

Installation and Operating Instructions

Swivel Unit

Types: SM, SE, SES, SHE





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Translation of Original Installation and Operating Instructions

	 NOTICE
	<p><i>Important! – Read carefully before use – Keep for future reference!</i></p> <p><i>The installation and operating instructions are an integral part of the device and must be available to the operating and maintenance personnel at all times.</i></p> <p><i>The safety information contained in them must be heeded accordingly.</i></p> <p><i>If the device is resold, these installation and operating instructions must always be delivered with it as well.</i></p> <p><i>The latest version is to be found on the Internet at the manufacturer's website: http://www.wagnerautomation.de</i></p>

Warranty and guarantee conditions:

See chapter 6.1, Warranty and guarantee conditions.

The **warning and safety symbols** are explained in chapters 3.1 and 3.1.1.

Translation

If the device is sold to a country in the EEA, these installation and operating instructions must be translated into the language of the country in which the device is to be used. Should the translated text be unclear, the original installation and operating instructions (German) must be consulted or the manufacturer contacted for clarification.

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1.4 Declaration of incorporation

Friedemann Wagner GmbH
Robert-Bosch-Straße 5
D-78559 Gosheim / Germany

Declaration of incorporation

pursuant to the

- EC Machinery Directive 2006/42/EC
- EC EMC Directive 2014/30/EU

We hereby declare that the design of the

Designation	Swivel Unit	
Type:	SM-X-X-190-X-X-X-P	SE-X-X-190-X-X-X-P
	SES-X-X-190-X-X-X-P	SHE-X-X-190-X-X-X-P

as delivered complies with the above directives.

Harmonized DIN EN standards applied pursuant to the Official Journals for the directives:

Directive / Standard	Title
DIN EN ISO 82079-1 :2012	Preparation of instructions for use – Structuring, content and presentation – Part 1: General principles and detailed requirements
2006/42/EC	EC Directive: Machinery <i>effective from 12/29/2009</i>
DIN EN ISO 12100 :2010	Safety of machinery – General principles for design – Risk assessment and risk reduction

- This declaration only applies to the swivel unit in the state in which it was placed on the market.
- The essential health and safety requirements according to Annex I of the Machinery Directive were applied and are fulfilled.
- The following chapters in Annex I of the Machinery Directive 2006/42/EC were considered in the risk assessment:
1.1.2, 1.1.3, 1.1.5, 1.2.6, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.6, 1.3.7, 1.3.8.2, 1.3.9, 1.4.1, 1.4.2.1, 1.5.3, 1.5.4, 1.5.9, 1.5.11, 1.5.15, 1.6.1, 1.6.4, 1.7.1, 1.7.2, 1.7.3, 1.7.4.
- The special technical file according to Annex VII B was compiled and will be presented to the competent national authorities in electronic form on demand.
- The swivel unit may not be put into service until the final machinery into which it is incorporated has been declared in conformity with the provisions of the directives.
- The person authorized to compile the technical documentation is:
Name: Mr. Andreas Wagner
Address: Robert-Bosch-Straße 5, D-78559 Gosheim / Germany

Gosheim, April 2017

.....
Authorized Signature
(A. Wagner, Managing Director)

2 Overview and intended use

2.1 Overview of the device

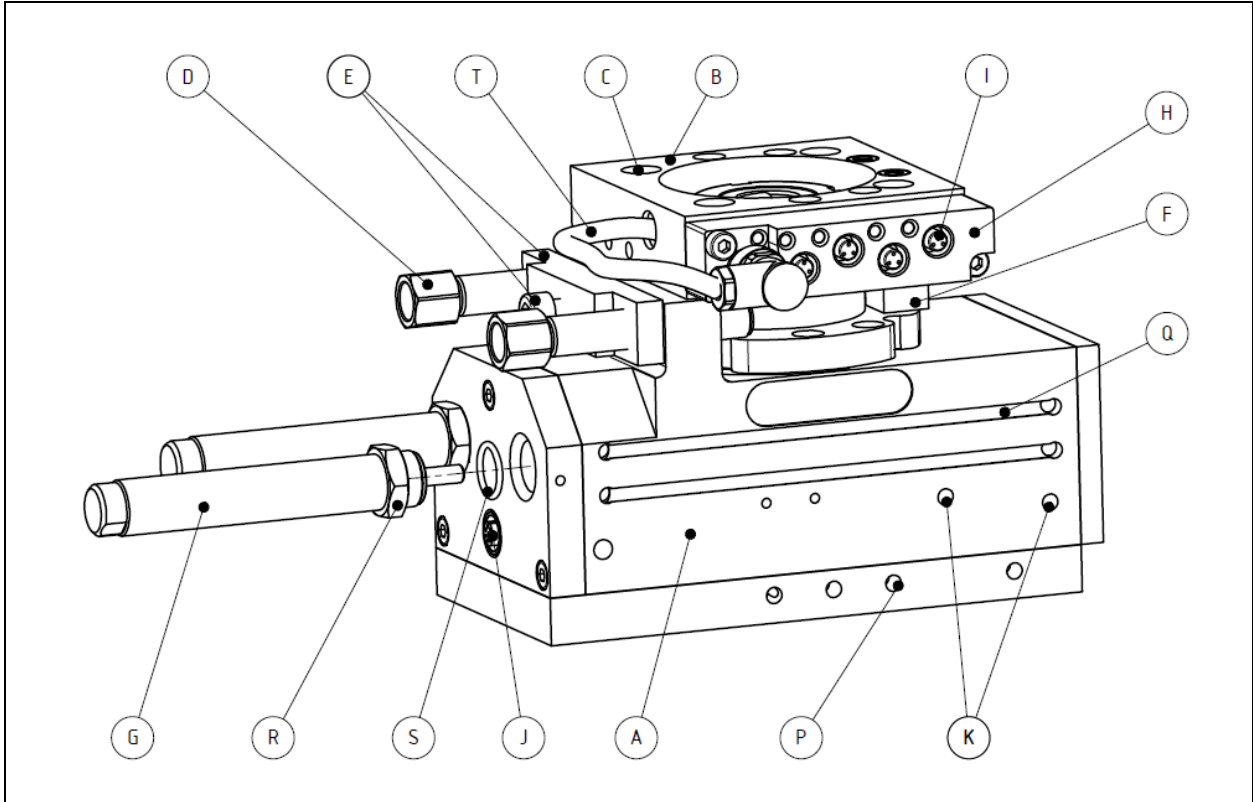




Fig. 2-1 Diagram of the parts of the swivel unit using the SES-6-S-190-H-4-4-P as example

The swivel unit SM, SE, SES, SHE consists of the following main components:	
<p>(A) Housing of high strength aluminum</p> <p>(B) Swivel surface for superstructures</p> <p>(C) Holes for centering rings</p> <p>(D) Stop screws for adjustment of the angle of rotation and as mount for proximity switches - External stop system for high repeatability on a defined toroidal area: both pistons to end position at full power</p> <p>(E) Locking plate with cylinder screw</p> <p>(F) Stop blocks for swivel range, for type SHE-*-A cf. chapter 5.3.5 - Adjustment of swivel range SHE</p>	<p>(G) Shock absorbers (partly included in the delivery or as accessories)</p> <p>(H) Multiway connector</p> <p>(I) M8 sockets, 3-pin (type-dependent)</p> <p>(J) Central cable</p> <p>(K) Air connections</p> <p>(P) Air grommets (type-dependent)</p> <p>(Q) C-slots for proximity switches</p> <p>(R) Hexagonal nut on shock absorber</p> <p>(S) Seal ring on shock absorber</p> <p>(T) Energy feedthroughs (type-dependent)</p>

2.2 Intended use



The swivel units were developed to turn components or superstructures by a defined angle. They are suitable for turning and rotating up to 190° (+/- 95° from center) for assembly work and processing of components.

This device was developed, designed and built exclusively for industrial and light-industrial use. Private use is prohibited.

	 DANGER
	<p><i>This device is intended solely for the purpose described above. Any other use or modification of the device without the written consent of the manufacturer is deemed improper.</i></p> <p><i>Modification without written agreement will lead to serious to deadly injuries. The manufacturer accepts no liability for resultant damage. The risk is borne solely by the operator. The device may only be put into operation when it has been ensured that all safety devices have been installed and are fully functional.</i></p>

Proper use of the device in accordance with its intended purpose includes compliance with the manufacturer's instruction handbooks and operating manuals and performance of all specified maintenance and service work.

Foreseeable misuse:

	 NOTICE
	<p><i>Products that could form explosive dust/air or gas/air mixtures may not be processed in critical concentrations (above LEL)!</i></p> <p><i>The device does not fulfil any EX requirements and may therefore also not be installed and operated in ATEX zones!</i></p> <p><small>*) LEL = Lower Explosive Limit</small></p>

The device is not suitable for use in machining operations, especially of aluminum, titanium and magnesium, as, depending on product compositions, particle sizes, chip sizes and distribution of quantities, potentially explosive atmospheres can result. The final decision on use lies in the end user's judgment.

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2.2.1 Product identification

The type key is laser-engraved on the connection side of the swivel unit. The following table explains the type key:

Module	Design size	Version	Rotation angle	Shock absorber	Energy feedthrough	Drive
SM	4	M	190	K	0-0	-P
SE	6	N	+/- 95° from center	H	2-0	-P
SES	9	S		HS	4-0	-P
SHE		A		4-4	-P	
				6-0	-P	
		M=mini N=normal S=heavy A=stop		K=unavailable H=hydraulic HS=hydr. heavy	0=pneumatic -0=electric	P=pneumatic

2.2.2 Distinguishing features

	Design size	Drive cylinders	Air grommets integrated	Signal lines integrated	Through hole through drive shaft	Hydraulic shock absorber optional	External stop system optional
SM-4-M-190-X-0-0-P	4	2	-	-	●	○	●
SM-4-M-190-X-2-0-P	4	2	2	-	-	○	●
SE-4-N-190-X-0-0-P	4	2	-	-	●	○	●
SE-4-N-190-X-2-0-P	4	2	2	-	-	○	●
SE-4-N-190-X-4-0-P	4	2	4	-	-	○	●
SES-4-S-190-X-0-0-P	4	2	-	-	●	○	●
SES-4-S-190-X-4-0-P	4	2	4	-	●	○	●
SE-6-N-190-X-0-0-P	6	2	-	-	●	○	●
SE-6-N-190-X-4-0-P	6	2	4	-	●	○	●

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SE-6-N-190-X-6-0-P	6	2	6	-	●	●	●
SES-6-S-190-H-0-0-P	6	2	-	-	●	●	●
SES-6-S-190-H-4-0-P	6	2	4	-	●	●	●
SES-6-S-190-H-4-4-P	6	2	4	4	-	●	●
SHE-6-N-190-X-0-0-P	6	2	-	-	-	○	-
SHE-6-A-190-X-0-0-P	6	2	-	-	-	○	●
SE-9-N-190-H-0-0-P	9	2	-	-	●	●	●
SE-9-N-190-H-6-0-P	9	2	6	-	●	●	●
SE-9-N-190-H-6-6-P	9	2	6	6	-	●	●
SES-9-S-190-H-0-0-P	9	2	-	-	●	●	●
SES-9-S-190-H-6-0-P	9	2	6	-	●	●	●
SES-9-S-190-H-6-6-P	9	2	6	6	-	●	●
SHE-9-N-190-X-0-0-P	9	2	-	-	-	○	-
SHE-9-A-190-X-0-0-P	9	2	-	-	-	○	●

2.2.3 Incorporation information (for the partly completed machinery) for the constructor of the final machinery

- Two racks (pistons) inside the unit work in opposite directions by means of compressed air. The translation of the pistons is converted to rotational movement by a toothed shaft. One piston stroke corresponds to the rotation from one end position to the other. As a result of this principle of double pistons, twice the force can be realized in a small space.
- External stops offer full holding force particularly in the end positions, enable high repeatability and absorb forces in the case of incorrect loading, thus not leading to direct destruction of the complete system.
- Control is effected via a 4/2 or 5/2 directional-control valve (not included in the delivery).
- The swivel units can be extended with accessories (shock absorbers, adapter plates, proximity switches, intermediate position units).

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- Some heavy duty versions already contain hydraulic shock absorbers (G) in their standard configuration.
- The external stop system makes it possible in combination with the toothed shaft and the proximity switches positioned in the stop screws to detect bouncing (PLC control detects double acknowledgement when bouncing occurs). The system can thus not only be set exactly, but aging shock absorbers are detected in good time before the whole system suffers.
- Thanks to the centering rings (Z), all superstructures can be fastened easily without the need for external design work.
- The speed can be adjusted freely with an external exhaust regulator.
- Integrated air grommets and signal grommets (depending on the version) enable easy supply of superstructures directly through the swivel unit, with tapping at the swivel surface:
 - free movement of the rotating system with superstructure
 - short hose or cable routes
 - clear design, no obstructing hoses/cables
 - no axial torsion of the hoses (long lifetime)
 - level of freedom through use/closing of multiple pneumatic tapping points at the swivel surface
 - collection of signals on special multiway connectors (IP 67) for central supply
- An existing through hole through the drive shaft can be used for air or signal canalization. This prevents twisting of hoses and cables.
- Depending on the version, the units are already equipped with hydraulic shock absorbers on delivery. Alternatively, shock absorbers can be retrofitted from the accessories range for end-position damping.

After considering the above points, the integrator of the final machinery can put this device into service as a safe device.

He must supply overall instructions for use and a declaration of conformity for the complete machinery and affix a type plate with CE marking to the machinery. The responsibility for the risk assessment for the complete machinery lies internally with the integrator.

