Automation+Robotics
Pneumatic Modules

7/2002
B5-30-0001-1-DE
5-15634-0-1 ◦

Pneumatic Modules

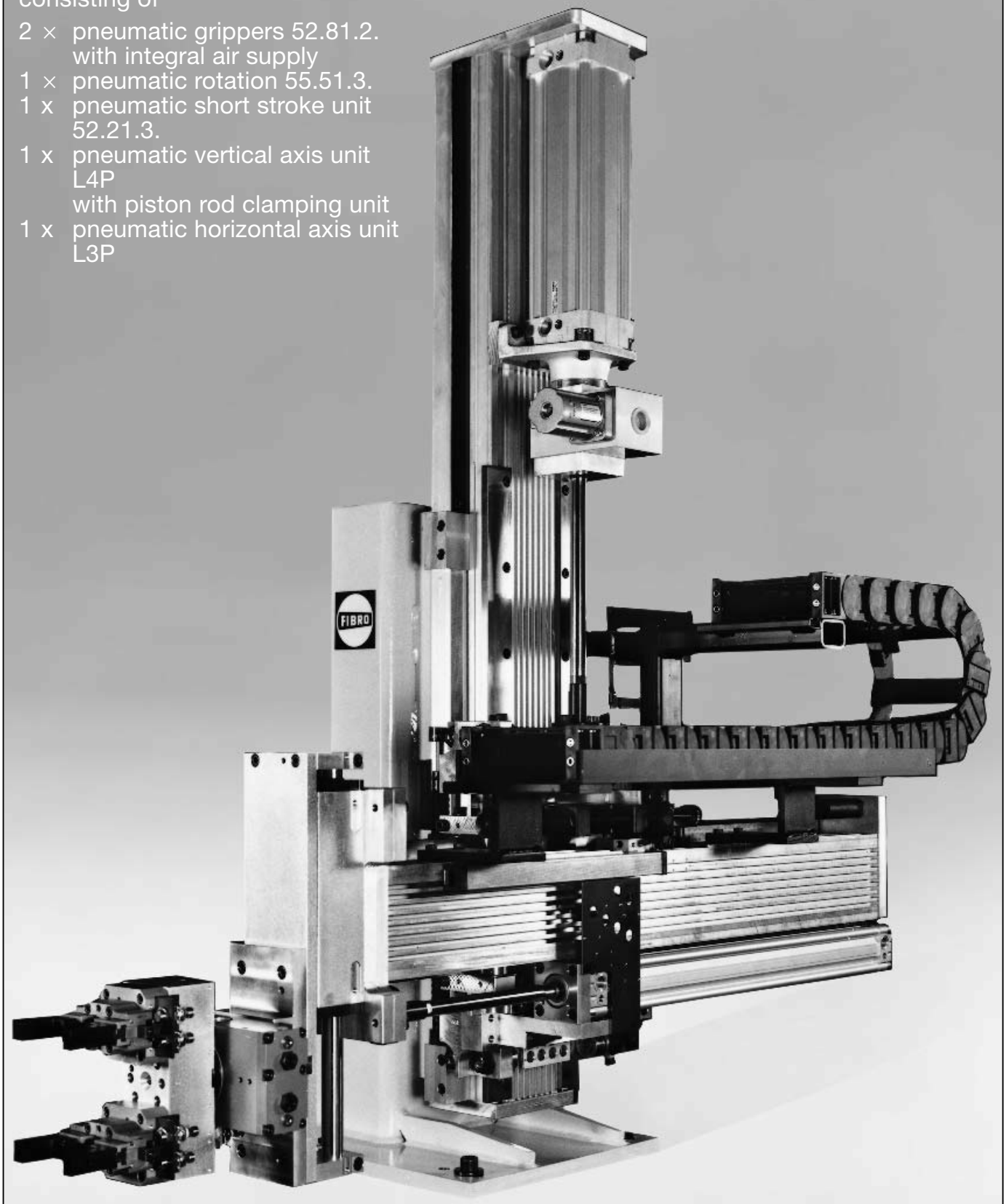
1nd Edition

5-16532-2001-1 ◦

Combinations of modules

consisting of

2 × pneumatic grippers 52.81.2.
with integral air supply
1 × pneumatic rotation 55.51.3.
1 x pneumatic short stroke unit
52.21.3.
1 x pneumatic vertical axis unit
L4P
with piston rod clamping unit
1 x pneumatic horizontal axis unit
L3P



5-15636.0-1 o

Contents

5-15637-0-2 ◦

Weibertreu
Castle at Weinsberg

FIBRO works at Weinsberg

Indexing tables

FIBRO – The latest technology – with a tradition of service

The FIBRO of today started up in Weinsberg on a very small scale back in 1958. Situated below the historic Weibertreu Castle, the company made precision ground round parts, the forerunners of today's FIBRO Standard Parts range for the toolmaking industry.
Progress was rapid and soon FIBRO needed new production facilities. A new factory was built at Hassmersheim on the River Neckar. Once again it was a historic location, this time opposite Hornberg Castle.

Indexing tables
From 1962 onwards FIBRO at Weinsberg pioneered the design and manufacture of indexing tables and soon gained an enviable reputation.
FIBROTAKT: indexing tables with face gear and ultra-high-precision indexing, combined with dependable rigidity. Drive options: pneumatic, hydraulic, electric. Rotation by rack and pinion or worm drive. Manual or NC control.
FIBROPLAN: indexing tables with worm drive and NC indexing and drive, for circular milling and divisions of any size.
FIBROTOR: revolving tables or indexing tables with positive-drive cam, offering very short cycle times even when transporting heavy loads. Suitable for automation with short cycle times. Thousands of FIBRO units are in use world-wide as integral key components in high-output machinery.

Standard Parts
Today the Standard Parts division operates from the Hassmersheim works which manufactures a comprehensive range of standard parts and maintains stocks ready for immediate despatch world-wide.
The machine tool, mechanical engineering and systems engineering product range includes machine pillars, guide rails, oilless guide elements and precision parts such as cutting dies and die bushes, special steel pressure springs, gas springs, forming materials, metal bonding agents and moulding resins, accessories for pressing and toolmaking, tool slides with cam or roller drives and independent hydraulic drives.
FIBRO has become renowned world-wide for its comprehensive range of products kept in stock and its readiness to deliver.

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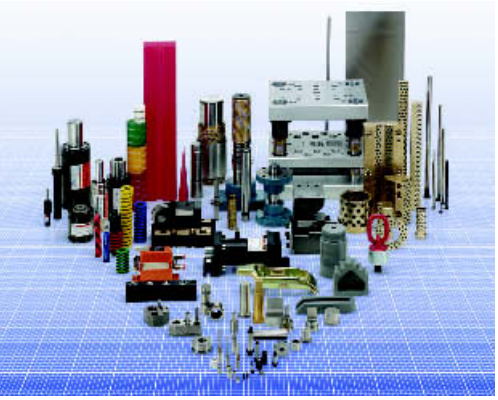

Hornberg castle on the opposite side of the river

The FIBRO Hassmersheim plant

Standard Parts

Automation+Robotics

Automation+Robotics
FIBRO has been active in the field of automation and robotics since 1974 from the Hassmersheim works. Modular construction based on translation units, rotary units, grippers and guide gantries with trolleys make for easy construction of individual machines and complete systems, ranging from simple pick & place units right through to multi-axis robots. These series-manufactured modules are available in several sizes for loads up to 3150 kg, traversing speeds up to 6.5 m/sec and travel of up to 30 m. Module series with electric-motor, hydraulic and pneumatic drive can be combined to suit the specific requirements. The system has a track record of success in many sectors of industry.

FIBRO is much in demand as a supplier to the mechanical engineering and metalworking sectors. This success is based largely on three factors: FIBRO's in-depth knowledge of the market, its commitment to quality assurance in line with ISO 9001 and its flexible and responsive organisational structure so typical of medium-sized German companies.

FIBRO: a company with a great history. FIBRO has developed at a rapid pace in these fast-moving times and will continue to demonstrate its proactive philosophy in the future.

FIBRO – precision technology for the toughest tasks.

More about FIBRO:
- 900 staff;
- 80 representatives and service stations world-wide;
- branch offices in France, USA, Singapore and Switzerland.

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FIBRO – Working on your Behalf

As you will no doubt already be aware, for many decades the name FIBRO has been synonymous with the systematic rationalisation of work processes.

Not content with our well-known range of indexing tables, FIBRO engineers have made another major step towards the automation of production lines by developing the modular handling system.

The Modular Handling System

The standardised elements of this modular system (the modules) enable users to solve their handling problems with the minimum of design and planning. The modules can be easily assembled to create devices specifically tailored to the particular handling task and the available space. This means that any point can be approached simply by combining translation and rotary modules. Modules from the various series can be combined with incredible flexibility, opening up a broad range of applications and enabling units to be matched precisely to individual tasks in a way that is normally only possible with expensive made-to-measure machines.

Elements of the Modular Handling System

We can provide translation modules (translational axes) and rotary modules (rotary axes) in a range of sizes in order to execute three-dimensional movements.

The modules can be driven pneumatically, hydraulically or electrically.

For the “gripping” function, the module has
- grippers for swivel motion, and
- grippers for parallel motion,

which are pneumatically, hydraulically or electrically actuated.

These options cover a wide range of gripping functions, and the interchangeable grippers enable the units to be adapted to specific workpiece contours.

The modules required for specific handling tasks can be easily selected with reference to the available design and load data (see datasheets).

Freely programmable control systems can be used to control these modular handling devices.

The modules can be fixed to one another in a number of ways, thus offering a high degree of flexibility when creating handling units for specific functions.

Advantages of the Modular Handling System

The modular handling system offers the user a number of advantages:

- A wide range of applications thanks to the highly versatile module combination opportunities
- Mature and proven modules guarantee maximum reliability
- Cuts the time required for design and planning
- Modules are interchangeable and can be reused for different tasks
- The best type of driving unit – pneumatic, hydraulic or electrical – is used for each application
- The elements can be purchased at series-production prices
- CAD support during the design phase

We shall be pleased to advise you on applications and implementation of the modules. Our team of experts will be pleased to hear from you. Confirmation of the versatility of the modular system is provided by many handling systems which have been in constant use for years.

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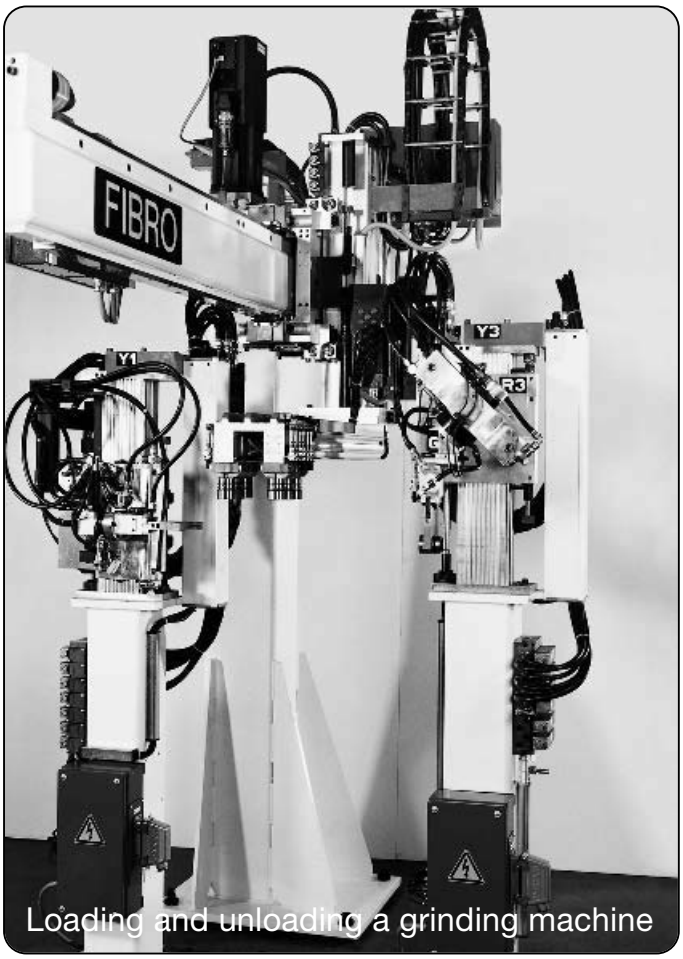
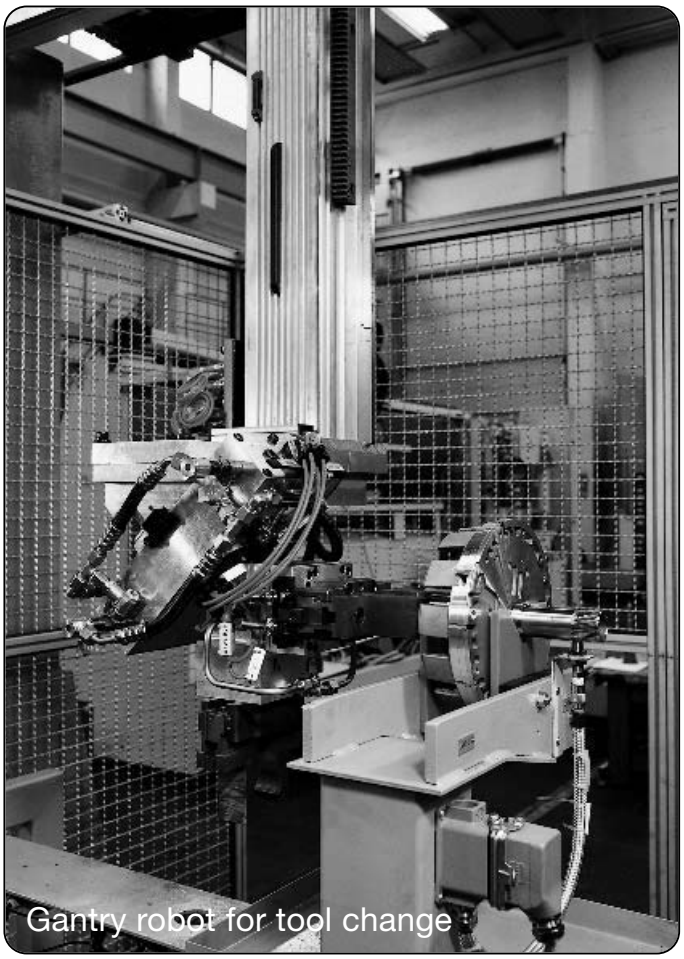
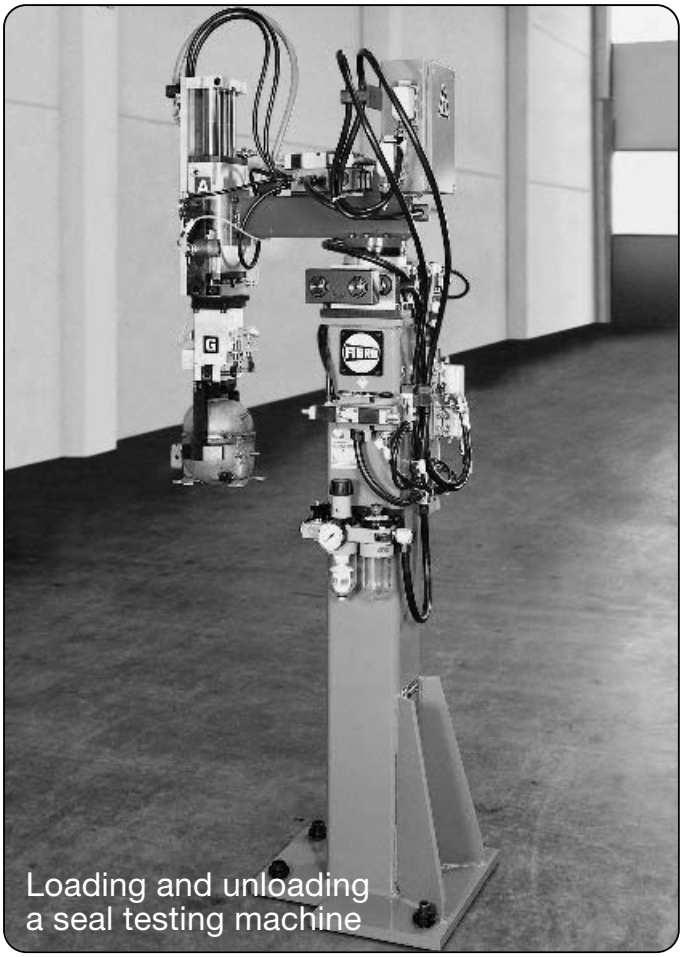
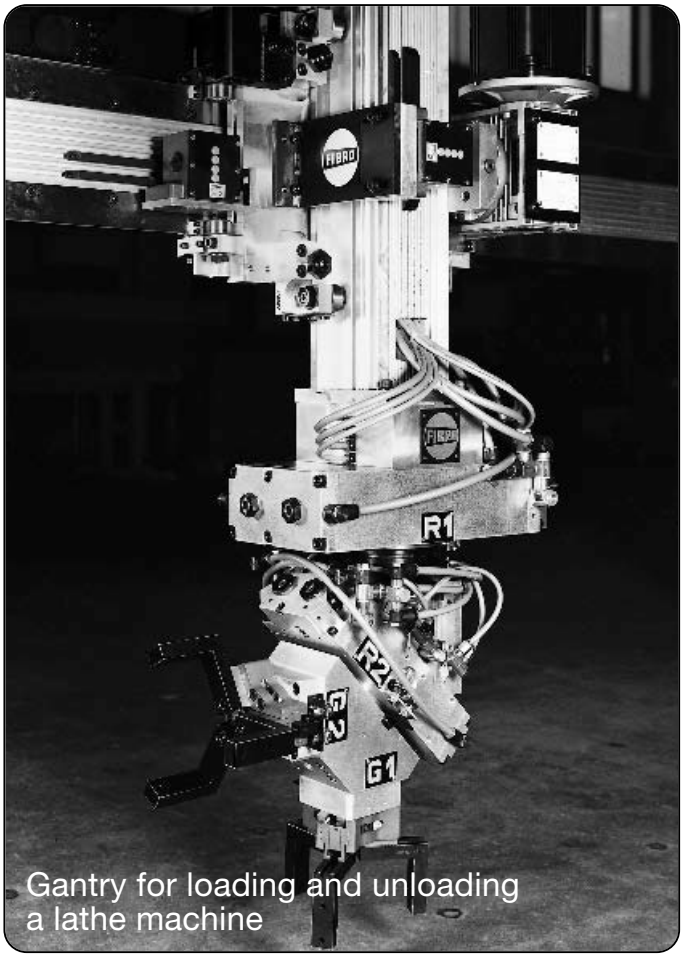
Applications



Loading and unloading a grinding machine


Gantry robot for tool change


Loading and unloading
a seal testing machine



Gantry for loading and unloading
a lathe machine

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Ordering codes
Translation, Short-Stroke, Linear and Rotary Units, Swivel Double Gripper Units

Code groups	A	B	C	D	E
Series	Model, driving unit	Size	Motion	Version	Sensing element
□□.	□□.	□.	□□□□.	□□.	□□.
52.	11.	2 to 4.	0160 to 1000.	100.	06
	Translation	Size	Stroke	Standard version	Mountings with holders and activator flags
	pneumatic				for Ø M12 mm proximity switches
				201.	
	15.	1 to 4.	0125 to 1000.	Solid pillar version	07
	Translation	Size	Stroke		Mountings with holders and activator flags
	hydraulic			000.	for Ø M12 mm proximity switches
				Special version	
	21.	2 to 4.	0040 to 0150.	100 D	06
	Short travel	Size	Stroke	Standard version	Mountings with holders and activator flags
	pneumatic			with end position damping	for Ø M12 mm proximity switches
	25.	2 to 5.	0040 to 0320.	130.	07
	Short travel	Size	Stroke	mit 3. Stellung	Mountings with holders and activator flags
	hydraulic				for Ø M12 mm proximity switches
	31.	2 and 3.	0250 to 1000.	301.	06
	Linear unit,	Size	Stroke	Installation position horiz.	Mountings with holders and activator flags
	pneumatic				for Ø M12 mm proximity switches
				302.	
				Installation position vertical	07
					Mountings with holders and activator flags
				311.	for Ø M12 mm proximity switches
				High-speed switch block,	
				horizontal installation	11
					4-position switch with cam
				312.	
				High-speed switch block,	
				vertical installation	12
					6-position switch with cam
				303.	
				Version with cylinder	
				piston rod	13
				Installed horizontally	8-position switch with cam
				303.	
				Version with cylinder	
				without piston rod and high	
				speed switch block,	
				horizontal installation	
55.	51.	2 to 5.	0090.	104.	06
	Rotation		0180.	4-way rotation version	Mounting with holder and activator flags
	pneumatic		0360.		for Ø 12 mm proximity switches
			Rotation angle	106.	
				6-way rotation version	07
					Mounting with holder and activator flags
					for Ø 18 mm proximity switches
52.	55.	2 to 5.	0090.	104.	06
	Rotation		0180.	4-way rotation version	Mounting with holder and activator flags
	hydraulic		Rotation angle		for Ø 12 mm proximity switches
				106.	
				6-way rotation version	07
					Mounting with holder and activator flags
					for Ø 18 mm proximity switches
51.	91.	2 to 4	0001.	501.	06
	Swivelling		for channel toothing	2 fingers, gripping External	Mounting with holder and activator flags
	double grippers		$^1/_1$ gripper travel		for Ø M12 mm proximity switches
	pneumatic		0011.	601.	
			for channel toothing	2 fingers, gripping Internal	
			$^1/_2$ gripper travel		
			0002.	531.	
			for fixed fingers	3 fingers, gripping External	
			$^1/_1$ gripper travel		
			0012.	631.	
			for fixed fingers	3 fingers, gripping Internal	
			$^1/_2$ gripper travel		

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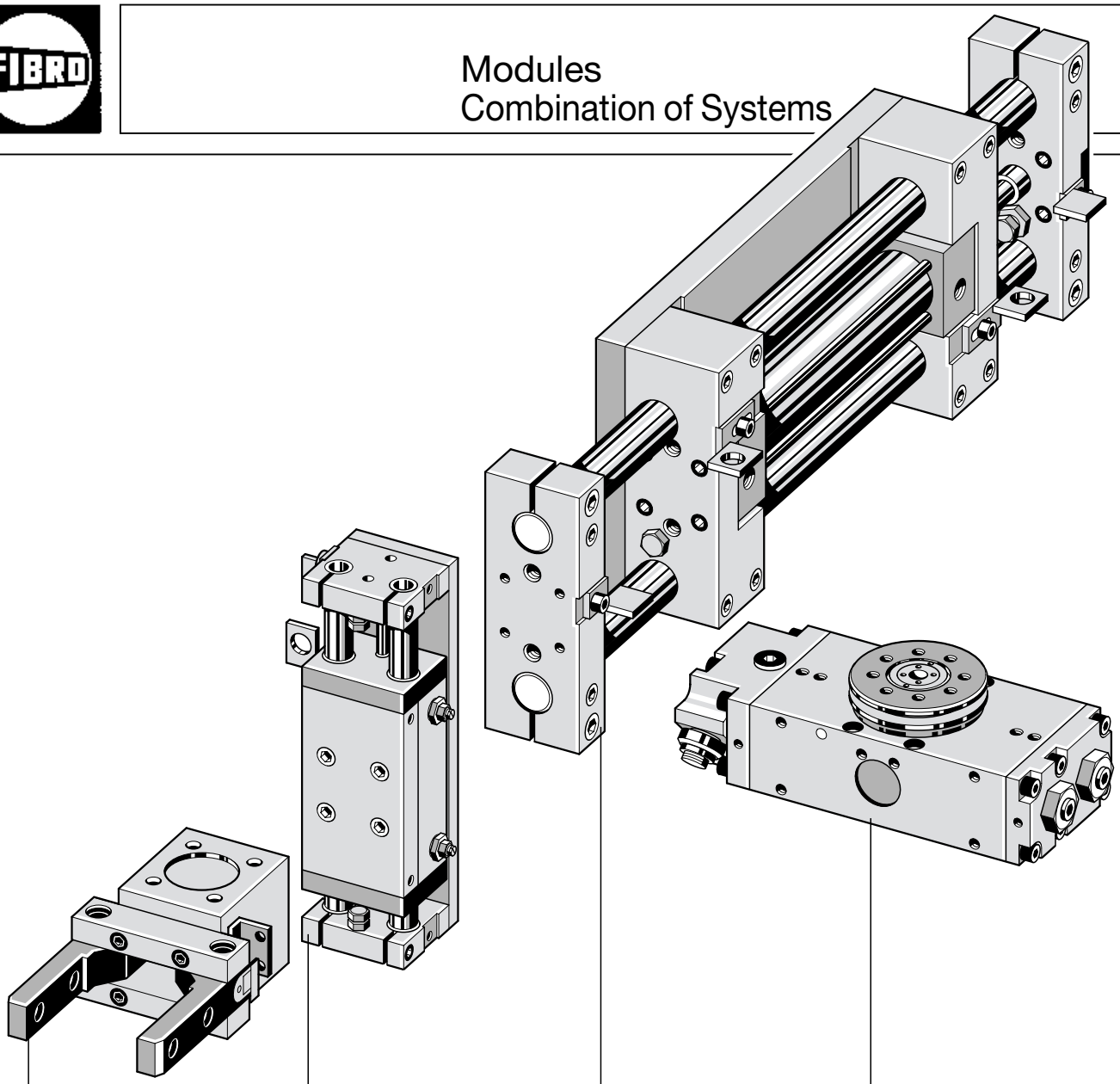


Grippers

With angular or parallel movement, pneumatic, hydraulic or spring loaded, motor driven for parallel movemement, for internal and external gripping, 2 or 3 fixed or adjustable gripping fingers, standard or double gripping force, 132 versions available.

Information:
“GRIPPERS” catalogue

Short-Stroke Units

Size	2
Length of travel	40 mm 80 mm
Max load	10 kg
Pillar ∅	15 mm
Size	3
Length of travel	50 mm 100 mm 150 mm
Max load	25 kg
Pillar ∅	25 mm
Size	4
Length of travel	75 mm 150 mm
Max load	40 kg
Pillar ∅	40 mm

Special travel to order

Accessories:

Drop protectors, sizes 3+4

Translation Units

Size	2
Length of travel	160, 200, 250, 320, 400, 500, 630 mm
Max load.	25 kg
Rods ∅	25 mm
Size	3
Length of travel	250, 320, 400, 500, 630, 800 mm
Max load	50 kg
Rods ∅	40 mm
Size	4
Length of travel	320, 400, 500, 630, 800, 1000 mm
Max load	90 kg
Rods ∅	60 mm

Special travel to order

Accessories:

Additional shock absorbers
Descent latches
High-speed switch block

Rotary Units

Size	2
Rated turning angle	90° or 180°
Transport load, max.	16 kg
Max. load moment of inertia	0,2 kg m²
Load moment	6 Nm
Rotator ∅	75 mm
Size	3
Rated turning angle	90° or 180°
Transport load, max.	32 kg
Max. load moment of inertia	0,6 kg m²
Load moment	12 Nm
Rotator ∅	82 mm
Size	4
Rated turning angle	90° or 180°
Transport load, max.	60 kg
Max. load moment of inertia	3 kg m²
Load moment	40 Nm
Rotator ∅	110 mm
Size	5
Rated turning angle	90° or 180°
Transport load, max.	120 kg
Max. load moment of inertia	6 kg m²
Load moment	100 Nm
Rotator ∅	150 mm

Option:

Special turning angles and intermediate points to order

5-15641-0-1 ❄

Pneumatic Translation Units

5-15643-0-1 ✻

52.11.2. Translation Unit Pneumatic

Ordering information

	A	B	C	D	E
Type	52. 11.				
Size		2.			
Stroke lengths: 160, 200, 250, 320, 400, 500, 630 mm			0250.		
Version: Solid pillar				201.	
Fixings for proximity switch					∅ M 12 06
with holders and activator flags					∅ M 18 07
Ordering example	52. 11.	2.	0250.	201.	06

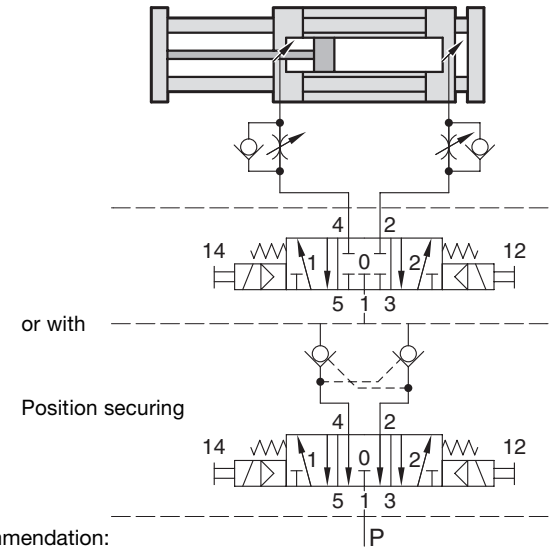
Special stroke lengths available upon request

Signalling can be provided by reed switches on the cylinder

Unloaden weight and load moments

Stroke	Centre piece	Guide rods	Total weight	2 M_H	3 M_F	4 M_T
160 mm	5,6 kg	5,4 kg	11 kg	298 Nm	120 Nm	18 Nm
200 mm	6,0 kg	6,0 kg	12 kg	278 Nm	111 Nm	16 Nm
250 mm	7,2 kg	6,8 kg	14 kg	253 Nm	100 Nm	14 Nm
320 mm	8,2 kg	7,8 kg	16 kg	218 Nm	68 Nm	12 Nm
400 mm	8,9 kg	9,1 kg	18 kg	150 Nm	39 Nm	10 Nm
500 mm	10,4 kg	10,6 kg	21 kg	98 Nm	25 Nm	8 Nm
630 mm	11,4 kg	12,6 kg	24 kg	62 Nm	16 Nm	5 Nm

Block diagram

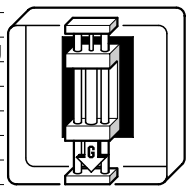


Recommendation:
Nominal flow rate through valv 800 l_N/min.

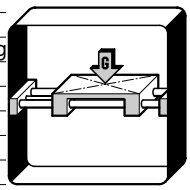
Carried load

1 G	Load = max. 25 kg for all loading cases	Note: The specified moment is based on a permissible deflection of approx. 0,5 mm – measured at the centre of the end flange.
2 M_H	Bending moment (on edge)	
3 M_F	Bending moment (lying flat)	
4 M_T	Torsional moment	
x, y	Distance to centre of gravity of load	

1 $G_{max.}$ Load 25 kg

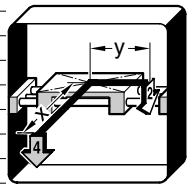


1 $G_{max.}$ Load 25 kg

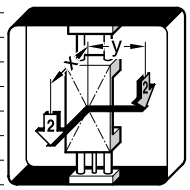


2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.} \times 2$ Torsion

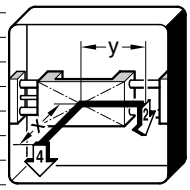


2 $M_{H\ adm.}$ Deflection on edge



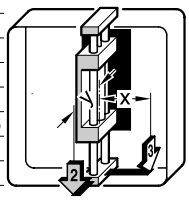
2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.} \times 2$ Torsion



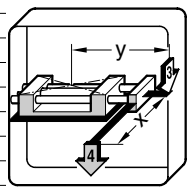
2 $M_{H\ adm.}$ Deflection on edge

3 $M_{F adm.} \times 0{,}66$ Deflection lying flat



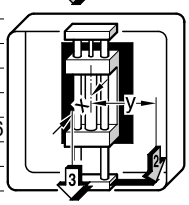
3 $M_{F\ adm.}$ Deflection lying flat

4 $M_{T\ adm.}$ Torsion



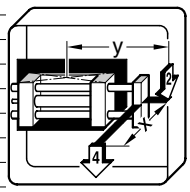
2 $M_{F\ adm.}$ Deflection on edge

3 $M_{F adm.} \times 0{,}66$ Deflection lying flat



2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.}$ Torsion



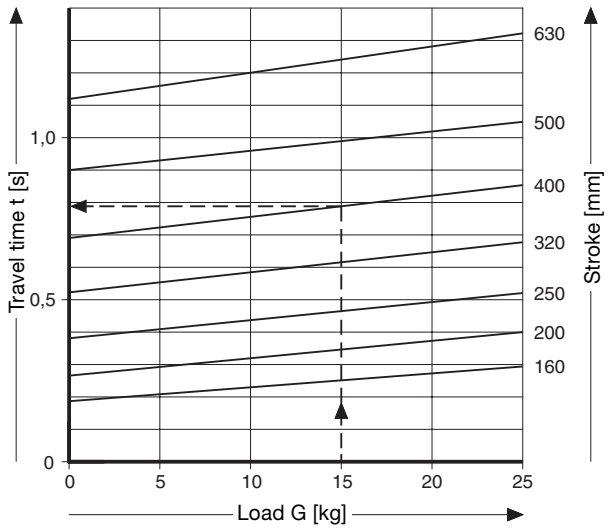
Lengths and stroke volumes

Stroke	L_1	L_2	L_3	Stroke vol.
160 mm	565 mm	308 mm	233 mm	0,20 dm³
200 mm	645 mm	348 mm	273 mm	0,25 dm³
250 mm	745 mm	398 mm	323 mm	0,31 dm³
320 mm	885 mm	468 mm	393 mm	0,40 dm³
400 mm	1045 mm	548 mm	473 mm	0,50 dm³
500 mm	1245 mm	648 mm	573 mm	0,63 dm³
630 mm	1505 mm	778 mm	703 mm	0,80 dm³

Special stroke lengths are determined as follows:
$L_1 = 2 \times$ stroke + 245 mm; L_2 = stroke + 148 mm; L_3 = stroke + 73 mm

Timing diagram (recommended stroke time)

Example
G = 15 kg
Stroke = 400 mm
Travel time: desired
Travel time = 0,78 sec



The calculated travel time is for guidance only. It excludes the valve switching time and the time required to build up pressure, and is specified for use with an additional hydraulic shock absorber and 6 bar system pressure. The travel time for operation without an additional shock absorber will be roughly 35% higher.

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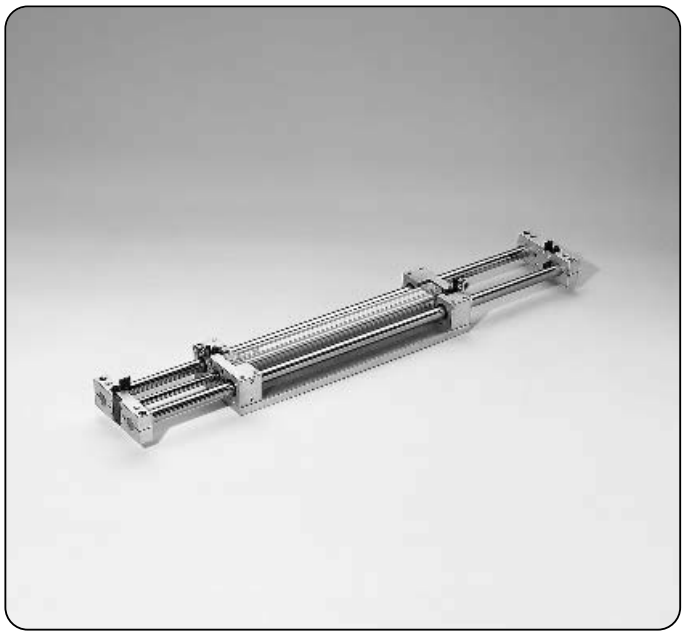
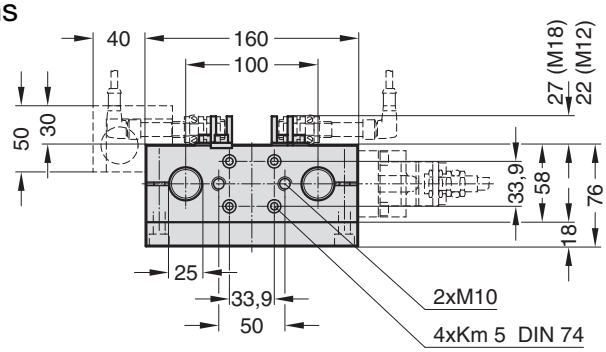
Translation Unit Pneumatic 52.11.2.

Technical description

Size	2
Stroke lengths	160, 200, 250, 320, 400, 500, 630 mm
Drive unit	pneumatic, can be operated with
	deoiled air
Nominal operating pressure	6 bar
Approved operating pressure	min. 4,5 bar, max. 10 bar
Piston area (piston end)	12,56 cm^2
Piston area (pillar end)	10,55 cm^2
Useful force of cylinder (piston end)	665 N at 6 bar (Pz)
Useful force of cylinder (pillar end)	560 N at 6 bar (Ps)
Repeat accuracy	fixed stop ± 0,1 mm
Fine adjustment of stroke	– 2 mm for each end position
Damping	variable
Installation position	any
Velocity control	external, by restricting exhaust air
Guide rods	hardened and ground
Pillar guide	maintenance-free, 4x ball-bearing
	linear guides
End block, sliding guides and base plate made of aluminium	
Guide and piston rods with dirt scrapers	
Functions monitored by inductive proximity switches	
Option: Additional hydraulic shock absorber, descent latch	

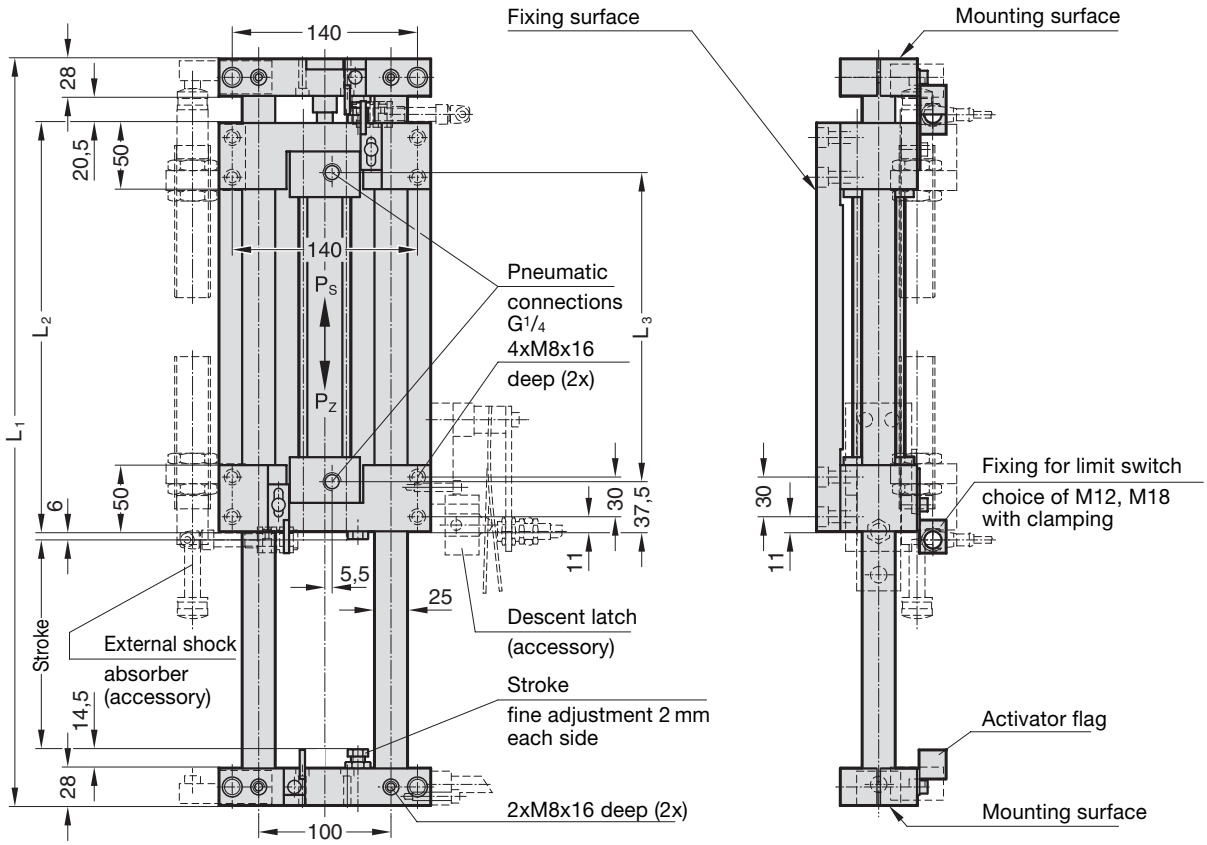


Dimensions



Note:

Bellows-type cover and intermediate positions available upon request



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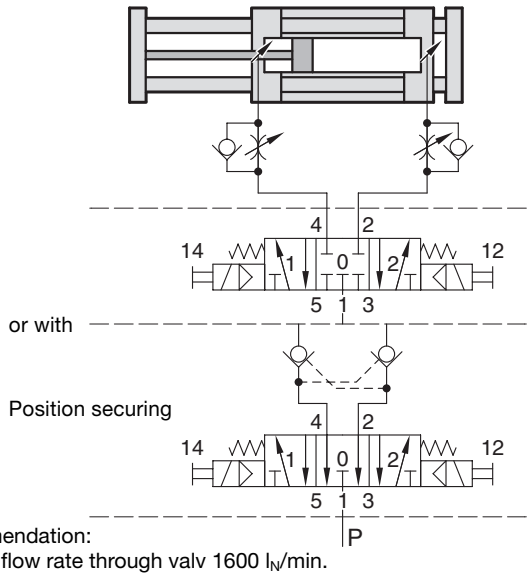
52.11.3. Translation Unit Pneumatic

Ordering information

	A		B	C	D	E
Type	52.	11.				
Size			3.			
Stroke lengths: 250, 320, 400, 500, 630, 800 mm				0320.		
Version: Tubular pillars					100.	
Fixings for proximity switch ∅ M 12						06
with holders and activator flags ∅ M 18						07
Ordering example	52.	11.	3.	0320.	100.	06

Special stroke lengths available upon request
Signalling can be provided by reed switches on the cylinder

Block diagram



Recommendation:
Nominal flow rate through valv 1600 l_N/min.

