

# DOUBLE PISTON ROTARY ACTUATORS

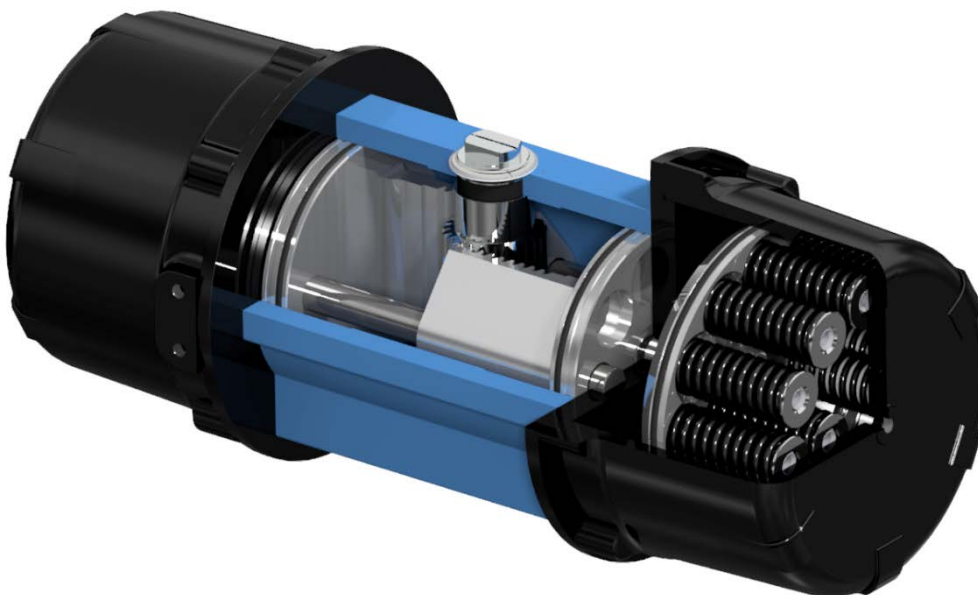
## TYPE SADT

DOUBLE ACTING WITH TANDEM PISTON  
FOR HIGH TORQUES



## TYPE SADF

DOUBLE ACTING WITH SPRING RETURN  
IN CASE OF CONTROL AIR FAILURE



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## 1. General

- This manual contains important instructions for the safe and proper installation, maintenance and operation of the actuators.
- Observing them helps to avoid dangers, reduce repair costs and downtimes and increase the reliability and service life of the drives.
- The instructions must be read and applied by every person who is entrusted for working on the actuators.
- The instructions must be available at all times. Always keep a copy of these instructions at location where the drives are used. Before you start to carry out assembly or maintenance work, you must read through the instructions in full beforehand. In case of doubt contact AMG-Pesch.
- We reserve the right to make technical changes and additions to the instructions.
- Responsibility
  - Manufacturer
    - Safe design / drive layout
    - Forwarding of all necessary documents, information, certificates
    - Compliance with all regulations, guidelines
  - Operator
    - Forwarding of all documents, information and certificates supplied / required by AMG-Pesch to the system operator / operating personnel
- Notes
  - In the following instructions the unit valve/actuator/accessory unit is referred as the "actuator"..
  - In addition to these instructions, all manufacturer's documents (connection diagrams etc.) for additional modules must be observed, any missing documents must be requested .

## 2. Safety instructions



- The basic prerequisite for safe handling and trouble-free operation of the drives is knowledge of the safety instructions in this manual.



- During all work the operational safety regulations, environmental regulations and the UVV must be observed.
- When handling oils, greases and other chemical substances, applicable safety regulations must be observed.
- Used lubricants must be disposed of in a professional and environmentally friendly manner. National regulations must be observed.
- The drives may only be only operated if they are in perfect working order and in fully functional condition.
- Use outside the range of application specified in [Section 5. Technical Data](#) and [Section 4. Intended use](#) are not permitted.
- The drives may only be operated with the control pressure specified on the nameplate, see [section 5.2. Nameplate](#).
- The safety devices in the system for limiting the control pressure are to be checked regularly for their functionality.
- Additional documents from the drive manufacturer / the manufacturer of the attached components must be observed..
- All work may only be carried out by specialists from AMG-Pesch or appropriately trained personnel.
- All work on the drive and the associated attachments may only be carried out in the dismantled / de-pressurized / vented / de-energized state..
- Actuators that can transmit additional torques/forces to the valve due to their size and/or installation situation must be supported accordingly.



- Drives with explosion protection are marked in accordance with [section 6. Marking DIR 2014 / 34 / EU + EAC \(TP TC 012/2011\)](#)..
- The drives with labelling according to DIR 2014 / 34 / EU may be operated as Ex devices under the following atmospheric conditions (DIN EN IEC 60079-0):  
**-20°C to +60°C**



- The temperature of the compressed air supplied must not exceed 45 ° C.
- Filter the control medium with a mesh size of at least 40 µm (ISO 8573-1, class 5).
- Appropriate measures must be taken for applications ≤ 0 ° C.
- Exchange of spare parts **only** with original parts from AMG-Pesch.
- In the case of single-acting drives, disassemble only in the safety position.. ([see section 7.2.2. SADF \(double-acting with spring mechanism\)](#)), spring released = fail-safe position); assembly/disassembly only after consultation with AMG-Pesch
- With single-acting drives, it must be ensured that no moisture or corrosive media can penetrate into the outer chamber through the pneumatic connection ([see section 7.5.1. Air supply](#)). (e.g. through filters, silencers)  
→ Risk of spring breakage
- The pinions of the standard drives are not suitable for absorbing external transverse forces..
- The drives cannot absorb any permanent torsional vibrations in the end positions..
- The locking ring must be checked prior to functional tests with the control medium; see [section 7.4. Exploded view](#) / item 40 → The pinion can be pushed out of the housing if the circlip is missing / defective  
→ Risk of injury

- The system operator must take measures to exclude dangers



- Warnings in the area of rotating parts (e.g. interface between valve and actuator).



- Warnings regarding heavy parts.



- Work in hazardous areas may only be carried out under the supervision of a second person.
- All work may only be carried out by qualified persons.

- A Work on electrical installations may only be carried out by trained personnel
- Electric circuits must be protected against overvoltage.
- Observe the system operator's safety regulations.
- Ensuring the voltage-free condition by a qualified electrician..

- Procedure



Activation of the plant components  
 Remove fuses  
 Attach prohibition signs



Protection against switching on again → Check that the device is no voltage





Earth plant parts

### 3. Scope of application

- These instructions apply to AMG double-piston quarter-turn actuators SADT (double-acting with tandem piston) and SADF (double-acting with spring return in case of control air failure) of sizes 45-60 and 50-70.

### 4. Intended use


- The pneumatic AMG double piston quarter-turn actuators are used for the automation of valves with a swivel movement  $\leq 90^\circ$ .
- Use outside the parameters specified in [section 5 Technical data](#) is not permitted.
- SIS for SADT / SADF
  - The drives are suitable for use in a safety-related system (SIS) up to SIL 2 (Low Demand Mode) according to IEC 61508. Taking into account the minimum required hardware fault tolerance of  $HFT = 1$ , the drives in redundant design can also be used up to SIL 3 according to IEC 61508 and IEC 61511.

 	<b>Operating and maintenance instructions</b> <b>AMG-Pesch DOUBLE PISTON ROTARY ACTUATORS</b> <b>TYPE SADT/SADF DOUBLE ACTING</b>	<b>QH-120en</b>
		Revision 1

## 5. Technical data


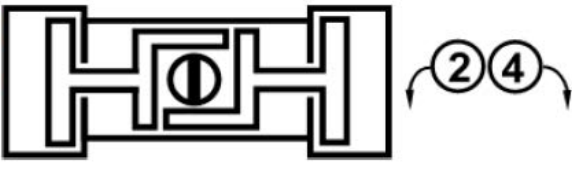




### 5.1. Application limits

- Ambient temperature
  - SADT / SADF
    - -25°C up to +80°C
    - higher/lower temperatures possible after consultation
- Pressure
  - Control pressure min.: standard = 2bar → for actuators according to the design conditions
  - Control pressure max.: 6bar Maximum control pressure according to name plate
    - Higher control pressures possible after consultation (adaptation of the mounting kits depending on requirements Actuator required)
  - Static pressure actuator housing max.10bar.
- Torque range
  - see "Technical data sheets"
- Switching time
  - see "Technical data sheets"; shorter switching times possible on request
  - the switching time depends on
    - Drive accessories (valves, piping, supply capacity)
    - Torque curve of the mounted valve
    - Medium temperature of the valve
- Control medium
  - Dried compressed air; other control media only after consultation with AMG-Pesch.
  - Filter control medium with at least 40 µm mesh width (ISO 8573-1, class 5).
  - ≤ 45°C
  - Appropriate measures must be taken for applications ≤ 0 ° C.
  - The dew point must be at least 10 ° C lower than the lowest operating temperature..
- Air connection (*see also Section 7.5.1-Air supply*)
  - see "Technical data sheets"
  - other connections on request
- Weight
  - see "Technical data sheets"
- Service life
  - see *section 12. Maintenance / duration of use.*
- Installation position
  - Any, exhaust air openings provided with protection against foreign objects in open-air operation!!!
- Installation
  - Indoor / Outdoor













 AMG-PESCH an ERIKS company	<b>Operating and maintenance instructions</b> AMG-Pesch DOUBLE PISTON ROTARY ACTUATORS TYPE SADT/SADF DOUBLE ACTING	<b>QH-120en</b>
		Revision 1

## 5.2. Nameplate





### Example

 AMG-PESCH GmbH www.amg-pesch.com		<b>VARIANT 01</b> <span style="float: right;">(12)</span> <b>OPERATING DIRECTION RIGHT</b>	
<b>TYPE: BR03C-SADF 45-60</b> <span style="float: right;">(01)</span>			
<b>ARTICLE: 217597</b> <span style="float: right;">(02)</span>	<b>YEAR: 2020</b> <span style="float: right;">(03)</span>		
<b>ORDER: 600000</b> <span style="float: right;">(04)</span>	<b>SN: A123456</b> <span style="float: right;">(05)</span>		
<b>ISO 5211: F16-Y-D-46</b> <span style="float: right;">(06)</span>	<b>AMBIENT TEMP.: -25/+80°C</b> <span style="float: right;">(13)</span>		
<b>ROTATION ANGLE: 0°/+90°</b> <span style="float: right;">(07)</span>	<b>min/max SPRING TORQUE: 2200/3675Nm</b> <span style="float: right;">(14)</span>		
<b>CONTROL PRESSURE: max 6 bar(g)</b> <span style="float: right;">(08)</span>	<b>CONNECTION: G1/2"</b> <span style="float: right;">(15)</span>		
<b>BODY PRESSURE: max 10 bar(g)</b> <span style="float: right;">(09)</span>	<b>QTY SPRING: n = 25</b> <span style="float: right;">(16)</span>		
<b>SEALING: NBR</b> <span style="float: right;">(10)</span>	<b>RL2014/34/EU</b> <span style="float: right;">(11)</span>	  II 2G Ex h IICT5 Gb II 2D Ex h IIICT80°C Db <span style="float: right;">(18)</span>	
			

