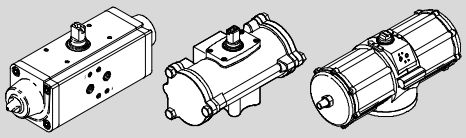
Quarter turn actuator
DAPS..R..-F..



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(en) Operating instructions

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[8037367]

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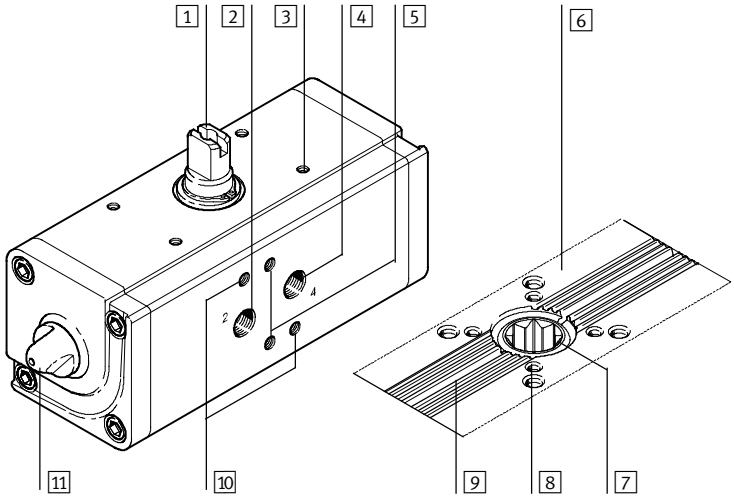
Quarter turn actuator DAPS..R..-F.. ..... English

1 Control sections and connections



1 Transmission shaft (shaft groove shows the process valve position – here closed)
2 Compressed air supply port 2 (A)
3 Four mounting threads – such as for mounting the limit switch or sensor box
4 Compressed air supply port 4 (B)
5 Mounting thread for threaded pin for aligning the NAMUR valve
6 View from below – flange to ISO 5211
7 Star-shaped coupling for seating of the square of a process valve
8 Mounting thread
9 Some product designs: leakage groove
10 Mounting thread for pneumatic NAMUR switching valve
11 Only for product variants with the ability to adjust the end position: lock nut for securing the set end position.

Fig. 1

2 Design

Quarter turn actuators of the DAPS series are compact in design and have simple and robust mechanics with little wear and tear. The design of the product is dependent on the product design and may differ from the representation shown in Fig. 1 (➔ Fig. 1).
Through the housing, a shaft is guided outward on both sides. Through this, the reaction torque is transmitted to a process valve (➔ Fig. 1, 6) and, if applicable, a limit switch or sensor box (➔ Fig. 1, 1).
The flange to the process valve is normally designed in accordance with ISO 5211 (➔ section 12). Four mounting threads on the top are used for mechanical attachment of a limit switch or sensor box (➔ Fig. 1, 3). The housing side has a hole pattern for valve attachment in accordance with VDI/VDE 3845 (NAMUR).
The housing of some quarter turn actuators has, on the process valve port side, a leakage groove (➔ Fig. 1, 9) through which the leakage of an untight process valve can escape.
The product is available in various designs. Depending on the version, the DAPS is designed as a single-acting or double-acting quarter turn actuator. The single-acting design with spring return is available with different spring strengths for various supply pressures.

These operating instructions describe the following product variants:

Features	Type codes	Description
Series	DAPS-	Quarter turn actuator
Size or nominal torque in Nm	0008- ... 8000-	Nominal torque 8 Nm ... Nominal torque 8000 Nm
Swivel angle in degrees	090-	90°
Closing direction	R	Closes to right
Mode of operation	- (without) S	Double-acting Single-acting
Spring strength (with mode of operation S)	(without) 1- 2- 3- 4-	(Omitted for double-acting) Spring strength for connection pressure 2.8 bar Spring strength for connection pressure 3.5 bar Spring strength for connection pressure 4.2 bar Spring strength for connection pressure 5.6 bar
1st flange hole pattern	F03 ... F25	Flange hole pattern F03 ... Flange hole pattern F25
2nd flange hole pattern	(without) 05 ... 16	No second flange hole pattern Flange hole pattern F05 ... Flange hole pattern F16
Design	(without) -T4 -T6 -CR	Standard design (-20 °C to + 80 °C) High temperature (-20 °C to +150 °C) Low temperature (-50 °C to +60 °C) Stainless steel (-20 °C to + 80 °C)

Fig. 2

Select suitable accessories (e.g. adapter kits) from the catalogue (www.festo.com/catalogue).

