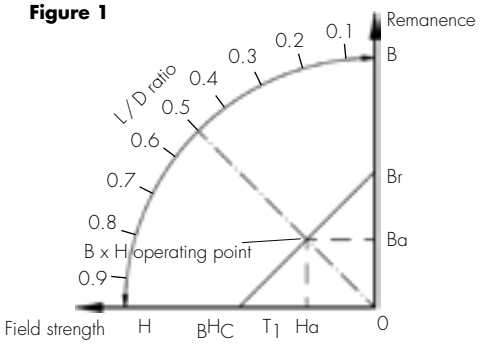
The magnetising types marked with an * are only possible for isotropic magnet materials.

Design guidelines for permanent magnet systems

Magnet dimensioning using the demagnetising characteristic curve:

Magnets cannot be designed or defined at will like other engineering parts. The dimensioning of the pole surface to the length in magnetising direction must correspond to its magnetic values.

Figure 1



The highest magnetic energy is available only when the product of remanence B and coercive field strength H reaches a maximum. This is the case when the largest possible square results under the demagnetising characteristic curve from B to H (see figure 1).

The diagram above has a scale at the side for the ratio of length to diameter of a magnet (L/D ratio).

For a disc magnet with 10 ⌀ x 5 mm thickness, the L/D ratio is 5 : 10 = 0.5. If a line is drawn from the 0.5 mark to the origin, the point of intersection on the characteristic curve for the corresponding magnet material is the operating point (B x H) of this disc magnet.

If this operating point is horizontally connected with the B axis and vertically with the H axis, the remanence and the coercive field strength can be read.

When B and H have the highest possible values, the operating point is in the (B x H) max. value.

For an “open” magnet which is used without an iron backing plate or iron poles, the dimensions should be selected so that the operating point is close to the (B x H) max. value.

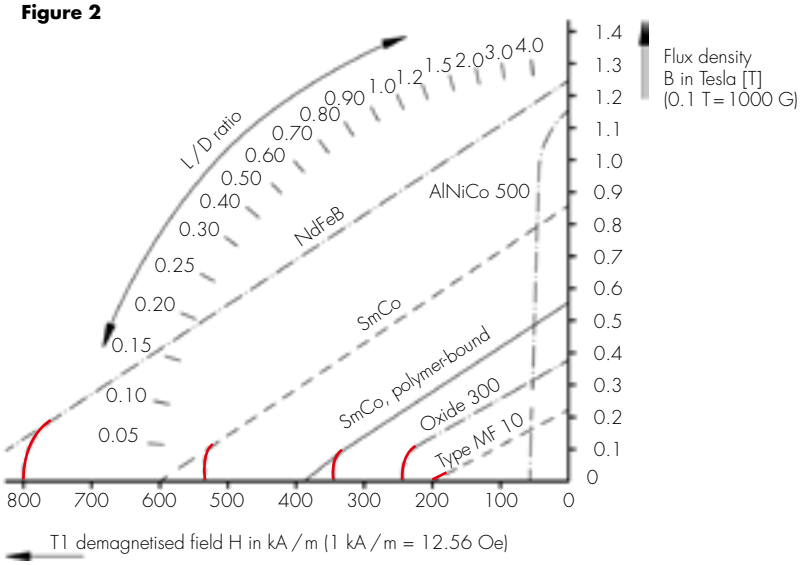
If the magnet has an iron backing, the magnet length L can be doubled with the L/D ration for an approximate value estimation. The prerequisite for this is that the iron backing is thick enough so that no magnetic saturation occurs.

For square or almost square magnetic pole areas, the pole area can be converted using the following formula:

$$D = \sqrt{\frac{A \times B \times 4}{\pi}}$$

The following curves for the different magnet materials are simplified and shown without temperature characteristic.
A temperature change does not cause a displacement of the operating point on the characteristic curve. As long as the operating point remains in the linear area of the demagnetising characteristic curve, the induction changes reversibly, i.e. the original value returns after cooling down. Otherwise, the change of the induction is irreversible and can only be reversed by being magnetised again.
See red temperature characteristic curve T_1 in figure 2.

Figure 2



1.4.12 TECHNICAL EXPLANATIONS AND SPECIALIST TERMS FOR MAGNET TECHNOLOGY

AlNiCo
Aluminium nickel cobalt magnet material. Metal permanent magnet with high remanence and relatively low coercive field strength.

Anisotropy
Anisotropic materials are referred to as having a preferred direction. During manufacturing (casting, sintering and mixing), they are already exposed to a magnetic field or a special layering process.

Air gap δ
Distance between magnet and opposing pole.

A/m
Ampere per metre; unit of magnetic field strength
(1 A/m = 0.01256 Oe).

Coercive field strength $_BH_C$
The coercive field strength is the required opposing field strength in kA/m or Oe which has to be applied to demagnetise a magnet again. The higher the value, the better the demagnetising resistance. A distinction is made between $_BH_C$ and $_JH_C$. $_BH_C$ is the coercive field strength under an applied opposing field (B) and $_JH_C$ for the coercive field strength at which demagnetising of the magnet is sustained even after the opposing field has been switched off (polarisation J ≥ magnetisation M). The coercive field strength $_JH_C$ is important for magnets with high coercive field strengths relative to the remanence.

Coercive field strength $_JH_C$
Strength of the opposing field in kA/m or Oe required for returning a saturated magnet material to zero even after the opposing field has been switched off.

Curie temperature t_{Curie} (°C)
At this temperature, magnet materials irreversibly lose their magnetisation.

Demagnetiser
Equipment for eliminating the residual magnetism (see remanence) in workpieces after impact of a magnetic field.

Demagnetising
Reduction of magnetisation by means of an opposing field or decaying alternating field or by means of temperature influences.

Demagnetising curve
The part of the hysteresis loop which runs in the second quadrant of a Cartesian coordinate system. The shape of the demagnetising curve and its end values B_r (remanence) and H_c (coercive field strength) identify the essential magnetic properties of a permanent magnet.

Diamagnetism
Refers to all substances which react only insignificantly to a magnetic field, e.g. plastic, liquids, organic substances.

Dimensional ratio
The ratio L/D = length/diameter of a bar magnet has an optimum value in the optimum operating point for each magnet material.

Displacement force
Force of a magnetic workholding system which is perpendicular to the holding force and therefore parallel to the pole plate.

Ferromagnetism
General term for all substances which have a more or less high level of magnetisation after application of an external magnet.

Flux density
Density of the force lines of the induction field.
Unit: 1 Tesla = 10^4 Gauss.

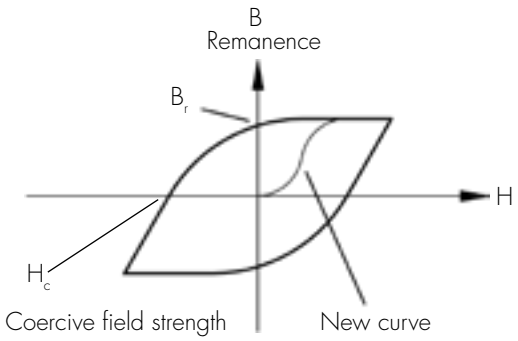
Force lines
Graphical representation of the magnetic field.

Gauss (G)
Old unit for magnetic induction.

Hard ferrite magnet
Oxide magnet made of iron oxide, barium or strontium carbonate with relatively low remanence and coercive field strength.

Holding force F_H
Operating force of a magnet or magnet system. The holding force refers to vertical workpiece pull-off and a precisely defined test workpiece.

Hysteresis loop
Graphical representation of the magnetising and demagnetising cycle.



Induction
Induction is the change caused in a substance by an applied magnetic field.

Isotropy
Uniformity of the magnetic properties in all directions of the magnet material.

Magnetic flux Θ
The magnetic flux in Wb (Weber) represents the "number of force lines".

Magnetising
Alignment of the molecular magnet areas by applying an external magnetic field.

Magnetisation M
Value in kA/m. Magnetisation indicates the field strength generated by aligned molecular magnets. It is taken into account for practical application through relative permeability.

Magnet system
Magnet with one or more attached pole shoes as well as two or more magnets acting in one functional unit.

Maximum energy product $(BxH)_{max}$
Maximum product of B and H on the demagnetising curve in kJ/m^3 or GOe (1 GOe = 79.6 10^{-7} kJ/m^3). The higher the $(B \times H)_{max}$ value, the smaller the volume of the magnet material can be for the same holding force with the same conditions. The higher the energy product, the more energy is stored in the magnet material. It results from the highest possible product of the flux density B and field strength H on the demagnetising characteristic curve.

Maximum operation temperature
A magnet can be used up to this temperature without irreversible magnetisation losses

Maximum operation temperature t_{max} (°C)
This is only an approximate value, because it depends on the dimensions of the magnet (L/D ratio). The stated value is reached only when the product of B and H reaches a maximum (see magnet dimensions).

NdFeB
Neodymium iron boron magnet material. High-energy magnet with the currently highest remanence values and coercive field strengths.

Oersted
Old unit for magnetic field strength.
1 Oe = 79.6 A/m.

Permeability μ_0
Permeability μ in Vs/Am is the magnetic permeability. For almost all magnet materials, the permeability is only slightly higher than for air, while it is a thousand times higher or more for iron. It consists of component caused by the magnetic field strength and a component resulting from the magnetising of the material.

Permeability, relative μ_r
The relative permeability takes into account the magnetisation of the material.

Permeability, absolute μ
"Conductivity" for magnetic force lines, the ratio between magnetic induction B and magnetic field strength H. $\mu = \mu_0 \times \mu_r$.

Permanence B_p
The permanence is the maximum flux density of the magnet material at 0 kA/m field strength. The difference to remanence B_r consists in the fact that permanence occurs if air gaps change repeatedly. The permanence is always lower than the remanence.

Pole raiser
Also referred to as pole shoes. They are used in conjunction with magnet systems to transmit the magnetic field into the workpiece. Pole shoes allow machining from 5 sides as well as chucking of complicated workpiece shapes.

Pole spacing P
Distance from an N pole to an S pole. The pole spacing always includes a pole gap.

Pole gap S
Distance between an N pole and an S pole consisting of non-magnetic material – usually brass, plastic or stainless steel.

Preferred direction
See anisotropy.

Remanence B_r
Remanence B_r is expressed in Tesla (T) or Millitesla (mT) or – in the cgs measuring system – in Gauss (G). Remanence is the remaining magnetisation or flux density in a magnet which was magnetised to saturation, with a closed magnetic circuit.

Resistance factor τ
Factor which takes into account the field strength losses on transition points and in the workpiece.

Saturation
Saturation flux density B_s is reached when the workpiece absorbs no more magnetisation.

Scatter factor σ
The scatter factor takes into account the portion of the magnetic flux which is not available for e.g. workholding. It greatly depends on the workholding system and the workpiece.

Shielded magnet design
Guiding and concentrating the magnetic field using an iron pot around the rear and sides of a magnet.

SmCo
Samarium cobalt magnet material. High-energy magnet with high remanence and high coercive field strength.

Temperature coefficient of coercive field strength TK_{Hc}
The temperature coefficient TK_{Br} of remanence in 1/K indicates the reversible reduction in coercive field strength – starting from room temperature (20 °C) – for each 1 K temperature increase.

Temperature coefficient of remanence TK_{Br}
Percentage which indicates the lowering of the remanence with increasing ambient temperature.

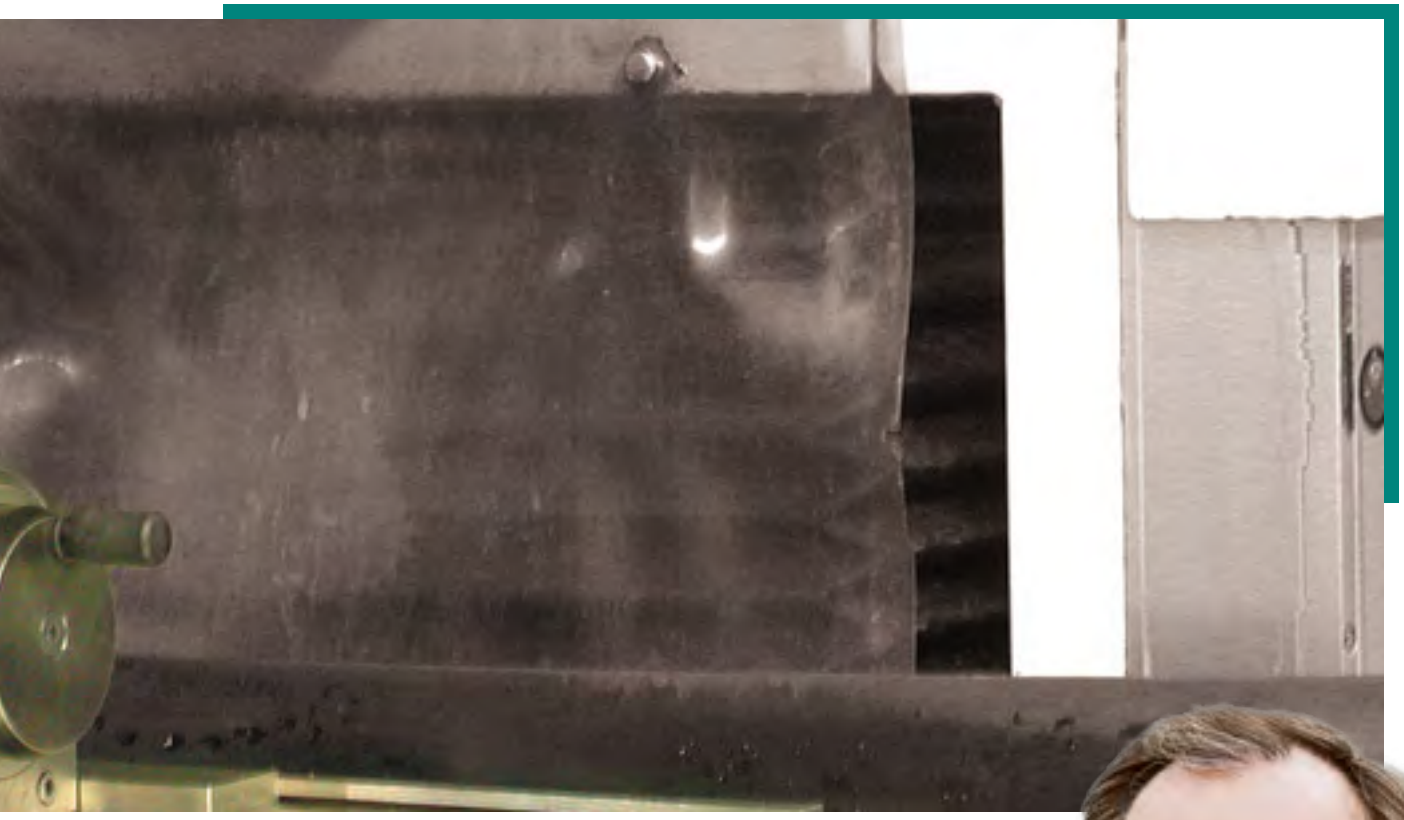
Tesla
Unit for magnetic induction. 1 Tesla = 10^4 Gauss.

CHAPTER 2

DRESSING AND WORKHOLDING SYSTEMS FOR GRINDING

Are you looking for a tailor-made option for upgrading your surface grinding machine? With the SAV accessory units for dressing grinding wheels and cylindrical grinding, we offer a simple and reliable option for expanding functions.

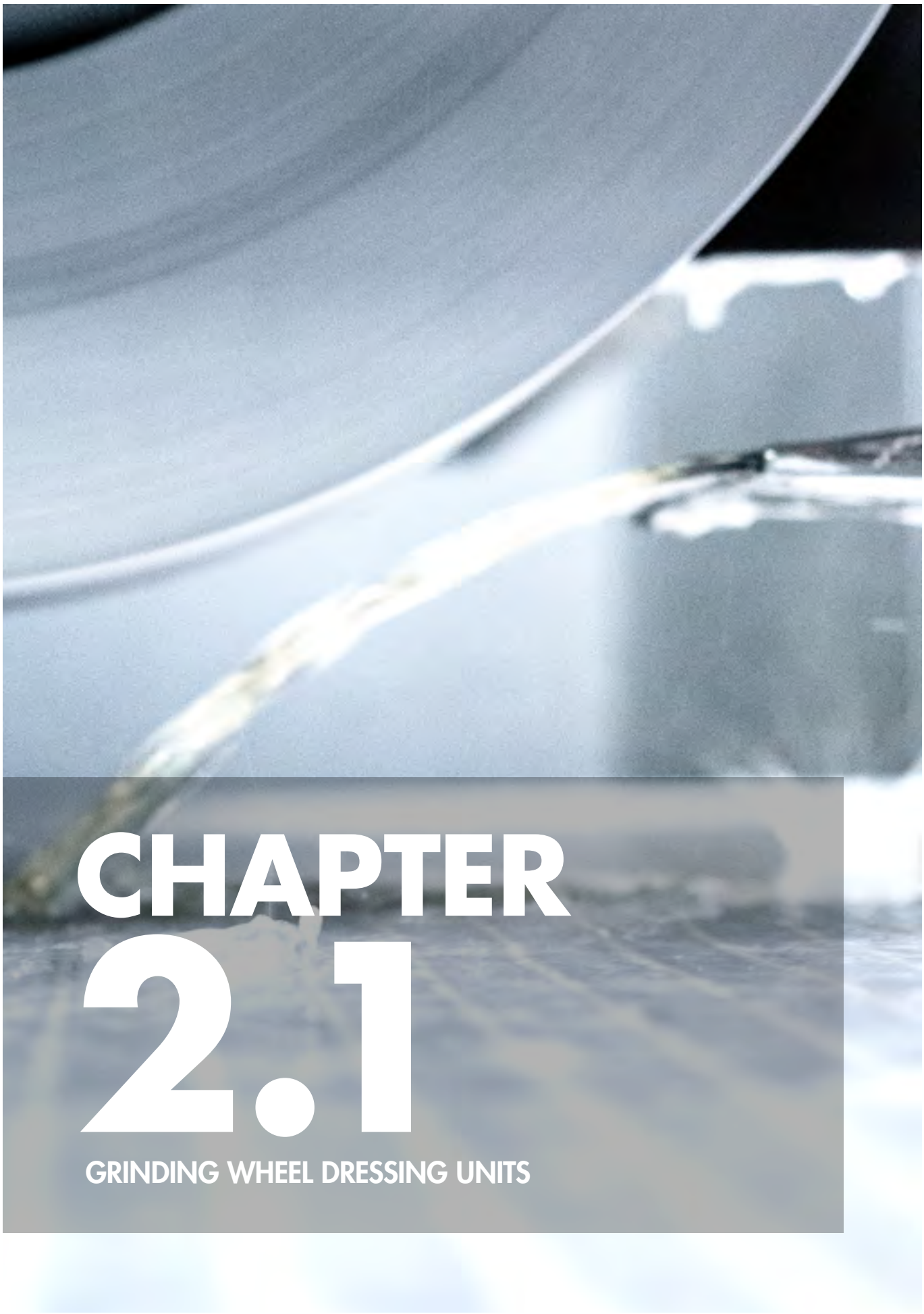
The supplementary SAV dressing and workholding systems are ideal, for example, if you only have to grind profiles, angles or radii occasionally but still require high-precision results. Our range of add-on units with proven, reliable precision offers exactly the right performance. But our precision cylindrical grinding units are also the ideal functional modules for your application if you want to use your surface grinding machine as aprecision cylindrical grinding unit for specific projects. Even if maximum precision is required, e.g. when grinding tapers, you can make use of our dressing and workholding systems with sine adjustment. Please contact us with your requirements so we can provide you with more information.