Pos	Designation	Remark
<b>01</b>	Type	<b>Example: BR03-SADF 45-60</b>
		<b>BR03 = Series</b>
		BR03            replaced by BR16 BR03C        Chemistry version BR16            Standard BR02, BR04... outdated series
		<b>SADF = Type</b>
		SAD            double-acting SAF            single-acting SAD-HP       double acting HP (High Performance) single SAF-HP       acting HP (High Performance) SAD-HD       double acting hydraulic damping SAF-HD       single-acting hydraulic damping SADT           double-acting tandem piston SADF           double-acting spring mechanism SAD-M        double-acting mechanical center position SADF-M       double-acting spring centered center position DAD           Dosing drive double-acting DAF            Dosing drive single-acting
		<b>45-60 = Size</b> 45-60, 50-70 see also "Technical data sheets"
		<b>90° = Swing angle</b>
<b>02</b>	Articlel-no.	Article number AMG-Pesch
<b>03</b>	Year of manufacture	Drive year of construction
<b>04</b>	Order no.	Order number AMG-Pesch

Pos	Designation	Comment										
<b>05</b>	Serial No.	Serial No. AMG-Pesch										
<b>06</b>	Interface ISO 5211	<p style="text-align: center;">Example: <b>F16-Y-D-46</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 15%; text-align: center;">F16</td> <td>Flange design</td> </tr> <tr> <td style="text-align: center;">Y</td> <td>with projection (N=without projection)</td> </tr> <tr> <td style="text-align: center;">D</td> <td>diagonal square</td> </tr> <tr> <td style="text-align: center;">46</td> <td>Dimension square in mm</td> </tr> </table>	F16	Flange design	Y	with projection (N=without projection)	D	diagonal square	46	Dimension square in mm		
F16	Flange design											
Y	with projection (N=without projection)											
D	diagonal square											
46	Dimension square in mm											
<b>07</b>	Setting angle	Adjustment of rotation range of the drive										
<b>08</b>	Max. permissible control pressure	Maximum permissible pneumatic control pressure in barg										
<b>09</b>	Max. permissible housing pressure	Maximum permissible static pressure of the pressure-bearing components (housing, cover) in barg										
<b>10</b>	Sealing material	Material installed O-rings										
<b>11</b>	Additional information	Additional customer-specific information										
<b>12</b>	Symbol representation	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">SADT</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: middle;">VARIANT 01 RIGHT</td> <td style="text-align: center;">           VARIANT 01 EFFECTIVE DIRECTION RIGHT   </td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">VARIANT 02 RIGHT TRANSVERSE STRUCTURE</td> <td style="text-align: center;">           VARIANT 02 EFFECTIVE DIRECTION RIGHT   </td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">VARIANT 03 LINKS</td> <td style="text-align: center;">           VARIANT 03 EFFECTIVE DIRECTION LEFT   </td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">VARIANT 04 LEFT TRANSVERSE STRUCTURE</td> <td style="text-align: center;">           VARIANT 04 EFFECTIVE DIRECTION LEFT   </td> </tr> </tbody> </table>	SADT		VARIANT 01 RIGHT	VARIANT 01 EFFECTIVE DIRECTION RIGHT 	VARIANT 02 RIGHT TRANSVERSE STRUCTURE	VARIANT 02 EFFECTIVE DIRECTION RIGHT 	VARIANT 03 LINKS	VARIANT 03 EFFECTIVE DIRECTION LEFT 	VARIANT 04 LEFT TRANSVERSE STRUCTURE	VARIANT 04 EFFECTIVE DIRECTION LEFT 
SADT												
VARIANT 01 RIGHT	VARIANT 01 EFFECTIVE DIRECTION RIGHT 											
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VARIANT 03 LINKS	VARIANT 03 EFFECTIVE DIRECTION LEFT 											
VARIANT 04 LEFT TRANSVERSE STRUCTURE	VARIANT 04 EFFECTIVE DIRECTION LEFT 											



Pos	Designation	Remark
<b>12</b>	Symbol representation	<p>SADF</p> <p>VARIANT 01 EFFECTIVE DIRECTION RIGHT</p> 
		<p>VARIANT 02 RIGHT TRANSVERSE STRUCTURE</p> 
		<p>VARIANT 03 LINKS</p> 
		<p>VARIANT 04 LEFT TRANSVERSE STRUCTURE</p> 
		<p>min. / max. ambient temperature in °C Watch out! Max. Control medium temperature; see <a href="#">Section 5 - Technical Data</a></p>
<b>13</b>	Ambient temperature	
<b>14</b>	Spring torque	min. / max. spring torque -single acting actuators- [Nm]
<b>15</b>	Air supply	Specification Thread air connections
<b>16</b>	Number of springs	umber of built-in springs -single-acting actuators -
<b>17</b>	Air connection drawing	"2" (inner chamber) and "4" (outer chamber)
<b>18</b>	RL2014/34/EU EAC Marking	ACTUATOR IS ONLY DESIGNED WITH VISIBLE MARKING ACCORDING TO ATEX and EAC !!!



## 6. Marking RL2014 / 34 / EU + EAC

- RL2014/34/EU



II 2G  
II 2D

Ex h  
Ex h

IIC  
IIIC

T6  
T80°C

Gb  
Db

### Equipment protection level EPL

*DIN EN IEC 60079-0 / DIN EN ISO 80079-36*

- **Gb** = Gases/Steam  
→ Occasionally occurs during normal operation  
→ Zone 1
- **Db** = Dust  
→ Occurs in the form of a cloud during normal operation  
→ Zone 21

### Temperature class

- **T6** = Gases/Steam  
→ ignition temperature >85°C to ≤100°C  
→ permissible surface temperature = 85 ° C
- **T80°C** = Dust  
→ maximum surface temperature 80 ° C. surface

### Explosion Group

- **IIC** = over days → Gases/Steam
- **IIIC** = over days → conductive dust

### Type of protection

*DIN EN ISO 80079-37*

- **Ex h** = design safety „c“  
→ he drive is designed in such a way that it cannot become a source of ignition during normal operation and in the event of a malfunction.

### Device group

- **II 2G** = over days  
→ Equipment category 2 → Gases/Steam  
→ suitable for zone 1 and 2
- **II 2D** = over days  
→ Equipment category 2 → dust  
→ suitable for zone 21 and 22

- EAC
  - Certificate of conformity for the territory of the Eurasian Economic Union
  - Requirements according to regulations TP TC 012/2011

## 7. Design

### 7.1. General

- The drive is an essential component of an actuator (valve + drive + control valves ...).
- The drives are used to automate fittings (ball valve, flap, control flap ...).
- The transfer of a thrust to a rotary movement takes place via two opposing pistons with cast racks.. The compressed air and the spring force act via the pistons on the pinion and thus initiate the rotary movement.
- The main difference to competing products is the use of additional guide rods (see [section 7.4.Exploded view / position 50](#)), which considerably increases the mechanical load capacity of the drives.
- Swivel angle
  - The drives do not have adjustable end stops as standard
  - In terms of design, 90 ° drives allow the following angles of rotation as standard::

Actuator size	45-60	50-70
Rotation angle <sup>1)</sup> [°]	91,5	91,6

<sup>1)</sup>averaged rotation angle (from tolerance chain min./max.)

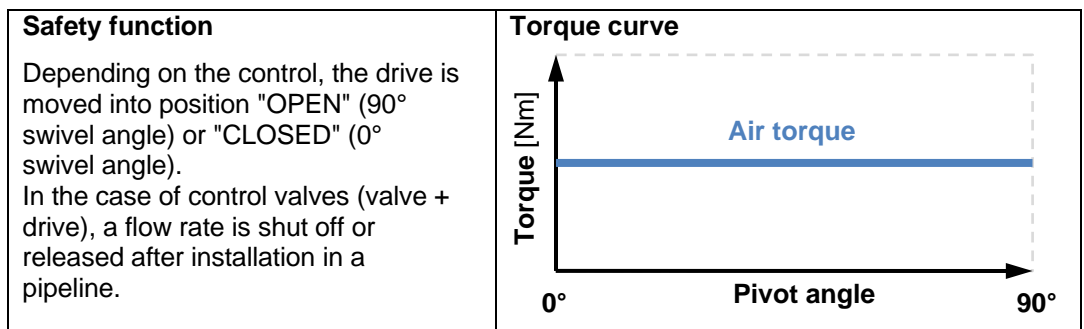
- The SADF Single-acting actuators allow safe assembly / disassembly through the use of "tied up" and "pre-tensioned" safety spring assemblies.

### 7.2. Type

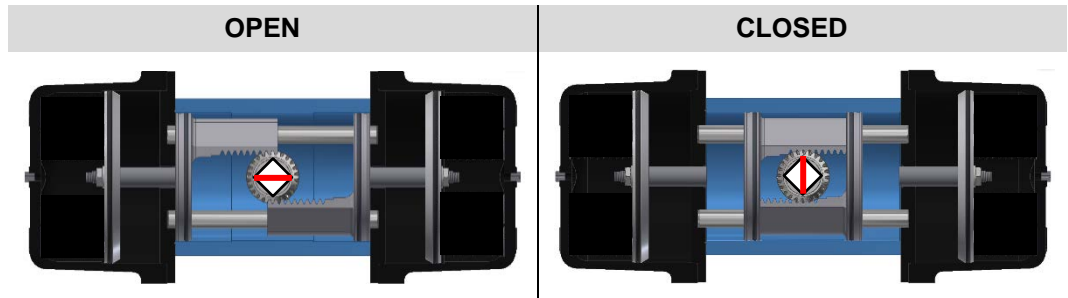
- See also document QH-121dt\_Variants-SADT\_SAD

#### 7.2.1. SADT (double acting with tandem piston)

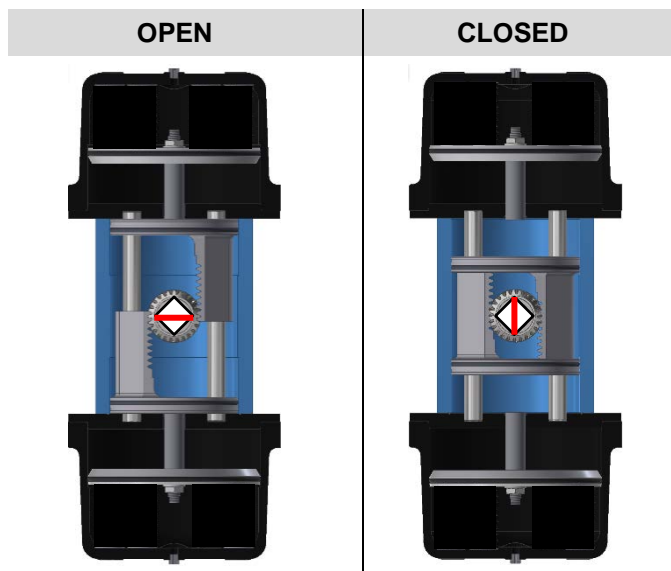
- Description
  - Double-acting double piston rotary actuator without internal reset function with tandem piston for high torques.
  - Double-acting actuators remain in the current position in case of failure of the control pressure.



