



# STATIONARY WORKHOLDING STANDARD & SPECIAL PRODUCTS

# SAV4

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SAV-

CATALOGUE II **STATIONARY WORKHOLDING** 





### STANDARD & SPECIAL PRODUCTS









THE COMPANY



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## THE PARTNER FOR:

- Workholding technologies magnetic-hydraulic-mechanical-vacuum
- Stationary and rotary workholding All technologies
- Heavy lifting systems

- Automation
- Standard parts
- Special applications

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 $\bigcirc$ 







### **ENGINEERING, R&D**





### Leading in technology – Not just a catch phrase for SAV

Research and development is the basis of our success. We develop magnetic, hydraulic, mechanical and vacuum technology solutions for our customers as well as tools and prototypes according to our customer's specifications. We have a network of approximately 25 CAD workstations at several locations. All of them are equipped with 3D-systems and FEM programmes for magneto-static, thermal, static and dynamic analyses.



Development competences in:





### The engineering of standard and special solutions

Our engineering department is specialised in the development and engineering of rotary workholding solutions. Our high levels of expertise enable us to implement your specific requirements.

Our many years of experience in the area of special-, workholding and lifting system solutions are integrated into the development of our standard products to ensure optimal results and the highest possible flexibility in their application.



### PRODUCTION



### The production of standard and special solutions

Our products are manufactured in our state-of-the art production facilities which are designed for various production processes.

5-Axis milling, circular and surface grinding, wire cutting and sinking operations are carried out in our own production facilities.

In order that we are able to offer our customers excellent levels of product





### **Our production facilities**

- 55 CNC-machining centres up to 5000 mm machining length and 3000 mm in width
- 2 CNC Gantry milling machines Gantry range 3 m, table length 5 m
- 4 HSC 5 axis milling machines
- 50 profile / surface / coordinate / circular (internal and outside) grinding machines up to 4000 mm machining length.
- Magnet test bench up to 50,000 kg





- We manufacture globally. Our main production facilities
- are located in Nuremberg, Mittweida and Göppingen in Germany. Naturally, our standard products are employed in our own production processes.
- This enables our experienced development team to continually monitor and improve the product specifications which provides a practical benefit to our customers.

- 12 wire cutting and sinker EDM machines
- 4 CNC horizontal lathes
- 1 large horizontal lathe Face plate diameter 3000 mm
- 4 coordinate measuring machines Range: x = 600 mm, y = 1000 mm,z=465 mm
- 1 injection moulding machine



### FROM STANDARD TO COMPLEX INTEGRATION



# 

- A Quality, operational safety and longevity
- ➡ Cost effectiveness
- Precision solutions
- Competence in problem solving
- + High clamping forces appropriate to the workpiece characteristics
- + Flexibility through R&D and our own production technologies
- ➡ Innovation new technologies
- Applications "Made in Germany"

### WORKHOLDING SOLUTIONS FOR TURNING, GRINDING AND MILLING

- → Universal and flexible
- Low wear and low maintenance
- Combined solutions
- Automation
- Adaptable for every spindle specially for your machinery
- Comprehensive solutions
- On-site service and installation
- → Workpiece and process orientated solutions
- Optimization of setup times

## SAV-CATALOGUES WORKHOLDING / SPECIAL SOLUTIONS

We develop and produce workholding technologies including individual solutions for your workpieces and operating requirements. Please request the SAV catalogues





Download under www.group-sav.com

SPANNTECHNIK



8 Catalogue II

www.group-sav.com









LEGAL NOTICE

# SAV.

## **CHAPTER OVERVIEW**

### CHAPTER 1

### MODULAR WORKHOLDING ELEMENTS

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If not otherwise specified, standard tolerances shall apply: Linear dimensions according to DIN ISO 2768-1-m Geometric and positional tolerances according to DIN ISO 2768-2-K Metric ISO-screw threads according to the tolerance classes medium

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### **APPLICATIONS**

### **MODULAR CLAMPING RAILS**

Clamping rails of 50 and 80 mm widths. Lengths of 200 to 500 mm. Wedge clamps, fixed jaws, aluminium jaws and pallets in various dimensions. Adapter system to connect clamping rails. A comprehensive clamping system with which it is possible to achieve an optimal clamping solution for almost all workpieces on almost machining centers.



### **APPLICATIONS**

### **MODULAR CLAMPING RAILS**

- · When you need optimal workpiece clamping
- · When you want economical clamping components
- · When innovative clamping concepts are required
- When economical production concepts are required

### HOLDING FORCES OF THE SAV-WEDGE CLAMPS



Holding forces with cleaned clamping elements and lubricated bolts tighten with a torque wrench





### FIXED CLAMPING JAW, WITH TOOTHING

#### 2mm pitch, toothed, clamping face

#### Application:

- The fixed stop is positioned on the clamping rail and fastened using the tensioning bolt and the jaw grips flush with the 2 mm toothing on the rail.

#### Execution:

- Material: Case-hardened steel 21MnCr5
- Tempered and case-hardened to 52 HRC
- Case depth 0.6 mm

		Dime	Thread D	Weight					
Α	A2	В	C	C1	C2	C3	DIN 912	in kg	
30	15	42	22	20	15	11	M6	0,30	
40	20	42	22	20	15	11	M6	0,37	
50	25	42	22	20	15	11	M6	0,45	
72	36	42	29	27	22	14,5	M6	0,80	

#### Ordering example:

Fixed clamping jaw, with toothing SAV 208.01 - 72 SAV-No. Designation - A

### CLAMPING WEDGE ELEMENT, WITH TOOTHING

#### 2mm pitch, toothed, clamping face

#### Application:

- Quick and secure clamping of workpieces
- Tensioned via the cylinder bolt and the wedge element, which moves the clamping jaw and thereby presses the workpiece against the stop.

#### Execution:

- Material: Case-hardened steel 21MnCr5
- Tempered and case-hardened to 52 HRC
- Case depth 0.6 mm

		Dii	nensio	Thread D	Holding	Weight				
Α	A1	A2 B <sub>min</sub> B <sub>max</sub> C C1		C2	DIN 912	force in kN	in kg			
30	40	15	49	55	22	20	29	M5	30	0,32
40	50	20	49	55	22	20	29	M5	30	0,40
50	60	25	49	55	22	20	29	M5	30	0,50
72	84	36	57	67	29	27	40	M6	30	1,10

#### Ordering example:

Clamping wedge element, with toothing SAV 208.02 - 72 Designation SAV-No. - A



SAV	208.	02

SAV 208.01



### **FIXED CLAMPING JAW, GROOVED**

#### Application:

- The fixed stop is positioned on the clamping rail and fastened using the tensioning bolt and the jaw grips flush with the 2 mm toothing on the rail.

#### Execution:

- Material: Case-hardened steel 21MnCr5
- Tempered and case-hardened to 52 HRC
- Case depth 0.6 mm

D	imensio	ns in m	Thread D	Weight		
Α	В	C	C1	DIN 912	in kg	
30	42	22	11	M5	0,30	
40	42	22	11	M5	0,37	
50	42	22	11	M5	0,45	
72	42	29	14,5	M6	0,80	

#### Ordering example:

Fixed clamping jaw, grooved Designation

#### SAV 208.03 - 72 SAV-No. - A

#### With grooved clamping face

#### Application:

- Quick and secure clamping of workpieces

- Tensioned via the cylinder bolt and the wedge

element, which moves the clamping jaw and thereby presses the workpiece against the stop.

#### Execution:

- Material: Case-hardened steel 21MnCr5

- Tempered and case-hardened to 52 HRC

- Case depth 0.6 mm

	D	imensio	Holding	Weight			
Α	A1	B <sub>min</sub> *	B <sub>max</sub> *	C <sub>min</sub>	C <sub>max</sub>	force in kN	in kg
30	40	39	45	22	29	30	0,27
40	50	39	45	22	29	30	0,34
50	60	39	45	22	29	30	0,40
72	84	47	57	29	40	30	0,87

\* Includes material oversize allowance (5 mm) to enable the inclusion of special profile geometries.

#### Ordering example:

Clamping wedge element, grooved	SAV 208.04 - 72	
Designation	SAV-No A	



### SAV 208.03







**CLAMPING WEDGE ELEMENT, GROOVED** 

SAV 208.04





### FIXED CLAMPING JAW, SMOOTH

#### Fixed clamping jaw, smooth

#### Application:

- The fixed stop is positioned on the clamping rail and fastened using the tensioning bolt and the jaw grips flush with the 2 mm toothing on the rail.
- Execution:
- Material: Case-hardened steel 21MnCr5
- Tempered and case-hardened to 52 HRC
- Case depth 0.6 mm

	D	imensio	ns in m	Thread D	Thread	Weight			
Α	A2	В	C	C1   C2		DIN 912	G	in kg	
30	15	42	22	15	11	M5	M6	0,30	
40	20	42	22	15	11	M5	M6	0,37	
50	25	42	22	15	11	M5	M6	0,45	
72	36	42	29	22	14,5	M6	M6	0,81	

Ordering example:	
Fixed clamping jaw, smooth	SAV 208.05 - 72
Designation	SAV-No A

### **CLAMPING WEDGE ELEMENT, SMOOTH**

#### With smooth clamping faces

#### Application:

- Quick and secure clamping of workpieces
- Tensioned via the cylinder bolt and the wedge element, which moves the clamping jaw and thereby presses the workpiece against the stop.

#### Execution:

- Material: Case-hardened steel 21MnCr5
- Tempered and case-hardened to 52 HRC
- Case depth 0.6 mm

ſ		D	imensio	Holding	Weight				
	Α	A1	B <sub>max</sub> *	$\mathbf{B}_{\min}^{*}$	C <sub>min</sub>	C <sub>max</sub>	force in KN	in kg	
	30	40	45	39	22	29	30	0,27	
	40	50	45	39	22	29	30	0,34	
	50	60	45	39	22	29	30	0,40	
	72	84	57	47	29	40	30	0,87	

\* Clamping faces with extra 5 mm material for special profiles

### Ordering example:

Clamping wedge element, smooth	SAV 208.06	5 - 30
Designation	SAV-No.	- A





### **CLAMPING WEDGE ELEMENT, OVERSIZED**

#### With an extra 5 mm material on the clamping faces

#### Application:

- Quick and secure clamping of workpieces
- Tensioned via the cylinder bolt and the wedge element, which moves the clamping jaw and thereby presses the workpiece against the stop.

#### Execution:

- Material: Case-hardened steel 21MnCr5
- Tempered and case-hardened to 52 HRC
   Case depth 0.6 mm
- Clamping wedge with extra material to
- allow the inclusion of special profiles

		Dim	ensions	in mm			Thread D	Holding	V
Α	A1	A2	$\mathbf{B}_{\min}^{*}$	B_max*	C <sub>min</sub>	C <sub>max</sub>	DIN 912	force in kN	
30	40	14	49	55	22	29	M5	30	(
40	50	20	49	55	22	29	M5	30	(
50	60	25	49	55	22	29	M5	30	(
72	84	36	57	67	29	40	M6	30	

\* Clamping faces with extra 5 mm material for special profiles

#### Ordering example:

Clamping wedge element, oversized SAV 208.07 - 30 Designation SAV-No. - A





MAAAAAN

SAV 208.06

SAV 208.05



### **CLAMPING OF ROUND PARTS – APPLICATION EXAMPLE**



**APPLICATIONS** 

# SAV-

## FIXED JAW, WITH TOOTHING

#### For 5-axis clamping block, 2mm pitch, toothed, clamping face

#### Application:

The fixed stop is positioned on the clamping rail and fastened using the tensioning bolt and the jaw grips flush with the 2 mm toothing on the rail.

#### Execution:

- Material: Case-hardened steel 21MnCr5
- Tempered and case-hardened to 52 HRC
- Case depth 0.6 mm

		Dime	Thread	Thread	Wei				
Α	A2	В	С	C1	C2	C3	D	G	in I
40	20	42	22	15	11,0	2	M5	M6	0,2
72	36	42	29	22	14,5	2	M6	M6	0,5

Ordering example:	
Fixed jaw, with toothing	SAV 208.10 - 40
Designation	SAV-No A

### CLAMPING WEDGE ELEMENT, WITH TOOTHING

### For 5-axis clamping block, 2mm pitch, toothed, clamping face

#### Application:

Quick and secure clamping of workpieces
Tensioned via the cylinder bolt and the wedge element, which moves the clamping jaw and thereby

presses the workpiece against the stop.

#### Execution:

- Material: Case-hardened steel 21MnCr5

- Tempered and case-hardened to 52 HRC

- Case depth 0.6 mm

			Dime	nsions	in m	n			Thread	Holding	V
Α	A1	A2	<b>B</b> <sub>min</sub>	<b>B</b> <sub>max</sub>	C <sub>min</sub>	C <sub>max</sub>	C1	C2	D	force in kN	i
40	50	20	53	60	22	29	11,0	20	M5	30	C
72	84	36	65	75	29	40	14,5	27	M6	30	1

Ordering example:	
Keilspann-Element, mit Krallen	SAV 208.
Designation	SAV-No.





- 5 Axis elements with improved access

- Raised jaws for swivel tables and rotary tables

- Off-set top jaws for improved tool access



# SAA

# SA/

### **FIXED JAW, SMOOTH**

#### For 5-axis clamping block

#### Application:

- The fixed stop is positioned on the clamping rail and fastened using the tensioning bolt and the jaw grips flush with the 2 mm toothing on the rail.
- Execution:
- Material: Case-hardened steel 21MnCr5
- Tempered and case-hardened to 52 HRC
- Case depth 0.6 mm

	D	imensio	ns in m	Thread	Thread	Weight		
Α	A2	В	C	C1	C2	D	G	in kg
40	20	42	22	15	11,0	M5	M6	0,23
72	36	42	29	22	14,5	M6	M6	0,55

Ordering example:			
Fixed jaw, smooth	SAV 208.12	_	40
Designation	SAV-No.	-	А

### **CLAMPING WEDGE ELEMENT, SMOOTH**

#### For 5-axis clamping block

#### Application:

- Quick and secure clamping of workpieces
- Tensioned via the cylinder bolt and the wedge element, which moves the clamping jaw and thereby presses the workpiece against the stop.

#### Execution:

- Material: Case-hardened steel 21MnCr5
- Tempered and case-hardened to 52 HRC
- Case depth 0.6 mm

	Dimensions in mm									Holding	Weight
Α	A1	A2	<b>B</b> <sub>min</sub>	<b>B</b> <sub>max</sub>	C <sub>min</sub>	C <sub>max</sub>	C1	C2	D	force in kN	in kg
40	50	20	58	65	22	28	11,0	20	M5	30	0,60
72	84	36	60	70	29	38	14,5	27	M6	30	1,15

#### Ordering example:

Clamping wedge element, smooth SAV 208.13 - 72 Designation

SAV-No. - A



SAV 208.13

SAV 208.12



	A	1
-		
	- <b>-</b>	

14



### **JAW FACING SHOES**

#### For 5-axis clamping blocks

#### Application:

- Aluminium jaw facing inserts to allow the grinding of
- customer-specific profiles
- Suitable for clamping wedge elements SAV 208.01, 208.05, 208.07, 208.10, 208.11, 208.12, 208.13

#### Execution:

- Material: Aluminium

	Dimensions in mm										
A	A1	A2	В	C	D	in kg					
42	21	7,5	11	15	5,5	20					
50	25	15	11	22	6,5	35					

#### Ordering example: g shoe SAV 208.14 - 50

Jaw lacing shoe	JAV 200.14	-	50
Designation	SAV-No.	-	А



### **5-AXIS CLAMPING BLOCKS**

#### Toothing top and bottom

#### Application:

- Mounting block for 5-face machining operations.
  It is installed on the clamping rail
  Grips flush to the clamping rail and can, for example,
- be supplemented with a clamping wedge and fixed stop.
- Suitable to convert a multiple clamping system into a

single assembly for for 5-face machining operations.

#### Execution:

- Material: Case-hardened steel 21MnCr5, plasma nitrided; hardness 58 HRC

	Dimensions in mm										
A	B	B1	C	D	in kg						
50	100	80	80	14	0,25						
80	100	80	80	14	0,45						

#### Ordering example:

5-axis clamping block SAV 208.20 - 80 Designation SAV-No. - A



### SAV 208.14





SAV 208.20











### **CLAMPING RAIL**

#### Application:

- Modular clamping system
- Versatile range of applications
- Designed for one or more worpieces
- Quick clamping of workpieces for maching operations

#### Execution:

- Material: Case-hardened steel 21MnCr5, plasma nitrided; hardness 58 HRC
- Other mounting bore holes, for example, for clamping nipples K10 or K40, available on request
- Positioning steps with a 2 mm interval are possible on the clamping rail
- Max. holding force per clamping point 30 kN



Clamping rail SAV 208.21 - 80 x 400

Designation SAV-No. - A x B



# SAV 208.21

### MINI RAIL FOR CLAMPING ELEMENTS

#### **CLAMPING RAIL WIDTH REDUCER (1)**

#### Application:

- Reduction from 2 T-Nuts to 1 T-Nut
- Used with horizontal tombstones,
- in order to maintain accessibility in the
- multi-sided machining of small parts
- Toothing top and bottom



### **CLAMPING RAIL WIDTH EXTENDER (2)**

#### Application:

- To widen clamping rails
- Positioning ofd the holding forces to the required points
- Suitable for clamping large, round parts

#### Ordering example: SAV 208.23 - 1 Mini rail

Designation SAV-No. - Execution

### **ADAPTER SET**

#### For 5-axis clamping blocks

#### Application:

- using the adapter it is possible to directly connect two clamping rails without a gap.

#### Execution: - Material: Case-hardened steel, plasma nitrided

#### Scope of delivery:

- Adapter - 2 hexagon socket screws

- Clamping wedge elements with thread D (M8) available on request

- Can be transversly mounted at a 90 degree

- Toothed longtitudinally on the underside - Only suitable for clamping wedge elements

angle onto rails of 50 mm width

**TRANSVERSE MOUNTED RAIL** 





#### Ordering example:

Application:

with an M8 thread

Transverse mounted rail Designation:

SAV 208.22 - 40 x 200 SAV-No. - A x B



Ordering example: Adapter set SAV 208.30 Designation SAV-No.

SAV 208.22







### **POSITIONING BUSHES**

#### For 5-axis clamping blocks

#### Application:

- Positioning bush for simplified setup of the clamping rail on the machining table.
- All clamping rails are equipped with openings on the underside for the positioning bushes. This enables the quick and easy setup of the clamping rails on the machining table.

#### Execution:

- Material: Tempered steel, burnished



### SAV 208.31



### SIDE STOP, FIXED

#### For 5-axis clamping blocks

#### Application:

- Side stop to position workpieces. The stop is screwed to the fixed jaw and is movable.

#### Execution:

- Material: Aluminium

#### Scope of delivery:

- Stop - Fixing screw

Dimensions in mm Weight **A** | **B** | **C** | **C1** | ø **D** | ø **D1** | in kg 14 30 4 9 12,5 20 0,015

Positioning bush SAV 208.31 - 14 x 30





	Dimensions in mm									
A	В	С	D	Ε	in kg					
50	15	8	13,5	6,5	0,017					

### Ordering example: Side stop, fixed<br/>DesignationSAV 208.40 - 50 x 15<br/>SAV-No. - A x B

SIDE STOP, FLEXIBLE

#### Designation SAV-No. - A x B

Ordering example:

### **CLAMPING CLAWS**

#### For 5-axis clamping blocks

#### Application:

- For mounting the clamping rail on to a slotted machine table

Execution: - Material: Case-hardened steel, hardened

#### Scope of delivery:

- 4 clamping claws per packaging unit



SAV 208.32



 -	A	•		-	C	
 	$\bigcirc$					øD
	øD			C1		

#### For 5-axis clamping blocks

#### Application:

- Side stop to position workpieces.
- The stop is screwed to the fixed jaw and is slidable.