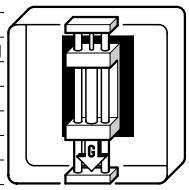
Unloaden weight and load moments

Stroke	Centre piece	Guide rods	Total weight	2 M_H	3 M_F	4 M_T
250 mm	16,9 kg	11,1 kg	28 kg	600 Nm	250 Nm	54 Nm
320 mm	18,5 kg	12,5 kg	31 kg	540 Nm	213 Nm	50 Nm
400 mm	20,8 kg	14,2 kg	35 kg	470 Nm	165 Nm	43 Nm
500 mm	23,9 kg	16,1 kg	40 kg	411 Nm	123 Nm	36 Nm
630 mm	27,3 kg	18,7 kg	46 kg	280 Nm	86 Nm	28 Nm
800 mm	31,9 kg	22,1 kg	54 kg	180 Nm	52 Nm	18 Nm

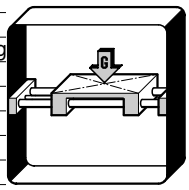
Carried load

1	G	Load = max. 50 kg for all loading cases	Note: The specified moment is based on a permissible
2	M_H	Bending moment (on edge)	deflection of approx. 0,5 mm –
3	M_F	Bending moment (lying flat)	measured at the centre of the
4	M_T	Torsional moment	end flange.
	x, y	Distance to centre of gravity of load	

1 $G_{max.}$ Load 50 kg

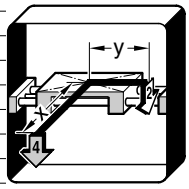


1 $G_{max.}$ Load 50 kg

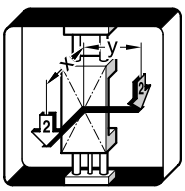


2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.} \times 2$ Torsion

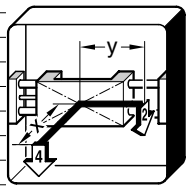


2 $M_{H\ adm.}$ Deflection on edge



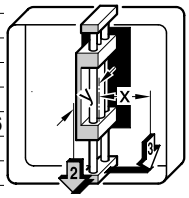
2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.} \times 2$ Torsion



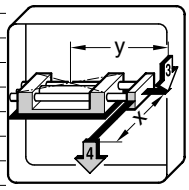
2 $M_{H\ adm.}$ Deflection on edge

3 $M_{F\ adm.} \times 0{,}66$ Deflection lying flat



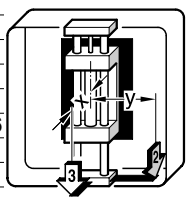
3 $M_{F\ adm.}$ Deflection lying flat

4 $M_{T\ adm.}$ Torsion



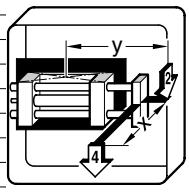
2 M_F adm. Deflection on edge

3 $M_{F\ adm.} \times 0{,}66$ Deflection lying flat



2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.}$ Torsion



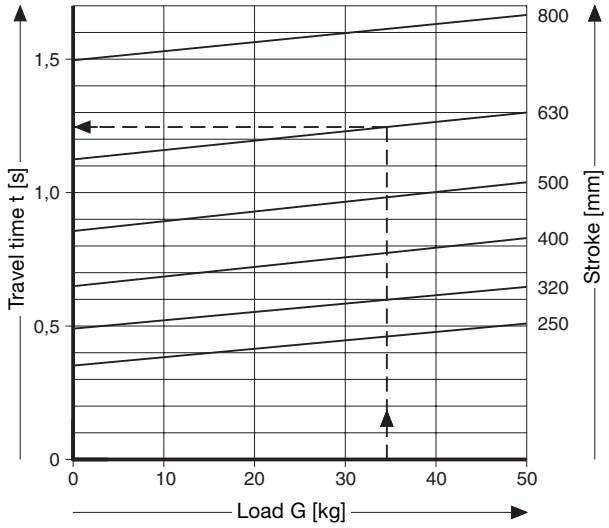
Lengths and stroke volumes

Stroke	L_1	L_2	L_3	Stroke vol.
250 mm	785 mm	417 mm	327 mm	0,78 dm³
320 mm	925 mm	487 mm	397 mm	1,00 dm³
400 mm	1085 mm	567 mm	477 mm	1,25 dm³
500 mm	1285 mm	667 mm	577 mm	1,56 dm³
630 mm	1545 mm	797 mm	707 mm	1,97 dm³
800 mm	1885 mm	967 mm	877 mm	2,50 dm³

Special stroke lengths are determined as follows:
$L_1 = 2 \times$ stroke + 285 mm; L_2 = stroke + 167 mm; L_3 = stroke + 77 mm

Timing diagram (recommended stroke time)

Example
G = 35 kg
Stroke = 630 mm
Travel time: desired
Travel time = 1,24 sec



The calculated travel time is for guidance only. It excludes the valve switching time and the time required to build up pressure, and is specified for use with an additional hydraulic shock absorber and 6 bar system pressure. The travel time for operation without an additional shock absorber will be roughly 35% higher.

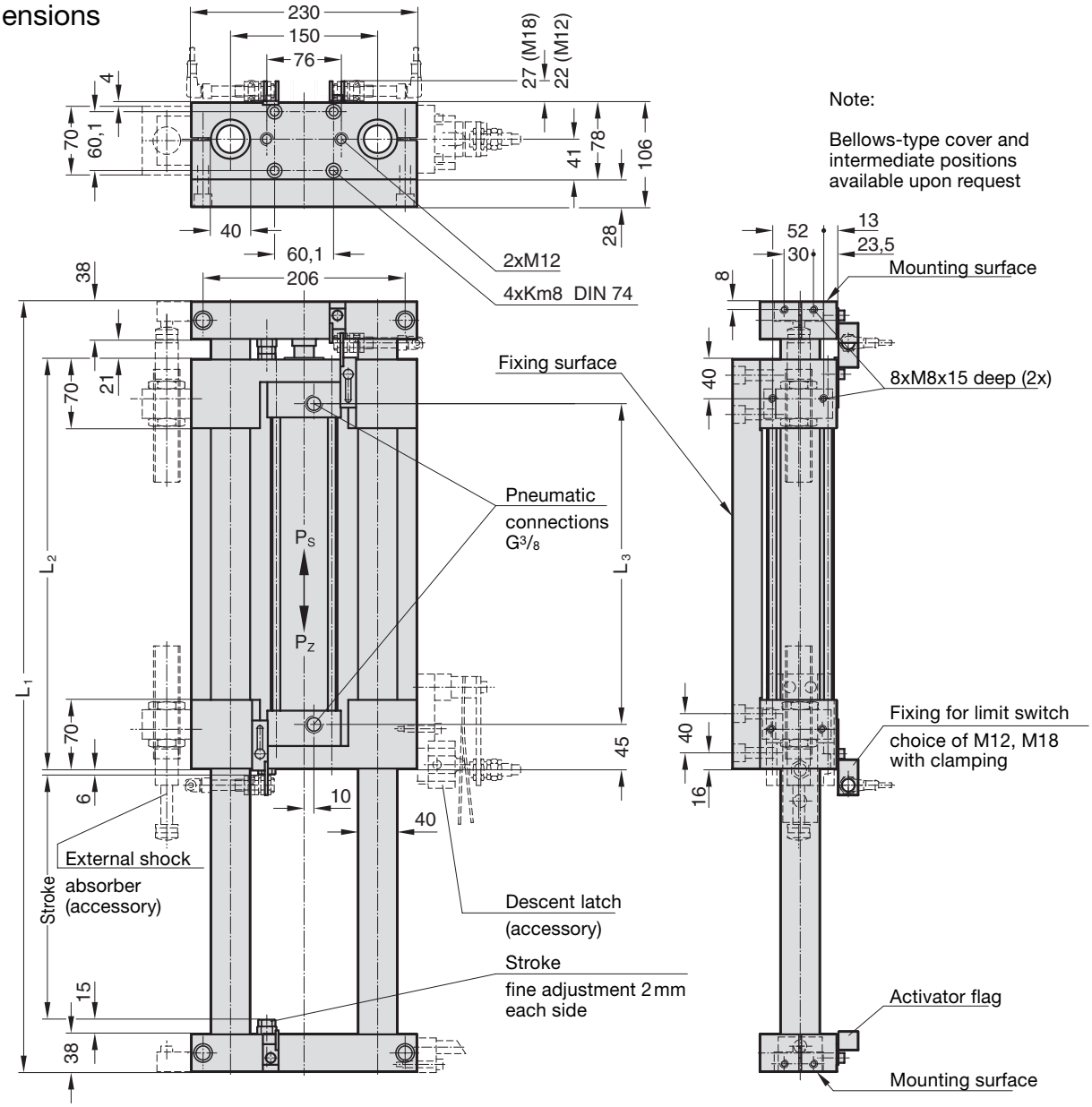
5-15646-0-2 ❋

Translation Unit Pneumatic 52.11.3.

Technical description

Size	3
Stroke lengths	250, 320, 400, 500, 630, 800 mm
Drive unit	pneumatic, can be operated with deoiled air
Nominal operating pressure	6 bar
Approved operating pressure	min. 4,5 bar, max. 10 bar
Piston area (piston end)	31,2 cm²
Piston area (pillar end)	28,0 cm²
Useful force of cylinder (piston end)	1647 N at 6 bar (Pz)
Useful force of cylinder (pillar end)	1478 N at 6 bar (Ps)
Repeat accuracy	fixed stop ± 0,1 mm
Fine adjustment of stroke	– 2 mm for each end position
Damping	variable
Installation position	any
Velocity control	external, by restricting exhaust air
Guide rods	hardened and ground
Pillar guide	maintenance-free, 4x ball-bearing linear guides
End block, sliding guides and base plate made of aluminium	
Guide and piston rods with dirt scrapers	
Functions monitored by inductive proximity switches	
Option: Additional hydraulic shock absorber, descent latch	

Dimensions



5-15647-0-1 ❄

52.11.4. Translation Unit Pneumatic

Ordering information

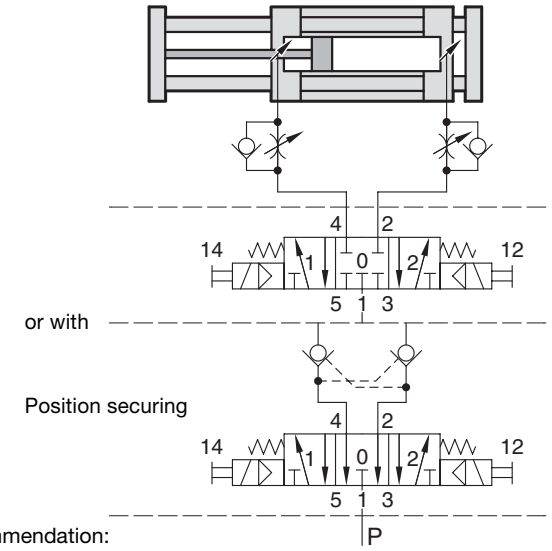
	A	B	C	D	E
Type	52. 11.				
Size		4.			
Stroke lengths: 320, 400, 500, 630, 800, 1000 mm			0630.		
Version: Tubular pillars				100.	
Fixings for proximity switch					∅ M 12 06
with holders and activator flags					∅ M 18 07
Ordering example	52. 11.	4.	0630.	100.	06

Special stroke lengths available upon request
Signalling can be provided by reed switches on the cylinder

Unloaden weight and load moments

Stroke	Centre piece	Guide rods	Total weight	2 M_H	3 M_F	4 M_T
320 mm	39,4 kg	34,6 kg	74 kg	2100 Nm	875 Nm	195 Nm
400 mm	42,8 kg	39,2 kg	82 kg	1950 Nm	810 Nm	178 Nm
500 mm	47,2 kg	44,8 kg	92 kg	1750 Nm	715 Nm	155 Nm
630 mm	52,8 kg	52,2 kg	105 kg	1400 Nm	466 Nm	130 Nm
800 mm	60,1 kg	61,9 kg	122 kg	980 Nm	290 Nm	100 Nm
1000 mm	68,7 kg	73,3 kg	142 kg	630 Nm	190 Nm	65 Nm

Block diagram

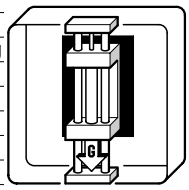


Recommendation:
Nominal flow rate through valv 4000 l_N/min.

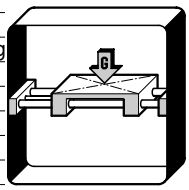
Carried load

1 G	Load = max. 90 kg for all loading cases	Note: The specified moment is based on a permissible deflection of approx. 0,5 mm – measured at the centre of the end flange.
2 M_H	Bending moment (on edge)	
3 M_F	Bending moment (lying flat)	
4 M_T	Torsional moment	
x, y	Distance to centre of gravity of load	

1 $G_{max.}$ Load 90 kg

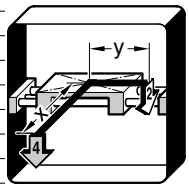


1 $G_{max.}$ Load 90 kg

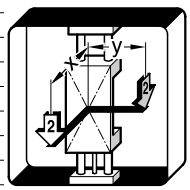


2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.} \times 2$ Torsion

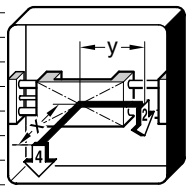


2 $M_{H\ adm.}$ Deflection on edge



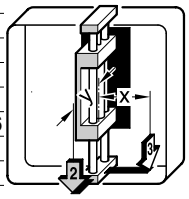
2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.} \times 2$ Torsion



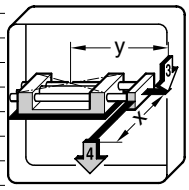
2 $M_{H\ adm.}$ Deflection on edge

3 $M_{F\ adm.} \times 0{,}66$ Deflection lying flat



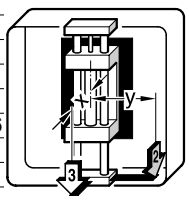
3 $M_{F\ adm.}$ Deflection lying flat

4 $M_{T\ adm.}$ Torsion



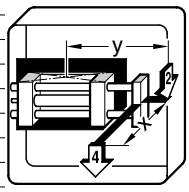
2 $M_{F\ adm.}$ Deflection on edge

3 $M_{F\ adm.} \times 0{,}66$ Deflection lying flat



2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.}$ Torsion



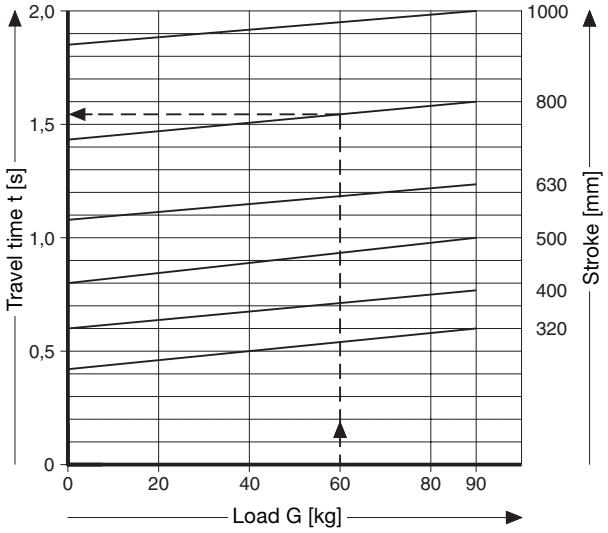
Lengths and stroke volumes

Stroke	L_1	L_2	L_3	Stroke vol.
320 mm	952 mm	498 mm	394 mm	1,61 dm³
400 mm	1112 mm	578 mm	474 mm	2,01 dm³
500 mm	1312 mm	678 mm	574 mm	2,51 dm³
630 mm	1572 mm	808 mm	704 mm	3,17 dm³
800 mm	1912 mm	978 mm	874 mm	4,02 dm³
1000 mm	2312 mm	1178 mm	1074 mm	5,03 dm³

Special stroke lengths are determined as follows:
$L_1 = 2 \times$ stroke + 312 mm; L_2 = stroke + 178 mm; L_3 = stroke + 74 mm

Timing diagram (recommended stroke time)

Example
G = 60 kg
Stroke = 800 mm
Travel time: desired
Travel time = 1,53 sec



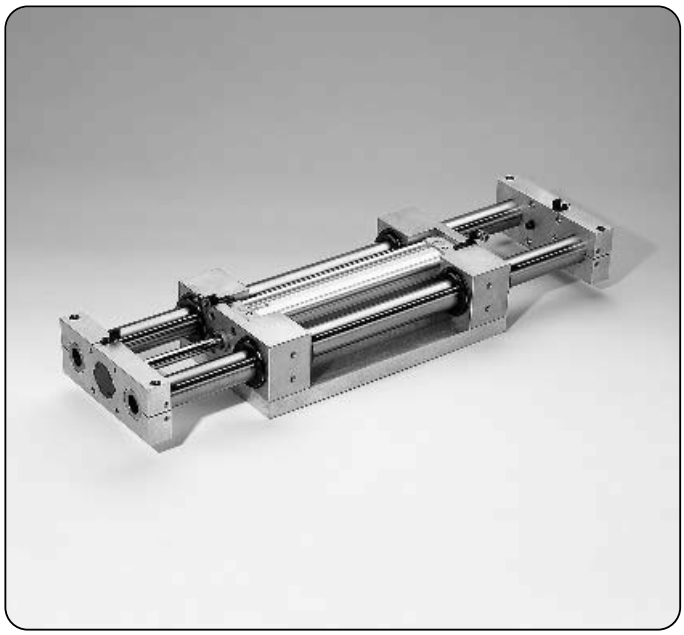
The calculated travel time is for guidance only. It excludes the valve switching time and the time required to build up pressure, and is specified for use with an additional hydraulic shock absorber and 6 bar system pressure. The travel time for operation without an additional shock absorber will be roughly 35% higher.

5-15648.0-2 ❋

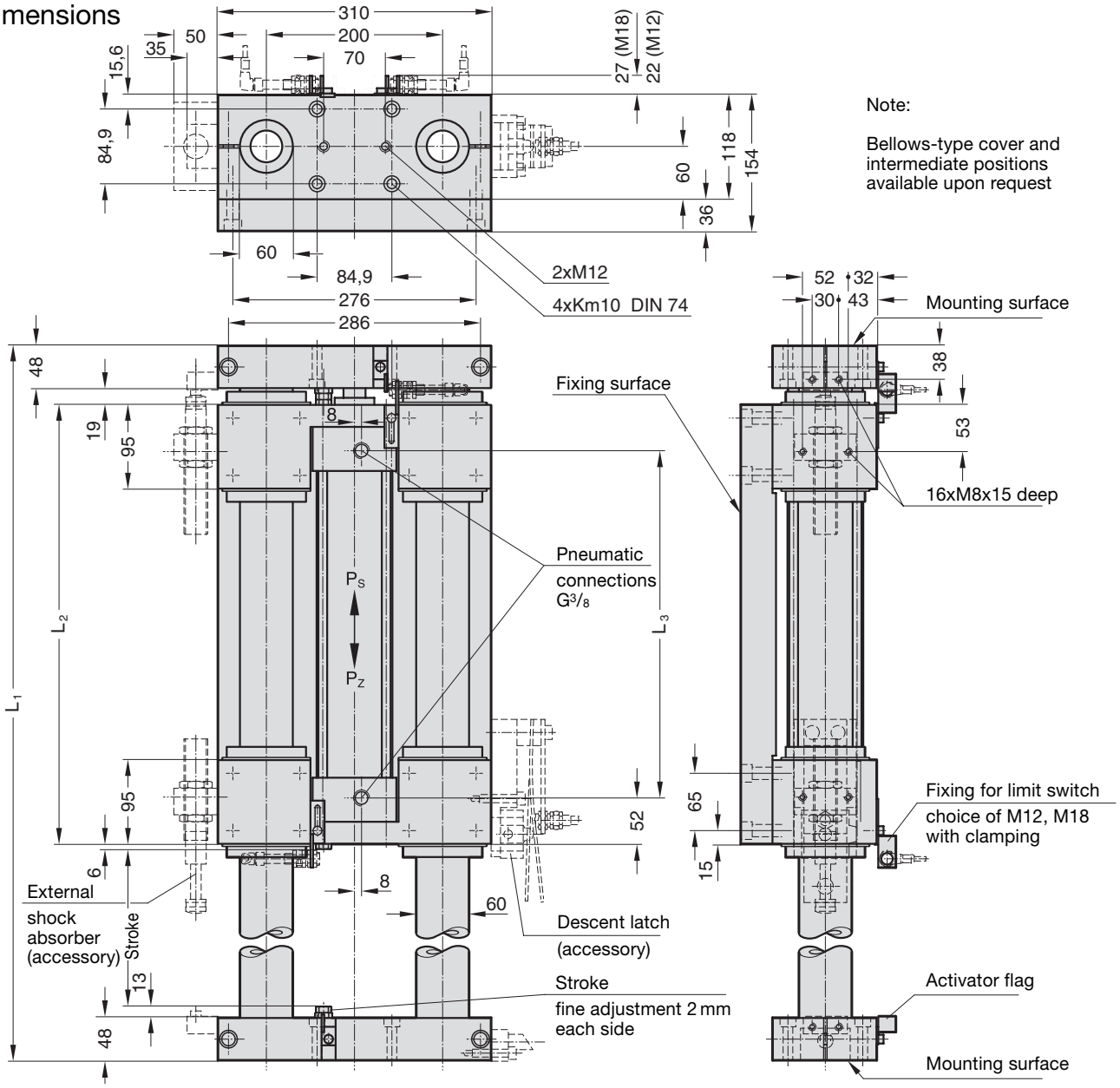
Translation Unit Pneumatic 52.11.4.

Technical description

Size	4
Stroke lengths	320, 400, 500, 630, 800, 1000 mm
Drive unit	pneumatic, can be operated with deoiled air
Nominal operating pressure	6 bar
Approved operating pressure	min. 4,5 bar, max. 10 bar
Piston area (piston end)	50,3 cm^2
Piston area (pillar end)	45,4 cm^2
Useful force of cylinder (piston end)	2656 N at 6 bar (Pz)
Useful force of cylinder (pillar end)	2397 N at 6 bar (Ps)
Repeat accuracy	fixed stop ± 0,1 mm
Fine adjustment of stroke	– 2 mm for each end position
Damping	variable
Installation position	any
Velocity control	external, by restricting exhaust air
Guide rods	hardened and ground
Pillar guide	maintenance-free, 4x ball-bearing linear guides
End block, sliding guides and base plate made of aluminium	
Guide and piston rods with dirt scrapers	
Functions monitored by inductive proximity switches	
Option: Additional hydraulic shock absorber, descent latch	



Dimensions

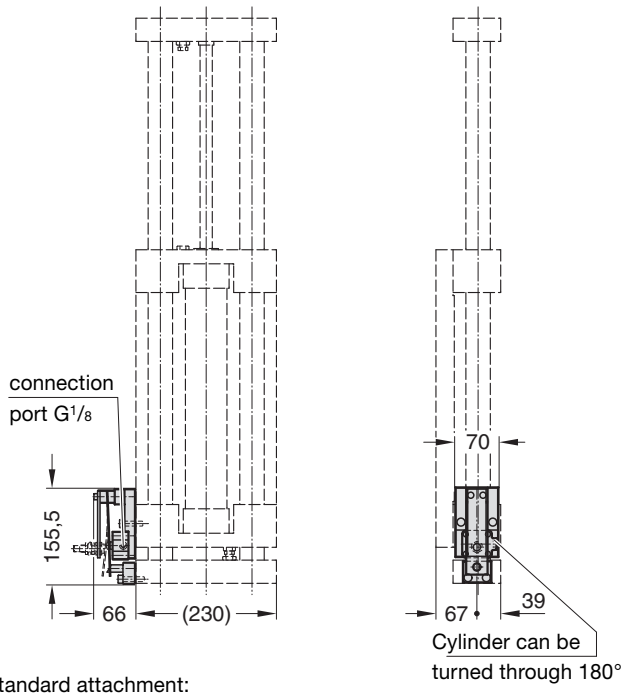


5-15649-0-1 ✻

Translations Units
Descent latches, Pneumatic

Descent latch

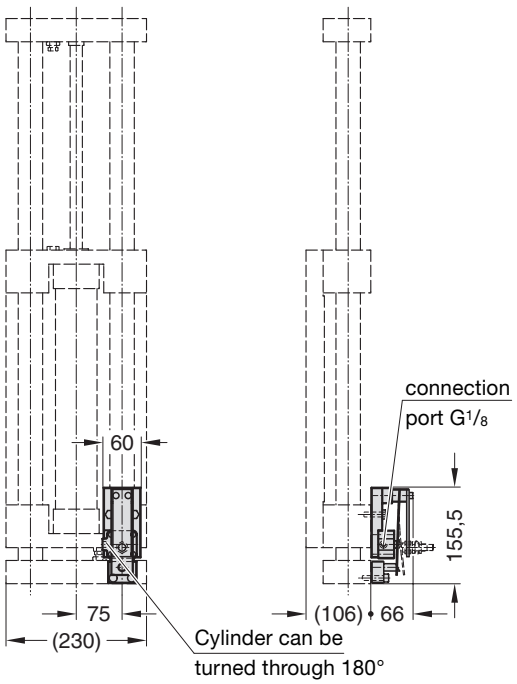
for translation unit 52.11.3.
Type AS Lp 3 (side)



Standard attachment:
Descent latch on left-hand side
Can optionally be attached on right-hand side

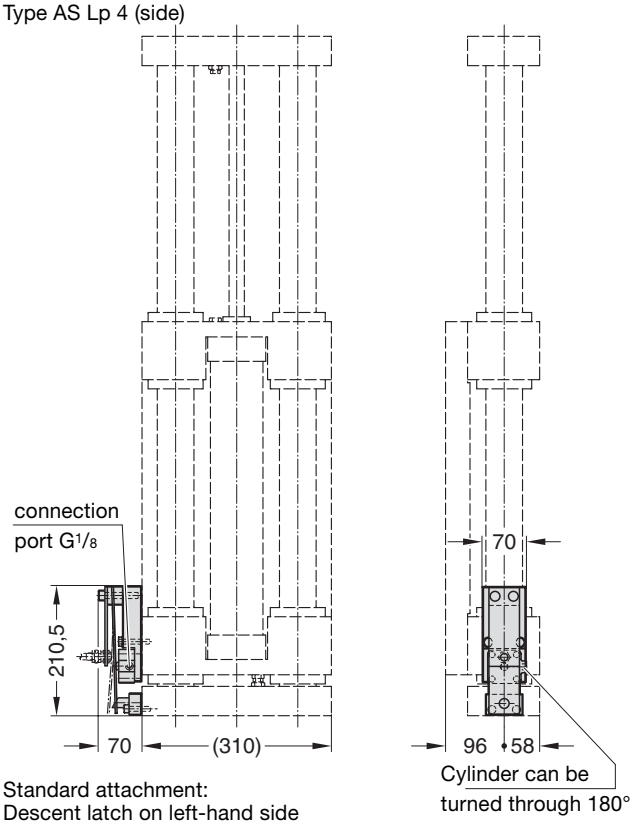
Descent latch

for translation unit 52.11.3.
Type AS Lp 3 (front)



Descent latch

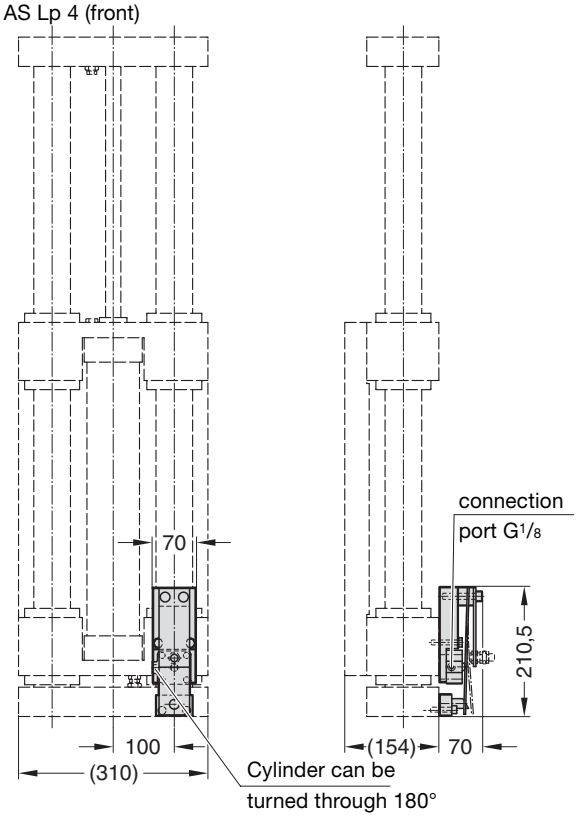
for translation unit 52.11.4.
Type AS Lp 4 (side)



Standard attachment:
Descent latch on left-hand side
Can optionally be attached on right-hand side

Descent latch

for translation unit 52.11.4.
Type AS Lp 4 (front)



5-12650-0-1 ✻

Translation Units
Descent latches, Pneumatic

Descent latches

When the pressure drops and during breaks from work, the descent latch prevents the vertically-installed unit from dropping out of its top end position.

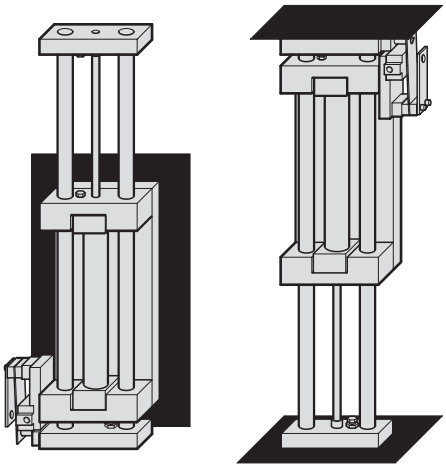
See other diagrams on page 30.

Descent latch with holder for proximity switch		∅M12	∅M18
Modul	Attachment	Order number	
Translation unit 52.11.2.	on side	1.051.00128	1.051.00179
3.	on side	.00129	.00188
	at front	.00133	.00189
4.	on side	.00130	.00190
	at front	.00130	.00190

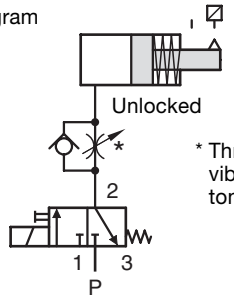
Installation positions

Fixed centre
= movable end flange

Fixed end flanges
= movable centre part



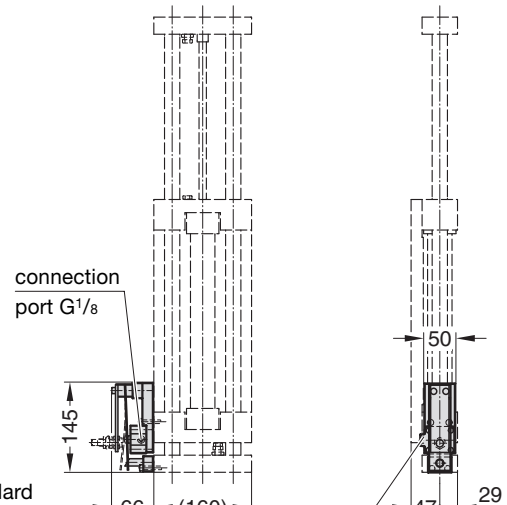
Block diagram



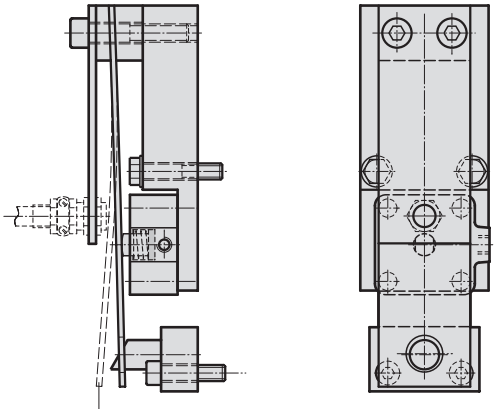
* Throttle valve prevents vibration noise of spring tongue

Descent latch

for translation unit 52.11.2.
Type AS Lp 2



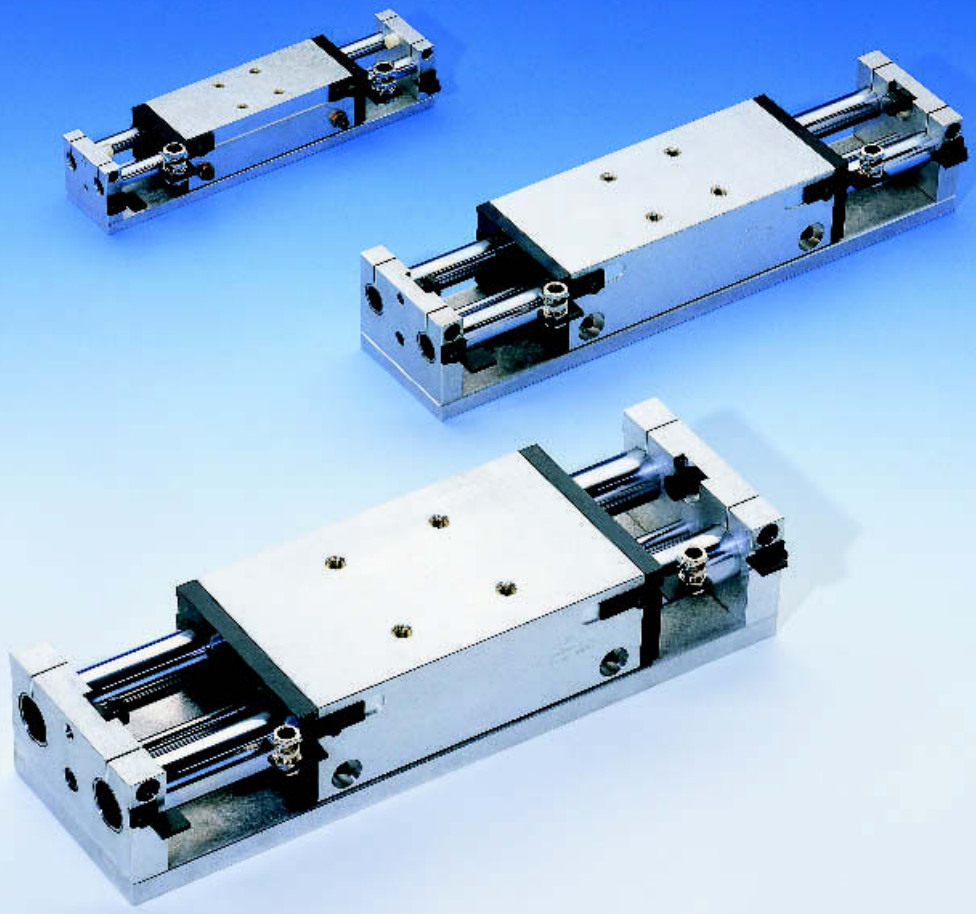
Standard attachment:
Descent latch on left-hand side
Can optionally be attached on right-hand side



Spring blade position:
unlocked

5-15651-0-2 ✻

Pneumatic Short-Stroke Units



5-15653-0-1 ✱

52.21.2. Short-Stroke Unit Pneumatic

Ordering information

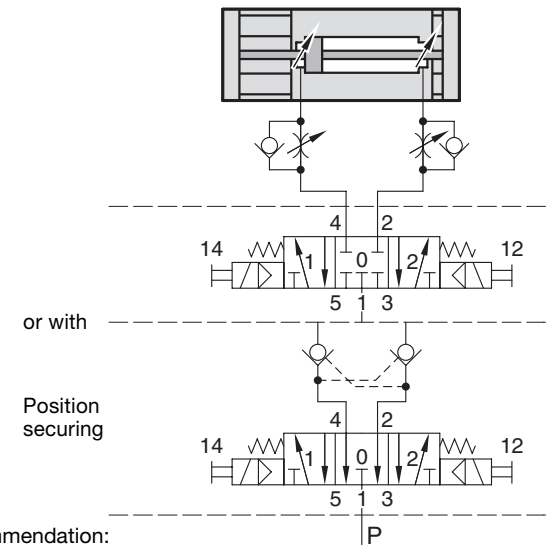
	A		B	C		D	E
Type	52.	21.					
Size			2.				
Stroke lengths: 40, 80 mm				0	0 4 0.		
Version: With end position damping						100 D.	
Fixings for proximity switch						∅ M 12	06
with holders and activator flags						∅ M 18	07
Ordering example	52.	21.	2.	0	0040.	100 D.	06

Special stroke lengths available upon request

Unloaden weight and load moments

Stroke	Centre piece	Guide rods	Total weight	2 M_H	3 M_F	4 M_T
40 mm	1,3 kg	0,9 kg	2,2 kg	36 Nm	20 Nm	20 Nm
80 mm	1,6 kg	1,1 kg	2,7 kg	36 Nm	20 Nm	20 Nm

Block diagram

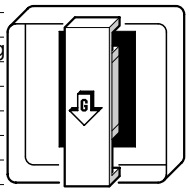


Recommendation:
Nominal flow rate through valve: 400 l_N/min.

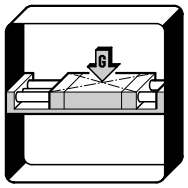
Carried load

1 G	Load = max. 10 kg for all loading cases	Note: The specified moment is based on a permissible deflection of approx. 0,15 mm – measured at the centre of the end flange.
2 M_H	Bending moment (on edge)	
3 M_F	Bending moment (lying flat)	
4 M_T	Torsional moment	
x, y	Distance to centre of gravity of load	

1 $G_{max.}$ Load 10 kg

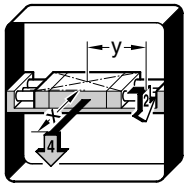


1 $G_{max.}$ Load 10 kg

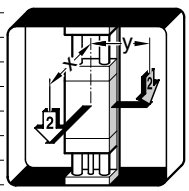


2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.}$ Torsion

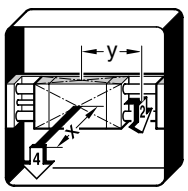


2 $M_{H\ adm.}$ Deflection on edge

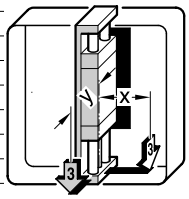


2 $M_{H\ adm.}$ Deflection on edge

3 $M_{F\ adm.}$ Deflection lying flat

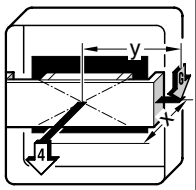


3 $M_{F\ adm.}$ Deflection lying flat



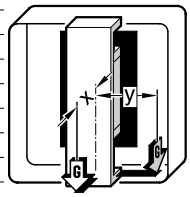
2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.}$ Torsion

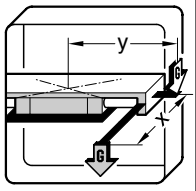


2 $M_{H\ adm.}$ Deflection on edge

3 $M_{F\ adm.}$ Deflection lying flat



3 $M_{F\ adm.}$ Deflection lying flat



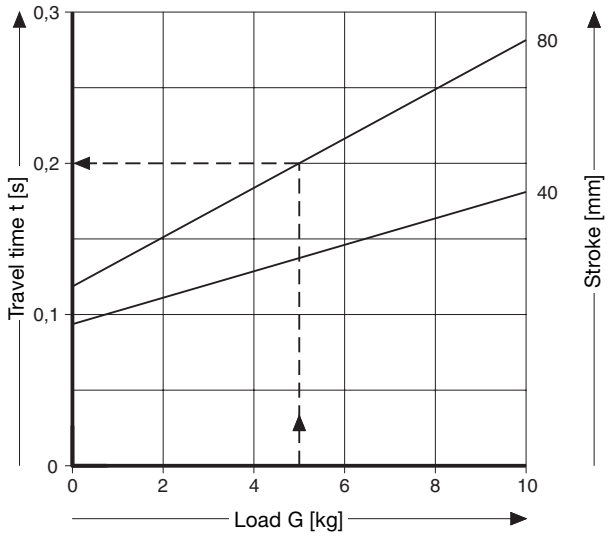
Lengths and stroke volumes

Stroke	L_1	L_2	Stroke vol.
40 mm	227 mm	115 mm	0,02 dm³
80 mm	307 mm	155 mm	0,04 dm³

Special stroke lengths are determined as follows:
$L_1 = 2 \times$ stroke + 147 mm; L_2 = stroke + 75 mm

Timing diagram (recommended stroke time)

Example
G = 5 kg
Stroke = 80 mm
Travel time: desired
Travel time = 0,2 s



The calculated travel time is for guidance only. It excludes the valve switching time and the time required to build up pressure, and is specified for 6 bar system pressure.