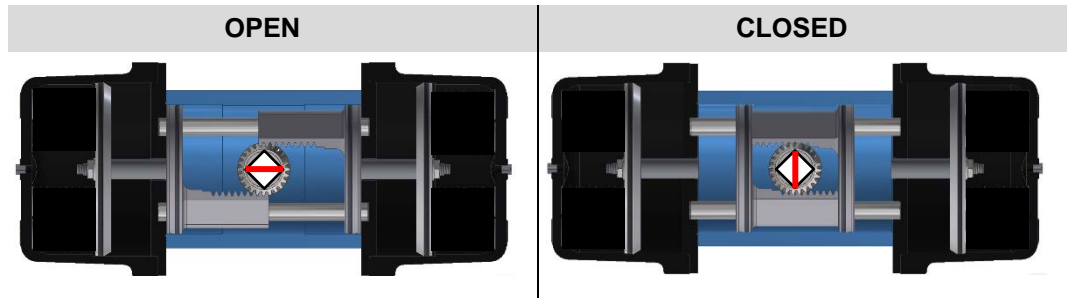
- VARIANT 01 **RIGHT**
  - When ventilating the inner chambers (2 + 2-1) and venting the outer chambers (4 + 4-1), switching shaft rotates counterclockwise (OPEN).
  - When venting the inner chamber (2 + 2-1) and venting the outer chambers (4 + 4-1), the switching shaft rotates clockwise (CLOSED).
  - Description of the connections; see [7.5.1 Air supply](#)



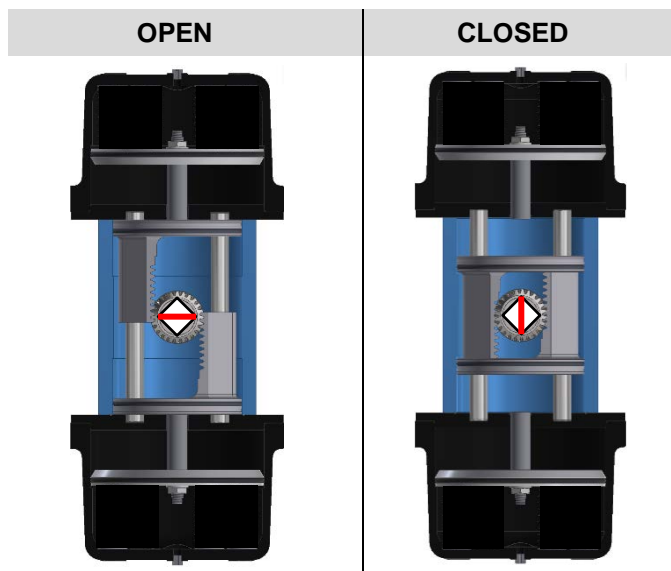
- VARIANT 02 **RIGHT TRANSVERSE STRUCTURE**
- Pinion rotated by 90 ° for control unit at right angles to the valve
  - Description; siehe VARIANT 01



- VARIANT 03 LEFT
  - When ventilating the inner chambers (2 + 2-1) and venting the outer chambers (4 + 4-1), the switching shaft rotates clockwise (OPEN).
  - When venting the inner chamber (2 + 2-1) and venting the outer chambers (4 + 4-1), the switching shaft rotates counterclockwise (CLOSED).
  - Description of the connections; see [7.5.1 Air supply](#)



- VARIANT 04 LEFT TRANSVERSE STRUCTURE
  - Pinion rotated by 90 ° for control unit at right angles to the valve
    - Description; see VARIANT 01



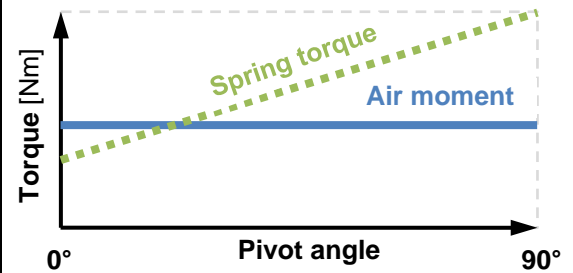
### 7.2.2. SADF (double-acting with spring mechanism)

- Description
  - Double-acting double-piston rotary actuator with internal reset function by additional spring mechanism.
  - Constant torque over complete swivel angle
  - If the control pressure fails, the drive moves to **SAFETY**

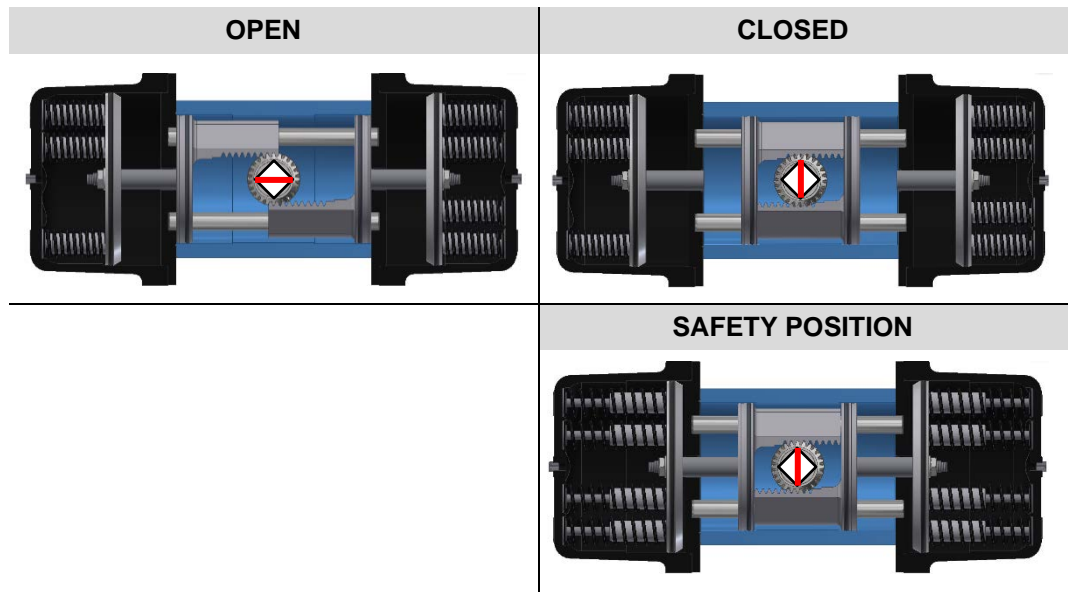
#### Safety function

If the pneumatic and/or electrical supply is lost, the actuators are moved to position "OPEN" (90° Swivel angle) or "CLOSED" (0° Swivel angle).  
 In the case of control valves (valve + drive), a flow rate is shut off or released after installation in a pipeline..

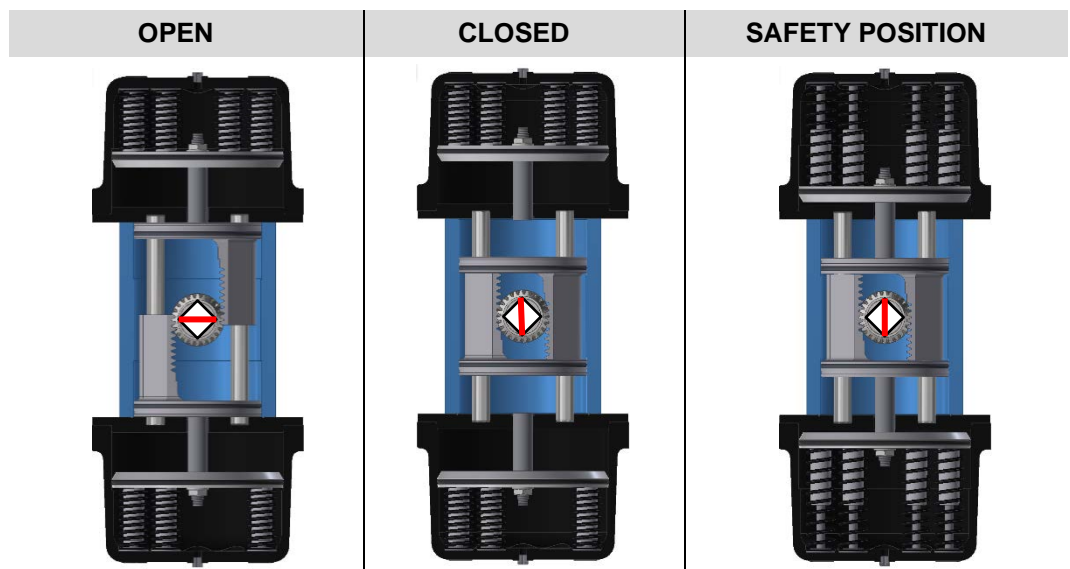
#### Torque curve



- **VARIANT 01 RIGHT**
  - When the inner chamber (2-1) is ventilated, the spring assemblies are preloaded.
  - When the inner chamber (2) is ventilated and the outer chamber (4) is vented, the switching shaft rotates counterclockwise (OPEN).
  - When the inner chamber (2) is vented and the outer chamber (4) is ventilated, the switching shaft rotates clockwise (CLOSED).
  - If the control pressure fails SAFETY, the tensioned springs turn the control shaft clockwise (CLOSED).
  - Description of the connections; see [7.5.1 Air supply](#)

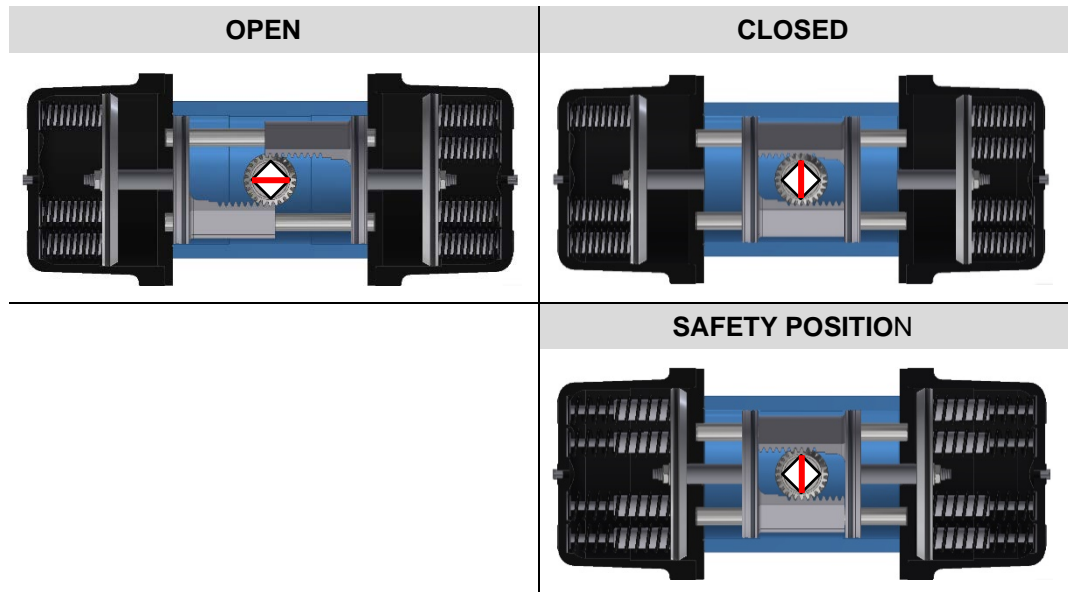


- **VARIANT 02 RIGHT TRANSVERSE STRUCTURE**
  - Pinion rotated by 90 ° for control unit at right angles to the valve
  - Description; see VARIANT 01