“ OUR DRESSING AND WORKHOLDING SYSTEMS HELP YOU TO CREATE EFFECTIVE HIGH-PRECISION GRINDING RESULTS.

TRUST IN THE EXPERTS WITH SAV!

DIETER LEIKAUF
BUSINESS UNIT MANAGER
MAGNET SYSTEMS



CHAPTER 2.1

GRINDING WHEEL DRESSING UNITS

2. DRESSING AND WORKHOLDING SYSTEMS FOR GRINDING

2.1 GRINDING WHEEL DRESSING UNITS

PAGES 320 – 326

	SAV ART. NO.	DESIGNATION	COMMENTS	PAGE
	434.01	Precision radius dresser	For profiling grinding wheels up to 400 mm diameter	320
	434.02	Precision radius dresser	For profiling grinding wheels up to 200 mm diameter, universal	321
	434.03	Precision angle dresser	For angled dressing of grinding wheels with scale and vernier	322
	434.05	Precision angle dresser	For angled dressing of grinding wheels using the sinusoidal principle	323
	434.06	Precision side dresser	For dressing the side faces on grinding wheels	324
	434.07	Precision punch grinder	For grinding dies and profiling grinding wheels	325
	401.01	Dressing diamonds	Accessories	326

SAV 434.01 PRECISION RADIUS DRESSER

For profiling grinding wheels

APPLICATION

The radius dressing unit can be used to profile dressing wheels up to 400 mm diameter with concave or convex radii.

DESIGN

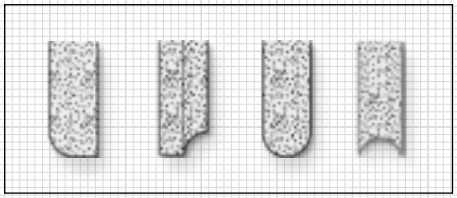
The lapped, robust spindle runs in a honed hole and is sealed against dust. With degree scale. The radius movement is limited by adjustable stops. The arm with the dressing diamond is height-adjustable using threads.
A fine-adjustment screw on the arm can be used to move the diamond into the correct position.
The precision radius dresser is delivered with 3 exchangeable dressing inserts and dressing arm 2 as a standard. 2 additional arms with a larger range for the dressing radius are available.
Arm 3 with a 100 mm raising foot for dressing larger radii.

ACCESSORIES

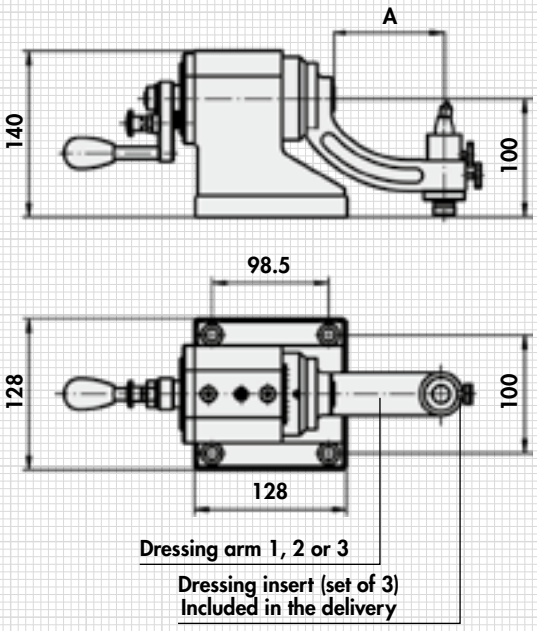
Dressing diamond SAV 401.01 - K 10, type D
Arm 1 - SAV 434.01 - 1
Arm 3 - SAV 434.01 - 3 - includes support block LxWxH 128x128x100
All subject to a surcharge.

	mm		
Arm	1	2*	3
Concave dressing radius	19-112	0-22/108-155	151-199
Convex dressing radius	-	0-25	21-68
Arm length A	143	143	158

* included in the delivery



Examples for profiled grinding wheels



ORDERING EXAMPLE

Designation	SAV no. - arm
Precision radius dresser	SAV 434.01 - 3

Benennung	SAV Nr. - Arm
Präzisions-Radien-Abrichtgerät	SAV 434.01 - 3

SAV 434.02 PRECISION RADIUS DRESSER

For profiling grinding wheels

APPLICATION

The radius dressing unit can be used to profile grinding wheels with concave and convex radii in combination with tangent bevels.

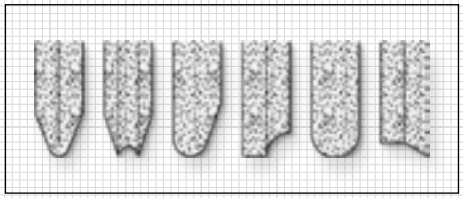
DESIGN

Finished on all sides, with limit stops and a magnifying sight glass in the spindle. The swivel arm features a scale. The radius movement is limited by adjustable stops. The slider with the dressing diamond is attached to the swivel arm with a dovetail structure. The dressing diamond is set with gauge blocks. A fine-adjustment screw on the diamond holder can be used to move the diamond into the correct position.

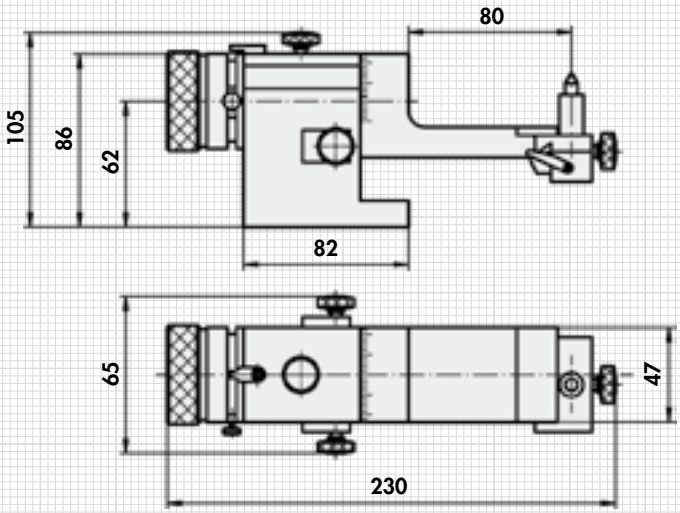
ACCESSORIES

Dressing diamond SAV 401.01 - K 06
Available subject to a surcharge.

Axis height	in mm	62
Max. concave dressing radius	in mm	26
Max. concave dressing radius	in mm	16
Max. grinding wheel ø	in mm	200
Opening for diamond	in mm	6
Adjustment path	in mm	±15
Weight	in kg	4.1



Examples for profiled grinding wheels



ORDERING EXAMPLE

Designation	SAV no.
Precision radius dresser	SAV 434.02

SAV 434.03 PRECISION ANGLE DRESSER

For angled dressing of grinding wheels

APPLICATION

The angled dressing unit can be used easily dress grinding wheels with any angle or shape. For dressing straight lines, angles and side faces for grinding faces, grooves and exact angled areas.

DESIGN

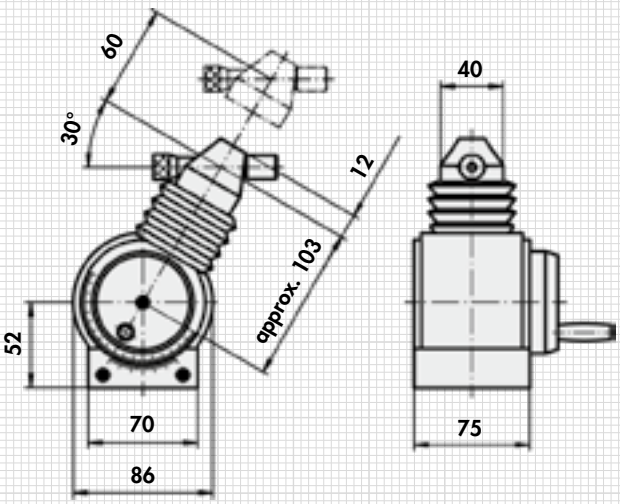
Swivels by 90° from the vertical position on both sides.
Adjustable with degree scale. Adjustable feed head for diamond.
6 mm diameter, 10 mm travel.
SAV 439.60 included in the delivery.

ACCESSORIES

Dressing diamond SAV 401.01 - K 06
Available subject to a surcharge.

Adjustable feed head for
diamond SAV 439.60 (included)

Base area approx.	in mm	70 x 75
Max. travel	in mm	60
Opening for diamond	in mm	6
Weight	in kg	4.1
Swivelling range	in °	± 90



ORDERING EXAMPLE

Designation	SAV no.
Precision angle dresser	SAV 434.03

SAV 434.05 PRECISION ANGLE DRESSERS

For angled dressing of grinding wheels

APPLICATION

For precise grinding wheel dressing using the sinusoidal principle on surface grinding machines.

DESIGN

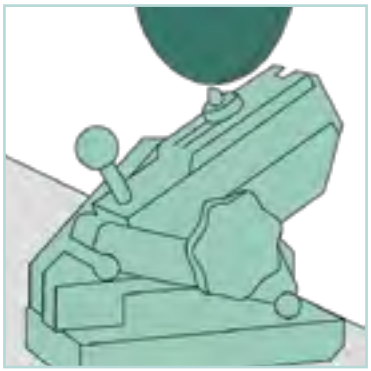
All parts hardened HRC 60 and precision-ground.
The starting position of the dressing unit is at 45°.
Angle accuracy: 5 arc sec

ACCESSORIES

Dressing diamonds for SAV 434.05 - 45:
SAV 401.01 - K 10
Dressing diamond for SAV 434.05 - 100:
SAV 401.01 - MK 1
Available subject to a surcharge.

APPLICATION

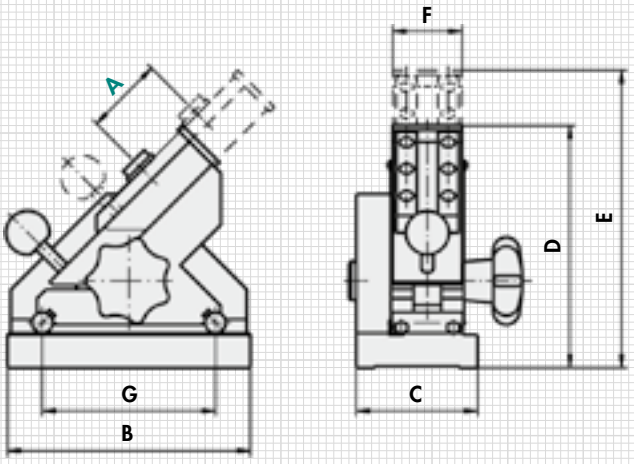
The desired angle is adjusted with gauge blocks as per a supplied table (sinusoidal principle).



SAV 434.05 - 45
Dressing travel: 45 mm

SAV 434.05 - 100
Dressing travel: 100 mm

Max. dressing travel A	in mm	45	100
Base area B x C	in mm	140 x 70	245 x 78
Height D – E	in mm	142 - 172	232 - 302
Slide width F	in mm	40	48
Home position	in °	45	45
Total adjustment range	in °	0 - 90	0 - 90
Axis distance G	in mm	100	200
ø for dressing diamond	in mm	6.2 / 1:10	MK 1
Weight	in kg	4.75	13.5



ORDERING EXAMPLE

Designation	SAV no. - max. dressing travel
Precision angle dresser	SAV 434.05 - 100

SAV 434.06 PRECISION SIDE DRESSER

For dressing the side faces of grinding wheels

APPLICATION

For dressing the side faces on grinding wheels, for penetration of slots, adjustment range 0.5 to 50 mm.

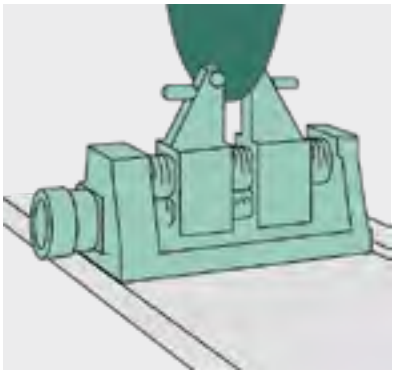
DESIGN

Manufactured from tool steel, hardened HRC 60. Available with (K) or without (N) cooling system on request.

ACCESSORIES

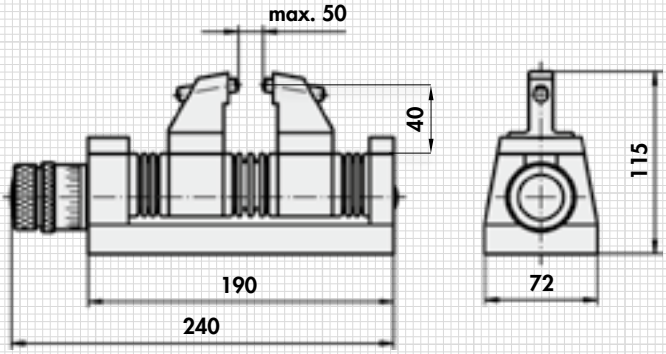
Dressing diamond SAV 401.01 - 08, available subject to a surcharge.

Side dressing unit SAV 434.06 - K, with cooling system



Side dressing unit SAV 434.06 - N, normal version without cooling system

Base area	in mm	190 x 72
Height	in mm	115
Adjustment range	in mm	0,5 - 50
Max. grinding wheel width	in mm	50
Feed per rotation	in mm	1
Feed per scale division	in mm	0,01
Opening for diamond	in mm	8
Weight	in kg	5,0



ORDERING EXAMPLE

Designation	SAV no. - version
Precision side dresser	SAV 434.06 - K

SAV 434.07 PRECISION PUNCH GRINDER

For grinding dies and profiling grinding wheels

APPLICATION

For grinding dies with maximum precision
and for profiling grinding wheels.

DESIGN

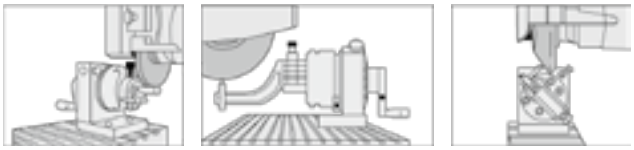
Manufactured completely from steel with maximum precision. All parts hardened and polished. Radius dressing arm for grinding wheels up to 200 mm diameter is delivered as a standard.

HANDLING

Adjustable stops and a stop pin allow any desired angle to be set. The stops are clamped to a conical strip to achieve the best possible workholding force. Adjusting screw for uncomplicated adjustment of the prism support. Device for setting any desired angle with the adjustable stop, the stop pin and the gauge blocks using the sinusoidal principle. The prism support is guided in a T-slot in the middle of the indexing plate. A single screw clamps the prism support in any position without deviation. Indexing pin and index plate with 24 notches, 15° division and an accuracy of ±30 arc sec Hand crank for easy turning of the index plate.
30 mm through hole for long dies. The L-shaped design of the base unit gives the device additional strength and rigidity.

ACCESSORIES

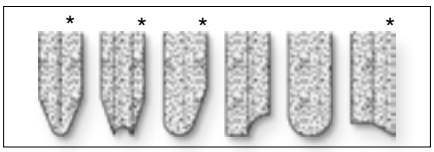
Angled dressing tool: SAV 434.07 - 01
Dressing diamond: SAV 401.01 - 10 - 92
Both subject to a surcharge.



Radius dressing arm for grinding wheels up to 200 mm diameter included in delivery

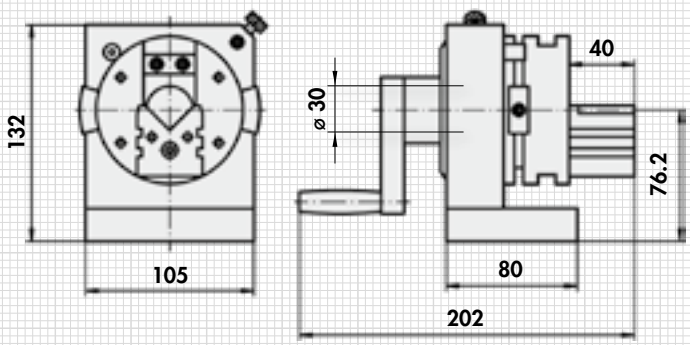
Angled dressing tool
SAV 434.07 - 01

Examples of manufactured dies



Examples for profiled grinding wheels
* Requires angled dressing tool

Width	in mm	105
Total height	in mm	132
Tip height	in mm	76.2
Depth	in mm	202
Length of the prism block	in mm	40
Chucking area prism ø	in mm	4 - 25
Max. concave dressing radius	in mm	100
Max. concave dressing radius	in mm	50
Max. dressing length	in mm	10
Taper for diamond	in mm	10
Weight	in kg	5



ORDERING EXAMPLE

Designation	SAV no.
Precision punch grinder	SAV 434.07

SAV 401.01 DRESSING DIAMONDS

For dressing grinding wheels

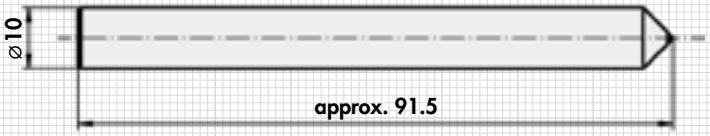
APPLICATION

For use in dressing and die grinding units.

DRESSING DIAMOND SAV 401.01 - 10 - 92:

Suitable for universal precision dressing units
SAV 434.04 and precision punch grinder SAV 434.07.

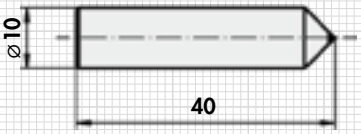
Diameter: 10 mm
Quality: 0.5 carat



DRESSING DIAMOND SAV 401.01 - 10 - 40:

Suitable for universal precision dressing unit
SAV 434.04.

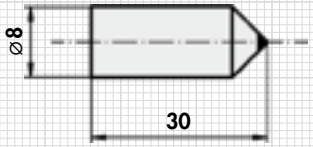
Diameter: 10 mm
Quality: 0.5 carat



DRESSING DIAMOND SAV 401.01 - 08:

Suitable for side dressing unit
SAV 434.06.

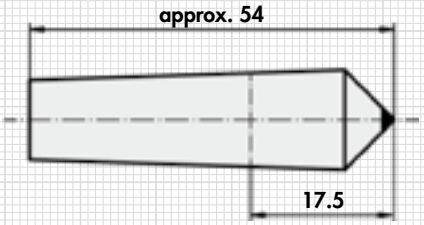
Diameter: 8 mm
Quality: 0.25 carat



DRESSING DIAMOND SAV 401.01 - MK1:

Suitable for precision angle grinding unit
SAV 434.05 - 100.

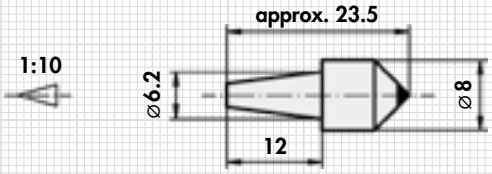
Diameter: 12.065 mm
Morse taper: MK 1
Quality: 0.5 carat



DRESSING DIAMOND SAV 401.01 - K10:

Suitable for grinding wheel dressing units
SAV 434.05 - 45 and SAV 434.01.

