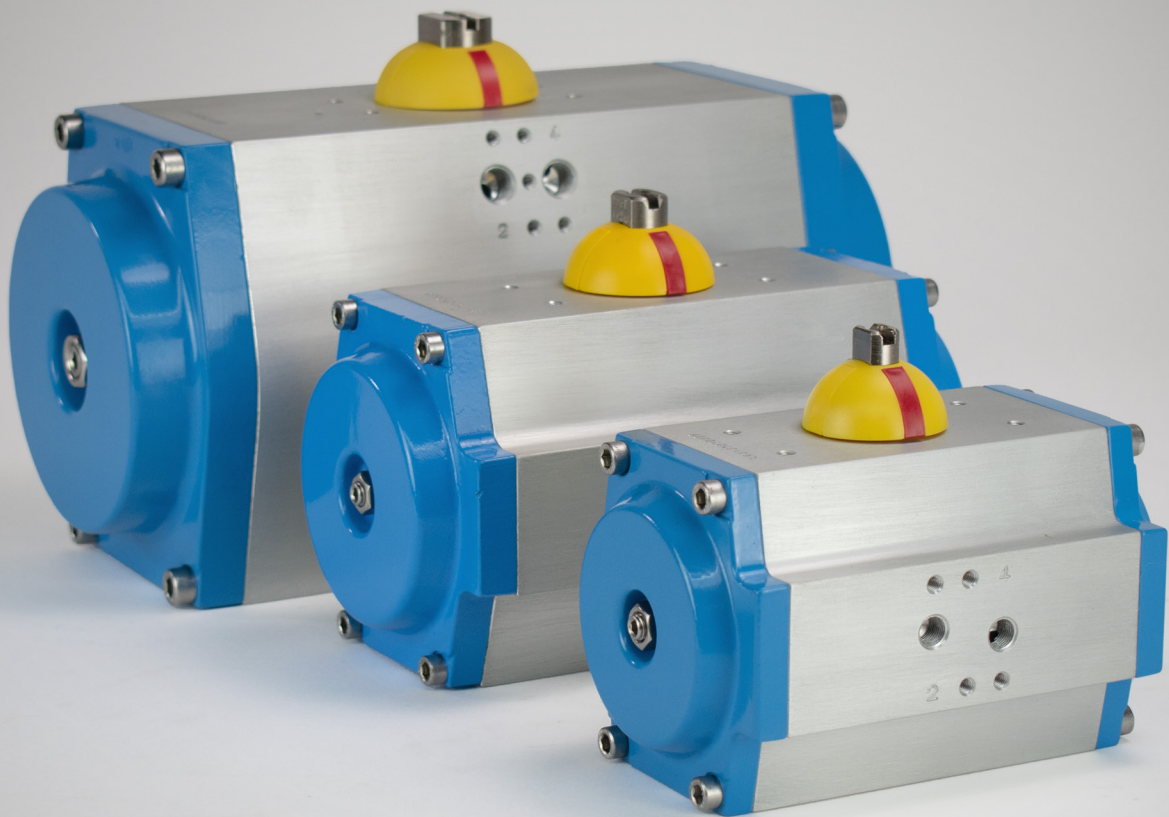




PNEUMATIC ACTUATORS

PRD Series

Issued: 09/ 2021

Description

Our Pneumatic Actuator Series PRD 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 PRD 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, PRD-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.

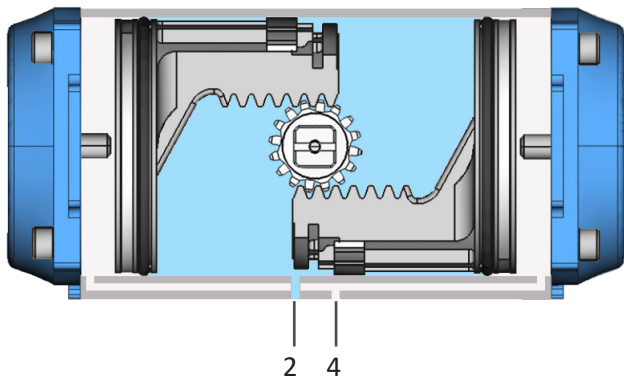
Function

Actuators of the PRD 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-acting function

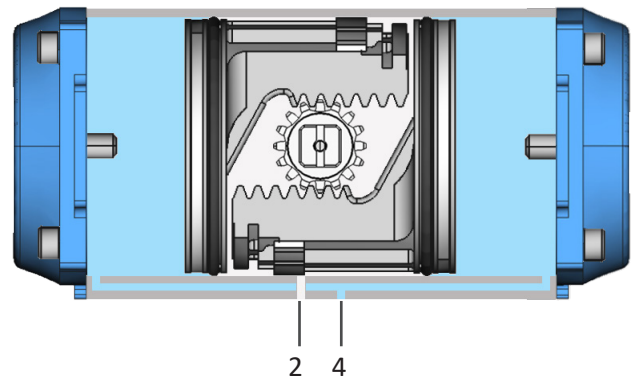
In the double-acting actuator version, the movement in both directions gets generated by the control pressure.

Via connection port "2" the pressure chamber between the two pistons gets pressurized and the pistons move out. The resulting force is transmitted to the pinion and effect a rotational movement.



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.

Once the outer pressure chamber is pressurized via connection port "4", the pistons move towards each other again and the rotation process is reversed.



