PROTACT

PNEUMATIC ACTUATORS 90°

PR series

Issued: 09/2023

Description

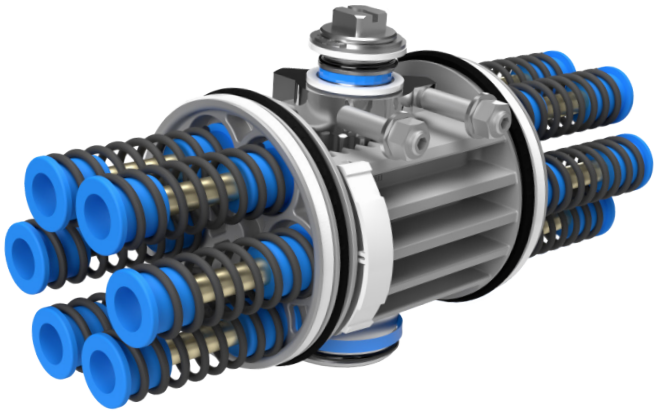
Our pneumatic actuator series PR combines a number of custom-required features and based on its large and finely subdivided torque bandwidth it is the perfect solution for nearly all requirements in the field of valve automation.

The well proven rack&pinion construction ensures a durable and reliable usage in continuous operation even in harshest conditions and is the key to process reliability for decades. It provides maximum torque output in combination with compact and weight saving design.

Through the structural design with internal slide-bearings, actuators of the PR series are completely maintenance free. All requirements of a simple service are achieved by the working principle and pre-loaded safety springs.

Thanks to the consideration of all common standards in respect of connection interfaces, PR actuators provide maximum modularity in terms of combination with valves and accessories such as solenoid valves, position feedback systems or positioners.

Based on the usage of high quality aluminum alloys and an additional powder coating, the actuators provide the highest level of corrosion-resistance and can be easily used in demanding environments.



Function

Actuators of the PR series are pneumatic double-piston rotary actuators, which are primarily used for the automation of quarter-turn valves such as ball valves, butterfly valves or plug valves. They are generally provided in two different functions: single-acting and double-acting.

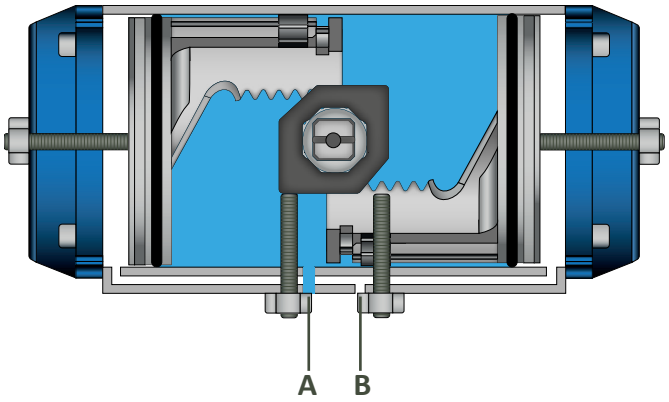
Double piston principle means that two pistons create two pressure chambers. By inflating one of these chambers the pistons are moved into opposite directions either towards or away from each other. The resulting force is provided to the central actuator pinion via toothed racks which are connected with the pistons and so creates a constant torque over the entire pivoting angle.

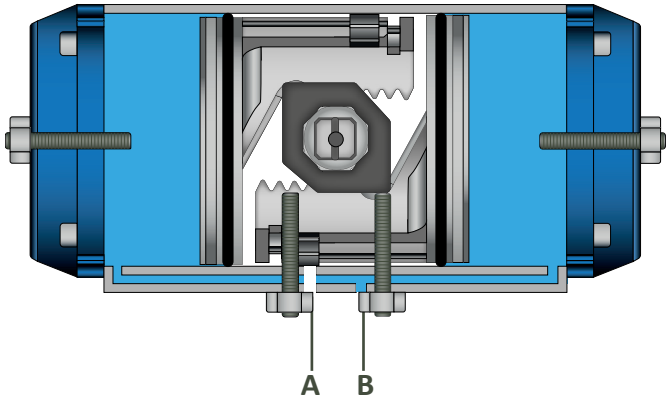
Double-acting function

In the double-acting actuator version, the movement in both directions gets generated by the control pressure.

Via connection port „A“ the pressure chamber between the two pistons gets pressurized and the pistons move out. The resulting force is transmitted to the pinion and effects a rotational movement.

Once the outer pressure chamber is pressurized via connection port “B”, the pistons move towards each other again and the rotation process is reversed.

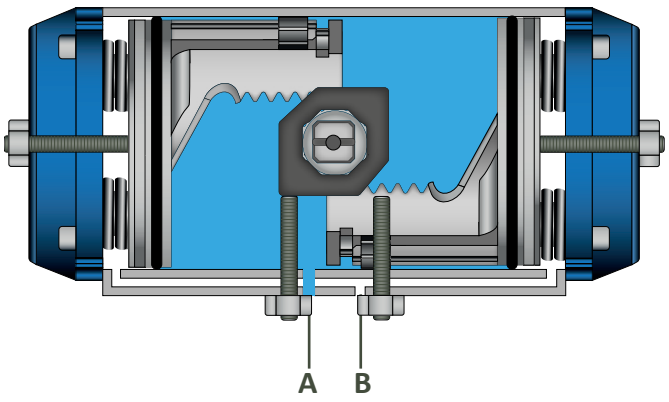


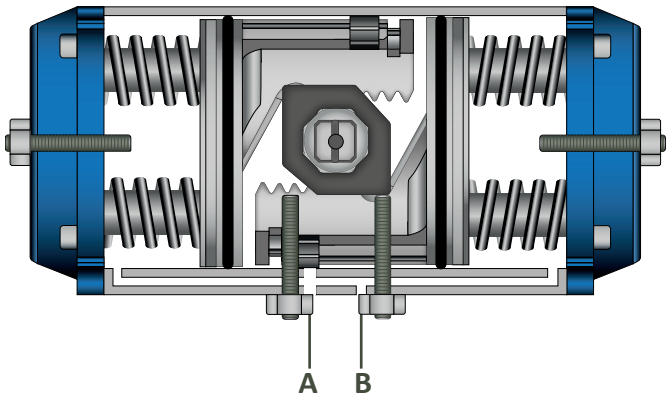


Single-acting function

In the single-acting actuator version, the movement into one rotation direction gets generated by the control pressure and the movement of the reverse rotation by integrated safety springs.
Via connection port „A“ the pressure chamber bet- ween the two pistons gets pressurized, the pistons move out and compress the integrated spring cart- ridges. At the same time the force resulting at the pistons is transmitted to the pinion and effects a rotational movement.
Once the pressure chamber is vented via port „A“, the springs push the pistons towards each other and the rotation process is reversed.

The single acting actuator version thereby provides a safety function for the case of pressure loss.