5-15654-0-2 ❋

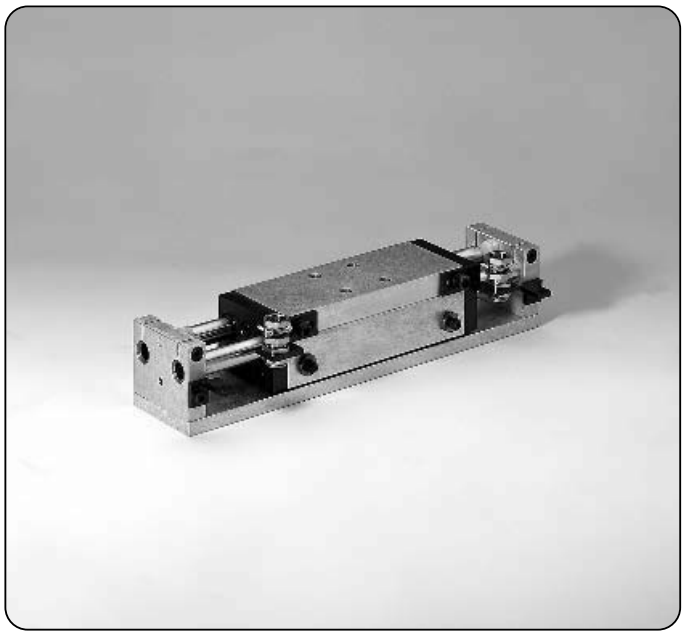
Short-Stroke Unit Pneumatic

52.21.2.

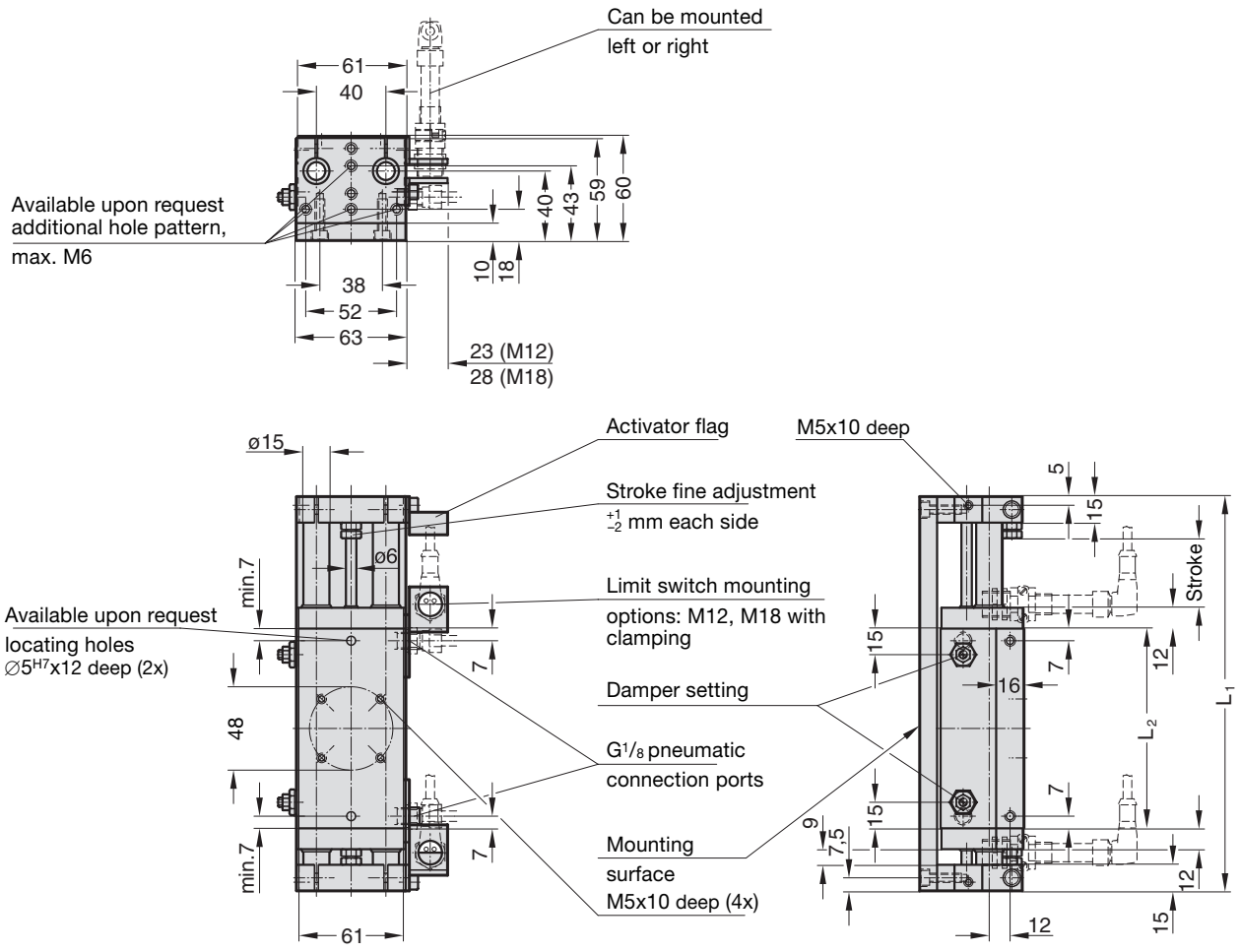
Technical description

Size	2
Stroke lengths	40, 80 mm
Drive unit	pneumatic, can be operated with deoiled air
Nominal operating pressure	6 bar
Approved operating pressure	min. 4,5 bar, max. 10 bar
Piston area (piston end)	4,63 cm²
Piston area (pillar end)	4,63 cm²
Useful force of cylinder	245 N at 6 bar (piston end)
Useful force of cylinder	245 N at 6 bar (pillar end)
Repeat accuracy	fixed stop ± 0,1 mm
Fine adjustment of stroke	+1 bis – 2 mm for each end position
Damping	variable
Installation position	any
Velocity control	external, by restricting exhaust air
Guide rods	steel, hard chromium plated and ground
Pillar guide	maintenance-free, linear guides

End flange, guide blocks and base plate are aluminium
Guide and piston rods with dirt scrapers
Functions monitored by inductive proximity switches



Dimensions



2-15655-0-1 ✻

52.21.3. Short-Stroke Unit Pneumatic

Ordering information

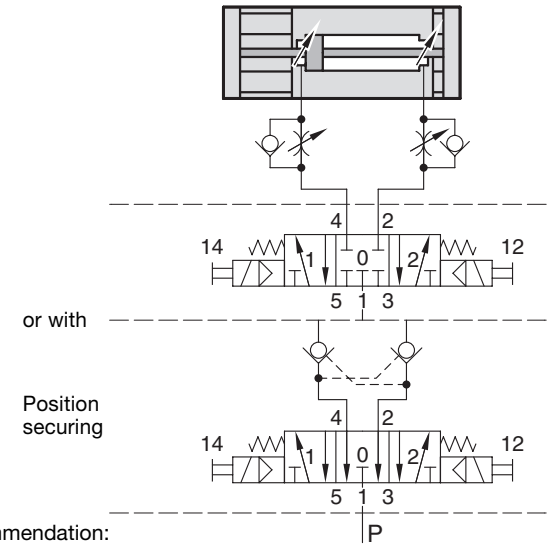
	A		B	C	D	E
Type	52.	21.				
Size			3.			
Stroke lengths: 50, 100, 150 mm				0 1 0 0.		
Version: With end position damping					100 D.	
Fixings for proximity switch						06
with holders and activator flags						07
Ordering example	52.	21.	3.	0100.	100 D.	06

Special stroke lengths available upon request

Unloaden weight and load moments

Stroke	Centre piece	Guide rods	Total weight	2 M_H	3 M_F	4 M_T
50 mm	4,3 kg	2,8 kg	7,1 kg	115 Nm	62 Nm	62 Nm
100 mm	5,0 kg	3,6 kg	8,6 kg	115 Nm	62 Nm	62 Nm
150 mm	5,7 kg	4,4 kg	10,1 kg	115 Nm	62 Nm	62 Nm

Block diagram

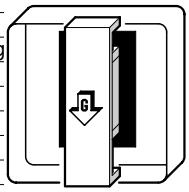


Recommendation:
Nominal flow rate through valve: 800 l_N/min.

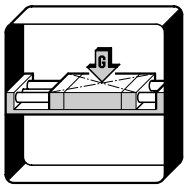
Carried load

1 G	Load = max. 25 kg for all loading cases	Note: The specified moment is based on a permissible deflection of approx. 0,5 mm – measured at the centre of the end flange.
2 M_H	Bending moment (on edge)	
3 M_F	Bending moment (lying flat)	
4 M_T	Torsional moment	
x, y	Distance to centre of gravity of load	

1 $G_{max.}$ Load 25 kg

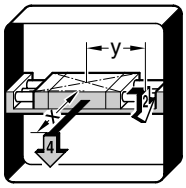


1 $G_{max.}$ Load 25 kg

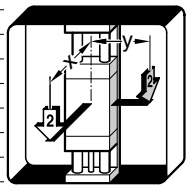


2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.}$ Torsion

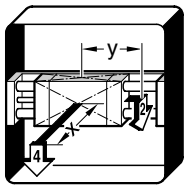


2 $M_{H\ adm.}$ Deflection on edge

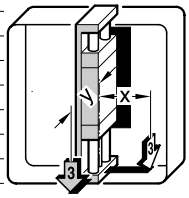


2 $M_{H\ adm.}$ Deflection on edge

3 $M_{F\ adm.}$ Deflection lying flat

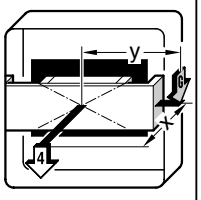


3 $M_{F\ adm.}$ Deflection lying flat



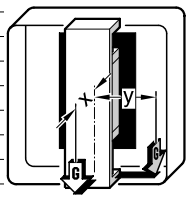
2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.}$ Torsion

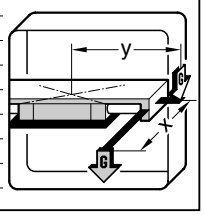


2 $M_{H\ adm.}$ Deflection on edge

3 $M_{F\ adm.}$ Deflection lying flat



3 $M_{F\ adm.}$ Deflection lying flat



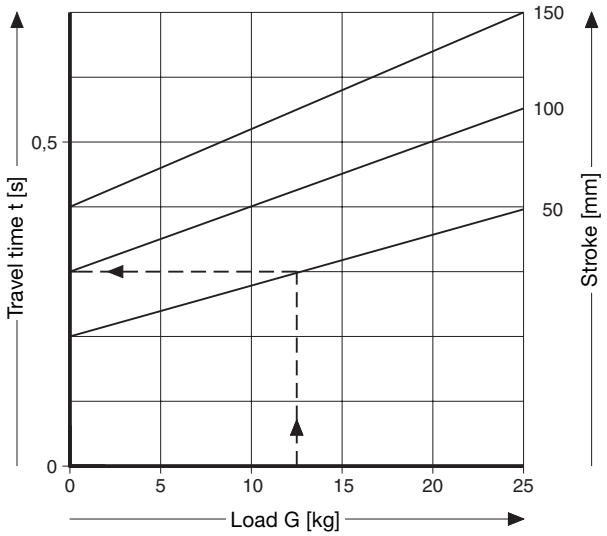
Lengths and stroke volumes

Stroke	L_1	L_2	Stroke vol.
50 mm	285 mm	146 mm	0,06 dm³
100 mm	385 mm	196 mm	0,12 dm³
150 mm	485 mm	246 mm	0,18 dm³

Special stroke lengths are determined as follows:
$L_1 = 2 \times$ stroke + 185 mm; L_2 = stroke + 96 mm

Timing diagram (recommended stroke time)

Example
G = 12,5 kg
Stroke = 50 mm
Travel time: desired
Travel time = 0,3 s



The calculated travel time is for guidance only. It excludes the valve switching time and the time required to build up pressure, and is specified for 6 bar system pressure.

5-15656-0-2 ✻

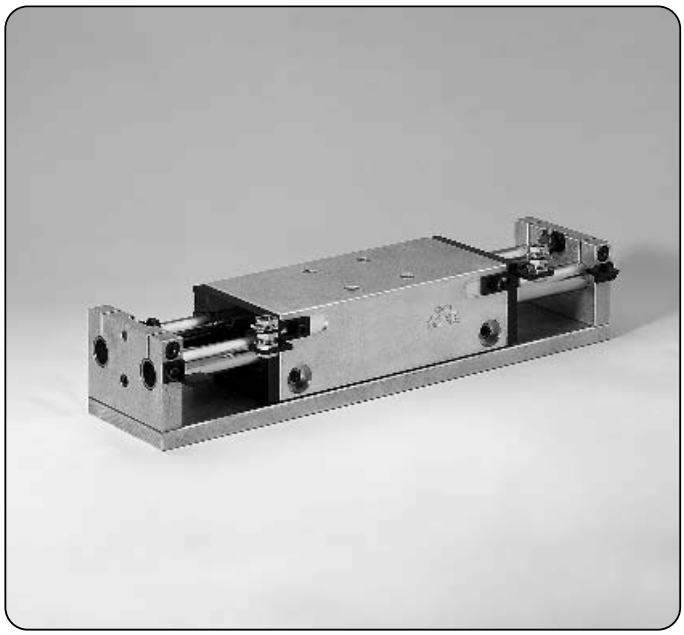
Short-Stroke Unit Pneumatic

52.21.3.

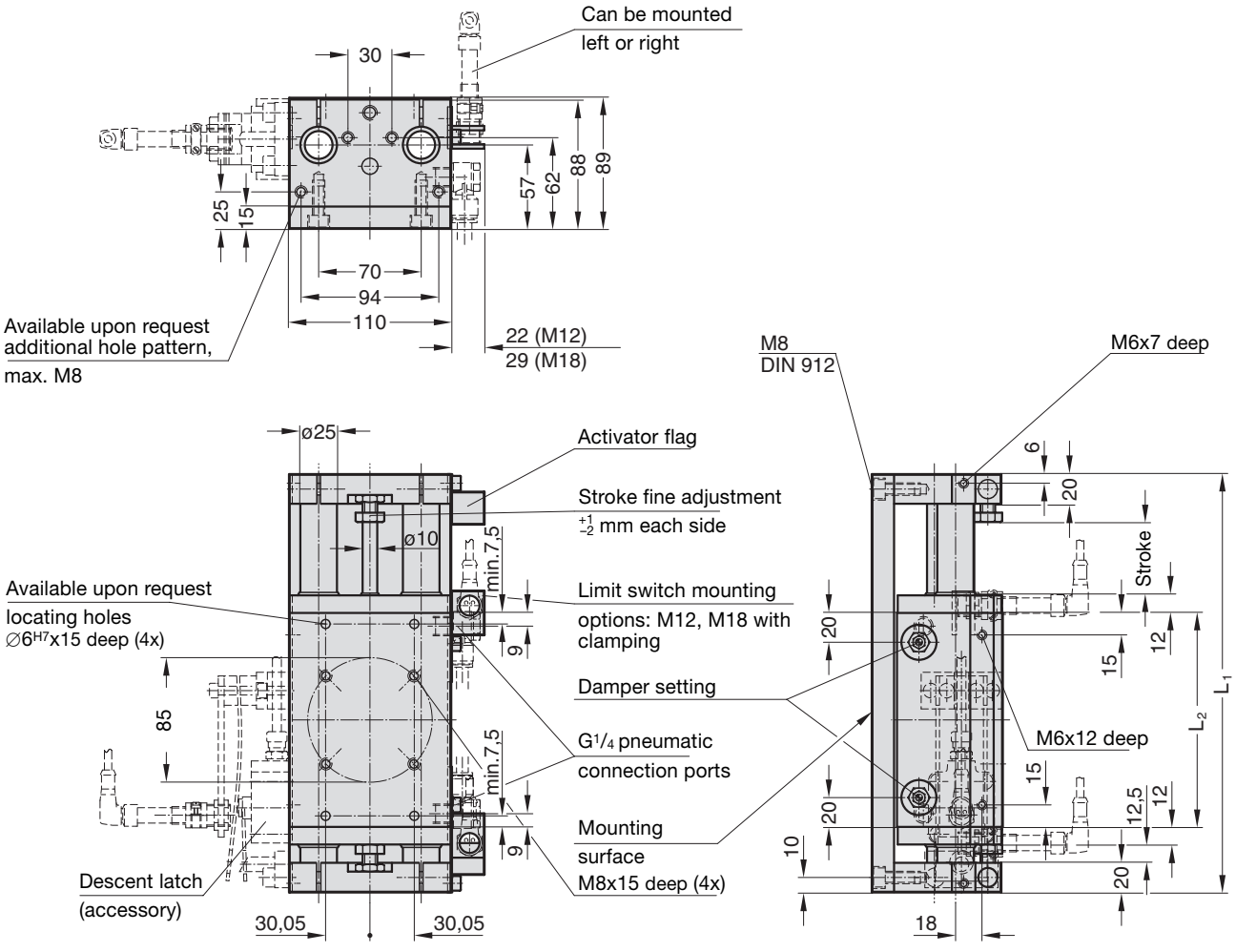
Technical description

Size	3
Stroke lengths	50, 100, 150 mm
Drive unit	pneumatic, can be operated with deoiled air
Nominal operating pressure	6 bar
Approved operating pressure	min. 4,5 bar, max. 10 bar
Piston area (piston end)	11,78 cm²
Piston area (pillar end)	11,78 cm²
Useful force of cylinder	620 N at 6 bar (piston end)
Useful force of cylinder	620 N at 6 bar (pillar end)
Repeat accuracy	fixed stop ± 0,1 mm
Fine adjustment of stroke	+1 bis – 2 mm for each end position
Damping	variable
Installation position	any
Velocity control	external, by restricting exhaust air
Guide rods	steel, hard chromium plated and ground
Pillar guide	maintenance-free, linear guides

End flange, guide blocks and base plate are aluminium
Guide and piston rods with dirt scrapers
Functions monitored by inductive proximity switches
Option: Descent latch



Dimensions



5-15657-0-1 ✻

52.21.4. Short-Stroke Unit Pneumatic

Ordering information

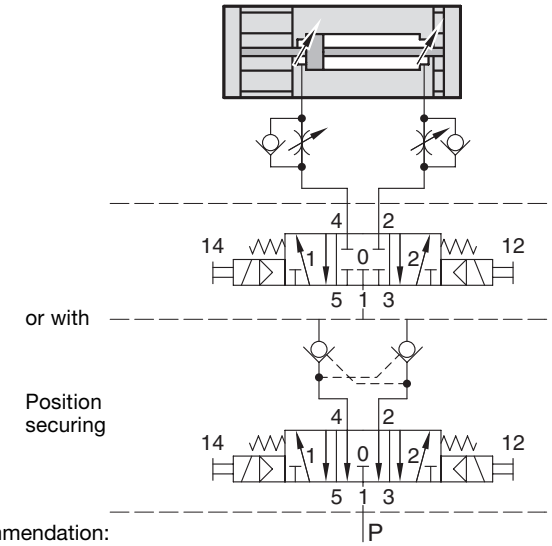
	A		B	C		D	E
Type	52.	21.					
Size			4.				
Stroke lengths: 75, 150 mm				0150.			
Version: With end position damping						100 D.	
Fixings for proximity switch						∅ M 12	06
with holders and activator flags						∅ M 18	07
Ordering example	52.	21.	4.	0150.		100 D.	06

Special stroke lengths available upon request

Unloaden weight and load moments

Stroke	Centre piece	Guide rods	Total weight	2 M_H	3 M_F	4 M_T
75 mm	8,2 kg	7,8 kg	16 kg	200 Nm	140 Nm	140 Nm
150 mm	10,2 kg	9,8 kg	20 kg	200 Nm	140 Nm	140 Nm

Block diagram

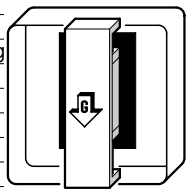


Recommendation:
Nominal flow rate through valve: 1600 l_N/min.

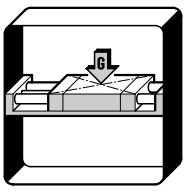
Carried load

1	G	Load = max. 40 kg for all loading cases	Note: The specified moment is based on a permissible deflection of approx. 0,5 mm – measured at the centre of the end flange.
2	M_H	Bending moment (on edge)	
3	M_F	Bending moment (lying flat)	
4	M_T	Torsional moment	
	x, y	Distance to centre of gravity of load	

1 $G_{max.}$ Load 40 kg

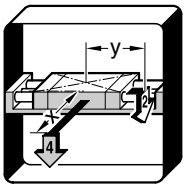


1 $G_{max.}$ Load 40 kg

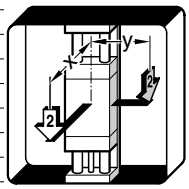


2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.}$ Torsion

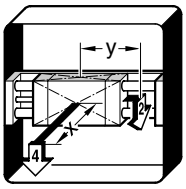


2 $M_{H\ adm.}$ Deflection on edge

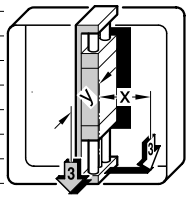


2 $M_{H\ adm.}$ Deflection on edge

3 $M_{F\ adm.}$ Deflection lying flat

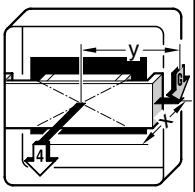


3 $M_{F\ adm.}$ Deflection lying flat



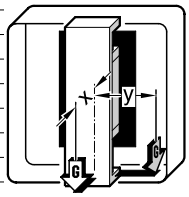
2 $M_{H\ adm.}$ Deflection on edge

4 $M_{T\ adm.}$ Torsion

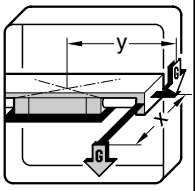


2 $M_{H\ adm.}$ Deflection on edge

3 $M_{F\ adm.}$ Deflection lying flat



3 $M_{F\ adm.}$ Deflection lying flat



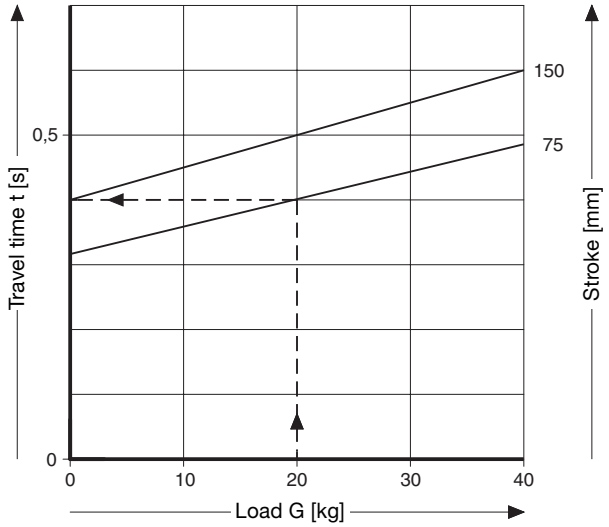
Lengths and stroke volumes

Stroke	L_1	L_2	Stroke vol.
75 mm	380 mm	190 mm	0,13 dm³
150 mm	530 mm	265 mm	0,26 dm³

Special stroke lengths are determined as follows:
L_1 = 2 × stroke + 230 mm; L_2 = stroke + 115 mm

Timing diagram (recommended stroke time)

Example
G = 20 kg
Stroke = 75 mm
Travel time: desired
Travel time = 0,4 s



The calculated travel time is for guidance only. It excludes the valve switching time and the time required to build up pressure, and is specified for 6 bar system pressure.

5-15658-0-2 ✻

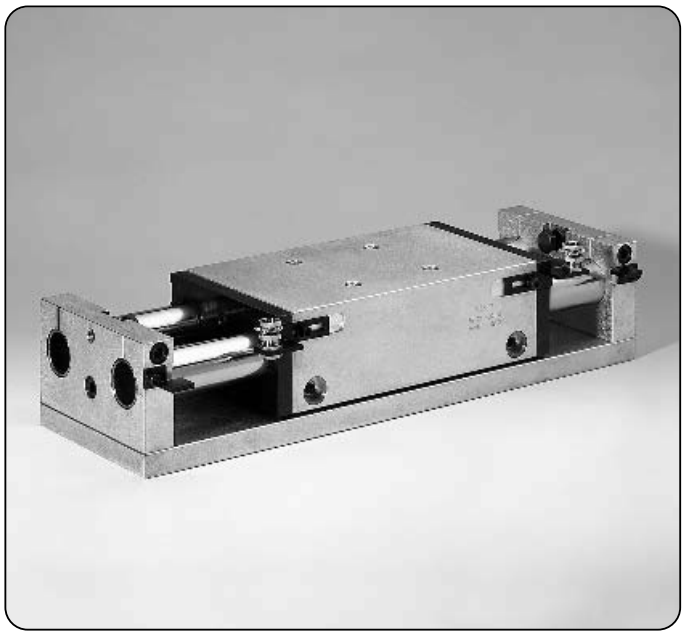
Short-Stroke Unit Pneumatic

52.21.4.

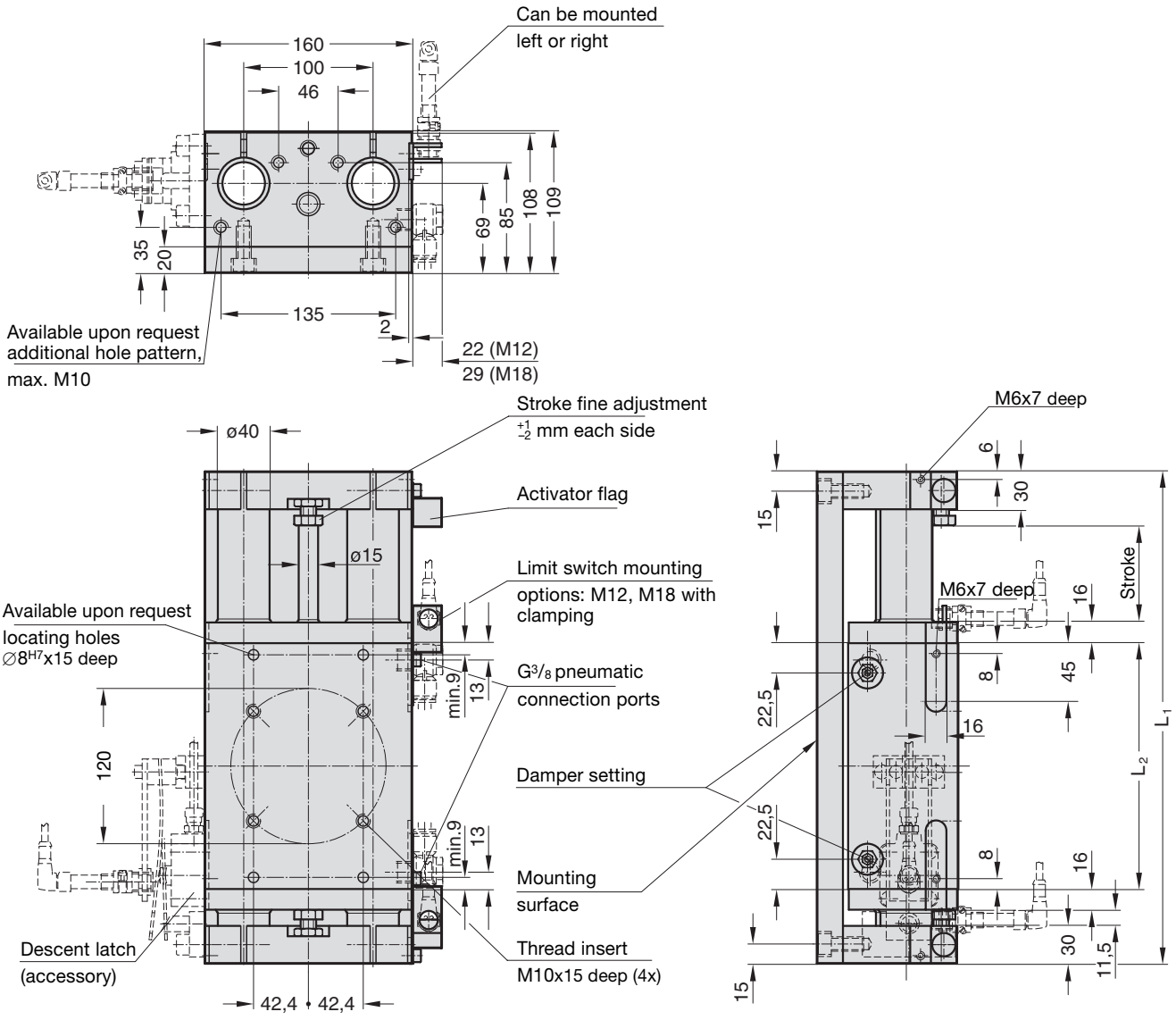
Technical description

Size	4
Stroke lengths	75, 150 mm
Drive unit	pneumatic, can be operated with deoiled air
Nominal operating pressure	6 bar
Approved operating pressure	min. 4,5 bar, max. 10 bar
Piston area (piston end)	17,86 cm²
Piston area (pillar end)	17,86 cm²
Useful force of cylinder	940 N at 6 bar (piston end)
Useful force of cylinder	940 N at 6 bar (pillar end)
Repeat accuracy	fixed stop ± 0,1 mm
Fine adjustment of stroke	+1 bis – 2 mm for each end position
Damping	variable
Installation position	any
Velocity control	external, by restricting exhaust air
Guide rods	steel, hard chromium plated and ground
Pillar guide	maintenance-free, linear guides

End flange, guide blocks and base plate are aluminium
Guide and piston rods with dirt scrapers
Functions monitored by inductive proximity switches
Option: Descent latch



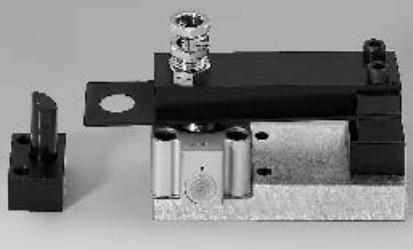
Dimensions



5-15659-0-1 ✻

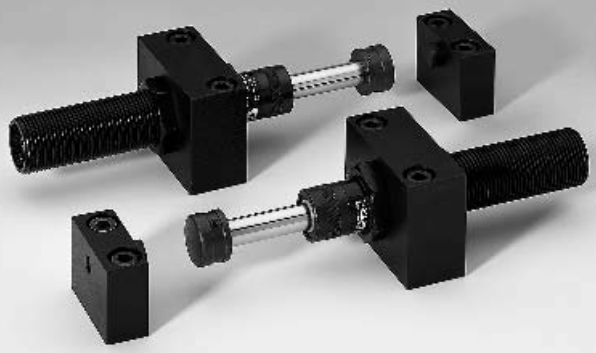
Translation Units
Descent Latch
External Hydraulic Damping

Descent latch



Attachment

External hydraulic damping



Attachment

5-15660-0-1 ✻

Short-Stroke Units
Descent Latches, Pneumatic

Descent latches

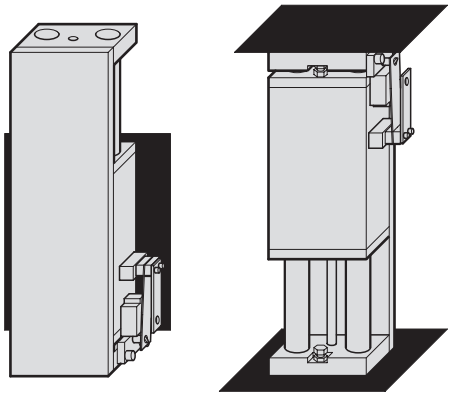
When the pressure drops and during breaks from work, the descent latch prevents the vertically-installed unit from dropping out of its top end position.

Descent latch with holder for proximity switch		∅ M12	∅ M18
Module	Attachment	Order number	
Short travel 52.21.3.	on side	1.051.00131	1.051.00191
52.21.4.	on side	.00132	.00192

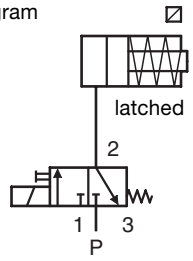
Installation positions

Fixed centre
= movable end flange

Fixed end flanges
= movable centre part

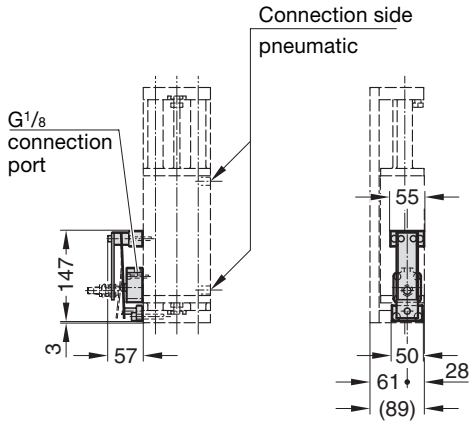


Block diagram



Descent latch

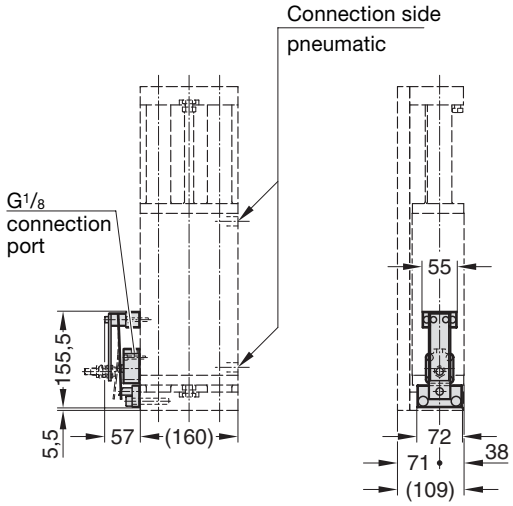
for translation short stroke unit 52.21.3.
Type AS KHp 3



Standard attachment:
Descent latch: bottom left
Special version: top left

Descent latch

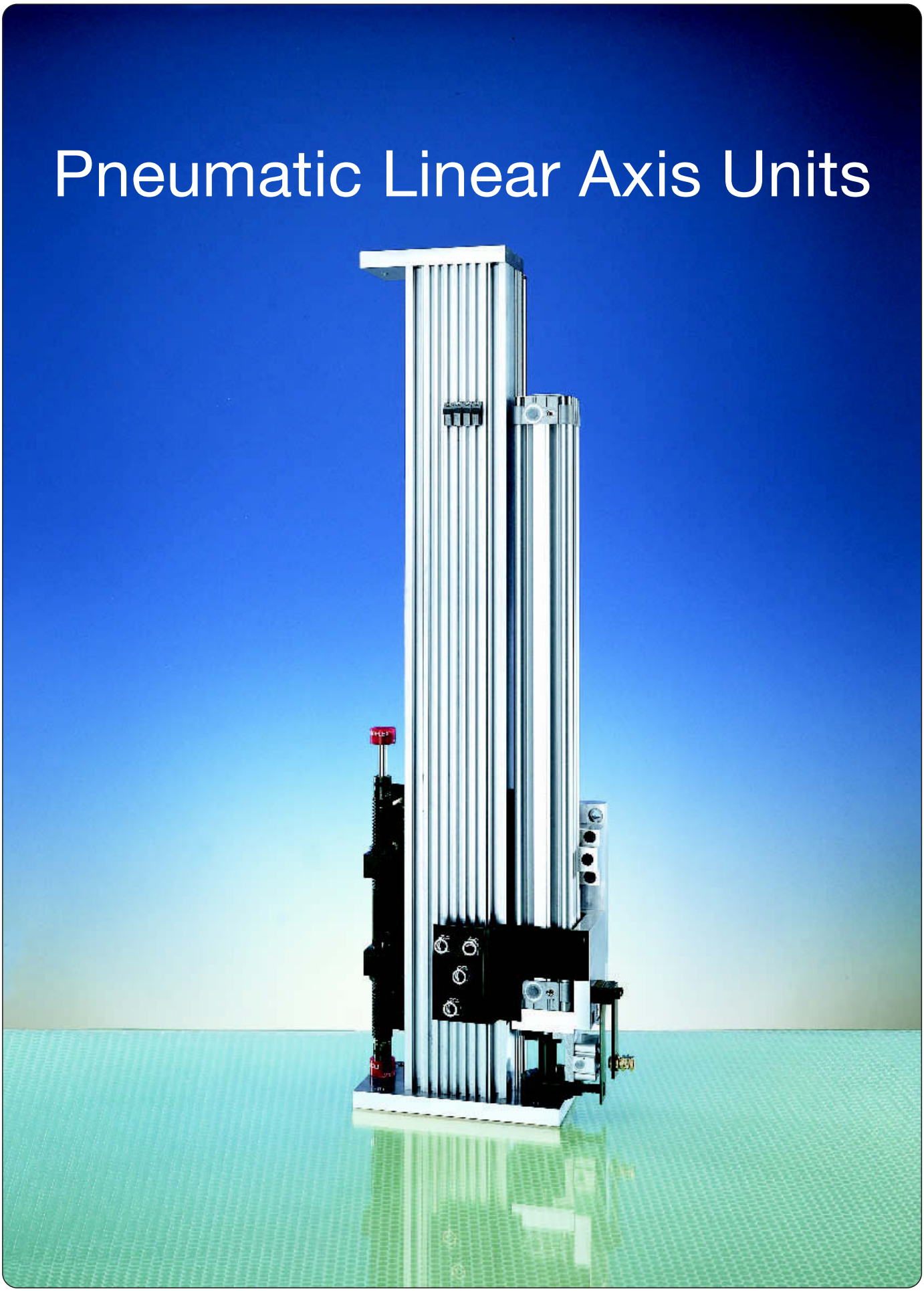
for translation short stroke unit 52.21.4.
Type AS KHp 4



Standard attachment:
Descent latch: bottom left
Special version: top left

5-15661-0-2 ✻

Pneumatic Linear Axis Units



52.31.2. Linear Axis Unit Pneumatic

Ordering information

		A		B	C		D		E
Type		52.	31.						
Size				2.					
Stroke lengths: 250, 400, 630, 1000 mm					0400.				
Version:	without high-speed switch block						3	0	
	with high-speed switch block						3	1	
	Installed horizontally							1	
	Installed vertically							2	
with fixings for proximity switch						Ø M 12			06
with holders and activator flags						Ø M 18			07
Ordering example		52.	31.	2.	0400.		312.		06

Unloaden weight and load moments

Stroke	Saddle cylinder	Rail	Total weight
250 mm	13 kg	15 kg	28 kg
400 mm	14 kg	18 kg	32 kg
630 mm	15 kg	23 kg	38 kg
1000 mm	16 kg	31 kg	47 kg

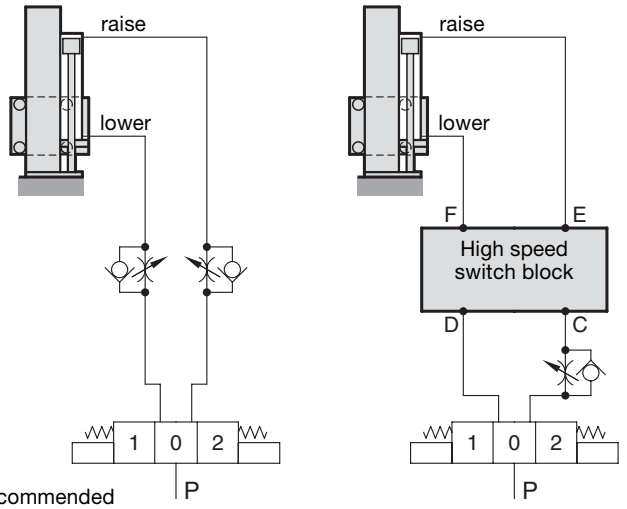
High speed switch block, fitted	2 kg
Descent latch	1 kg
Intermediate stop	2 kg

Block diagram

For details see pages 36–37

ⓐ with restriction of exhaust air

ⓑ with high-speed switch block

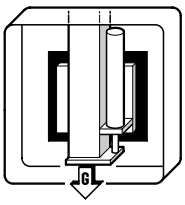


Recommended nominal flow rate through valve 1600 l_N/min

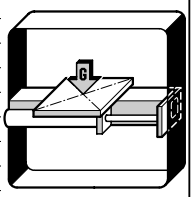
Carried load

1 G	Load = Max. 100 kg for all loading cases	x, y	distance to centre of gravity of load
2 M_H	Bending moment Nm (on edge)	$Z_{max.}$	max. height of the structure at b. $G_{max.}$ and $V_{max.}$
3 M_F	Bending moment Nm (lying flat)		
4 M_T	Torsional moment Nm	M	Max load

1 G Load 50 kg



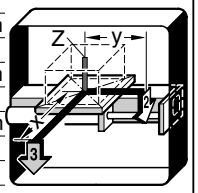
1 G Load 50 kg



2 M_H 50 Nm

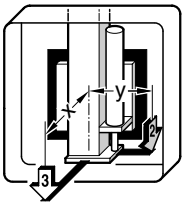
$Z_{max.}$ 0,6 m

4 M_T 50 Nm



2 M_H 50 Nm

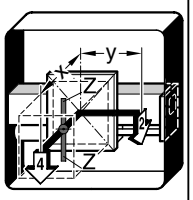
3 M_F 50 Nm



2 M_H 50 Nm

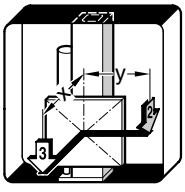
$Z_{max.}$ 0,8 m

4 M_T 50 Nm



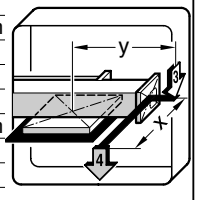
2 M_H 50 Nm

3 M_F 50 Nm



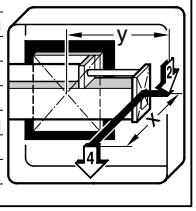
3 M_F 206 Nm

4 M_T 50 Nm



2 M_H 392 Nm

4 M_T 51 Nm

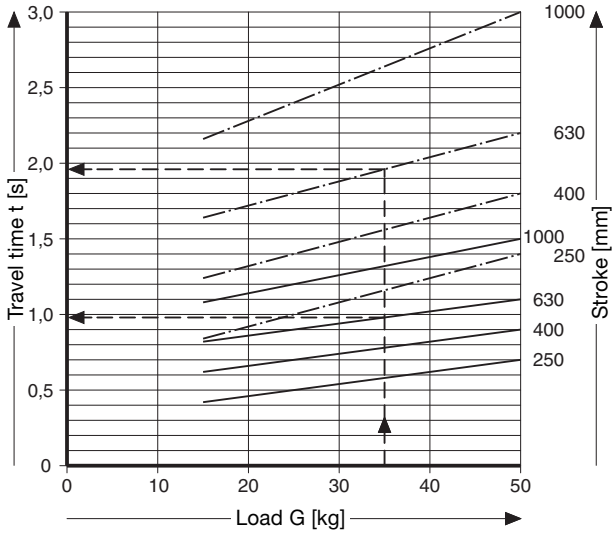


Lengths and stroke volumes

Stroke	L_1	L_2	L_3	Stroke vol.
250 mm	690 mm	501 mm	327 mm	0,78 dm³
400 mm	840 mm	651 mm	477 mm	1,25 dm³
630 mm	1070 mm	881 mm	707 mm	1,97 dm³
1000 mm	1440 mm	1251 mm	1077 mm	3,11 dm³