#### Execution:

- Material: Aluminium

#### Scope of delivery:

- Flexible Stopp

- Fixing screw M6 - AdjJusting screw M6

Dime	Dimensions in mm							
A	В	C	in kg					
12	40	25	0,1					

Ordering example:		
Side stop, flexible	SAV 208.41	l - 12 x 40
Designation	SAV-No.	- A x B

Ordering example:

Clamping claw SAV 208.32 - 30 x 40 Designation SAV-No. - A x B

















### TOMBSTONES

#### For horizontal and 5-Axis machines

#### Application:

- To increase the machine's operating time
  To increase the capacity at the highest levels of variability

### Execution:

Steel clamping rails

Scope of delivery: Without clamping wedges



Base plate with bore holes  $G = \emptyset 13$  mm für M 12, Other bore intervals available on request

Dimensions in mm									
Α	B1 - B2	B3	G (M12)	н	H1	H2	H3	in kg	
160	250	50	13	375	300	55	35	ca. 55	
160	250	50	13	475	400	55	35	ca. 65	
160	250	50	13	575	500	55	35	ca. 75	



Ordering example: Tombstone SAV 183.01 - 160 x 250 x 375 Designation SAV-No. - A x B1-B2 x H

- Material: Aluminimum body



G

Photo with clamping wedges (optional), Tombstone combined of 4 standard clamping rails



SAV 183.01

### **CHAPTER OVERVIEW**

SAV.

### **CHAPTER 2**

### **CLAMPING PLATES AND TOMBSTONES**

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### **APPLICATIONS**



### **APPLICATIONS**

### **CUBE TOMBSTONE**

### **PERMANENT MAGNET TOMBSTONE**

Special design with magnetic chuck plates for milling operations.



### **DOUBLE ANGLE TOMBSTONE**



Polymer concrete tombstones for applications in which weight is a relevant factor (upon request).





### **ELECTRO-PERMANENT MAGNETIC FIXTURE**

Clamping fixture for machining of cast iron parts on machining centers in first and second clamping on pallet systems.



### **TOMBSTONE WITH VACUUM** MATRIX CHUCK MODULES







## **GRID PLATE**

# SAV-

### SAV 103.01

### **GRID PLATE**

### Execution:

- Cast iron 30, stress-free annealed
- Hardened bushes 100Cr6
- Bore matrix:  $\pm$  0.02 mm: 40 mm, M12 / 50 mm, M16
- Other dimensions and tolerances available on request
- Steel and aluminium grid plates available on request







		Motrix	Poroc	Weight					
Α	В	С	D	E	F	<b>T</b> F7	IVIALITX	Bules	in kg
400	600		Ø18			ø12/M12	40	126	90
500	600	ies	Ø18	les.	lies	ø12/M12	40	154	112
600	600	appl	Ø18	lqqe	app	ø12/M12	40	196	134
400	800	rge	Ø18	ge	Be	ø12/M12	40	171	119
450	900	cha	Ø18	cha	,cha	ø12/M12	40	210	151
500	1000	sur	Ø18	sur	l Ins ,	ø12/M12	40	264	187
400	600	ific /	Ø18	ific /	ific ,	ø16/M16	50	96	87
500	600	bec	Ø18	bec	bec	ø16/M16	50	120	108
600	600	ler-s	Ø18	ler-s	Jer-9	ø16/M16	50	144	129
400	800	stor	Ø18	stom	ston	ø16/M16	50	128	115
450	900	Ous	Ø18	Cuts	Cri	ø16/M16	50	158	146
500	1000		Ø18			ø16/M16	50	200	171

#### Ordering example:

Grid plate	SAV 103.01	-	450	Х	900	Х	M12
Designation	SAV-No.	-	А	Х	В	Х	Т



A	Dimensions in mm						Fixing holes	Weight in kg
400	320	55	25	ø12/M12	40	81	4	54
500	400	75	25	ø12/M12	40	121	8	83
630	500	100	40	ø12/M12	40	196	8	134
400	320	55	25	ø16/M16	50	59	4	52
500	400	75	25	ø16/M16	50	93	8	80
630	500	100	40	ø16/M16	50	139	8	130

#### Ordering example: SAV 103.02 - 500 - M16 Grid plate Designation SAV-No. - A - T

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### SAV 103.02





### **T-SLOT PLATE**

#### Execution:

- Cast iron 30, stress-free annealed
- Including lid and transportation bolt



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Α	В	<b>C</b> (+0,015) (+0,005)	D	E	<b>F</b> (±0,02)	<b>G</b> (±0,02)	in kg		
400	320	14	55	ø18	160	80	56		
500	400	14	75	ø18	200	100	90		
630	500	14	100	ø18	250	125	149		
800	640	14	135	ø18	320	160	230		
400	320	18	55	ø18	160	80	85		
500	400	18	75	ø18	200	100	118		
630	500	18	100	ø18	250	125	195		
800	640	18	135	ø18	320	160	298		

Ordering example: T-Slot Plate SAV 103.04 - 800 - 18 Designation SAV-No. - A - C

SAV 103.04

### SINGLE ANGLE TOMBSTONE

#### Application:

- For use on various types of machining table
- To clamp large parts
- To clamp parts for horizontal and vertical machining

#### Execution:

- Cast iron 30, stress-free annealed
- Other dimensions available on request

#### Note:

Version V = Pre-machined clamping surfaces with excess material Version F = Fully finished clamping surfaces machined to the exact size

In both versions, the machining for the connection of the base (positioning and fixing) to the corresponding machine pallet is included in the price.

When ordering always specify the pallet type and include a drawing.



ſ	Dimensions in mm									
	Α	В	C	D	E	F	G	н	in kg	
ſ	300	300	220	100	250	90	40	30	52	
	400	400	280	160	320	90	40	30	90	
	500	500	340	200	400	90	50	35	175	
	630	630	435	250	500	100	50	40	305	
	800	800	525	320	640	115	50	45	480	

Ordering example:	
Single angle tombstone	SAV 137
Designation	SAV-No.



### SAV 137.07







# SAV-



### SINGLE ANGLE TOMBSTONE, BORE MATRIX

SAV 137.20

 $\Box$ 

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### **CUBE TOMBSTONE**

- Cast iron 30, stress-free annealed

- Including lid and transportation bolt

- Other dimensions and tolerances available on request

Execution:

#### Execution:

- Bore matrix: ± 0,02 mm
  - M12 = 40 mm
  - M16 = 50 mm

#### Note:

- Version V =Pre-machined clamping surfaces with excess material
- Fully finished clamping surfaces machined to the Version F =exact size

In both versions, the machining for the connection of the base (positioning and fixing) to the corresponding machine pallet is included in the price.

When ordering always specify the pallet type and include a drawing.









Dimensions in mm									Fixing	Weight				
Α	B	C	D	E	F	G	н		J <sup>F7</sup>	<b>K</b> (±0,04)	Matrix	Bores	holes	in kg
300	300	220	100	250	90	40	30	ø18	ø12/M12	75	40	30	4	50
400	400	280	160	320	90	40	30	ø18	ø12/M12	75	40	56	4	87
500	500	340	200	400	90	50	35	ø18	ø12/M12	75	40	90	4	173
630	630	435	250	500	100	50	40	ø18	ø12/M12	40	40	132	6	300
800	800	525	320	640	115	50	45	ø18	ø12/M12	75	40	240	6	477
300	300	220	100	250	90	40	30	ø18	ø16/M16	75	50	30	4	46
400	400	280	160	320	90	40	30	ø18	ø16/M16	75	50	56	4	85
500	500	340	200	400	90	50	35	ø18	ø16/M16	75	50	90	4	170
630	630	435	250	500	100	50	40	ø18	ø16/M16	40	50	132	6	295
800	800	525	320	640	115	50	45	ø18	ø16/M16	75	50	240	6	470

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#### Ordering example:

0	
Single angle tombstone, bore matrix	SAV 137.20 - 400 x 400 x M12
Designation	SAV-No A x B x J





		Fixing holes	Weight					
A	В	С	D	E	F	G	Fixing noies	in kg
500	400	250	320	200	55	50	4	56
600	500	300	400	250	75	50	8	91
700	630	350	500	315	100	50	8	129
800	800	500	640	400	135	50	8	215

#### Ordering example: Cube tombstone SAV 183.06 - 600 x 500 Designation SAV-No. - A x B



### SAV 183.06



# SAV-



### **CUBE TOMBSTONE, BORE MATRIX**

SAV 183.20

### **DOUBLE ANGLE TOMBSTONE**

#### Execution:

- Cast iron 30, stress-free annealed
- Including lid and transportation bolt
- Hardened bushes 100Cr6
- Bore matrix:  $\pm$  0.02 mm: 40 mm, M12 / 50 mm, M16
- Other dimensions and tolerances available on request



#### Execution:

- Cast iron 30, stress-free annealed
- Including lid and transportation bolt

Н

• •

FF

В

400

500

630

800

Е

С

150

200

250

300

Α 500

600

700

800







			Matrix	Dama	Eluine halas	Weight					
Α	В	C	D	E	F	G	<b>T</b> F7	IVIALITIX	Dores	Fixing noies	in kg
500	400	250	320	200	55	50	ø12/M12	40	180	4	145
600	500	300	400	250	75	50	ø12/M12	40	264	8	230
700	630	350	500	315	100	50	ø12/M12	40	392	8	380
800	800	500	640	400	135	50	ø12/M12	40	704	8	720
500	400	250	320	200	55	50	ø16/M16	50	128	4	148
600	500	300	400	250	75	50	ø16/M16	50	200	8	234
700	630	350	500	315	100	50	ø16/M16	50	288	8	340
800	800	500	640	400	135	50	ø16/M16	50	504	8	655

Ordering	example:
Si doning	example.

Cube	tombstone,	bc
Desig	nation	

ore matrix SAV 183.20 - 700 x 630 x M12 SAV-No. - A x B x T

Ord	ering	exar	nple	:	
_					

Designation

Double angle tombstone SAV 183.41 - 600 x 500 SAV-No. - A x B

// 0.02/300

25

M16

J

Dimensions in mm

Е

200

250

315

400

F

55

75

100

135

Ý

D

320

400

500

640

⊥ 0.02/300 Y



### SAV 183.41





G	н	Fixing holes	Weight in kg
50	400	4	170
50	500	6	265
50	630	6	425
50	800	6	598



# DOUBLE ANGLE TOMBSTONE, BORE MATRIX

#### Execution:

- Cast iron 30, stress-free annealed
- Including lid and transportation bolt
- Hardened bushes 100Cr6
- Bore matrix:  $\pm$  0.02 mm: 40 mm, M12 / 50 mm, M16



SAV 183.60





	Dimensions in mm									Poroc	Eiving holos	Weight
Α	B	C	D	E	F	G	H	TF7	IVIALITA	DUIES	FIXING HOLES	in kg
500	400	150	320	200	55	50	400	ø12/M12	40	162	4	160
600	500	200	400	250	75	50	500	ø12/M12	40	242	6	250
700	630	250	500	315	100	50	630	ø12/M12	40	392	6	475
800	800	300	640	400	135	50	800	ø12/M12	40	512	6	700
500	400	150	320	200	55	50	400	ø16/M16	50	128	4	164
600	500	200	400	250	75	50	500	ø16/M16	50	200	6	248
700	630	250	500	315	100	50	630	ø16/M16	50	288	6	470
800	800	300	640	400	135	50	800	ø16/M16	50	420	6	700

#### Ordering example:

Double angle tombstone, bore matrix SAV 183.60 - 600 x 500 x M12 Designation

SAV-No. - A x B x T

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## **CHAPTER OVERVIEW**

### CHAPTER 3

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# SA A

# SA/-

### TAPERED CLAMPS

#### Execution:

- Paint-coated clamp; other parts burnished

#### Note:

The soldered-on brass plate protects the workpiece. The clamp can be used with a soft or hard clamping surface on both sides.

- Form A Clamp with adjusting screw and tensioning screw
- Form B Clamp with adjusting screw





Tapered clampSAV 203.03 -A- 12 x 125DesignationSAV-No.- Form- A1 x L4/B1 (with Form C)



Other sizes according to DIN 6314

	Di	mension	s in mm			
Form	Nominal size		Clamping H	g height I	Form <b>A</b> in kg	Form <b>B</b> in kg
	A1	L4	Hmin	Hmax	0	
	0	50	0	15	0,200	0,150
	0	80	0	45	0,220	0,160
	10	65	10	22	0,385	0,295
	10	100	10	57	0,420	0,310
•	10	80	10	26	0,740	0,590
A	12	125	10	71	0,805	0,620
R	14	80	10	24	0,755	0,590
U	14	125	10	69	0,820	0,620
	16	100	10	30	1,470	1,150
	10	160	12	90	1,630	1,220
	10	100	12	28	1,490	1,150
	10	160	12	88	1,650	1,220

## SAV 203.03

### **ECCENTER CLAMPS**

#### Rear eccenter

#### Material:

Tempered steel eccenter and clamp

Execution: Burnished

Scope of delivery: Complete





1,5	-	A
B1		
SAV	203.23	J4

Thread						Dime	ensions ir	n mm								Weight
D	A	A1	B1	B2	B3	D2	H1	H2max	H3	J1	J2	J3	J4	J5	SW	in kg
M8	14	16	25	38	12	20	70	25	32	27	28	100	28	27	13	0,195
M10	16	20	32	41	13,5	25	80	24	40	34	36	120	32	35	17	0,720
M16	19	25	40	43	14,5	20	100	31	48	43	45	139	37	45	19	1,215

#### Ordering example:

Eccenter clamp SAV 203.75 - M10 Designation SAV-No. - D

**ECCENTER CLAMPS** 

### SWIVEL HOOK CLAMP

Swivel hook allows clamping angle adjustment

#### Material:

Ordering example:

- Steel; tempered steel clamping hook and tensioning screw, tempered

#### Execution:

Burnished



Thread		Dimensions in mm											F	Weight
D	D1	Н	H1	H2	H3	I .	J1	J2	J3	J4	J5	R	in kN	in kg
M8	6,4	62	47,5	25	18	38	26	6	19,5	12	6	26	17	0,33
M10	8,4	74	57,5	30	21	48	31	9	22,5	14	7,5	32	18	0,55
M12	10,5	87	67	25	24	55	36,5	10,5	26,0	16,5	9	37,5	20	0,81
M16	12,8	112	87	45	32	65	43,5	16,5	31,0	19,5	10	44	24	1,59

#### Ordering example:

SAV 203.55 - M8 Swivel hook clamp Designation SAV-No. - D



### Material:

Eccenter in the centre

Tempered steel eccenter and clamp

Execution: Burnished

Scope of delivery: Complete





[	Thread				Dimensio	ns in mm					Weight
	D	Α	В	D1	H1max	H2	J1	J2max	J3	SW	in kg
	M8	12	20	20	28	72	39	37	100	13	0,3
	M10	16	25	25	39	92	49	46	120	17	0,6
	M12	25	32	25	49	120	61	58	138,5	19	1,1

Ordering example: Eccenter clamp SAV 203.76 - M12 Designation SAV-No. - D



SAV 203.75

3





SAV 203.76





# SAA

### **PULL-DOWN CLAMPS**

#### Also known as "flat clamps"

#### Material:

Tempered steel

#### Execution:

- Tempered, burnished/black

- Complete with screw and clamping piece

Application: Suitable for lateral clamping of flat workpieces

#### Note:

In order to maintain a low clamping height, the depth of the clamp can be reduced by the dimension X.

Slot size			D	imensions	s in m	m			F1	F2	Weight
Α	В	С	H1 <sub>max</sub>	H1min	H2	H3min		Х	in kN	in kN	in kg
12	18	1 0	25,5	20,5	7	11	52	F	5	0,6	0,11
14	22	1,0	26,5	21,5	8	13	55	5	5,5	0,7	0,16
16	25	2 5	32	25	9	15	68	G	8	0,9	0,26
18	28	2,5	33	26	10	16	71	0	9	1	0,34
22	35	3	43	34	14	20	89	9	16	1,9	0,69



SAV 204.01

#### Ordering example:

Pull-down clamp SAV 204.01 - 16 Designation SAV-No. - A

### **PULL-DOWN CLAMPS**

#### Also known as "stable clamping jaws"

#### Material:

Body: Malleable cast iron Jaws: Case hardened steel

### Execution: Reversible jaws, case hardened

Application:

High design, with precise V-guide.



Ordering example: SAV 204.02 - 19 Pull-down clamp

Designation SAV-No. - B1



L2 P S F1 F2 Weight

40 12

8 1,2

15 2,2

20 3

28 4,2

30 4,5

32 4,8

36 5,4

50 7,5

Weight

4,05

6,80

11,30

SAV 204.02



#### With workpiece locating edge

SAA

#### Material:

Tempered steel

#### Execution:

Tempered steel and burnished body and clamping plate. Brass coated clamping plate. The workpiece locating edge is hardened and precisely ground to  $\pm 0.006$  mm.

#### Note:

The workpiece is held in a level position and can be machined at right angles. Ideal for parts which must be through-bored or through-milled. Eccenter clamping screw M12 for a clamping force of 18 kN.

The clamping plate has a toothed edge for rough parts and a smooth edge for machined parts.

#### Ordering example:

Eccenter clamp unit SAV 204.08 - 12 SAV-No. Designation - T-Nut

						Dimensio	ns in mm									Weight
T-Slot	A	B	С	D	E	F	G	н	I	J	K	L	M	N	0	in g
12																284
14	62.5	20 E	16	100	21 5	27	0	25 4	7	20	10		1.00	M10	M10	320
16	05,5	20,0	10	12,2	21,5	27	9	25,4		2,0	10	0	10			334
18																370



Ordering example: Eccenter clamp unit Designation

SAV 204.08 - 12 Satz SAV-No. - T-Slot (Set)

Slot size

12

14

16

18

20

22

24 28

30

32 36

42

Dimensions in mm

99

26 75 11 100 118 45 226,5 136,5

90 15 120 145 55 262,5 157,5

L1

37 177,5 112,5

B1 B2 C H1 H2<sub>max</sub> H3

19 65 8 85

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### SAV 204.08

3









Storag	ge case <sup>1)</sup>	
4 Pc. 2 Pc.	Clamp units Allen keys	

<sup>1)</sup> When ordering a set with a storage case please specify "Set" in the designation.



### **UNIVERSAL CLAMPING FIXTURE**

#### With workiece locating edge; storage case

The clamping elements, with workpiece locating edge, (see SAV 204.08) together with the corresponding support bar, make up a universal clamping fixture. Various workpiece dimensions are accomodated by adjustment of the clamping elements and the corresponding end or centre stops.

- Economical, time-saving production of a special clamping fixture using standard elements
- Due to the interspace to the table top, the workpieces can be through-bored and through-milled
- Short workpiece replacement times, low build height - Holding for up to 27 kN (2.7 tons)
- The locating edges are hardened are precision ground to a uniform height to a tolerance of  $\pm 0.006$  mm

When ordering a set with a storage case please specify "K" in the designation.