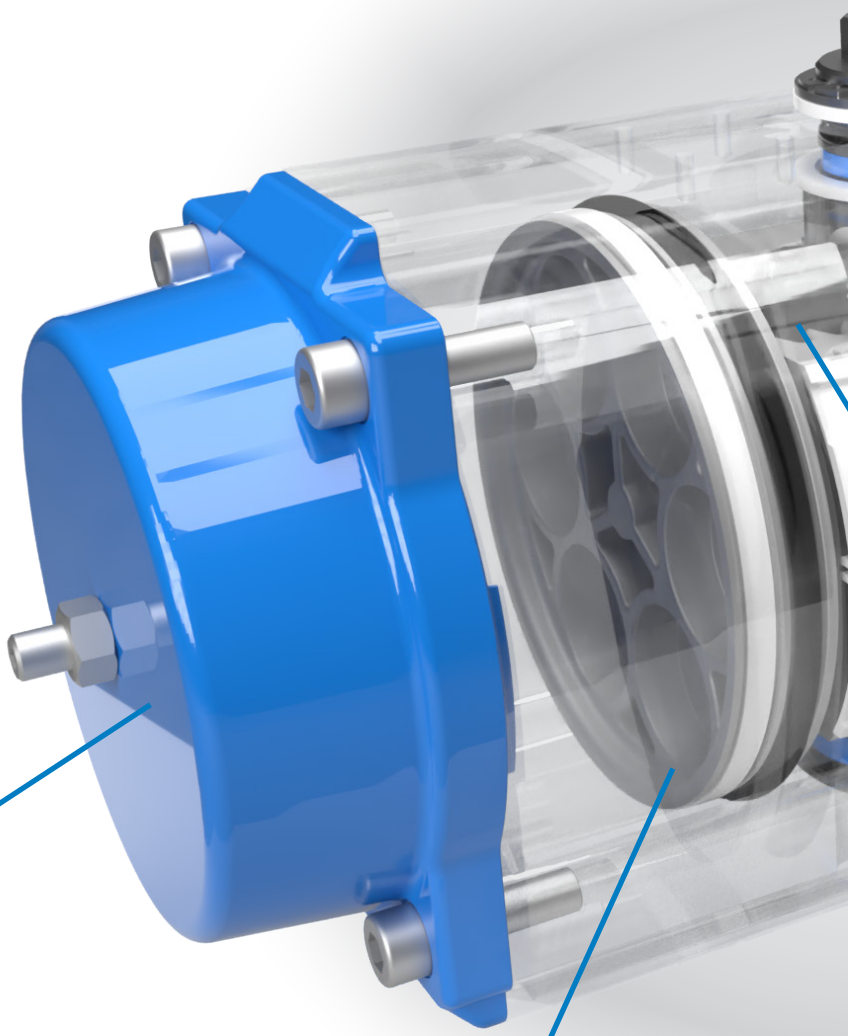


Features

Wide torque range up to 13000Nm double acting and 4200Nm single acting
One actuator series for all your valve series.

90°, 120°, 135°, 180° and 3-position actuator versions available
Full scope of rotation angles available

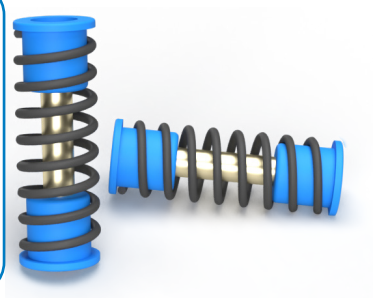
Full powder-coating
Besides the usage of high grade aluminium alloy the full coating provides an additional increase of the actuator´s corrosion resistance.



Identical actuator caps for double- and single-acting actuators for all sizes
Reduced stock-holding, simple conversion between double- and single-action.

Stroke adjustment +5° to -20° Optional: 100%-stroke-adjustment
Enables an easy adjustment of pi- voting angles for special valves as distributor valves, 3-way valves and other special applications.

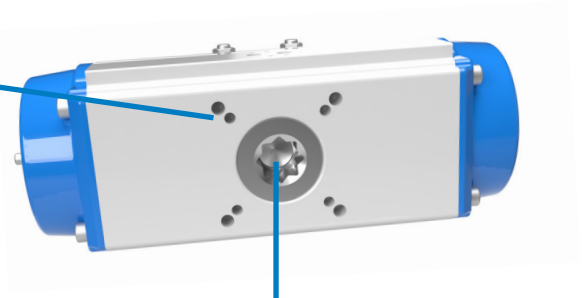
Pre-loaded safety springs
Vereinfachen die Adaption an die Simplifies the configuration according to the operation parameters as well as the maintenance and avoids the risk of injury while dismantling the actuator caps.

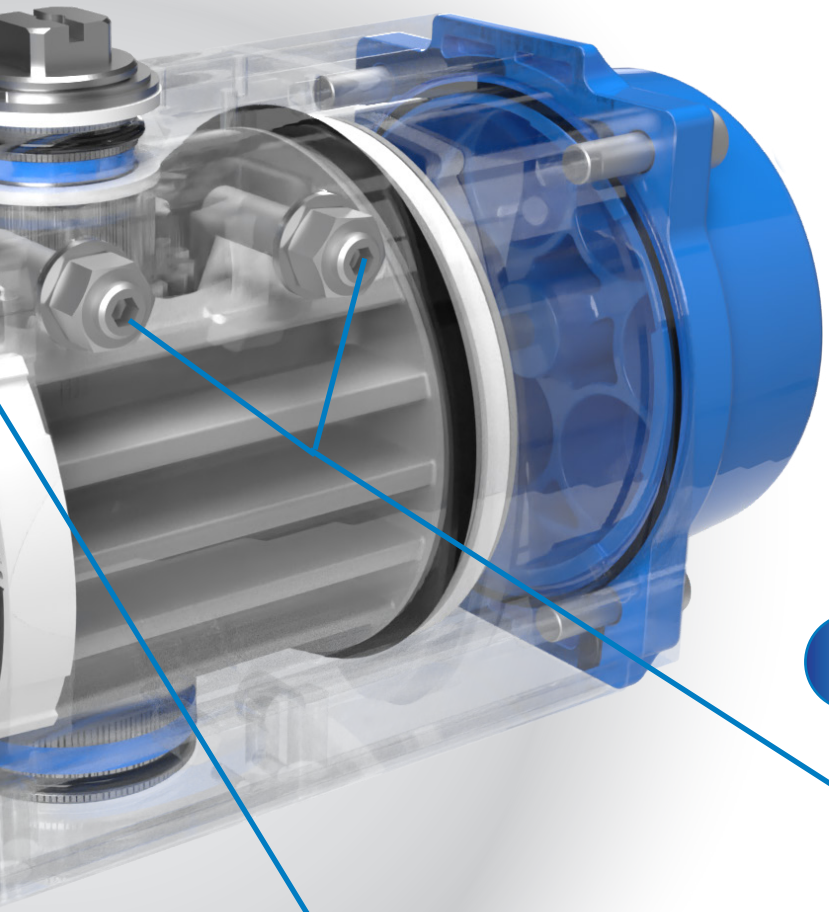


Hard-coated pistons
The surface treatment of the actuator pistons protects against influences due to aggressive components in the control air or instreaming ambient air. This significantly increases the service life

Multiple ISO-connection interfaces per actuator size

Maximized possibility to mount the valve directly to the actuator without any need of adapters and mounting kits.





Double-square stem connection (Double-D- or Key-connection optional)

Allows the adaptation of valves according to ISO 5211 and DIN 3337 with parallel or diagonal square head

Double end stop adjustment +/- 5°

Provides the possibility to exactly adjust open and closed valve-position. This prevents flow losses and increased wear of the valve and simultaneously reduces the quantity of actuator variants.

18 actuator sizes with customizable spring packages

An accurate actuator-adaptation in respect of valve torque and control pressure provides optimized cost-benefit ratio.

Precision milled gear teeth

The machine tooth flanks minimize wear and ensure optimum function even for demanding control operation.

Technical data

General Specification

Construction principle	Pneumatic double-piston rotary actuator in rack&pinion-design with self-centering pistons; double- and single-acting execution	
Materials	See chapter „Parts and materials“	
Temperature range	Standard	-20°C ... +80°C
	Low temperature	-40°C ... +80°C
	High temperature	-10°C ... +150°C
ATEX marking	CE Ex	Standard and low temperature II 2 G Ex h IIC T6/T5 Gb II 2 D Ex h IIIC 100°C Db High temperature II 2 G Ex h IIC T6...T3 Gb II 2 D Ex h IIIC 170°C Db
Control pressure	2,5 ... 8 bar	
Pressure media	Dry, filtered air or inert gases in respect of remaining oil-, dust and water-content according to DIN ISO 8573-1 / class 4, maximum particle diameter 30µm, dew point minimum 10°C below ambient temperature	
Nominal rotation angle	90° resp. 180° Adjustable in both end positions +/-5° Serial stroke adjustment for switched position up to -20° (optional 100% stroke adjustment)	
Torque range	Double-acting: 3 ... 13000Nm Single-acting: 4 ... 4200Nm	
Standards	Interface actuator/ feedback-unit	VDI/VDE 3845 resp. NAMUR
	Interface actuator/ control media	VDI/VDE 3845 resp. NAMUR
	Interface actuator/ valve	ISO 5211 and DIN 3337