Timing diagram (recommended stroke time)

Example
G = 35 kg
Stroke = 550 mm
Travel time: desired
Travel time = ⓐ -block diagram 2,0 s, ⓑ-block diagram 1,0 s



ⓐ-block diagram — frequency of operating cycles approx. 400 Double travel / hr

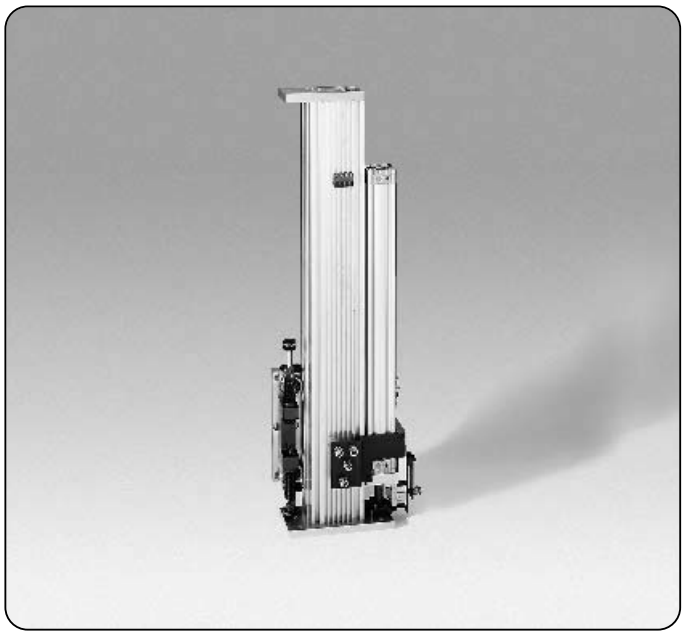
ⓑ-block diagram — frequency of operating cycles unlimited

5-15664-0-1 ✻

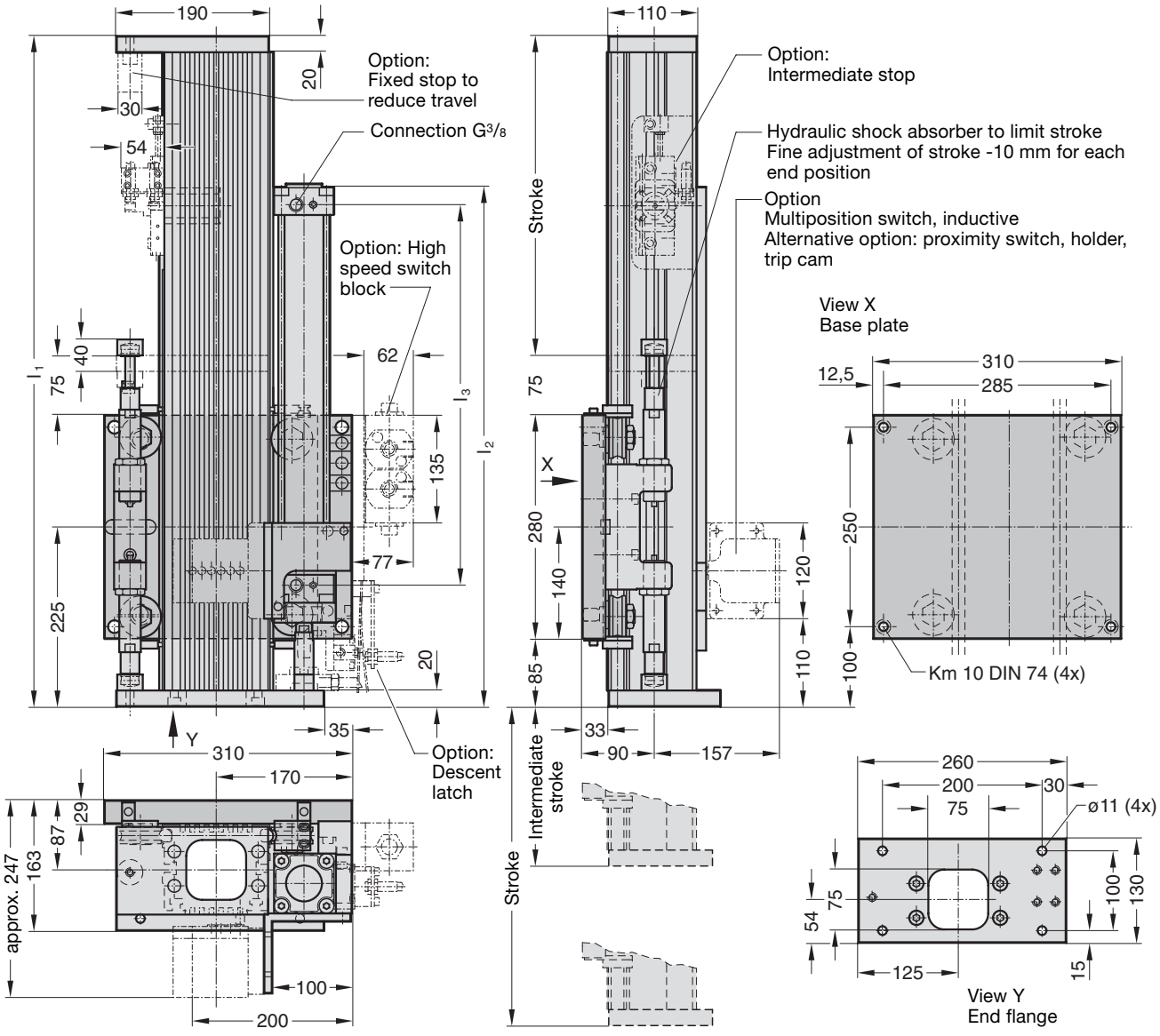
Linear Axis Unit Pneumatic 52.31.2.

Technical description

Size	2
Stroke lengths	250, 400, 630, 1000 mm
Drive unit	pneumatic, can be operated with
	deoiled air
Nominal operating pressure	6 bar
Piston area (piston end)	31,15 cm^2
Piston area (pillar end)	28,0 cm^2
Useful force of cylinder (piston end)	1647 N at 6 bar (Pz)
Useful force of cylinder (pillar end)	1478 N at 6 bar (Ps)
Repeat accuracy	± 0,05 mm for each piston head end position
	± 0,20 mm for each shock absorber stop
	for each travel reduction or intermediate position
Fine adjustment of stroke	– 10 mm for each end position
Damping	adjustable, hydraulic external
Installation position	any
Velocity control	external by restriction of exhaust air as required
Guide rail	recessed hardened tubular guide
Rollers	hardened, maintenance-free,
	4 ball bearings two with off-centre axis
Guide beams, end flange and trolley of aluminium.	
Guide rail with dirt scrapers and long life lubrication device.	
Functions monitored by inductive proximity switches	
Options: High-speed switch block, descent latch, intermediate stop, travel reduction with fixed stop	



Dimensions



5-15685-0-1 ❄

52.31.3. Linear Axis Unit Pneumatic

Ordering information

	A		B	C		D	E
Type	52.	31.					
Size			3.				
Stroke lengths: 320, 400, 630, 1000 mm				0630.			
Version: without high-speed switch block						30	
with high-speed switch block						31	
Installed horizontally							1
Installed vertically							2
with fixings for proximity switch					Ø M 12		06
with holders and activator flags					Ø M 18		07
Ordering example	52.	31.	3.	0630.		312.	06

Unloaden weight and load moments

Stroke	Saddle cylinder	Rail	Total weight
320 mm	17 kg	16 kg	33 kg
400 mm	18 kg	18 kg	36 kg
630 mm	20 kg	23 kg	43 kg
1000 mm	23 kg	31 kg	54 kg

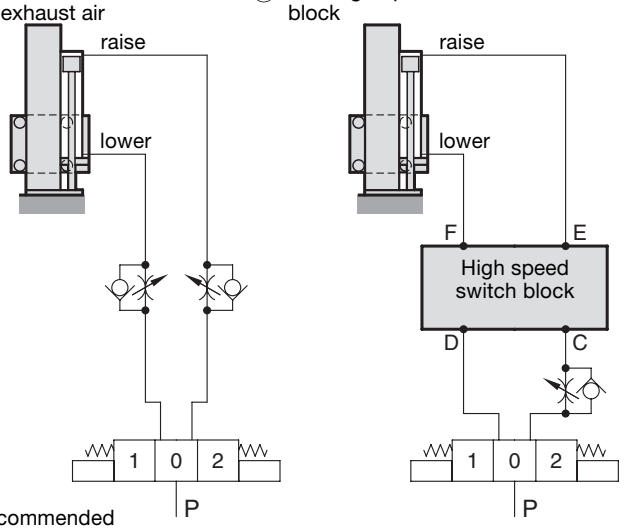
High speed switch block, fitted	2 kg
Descent latch	1 kg
Intermediate stop	2 kg

Block diagram

For details see pages 36–37

ⓐ with restriction of exhaust air

ⓑ with high-speed switch block

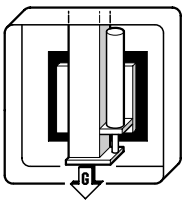


Recommended nominal flow rate through valve 4000 l_N/min

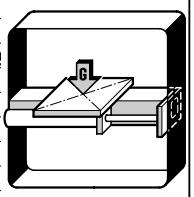
Carried load

1 G	Load = Max. 100 kg for all loading cases	x, y	distance to centre of gravity of load
2 M_H	Bending moment Nm (on edge)	$Z_{max.}$	max. height of the structure at b. $G_{max.}$ and $V_{max.}$
3 M_F	Bending moment Nm (lying flat)		
4 M_T	Torsional moment Nm	M	Max load

1 G Load 100 k



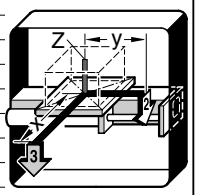
1 G Load 100 k



2 M_H 100 Nm

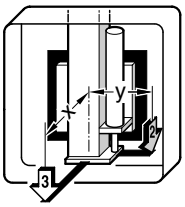
$Z_{max.}$ 0,6 m

4 M_T 100 Nm



2 M_H 100 Nm

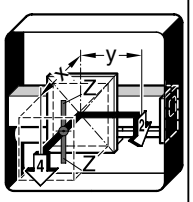
3 M_F 100 Nm



2 M_H 100 Nm

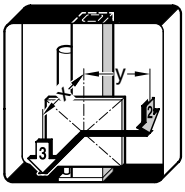
$Z_{max.}$ 0,8 m

4 M_T 100 Nm



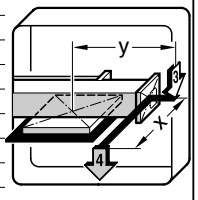
2 M_H 100 Nm

3 M_F 100 Nm



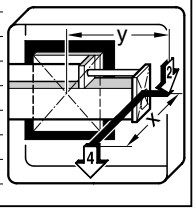
3 M_F 235 Nm

4 M_T 58 Nm



2 M_H 392 Nm

4 M_T 58 Nm

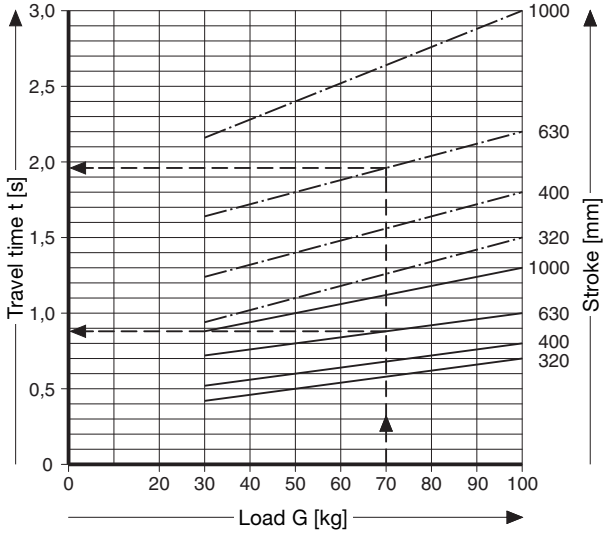


Lengths and stroke volumes

Stroke	L_1	L_2	L_3	Stroke vol.
320 mm	760 mm	593 mm	394 mm	1,61 dm³
400 mm	840 mm	973 mm	474 mm	2,01 dm³
630 mm	1070 mm	903 mm	704 mm	3,17 dm³
1000 mm	1440 mm	1273 mm	1074 mm	5,03 dm³

Timing diagram (recommended stroke time)

Example
G = 70 kg
Stroke = 550 mm
Travel time: desired
Travel time = ⓐ -block diagram 1,95 s, ⓑ-block diagram 0,90 s



ⓐ-block diagram — frequency of operating cycles approx. 400 Double travel / hr

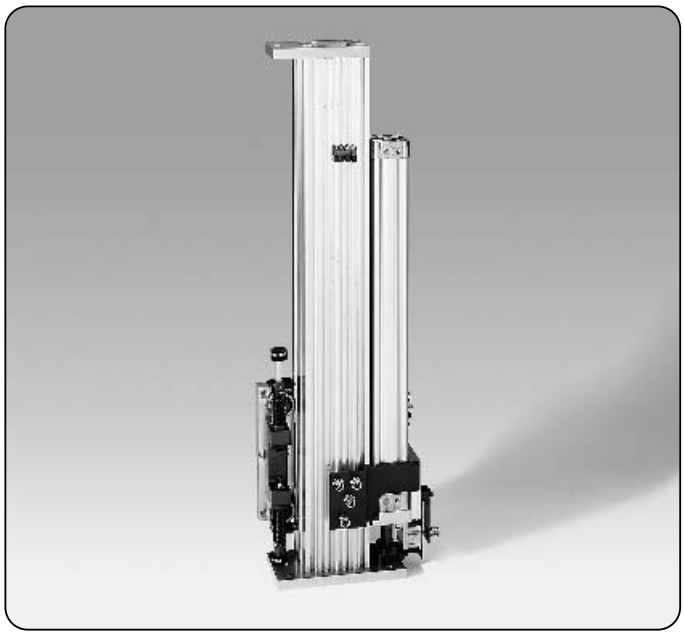
ⓑ-block diagram — frequency of operating cycles unlimited

5-15666-0-1

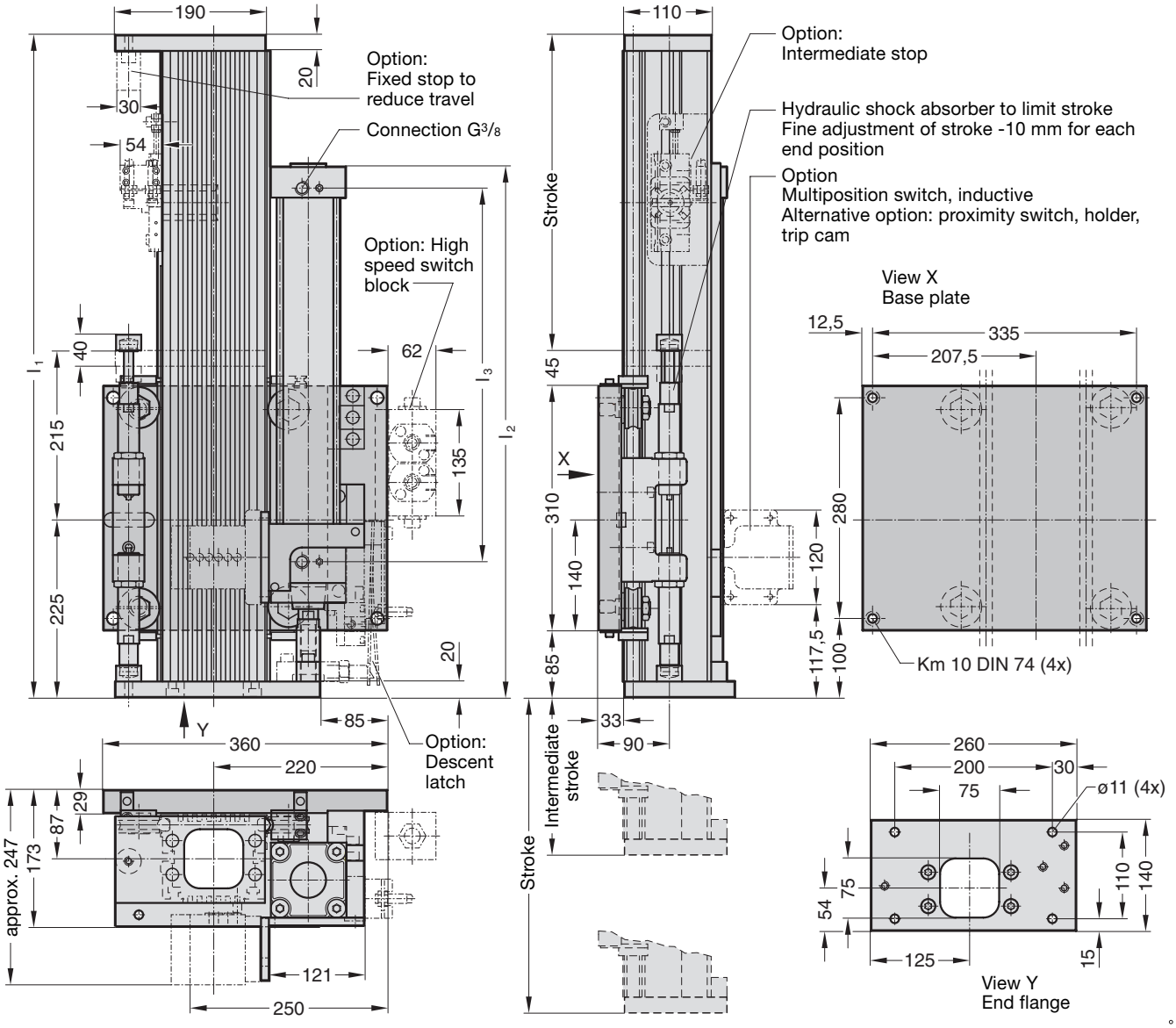
Linear Axis Unit Pneumatic 52.31.3.

Technical description

Size	3
Stroke lengths	320, 400, 630, 1000 mm
Drive unit	pneumatic, can be operated with
	deoiled air
Nominal operating pressure	6 bar
Piston area (piston end)	50,30 cm^2
Piston area (pillar end)	45,40 cm^2
Useful force of cylinder (piston end)	2656 N at 6 bar (Pz)
Useful force of cylinder (pillar end)	2397 N at 6 bar (Ps)
Repeat accuracy	± 0,05 mm for each piston head end position
	± 0,20 mm for each shock absorber stop
	for each travel reduction or intermediate position
Fine adjustment of stroke	– 10 mm for each end position
Damping	adjustable, hydraulic external
Installation position	any
Velocity control	external by restriction of exhaust air as required
Guide rail	recessed hardened tubular guide
Rollers	hardened, maintenance-free,
	4 ball bearings two with off-centre axis
Guide beams, end flange and trolley of aluminium.	
Guide rail with dirt scrapers and long life lubrication device.	
Functions monitored by inductive proximity switches	
Options: High-speed switch block, descent latch, intermediate stop, travel reduction with fixed stop	



Dimensions

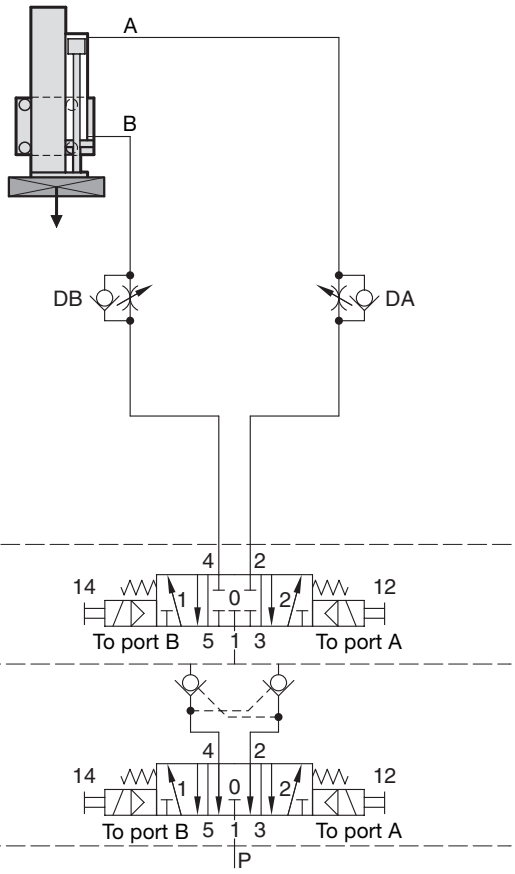


5-15667-0-1 ✻

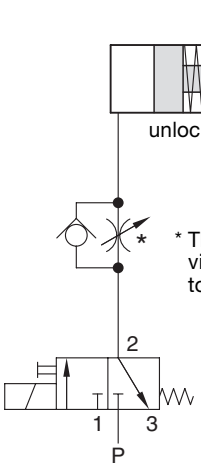
Block diagram for vertical and horizontal installation

Vertical Top 16 ⊠ N.O.
Horizontal Bottom Braking 15 ⊠ N.C.

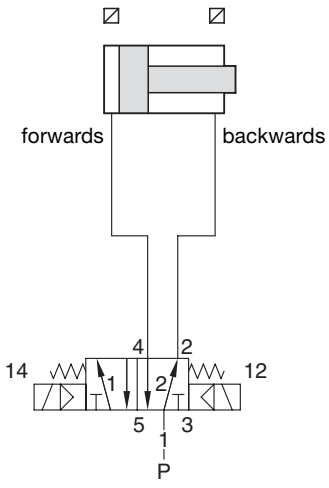
Braking 13 ⊠ N.C.
Vertical (Bottom) 18 ⊠ N.O.
Horizontal Front



Block diagram – descent latch



Block diagram intermediate stop



5-15668-0-1 ✻

Pneumatic
High-Speed Switch Block

High speed switch block

The high speed switch block produces very short travel times at a high frequency.

This is achieved by signal controlled exhaust air restriction.

Before the end position is reached, a sliding follower on the travel beam operates a sensor switch which activates the servo-assisted exhaust air restriction.

The end position damping can be influenced by pushing the trip cam, resetting the switching speed of the high-speed switching block and by restricting the air supply cross section.

The end position stop is in the external hydraulic damper. The damping required is so minimal that it does not need restricting for high speed operation.

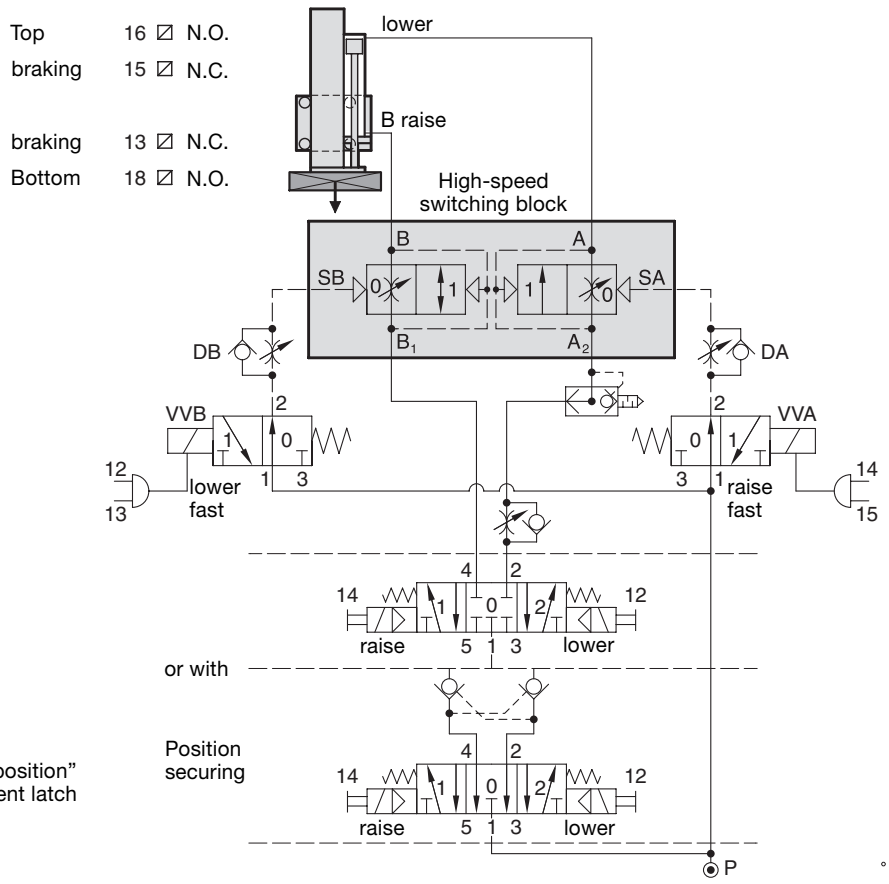
Sequence of motion: (e.g. lowering)

- Initial position (axis above)
  Sensor switches 15 and 16 are operated, direction valve solenoid 14 is triggered, valve setting 1, pilot valves VVA and VVB are not triggered, both valve positions 0, servo valves SA and SB in the high-speed switching block are in position 0.

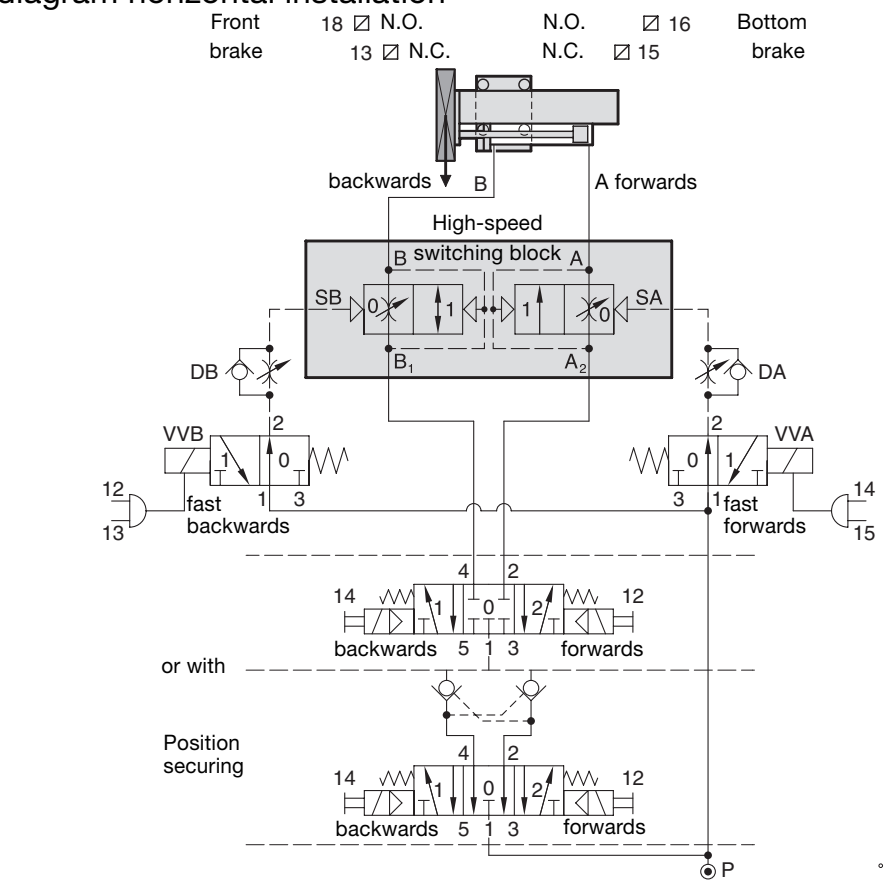
Travel (control)

- Approach
  Both pilot valves VVA and VVB are triggered, valve position 1, servo valves SA and SB are open, valve position 1, directional valve solenoid 12, valve position 2, compressed air at A_2 and A.
  The spindle lowers unbraked at maximum speed.
- Braking
  Sensing element 13 and UND-signal of solenoid 12 return the pilot valve VVB to position 0.
  Servo valve SB returns to position 0 and the exhaust air is restricted, with adjustable level. The throttle valve DB controls the reversing speed and hence the reversing profile.
  The increasing pressure brakes the travel.
  The residual energy is absorbed just before the end position by the external shock absorber.
- End position
  Sensor element 18 is triggered – end position is reached.
  Sensor element 13 is triggered.
  Directional valve remains triggered, position 2, pilot valve VVB remains at position 1.
  Pilot valve VVA remains triggered at position 1.
- The braking processes for raising/-lowering and backwards/forward can be adjusted independently of each other.
- The start of the braking process can be changed by adjusting the DA/DB throttling and by trip cam adjustment.
- The spindle is factory run and checked by FIBRO before delivery.
- Control: During control Signals 13 and 15 must be processed as priority. The cycle time scatter for switching from fast to creep control should not exceed 10 ms.

Block diagram vertical installation

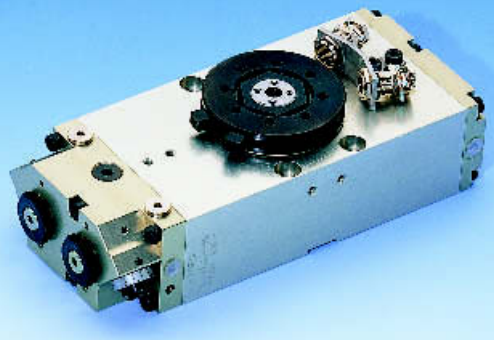


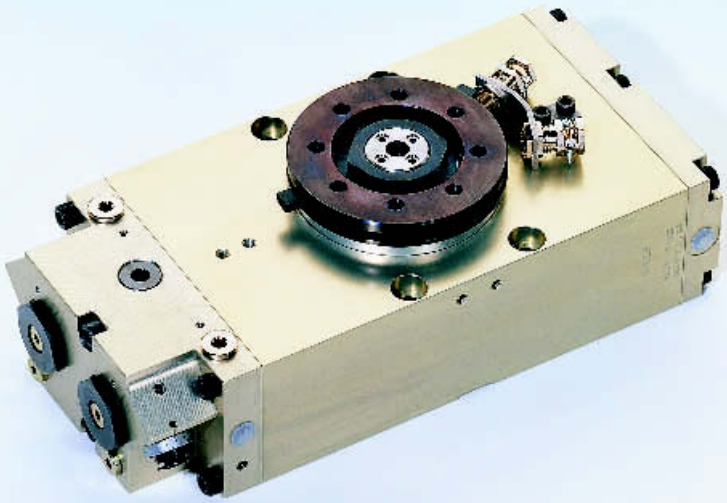
Block diagram horizontal installation



5-15669-0-1 ✻

Pneumatic Rotary Units





5-15671-0-1 ✱

55.51.2. Rotary Unit, Pneumatic

Ordering information

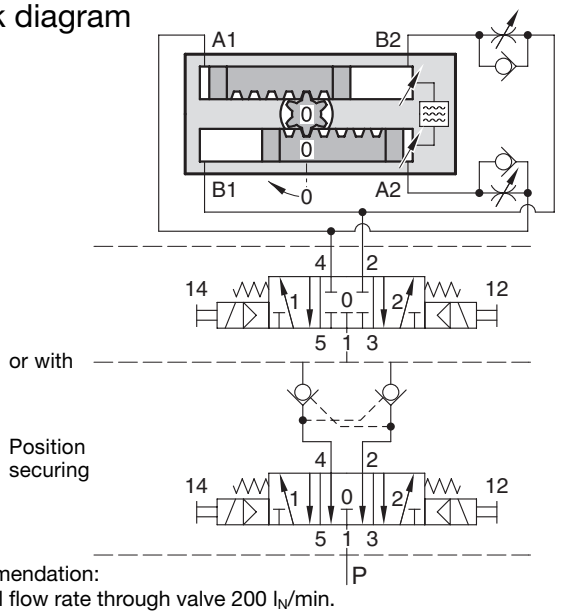
	A		B	C		D	E
Type	55.	51.					
Size			2.				
Rotation angle – 90°				0	0	9	0.
– 180°				0	1	8	0.
Version – Standard						100.	
Fixings for proximity switch						∅ M 12	06
with holders and activator flags						∅ M 18	07
Ordering example	55.	51.	2.	0180.		100.	06

Special rotation angles available upon request

Technical data

Nominal rotation angle	90°	180°
Other rotation angles	available upon request	
Rotation angle setting range	±2,5°	
Nominal operating pressure	6 bar	
Approved operating pressure	min. 4,5 bar	max. 10 bar
Stroke volume/rotation angle	0,034 dm³	0,068 dm³
Nominal torque	12 Nm	
Repeat accuracy	±0,05°	
Unloaden weight	3,5 kg	3,5 kg

Block diagram

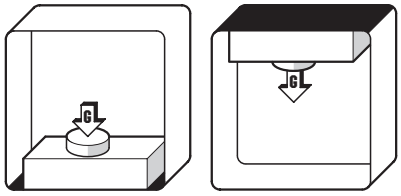


Recommendation:
Nominal flow rate through valve 200 l_N/min.

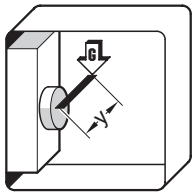
Carried load

Load moment of inertia – max. 0,2 kgm²

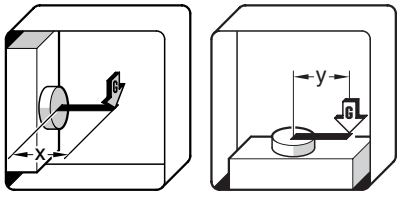
Axial load G
Vertical rotary axis
G max 16 kg



Load moment M_L
Horizontal rotary axis
ML max. 6 Nm

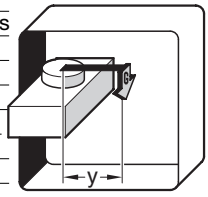


Tilting moment KG
when fixed to
base surface
KG max. 75 Nm



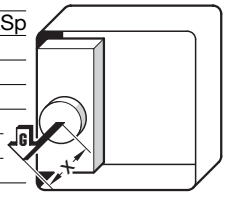
Tilting moment when KSs
fixed to side surface,
perpendicular to
fixing surface

KSS max. 31 Nm



Tilting moment when KSp
fixed to side surface,
parallel to
fixing surface

KSp max. 50 Nm



x = distance of centre of gravity from surface
y = distance of centre of gravity from centre of rotary axis

Specific static moments are max permissible
See page 56 for determination of the mass moment of inertia

Swivel times at 6 bar

Rotating mass kgm²	ts s	tv s	tg s
0,06	0,5	0,15	0,65
0,12	0,6	0,20	0,80
0,20	0,7	0,25	0,95

Load moment Nm	rotating mass kgm²			
3	0,032	0,50	0,20	0,70
6	0,075	0,65	0,25	0,90

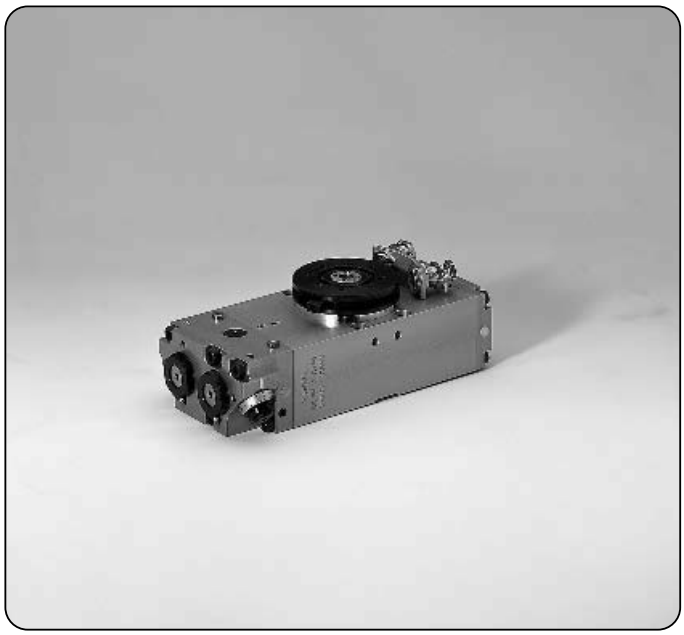
ts = swivel time through 180°
tv = pressure build-up time
tg = swivel time, total

5-15672-0-2 ❋

Rotary Unit Pneumatic 55.51.2.

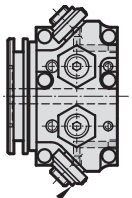
Technical description

Size	2
Rotation angle	90°, 180°
Drive unit	pneumatic,
	can be operated with deoiled air
Nominal operating pressure	6 bar
Approved operating pressure	min. 4,5, max. 10 bar
Working principle	double-piston rack and pinion
	rotary actuator
	end position backlash-free
Piston	double-acting
Bearings	2 of large roller bearings
Lubrication	life-lubricated
Damping	adjustable, pressure controlled
	with oil balance reservoir
Velocity control	external, by restricting exhaust air
End position limitation	adjustable fixed stops
Installation position	any
Basic housing	aluminium
Rotary table, rack, pinion	steel
Functions monitored by inductive proximity switches	

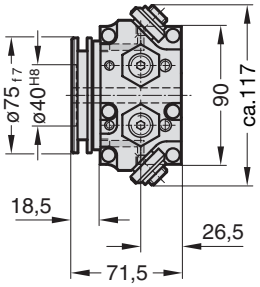


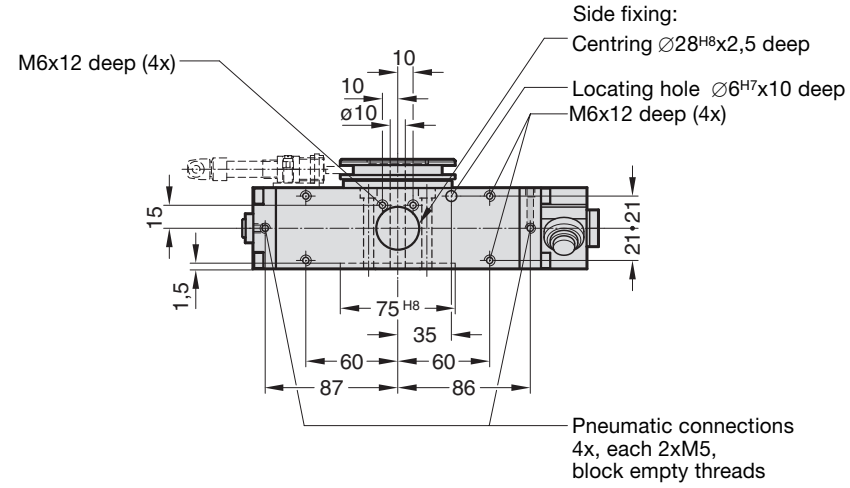
Dimensions

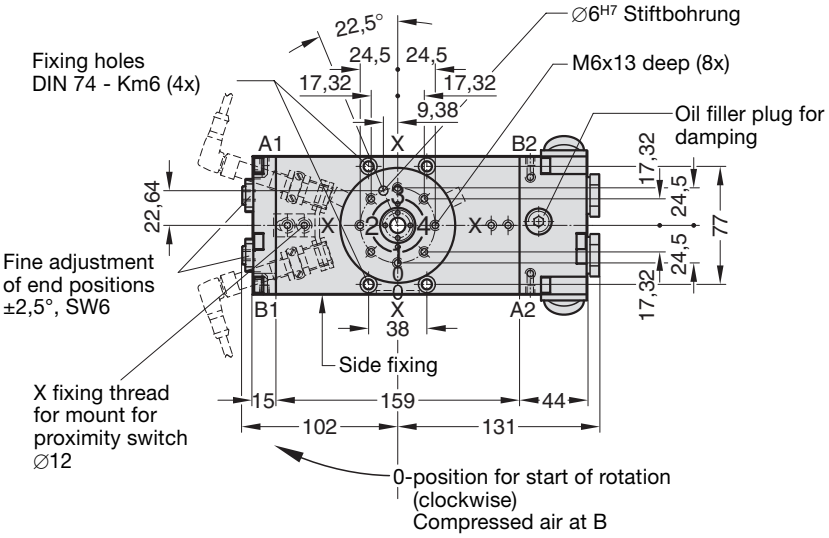
Illustration:
Damping plate
rotated through 180°



Scale for setting
the end position
damping





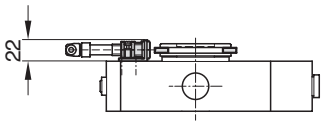


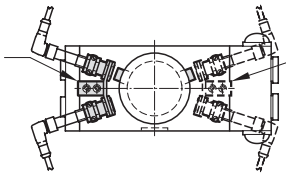
5-15673-0-1 ✻

55.51.2. Rotary Unit Pneumatic

Proximity switch – mounting

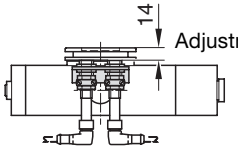
Attachment:
Standard

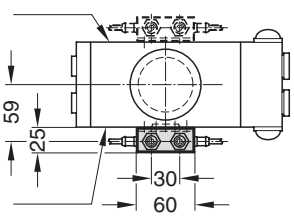




Attachment:
On side

Activator flags provided
by customer





Standard attachment			Side attachment
Fixings for			Fixings for
Proximity switch			Proximity switch
with activator flags			without activator flags
M12 proximity switch			M18 proximity switch
Attachment		Order no.	Order no.
side	1	1.211.01498	not possible
	2	01498	not possible
	3	01458	not defined
	4	01458	not defined

Notes:

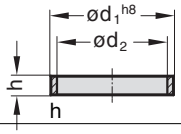
CAD:

- We shall be pleased to send you, upon request, the CAD dataset for designing the rotary unit. Please specify whether you would like the data on diskette, CD or by e-mail in DXF or IGES format.