3 Function

The piston movement of the DAPS is converted to a rotary movement by means of yoke kinematics (Scotch yoke). These kinematics are only effective within an angle of approx. 90°.

For double-acting quarter turn actuators:
Pressurising and venting of the cylinder chambers cause the piston in the DAPS to move back and forth. The
linear motion of the piston is transformed into a swivel motion of the transmission shaft.

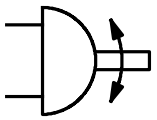


Fig. 3

For single-acting quarter turn actuators:
Return is through spring force.
Product designs with different spring strengths are available (➔ Fig. 2).

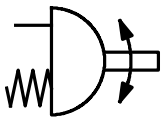


Fig. 4

The screwed-on processing valve absorbs the reaction torque of the quarter turn actuator. The torques permitted in accordance with the technical data (➔ catalogue www.festo.com/catalogue) apply here.

4 Application

The DAPS quarter turn actuator is intended to activate right-closing process valves, such as ball valves and butterfly valves with a rotation angle from 0° (valve closed) to 90° (valve open).
It is completely tailored to the requirements of the processing industry and is suitable for control of media-flow process valves in fluid engineering systems.

5 Transport and storage

Ensure the following storage conditions: short storage times in cool, dry, shaded and corrosion-resistant locations.

Warning

Danger of crushing! Danger of shearing!
The DAPS weighs up to about 183 kg, depending on the product version.
Body parts can be crushed or cut off if the product falls.
- For product versions weighing more than 12 kg, always use appropriate load-carrying equipment in order to handle the product safely during transport and assembly.

6 Requirements for product use

Note

Incorrect handling can result in malfunctions.
- Make sure that all the instructions in this section are always observed. The product will then function correctly and safely.

- Compare the limit values specified in these operating instructions with your actual application (e.g. pressures, forces, torques, masses, speeds, temperatures). The product can be operated in compliance with the relevant safety guidelines only if the load limits are observed.

- Ensure that all applicable regulations for your location are adhered to, e.g. of the trade association or national institutions.
- Take into consideration the ambient conditions at the location of use. Corrosive environments reduce the service life of the product.
- Remove the packaging except for the adhesive labels on the compressed air supply ports (danger of contamination). The material used in the packaging has been specifically chosen for its recyclability (exception: oil paper = residual waste).
- Use the product in its original status, without any unauthorised product modifications.
- Protect the device from pressure fluctuations. Use excess-pressure and pressure-regulating valves.
- Make sure the compressed air is properly prepared (Technical data ➔ section 12).
- Before carrying out installation, dismantling and maintenance work, switch off the compressed air supply and vent the actuator. Secure compressed air supply against accidental restarting.

Danger

In the case of single-acting DAPS, high spring forces (mechanically stored energy) are at work inside the product.
Parts can be ejected and cause serious personal injuries if the end cap is dismounted.
- Never remove the end cap!
- Return the product to Festo if defective or for service.

Note

- Use only unlubricated compressed air under normal conditions.

The DAPS quarter turn actuator possesses an initial lubrication which suffices for the complete service life.

Note

Continuous operation at the limits of the specified ambient temperature and work frequency can reduce the service life of the quarter turn actuator.
- Use lubricated compressed air for continuous operation under extreme conditions. The oil must be chemically inert and must not carbonise.

If lubricated compressed air is used:
The initial lubrication will be washed out. The quarter turn actuator may then only be operated with lubricated compressed air.

7 Installation

Note

The following instructions on fitting the DAPS quarter turn actuator onto a processing valve may only be used if the following requirements are met:
– The quarter turn actuator is installed in the direction of the tubing.
– If a 2-way process valve is used:
The 2-way process valve is closed.
– If a 3-way process valve is used:
The switching status of the 3-way process valve is known.

Note

If a 3-way processing valve is used:
- Align the quarter turn actuator so that the port openings for a NAMUR valve face the side without tubing.

Note

Outflowing processing medium must not ingress into the quarter turn actuator.
The housing of some quarter turn actuators has a leakage groove on the process valve port side. If the processing valve leaks, the leakage can flow through the open groove.
- For housings with leakage grooves, make sure that the groove (➔ Fig. 1, 9) is not sealed. In this way you can be sure that neither processing medium nor escaping air from the processing valve can penetrate into the quarter turn actuator.