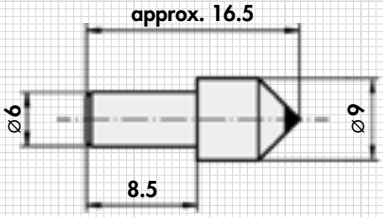
Diameter: 6.2 mm
Taper ratio: 1 : 10
Quality: 0.5 carat



DRESSING DIAMOND SAV 401.01 - 06:

Suitable for grinding wheel dressing units
SAV 434.03 and SAV 434.02.

Diameter: 6 mm
Quality: 0.5 carat

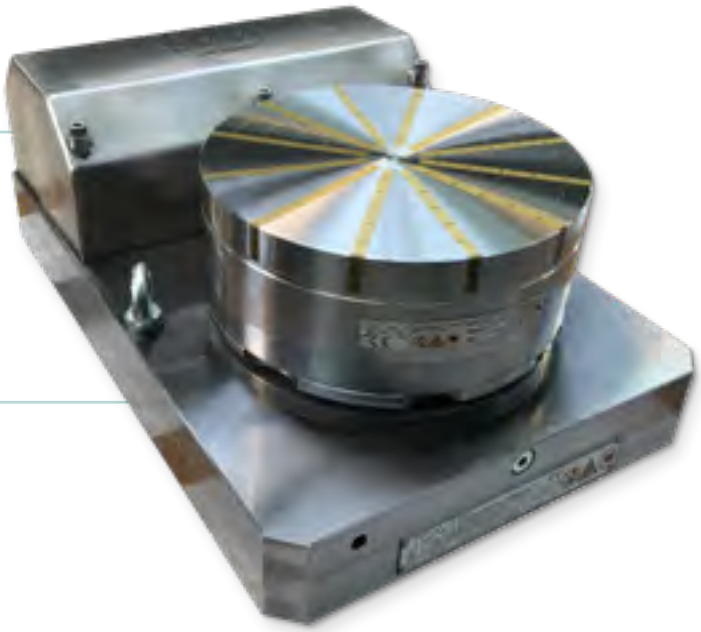


ORDERING EXAMPLE

Designation	SAV no. - type
Dressing diamond	SAV 401.01 - 06

APPLICATION

Precision rotary table, special version
250 mm diameter
Axial and radial runout 2 µm
Speed continuously adjustable



Hydraulic tailstock, special version
For precision grinding
Tip height adjusted to 3 µm

CHAPTER 2.2

PRECISION CYLINDRICAL GRINDING UNITS

2. DRESSING AND WORKHOLDING SYSTEMS FOR GRINDING

2.2.2 PRECISION CYLINDRICAL GRINDING UNITS

PAGES 330 – 337

	SAV ART. NO.	DESIGNATION	COMMENTS	PAGE
INDEX TABLES				
	434.47	Digital precision dividing unit	With sine adjustment with rotary encoder and display unit	330
CYLINDRICAL GRINDING UNITS				
	434.80	Precision cylindrical grinding unit	Complete with tailstock, adjustable using the sinusoidal principle	331
	434.81	Precision cylindrical grinding unit	With sine adjustment	332
	434.83	Precision cylindrical grinding unit	With sine adjustment	333
	434.85	Precision cylindrical grinding unit	With manual drive	334
	434.87	Precision cylindrical grinding unit	With side drive	335
	439.62	Three-jaw chuck	Accessories for cylindrical grinding units and index tables	336
	439.63	Four-jaw chuck	Accessories for cylindrical grinding units and index tables	336
	439.66	Collet chuck Deckel no. 355 E	Accessories for cylindrical grinding units and index tables	336
	439.68	Nut for collet chuck	Accessories for cylindrical grinding units and index tables	336
	439.69	Lathe centre	Accessories for cylindrical grinding units and index table, rigid, tailstock side for cylindrical grinding units	336
	439.70	Lathe centre	Accessories for cylindrical grinding units and index tables, spring-loaded, tailstock side for cylindrical grinding units	336
	439.71	Lathe centre	60° acute angle, with catch, spindle side with flange	337
	439.73	Three-jaw quick-release chuck	Accessories for cylindrical grinding units and index tables	337
ZERO SETTER				
	483.02	Zero setter – THE ORIGINAL	Vertical and horizontal	337

SAV 434.47 DIGITAL PRECISION DIVIDING UNIT

With rotary encoder and display unit

APPLICATION

Index tables with digital display (SAV 877.41, included in the delivery). Swivelling up to 90°. For measuring complicated workpieces. Due to its convenient size, the device can be used any time without setup work. Digital display unit Heidenhain type ND 281. Rotary encoder Heidenhain RON 455 B.

DESIGN

The base plate, the workholding bracket and all wear parts are hardened. The bearing is protected against splash water.

- Compact design, protection rating IP 54
- High part accuracy, zero point adjustment
- Easy maintenance and cleaning
- Unobstructed view of the workpiece
- Sine swivel range 0 – 90°
- Spindle taper MK 4

Other tapers and dimensions on request.

ACCESSORIES

- Round magnets ø 100 mm
- 3 and 4-jaw chuck ø 80 mm and ø 100 mm
- Mandrels
- Special collets

Digital display unit SAV 877.41
(Heidenhain 281)

Length	in mm	approx. 180
Width	in mm	approx. 140
Height, horizontal	in mm	approx. 180
Height, vertical	in mm	approx. 190
Spindle height	in mm	approx. 122
Base plate	in mm	140 x 130
Weight	in kg	approx. 15
Angle adjustment	in °	0 - 90
Partial measurements	in °	0 - 360
Spindle concentricity	in mm	0.003
Resolution	in °	0.01
Spindle taper	in °	MK 4

ORDERING EXAMPLE

Designation	SAV no.
Digital precision dividing unit	SAV 434.47

SAV 434.80 PRECISION CYLINDRICAL GRINDING UNIT

Complete with tailstock, adjustable using the sinusoidal principle

APPLICATION

The cylindrical grinding unit was developed specially for use in tool-making, die making and mould making. Due to its convenient size, the device can be used any time without setup work.
Its universal suitability makes it possible to machine parts which cannot be manufactured on cylindrical grinding machines or only with great effort.

DESIGN

The base plate and all wear parts are hardened.
Protection rating of bearing and motor: IP 54.
With spindle versions:

- Schaublin 470 E (Sch): Feedthrough 23.5 mm
- SK 30 (SK 30)
- Deckel 355 E (D): Feedthrough 20.0 mm

Tailstock adjustable on base plate, with spring-loaded lathe centre.
Control unit SAV 875.40 included in the delivery. 24 V electric motor, continuously adjustable from 0 – 333 rpm. Clockwise/anti-clockwise rotation.
With dividing unit 12 x 30° using indexing bolt, other divisions on request. Sine swivel range from 0 – 45°.

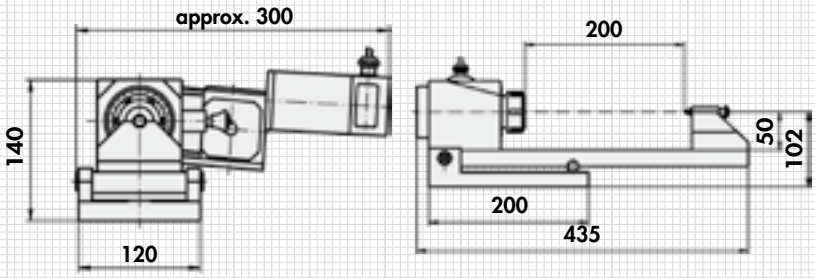
Image shows version with lathe centre on spindle side (accessories)

ACCESSORIES

- Permanent magnetic circular chuck:
  D = 100 mm, with flange. SAV 244.03 - 100 - taper
- Three-jaw chuck:
  D = 80 mm, with flange. SAV 439.62 - 80 - taper
- Four-jaw chuck:
  D = 80 mm, with flange. SAV 439.63 - 80 - taper
- Flat disc:
  D = 90 mm, with threads M8. SAV 439.64 - 90 - taper
- Collet chuck Schaublin no. 470 E:
  D = 2.0 to 3.0 mm, 0.5 mm step
  D = 4.0 to 20.0 mm, 1.0 mm step
  or complete set from 3.0 to 18.0 mm (set)
  SAV 439.67 - 470 E - set
- Lathe centre:
  60° point angle with catch, spindle side with flange SAV 439.71 - taper
- Collet chuck Deckel no. 355 E:
  D = 0.5 – 18.0 mm or complete set from 3.0 – 18.0 mm (set)
  SAV 439.66 - 355 E - set

Control unit SAV 875.40
W x H x L = 170 x 140 x 230

Footprint	in mm	200 x 120
Height, horizontal	in mm	140
Swivelling range	in °	0 - 90
Adjustm. with gauge blocks	in °	up to 45
Tip width	in mm	200
Tip height	in mm	50
Speed	rpm	0 - 333
Spindle concentricity	in mm	0.003
Weight	in kg	15.5
Weight of control	in kg	4.8



ORDERING EXAMPLE

Designation	SAV no. - taper
Precision cylindrical grinding unit	SAV 434.80 - SK 30

SAV 434.81 PRECISION CYLINDRICAL GRINDING UNIT

With sine adjustment

APPLICATION

The cylindrical grinding unit was developed specially for use in toolmaking, die making and mould making. Due to its convenient size, the device can be used any time without setup work. Its universal suitability makes it possible to machine parts which cannot be manufactured on cylindrical grinding machines or only with great effort.

DESIGN

The base plate, the workholding bracket and all wear parts are hardened. Protection rating of bearing and motor: IP 54.

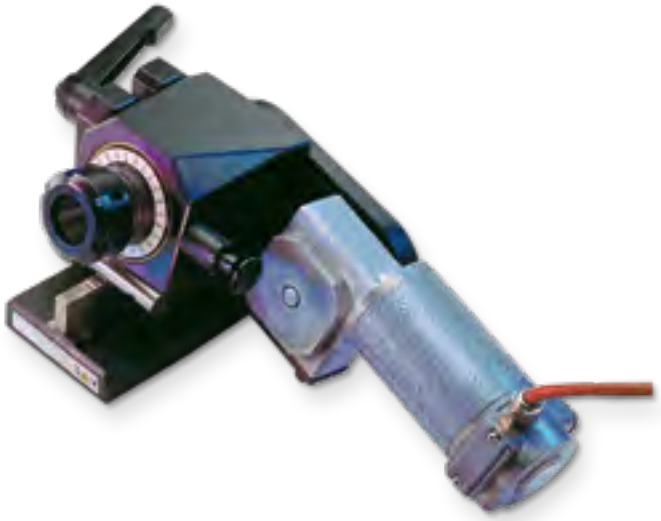
With spindle versions:
- Schaublin 470 E (Sch)
- SK 30 (SK 30)
- Deckel 355 E (D)

Control unit SAV 875.40 included in the delivery. 24 V electric motor, continuously adjustable from 0 – 333 rpm. Clockwise/anti-clockwise rotation.

With dividing unit 12 x 30° using indexing bolt, other divisions on request. Max. 24 x 15° possible. Sine swivel range from 0 – 35°.

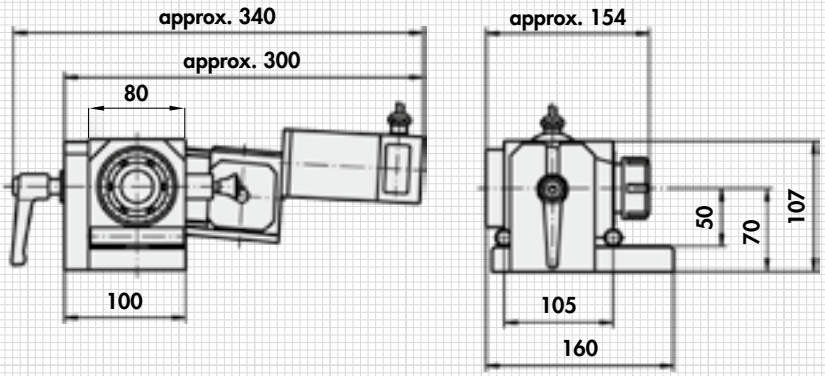
ACCESSORIES

- Permanent magnetic circular chuck:
  D = 100 mm, with flange. SAV 244.03 - 100 - taper
- Three-jaw chuck, adjustable:
  D = 80 mm, with flange. SAV 439.62 - 80 - taper
- Four-jaw chuck:
  D = 80 mm, with flange. SAV 439.63 - 80 - taper
- Flat disc:
  D = 90 mm, with threads M8. SAV 439.64 - 90 - taper
- Collet chuck Schaublin no. 470 E:
  D = 2.0 to 3.0 mm, 0.5 mm step
  D = 4.0 to 20.0 mm, 1.0 mm step
  or complete set from 3.0 to 18.0 mm (set)
  SAV 439.67 - 470 E - set
- Collet chuck type ER:
  SAV 439.65 - ER 32 - SK 30
- Collet chuck Deckel 355 E:
  D = 0.5 to 18.0 mm or complete set from 3.0 to 18.0 mm (set)
  SAV 439.66 - 355 E - set



Control unit SAV 875.40
W x H x L = 170 x 140 x 230

Contact surface	in mm	160x80
Height, horizontal	in mm	107
Total length	in mm	160
Spindle height	in mm	50
Speed	rpm	0 - 333
Spindle concentricity	in mm	0.003
Weight of cylindrical grinding unit	in kg	approx. 9.0
Weight of control	in kg	4.8



ORDERING EXAMPLE

Designation	SAV no. - taper
Precision cylindrical grinding unit	SAV 434.81 - SK 30

SAV 434.83 PRECISION CYLINDRICAL GRINDING UNIT

With sine adjustment

APPLICATION

Cylindrical grinding, taper grinding, profile grinding, plunge grinding. The cylindrical grinding unit was developed specially for use in toolmaking, die making and mould making. Swivelling using the sine principle can be used to additionally set this unit to a vertical position. This then makes it possible to carry out surface grinding work.

DESIGN

The base plate and all wear parts are hardened. The bearing and the motor are splash water protected, IP 54. Swivelling up to 90°. Special version on request.

With spindle versions:
- Schaublin 470 E (Sch)
- Steep taper 40 (SK 40)

Compact, small space requirement. Instantly ready for use.

Control unit SAV 875.40 included in the delivery. 24 V electric motor, continuously adjustable from 0 – 200 rpm. Clockwise/anti-clockwise rotation.

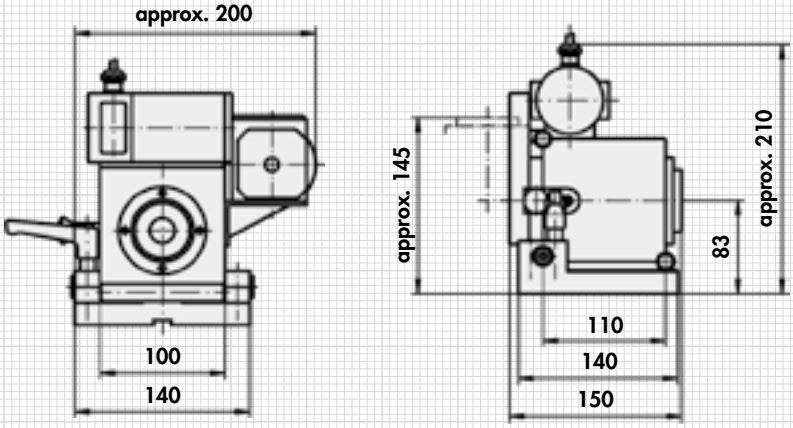
With grid holes 4 x 90°. With grid indexing for use as index table available on request (surcharge applies). Max. direct division 24 x 15°.
Sine swivel range from 0 – 90°.
Modular system. Special taper and versions possible on request.
Suitable for concentricity testing.

ACCESSORIES

- Three-jaw chuck:
  D = 80 mm, with flange. SAV 439.62 - 80 - taper
  D = 100 mm, with flange. SAV 439.62 - 100 - taper
- Four-jaw chuck:
  D = 80 mm, with flange. SAV 439.63 - 80 - taper
  D = 100 mm, with flange. SAV 439.63 - 100 - taper
- Permanent magnetic circular chuck:
  D = 100 mm, switchable, with flange. SAV 244.03 - 100 - taper
- Collet chuck Schaublin no. 470 E:
  D = 2.0 to 3.0 mm, 0.5 mm step
  D = 4.0 to 20.0 mm, 1.0 mm step
  or complete set from 3.0 to 18.0 mm (set)
  SAV 439.67 - 470 E - set

Control unit SAV 875.40
W x H x L = 170 x 140 x 230

Spindle height	in mm	83
Length	in mm	150
Width incl. motor	in mm	200
Height incl. motor	in mm	210
Height, vertical	in mm	145
Speed	rpm	0 - 200
Weight	in kg	13



ORDERING EXAMPLE

Designation	SAV no. - taper
Precision cylindrical grinding unit	SAV 434.83 - SK 40

SAV 434.85 PRECISION CYLINDRICAL GRINDING UNIT

With manual drive

APPLICATION

Cylindrical grinding, profile grinding, dividing, concentricity testing.

DESIGN

All wear parts are hardened. The bearing is protected against splash water. Compact, small space requirement, instantly ready for use. Modular system. Special versions on request.

Size 100 (with spindle versions):
- Schaublin 470 E (**Sch**)
- Steep taper 30 (**SK 30**)
- Deckel 355 E (**D**)

With dividing unit 12 x 30° using indexing bolt, other divisions on request.

Size 200 (with spindle tapers):
- Schaublin 470 E (**Sch**)
- Steep taper 40 (**SK 40**)

With grid holes 4 x 90°. With grid indexing for use as index table available on request (surcharge applies). With indexing holes on request, division as specified.

ACCESSORIES

- Three-jaw chuck:
  D = 80 mm, with flange. SAV 439.62 - 80 - SK 40
  D = 100 mm, with flange. SAV 439.62 - 100 - SK 40
- Four-jaw chuck:
  D = 80 mm, with flange. SAV 439.63 - 80 - SK 40
  D = 100 mm, with flange. SAV 439.63 - 100 - SK 40
- Permanent magnetic circular chuck:
  D = 100 mm, switchable, with flange, SAV 244.03 - 100 - taper
- Collet chuck Schaublin no. 470 E:
  D = 2.0 to 3.0 mm, 0.5 mm step
  D = 4.0 to 20.0 mm, 1.0 mm step
  or complete set from 3.0 to 18.0 mm (set)
  SAV 439.67 - 470 E - set
- Collet chuck Deckel no. 355 E:
  D = 0.5 to 19.0 mm
  or complete set from 3.0 to 18.0 mm (set) SAV 439.66 - 355 E - set

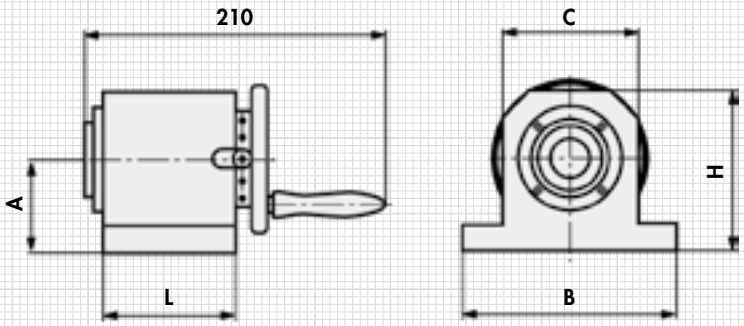
Size 200
with SK 40 taper

Size 100
with Deckel taper

Size 200
with three-jaw chuck (accessory)

	mm					kg
Size	A	L	B	H	C	Weight
100	60	105	100	100	80	8
200	70	110	150	120	100	10

Concentricity accuracy = 0.003 mm



ORDERING EXAMPLE

Designation	SAV no. - size - taper
Precision cylindrical grinding unit	SAV 434.85 - 100 - SK 30

SAV 434.87 PRECISION CYLINDRICAL GRINDING UNIT

With side drive

APPLICATION

For surface grinding machines in individual and small-batch production in toolmaking, die making and mould making. Special device for profile, cylindrical and plunge grinding. Suitable for continuous operation.