Weight

		Actuator size									
		002	003	004	007	010	015	023	033	043	052
Weight (kg)	double-acting	0,80	0,97	1,22	2,02	2,60	3,23	4,58	5,92	8,18	8,68
	single-acting	-	-	1,35	2,19	2,86	3,64	5,35	6,76	9,30	10,06
		069	088	134	216	263	387	587	763	1143	1628
Weight (kg)	double-acting	11,20	14,10	20,60	33,20	39,70	57	78,70	114	171	240
	single-acting	13,70	16,50	24,40	40,20	49,20	70	100	141	220	285

Volume

		Actuator size									
		002	003	004	007	010	015	023	033	043	052
Volume (l)	double-acting	0,09	0,19	0,28	0,44	0,64	0,90	1,37	1,83	2,5	3,0
	single-acting	-	-	0,12	0,21	0,30	0,43	0,64	0,95	1,3	1,6
		069	088	134	216	263	387	587	763	1143	1628
Volume(l)	double-acting	4,4	4,7	6,9	11,3	15,0	20,0	31,0	53,5	81,4	108,6
	single-acting	2,3	2,5	3,7	5,9	7,5	11,0	17,0	23,8	35,1	52,6

Typecode

PR | 004 | S | . | 10 | . | 090 | . | 0305 | S | 11 | . | P | R | S

Type

Size

Function

D: double-acting

S: single-acting

Spring set

Rotation angle

Rotation angle in degree

ISO valve interface

03: F03
04: F04
05: F05
07: F07
10: F10
12: F12
14: F14
16: F16
25: F25

0305: F03 + F05
0507: F05 + F07
0710: F07 + F10
1012: F10 + F12
1625: F16 + F25

Stem connection

S: Square acc to ISO 5211 and DIN 3337

D: Double-D

Stem connection dimensions

Dimension in mm

Mounting direction

P: Parallel to pipe

T: Transversal to pipe

Spring rotation sense

R: Clockwise CW (Spring to close)

L: Counterclockwise CCW (Spring to open)

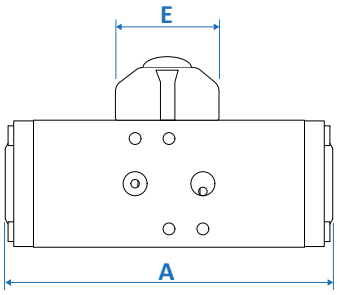
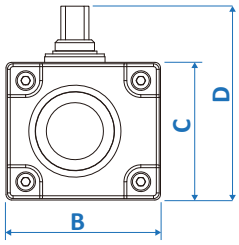
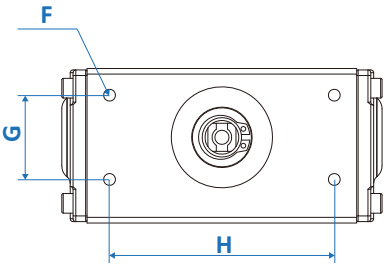
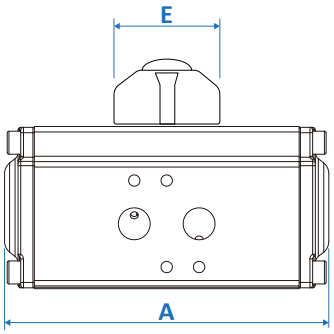
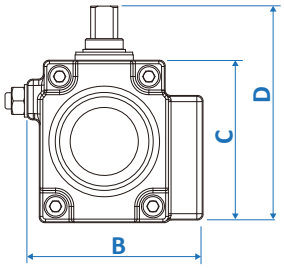
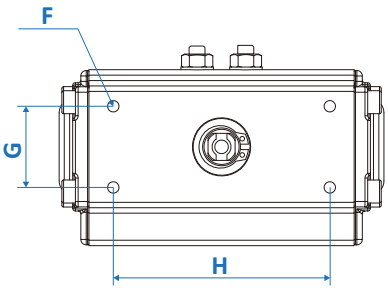
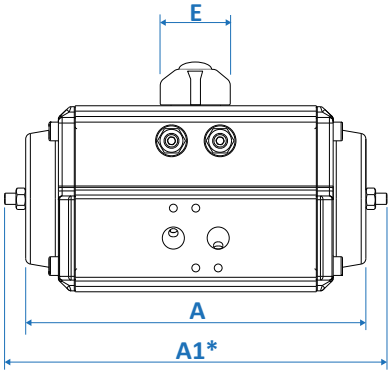
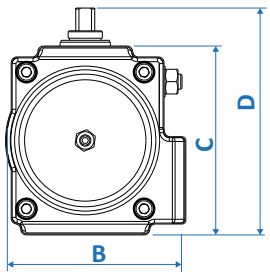
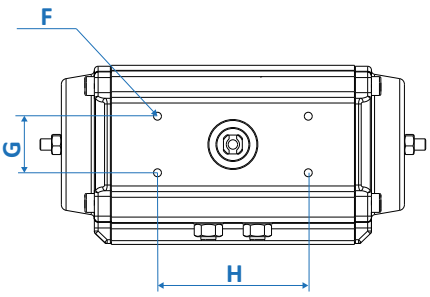
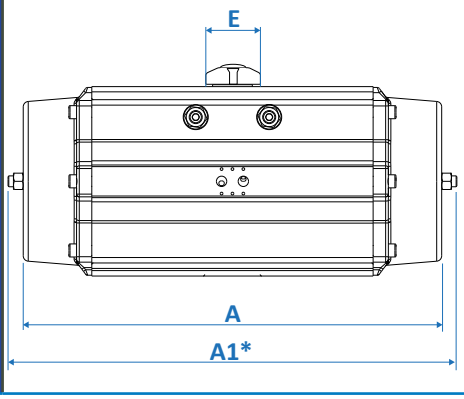
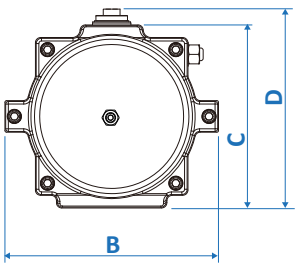
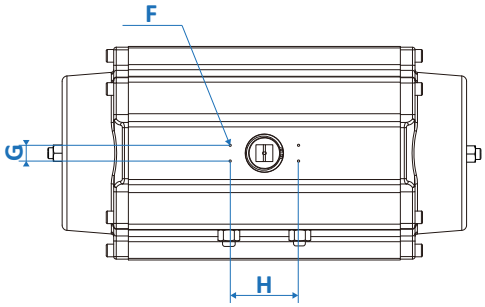
Temperature version

S: Standard (-20°...+80°C)

H: High temperature (-10°...+150°C)

T: Low temperature (-40° ... +150°C)