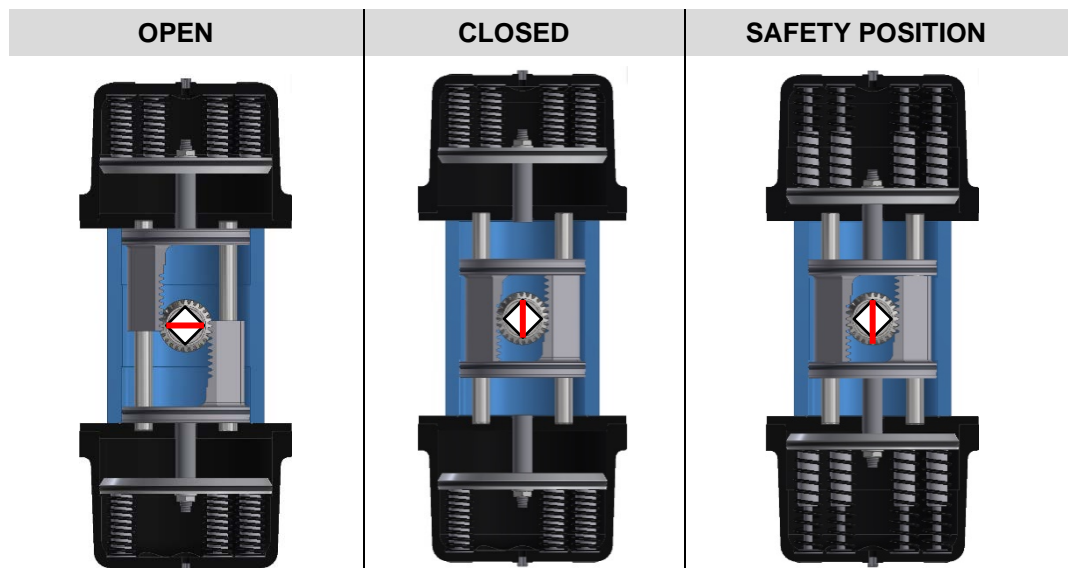
- **VARIANTE 03 LEFT**

- When the inner chamber (2-1) is ventilated, the spring assemblies are pretensioned.
- When the inner chamber (2) is ventilated and the outer chamber (4) is vented, the switching shaft rotates clockwise (OPEN).
- When the inner chamber (2) is vented and the outer chamber (4) is ventilated, the switching shaft rotates counterclockwise (CLOSED).
- For the control pressure fails SAFETY, the tensioned springs turn the control shaft counterclockwise (CLOSED).
- Description of the connections; see [7.5.1 Air supply](#)



- **VARIANT 04 LEFT TRANSVERSE STRUCTURE**

- Pinion rotated by 90 ° for control unit at right angles to the valve
- Description; see VARIANT 01





### 7.3. Series

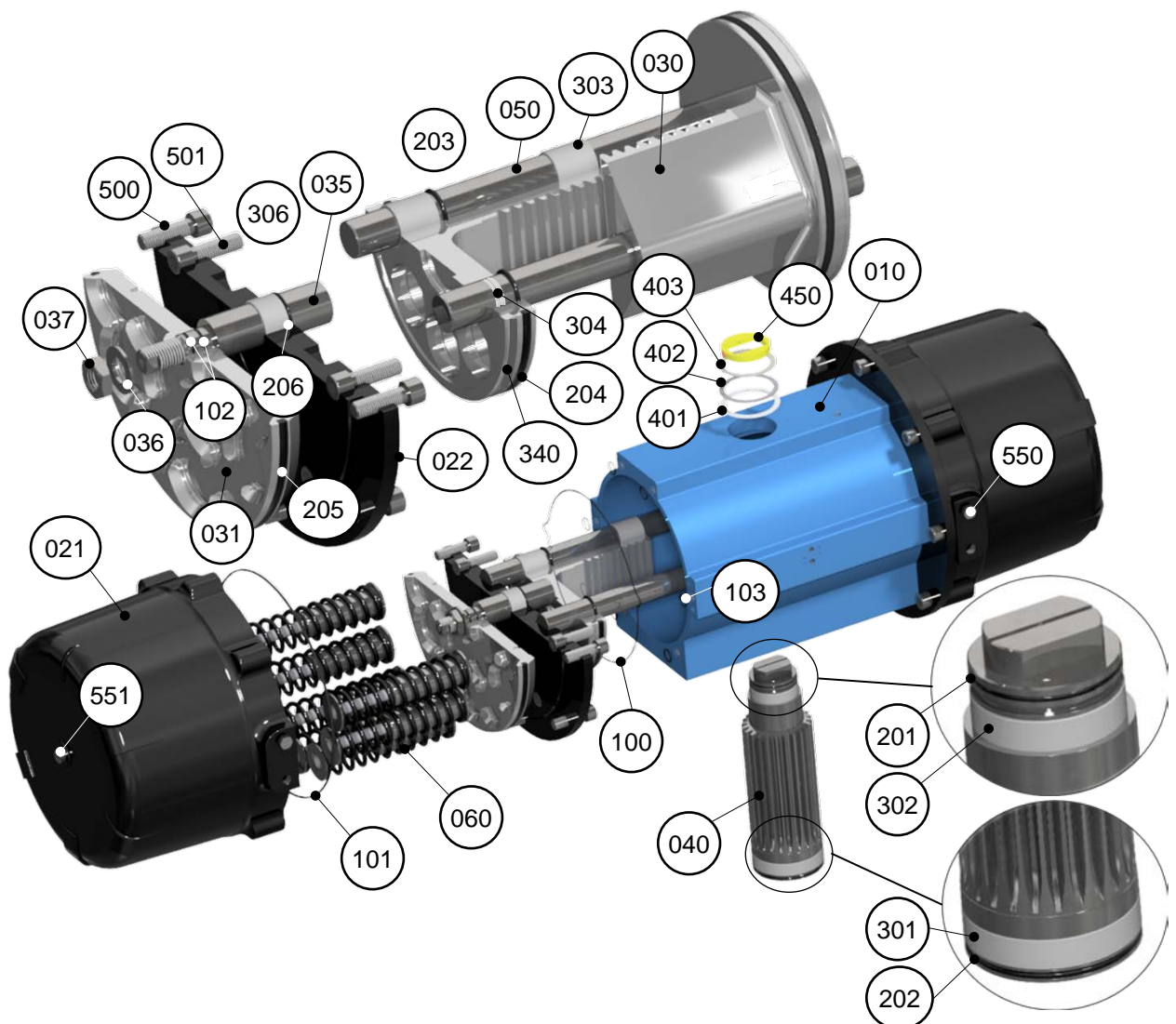
- Series specification, see [section 5.2.Nameplate](#)
- Comparison, see also [section 7.5.3. InterfaceValves](#)

	<b>BR03</b> Special	<b>BR03C</b> Chemical version	<b>BR16</b> Standard version
<i>Pinion holder</i>	Bi-Square	diagonal square	Bi-Square
Interface	one interface ISO 52110	one interface ISO 5211	one interface ISO 5211
	Fixed centering ring ISO 5211	Fixed centering ring ISO 5211	additional interface stroke limitation module <sup>1)</sup> exchangeable centering ring ISO 5211
Circlip	X39CrMo17-1	X8CrNiMoAl15-7-2	X39CrMo17-1

<sup>1)</sup> see section 7.8-stroke limitation

### 7.4. Exploded view

#### 7.4.1. PARTS LIST / SPARE PARTS SADP

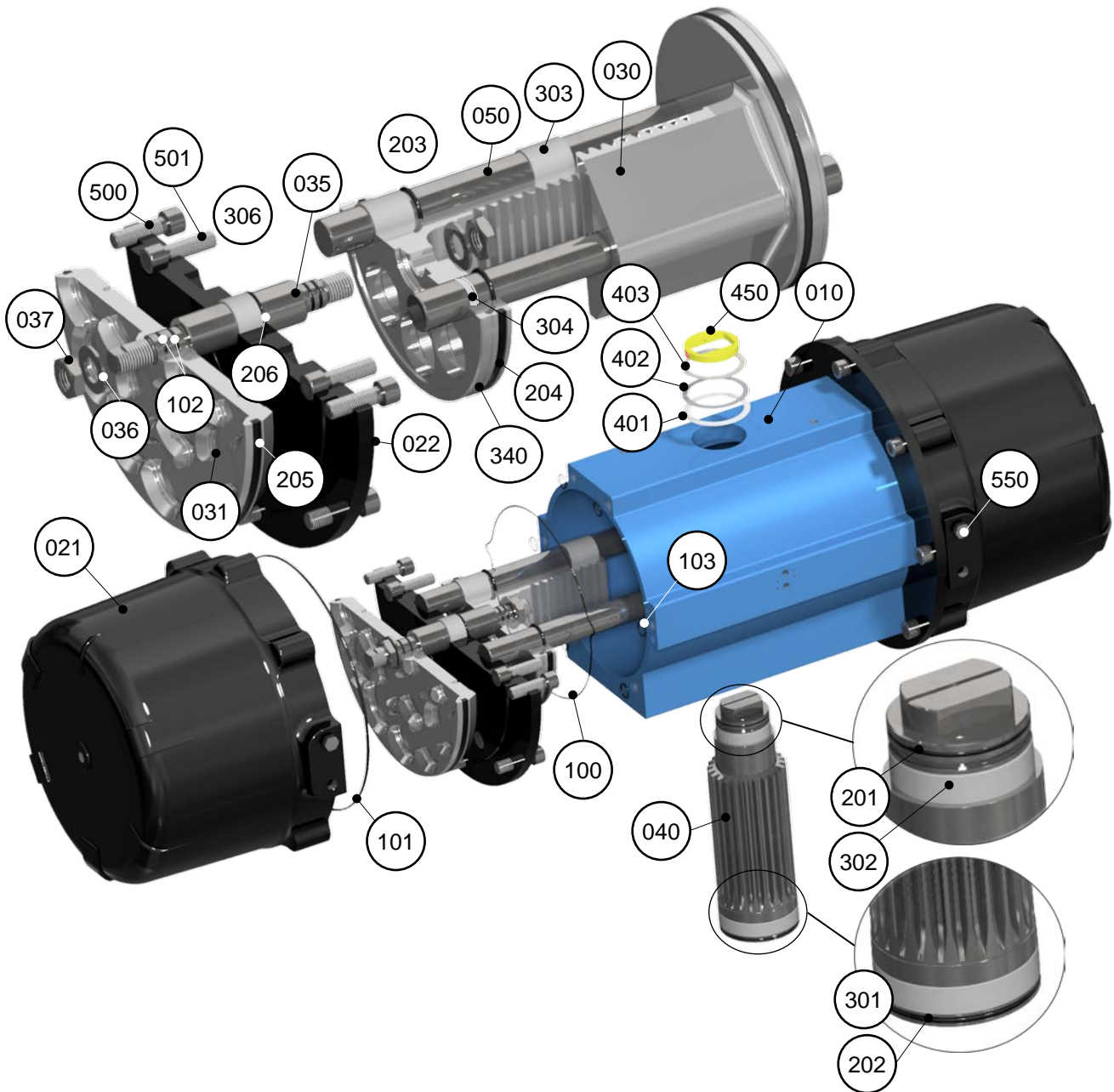


POS	QUANTITY	DENOMINATION	MATERIAL	SP <sup>2)</sup>
010	1	Housing	Aluminium, anodized	
021	2	Spring cover	Aluminium, coated	
022	2	intermediate cover	Aluminium, coated	
030	2	Pistons SADF	Alu	
031	2	Pistons	Alu	
035	2	Piston rod	Stainless steel	
036	2	Disc	Stainless steel	
037	2	Nut	Stainless steel	
040	1	Pinion	Stainless steel	
050	2	Führungsstange	Stainless steel	
060	10-34	Safety spring package	Stainless steel, coated	
100	2	O-Ring static	NBR <sup>1)</sup>	X
101	2	O-Ring static	NBR <sup>1)</sup>	X
102	4	O-Ring static	NBR <sup>1)</sup>	X
103	12	O-Ring static	NBR <sup>1)</sup>	X
201	1	O-Ring dynamic	NBR <sup>1)</sup>	X
202	1	O-Ring dynamic	NBR <sup>1)</sup>	X
203	4	O-Ring dynamic	NBR <sup>1)</sup>	X
204	2	O-Ring dynamic	NBR <sup>1)</sup>	X
205	2	O-Ring dynamic	NBR <sup>1)</sup>	X
206	2	O-Ring dynamic	NBR <sup>1)</sup>	X
301	1	Slide bearing, bottom	Bearing material	
302	1	Slide bearing, top	Bearing material	
303	4	Guide bushing	Bearing material	
304	2	Guide bushing	Bearing material	
306	2	Guide bushing	Bearing material	
340	2	Guide tape	Bearing material	
401	1	Bearing washer	Bearing material	X
402	1	Adjusting washer	Stainless steel	X
403	1	Circlip	Stainless steel	X
450	1	Position indicator	PVC	
500	16	Cover screws	Stainless steel	
501	12	Cover screws	Stainless steel	
550	4	Locking screw	Stainless steel	
551	2	Venting	Stainless steel	