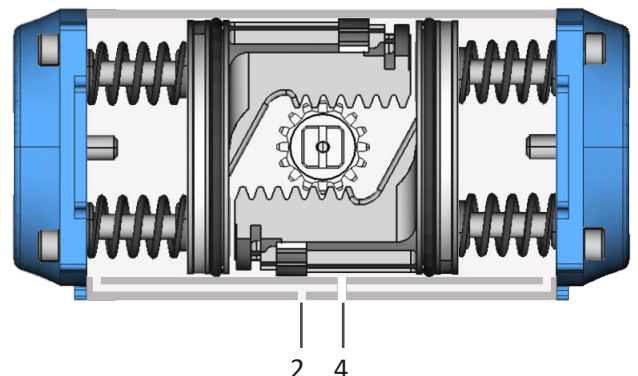
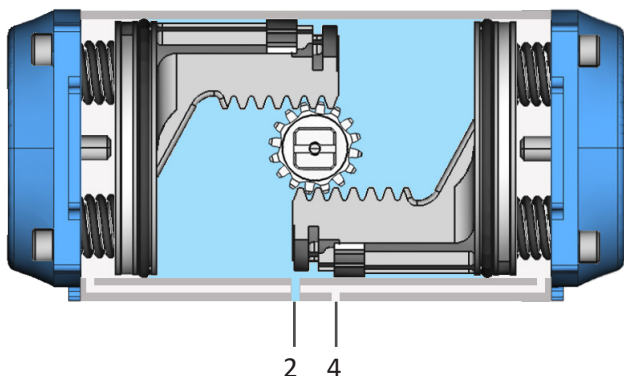
Single-acting function

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 "2" the pressure chamber between the two pistons gets pressurized, the pistons move out and compress the integrated spring cartridges. At the

same time the force resulting at the pistons is transmitted to the pinion and effect a rotational movement. Once the pressure chamber is vented via port "4", the springs push the pistons towards each other and the rotation process is reversed.

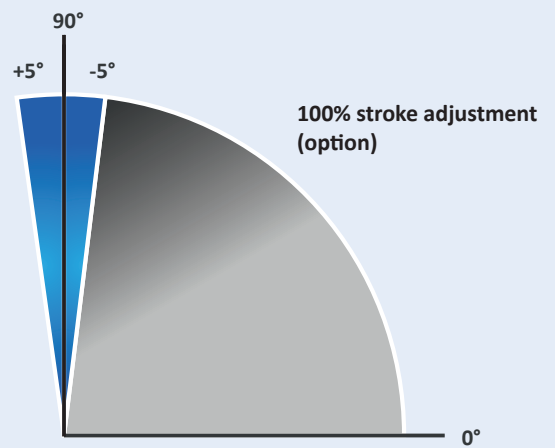
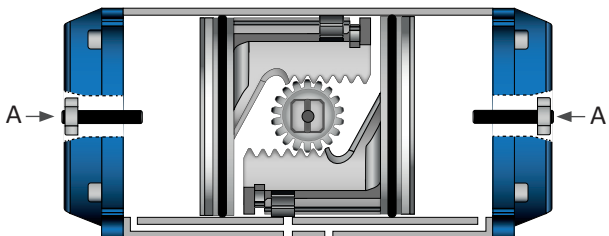
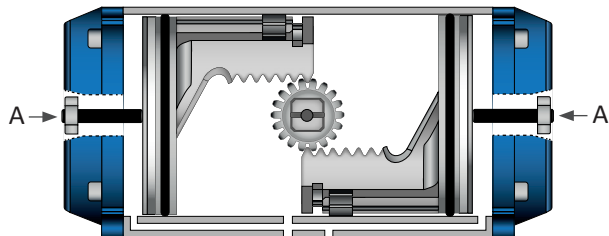
The single acting actuator version thereby provides a safety function for the case of pressure loss.



Pivoting angle adjustment

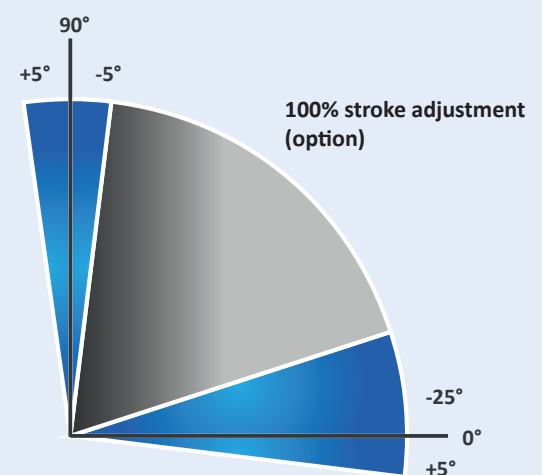
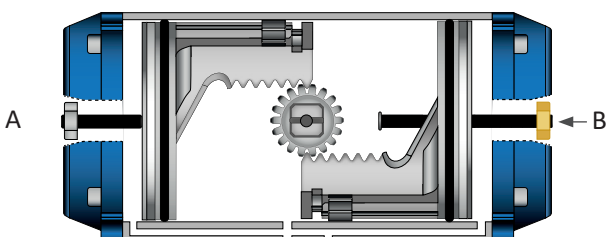
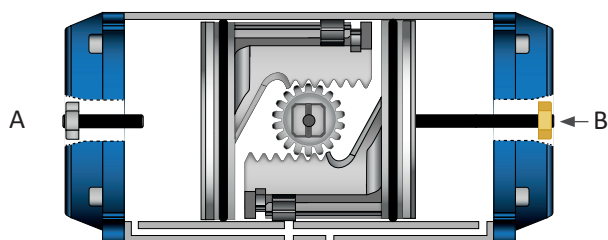
End stop adjustment

Version "Standard"



The switched position can be adjusted by $\pm 5^\circ$ for a precise setting of the final valve position. The optional stroke adjustment offers a 100% setting of the switched end position.