Special swivel angle:

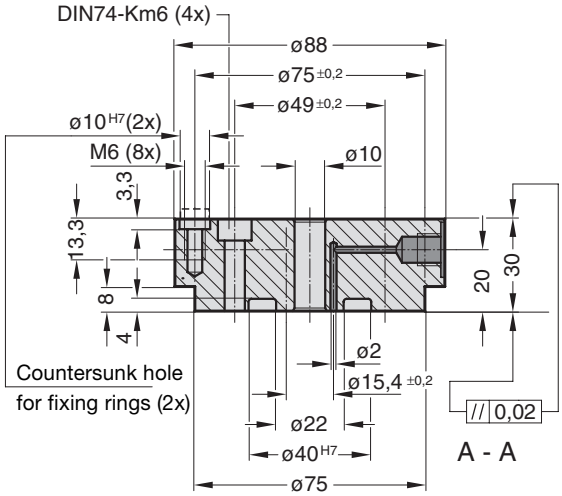
- Rotary unit with any swivel angle between 15° and 180° available upon request

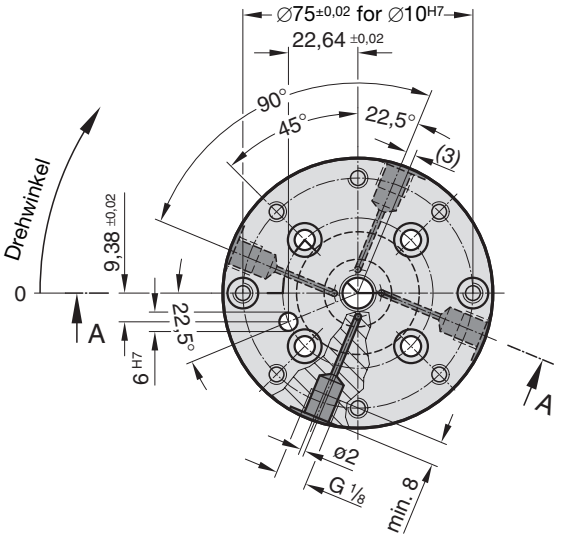
Centring rings
Fixing ring



Order no.	d_1	d_2	h
Centring rings			
0.181.00795	28	18	4
01618	40	36	11
Fixing ring			
0.181.01599	10	6,4	6

Distributor table





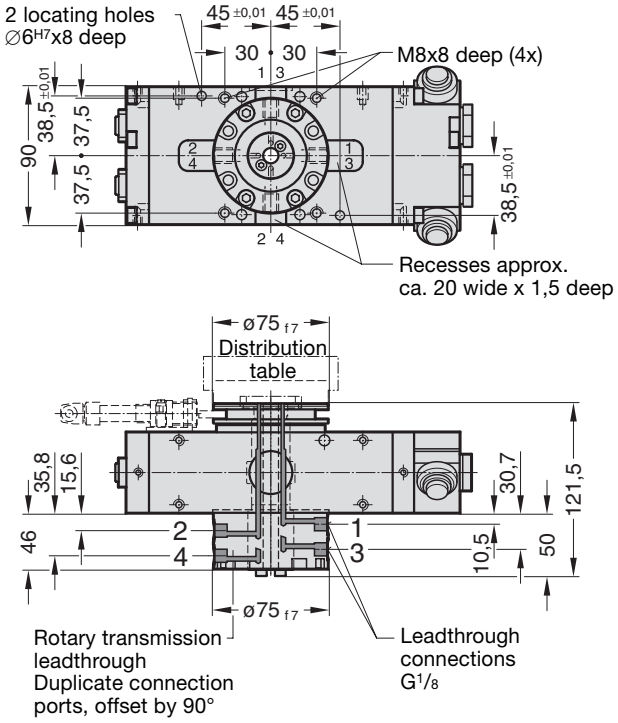
Order no.

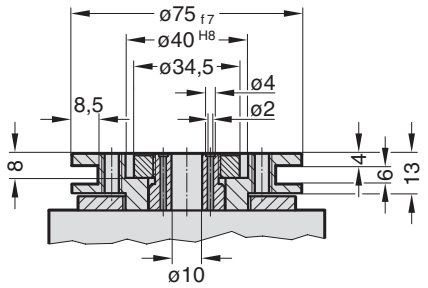
Distribution table, 4 x including centring ring and screws
1.048.02797

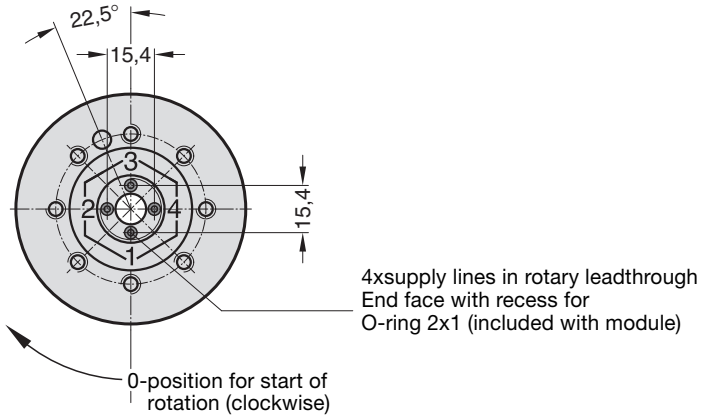
5-15674-0-2 ❋

Rotary Unit Pneumatic 55.51.2.

With rotary transmission leadthrough







Order no.

Pneumatic rotary unit with rotary transmission leadthrough, 4 x

55.51.2. C .104.

See also page 59

5-15675-0-2

55.51.3. Rotary Unit, Pneumatic

Ordering information

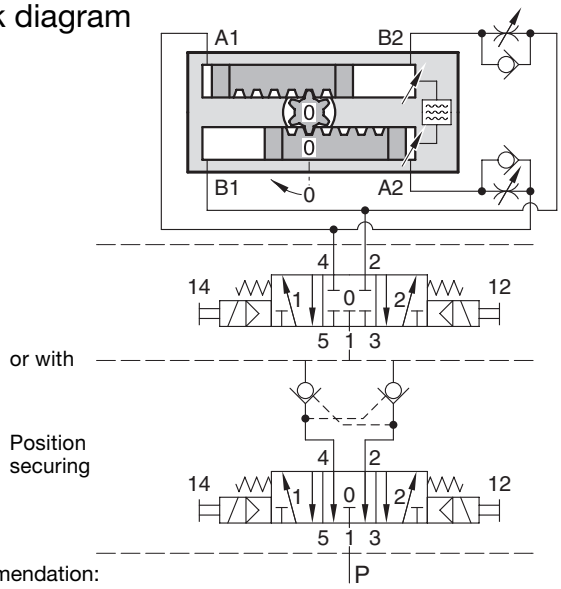
	A		B	C		D	E
Type	55.	51.					
Size			3.				
Rotation angle – 90°				0	0	9	0.
– 180°				0	1	8	0.
Version – Standard						100.	
Fixings for proximity switch						Ø M 12	06
with holders and activator flags						Ø M 18	07
Ordering example	55.	51.	3.	0180.		100.	06

Special rotation angles available upon request

Technical data

Nominal rotation angle	90°	180°
Other rotation angles	available upon request	
Rotation angle setting range	±2,5°	
Nominal operating pressure	6 bar	
Approved operating pressure	min. 4,5 bar	max. 10 bar
Stroke volume/rotation angle	0,067 dm³	0,134 dm³
Nominal torque	24 Nm	
Repeat accuracy	±0,05°	
Unloaden weight	4,0 kg	4,0 kg

Block diagram

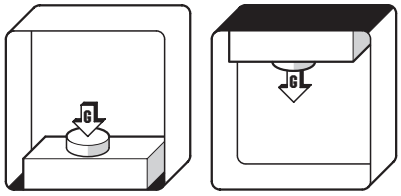


Recommendation:
Nominal flow rate through valve 400 l_N/min.

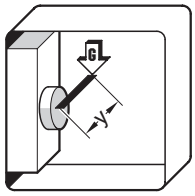
Carried load

Load moment of inertia – max. 0,6 kgm²

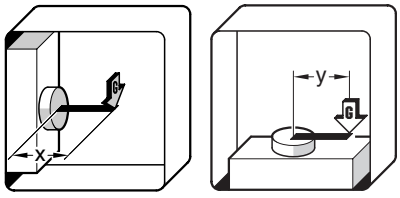
Axial load G
Vertical rotary axis
G max 32 kg



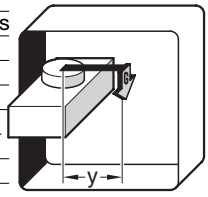
Load moment M_L
Horizontal rotary axis
ML max. 12 Nm



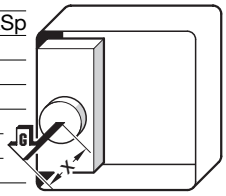
Tilting moment KG
when fixed to
base surface
KG max. 170 Nm



Tilting moment when KSs
fixed to side surface,
perpendicular to
fixing surface
KSS max. 62 Nm



Tilting moment when KSp
fixed to side surface,
parallel to
fixing surface
KSp max. 100 Nm



x = distance of centre of gravity from surface
y = distance of centre of gravity from centre of rotary axis

Specific static moments are max permissible
See page 56 for determination of the mass moment of inertia

Swivel times at 6 bar

Rotating mass kgm²	ts s	tv s	tg s
0,12	0,5	0,1	0,6
0,20	0,6	0,15	0,75
0,6	0,7	0,25	0,95

Load moment Nm	rotating mass kgm²			
3	0,032	0,6	0,2	0,8
6	0,075	0,65	0,2	0,85
12	0,23	0,7	0,25	0,95

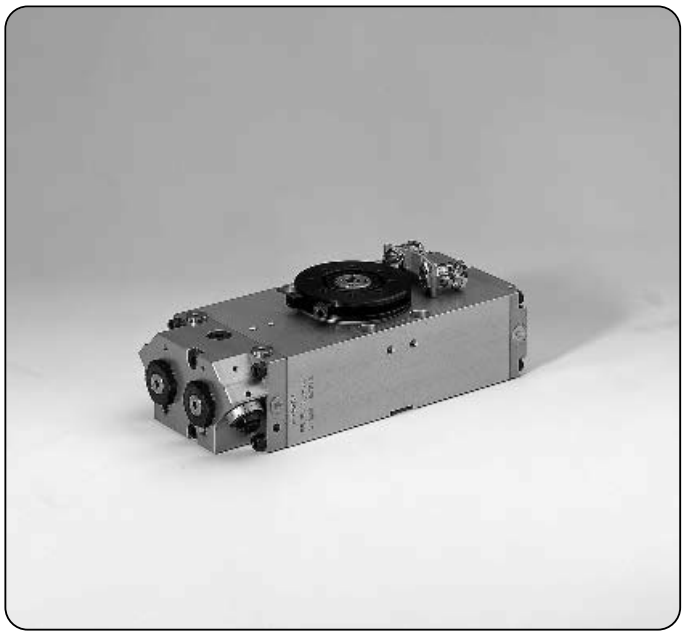
ts = swivel time through 180°
tv = pressure build-up time
tg = swivel time, total

5-15676-0-2 ❋

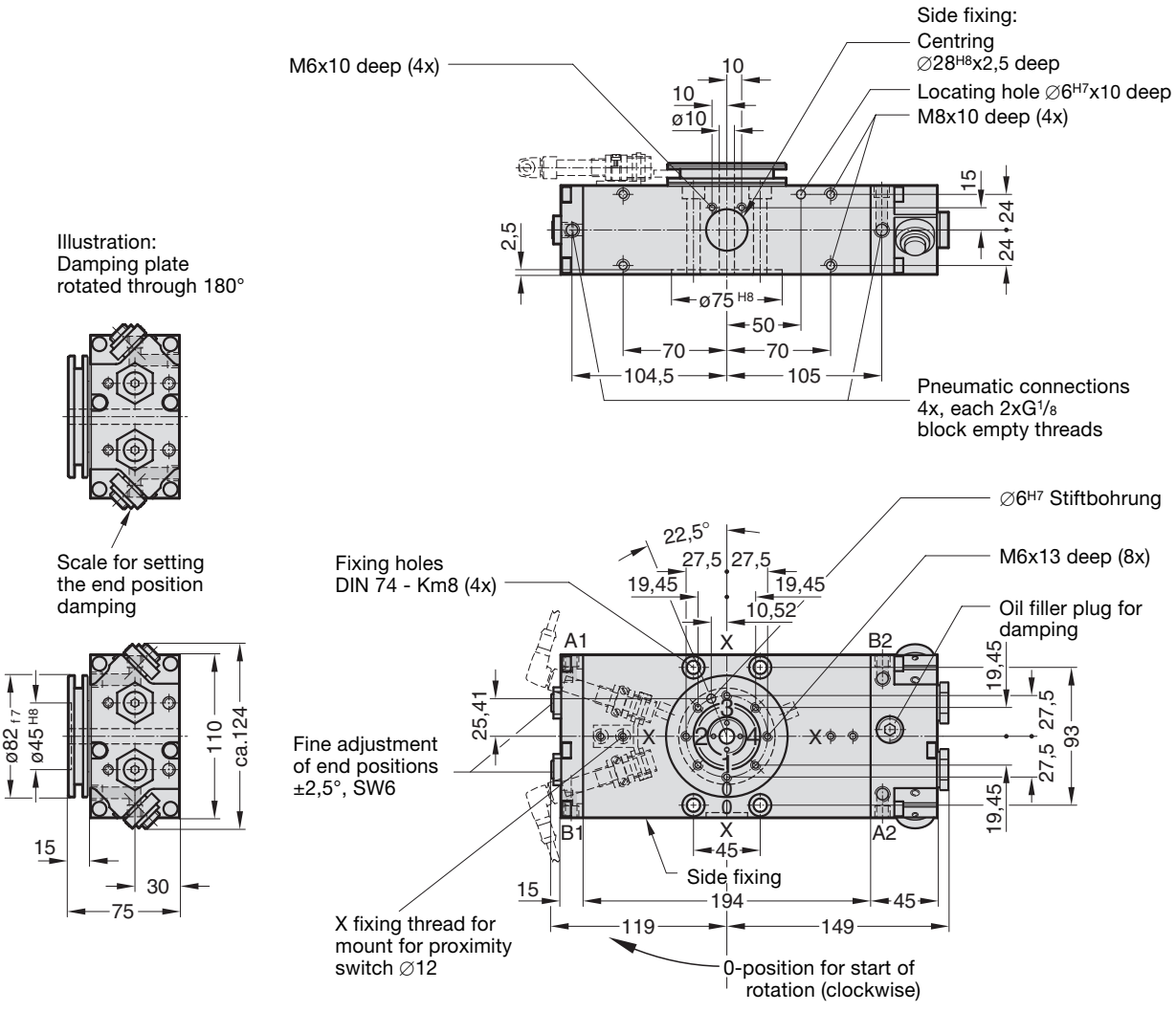
Rotary Unit Pneumatic 55.51.3.

Technical description

Size	3
Rotation angle	90°, 180°
Drive unit	pneumatic,
	can be operated with deoiled air
Nominal operating pressure	6 bar
Approved operating pressure	min. 4,5, max. 10 bar
Working principle	double-piston rack and pinion
	rotary actuator
	end position backlash-free
Piston	double-acting
Bearings	2 of large roller bearings
Lubrication	life-lubricated
Damping	adjustable, pressure controlled
	with oil balance reservoir
Velocity control	external, by restricting exhaust air
End position limitation	adjustable fixed stops
Installation position	any
Basic housing	aluminium
Rotary table, rack, pinion	steel
Functions monitored by inductive proximity switches	



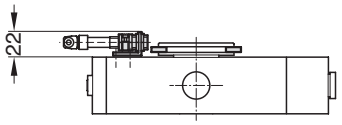
Dimensions

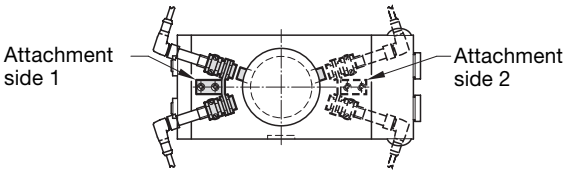


5-15677-0-1 ✻

55.51.3. Rotary Unit Pneumatic

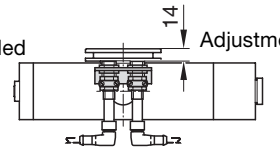
Proximity switch – mounting

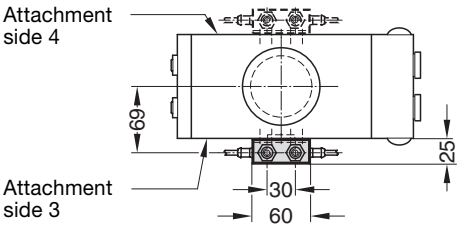




Attachment:
On side

Activator flags provided by customer





Standard attachment	Side attachment
Fixings for proximity switch	Fixings for proximity switch
with activator flags	without activator flags
M12 proximity switch	M18 proximity switch

Attachment		Order no.	Order no.
side	1	1.211.01551	not possible
	2	01551	not possible
	3	01458	not defined
	4	01458	not defined

Notes:

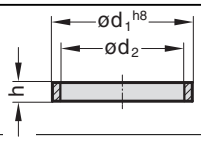
CAD:

- We shall be pleased to send you, upon request, the CAD dataset for designing the rotary unit. Please specify whether you would like the data on diskette, CD or by e-mail in DXF or IGES format.

Special swivel angle:

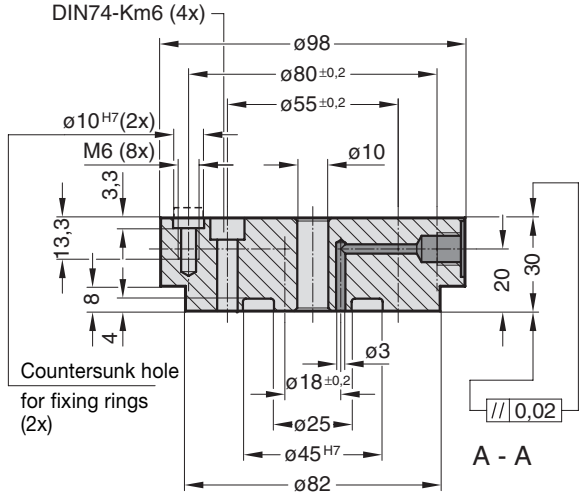
- Rotary unit with any swivel angle between 15° and 180° available upon request

Centring rings Fixing ring

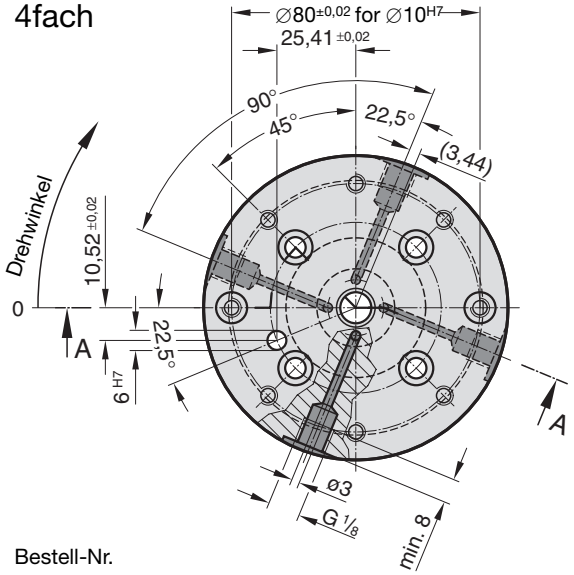


Order no.	d_1	d_2	h
Centring rings			
0.181.00795	28	18	4
01619	45	41	10,5
Fixing ring			
0.181.01599	10	6,4	6

Distributor table



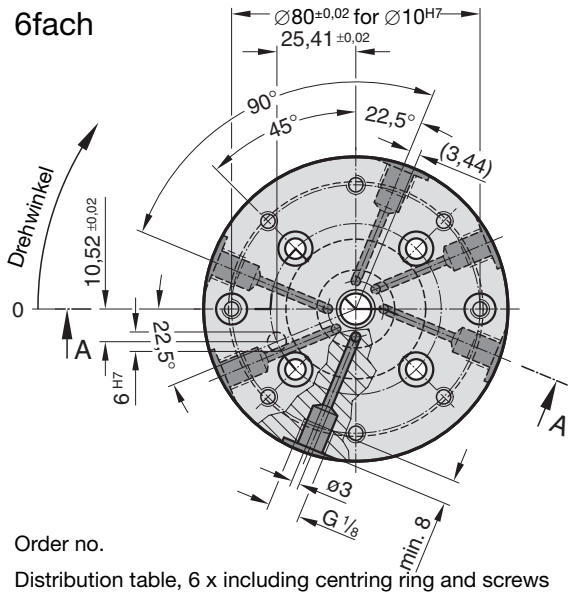
4fach



Bestell-Nr.

Verteilerteller, 4fach einschl. Zentrierring u. Schrauben
1.048.02798

6fach



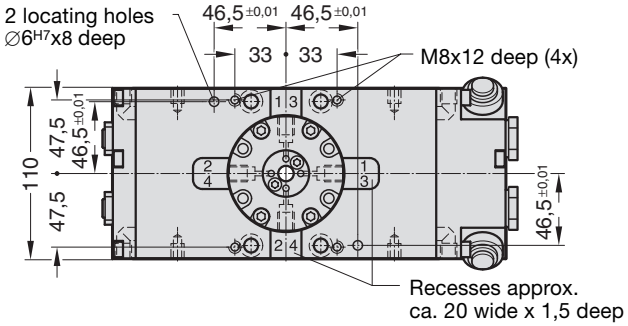
Order no.

Distribution table, 6 x including centring ring and screws
1.048.02973

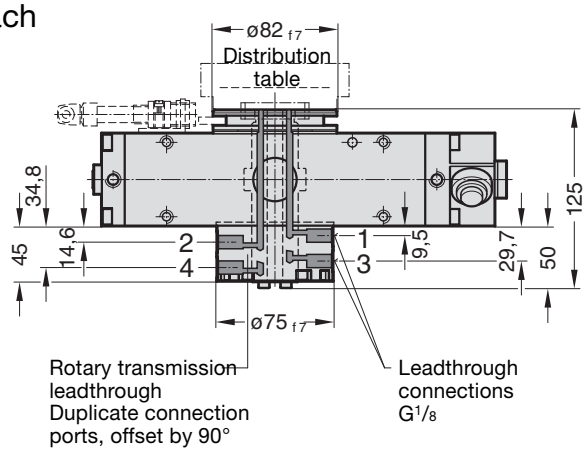
5-15678-0-2 ❋

Rotary Unit Pneumatic 55.51.3.

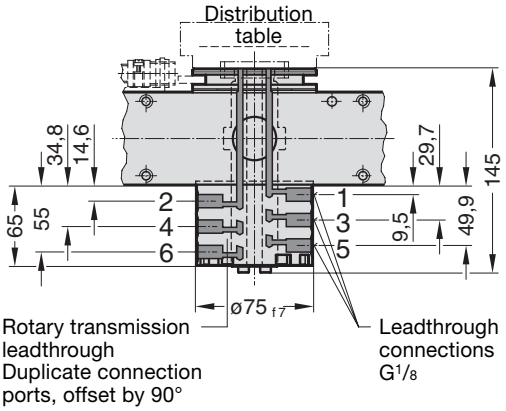
With rotary transmission leadthrough

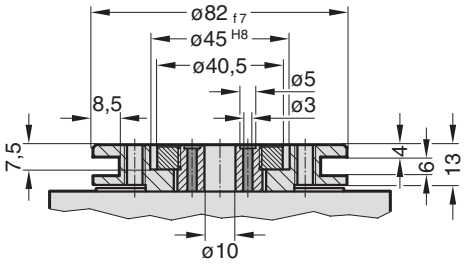


4 fach

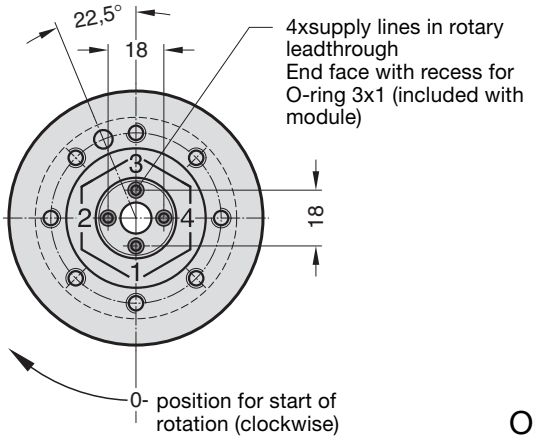


6 fach





4 fach

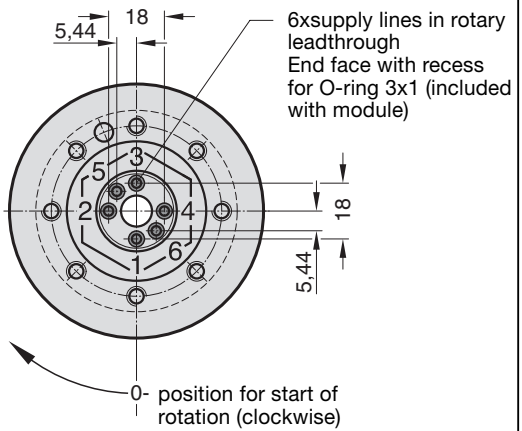


Order no.

Pneumatic rotary unit with rotary transmission leadthrough, 4 x

55.51.3. C .104.

6 fach



Order no.

Pneumatic rotary unit with rotary transmission leadthrough, 6 x

55.51.3. C .106.

See also page 59

5-15679-0-2 ❄

55.51.4. Rotary Unit, Pneumatic

Ordering information

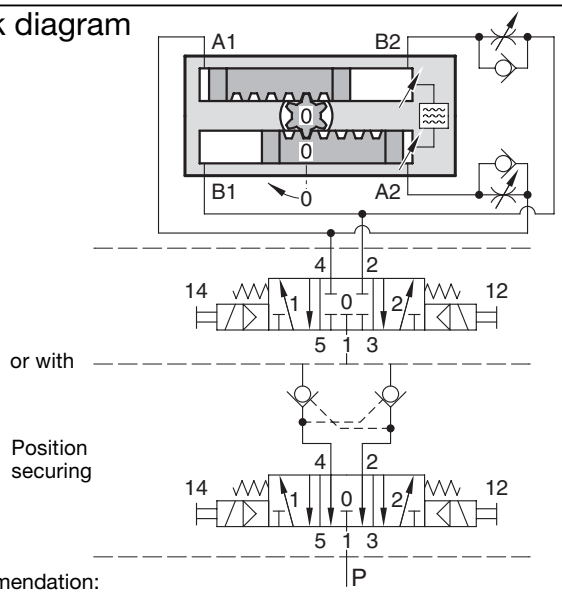
	A		B	C		D	E
Type	55.	51.					
Size			4.				
Rotation angle – 90°				0	0	9	0.
– 180°				0	1	8	0.
Version – Standard						100.	
Fixings for proximity switch						Ø M 12	06
with holders and activator flags						Ø M 18	07
Ordering example	55.	51.	4.	0180.		100.	06

Special rotation angles available upon request

Technical data

Nominal rotation angle	90°	180°
Other rotation angles	available upon request	
Rotation angle setting range	±2,5°	
Nominal operating pressure	6 bar	
Approved operating pressure	min. 4,5 bar	max. 10 bar
Stroke volume/rotation angle	0,196 dm³	0,392 dm³
Nominal torque	80 Nm	
Repeat accuracy	±0,05°	
Unloaden weight	12 kg	12 kg

Block diagram

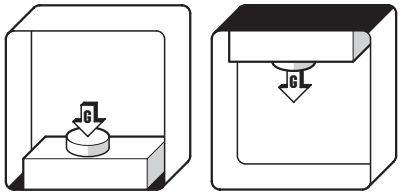


Recommendation:
Nominal flow rate through valve 800 l_N/min.

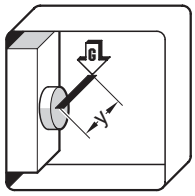
Carried load

Load moment of inertia – max. 3,0 kgm²

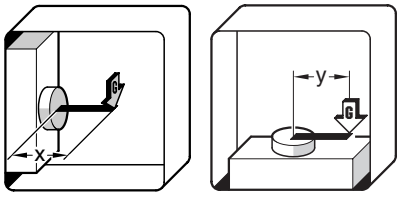
Axial load G
Vertical rotary axis
G max 60 kg



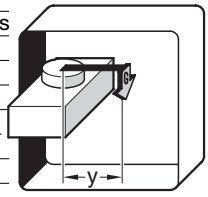
Load moment M_L
Horizontal rotary axis
ML max. 40 Nm



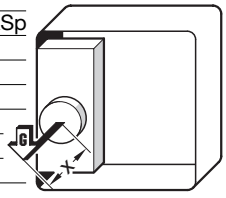
Tilting moment KG
when fixed to
base surface
KG max. 340 Nm



Tilting moment when KSs
fixed to side surface,
perpendicular to
fixing surface
KSS max. 125 Nm



Tilting moment when KSp
fixed to side surface,
parallel to
fixing surface
KSp max. 200 Nm



x = distance of centre of gravity from surface
y = distance of centre of gravity from centre of rotary axis

Specific static moments are max permissible
See page 56 for determination of the mass moment of inertia

Swivel times at 6 bar

Rotating mass kgm²	ts s	tv s	tg s
0,30	0,50	0,15	0,65
0,90	0,60	0,20	0,80
2,00	0,70	0,20	0,90
3,00	1,55	0,25	1,80

Load moment Nm	rotating mass kgm²			
8	0,14	0,50	0,20	0,70
18	0,22	0,70	0,20	0,80
33	0,69	1,00	0,30	1,30

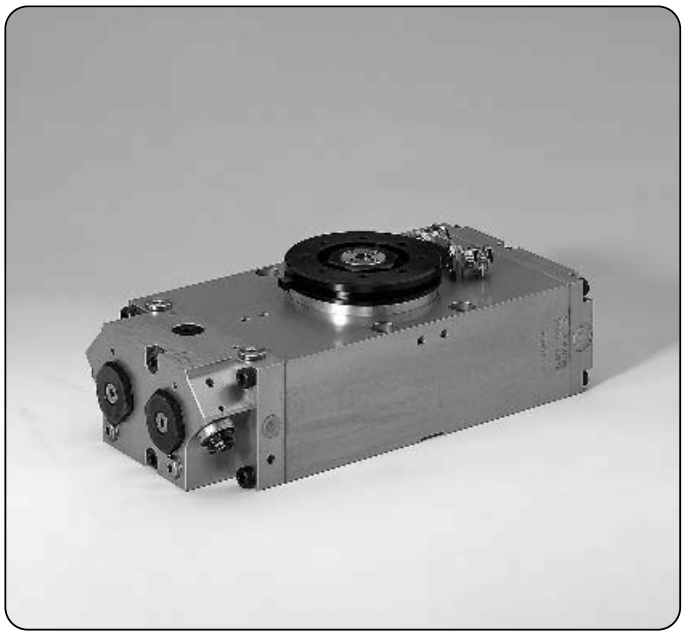
ts = swivel time through 180°
tv = pressure build-up time
tg = swivel time, total

5-15680-0-2 ✻

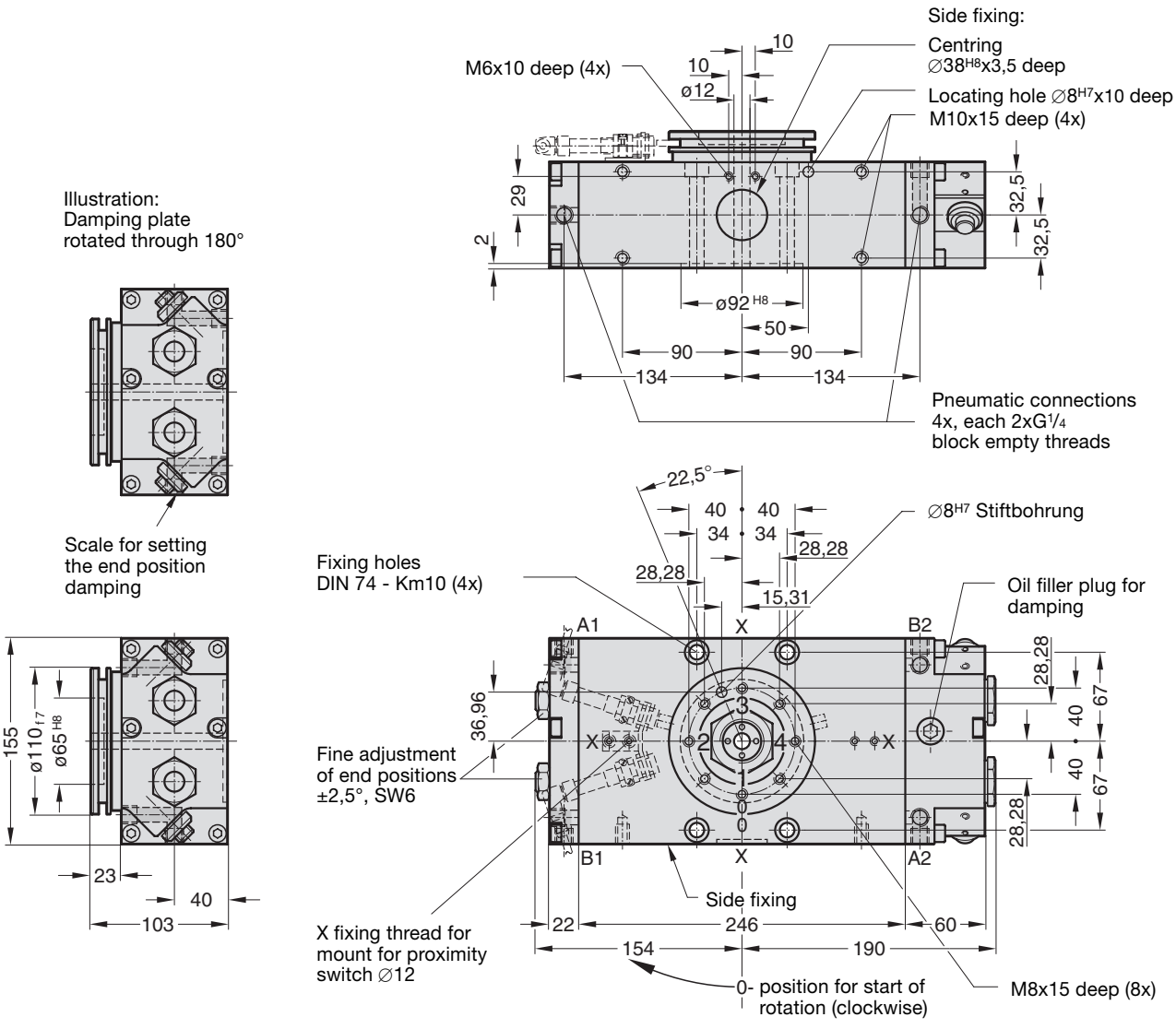
Rotary Unit Pneumatic 55.51.4.

Technical description

Size	4
Rotation angle	90°, 180°
Drive unit	pneumatic,
	can be operated with deoiled air
Nominal operating pressure	6 bar
Approved operating pressure	min. 4,5, max. 10 bar
Working principle	double-piston rack and pinion
	rotary actuator
	end position backlash-free
Piston	double-acting
Bearings	2 of large roller bearings
Lubrication	life-lubricated
Damping	adjustable, pressure controlled
	with oil balance reservoir
Velocity control	external, by restricting exhaust air
End position limitation	adjustable fixed stops
Installation position	any
Basic housing	aluminium
Rotary table, rack, pinion	steel
Functions monitored by inductive proximity switches	



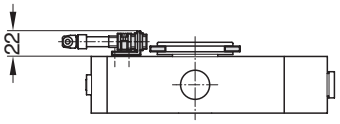
Dimensions

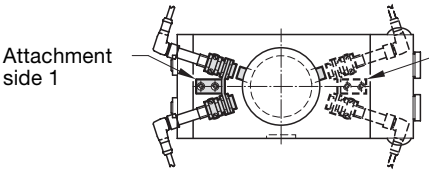


5-15681-0-1 ✻

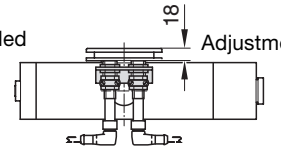
55.51.4. Rotary Unit Pneumatic

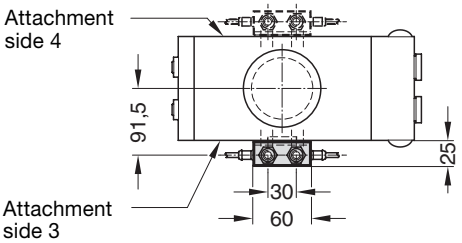
Proximity switch – mounting





Attachment:
On side
Activator flags provided by customer





Standard attachment		Side attachment
Fixings for proximity switch		Fixings for proximity switch
with activator flags		without activator flags
M12 proximity switch		M18 proximity switch

Attachment		Order no.	Order no.
side	1	1.211.01552	not possible
	2	01552	not possible
	3	01458	not defined
	4	01458	not defined

Notes:

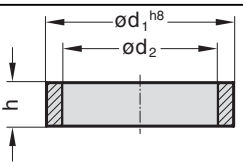
CAD:

- We shall be pleased to send you, upon request, the CAD dataset for designing the rotary unit. Please specify whether you would like the data on diskette, CD or by e-mail in DXF or IGES format.

Special swivel angle:

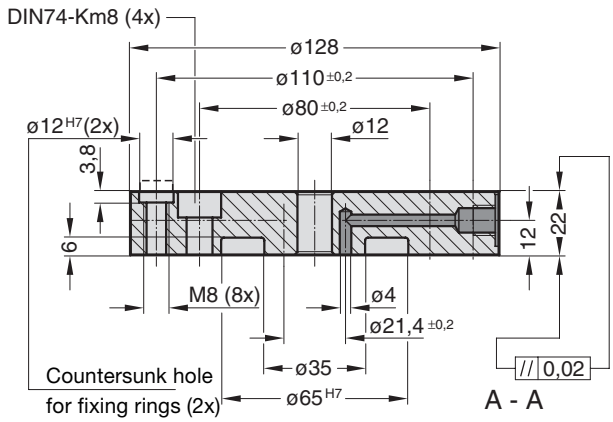
- Rotary unit with any swivel angle between 15° and 180° available upon request

Centring rings Fixing ring

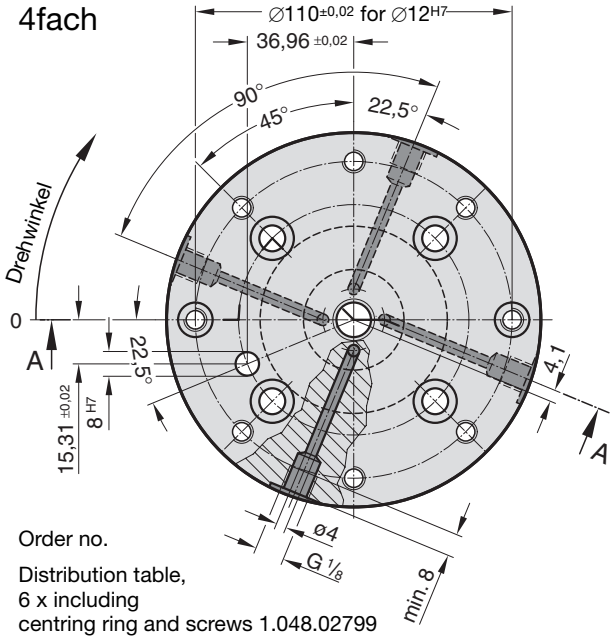


Order no.	d_1	d_2	h
Centring rings			
0.181.00796	38	28	5
01548	65	54	13
Fixing ring			
0.181.01600	12	8,4	7

Distributor table



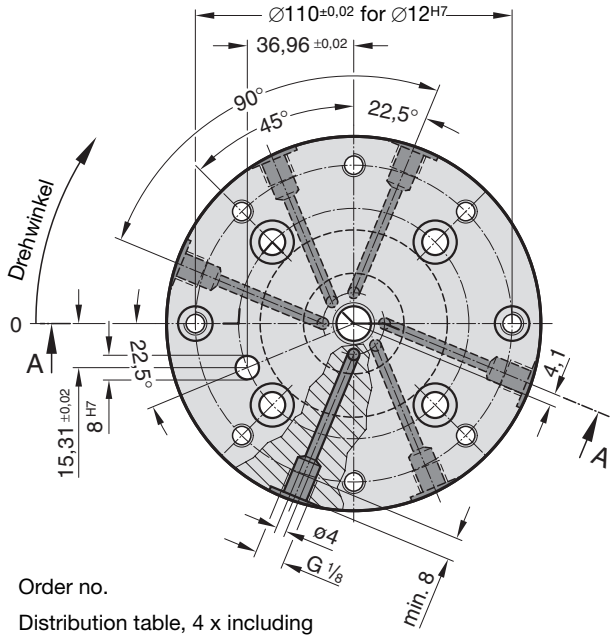
4fach



Order no.

