

Application

Single-acting pneumatic diaphragm rotary actuator for butterfly valves and other final control elements with rotary closure members. Suitable for throttling or on/off service.

Maximum opening angle $\varphi = 90^\circ$

The Type CTS Pneumatic Rotary Actuator contains a rolling diaphragm and internal springs.

Special features

- Direction of action (fail-open/fail-close) can be selected as required
- Various signal pressure ranges
- Travel stops externally adjustable to limit the opening angle
- No special tools required for mounting and conversion
- Signal pressure up to maximum 6 bar
- Continuous operation at temperatures from -35 to $+90$ °C
- Connections according to DIN ISO 5211
- Actuator shaft available in three different diameters (depending on the actuator size)
- Attachment of control valve accessories, such as pneumatic or electropneumatic positioners, electric or pneumatic limit switches or solenoid valves

Versions

Pneumatic rotary actuator (Fig. 1) with 160 or 320 cm² actuator area

- **Type CTS** · Without handwheel
- **Type CTS** · With handwheel



Fig. 1: Type CTS Pneumatic Rotary Actuator

Principle of operation (Fig. 2)

The signal pressure p_{st} creates a force at the diaphragm surface which is opposed by the springs (4) in the actuator. The travel movement of the actuator stem (5), which is proportional to the signal pressure, is transferred to the lever system (6) where it is converted into a rotary motion. The two externally accessible stop screws (8) can be used to limit the lower and upper opening angles.

The number of springs and their compression determine the signal pressure range and the useable actuator torque.

The valve can be connected either to the housing flange 1 or 2. The flange dimensions and actuator shaft (7) with four feather key notches of both connections are designed according to DIN ISO 5211.

When the signal pressure fails, the mounted valve is moved to its fail-safe position. The springs (4) in the actuator close or open the valve depending on how the valve is mounted to the housing flange 1 or 2 and depending on the fail-safe action.

Fail-safe action

- **Fail-close:** The actuator springs close the mounted valve when the pressure acting on the diaphragm decrease and when the supply air or control signal fails.
- **Fail-open:** The actuator springs open the mounted valve when the pressure acting on the diaphragm decrease and when the supply air or control signal fails.

Torque curve (Fig. 3)

The course of torque depends on the lever design. Fig. 3 shows a typical example of the useable air-driving torque M_{dL} and useable spring-driving torque M_{dF} based on the opening angle φ .