The DAPS quarter turn actuator can be mounted with or without an adapter bridge.
If there are high media temperatures in the tubing and in processing valve:
- Use an adapter bridge and also a heat-insulated coupling extension.

7.1 Mechanical installation

- In order to mount the DAPS quarter turn actuator, set the switching shaft of the process valve so that the desired operating method for opening and closing the process valve is implemented.
- Note that a processing valve with butterfly valve can only be opened in one direction and closed in the opposite direction.
- Observe the tightening torque

Thread		M5	M6	M8	M10	M12	M14	M16	M20
Tightening torque	[Nm]	5 ... 6	10 ... 11	20 ... 23	45 ... 50	80 ... 85	125 ... 135	190 ... 200	370 ... 390

Fig. 5

To mount the quarter turn actuator without an adapter bridge:

1. Place the quarter turn actuator on the switching shaft of the process valve. Make sure here that the square of the processing valve sits in the star-shaped coupling of the quarter turn actuator without being tilted.
2. Fasten the quarter turn actuator with 4 corrosion-resistant screws and retaining rings (material: VA) to the connection flange of the process valve.
3. Tighten all the screws in diagonally opposite sequence. Tightening torque ➔ Fig. 5.
4. Continued ➔ Point 6.

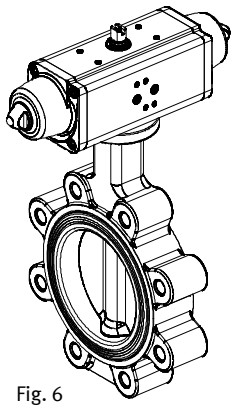


Fig. 6

To mount the quarter turn actuator with an adapter bridge, you need:
– an adapter bridge (➔ Fig. 7, 1),
– a shaft extension (➔ Fig. 7 2).

1. Align the adapter bridge so that its supports are oriented in the direction of the longitudinal axis of the quarter turn actuator and, if necessary, the open side of the adapter bridge towards the process valve.
2. Fasten the adapter bridge to the quarter turn actuator. But do not tighten the screws yet.
3. Guide the shaft extension through the adapter bridge into the star-shaped coupling on the bottom of the quarter turn actuator. Make sure that the shaft extension sits in the coupling without being tilted.

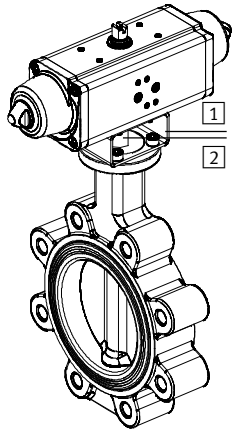


Fig. 7

4. Fasten the quarter turn actuator with adapter bridge and shaft extension to the connection flange of the process valve. Make sure here that the square of the process valve sits in the shaft extension without being tilted.
5. Tighten all the screws in diagonally opposite sequence. Tightening torque ➔ Fig. 5.

After attachment of the quarter turn actuator:
6. Check in cyclical tests whether the quarter turn actuator turns in the required direction of rotation and whether the process valve takes the required position.
7. If the quarter turn actuator does not turn in the required direction of rotation: Carry out the following modification:

DAPS..R-... (double-acting)	DAPS..RS-... (single-acting)
1. Remove the pneumatic solenoid valve. 2. Turn the solenoid valve 180°. 3. Note the position of the threaded pin for orientation of a NAMUR valve. 4. Fasten the solenoid valve again.	1. Remove the screws on the actuator side. 2. Turn the actuator 90° while it is still connected through the shaft extension or directly to the processing valve. 3. Tighten the mounting screws.

Fig. 8

7.2 Pneumatic installation

Connections for the compressed air supply
DAPS quarter turn actuator, double-acting:
– Air supply at port 2 (A) – see Fig. 1, 2
Rotational movement of the switching shaft in an anti-clockwise direction.
– Air supply at port 4 (B) – see Fig. 1, 4
Rotational movement of the switching shaft clockwise.

DAPS quarter turn actuator, single-acting (spring return):
– Air supply at port 4 (B): rotational movement anti-clockwise.
– Spring return: rotation clockwise.

Note

For DAPS..RS-... (single-acting):
- Fasten a filter element to the exhaust port 2 (A) to prevent ingress of dirt particles.