Distribution table,
6 x including
centring ring and screws 1.048.02799

6fach



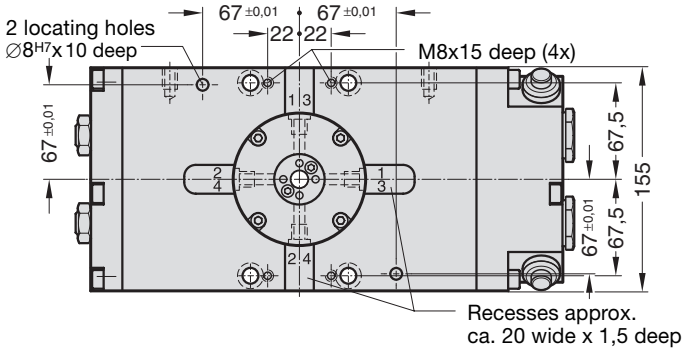
Order no.

Distribution table, 4 x including
centring ring and screws 1.048.02799

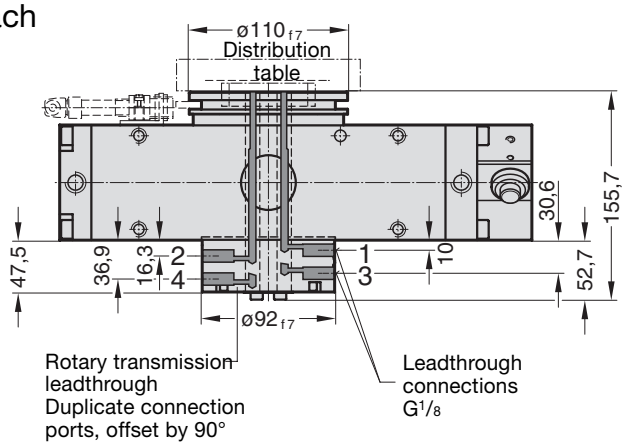
5-15682.0-2 ✻

Rotary Unit Pneumatic 55.51.4.

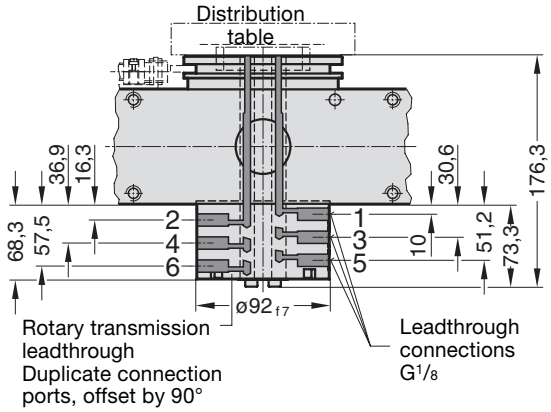
With rotary transmission leadthrough

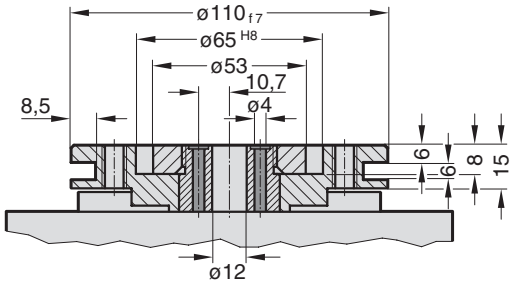


4 fach

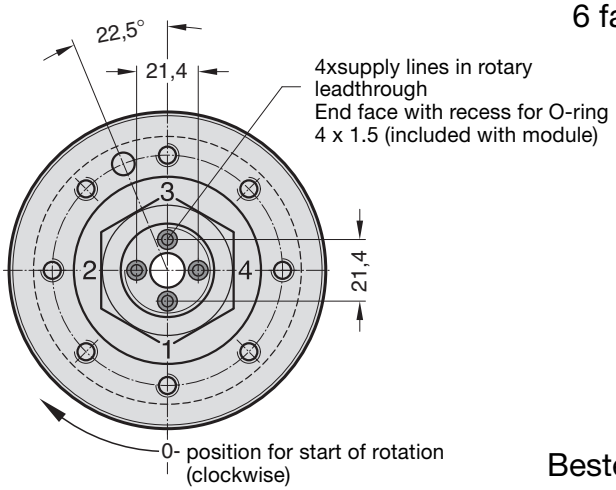


6 fach

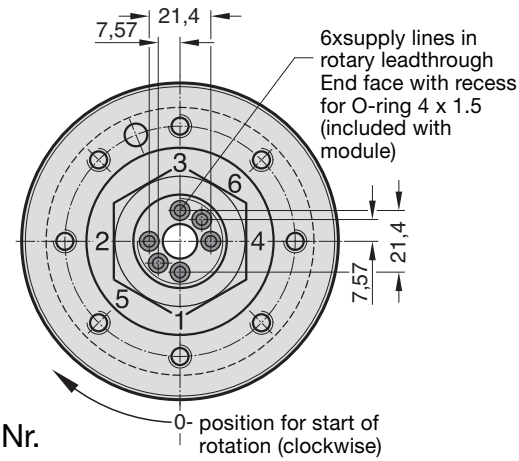




4 fach



6 fach



Order no.

Pneumatic Rotary unit with rotary transmission leadthrough,

55.51.4. C .104.

Bestell-Nr.

pneum. Rotation mit Drehdurchführung, 6fach

55.51.4. C .106.

See also page 59

5-15683-0-2 *

55.51.5. Rotary Unit, Pneumatic

Ordering information

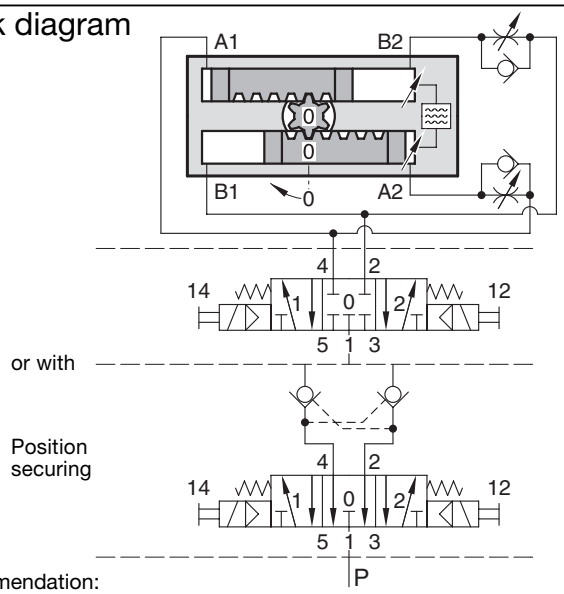
	A	B	C	D	E
Type	55. 51.				
Size		5.			
Rotation angle – 90°			0090.		
– 180°			0180.		
Version – Standard				100.	
Fixings for proximity switch					∅ M 12 06
with holders and activator flags					∅ M 18 07
Ordering example	55. 51.	5.	0180.	100.	06

Special rotation angles available upon request

Technical data

Nominal rotation angle	90°	180°
Other rotation angles	available upon request	
Rotation angle setting range	±2,5°	
Nominal operating pressure	6 bar	
Approved operating pressure	min. 4,5 bar	max. 10 bar
Stroke volume/rotation angle	0,5 dm³	1,0 dm³
Nominal torque	200 Nm	
Repeat accuracy	±0,05°	
Unloaden weight	30 kg	30 kg

Block diagram

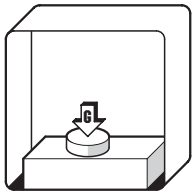
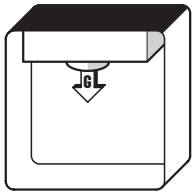


Recommendation:
Nominal flow rate through valve 800 l_N/min.

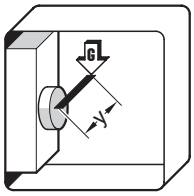
Carried load

Load moment of inertia – max. 6,0 kgm²

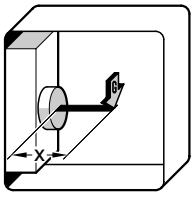
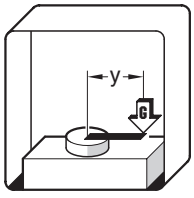
Axial load G
Vertical rotary axis
G max 120 kg

Load moment M_L
Horizontal rotary axis
ML max. 100 Nm

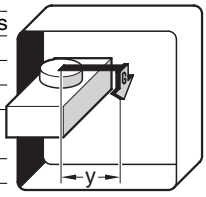


Tilting moment KG
when fixed to
base surface
KG max. 750 Nm

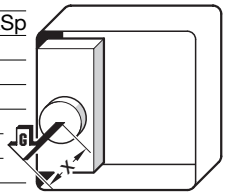
Tilting moment when KSs
fixed to side surface,
perpendicular to
fixing surface

KSS max. 280 Nm



Tilting moment when KSp
fixed to side surface,
parallel to
fixing surface

KSp max. 460 Nm



x = distance of centre of gravity from surface
y = distance of centre of gravity from centre of rotary axis

Specific static moments are max permissible
See page 56 for determination of the mass moment of inertia

Swivel times at 6 bar

Rotating mass kgm²	ts s	tv s	tg s
3,0	1,00	0,30	1,30
4,7	1,20	0,30	1,50
6,0	1,40	0,30	1,70

Load moment Nm	rotating mass kgm²			
38	1,05	0,90	0,30	1,20
52	1,47	1,20*	0,40*	1,60*
81	2,33	1,60*	0,60*	2,20*
100	3,00	1,00*	1,00*	2,80*

ts = swivel time through 180°
tv = pressure build-up time
tg = swivel time, total

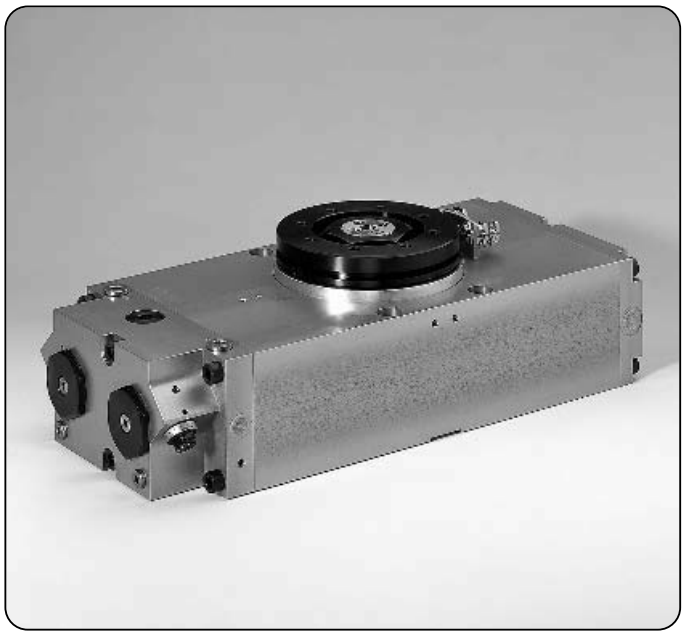
* shorter swivel times to order

5-15684-0-2 ❋

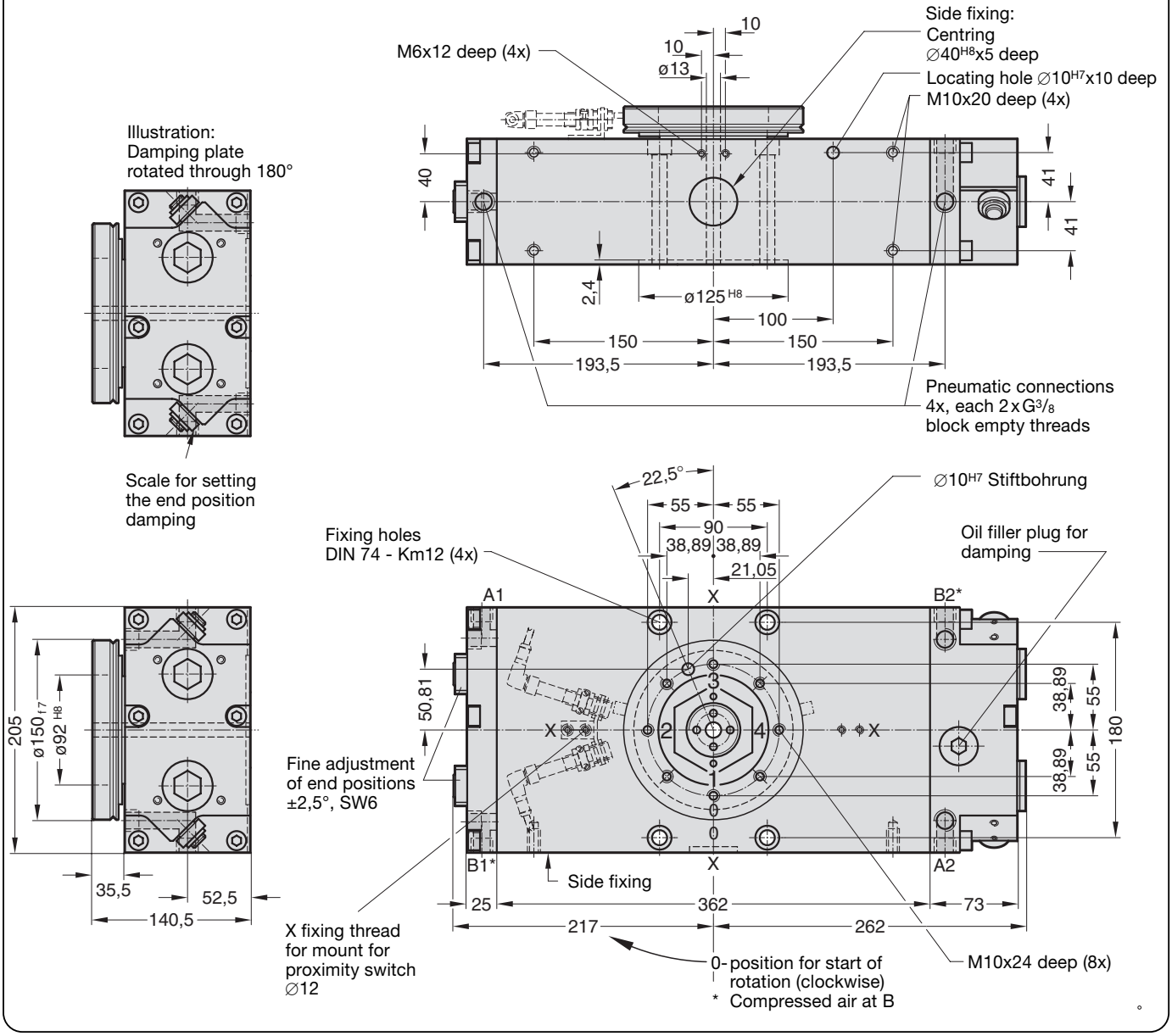
Rotary Unit Pneumatic 55.51.5.

Technical description

Size	5
Rotation angle	90°, 180°
Drive unit	pneumatic, can be operated with deoiled air
Nominal operating pressure	6 bar
Approved operating pressure	min. 4,5, max. 10 bar
Working principle	double-piston rack and pinion rotary actuator end position backlash-free
Piston	double-acting
Bearings	2 of large roller bearings
Lubrication	life-lubricated
Damping	adjustable, pressure controlled with oil balance reservoir
Velocity control	external, by restricting exhaust air
End position limitation	adjustable fixed stops
Installation position	any
Basic housing	aluminium
Rotary table, rack, pinion	steel
Functions monitored by inductive proximity switches	



Dimensions

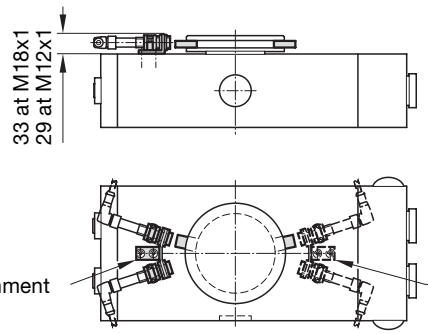


5-15685-0-1 ✻

55.51.5. Rotary Unit Pneumatic

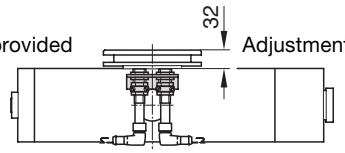
Proximity switch – mounting

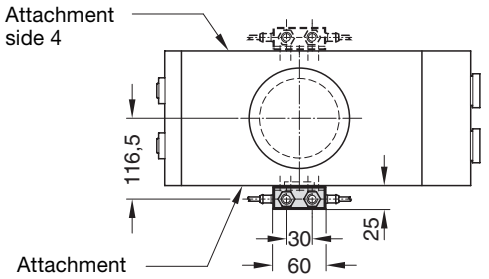
Attachment:
Standard



Attachment:
On side

Activator flags provided by customer





Standard attachment			Side attachment
Fixings for proximity switch			Fixings for proximity switch
with activator flags			without activator flags
M12 proximity switch			M18 proximity switch
Attachment		Order no.	Order no.
side	1	1.211.01666	1.211.01667
	2	01666	01667
	3	01458	not defined
	4	01458	not defined

Notes:

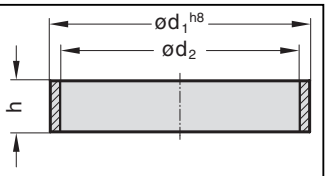
CAD:

- We shall be pleased to send you, upon request, the CAD dataset for designing the rotary unit. Please specify whether you would like the data on diskette, CD or by e-mail in DXF or IGES format.

Special swivel angle:

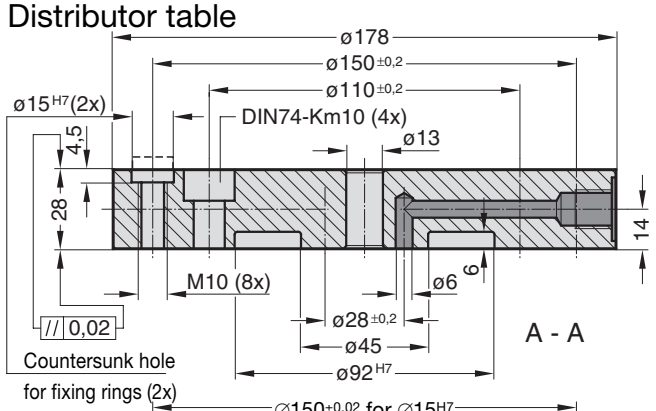
- Rotary unit with any swivel angle between 15° and 180° available upon request

Centring rings Fixing ring

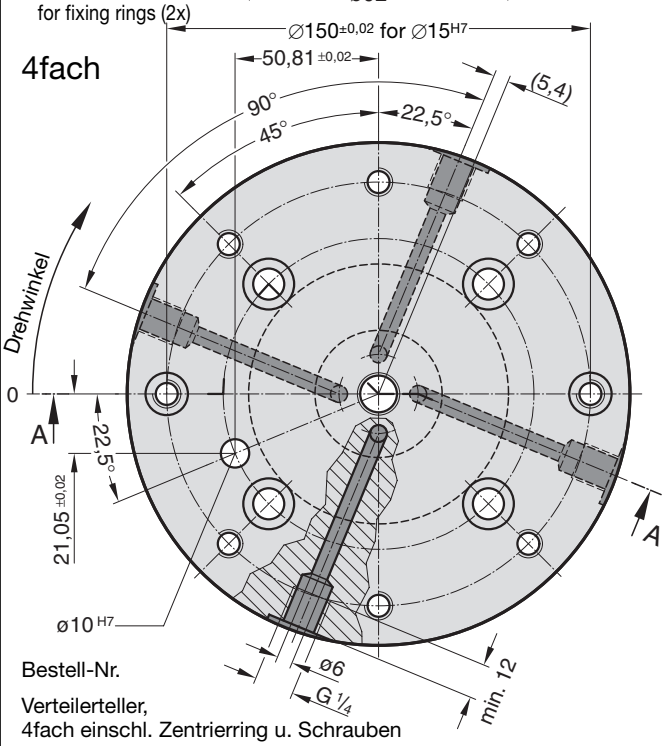


Order no.	d_1	d_2	h
Centring rings			
0.181.01024	40	30	8
01549	92	85	18
Fixing ring			
0.181.01601	15	10,5	8

Distributor table



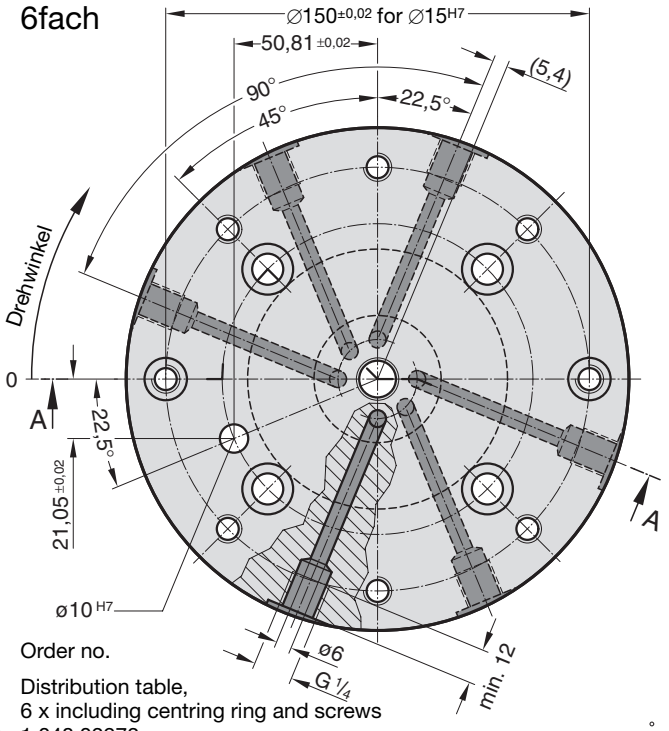
4fach



Bestell-Nr.

Verteilerteller,
4fach einschl. Zentrierring u. Schrauben
1.048.02800

6fach



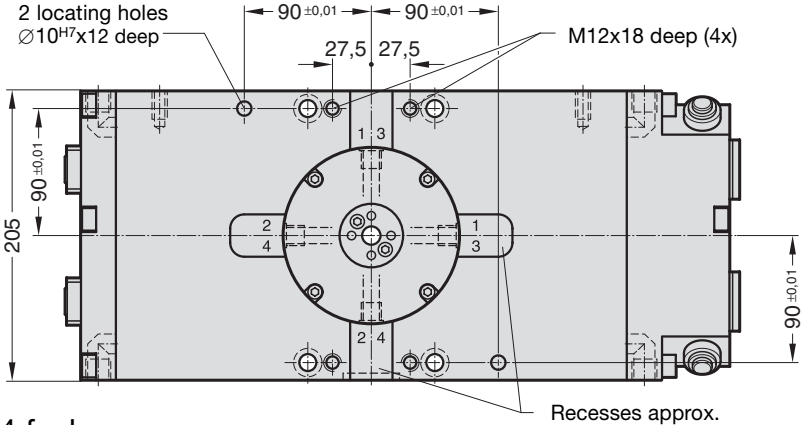
Order no.

Distribution table,
6 x including centring ring and screws
1.048.02972

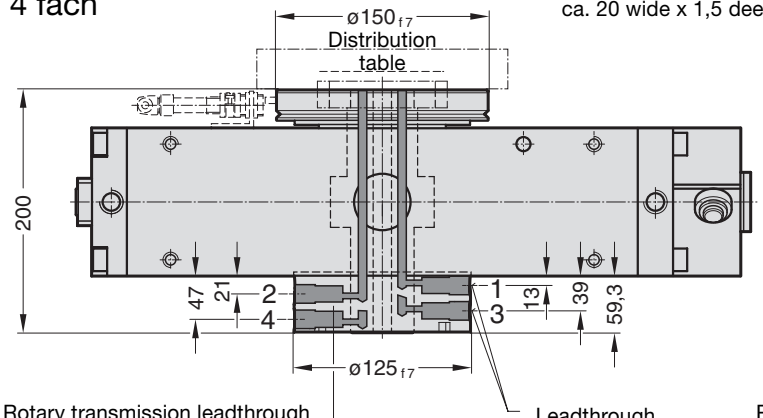
5-14628.0 2

Rotary Unit Pneumatic 55.51.5.

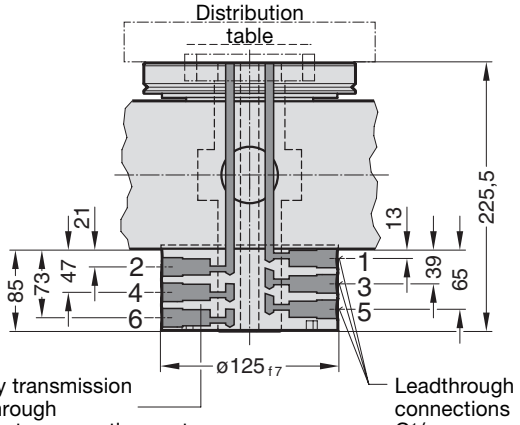
With rotary transmission leadthrough

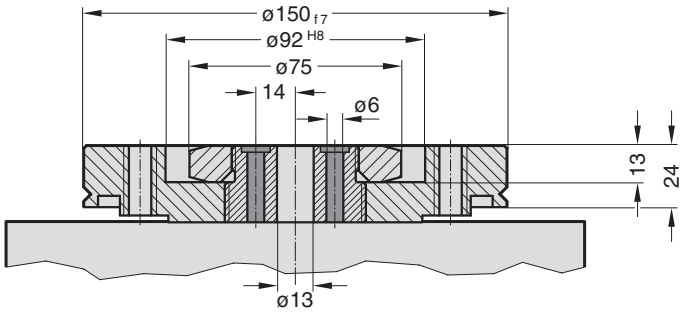


4 fach



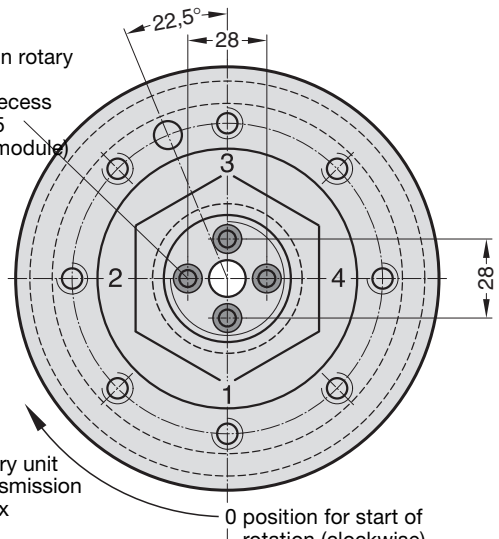
6 fach





4 fach

4xsupply lines in rotary leadthrough
End face with recess for O-ring 6x1,5 (included with module)



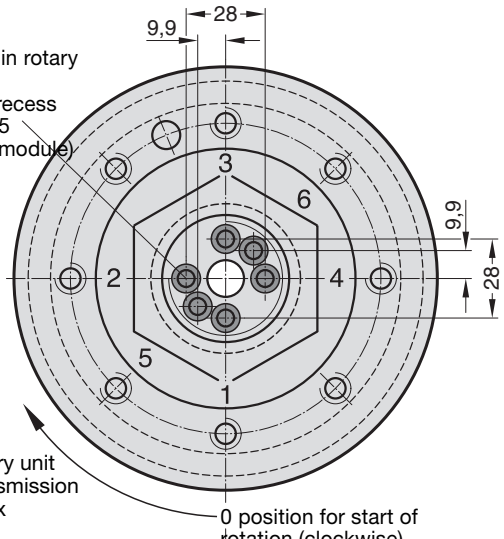
Order no.

Pneumatic rotary unit with rotary transmission leadthrough, 4 x

55.51.5. C .104.

6 fach

6xsupply lines in rotary leadthrough
End face with recess for O-ring 6x1,5 (included with module)



Order no.

Pneumatic rotary unit with rotary transmission leadthrough, 6 x

55.51.5. C .106.

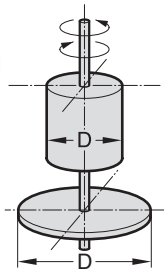
See also page 59

5-15687-0-2

Determination of the moment of inertia

1. Bodies with central axis

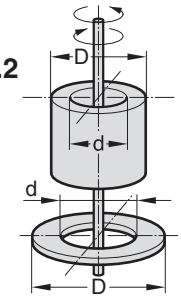
1.1



Solid cylinder or flat disc rotating about its own axis.

$$J = \frac{D^2}{8} \times m$$

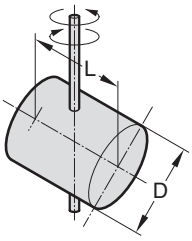
1.2



Hollow cylinder or flat ring rotating about its own axis.

$$J = \frac{D^2+d^2}{8} \times m$$

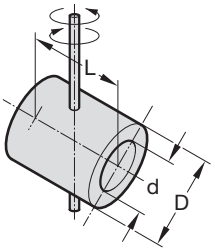
1.3



Solid cylinder rotating about an axis perpendicular to its central axis.

$$J = \left(\frac{L^2}{12} + \frac{D^2}{16}\right) \times m$$

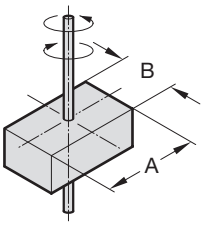
1.4



Hollow cylinder rotating about an axis perpendicular to its central axis.

$$J = \left(\frac{L^2}{12} + \frac{D^2+d^2}{16}\right) \times m$$

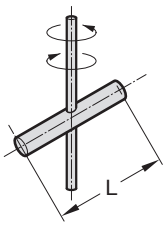
1.5



Rectangular plate of any thickness rotating about one central axis.

$$J = \frac{A^2+B^2}{12} \times m$$

1.6



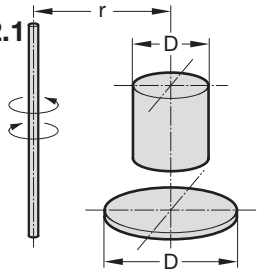
Long thin rod any cross-section rotating about one central axis.

$$J = \frac{L^2}{12} \times m$$

J = Moment of inertia in kgm²
Dimensions in metres, masses in kg

2. Bodies with offset axis

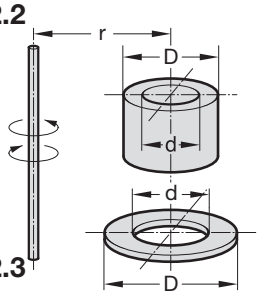
2.1



Solid cylinder or flat disc rotating about an external axis.

$$J = \left(\frac{D^2}{8} + r^2\right) \times m$$

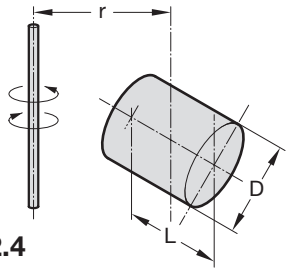
2.2



Hollow cylinder or flat ring rotating about an external axis.

$$J = \left(\frac{D^2+d^2}{8} + r^2\right) \times m$$

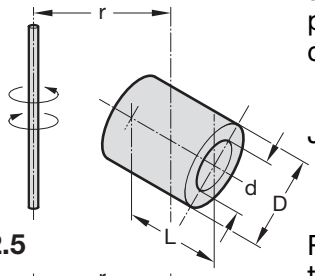
2.3



Solid cylinder rotating about an external axis perpendicular to its own central axis.

$$J = \left(\frac{L^2}{12} + \frac{D^2}{16} + r^2\right) \times m$$

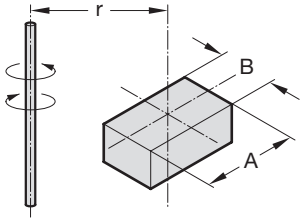
2.4



Hollow cylinder rotating about an external axis perpendicular to its own central axis.

$$J = \left(\frac{L^2}{12} + \frac{D^2+d^2}{16} + r^2\right) \times m$$

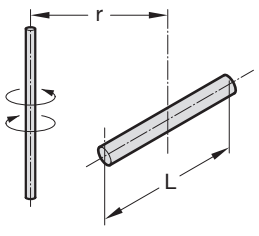
2.5



Rectangular plate of any thickness rotating about an external central axis parallel to the axis of symmetry.

$$J = \left(\frac{A^2+B^2}{12} + r^2\right) \times m$$

2.6



Long thin rod of cross-section rotating about an external axis perpendicular to its own central axis.

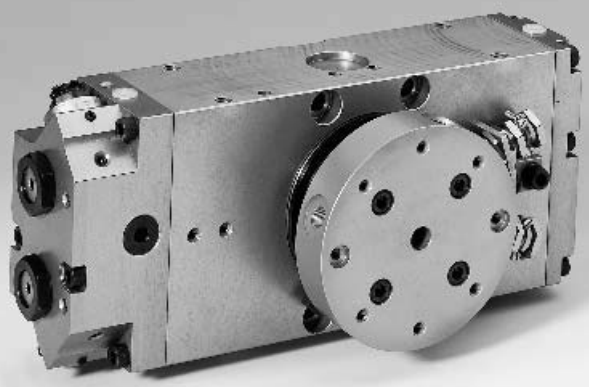
$$J = \left(\frac{L^2}{12} + r^2\right) \times m$$

J = Moment of inertia in kgm²
Dimensions in metres, masses in kg

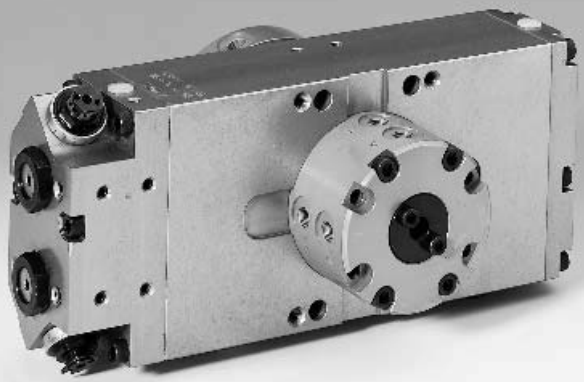
1.55688.9.3 ✻

Rotary leadthrough, distribution table

Distribution table fitted



Rotary leadthrough fitted

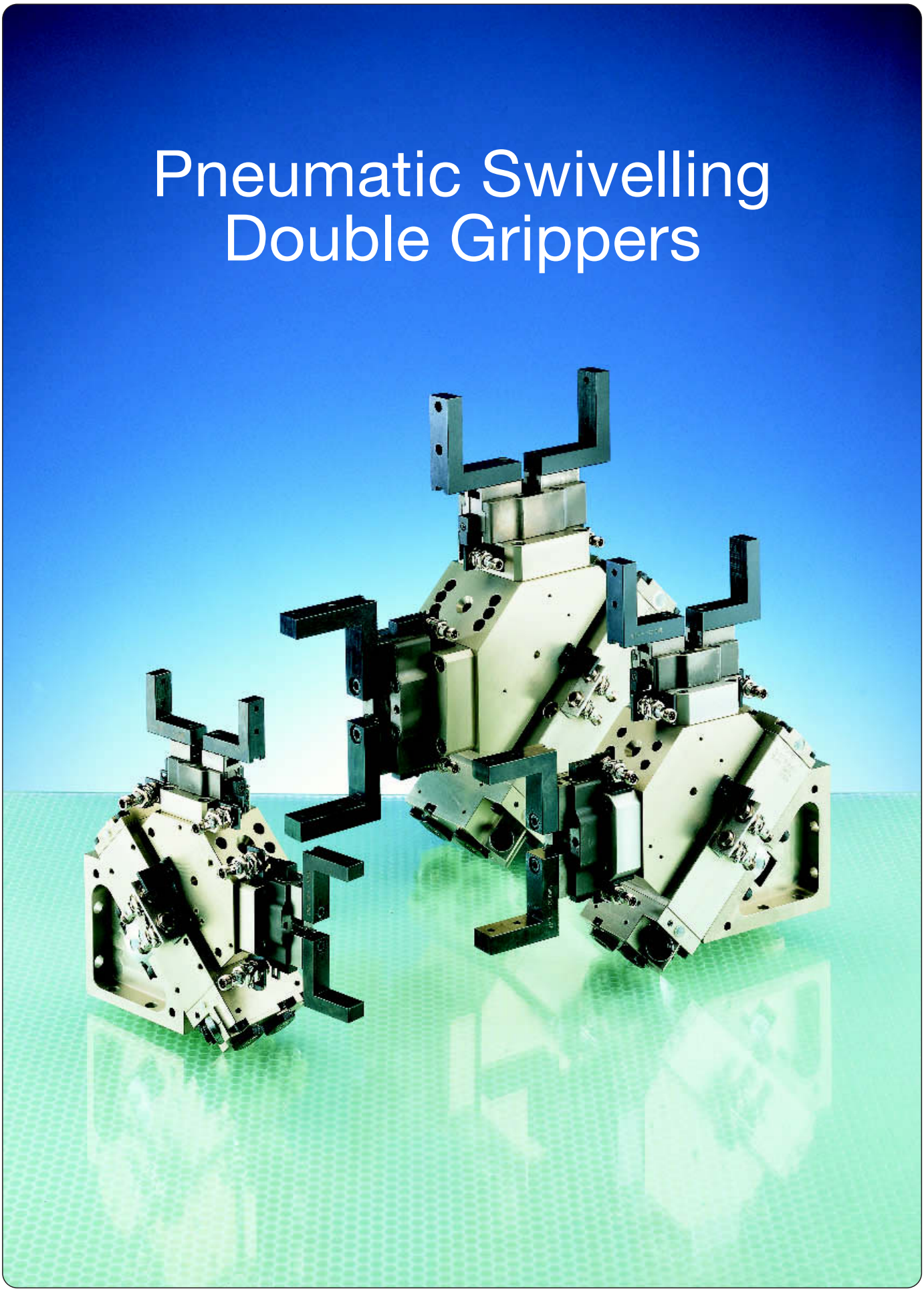


Distributor table

Rotary leadthrough connections

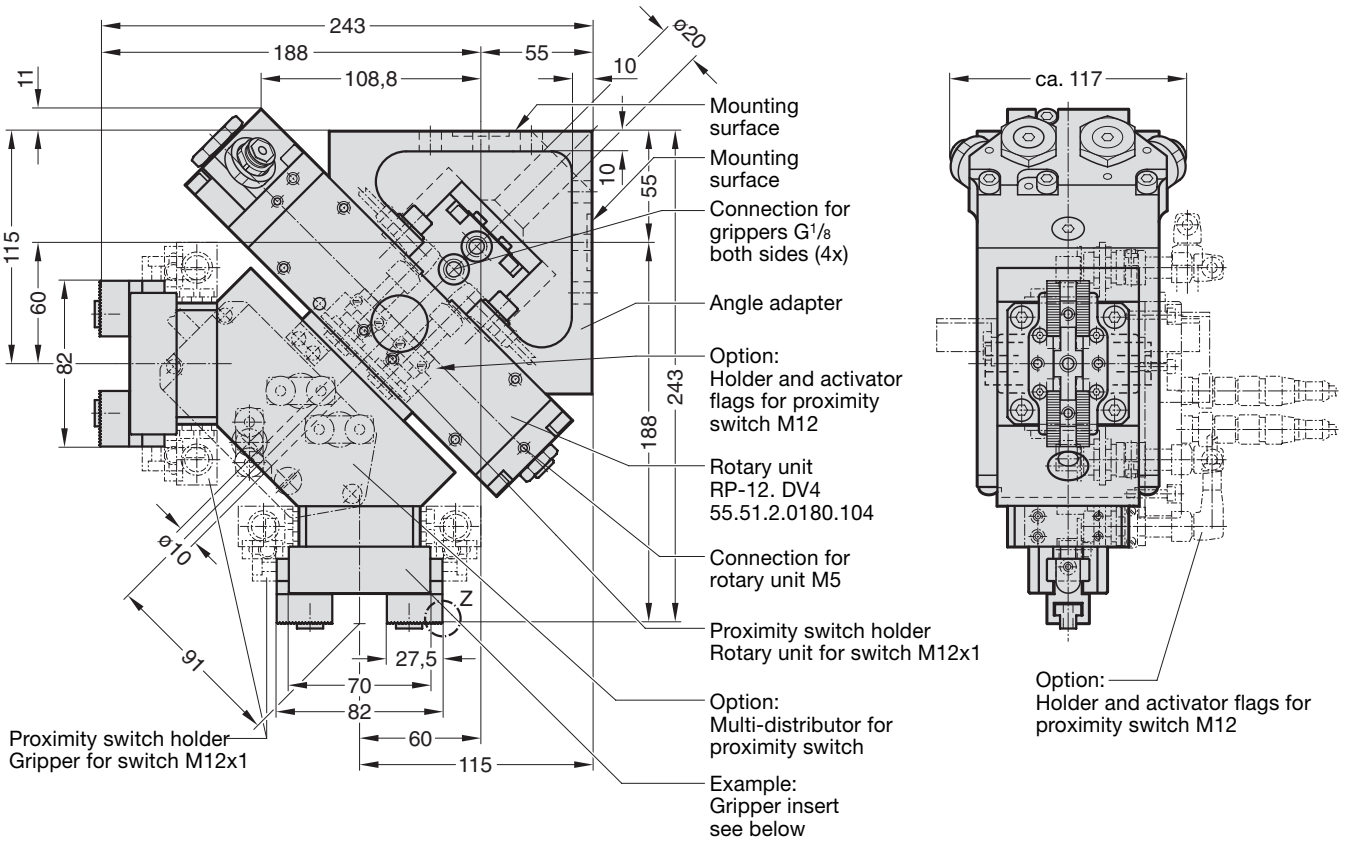
5-15689-0-1 ✻

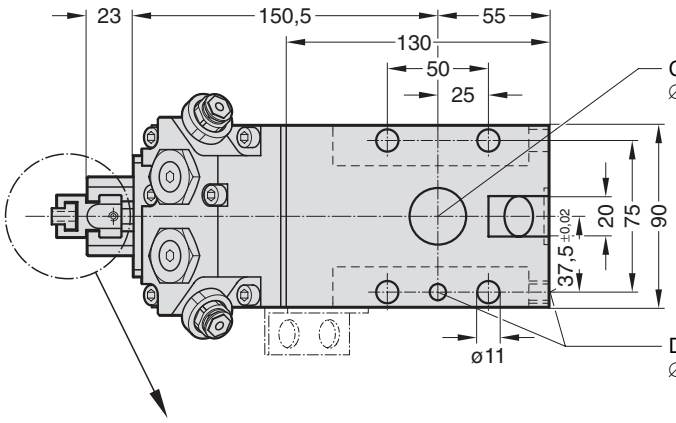
Pneumatic Swivelling Double Grippers

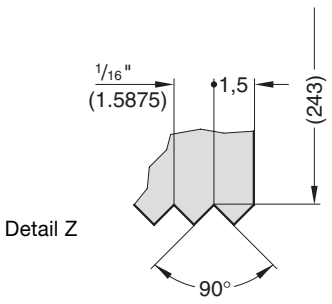


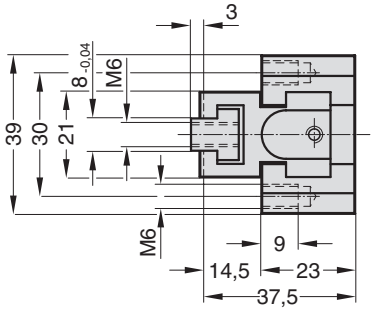
5-15691-0-1-#

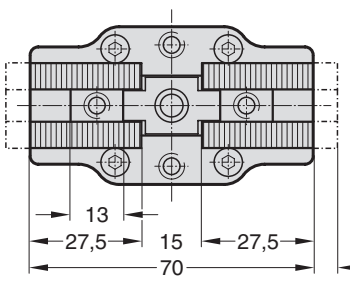
51.91.2. Swivelling double grippers pneumatic











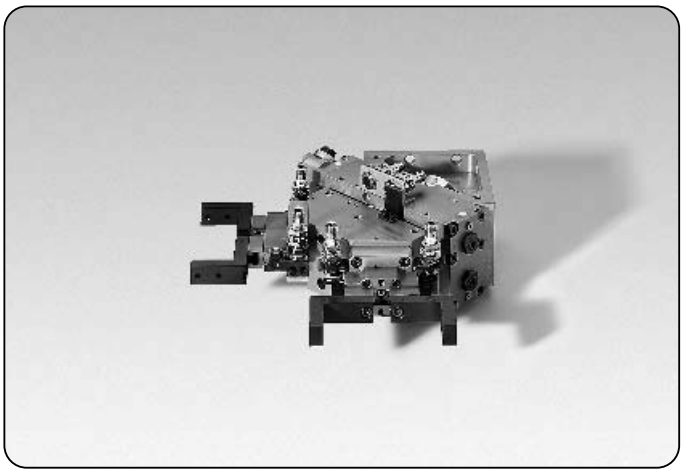
Weight as depicted = 9 kg

5-15682.0-1

Swivelling Double Grippers Pneumatic 51.91.2.