## SAV 204.17

### **STEP CLAMP**

SA/

#### Material:

- Special cast iron,
- Screw and bushing 8.8

#### Note:

Clamping unit for quick application. The fine spiral serration allows fast adjusting to any workpiece height up to 320 mm. Low space requirement on machine table due to compact design.

in mm			Dimens	sions in m	ım		Weight
Α	Size	Н	E	С	I	В	in kg
	0	0-45	0.75	11	140		0,70
	1	15-45	0,75	14	110		0,60
10	2	30-75	1,25	15			0,80
12	3	60-135		16	110		1,20
	4	120-195	2,50	18			1,70
	5	180-255		19		24	2,20
	0	0-45	0.75	14	140	34	0,70
	1	15-45	0,75	14			0,60
1.4	2	30-75	1,25	15			0,80
14	3	60-135		16	112		1,20
	4	120-195	2,50	18			1,70
	5	180-255		19			2,20
	0	0-70	1.05	20	160		1,90
	1	25-70	1,25	20			1,70
16	2	50-120	2,50	01	1.05		2,50
	3	100-220	2 75	21	125		3,54
	4	200-320	3,75	24		50	4,90
	0	0-70	1.05	20	160	50	1,87
	1	25-70	1,25	20			1,67
18	2	50-120	2,50	21	1.25		2,50
	3	100-220	2 75	21	125		3,58
	4	200-320	3,70	24			4,75

#### Form E Universal clamping system - Single



Content	T-Slot
1 Pc. Support bar 2 Pc. Clamping units 1 Pc. Workpiece stop 3 Pc. Allen keys	10 12 14 16 18

#### Form D

Universal clamping system - Double

0



Content	T-Slot
1 Pc. Support bar 4 Pc. Clamping units 1 Pc. Workpiece stop 3 Pc. Allen keys	10 12 14 16 18

Ordering example:

Universal clamping fixture SAV 204.17 - E - 12 - K Designation SAV-No. - Form - T-Slot - Storage case Ordering example: Step clamp SAV 203.33 - 12 x 1 Designation SAV-No. - A x Size

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### SAV 203.33



# SAA

### **HEXAGON ECCENTER CLAMPS**

#### Also known as "flat clamps"

#### Material:

Case hardened clamping bolt Brass hexagon clamping washer

#### Execution:

Clamp case hardened to 10.9 and burnished

#### Note:

A whole range of clamping problems in fixture and apparatus construction can be solved due to the very low design of the clamp. The brass clamping washer provides a very strong and secure clamping of the workpiece whilst avoiding damage to the material. Even whole pallets can be equipped by the use of a number of eccenter clamps.



	Thread		Dime	ensions in	mm		Do/Dool	Holding	Weight	
	A B		C	D	SW1	SW2	PC/Pack	force in kN	in g	
	M4	9,6	2,8	0,76	8	3	10	0,9	3	
	M6	11,2	4,75	1,01	16	4	10	3,4	11	
	M8	15	4,75	1,01	20	5	12	3,9	18	
	M10	19	6,35	1,52	20	7	10	9	27	
	M12	22,8	9,52	2,03	25	8	8	18	53	
ı)	M16	28,5	12,69	2,54	30	12	4	27	103	

#### Ordering example:

Hexagon eccenter clamp Designation

SAV 204.39 - M4 SAV-No. - A

### **KNIFE-EDGE ECCENTER CLAMPS**

#### Material:

Tempered steel knife-edge washer. Steel alloy eccenter bolt.

### Execution:

Hardened and anodised knife-edge washer.

#### Note:

The hardened knife-edge washer is suited for the clamping of unfinished parts (sawn cut-offs, cast and forged parts). A pack contains knife-edge washers and eccenter bolts.



### Ordering example: Knife-edge eccenter clamp

Designation

SAV 204.40 - M12 SAV-No. - A

Thread		Dimensio	ns in mm		C\//		Holding force	Weight
Α	В	С	D	Е	300	PC/Pack	in kN	in g
M12	22,5	9,6	25,4	2,03	8	8	18	45
M16	26,85	12,7	30,15	2,54	12	4	27	90

SAV 204.39



SAV 204.40



### **DOWN-THRUST CLAMPS**

With eccenter and screw tensioner

Material:

Steel

#### Execution: Case hardened, burnished and ground.

#### Application:

The down-thrust clamps can be used, for example, on tooling machines, on pallets for NC-machines and as standardised parts for fixtures.

#### The clamps offer the following advantages:

- Rapid manual clamping, by means of clamping screw or eccenter lever
- Easy and quick changing of the workpiece by
- swinging the clamping head to the left or right
- Reduced space requirements due to compact design

#### The clamps can be secured in four ways:

- In a T-slot
- Directly to a fixture using the set screw
- By using a support SAV 204.68
- Together with securing bars SAV 204.14

The clamping height can be increased by using height adjusting cylinders SAV 204.70 or other fixture elements.

#### Form A

With eccentric clamping lever

#### Diagram 2





1) Only Form B

2) If A is not specified, it will be supplied with Nut A = column 2 3) Applies to Form B

#### Ordering example:

e					
Down-thrust clamp	SAV 204.67	- A	- 40 x	98 x	20
Designation	SAV-No.	- Form	- D1 x	H1 <sub>max</sub> x	А



### SAV 204.67



3

Form B With clamping screw





nm				C/V/	Fmax	Weight <sup>3)</sup>		
D2	D3	H2	H3	L1	L2	200	in kN	in kg
M8	M8	-	44-49	35	28	22	5	0,21
	-	-	54-59	40	-			0,65
		51	73-93					0,9
M12	M12	72	91-121	55	43	36	10	1,1
			118-158					1,28
		98	123-158	65	50	66	15	2,7
W161)	M16		123-158	69	22	55	15	2,9



### **DOWN-THRUST CLAMPS**

#### With clamping lever / positioning ring

Material:

Steel

Execution: Case hardened, burnished and ground.

#### Application:

The down-thrust clamps can be used, for example, on tooling machines, on pallets for NC-machines and as standardised parts for fixtures.

#### The clamps offer the following advantages:

- Rapid manual clamping, by means of clamping screw or eccenter lever
- Easy and quick changing of the workpiece by swinging the clamping head to the left or right
- Reduced space requirements due to compact design

#### The clamps can be secured in four ways:

- In a T-slot
- Directly to a fixture using the set screw
- By using a support SAV 204.68
- Together with securing bars SAV 204.14

The clamping height can be increased by using height adjusting cylinders SAV 204.70 or other fixture elemen

djusting cylinders SAV 204.70 or other fixture elements.							Locatir insert	ng thread for p e.g. SAV 200.	endulum 14		
	Dimensions in mm									Fmax	Weight in kg
Form	D1	H1 max	H2 min	H3	H4		A <sup>2)</sup> S Stroke				weight in kg
		70	50	15	73-93		16	18	20	10	1,120
С	40	98	68	15	91-121	14			30	10	1,285
		135	96	22	118-158		20	~~	40	10	1,500

Form C

M12

22

With clamping lever

55

43 - 108

Adjustable clamping lever M12

with axial bearing

360° swivel range

SW 36

DIN 913 DIN 508 M 12 x A

#### Ordering example:

Down-thrust clamp Designation

SAV 204.67 - C - 40 x 135 x 16 SAV-No. - Form - D1 x H1max x A

### **POSITIONING RING**

#### Material:

Steel, burnished

If the positioning ring is used, the dimension H2 is increased by 7 mm (stroke S minus 7 mm). Positioning ring is rotating by 360° on down-thrust clamps. After mounting, the clamp can swing 110° to the left or right.



Ordering example: Positioning ring SAV 204.67 - 40 Designation SAV-No. - Size

			 ø5
	St	op pin	
Ŧ			
t			- 4
ł	()		



	R
JA	

### **CHAPTER OVERVIEW**

e:

### **CHAPTER 4**

SAV 204.67

### CLAMPING BLOCKS, PRECISION PULL DOWN VICES AND PRECISION VICES

	SAV-ARTNO.	DESCRIPTION	COMMENTS	PAGE
	231.01 231.02	Precision pull down vice Precision mini pull down vice	Stainless tool steel	50
	233.07	Precision machine vice	For precise clamping	51
Real Providence	233.70	Machine vice	Mechanical-hydraulic	52
	233.72	Machine vice	Mechanical-hydraulic	53
- E	233.80	Standard jaws	Optimal workpiece clamping	54
7070	233.81	Q.I.S. quick insert jaw system	Setup time optimisation	55
-	233.75	Hydraulic machining vice - KNC	Mechanical-hydraulic	56
E)	233.75	Accessories for Hydraulic machining vice – KNC	Drive, crank handle, clamping claws etc.	57-59
-	233.76	Double clamping system DS Accessories for double clamping system DS	Mechanical, for multiple clamping, jaws, plates, clamping claws	60-65
the set	233.82-85	Accessories for hydraulic and machine vices	Clamping jaws, angle drive etc.	66-67
1.010.	233.89	Slimflex jaw system	For flexible clamping	68
-	751.31	2-Jaw chuck	Manually via spindle drive, self-centring	69
Ĩ.)	751.25	2-Jaw chuck	Self-centring, hydraulically actuated, manually actuated	70-71
	751.26	Hydraulic clamping block	Hydraulically actuated	72
-	751.27	Hydraulic / pneumatic clamping block	Hydraulically or pneumatically actuated	73
	751.30	3-Finger Gripper	Pneumatically actuated	74



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### PRECISION PULL DOWN VICE

#### For precise clamping

#### Execution:

- Precision ground
- For precise clamping
- Prism in moveable jaw
  Rectangularity: 0.005 / 100 mm
- Parallelism: 0.003 / 100 mm
- Hardness: HRC 58

#### Material:

Tool steel, hardened

#### Optional:

- Wooden storage case available at a surcharge

	Dime	nsions i	n mm		Weight	Wooden case
Α	B	C	D	E	in kg	Order no.
63	172	90	60	30	3,7	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:

Precision pull down vice SAV 231.01 - 48 Designation SAV - No. - A

### PRECISION MINI PULL DOWN VICE

#### For precise clamping of small workpieces

#### Application:

For precision grinding and EDM applications on small workpieces. Can also be used as electrode holding device for spark erosion machinery, such as SAV 581.05, Type EH 25.

#### Technical data:

Rectangularity: Parallelism:

### 0.005 / 100 mm 0.003 / 100 mm

- Execution:
- Tool steel, through-hardened HRC 55 and ground on all sides
- Pull-down-system
- Mounting threads on the sides
- Stainless execution on request,
- with extension (RF)

#### Scope of delivery:

- Hexagon socket wrench
- Wooden storage case optional

Dimensions in mm					Weight	Wooden case
Α	B	C	D	E	in kg	optional ord.no.
25	65	20	30	10	0,3	SAV 539.01

#### Ordering example:

5 1		
Precision mini pull down vice	SAV 231.02	- RF
Designation	SAV-No.	- Execution



SAV 231.01











### PRECISION MACHINE VICE

#### For precise clamping

#### Execution:

- Produced from tool steel
- Hardened to HRC 58 and precision ground
- For precise clamping
- 0.004 / 100 mm - Rectangularity:
- 0.004 / 100 mm - Parallelism:

#### Application: Grinding, drilling, measuring, milling

#### Optional:

- Wooden storage case available at a surcharge (SAV 539.03)
- Available with horizontally ground prism in moveable
- jaw (PR) (at a surcharge) Rectangularity: 0.005 / 100 mm
- Rectangularity:
- 0.003 / 100 mm - Parallelism:
- Hardness: HRC 58

	Dime	nsions i	n mm		Weight	Wooden case
A	В	С	D	E	in kg	Order no.
30	92	30	30	15	0,5	SAV 539.03
50	155	65	50	25	2,0	SAV 539.03
65	175	70	65	30	4,5	SAV 539.03
80	215	110	65	35	7,5	SAV 539.03
100	285	140	80	40	12,0	SAV 539.16
125	285	140	80	40	18,0	SAV 539.16
150	320	170	90	40	27,0	SAV 539.16

#### Ordering example: Precision machine vice Designation

SAV 233.07 - 150 - PR SAV-No. - A - Prism



### SAV 233.07





# SAA

### **MACHINE VICE**

#### Mechanical-hydraulic

#### Application:

An economical clamping alternative for moulds, tools and fixtures and production. Especially suitable for conventional machines.

#### Execution:

- Slide carriage and base made from steel with hardened and ground guides
- Compact design
- Stepless adjustment of the clamping force
- due to the mechanical-hydraulic system - High precision
- Quick setup using socket bolts
- Threaded bores in the fixed jaw for
- workpiece stops (accessorie)
- Angle drive (accessorie) available

#### Scope of delivery:

- Standard reversible jaws smooth / grooved
- Crank handle
- Instructions for use

#### Accessories:

- Large selection Standard jaws SAV 233.80
- Large selection Q.I.S. quick insert jaws SAV 233.81
- Angle drive SAV 233.84
- Precision workpiece stop SAV 233.86
- Set of clamping claws SAV 233.88-A







Dimensions in mm									max. holding force	max. clamping range	max. total length	Woight in kg	
Α	B* C D E* F* G H* K SW		in kN	in kN	in mm	weight in Kg							
100	100 380 205 464 34 13 80 70 24		14	25	205	464	18,5						
125	430	430 225 526 45 15 100 82 27 17		40	225	526	31,5						
160	550	309	684	54	18	120	95	27	19	50	309	684	58,5
160L	0L 750 509 884 54 18 120 95 27 19		50	509	884	75,0							

\* Tolerance  $\pm 0.01$ 

#### Ordering example:

Machine vice SAV 233.70 - 125 Designation SAV-No. - A



### MACHINE VICE

#### Mechanical-hydraulic

#### Application:

For stable and exact clamping operations. Especially suitable for use on vertical machining centers. Especially advantagous through exact positioning on all slotted tables due to the side slots. The very large clamping range, which is achieved by the use of

top stepped jaws, guarantees an optimal use of travel range of the machines.

#### Execution:

- Quick and exact positioning via longtitudinal and transverse slots
- Stepless adjustment of the clamping force due to the mechanical-hydraulic system
- High precision
- Hardened and ground guide rails
- Optimal protection against dirt and chippings as the spindle and power transmission are integrated into the slide body
- Quick setup using socket boltsThreaded bores in the fixed jaw for precision workpiece stops
- Slots and threaded bores on the slide carriage and fixed jaw enable the extension of the clamping range
- Quick and secure fixing using clamping claws
- Comprehensive range of accessories
- Hydraulic-hydraulic execution with hydraulic
- aggregate and accessories on request

#### Scope of delivery:

- Standard reversible jaws smooth / grooved
- Crank handle
- Instructions for use

#### Accessories:

- Large selection Standard jaws SAV 233.80

- Large selection

Q.I.S. quick insert jaws SAV 233.81

Designation SAV-No. - A

- Set of clamping claws

SAV 233.80

- Angle drive SAV 233.84

- Precision workpiece stop SAV 233.86



Dimensions in mm											max.	Weight					
Α	В	С	D	<b>E</b> *	<b>F</b> *	G	H*	K	L g6	M**	V	W	X	Ζ	SW	force in kN	in k̃g
100	34	205	464	13	380	80	70	24	78	110	17,5	35	M12 x 18	58	14	25	18,5
125	45	225	526	15	430	100	82	27	98	115	23,0	36	M12 x 18	60	17	40	31,5
160	54	309	684	18	550	120	95	27	125	155	27,0	50	M20 x 27	80	19	50	58,5
	Dimensions for use with top stepped jaws in mm																
Λ	<b>~</b> 1								1			i i	1				
A	CI	C2	G1	G2	J1**	J2**	Ν	0	P1	P2	R	S <sub>H7</sub>	T				0.01
100	330	<b>C2</b> 386	<b>G1</b> 28	<b>G2</b> 56	<b>J1**</b> 40	<b>J2**</b> 45	<b>N</b> 45	<b>0</b> 122	<b>P1</b> 83	<b>P2</b> 65	<b>R</b> 25	<b>S <sub>н7</sub></b> 10	<b>T</b> M8 x 12	4	* Tole	erance =	± 0,01
<b>A</b> 100 125	330 363	<b>C2</b> 386 431	<b>G1</b> 28 35	<b>G2</b> 56 69	<b>J1**</b> 40 53	<b>J2**</b> 45 58	<b>N</b> 45 56	<b>0</b> 122 132	<b>P1</b> 83 104	<b>P2</b> 65 80	<b>R</b> 25 30	<b>S <sub>н7</sub></b> 10 12	<b>T</b> M8 x 12 M10 x 13	k	* Tole ** Tole	erance = erance =	± 0,01 ± 0,02
A 100 125 160	330 363 503	<b>C2</b> 386 431 573	<b>G1</b> 28 35 37	<b>G2</b> 56 69 72	<b>J1**</b> 40 53 65	<b>J2**</b> 45 58 70	<b>N</b> 45 56 73	0 122 132 171	<b>P1</b> 83 104 130	<b>P2</b> 65 80 100	<b>R</b> 25 30 45	<b>S <sub>н7</sub></b> 10 12 18	<b>T</b> M8 x 12 M10 x 13 M12 x 16	k	* Tole ** Tole	erance = erance =	± 0,01 ± 0,02
A 100 125 160 Orderi	330 363 503 ng exa	C2 386 431 573 ample	<b>G1</b> 28 35 37	<b>G2</b> 56 69 72	<b>J1**</b> 40 53 65	<b>J2**</b> 45 58 70	<b>N</b> 45 56 73	0 122 132 171	<b>P1</b> 83 104 130	<b>P2</b> 65 80 100	<b>R</b> 25 30 45	<b>S <sub>н7</sub></b> 10 12 18	<b>T</b> M8 x 12 M10 x 13 M12 x 16	×	* Tole ** Tole	erance = erance =	± 0,01 ± 0,02

G2

## SAV 233.70



SAV 233.72





Accessories: Top stepped jaws SAV 233.80 - ASB

- = 0.02 A

Accessories: Angle drive SAV 233.84 (W)

< --



# SAA

### **STANDARD JAWS**

#### Enables optimal workpiece clamping

#### Application:

Exchangeable jaws for diverse clamping operations on hydraulic machining vices of type HMS.

	Standard jaws	SAV 233.80-SB-A	Prismatic jaws	SAV 233.80-PR-A
	Both sides can be used: 1st side serrated; 2nd side smooth Relevante dimensions: ± 0,01 mm		Clamping of round workpieces in a horizontal or vertical position. Relevante dimensions: ± 0,01 mm	00
	Dimensions in mm           A         B         C           100         34         13           125         45         15           160         54         18		Dimensions in mm           A         B         C         D         E           100         34         17         8-35         19           125         45         19         10-50         27         m           160         54         21         12-60         32         m	
	Precision stepped jaws	SAV 233.80-PSB-A	Extra tall flat jaws	SAV 233.80-SBH-A
ш	Dimensions in mm       F       G         A       B       C       D       E       F       G         100       34       19       10       29       15       11         125       45       25       13       39       20       16         160       54       25       15       45       20       16	Relevante dimensions: ± 0,01 mm	Clamping of high workpieces. Use singly or in pairs. A E Dimensions in mm A B C D E 100 58,0 25 25 60 125 75,5 32 32 74 160 92,5 40 40 100	00
	Pendulum jaws	SAV 233.80-PB-A	Top stepped jaws SAV	233.80-ASB-A -S or -F*
	Clamping of non-par- allel workpieces or two workpieces of different tolerances.		Only for use with hydraulic Machining vice Type HMS SAV 233.72. To extend the clamping range.	
		A		
	Dimensions in mm         m         m           A         B         C         D           100         34         35         16           125         45         50         22           160         54         55         26		Dimensions in mm           A         B         C         D         E         F           100         48         34         6         6,5         11,5           125         58         40         6         9,0         14,0           160         64         43         8         12,0         17,0	Relevante dimensions: ± 0,01 mm
		I	* When ordering please quote:	Jaw for slide bed -S
	Ordering example:			Jaw IUI IIXeu Jaw -r



SAV 233.80

## Q.I.S. Quick insert jaw system

For use with hydraulic machining vices SAV 233.70 und 233.72

Application: The quick insert jaws, which are held by 2 permanent magnets and secured from lateral displacement, can be changed in a minimum of time. The thrust-down effect of the exchangeable jaws as well as the constant zero-point in the clamping position allows a very high workpiece accuracy level.