Dimensions

	Front view	Side view	Top view
PR002			
PR003			
PR004 - PR587			
PR763 - PR1628			

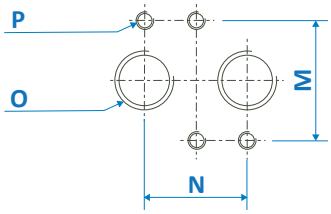
																		Standard		Optio-nal			
Size	A	A1*	B	C	D	E	F	G	H	J	K	L	T	M	N	O	P	Q	Q1	ISO	R	R1	S
002	116	-	51	45	65	Ø40	M5x8	30	80	20	10	12	21,4	32	24	G1/8"	M5x8	F03	-	-	M5x8	-	9x11
003	120	~135	65	60	80	Ø40	M5x8	30	80	20	10	12	21,4	32	24	G1/4"	M5x8	F03	F05	F04	M5x8	M6x10	11x14
004	147	~162	71,5	72	92	Ø40	M5x8	30	80	20	10	12	21,4	32	24	G1/4"	M5x8	F03	F05	F04	M5x8	M6x10	11x14
007	165	~180	83	88	108	Ø40	M5x8	30	80	20	10	12	26,4	32	24	G1/4"	M5x8	F05	F07	F04	M6x10	M8x13	14x18
010	182	~197	95	99,5	119,5	Ø40	M5x8	30	80	20	10	12	26,4	32	24	G1/4"	M5x8	F05	F07	F04	M6x10	M8x13	14x18
015	208	~228	103	109	129	Ø40	M5x8	30	80	20	10	12	26,4	32	24	G1/4"	M5x8	F05	F07	-	M6x10	M8x13	17x21
023	262	~282	108,5	116,5	136,5	Ø40	M5x8	30	80	20	14	12	34,6	32	24	G1/4"	M5x8	F05	F07	-	M6x10	M8x13	17x21
033	270	~290	124,5	133	153	Ø40	M5x8	30	80	20	14	12	34,6	32	24	G1/4"	M5x8	F07	F10	-	M8x13	M10x16	22x26
043	298	~318	134	144	164	Ø55	M5x8	30	80	20	22	10	45,3	32	24	G1/4“	M5x8	F07	F10		M8x13	M10x16	22x26
052	301	~321	142	155	175	Ø55	M5x8	30	80/130	20	22	10	45,3	32	24	G1/4"	M5x8	F07	F10	-	M8x13	M10x16	22x26
069	367	~387	149,5	160	180	Ø55	M5x8	30	80/130	20	22	10	45,3	32	24	G1/4“	M5x8	F10	F12		M10x16	M12x20	27x31
088	395	~315	152,5	172	192	Ø55	M5x8	30	80/130	20	22	10	49,5	32	24	G1/4"	M5x8	F10	F12	-	M10x16	M12x20	27x31
134	454	~474	174	197	217	Ø55	M5x8	30	80/130	20	22	12	49,5	32	24	G1/4"	M5x8	F10	F12	-	M10x16	M12x20	27x31
216	528	~558	206	230	260	Ø80	M5x8	30	130	30	32	12	60,2	32	24	G1/4"	M5x8	F14	-	F12	M16x25	-	36x40
263	536	~566	226	255	285	Ø80	M5x8	30	130	30	32	12	72,4	32	24	G1/4"	M5x8	F14	-	F12	M16x25	-	36x40
387	608	~638	260	289	319	Ø80	M5x8	30	130	30	32	12	72,4	32	24	G1/4"	M5x8	F16	-	F12/F14	M20x25	-	46x50
587	721	~751	294	328	358	Ø80	M5x8	30	130	30	32	12	72,4	45	40	G1/2"	M6x10	F16	-	-	M20x25	-	46x50
763	769	~799	406	348	378	Ø80	M5x8	30	130	30	32	12	72,4	45	40	G1/2"	M6x10	F16	-	F25**	M20x25	-	46x60
1143	909	~939	460	408	438	Ø80	M5x8	30	130	30	32	12	72,4	45	40	G1/2"	M6x10	F16	F25	-	M20x25	M16x25	55x60
1628	925	~935	516	480	510	Ø80	M5x8	30	130	30	32	12	72,4	45	40	G1/2"	M6x10	F16	F25	-	M20x25	M16x25	55x60

*Varies depending on the stroke limitation setting and the adjustment screws used for it.

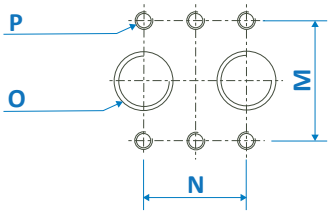
** The PR763 with the optional F25 flange has a double square (S) 55x60mm at the valve connection.

Connections

Connection control medium according to NAMUR

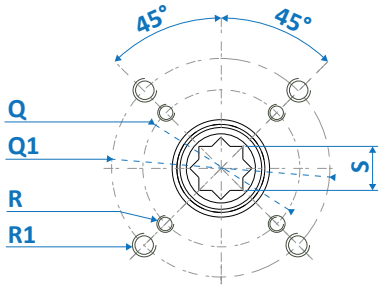


PR002 - PR387



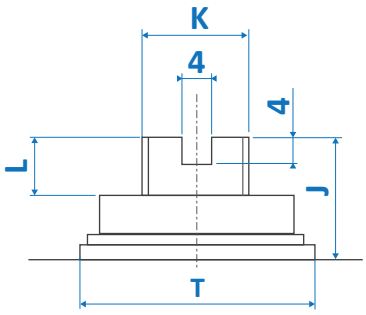
PR587 - PR1628

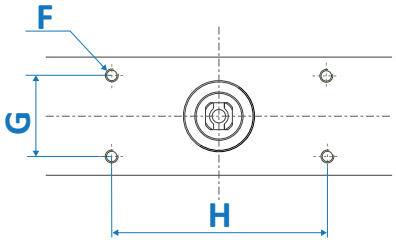
Valve connection



ISO 5211 / DIN 3337

Connection of signalling devices/controller



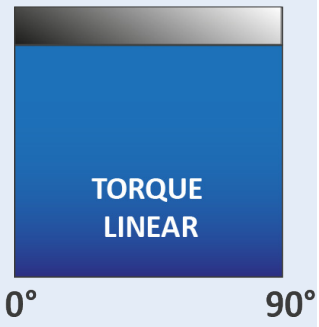


VDI/VDE 3845

Torque

Torque diagram double-acting

The double-acting actuator version provides a linear and constant torque over the complete pivoting angle in both pivoting directions.



Torque table double-acting

	Torque pneumatic stroke in Nm at control pressure in bar (g)										
Größe	2	2,5	3	3,5	4	4,5	5	5,5	6	7	8
002	3	4	5	5	6	7	8	8	9	11	12
003	5	6	7	8	10	11	12	13	14	17	19
004	8	10	12	14	16	18	20	22	24	28	32
007	14	18	21	25	28	32	35	39	42	49	56
010	20	25	30	35	40	45	50	55	60	70	79
015	31	38	46	53	61	69	76	84	92	107	122
023	45	56	67	79	90	101	112	124	135	157	180
033	65	81	98	114	130	146	163	179	195	228	260
043	86	108	130	151	173	194	216	238	259	302	346
052	101	127	152	178	203	228	254	279	304	355	406
069	138	173	208	226	277	312	346	381	416	485	555
088	174	217	260	304	347	390	434	477	521	607	694
134	264	331	397	463	529	595	661	727	793	925	1058
216	426	533	639	746	852	959	1066	1172	1279	1492	1705
263	521	651	781	911	1041	1171	1302	1432	1562	1822	2082
387	765	956	1148	1339	1530	1721	1913	2104	2295	2678	3060
587	1162	1453	1743	2034	2324	2615	2905	3196	3486	4067	4648
763	1594	1993	2391	2790	3188	3587	3985	4384	4782	5579	6376
1143	2387	2983	3580	4177	4773	5370	5967	6563	7160	8353	9546
1628	3256	4070	4884	5698	6512	7326	8140	8954	9768	11396	13024

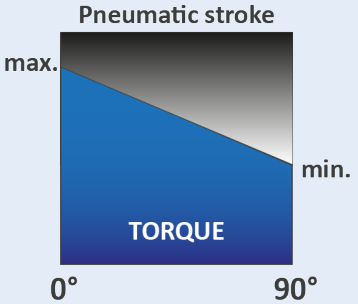
Torque diagram single-acting

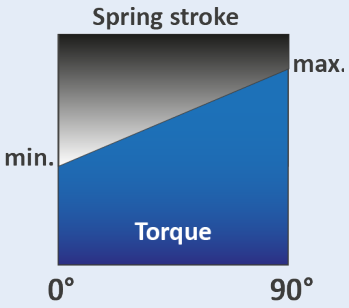
Single-acting actuators don´t provide a consistent torque throughout the entire pivoting angle due to the integrated spring cartridges. We differentiate between the torque diagrams of the pneumatic stroke and the spring stroke.

At the beginning of the pneumatic stroke the springs are mostly relaxed and the maximum pneumatic torque is available for the valve-operation. In the course of the air stroke the springs get compressed and the rising spring force linearly reduces the available pneumatic torque to operate the valve. In the end position the torque of the air stroke reaches its minimum value, the so-called minimum pneumatic torque.

The spring stroke starts with maximum tensioned springs and accordingly offers the maximum spring torque at the beginning of the reverse movement. In the course of the spring stroke the springs progressively relax so that the actuator torque linearly reduces until it reaches the minimum spring torque in the end position.