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2.3 Technical data

2.3.1 Swivel units

	SM-4-M-190-K/H-0-0-P	SM-4-M-190-K/H-2-0-P	SE-4-N-190-K/H-0-0-P	SE-4-N-190-K/H-2-0-P SE-4-N-190-K/H-4-0-P	SES-4-S-190-K/H-0-0-P	SES-4-S-190-K/H-4-0-P
Integrated air grommet		●		●		●
Integrated signal grommet						
For small installation spaces	●	●				
Heavy duty version					●	●
Repeatability	+/-0.01°	+/-0.01°	+/-0.01°	+/-0.01°	+/-0.01°	+/-0.01°
Drive torque [Nm]	0.3	0, 3	0.94	0.94	1.6	1.6
Max. moment of inertia [kgcm ²]	3.5	3.5	110	110	343	343
Radial load at flange [N]	251.8	251.8	321.2	321.2	502	502
Axial load strain [N]	234.5	199.5	203	203	538.8	538.8
Axial load stress [N]	234.5	234.5	325.5	325.5	538.8	538.8
Swivel time [s]	0.05-0.28	0.05-0.28	0.09-0.58	0.09-0.58	0.2-0.6	0.2-0.6
Weight [kg]	0.24	0.29	0.45	0.55/0.65	0.8	1.1
No. of cylinders	2	2	2	2	2	2
Cylinder Ø [mm]	10	10	14	14	16	16
Air consumption/double stroke [cm ³]	5.4	5.4	14.2	14.2	22.5	22.5
Connection 4-8 bar	M5	M5	M5	M5	M5	M5
Housing material	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized
Stop system material	Hardened steel	Hardened steel	Hardened steel	Hardened steel	Hardened steel	Hardened steel
Stop screw material	Steel	Steel	Hardened steel	Hardened steel	Hardened steel	Hardened steel
Shaft material	ETG-100 burnished	ETG-100 burnished	ETG-100 burnished	ETG-100 burnished	ETG-100 burnished	ETG-100 burnished
Rack material	ETG-100 nitride treated	ETG-100 nitride treated	ETG-100 nitride treated	ETG-100 nitride treated	ETG-100 nitride treated	ETG-100 nitride treated

	SE-6-N-190-K/H-0-0-P	SE-6-N-190-K/H-4-0-P SE-6-N-190-K/H-6-0-P	SES-6-S-190-K/H-0-0-P	SES-6-S-190-K/H-4-0-P	SES-6-S-190-K/H-4-4-P	SHE-6-N-190-K/H-0-0-P
Integrated air grommet		●		●	●	
Integrated signal grommet					●	
For small installation spaces						
Heavy duty version			●	●	●	
Repeatability	+/-0.01°	+/-0.01°	+/-0.01°	+/-0.01°	+/-0.01°	+/-0.03°
Drive torque [Nm]	3.5	3.5	6.5	6	6	2
Max. moment of inertia [kgcm ²]	1164	1164	6000	6000	6000	160
Radial load [N]	738.46	738.46	2493.3	2,493.3	2493.3	1371.68
Axial load strain [N]	280	280	1,662.5	1,662.5	1,662.5	581
Axial load stress [N]	910	910	2,572.5	2,572.5	2,572.5	1137.5
Swivel time [s]	0.3-1.2	0.3-1.2	0.35-2.0	0.35-2.0	0.35-2	0.4-1.8
Weight [kg]	1.1	1.45/1.55	2.6	3.1	3.1	0.75
No. of cylinders	2	2	2	2	2	2
Cylinder Ø [mm]	22	22	25	25	25	20
Air consumption/double stroke [cm ³]	49	49	91	91	91	28

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Connection 4-8 bar	M5	M5	M5	M5	M5	M5
Housing material	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized
Stop system material	Hardened steel	Hardened steel	Hardened steel	Hardened steel	Hardened steel	
Stop screw material	Hardened steel	Hardened steel	Hardened steel	Hardened steel	Hardened steel	Hardened steel
Shaft material	AlZnMgCu0.5 anodized	AlZnMgCu0.5 anodized	ETG100 induction hardened	ETG100 induction hardened	ETG100 induction hardened	42CrMo4 nitride treated
Gear material	42CrMo4 plasma nitrided	42CrMo4 plasma nitrided				
Rack material	ETG-100 nitride treated	ETG-100 nitride treated	ETG-100 nitride treated	ETG-100 nitride treated	ETG-100 nitride treated	ETG-100 nitride treated
	SHE-6-A-190-K/H-0-0-P	SE-9-N-190-H-0-0-P	SE-9-N-190-H-6-0-P	SE-9-N-190-H-6-6-P	SES-9-S-190-H-0-0-P	SES-9-S-190-H-6-0-P
Integrated air grommet			●	●		●
Integrated signal grommet				●		
For small installation spaces						
Heavy duty version					●	●
Repeatability	+/-0.015°	+/-0.01°	+/-0.01°	+/-0.01°	+/-0.01°	+/-0.01°
Drive torque [Nm]	2	12	11	11	24	24
Max. moment of inertia [kgcm ²]	600	34900	34900	34900	64200	64200
Radial load [N]	1371.68	3039	3039	3039	3448.95	3448.95
Axial load strain [N]	581	1622.5	1622.5	1622.5	1622.5	1622.5
Axial load stress [N]	1137.5	3780	3780	3780	3780	3780
Swivel time [s]	0.3-1.5	1.1-3.2	1.1-3.2	1.-3.2	0.7-2,4	0.7-2,4
Weight [kg]	0.84	4.1	5.0	5.0	7	7.8
No. of cylinders	2	2	2	2	2	2
Cylinder Ø [mm]	20	32	32	32	38	38
Air consumption/double stroke [cm ³]	28	170	170	170	318	318
Connection 4-8 bar	M5	G1/8"	G1/8"	G1/8"	G1/8"	G1/8"
Housing material	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized
Stop system material	Hardened steel	Hardened steel	Hardened steel	Hardened steel	Hardened steel	Hardened steel
Stop screw material	Hardened steel	Hardened steel	Hardened steel	Hardened steel	Hardened steel	Hardened steel
Shaft material	42CrMo4 nitride treated	ETG-100 induction hardened	ETG-100 induction hardened	ETG-100 induction hardened	ETG-100 induction hardened	ETG-100 induction hardened
Rack material	ETG-100 nitride treated	ETG-100 nitride treated	ETG-100 nitride treated	ETG-100 nitride treated	16MnCrS5 hardened	16MnCrS5 hardened
	SES-9-S-190-H-6-6-P	SHE-9-N-190-K/H/HS-0-0-P	SHE-9-A-190-K/H/HS-0-0-P			
Integrated air grommet	●					
Integrated signal grommet	●					
For small installation spaces						
Heavy duty version	●					
Repeatability	+/-0.01°	+/-0.03°	+/-0.015°			
Drive torque [Nm]	24	8	8			
Max. moment of inertia [kgcm ²]	64200	2800	4800			
Radial load [N]	3448.95	2834.41	2834.41			
Axial load strain [N]	1622.5	1085	1085			
Axial load stress [N]	3780	2292.5	2292.5			
Swivel time [s]	0.7-2,4	0.5-2,0	0.4-1,8			

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	SES-9-S- 190- H-6-6-P	SHE-9-N- 190- K/H/HS-0-0-P	SHE-9-A- 190- K/H/HS-0- 0-P			
Weight [kg]	7.8	2.73	2.93			
No. of cylinders	2	2	2			
Cylinder Ø [mm]	38	32	32			
Air consumption/double stroke [cm ³]	318	101	101			
Connection 4-8 bar	G1/8"	G1/8"	G1/8"			
Housing material	High strength aluminum, anodized	High strength aluminum, anodized	High strength aluminum, anodized			
Stop system material	Hardened steel		Hardened steel			
Stop screw material	Hardened steel	Hardened steel	Hardened steel			
Shaft material	ETG-100 induction hardened	42CrMo4 nitride treated	42CrMo4 nitride treated			
Rack material	16MnCrS5 hardened	ETG-100 nitride treated	ETG-100 nitride treated			

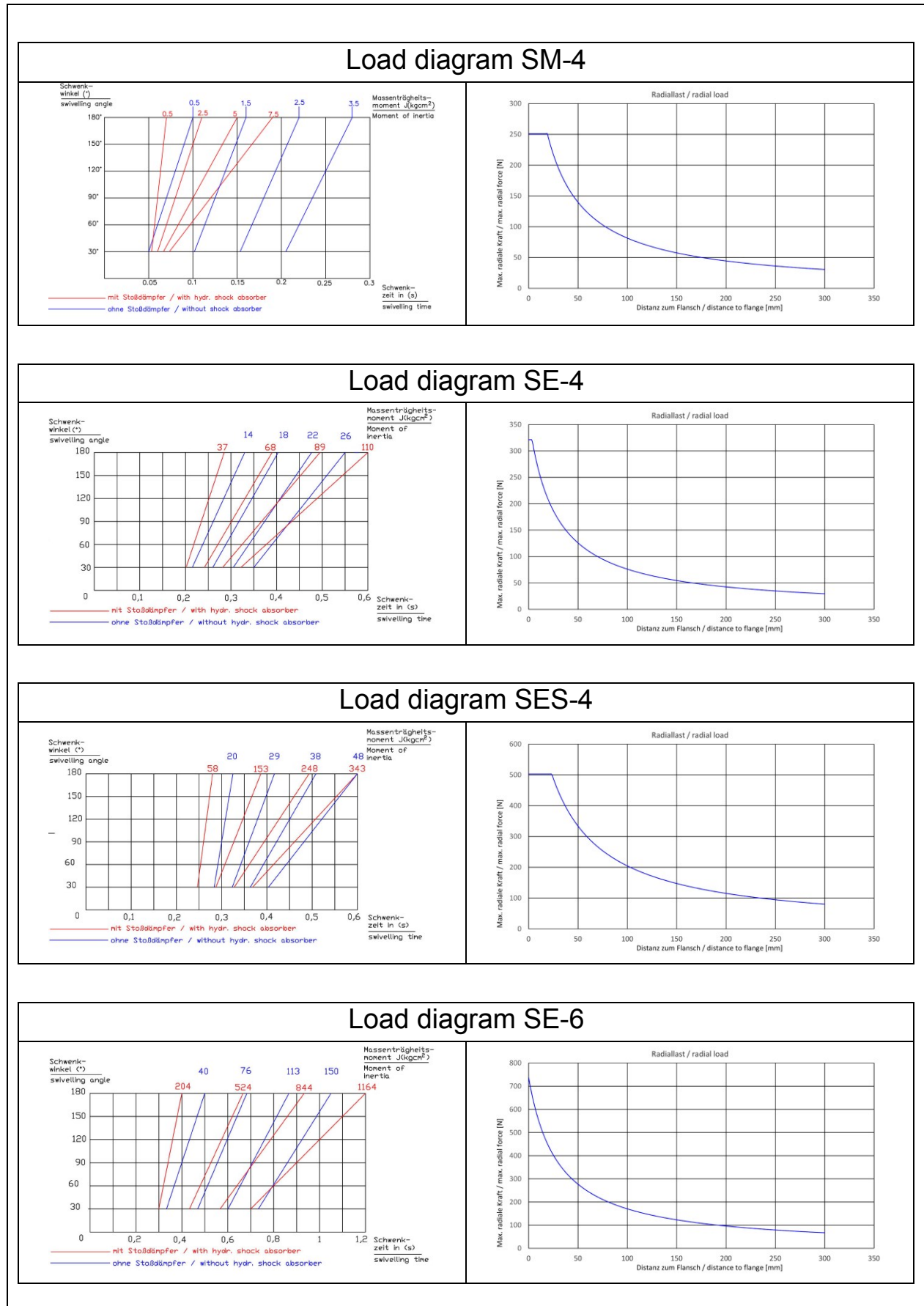
- Freely adjustable angle of rotation 190° (+/-95° from center)
- Drive compressed air 4-8 bar, filtered and dry
- Control via 4/2 or 5/2 directional-control valve, bistable
- Continuous sound pressure level < 70 db (A)

2.3.2 Environmental conditions

- Operation only in closed rooms and low-vibration environments (no potentially explosive or condensing atmospheres).
- No operation in environments with spray water, vapors, process dusts or abrasion dusts.
- Swivel units with proximity switches should not be used in areas with static discharges, high-frequency oscillations or strong magnetic fields. Otherwise it can happen that the proximity switches for recognition of the end positions deliver wrong signals.
- The swivel units are only suitable for use in environments with spray water to a limited extent. It might be necessary to protect them against ingressing spray water with a suitable cover.

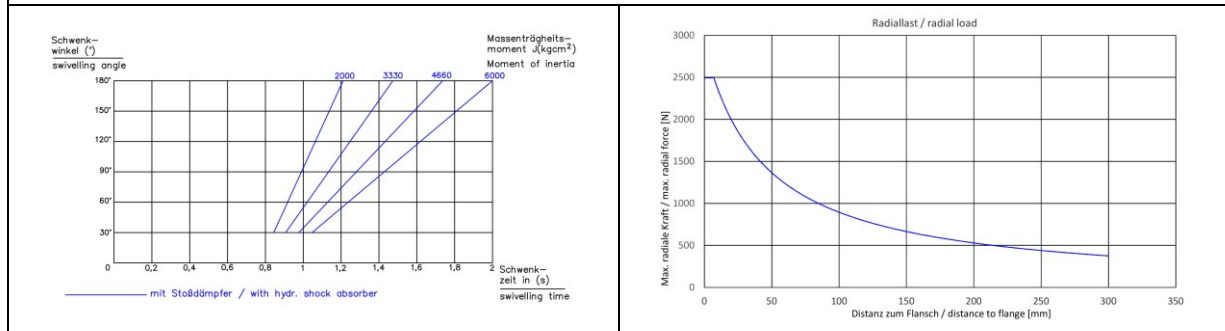
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2.3.3 Characteristics

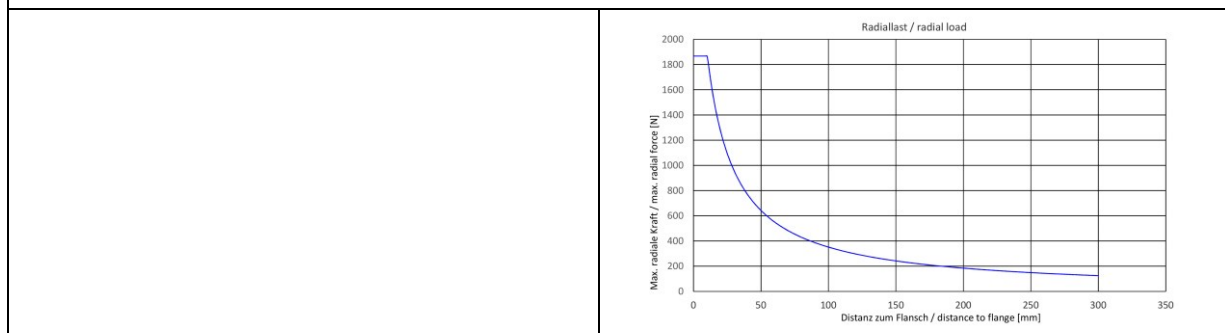


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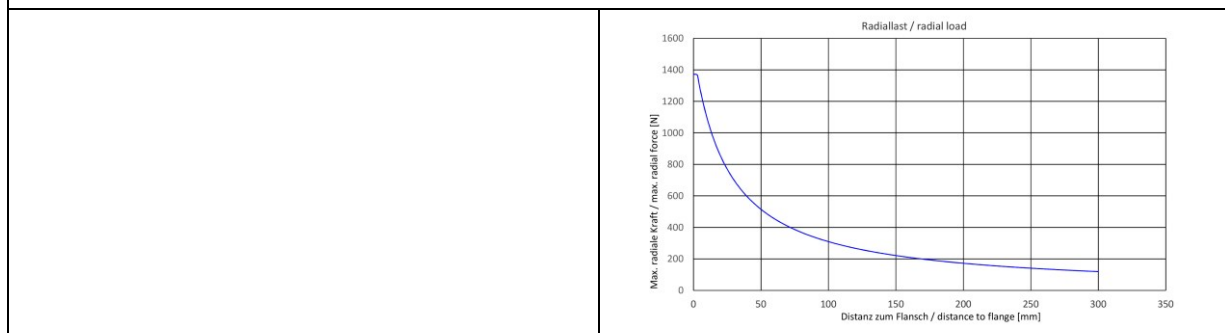
Load diagram SES-6