<sup>1)</sup> Alternative elastomers available on request

<sup>2)</sup> spare parts

7.4.2. PARTS LIST / SPARE PARTS SADT



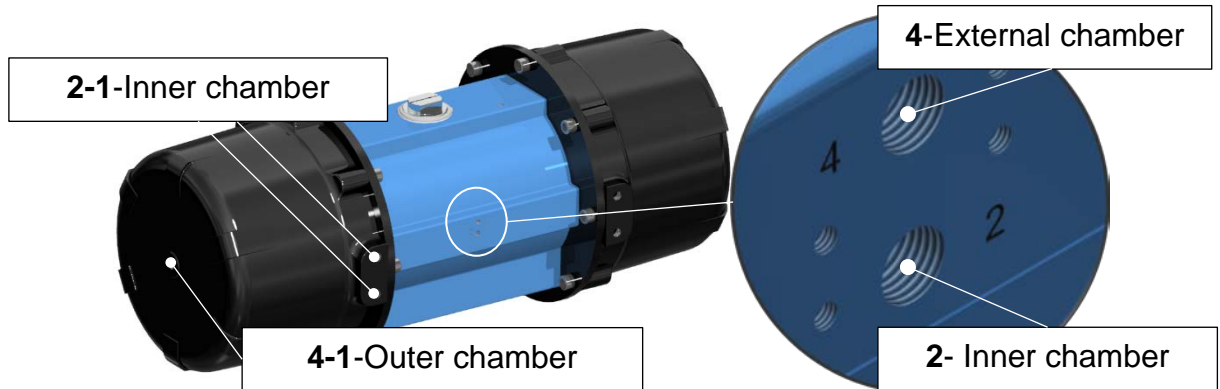
POS	QUANTITY	DENOMINATION	MATERIAL	SP <sup>2)</sup>
010	1	Housing	Aluminium, anodized	
021	2	Spring cover	Aluminium, coated	
022	2	intermediate cover	Aluminium, coated	
030	2	Pistons SADF	Alu	
031	2	Pistons	Alu	
035	2	Piston rod	Stainless steel	
036	2	Disc	Stainless steel	
037	2	Nut	Stainless steel	
040	1	Pinion	Stainless steel	
050	2	Guide rod	Stainless steel	
100	2	O-Ring static	NBR <sup>1)</sup>	X
101	2	O-Ring staitc	NBR <sup>1)</sup>	X
102	4	O-Ring static	NBR <sup>1)</sup>	X
103	12	O-Ring static	NBR <sup>1)</sup>	X
201	1	O-Ring dynamic	NBR <sup>1)</sup>	X
202	1	O-Ring dynamic	NBR <sup>1)</sup>	X
203	4	O-Ring dynamic	NBR <sup>1)</sup>	X
204	2	O-Ring dynamic	NBR <sup>1)</sup>	X
205	2	O-Ring dynamic	NBR <sup>1)</sup>	X
206	2	O-Ring dynamic	NBR <sup>1)</sup>	X
301	1	Slide bearing, bottom	Bearing material	
302	1	Slide bearing, top	Bearing material	
303	4	Guide bushing	Bearing material	
304	2	Guide bushing	Bearing material	
306	2	Guide bushing	Bearing material	
340	2	Guide tape	Bearing material	
401	1	Bearing washer	Bearing material	X
402	1	Adjusting washer	Stainless steel	X
403	1	Circlip	Stainless steel	X
450	1	Position indicator	PVC	
500	16	Cover screws	Stainless steel	
501	12	Cover screws	Stainless steel	
550	4	Locking screw	Stainless steel	

- 1) Alternative elastomers available on request  
 2) spare parts

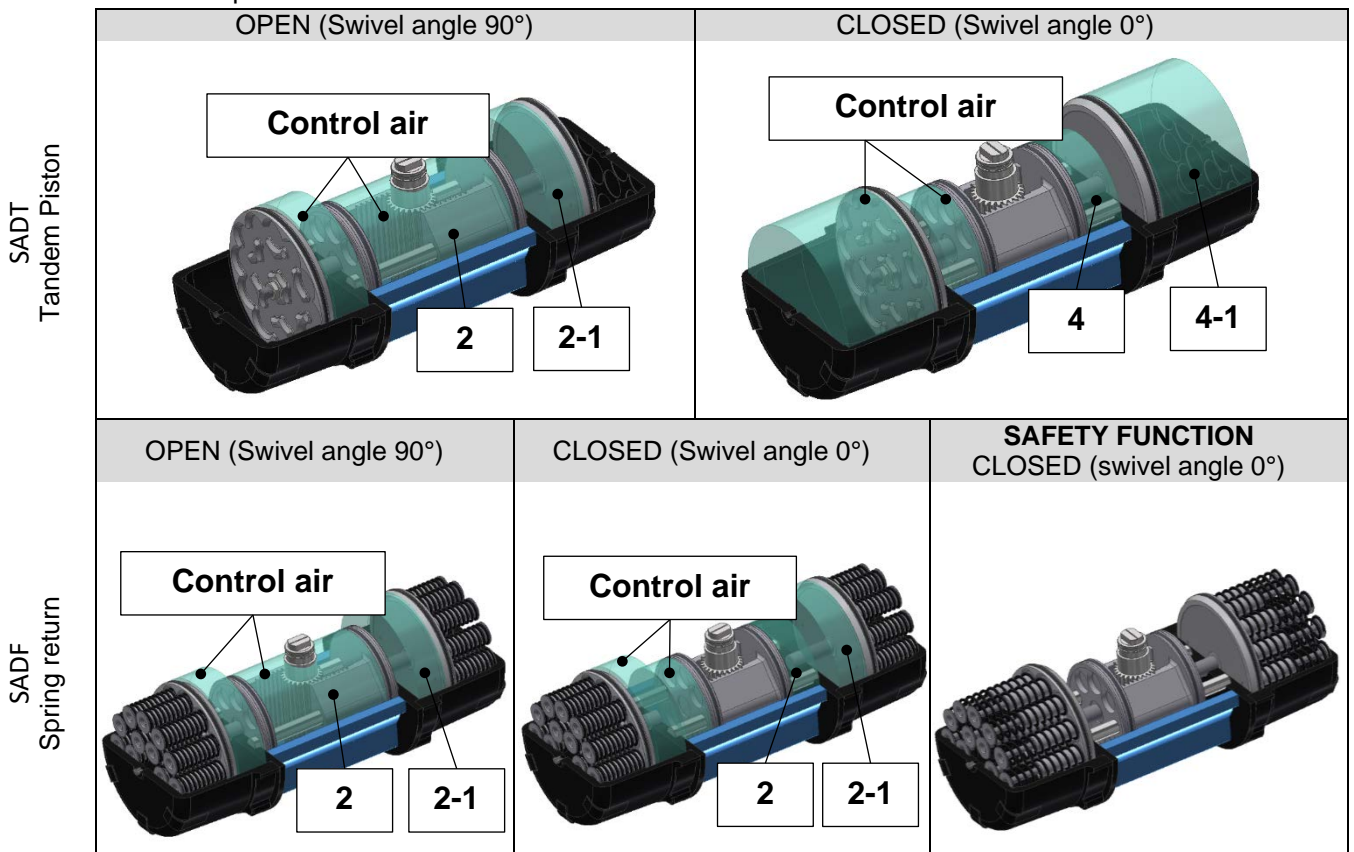
## 7.5. Interfaces / Connections

### 7.5.1. Air supply

- The air connections are marked with "2" (inner chamber) and with "4" (outer chambers). In addition, the air connections "2-1" (inner chamber) and "4-1" (outer chamber) are marked on the lids as shown.