Thus, at the starting point of each movement the maximum torque is available to overcome the breakaway torque.





Size	Spring set	Torque spring stroke in Nm		Torque pneumatic stroke in Nm at control pressure in bar (g)																	
				3		3,5		4		4,5		5		5,5		6		7		8	
		max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
004	5	5,9	4,1	7,9	6,1	9,9	8	11,9	10	13,9	12	15,9	14	17,9	16	19,9	18	23,9	22	27,9	26
	6	7,1	4,9	7,1	4,9	9,1	6,9	11,1	8,9	13,1	10,9	15,1	12,9	17,1	14,9	19,1	16,8	23,1	20,8	27,1	24,8
	7	8,3	5,7	6,3	3,7	8,3	5,7	10,3	7,7	12,3	9,7	14,3	11,7	16,3	13,7	18,3	15,7	22,2	19,7	26,2	23,7
	8	9,5	6,5	5,4	2,5	7,4	4,5	9,4	6,5	11,4	8,5	13,4	10,5	15,4	12,5	17,4	14,5	21,4	18,5	25,4	22,5
	9	10,7	7,4	4,6	1,3	6,6	3,3	8,6	5,3	10,6	7,3	12,6	9,3	14,6	11,3	16,6	13,3	20,6	17,3	24,6	21,3
	10	11,9	8,2			5,8	2,1	7,8	4,1	9,8	6,1	11,8	8,1	13,8	10,1	15,8	12,1	19,8	16,1	23,8	20,1
	11	13,1	9					7	2,9	9	4,9	11	6,9	13	8,9	15	10,9	19	14,9	23	18,9
	12	14,2	9,8					6,2	1,7	8,2	3,7	10,2	5,7	12,2	7,7	14,2	9,7	18,2	13,7	22,2	17,7
007	5	10,5	7,2	13,9	10,6	17,4	14,2	20,9	17,7	24,4	21,2	28	24,7	31,5	28,2	35	31,7	42	38,8	49	45,8
	6	12,5	8,6	12,5	8,6	16	12,1	19,5	15,6	23	19,1	26,5	22,6	30	26,1	33,5	29,6	40,6	36,7	47,6	43,7
	7	14,6	10,1	11	6,5	14,5	10	18	13,5	21,6	17	25,1	20,5	28,6	24	32,1	27,6	39,1	34,6	46,2	41,6
	8	16,7	11,5	9,6	4,4	13,1	7,9	16,6	11,4	20,1	14,9	23,6	18,4	27,1	21,9	30,7	25,5	37,7	32,5	44,7	39,5
	9	18,8	13	8,1	2,3	11,6	5,8	15,2	9,3	18,7	12,8	22,2	16,3	25,7	19,9	29,2	23,4	36,3	30,4	43,3	37,4
	10	20,9	14,4			10,2	3,7	13,7	7,2	17,2	10,7	20,8	14,3	24,3	17,8	27,8	21,3	34,8	28,3	41,8	35,3
	11	23	15,8					12,3	5,1	15,8	8,6	19,3	12,2	22,8	15,7	26,3	19,2	33,4	26,2	40,4	33,3
	12	25,1	17,3					10,8	3	14,4	6,6	17,9	10,1	21,4	13,6	24,9	17,1	31,9	24,1	39	31,2
010	5	15	11	19	16	24	21	30	26	35	31	40	36	45	41	50	46	60	56	70	66
	6	17	13	17	13	22	18	27	23	32	28	38	33	42	38	47	43	58	53	68	63
	7	20	15	15	10	20	15	25	20	30	25	35	30	40	35	45	40	55	50	65	60
	8	23	17	13	7	18	12	23	17	28	22	33	27	38	32	43	37	53	47	63	57
	9	26	19			16	9	21	14	26	19	31	24	36	29	41	34	51	44	61	54
	10	29	21					19	11	24	16	29	21	34	26	39	31	49	41	59	51
	11	32	23							22	13	27	18	32	23	37	28	47	38	57	48
	12	35	25									25	15	30	20	35	25	45	35	55	45
015	5	23	16	31	24	39	32	47	40	55	48	63	55	70	63	78	71	94	87	110	102
	6	28	19	28	19	36	27	44	35	52	43	59	51	67	59	75	66	91	82	106	98
	7	32	22	25	15	33	23	41	31	48	38	56	46	64	54	72	62	88	78	103	93
	8	37	25	22	10	30	18	37	26	45	34	53	42	61	49	69	57	85	73	100	89
	9	41	29			26	13	34	21	42	29	50	37	58	45	66	53	81	68	97	84
	10	46	32					31	17	39	24	47	32	55	40	62	48	78	64	94	79
	11	51	35							36	20	44	28	51	36	59	43	75	59	91	75
	12	55	38									40	23	48	31	56	39	72	55	87	70
023	5	33	23	44	34	56	45	67	56	78	68	89	79	101	90	112	101	134	124	157	146
	6	40	28	40	27	51	39	62	50	73	61	85	72	96	83	107	95	130	117	152	140
	7	47	32	35	21	46	32	58	43	69	54	80	66	91	77	103	88	125	110	147	133
	8	54	37	31	14	42	25	53	36	64	48	75	59	87	70	98	81	120	104	143	126
	9	60	41	26	7	37	18	48	30	60	41	71	52	82	63	93	75	116	97	138	120
	10	67	46			33	12	44	23	55	34	66	45	77	57	89	68	111	90	134	113
	11	74	51					39	16	50	28	62	39	73	50	84	61	107	84	129	106
	12	80	55					35	10	46	21	57	32	68	43	80	55	102	77	124	99
033	5	48	33	64	49	80	65	97	82	113	98	129	114	145	130	162	147	194	179	227	212
	6	58	40	57	39	74	56	90	72	106	88	122	104	139	121	155	137	187	169	220	202
	7	68	47	51	30	67	46	83	62	99	78	116	95	132	111	148	127	181	160	213	192
	8	77	53	44	20	60	36	77	53	93	69	109	85	125	101	142	118	174	150	207	183
	9	87	60			54	27	70	43	86	59	102	75	119	92	135	108	167	140	200	173
	10	97	67			47	17	63	33	79	49	96	66	112	82	128	98	161	131	193	163
	11	106	73					57	24	73	40	89	56	105	72	122	89	154	121	187	154
	12	116	80					50	14	66	30	82	46	99	63	115	79	147	111	180	144
043	5	65	43	87	65	108	86	130	108	151	129	173	151	194	172	216	194	259	237	302	280
	6	78	52	78	52	99	73	121	95	142	116	164	138	186	160	207	181	250	224	293	267
	7	91	61	69	39	90	60	112	82	133	103	155	125	177	147	198	168	241	211	284	254
	8	104	69	61	26	82	47	104	69	125	90	147	112	169	134	190	155	233	198	276	254
	9	117	78			73	34	95	56	116	77	138	99	160	121	181	142	224	185	259	228
	10	130	87			64	21	86	43	107	64	129	86	151	108	172	129	215	172	259	216
	11	143	95							99	51	121	73	143	95	164	116	207	159	251	203
	12	156	104							90	38	112	60	134	82	156	104	198	146	242	190