	Dime	nsions ir	n mm	]	A		С
	Α	В	C				
ĺ	100	34	21			Γ	Τ
	125	45	26	m		I	1
	160	54	31				

Q.I.S. Jaw insert, smooth

### SAV 233.81-WBG-A

For clamping right-angled workpieces when using parallel pieces.



Dime	ensions in	mm		А	С
Α	В	C		*	
100	34	21	1 T		
125	45	26	m		1 / í
160	54	31			

Ordering example: SAV 233.81 - GB - 125 Base jaw Designation SAV-No. - Typ - A

Ordering example: Prismatic jaw SAV 233.80 - PR - 125 Designation SAV-No. - Type - A

www.group-sav.com



## SAV 233.81

SAV 233.81-PWB-A

### Q.I.S. Prismatic jaw insert

Horizontal or vertical clamping of cylindrical workpieces. The crossover to the lower guide profile enables exact positioning in the centre. Used singly for

3-point clamping.

Dimensions in mm												
A B C D E F												
100	34	28,0	8 - 35	19	78							
125	45	34,2	10 - 50	27	98							
160	54	37,0	12 - 60	32	125							



16MnCr5

For the self-preparation of special jaws, with a crossover to the lower guide profile for an exact repeat tension.

A

SAV 233.81-WBW-A

Dimensions in mm										
A B C D										
100	34	30,0	78							
125	45	36,5	98							
160	54	47,0	125							



For clamping right-angled workpieces without parallel pieces. The production of rimless bores is possible due to the narrow seat.



SAV 233.81-SWB-A

 $\mathsf{D}^{\mathsf{H7}}$ 



Used in pairs





### HYDRAULIC MACHINING VICE KNC

#### Mechanical-hydraulic

Compact • precise • reliable The new KNC machining vice.

The hydraulic power transmission and the spindle drive are both completely enclosed and integrated in to the slide bed. Almost all the available additional jaws such as Standard SAV 233.80, Q.I.S. (SAV 233.81) etc. can be used. The tried and tested quick adjustment of the clamping range using socket bolts has been retained.

#### Execution:

- The hydraulic power transmission and the spindle drive are both completely enclosed and integrated in to the slide bed
- Clamping range up to 350 mm with stepped reversible jaws
- Reversible block jaws, 1st side smooth, 2nd side coated for a high friction coefficient
- Mountable on all sides (Type Universal)
- For use with workpiece-specific special jaws
- Locking mechanism for purely mechanical clamping of sensitive workpieces
- Execution for vertical use with face plate and slide brake on request

#### Scope of delivery:

- Vice
- Block jaw set SAV 233.75-BBF+BBM
- Crank handle

#### Accessories:

Large selection - Standard jaws SAV 233.80 and

- Q.I.S. quick insert jaws

- SAV 233.81
- Block jaws and stepped reversible jaws SAV 233.75
- Angle drive SAV 233.84
- Precision workpiece stop SAV 233.86





Only in execution-U



SAV 233.75

tal machining equipment, surcharge applies.

-					 
Accossor	inc tor	hyd	naulic -	macl	ning
ALLESSUI		IIVUI	aulic	IIIali	

#### Stepped reversible jaw, fixed

For fixed jaws. Suitable for various clamping ranges.

Complete with fixing bolts and cylinder pin.

Relevante dimensions  $\pm$  0,01 mm

 $\bigcirc$ 

				Dimensio	ns in mm	
Α	B	C	D	E	F*	G
100	80	22	4	16	24	63
125	100	28	5	20	28	70,5
160	120	38	6	27	36	89

\*=Tolerance - 0,01 mm

Ordering example: Stepped reversible jaw, fixed Designation SAV-No.

#### Stepped reversible jaw, mobile

For moveable jaws. Suitable for various clamping ranges.

G\*\*  $\odot$ 

Complete with fixing bolts and cylinder pin.

 $\bigcirc$ 

				Dimensio	ns in mm	
Α	B	C	D	E	F*	G
100	60	20	4	16	24	57
125	80	28	5	20	28	65,5
160	100	34	6	27	36	83
*=Tolera	ince - 0,0	)1 mm			-	

Ordering example: Stepped reversible jaw, mobile SAV-No. Designation



Relevante dimensions  $\pm$  0,01 mm

Usuable on both sides as a

1<sup>st</sup> side smooth. 2<sup>nd</sup> side hard

Complete with fixing bolts and

Block jaw, fixed

standard jaw.

metal coated.

cylinder pin.



Dimensions in mm											
4	B	<b>C</b> -0,02	D	E	G	н	l/g6	KM			
00	33,5	80	78	50	63	8	24	10			
25	44	100	96	60	70,5	10	30	12			
60	53	120	120	70	89	12	36	16			
	<b>A</b> 00 25 60	A         B           00         33,5           25         44           60         53	A         B         C -0,02           00         33,5         80           25         44         100           60         53         120	Dir           A         B         C -0,02         D           00         33,5         80         78           25         44         100         96           60         53         120         120	Dimensions in r           A         B         C -0,02         D         E           00         33,5         80         78         50           25         44         100         96         60           60         53         120         120         70	A         B         C -0,02         D         E         G           00         33,5         80         78         50         63           25         44         100         96         60         70,5           60         53         120         120         70         89	Dimensions in mm           A         B         C -0,02         D         E         G         H           00         33,5         80         78         50         63         8           25         44         100         96         60         70,5         10           60         53         120         120         70         89         12	A         B         C -0,02         D         E         G         H         l/g6           00         33,5         80         78         50         63         8         24           25         44         100         96         60         70,5         10         30           60         53         120         120         70         89         12         36			

Ordering example:						
Block jaw, fixed	SAV 233.7	5 - BBF - 100				
Designation	SAV-No.	- Type - A				

-	<u>ш</u> , ш		T		
2	*		0	0	0 (
	,	- D		С	
	B				
	* , _		0	0	5 (
			N	20H7 F	
	A 20H7				



Dimensions in mm									max. hol-	Weight							
A	B	B1	B2*	B3	С	C1	D	Ε	F	G	H*	Κ	N**	N1**	SW	in kN	in kg
100 3	33,5	30	24	16	140	230	100	60	300	60,5	90	16	35	89	14	25	16,7
125	44	44	28	20	240	354	120	80	440	68,5	104	20	70	137	17	40	39,5
160	53	52	36	27	300	436	140	100	540	68,5	125	24	120	196	17	50	72

\* Tolerance  $\pm$  0,01 / \*\* Tolerance  $\pm$  0,02

### Ordering example:

Hydraulic machining vice	SAV 233.75 - 125 - S	
Designation	SAV-No A - Standard	

Standard SAV 233.75-A-S

For vertical use on horizon-

# or

Universal SAV 233.75-A-U





### g vice KNC

### SAV 233.75







SAV 233.75-SWF-A

SAV 233.75 - SWF - 100 -Type - A











4





SAV 233.75-BBF-A





Accessories for hydraulic machining vice KNC	SAV 233.75
Block jaw, mobile Usuable on both sides as a standard jaw. L <sup>st</sup> side smooth. 2 <sup>nd</sup> side hard metal coated. Complete with fixing bolts. Relevante dimensions $\pm$ 0,01 mm $\overline{A \ B \ C \cdot 0,02 \ D \ E \ G \ H \ Vg6 \ KM}$ $\overline{A \ B \ C \cdot 0,02 \ D \ E \ G \ H \ Vg6 \ KM}$	ССС 4 233.75-ВВМ-А
120       11       00       00       10       00,0       10       10       11         160       53       100       60       54       83       9       24       16         Ordering example:       Block jaw, mobile       SAV 233.75 - BBM - 100       SAV-No.       - Type - A	
Angle drive For clamping points which are difficult to access	9-3153-602 0
A*       B       C       D       E       SW         100       54       76       85       22,5       14         125       62       82       90       24       17         160       62       82       90       24       17         Ordering example:       Angle drive SAV 233.75 - WA - 100 Designation SAV-No.       - Type - A	SAV 233.75-WA-A
Face plate (only for the execution Universal -U) To fix 2 machining vices back to back. For use with horizontal-BAZ.	B C

\* For jaw width A

Dimensions in mm							
<b>A</b> *	B	C	<b>D</b> H6	E	KM	Depth ± 0,01	
100	256	200	32	100	12	30	
125	256	200	32	100	12	40	
160	340	300	50	150	16	50	

Ordering example: Face plate SAV 233.75 - KP - 100

Designation SAV-No. - Type - A



SAV 233.75-KP-A

### Accessories for hydraulic machining vice KNC

### Precision workpiece stop:

Only for use with hydraulic machining vice Type KNC SAV 233.75

Ordering example:	Precision workpiece stop	SAV 233.75	- PWA
	Designation	SAV-No.	- Туре

#### Holding force pre-selector:

For the pre-selection and setting of defined holding forces. Only for use with hydraulic machining vice Type KNC SAV 233.75

\* for jaw width A

Dimensions in mm							
<b>A</b> *	В	С	SW				
100	51	79	14				
125	56	87,5	17				
160	56	87,5	17				

- PWA

Ordering example:	Holding force pre-selector	SAV 233.75
	Designation	SAV-No.

## Set of clamping claws with bolts: (1 Set = 4 Pieces)

Dim	nensions in	mm	
<b>A</b> *	М	Slot	* for jaw width A
100	M12	14	
100	M16	18	
125	M12	14	
125	M16	18	
160	M16	18	

Ordering example:	Clamping claws	SAV 233.75	- SPP - 2
	Designation	SAV-No.	- Туре -

Set of ground T-slot blocks DIN 6323 (1 Set = 2 Pieces)

	-		Dimensio	ns in mm		
	Form	<b>A1</b> h6	<b>A2</b> h6	B1	B2	ā
	٨	20	14	14	5,5	
	A	20	18	14	5,5	
						3,2 0
1	Ordering	example	T-slot b	locks S	AV 201.4	40 - A - 20 x 18 (
	0		Designa	ation S	AV-No.	- Form A1 x A2
	Set of nu DIN 508 (1 Set =	ts for T-s	slots 5)			Nominal siz
	Do you h find the i	ave a spe right worl	ecial task kholding	and wer device?	en't able	to
	Ask us! \	Ne've got	the ansv	ver.		Thread

### Ordering example:

Nuts for T-Slots SAV 320.21 - G 18 x M12 - ST 10 - Satz SAV-No. - Form nom. size x Weight - Strength - Set Designation



## SAV 233.75

### SAV 233.75-PWA

(All sizes have the same execution; for use with all vice widths)

SAV 233.75-SKV-A







### **DOUBLE CLAMPING SYSTEM DS**

The double clamping system provides efficient and flexible workpiece clamping through multiple clamping.

Very economical in the production of small, medium and large batches but also for single production tasks.

Easy to operate due to the 3rd hand function. Mechanically or hydraulically actuated.

#### Execution:

- Maximum use of the working space, high workpiece density and minimal travel distances
- Used for vertical and horizontal machining operations
- Clamping of up to 4 workpieces, even if they are of different sizes
- Spindle well protected as the device is sealed from chipping ingress

#### Scope of delivery:

- Vice without jaws
- Instructions for use







Up to 4 workpieces, with the same or different dimensions, can be clamped using standard jaws.

Details of the clamping ranges possible and the corresponding jaws can be found in the table.

Accessories e.g.

SAV 233.76-SWB-A / SAV 233.76-SMB-A

Hydraulic aggregates and accessories on request.



SAV 233.76





### Accessories for double clamping system DS



		Clamping range dimensions in mm												
	Α	1	2	3	4	5	6	7	8	9	10	11	12	13
Γ	100	150-266	81-156	40-120	46-126	10-90	-	-	-	-	-	-	-	-
	125	146-270	80-164	40-124	50-134	10-94	60-77	60-77	40-57	40-57	50-62	50-62	25-42	25-42
-	125L	186-350	80-204	40-164	50-174	10-134	75-97	75-97	55-77	55-77	60-82	60-82	40-62	40-62
,	* Tole	ercance +	0.02							•				





Dimensions in mm					Clamping force in kN		Clamping	Power stroke	Weight					
Α	<b>B</b> *	С	D	Ε	G	Н	<b>K</b> H7	MxDepth	SW	mechanical	hydraulic	carriage	per carriage	mechanical / hydraulic
100	70	420	200	58	20	24	18	M10x17	14	25kN/55Nm	25kN/400bar	44	10mm/8ccm	19,5 / 21
125	82	430	200	68	21	27	20	M12x20	17	40kN/115Nm	40kN/400bar	44	10mm/10ccm	29 / 32
125L	82	510	240	68	21	27	20	M12x20	17	40kN/115Nm	40kN/400bar	44	10mm/10ccm	34 / 37
* Tole	ranz -	+ 0.0	2											

Toleranz  $\pm$  0,02

#### Ordering example:

Designation

Double clamping system SAV 233.76 - 125 - M SAV-No. - A - Execution



## SAV 233.76

•

	1	
<u> </u>	U	











E f7	G	G1	н	H1
18	78	40	18	36
20	98	54	20	40

<u>/</u>

0

E f7	G	G1	Н	H1
18	78	40	18	-
20	98	54	20	40







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Designation

SAV-No.

- Type - A

www.group-sav.com





### Accessories for hydraulic and machine vices

Angle drive SAV 233.84-A

For use with hydraulic machining vices Type HMS, SAV 233.70 and SAV 233.72

For use with vice spindles that are difficult to access or if the vice is mounted in the longtitudinal direction of the machine table.

Ordering example: Angle drive SAV 233.84 - 100 Designation SAV-No. - Jaw width

Crank handle SAV 233.85-HK-A

For use with hydraulic machining vices Type HMS, SAV 233.70 and SAV 233.72

Ordering example: Crank handle SAV 233.85 - HK - 100 Designation SAV-No. - Type - Jaw width

#### Holding force pre-selector SAV 233.85-SKV-A

For use with hydraulic machining vices Type HMS, SAV 233.70 and SAV 233.72

Presetting of the holding force by blocking the spindle stroke.



SAV 233.82 - 85

Ordering example: SAV 233.85 - SKV - 100 Holding force pre-selector SAV-No. Designation - Type - Jaw width

## Precision workpiece stop SAV 233.86-PWA-A

For use with hydraulic machining vices Type HMS, SAV 233.70 and SAV 233.72

Mountable on either side of the fixed jaw. Can be swung away when not required.



### Accessories for hydraulic and machine vices

**Set of clamping claws** (1 Set = 4 Pieces) For use with hydraulic machining vices Type HMS, SAV 233.70 and SAV 233.7 Type HMS, SAV 233.70 and SAV 233.72

Comprised of 4 clamping claws with screws

Dim	ensions in	mm
Α	Μ	Nut
100	M12	14
125	M12	14
125	M16	18
160	M12	14
160	M16	18
Ordering	example	: Clampi

Force gauge

For use with all machine vices and for all jaw widths.

Designation

Ordering example:	Force gauge	SAV 233.91
	Designation	SAV-No.

## Set of ground T-Nuts DIN 6325

(1 Set = 2 Pieces) (1 Satz = 2 Stück)

For use with hydraulic machining vices Type HMS, SAV 233.72 for exact positioning via longtitudinal and transverse slots.

Farm		Dimensio	ns in mm		
Form	<b>A1</b> h6	<b>A2</b> h6	B1	B2	
•	20	14	14	5,5	
A	20	18	14	5,5	
Ordering	example:	T-Nut s Designa	et ation	SAV 201.4 SAV-No.	40 - A 20 x - Type

Set of nuts for T-slots DIN 508 (1 Set = 4 Pieces)

Ordering example:	T-Nut set	SAV 320.21	- G 18 x M
	Designation	SAV-No.	- Form nor

Do you have a special task and weren't able to find the right workholding device? Ask us! We've got the answer.

#### Ordering example:

SAV 233.86 - PWA - 100 Precision workpiece stop Designation SAV-No. - Type - Jaw width 14



SAV 233.88-A-M



00 - M12 Also see SAV 201.40 T-Nuts p. 59. - A - M





SAV 201.40-A 20 x 14 △ 20 x 18

4





SAV 320.21-G 14 x M12 - St 10 - Set G 18 x M12 - St 10 - Set G 18 x M16 - St 10 - Set





112 - ST 10 - Satz n. size x Weight - Strength - Set







### **SLIMFLEX JAW SYSTEM**

#### For hydraulic machining vices SAV 233.70 and 233.72

#### Application:

Allows 3-side machining of small workpieces in a single clamping step. The workpiece is kept away from the edge of the jaw through transversally movable, stepped inserts or soft inserts.



SlimFlex Standard jaw SAV 233.89-SFS-A:

With reversable, hardened stepped inserts and a scale to preset the inserts.

Dimensions in mm											
A B C DH7 E F1* F2* G1 G2 H											
100	34	18	78	23	30	33	24	31	30		
125	45	20	98	29	32	35	30	42	40		
160 54 22 125 38 34 37 39 51 40											

Tolerance: ± 0,02

Ordering example: SlimFlex Standard jaw SAV 233.89 - SFS - 100 Designation SAV-No. - Type - A

#### SlimFlex-QIS Quick change jaw SAV 233.89-SFQ-A:

With reversable, hardened stepped inserts and a scale to preset the inserts. Used together with SAV 233.81-GB-A.



#### Ordering example:

SAV 233.89 - EW - A SlimFlex Retaining insert Designation

SAV-No. - Type - Jaw width





## SAV 233.89

F2

С

### 2-JAW CHUCK

#### Hand actuated

#### Execution:

- Centered manually over the spindle drive
- Also possible in compensating execution

#### Scope of delivery:

- Without jaws
- If required, on request





	Dimensions in mm											Stroke / Jaw	Max.tightening	Maximum	Maximum	Weight
A	1	В	B1	С	D	<b>E</b> <sup>H7</sup>	F	<b>G</b> ±0,10	Н	J	Κ	in mm	in Nm	in daN	in daN	in kg
15	50	41	45	80	3	14	SW 8	15	52	10	20	15	95	6300	6300	16
22	20	60	65	118	4,5	20	SW12	22,5	75	15	30	22,5	140	9300	9300	23
32	20	87	94	170	6	30	SW17	32	108	22	44	32	200	13500	13500	33

## Ordering example:

2-Jaw chuck SAV 751.31 - 220 x 60 Designation SAV - No. - A x B



### SAV 751.31



#### Illustration with jaws



B1



### **2-JAW CHUCK**

#### Self centring

#### Execution:

- Hydraulically actuated, with integrated clamping cylinder
- High clamping repeat-accuracy (0.01 mm)

#### Application:

- As a single centering clamping element
- Used in groups on fixtures
- Can be combined with other SAV clamping elements

#### Material:

- Hardened steel
- Wear protected

#### Scope of delivery:

- Without jaws - If required, on request





Ð



Shown in the middle position

Maximum

holding force in daN

1000

1650

3850

6700

lax.operatir

pressure in bar

80

80

80

80

Stroke / Jaw

in mm

1,5

2

3

4

Κ

M6

M8

M12

M16

48

64

Maximum Release force in daN

1250

2050

4750

8350

Weight in kg

2,5

5.8

20

47

				Dime	ensions i	n mm	Dimensions in mm										
A	B	C	D	Eh6	F	G	Hh6	J	K	in mm	in bar	in daN	in daN	in kg			
150	150	75	80	39	126	126	30	M60x1,5	M8	5,5	130	4650	4650	14			
250	250	126	132	65	210	210	48	M100x1,5	M12	9,3	130	13000	13000	62			
250	400	126	132	65	210	336	48	M100x1,5	M12	9,3	130	13000	13000	100			

B C

150 150 111 120

100

55,5 74

200 148 160

Α

75

100

200

### Ordering example:

2-Jaw chuck SAV 751.25 - 100 x 100 - 80 Designation SAV - No. - A x B - max. working pressure

D

60 80

Dimensions in mm

30

40

Eh6 F

# 2-JAW CHUCK

#### Self centring

#### Execution:

- Hydraulically actuated, with integrated clamping cylinder
- High clamping repeat-accuracy (0.01 mm)
- High holding forces
- Stable jaw guidance over long jaw strokes

#### Application:

- As a single centering clamping element
- Used in groups on fixtures
- Can be combined with other SAV clamping elements

#### Material:

- Hardened steel
- Wear protected

#### Scope of delivery:

- Without jaws
- If required, on request

Ordering example: 2-Jaw chuck SAV 751.25 - 150 x 150 - 130

Designation SAV - No. - A x B - max. working pressure

G H Jh6

 55,5
 25,05
 26,25
 24

 75,0
 33,4
 35
 32

60 112,5 50,1 52,5

80 150 66,8 70



## SAV 751.25



### SAV 751.25









### HYDRAULIC CLAMPING BLOCK

#### Self centring

#### Execution:

- Operating pressure: max. 45 bar Accuracy: 20-40: 0.01 mm
- - 50-120: 0.02 mm
- Operating temperature range: 5°C 60°C
- Operating principle: Wedge hook system
- Actuation: Hydraulically via filtered oil
- Lubrication interval: 5000 h
- Protection classification: IP 40
  Compressed air connections on the sides
- M5 Purging air connection is possible
- Execution 1: Low force / long stroke
- Execution 2: Large force / small stroke

#### Application:

Hydraulic centering clamp for use in jig manufacture and automation. Robust and reliable.