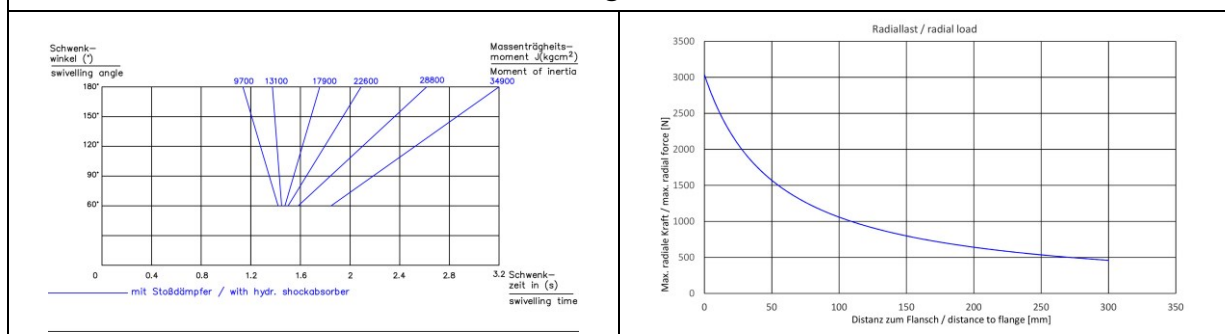
Load diagram SHE-6-N



Load diagram SHE-6-A



Load diagram SE-9



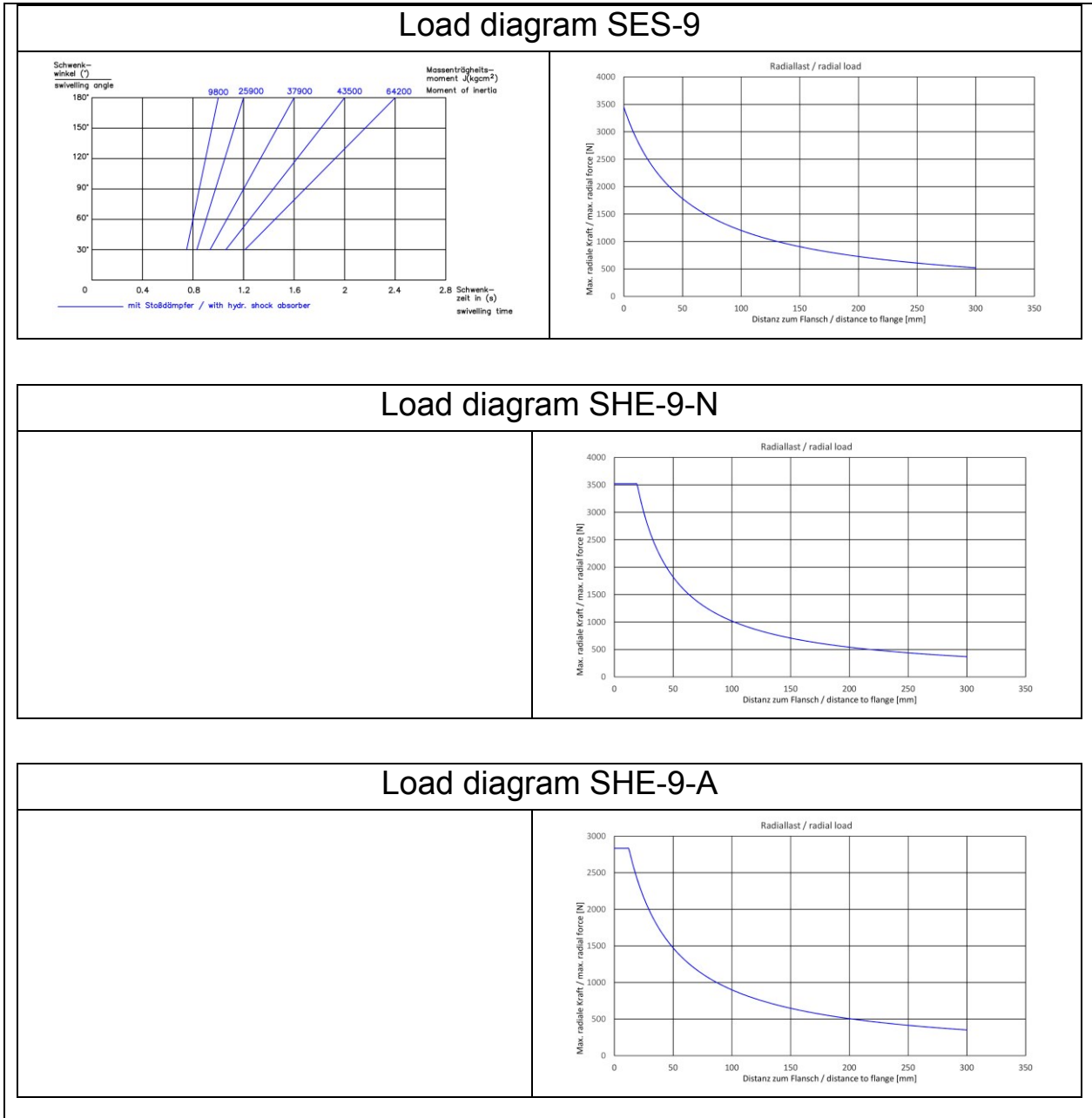


Fig. 2-2 Characteristics

2.3.4 General data

Operating temperature range:



Temperature range device: + 5° ... + 65° C
 Relative air humidity: max. 70 %, non-condensing



Storage conditions:



Minimum temperature: - 10° C
 Maximum temperature: + 50° C
 Relative air humidity: max. 70 %, non-condensing



3 Safety



3.1 Notes and explanations

		DANGER
	<p>“DANGER” warns of dangerous situations. Avoid these dangerous situations! Otherwise serious injuries or death will result.</p>	

		WARNING
	<p>“WARNING” warns of dangerous situations. Avoid these dangerous situations! Otherwise serious injuries or death can result.</p>	

		CAUTION
	<p>“CAUTION” in combination with the warning symbol warns of dangerous situations. Avoid these dangerous situations! Otherwise minor or light injuries could result.</p>	

		NOTICE
	<p>“NOTICE” gives recommendations on how to proceed. Ignoring these recommendations will not lead to personal injuries. Follow the recommendations to avoid damage to the unit and problems in general!</p>	

		NOTICE
	<p>References to installation and operating instructions / documentation are marked with a book symbol (see external documentation). Follow the recommendations to avoid damage to the unit and problems in general!</p>	

3.1.1 Explanation of safety symbols used

		DANGER
<p>Crushing hazards, dangers of injuries to the hands (closing movements of mechanical parts).</p> <p>Ignoring this warning will result in serious injuries or death. Do not carry out any manual work on such parts during movements.</p>		
		WARNING
<p>Mandatory: Safety boots must be worn.</p> <p>Ignoring this warning could result in serious injuries or death. Take note of the dangers to the lower limbs.</p>		
		WARNING
<p>Mandatory: Protective gloves must be worn.</p> <p>Ignoring this warning could result in serious injuries or death. Take note of the dangers to the hands.</p>		
		WARNING
<p>Mandatory: Hands must be washed.</p> <p>Ignoring this warning could result in serious injuries or death. Take note of the dangers due to deficient hygiene.</p>		
		NOTICE
<p>The environment sign marks actions to protect the environment (warning of environmental pollution, in the chapter Disposal).</p> <p>Damage to the environment will result if ignored. Improper disposal can result in serious damage to the environment.</p>		

3.2 Safety precautions (to be carried out by the operator)

- ▶ The swivel units may only be installed, serviced and modified by qualified skilled personnel. This personnel must have read and understood the operating instructions.
- ▶ The energy and compressed air supply must be disconnected from the swivel unit before any service, maintenance or modification work. Make sure there are no residual energies present.
- ▶ Only use the swivel unit if it is in perfect technical condition and do not carry out any unauthorized modifications.
- ▶ The swivel units can be heavy. Secure them so that they cannot fall down.
- ▶ In the event of an emergency, malfunction or other irregularity, switch off the swivel unit, disconnect it from the energy and compressed air supply and lock against reconnection.
- ▶ Carry out a visual inspection of the compressed air lines regularly. Operation with damaged compressed air lines is prohibited.
- ▶ Make sure that the technical specifications and environmental conditions specified in the product documentation are adhered to.
- ▶ The swivel unit may only be operated in accordance with its intended use.
- ▶ Take note of the valid regulations on accident prevention and environmental protection.
- ▶ Implement the safeguards required by EC directives.
- ▶ Pressurize your complete equipment with compressed air slowly to avoid uncontrolled movements.
- ▶ Only put your equipment into service if you are sure that no personnel or foreign objects can be caught by the moving parts.

3.3 Safety inspections and tests



Factory inspections and tests by the manufacturer.

1. Risk assessment according to Machinery Directive 2006/42/EC (to Annex I) and to DIN EN ISO 12100:2010.

4 General warnings

4.1 Dangers

The safety systems and safety instructions described in these installation and operating instructions are to be heeded accordingly.



		DANGER
	<p><i>Pay attention to the possible danger of injuries to the hands and/or body when carrying out adjustment, maintenance and repair work!</i></p> <p>Otherwise serious injuries or death will result.</p> <p><i>The machine builder must implement safety equipment to ensure safe operation.</i></p>	

4.2 Spare and wearing parts

Spare parts and accessories that have not been supplied by us have also not been tested and approved by us. The fitting and/or use of such products could therefore negatively affect the design characteristics of your device.

We accept no liability whatsoever for damage arising from the use of non-original parts and accessories.

Standard parts can be bought through the specialized trade.

		NOTICE
	<p>Lists of spare and wearing parts are to be found in the <i>technical reference material</i>.</p> <p><i>Significant damage to the unit can result if the technical reference material is ignored and/or deviant parts are used.</i></p>	

Service

When necessary, these parts can be obtained from:

Friedemann Wagner GmbH
 Robert-Bosch-Straße 5
 D-78559 Gosheim / Germany
 Telephone: +49 (0) 7426 / 94900-0
 Fax: +49 (0) 7426 / 94900-9
 Email: info@wagnerautomation.de

5 Installation

5.1 Scope of delivery

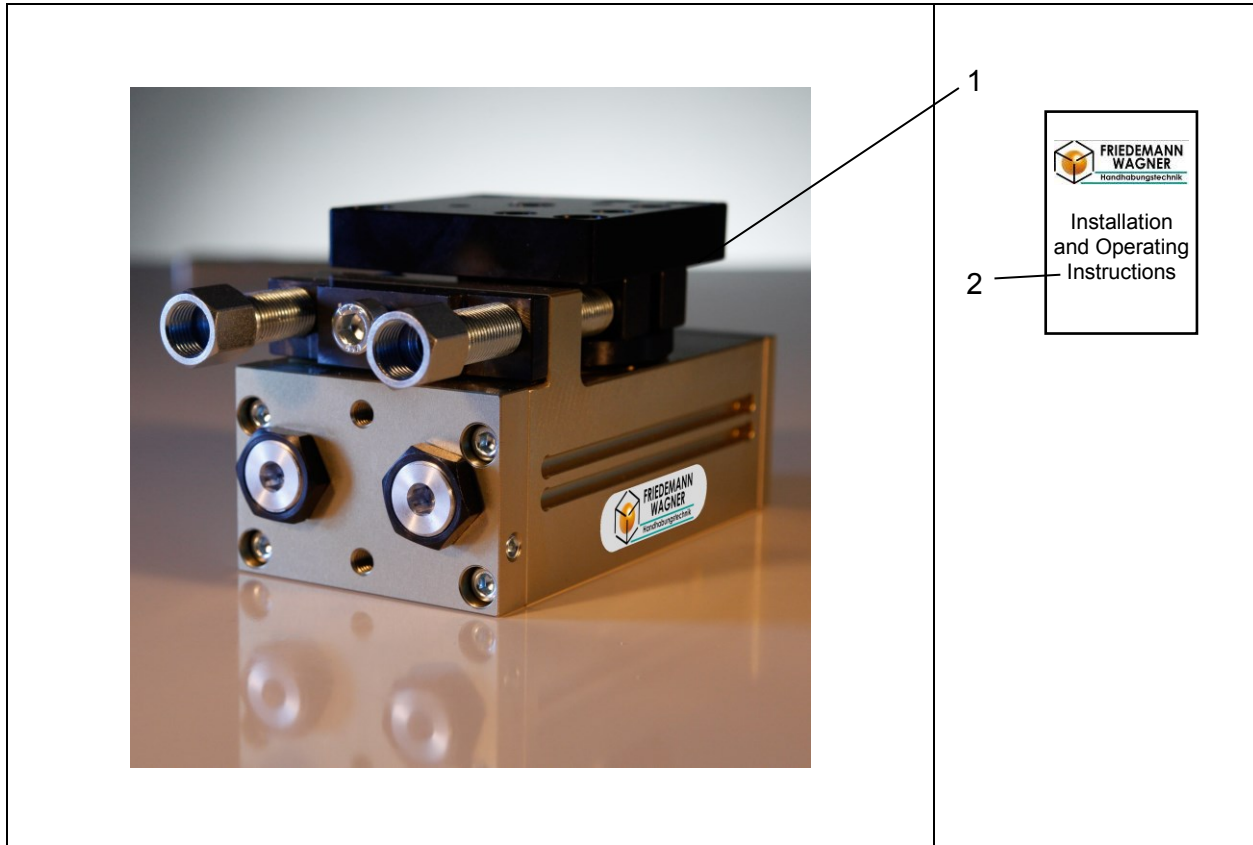


Fig. 5-1 Scope of delivery of the device

The scope of delivery comprises:

- 1 Swivel unit including base construction
- 2 These installation and operating instructions with declaration of incorporation
- 3 Centering ring
- 4 Cardboard packaging
- 5 For SM-4-X: Screws with flat cylinder head for mounting of the superstructure on the slim swivel surface
- 6 From SES-6: 5 m connection cable, 8-pin, straight connector

5.2 Transport and packaging

The customer is sent a specification of the scope of delivery before shipment begins. It contains details on:

- date of delivery,
- number and type of transport units.

The devices are carefully inspected and packed before shipment, but it is nevertheless still possible that they might become damaged during transit.

5.2.1 Delivery (also of spare and replacement parts)

Receiving inspection:

- Check the shipment against the delivery note to ensure that it is complete!

If the packaging is damaged

- Check the shipment itself for damage (visual inspection)!

Complaints

If the shipment was damaged during transit:

- Immediately contact the last carrier!
- Keep the packaging material (for possible inspection by the carrier or for return shipment).

Packaging for return shipment



Use the original packaging material as far as possible.

Swivel Unit Type: SM, SE, SES, SHE

5.2.2 Temporary storage/Storage conditions

The freight packaging of the device and spare and replacement parts is designed for a storage period of 3 months from delivery.



After dismantling of the device, it must be stored properly to enable reuse.

		NOTICE
	<p><i>Temporary storage: Store with desiccant in a dry factory hall.</i></p> <p>Otherwise the unit will be damaged.</p> <p><i>Moisture could penetrate into the device and cause major damage.</i></p>	



Storage conditions

- See chapter 2.3.4, Technical data
- No direct sunlight.
- No exposure to direct rain, condensation, water.

5.3 Mounting



		WARNING
	<p><i>Disconnect the swivel unit from the compressed air supply and lock against reconnection.</i></p> <p>Otherwise light to serious injuries can result.</p> <p><i>Avoid these dangerous situations!</i></p>	

5.3.1 Mounting of the swivel unit and adjustment of the rotation range

		NOTICE
	<p>If the swivel unit is not mounted horizontally, it must be checked whether the torque and end-position damping suffice for the respective application in question.</p>	



- ▶ Place at least 2 diagonally offset centering rings (Z) (are included in the delivery) in the holes (C) provided.
- ▶ In some cases there are mounts available for different centering ring sizes. In these cases the mounts opposite each other should be used.

- ▶ Screw the swivel unit tight.

		NOTICE
	<p><i>If a centering ring (Z) is stuck in a hole, you can remove it from the hole easily with a threaded screw. The centering rings have an internal thread specifically for this purpose. Simply screw a suitable screw into the thread of the centering ring and pull the screw plus centering ring out of the hole.</i></p>	

Centering ring	Internal thread
ZR-4	M5
ZR-6	M8
ZR-9	M10



5.3.2 Mounting of superstructures



		WARNING
	<p>Disconnect the swivel unit from the compressed air supply and lock against reconnection.</p> <p><i>Otherwise light to serious injuries can result.</i></p> <p><i>Avoid these dangerous situations!</i></p>	



- ▶ Fasten the superstructures with screws in the threaded holes (C) provided.
- ▶ Pay attention to the scope of delivery (chapter 5.1) of swivel units of the type SM-4-X.