DESIGN

With Deckel spindle taper 355 E. Axial angular ball bearing unit pre-tensioned without play. Maintenance-free, robust DC motor. Protection rating IP 65, splash water protected.
Control unit **SAV 875.41** included in the delivery. Manufactured from hardened, precision-ground steel. 20 mm free spindle sleeve clearance thanks to side drive. Planetary gears with gear ration 1 : 3. Clockwise/counter-clockwise rotation continuously adjustable from 70 to 430 rpm.
Wooden box **SAV 539.23**, available subject to a surcharge.

ACCESSORIES

- Three-jaw chuck:
  D = 80 mm. SAV 439.62 - 80 - D
- Four-jaw chuck:
  D = 80 mm. SAV 439.63 - 80 - D
- Permanent magnetic circular chuck:
  D = 100 mm. SAV 244.03 - 100 - D
- Flat disc:
  D = 90 mm. SAV 439.64 - 90 - D
- Sine disc with clamping device.
  SAV 439.72 - T 100 - S
- Collet chuck Deckel no. 355 E:
  D = 1.0 to 18.0 mm
  or complete set from D = 3.0 to 18.0 mm
  (set) SAV 439.66 - 355 E - 4.0

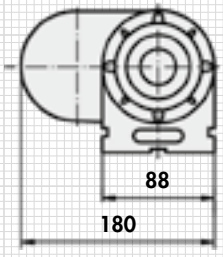
Workpiece samples

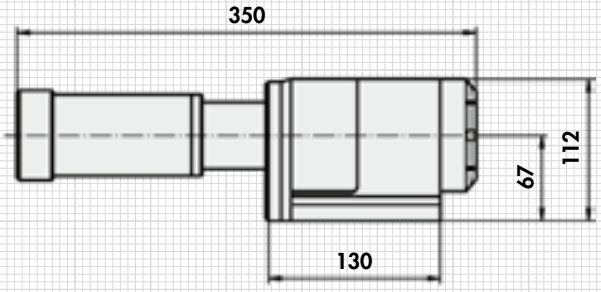
Precision cylindrical grinding unit:

Length	in mm	130
Width	in mm	180
Height	in mm	112
Total length incl. motor	in mm	350
Spindle height	in mm	67
Spindle concentricity	in mm	0.002
Speed	rpm	70 - 430
Weight	in kg	8.9

Control:

Width	in mm	230
Height	in mm	70
Depth	in mm	112
Weight	in kg	2.2





ORDERING EXAMPLE

Designation	SAV no.
Precision cylindrical grinding unit	SAV 434.87

SAV 439.62 - 439.70

ACCESSORIES FOR CYLINDRICAL GRINDING UNITS/ INDEX TABLES

Special-purpose accessories

THREE-JAW CHUCK SAV 439.62

Adjustable version (E), fixed version (F)
Diameter A = 80 mm or A = 100 mm
Flange types Schaublin (Sch), Deckel (D), SK 30 (SK 30), SK 40 (SK 40) and MK 4 (MK) available

ORDERING EXAMPLE

Designation	SAV no. - A - version - flange
Three-jaw chuck	SAV 439.62 - 100 - E - D

FOUR-JAW CHUCK SAV 439.63

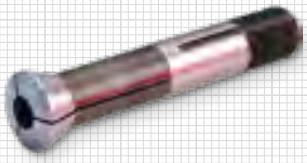
Diameter A = 80 mm or A = 100 mm
Flange types Schaublin (Sch), Deckel (D), SK 30 (SK 30), SK 40 (SK 40) and MK 4 (MK) available.

ORDERING EXAMPLE

Designation	SAV no. - A - flange
Four-jaw chuck	SAV 439.63 - 100 - SK 30

COLLET CHUCK DECKEL NO. 355 E SAV 439.66

S 20 x 2, chucking range from D = 0.5 mm to 18.0 mm, 0.5 mm increments increasing. Also available in sets (Satz), consisting of 31 collet chucks from 3 to 18 mm diameter.



ORDERING EXAMPLE

Designation	SAV no. - type - D or Satz
Collet chuck	SAV 439.66 - 355 E - 4,0

NUT FOR COLLET CHUCK 470 E SAV 439.68

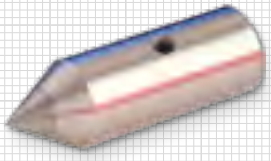
For all units with Schaublin (Sch) spindle taper M40 x 1.5

ORDERING EXAMPLE

Designation	SAV no.
Nut for collet chuck	SAV 439.68-1

LATHE CENTRE SAV 439.69

Fixed, tailstock side, for cylindrical grinding machines SAV 434.80/SAV 434.82/SAV 434.84



ORDERING EXAMPLE

Designation	SAV no.
Lathe centre	SAV 439.69

LATHE CENTRE SAV 439.70

Spring-loaded, tailstock side, for cylindrical grinding machines SAV 434.80/SAV 434.82/SAV 434.84

ORDERING EXAMPLE

Designation	SAV no.
Lathe centre	SAV 439.70

SAV 439.71 / 439.73

ACCESSORIES FOR CYLINDRICAL GRINDING UNITS/ INDEX TABLES

Special-purpose accessories

LATHE CENTRE SAV 439.71

60° tip angle, with catch. Spindle side with flange. Flange types Schaublin (Sch), Deckel (D), SK 30 (SK 30) and SK 40 (SK 40) available.

ORDERING EXAMPLE

Designation	SAV no. - flange
Lathe centre	SAV 439.71 - Sch

THREE-JAW QUICK-RELEASE CHUCK SAV 439.73

Diameter A = 80 mm or A = 110 mm.
Flange types Schaublin (Sch), Deckel (D), SK 30 (SK 30), SK 40 (SK 40) and MK 4 (MK) available. Version with 6 jaws available on request.

ORDERING EXAMPLE

Designation	SAV no. - A - flange
Three-jaw quick-release chuck	SAV 439.73 - 110 - SK 30

SAV 483.02

ZERO SETTER – THE ORIGINAL

Vertical and horizontal

APPLICATION

For adjusting the tools (e.g. milling cutter) to "zero" and for determining the reference point of the machine spindle. No damage to tools during start-up, no feeler gauge or centre finder required.

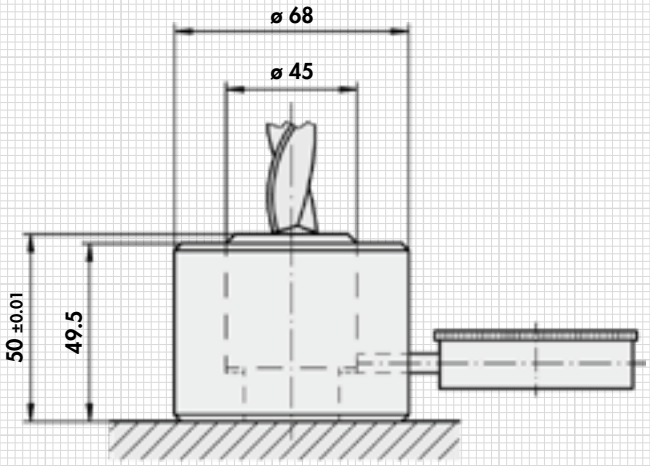
DESIGN

Spring-loaded contact pad and housing body made of hardened tool steel, precision ground. Delivered complete with dial gauge (0.01 mm reading accuracy) in rubber storage box.

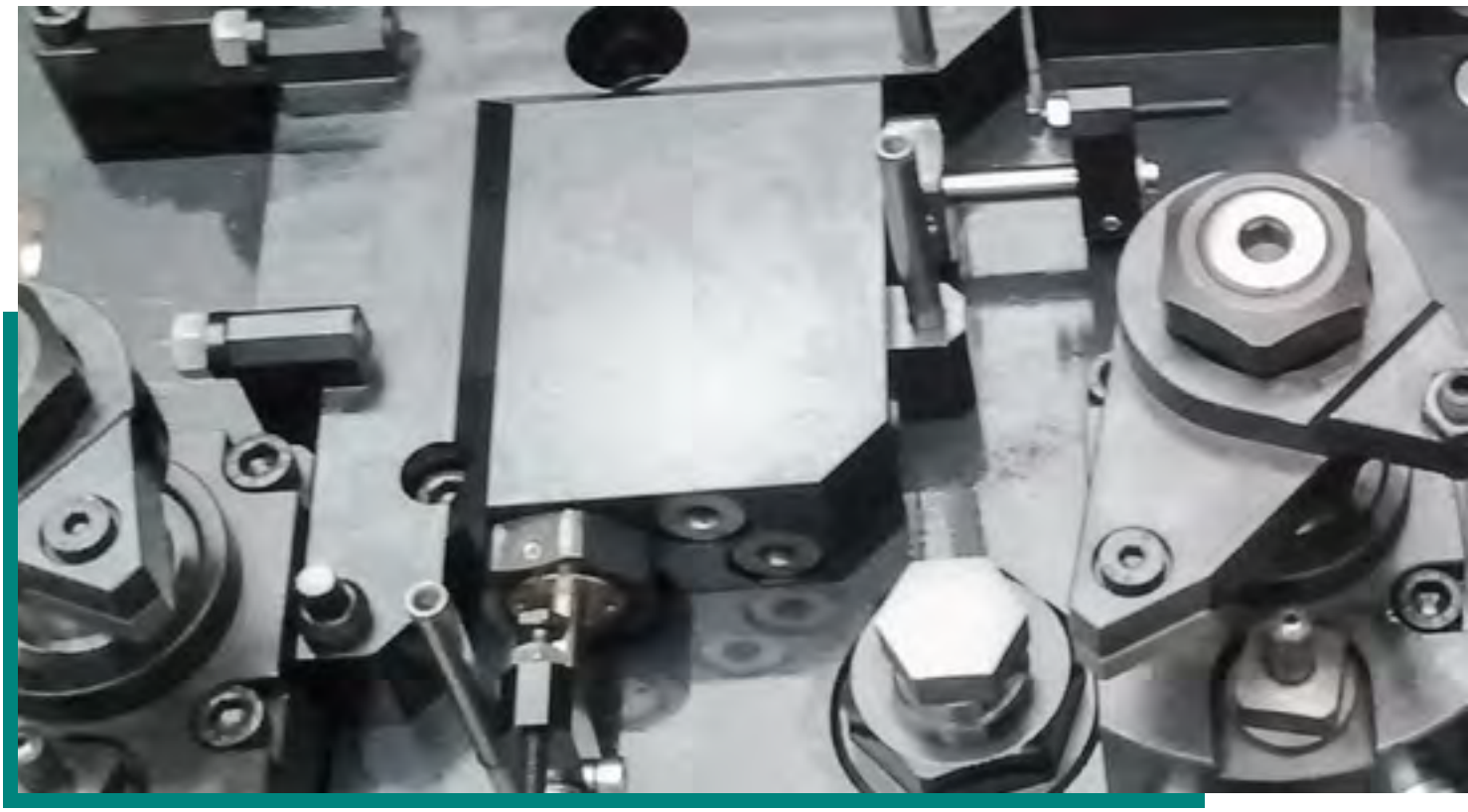
Reading accuracy of the dial gauge	in mm	0.01
Housing height – reference surface	in mm	49.5
Height of spring-loaded contact pad	in mm	51.5
Housing diameter	in mm	68
Contact pad diameter	in mm	45

ORDERING EXAMPLE

Designation	SAV no. - type
Zero setter	SAV 483.02 - NE 1



Type NE 1



CHAPTER 3
STATIONARY WORKHOLDING

Customer requirements are our benchmark: better, safer, more efficient. Our aim is to develop optimum workholding systems using state-of-the-art engineering development and manufacturing methods.

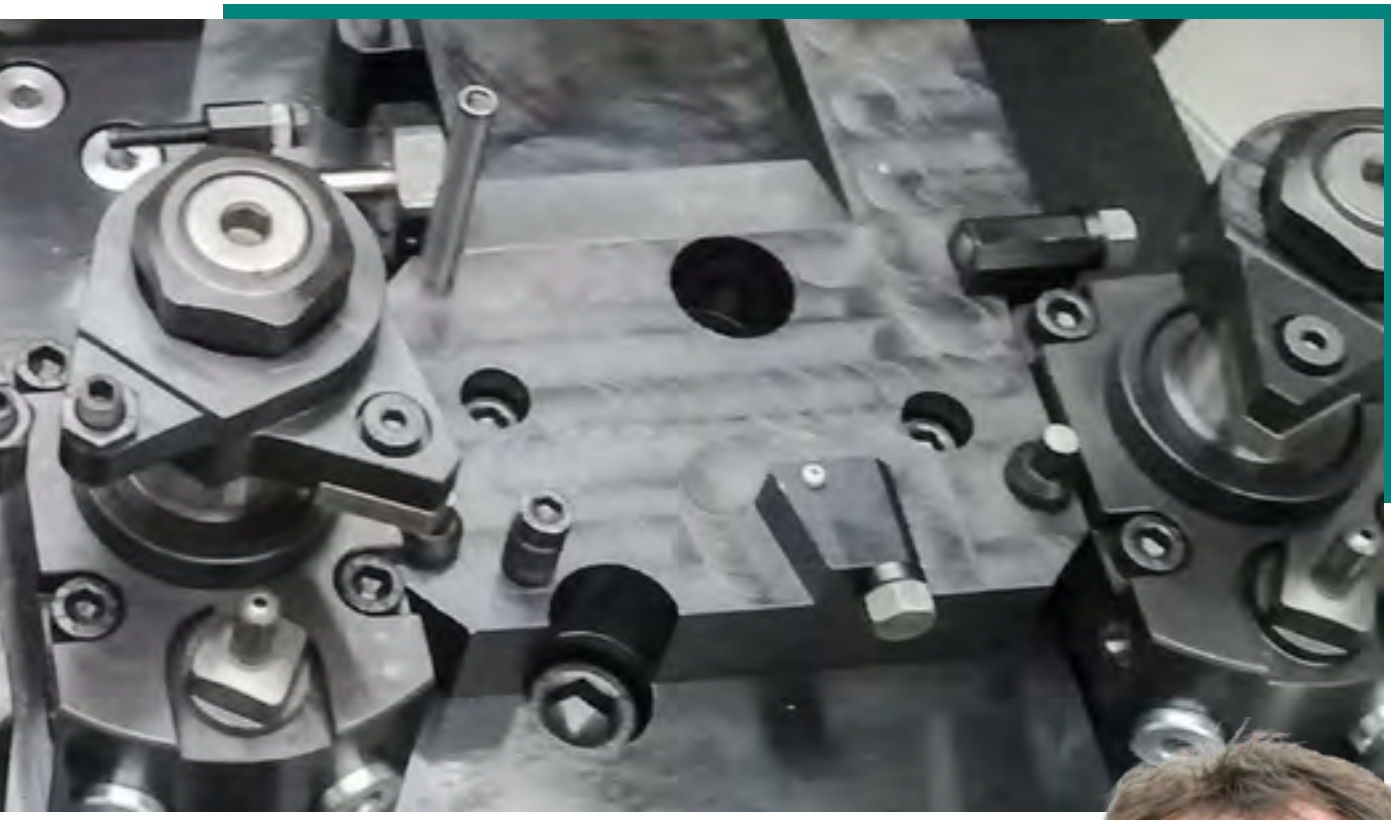
Our range includes standard workholding elements such as precision pull-down clamps, sine tables for grinding and EDM applications.

Other products from the portfolio of our partners:

- Hydraulic workholding for subtractive manufacturing
- Workpiece workholding systems, machine vices
- Vacuum workholding systems in standard and custom versions

Our development department, which specialises in the mechanical and hydraulic design of stationary workholding and fixtures, develops the best possible solutions in each case together with the customer and implements these with expert knowledge, experience, precision craftsmanship and quality awareness.

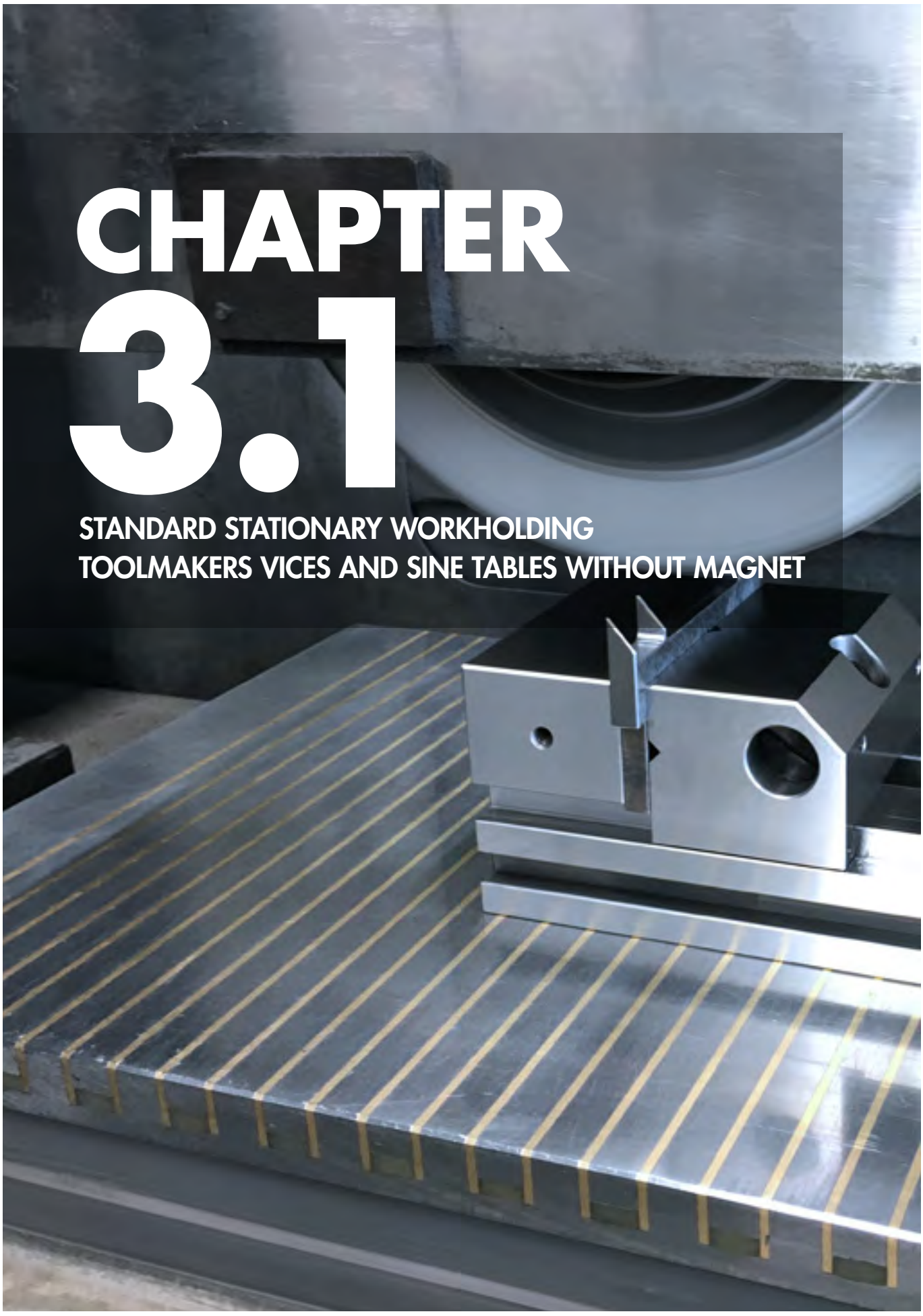
The full skill set of a supplier is revealed in the multi-faceted discipline of stationary workholding: Virtually nothing is a standard – almost everything has to be made possible. This requires more than just theoretical design engineering knowledge: It requires a feeling for different materials and their properties, an understanding of the complexity of processes and creativity for finding the most reliable solution.