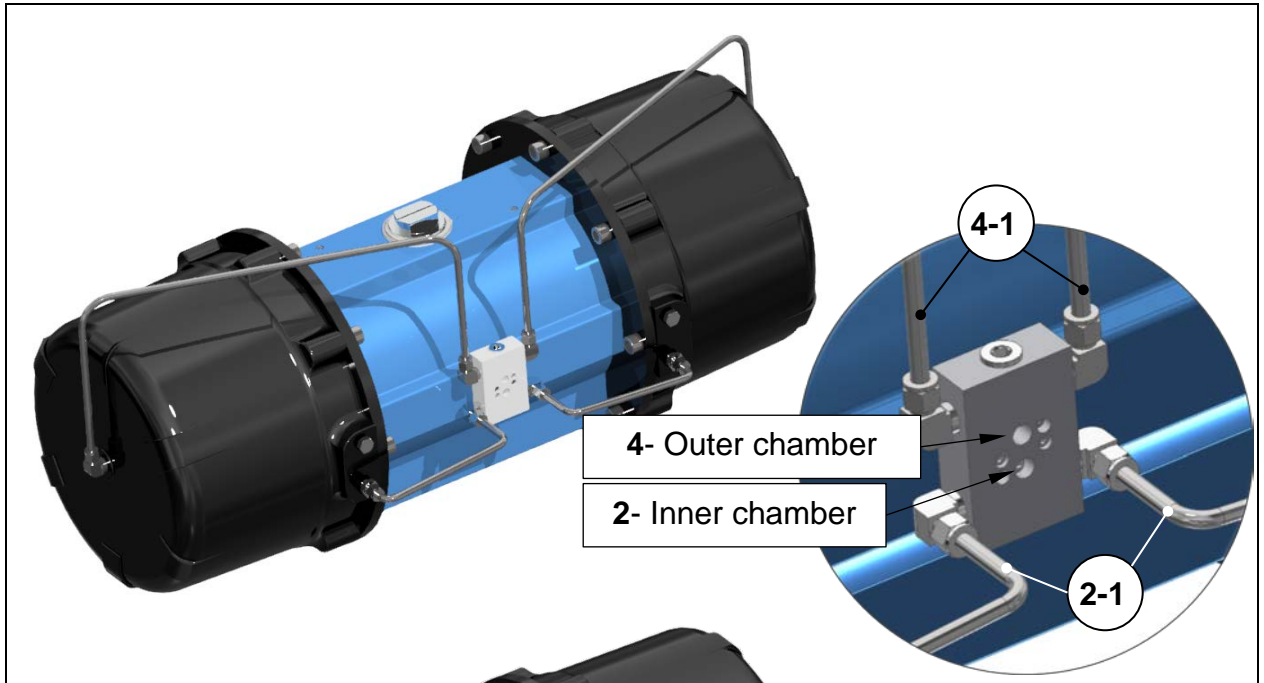
- Switch positions



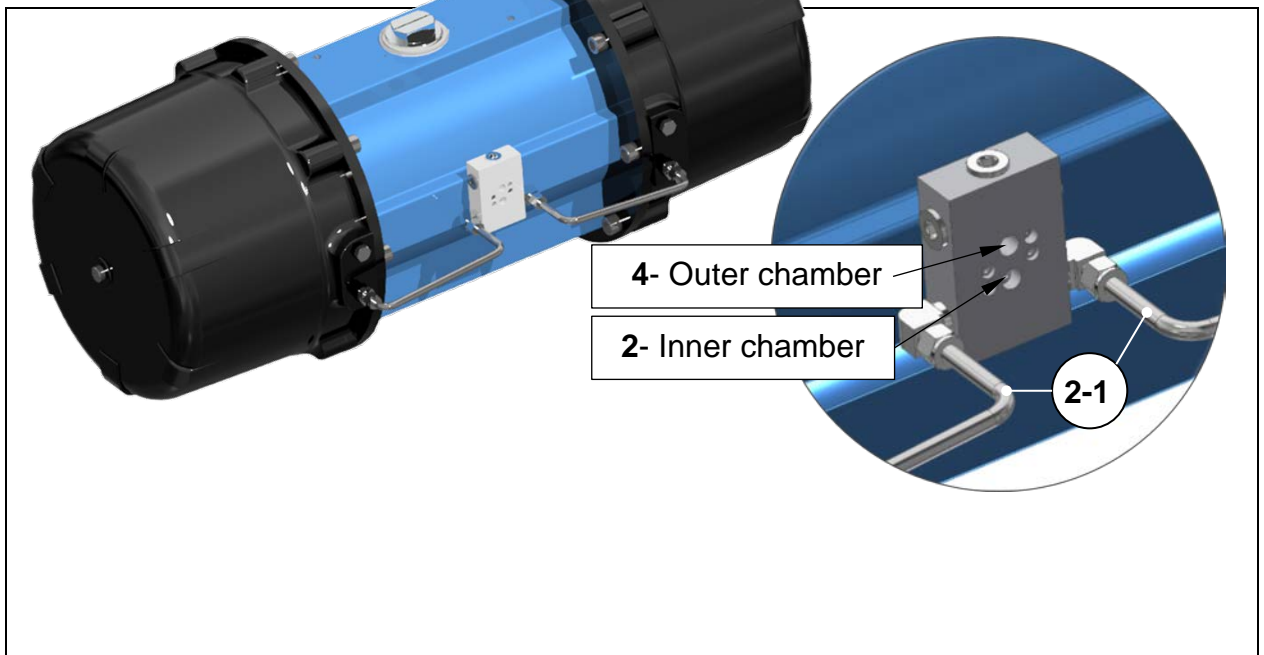
- Connection dimensions see also [section 5.1 Application limits and technical data sheets](#)
- For recommended control see document QH-121dt\_Variants-SADT\_SADF
- The drive can be supplied on request with adapter plate + piping to connect Namur valves



SADT  
Tandem Piston

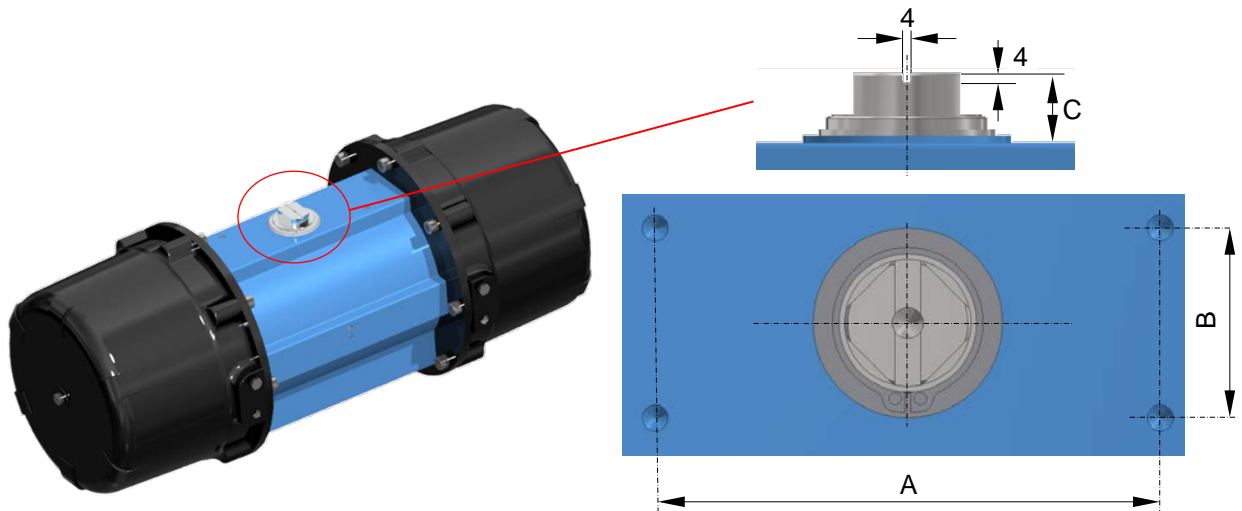


SADF  
Spring return



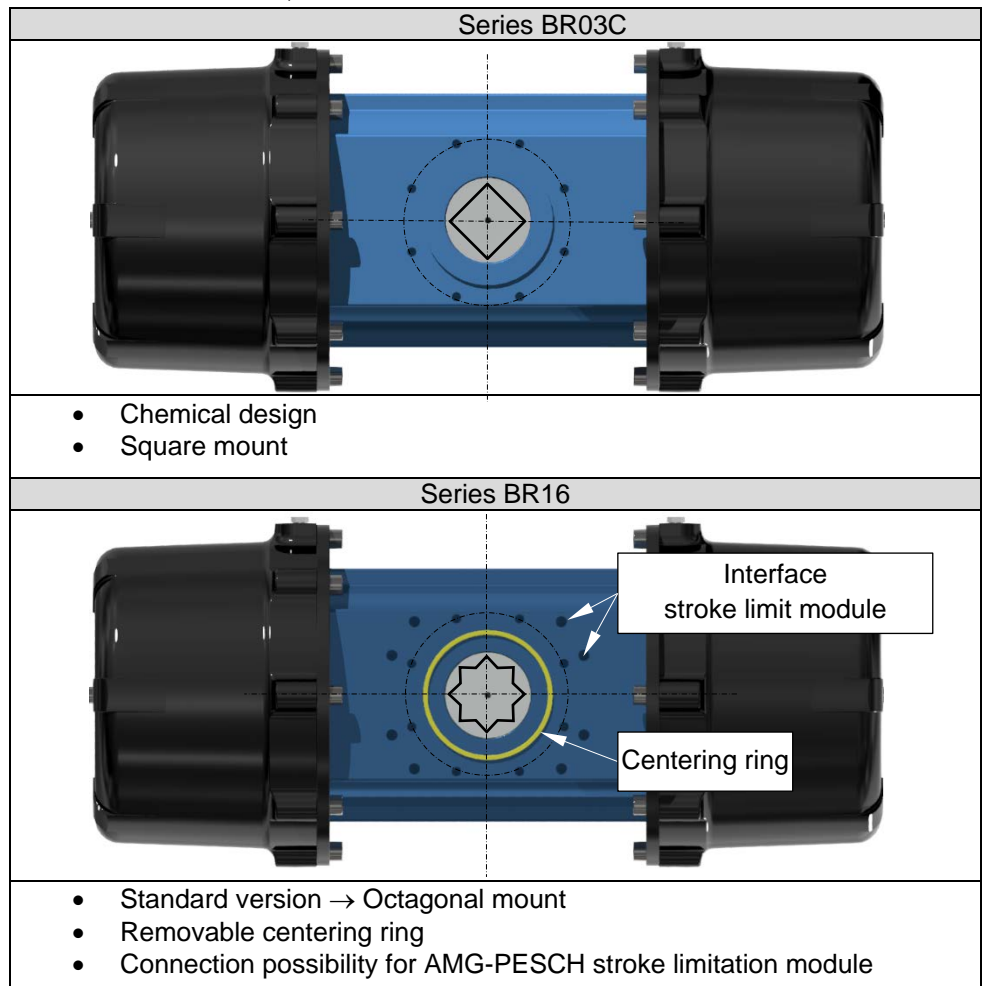
### 7.5.2. interface positioner / signal devices

- AMG double-piston rotary actuators have a connection point as standard for attaching positioners and signalling devices in accordance with VDI / VDE 3845-1 mounting level 1.
- Connection dimensions, see *technical data sheets*



### 7.5.3. Valve interface

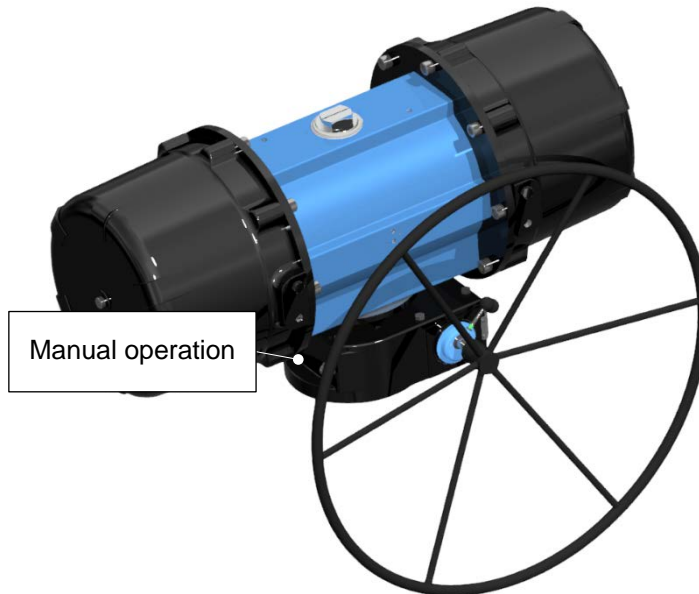
- AMG double-piston rotary actuators have a connection for valves according to DIN EN ISO 5211 as standard.
- Series
  - Connection dimensions, see *technical data sheets*





### 7.6. Manual operation

- here is the option of installing an emergency manual gearbox between the drive and the valve. The valve interface is used for assembly (see 7.3.3). The manual emergency gear must meet the following requirements:
  - The manual actuation forces must comply with EN 12570.
  - The handwheel / hand lever must remain stationary when powered..
  - The current operation must be switched off before manual operation is initiated..
  - The closing/opening directions for manual operation must be clearly marked, the closing direction must be clockwise unless otherwise specified.