#### Material:

Housing and functional parts made from hardened steel

#### Scope of delivery:

- Without jaws - If required, on request

#### Maximum permitted forces and torque at the finger

A in mm	CA in N	MR in Nm	MF in Nm	MT in Nm
68	500	35	30	20
80	1200	90	40	35
100	2200	100	55	55
125	6000	105	80	70
160	10000	110	90	90
180	12000	125	110	110
200	15000	160	150	150
250	20000	300	220	220
320	30000	500	360	360
400	45000	700	470	470



G



			Dimensio	ns in mm		Holding f	orce in N	Full strok	ke in mm	Weight		
Α	<b>B</b> -0,1	C	<b>D</b> ±0,1	<b>E</b> ±0,1	F	G	н	Exec. 1*	Exec. 2*	Exec. 1*	Exec. 2*	in kg
68	36	50	42	27	26	52	21	890	1480	12	6	0,8
80	42	56	52	32	32	64	29	1290	2150	16	8	1,2
100	50	60	66	38	40	80	34	3010	5080	20	10	1,8
125	60	68	82	45	52	100	43	4360	7120	26	13	2,9
160	72	81	100	56	66	125	56	8470	14280	32	16	5,4
180	80	98	120	60	72	140	66	10660	17830	40	20	8,5
200	90	112	130	68	76	155	74	12540	20960	50	25	11,5
250	120	136	164	90	104	200	88	25820	43140	60	30	24,5
320	144	162	200	112	132	250	116	33000	53070	72	36	44,5
400	180	224	260	136	170	310	148	45600	73320	100	50	97,0

\* Execution 1 / 2 with different wedge hook angles for different strokes and holding forces. When ordering please specify.

#### Ordering example:

Hydraulic clamping block	SAV 751.26	5 -	250	Х	120	-	2
Designation	SAV - No.	-	А	Х	В	-	Exe



MT



### HYDRAULIC / PNEUMATIC CLAMPING BLOCK

#### Self centring

#### Execution:

- Operating pressure: max. 9 bar (pneumatic) (P) max. 120 bar (hydraulic) (H)
- Accuracy: 66-100: 0.02 mm
- Operating temperature range: 5°C 60°C
- Operating principle: Wedge hook system
- Actuation: Pneumatic via filtered compressed
- air or hydraulically via filtered oil
- Lubrication interval: 5000 h

SAA

- Protection classification: IP 40
- Compressed air connections on the sides
- M5 Purging air connection is possible
- Execution 1: Low force / long stroke
- Execution 2: Large force / small stroke

#### Application:

Clamping block for stationary use in machining equipment and as a mounting fixture

#### Material:

Housing and functional parts made from hardened steel

#### Accessories:

Proximity switch, finger blanks

## and

A in mm	CA in N	MR in Nm	MF in Nm	MT in Nm
52	2500	70	120	140
82	18000	100	250	200
100	22000	120	250	240
128	24500	140	250	270

Type: Pneumatic (P)

		Di	mensio	ns in mr	n					Holding force in N (9 bar)		Full stroke in mm		max. rec'd workpiece weight in kg	
A	В	<b>C</b> ±0,02	D	E	F	G	н	J	K	Exec. 1*	Exec. 2*	Exec. 1*	Exec. 2*	Exec. 1*	Exec. 2*
102	52	68	2,5	82	36	41	20	56	52	5900	14000	12	4,6	19	44
162	82	88	3	128	62	69	24	90	82	14000	35000	16	6,2	45	105
200	100	91	3	160	74	88	24	110	100	20000	51000	18	7	65	160
254	128	100	3	202	92	112	30	140	128	20500	51500	20	7,8	95	255

#### Type: Hydraulic (H)

	Dimensions in mm									Holding force in N (9 bar)		Full stroke in mm		max. rec'd workpiece weight in kg	
A	В	<b>C</b> ±0,02	D	E	F	G	н	J	K	Exec. 1*	Exec. 2*	Exec. 1*	Exec. 2*	Exec. 1*	Exec. 2*
102	52	68	2,5	82	36	41	20	56	52	6400	16500	12	4,6	28	65
162	82	88	3	128	62	69	24	90	82	14800	38000	16	6,2	65	170
200	100	91	3	160	74	88	24	90	82	20000	52000	18	7	100	235
254	128	100	3	202	92	112	30	140	128	29000	66000	20	7,8	150	260

\* Execution 1 / 2 with different wedge hook angles for different strokes and holding forces. When ordering please specify.

#### Ordering example:

0 1		
Hydraulic / Pneumatic clamping block	SAV 751.27	- 200 x
Designation	SAV - No.	- A x



Maximu torque a	um permi at the fin	itted fo ger	orces
Δ	CA	MP	ME

torque	at the f
A in mm	CA in N
52	2500
82	18000

ecution



atai	ogu	ie i		
	0			



## SAV 751.27





```
200 - 1 - P
B - Execution - Type
```

# SA A

## **3-FINGER GRIPPER**

#### Self centring

#### Execution:

- Operating pressure: 2 8 bar Accuracy: 64 125: 0.02 mm 160-250: 0.05 mm
- Operating temperature range: -10°C 90°C to 130°C and higher on request
- Operating principle: Wedge hook system
  Actuation: Pneumatic via filtered compressed
- air 10 mm, dry or lubricated
- Pressurized
- Maintenance-free: up to 1.5 million cycles
- Compressed air connections on the sides and base
- M5 Purging air connection is possible Protection classification: IP 40
- With spring package
- With pressure plate
- Stabilised clamping force
- Stroke control
- Execution 1: Low force
- Execution 2: Large force

#### Application:

Pneumatic centering clamp for use in jig manufacture and automation. Robust and reliable.

#### Material:

Housing and functional parts made from hardened steel

#### Scope of delivery:

- Without jaws

- If required, on request

Maximum permitted forces and torque at the finger

Α	CA	MR	MF	MT
in mm	in N	in Nm	in Nm	in Nm
64	1350	35	30	15
80	1820	85	35	35
100	2250	95	50	45
125	2500	100	70	65
160	2800	110	85	85
200	3500	135	100	120
250	4450	205	155	170



MT



SAV 751.30



		Dir	nensior	ns in mr	n												Holding f	force in N	Full strol	ke in mm	Weight
Α	В	C	D	E	F	G	H	J	K	L	M	Nm6	0	Р	<b>Q</b> ±0,01	R	Exec. 1*	Exec. 2*	Exec. 1*	Exec. 2*	in kg
64	43	27,5	11	14	18	24	19,5	11	26	5,5	47,5	4	10,5	4	13	10	580	970	12	12	0,4
80	49	34,5	17	17	21	30	26,5	13	40	6,5	60	5	13	5	16	11	1000	2300	16	16	0,75
100	59	44	19	22	25	40	32	15	50	6,5	76	6	16	6	20	11	1800	4050	20	20	1,4
125	71	55	25	27,5	32	50	41,5	18	55	9	95	6	20,5	8,5	24	14	3000	5800	26	26	2,4
160	85	72	34	36	40	65	55	22	80	9	125	8	25	9	32	14	6000	11000	32	32	4,9
200	125	90	42,5	45	48	85	67	30	90	13	156	12	31	11	40	19	7100	16000	50	50	11,5
249	150	112	52	56	56	95	84	36	115	17	194	12	41	17	48	25	10300	18600	60	60	21,5

\* Execution 1 / 2 with different wedge hook angles for different strokes and holding forces.

### When ordering please specify.

#### Ordering example:

3-Finger Gripper SAV 751.30 - 100 x 59 - 1 Designation SAV - No. - A x B - Execution



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### CHAPTER OVERVIEW

### **CHAPTER 5**

### **MAGNETIC PALLETS**

	SAV-ARTNO.	DESCRIPTION	COMMENTS	PAGE
0	220.25	Screw-threaded pallet	With bore hole matrix	76
	220.30	Permanent magnet pallet	With fine pole pitch, for zero-point clamping systems	77
	220.31	Power magnet pallet	With high clamping force, for zero-point clamping systems	78
	220.32 220.33	Permanent magnet pallet	With wide pole pitch, for zero-point clamping systems	79

## ADAPTABLE TO ALL AVAILABLE REFERENCE SYSTEMS FOR THE APPLICATIONS





### Pages 75 - 80



# SA/

# SAV-

### SCREW-THREADED PALLET

#### Material:

Aluminium base with screwed-on, hardened, stainless steel, top plate with threaded screw holes M8 /  $\emptyset$  8H7 and M12 /  $\emptyset$  12H7.

#### Technical specifications:

<ul> <li>Parallelism:</li> </ul>	0.01 mm
- Top plate:	hardened

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



Dimensions in mm			Matrix bore hole in mm	Matrix / Bore holes in mm	Weight	
Α	В	C*	D	E/F	in kg	
200	200	50			8,9	
240	240	55		21,5 / 50	11,5	
280	280	55	M.O. ( ~ 0117		15,5	
320	320	60	M 12 / Ø 8H /		24,0	
320	160	60			11,0	
480	280	60			30,0	
650	340	60			44,0	



#### Screw-threaded pallet SAV 220.10 on a reference system



#### Ordering example: Screw-threaded pallet Designation

SAV 220.10 - 320 x 320 - Reference system - Adaption SAV - No. - A x B - Reference system - Adaption

# SAV 220.10

### PERMANENT MAGNET PALLET

Transverse pole pitch P = 2 mm

#### Application:

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

#### Material:

Aluminium base with pole plate St 37/V4A

#### Technical specifications:

- Can be executed with threaded	bores
for stop rails and angled stops	
<ul> <li>Magnet field height:</li> </ul>	4 mm
- Pole plate wear limit:	3 mm
- Nominal holding force:	80 N/cm <sup>2</sup>
- Pole pitch:	2 mm
Parallelism in the executions	
Standard (S): 0.03 / fine milled	

Precision (P): 0.01 / ground

C	Dimensio	Switchable	Weight		
A	В	C*	D	sections	in Kg
240	240	46	204	1/2	19,0
280	280	67	230	2	25,0
320	320	60	250	1/2	32,0
320	160	60	250	1	16,0

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



Execution: Magnet pallet SAV 220.30 - 320 x 320



Execution: Magnet pallet

### Ordering example:

Magnet Pallet SAV 220.30 - 320 x 160 - 1 - Reference system - Adaption - P Designation SAV - No. - A x B - Switchable sections - Reference system - Adaption - Accuracy

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### SAV 220.30





\* Please specify the reference system and adaptation for robots. We will be happy to advise you. Please request the technical information to your reference system.

Reference system\*





Example

SAV 220.30 - 240 x 240 Reference system\*





### **POWER MAGNET PALLET**

#### True transverse pole pitch P = 6 mm

#### Application:

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

#### Material:

Aluminium base with pole plate St 37/V4A

#### Technical specifications:

- Low weight with high holding force
- 2 mm - Pole plate wear limit:
- Nominal holding force: 140 N/cm<sup>2</sup>
- Can be executed with threaded bores for stop rails and angled stops
- Low magnetic field height
- Can be executed with clamping bore holes on the top plate if required

#### Parallelism in the executions: Standard (S): 0.03 / fine milled

Precision (P): 0.01 / ground

		Dimen	sions in m	ım		Swit-	Weight
Α	В	C*	D	E	F	sections	in kg
240	240	60	126,0	-	-	1	18,0
280	280	66	166,0	80,0	80,0	2	21,5
320	320	65	206,0	80,0	80,0	1/2	25,0/36,0



4 Stee





Power magnet pallet

system.

SAV 220.31 - 320 x 320 Reference system\*





Execution: Power magnet pallet for HSC-milling

SAV 220.31 - 320 x 320 Reference system\*



# SAV 220.31



Transverse pole pitch P = 15 mm

SA/-

#### Application:

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

#### Technical specifications:

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

Pole pitch steel/brass:	11/4 mm
Nominal holding force:	130 N/cm <sup>2</sup>
Magnetic field height:	6 mm
Pole plate wear limit:	6 mm
Re-machining of the bottom face	e: up to 12 mm
Parallelism	0.03 mm

Dim	ensions in		Weight	
Α	В	C*	D	in Kg
240	240	63,5	200	21,5
280	280	63,5	230	29
320	320	63,5	290	38

\* Exact dimension is determined using the reference system

#### Ordering example:

Designation

Permanent Magnet Pallet SAV 220.32 - 320 x 320 - Adaption SAV - No. - A x B - Adaption

### PERMANENT MAGNET PALLET

#### Transverse pole pitch P = 19 mm

#### Application:

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

- **Technical specifications:**  Steel body, for attachment or installation Stops on 3 sides
- 2 Switchable sections
- Threaded bores on all sides
- Hexagon key and instructions
  Finely milled execution

Pole pitch steel/brass:	15/4 mm
Nominal holding force:	140 N/cm <sup>2</sup>
Magnetic field height:	8 mm
Pole plate wear limit:	6 mm
Re-machining of the bottom fac	ce: up to 4 mm
Parallelism	0.03 mm

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

\* Exact dimension is determined using the reference system. Size 320 can be supplied with bevelled edges 320-45.

### Ordering example:

Permanent Magnet Pallet	SAV 220.33	-	320	Х
Designation	SAV - No.	-	А	Х

320 - Adaption B - Adaption

Ordering example:

Designation





### SAV 220.32















### **APPLICATIONS**

### **CHAPTER OVERVIEW**

### **CHAPTER 6**

### SINE TABLES

SAV-ARTNO.	DESCRIPTION	COMMENTS	PAGE
235.71	Precision sine table	Tilts on the longtitudinal axis	82
235.72	Precision sine table	Tilts on the longtitudinal and transversal axes, without magnet plate	83
245.40	Precision sine table Also in tool-steel execution	Tilts on the longtitudinal axis, with switchable permanent magnet block SAV 242.1	84
245.41	Precision sine table Also in tool-steel execution	Tilts on the transversal axis, with switchable permanent magnet block SAV 242.11	84





SAV Pallet changer for loading and unloading with pallets and zero-point clamping systems



### Pages 81 - 84

# SA/

### PRECISION SINE TABLE

#### Tilts on the longtitudinal axis

#### Execution:

Tilts on the longitudinal axis. The base plate of the sine table is made of hardened steel (HRC 60), burnished and precision ground. The tilt-plate is executed with threaded bores M8 (G).

Sizes from 400 x 200 can be supllied with T-slots (T) at a surcharge. An alternative mechanical adjustment drive can be supllied at a surcharge. The height at 0° tilt angle then increases by 40 mm per axis.

Tables up to size 400 x 150 are delivered in a wooden storage case.

Sine conversion table in degrees / minutes in mm.

Angle precision:		± 5 sec.
Planar parallelism:	± 0.0	005 / 100 mm
Shimming dimension a	t 0°:	3 mm
Anle tilt range:		0° bis 45°

#### Application:

The angles are set using the end gauge according the sine principle. Depending on the workpiece, a choice of precision grinding vices or switchable permanent magnets can be installed on the tilt-plate.

Fixation is achieved by means of the sidemounted retaining shears and tightening the upper bearing clamps.

#### Top plate for the execution with T-slots (T) from size 400





GH

Dimensions in mm									Weight				
A	В	С	D	E	F	G	н	1	J	L	M	N	in 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

- A - Execution

10

#### Ordering example: Pre

Precision Sine Table	SAV 235.71	-	600	-	G
Designation	SAV - No.	-	А	-	Еx



SAV 235.71

8 ≥







## **PRECISION SINE TABLE** without magnet plate

#### Tilts on the longtitudinal and transversal axes

#### Execution:

SAV.

Tilts on the longitudinal and transversal axes. The base plate of the sine table is made of hardened steel (HRC 60), burnished and precision ground. The tilt-plate is executed with threaded bores M8 (G). Sizes from 400 x 200 can be supllied with T-slots (T) at a surcharge. An alternative mechanical adjustment drive can be supllied at a surcharge. The height at  $0^{\circ}$  tilt angle them increases by 40 mm per axis.

Tables up to size 400 x 200 are delivered in a wooden storage case. Sine conversion table in degrees / minutes in mm.

Angle precision:	± 5 sec.
Planar parallelism:	± 0,005 / 100 mm
Shimming dimension at	0°: 3 mm
Tilt range long axis:	0° bis 45°
Tilt range short axis:	0° bis 30°

#### Application:

The angles are set using the end gauge according the sine principle. Suitable for workpieces with two working planes.

Fixation is achieved by means of the sidemounted retaining shears and tightening the upper bearing clamps.







Γ	Dimensions in mm									Weight				
	Α	В	C	D	E.0	F	G	н	1	J	L	M	N	in kg
Γ	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:	
Precision Sine Table	SAV 235.72 - 450 - G
Designation	SAV - No A - Execution





### SAV 235.72







Top plate for the execution with threaded bores (G)





### PRECISION SINE TABLE

Also in tool-steel execution

SAA

Tilts on the longitudinal axis, with switchable permanent magnet block SAV 242.11

#### Execution:

Tilts on the longitudinal axis. The base plate of the sine table is made of hardened steel (HRC 60), burnished and precision ground. Delivery in wooden storage case. Sine conversion table in degrees / minutes in mm, Tool steel execution (RF) can be supplied.

Angle precision:	± 5 sec.
Planar parallelism:	$\pm$ 0.005 / 100 mm
Shimming dimension at 0°:	3 mm
Angle tilt range:	0° to 45°
Nominal holding force:	50 N/cm <sup>2</sup>
Nom. holding force tool steel:	30 N/cm <sup>2</sup>

#### Application:

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

	Weight					
Α	В	С	D	E .2	F	in kg
140	118,5	150	95	54	65	7,2

#### Ordering example:

Precision Sine Table Designation

SAV 245.40 - RF SAV - No. - Execution

### **PRECISION SINE TABLE**

Also in tool-steel execution

### Tilts on the transversal axis,

with switchable permanent magnet block SAV 242.11

#### Execution:

Tilts on the transversal axis. The base plate of the sine table is made of hardened steel (HRC 60), burnished and precision ground. Delivery in wooden storage case. Sine conversion table in degrees / minutes in mm, Tool steel execution (RF) can be supplied.