“ FOR OUR CUSTOMERS FROM ALMOST ALL AREAS OF INDUSTRY, WE ARE MORE THAN JUST A SUPPLIER OF WORKHOLDING SYSTEMS –

WE ARE A PARTNER, A TRUSTED ALLY AND AN ENTHUSIASTIC CO-DEVELOPER.

HARALD LEIBOLD
BUSINESS UNIT MANAGER
STATIONARY WORKHOLDING



CHAPTER 3.1

STANDARD STATIONARY WORKHOLDING TOOLMAKERS VICES AND SINE TABLES WITHOUT MAGNET

3. STATIONARY WORKHOLDING

3.1 STANDARD/TOOLMAKERS VICES AND SINE TABLES WITHOUT MAGNET

PAGES 342 – 347

	SAV ART. NO.	COMMENTS	PAGE
PRECISION PULL DOWN VICE			
	231.01	For precision grinding	342
	231.03	For precision grinding	343
	231.10	Stainless version	343
PRECISION MINI PULL DOWN VICE			
	231.02	Made of stainless tool steel	342
PRECISION MACHINE VICE			
	233.03	Standard with spindle	344
	233.10	Stainless version	344
PRECISION SINE TABLE			
	235.71	Swivelling around the longitudinal axis	346
	235.72	Swivelling around longitudinal and transverse axis	347

SAV 231.01 PRECISION PULL DOWN VICES

For precision workholding, accuracy version

DESIGN

- Made of tool steel
- Fully hardened HRC 58-60
- Perpendicularity 0.003/100 mm
- Parallelism: 0.003/100 mm
- Horizontally and vertically ground-in prism in movable jaws
- Maximum accuracy when engaged through a "positive locking bridge" in the lower part, measured deformation: ±0.004 mm

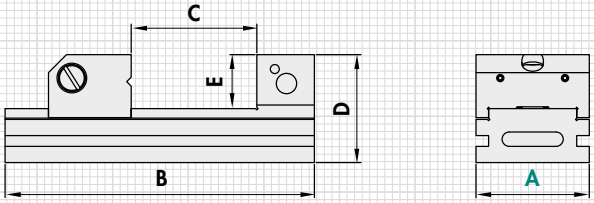
APPLICATION

Grinding, drilling, measuring

OPTIONAL

Wooden storage box (surcharge applies)

mm					kg	Order no.
A	B	C	D	E	Weight	Wooden box
73	190	100	70	35	4.6	SAV 539.03
98	230	125	80	40	11.4	SAV 539.05
125	300	160	98	48	18.5	SAV 539.09
150	350	210	100	50	24.9	SAV 539.09



ORDERING EXAMPLE

Designation	SAV no. - A
Precision pull down vice	231.01 - 73

SAV 231.02 PRECISION MINI PULL DOWN VICE

For precision workholding of small workpieces

DESIGN

- Stainless tool steel, hardened
- Fully hardened HRC 45-55
- Perpendicularity 0.004
- Parallelism: 0.004
- Fastening holes on the side
- Stainless version

APPLICATION

Wire-cut and die-sinking EDM, grinding, drilling, measuring

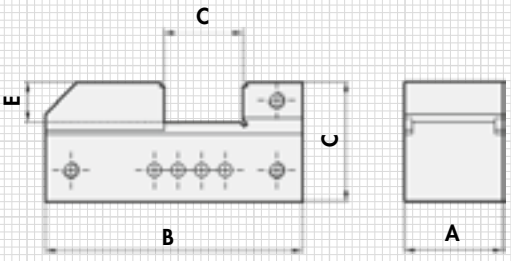
OPTIONAL

Wooden storage box (surcharge applies)

SCOPE OF DELIVERY

- Allen key
- Wooden storage box, optional

mm					kg	Order no.
A	B	C	D	E	Weight	Wooden box
25	65	20	30	10	0.3	SAV 539.01



ORDERING EXAMPLE

Designation	SAV no.
Precision mini pull down vice	231.02

SAV 231.03

PRECISION PULL DOWN VICES

For precision workholding, standard version

DESIGN

- Made of tool steel
- Fully hardened HRC 58-60
- Perpendicularity 0.003/100mm
- Parallelism: 0.003/100mm
- Horizontally and vertically ground-in prism in movable jaws

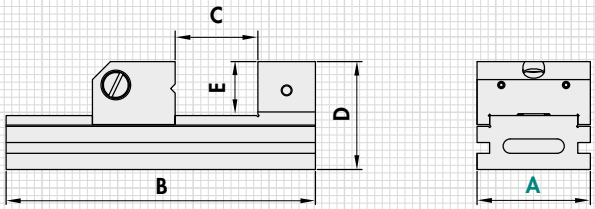
APPLICATION

Grinding, drilling, measuring

OPTIONAL

Wooden storage box (surcharge applies)

mm					kg	Order no.
A	B	C	D	E	Weight	Wooden box
34	75	25	35	15	0.4	SAV 539.03
45	110	50	45	20	1.0	SAV 539.03
70	160	80	62	30	3.3	SAV 539.03
90	212	120	80	40	6.7	SAV 539.16
120	286	150	90	40	16.8	SAV 539.16



ORDERING EXAMPLE

Designation	SAV no. - A
Precision pull down vice	231.03 - 70

SAV 231.10

PRECISION PULL DOWN VICES

For precision workholding, stainless version

DESIGN

- Stainless tool steel, hardened
- Fully hardened HRC 45-55
- Perpendicularity 0.003/100 mm
- Parallelism: 0.003/100 mm
- Horizontally and vertically ground-in prism in movable jaws

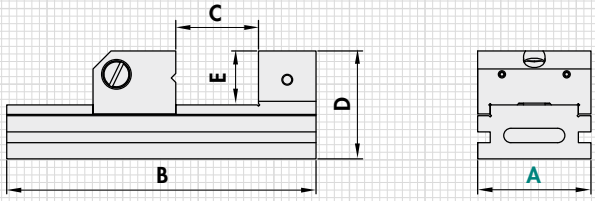
APPLICATION

Wire-cut and die-sinking EDM, grinding, drilling, measuring

OPTIONAL

Wooden storage box (surcharge applies)

mm					kg	Order no.
A	B	C	D	E	Weight	Wooden box
48	150	75	50	25	2.0	SAV 539.03
63	176	90	60	30	3.3	SAV 539.05
73	190	100	70	35	4.3	SAV 539.05
98	245	125	80	40	9.8	SAV 539.09



ORDERING EXAMPLE

Designation	SAV no. - A
Precision pull down vice	231.10 - 73

SAV 233.03

PRECISION MACHINE VICES

For precision workholding, standard version

DESIGN

- Made of tool steel
- Fully hardened HRC 58-60
- Perpendicularity 0.005/100 mm
- Parallelism: 0.005/100 mm
- Horizontally and vertically ground-in prism in movable jaws

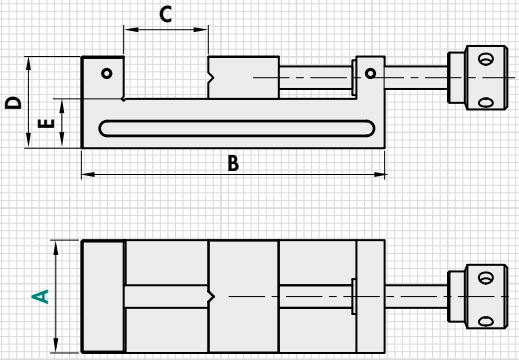
APPLICATION

Grinding, drilling, measuring

OPTIONAL

Wooden storage box (surcharge applies)

mm					kg	Order no.
A	B	C	D	E	Weight	Wooden box
25	70	25	32	14	0.5	SAV 539.03
48	155	60	54	25	1.9	SAV 539.03
63	176	75	60	30	3.1	SAV 539.03
73	181	75	70	30	4.7	SAV 539.03
88	250	125	73	38	7.7	SAV 539.16
98	250	125	73	38	8.9	SAV 539.16



ORDERING EXAMPLE

Designation	SAV no. - A
Precision machine vice	233.03 - 73

SAV 233.10

PRECISION MACHINE VICES

For precision workholding, stainless version

DESIGN

- Stainless tool steel, hardened
- Fully hardened HRC 45-55
- Perpendicularity 0.003/100 mm
- Parallelism: 0.003/100 mm
- Horizontally and vertically ground-in prism in movable jaws

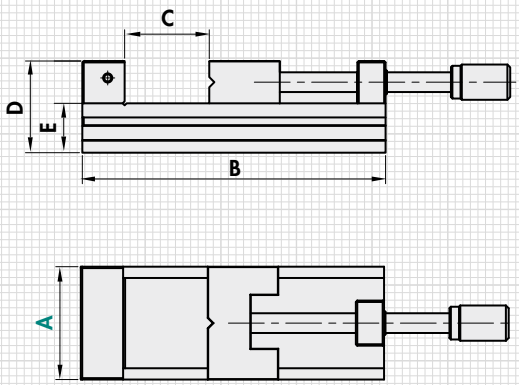
APPLICATION

Wire-cut and die-sinking EDM, grinding, drilling, measuring

OPTIONAL

Wooden storage box (surcharge applies)

mm					kg	Order no.
A	B	C	D	E	Weight	Wooden box
48	140	70	55	25	2.6	SAV 539.03
63	172	85	69	30	4.8	SAV 539.03
73	190	100	78	35	6.6	SAV 539.16
98	230	125	92	40	13.0	SAV 539.16



ORDERING EXAMPLE

Designation	SAV no. - A
Precision machine vice	233.10 - 48

CUSTOM GRINDING FIXTURES

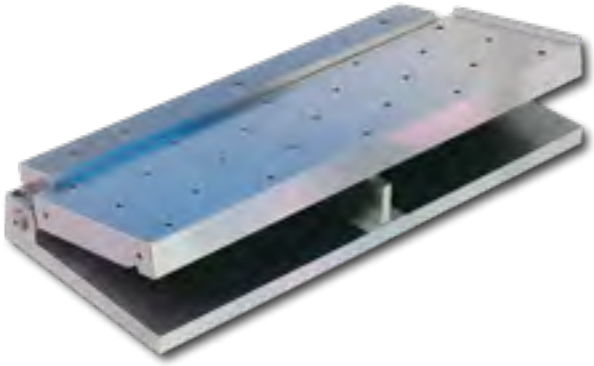
We develop and manufacture custom grinding fixtures.
Please contact us for a consultation.

SAV 235.71 PRECISION SINE TABLES

Swivelling around the longitudinal axis

DESIGN

Swivelling around the longitudinal axis. Sine table base unit made of steel. Hardened, burnished and precision-ground. Swivel plate designed with tapped holes M8 (G). From size 400 x 200 mm available with T-grooves (T) (subject to a surcharge). Mechanical adjustment gear alternatively available (subject to a surcharge.) This increases the height by approx. 40 mm at 0° swivel angle. Delivered in a wooden storage box, up to and including size 450 x 150 mm. With sine table with degrees/minutes in mm.

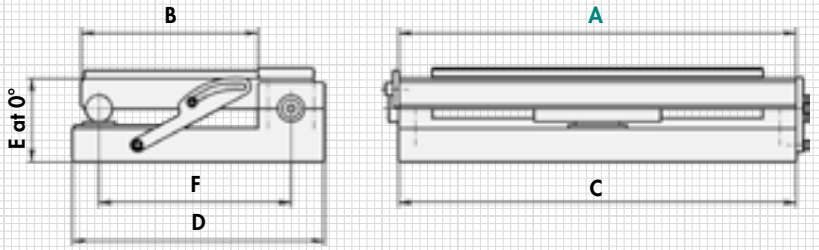


TECHNICAL DATA

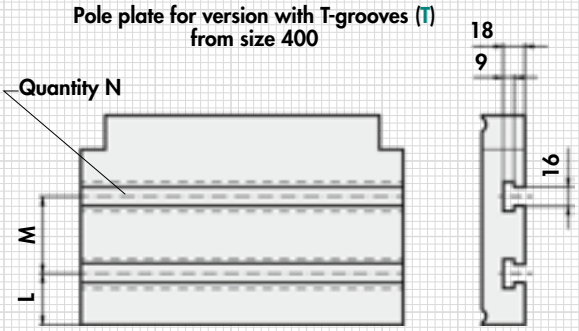
- Angle accuracy: ±5 arc sec
- Plane parallelism: ±0.005/100 mm
- Gauge block at 0°: 3 mm
- Swivelling range: 0° to 45°

APPLICATION

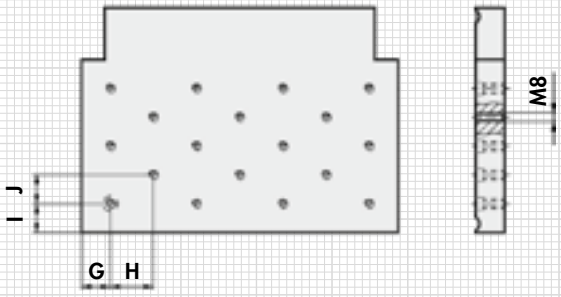
The angles are determined using the gauge blocks using the sinusoidal principle. Depending on the workpiece, either precision toolmakers vices or controllable permanent magnets can be placed on the swivel plate. Clamping with lateral fastening brace and on the upper bearing shells.



Pole plate for version with T-grooves (T) from size 400



Pole plate for design with tapped holes (G)



A	B	C	D	E	F	G	H	I	J	L	M	N	Weight
	mm												kg
100	50	100	95	47	65	12,5	12,5	25	12,5	-	-	-	3.0
160	160	160	205	47	175	20	20	20	20	-	-	-	9.0
175	100	175	145	47	115	20	22,5	20	30	-	-	-	7.5
250	150	250	195	52	165	25	25	25	25	-	-	-	14.0
350	150	350	195	60	165	25	25	25	25	-	-	-	26.0
400	200	400	245	60	215	25	25	25	25	50	100	2	37.0
450	150	450	195	60	165	25	25	25	25	35	80	2	33.5
500	200	500	245	65	215	25	25	25	25	50	100	2	48.5
600	300	600	345	70	315	25	25	25	25	50	100	3	90.0

ORDERING EXAMPLE

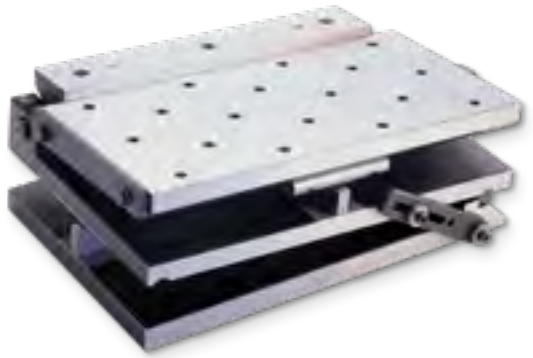
Designation	SAV no. - A - version
Precision sine table	SAV 235.71 - 600 - G

SAV 235.72 PRECISION SINE TABLES

Swivelling around longitudinal and transverse axis

DESIGN

Swivelling around longitudinal and transverse axis. Sine table base unit made of steel. Hardened, burnished and precision-ground. Swivel plate designed with tapped holes M8 (G). From size 400 x 200 mm available with T-grooves (T) (subject to a surcharge).
Mechanical adjustment gear alternatively available (subject to a surcharge.) This increases the height by approx. 40 mm at 0° swivel angle for each axis.
Delivered in a wooden storage box, up to and including size 400 x 200 mm. With sine table with degrees/minutes in mm.

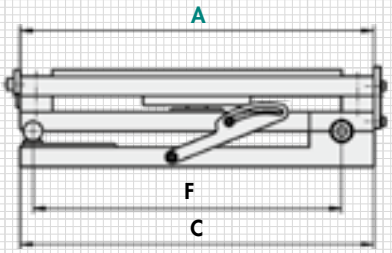


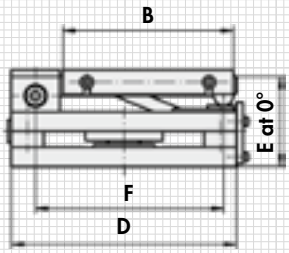
TECHNICAL DATA

- Angle accuracy: ±5 s
- Plane parallelism: ±0.005/100 mm
- Gauge block at 0°: 3 mm
- Swivelling range, long axis: 0° to 45°
- Swivelling range, short axis: 0° to 30°

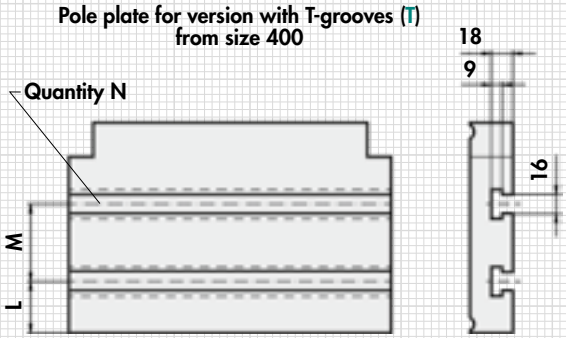
APPLICATION

The angles are determined using the gauge blocks using the sinusoidal principle. Suitable for workpieces with two work levels. Clamping is achieved with a fastening brace at the side and the upper bearing shells.