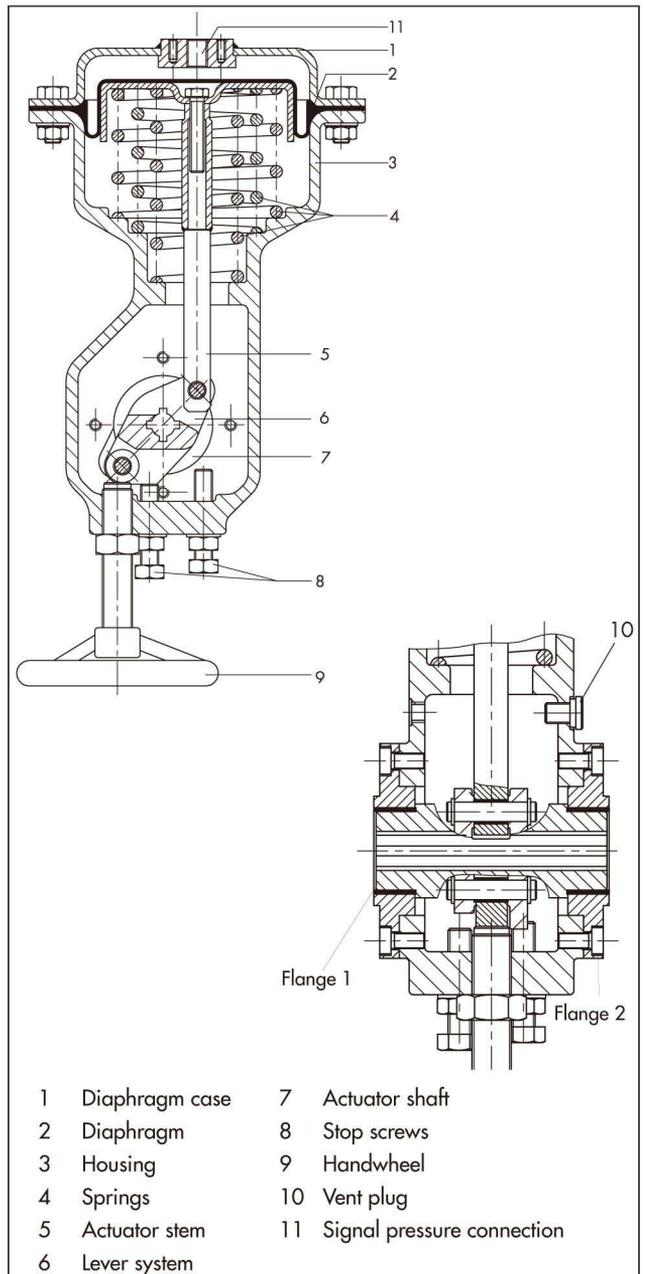


Fig. 2: Type CTS Rotary Actuator with handwheel

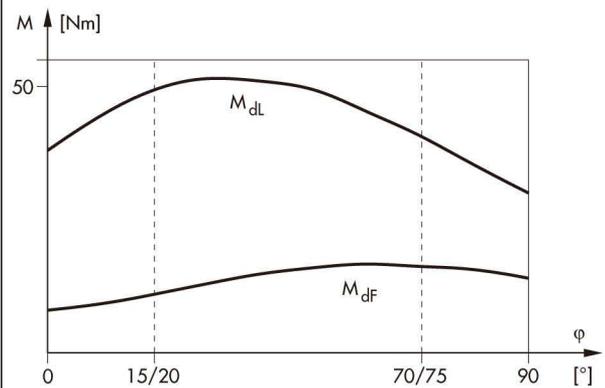


Fig. 3: Typical torque curve

Table 1: Technical data

Type CTS	
Permissible signal pressure	6 bar
Actuator area	160 cm ² · 320 cm ²
Opening angle	90°
No. of springs	3
Signal pressure ranges	7 (through different spring combinations)
Permissible temperatures	-35 to +90 °C in continuous operation

Table 2: Materials

Housing	EN-JS1049, powder paint coated
Rolling diaphragm	NBR (nitrile butadiene rubber) with fabric reinforcement (polyester)
Diaphragm plate	Sheet steel, zinc coated/chromate coating
Springs	55 Si Cr 6
Actuator stem	St 37, zinc coated/chromate coating
Actuator shaft	EN-JS1049, zinc coated/chromate coating

Table 3: Useable air-driving torque · Pressures in bar (gauge)**Table 3.1: 160 cm² actuator area**

Signal pressure range	Opening angle	Useable air-driving torque M in Nm at max. signal pressure p _{st}									
		1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
0.4 to 0.8 ¹⁾	0°	26	38	50	62	74	86	97	109	121	133
	70°/75°	22	38	54	69	85	101	116	132	148	163
	90°	16	29	41	54	67	79	92	104	117	129
	M _{max}	40	58	76	95	113	133	150	169	187	206
0.5 to 1.0	0°	23	35	47	59	71	83	95	107	119	131
	70°/75°	17	33	49	64	80	96	111	127	143	158
	90°	12	24	37	50	62	75	87	100	112	125
	M _{max}	34	52	70	89	107	126	144	163	181	200
0.8 to 1.6	0°	16	28	40	52	64	76	88	100	111	123
	70°/75°	–	15	30	46	62	77	93	109	124	140
	90°	–	9	21	34	46	59	71	84	97	109
	M _{max}	–	33	50	68	86	105	123	142	160	179
0.9 to 1.8 ¹⁾	0°	14	26	37	49	61	73	85	97	109	121
	70°/75°	–	–	24	40	55	71	87	102	118	134
	90°	–	–	16	28	41	53	66	78	91	104
	M _{max}	–	–	44	62	80	99	117	136	154	173
1.2 to 2.4	0°	6	18	30	42	54	66	78	90	102	114
	70°/75°	–	–	–	21	37	53	68	84	100	115
	90°	–	–	–	12	25	37	50	63	75	88
	M _{max}	–	–	–	50	68	83	101	119	137	157
1.3 to 2.6 ¹⁾	0°	4	16	27	40	51	63	75	87	99	111
	70°/75°	–	–	–	16	32	47	63	79	95	110
	90°	–	–	–	8	21	33	46	58	71	83
	M _{max}	–	–	–	45	62	79	97	115	134	153
1.7 to 3.4	0°	–	6	18	30	42	54	65	77	89	101
	70°/75°	–	–	–	–	–	23	38	54	70	86
	90°	–	–	–	–	–	12	24	37	49	62
	M _{max}	–	–	–	–	–	62	79	95	113	131