Swivel Unit Type: SM, SE, SES, SHE

5.3.3 Connection examples



		WARNING
	<p>Disconnect the swivel unit from the compressed air supply and lock against reconnection.</p> <p>Otherwise light to serious injuries can result.</p> <p><i>Avoid these dangerous situations!</i></p>	

		NOTICE
	<p>The following figures show connection examples and illustrate how the swivel unit can be connected.</p>	

		NOTICE
	<p><i>A function check must be carried out with compressed air after connection.</i></p>	

		NOTICE
	<p><i>Pressurization of the connections achieves the following movements:</i></p>	
	Connection	Direction of plate rotation
	<i>Top</i>	<i>Anticlockwise</i>
	<i>Bottom</i>	<i>Clockwise</i>
	Connections on the long side	
	<i>Left</i>	<i>Anticlockwise</i>
	<i>Right</i>	<i>Clockwise</i>
	<i>*Exceptions</i>	
	SE-6-N-*	
<i>Top</i>	<i>Clockwise</i>	
SHE-6-*/SHE-9-*, connection per piston		
<i>A</i>	<i>Anticlockwise</i>	
<i>B</i>	<i>Clockwise</i>	

5.3.3.1 Example of standard pneumatic connection

		NOTICE
	<p><i>Please note that we recommend a different standard circuit when using intermediate position units. (Cf. chapter 5.5.1, Use of intermediate position units)</i></p>	

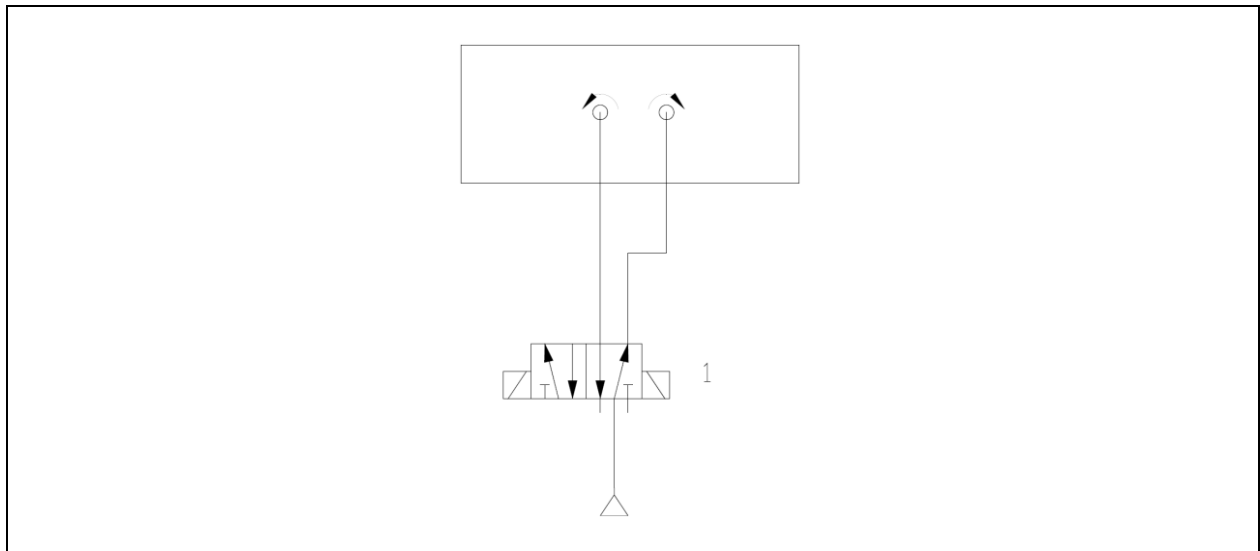






Fig. 5-2 Standard circuit

- A. Compressed air connection (left, cf. table)
- B. Compressed air connection (right, cf. table)
- 1. 5/2 control valve, bistable
- 2. Proximity switches in stop screws, C-slots or threaded holes

5.3.3.2 Example of pneumatic connection with EMERGENCY STOP circuit

		WARNING
	<p><i>In the event of a sudden loss of pressure the payload can drop uncontrolled into one end position. To prevent this, piloted non-return valves are recommended.</i></p> <p><i>Otherwise light to serious injuries can result.</i></p> <p><i>Avoid these dangerous situations!</i></p>	

		NOTICE
	<p><i>Please note that suitable emergency stop systems (e.g. systematic shutdown) and restart systems (e.g. correct valve switching sequence, pressure buildup valves) are needed for pneumatic actuators. Unwanted blocking of the compressed air supply can lead to unwanted situations.</i></p>	

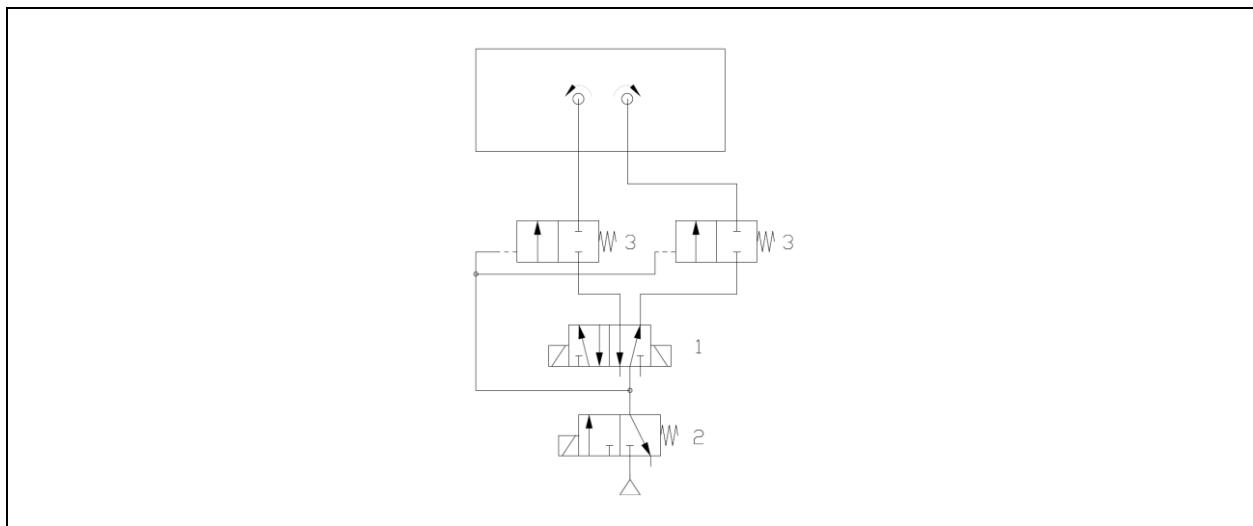




Fig. 5-3 *Emergency stop circuit*



- A. Compressed air connection (left, cf. table)
- B. Compressed air connection (right, cf. table)
- 1. 5/2 control valve, bistable
- 2. 3/2 control valve, monostable / emergency stop
- 3. Piloted non-return valve



Proximity switches in stop screws, C-slots or threaded holes

Swivel Unit Type: SM, SE, SES, SHE

5.3.4 Adjustment possibilities for the swivel unit

		NOTICE
	<p>Except for swivel units of the type SHE-X-N, the end position is realized with external stops and not via the racks. Under no circumstances should the racks lie against or on the end plates, shock absorber systems or screw plugs after changes. This will lead to damage to the unit.</p>	

		NOTICE
	<p>In many cases the adjustment can be made easily and exactly with the stop screws.</p>	

		NOTICE
	<p>After adjustment, carry out the first two rotational movements to end position manually, also in order to align the rotatable stop blocks on the toroidal area of the screws.</p>	

5.3.5 Adjustment of the rotation/swivel range with external stop system

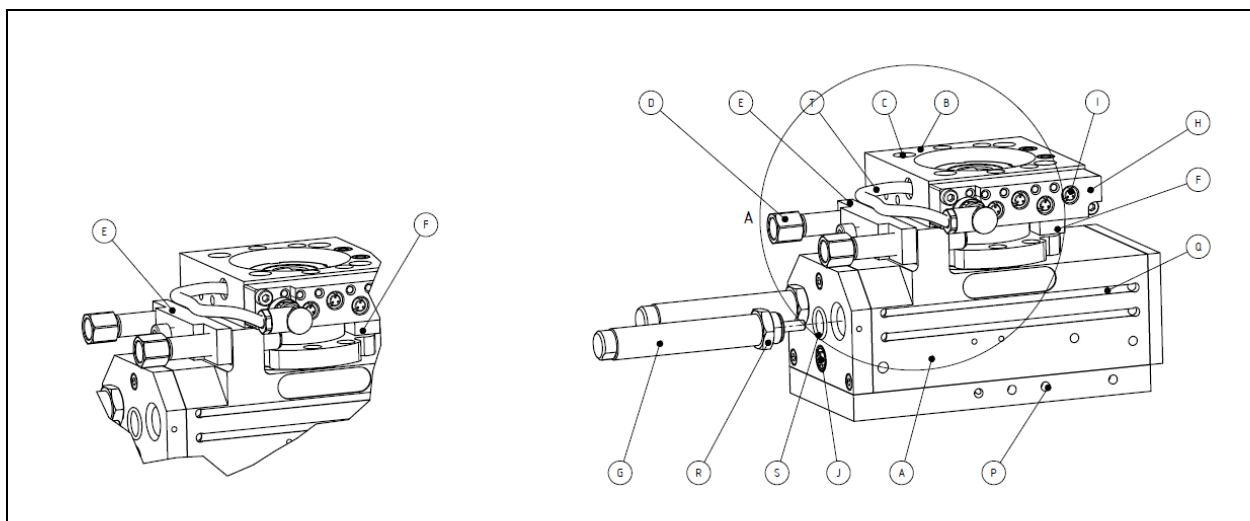


Fig. 5-4 Rotation/Swivel range with external stop system

- ▶ Loosen the cylinder screw that fastens the locking plate (E).
- ▶ Set the swivel range with the stop screws (D).
- ▶ The stop blocks (F) are mounted such that they can rotate and can be adjusted plane-parallel to the toroidal area of the stop screws.

Swivel Unit Type: SM, SE, SES, SHE

- ▶ Tighten the cylinder screw of the locking plate (E) again.
- ▶ Depending on the length of the screw or swivel position, the end position can also be fixed by moving the stop blocks.
 - To do so, screw a suitable screw into the internal thread of the pin of the stop block from above and remove the pin upwards.
 - Move the stop block together with the O-ring to a suitable point and fasten it again with the pin.
 - Later fine adjustment is performed by loosening the locking plate (E) and adjusting the stop screws (see above).

5.3.5.1 Adjustment of the rotation/swivel range for SHE-X-N

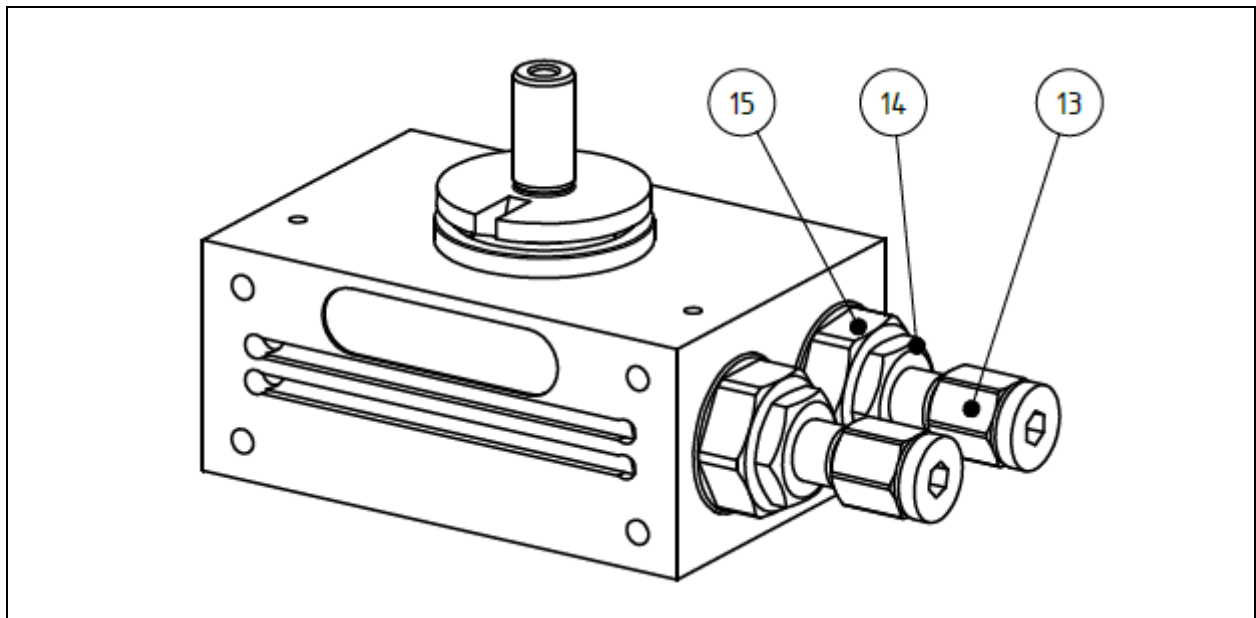


Fig. 5-5 Adjustment of the rotation/swivel range for SHE-X-N

- ▶ Loosen the lock nut (14) of the stop screw (13) in the extension of the piston.
- ▶ Set the swivel range and tighten the lock nut (14) again.

Swivel Unit Type: SM, SE, SES, SHE

5.3.5.2 Adjustment of the rotation/swivel range for SHE-X-A

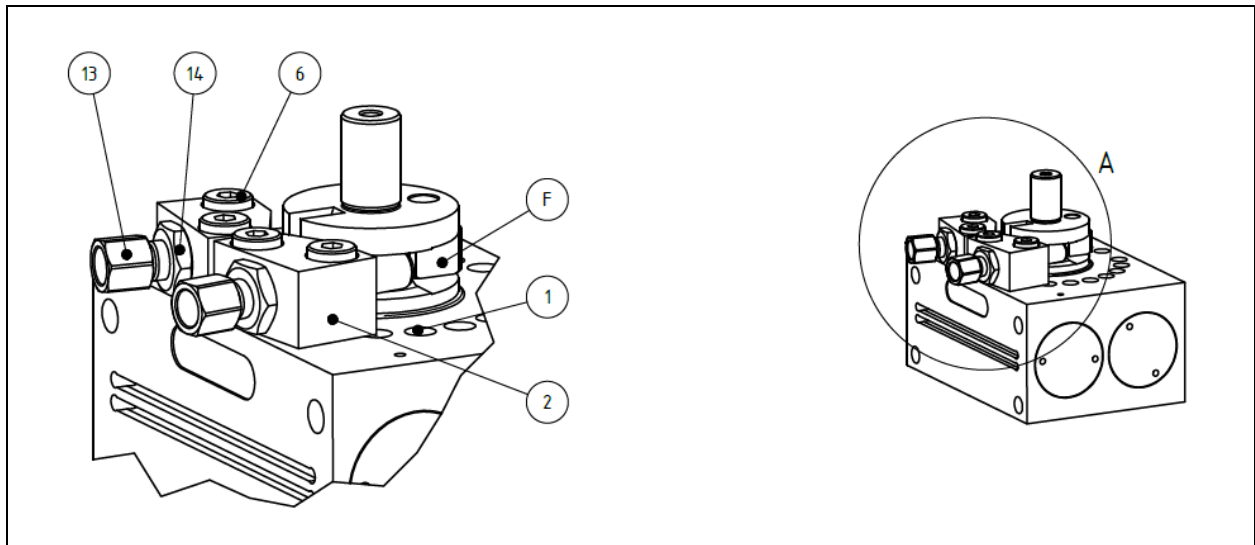


Fig. 5-6 Adjustment of the rotation/swivel range for SHE-X-A

- ▶ The stop system (2) consists of stop screws (13) fastened in blocks on top of the housing. The stop surface is a spring-assisted rocker (F) that makes it possible for the mounting surface to remain defined even after adjustment of the stops.
- ▶ Depending on the length of the screw or swivel position, the end position can also be fixed by moving the stop system (2).



SHE-6	SHE-9
Loosen the lock nut (14) and screw the screw (13) back. Unscrew the screw (6) from the mounting block and remove the block connected by cylinder pins upwards.	To do so, turn the two fitting screws (6) out of the mounting block.