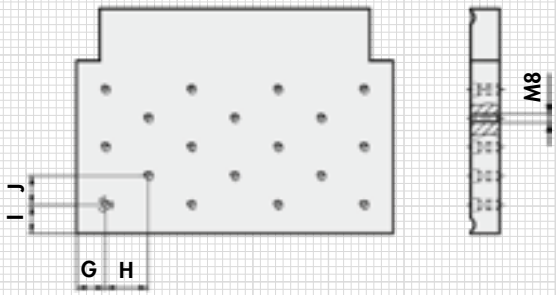




Pole plate for version with T-grooves (T) from size 400



Pole plate for design with tapped holes (G)



	mm												kg
A	B	C	D	E $^{0}_{-1}$	F	G	H	I	J	L	M	N	Weight
160	160	160	205	75	175 / 145	20	20	20	20	-	-	-	12.0
250	150	250	195	80	165 / 220	25	25	25	25	-	-	-	17.5
350	150	350	195	96	165 / 315	25	25	25	25	-	-	-	36.0
400	200	400	245	96	215 / 365	25	25	25	25	50	100	2	52.0
450	300	450	345	96	315 / 415	25	25	25	25	50	100	3	84.0

ORDERING EXAMPLE

Designation	SAV no. - A - version
Precision sine table	SAV 235.72 - 450 - G

CHAPTER 3.2

STATIONARY WORKHOLDING SPECIAL SOLUTIONS (FIXTURE CONSTRUCTION)

3. STATIONARY WORKHOLDING

3.2 SPECIAL SOLUTIONS (TOOLMAKING)

PAGES 350 – 355

VACUUM WORKHOLDING FIXTURE

For cast magnesium parts

SIZE
Length 1600 mm

WORKPIECE
Automotive parts

APPLICATION
Milling, drilling

DESCRIPTION
Pneumatic centring and positioning, includes pneumatic control

VACUUM WORKHOLDING FIXTURE

For aluminium plates

SIZE
1100 x 750 mm

WORKPIECE
Automotive parts

APPLICATION
Milling, drilling

DESCRIPTION
- Hydraulic pre-clamping
- Main workholding with vacuum

HYDRAULIC DUAL WORKHOLDING FIXTURE

SIZE
800 x 400 x 400 mm

WORKPIECE
Automotive parts

APPLICATION
Milling, drilling, thread cutting

DESCRIPTION
- Swivel/tilt fixture
- 4/5-axis machining with NC index table and clamping counterbearing
- Pneumatic/hydraulic rotary feedthroughs
- Limit position scanning of the tilting positions

LEVER WORKHOLDING FIXTURE
With mandrel

SIZE
450 x 450 x 480 mm

WORKPIECE
Flange

APPLICATION
Milling, drilling

DESCRIPTION
- Workholding fixture with special lever clamping, hydraulic
- Integrated special sliding jaws mandrel

HYDRAULIC 4-FOLD WORKHOLDING FIXTURE

On dual index table

SIZE
800 x 550 x 420 mm

WORKPIECE
Aluminium housing

APPLICATION
Milling, drilling, spindles

DESCRIPTION
- 2-axle indexing unit with 4 NC axes
- 3 special swivel clamps each
- Workpiece placement monitoring using air sensoring
- Base structure made of high-strength aluminium, hard-coated

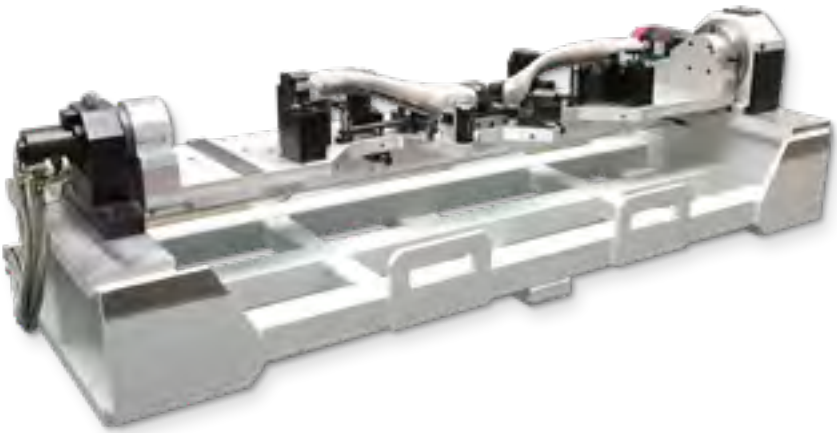
DUAL WORKHOLDING FIXTURE

SIZE
2400 x 1150 x 720 mm

WORKPIECE
Automotive magnesium chassis parts

APPLICATION
Milling, drilling, spindles

DESCRIPTION
- NC index table (NC axis 360°)
- Counterbearing with hydraulic clamping and multiple rotary feedthrough for hydraulics and pneumatics
- Workpiece placement monitoring using air sensoring
- Basic fixture designed as a welded structure with square tube profiles



HYDRAULIC 4-FOLD WORKHOLDING FIXTURE

SIZE
620 x 400 x 350 mm

WORKPIECE
Forged steel parts, automotive parts

APPLICATION
Milling, drilling

DESCRIPTION
Placement and clamping monitoring integrated for automatic loading

6-FOLD WORKHOLDING FIXTURE

SIZE
950 x 450 x 450 mm

WORKPIECE
Cast aluminium parts

APPLICATION
Milling, drilling, spindles

DESCRIPTION
- Workpieces pressed down with swivel-clamping pendulum claws
- Dynamic pressure scan of the open position of the contact cylinder
- Lateral "floating" clamping of the workpieces, self-locking workholding

HYDRAULIC WORKHOLDING FIXTURE

SIZE
2000 x 400 x 400 mm

WORKPIECE
Racks

APPLICATION
Assembly

DESCRIPTION
Used for assembling rack elements in linear guideways

DUAL WORKHOLDING FIXTURE

SIZE
396 mm diameter

WORKPIECE
Cast aluminium parts

APPLICATION
Milling, drilling, spindles

DESCRIPTION
- Workholding with swivel clamps, hydraulic
- Spring-loaded conical bolts for positioning
- Workpiece scanning using air sensor bolts
- Hydraulic support elements
- Chuck body made of high-strength aluminium, hard-coated

4-FOLD WORKHOLDING FIXTURE

SIZE
630 x 450 x 350 mm

WORKPIECE
Cast aluminium parts, workholding position 1

APPLICATION
Milling, drilling, spindles

DESCRIPTION
- Workholding with special swivel clamps, hydraulic
- X/Y aligned workholding units for double-spindle machining centre
- Exchangeable parts for different workpieces
- Hydraulic support elements

4-FOLD WORKHOLDING FIXTURE

SIZE
630 x 450 x 350 mm

WORKPIECE
Cast aluminium parts, workholding position 2

APPLICATION
Milling, drilling, spindles

DESCRIPTION
- Workholding with special swivel clamps, hydraulic
- X/Y aligned workholding units for double-spindle machining centre
- Exchangeable parts for different workpieces
- Hydraulic support elements

CHAPTER 4
ROTARY WORKHOLDING

Whether round or cubic workpieces, whether conventional or cycle-controlled machines: Our rotary workholding products ensure minimum setup times, maximum efficiency and flexibility.

We offer a broad range of jaw chucks and accessories, clamping chucks, mandrels and vacuum workholding systems as standard and special versions.

Regardless of the task at hand – our work is always

- absolutely economically viable and focused on practical value
- workpiece and process oriented
- highly precise
- fast and flexible thanks to in-house development and production

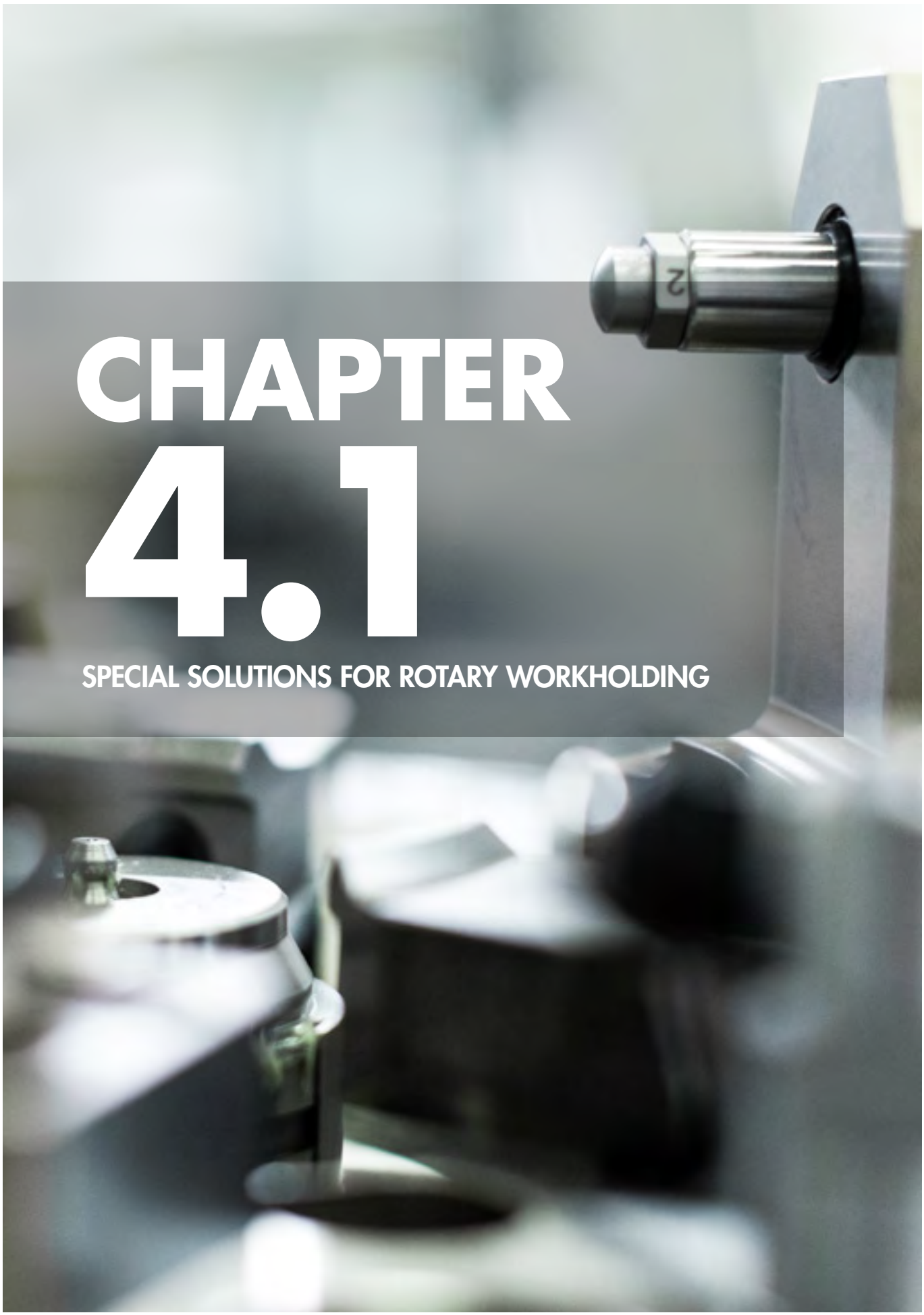
This ensure SAV workholding solutions for turning, grinding and milling

- Low wear and maintenance
- Intelligent combinations and automation options
- Adaptable to any spindle, specifically for your machine
- Well thought-out as an intelligent complete solution

“ FROM STANDARD TO COMPLEX INTEGRATION INTO EXISTING APPLICATIONS: WE CAN FIND THE IDEAL SOLUTION FOR ANY REQUIREMENT.

TRUST IN THE EXPERTS WITH SAV!

KLAUS KRAYL
BUSINESS UNIT MANAGER
ROTARY WORKHOLDING



CHAPTER 4.1

SPECIAL SOLUTIONS FOR ROTARY WORKHOLDING

4. ROTARY WORKHOLDING

4.1 SPECIAL SOLUTIONS

PAGES 360 – 367

FORCE-ACTUATED SOLUTIONS
Designs

BOLT CHUCKS
- Extreme machining

FINGER CHUCK
- Precision workholding with point contact/clamping, no flattening of uneven parts

COMPENSATION CHUCK
- Shaft workholding with centre offset

6-JAW COMPENSATION LEVER CHUCK
- Low-deformation chucking of rings

CENTRING AND FACE CHUCK
- Fine turning

BOX JAWS
- Machining of large parts

SPECIAL CLAMPING CHUCK

For pipeline elements

SIZE

Diameter: 1140 mm

WORKPIECE

Pipes for the petroleum industry

APPLICATION

Pipe end machining (squaring, chamfering and thread cutting)

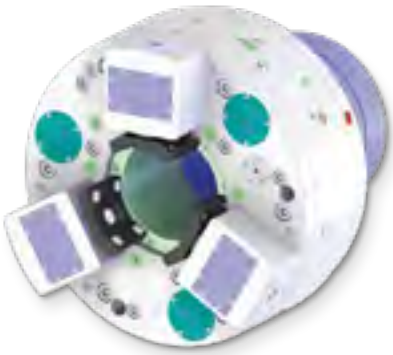
DESCRIPTION

- Front and rear chuck for special turning machines for pipe end machining
- Hydraulic 12-point clamping chuck, with changeover from centred to compensating action
- Front chuck additionally with integrated pre-centring function on one plane in front of the clamping jaws
- Centring jaws move fully back behind the level surface of the chuck body after centring

TECHNICAL DATA

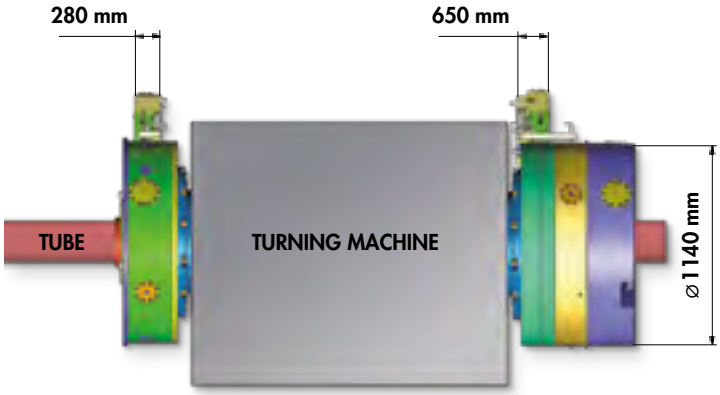
- Clamping range: 6 1/2" – 16"
- Clamping force: 40000 daN
- Max. speed: 500 rpm

Front chuck



Rear chuck

Force and accuracy – tailored to workpiece and process



~ 1600 kg

~ 3500 kg

3-FINGER CLAMPING CHUCK
With bolt

SIZE
Diameter: 315 mm

WORKPIECE
Slip rings

APPLICATION
Grinding

DESCRIPTION
- 3-finger clamping chuck (angled finger)
- Axial tension disc of the chuck is engaged using an electro magnet
- Chuck released with compression springs
- Chuck body made of high-strength aluminium, hard-coated and non-magnetic

3-FINGER CLAMPING CHUCK
With centring system

SIZE
Diameter: 315 mm

WORKPIECE
Flat lock washers

APPLICATION
Axial and radial cylindrical grinding

DESCRIPTION
- 3-finger clamping chuck (axial finger)
- 3 synchronised, clamping profile pins for positioning in the tooth gap
- Fast conversion to 2 workpieces
- Workpiece with hardening distortion: offsets are aligned

CENTRING AND FACE CHUCK
Radial displacement

SIZE
Diameter: 630 mm

WORKPIECE
Sheet metal housings

APPLICATION
Turning (inner and outer contours), drilling

DESCRIPTION
- Modular kit for flexible workholding of part families

COMPENSATION CHUCK WITH SPRING-LOADED CENTRING PINS
Hydraulic ball stud

SIZE
Diameter: 200 mm

WORKPIECE
Aluminium discs

APPLICATION
Face and external turning

DESCRIPTION
- Low-deformation chucking with hydraulic compensation
- Accommodation in positioning pins

HYDRAULIC 3-JAW CHUCK
Compensating

SIZE
Diameter: 315 mm
Clamping range: 150 – 225 mm
Clamping force: 14000 daN

WORKPIECE
Pipes for the petroleum industry

APPLICATION
Centring of tubes before (compensating) chucking on special turning machines for tube end machining

DESCRIPTION
- Hydraulic 3-jaw lever chuck, external and internal clamping

REAR CHUCK
Centred and compensating

SIZE
Diameter: 630 mm
Clamping range: 2 3/8" – 7"
Clamping force: 18000 daN
Max. speed: 1000 rpm

WORKPIECE
Pipes for the petroleum industry

APPLICATION
Pipe end machining (squaring, chamfering and thread cutting)

DESCRIPTION
- Hydraulic clamping chuck, with changeover, centred and compensating action

3-JAW LEVER CHUCK
With axial clamping

SIZE
Diameter: 420 mm
Height: 180 mm

WORKPIECE
Cast aluminium covers

APPLICATION
Turning

DESCRIPTION
- 2 conical spring-loaded tapers
- 3 clamping levers with axial clamping
- Integrated rinsing nozzles through the spindle of the turning centre

2+2 JAW CHUCK
for automotive parts

SIZE
Diameter: 400 mm

WORKPIECE
Differential housing

APPLICATION
Turning the spherical shape

DESCRIPTION
- 2+2 jaw chuck with axial pressure element and radial alignment unit

SPECIAL CLAMPING CHUCK
Console taper

SIZE
Diameter: 250 mm

WORKPIECE
Automotive parts

APPLICATION
Turning

DESCRIPTION
- Hydraulic clamping on lateral flange face

SPECIAL WORKHOLDING FIXTURE IN SPECIAL DESIGN
For face side machining

SIZE
Diameter: 280 mm
Height: 500 mm

WORKPIECE
Shafts, injector bodies

APPLICATION
Grinding the flat surface

DESCRIPTION
- Workholding device for clamping rotation-symmetrical workpieces
- Fixture flap for easier inserting of the workpiece

CENTRING WORKHOLDING FIXTURE
With vacuum

SIZE
700 x 700 x 420 mm

WORKPIECE
Carbon fibre brake discs

APPLICATION
Milling, drilling, spindles

DESCRIPTION
- 3-jaw centring from inside and outside
- 1 pneumatic alignment unit (indexer)
- Workpiece support rings with vacuum pockets
- Extraction channels with carbon fibre dust

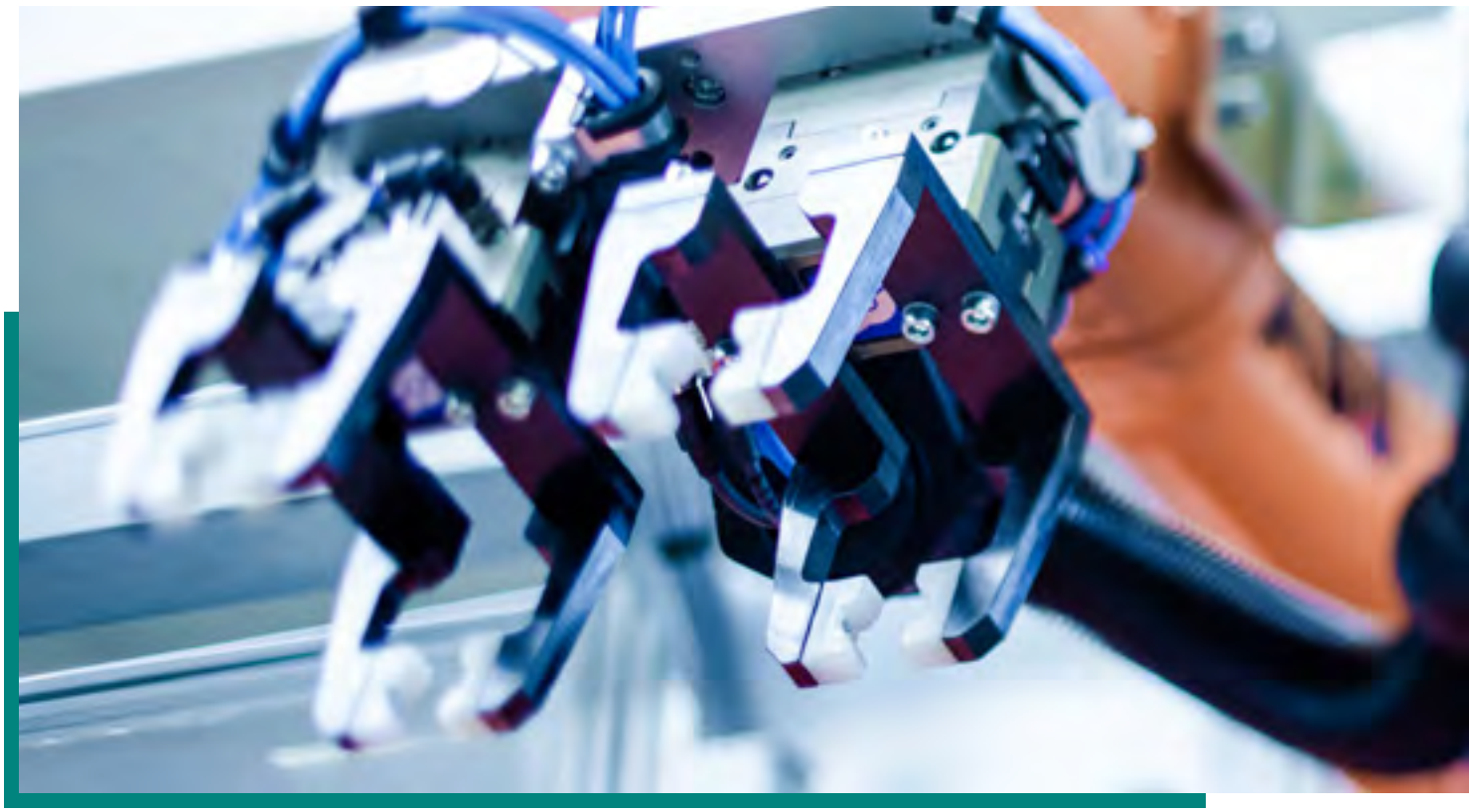
CENTRING WORKHOLDING FIXTURE
With axial clamping

SIZE
600 x 600 x 410 mm

WORKPIECE
Cast rings

APPLICATION
Milling with slotting cutter set

DESCRIPTION
- 4-jaw centring from inside
- 4-axial swivel clamps with pendulum claws
- Quick-change jaws
- Quick-change workpiece support



CHAPTER 5
AUTOMATION

We at SAV are reliable partners when it comes to optimising manufacturing processes. With our longstanding experience and our competence in the field of workholding, we also develop automation solutions which allow highly efficient production. Our automation systems can take on sorting, deburring, cleaning, testing, measuring and transporting.