Angle precision:	± 5 sec.
Planar parallelism:	± 0.005 / 100 mm
Shimming dimension at 0°:	3 mm
Angle tilt range:	0° to 45°
Nominal holding force:	50 N/cm <sup>2</sup>
Nom. holding force tool steel:	30 N/cm <sup>2</sup>

#### Application:

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

Dimensions in mm						Weight
Α	B	C	D	E.2	F	in kg
140	118,5	130	95	54	100	7,8

ſ

SAV-Group

at 0°

D

#### Ordering example:

Precision Sine Table	SAV 245.41	- RF
Designation	SAV - No.	- Execution







# CHAPTER OVERVIEW

### **CHAPTER 7**

### **5-AXIS ATTACHMENT MODULES**

	SAV-ARTNO.	DESCRIPTION	COMMENTS	PAGE
R.	SAV 220.80	5-axis Basic module	For direct mounting on the machining table	86
	SAV 220.81	5-axis extension module	To increase the height of the basic module	87
4	SAV 220.xx	5-axis Reduction adapter	To compensate for different workpiece heights	87
	SAV 220.82	5-axis collet adapter	For the clamping round workpieces	88
	SAV 220.83	5-axis clamping bolts	For the fixing of workpieces or pallets	89
	SAV 220.84	5-axis accessories	Tools for the application of the exact clamping force	90











### Pages 85 - 90







### **5-AXIS BASIC MODULE**

#### Application:

- For mounting on machining tables using clamping bolts
- Can be supplied in the basic heights of 75 mm, 100 mm and 125 mm
- Reduction adapter with the dimensions 25 mm and 50 mm

Scope of delivery:

- 5-Axis basic module incl. fixing bolts



øΑ

 $\bigcirc$ 

Dimensions in mm

С

øD

D<sup>H7</sup>

C

Repeat accuracy



### SAV 220.80





### **5-AXIS EXTENSION MODULE**

#### Application:

- Used to extend the height of the basic module - Difficult to access workpieces and workpieces of different heights can be clamped by stacking various module types

#### Scope of delivery:

- 5-Axis extension module incl. 1x SBA 40-25-5-16 centering clamping bolts



Dimensions in mm						
A B C D E <sup>H7</sup> Repeat accura						
80	75	12,0	5,5	25	< 0,005	
80	100	12,0	5,5	25	< 0,005	

#### Ordering example:

5-Axis extension module Designation

SAV 220.81 - 80 x 100 SAV - No. - A x B

### **5-AXIS REDUCTION ADAPTER**

#### Application:

- Hard and soft reduction adapters are used to clamp workpieces with small locating surfaces - Soft adapters can be machined enabling an improved

level of workpiece accessibility

#### Scope of delivery:

- 5-Axis reduction adapter incl. fixing bolt and centering clamping bolts

	Dimensions in mm					
A B		С	Dh7	E	Fixing boit	
80	25	50	25	5	M10 x 75	
80	50	50	25	5	M10 x 100	
80	100	50	25	5	M12 x 100	

Ordering example:	
5-Axis reduction adapter	SAV 220.82 - 80 x 50
Designation	SAV - No A x B

12,0 < 0,005 80 75 17,0 80 100 17,0 12,0 < 0,005 80 125 17,0 12,0 < 0,005

### Ordering example:

В

Α

SAV 220.80 - 80 x 125 5-Axis Basic module Designation SAV - No. - A x B

0

أداعك

G

Holding force in N

M12

50'000

50'000

50'000

M10

35'000

35'000

35'000

Weight

in kg

3,65

4,45

5,00

Thread

G

M10/M12

M10/M12

M14



### SAV 220.81



Thread	Holding f	Weight	
G	M10	M12	in kg
M10/M12	35'000	50'000	2,85
M10/M12	35'000	50'000	3,65
	Thread G M10 / M12 M10 / M12	Thread         Holding f           G         M10           M10 / M12         35'000           M10 / M12         35'000	Thread         Holding force in N           G         M10         M12           M10 / M12         35'000         50'000           M10 / M12         35'000         50'000





### **5-AXIS COLLET ADAPTER**

#### Application:

- To clamp axles and other round parts
- Designed for ER 40 collets up to a diameter of 25 mm

#### Scope of delivery:

- 5-Axis collet adapter incl. length-adjustable centering clamping bolts, without collet
- Supplied without the basic module



SAV 220.83

### **5-AXIS CLAMPING BOLTS**

#### Application:

- Fixing sets for the optimal use of the

5-axis clamping elements

SAV-

- The fixings guarantee efficient operating conditions

- Scope of delivery for 5-axis fixings: 5-axis clamping bolts for workpiece fixing
- M12/M10, incl. 1x Fixing bolt M10x45 5-axis clamping bolts for workpiece fixing
- M16/M12, incl. 1x Fixing bolt M12x45
- 5-axis clamping bolts for workpiece fixing with
- centre bore 16F6 without fixing bolt
- 5-axis clamping bolts for workpiece fixing with centre bore 12F7 without fixing bolt





	Dimensions in mm					orce in N	Weight
Α	В	C	D	Repeat accuracy	M10	M12	in kg
80	100	~88	50	< 0,005	35'000	50'000	1,95

#### Ordering example: 5-Axis collet adapter Designation

SAV 220.83 - 80 x 100 SAV - No. - A x B



#### Centering clamping bolts Typ A

- Also available in the sizes M16 and M20

- The complete clamping bolt range is available



Standard bolts M16

Scope of delivery:

in tool steel execution

Fixing DIN 912 M12x45



Tur		Dim	Wrench			
тур	Α	B <sub>h6</sub>	C	D	E	size SW
А	40	25	10,3	16,5	20	12
В	40	25	10,3	16,5	20	12
С	39,90	25	10,3	16,5	20	12

Ordering example:		
5-Axis clamping bolt	SAV 220.84	- B
Designation	SAV - No.	- Туре



### SAV 220.84



STANDARD CLAMPING BOLTS FOR M10, M12, M16



Compensating clamping bolts

#### Non-centering (play) clamping bolts Typ C



Typ B

Thread G
M12
M12
M12





# SAV-

**CHAPTER 8** 

(at

**SPECIAL SOLUTIONS** 

### **5-AXIS ACCESSORIES**

### SAV 220.85

### **CHAPTER OVERVIEW**

#### Application:

- A 15 Nm torque wrench is recommended to tauten the initial manual tightening of the 5-axis modules

#### Accessories:

- 5-Axis body-fit shoulder screw M12/12h6, Length 55 mm
- 5-Axis torque wrench to tauten the initial manual tightening (15 Nm), wrench size 6 mm
- 5-Axis fitting bush, diameter 25h7x16 mm, Hardened, ground steel





### **COMPLETE RANGE OF 5-AXIS ATTACHMENT MODULES**





# Applications for special solutions SAL

Stor 📂 🏟

SPANNTECHNIK

4

Magnetic special solutions can be found in SAV-Catalogue VII "Special Solutions"

Ordering example: 5-Axis accessorie SAV 220.85 Designation SAV - No.

### Pages 91 - 98

DESCRIPTION	COMMENTS	PAGE
Hydraulic quadruple fixture on dual axis indexer	For complex, multiple clamping operations	92
Dual hydraulic fixture	Dual clamping fixture for magnesium parts	92
Hydraulic quadruple fixture	Clamping fixture for forged parts	93
Hextruple fixture	Swing-clamp fixture for aluminium castings	93
2+2 symmetric fixture	Fixture for automatic loading	94
Hydraulic quadruple fixture for truck steering parts	Hydraulic-mechanical solutions	94
Hydraulic fixture for truck steering parts	Fixture for combined machining operations (Milling, drilling, line boring)	95
Hydraulic 2-jaw-chuck	For pipe-end machiing	95
Applications for special solutions	Customer-specific solutions	96-98





### **SPECIAL SOLUTIONS**

### HYDRAULIC AND MECHANICAL SOLUTIONS, RECTANGULAR

### **Dimensions:**

800 x 550 x 420 mm

### Workpieces:

Aluminium housings Application:

#### Milling, drilling, line boring Description:

- 2-Axis indexer with 4 NC axes
- 3 special swing clamps per fixture
- Workpiece positioning check via air sensoring
- Main body from high density aluminium, hard coated



Hydraulic quadruple fixture on dual axis indexer

#### **Dimensions:**

2400 x 1150 x 720 mm

#### Werkstücke:

Magnesium automotive chassis parts

### Application:

Milling, drilling, line boring Description:

- NC indexer (NC axis 360°)
- Tail stock with hydraulic clamping & multiple rotary feed for hydraulics and pneumatics
- Workpiece positioning check via air sensoring - Fixture base made from welded square
- profiles



SAV.

### **SPECIAL SOLUTIONS**

### **EFFICIENT MANUFACTURING - CUSTOM WORKHOLDING SOLUTIONS**

**Dimensions:** 620 x 400 x 350 mm

Workpieces: Forged steel parts, automotive parts

Application: Milling, drilling Description:

- Integrated positioning and clamping control for automatic loading



Dimensions: 950 x 450 x 450 mm

Workpieces: Aluminium castings

Application: Milling, drilling, line boring

Description:

- Workpiece positioning with swing clamps and pendular claws
- Pressure control on opened clamp cylinders
- Lateral "floating" clamping of the workpieces, self impeding





Hydraulic quadruple fixture





### **SPECIAL SOLUTIONS**

### HYDRAULIC AND MECHANICAL SOLUTIONS, RECTANGULAR

**Dimensions:** 

580 x 350 x 430 mm

### Workpieces:

Aluminium castings

#### Application: Milling, drilling, line boring

Description:

- Holding with block clamping cylinders, hydraulic
- Pressure control on workpieces
- Double clamping position per fixture side
- Fixture for automatic loading
- Control of opened block cylinders, pneumatic



Dimensions: 650 x 480 mm

Werkstücke: Steering parts Application: Milling, drilling Description: Hydraulic clamping



Hydraulic quadruple fixture for truck steering parts

### **SPECIAL SOLUTIONS**

### **EFFICIENT MANUFACTURING - CUSTOM WORKHOLDING SOLUTIONS**

Dimensions:

1200 x 800 x 420 mm

Workpieces: Forged steel parts, automotive parts

Application: Milling, drilling, line boring

#### Description:

converter

- 2 swing clamps against fixed references
  2 compensating, mechanically-coupled
- references, hydraulically clampable
- Clamping with 2 swing clamps against
- 2 compensating references - Integrated valve control and pressure

#### Dimensions:

Jaw width: 140 mm Clamping range: Holding force: Weight:

109.9 - 219 mm 20,000 daN at 80 bar 180 kg

Workpieces: Pipes for the oil industry

#### Application:

Machining of pipe-ends on machinery with rotating tools (Facing, chamfering and tapping)

Description: Hydraulically centering chuck, exchangeable jaws

SAV-Group





Hydraulic fixture for truck steering parts



Hydraulic 2-jaw-chuck





### **APPLICATIONS**

### ADAPTER PLATE WITH ZERO-POINT CLAMPING BOLTS

Dimensions:

400 x 400 mm Workpieces:

Cast iron parts Application: Milling, drilling

Description: - Media transfer via couplings

- Hydraulic clamping

- Zero point reference system





### FOUR-FACE MACHINING

**Dimensions:** 600 x 600 mm

Workpieces: Aluminium die-cast body

Application: Drilling, thread milling

Description:

Overhead damping
Internal hydraulics

- Hardened base



### **APPLICATIONS**

### **BASE PLATE WITH 2 CLAMPING AREAS**

Dimensions:

1200 x 800 mm Workpieces:

Cast iron parts (Man-hole covers) Application:

First machining of casting blanks

- Description: Mounting via zero-point clamping Media transfer via couplings
- Hardened materials



### **CONSOLE CLAMPING**

#### **Dimensions:**

600 x 600 mm to 1500 x 1500 mm

Workpieces:

Piston rod heads Application:

Drilling, thread milling

### Description:

- Mounted on a row on beams - Multi-side machining possible

- Piston rod eyes











### **APPLICATIONS**

### HYDRAULIC CLAMPING FIXTURE

**Dimensions:** 800 x 280 x 200 mm

Workpieces: Slide valve plates

Application: Face milling

**Description:** - Milling, thickness according to the valve bores



### HYDRAULIC CLAMPING FIXTURE

Dimensions: Ø 450 mm

Workpieces: Motor housings

Application: Turning, drilling, thread milling Description:

Centric clampingRadial fixed alignment

- Radial compensating clamps



**Dimensions:** 800 x 600 x 800 Workpieces: Camshafts Application: Milling, drilling Description: - End faces - Oil channels, radial

### **CHAPTER OVERVIEW**

### **CHAPTER 9**

### VACUUM WORKHOLDING

	SAV-ARTNO.	DESCRIPTION	COMMENTS	PAGE
		Vacuum workholding	Application criteria and examples	100-102
	249.01	Slot vacuum chucks	For clamping of workpieces	103
	249.03	Vacuum grid chucks – modular, aluminium	For clamping of workpieces	104
	249.04	Sintermetal vacuum chucks – modular	For almost all material types	105-106
	249.05/.85	Vacuum mat chucks - modular	With rubber vacuum mats	107
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	249.42	Vacuum circular grid chuck	With radial grid	109
9	249.06	Flip-Pod Vacuum system	Suitable for a wide range of applications	110-111
Ċ.	249.70	Vacuum rotation joints	For circular vacuum chucks	112
	249.71	Vacuum fluid separator	For coolants and lubricants	113
	249.72	Modular vacuum compressors	Generate vacuum pressure	114
Q	249.72	Vacuum compressor pumps, Modular vacuum compressors	Generate vacuum pressure	115-116
	249.76	Vacuum sealant materials and accessories	For use with vacuum chucks	117
1	249.82	Masking foil and adapter mats	For vacuum chucks	118
	249.90	Accessories – Vacuum workholding	For vacuum workholding systems	119





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### VACUUM WORKHOLDING

Application criteria and holding forces

Design of vacuum workholding systems:

#### Criteria for the application of vacuum workholding:

Due to the increasing use of light-metal alloys and composite, fibre materials – which are not clampable magnetically – a large increase in the demand for vacuum clamping systems has been observed.

Despite the limitations in holding forces compared to magnetic workholding (ca. factor 0.1), vacuum clamping is a competitive alternative - especially when residual magnetism is undesired - or may even be combined with magnetic systems. As is the case for magnetic workholding, a further advantage is the full-surface application of the holding forces, which makes it especially suitable for parts which are susceptible to distortion or vibrational effects.

As the atmospheric air pressure is subject to variations between ca. 930 hPa and 1013 hPa, the maximum available vacuum also varies within this range. This then clearly prescribes the maximum holding force per effective contact surface area.

As the maximum possible vacuum is dependent on the leakage losses of the system and thereby the evenness of the contact surface and its roughness, the maximum holding force of 9.3 N/cm2 is subject to further reductions, whereby the sealing characteristics of the workpiece contact surface play a special role.

The leakage losses also increase as the size of the workpiece increases. In order to keep the vacuum pressure loss through the sealing gap as small as possible, it is therefore necessary to select the correct vacuum power- unit appropriate to size of the workpiece or plate.

#### Various vacuum generation systems are available, according upon the application:

#### Vacuum compressor pumps:

Standard solutions; Almost all pumps can be used together with our liquid separator units, if fluids are drawn in during the machining operations. SAV 249.72 - VP

#### Modular vacuum compressors:

Modular compressors are especially recommended if lar amounts of fluid are drawn in during machining operatio SAV 249.72 - VW

#### Modular vacuum compressor aggregates:

These aggregate units contain an integral vacuum storage unit and a fluid separator. SAV 249.72 - VM

#### Vacuum aggregates: \*

These aggregates provide an additional vacuum storage unit. SAV 249.72 - VA Available upon request.

	Alea	Throughput	INIOUEI	
	< 100 cm <sup>2</sup>	3 m³/h	Vacuum compressor pump	VP
	< 1200 cm <sup>2</sup>	5 m³/h	Vacuum compressor pump	VP
		10 m³/h	Vacuum aggregate *	VA
		10 m³/h	Modular aggregate	VM
	$< 5000 \text{ cm}^2$	16 m³/h	Vacuum compressor pump	VP
		16 m³/h	Modular aggregate	VM
	< 1 m <sup>2</sup>	21 m³/h	Vacuum compressor pump	VP
		21 m³/h	Vacuum aggregate *	VA
		21 m³/h	Modular aggregate	VM
ge		22 m³/h	Modular compressor	VW
ns.	< 2 m <sup>2</sup>	63 m³/h	Vacuum compressor pump	VP
		63 m³/h	Vacuum aggregate *	VA
		63 m³/h	Modular aggregate, mobile	VM
		65 m³/h	Modular compressor	VW
ge	< 3 m <sup>2</sup>	100 m³/h	Vacuum compressor pump	VP
		100 m³/h	Vacuum aggregate *	VA
		100 m³/h	Modular aggregate, mobile	VM
		100 m³/h	Modular compressor	VW
	< 4,5 m <sup>2</sup>	160 m³/h	Vacuum compressor pump	VP
		160 m³/h	Vacuum aggregate, mobile *	VA
		232 m³/h	Modular compressor	VW
		250 m³/h	Vacuum compressor pump	VP
		250 m³/h	Vacuum aggregate, mobile *	VA

Avea Threushaut

Madal

#### Weiterhin erfolgt eine Reduzierung der Spannzeiten auf Bruchteile von Sekunden.

For safety reasons, it is recommended that a vacuum auxiliary storage unit in combination with a machine tool interlock is used. In the case of a power failure, the vacuum auxiliary storage unit also ensures that the vacuum force is available for a longer period. In addition it prevents the permanent operation of the aggregate, which can lead to excessive heat generation and wear through the ingress of dirt or chippings or shavings. It also enables the reduction of clamping times to a fraction of a second



### VACUUM WORKHOLDING

**Application examples** 





Workholding system for the vacuum clamping of cylindrical, pre-rolled aluminium sheets of up to 4 x 11m. An automaticallydriven pressure beam presses rolled, aluminium fuselage panels onto a vacuum clamping plate, which activates the individually required vacuum area via sensors. Hydraulic and pneumatic clamping elements support the workpiece fixing process.



www.group-sav.com







Vacuum workholding systems to clamp precision workpieces or workpieces with large surface areas for the airline industry.







Machine table 3.3 x 11m. Equipped with VAC-MAT vacuum system. Used for pocket-milling, on 468 mats, to reduce the weight of aircraft fuselage panels.



### VACUUM WORKHOLDING

#### Information and application examples

#### Vacuum workholding systems:

Vacuum workholding systems are used in a range of applications when non-magnetic materials such as light, heavy, carbide and non-ferrous metals, plastics, glass, wood, steel, iron etc are to be machined.

The workpieces to be clamped must have a smooth clamping surface and must not be porous. In vacuum clamping, a vacuum is generated between the vacuum clamping plate and the workpiece contact surface.

Various vacuum workholding systems are available for a range of machining operations.

The size of the workpiece and its shape as well as the evenness of the contact surface are decisive factors influencing the holding forces that can be achieved. In addition, under certain circumstances, the rigidity of the workpiece may also play a decisive role.



Electro-permanent milling magnet with integrated vacuum clamping plate and matrix indexing system. In special executions a hydraulic supply for hydro-clamps is available.



# SAA WITTE WOF

### **SLOT VACUUM CHUCKS**

All slot vacuum chucks have integrated slots in their surface area. To clamp parts that do not cover the full surface area rubber adapter mats or foils are used to cover the area not needed.

#### Use:

- For light machining work such as
- milling
- Drilling (e.g. circuit boards, electronic parts)
- Engraving and for complicated workpieces
  - e.g. cut-outs

#### Special advantages:

- Very flat
- Large range of applications through the use of (normally reuseable) rubber adapter mats
- Can be used in high speed cutting for precision milling of contours with the aid of the plane parallel black mat that can be machined down to achieve optimum accuracy
- Clamping very small workpieces possible

#### Handling:

- Makes workpiece positioning easier with the aid of height adjustable end stops
- Limiting of vacuum area can be achieved by
- the moveable hose connection, masking foil or rubber adapter mats.