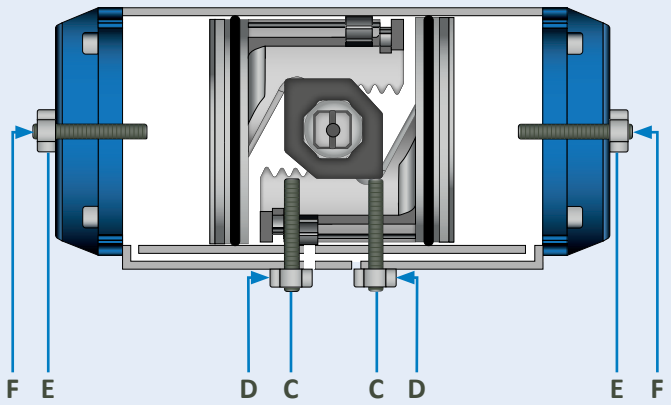
Size	Spring set	Torque spring stroke in Nm		Torque pneumatic stroke in Nm at control pressure in bar (g)																	
				3		3,5		4		4,5		5		5,5		6		7		8	
		max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
052	5	75	52	100	77	126	102	151	127	176	153	202	178	227	204	252	229	303	280	354	330
	6	91	62	90	62	115	87	140	112	166	138	191	163	217	188	242	214	293	265	343	315
	7	106	73	79	47	105	72	130	97	155	123	181	148	206	173	232	199	282	249	333	300
	8	121	83	69	31	94	57	120	82	145	108	170	133	196	158	221	184	272	234	323	285
	9	136	94			84	42	109	67	135	92	160	118	185	143	211	169	261	219	312	270
	10	151	104			74	27	99	52	124	77	150	103	175	128	200	153	251	204	302	255
	11	166	114					88	37	114	62	139	88	165	113	190	138	241	189	291	240
	12	181	125					78	22	103	47	129	73	154	98	180	123	230	174	281	225
069	5	105	66	142	103	176	137	211	172	245	206	280	241	315	275	349	310	418	379	487	448
	6	127	80	128	81	163	116	197	150	232	185	266	219	301	254	335	288	404	357	473	426
	7	148	93	115	60	150	95	184	129	219	164	253	198	288	233	322	267	391	336	460	405
	8	169	107	101	39	136	74	170	108	205	143	239	177	274	212	309	247	378	316	447	405
	9	190	120			123	53	157	87	192	122	226	156	261	191	296	226	365	295	434	364
	10	212	133					144	65	179	100	213	134	248	169	283	204	352	273	422	343
	11	233	147							165	79	199	113	234	148	269	183	338	252	408	322
	12	255	161									185	91	220	126	255	161	324	230	394	300
088	5	129	89	171	131	215	175	258	218	302	261	345	305	388	348	432	391	518	478	605	565
	6	155	107	154	105	197	149	240	192	284	235	327	279	371	322	414	366	501	452	587	539
	7	181	124	136	80	179	123	223	166	266	210	309	253	353	296	396	340	483	427	570	513
	8	207	142	118	54	162	97	205	140	248	184	292	227	335	271	378	314	465	401	552	487
	9	232	160			144	71	187	115	231	158	274	201	317	245	361	288	447	375	534	462
	10	258	178			126	45	169	89	213	132	256	176	300	219	343	262	430	349	516	436
	11	284	195					152	63	195	106	238	150	282	193	325	236	412	323	499	410
	12	310	213					134	37	177	81	221	124	264	167	307	211	394	297	481	384
134	5	197	136	261	200	327	266	393	332	459	398	525	464	592	530	658	597	790	729	922	861
	6	236	163	234	161	300	227	366	293	432	359	498	425	564	491	631	557	763	689	895	822
	7	275	190	207	121	273	187	339	253	405	320	471	386	537	452	603	518	736	650	868	782
	8	315	217	180	82	246	148	312	214	378	280	444	346	510	412	576	478	709	611	841	743
	9	354	244			219	109	285	175	351	241	417	307	483	373	549	439	681	571	814	704
	10	393	271			192	69	258	135	324	202	390	268	456	334	522	400	654	532	787	664
	11	433	298					231	96	297	162	363	228	429	294	495	360	627	493	759	625
	12	472	325					203	57	270	123	336	189	402	255	468	321	600	453	732	586
216	5	317	218	421	322	528	429	634	536	741	642	847	749	954	855	1060	962	1274	1175	1487	1388
	6	380	262	377	259	484	366	590	472	697	579	804	685	910	792	1017	898	1230	1112	1443	1325
	7	444	306	334	196	440	302	547	409	653	515	760	622	866	728	973	835	1186	1048	1399	1261
	8	507	350	290	132	396	239	503	345	610	452	716	559	823	665	929	772	1142	985	1356	1198
	9	571	393			353	175	459	282	566	389	672	495	779	602	886	708	1099	921	1312	1135
	10	634	437			309	112	416	219	522	325	629	432	735	538	842	645	1055	858	1268	1071
	11	697	481					372	155	479	262	585	368	692	475	798	581	1011	795	1225	1008
	12	761	524					328	92	435	198	541	305	648	411	755	518	968	731	1181	944
263	5	380	275	523	418	656	551	789	684	922	817	1055	950	1188	1083	1321	1216	1587	1482	1853	1748
	6	456	330	468	342	601	475	734	608	867	741	1000	874	1133	1007	1266	1140	1532	1406	1798	1672
	7	532	385	413	266	546	399	679	532	812	665	945	798	1078	931	1211	1064	1477	1330	1743	1596
	8	608	440	358	190	491	323	624	456	757	589	890	722	1023	855	1156	988	1422	1254	1688	1520
	9	684	495			436	247	569	380	702	513	835	646	968	779	1101	912	1367	1178	1633	1444
	10	760	550					514	304	647	437	780	570	913	703	1046	836	1312	1102	1578	1368
	11	836	605							592	361	725	494	858	627	991	760	1257	1026	1523	1292
	12	912	660									670	418	803	551	936	684	1202	950	1468	1216
387	5	554	410	744	600	937	793	1129	985	1322	1178	1514	1370	1706	1562	1898	1754	2283	2139	2668	2524
	6	665	492	662	489	855	682	1047	874	1240	1067	1432	1259	1624	1451	1816	1643	2201	2028	2586	2413
	7	775	575	580	379	772	572	964	764	1157	957	1349	1149	1541	1341	1733	1533	2118	1918	2503	2303
	8	886	656	498	268	691	461	883	653	1075	845	1267	1037	1460	1230	1652	1422	2037	1807	2422	2192
	9	998	739			608	350	800	542	993	734	1185	926	1377	1119	1569	1311	1954	1696	2339	2080
	10	1108	821					718	431	911	624	1103	816	1296	1009	1488	1201	1872	1586	2257	1970
	11	1219	903							829	513	1021	705	1214	898	1406	1090	1791	1474	2176	1859
	12	1330	985									939	594	1131	787	1323	979	1708	1363	2093	1748