7.3 Installing circuitry

Using the pneumatic switching valves:
- Please note the instructions and explanations in the relevant operating instructions for the pneumatic valves.

8 Commissioning

Note

- Make sure that the operating conditions ➔ section 12 lie within the permissible ranges.

The product is ready for operation as soon as it is installed and connected.
- Make sure that a process valve attached to the quarter turn actuator can be switched without hindrance.
- Slowly pressurize the quarter turn actuator at first. For slow start-up pressurisation use soft-start valve type HEL.

8.1 Adjustment of the end positions

Some product variants offer the possibility to adjust one or even both end positions of the DAPS within narrow limits in order to influence the closing or opening angle of the mounted process valve. During adjustment of the end positions, observe the permissible adjustment range of the DAPS used (➔ section 12, end position adjustment range).

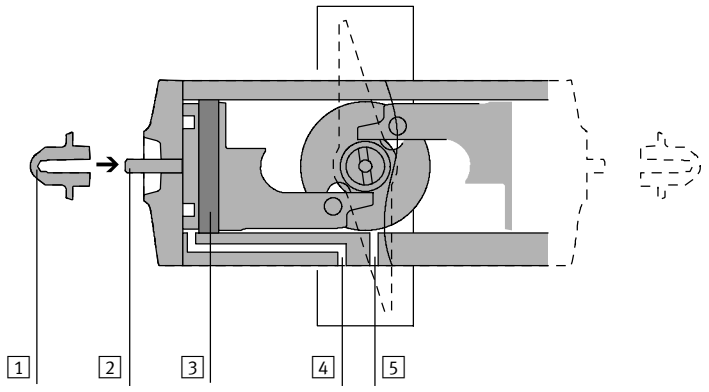
Note

Product variants without specification of an adjustment range have **no** possibility for setting end positions, e.g. all product variants made of stainless steel (DAPS-...-CR).

The now following description for end position setting refers to the following sizes in the designs “Standard”, “High temperature” (-T4) and “Low temperature” (-T6):
– DAPS-...-R-...(double-acting); size 0015 up to 1920 (➔ section 8.2)
– DAPS-...-RS.. (single-acting); size 0015 up to 0960 (➔ section 8.3)
Information on adjustment of the end position for other sizes can be found, if applicable, in the appendix to the operating instructions supplied with the product (➔ www.festo.com).

8.2 Adjustment for the DAPS-...-R-... (double-acting) – size 0015 ... 1920

For these product variants, the end position that the actuator takes during venting through port 4 (B) can be adjusted (turn to the right - close process valve).



1 Lock nut with sealing ring
2 Threaded rod
3 Piston
4 Port 2 (B)
5 Port 4 (A)

Fig. 9

1. Supply compressed air and close the process valve. This fixes the threaded rods, if necessary – dependent on the current setting. Loosening of the lock nuts will then not accidentally change the current setting.
2. Screw down the lock nuts with sealing ring on both sides. If the threaded rods have loosened, retighten them by hand until a light resistance is felt.
3. Supply compressed air and open the process valve. The pistons run into the inside end position
4. Adjust the end position:
   Observe that a complete turn of the threaded rod can change the swivel angle approx. 1.5° to 3.5° – dependent on the product design.
   – Turning threaded rods clockwise reduces the swivel angle.
   – Turning threaded rods anti-clockwise increases the swivel angle.
   - Turn both threaded rods so they stop the pistons in operation simultaneously.
5. Supply compressed air and close the process valve. The pistons run against the threaded rods into the outer end position.
6. Check the position of the process valve. To change the swivel angle, repeat step 3 and 4.
7. If the desired position is found, check whether both threaded rods offer resistance to the pistons in a closed process valve position. If necessary, screw in loose threaded rods until resistance is felt.
8. Screw the lock nuts back onto the threaded rods – tightening torque 5 Nm.
9. Check the mode of operation of the quarter turn actuator (➔ section 8.4)

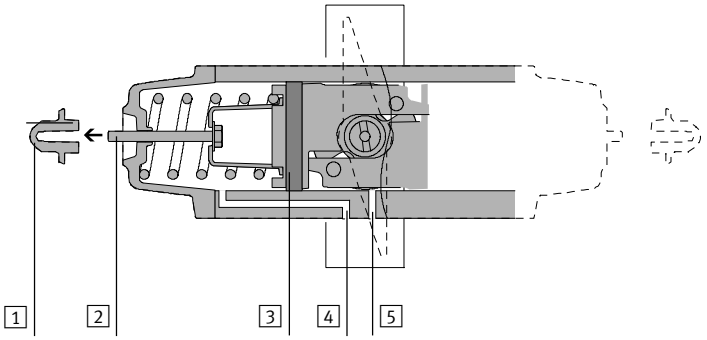
8.3 Adjustment with the DAPS-...-RS.. (single-acting) – size 0015 to 0960

For these product variants, one of the two end positions of the DAPS can be adjusted – either the end position for right turning or the end position for left turning.