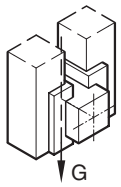
Ordering information

	A	B	C	D	E
Swivel module	51. 91.				
Size		2.			
Grippers module					
Gripper travel 6 mm for changeable fingers			0001.		
3 mm for changeable fingers			0011.		
6 mm for with fingers			0002.		
3 mm for with fingers			0012.		
2 fingers: gripping: External				501.	
Internal				601.	
3-Finger: gripping: External				531.	
Internal				631.	
Fixings for proximity switch				∅ M 12	06
with holders and activator flags					
Ordering example	51. 91.	2.	0001.	501.	06

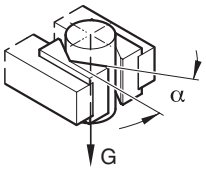


Grippers Carried load

Held by shape
up to 10 kg

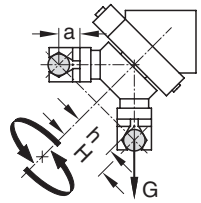


Held by force
up to 4,6 kg



Swivelling Max load

Max. load moment of inertiamax. 0,2 kg m²
Load moment max. 6,0 Nm



H = finger mounting reference
h = radius of centre of gravity
a = gripping distance
h_{Wst} = centre of gravity radius for workpiece [m]
h_{Gf} = centre of gravity radius of gripper fingers [m]
m_{Wst} = weight of workpiece [kg]
m_{Gf} = weight of gripper fingers [kg]
J_{Wst} = moment of inertia of the workpiece

max. load moment with 1 workpiece
$M_L = m_{Wst} \cdot g \cdot h_{Wst}$ [Nm]

max. load moment with 2 workpieces
$J = 2 \cdot (m_{Wst} \cdot h_{Wst}^2 + m_{Gf} \cdot h_{Gf}^2 + J_{Wst})$ [kgm²]

Grippers Technical description

The casing is made of high tensile aluminium, gripping fingers and guides of steel.
The motion piston and the spring are in the mounting casing.
The gripping fingers are moved by an oblique crank in a hardened, large surface area flat guideway.
The gripper fingers are available in various designs.
Position detection uses activator flags at one of the ends of the gripper flat guideway.

Swivelling Technical description

Size, swivelling angle	2, 180°
Drive unit	pneumatic, can be operated with deoiled air
Rated operating pressure	6 bar
Approved operating pressure	min. 4,5, max. 10 bar
Working principle	double-piston rack and pinion rotary actuator, end position zero play
Piston	double-acting
Bearings	2 of large roller bearings
Damping	adjustable, pressure controlled with oil balance reservoir
Velocity control	external, by restricting exhaust air
End position limitation	adjustable fixed stops
Installation position	any
Basic housing	aluminium
rotary table, rack, pinion	steel
Functions monitored by inductive proximity switches	

Grippers Technical data

Gripper travel		6 mm each finger
Gripper travel		3 mm each finger
Gripper travel		8 mm each finger available to order
Gripping power		see diagram
Max load	held by force	see diagram
	held by shape	see transport load
		see diagram on gripping by shape
Closing and opening time		approx. 0.2 s excluding switching times
Repeat accuracy		± 0,1 mm
Rated pressure		6,0 bar
Operating pressure, min		4,5 bar
Piston area “close“		16,6 cm²
Piston area "open"		18,1 cm²
Piston travel		6 mm
Weights		see dimensions drawing

Swivelling Technical data and times

Rotating mass kgm²	ts s	tv s	tg s	Load moment Nm	Rotating mass kgm²	ts s	tv s	tg s
0,06	0,5	0,15	0,65	3	0,032	0,50	0,20	0,70
0,12	0,6	0,20	0,80	6	0,075	0,65	0,25	0,90
0,20	0,7	0,25	0,95					

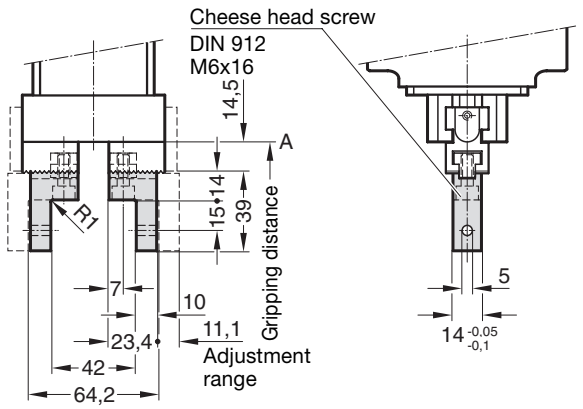
ts = swivel time through 180°
tv = pressure build-up time
tg = swivel time, total

5-15693-0-1 ✻

51.91.2. Swivelling Double Grippers Pneumatic

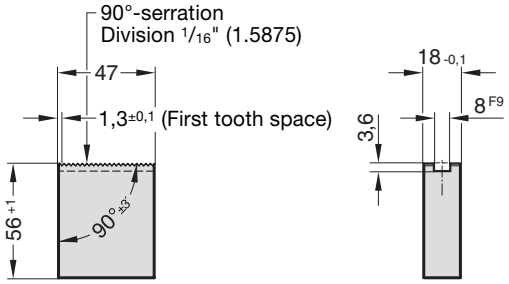
Gripper fingers 0.510.01103

External gripping



Weight = 0,06 kg/item

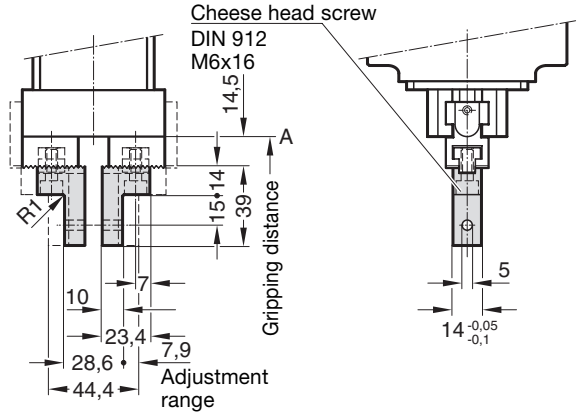
Gripper finger blank 0.510.01112



Material: 16 MnCr5

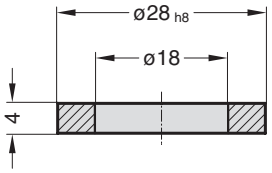
Gripper fingers 0.510.01103

Internal gripping



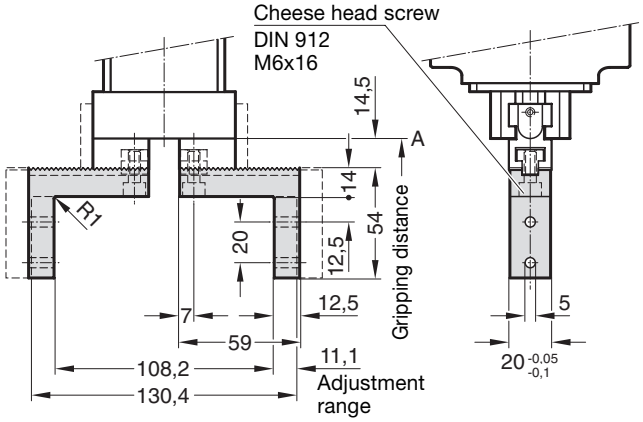
Weight = 0,06 kg/item

Centring ring 0.181.00795



Gripper fingers 0.510.01104

External gripping



Weight = 0,19 kg/item

Notes

Gripper versions

The grippers employed correspond to
the types 52.81.1. … .501/601
and 52.81.1. … .531/631

See

- FIBRO catalogue Grippers
  The 2 finger grippers employed here will be found on pages C6 – C9.
  The 3 finger grippers will be found on pages E6 – E9.
- Gripper travel is defined as the travel of the individual finger.
- Gripper with 8 mm travel to order.

Swivel module

- Special rotation angles available upon request

CAD

- We shall be pleased to send you, upon request, the CAD dataset for your design for the swivelling double gripper. Please specify whether you would like the data on diskette, CD or by e-mail in DXF or IGES format.

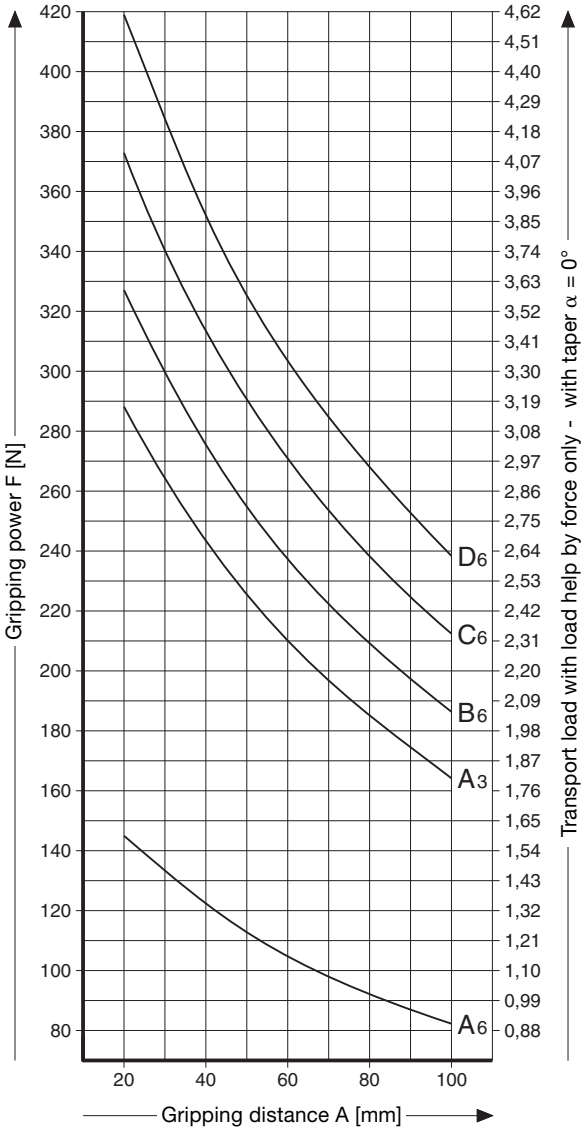
5-15694-0-1 ❄

Swivelling Double Grippers Pneumatic

51.91.2.

Transport load / gripping power diagram

für Greifweg = 6 und 3 mm

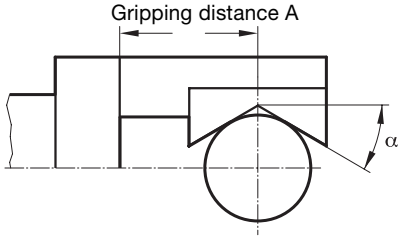


Captions:

Gripper with 6 mm travel:
A_6 = spring force only
B_6 = reinforced by 4 bar pressure
C_6 = reinforced by 5 bar pressure
D_6 = reinforced by 6 bar pressure

Gripper with 3 mm travel:
A_3 = spring force only

Gripping distance A:



Values:

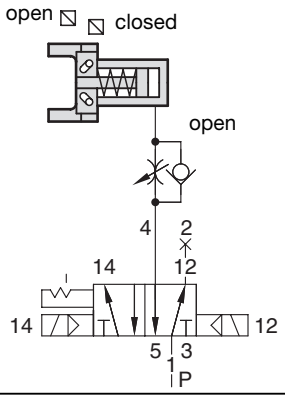
Acceleration = 0,3 m/s²
Coefficient of friction workpiece – gripper surface = 0,1
When the workpiece is held in the grippers in prisms the possible transport load increases to:

$$\frac{\text{Diagram - transport load}}{\cos \alpha}$$

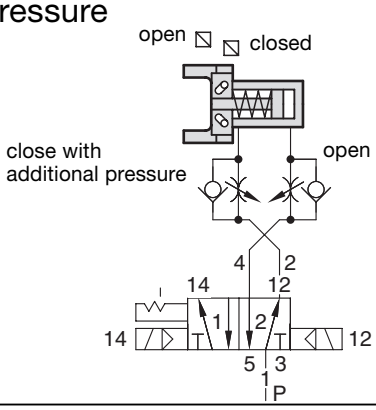
Please note that the maximum permissible transport load must not be exceeded.

5-15695-0-1 *

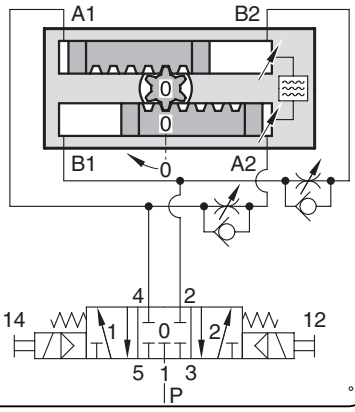
Block diagram gripping spring pressure A_3, A_6



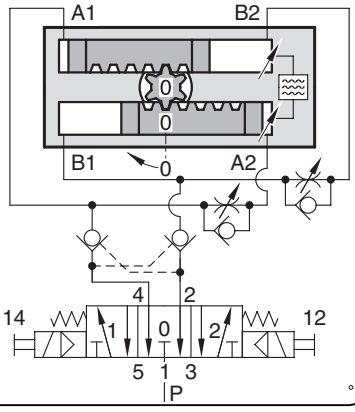
Block diagram gripping spring pressure + application of pressure B_6, C_6, D_6



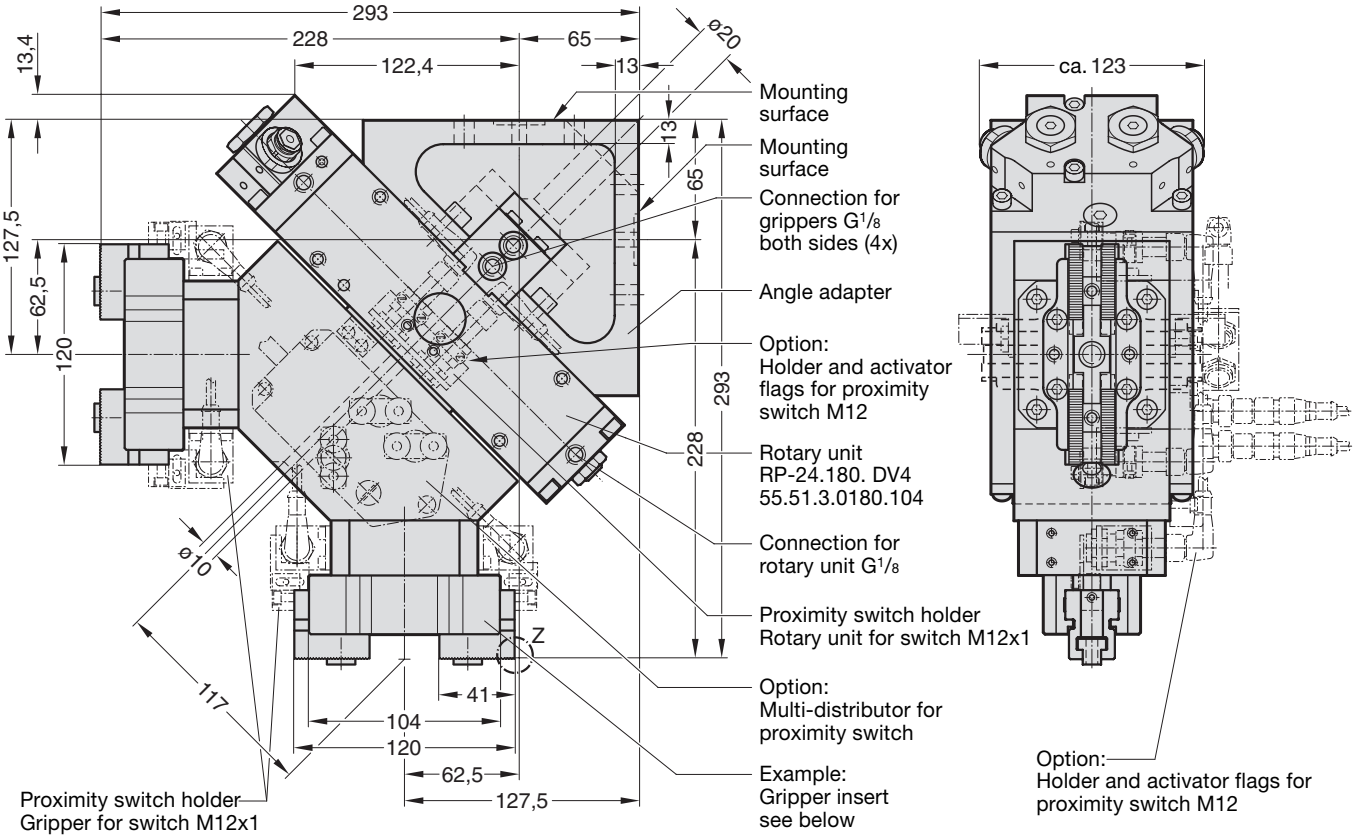
Block diagram swivelling

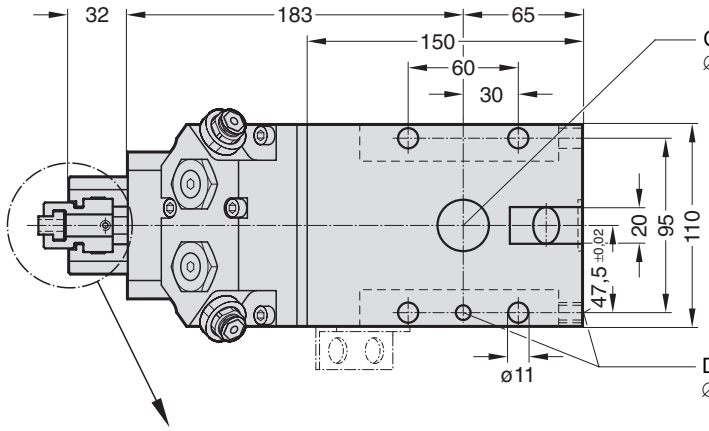


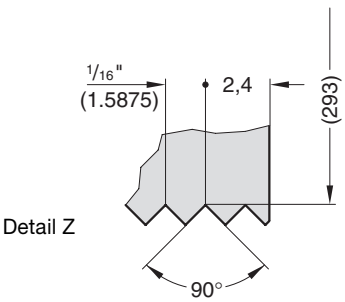
Block diagram swivelling with position securing

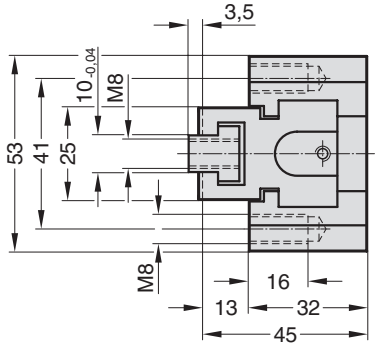


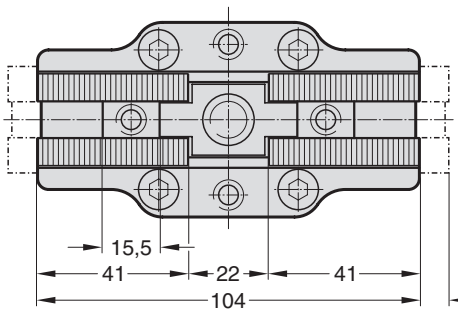
51.91.3. Swivelling double grippers pneumatic











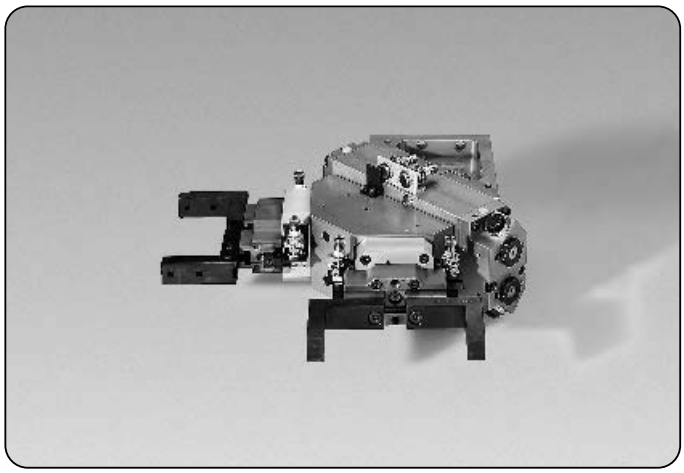
Weight as depicted = 14 kg

5-15696.0-1 ❄

Swivelling Double Grippers Pneumatic 51.91.3.

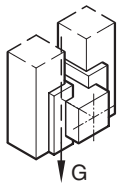
Ordering information

	A	B	C	D	E
Swivel module	51. 91.				
Size		3.			
Grippers module					
Gripper travel 8 mm for changeable fingers			0001.		
4 mm for changeable fingers			0011.		
8 mm for with fingers			0002.		
4 mm for with fingers			0012.		
2 fingers: gripping: External				501.	
Internal				601.	
3-Finger: gripping: External				531.	
Internal				631.	
Fixings for proximity switch ∅ M 12 with holders and activator flags					06
Ordering example	51. 91.	3.	0001.	501.	06

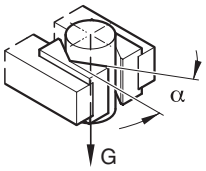


Grippers Carried load

Held by shape
up to 20 kg

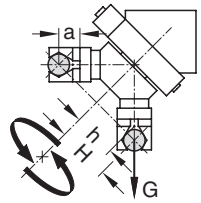


Held by force
up to 8,5 kg



Swivelling Max load

Max. load moment of inertiamax. 0,6 kg m²
Load moment max. 12 Nm



H = finger mounting reference
h = radius of centre of gravity
a = gripping distance
h_{Wst} = centre of gravity radius for workpiece [m]
h_{Gf} = centre of gravity radius of gripper fingers [m]
m_{Wst} = weight of workpiece [kg]
m_{Gf} = weight of gripper fingers [kg]
J_{Wst} = moment of inertia of the workpiece

max. load moment with 1 workpiece
$M_L = m_{Wst} \cdot g \cdot h_{Wst}$ [Nm]

max. load moment with 2 workpieces
$J = 2 \cdot (m_{Wst} \cdot h_{Wst}^2 + m_{Gf} \cdot h_{Gf}^2 + J_{Wst})$ [kgm²]

Grippers Technical description

The casing is made of high tensile aluminium, gripping fingers and guides of steel.
The motion piston and the spring are in the mounting casing.
The gripping fingers are moved by an oblique crank in a hardened, large surface area flat guideway.
The gripper fingers are available in various designs.
Position detection uses activator flags at one of the ends of the gripper flat guideway.

Swivelling Technical description

Size, swivelling angle	3, 90°, 180°
Drive unit	pneumatic, can be operated with deoiled air
Rated operating pressure	6 bar
Approved operating pressure	min. 4,5, max. 10 bar
Working principle	double-piston rack and pinion rotary actuator, end position zero play
Piston	double-acting
Bearings	2 of large roller bearings
Damping	adjustable, pressure controlled with oil balance reservoir
Velocity control	external, by restricting exhaust air
End position limitation	adjustable fixed stops
Installation position	any
Basic housing	aluminium
rotary table, rack, pinion	steel
Functions monitored by inductive proximity switches	

Grippers Technical data

Gripper travel		8 mm each finger
Gripper travel		4 mm each finger
Gripper travel		11 mm each finger available to order
Gripping power		see diagram
Max load	held by force	see diagram
	held by shape	see transport load
		see diagram on gripping by shape
Closing and opening time		approx. 0.2 s excluding switching times
Repeat accuracy		± 0,1 mm
Rated pressure		6,0 bar
Operating pressure, min		4,5 bar
Piston area “close“		30 cm²
Piston area "open"		33,2 cm²
Piston travel		8 mm
Weights		see dimensions drawing

Swivelling Technical data and times

Rotating mass kgm²	ts s	tv s	tg s	Load moment Nm	Rotating mass kgm²	ts s	tv s	tg s
0,12	0,5	0,1	0,6	3	0,032	0,6	0,2	0,8
0,20	0,6	0,15	0,75	6	0,075	0,65	0,2	0,85
0,6	0,7	0,25	0,95	12	0,23	0,7	0,25	0,95

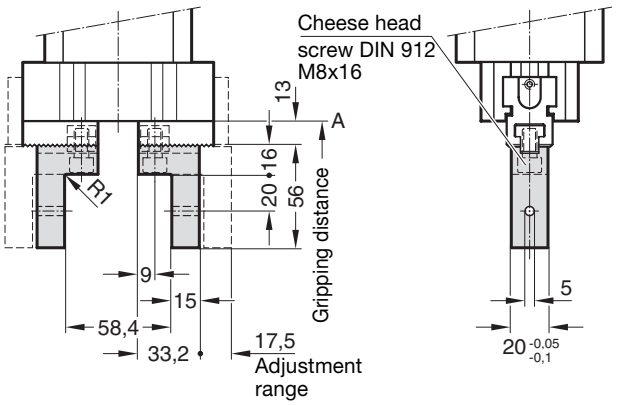
ts = swivel time through 180°
tv = pressure build-up time
tg = swivel time, total

5-15697-0-1 ✻

51.91.3. Swivelling Double Grippers Pneumatic

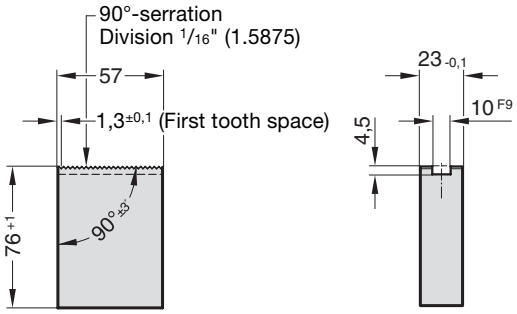
Gripper fingers 0.510.01105

External gripping



Weight = 0,16 kg/item

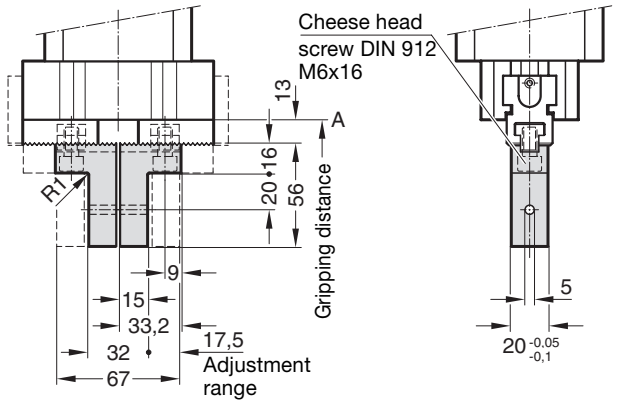
Gripper finger blank 0.510.01113



Material: 16 MnCr5

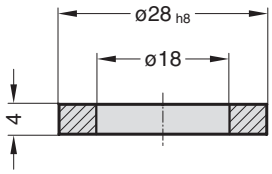
Gripper fingers 0.510.01105

Internal gripping



Weight = 0,16 kg/item

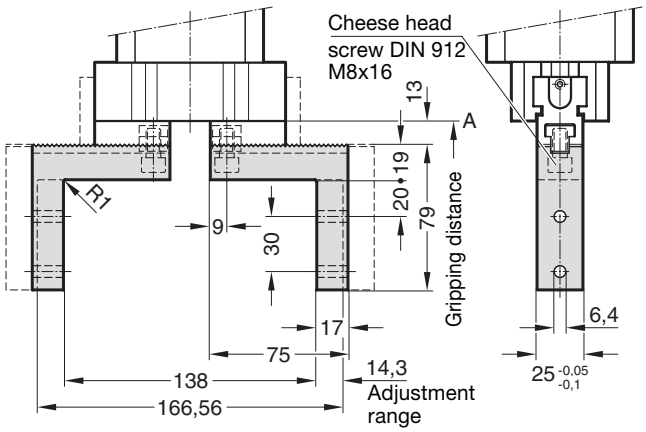
Centring ring 0.181.00795



0.181.00795

Gripper fingers 0.510.01106

External gripping



Weight = 0,44 kg/item

Notes

Gripper versions

The grippers employed correspond to the types 52.81.2. … .501/601 and 52.81.2. … .531/631

See

- FIBRO catalogue Grippers
  The 2 finger grippers employed here will be found on pages C14 – C17.
  The 3 finger grippers will be found on pages E14 – E17.
- Gripper travel is defined as the travel of the individual finger.
- Gripper with 11 mm travel to order.

Swivel module

- Special rotation angles available upon request

CAD

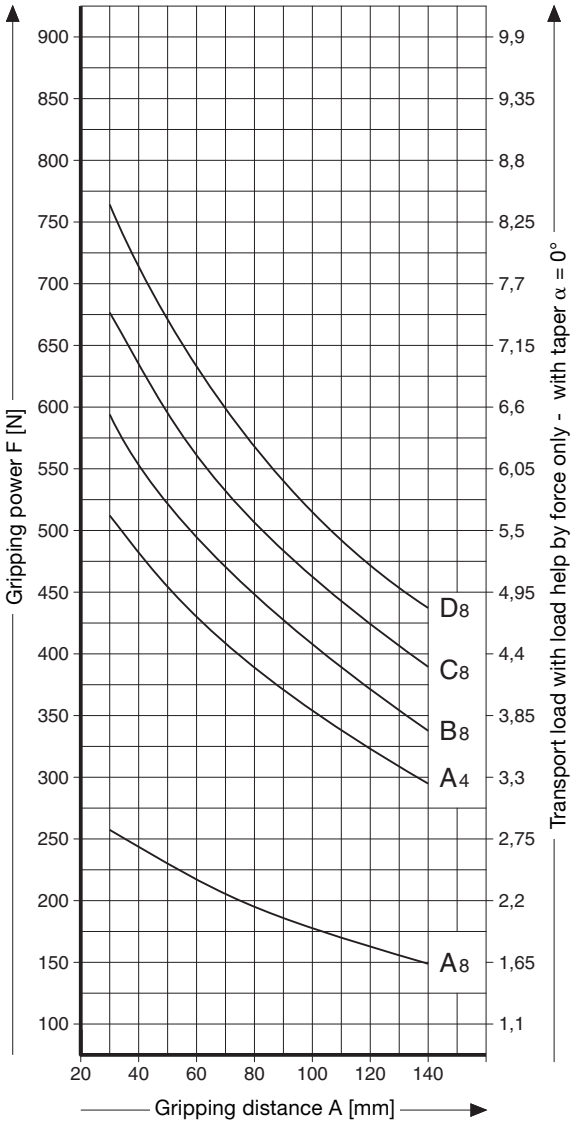
- We shall be pleased to send you, upon request, the CAD dataset for your design for the swivelling double gripper. Please specify whether you would like the data on diskette, CD or by e-mail in DXF or IGES format.

5-15698.0-1 ❄

Swivelling Double Grippers Pneumatic 51.91.3.

Transport load / gripping power diagram

for gripper travel = 8 and 4 mm

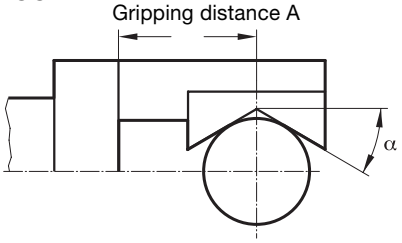


Captions:

Gripper with 12 mm travel:
A_8 = spring force only
B_8 = reinforced by 4 bar pressure
C_8 = reinforced by 5 bar pressure
D_8 = reinforced by 6 bar pressure

Gripper with 6 mm travel:
A_4 = spring force only

Gripping distance A:



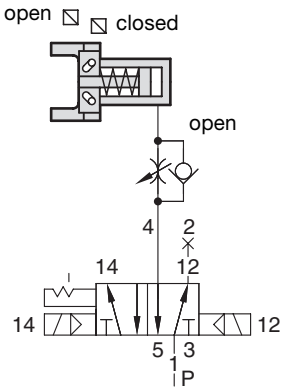
Values:

Acceleration = 0,3 m/s²
Coefficient of friction workpiece – gripper surface = 0,1
When the workpiece is held in the grippers in prisms the possible transport load increases to:

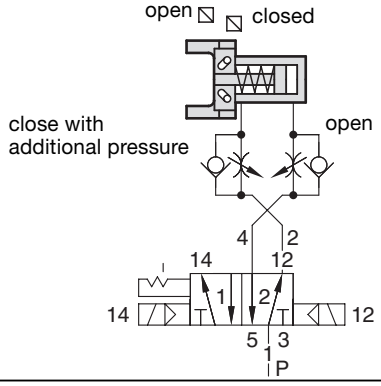
$$\frac{\text{Diagram - transport load}}{\cos \alpha}$$

Please note that the maximum permissible transport load must not be exceeded.

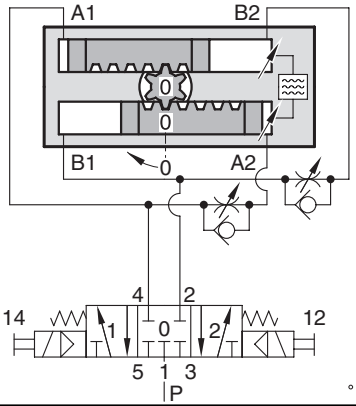
Block diagram gripping spring pressure A_4, A_8



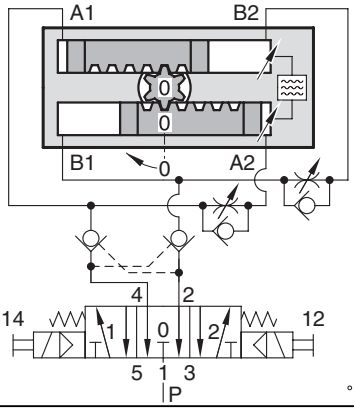
Block diagram gripping spring pressure + application of pressure B_8, C_8, D_8



Block diagram swivelling

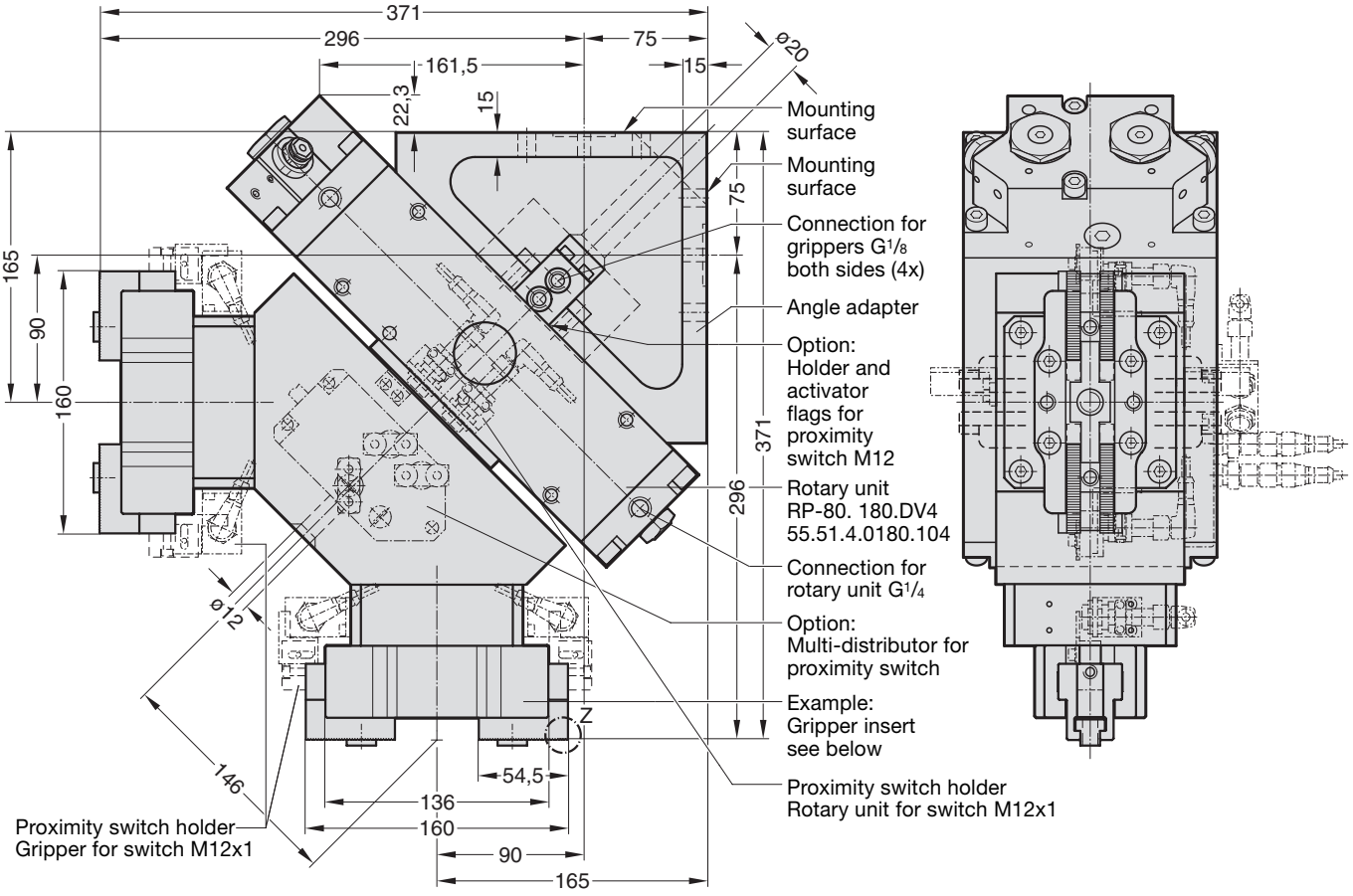


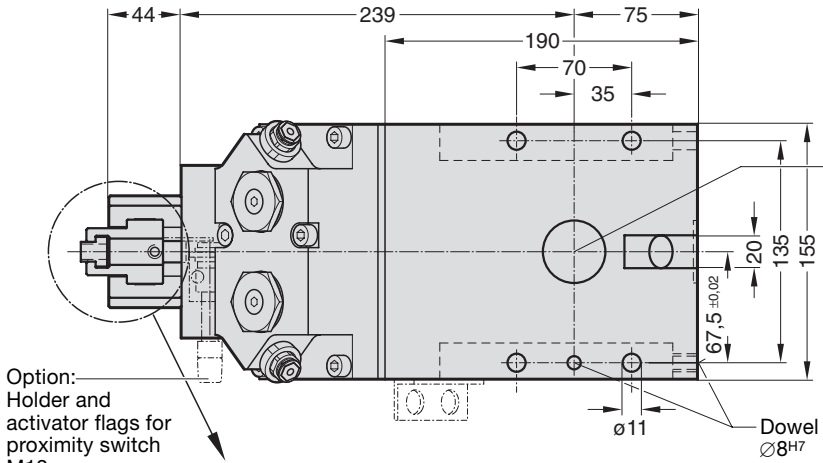
Block diagram swivelling with position securing

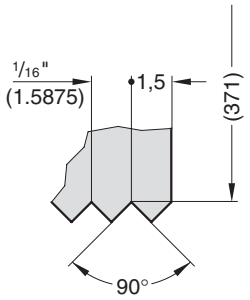


5-15699-0-1 ✻

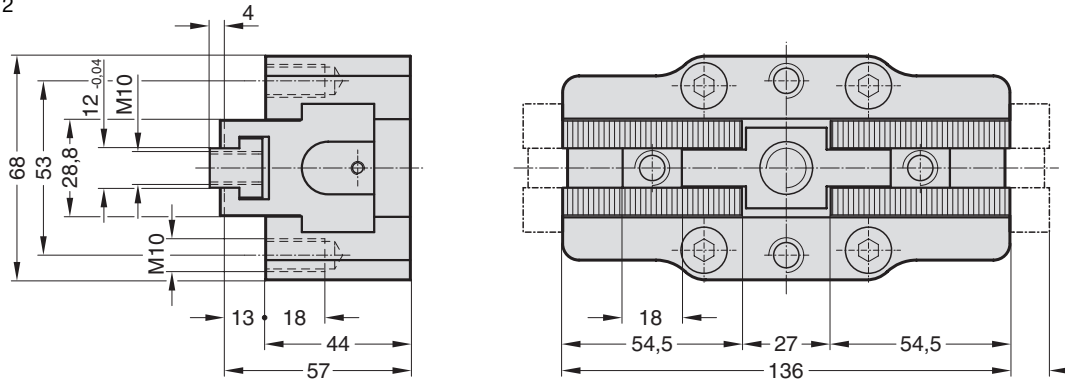
51.91.4. Swivelling double grippers pneumatic







Detail Z



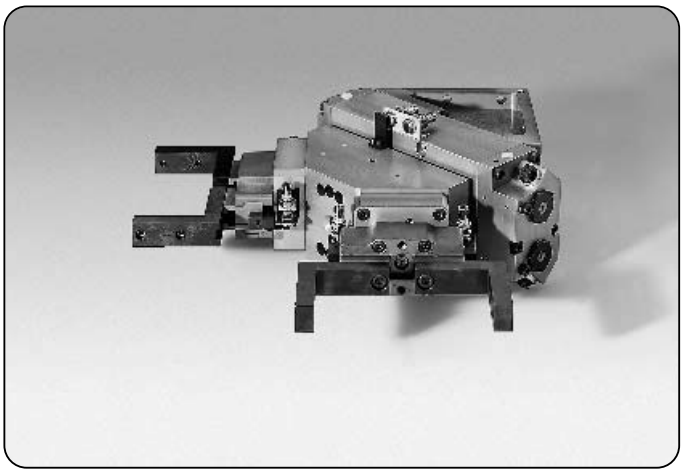
Weight as depicted = 30 kg

5-15700-0-1 ✻

Swivelling Double Grippers Pneumatic 51.91.4.