Version "BE"

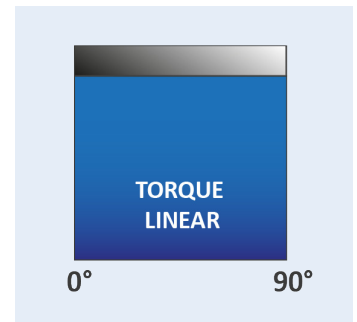


With the optional version „BE“, both end position can be set independently of one another for fine adjustment.

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

Size	Torque in Nm at Control Pressure in (g)											
	2	2,5	3	3,5	4	4,5	5	5,5	6	6.5	7	8
049	4,7	5,8	7,0	8,2	9,4	10,5	11,7	13,1	14,0	15,2	16,4	18,7
058	7,8	9,7	11,7	13,6	15,6	17,5	19,5	21,8	23,4	25,3	27,3	31,2
068	11,6	14,5	17,4	20,3	23,2	26,1	29,0	32,5	34,8	37,7	40,6	46,4
078	20,0	25,0	30,0	35,0	40,0	45,0	50,0	56,0	60,0	65,0	70,0	80,0
088	29,0	36,2	43,5	50,7	58,0	65,2	72,5	81,2	87,0	94,2	101,5	116,0
098	40,0	50,0	60,0	70,0	80,0	90,0	100,0	112,0	120,0	130,0	140,0	160,0
110	58,0	72,5	87,0	101,5	116,0	130,5	145,0	162,4	174,0	188,5	203,0	232,0
115	86,0	107,5	129,0	150,5	172,0	193,5	215,0	240,8	258,0	279,5	301,0	344,0
127	116,0	145,0	174,0	203,0	232,0	261,0	290,0	324,8	348,0	377,0	406,0	464,0
143	186,0	232,5	279,0	325,5	372,0	418,5	465,0	520,8	558,0	604,5	651,0	744,0
163	230,0	287,5	345,0	402,5	460,0	517,5	575,0	644,0	690,0	747,5	805,0	920,0
185	400,0	500,0	600,0	700,0	800,0	900,0	1.000	1.120	1.200	1.300	1.400	1.600
210	480,0	600,0	720,0	840,0	959,9	1.080	1.200	1.344	1.440	1.560	1.680	1.920
230	690,5	863,1	1.035	1.208	1.381	1.553	1.726	1.933	2.071	2.244	2.416	2.762
250	920,0	1.150	1.380	1.610	1.840	2.070	2.300	2.576	2.760	2.990	3.220	3.680
254	1.160	1.450	1.740	2.030	2.320	2.610	2.900	3.248	3.480	3.770	4.060	4.640
300	1.600	2.000	2.400	2.800	3.200	3.600	4.000	4.480	4.800	5.200	5.600	6.400

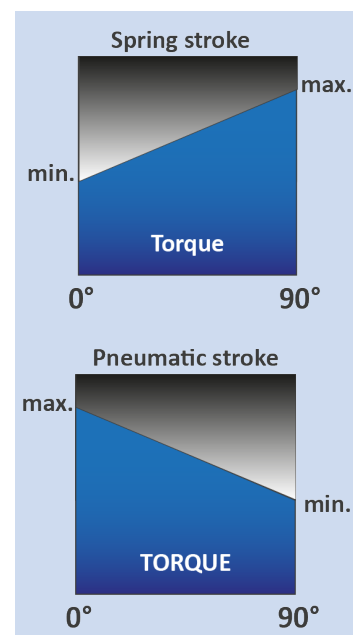
Torque diagram single-acting

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 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.