End position for right turning – closing process valve

Note

For the single-acting DAPS, the end position setting for right turning (closing process valve) does not have a mechanical stop, since the spring disc is not mechanically connected to the piston. The threaded rod therefore limits only the path of the return spring so that the piston comes to rest without spring force. But the piston movement or turning of the shaft is not mechanically limited and can be continued through external forces.

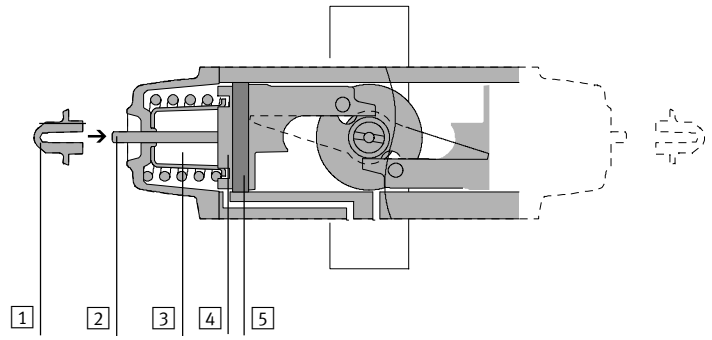


1 Lock nut with sealing ring
2 Threaded rod
3 Piston
4 Port 2 (B)
5 Port 4 (B)

Fig. 10

1. Vent the DAPS and close the process valve. Through spring return, the pistons run into the inside end position up to the spring disc and are held by the threaded rods, if necessary. This fixes the threaded rods, if necessary – dependent on the current setting. Loosening of the lock nuts will then not accidentally change the current setting.
2. Screw down the lock nuts with sealing ring on both sides. If the threaded rods have loosened, loosen them by hand until a light resistance is felt.
3. Supply compressed air and open the process valve. The pistons move to the outer end position.
4. Adjust the end position:
   Observe that a complete turn of the threaded rod can change the swivel angle approx. 1.5° to 3.5° – dependent on the product design.
   – Turning threaded rods clockwise increases the swivel angle.
   – Turning threaded rods anti-clockwise reduces the swivel angle.
   - Turn both threaded rods equally far, so that the path of both return springs is identical.
5. Vent the DAPS and close the process valve. Through spring force, the pistons are moved into the inside end position until the threaded rods and spring discs delimit the spring path.
6. Check the position of the process valve. To change the swivel angle, repeat steps 3 to 6
7. If the desired position is found, check whether both threaded rods offer resistance to the pistons in a closed process valve position. If necessary, screw in loose threaded rods carefully until resistance is felt.
8. Screw the lock nuts back onto the threaded rods – tightening torque 5 Nm.
9. Check the mode of operation of the quarter turn actuator (➔ section 8.4)

End position for left turning – opening process valve



1 Lock nut with sealing ring
2 Threaded rod
3 Adjustment range of the outer end position (see technical data)
4 Spring disc
5 Piston

Fig. 11

1. Supply compressed air and open the process valve. The pistons move to the outer end position. This fixes the threaded rods, if necessary – dependent on the current setting. Loosening of the lock nuts will then not accidentally change the current setting.
2. Screw down the lock nuts with sealing ring on both sides. If the threaded rods have loosened, retighten them by hand until a light resistance is felt.
3. Vent the DAPS and close the process valve. The pistons move to the inner end position.
4. Adjust the end position:
   Observe that a complete turn of the threaded rod can change the swivel angle approx. 1.5° to 3.5° – dependent on the product design.
   – Turning threaded rods clockwise reduces the swivel angle.
   – Turning threaded rods anti-clockwise increases the swivel angle.
   • Turn both threaded rods equally far so they stop the pistons in operation simultaneously.
5. Supply compressed air and open the process valve. The pistons run against the threaded rods into the outer end position.
6. Check the position of the process valve. To change the swivel angle, repeat steps 3 to 6
7. If the desired position is found, check whether both threaded rods offer resistance to the pistons in the opened process valve position. If necessary, screw in loose threaded rods carefully until resistance is felt.
8. Screw the lock nuts back onto the threaded rods – tightening torque 5 Nm.
9. Check the mode of operation of the quarter turn actuator (➔ section 8.4)