- ▶ Move the block (2) to a suitable point (e.g. (1)) and fasten it again.
- ▶ Fine adjustment is performed later by adjusting the stop screws (13) with the help of the lock nuts (14).

5.3.5.3 Integration

Integrated air grommets and signal grommets (depending on the version) enable easy supply of superstructures directly through the swivel unit, with tapping at the swivel surface:

- free movement of the rotating system with superstructure
- short hose or cable routes
- clear design, no obstructing hoses/cables
- no axial torsion of the hoses (long lifetime)
- level of freedom through use/closing of multiple pneumatic tapping points at the swivel surface
- collection of signals on special multiway connectors for central supply



		NOTICE
	<p><i>Existing through holes in the drive shaft can, depending on the diameter, also be used for air and signal feedthrough. This prevents twisting of hoses and cables.</i></p> <p><i>It might be necessary for you to fabricate adapter plates for mounting of peripherals that route the hoses/cables in a slot on top of the plate.</i></p>	

5.3.5.4 Air grommets

Connect the compressed air supply hoses to the connections on the housing (identifier A, B, etc.).

Connect the mounted peripherals by tapping the air for the peripherals directly at the swivel plate in accordance with the corresponding letter for the supply.

Some systems have additional tapping points that can be opened/blocked, thereby enabling high flexibility.

		NOTICE
	<p><i>Malfunctions will occur if compressed air openings are not blocked. Therefore make sure that unused connection possibilities are blocked.</i></p>	

Swivel Unit Type: SM, SE, SES, SHE

5.3.5.5 Signal grommets

Connect the signal transmitters via the 3-pin sockets on the multiway connector.

The multiway connector (IP 67) collects the signals in a round plug and passes them through the unit to a socket. From there they can then be forwarded, e.g. to the controller.

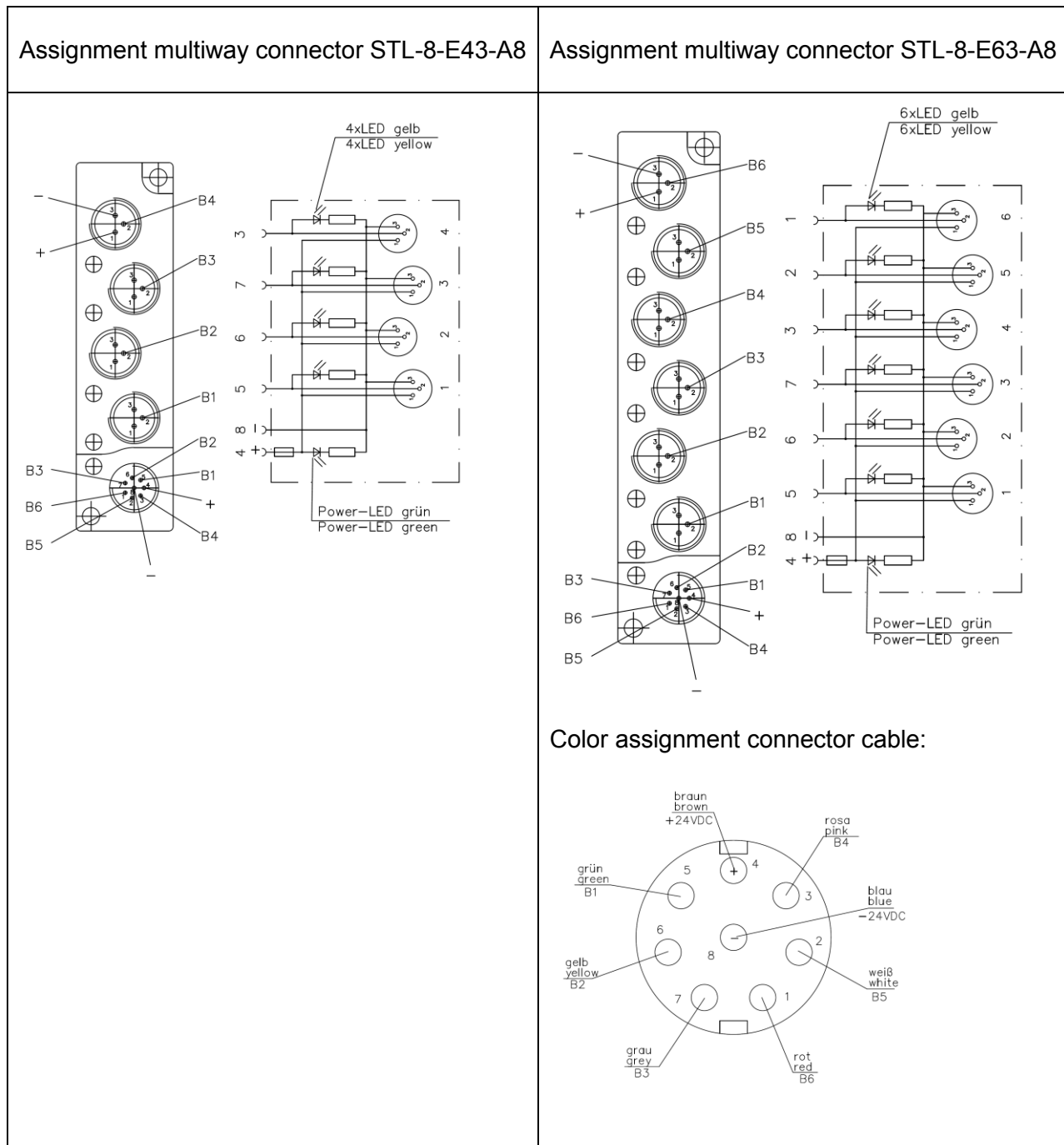




Fig. 5-7 Assignment multiway connectors and connector cable



5.4 Set speed

		WARNING
	<p><i>Take special care whenever carrying out adjustment work and keep sufficiently far away from danger zones.</i></p> <p><i>Otherwise light to serious injuries can result.</i></p> <p><i>Wear personal protective equipment such as gloves or safety glasses if necessary.</i></p>	



The speed and damping action must be adjusted to each other such that the movement is decelerated softly. The setting depends on the cycle times that are to be achieved.



The speed can be adjusted to the load by an external exhaust regulator. If the regulator is set too fast, this will cause hard stopping and bouncing. This can also have a negative effect on the lifetime of the swivel unit and even result in destruction of its mechanical components.

5.4.1 Set shock absorber

		WARNING
	<p><i>Take special care whenever carrying out adjustment work and keep sufficiently far away from danger zones.</i></p> <p><i>Otherwise light to serious injuries can result.</i></p> <p><i>Wear personal protective equipment such as gloves or safety glasses if necessary.</i></p>	

The strength of the shock absorber must be adjusted to the load. If the shock absorber (G) is set too soft, this will cause hard stopping and bouncing. This can also have a negative effect on the lifetime of the swivel unit and even result in destruction of its mechanical components.

		NOTICE
	<p><i>If shock absorbers are included on delivery, they are merely pre-set. It is very likely that the damping action needs to be set softer or harder to meet the requirements of the application in question.</i></p>	

		WARNING
	<p><i>Work may only be carried out by specially trained personnel because the device is pressurized.</i></p> <p><i>Otherwise light to serious injuries can result.</i></p> <p><i>Avoid these dangerous situations!</i></p>	

- ▶ Depending on the mass being moved and the rotational speed, there are kinetic energies in the system that are absorbed by hydraulic shock absorbers.
- ▶ Some swivel units are already equipped with shock absorbers on delivery (cf. table in the technical data).
- ▶ To mount the shock absorber (G), turn the swivel plate until the racks are in the set end positions.
- ▶ Loosen the two screw plugs for mounting of the absorbers and unscrew them from the housing.
- ▶ For the units SHE-6-* and SHE-9-*, the cylinder cover must be replaced with a cylinder cover with internal thread (shock absorber cover) for mounting of the shock absorber.
- ▶ Screw in the adjustable shock absorber (G) until its system rests on the rack (make full use of the shock absorber's stroke).
- ▶ Then screw the shock absorber (G) out again by at least half a revolution and lock it with the hexagonal nut (R). Make sure that the seal ring (S) is positioned under the nut.
- ▶ The action of the shock absorber can be influenced/set by screwing in or out. This is particularly necessary when shock absorbers that cannot be adjusted externally are used.
- ▶ Proceed in the same way to mount the second shock absorber.
- ▶ Pressurize the system with compressed air and let the swivel unit drive into the end positions. Adjustment is correct when the end positions are reached without visible delay and without bouncing back.
- ▶ To dismount to replace the shock absorber (G), loosen the hexagonal nut (R) and unscrew it. Carry out the above-mentioned steps.

Swivel Unit Type: SM, SE, SES, SHE

Shock absorbers											
	STD-10-S	STD-12-M	STD-14-W	STD-14-H	Shock absorber cover 26-14	STD-20-H	STD-25-W	STD-25-M	STD-25-H	Shock absorber cover 40-14	Shock absorber cover 40-25
Swivel units											
SM-4-M-190-*	•										
SE-4-N-190-*		•									
SES-4-S-190-*			•								
SE-6-N-190-*			•								
SES-6-S-190-*				•							
SHE-6-X-190-*			•		•						
SE-9-N-190-*							•				
SES-9-S-190-*								•			
SHE-9-X-190-*				•*			•*		•	•*	•*
ZWP-4-SE-20-*		•									
ZWP-4-SES-20-*											
ZWP-6-SE-20-*			•								
ZWP-6-SES-20-*				•							
ZWP-9-SE-20-*				•							
ZWP-9-SES-10-*						•					

*By choosing a different shock absorber cover, the SHE-9- can also be equipped with an absorber that, due to the dimension D=25 mm, can dampen higher masses.

Swivel Unit Type: SM, SE, SES, SHE

Technical data

Type	STD-10-S	STD-12-M	STD-14-W	STD-14-H	STD-20-H	STD-25-W	STD-25-M	STD-25-H
Fastening	M10x1	M12 x 1	M14 x 1	M14 x 1	M20x1.5	M25 x 1.5	M25 x 1.5	M25 x 1.5
Stroke	8 mm	10 mm	12 mm	12 mm	15 mm	25 mm	25 mm	25 mm
Impact speed (min./max.)	1.8-3.5 m/s	-0.8-2.2 m/s	0.4/5.0 m/s	0.2-2 m/s	0.2-1.2 m/s	1.8-4 m/s	0.8/2.2 m/s	0.2/1.2 m/s
Absorption	10 Nm	18 Nm	30 Nm	30 Nm	80 Nm	100 Nm	210 Nm	210 Nm
Damping work max.	18,000 Nm/h	33,000 Nm/h	50,000 Nm/h	50,000 Nm/h	80,000 Nm/h	80,000 Nm/h	120,000 Nm/h	120,000 Nm/h
Material	Steel							
Weight	0.025 kg	0.035 kg	0.065 kg	0.065 kg	0.135 kg	0.3 kg	0.3 kg	0.3 kg

The damping characteristic of absorbers of the type **STD-14** can be adjusted per adjusting screw.

For the rest, the action of the absorbers can be influenced/adjusted by screwing the complete absorber in or out.

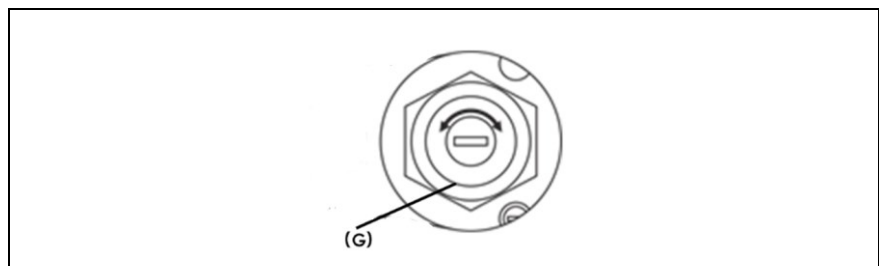




Fig. 5-8 Set shock absorber for STD-14

Set shock absorber harder



Turn the adjusting screw to the right.

Set shock absorber softer

Turn the adjusting screw to the left.

		NOTICE
	<p><i>Only adjust the damping action with the adjusting screw. If there is no adjusting screw available, the shock absorber should be adjusted via the shock absorber stroke.</i></p>	

5.5 Startup

		WARNING
	<p><i>Risk of injury from rotating masses. Make sure that no personnel or foreign objects can be caught by moving parts. Disconnect the swivel unit from the compressed air supply.</i></p> <p><i>Otherwise serious injuries or death can result.</i></p> <p><i>Avoid these dangerous situations!</i></p>	

- ▶ Do not overload the devices.
- ▶ Pre-set the swivel range with the shock absorbers screwed out.
- ▶ Connect all air hoses and signal cables correctly.
- ▶ Perform the first two turning movements manually.
- ▶ Pre-set the sensors.
- ▶ Close all regulators and then open them again by one revolution.
- ▶ Set the proximity switches (if available).
- ▶ Set the required rotational speed via an external exhaust regulator.
- ▶ Set the shock absorbers.
- ▶ Make sure that no personnel or foreign objects can be caught by moving parts.
- ▶ Start a trial run.
- ▶ Pressurize your equipment slowly with compressed air.
- ▶ Readjust the proximity switches and shock absorbers if necessary.
- ▶ End the trial run.



Swivel Unit Type: SM, SE, SES, SHE

5.5.1 Use of intermediate position units (accessories)

Intermediate position units make it possible to move to a so-called intermediate position or “third position” in a range of about 90°. For example, in an application with end positions at 0° and 180° it is possible to move to the middle at 90°. The intermediate position units come in various versions, each suitable for the particular size of swivel unit (cf. chapter Technical data) and can be complemented with proximity switches and shock absorbers.

	ZWP-4-SE-20-K/H-0-0-P	ZWP-4-SES-20-K-0-0-P	ZWP-6-SE-20-K/H-0-0-P	ZWP-6-SES-20-K/H-0-0-P	ZWP-9-SE-20-K/H-0-0-P	ZWP-9-SES-10-K/H-0-0-P
Integrated air grommet						
Integrated signal grommet						
2nd through hole for air connection / exhaust regulator		●		●	●	●
Heavy duty version		●		●		●
Repeatability	0.05°	0.05°	0.05°	0.05°	0.05°	0.05°
Torque at 6 bar without shock absorbers, SE depressurized/neutral pressure [Nm]	0.9	3.0	3.5	10.1	20.2	40
Torque at 6 bar without shock absorbers, SE pressurized [Nm]	-	1.0	-	1.9	5	8
Angle of rotation [freely adjustable]	90° +/-20°	90° +/-20°	90° +/-20°	90° +/-20°	90° +/-20°	90° +/-10°
Weight [kg]	0.18	0.38	0.4	0.95	1.25	1.6
No. of cylinders	2	1	2	1	1	1
Cylinder Ø [mm]	16	36	25	50	63	80
Air consumption/double stroke [cm ³]	4	32	22	104	186	186
Connection 4-8 bar	M5	M5	M5	M5	G1/8"	G1/8"
Housing material	AlZnMgCu0.5 anodized	AlZnMgCu0.5 anodized	AlZnMgCu0.5 anodized	AlZnMgCu0.5 anodized	AlZnMgCu0.5 anodized	AlZnMgCu0.5 anodized
Use for	SE-4-N-190*	SES-4-S-190*	SE-6-N-190*	SES-6-S-190*	SE-9-N-190*	SES-9-S-190*

5.5.1.1 Mounting of intermediate position units

		WARNING
	<p><i>Disconnect the swivel unit from the compressed air supply and lock against reconnection.</i></p> <p><i>Otherwise light to serious injuries can result.</i></p> <p><i>Avoid these dangerous situations!</i></p>	

- Unscrew the plate of the swivel unit (pay attention to the O-rings!) and remove the 4 fastening nuts of the bolts of the intermediate position unit.