### 7.7. Lubrication

- To protect the actuators and to ensure proper function, we only recommend the use of original AMG-Pesch lubricating grease.
- The following grease types are used

Temperature range		Type of grease
Standard	-25°C / +80°C	AMG-Pesch Standard Grease
Low temperature	-40°C / +60°C	AMG-Pesch high-performance greas
High Temperature	-25°C / +100°C	

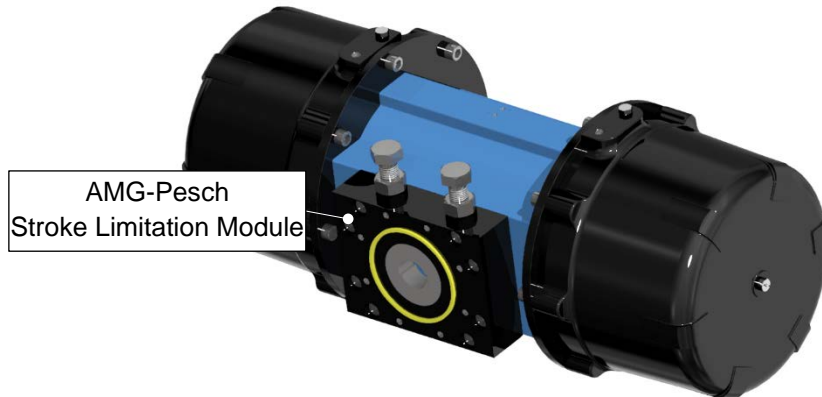
- Required amounts of grease

Size <sup>1)</sup>	45-60	50-70
Quantity of grease [g]	280	320

<sup>1)</sup> see [section 5.2 Type plate](#)

## 7.8. stroke limitation

- Stroke limiting module
  - The BR16 series is equipped with an interface for the AMG Pesch stroke limiter module as standard.
  - The assembly takes place without a centring ring; see [section 7.6.3. Valve interface.](#)
  - The stroke limitation module is used to adjust the swivel angle of the drive..
  - For more information, see also HBM dimension sheets

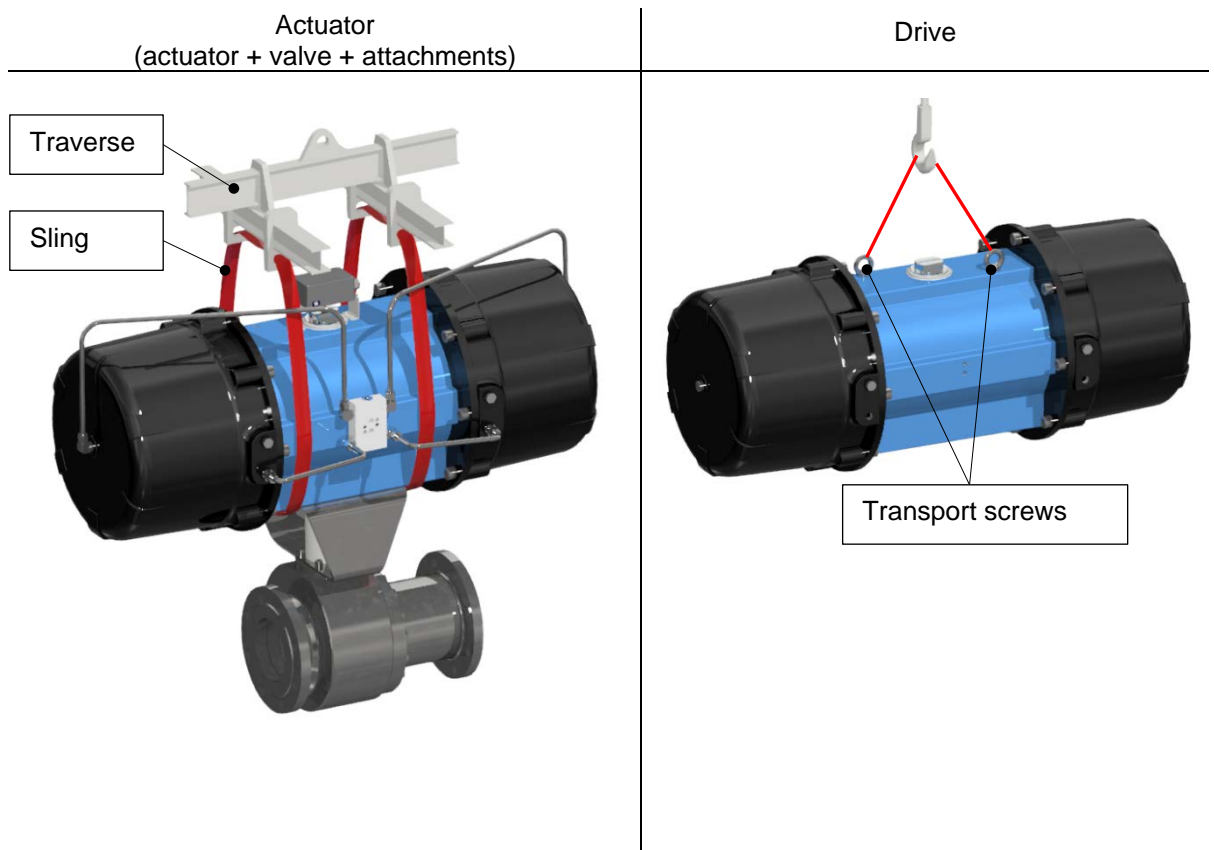


## 8. Storage

- Store the product in the original AMG PESCH packaging.
- Open connections must be closed.
- Standard storage conditions:
  - Dry
  - Covered
  - Ambient conditions -10/+40°C
  - Humidity < 65%
  - Storage period: < 6 months
- Do not remove original packaging shortly before installation (drying agents are used depending on the place of delivery).
- Storage of soft seals
  - Storage according to DIN 7716
  - Do not use after > 5 years of storage
  - Seals must be stored stress-free
  - Storage temperature
    - Non-vulcanized rubber seals = +15/+25°C
    - rubber seals = -10/+25°C
  - Humidity <65%
  - Protection from sunlight, light with UV component
  - Storage in airtight packaging

## 9. Transport

- All additional documents from the valve manufacturer / drive manufacturer and all components included in the scope of delivery must be observed
- The centre of gravity and weight must be observed during transport
- Control air line, valves and mounted parts of the drive are not permitted as suspensions; if necessary, they must be protected against damage during transport
- Handwheels and mounting parts of the valve are not permitted as suspensions; if necessary, these must be protected against damage during transport
- If the drive is equipped with transport screws / slings, these may ONLY be used to transport the driver
- All lifting devices and hoists must be approved and tested



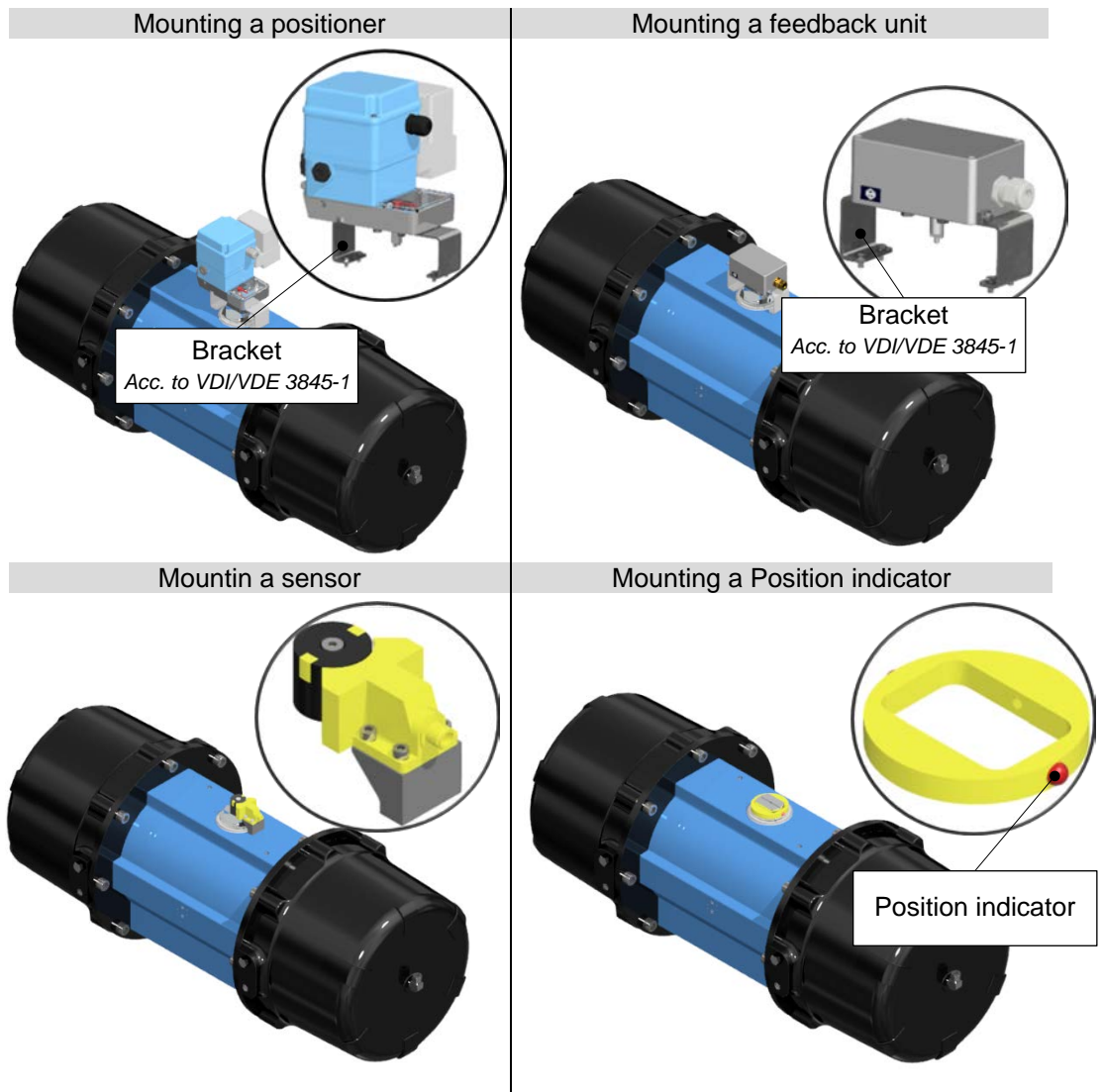
## 10. Assembly

### 10.1. General

- AMG drives are usually delivered complete with the necessary accessories, such as control valve and feedback unit. If this is not the case, the following instructions must be observed when attaching and assembling accessories and valves.
- All safety instructions and additional documentation must be observed.

### 10.2. Mounting positioner / signal devices

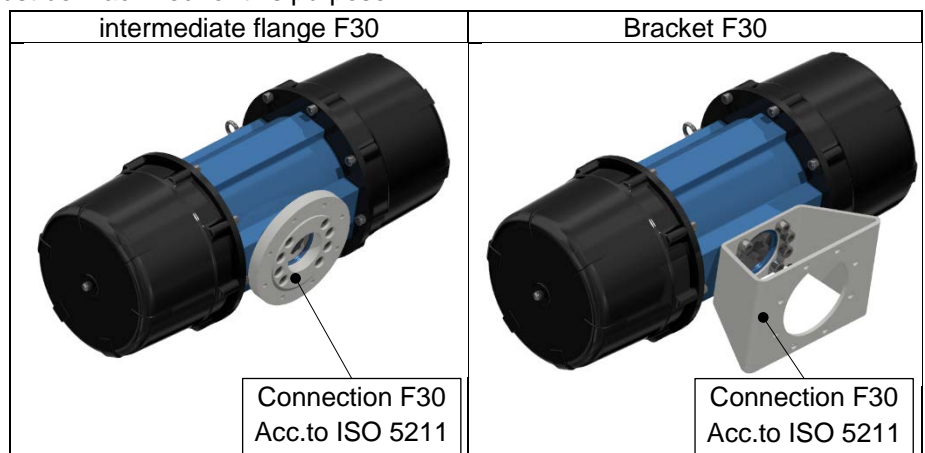
- See [section 7.5.2. Interface positioner / signal devices](#).
- During installation, all additional documents of the attached positioners / signal devices / feedback units must be observed.
- Structures



- The components / assemblies are available directly from AMG-Pesch

### 10.3. Assembly of the Valve

- The connection to valves is usually made by means of a bracket and adapter (coupling) in accordance with DIN EN 15081, The correct direction of rotation of the drive must be ensured. Non-standard structures have a negative influence on the functionality and service life of the actuator. The drive must be aligned in such a way that full passage of the valve or safe closing is guaranteed in the end positions
- Attention!!
  - Consult AMG-Pesch if the following valve torques are exceeded
    - SADT/SADF 45-60 > 4000 Nm
    - SADT/SADF 45-60 > 8000 Nm
  - To transmit higher torques, an intermediate flange or a bracket can be mounted; the drive must be machined for this purpose.