#### Scope of delivery:

- 1 x Vacuum chuck
- 1 x Vacuum stopper
- 1 x Rubber adapter mat
- 2 x Height adjustable end stops
- 1 m Vacuum tubing with a quick attachment coupling

		Dimens		Weight Alu	Weight Steel		
Α	В	С	Width of suction slits	Interspace	in kg	in kg	
150	100	38	1	5	1,0	4,0	
200	100	38	1	5	2,0	6,0	
250	150	38	1	5	3,0	11,0	
300	150	38	1	5	4,0	13,0	
350	150	38	1	5	5,0	15,0	
400	200	48	1	5	8,0	24,0	
500	200	48	2	10	13,0	37,0	
600	200	48	2	10	15,0	45,0	
400	250	48	2	10	13,0	37,0	
500	250	48	2	10	16,0	47,0	
400	300	48	2	10	15,0	45,0	
500	300	48	2	10	19,0	56,0	
600	300	48	2	10	23,0	67,0	
400	400	48	2	10	21,0	60,0	
600	400	48	2	10	31,0	90,0	
800	400	48	2	10	41,0	120,0	
1000	500	48	2	10	65,0	188,0	

Ordering example:

Slot vacuum chuck Designation

SAV 249.01 - 800 x 400 - A SAV-No. - A x B - Execution





### SAV 249.01



#### Execution:

Vacuum chucks with 38 / 48 mm build height Execution A = Alumiunium (Standard) Execution S = Steel

Chucks with a build height of 28 mm available on request



Slot vacuum chuck with rubber adapter mat and workpiece.







### VACUUM GRID CHUCK – MODULAR, ALUMINIUM

SAV 249.03

## SINTERMETAL VACUUM CHUCKS – MODULAR

### Use:

- Suitable for simple shaped workpieces with rough
- surfaces. For heavy machining such as
- Grinding
- Milling
- Drilling

### **Special advantages:**

- High holding forces
- Universal application
- Secure clamping of unmachined workpiece surfaces due to high friction coefficient of clamping surface
- Sealing cord evens out any irregularities between workpiece and chuck surface

#### Handling:

- Special shapes and sizes of all dimensions available on request
- The most suitable grid dimensions are determined by workpiece outline and size
- Clamping area is defined by neoprene sealing cords
- Vacuum chuck with fine grid for small workpieces with different shapes
- Forms the basis for many different special solutions in combination with special vacuum adapter chucks

#### Scope of delivery:

- 1 x Tubing nozzle
- 7 x blind plugs
- 10 x O-rings
- 1 x Connector LW12
- 10 m sealing cord Ø 4 mm
- 1 m vacuum tubing 18 / 12, spiral reinforced
- Height adjustable, eccentric side stops with discs
- 2 clamps

	Dimensions in mm				
Α	В	С	in kg		
300	200	32,5	12,5	5	
300	400	32,5	12,5	10	
600	400	32,5	12,5	20	
300	200	32,5	25,0	5	
300	400	32,5	25,0	10	
600	400	32,5	25,0	20	

The Vacuum Grid Chucks are manufactured from high density aluminium. Steel execution manufactured on request.

Standard vacuum grid chucks with the same dimensions as SAV 249.01 are available on request in either steel or aluminium.

#### Ordering example:

Vacuum Grid Chuck - modular, Alu SAV 249.03 - 600 x 400 - 12,5 Designation SAV-No.

Execution with 25 grid pitch



When used in a modular arrangement, the operational vacuum pressure is supplied to the individual chucks via the connectors.



### For almost all material types

Depending upon the application, the chuck surface is made of air-permeable sinter bronze, ceramic or porous aluminium. The special properties of METAPOR open up a wide range of application opportunities and novel problem-solving solutions.

#### Use:

- Preferred for the following workpieces: - Thin-walled (e.g. Paper, foils, circuit boards,
- metal tapes)
- Fine (e.g. Optics)
- Soft (e.g. Rubber) or for
- Measurement and test procedures in micro-
- meter or nanometer ranges, for
- Precision machining and for - Silicon wafer production

#### Special advantages:

- Workpiece distortions are ruled out as there are no slots or bore holes
- Through-milling is possible with the use of a Friction Booster
- Various qualities of METAPOR-p plates are available (e.g. clean room, Class 10)

#### Handling:

- Modular execution for large clamping surfaces
- Workpiece-specific special executions available on request

#### Scope of delivery:

- 1 x Tubing nozzle
- 7 x Blind plugs
- 10 x O-rings
- 1 x Plug, inside diameter 12
- 1 m Vacuum tubing 18 / 12 spiral reinforced

12

- Height-adjustable, excentric end stops with
- discs
- 2 x Clamps

- A x B - Grid pitch





SAV 249.04









### SINTERMETAL VACUUM CHUCKS – MODULAR

#### For almost all material types



Sintermetal vacuum chuck Execution Si

Plate inlay made from tested, Wear-resistant sinter bronze



Special vacuum chuck with a METAPOR inlay. All sizes available on request!



Metapor vacuum chuck Execution BF

Plate inlay made from air-permeable material Metapor BF 100 AL

Medium-sized pores ø ca. 15  $\mu$ m



Metapor vacuum chuck Execution MC

Plate inlay made from air-permeable material Metapor MC 100 AL with a greater porosity in comparison to BF 100 AL

Medium-sized pores ø ca. 40  $\mu$ m



Dimensions in mm			Weight	Weight for BF 100 AL	
Α	В	С	in kg	CE 100 AL CE 100 in kg	
300	200	38	7,1	6,1	
300	400	38	14,2	12,2	
600	400	38	28,4	24,4	

#### Ordering example:

Sintermetal vacuum chucks - modular SAV 249.04 - 600 x 400 - BF Designation

Metapor vacuum chuck

Execution CE

Plate inlay made from avery fine porous material with a small pore diameter and very high, homogenous, overall porosity. Metapor CE 100 White Particularly suited for silicon wafer production

Medium-sized pores ø ca. 10 - 12  $\mu$ m



Vacuum mats Thickness tolerance: ± 0.04 mm Concave to: 0.1 mm

With rubber vacuum mats

Use:

loss.

Execution:

machining.

chining.

#### Scope of delivery:

- 1 x Vacuum chuck
- 1 x Hose connector
- 1 x Coupling
- 7 x Blind plugs
- 10 x O-rings
- 8 x Crosspieces
- 10 x Vacuum mats blue
- 1 m Vacuum tubing 18 / 12 spiral reinforced
- 2 x Clamps







()

SAV 249.05 - 600 x 400

Vacuum mat chucks SAV 249.05: Dimensions in mm Weight in kg Execution B С Δ 30 Single 5,0 30 300 400 Double 10,0 400 30 600 Quadruple 20,0

Ordering example:

Ordering example:

Designation

Vacuum Mat

Designation

Vacuum mat chuck - modular

Δ

	Dimensions in mm			Evenution	
Colour	Α	В	C	Execution	
blue	300	200	2,42	Standard	
green	300	200	2,42	Hard	
red	300	200	2,42	Soft	
black	300	200	2,42	without bores	

SAV 249.05 - 600 x 400 SAV-No. - A x B

SAV 249.85 - red

SAV-No. - Colour

- A x B - Execution

SAV-No.



∍⊙ ∈\_\_\_\_



### SAV 249.04

### **VACUUM MAT CHUCKS - MODULAR**

For the machine-finishing of workpieces.

In particular for through-milling of pockets,

cutouts and bore holes without any vacuum

The vacuum mats have fine suction holes and sucker points which are spaced out across the mat. Each mat has six lugs on the underside

which locate in the chuck. To increase the

size of the working area, the modular chucks

can simply be connected to one another using

plug-in couplings. After through cutting or

milling the mats can easily be replaced after





### SAV 249.05 / SAV 249.85







SAV 249.05 - 300 x 400 Modular execution

Vacuum mats SAV 249.85:



SAV 249.05 - 300 x 200

### Required suction capacity:

1 Mat	3 -	6 m³/h
≥ 8 Mats	16 -	21 m³/h
≥ 20 Mats	40 -	63 m³/h
≥ 50 Mats	100 - 1	.60 m³/h





METAPOR – Air-permeable, porous aluminium



### VACUUM CIRCULAR GRID CHUCK

With this circular vacuum chuck, disc and

ring shaped Workpieces can be clamped,

glass and plastic processing.

- 10 m seal for 38 mm plate height - 20 m seal for plate heights from 48 mm

Available in high-tensile aluminium (A) or

Circular vacuum grid chucks are available in custom-made formats for workpiece-specific

for instance on lathes. Particularly suited for

With radial grid

Scope of delivery:

clamping operations.

Use:

steel (S).

#### Use:

METAPOR is a unique, porous aluminium compound material for vacuum and compressed air applications. Supplied as plates, it can be used for moulds and tool manufacture as well as conveyancing and workholding systems.

METAPOR's special properties open up a wide range of application opportunities and novel problem-solving solutions:

#### Evacuation

- With vacuum-moulded clamps made of METAPOR
- With vacuum chucks made of METAPOR
- or clamping electronic parts and foils among other applications

#### Lifting

- With air-film glide handling equipment made of METAPOR

#### Through flow

- With fluidizer beds and
- Conveyor channels made of METAPOR

#### Moulding/ demoulding

- With deep-drawn and die moulds made of METAPOR
- With ceramic and machined moulds made of METAPOR



#### Vacuum clamping technology

The main feature of METAPOR vacuum clamping systems is suction over the complete surface area without suction bores.

Foils are held absolutely flat. The pressure drop, which takes place within the structure, means that it is not necessary to cover areas which are not in use. METAPOR is ideally suited for holding foils and electronic parts as well as for mould-forms and soft workpieces.



#### Air-film glide technology

The pressure distribution in the METAPOR structure allows even surface airflow capacity, even if only part of the surface is covered. Air consumption and noise emission are considerably reduced.

Trouble-free machining offers cost reduction on air-flow components and a new perspective for rotation bearings, conveyance and extrusion beds.



#### Through-flow technology

The microporous METAPOR structure allows an even fluidisation of granulates and powders without the formation of bubbles. Low air consumption reduces friction and mechanical load.

METAPOR is ideal for mixing processes, coating, conveyance troughs and dismantling of silo bridges.



#### Molding technology

Deep-drawn moulds made of METAPOR do not require any bores.

Bore imprints on the moulded workpiece are avoided. Suction over the complete area allows the production of complex structures without air

pockets and distortions. The complete flow-through of air prevents high-temperature areas developing. The rational production process and immediate usability offer a valuable technological advantage.



A deep-drawn form made of METAPOR - the revolutionary innovation for universal applications



Other formats e.g. 2 m<sup>2</sup> glued plates and/or thicknesses up to 430mm available upon request.

Orderin	g example:
Vacuum	n circular grid o

Δ

100

125

160

200

250

315

400

500

630

В

38

38

38

48

48

58

58

38

38

Vacuum circular grid chuck	SAV 249.42 -	630	- S
Designation	SAV-No	А	- Execution

Dimensions in mm

Ε

83

108

4 | 140 | M 10 |

5 | 224 | M 12 |

176 M 10

286 M 16

458 M 16

586 M 16

362 M 16

F

M 8

M 8

D

3

4

4

5

5

5

7

С

70

95

125

160

200

260

330

420

545

108 Catalogue II





SAV 249.42







Weight Alu in kg	Weight Steel in kg
1.0	
1,0	2,0
1,0	3,0
2,0	6,0
3,0	9,0
5,0	14,0
5,0	14,0
16,0	47,0
31,0	89,0
49,0	142,0

Grid size

10,0

10,0

10,0

10,0

10,0

12,5

12,5

12,5

12,5





### FLIP-POD VACUUM SYSTEM

#### Use:

For mechanical machining – milling (face and contour milling), drilling and thread tapping of large-surface workpieces made of

- wood
- plastic, glass
- metal, sand castings

including those with sawn surfaces and rough, non-machined surfaces.

#### Special advantages:

Strong hold down forces enable use on large machines. Chamfers, undercuts and radii can be machined on the outer upper and lower workpiece surfaces. Clamping dimensions can be changed within seconds to adapt to new workpiece sizes.

Can be used on most machine tables.

#### Handling:

The pods serve as the contact surfaces for the workpiece. Simply activate or deactivate the pods by turning them around. To clamp a workpiece effectively 6-8 pods are

advised. This modular system can be extended for lar-

ger clamping surfaces.



SAV 249.06



Alu Flip-Pod



ALU FLIP-PODTM-clamping system for a CNC deburring machine, used on aircraft parts



FLIP-PODTM clamping system to clamp large aluminium workpieces with cut-outs



Height adjustable ALU Flip-Pod



Flip-Pod



#### Function:

The round polymer pods (1) protrude out of the pod plate when in use.

The pods not required lie in a recess cavity (2) of the pod plate. Simply flipping them over activates or deactivates the pods. The valve ball which stops the vacuum supply when the pod is resting, opens the valve and the vacuum system is activated.

All active pods stand 27mm above the pod plate surface, allowing contour milling and recess cutting on the outer contours.





The sketches show a range of possible pod panel designs.

The pod voids can be arranged in almost out in almost any design and combination. This means the best panel design can be selected for every application.





### SAV 249.06





Pods in the active position with an "apparent" workpiece.

The cross-section shows the design of the FLIP-POD with: - Sucker

- Unit
- Polymer valve ball
- and
- Filter
- Located in the pod plate are the
- Large gasket - Centre hole gasket







Required execution upon request.





### **VACUUM ROTATION JOINTS**

#### VACUUM ROTATION JOINTS

#### Vacuum rotation joints

- For use with:
- Circular vacuum chucks on lathes with a hollow spindle
- Vacuum chucks on a rotating machine table with a hollow spindle

The vacuum rotation joint allows the rotary movement of the vacuum plates / circular vacuum chucks connected to a stationary vacuum supply without any vacuum loss.

Standard rotation joints are available for three rotation ranges: up to 1500, 3000 and 6000 1/min.

The rotation joints are supplied with a plastic tube. The plastic tube connects the chuck with the rotation joint through the hollow spindle. The tube transmits the torque forces.

#### Scope of delivery:

- 1.5 m tube
- Connection parts





### SAV 249.70

### VACUUM FLUID SEPARATOR SAV

Fluid separators are essential in systems which employ coolants and lubricants.

#### Application:

Installed between the vacuum plate and the vacuum compressor. Drainingis performedmanually.

- For the retention of swarf, shavings, fluids
- and operational residues
- Easy use due to its light weight
- Directly observable fluid level

#### Scope of delivery:

- With 2 hoses of 0.5 m each - Hose couplings

Automatic fluid separator available upon request



Contents: 21 I

Volume	Dimensio	ns in mm	Connection	Weight
in I	Diameter	Height	diameter	in kg
5	200	400	LW 12	4,0
21	300	500	LW 32	10,0

Ordering example:		
Vakuum-Flüssigkeitsabscheider	SAV 249.71	- 5
Designation	SAV-No.	- Volumen





nax.RPM

3000

6000

Vacuum rotation joint SAV 249.70 - 3000 Designation

Dimensions in mm

Α

50

50

В

110

110

Weight

ca. in kg

Connection

in inches

SAV-No. - max. RPM



### SAV 249.71



Contents: 5 I





### MODULAR VACUUM COMPRESSOR

#### For coolant and lubricants

#### Special features:

- vacuum storage with integrated liquid separator – additional liquid separator is not required
- very compact design
- transparent combined container for liquid separation and vacuum storage offer quick visible safety
- different storage capacity can be achieved by exchanging the acryl glass container
- integrated air filter, liquid separator, relays, motor protection and differential pressure switch
- available with different vacuum pumps from 6 m<sup>3</sup> to 63 m<sup>3</sup>. On request also available with dry running pumps.
- all pumps for the modular compressors are equipped with oil lubrication.

Also available with dry running vacuum pump for module compressor on request.

#### Scope of delivery:

- 1 interface unit, with:
- 2 m vacuum tubing
- 3/2 manual valve with air vent
- 1 vacuummeter
- 1 electric connector with 3 m cable







a storage accumulator cover b storage accumulator bottom c acrylic glass cylinder d threaded stut e mist collector f profile seal g drainage plug h e-motor i pressure difference switch k circuit relay I airfilter m oil filling plug n vacuum pump p exhaust air valve r oil level gauge s Schuko / CEE-Plug with overvoltage relay t ON/OFF switch u wire spiral hose

0.		Suction	uction Motor drive	max.	max. mbar dB (A)	Dimensions in mm			Weight
Size	Design	in m <sup>3</sup> /h	in V/kW	mbar		L	В	Н	in Kg
VM 10 - 230	Modular compressor	10	230 / 0,37	50	59	ø 500		630	25
VM 10 - 400	Modular compressor	10	400 / 0,37	50	61	ø 500		630	25
VM 16 - 230	Modular compressor	16	230 / 0,55	20	60	ø 500		630	31
VM 16 - 400	Modular compressor	16	400 / 0,55	20	60	ø 500		630	31
VM 21 - 230	Modular compressor	21	230/0,75	20	62	ø 500		630	45
VM 21 - 400	Modular compressor	21	400 / 0,75	20	62	ø 500		630	45
VM 63 - 400	Modular mobile compressor	63	400 / 1,50	20	65	600	600	1030	95
VM100 - 400	Modular mobile compressor	100	400 / 3,00	50	67	700	700	1130	113

m n

#### Ordering example:

SAV 249.72 - VM 16 - 400 Modular Vacuum Compressor Designation SAV-No - Dimension

# SAA WITTE

### SAV 249.72

## VACUUM COMPRESSOR PUMP

#### Generates vacuum pressure

#### Use:

Economical alternative for small vacuum chucks.

#### Oil lubricated vacuum pumps

offer the following advantages:

- Air-cooled
- High reliability
- Low operating costs
- Good resistance to condensation
- Equipped with an integrated oil mist

separator, oil filter, check valve on

suction side with sieve as standard.

#### Scope of delivery:

- 1 Pc. Connection unit, consisting of:
- 2m wire spiral hose
- 3/2-way aerated handvalve
- 1 x Vacuum meter



VP 3 - 230 - 230



VP 16 - 230



0.	Suction	Motor	max.		Dimensions in mm			Weight	
Size	in m <sup>3</sup> /h	in V/kW	Lubricant	mbar	ав (A)	L	В	Н	in kg
VP 3 - 230	3	230 / 0,12	Dry	150	57	209	152	120	6,3
VP 5-230	5	230 / 0,25	Dry	150	63	172	147	143	7,9
VP 10 - 230	10	230 / 0,40	Oil	20	60	271	258	296	18,0
VP 16 - 230	16	230 / 0,55	Oil	20	60	306	226	182	18,0
VP 16 - 400	16	400 / 0,55	Oil	20	60	306	226	182	18,0
VP 21 - 230	21	230 / 0,75	Oil	20	62	410	230	225	19,0
VP 21 - 400	21	400 / 0,75	Oil	20	62	410	230	225	19,0
VP 63 - 400	63	400/1,5	Oil	20	65	602	406	225	52,0
VP100-400	100	400 / 3,0	Oil	20	67	692	406	290	70,0
VP160-400	160	400 / 5,1	Oil	20	70	834	473	407	140

#### Ordering example: Vacu

Vacuum compressor pump	SAV 249.72 -
Designation	SAV-No

114 Catalogue II





SAV 249.72



VP 63 - 400



VP 21 - 400



### MODULAR VACUUM COMPRESSOR

Generates vacuum pressure for coolant and lubricant feeds

#### Features:

These robust, low wear and low maintenance pumps produce an operating vacuum of up to 50 mbar and do not require an additional liquid separator.