1) Special spring range

Table 3.2: 320 cm² actuator area

Signal pressure range	Opening angle	Useable air-driving torque M in Nm at max. signal pressure p _s									
		1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
0.4 to 0.8 ¹⁾	0°	88	128	168	208	248	288	328	368	408	448
	70°/75°	78	131	183	235	288	340	392	445	497	549
	90°	57	99	140	182	223	266	307	349	390	432
	M _{max}	130	190	258	325	393	460	528	595	663	730
0.5 to 1.0	0°	80	120	160	200	240	280	320	360	400	440
	70°/75°	57	110	162	214	267	319	371	424	476	528
	90°	38	80	122	163	205	247	289	331	372	414
	M _{max}	110	170	238	305	373	440	508	575	643	710
0.8 to 1.6	0°	56	96	136	176	216	256	296	336	376	416
	70°/75°	–	55	107	160	212	264	317	369	421	474
	90°	–	34	75	117	159	200	242	284	326	367
	M _{max}	–	110	178	245	313	380	448	515	583	650
0.9 to 1.8 ¹⁾	0°	48	88	128	168	208	248	288	328	368	408
	70°/75°	–	–	83	136	188	240	293	345	397	449
	90°	–	–	54	96	137	179	221	263	305	346
	M _{max}	–	–	158	225	293	360	428	495	563	630
1.2 to 2.4	0°	24	64	104	144	184	224	264	304	344	384
	70°/75°	–	–	–	81	134	186	238	291	343	395
	90°	–	–	–	49	91	133	174	216	258	300
	M _{max}	–	–	–	190	253	315	378	440	508	573
1.3 to 2.6 ¹⁾	0°	16	56	96	136	176	216	256	296	336	376
	70°/75°	–	–	–	60	112	165	217	269	322	374
	90°	–	–	–	31	73	114	156	198	240	281
	M _{max}	–	–	–	175	238	300	363	425	493	560
1.7 to 3.4 ¹⁾	0°	–	24	64	104	144	184	224	264	304	344
	70°/75°	–	–	–	–	–	86	138	191	243	295
	90°	–	–	–	–	–	47	88	130	172	213
	M _{max}	–	–	–	–	–	235	298	360	420	480

¹⁾ Special spring range

Table 4: Useable spring-driving torque · Pressures in bar (gauge)

Signal pressure range	Opening angle	Useable spring-driving torque M in Nm with actuator area	
		160 cm ²	320 cm ²
0.4 to 0.8 ¹⁾	0°	10	32
	15°/20°	15	49
	90°	21	67
	M _{max}	24	85
0.5 to 1.0	0°	12	40
	15°/20°	19	61
	90°	23	85
	M _{max}	28	115
0.8 to 1.6	0°	20	64
	15°/20°	30	97
	90°	42	132
	M _{max}	50	175
0.9 to 1.8 ¹⁾	0°	22	72
	15°/20°	34	109
	90°	47	153
	M _{max}	55	200
1.2 to 2.4	0°	30	96
	15°/20°	45	145
	90°	63	200
	M _{max}	77	265
1.3 to 2.6 ¹⁾	0°	32	104
	15°/20°	48	157
	90°	67	218
	M _{max}	82	285
1.7 to 3.4	0°	42	136
	15°/20°	63	206
	90°	89	286
	M _{max}	107	375

¹⁾ Special spring range

Table 5: Dimensions and weights

Actuator area	ØD	H	H1	H2	C	B	ØE	ØF ²⁾	Øa	b (approx.)	Connecting flanges according to DIN ISO 5211	Weight (approx. kg)
160 cm ²	225	332	260	72	132	118	110	16 ¹⁾ 20/25	180	120	F07	16
320 cm ²	295	516	421	95	183	162	150	25 ¹⁾ 36/40	250	150	F12	50

1) Standard version for Type CTS Butterfly Valve

2) Hollow shaft with four keyways offset by 90° to accommodate the shaft of the valve (shaft end with feather key notch according to DIN 6885)

Dimensional drawings