### 10.4. Disassembly of the drive

- All disassembly work should only be carried out by qualified personnel of AMG-Pesch

### 10.5. Assembly of the drive

- All assembly work should only be carried out by qualified personnel of AMG-Pesch

## 11. Commissioning

### 11.1. General

- Commissioning may only be carried out by qualified fitters; we recommend the assistance of one of our experienced specialist fitters
- All safety instructions and additional documentation must be observed
- Check all main connections
- Check all additionally required connections
  - Electrical connections
  - Pneumatic/hydraulic connections/supply units/control units
  - Check the "grounding" of the piping system to avoid electrostatic charge
- Checking the drive functions
  - Check the correct end positions by operating the drive; if necessary, check the connected valves
  - Check the limit switch signals in the specified switch position
  - Check the specified position when using a positioner
- For control units (actuators)
  - Check the correct installation in the pipeline
  - Check the specified drive function
  - Pressure tests, functional tests according to documentation of valve manufacturer
  - Safety instructions of all attached components must be observed


## 12. Maintenance / Service life

- Minimum durability  
 The drives are lubricated for life, the minimum number of switching cycles<sup>1)</sup> is according to DIN EN 15714-3; see also [technical data sheets](#).

Size	Nominal Torque [Nm]	Flange design (ISO 5211)	Switching cycles (DIN EN 15714-3)
45-60	≤ 2000	≥ F14	250000
50-70	≤ 8000	≥ F25	100000

<sup>1)</sup> 1 Schaltspiel = Antrieb 1 x öffnen + 1 x schließen

- The values are based on a load of at least 60% of the load torque at 5.5 bar control pressure and the test procedure described in DIN EN 15714-3 Annex A
- Requirement
  - Professional assembly of the drives
  - Compliance with the intended use
  - Compliance with the technical data
- Use in safety-oriented system
  - Experience shows that the service life is 10-15 years if the instructions are followed.
  - Maintenance must be carried out after 50,000 switching cycles or after max. 5 years.
  - The responsibility lies with the operator of the "safety-oriented" system.
  - see also [section 13.SIS \(Safety Instrumented System\)](#).

 AMG-PESCH an ERIKS company	<b>Operating and maintenance instructions</b> <b>AMG-Pesch DOUBLE PISTON ROTARY ACTUATORS</b> <b>TYPE SADT/SADF DOUBLE ACTING</b>	<b>QH-120en</b>
		Revision 1

- Maintenance procedure

- Attention!!! Safety instructions must be observed.
- Check
  - Function at minimum control pressure on site; technical data sheets
  - leak test (e.g. with leakage spray)
    - Check tightness at pinion top / bottom
    - Check tightness between cover and housing

- **In case of leakage, remove drive**

- For dismantling, *see section 10.4. Dismantling the drive.*

- Cleaning
- Check and, if necessary, replace parts

- For assembly *see section 10.5. Assembling the actuator*

- Smooth running test

- for double-acting actuators SADT with test pressure  $p_T=2,0\text{bar}$

- for single-acting actuators SADF depending on the number of springs n

n	10	13	16	19	25	28	31	34
$p_T$ [bar]	2,0	2,5	3,0	4,0	4,5	5,0	5,5	6,0

- Angular position
- Leak test (if necessary consult AMG-Pesch)
  - Apply compressed air to the inner chamber (2) and check the tightness of the pinion at the top/bottom. Connect outer chamber (4) with hose and immerse open hose end in water bath and check for leaks.
  - Change connections (compressed air=4 hose=2), apply compressed air to outer chamber (on the lid side). Check tightness between cover and housing. Immerse open hose end in water bath and check tightness.

### 13. SIS (Safety Instrumented System)

- Approval according to SIL applies **only** for temperature range  $-25/+80^\circ\text{C}$  and control pressure  $\leq 6\text{bar}!!$

#### 13.1. Terms and abbreviations

	DEUTSCH	ENGLISCH
SIL	Sicherheits-Integritätslevel	Safety Integrity Level
SIS	Sicherheitsgerichtetes System	Safety Instrumented Function
FMEDA	Betrachtung Anteil ungefährlicher Ausfälle und Diagnosedeckungsgrad	Failure Modes, Effects and Diagnostic Analysis
HFT	Hardware-Fehlertoleranz	Hardware Fault Tolerance
$PFD_{avg}$	Mittlere Wahrscheinlichkeit eines gefährlichen Ausfalls bei Anforderung	Average Probability of dangerous Failure on Demand
$\lambda_D$	Ausfallrate gefährliche Fehler	
PSTC	Abdeckung Teilhubtest	Partial Stroke Test Coverage
PTC	Prozentsatz zufälliger, gefährlicher, unentdeckter Fehler	Proof Test Coverage
MTC		Maintenance Coverage
PST		Partial Stroke Test
FST		Full Stroke Test



### 13.2. Reference documents

- TÜV certificate no.:968/V 1097.00/19
- FMEDA
- QF-084\_6 Declaration of Conformity actuators
- DIN EN 61508-1: Functional safety of safety-related electrical/electronic/programmable electronic systems Part 1: General requirements
- DIN EN 61508-2: Functional safety of safety-related electrical/electronic/programmable electronic systems Part 2: Requirements for safety-related electrical/electronic/programmable electronic systems
- DIN EN 61511-1: Functional safety - PCT safety devices for the process industry - Part 1: General, Terminology, requirements for systems, hardware and application programming
- DIN EN 61511-2: Functional safety - PCT safety devices for the process industry - Part 2: Instructions for use of IEC 61511-1
- DIN EN 61511-3: Functional safety - PCT safety devices for process industries - Part 3: Guidance for determining the required safety integrity levels
- DIN EN 15714-3: Industrial valves - Actuators - Part 3: Pneumatic rotary actuators for industrial valves - Basic requirements
- DIN EN ISO 5211: Industrial valves - Connections of rotary actuators
- DIN EN 15081: Industrial valves - Mounting kits for connection of rotary actuators to valves
- VDI/VDE 3845: Actuators for flowing substances - Pneumatic drives - Connection points between actuator and actuator accessories

### 13.3. Safety function

- The safety function consists of assuming the desired position of the drive on demand in order to shut off or release a volume flow accordingly.
- see [section 7.2.1.SADT \(double-acting with tandem piston\)](#)
- see [section 7.2.2.SADF \(double-acting with spring mechanism\)](#)

### 13.4. Application limits

- With a safety-related function SIF, it must be ensured that the product is suitable for use within the expected application limits. The compatibility of the operating medium with the materials used must be agreed with the manufacturer for use in safety-related applications.
- Type designation
  - SADT (double acting with tandem piston)
  - SADF (double-acting with spring mechanism)
- Ambient temperature
  - -25°C / +80°C
- Temperature control medium
  - ≤ 45°C
- See also [section 5.Technical Data](#)

### 13.5. Verification

- For the evaluation of possible failure types within the SIF and their classification into safe and dangerous failures, a failure mode and effect analysis has been carried out for the product.
- The suitability of the SIF has been proven by positive results of a type examination / endurance test and sufficient field experience..

### 13.6. SIL-Suitability

- The product is suitable for use in a safety-related system according to IEC 61508 up to SIL 2. Taking into account the minimum required hardware fault tolerance of  $HFT = 1$ , the product can also be used in redundant design up to SIL 3 (see test report). The achieved safety integrity level (SIL) of the entire safety chain must be verified by calculating the  $PFD_{avg}$  value, taking into account the architecture, the test intervals as well as its effectiveness, the respective automatic diagnostic devices, the average repair times and the specific failure rates of all products integrated in the safety chain.

### 13.7. FMEDA

- Verification of failure rates
  - Failure rates at component level in low demand mode
    - Safety functions
      - Closing/opening on demand by compressed air supply
      - Closing/opening on demand by spring force in case of failure of and/or compressed air and/or power supply

Failure rate $\lambda_D$	SADT		SADF	
		3,90 E-07/h	390 FIT	2,91 E-07/h

- Average probability of a dangerous failure  $PFD_{avg}$

	SADT	SADF
	$PFD_{avg,1001}$	1,71 E-03 $\triangleq 17\%$ SIL2
$PFD_{avg,1002}$	1,74 E-04 $\triangleq 17\%$ SIL3	1,29 E-04 $\triangleq 13\%$ SIL3

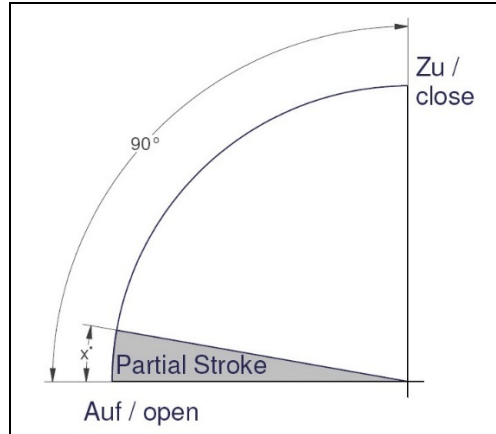
- single channel up to SIL 2
- multi-channel up to SIL 3

- Safety functions

	SADT	SADF
PSTC	53%	93%
PTC	99%	99%
MTC	>99%	>99%

### 13.8. Test interval

- The function test in the field must be carried out once a year. Possible function tests::
  - Partial Stroke Test (PST)



The Partial Stroke Test (PST) is a partial stroke X for testing the start-up behaviour of actuators without significantly influencing the plant process. The safety-related design is a prerequisite for the test, i.e. the maximum air torque must not deform the switching shaft of the valve. This is the only way to ensure that the drive also moves the valve. The application limits of the valves and drives must be observed.


- Full Stroke Test (FST)
  - A switching cycle is performed (1 x open + 1 x close)
- Redundant safety systems can be tested by bypass switching without disturbing the plant process..
- Non-redundant safety systems can be checked by partial stroke systems
  - Electronically controlled partial stroke solutions (positioner)
  - Pneumatically controlled partial stroke solutions (AMG actuator)
  - Mechanical partial stroke solutions (manual or automated)

## 14. Faults

### 14.1. Contact

- AMG-Pesch GmbH  
 Adam-Riese-Straße 1  
 50996 Köln  
 Deutschland  
 Telefon: +49 (0) 22 36 - 89 16 – 0  
 Telefax: +49 (0) 22 36 - 89 16 – 56  
 e-mail: info@amg-pesch.com

### 14.2. Analysis

Faults	Measure	Remark
Drive does not respond to control signal	<ul style="list-style-type: none"> <li>▪ Check control pressure At least the control pressure according to design is required</li> <li>▪ Check drive for stiffness</li> <li>▪ Check control Checking the cabling</li> </ul>	 <p>Observe safety instructions</p> <p>In case of queries, please have the data on the nameplate ready</p>
Solenoid valve does not switch	<ul style="list-style-type: none"> <li>▪ Check control coil Check specified control voltage Observe valve documentation</li> </ul>	
Valve switches too quickly	<ul style="list-style-type: none"> <li>▪ Provide throttle valve depending on requirements</li> </ul>	
Leakage to the outside Increased consumption of control air in the limit positions	<ul style="list-style-type: none"> <li>▪ Check control valve Seal between drive and valve defective</li> <li>▪ Check connections between housing/cover and pinion seal for leaks; see <a href="#">section 7.4. Exploded view</a></li> <li>▪ Carry out leak test on the drive → Check drive according to <a href="#">section 12. Maintenance</a></li> </ul>	
Malfunction due to switching angle adjustment	<ul style="list-style-type: none"> <li>▪ Check interface between drive and valve</li> <li>▪ Readjust if necessary and retighten screws</li> </ul>	