We use our skills for the following topics, for example:

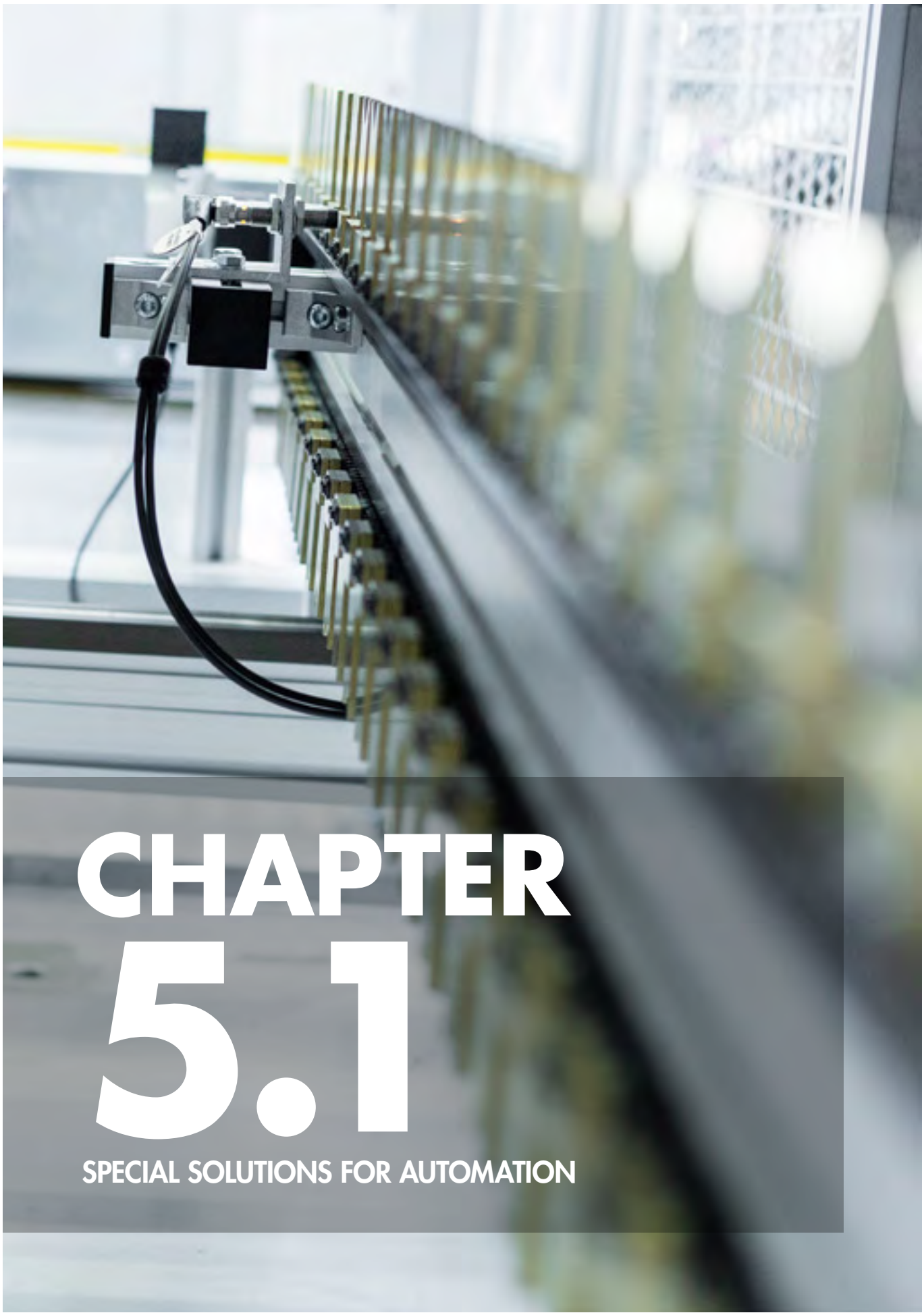
- Automation for machine tools – from blanks to finished parts
- Pallet changing and handling systems
- Intelligent integration of upstream and downstream processes – from workpiece detection to autonomous transport systems
- Linking systems

But we also have in-house experts and solutions for individual assembly and processing technology. The great advantage: We actually offer everything from a single source and share the responsibility for the entire workflow – from project management and development, design engineering and programming to manufacturing and installation, integration, commissioning, training and service.

“ WE DESIGN SOLUTIONS WITH FORESIGHT, PRECISION AND TOP EXPERTISE FOR ALL POSSIBLE PROCESSES –

YOUR REQUIREMENT IS OUR CHALLENGE.

ANDREAS WALTER
BUSINESS UNIT MANAGER
AUTOMATION



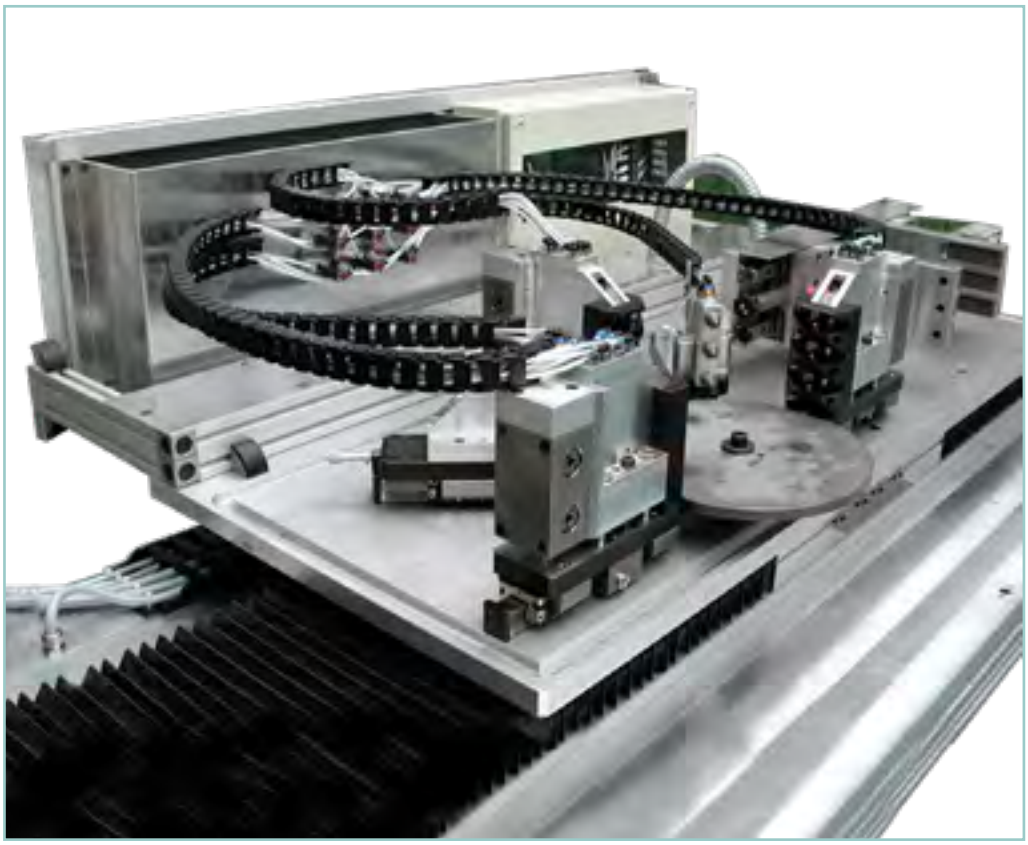
CHAPTER 5.1

SPECIAL SOLUTIONS FOR AUTOMATION

5. AUTOMATION

5.1 SPECIAL SOLUTIONS

PAGES 372 – 375



just experts.

PROMODUL ROBOT CELL

For modular automation

ECONOMICALLY VIABLE AUTOMATION EVEN FOR SMALL BATCH SIZES

APPLICATION

The ProModul production system is flexible and modular. You get exactly what you need. All ProModul units are coordinated and can be selected according to the task.

WORKPIECE

Up to 5 kg

YOUR BENEFIT

- Processing of OP 10 and OP 20
- Throughput increase in production – economically viable even for small batch sizes
- Avoids downtime through automated setup
- Unlimited unmanned runtime possible, as not limited by e.g. the number of pallets
- Complete solutions from a single source
- Completed workpieces
- Increased throughput
- Less work for employees
- Improves quality
- Increases output

FEATURES

- Automated handling of workpieces with re-gripping and gripper changes
- Optimisation of the workholding system: mechanical, hydraulic or electrical – controlled by the cell
- Easy to retrofit on existing machine tools
- ProModul units are mobile and can be used on different machine tools

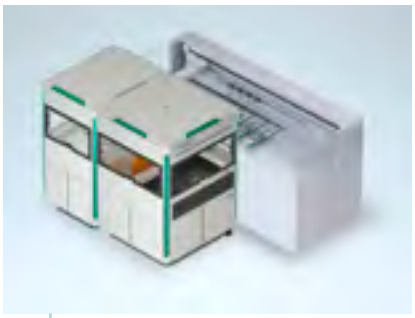
PROMODUL UNITS CAN BE INDIVIDUALLY ADAPTED TO:

- your workpieces
- your machine tool

THE MODULAR STRUCTURE

BASE MODULE

The ProModul R is linked to the machine tool for automatic loading of the workpieces.



LEFT OR RIGHT

Installation of an add-on module on the left or right of the ProModul R for further processing.
The robot of the ProModul R loads and unloads the add-on module with the workpieces.

LEFT AND RIGHT

Installation of another add-on module on the right of the ProModul R.
The robot of the ProModul R loads and unloads the two add-on modules with the workpieces.

OTHER AUTOMATED PROCESSES IN ADD-ON MODULES

Subsequent machining of the workpieces can be conducted in add-on modules. The ProModul R robot transfers the workpieces directly to the add-on modules.

Even minor assembly tasks, such as pressing in, can be completed in the add-on modules, so that workpieces can be completely machined by the modular ProModul production system using a fully automated process.

CHANGING

ProModul R

DEBURRING

ProModul D

MEASURING

ProModul M

LABELLING

ProModul S

PRESSING IN

ProModul P

DEMAGNETISING

ProModul E

SAV PALLET CHANGER PW 1250/1600

With NC rotary table

DESCRIPTION

- SAV pallet changer for up to 8 pallets 320 x 320 mm
- Handling control and pallet management by the machine controller or with integrated own controller

TECHNICAL DATA

Flexibly usable NC rotary table as workpiece pallet or electrode storage with integrated pneumatic handling for max. 100 kg handling weight for automatic machine loading and unloading.

DIMENSIONS

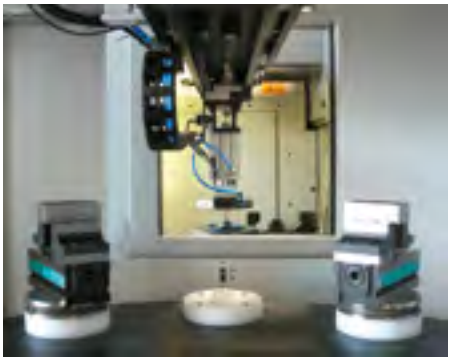
- Type PW 1600
  L x W x H: 1740 x 1740 x 1600 mm
  Table diameter: 1580 mm
- Type PW 1250
  L x W x H: 1250 x 1250 x 1600 mm
  Table diameter: 1180 mm

STORAGE CAPACITY

Flexibly designed workpiece holding plate for all currently known workholding systems.

TABLE DRIVE

NC rotary table with three-phase current servo motor for any angle position.



just experts.

SAV PALLET CHANGER PW 1600 - O

Open version

DESCRIPTION

- SAV pallet changer for up to 8 pallets 320 x 320 mm
- Handling control and pallet management by the machine controller or with integrated own controller
- Workpiece change possible without system stop
- Secured with a light curtain

TECHNICAL DATA

Flexibly usable NC rotary table as workpiece pallet or electrode storage with integrated pneumatic handling for max. 100 kg handling weight for automatic machine loading and unloading.

DIMENSIONS

- Type PW 1600 - 0
  L x W x H: 1740 x 1740 x 1600 mm
  Table diameter: 1580 mm

STORAGE CAPACITY

Flexibly designed workpiece holding plate for all currently known workholding systems.

TABLE DRIVE

NC rotary table with three-phase current servo motor for any angle position.

CHAPTER 6
GENERAL INFORMATION

INDEX

MAGNETIC WELDING AIDS

TOP PLATES, CLAMPING BLOCKS AND ACCESSORIES

CURRENT TRANSMISSION ELEMENTS

PRECISION DRESSING UNITS

PRECISION CYLINDRICAL GRINDING UNITS

ADJUSTMENT AND MEASURING DEVICES

LIFTING MAGNETS

POLARITY REVERSAL CONTROL UNITS

DEMAGNETISERS

GENERAL TERMS AND CONDITIONS

Last updated: June 2018

1. GENERAL INFORMATION, SCOPE

1.1. The legal relationships between the seller (SAV GmbH) and the customer ("buyer" in the following) are based on these General Terms and Conditions ("T&C" in the following). The T&C apply only to natural or legal entities or legally responsible limited companies which, at the time of entering into the contract, are exercising their commercial or self-employed professional activity (definition of company owner as per art. 14 par. 1 BGB [German Civil Code]) or to legal entities of public law or public separate funds.

1.2. The T&C apply in particular to contracts on the sale and/or delivery of movable property ("goods" in the following) without consideration of whether the seller produces these goods itself or purchases them from sub-suppliers (art. 433, 650 BGB) and to contracts for work and services (art. 631 BGB). The T&C apply in their current version as a framework agreement also to future contracts on the sale and/or delivery of movable objects with the same buyer, without the seller having to reference the T&C in every individual case. In case of any changes to the T&C, the seller will inform the buyer immediately. Such changes will come into force between seller and buyer if the buyer does not object to the validity within one month after receipt of the change notification and the seller has included information about the consequence of failure to object in the change notification.

1.3. Deviating, conflicting or supplementary General Terms and Conditions from the buyer will become part of the contract only if and insofar as the seller has expressly consented to their validity in writing. This requirement for consent also applies if the seller executes the delivery to the buyer outright while being aware of conflicting conditions or buyer's conditions deviating from these conditions.

1.4. Any individual agreements with the buyer made in individual cases (including subsidiary agreements, supplements and amendments) always take priority over these T&C.

1.5. Legally relevant declarations and notices which must be made by the buyer towards the seller after finalising of a contract (e.g. deadlines, notices of defect, declaration of termination or reduction) require the written form to become effective (excludes emails).

1.6. Information on the validity of legal provisions is only of clarifying character. Even without such a clarification, the legal provisions therefore apply, in as far as they are not directly changed or expressly excluded in these T&C.

2. QUOTATION and QUOTATION DOCUMENTS, TERMINATION

2.1. The seller's quotations are not binding and without obligation. This also applies if the seller provides the buyer with catalogues, images, technical documentation (e.g. drawings, plans, calculations, numerical simulations, references to DIN standards), other product descriptions or documents – also in electronic form – for which the seller reserves right of ownership and copyrights. The buyer must not make these objects accessible to third parties, disclose them, use them himself or through third parties or copy them, neither as such nor their content. Upon the seller's request, the buyer must return these objects to the seller in full and destroy any copies made, if these are no longer required by the seller as part of regular business or if negotiations do not lead to finalizing of a contract.

2.2. When the buyer orders the goods, this is considered as a binding tender to contract.

2.3. Acceptance can be declared either in writing (e.g. with an order confirmation) or by delivery of the goods to the buyer. Failure to respond to an order does not constitute acceptance under any circumstances.

2.4. The seller has the right to reject acceptance of an order by the buyer, in particular if it becomes evident that the seller's claim for payment from the individual contract would be at risk due to the buyer's lack of capacity for payment at the time of accepting the order. This is the case in particular if the customer's financial standing is rated as "high risk" (rating level 7 or lower) by Euler Hermes Forderungsmanagement Deutschland GmbH or if another reason as defined by art. 321 par. 1 BGB is present.

2.5. A verification of the stipulations in an order with respect to copyright or other intellectual property right infringements must be conducted by the buyer. If the buyer finds that the seller's stipulations or their implementation infringe the intellectual property rights of third parties, the seller can withdraw from the contract or – in case of a continuing obligation relationship or an already partially executed contract – terminate the order without notice.

2.6. The seller has the right to terminate the contract without notice if there is a good reason for this. A good reason is present in particular if it becomes evident after entering into the contract that the seller's contractual payment claims are at put at risk by the customer's capacity for payment. Legal reasons for refusal to perform, termination and withdrawal remain unaffected.

3. PRICES AND PAYMENT TERMS

3.1. Unless otherwise agreed in individual cases, the seller's prices current at the time of entering into the contract apply. The prices apply ex warehouse including packaging. The prices are exclusive of the current statutory added-value tax.