Torque

Torque table single-acting

Size	Spring set	Torque spring Stroke in Nm		Torque pneumatic stroke in Nm at Control Pressure in bar (g)															
		max.	min.	2		3		4		5		5,5		6		7		8	
049	2	2,5	1,7	3,0	2,1	5,3	4,4	7,6	6,8	10,0	9,1	11,4	10,5	12,3	11,5	14,7	13,8	17,0	16,1
	4	5,1	3,4	-	-	3,6	1,9	5,9	4,2	8,3	6,5	9,7	7,9	10,6	8,9	13,0	11,2	15,3	13,5
	6	7,6	5,0	-	-	-	-	4,2	1,6	6,6	3,9	8,0	5,3	8,9	6,3	11,2	8,6	13,6	11,0
	8	10,1	6,7	-	-	-	-	-	-	4,9	1,4	6,3	2,8	7,2	3,7	9,5	6,0	11,9	8,4
058	2	3,2	1,9	5,8	4,5	9,7	8,4	13,6	12,3	17,5	16,2	19,9	18,6	21,4	20,1	25,3	24,0	29,2	27,9
	4	6,4	3,8	3,9	1,3	7,8	5,2	11,7	9,1	15,6	13,0	17,9	15,3	19,5	16,9	23,4	20,8	28,3	24,7
	6	9,6	5,7	-	-	5,8	1,9	9,7	5,8	13,6	9,7	16,0	12,1	17,5	13,6	21,4	17,5	25,3	21,4
	8	12,8	7,6	-	-	-	-	7,8	2,6	11,7	6,5	14,0	8,8	15,6	10,4	19,5	14,3	23,4	18,2
	10	15,9	9,6	-	-	-	-	-	-	9,7	3,2	12,1	5,6	13,6	7,1	17,5	11,0	21,4	14,9
	12	19,1	11,5	-	-	-	-	-	-	-	-	10,1	2,3	11,7	3,9	15,6	7,8	19,5	11,7
068	2	4,4	3,0	8,5	7,1	14,3	12,9	20,1	18,7	25,9	24,5	29,4	28,0	31,7	30,3	37,5	36,1	43,3	41,9
	4	8,8	6,0	5,5	2,6	11,3	8,4	17,1	14,2	22,9	20,0	26,4	23,5	28,7	25,8	34,5	31,6	40,3	37,4
	6	13,3	9,0	-	-	8,2	3,9	14,0	9,7	19,8	15,5	23,3	19,0	25,6	21,3	31,4	27,1	37,2	32,9
	8	17,7	12,0	-	-	-	-	10,9	5,2	16,7	11,0	20,2	14,5	22,5	16,8	28,3	22,6	34,1	28,4
	10	22,1	15,0	-	-	-	-	-	-	13,7	6,5	17,2	9,9	19,5	12,3	25,3	18,1	31,1	23,9
	12	26,5	18,0	-	-	-	-	-	-	-	-	14,1	5,4	16,4	7,8	22,2	13,6	28,0	19,4
078	2	8,0	5,2	14,7	11,9	24,7	21,9	34,7	31,9	44,7	41,9	50,7	47,9	54,6	51,9	64,6	61,9	74,6	71,9
	4	15,9	10,5	9,3	3,8	19,3	13,8	29,3	23,8	39,3	33,8	45,3	39,7	49,3	43,7	59,3	53,7	69,3	63,7
	6	23,9	15,7	-	-	14,0	5,6	24,0	15,6	34,0	25,6	40,0	31,6	44,0	35,6	54,0	45,6	64,0	55,6
	8	31,9	21,0	-	-	-	-	18,6	7,5	28,6	17,5	34,6	23,5	38,6	27,5	48,6	37,5	58,6	47,5
	10	39,8	26,2	-	-	-	-	-	-	23,3	9,4	29,3	15,4	33,3	19,4	43,3	29,4	53,3	39,4
	12	47,8	31,4	-	-	-	-	-	-	17,9	1,3	23,9	7,3	27,9	11,3	37,9	21,3	47,9	31,3
088	2	11,2	7,2	21,6	17,6	36,1	32,1	50,6	46,6	65,1	61,1	73,8	69,8	79,6	75,6	94,1	90,1	108,6	104,6
	4	22,4	14,5	14,3	6,2	28,8	20,7	43,2	35,2	57,7	49,7	66,4	58,4	72,2	64,2	86,7	78,6	101,2	93,1
	6	33,6	21,7	-	-	21,4	9,2	35,9	23,7	50,4	38,2	59,1	46,9	64,9	52,7	79,4	67,2	93,9	81,7
	8	44,8	28,9	-	-	-	-	28,5	12,3	43,0	26,8	51,7	35,5	57,5	41,3	72,0	55,8	86,5	70,3
	10	56,0	36,1	-	-	-	-	-	-	35,6	15,4	44,3	24,1	50,1	29,9	64,6	44,4	79,1	58,9
	12	67,2	43,4	-	-	-	-	-	-	28,3	4,0	37,0	12,7	42,8	18,5	57,2	33,0	71,7	47,5
098	2	14,3	9,1	30,7	25,4	50,7	45,4	70,7	65,4	90,7	85,4	102,7	97,4	110,7	105,4	130,7	125,4	150,7	145,4
	4	28,7	18,2	21,4	10,7	41,4	30,8	61,5	50,8	81,5	70,8	93,5	82,8	101,5	90,8	121,5	110,8	141,5	130,8
	6	43,0	27,3	-	-	32,2	16,1	52,2	36,1	72,2	56,1	84,2	68,1	92,2	76,1	112,2	96,1	132,2	116,1
	8	57,4	36,4	-	-	-	-	42,9	21,5	62,9	41,5	74,9	53,5	82,9	61,5	102,9	81,5	122,9	101,5
	10	71,7	45,5	-	-	-	-	33,6	6,9	53,6	26,9	65,6	38,9	73,6	46,9	93,6	66,9	113,6	86,9
	12	86,1	54,6	-	-	-	-	-	-	44,3	12,2	56,3	24,2	64,3	32,2	84,3	52,2	104,3	72,2
110	2	24	16	42	34	71	63	100	92	129	121	146	138	158	150	187	179	216	208
	4	47	32	26	10	55	39	84	68	113	97	130	114	142	126	171	155	200	184
	6	71	47	-	-	39	15	68	44	97	73	114	90	126	102	155	131	184	160
	8	95	63	-	-	-	-	52	19	81	48	98	66	110	77	139	106	168	135
	10	119	79	-	-	-	-	-	-	64	24	82	42	93	53	122	82	151	111
	12	142	95	-	-	-	-	-	-	-	-	66	17	77	29	106	58	135	87
115	2	36	21	64	49	107	92	150	135	193	178	219	204	236	221	279	264	322	307
	4	73	43	43	12	86	55	129	98	172	141	198	166	215	184	258	227	301	270
	6	109	64	-	-	64	17	107	60	150	103	176	129	193	146	236	189	279	232
	8	146	85	-	-	-	-	85	23	128	66	154	92	171	109	214	152	257	195
	10	182	106	-	-	-	-	-	-	107	29	132	55	150	72	193	115	236	158
	12	219	128	-	-	-	-	-	-	-	-	111	18	128	35	171	78	214	121
127	2	49	30	86	66	144	124	202	182	260	240	294	275	317	298	375	356	433	414
	4	98	60	55	17	113	75	171	133	229	191	264	225	287	249	345	307	403	365
	6	146	90	-	-	82	25	140	83	198	141	233	176	256	199	314	257	372	315
	8	195	120	-	-	-	-	110	33	168	91	203	126	226	149	284	207	342	265
	10	244	150	-	-	-	-	-	-	137	41	172	76	195	99	253	157	311	215
	12	293	180	-	-	-	-	-	-	-	-	142	26	165	49	223	107	281	165