Swivel Unit Type: SM, SE, SES, SHE

- Make sure when mounting that a piston rod is inserted in each of the drive cylinders of the swivel unit.
- The positions of the piston rods of the intermediate position units are connected differently depending on the type, cf. table below.
- Loosen these screws, set screws or nuts.
- Screw the two units together.
- Make sure the O-rings (swivel unit) are fitted correctly.
- Then insert the piston rods manually (for ZWP-4/6-SE by pushing, otherwise by turning) until they touch the drive cylinders of the swivel unit.
- Align the piston rods of the intermediate position units by setting the required position by simply turning the swivel plate manually.
- Fasten the position of the piston rods by tightening the respective fasteners (screws, set screw or lock nuts).
- Connect the compressed air supply and proximity switches.
- Cover the vent hole with a screw-on filter (not for ZWP-4-SE and ZWP-6-SE).
- Any speed settings for the intermediate position unit can be implemented with an upstream supply air regulator.

Type	Connection to stop plate by	Piston adjustment by
ZWP-4-SE ZWP-6-SE	2 pc. set screws	Moving the piston rods
ZWP-4-SES	1 pc. cylinder screw underneath the switching flag of the proximity switch	Screwing the stop screws in/out
Other ZWP	2 pc. lock nuts	Screwing the stop screws in/out

If a swivel unit is used in combination with an intermediate position unit, we recommend connection via 3 pc. 3/2 directional-control valves (2x for SE, 1x for intermediate position unit).

This gives you the greatest possible flexibility:

Existing exhaust regulators (at the swivel unit) can be used further and the system can be set to “neutral pressure” under full pressure.

A depressurized state is prerequisite for use of the ZWP-4-SE and ZWP-6-SE. These two variants cannot work against a pressurized system.

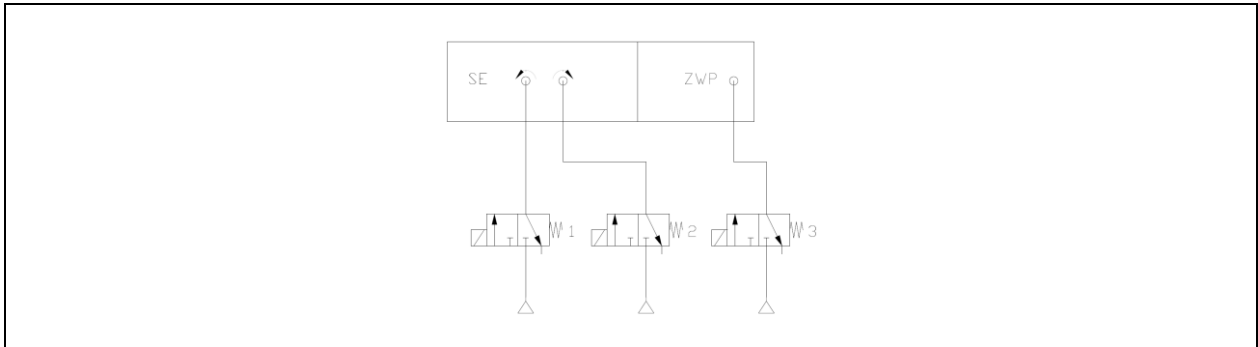


Fig. 5-9 Standard circuit intermediate position unit

- A. Compressed air connection (left)
- B. Compressed air connection (right)
- 1. 3/2 control valve, monostable, with spring reset (SE)
- 2. 3/2 control valve, monostable, with spring reset (SE)
- 3. 3/2 control valve, monostable, with spring reset (ZWP)

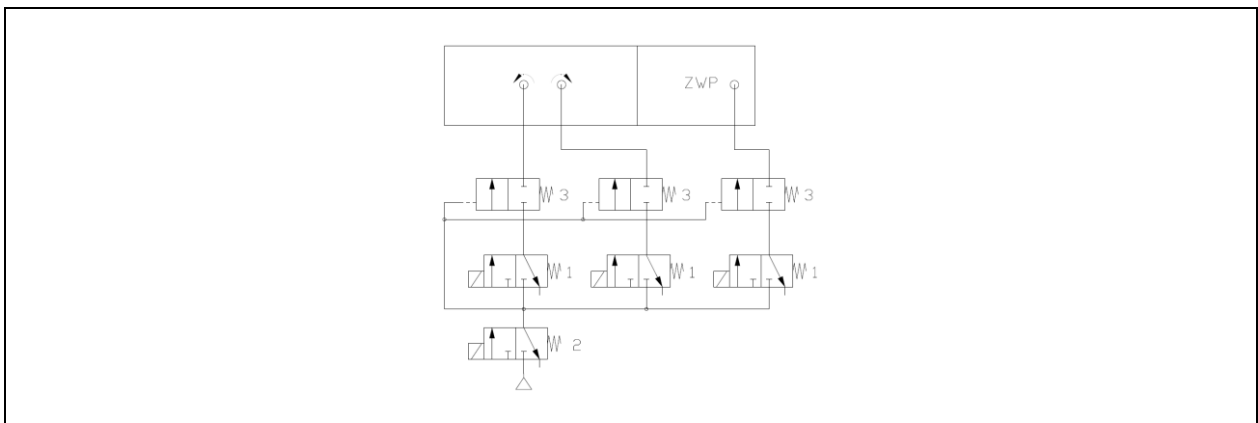








Fig. 5-10 Emergency stop circuit intermediate position unit

- A. Compressed air connection (left)
- B. Compressed air connection (right)
- 1. 3 pc. 3/2 control valve, monostable, with spring reset
- 2. 3/2 control valve, monostable / emergency stop
- 3. 3 pc. piloted non-return valve

5.5.1.2 Use of multiway connectors (accessories)

Multiway connectors protected against overload (self-repairing) are used to connect and collect electrical signals. They reduce cost-intensive wiring and offer the possibility of orderly cable routing for the superstructure. To this end, sockets in various sizes are consolidated on multi-core central plugs. LEDs indicate when the multiway connector is operational and when the proximity switch at the threaded bush is in working order. The threaded bores of the swivel unit serve as mounts, cf. chapter 5.3.5.5 Signal grommets.



5.5.2 Mounting of proximity switches (accessories)



		WARNING
	<p><i>Disconnect the swivel unit from the compressed air supply and lock against reconnection.</i></p> <p><i>Otherwise light to serious injuries can result.</i></p> <p><i>Avoid these dangerous situations!</i></p>	
		NOTICE
	<p><i>The standard device does not come with proximity switches. However, to query end positions, it is necessary to retrofit proximity switches. The proximity switches can be obtained separately as accessories in the form of inductive and/or magnetic switches.</i></p>	
		NOTICE
	<p><i>The swivel units with proximity switches should not be used in areas with static discharges, high-frequency oscillations or strong magnetic fields. Otherwise it can happen that the proximity switches for recognition of the end positions deliver wrong signals.</i></p>	



- ▶ Turn the **screw-in proximity switches** into the internal thread of the connection screws until they are at most flush with the connection screws.. Then turn the sensors back by about 1-2 revolutions.
- ▶ A mounting kit is available for screwing in when using **conventional switches**.
- ▶ It can also be used, for example, for machining operations.

Swivel Unit Type: SM, SE, SES, SHE

- ▶ When using **magnetic switches**, insert them into the C-slots (Q) available.
- ▶ Fasten **rectangular proximity switches** (e.g. for the intermediate positions) at the mounting points concerned.
- ▶ If there is more than one connection possibility for proximity switches at the intermediate positions, it might be necessary to move the screw used for signal generation in the stop plate.
- ▶ Connect the proximity switches with the cables.
- ▶ Set the proximity switches so that the LED of the switch lights up when the respective end position is reached. Make sure that the switch signal does not set in too soon.

		NOTICE
	<i>Make sure that the sensors do not protrude as this could result in mechanical damage.</i>	

		NOTICE
	<i>Make sure that the cables are not kinked or pinched. If possible by design reasons, there are different types of switch fastening available in part. It could be better for cable routing to insert the switches in the C-slots from the other side.</i>	

		NOTICE
	<i>Avoid excessive force when screwing in the proximity switches.</i>	

Type	NSS/ NSI / NSR
Switching distance	0.8 - 1.5 mm
Circuit type	PNP
Switching characteristic	NO
Supply voltage	10-30 V DC
Current consumption	<10 mA
Switching current	100 mA - max. 200 mA
Switching frequency	Max. 5 kHz
LED	Yes
Protected against polarity reversal	Yes



Swivel Unit Type: SM, SE, SES, SHE



Type	NSS/ NSI / NSR
Short-circuit proof	Yes
Protection	IP 65/ IP 67

Overview of proximity switches

Proximity switches	NSS-O6,5-S-65	NSS-O6,5-S-85	NSS-O4-S-54	NSI-Q8-K-44-M	NSI-Q8-S-59-M	NSR-C4-K-24	NSR-C4-S-24
Swivel units							
SM-4-M-190-*			•			•	•
SE-4-N-190-*	•					•	•
SES-4-S-190-*	•					•	•
SE-6-N-190-*		•				•	•
SES-6-S-190-*		•				•	•
SHE-6-*.190-*	•					•	•
SE-9-N-190-*		•				•	•
SES-9-S-190-*		•				•	•
SHE-9-N-190-*	•					•	•
SHE-9-A-190-*		•				•	•
ZWP-4-SE-20-*				•	•		
ZWP-4-SES-20-*				•	•	•	•
ZWP-6-SE-20*				•	•		
ZWP-6-SES-20-*				•	•		
ZWP-9-SE-20-*				•			
ZWP-9-SES-10-*				•			



6 Maintenance/Serviceing

		WARNING
	<p><i>Disconnect the swivel unit from the compressed air supply and lock against reconnection!</i></p> <p>Otherwise light to serious injuries can result.</p> <p><i>Make sure there are no residual energies present.</i></p>	

		NOTICE
	<p><i>If you have opted for use with an oil/air mixture, the device should then later not be operated otherwise because the lubricating film could fail.</i></p>	

Shock absorbers

The hydraulic shock absorbers are wearing parts. They should therefore be inspected at regular intervals (about every 2,000,000 strokes). Defective shock absorbers can cause consequential damage. Our STD14 are repairable, and we therefore recommend you arrange the possibility of repair with our customer service.

		NOTICE
	<p><i>Worn shock absorbers lose the damping characteristic and lead to bouncing of the whole system. Our swivel units with external stops are suitable for monitoring of the shock absorbers by design. The defined stop situation can be used via the proximity switches (fitted directly in the stop screws) to detect this bouncing as multiple electrical pulse via the controller.</i></p> <p><i>This monitoring possibility results in early detection of a critical situation before the overall system is damaged.</i></p>	

Servicing

After a modification/repair, all moving parts and their guides should be smeared with our special grease.

The seals and the grease inside the swivel units can age depending on use; we therefore recommend that you send the device in to us for servicing every 3 years, after 20,000,000 cycles (from size 9: 10,000,000 cycles) or should you notice a fault in the rotational movement.

Only clean the swivel unit with soft cloths and agents that do not damage the material.

Contact with aggressive media and grinding dust should be avoided.

6.1 Warranty and guarantee conditions

The statutory warranty period of the manufacturer / distributor is 24 months from the date of delivery.

For spare parts, we guarantee delivery according to chapter (see also DIN EN 82079-1).

We grant a warranty of 24 months (from the date of delivery ex works) on the proviso that the device is treated correctly in 1-shift operation and the application and environmental conditions are complied with. This includes replacement or repair of defective parts of Friedemann Wagner GmbH.

Wearing parts (e.g. shock absorbers) are not covered by the warranty.

During the warranty period repairs may only be carried out or authorized by Friedemann Wagner GmbH.

7 Troubleshooting

Fault	Cause	Correction
Irregular rotational movement	Long-time operation	Grease, lubricate, wearing part set or repair
	Air ducts are blocked	Clean air ducts with compressed air
	Irregular compressed air supply, pressure too low	Check supply and pressure
	Throttle non-return valve	Check setting and correct
No swivel plate movement	Unit connected incorrectly	Connect compressed air connections correctly, see chapter 5.3.3.
	Unit controlled incorrectly	Check program and change
	Incorrect switching signal or signal sets in too soon	Set proximity switch correctly, see chapter 5.5.1.
	Throttle is turned in too far	Set throttle correctly, see chapter 5.4.
Proximity switch emits incorrect signals No switching signal	Proximity switch is set incorrectly	Set proximity switch correctly, see chapter 5.5.1.
	Proximity switch is defective	Replace proximity switch, see chapter 5.5.1.
End-position stop too hard Bouncing	Shock absorber (G) is set incorrectly	Set shock absorber (G) correctly, see chapter 5.4.1.
	Shock absorber (G) is defective	Replace shock absorber (G), see chapter 5.4.1.
End-position stop too soft	Shock absorber (G) is set incorrectly	Set shock absorber (G) correctly, see chapter 5.4.1.
End position is not reached No switching signal	Shock absorber turned in too far (rack lying on shock absorber)	Mount shock absorber (G) correctly, see chapter 5.4.1.

Table 1 Troubleshooting



You can obtain further help from:

Friedemann Wagner GmbH, D-78559 Gosheim / Germany

Telephone: +49 (0) 7426 / 94900-0

Fax: +49 (0) 7426 / 94900-9

Email: info@wagnerautomation.de

		NOTICE
<p>Further information on troubleshooting is to be found in the separate manufacturer instruction manuals.</p>		

8 Dismantling / Disposal

Dismantling

Dismantling work may only be carried out by skilled personnel. Make sure the shutdown procedure is followed before beginning dismantling work.

Further, the following must be followed where applicable / available:

- Release the energy in the pressure accumulator.
- Make sure there are no residual energies in the system anymore.
- Release all tensioned springs.

Disposal



The device is primarily made of steel and to a certain extent also of aluminum (except for the electrical equipment) and is to be disposed of in accordance with local environmental protection regulations applicable **at the time** of disposal.

Dispose of according to properties, existing laws and regulations as, for example:

- electric and electronic scrap (circuit boards), PC system, keyboard, mouse, monitor (according to WEEE regulations);
- batteries, fluorescent lamps/energy-saving lamps (collection points);
- plastics (housing), rubber;
- metal, steel, copper, aluminum (separated by sorts).

All parts touched by media must be decontaminated before disposal. Hazardous substances are to be removed from the device.