8.4 Check the mode of operation of the quarter turn actuator

- Check in cyclical tests, through alternating pressurisation and, if necessary, venting, whether the quarter turn actuator takes the required positions.
- If necessary, adjust the end positions to the extent the quarter turn actuator offers this possibility (➔ section 8.1).

9 Maintenance and care

If used as intended in the operating instructions, the device will be maintenance-free.

10 Disassembly

Warning

Danger of injury due to uncontrolled movements.
- Switch the tubing system pressureless before dismantling.

1. If necessary, remove any existing limit switches.
2. Remove the pneumatic switching valve.
3. Loosen the screws on the flange of the process valve.
4. Remove the quarter turn actuator (if necessary including mounting adapter and coupling extension) from the process valve.

11 Troubleshooting

- Please contact Festo.

12 Technical data

General technical data	DAPS-...	DAPS-...-T4	DAPS-...-T6	DAPS-...-CR
Operating medium	Compressed air to ISO8573-1:2010 [7:4:4]			
Note about the operating medium	Operation with lubricated medium possible (required in further operation)			
	Ester oil ‹ 0.1 mg/m³, corresponds to ISO 8573:2010 class [-:-:2]			
Ambient temperature [°C]	–20 ... +80	–20 ... +150	–50 ... +60	–20 ... +80
Swivel angle [°]	90			
Mounting position	Any			
Valve connection corresponding to standard				
– DAPS-0008-... – ... – DAPS-0030-...	VDI/VDE 3845 (NAMUR)	VDI/VDE 3845 (NAMUR)	VDI/VDE 3845 (NAMUR)	–
– DAPS-0053-... – ... – DAPS 8000				VDI/VDE 3845 (NAMUR)
Pneumatic connection				
– DAPS-0015..RS to DAPS-0180..RS.. – DAPS-0008..R- to DAPS-0360..R-..	G1/8			
– DAPS-0240..RS to DAPS-0960..RS.. – DAPS-0480..R- to DAPS-1920..R-..	G1/4			G1/8
– DAPS-1440..RS to DAPS-4000..RS.. – DAPS-2880..R- to DAPS-8000..R-..	G3/8			–
Standard connection to the process valve	ISO 5211			
CE marking (see declaration of conformity ➔ www.festo.com)	in accordance with EU Explosion Protection Directive (ATEX) [1]			

1) Certification-specific special documentation and the documentation of the sensors must be considered ➔ www.festo.com

Fig. 12

Operating conditions DAPS..RS-... (single-acting)		DAPS-0015 ... 0960	DAPS-1440 ... 2880	DAPS-4000
Nominal operating pressure	[bar]	5.6		
Operating pressure [1]	[bar]			
– DAPS..RS1-...		2.8 ... 8.4		
– DAPS..RS2-...		3.5 ... 8.4		
– DAPS..RS3-...		4.2 ... 8.4		
– DAPS..RS4-...		5.6 ... 8.4		
End-position adjusting range at 0°				
– DAPS..RS-...	[°]	One end position adjustable; -1 ... +9	±5	
– DAPS..RS-...-T4	[°]	One end position adjustable; -1 ... +9	–	
– DAPS..RS-...-T6	[°]	One end position adjustable; -1 ... +9	±5	–
– DAPS..RS-...-CR	[°]	–		
End-position adjusting range at 90°				
– DAPS..RS-...	[°]	One end position adjustable; 81 ... +91	85 ... +95	
– DAPS..RS-...-T4	[°]		–	
– DAPS..RS-...-T6	[°]		85 ... +95	–
– DAPS..RS-...-CR	[°]	–		

1) Minimum operating pressures vary for single-acting quarter turn actuators dependent on the number of springs