Torque

Size	Spring set	Torque spring Stroke in Nm		Torque pneumatic stroke in Nm at Control Pressure in bar (g)															
		max.	min.	2		3		4		5		5,5		6		7		8	
				max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
143	2	69	48	137	116	230	209	323	302	416	395	472	451	509	488	602	581	695	674
	4	138	96	88	46	181	139	274	232	367	325	423	380	460	418	553	511	646	604
	6	207	144	-	-	132	68	225	161	318	254	374	310	411	347	504	440	597	533
	8	276	192	-	-	-	-	176	91	269	184	325	240	362	277	455	370	548	463
	10	344	240	-	-	-	-	127	21	220	114	276	170	313	207	406	300	499	393
	12	413	288	-	-	-	-	-	-	171	43	227	99	264	136	357	229	450	322
163	2	83	56	172	145	287	260	403	375	518	490	587	559	633	605	748	720	863	835
	4	166	112	115	59	230	174	345	289	460	404	529	473	575	519	690	634	805	749
	6	249	168	-	-	172	89	287	204	402	319	471	388	517	434	632	549	747	664
	8	332	224	-	-	-	-	230	118	345	233	414	302	460	348	575	463	690	578
	10	415	279	-	-	-	-	172	33	287	148	356	217	402	263	517	378	632	493
	12	498	335	-	-	-	-	-	-	230	62	299	131	345	177	460	292	575	407
185	2	134	106	291	262	491	462	691	662	891	862	1011	982	1091	1062	1291	1262	1491	1462
	4	268	213	181	124	381	324	581	524	781	724	901	844	981	924	1181	1124	1381	1324
	6	402	319	-	-	272	186	472	386	672	586	792	706	872	786	1072	986	1272	1186
	8	536	425	-	-	162	48	362	248	562	448	682	568	762	648	962	848	1162	1048
	10	670	531	-	-	-	-	253	111	453	311	573	431	653	511	853	711	1053	911
	12	803	637	-	-	-	-	-	-	344	173	464	293	544	373	744	573	944	773
210	2	160	114	362	315	602	555	842	795	1082	1034	1226	1178	1322	1274	1562	1514	1802	1754
	4	321	228	245	149	485	389	725	629	965	869	1109	1016	1205	1109	1445	1349	1685	1589
	6	482	342	-	-	367	224	607	464	847	704	991	847	1097	943	1327	1183	1567	1423
	8	642	456	-	-	250	58	490	298	729	538	873	682	969	778	1209	1018	1449	1258
	10	803	571	-	-	-	-	372	133	612	373	756	517	852	613	1092	852	1332	1092
	12	964	685	-	-	-	-	-	-	494	207	638	351	734	447	974	687	1214	927
230	2	231	168	524	462	870	807	1214	1152	1560	1498	1767	1705	1905	1843	2250	2188	2596	2533
	4	461	336	358	234	704	579	1048	9244	1394	1269	1601	1476	1739	1614	2084	1960	2429	2305
	6	692	503	-	-	538	351	882	696	1228	1041	1435	1248	1573	1386	1918	1731	2263	2077
	8	923	671	-	-	372	123	716	467	1062	813	1269	1020	1407	1158	1752	1503	2097	1848
	10	1153	838	-	-	-	-	550	239	895	584	1103	791	1241	929	1586	1275	1931	1620
	12	1383	1006	-	-	-	-	-	-	729	356	937	563	1075	701	1420	1046	1765	1392
250	2	321	238	675	589	1135	1049	1595	1509	2055	1969	2331	2245	2515	2429	2975	2889	3435	3349
	4	643	476	430	258	890	718	1350	1178	1810	1638	2086	1914	2270	2098	2730	2558	3190	3018
	6	964	714	-	-	644	387	1104	847	1564	1307	1840	1583	2024	1767	2484	2227	2945	2687
	8	1285	953	-	-	-	-	859	516	1319	976	1595	1252	1779	1436	2239	1896	2699	2356
	10	1607	1191	-	-	-	-	614	185	1074	645	1350	921	1534	1105	1994	1565	2454	2025
	12	1928	1429	-	-	-	-	-	-	829	314	1105	590	1289	774	1749	1234	2209	1694
254	2	406	272	880	742	1460	1322	2040	1902	2620	2482	2968	2830	3200	3062	3780	3642	4360	4222
	4	812	544	599	323	1179	903	1759	1484	2339	2640	2687	2412	2919	2644	3499	3224	4079	3804
	6	1218	817	-	-	899	485	1479	1065	2059	1645	2407	1993	2639	2225	3219	2805	3799	3385
	8	1624	1089	-	-	-	-	1199	647	1779	1227	2127	1575	2359	1807	2939	2387	3519	2967
	10	2031	1361	-	-	-	-	918	229	1498	809	1846	1157	2078	1389	2658	1969	3238	2549
	12	2437	1633	-	-	-	-	-	-	1218	390	1566	738	1798	970	2378	1550	2958	2130
300	2	406	272	1320	1182	2120	1982	2920	2782	3720	3582	4200	4062	4520	4382	5320	5182	6120	5982
	4	812	544	1039	763	1839	1563	2639	2363	3439	3163	3919	3643	4239	3963	5039	4763	5839	5563
	6	1218	817	759	345	1559	1145	2359	1945	3159	2745	3639	3225	3959	3545	4759	4345	5559	5145
	8	1624	1089	-	-	1278	727	2078	1527	2878	2327	3358	2807	3678	3127	4479	3927	5279	4727
	10	2031	1361	-	-	998	309	1798	1109	2598	1909	3078	2389	3398	2709	4198	3509	4998	4309
	12	2437	1633	-	-	-	-	1518	690	2318	149	2798	197	3118	2290	3918	309	4718	3890
	14	2843	1906	-	-	-	-	1237	272	2037	1072	2517	1552	2837	1872	3637	2672	4437	3472
	16	3249	2178	-	-	-	-	-	-	1757	654	2237	1134	2557	1454	3357	2254	4157	3054