In operation, the water contained in the pump is swirled in to a ring form by a fast rotating impeller and serves to seal the contactless running impeller. A re-cleanable polyester filter and a patented condenser are installed to clean the incoming air supply before it enters the pump.

The discharged lubricant is re-introduced into the operating fluid circulation system and a valve enables the removal and return of excess fluid to the machinery during operation.

Air cooling protects the compressor from overheating.

#### Scope of delivery:

- 1 connection unit comprised of:
- 2 m Vacuum tubing
- 3/2-way manual valve with air vent
- 1 Vacuum gauge









SAV 249.72

Size	Suction capacity in m <sup>3</sup> /h	Motor drive in V/kW	Dimensions H x B x L	Re Air Re
VW - 25	25	400 V, 50/60 Hz, 0,83 / 1,06 kW	463 x 432 x 602	
VW - 45	45	400 V, 50/60 Hz, 1,20 / 1,60 kW	515 x 572 x 743	
VW - 65	65	400 V, 50/60 Hz, 2,40 / 3,50 kW	515 x 572 x 743	
VW - 100	100	400 V, 50 Hz, 3,85 kW	525 x 620 x 920	
VW - 150	150	400 V, 50 Hz, 4,0 kW	710 x 845 x 1100	
VW - 198	198	400 V, 50 Hz, 5,5 kW	710 x 845 x 1100	
VW - 232	232	400 V, 50 Hz, 7,5 kW	710 x 845 x 1100	N

eplacement part: r filter element 3  $\mu$ m, e-cleanable

Size	For suction capacity in m <sup>3</sup> /h
VW - L - 25	25
VW - L - 45	45 - 100
VW - L - 150	150 - 198
VW - L - 232	232



### VACUUM SEALANT MATERIALS AND ACCESSORIES

Accessories for use with vacuum grid chucks

#### Vacuum seal SAV 249.76

The neoprene seal is placed into the suction slot of the vacuum grid type chuck to restrict the clamping area. The seal diameter is dependent upon the cross section of the slot. If a plate is re-machined, then a seal with a smaller diameter should be selected.

Minimum seal length: 50 m

When ordering please state the length in m.

Ordering	Vacuum seal	SAV 249.76 -	100 - 50
example:	Designation	SAV-No.	- Length

#### Vacugrease SAV 249.79

For the occasional greasing of suction tubing and strain relievers. Brush-on sealant for workpieces with rough and scored surfaces.

Container, contents 250 g

Ordering	Vacugrease	SAV 249.79	
example:	Designation	SAV-No.	

#### Vacuum dial gauges



Туре	thread	in mm	Scale range
A R	1/8" axial	40	0 bis -1 bar
B R	1/8" radial	40	0 bis -1 bar

Auf Anfrage

#### Manifold



#### Ordering example:

Modular vacuum compressor Designation

SAV 249.72 - VW - 45 SAV-No. - Size





### SAV 249.76

SAV-No.	Diameter in mm
249.76 - 20	2,0
249.76 - 30	3,0
249.76 - 35	3,5
249.76 - 40	4,0
249.76 - 45	4,5
249.76 - 50	5,0
249.76 - 55	5,5
249.76 - 60	6,0
249.76 - 65	6,5
249.76 - 70	7,0
249.76 - 80	8,0
249.76 - 100	10,0



### Vacuum hoses SAV 249.83

Wire spiral hose Type A: 13 / 8 diameter Wire spiral hose Type B: 18 / 12 diameter Wire spiral hose Type C: 25 / 18 diameter Wire spiral hose Type D: 34 / 25 diameter Wire spiral hose Type E: 40 / 32 diameter Wire spiral hose Type F: 60 / 50 diameter

When ordering please state the length in m.

Ordering	Schlauch	SAV 249.83	- A - 10
example:	Designation	SAV-No.	- Type - Lenght

#### Manually operated lever valve with air vent



Connection thread	Туре		
1/4" Internal	14		
3/8" Internal	38		
1/2" Internal	12		
3/4" Internal	34		
1" Internal	10		

Auf Anfrage

### Scope of delivery:

- Hose connector for vacuum pumps Inlet
- Hose connector for 3/2-way manually operated vacuum lever valve with air vent for each outlet
- Vacuum gauge

Outlets and connections according to your specifications upon request.

9)



### MASKING FOIL, ADAPTER MATS

#### Accessories for vacuum chucks

### Masking foil

Application: This foil is vapour-coated with aluminium and is recommended as an aid for every slotted vacuum chuck.

It is applied directly to the slotted vacuum plate. By drawing around the workpiece shape and cutting slits in the foil beneath it, a wide range of diverse workpieces can be clamped without any vacuum losses. The thickness tolerance of the foil is ca.  $\pm$  0.02 mm.

After using, the foil can easily be peeled off. The vacuum plate remains free of adhesive residues.

Masking foil (Foil thickness 0.06 – 0.11 mm) The process of using masking foil for the slotted vacuum chucks is very similar to that of the rubber adapter mats.

It differs in that slits are cut in the foil, parallel to the slots in the vacuum plate, within the contours of the workpiece.

The surface of the workpiece must be level and relatively smooth to ensure perfect functioning.

#### Adapter mat, rubber, red Application:

The workpiece contours can be simply drawn on to the rubber adapter mat using an ordinary pen.

Remove the mat and punch holes into the area corresponding to the actual clamping surface of the work piece. Replace the mat and the workpiece onto the slotted vacuum plate and they will both be sucked down together. The excellent friction values offer especially good resistance to displacement forces during machining. The rubber adapter mat allows milling into the mat to a depth of 1.5mm without a loss of vacuum presssure. As the mat suffers hardly any wear and tear it can be repeatedly used for workpieces with the same contours. The height tolerance range of the rubber adapter mat is up to  $\pm$  0.3 mm (DIN 7715, Part 5 class P2).

#### Adapter mat, elastomer, black Application:

These mats can be face-milled and therefore offer a significantly higher planar parallelism.

Ordering example:	Anti-slip mat blue Designation	SAV 249.82 - 150 x 100 - B SAV-No Length x Width - Colour
Ordering example:	Anti-slip mat red Designation	SAV 249.82 - 150 x 100 - R SAV-No Length x Width - Colour
Ordering example:	Anti-slip mat black Designation	SAV 249.82 - 150 x 100 - S SAV-No Length x Width - Colour



Dimensions in mm Ada		Adapte red	er mat (R)	Adapter mat black (S)		Masking foil (F)	
Lenght	Width	Piece	Height in mm	Piece	Height in mm	Pieces per set	Height in mm
150	100	1	3	1	3	400	0,06 - 0,11
200	100	1	3	1	3	300	0,06 - 0,11
250	150	1	3	1	3	170	0,06 - 0,11
200	200	1	3	1	3	-	-
200	500	1	3	1	3	-	-
200	600	1	3	1	3	-	-
300	150	1	3	1	3	140	0,06 - 0,11
350	150	1	3	-	-	120	0,06 - 0,11
400	200	1	3	1	3	70	0,06 - 0,11
350	250	1	3	1	3	-	-
300	300	1	3	1	3	-	-
400	250	1	3	1	3	60	0,06 - 0,11
400	300	1	3	1	3	48	0,06 - 0,11
400	400	1	3	1	3	32	0,06 - 0,11
400	500	1	-	1	3		-
500	300	1	3	1	3	35	0,06 - 0,11
500	500	1	3	1	3	-	-
500	1000	1	3	1	3	8	0,06 - 0,11
600	300	1	3	1	3	30	0,06 - 0,11
600	400	1	3	1	3	21	0,06 - 0,11
800	400	1	3	1	3	18	0,06 - 0,11
1000	1000	1	3	1	3	-	-
1000	2000	1	3	1	3	-	-

SALA WOF

## ACCESSORIES – VACUUM WORKHOLDING

A comprehensive range of accessories is available for our vacuum workholding systems.

Examples:

#### SAV 249.74 - 210

Vacuum switch, electronic For use as a safety switch in wet and explosion-protected environments. The upper and lower threshold limits of the vacuum gauge can be preset.

Dimensions ø 33 x 92 - 24 Volt

Vacuum electro-magnet valve

Vacuum valve with manual slide connector

Quick-release coupling with external thread

Connector for the quick-release coupling

Hose connectors, hose couplings, reducing adaptors, double nipples etc, available upon request

118 Catalogue II

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SAV 249.90



### CONDITIONS OF SALE AND DELIVERY

### NOTES

#### 1 General and contract conclusion

a) all agreements and offers are based on our conditions; they apply as accepted through placement of order or acceptance of the supply. Deviating conditions of the custome which we do not accept expressly in writing, are noncommittal for us, even if we do not contradict explicitly.

b) For the scope of supply our confirmation of order is determining. Verbal, telephonically, telegraphic and telefaxed special agreements and additional contract modifications have validity only if they are confirmed in writing by us. The same applies to assured properties of the supplied article. All data in our designs, illustrations, measurement tables, weight tables etc. are - so far not explicitly confirmed by us - only approximate values. The documents belonging to the offers remain our property, are subordinate to our copyright and may not be made accessible to third parties or only with our written approval.

c) The order acceptance by us takes place in writing. If we should deviate slightly in our order confirmation in relation to the order of the customer, then our order confirmation is obligatory, if within eight days - in urgent cases by telephone call, telegram or telefax - one does not contradict to these. Hereunder applies the principle that a wrong transmission always goes debited to the customer, and will not be borne by us.

d) Place of delivery for all obligations developing from the contractual relation is Nuremberg Germany. Area of jurisdiction for all from the contractual relation as well as law cases rising over its developing and its effectiveness is Nuremberg; after our choice also seat of the customer (with foreign contracts: also court of the capital of the country, in which the customer has his seat). The contractual relation is always subject to the German material right under exclusion of international purchase rights.

e) All written or oral offers are, unless no other agreements are made or confirmed by us. not binding

#### 2. Prices

The prices are in Euro. The prices apply, if not explicitly differently agreed, purely net ex works including loading, excluding packing, freight, insurance, assembly and other additional expenses. All increase of freight and tariffs, value added tax, material prices and wages are for the account of the customer. With supplementary orders the prices are newly agreed upor

#### 3. Delivery time

The delivery time is specified after best discretion and is therefore to be understood as approximately, excluding explicitly firm designated agreements. The time for delivery starts only from the time, in which written agreement exists over the final supply and all questions necessary for the trouble-free execution of the order are clarified. The time for delivery does not begin before the time that all documents are made available to us, the necessary official and private explanations, permissions and releases etc. are available and the customer has fulfilled the agreed payments and other obligations. The delivery time is considered as firm, if the shipment has left our works within the agreed

delivery time. If the delivery is delayed for reasons not attributable to us, then the time for delivery is considered as firm with the message that goods are ready for dispatch within the agreed delivery time.

The time for delivery extends - also within a delivery delay appropriate at occurrence of foreseen events, which we could reasonably not prevent despite the circumstances of the case – equally to events in our work or at possible subcontractors - for example operational disturbances, wasting of an important working part, delays in the delivery of substantial raw terials and delivery parts, strike, lockout, mobilization, war and riot as well as in delay of the customer from this or another contract

At later changes of the contract, which can affect the delivery time, the delivery time extends, unless special agreements concerning this can be made, to appropriate extent. Consequential loss or damage because of late supply with negligent behaviour by us or our personnel are explicitly excluded.

any case we are responsible for such damage only up to the invoice amount excluding V.A.T., whose cause and extent could have been foreseen by us. Partial deliveries are permissible. For special and customer specific products a withdrawal is not possible.

#### 4. Terms of payment

Our invoices are payable within eight days from invoice date with 2% discount or within 30 days net. Repair and spare part invoices are immediately payable without any deduction. The retention of payment due to whatever unrecognized or legally invalid counterclaims of the customer is just as inadmissible as the set-off with such counterclaims.

Cheques and discountable changes are accepted only after special agreement and only when all additional collection and discount charges are paid. When payment is received after the due date, interests according the usual bank interest on debit balances plus 2% as well as all arising additional fees or other costs can be charged.

With call-off orders we are entitled make our invoices payable at readiness for dispatch. With call-off delays, starting 14 days after announcement of readiness for dispatch, the additional charges for storage, care and shifting of the commodities can be charged. With payments by instalments which were accepted by us the entire remainder becomes

immediately due, if the customer with a due payment is over 10 days in delay or in his financial circumstances nature-due, if the customer with a due payment is over 10 days in delay or substantial degradations in his financial circumstances occurs. In addition we are entitled to reject all pending supplies subject to payment, or to insist on

acceptance and/or if necessary validate claims for damages in accordance with the condition of the previous paragraph

#### 5. Transfer of risk

The risk is passed-on to the customer, even if freight-free delivery was agreed: a) At delivery of the supplies by us or one of our assigned transporters, however latest at leaving of our works or warehouse. The packing takes place with best care. The dispatch takes place after best discretion of the supplier. On request and for the account of the customer the delivery is insured by the supplier against breakage, transportation- and fire damage.

b) If the dispatch, the delivery or the acceptance are delayed for reasons, which are not attributable to us, then the risk is transferred to the customer on the day of readiness for dispatch; however we are prepared to take out a desired insurance on request and for the account of the customer

#### 6. Receipt

Delivered articles are to be received by the customer, even if they show insignificant defects. Partial deliveries are permissible Guarantee

If a commodity is defective, is missing assured characteristics or will loose characteristics during the guarantee period due to production or material failures or will it become defective during the guarantee period due to production or material failures, then we will under exclusion of further guarantee claims of the customer, according our choice supply a replacement or have the commodity reworked.

If this is not possible, the rework fails or is refused by us or unreasonably delayed, then the customer has the right to a replacement or reduction. Damage claims because of non fulfilment or consequential damage are explicitly not accepted, except for mandatory liability because of guilt.

For consequential damages we only take responsibility, if the customer should be secured by the warranty against such consequential damages. In these cases we are liable only up to expectation interest, maximum up to 2-times the value of the supply, excluding value added tax.

Determination of all defects must be announced immediately - with recognized defects at the latest within 8 days after receipt of the commodities, with non-recognized defects immediately after determination - in writing. Costs of the rework are for our account up to the value of the defective part, beyond that it

is for the account of the customer.

Wear or damages, which are due to careless or unsuitable use, excessive load, unsuitable equipment, inadequate construction work, is excluded, as far as unknown to us at ompletion of contract and the use was expressly assured.

When improper changes or repairs are made by the customer or a third party, our liability for the consequences caused by this is waived.

For improvement work and spare pieces we are liable to the same amount as for the original delivered commodity, and only up to the expiration of the guarantee period of the original delivery commodity.

For sub supplied commodities our total liability is limited to passing on the liability claims. which we have against the supplier of these commodities. Only if these were claimed without result, our liability according paragraph 1 is revived

again. In all cases only such damages, whose cause and extent were foreseeable for us are replaced.

The quarantee claims expire 12 months after delivery.

#### 8. Other claims for damages, resignation

Claims for damages from impossibility of the performance, delay, positive violation of contract, debts at completion contract or tortuous liability are excluded, unless, these are based on intent or gross negligence of us. Claims for damages are limited in each case to the value of the supply.

When the performance becomes impossible to us or the customer, then general rights of

law apply under the following condition: If the impossibility is due to our fault, then the customer is entitled to require compensation of damages. This is limited to half of the value of the supply, excluding value added tax, of the part of the supply or performance, which cannot be taken in useful service because of the impossibility.

The right of the customer to the resignation remains unaffected. If unexpected events in the sense of number 3 of the economic meaning or the contents of the supply or performance change substantially or considerably affect on our company, the contract will be changed proportionally.

As far as this is economically not justifiable, a right of resignation is entitled to us. If we want to make use from this right, then we will communicate this to the customer immediately after determination of significance, and also then, when even at first with this an extension of the delivery time was agreed upon.

In all cases only such damages, whose origin and extent were foreseeable for us, are replaced

#### 9 Right of ownership

The supplied commodity remains our full property until full payment, also the future developing demands, indifferently from whatever argument this developed, even if payments for particularly designated demands were made. With open invoices the reserved property applies as security of our demand for balance.

a) By machining and processing of the reserved commodities, the customer does not acquire the property of the new item in accordance with. § 950 BGB. The processing is performed by the customer for us, without resulting in any obligations to us. If the reserved commodities are processed, connected, mixed or integrated with other items not belonging to us, we acquire the property of the new item in relationship to the value of the reserved b) The allowances of the customer from resale or rental of the reserved commodities are

directly assigned to us and without consideration, if the reserved commodities are without or after processing, connection, mixture or integration and if they are resold to one or multiple customers

These demands serve as protection only upto the value of the already sold reserved commodities. In case that the reserved commodities are sold together with other items not belonging to us, with or without processing, the transfer of the demand for purchase price applies only to the amount of the reserved commodities , which is, together with other items the subject of this contract

Regardless of the transfer and our right to resignation, the customer is entitled for resignation in so far, when he fulfils his obligations to us and does not come into financial collapse. On request the customer has to give us the details necessary for the resignation of the resigned demands, and communicate the resignation to the debtors.

The customer has to inform us immediately about the execution measures of third parties in the reserved commodities or the in advance resigned demands, by handing over the documents necessary for an intervention. The customer bears the cost of our intervention c) The customer has the obligation to keep the commodities in proper condition during the duration of the right of ownership and will directly have the necessary repairs - apart from emergencies - performed by us or by one of our recognized repair workshop at owr

#### 10. Transfer of the contract

The transfer of demands on us to third parties is impossible, if we do not agree in writing

### SAV – CATALOGUES



MAGNET-**SPANNTECHNIK** 



SAV – MAGNETIC WORKHOLDING



UMLAUFENDE SPANNTECHNIK

2 9 0

NORMTEILE - KATALOG

SPANNTECHNIK

SV







**STATIONÄRE** 

**SPANNTECHNIK** 

SN

CATALOGUE II

CATALOGUE IV

CATALOGUE VI

SAV – MAGNETIC LIFTING

SAV – STATIONARY WORKHOLDING

SAV – PRODUCTION AUTOMATION

AUTOMATISIERUNGSTECHNIK UND HANDLINGSYSTEME



MAGNETISCHES LASTHEBEN



### THE SAV PRODUCT RANGE



CATALOGUE I: SAV-MAGNETIC WORKHOLDING Permanent, electro and ep-magnetic, mechanical, hydraulic, vacuum, multi-technique. Demagnetisers, sine tables, magnetic tools



Vices and clamping equipment, vacuum clamping,



finger, console and column chucks



loading/unloading robots



CATALOGUE V: SAV-STANDARD PARTS Semi-finished parts, spanners, positioning elements, actuating, guiding and driving components



CATALOGUE VI: SAV-MAGNETIC LIFTING Heavy duty magnetic lifting equipment, Permanent lifting magnets, battery lifting magnets, handling tools



CATALOGUE VII: SAV-SPECIAL SOLUTIONS Customized magnetic, mechanical, hydraulic, vacuum, stationary and rotary workholding



CATALOGUE VIII: SAV-SMALL MAGNETS Flat and holding magnets, pot magnets, magnet cores and office magnets



Dressing, circular grinding, indexing tables



CATALOGUE X: SAV-QMC



CATALOGUE VII AV – SPECIAL SOLUTIONS

CATALOGUE V

SAV – STANDARD PARTS







### CATALOGUE II: SAV-STATIONARY WORKHOLDING

Angle plates and tombstone fixtures, stationary chucks and attachments

### CATALOGUE III: SAV-ROTARY WORKHOLDING

Manually and power operated chucks, lever compensating,

### CATALOGUE IV: SAV-PRODUCTION AUTOMATION

Pallet changers, transfer lines, deburring cells, tool changers,

# CATALOGUE IX: SAV-DRESSING AND CIRCULAR GRINDING

Mould holding and changing systems for injection moulding and presses





### THE SAV PRODUCT RANGE

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