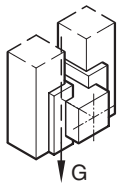
Ordering information

	A	B	C	D	E
Swivel module	51. 91.				
Size		4.			
Grippers module					
Gripper travel 12 mm for changeable fingers			0001.		
6 mm for changeable fingers			0011.		
12 mm for with fingers			0002.		
6 mm for with fingers			0012.		
2 fingers: gripping: External				501.	
Internal				601.	
3-Finger: gripping: External				531.	
Internal				631.	
Fixings for proximity switch					∅ M 12 06
with holders and activator flags					
Ordering example	51. 91.	4.	0001.	501.	06

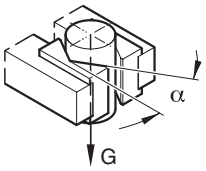


Grippers Carried load

Held by shape
up to 33 kg

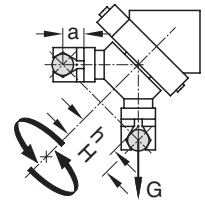


Held by force
up to 15,6 kg



Swivelling Max load

Max. load moment of inertiamax. 3 kg m²
Load moment max. 40 Nm



H = finger mounting reference
h = radius of centre of gravity
a = gripping distance
h_{Wst} = centre of gravity radius for workpiece [m]
h_{Gf} = centre of gravity radius of gripper fingers [m]
m_{Wst} = weight of workpiece [kg]
m_{Gf} = weight of gripper fingers [kg]
J_{Wst} = moment of inertia of the workpiece

max. load moment with 1 workpiece
$M_L = m_{Wst} \cdot g \cdot h_{Wst}$ [Nm]

max. load moment with 2 workpieces
$J = 2 \cdot (m_{Wst} \cdot h_{Wst}^2 + m_{Gf} \cdot h_{Gf}^2 + J_{Wst})$ [kgm²]

Grippers Technical description

The casing is made of high tensile aluminium, gripping fingers and guides of steel.
The motion piston and the spring are in the mounting casing.
The gripping fingers are moved by an oblique crank in a hardened, large surface area flat guideway.
The gripper fingers are available in various designs.
Position detection uses activator flags at one of the ends of the gripper flat guideway.

Swivelling Technical description

Size, swivelling angle	3, 90°, 180°
Drive unit	pneumatic, can be operated with deoiled air
Rated operating pressure	6 bar
Approved operating pressure	min. 4,5, max. 10 bar
Working principle	double-piston rack and pinion rotary actuator, end position zero play
Piston	double-acting
Bearings	2 of large roller bearings
Damping	adjustable, pressure controlled with oil balance reservoir
Velocity control	external, by restricting exhaust air
End position limitation	adjustable fixed stops
Installation position	any
Basic housing	aluminium
rotary table, rack, pinion	steel
Functions monitored by inductive proximity switches	

Grippers Technical data

Gripper travel		12 mm each finger
Gripper travel		6 mm each finger
Gripper travel		16 mm each finger available to order
Gripping power		see diagram
Max load	held by force	see diagram
	held by shape	see transport load
		see diagram on gripping by shape
Closing and opening time		approx. 0.2 s excluding switching times
Repeat accuracy		± 0,1 mm
Rated pressure		6,0 bar
Operating pressure, min		4,5 bar
Piston area “close“		58,7 cm²
Piston area "open"		63,6 cm²
Piston travel		12 mm
Weights		see dimensions drawing

Swivelling Technical data and times

Rotating mass kgm²	ts s	tv s	tg s	Load moment Nm	Rotating mass kgm²	ts s	tv s	tg s
0,12	0,5	0,1	0,6	3	0,032	0,6	0,2	0,70
0,20	0,6	0,15	0,75	6	0,075	0,65	0,2	0,85
0,6	0,7	0,25	0,95	12	0,23	0,7	0,25	0,95

ts = swivel time through 180°
tv = pressure build-up time
tg = swivel time, total

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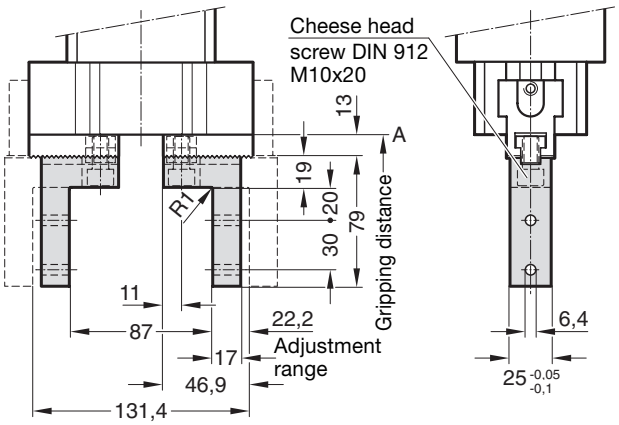
51.91.4. Swivelling Double Grippers Pneumatic

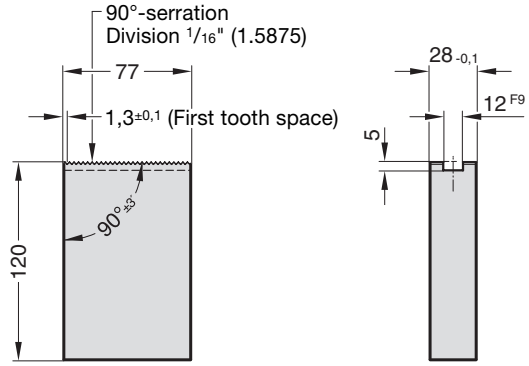
Gripper fingers 0.510.01107

External gripping



Weight = 0,35 kg/item

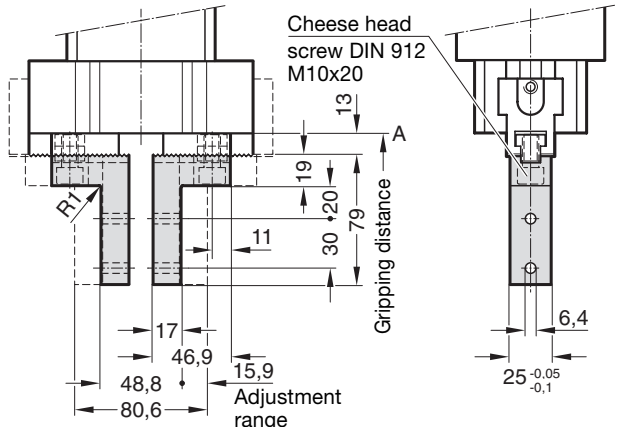
Gripper finger blank 0.510.01056



Material: 16 MnCr5

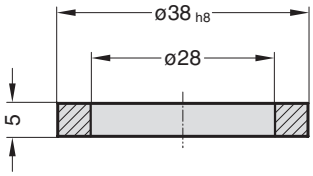
Gripper fingers 0.510.01107

Internal gripping



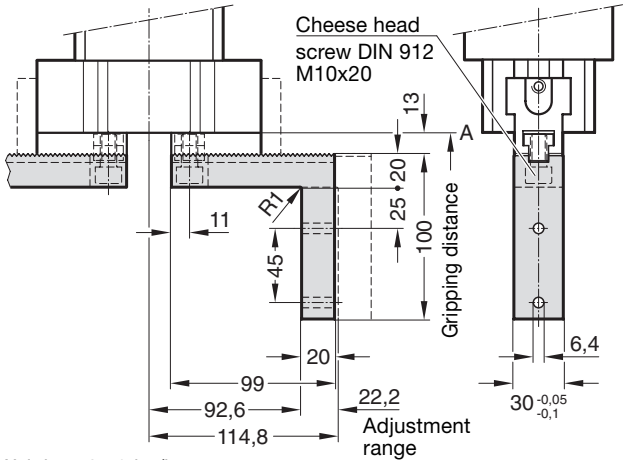
Weight = 0,35 kg/item

Centring ring 0.181.00796



Gripper fingers 0.510.01108

External gripping



Weight = 0,78 kg/item

Notes

Gripper versions

The grippers employed correspond to
the types 52.81.3. … .501/601
and 52.81.3. … .531/631

See

- FIBRO catalogue Grippers
  The 2 finger grippers employed here will be found on pages C22 – C25.
  The 3 finger grippers will be found on pages E22 – E25.
- Gripper travel is defined as the travel of the individual finger.
- Gripper with 16 mm travel to order.

Swivel module

- Special rotation angles available upon request

CAD

- We shall be pleased to send you, upon request, the CAD dataset for your design for the swivelling double gripper. Please specify whether you would like the data on diskette, CD or by e-mail in DXF or IGES format.

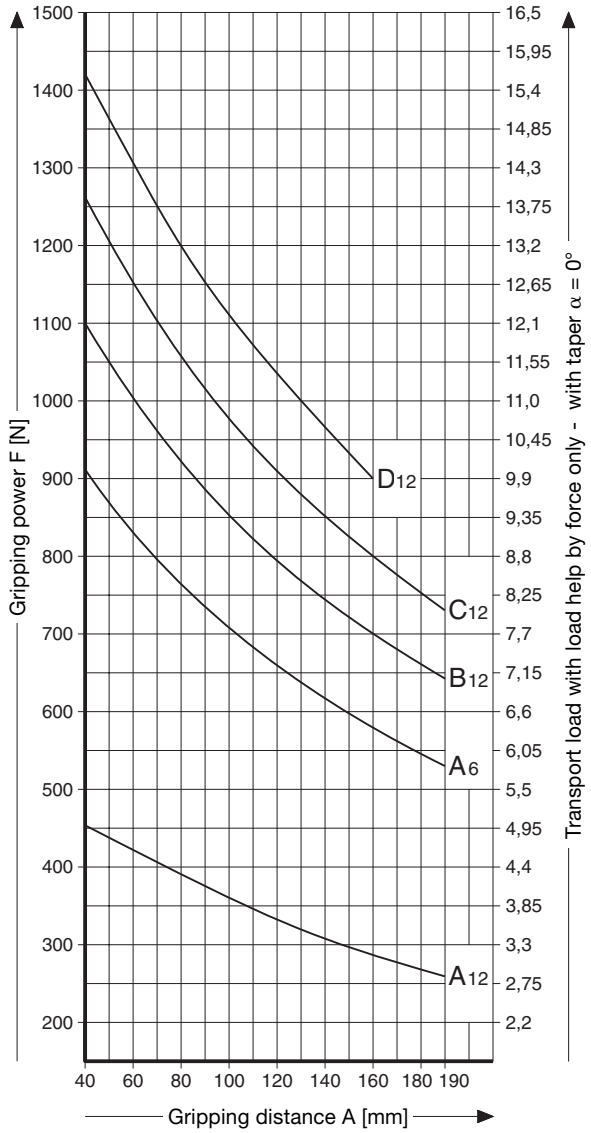
5-15702-0-1 ❄

Swivelling Double Grippers Pneumatic

51.91.4.

Transport load / gripping power diagram

for gripper travel = 12 and 6 mm

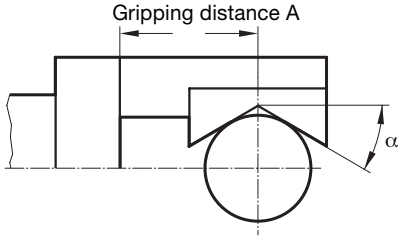


Captions:

Gripper with 12 mm travel:
A_{12} = spring force only
B_{12} = reinforced by 4 bar pressure
C_{12} = reinforced by 5 bar pressure
D_{12} = reinforced by 6 bar pressure

Gripper with 6 mm travel:
A_6 = spring force only

Gripping distance A:



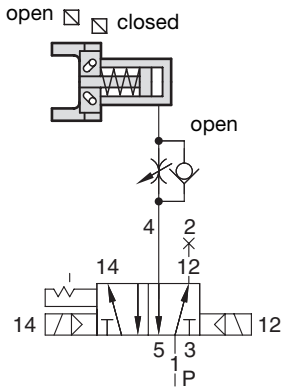
Values:

Acceleration = 0,3 m/s²
Coefficient of friction workpiece – gripper surface = 0,1
When the workpiece is held in the grippers in prisms the possible transport load increases to:

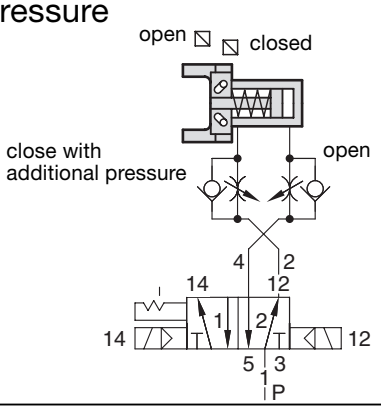
$$\frac{\text{Diagram - transport load}}{\cos \alpha}$$

Please note that the maximum permissible transport load must not be exceeded.

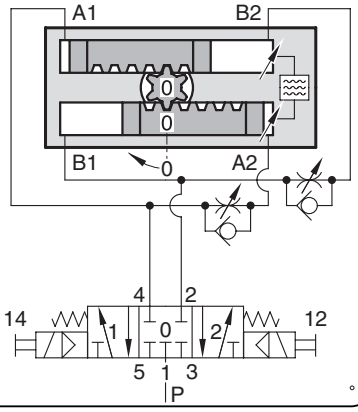
Block diagram gripping spring pressure A_6, A_{12}



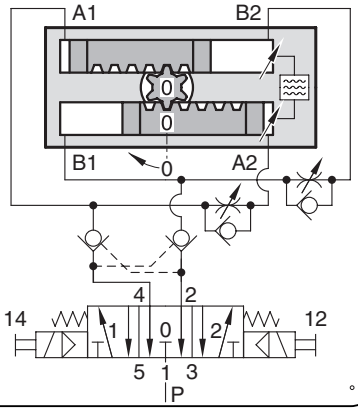
Block diagram gripping spring pressure + application of pressure B_{12}, C_{12}, D_{12}



Block diagram swivelling



Block diagram swivelling with position securing



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Automation+Robotik
Automation+Robotics
Automatisme+robotique

Postleitzahlgebiet
Zip Code
Code postal

DE

Heinrich Siggel GmbH
Waldstraße 1 · 14163 Berlin
14000 Tel. 030-802 90 13 · Fax 030-802 90 14
siggel-gmbh@t-online.de

Walter Ruff GmbH
Postfach 110266 · 28082 Bremen
28000 Heerenholz 9 · 28307 Bremen
Tel. 0421-438 78-0 · Fax 0421-438 78-22
mail@praeziruff.de · www.praeziruff.de

Außendienst Karl-Heinz Keßler
30000 Mehlstraße 8 · 33729 Bielefeld
33000 Tel. 0521-764 43 · Fax 0521-770 75 58
Mobil-Tel. 0170-564 34 15
k.kessler@fibro.de

Walter Ruff GmbH Präzisionswerkzeuge
Berliner Straße 28 · 31174 Schellerten
31000 Tel. 05123-20 40 · Fax 05123-26 40

Oltrogge & Co.
Postfach 102093 · 33520 Bielefeld
33000 Finkenstraße 61 · 33609 Bielefeld
Tel. 0521-32 08-0 · Fax 0521-32 08-129
werkzeuge.verkauf@oltrogge.de · www.oltrogge.de

Schwab GmbH
Postfach 1209 · 35323 Mücke
35000 Bergwiesenstraße 10 · 35325 Mücke
Tel. 06400-80 11 · Fax 06400-80 12

Ing. Büro für Automation Dirk Ahke VDI
Zum Wenzelnberg 2a · 40764 Langenfeld
40000 Tel. 02173-270 41-0 · Fax 02173-270 41-30
ing-buero-ahke@netcologne.de

Außendienst Lars Jahncke
Flockertsberg 17 · 42653 Solingen
40000 Tel. 0212-254 34 62 · Fax 0212-254 33 90
50000 Mobil-Te. 0170-763 71 25
l.jahncke@fibro.de

Außendienst Hartwig Hennemann
Staubenthaler Höhe 79
40000 42369 Wuppertal
50000 Tel. + Fax 0202-759 55 80
Mobil-Tel. 0175-296 59 30
hennemann.fibro@t-online.de

Normalien-Zentrale-Siegerland Bernd Kreitzberg
Postfach 1132 · 57225 Wilnsdorf
57000 Rudersdorfer Straße 18 · 57234 Wilnsdorf
Tel. 02739-25 44 · Fax 02739-41 16
Mobil-Tel. 0170-274 27 95

Stahlschmidt Industriebedarf und -vertretungen
Postfach 65 · 58846 Herscheid
58000 Eichenweg 12 · 58849 Herscheid
Tel. 02357-30 99 · Fax 02357-22 55
Mobil-Tel. 0171-642 57 97
e.stahlschmidt@t-online.de
www.stahlschmidt-industrievertretung.de

Außendienst Volker Hottes
Erzberger Straße 1 · 64846 Groß-Zimmern
64000 Tel. 06071-416 10 · Fax 06071-416 10
Mobil-Tel. 0171-957 79 89
volker.hottes@t-online.de

Außendienst Guido Steinbrück
Gartenfeldstraße 28 · 65396 Walluf
65000 Tel. 06123-70 46 90 · Fax 06123-70 46 91
Mobil-Tel. 0171-229 45 14
g.steinbrueck@fibro.de

Außendienst Henning Reiner
Am Eselsberg 53 · 89075 Ulm
71000 Tel. 0731-95 08 05 44 · Fax 0731-95 08 05 45
Mobil-Tel. 0151-11 71 29 75
h.reiner@fibro.de

Außendienst Peter Finkenbeiner
Grüner Weg 2 · 72218 Wildberg
72000 Tel. 07054-83 07 · Fax 07054-92 89 59
Mobil-Tel. 0170-564 31 78
p.finkenbeiner@fibro.de

Außendienst Matthias Ehrenfried
Breisgaustraße 9 · 74172 Neckarsulm
74000 Tel. 07132-98 94 82 · Fax 07132-98 94 82
Mobil-Tel. 0171-864 95 52
ehrenfried.matthias@t-online.de

Außendienst Manfred Wagner
Breslauer Straße 57 · 74372 Sersheim
74000 Tel. 07042-350 86 · Fax 07042-350 86
Mobil-Tel. 0170-563 52 30
m.wagner.fibro@t-online.de

Nestle & Koch · Stahllager GmbH
Maximilianstraße 159 · 75172 Pforzheim
75000 Tel. 07231-457 67-0 · Fax 07231-457 67 99
info@nestle-koch.de

Außendienst Wilhelm Volk
Rintheimer Hauptstraße 135 · 76131 Karlsruhe
76000 Tel. 0721-61 20 95 · Fax 0721-61 20 95
Mobil-Tel. 0170-850 56 86

Hamacher GmbH
Postfach 3308 · 78022 VS-Schwenningen
78000 Grabenäckerstraße 47 · 78054 VS-Schwenningen
Tel. 07720-349 69 · Fax 07720-341 73
hamacher-normalien@t-online.de
www.hamacher-normalien.de

Jugard & Künstner GmbH
Landsberger Straße 289/I · 80687 München
80000 Tel. 089-546 15 60 · Fax 089-580 27 96
muc@jugard-kuenstner.de
www.jugard-kuenstner.de

Jugard & Künstner GmbH
Postfach 900152 · 90492 Nürnberg
90000 Thomas-Mann-Straße 63 · 90471 Nürnberg
Tel. 0911-86 08 11 · Fax 0911-86 08 90
nbg@jugard-kuenstner.de
www.jugard-kuenstner.de

HELD Werkzeugmaschinen Präzisionswerkzeuge GmbH
07500 Tivolistraße 1 · 07545 Gera
Tel. 0365-824 91-0 · Fax 0365-824 91 11
e-mail: info@held-wzm.de · www.held-wzm.de

Außendienst Stefan Schumann
Forstweg 44 · 07570 Weida
07500 Tel. 036603-408 02 · Fax 036603-602 37
Mobil-Tel. 0170-564 51 15
s.schumann@fibro.de

AT

Rath & Co. Ges. m.b.H.
Teiritzstrasse 3 · 2100 Korneuburg
Tel. +43 2262-608 · Fax +43 2262-608-60
office@rath-co.at · www.rath-co.at

AU

Bruderer Presses Australia Pty. Ltd.
92 Trafalgar Street · Annandale, NSW 2038
Tel. +61-419-400-995 · Fax +61-296-864-809
Brudsyd@tpgi.com.au

Enmor Tool & Machine Co. Pty. Ltd.
Unit 18 · 41 Walter Street
P.O. Box 39 · Belmont, NSW 2280
Tel. +61-249-455-898 · Fax +61-249-479-919
enmor@bigpond.com

BA

Oro-Tech trgovina d.o.o.
Ulica borcev 1/b · SI-2000 Maribor
Tel. +386 2-426 08 43 · Fax +386 2-426 08 44
oro-tech.trgovina@siol.net

BE

Doedijns Fluitronics NV/SA
Zoning d'Amay Allée II n° 4 · 4540 Amay
Tel. +32 8 551 9696 · Fax +32 8 551 9697

Schiltz S.A.
Chaussee de Gand 1034 · 1082 Bruxelles
Tel. +32 2 464 4830 · Fax +32 2 464 4839
info@schiltz.be

BG

Bavaria 2002 EOOD
Pirotstr. 22 · 5100 Gorna Orjachoviza
Tel. +359 618 64158 · Fax +359 618 41874
bavaria2002@gorna.net

BR

Coloman Industria e Comercio
de Maquinas e Ferramentas Ltda.
Rua A-N° 315 · Parque Industrial · Caixa Postal 49
Franco da Rocha - SP · CEP - 07851-970
Tel. +55-11-4449-4460 · Fax +55-11-4819-6188
coloman@uol.com.br

LCPA Ltda.
Rua Maria Maiolino de Souza, 40/Sala 04
CEP 13.230-270 São Paulo, SP
Tel. +55-11-4038-4677 · Fax +55-11-4038-4677
lcpa@picture.com.br

CH

FIBRO GmbH Zweigniederlassung
Buechstrasse 10 · 5027 Herznach
Tel. +41 62-878 18 80 · Fax +41 62-878 18 82
s.weyeneth@bluewin.ch · www.fibro.com

Brütsch/Rüegger AG
In der Luberzen 1 · 8902 Urdorf
Tel. +41-1 736 63 63 · Fax +41-1 736 63 00
central@brw.ch · www.b-r.ch

CL

Bermat S.A.
Coyancura 2283, Of. 601 · Casilla 9781 · Santiago
Tel. +56-2-231 88 77 · Fax +56-2-231 42 94
bermat@bermat.cl · www.bermat.cl

CN

Forsteppe Precision Engineering Co. Ltd.
199-3 LuXing Road · Liuzao Town
Nanhui County · 201322 Shanghai
Tel. +86 21-68 16 01 69 · Fax +86 21-68 16 01 62
ayft@forsteppe.com.hk

Forsteppe Trading (Guangzhou)
Room E, 11/F. · East Tower Tianxing Building
No. 21, Zhongshan First Road · 510600 Guangzhou
Tel. +86 20-87 32 91 29 · Fax +86 20-87 32 82 12
jimmyau@forsteppe.com.hk

CY

Militos Trading Ltd.
K. Erotokritou & A. Demetriou Ltd.
P.O.B. 27297 · 1643 Nicosia
Tel. +357 2-75 12 56 · Fax +357 2-75 22 11
militos@cytanet.com.cy

CZ

Gore s.r.o.
Prístavní 6 · CZ-63500 Brno-Bystrc
Tel. +420 5-41 59 25 18 · Fax +420 5-41 59 25 19
gore@gore.cz · www.gore.cz

SK Technik, spol. s r.o.
Merhautova 20 · 61300 Brno
Tel. +42 0 5-45 42 95 11 · Fax +42 0 5-45 21 12 75
info@sktechnik.cz · www.sktechnik.cz

DK

A/S Erling B. Ibsen
Metalbuen 28 · Postbox 79 · 2750 Ballerup
Tel. +45 44-97 81 11 · Fax +45 44-68 06 26
ibsen@image.dk · www.ebi.dk

BONDY A/S
Industriparken 16-18 · 2750 Ballerup
Tel. +45 7015 1414 · Fax +45 4464 1416

PMC Technology A/S
Klausdalsbrovej 1 · 2860 Søborg
Tel. +45 7021 2121 · Fax +45 7021 2122
info@pmctechnology.dk · www.pmctechnology.dk

DZ

Pneumacoupe Blida Boufarik
86 Bld. Menad Mohamed · Boufarik, 09400 Blida
Tel. +213 3-47 56 55 · Fax +213 3-47 56 55
pneumacoupe@yahoo.fr

EE

Cle Baltik Oue
Laki 9A · 10621 Tallin
Tel. +372 509 3228 · Fax +372 650 7998
roland.rebane@clebaltic.com

EG

Smeco
68, Abdel Rahman El Raffei St.
11351-Heliopolis West, Cairo
Tel. +20 2-620 06 71 · Fax +20 2-620 06 74
smeco@access.com.eg

ES

Daunert Máquinas-Herramientas, S.A.
C/. Tirso de Molina s/n Esqina C/. Albert Einstein
Polígono Industrial Almeda
08940 Cornellá de Llobregat · Barcelona
Tel. +34 93-475 14 80 · Fax +34 93-377 64 64
info@daunert.com · www.daunert.com

FI

OY Christer Lindholm Eng. AB
Santalantie 25, PL. 66 · 10901 Hanko
Tel. +358 19-280 72 00 · Fax +358 19-248 43 23
cle@clegroup.fi · www.clegroup.fi

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FIBRO
GmbH

info@fibro.de
www.fibro.com

Normalien · Standard Parts · Eléments normalisés
Postfach 1120 · D-74851 Hassmersheim
August-Läpple-Weg · D-74855 Hassmersheim
Tel. (+49)6266-73-0*· Fax (+49)6266-73-237

Rundschalttische · Indexing Tables · Plateaux diviseurs
Postfach 1120 · D-74183 Weinsberg
Weidachstrasse 41-43 · D-74189 Weinsberg
Tel. (+49)7134-73-0*· Fax (+49)7134-73-120

Automation+Robotik · Automation+Robotics · Automatisme+robotique
Postfach 1120 · D-74851 Hassmersheim
August-Läpple-Weg · D-74855 Hassmersheim
Tel. (+49)6266-73-0*· Fax (+49)6266-73-213

FR

FIBRO
19/21, rue Jean Lolive · 93170 Bagnolet
B.P. no 129 · 93172 Bagnolet Cedex
Tél. +33 1-43-62-18-80 · Fax +33 1-48-59-17-47
info@fibro.fr · www.fibro.fr

Secteur Franche Comté
Codimec SA
Rue des Maurapans · ZAC de Valentin
BP no. 3051 · 25046 Bésançon Cedex
Tel. +33 3-81-88-83-11 · Fax +33 3-81-88-05-45

GB

Burrhart Machinery Ltd.
Cradock Road · Luton · Beds LU4 0JF
Tel. +44 1582-56 3400 · Fax +44 1582-49 39 93
mail@burrhart.co.uk · www.burrhart.co.uk

W. & H. Eves Ltd.
PO Box 6544 · Burton on Trent DE13 7ZX
Tel. +44 1543-47 34 44 · Fax +44 1543-47 21 52
t.lambon@wheves.co.uk

GR

Mek-Maria Koutseris & Co.
Pyloy 100 · 10441 Athen
Tel. +30 210-522 05 57 · Fax +30 210-522 12 08
mekouts@hellasnet.gr · www.mek.com.gr

HK

Forsteppe Enterprise Ltd.
Unit 207, 2/F · Shing Chuen Industrial Building
25-27 Shing Wan Road
Tai Wai Shatin N.T. (Hong Kong)
Tel. +852-26 01 13 68 · Fax +852-26 01 16 38
angelay@forsteppe.com.hk

HR

Oro-Tech trgovina d.o.o.
Ulica borcev 1/b · SI-2000 Maribor
Tel. +386 2 426 08 43 · Fax +386 2 426 08 44
oro-tech.trgovina@siol.net

HU

Rath & Co. Ges. m.b.H.
Teiritzstraße 3 · AT-2100 Korneuburg
Tel. +43 2 262-608 · Fax +43 2 262-608-60
office@rath-co.at · www.rath-co.at

ID

Pt. Normalindo Tunas Sentosa
Jintanjung Duren Raya 21 A · Jakarta 11470
Tel. +62 21-564 07 18 · Fax +62 21-564 07 19
normalindo@cbn.net.id

IE

K & A Engineering Ltd.
49 Barrack Street · Waterford City
Tel. +353 51-37 82 55 · Fax +353 51-37 90 26
kandaeng1@eircom.net

IL

A. J. Englander 1980 Ltd.
13 Harechev Street · Tel Aviv 67771
Tel. +972 3-537 36 36 · Fax +972 3-537 33 25
info@englander.co.il · www.englander.co.il

IN

Nitoo Sales · Antaral Plot No 464/B/2
Dhotre Marg. Ghaneshkhind Road · Pune - 411016
Tel. +91 20-25 65 62 39 · Fax +91 20-25 65 64 87
nitusale@bom3.vsnl.net.in · www.nitoo.com

NN Combined Engineering Agencies Private Ltd.
Dr. Ranji Block, First Floor
125. M. G. Road · Secunderabad 500003 A.P.
Tel. +91 40-27 84 42 79 · Fax +91 40-27 84 16 52
mail@nncea.com · www.nncea.com

IR

Eximrad Co.
268 Dr. Mofatah Ave. · Tehran 15848
Tel. +98 21-882 12 03 · Fax +98 21-830 97 78
eximrad@yahoo.com

IT

Millutensil S.R.L.
Corso Buenos Aires, 92 · 20124 Milano
Tel. +39 2-29 40 43 90 · Fax +39 2-204 66 77
millut@tin.it · www.millutensil.com

IT

NC Componenti S.R.L.
Via F. Raimondo, 11/B · 10090 Cascine Vica-Rivoli (TO)
Tel. +39 11-957 52 22 · Fax +39 11-957 51 13
info@nccomponenti.it · www.nccomponenti.it

JP

Tomita Co. Ltd.
No. 1-18-16 · 1-Chome Ohmorinaka Ohta-Ku · Tokio
Tel. +81 3-37 65 49 11 · Fax +81 3-37 67 83 77
bando@tomitaj.co.jp

KR

Jinsan Commercial Co. Ltd.
Rm 103, 12 Dong, Anyang Int'L · Circulation Complex
#555-9, Hogye-Dong, Dongan-Gu
Tel. +82 31 479 31 81 · Fax +82 31 479 31 80
jinsan@aftak.com

Jinsung Trading Corp.
Dong Woo Bld. 303
#520-2, 2AV Choryang Dong Gu, Pusan
Tel. +82 51-466-5462/3 · Fax +82 51-466-5464
jstrade@chollian.net

Intech Automation Inc.
13 FL. Jeil Bd., 94-46, Youngdeungpo7-Ga,
Youngdeungpo-ku · Seoul 150-037
Tel. 02-26 32 67 70 · Fax 02-26 32 68 80
intech01@kornet.net

MY

FIBRO Asia Pte. Ltd.
121, Genting Lane, 2nd Floor · Singapore 349572
Tel. +65 68 46 33 03 · Fax +65 68 46 33 02
fibro@pacific.net.sg · www.fibro.com

NL

Item Systems B.V.
Zwarte Zee 40-42 · 3144 DE Maassluis
Tel. +31 10-593 72 60 · Fax +31 10-592 85 38
info@item-systems.nl · www.item-international.com

Jeveka B.V.
Postbus 22966 · Keienbergweg 8
1100 DL-Amsterdam · 1101 GB Amsterdam
Tel. +31 20-342 03 42 · Fax +31 20-342 03 02
info@jeveka.com · www.jeveka.com

NO

Kaspo Maskin AS
Hoeggveien 66 · 7489 Trondheim
Tel. +47 73 96 96 00 · Fax +47 73 96 96 01
kaspo@kaspo.no · www.kaspo.no

Wolf Verktoy
Postboks 602, Busterud · 1754 Halden
Tel. +47 69 17 89 19 · Fax +47 69 17 89 45

PE

Ing. E. Brammertz S.c.r.l.
Av. José Pardo 182 · OF. 905
Apartado 0173 · Miraflores, Lima 18
Tel. +51 1 445 81 78 · Fax +51 1 445 19 31
braming@terra.com.pe

PL

Laska Technika Przemyslowa Sp.z.o.o.
ul. Budowlanych 43 · 43-100 Tychy
Tel. +48 32-326 24 50 · Fax +48 32-326 24 51
laska@laska.com.pl · www.laska.com.pl

PT

Ferrometal Lda.
Estrada Manuel Correia Lopes
Rua da Rosita, Lote 12 · Conceição da Abóboda
2785-543 S. Domingos de Rana-Cascais
Tel. +35 21-444 71 60 · Fax +35 21-444 71 69
ferrometal@mail.telepac.pt

Seri Lda.
Zona Industrial da Varziela
Av. José Ramos Maia – Lote no 3, Apartado 197
4481-911 Vila do Conde
Tel. +35 252 24 85 40 · Fax +35 252 24 85 41
seri.tec@mail.telepac.pt

RO

Proiect Alide Srl
Str. Plaiul Muntelui 22 · Sect. 1 Bucaresti
Tel. +40 21-305 59 54 · Fax +40 21-222 07 03
wtulburean@artelecom.net

SA

Abdullah Yahya Munshi Est
P. O. Box 20123 · 21455 Jeddah
Tel. +966 2-643 62 42 · Fax +966 2-643 62 42
johnkaniamparampil@hotmail.com

SE

Dankab Verktygsmaskiner AB
Box 4002 · 18104 Lidingö
Larsbergsvägen 12b · 18139 Lidingö
Tel. +46 854 44 03 40 · Fax +46 854 44 03 45
info@dankab.se · www.dankab.se

Lideco AB
Verkstadsvägen 4 · 51463 Dalstorp
Tel. +46 321 53 03 50 · Fax +46 321 603 77
info@lideco.se · www.lideco.se

SG

FIBRO Asia Pte. Ltd.
121, Genting Lane, 2nd Floor · Singapore 349572
Tel. +65 68 46 33 03 · Fax +65 68 46 33 02
fibro@pacific.net.sg · www.fibro.com

SI

Oro-Tech trgovina d.o.o.
Ulica borcev 1/b · SI-2000 Maribor
Tel. +386 2 426 08 43 · Fax +386 2 426 08 44
oro-tech.trgovina@siol.net

SK

Gore s.r.o.
Prístavní 6 · CZ-63500 Brno-Bystrc
Tel. +420 5-41 59 25 18 · Fax +420 5-41 59 25 19
gore@gore.cz · www.gore.cz

SK Technik, spol. s.r.o.
Merhautova 20 · 61300 Brno
Tel. +420 5-45 21 16 66 · Fax +420 5-45 21 12 75
info@sktechnik.cz · www.sktechnik.cz

TR

Ender Kesici Ve Teknik · Takimlar Ltd. Sti.
Tersane Caddesi No. 16 · 80000 Karaköy/Istanbul
Tel. +90 212-253 26 00 · Fax +90 212-254 57 91
enderltd@turk.net · www.enderltd.com

Fikret Erdogan ve Ort. Koll. Sti.
Otakçilar Cad. No. 56 · 34050 Eyüp-Istanbul
Tel. +90 212-544 87 53 · Fax +90 212-567 99 66
fikreterdogan@superonline.com

TW

SunNan Enterprises Co. Ltd.
2F, No. 7, Alley 6, Lane 235 · Pao-Chiao Road
Hsin-Tien City · Taipei
Tel. +886 2-29 17 6454 · Fax +886 2-29 11 03 98
s9176454@ms16.hinet.net

US

FIBRO Inc.
139 Harrison Ave. · Rockford, IL 61104
P. O. B. 5924 · Rockford, IL 61125
Tel. +1 815-229 13 00 · Fax +1 815-229 13 03
info@fibroinc.com · www.fibro.com

YU

Andrija Tesic, Dipl. Ing.
Partisanska 12/a-II · 11090 Beograd
Tel. +381 11-533 83 62 · Fax +381 11-533 83 62
atesic@verat.net

ZA

Herrmann & Herrmann Pty. Ltd.
24, Shaft Road · P. O. B. 13030 · Knights 1413
Tel. +27 11 828 01 00 · Fax +27 11 828 60 21
hermstools@mweb.co.za · www.hermstools.com

0 · 17783 · 08/2004 · 24 □

FIBRO GmbH

Standard Parts

Postfach 1120
D-74851 Hassmersheim

August-Läpple-Weg
D-74855 Hassmersheim

Phone +49 6266-73-0*
Fax +49 6266-73-139

e-mail: info@fibro.de
http://www.fibro.de/ com

Indexing Tables

Postfach 1120
D-74183 Weinsberg

Weidachstrasse 41 – 43
D-74189 Weinsberg

Phone +49 7134-73-0*
Fax +49 7134-73-120

e-mail: info@fibro.de
http://www.fibro.de/ com

Automation+Robotics

Postfach 1120
D-74851 Hassmersheim

August-Läpple-Weg
D-74855 Hassmersheim

Phone +49 6266-73-0*
Fax +49 6266-73-213

e-mail: info@fibro.de
http://www.fibro.de/ com

F

FIBRO SARL

BP no 129
93172 Bagnolet Cedex

19/21, rue Jean Lolive
93170 Bagnolet

Téléphone 01 43 62 18 89
Télécopieur 01 48 59 17 46

e-mail: info@fibro.fr
http://www.fibro.fr

USA

FIBRO Inc.

P.O. Box 5924
Rockford, IL 61125

139 Harrison Avenue
Rockford, IL 61104

Phone 815-229 13 00
Fax 815-226 17 65

e-mail: info@fibroinc.com
http://www.fibro.com

SGP

FIBRO ASIA Pte.Ltd.

121 Genting Lane
2nd floor
Singapore 349572

Phone +65-846 33 03
Fax +65-846 33 02

e-mail: fibro@pacific.net.sg
http://www.fibro.com

0-11753-9-5 ◇