Dimensional drawing

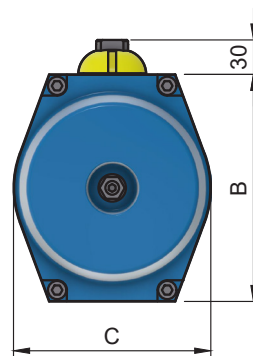
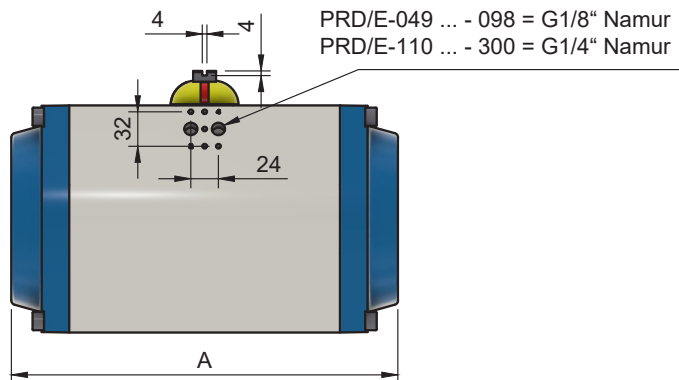
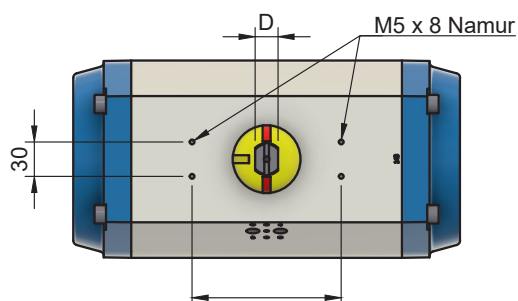
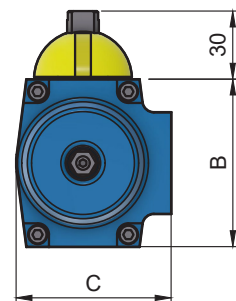
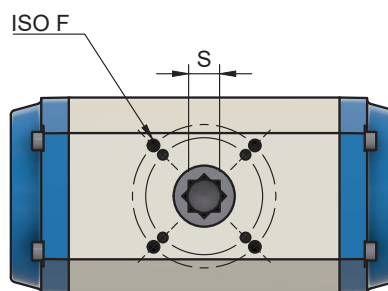


Illustration:
PRD/E-049 to -098



PRD/E-049 ... -127 = 80mm
PRD/E-143 ... -300 = 130mm



Size	Dimension in mm							
	90°	A 120°	180°	B	C	D	S	ISO-F
049	116	-	-	65	61,50	10	9	F03/F05
058	133	151	195	74	68,50	10	14	F03/F05
068	137	155	200	88	80	10	14	F05/F07
078	161	183	237	100	92,50	10	17	F05/F07
088	180	205	268	108	99,50	10	17	F05/F07
098	209	239	310	117	110,50	14	17	F05/F07
110	223	253	323	140	120	14	22	F07/F10
115	293	345	429	140	120	20	22	F07/F10
127	301	353	453	160	137	20	22	F07/F10
143	337	387	488	198	172	20	27	F10/F12
163	379	444	570	198	172	28	27	F10/F12
185	422	-	-	255	224	28	36	F14
210	468	544	696	255	224	32	36	F14
230	524	600	751	302	272	32	46	F16
250	609	711	911	302	272	32	46	F16
254	689	815	-	302	272	32	46	F16
300	689	814	-	360	360	32	46	F16