Size	Spring set	Torque spring stroke in Nm		Torque pneumatic stroke in Nm at control pressure in bar (g)																	
				3		3,5		4		4,5		5		5,5		6		7		8	
		max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
587	5	864	596	1147	879	1438	1169	1728	1460	2019	1750	2309	2041	2600	2331	2890	2622	3471	3203	4052	3783
	6	1037	715	1028	706	1319	996	1609	1287	1900	1577	2190	1868	2481	2158	2771	2449	3352	3030	3933	3611
	7	1210	834	909	533	1200	824	1490	1114	1781	1404	2071	1695	2362	1985	2652	2276	3233	2857	3814	3438
	8	1383	953	790	360	1081	651	1371	941	1661	1232	1952	1522	2242	1813	2533	2103	3114	2684	3695	3265
	9	1555	1072			961	478	1252	768	1542	1059	1833	1349	2123	1640	2414	1930	2995	2511	3576	3092
	10	1728	1191			842	305	1133	596	1423	886	1714	1176	2004	1467	2295	1757	2876	2338	3457	2919
	11	1901	1310					1014	423	1304	713	1595	1004	1885	1294	2176	1585	2757	2166	3338	2746
	12	2074	1429					895	250	1185	540	1476	831	1766	1121	2057	1412	2637	1993	3218	2574
763	5	1185	817	1574	1205	1972	1604	2371	2002	2769	2401	3168	2799	3566	3198	3965	3596	4762	4393	5559	5190
	6	1423	980	1411	968	1809	1367	2208	1765	2606	2164	3005	2562	3403	2961	3801	3359	4598	4156	5395	4953
	7	1660	1144	1247	731	1646	1130	2044	1528	2443	1927	2841	2325	3240	2724	3638	3122	4435	3919	5232	4716
	8	1897	1307	1084	494	1482	893	1881	1291	2279	1690	2678	2088	3076	2487	3475	2885	4272	3682	5069	4479
	9	2134	1470			1319	656	1717	1054	2116	1452	2514	1851	2913	2249	3311	2648	4108	3445	4905	4242
	10	2371	1634			1156	418	1554	817	1953	1215	2351	1614	2750	2012	3148	2411	3945	3208	4742	4005
	11	2608	1797					1391	580	1789	978	2188	1377	2586	1775	2985	2174	3782	2971	4579	3768
	12	2845	1960					1227	343	1626	741	2024	1140	2423	1538	2821	1937	3618	2734	4415	3531
1143	5	1775	1223	2357	1805	2953	2401	3550	2998	4146	3595	4743	4191	5340	4788	5936	5384	7129	6578	8323	7771
	6	2130	1468	2112	1450	2709	2046	3305	2643	3902	3240	4498	3836	5095	4433	5692	5029	6885	6223	8078	7416
	7	2485	1712	1867	1095	2464	1691	3061	2288	3657	2885	4254	3481	4850	4078	5447	4674	6640	5868	7833	7061
	8	2840	1957	1623	740	2219	1336	2816	1933	3413	2530	4009	3126	4606	3723	5202	4319	6396	5513	7589	6706
	9	3195	2201			1975	981	2571	1578	3168	2175	3765	2771	4361	3368	4958	3964	6151	5158	7344	6351
	10	3550	2446			1730	627	2327	1223	2923	1820	3520	2416	4117	3013	4713	3610	5906	4803	7100	5996
	11	3905	2691					2082	868	2679	1465	3275	2061	3872	2658	4469	3255	5662	4448	6855	5641
	12	4260	2935					1838	513	2434	1110	3031	1706	3627	2303	4224	2900	5417	4093	6610	5286
1628	5	2057	1312	3572	2827	4386	3641	5200	4455	6014	5269	6828	6083	7642	6897	8456	7711	10084	9339	11712	10967
	6	2469	1575	3309	2415	4123	3229	4937	4043	5751	4857	6565	5671	7379	6485	8193	7299	9821	8927	11449	10555
	7	2880	1837	3047	2004	3861	2818	4675	3632	5489	4446	6303	5260	7117	6074	7931	6888	9559	8516	11187	10144
	8	3292	2100	2784	1592	3598	2406	4412	3220	5226	4034	6040	4848	6854	5662	7668	6476	9296	8104	10924	9732
	9	3703	2362	2522	1181	3336	1995	4150	2809	4964	3623	5778	4437	6592	5251	7406	6065	9034	7693	10662	9321
	10	4115	2625	2260	769	3074	1583	3888	2397	4702	3211	5516	4025	6330	4839	7144	5653	8772	7281	10400	8909
	11	4526	2887			2811	1172	3625	1986	4439	2800	5253	3614	6067	4428	6881	5242	8509	6870	10137	8498
	12	4938	3149			2549	760	3363	1574	4177	2388	4991	3202	5805	4016	6619	4830	8247	6458	9875	8086
	13	5349	3412					3100	1163	3914	1977	4728	2791	5542	3605	6356	4419	7984	6047	9612	7675
	14	5761	3674					2838	751	3652	1565	4466	2379	5280	3193	6094	4007	7722	5635	9350	7263
	15	6172	3937							3389	1154	4203	1968	5017	2782	5831	3596	7459	5224	9087	6852
	16	6584	4199							3127	742	3941	1556	4755	2370	5569	3184	7197	4812	8825	6440

Consumption

Size	Function	Air consumption for pivoting angle 90° at control pressure in bar (g) in litres/cycle								
		3	3,5	4	4,5	5	5,5	6	7	8
002	double-acting	0,27	0,32	0,36	0,41	0,45	0,50	0,54	0,63	0,72
	single-acting	-	-	-	-	-	-	-	-	-
003	double-acting	0,57	0,67	0,76	0,86	0,95	1,05	1,14	1,33	1,52
	single-acting	-	-	-	-	-	-	-	-	-
004	double-acting	0,84	0,98	1,12	1,26	1,40	1,54	1,68	1,96	2,24
	single-acting	0,36	0,42	0,48	0,54	0,60	0,66	0,72	0,84	0,96
007	double-acting	1,32	1,54	1,76	1,98	2,20	2,42	2,64	3,08	3,52
	single-acting	0,63	0,74	0,84	0,95	1,05	1,16	1,26	1,47	1,68
010	double-acting	1,92	2,24	2,56	2,88	3,20	3,52	3,84	4,48	5,12
	single-acting	0,90	1,05	1,20	1,35	1,50	1,65	1,80	2,10	2,40
015	double-acting	2,70	3,15	3,60	4,05	4,50	4,95	5,40	6,30	7,20
	single-acting	1,29	1,51	1,72	1,94	2,15	2,37	2,58	3,01	3,44
023	double-acting	4,11	4,80	5,48	6,17	6,85	7,54	8,22	9,59	10,96
	single-acting	1,92	2,24	2,56	2,88	3,20	3,52	3,84	4,48	5,12
033	double-acting	5,49	6,41	7,32	8,24	9,15	10,07	10,98	12,81	14,64
	single-acting	2,85	3,33	3,80	4,28	4,75	5,23	5,70	6,65	7,60
043	double-acting	7,25	8,46	9,66	10,87	12,08	13,29	14,49	16,91	19,32
	single-acting	3,83	4,47	5,10	5,74	6,38	7,02	8,13	8,93	10,20
052	double-acting	9,00	10,50	12,00	13,50	15,00	16,50	18,00	21,00	24,00
	single-acting	4,80	5,60	6,40	7,20	8,00	8,80	9,60	11,20	12,80
069	double-acting	11,55	13,48	15,40	17,33	19,25	21,18	23,10	26,95	30,80
	single-acting	6,15	7,18	8,20	9,23	10,25	11,28	12,30	14,35	16,40
088	double-acting	14,10	16,45	18,80	21,15	23,50	25,85	28,20	32,90	37,60
	single-acting	7,50	8,75	10,00	11,25	12,50	13,75	15,00	17,50	20,00
134	double-acting	20,7	24,2	27,6	31,1	34,5	38,0	41,4	48,3	55,2
	single-acting	11,1	13,0	14,8	16,7	18,5	20,4	22,2	25,9	29,6
216	double-acting	33,9	39,6	45,2	50,9	56,5	62,2	67,8	79,1	90,4
	single-acting	17,7	20,7	23,6	26,6	29,5	32,5	35,4	41,3	47,2
263	double-acting	45,0	52,5	60,0	67,5	75,0	82,5	90,0	105,0	120,0
	single-acting	22,5	26,3	30,0	33,8	37,5	41,3	45,0	52,5	60,0
387	double-acting	60,0	70,0	80,0	90,0	100,0	110,0	120,0	140,0	160,0
	single-acting	33,0	38,5	44,0	49,5	55,0	60,5	66,0	77,0	88,0
587	double-acting	93,0	108,5	124,0	139,5	155,0	170,5	186,0	217,0	248,0
	single-acting	51,0	59,5	68,0	76,5	85,0	93,5	102,0	119,0	136,0
763	double-acting	160,5	187,3	214,0	240,8	267,5	294,3	321,0	374,5	428,0
	single-acting	71,4	83,3	95,2	107,1	119,0	130,9	142,8	166,6	190,4
1143	double-acting	244,2	284,9	325,6	366,3	407,0	447,7	488,4	569,8	651,2
	single-acting	105,3	122,9	140,4	158,0	175,5	193,1	210,6	245,7	280,8
1628	double-acting	325,8	380,1	434,4	488,7	543,0	597,3	651,6	760,2	868,8
	single-acting	157,8	184,1	210,4	236,7	263,0	289,3	315,6	368,2	420,8