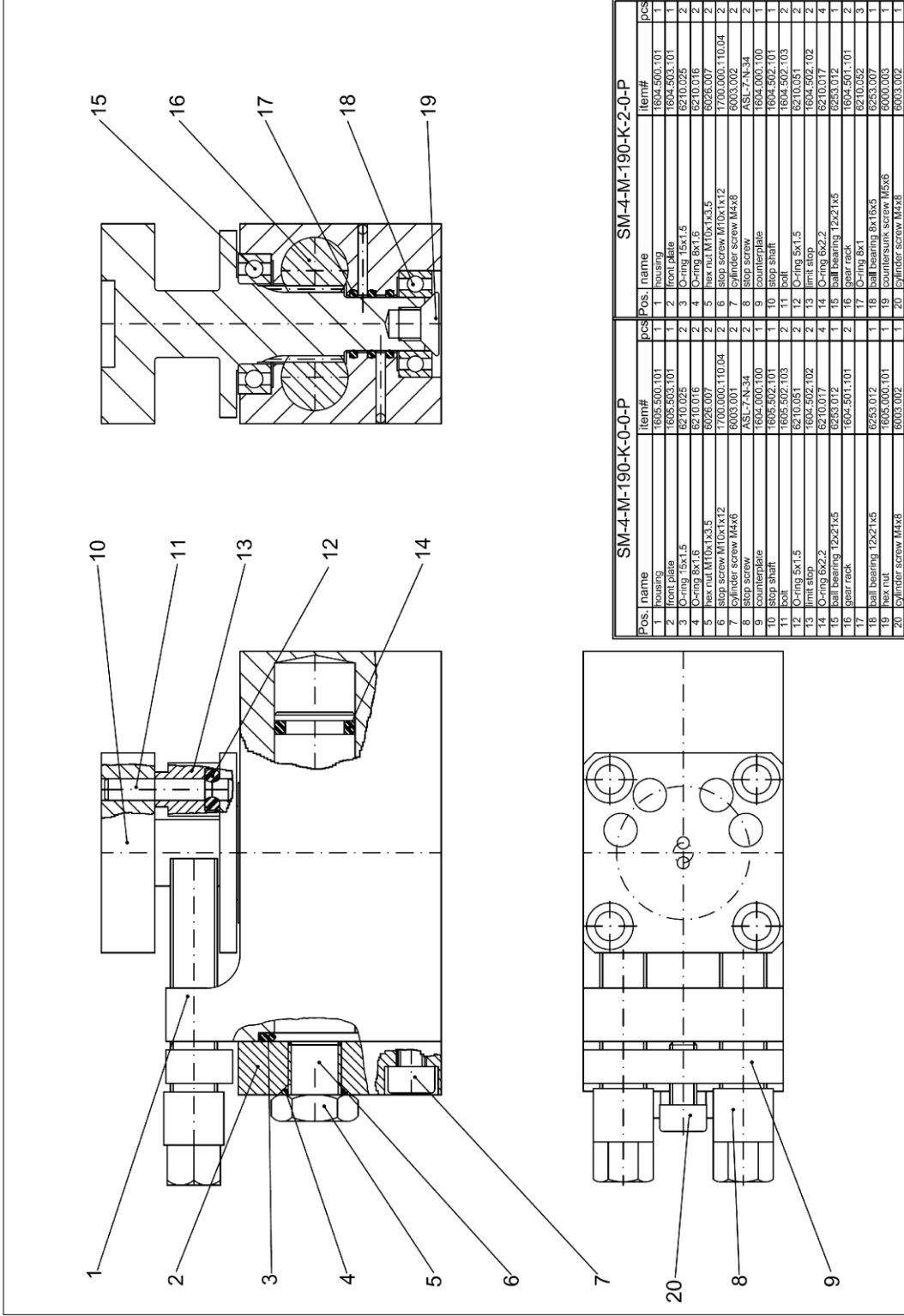
For proper disposal of hazardous substances, observe the material safety data sheets (MSDS) and current applicable disposal regulations.

Oils, solvents, cleaning agents and contaminated cleaning materials (brushes, cloths, etc.) must be disposed of according to local regulations, the applicable disposal codes and the information in the manufacturer's material safety data sheets.

9 Spare part lists and accessories

9.1 Spare part lists

SM-4-M-190-X-0-X-0-P



SM-4-M-190-K-0-0-P			SM-4-M-190-K-2-0-P		
Pos.	Name	Item#	Pos.	Name	Item#
1	Bearing	1605-502.101	1	Bearing	1605-502.101
2	Stop screw	1605-502.101	2	Stop screw	1605-502.101
3	C-ring	8210.026	3	C-ring	8210.026
4	C-ring 8x1.5	8210.016	4	C-ring 8x1.5	8210.016
5	hex nut M10x1.5	6028.007	5	hex nut M10x1.5	6028.007
6	stop screw M10x1.5	1700.000.110.04	6	stop screw M10x1.5	1700.000.110.04
7	Cylinder screw M4x8	6003.001	7	Cylinder screw M4x8	6003.002
8	stop screw	ASL-7-N-34	8	stop screw	ASL-7-N-34
9	counterplate	1604.000.100	9	counterplate	1604.000.100
10	stop shaft	1605-502.101	10	stop shaft	1604-502.101
11	bolt	1605-502.103	11	bolt	1604-502.103
12	C-ring 5x1.5	6210.051	12	C-ring 5x1.5	6210.051
13	limit stop	1604-502.102	13	limit stop	1604-502.102
14	C-ring 6x2.2	6210.017	14	C-ring 6x2.2	1604-502.102
15	ball bearing 12x21x5	6203.017	15	ball bearing 12x21x5	6210.017
16	gear rack	1604-501.101	16	gear rack	1604-501.101
17	ball bearing 8x1	6203.007	17	ball bearing 8x1	6203.007
18	ball bearing 12x21x5	1605-000.101	18	ball bearing 8x18x5	6203.007
19	hex nut	1605-000.101	19	countersunk screw M5x8	6000.003
20	Cylinder screw M4x8	6003.002	20	Cylinder screw M4x8	6003.002

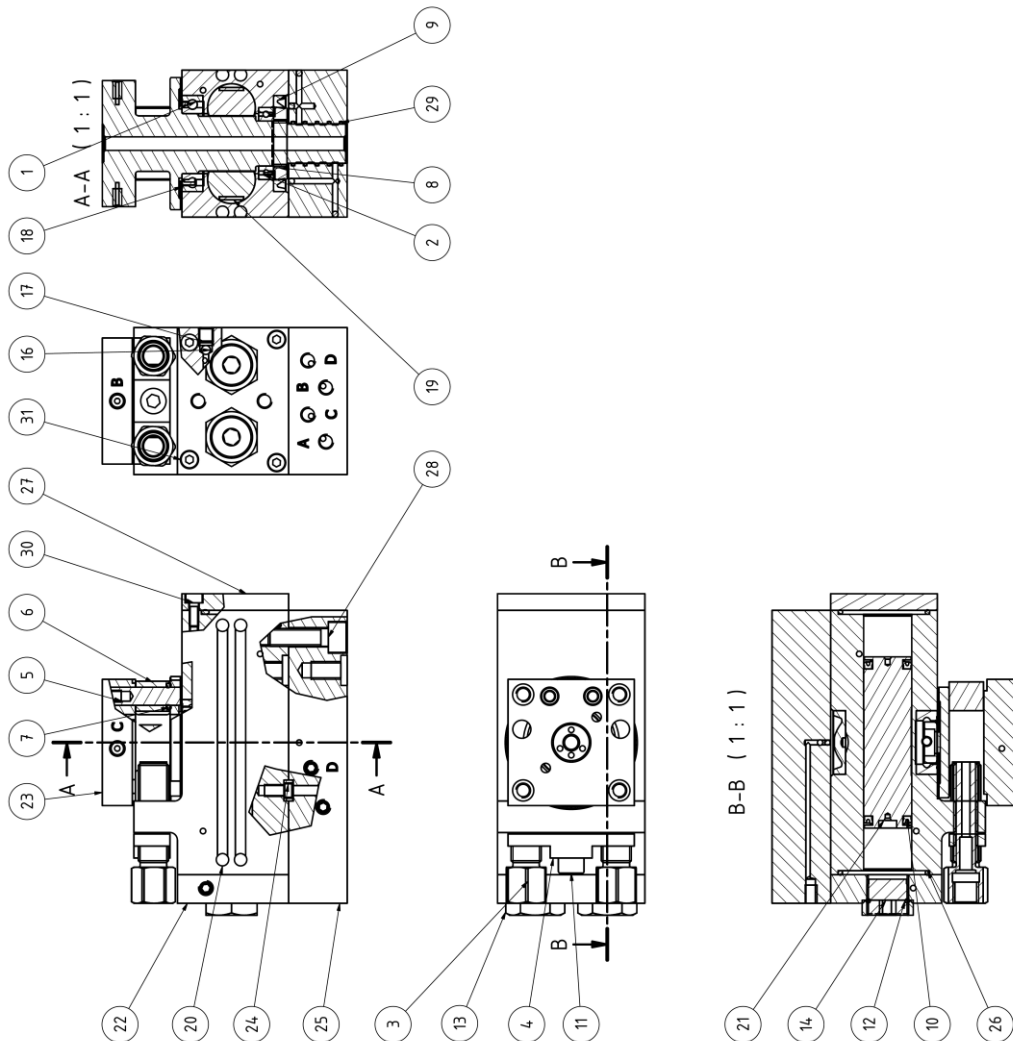
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SE-6-N-190-X-0-X-X-P

SE-4-N-190-X-0-X-X-P		SE-6-N-190-X-0-X-X-P	
Pos.	Item#	Pos.	Item#
1	stop screw	1	stop screw
2	front plate	2	front plate
3	O-ring 18x1,5	3	O-ring 28x1,5
4	stop screw	4	stop screw
5	O-ring 11,5x1,5	5	O-ring 11,5x1,5
6	cylinder screw M3x10	6	cylinder screw M4x8
7	base plate	7	base plate
8	center ring ZR-4	8	center ring ZR-6
9	nut M12x1x4	9	nut M14x1x5
10	cylinder screw M5x12	10	cylinder screw M6x14
11	counter plate	11	counter plate
12	housing	12	housing
13	stop pin	13	stop pin
14	O-ring 6x1,5	14	O-ring 8x1,6
15	limit stop	15	limit stop
16	sheet	16	plate
17	O-ring 9,3x2,4	17	O-ring 1,3x2,4
18	cylinder screw M3x8	18	cylinder screw M4x8
19	cylinder screw M5x14	19	cylinder screw M6x20
20	cylinder screw M5x20	20	cylinder screw M6x30
21	stop shaft	21	stop shaft
22	stop shaft	22	stop shaft
23	ball bearing 14x28x5	23	ball bearing 23x37x7
24	gear rack	24	gear rack
25	ball bearing 10x19x5	25	ball bearing 15x24x5
26	nut M10x1x3,5	26	nut M14x1x5
27	O-ring 8x1	27	O-ring 13x1
		28	O-ring 8x1
		29	ball 04
		30	ball 04
		31	ball 04
		32	ball 04
		33	ball screw w. cone M5x5
		34	ball screw w. cone M5x5
		35	ball screw w. cone M5x5
		36	ball screw w. cone M5x5
		37	ball screw w. cone M5x5
		38	ball screw w. cone M5x5
		39	ball screw w. cone M5x5
		40	ball screw w. cone M5x5
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		94	ball screw w. cone M5x5
		95	ball screw w. cone M5x5
		96	ball screw w. cone M5x5
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		99	ball screw w. cone M5x5
		100	ball screw w. cone M5x5

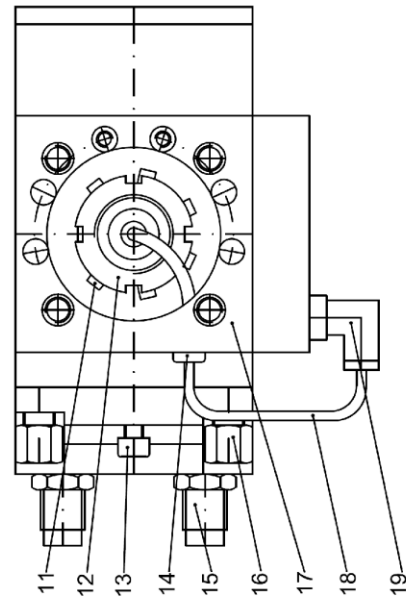
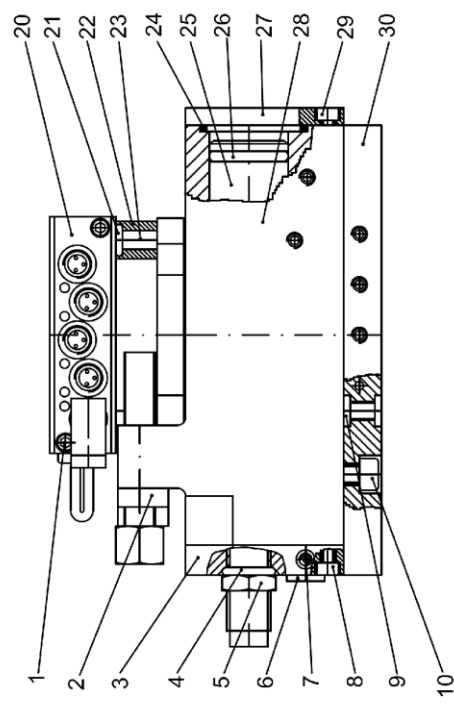
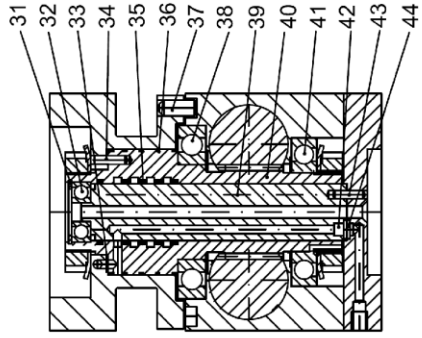
SES-4-S-190-X-0-0-P
SES-4-S-190-X-4-0-P

object	qty	item no	description
1	1	6253.032	four-point-bearing 20x32x7
2	1	6253.031	four-point-bearing 15x24x5
3	2	1801.600.101.01	stop screw
4	1	1602.000.100	counterplate
5	2	1602.000.103	stopping pin
6	2	1602.000.102	limit stop
7	2	6210.056	O-ring 6x1,5 Viton
8	1	1607.000.102	nutf M15x1
9	1	6212.013	wiping seal 24x32x4
10	4	6211.025	piston seal profile Z8 (16x10x2,55)
11	1	6003.036	cylinder screw DIN 912 - M5 x 12
12	2	6210.024	O-ring 11,5x1,5 NBR
13	2	6026.006	hex-nut M14x1x5 SW-17
14	2	1603.000.104	plug M14x1x12
16	**2	6035.002	ball 3 St
17	**2	6001.004	threaded pin DIN 913 - M5 x 5
18	1	1607.502.102	cover ring
19	2	7000.086	magnet 8x1 Neodym
20	1	1607.500.101	housing
21	2	1607.501.101	gear rack
22	1	1607.504.101	front plate
23	*1	1607.502.101	stopping shaft
24	**1	1607.502.101.01	center ring ZR-4
25	**4	1805.000.103	base plate
26	4	6210.028	O-ring 24,8x1,5
27	1	1607.000.101	plate
28	**2	6003.014	cylinder screw DIN 912 - M6 x 20
29	**5	6210.055	O-ring 13x1 Viton
30	4	6003.027	cylinder screw DIN 912 - M3 x 8
31	4	6003.045	cylinder screw DIN 912 - M3 x 12