Technical Data

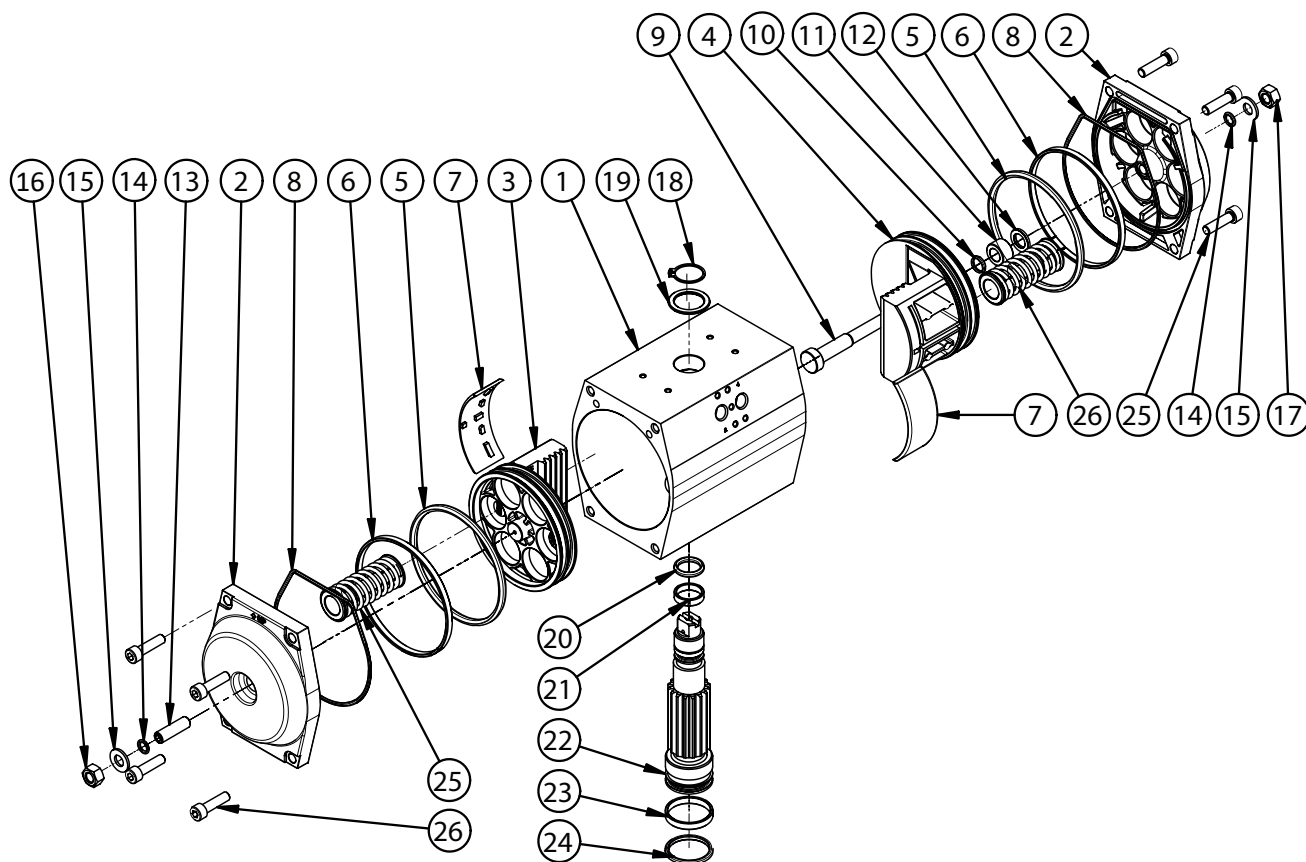
General Specification

Construction principle	Pneumatic double-piston rotary actuator in rack&pinion-design with self-centering pistons; double- and single-acting execution	
Temperature range	Standard	-50°C to+70°C (NBR)
	Hightemperature	-15°C to +160°C (Viton)
	Extended temperature	-60°C to +200°C (Silicone)
Control pressure	2...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°, 120°, 180° resp. 240°	
	Adjustable in one end position +/-5° (optional 100% stroke adjustment) Version BE: Adjustable in both end positions	
Torque range	up to 6.400 Nm (double-acting) up to 2.178 Nm (single-acting)	
Standards	ISO 5211, VDI/VDE 3845 resp. NAMUR	
Materials	Housing	Anodised aluminum ASTM 6083, UNI 4522
	Caps	Aluminum UNI 5076, epoxy resin coated
	Piston	Aluminum UNI 5076
	Pinion	Steel, nickel-plated (optional: stainless steel)
	Bearings	POM
	Sealings	NBR, optional: FKM or silicone

Volume, Weight

Size	Volume (l)				Weight (kg)			
	90° single-acting	90° double-acting	120° double-acting	180° double-acting	90° single-acting	90° double-acting	120° double-acting	180° double-acting
049	0,10	0,18	-	-	0,66	0,60	-	-
058	0,13	0,25	0,28	0,46	1,00	0,90	1,10	1,30
068	0,21	0,40	0,45	0,74	1,62	1,45	1,70	2,00
078	0,32	0,60	0,68	1,12	2,45	2,10	2,46	2,90
088	0,45	0,88	1,00	1,63	2,95	2,50	2,95	3,50
098	0,62	1,20	1,35	2,25	4,00	3,40	4,00	4,60
110	0,98	1,90	2,15	3,52	6,20	5,20	6,10	7,20
115	1,40	2,70	3,05	5,00	8,35	7,10	8,00	9,70
127	2,00	3,65	4,10	6,80	10,70	9,00	10,00	12,50
143	2,50	4,60	6,12	9,20	15,80	12,40	14,00	16,00
163	3,80	7,00	8,00	13,00	20,1	16,40	18,80	26,00
185	6,50	12,50	-	-	37,80	28,00	-	-
210	8,00	15,00	17,00	21,50	39,60	31,80	37,40	49,20
230	10,00	19,20	22,00	29,00	56,00	44,00	50,00	63,00
250	14,00	27,00	31,50	41,00	70,60	55,5	66,50	79,80
254	17,00	32,00	38,00	-	84,30	69,20	77,00	-
300	25,00	46,00	68,00	-	107,10	92,00	105,00	-