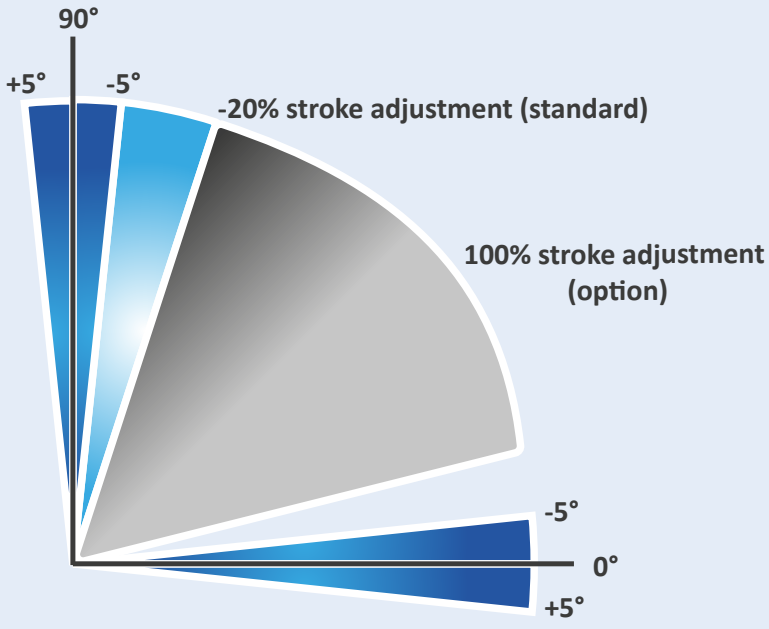
Pivoting angle adjustment



All actuator sizes (exception: PR002 and PR003) are serially equiped with a double end-stop adjustment and an additional stroke adjustment. Through this, the actuators of the PR series can be adapted to almost any pivoting angle requirement without extensive modifications.

By turning the end-stop adjustment screws „C“ , both end positions can be adjusted by +/-5° for a precise set- ting of the final valve position. The according settings are secured by tightening the lock nuts „D“. Thanks to the serially integrated stroke adjustment, the limit of the switched position can additionally be adjusted up to -20° by turning the stroke adjustment screws „F“. The according settings are secured by tightening the lock nuts „E“.

By a simple modification it is even possible to provide a stroke adjustment for the entire pivoting angle. Thus, also exceptional pivoting angle requirements can easily be met.



Operating time

The operating time of actuators depends on many influencing factors such as the control valve flow rate, the supplyline-diameter and -length, the control pressure, the load, etc. An exact indication of the operating time in general is not possible. The following table contains values in accordance with the mentioned conditions.

If your operating time requirements differ from the list, ask our advice.

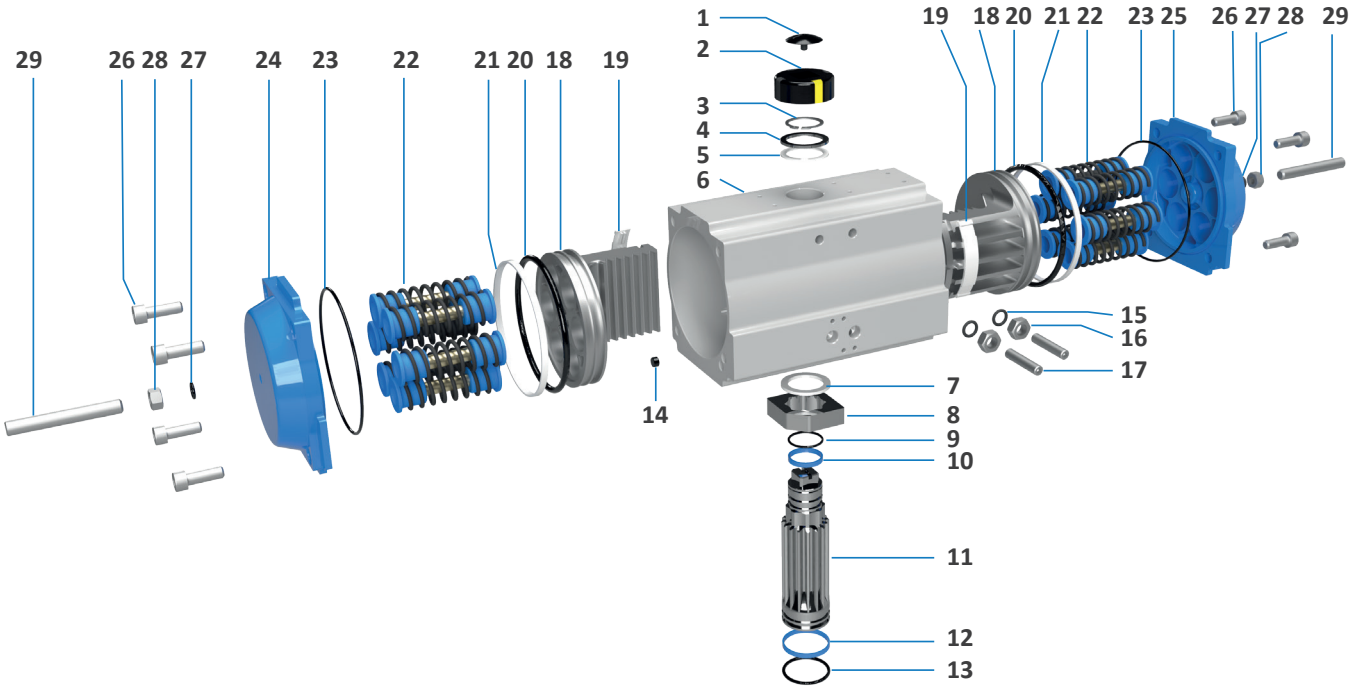
Measurement conditions of the above values:

Operating time under load and with control valve

Control valve flow rate:	600 l/min
Supplyline diameter:	6mm
Supplyline length:	2m
Control pressure:	5bar
Load:	medium load
Temperature:	ambient temperature

Size	Operating time in seconds for rotation angle 90°				Minimum travel time
	double-acting		single-acting		
	Activation via port "A"	Activation via port"B"	Activation via por t"A"	Spring return	
002	0,5	0,5	-	-	0,1
003	0,5	0,5	-	-	0,1
004	0,6	0,6	2	0,5	0,1
007	0,7	0,7	2	1	0,1
010	0,8	0,7	2	1	0,1
015	0,9	0,8	2,5	1	0,1
023	1	1	3	1	0,1
033	1,5	1,5	3	1	0,2
043	1,7	1,7	3,5	1	0,2
052	2	2	4	1	0,2
069	2,3	2,3	4	1	0,2
088	2,5	2,5	4	1	0,2
134	4	3	4	3	0,5
216	5	4	5	3	0,5
263	5	4	6	3	0,7
387	6	6	12	4	0,7
587	8	8	15	6	1
763	12	12	18	8	1
1143	14	14	20	10	2,5
1628	15	15	25	12	2,5

Parts & materials



No.	Designation	Qty	Material standard	Protection	Option material
1	Screw visual indicator	1	ABS		
2	Visual indicator	1	ABS		
3	Circlip	1	Stainless steel		
4	Thrust washer	1	Stainless steel		
5	Outside washer	1	POM		PTFE
6	Body	1	Aluminium	Powder coated	
7	Inside washer	1	POM		PTFE
8	Stop cam	1	Carbon steel		
9	O-ring (pinion top)	1	NBR		FKM/HNBR
10	Bearing (pinion top)	1	POM		PTFE
11	Pinion	1	Carbon steel	Nickel plated	Stainless steel
12	Bearing (pinion bottom)	1	POM		PTFE
13	O-ring (pinion bottom)	1	NBR		FKM/HNBR
14	Plug	2	NBR		FKM/HNBR
15	O-ring (end adjustment screw)	2	NBR		FKM/HNBR
16	Nut (end adjustment screw)		Stainless steel		
17	End adjustment screw	2	Stainless steel		
18	Piston	2	Aluminium	Anodized	Stainless steel
19	Guidance segment	2	POM		PTFE
20	O-ring (piston)	2	NBR		FKM/HNBR
21	Guidance ring (piston)	2	POM		PTFE
22	Safety spring	0-12	Spring steel	Dip coating	
23	O-ring (end cap)	2	NBR		FKM/HNBR
24	End cap left	1	Aluminium	Powder coated	
25	End cap right	1	Aluminium	Powder coated	
26	Cap screw	8	Stainless steel		
27	O-ring (stroke adjustment screw)	2	NBR		FKM/Silicone
28	Nut (stroke adjustment screw)	2	Stainless steel		
29	Stroke adjustment screw	2	Stainless steel		

Notes

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