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***=SES-4-S-190-K-4-0-P



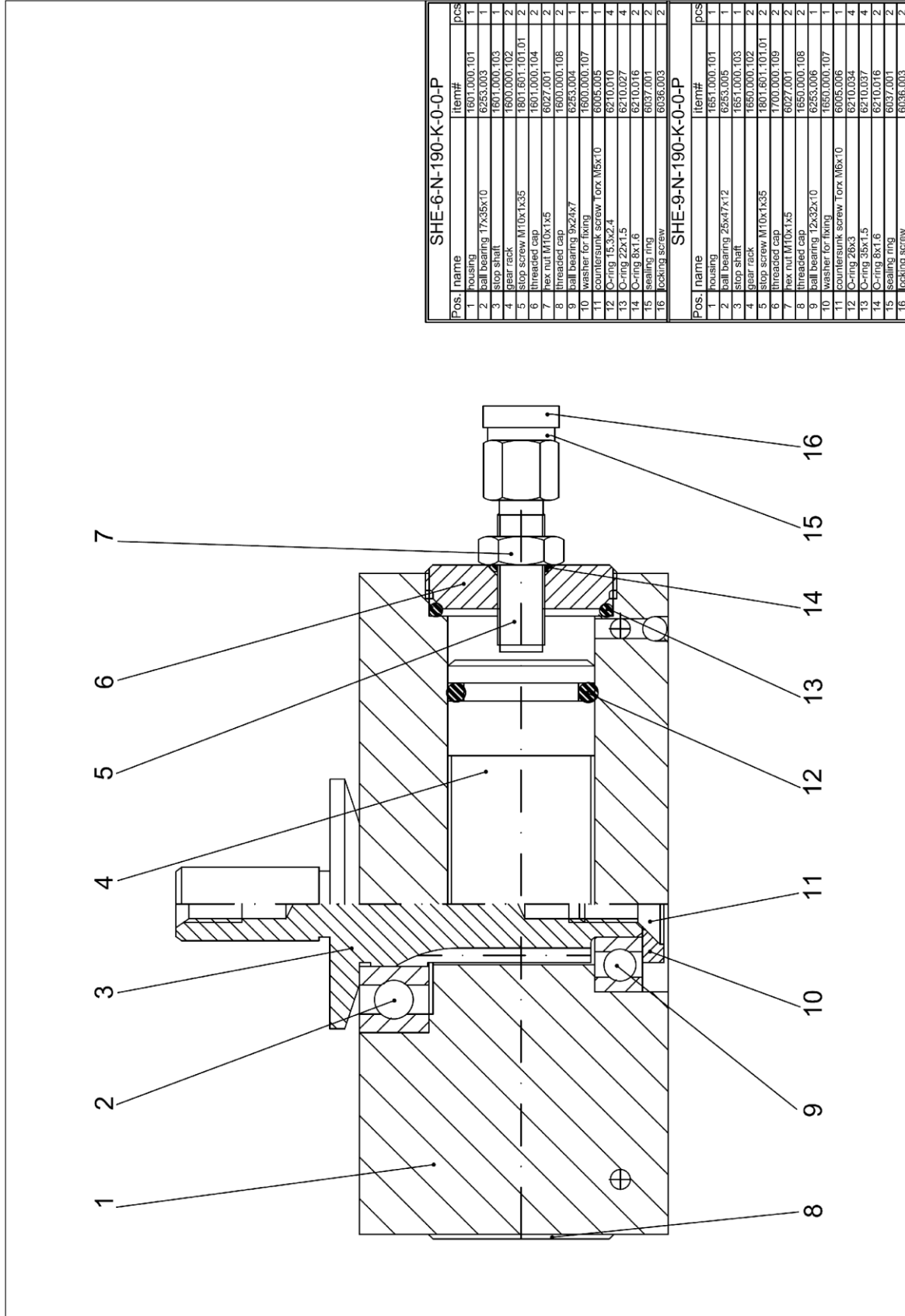
SES-6-S-190-X-X-X-P / SE-9-N-190-X-X-X-P / SES-9-S-190-X-X-X-P



SES-6-S-190-X-X-X-P			SE-9-N-190-X-X-X-P			SES-9-S-190-X-X-X-P		
Pos.	Name	Item#	Pos.	Name	Item#	Pos.	Name	Item#
1	Cylinder screw M3x18	6003.048	1	Cylinder screw M3x18	6003.048	1	Cylinder screw M3x18	6003.048
2	counter plate	1605.000.104	2	counter plate	1653.000.103	2	counter plate	1653.000.103
3	front plate	1605.503.101	3	front plate	1653.503.101	3	front plate	1653.503.101
4	O-ring 11x1,5	6210.029	4	O-ring 25x2	6210.020	4	O-ring 25x2	6210.020
5	nut M3x1,5	6003.002	5	nut M3x1,5	6003.002	5	nut M3x1,5	6003.002
6	ball screw M3x4	6003.012	6	ball screw M3x4	6003.012	6	ball screw M3x4	6003.012
7	grub screw M3x4	6003.002	7	grub screw M3x4	6003.002	7	grub screw M3x4	6003.002
8	Cylinder screw M3x12	6003.012	8	Cylinder screw M3x12	6003.012	8	Cylinder screw M3x12	6003.012
9	center ring ZF-6	1605.000.102	9	center ring ZF-9	1605.000.101	9	center ring ZF-9	1605.000.101
10	Cylinder screw M3x12	6003.007	10	Cylinder screw M3x12	6003.008	10	Cylinder screw M3x12	6003.008
11	locking plate 25	6054.002	11	locking plate 30	6054.001	11	locking plate 30	6054.001
12	locking plate 25	6054.002	12	locking plate 30	6054.001	12	locking plate 30	6054.001
13	Cylinderscrew M3x18	6003.013	13	Cylinder screw M3x18	6003.013	13	Cylinder screw M3x18	6003.013
14	socket	6004.001	14	socket	6004.001	14	socket	6004.001
15	shock absorber	STD-144	15	shock absorber	STD-25-M	15	shock absorber	STD-25-M
16	stop screw	1603.000.101	16	stop screw	1602.000.101	16	stop screw	1602.000.101
17	stop plate	1605.502.101	17	stop plate	1653.502.101	17	stop plate	1653.502.101
18	stop plate	1605.502.101	18	stop plate	1653.502.101	18	stop plate	1653.502.101
19	angled socket	1603.013	19	angled socket	1603.013	19	angled socket	1603.013
20	multway connector	SL-24-43-A8	20	multway connector	SL-24-43-A8	20	multway connector	SL-24-43-A8
21	O-ring 8x1,5	6210.016	21	O-ring 9.3x2.4	6210.007	21	O-ring 9.3x2.4	6210.007
22	limit stop	1603.000.102	22	limit stop	1653.002.103	22	limit stop	1653.002.103
23	stop pin	1603.502.103	23	stop pin	1653.502.104	23	stop pin	1653.502.104
24	O-ring 8x1,5	6210.016	24	O-ring 9.3x2.4	6210.007	24	O-ring 9.3x2.4	6210.007
25	stop pin	1603.502.103	25	stop pin	1653.502.104	25	stop pin	1653.502.104
26	stop pin	1603.502.103	26	stop pin	1653.502.104	26	stop pin	1653.502.104
27	plate	6210.030	27	plate	6210.034	27	plate	6210.034
28	housing	1605.000.101	28	housing	1653.000.101	28	housing	1653.000.101
29	Cylinder screw M3x8 n.k.	6004.001	29	Cylinder screw M3x10 n.k.	6004.001	29	Cylinder screw M3x10 n.k.	6004.001
30	locking plate 18x1 B	6033.015	30	locking plate 18x1 B	6033.015	30	locking plate 18x1 B	6033.015
31	locking plate 18x1 B	6033.015	31	locking plate 18x1 B	6033.015	31	locking plate 18x1 B	6033.015
32	ball bearing 8x16x5	6253.009	32	ball bearing 10x18x5	6253.008	32	ball bearing 10x18x5	6253.008
33	O-ring 3x1	6210.009	33	O-ring 3x1	6210.009	33	O-ring 3x1	6210.009
34	pin 5x20	6040.002	34	pin 5x20	6040.002	34	pin 5x20	6040.002
35	O-ring 18x1,5	6210.048	35	O-ring 20x1,5	6210.083	35	O-ring 20x1,5	6210.083
36	O-ring 3x1	6210.009	36	O-ring 3x1	6210.009	36	O-ring 3x1	6210.009
37	O-ring 3x1	6210.009	37	O-ring 3x1	6210.009	37	O-ring 3x1	6210.009
38	ball bearing 30x5x9	6253.015	38	ball bearing 45x8x12	6253.016	38	ball bearing 45x8x12	6253.016
39	air grommet	1605.000.102	39	air grommet	1653.000.102	39	air grommet	1653.000.102
40	stop shaft	1605.502.102	40	stop shaft	1653.502.102	40	stop shaft	1653.502.102
41	ball bearing 25x47x8	6253.018	41	ball bearing 30x55x9	6253.015	41	ball bearing 30x55x9	6253.015
42	connection tube	6004.000.103	42	connection tube	6004.000.103	42	connection tube	6004.000.103
43	connection tube	6004.000.103	43	connection tube	6004.000.103	43	connection tube	6004.000.103
44	O-ring 3x1	6210.068	44	O-ring 3x1	6210.068	44	O-ring 3x1	6210.068

Drawing shows maximum configuration

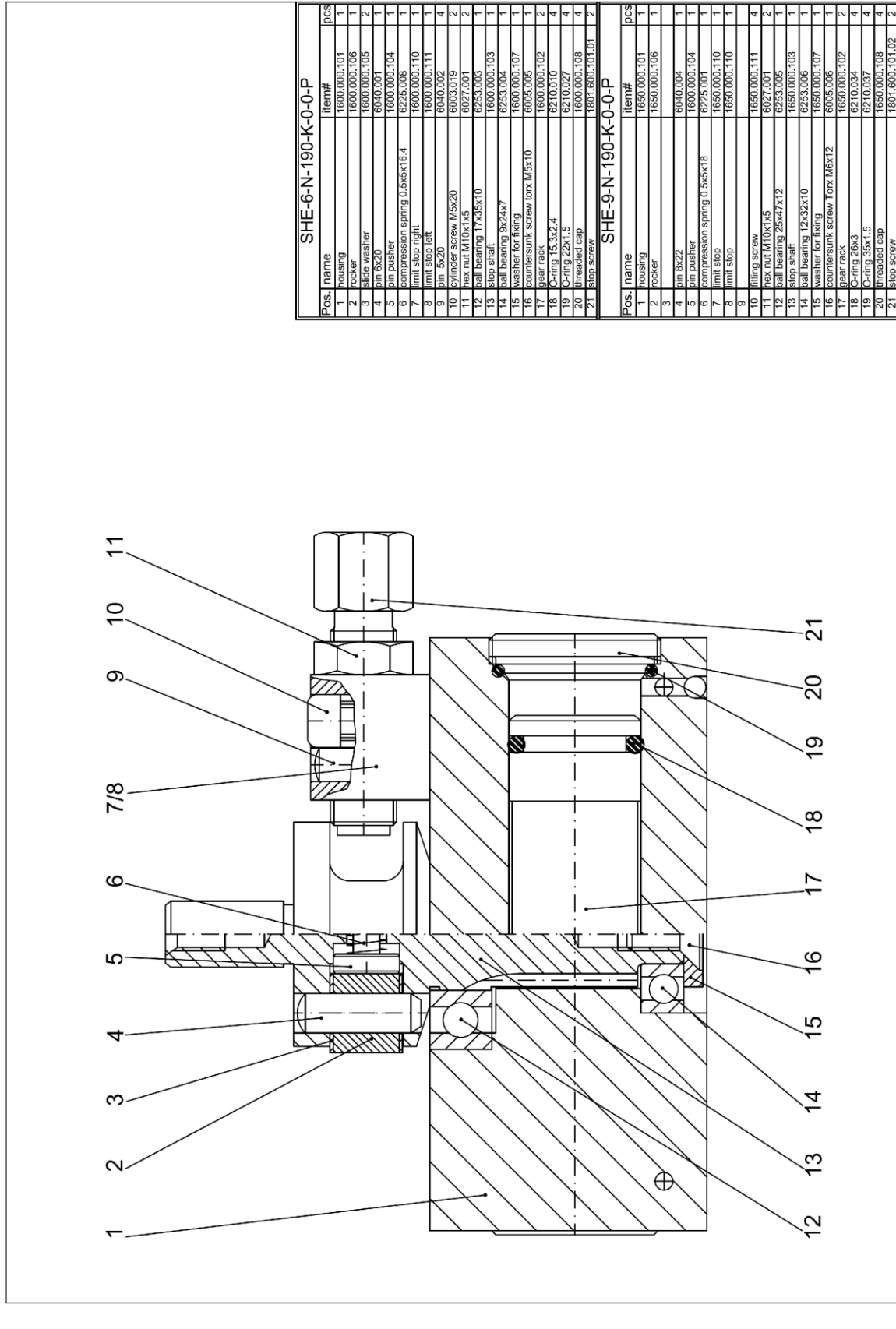
SHE-X-N-190-X-0-0-P



Pos.	name	Item#	pcs
1	housing	1601.000.101	1
2	ball bearing 17x35x10	6253.003	1
3	stop shaft	1601.000.103	1
4	gear rack	1601.000.102	2
5	stop screw M10x1x35	1601.601.101.01	2
6	threaded cap	1601.000.104	2
7	hex nut M10x1x5	6027.001	2
8	threaded cap	1600.000.108	2
9	ball bearing 3x24x7	6253.004	1
10	washer for fitting	1600.000.107	1
11	countersunk screw Torx M6x10	6005.006	1
12	O-ring 15.3x2.4	6210.010	4
13	O-ring 22x1.5	6210.027	4
14	O-ring 8x1.6	6210.016	2
15	sealing ring	6037.001	2
16	locking screw	6036.003	2

Pos.	name	Item#	pcs
1	housing	1651.000.101	1
2	ball bearing 25x47x12	6253.005	1
3	stop shaft	1651.000.103	1
4	gear rack	1650.000.102	2
5	stop screw M10x1x35	1601.601.101.01	2
6	threaded cap	1700.000.109	2
7	hex nut M10x1x5	6027.001	2
8	threaded cap	1650.000.108	2
9	ball bearing 12x32x10	6253.006	1
10	washer for fitting	1650.000.107	1
11	countersunk screw Torx M6x10	6005.006	1
12	O-ring 26x3	6210.034	4
13	O-ring 35x1.5	6210.037	4
14	O-ring 8x1.6	6210.016	2
15	sealing ring	6037.001	2
16	locking screw	6036.003	2

SHE-X-A-190-X-0-0-P



Pos.	name	Item#	pcs
1	housing	1600.000.101	1
2	rocker	1600.000.106	1
3	slide washer	1600.000.105	2
4	pin 6x20	6040.001	1
5	pin pusher	1600.000.104	1
6	compression spring 0.5x5x16.4	6225.008	1
7	limit stop right	1600.000.110	1
8	limit stop left	1600.000.111	1
9	pin 5x20	6040.002	4
10	cylinder screw M5x20	6005.019	2
11	hex nut M10x1x5	6027.001	2
12	ball bearing 17x35x10	6253.003	1
13	stop shaft	1600.000.103	1
14	ball bearing 9x24x7	6253.004	1
15	washer for fixing	1600.000.107	1
16	countersunk screw torx M5x10	6005.005	1
17	gear rack	1600.000.102	2
18	O-ring 15.3x2.4	6210.010	2
19	O-ring 22x1.5	6210.027	4
20	threaded cap	1600.000.108	4
21	stop screw	1801.600.101.01	2

Pos.	name	Item#	pcs
1	housing	1650.000.101	1
2	rocker	1650.000.106	1
3			
4	pin 6x22	6040.004	1
5	pin pusher	1600.000.104	1
6	compression spring 0.5x5x18	6225.001	1
7	limit stop	1650.000.110	1
8	limit stop	1650.000.110	1
9			
10	fitting screw	1650.000.111	4
11	hex nut M10x1x5	6027.001	2
12	ball bearing 25x47x12	6255.005	1
13	stop shaft	1650.000.103	1
14	ball bearing 12x32x10	6253.006	1
15	washer for fixing	1650.000.107	1
16	countersunk screw Torx M6x12	6005.006	1
17	gear rack	1650.000.102	2
18	O-ring 26x3	6210.034	4
19	O-ring 35x1.5	6210.037	4
20	threaded cap	1650.000.108	4
21	stop screw	1801.600.101.02	2

Fig. 9-1 Part list

9.2 Accessories

The following accessories are available from us for the swivel unit.
See www.wagnerautomation.de for selection tables for accessories.

Designation	Type
Proximity switches	Cf. table (chapter 5.5.2)
Cable connectors	KST-8-G-9-B-5
Hydraulic shock absorbers and shock absorber covers	(See chapter 5.4.1)
Centering ring, size-dependent	ZR-4 ZR-6 ZR-9
Multiway connectors	STL-8-E43-A8 STL-8-E63-A8
Stop screws	ASL10-X-35 ASL10-X-55 ASL-7-X-34 ASL12-X-55