Fig. 13

Operating conditions DAPS..R-... (double-acting)		DAPS-0008	DAPS-0015 ... 0960	DAPS-1440 ... 1920	DAPS-2880 ... 5760	DAPS-8000
Nominal operating pressure	[bar]	5.6				
Operating pressure [1]						
– DAPS..R-...	[bar]	1 ... 8.4				1 ... 7
– DAPS..R-...-T4	[bar]	3 ... 8.4		–		
– DAPS..R-...-T6	[bar]	3 ... 8.4				–
– DAPS..R-...-CR	[bar]	2.5 ... 8.4				–
End-position adjusting range at 0°						
– DAPS..R-...	[°]	–	-1 ... +9		±5	
– DAPS..R-...-T4	[°]	–	-1 ... +9	–		
– DAPS..R-...-T6	[°]	–	-1 ... +9		±5	–
– DAPS..R-...-CR	[°]	–				
End-position adjusting range at 90°						
– DAPS..R-...	[°]	–			85 ... +95	
– DAPS..R-...-T4	[°]	–				
– DAPS..R-...-T6	[°]	–			85 ... +95	–
– DAPS..R-...-CR	[°]	–				

1) Exceptions for devices with special marking

Fig. 14

Switching time [s] per cycle[1)]	DAPS..RS-... (single-acting)	DAPS..R-... (double-acting)
DAPS-0008-...	–	0.08
DAPS-0015-... DAPS-0015-...-CR	0.2 0.24	0.08 0.08
DAPS-0030-... DAPS-0030-...-CR	0.5 0.50	0.13 0.13
DAPS-0053-...	0.9	–
DAPS-0060-... DAPS-0060-...-CR	– 1.02	0.2 0.21
DAPS-0090-...	1.3	–
DAPS-0106-...	–	0.4
DAPS-0120-... DAPS-0120-...-CR	1.7 1.71	– 0.47
DAPS-0180-...	2.7	0.6
DAPS-0240-... DAPS-0240-...-CR	3.7 3.2	0.8 0.81
DAPS-0360-...	3.9	1.2
DAPS-0480-... DAPS-0480-...-CR	3.1	1.6 1.54
DAPS-0720-...	5.8	2.7
DAPS-0960-...	6.3	3.1
DAPS-1440-...	19.0	5.5
DAPS-1920-...	15.0	6.0
DAPS-2880-...	19.0	16.0
DAPS-3840-...	–	12.0
DAPS-4000-...	25.0	–
DAPS-5760-...	–	16.0
DAPS-8000-...	–	22.0

1) Average values under idle conditions

Fig. 15

Product weight [kg]	DAPS..RS-... [1)] (single-acting)	DAPS..R-... (double-acting)
DAPS-0008-...	–	0.3
DAPS-0015-... DAPS-0015-...-CR	1 ... 1.2 1.7	0.75 0.9
DAPS-0030-... DAPS-0030-...-CR	1.65 ... 1.95 2.4	1 1.3
DAPS-0053-...	2.6 ... 3	–
DAPS-0060-... DAPS-0060-...-CR	– 4.5	1.6 1.8
DAPS-0090-...	5 ... 5.9	–
DAPS-0106-...	–	2.5
DAPS-0120-... DAPS-0120-...-CR	5.8 ... 6.8 7.6	– 3.3
DAPS-0180-...	7.4 ... 8.9	4.6
DAPS-0240-... DAPS-0240-...-CR	10.2 ... 11.8 12.9	5.4 5.6
DAPS-0360-...	14.5 ... 16.5	6.5
DAPS-0480-... DAPS-0480-...-CR	19.3 ... 22.7 –	9.6 9.5
DAPS-0720-...	26.2 ... 33	12
DAPS-0960-...	36 ... 42	17.4
DAPS-1440-...	74	23.4
DAPS-1920-...	67	32
DAPS-2880-...	117	56
DAPS-3840-...	–	49
DAPS-4000-...	183	–
DAPS-5760-...	–	86
DAPS-8000-...	–	106

1) Product weight is dependent on the spring strength (➔ www.festo.com/catalogue).

Fig. 16

Information on materials	DAPS-...	DAPS-...-T4	DAPS-...-T6	DAPS-...-CR
Seals	Nitrile rubber Polyurethane (PUR) Fluoro elastomer	Fluoro elastomer PTFE-reinforced	FVMQ PTFE-reinforced	Nitrile rubber Polyurethane (PUR) Fluoro elastomer
Shaft	High-alloy steel (1.4305)			High-alloy stainless steel (1.4301)
Cover	Wrought aluminium alloy			High-alloy stainless steel (1.4408)
Housing				
Screws	High-alloy steel			High-alloy stainless steel

Fig. 17