Components

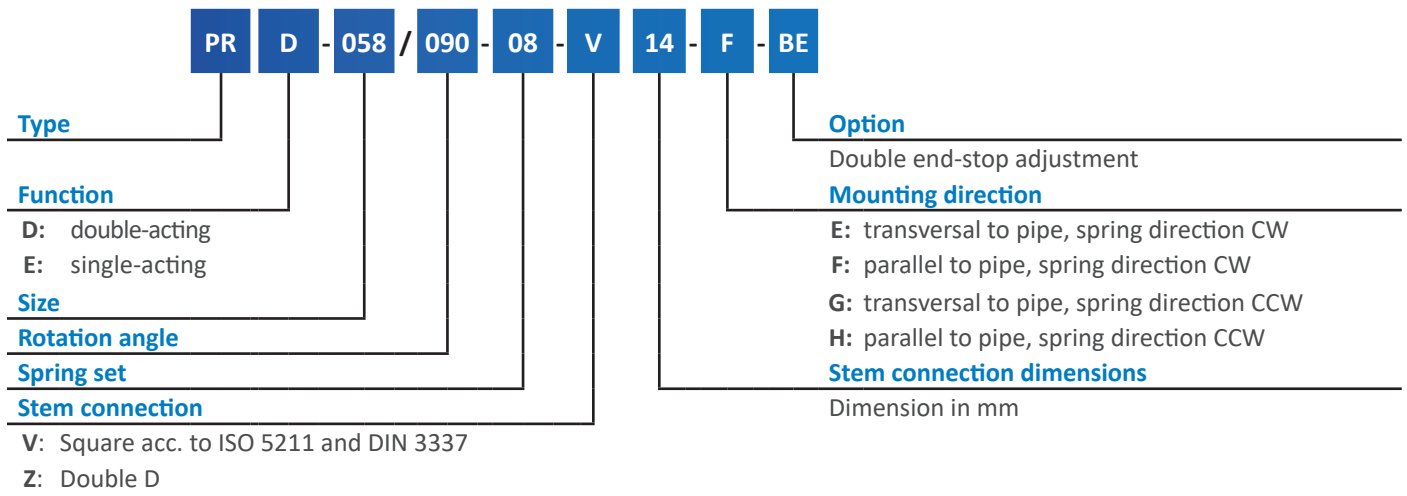


No.	Description	Quantity	Spare parts set							
			Set 1	Set 2	Set 3	Set 4	Set 5	Set 6	Set 7	Set 8
1	Actuator body	1	-	-	-	-	-	-	-	-
2	Actuator end cap	2	1	-	-	-	-	-	-	-
3	Blind piston	1	-	1	-	-	-	-	-	-
4	Drilled piston	1	-	-	1	-	-	-	-	-
5	Piston sealing O-Ring	2	-	1	1	-	-	-	2	-
6	Piston guide ring	2	-	1	1	-	-	-	-	2
7	Piston guide skate	2	-	1	1	-	-	-	-	2
8	End cap sealing O-Ring	2	1	-	-	-	-	-	2	-
9	Internal travel stop rod	1	-	-	-	-	1	-	-	-
10	Internal travel stop rod sealing O-Ring	1	-	-	-	-	1	-	1	-
11	Internal stop rod guide bush	1	-	-	-	-	1	-	-	-
12	Rod guide bush stop washer	1	-	-	-	-	1	-	-	-
13	External travel stop screw	1	-	-	-	-	-	1	-	-
14	Stop sealing O-Ring	2	-	-	-	-	-	1	2	-
15	O-Ring stop washer	2	-	-	-	-	-	1	-	-
16	External stop nut	1	-	-	-	-	-	1	-	-
17	Internal stop nut (yellow)	1	-	-	-	-	1	-	-	-
18	Pinion stop circlips	1	-	-	-	1	-	-	-	-
19	Upper pinion washer	1	-	-	-	1	-	-	-	1
20	Upper pinion O-Ring sealing	1	-	-	-	1	-	-	1	-
21	Upper pinion guide ring	1	-	-	-	1	-	-	-	1
22	Pinion	1	-	-	-	1	-	-	-	-
23	Lower pinion guide ring	1	-	-	-	1	-	-	-	1
24	Lower pinion O-Ring sealing	1	-	-	-	1	-	-	-	-
25	End cap screws	8	4	-	-	-	-	-	-	-
26	Spring cartridges	0 - 12	-	-	-	-	-	-	-	-

Set 1 = Cap, complete
Set 2 = Blind piston, complete
Set 3 = Drilled piston kit, complete
Set 4 = Shaft complete

Set 5 = Internal stop kit, complete
Set 6 = External stop kit, complete
Set 7 = Seal kit
Set 8 = Guide kit

Typecode



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