3.2. For shipment sales (section 5.1 of these T&C), the seller is additionally responsible for paying the transport/shipping costs ex warehouse and the costs of any transport insurance requested by the buyer. Any customs duties, fees, taxes and other public levies must be paid by the seller.

3.3. The purchase price is due and payable within 5 days of shipping of the goods. For contracts with a delivery value of over 5,000.00 EUR, however, the seller has the right to demand a payment on account of 1/3 of the purchase price. The payment on account is due and payable within 5 days of the invoice date.

3.4. The seller will be considered in default of the payment when the payment period shown above has expired. During the default period, interest must be paid on the purchase price at the applicable legal default interest rate at the time, but at last to the amount of 9 per cent above the applicable base rate of the European Central Bank at the time. The seller's claim to the commercial default interest (art. 353 HGB [German Commercial Code]) remains unaffected towards business persons. The seller reserves the right to assert claims for additional damage caused by default.

3.5. The seller is entitled to offsetting or retention rights only insofar as its claim has been established in a legally binding manner or is uncontested. In case of defects on the delivery, the seller's reciprocal rights, in particular as per section 7.6, sentence 2 of these T&C, remain unaffected.

3.6. If it becomes evident after entering into the contract that the seller's claim to the purchase price is at risk due to the buyer's lack of capacity for payment (e.g. due to an application for initiating insolvency proceedings), the legal provisions give the seller the right to a refusal to fulfil the obligation and – after fixing of a time limit, if applicable – the right to withdraw from the contract. For contracts concerning the production of non-exchangeable goods (custom products), the seller can declare withdrawal immediately; the legal provisions on dispensing with the fixing of a time limit remain unaffected.

4. DELIVERY DEADLINE AND DEFAULT IN DELIVERY

4.1. The delivery deadline must be agreed upon individually or must be set by the seller with reasonable discretion upon acceptance of the order. If this is not the case, the delivery deadline is 8 weeks from the date of entering into the contract. Delivery is "ex works".

4.2. Partial deliveries are permitted to a reasonable extent. These are invoiced separately.

4.3. If the seller cannot comply with binding delivery deadlines due to reasons for which it is not responsible (e.g. non-availability of the product/service, any interruption of operations, impossibility of manufacturing the goods on the common machines, difficulties in procuring material or energy sources, transport delays, strike, lawful lockouts, lack of workforce, lack of energy sources or raw materials, difficulties in procuring the required official approvals, official measures, or incorrect, late or failed deliveries from suppliers), the seller must inform the buyer of this without delay and at the same time notify the buyer of the expected new delivery deadline. If the product/service is not available within the new delivery deadline, the seller has the right to withdraw from the contract wholly or in part if the seller informs the buyer about the non-availability within the new delivery deadline without delay; any counterperformance already provided by the buyer must be immediately reimbursed by the seller. Non-availability of the product/service in this sense is in particular a failure of the sub-supplier to supply the seller in time if the seller has entered into a congruent covering transaction, neither the seller nor the sub-supplier are at fault or the seller is not obligated to procure in the individual case.

4.4. The legal provisions determine when the seller defaults on the delivery. In any case, however, a reminder notice from the buyer is required.

4.5. The legal requirements notwithstanding, the buyer is only entitled to withdraw from the contract if the seller is responsible for the failure to comply with the delivery deadline and/or if the buyer had set the seller a reasonable period of grace which has expired.

4.6. The buyer's rights as per section 8 of these T&C and the seller's legal rights, in particular in case of an exclusion of the obligation to perform (e.g. due to impossibility or unreasonableness of the performance and/or subsequent performance) remain unaffected.

5. DELIVERY, PLACE OF DELIVERY, TRANSFER OF RISK, ACCEPTANCE, DELAY IN ACCEPTANCE

5.1. Delivery is ex warehouse. Place of delivery is the seller's location. At the buyer's request and at the buyer's expense and risk, the goods will be sent to a different destination (shipment sales). Unless agreed otherwise, the seller has the right to determine the shipping method (in particular forwarding company, shipping route, packaging) independently.

5.2. Any tools, moulds, devices, models, assembly parts and other production equipment (jointly "tools") to be provided must be handed over to the seller free of charge, free of extra costs and in good time, without the seller becoming liable for their deterioration or destruction. The seller has the right to dispose of, at the buyer's expense, any tools or paid-for goods which have not been collected within a reasonable period set by the seller.

5.3. If an acceptance as per the legal provisions is required, the buyer must accept the completed work, which is ready for acceptance, upon request or upon notification of completion by the seller. If the buyer refuses the acceptance, it must notify the seller of the defects without delay, but within of 15 working days after provision of the work at the latest.

5.4. If the buyer does not refuse the acceptance within the above period listing at least one defect, the work will be considered as accepted. This also applies if the work is commissioned or put into use. The buyer must not refuse acceptance in case of insignificant defects.

5.5. The risk of accidental destruction and accidental deterioration of the goods is transferred with handover to the buyer at the latest.

5.6. For shipment sales, however, the risk of accidental destruction and accidental deterioration of the goods as well as the risk of delay passes already with delivery to the forwarder, the carrier or the person or institution otherwise designated for executing the shipping (the start of the loading process is decisive). If an acceptance has been agreed, this is decisive for the transfer of risk. If the buyer defaults on the acceptance, this is equivalent to handover or acceptance.

5.7. If the buyer has defaulted on the acceptance or omits to perform a cooperation task or if the delivery from the seller is delayed for other reasons for which the buyer is responsible, the seller has the right to demand compensation for the damage caused by this, including additional expenditure (e.g. storage costs). For this, the seller will charge a flat-rate compensation of 0.25 % of the invoice total for each full calender week, starting with the expiration of the delivery deadline or – if no delivery deadline was set – with the notification of readiness for shipping of the goods, but to a maximum of 10.00 % of the purchase price of the goods or of the wages. The compensation will not be omitted in case of a final non-acceptance.

5.8. The proof of a higher damage and the seller's legal claims (in particular compensation for additional expenditures, adequate reimbursement, cancellation) remain unaffected; the flat-rate payment, however, must be offset against further claims for damages or compensation for expenditures.

5.9. The buyer is entitled to prove that only a substantially lesser damage than the above flat-rate (section 5.5) or no damage at all was sustained by the seller.

GENERAL TERMS AND CONDITIONS

6. RETENTION OF TITLE

6.1. The seller retains the title in the goods until receipt of all current and future claims from the contract of sale and an ongoing business relationship with the buyer.

6.2. If the buyer acts in breach of the terms of the contract, in particular by failing to pay the due purchase price and by refusing the acceptance, the seller has the right to withdraw from the contract as per the legal provisions and/or to demand return of the goods based on the retention of title. If the seller demands return of the goods, this does not at the same time include a declaration of withdrawal from the contract, unless the seller has expressly declared this in writing. The seller rather has the right to simply demand return of the goods and reserve the right to withdrawal. If the buyer does not pay the due purchase price, the seller has the right to assert these rights only if it had previously set a reasonable payment deadline for the buyer without success or if such a deadline is expendable as per the legal provisions.

6.3. The buyer has the duty to take good care of the goods subject to retention of title. In particular, the buyer has the duty to sufficiently insure these against fire, water and theft damage to the value as new at its own expense. If maintenance and inspection work is required, the buyer must carry these out in good time at its own expense.

6.4. The goods subject to retention of title must not be mortgaged or transferred as a safety to third parties before complete payment has been made. In case of seizure or other interventions by third parties, the buyer must notify the seller in writing immediately.

6.5. The buyer has the right to resell and/or process the goods subject to retention of title as part of regular business routine. The following provisions apply additionally in this case:

6.5.1. The seller must transfer to the buyer already at this time all claims which arise for him from the reselling towards its purchasers or third parties, regardless of whether the goods have been sold without or after processing. This constitutes acceptance of the transfer by the buyer. The buyer remains authorised to collect this claim even after the transfer. The seller's authority to independently collect the claim remains unaffected by this. The seller, however, undertakes not to collect the claim as long as the buyer is meeting its payment obligations towards the seller, has not defaulted on its payments and has not filed for initiating insolvency proceedings and no other defect has occurred in its capacity for payment. If this is the case, however, the seller can demand that the buyer discloses the ceded claims and their debtors to the seller, provides all information required for collection, hands over the associated documents and notifies the debtors (third parties) of the transfer

6.5.2. Processing or reshaping of the goods subject to retention of title by the buyer must always be conducted for the seller as the manufacturer as per art. 950 BGB. The buyer's expectancy for the goods continues in the reshaped object. If the goods subject to the retention of title are processed jointly with other objects not belonging to the seller, the seller acquires part ownership in the new object at the ratio of the invoice value of the seller's goods to the other processed objects at the time of processing. Apart from that, the same applies to the object resulting from the processing as to the goods delivered subject to retention of title.

6.5.3. If the goods subject to the retention of title are inseparably joined, mixed or blended with other objects not belonging to the seller, the seller acquires part ownership in the new object at the ratio of the invoice value of the seller's goods to the other joined, mixed or blended objects at the time of processing. Mixing or blending. If the joining, mixing or blending is conducted in such a way that the buyer's object can be regarded as the main object, it must be considered as agreed that the buyer transfers part ownership to the seller at the respective ratio. The seller must accept this transfer. Apart from that, the same applies to the object resulting from the joining, mixing or blending as to the goods delivered subject to retention of title.

6.5.4. The buyer must keep in its custody the sole ownership or part ownership in an object resulting as per sections 6.5.2 and 6.5.3 for the seller as the indirect owner free of charge.

6.6. The buyer undertakes to release the securities to which the seller is entitled at the seller's request insofar as the realisable value of the seller's securities exceeds the claims to be secured by more than 10.00 %; the selection of the securities to be released is incumbent on the seller.

7. WARRANTY

7.1. The legal provisions apply to the buyer's rights in case of material defects and legal deficiencies (including defective delivery and short delivery as well as inexpert assembly/installation or inadequate assembly/installation instructions), unless specified otherwise in the following. In all cases, the special legal provisions remain unaffected in case of final delivery of the goods to a consumer (supplier recourse as per art. 445a, 445b, 477,478 BGB), insofar as the right to compensation is not affected.

7.2. The seller's warranty is primarily based on the agreement made on the condition and quality of the goods. The agreement on the condition and quality of the goods are the product descriptions designated as such (also from the manufacturer) which were handed over to the buyer before the order or which were included in the contract.

7.3. Insofar as the condition and quality was not agreed upon, an assessment as to whether a defect is present or not must be made based on the legal regulations (art. 434 par. 1 sent. 2 and 3 BGB). The seller accepts no liability, however, for public statements by the manufacturer or other third parties (e.g. advertising statements). The seller also accepts no liability for defects caused by unsuitable or inexpert use, incorrect assembly/installation or startup by the buyer or third parties, normal wear and tear, or incorrect or negligent handling. Beyond this, the seller also accepts no liability for defects which result from inexpert changes made without the seller's consent or from repair work carried out by the buyer or third parties.

7.4. The buyer's warranty rights require that the buyer has correctly met its examination and notification obligations as per art. 377, 381 HGB. If a defect becomes evident during the examination or subsequently, the seller must be notified of this in writing immediately. The notification is regarded as having been issued immediately if it occurs within 2 weeks from the occurrence of the defect, whereby the timely dispatch of the notification is sufficient for meeting this deadline. If the buyer fails to notify the seller of the defect, the goods will be regarded as approved. Independent of this examina-

tion and notification obligation, the buyer must report any obvious defects – i.e. defects which are apparent with correct examination – (including defective delivery and short delivery) in writing within 2 weeks from delivery, whereby here as well the timely dispatch of the notification is sufficient for meeting this deadline. If the buyer does not carry out the correct and timely examination and/or notification of defects, the seller's liability for the defect which was not reported or not reported in due time will be excluded. The goods will then be regarded as approved.

7.5. If the delivered object is defective, the seller can initially choose whether to provide subsequent performance by eliminating the defect (rectification) or by delivering an object free from defects (substitute delivery). The seller's right to refuse subsequent performance subject to the legal requirements remains unaffected.

7.6. The seller has the right to make the owed subsequent performance dependent on the buyer paying the due purchase price.

7.7. The buyer, however, has the right to retain a part of the purchase price at the appropriate ratio of the defect. The buyer must grant the seller the time and opportunity required for the owed subsequent performance; in particular the buyer must hand over the nonconforming goods for verification purposes. In case of a substitute delivery, the buyer must return the nonconforming object to the seller as per the legal provisions. Subsequent performance includes neither de-installation of the nonconforming object nor re-installation if the seller was originally not obligated to carry out installation, unless the seller is responsible for the defect.

7.8. The seller is responsible for paying the expenditures, in particular transport, travel, labour and materials costs, if a defect is indeed present. If the buyer's demand for elimination of a defect proves to be unjustified, however, the seller can demand compensation for the incurred costs from the buyer. The seller only pays the costs for de-installation and re-installation if and insofar as it is liable for paying damages for the defect.

7.9. In urgent cases, e.g. if operational safety is at risk or if excessively high damage must be averted, the buyer has the right to eliminate the defect independently and to demand compensation from the seller for the expenditures objectively required for this. The seller must be notified of such independent remedial actions immediately, beforehand if possible. The right to eliminate defects independently does not apply if the seller would be entitled to refuse the respective subsequent performance as per the legal provisions.

7.10. If the subsequent performance has failed or if a grace period set by the buyer for the subsequent performance has expired unsuccessfully, the buyer has the right to choose whether to withdraw from the contract of sale or to demand an appropriate reduction of the purchase price. No right to withdrawal applies, however, in case of an insignificant defect.

7.11. The buyer can claim for damages or compensation for futile expenditures only as per section 8 of these T&C and these are otherwise excluded

8. OTHER LIABILITIES

8.1. Unless stipulated otherwise in these T&C including the following provisions, the seller is liable as per the applicable legal provisions in case of infringement of contractual and non-contractual obligations.

8.2. The seller is only liable to pay damages – regardless of the legal basis – in case of intent and gross negligence. In case of ordinary negligence, the seller is liable only

8.2.1. for damage resulting from injury to life, body or health

8.2.2. for damage resulting from the breach of an essential contractual duty (duty where fulfilment only enables correct execution of the contract in the first place and for which the other party to the contract regularly trusts or can regularly trust that it will be fulfilled); in this case, however, liability is limited to compensation for the foreseeable, typically occurring damage

8.3. The liability limitations resulting from section 8.2 do not apply insofar as the seller has fraudulently concealed or intentionally caused a defect or has accepted a guarantee for the quality and condition of the goods, as well as for any buyer's claims based on product liability law. The buyer can only withdraw from or cancel the contract due to breach of duty if the seller is responsible for the breach of duty. A free right of cancellation for the buyer (in particular as per art. 650, 648 BGB) is excluded. Apart from that, the legal requirements and legal consequences apply.

8.4. Insofar as the seller's liability is excluded or limited, this also applies to the personal liability of the seller's employees, legal representatives and agents.

8.5. The buyer bears the full burden of proof for the presence of the defect.
Art. 477, 478 par. 1 BGB remain unaffected in case of a final sale in the delivery chain to a consumer.

8.6. The buyer – also beyond the duties incumbent on it as per art. 254 BGB – is obligated to alert the seller to the risk of an unusually high damage and to make all reasonable efforts to avert or mitigate damage.

9. INTELLECTUAL PROPERTY RIGHTS

9.1. As per this section 9, the seller is responsible for the goods being free from intellectual property rights or copyrights by third parties, insofar as the goods were not manufactured based on the buyer's specifications (drawings, design, plans. etc.). Each party to the contract must immediately notify the other party in writing if any claims are made towards it due to the infringement of such rights.

GENERAL TERMS AND CONDITIONS

9.2. If the goods infringe on a commercial property right or copyright of a third party, the seller must change or replace the goods – as per the seller's choosing and at its own cost – in such a way that no third-party rights are infringed any longer while the goods continue to fulfil the contractually agreed functions or the seller must provide the buyer with the usage right by entering into a license agreement. If the seller is unable to do this within a reasonable period of time, the buyer has the right to withdraw from the contract or to reduce the purchase price by a reasonable amount. Any claims for damages by the buyer are subject to the restrictions of section 8 of these T&C.

9.3. If products from other manufacturers delivered by the seller cause any legal breaches, the seller must choose to either assert its claims against the manufacturers and sub-suppliers on account of the buyer or transfer these to the buyer. In these cases, claims against the seller as per section 9 exist only if a legal enforcement of the claims listed above against the manufacturers and sub-suppliers failed or is expected to fail, e.g. due to insolvency. However, as per further specification of section 8, the seller owes compensation for damage or expenditures only if it is responsible for the defective title.

10. CONFIDENTIALITY

10.1. Each party to the contract must use any documents (this also includes samples, models and data) and knowledge gained from the business relationship only for the jointly pursued purposes and keep these confidential from third parties with the same diligence as its own comparable documents and knowledge if the other party to the contract designates these as confidential or has an obvious interest in their secrecy.

10.2. This duty starts from initial receipt of the documents or knowledge and ends 36 months after the end of the business relationship.

10.3. The duty does not apply to documents and knowledge which are generally known or were already known to the party to the contract at the time of receipt without being obligated to secrecy, or which are subsequently transferred by a third party authorised to pass these on, or which were developed by the receiving party to the contract without using secret documents or knowledge from the other party.

11. LIMITATION OF TIME

11.1. Deviating from art. 438 par. 1 no. 3, 634a par. 1 no. 3 BGB, the limitation period for claims from material defects and legal deficiencies is one year after handover. If an acceptance is agreed or required by law, the limitation period starts with the acceptance. In case of claims based on injury to life, body or health and in cases of intent and gross negligence, the statutory limitation period is maintained.

11.2. If the goods are a building or an object which was used for a building according to its usual mode of use and caused the building's defect (construction material), the limitation period as per the legal provisions is 5 years from handover (art. 438 par. 1 no. 2, 634a par. 1 no. 2 BGB). Special legal regulations for rights in rem of third parties (art. 438 par. 1 no. 1 BGB), in case of fraudulent behaviour by the seller (art. 438 par. 3 BGB) and for claims in supplier regress in case of final delivery to a consumer (art. 445b, 478 par. 2 BGB) remain unaffected. Instead of the limitation periods as per art. 445b BGB, however, only the limitation period as per the previous section applies if the final sale in the delivery chain is not a consumer goods purchase.

11.3. The above limitation periods also apply to contractual and pre-contractual or non-contractual claims for compensation by the buyer which are based on a defect on the goods, unless the application of the regular statutory limitation period (art. 195, 199 BGB) would result in a shorter limitation in the individual case. The limitation periods from the product liability law remain unaffected in all cases. The statutory limitation periods exclusively apply to any other claims for compensation by the buyer as per section 8.

12. GENERAL PROVISIONS

12.1. These T&C and the relationship between seller and buyer are solely governed by the law of the Federal Republic of Germany, unless agreed otherwise. The application of international uniform law, in particular the United Nations Convention of 11 April 1980 on Contracts for the International Sale of Goods, is excluded. Assumptions and effect of ownership subject to section 6 are subject to the laws at the respective location of the object, insofar as it renders the choice in favour of German law invalid or ineffective.

12.2. Nürnberg (Germany) is the exclusive – also international – place of jurisdiction for all disputes arising directly or indirectly from the contractual relationship.

NOTES

NOTES

MAGNET SYSTEMS

STATIONARY WORKHOLDING

ROTARY WORKHOLDING

AUTOMATION

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