

Application

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

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

The Type 3278 Pneumatic Rotary Actuator is equipped with a rolling diaphragm and internal springs

- Operating direction (spring opens/spring closes) can be customized
- Various bench ranges
- Externally adjustable stop screws to limit the opening angle
- Attachment of positioner, limit switch, solenoid valve, and other devices conforming to VDI/VDE 3845
- No special tools needed for mounting and conversion
- Designed for supply pressures up to max. 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

Versions

Pneumatic rotary actuator (Fig. 1) with an effective diaphragm area of 160 or 320 cm².

- **Type 3278** · Without handwheel
- **Type 3278** · With handwheel

Further versions with

- Type 3766 Pneumatic Positioner (see Data Sheet T 8355 EN) or
- Type 3767 Electropneumatic (i/p) Positioner (see Data Sheet T 8355 EN)
- Type 3776 Limit Switch (see Data Sheet T 8368 EN)
- Type 3963 Solenoid Valve (see Data Sheet T 963 EN)
- Type 3780 Electropneumatic Positioner (see Data Sheet T 8380 EN)
- Type 3761 Electropneumatic Positioner (see Data Sheet T 8386 EN)

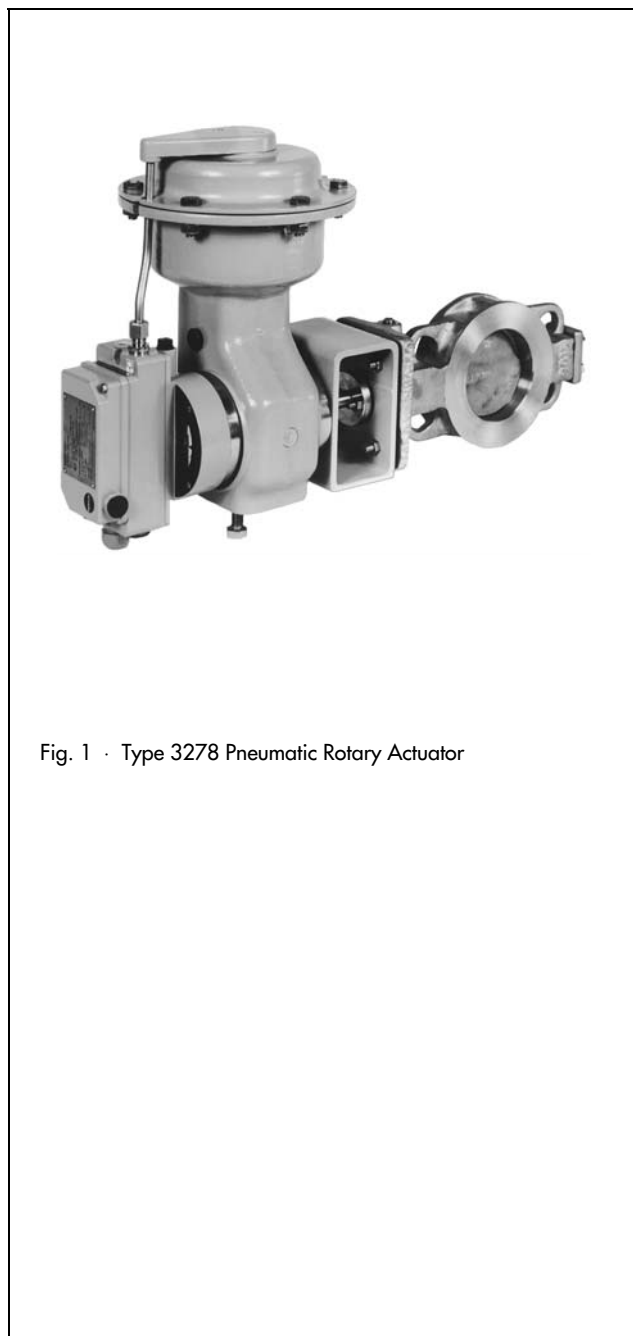


Fig. 1 · Type 3278 Pneumatic Rotary Actuator

Principle of operation (Fig. 2)

The signal pressure p_{st} generates a force at the diaphragm surface which is balanced by the compression springs (4). In this process, the linear motion of the actuator stem (5), which is proportional to the signal pressure, is transmitted to the lever system (6), where it is converted into a rotary motion. The upper and lower limits of the opening angle can be adjusted using the two externally accessible stop screws (8).

The bench range and useable actuator torque are determined by the number of springs and their compression.

The final control element can be connected to either flange 1 or 2. For both connections, the flange dimensions and sleeve shaft (7) with four feather key notches are designed according to DIN ISO 5211.

In case the signal pressure fails, the connected valve moves to the predetermined fail-safe position, in which the actuator springs (4) either close (fail-close) or open (fail-open) the final control element depending on the respective fail-safe action and whether the final control element is attached to flange 1 or 2.

Fail-safe position

Control valve CLOSED when the supply air fails

The springs close the connected final control element whenever the pressure acting on the diaphragm decreases or the supply air fails.

Control valve OPEN when the supply air fails

The springs open the final control element whenever the pressure acting on the diaphragm decreases or the supply air fails.

Torque characteristic curve (Fig. 3)

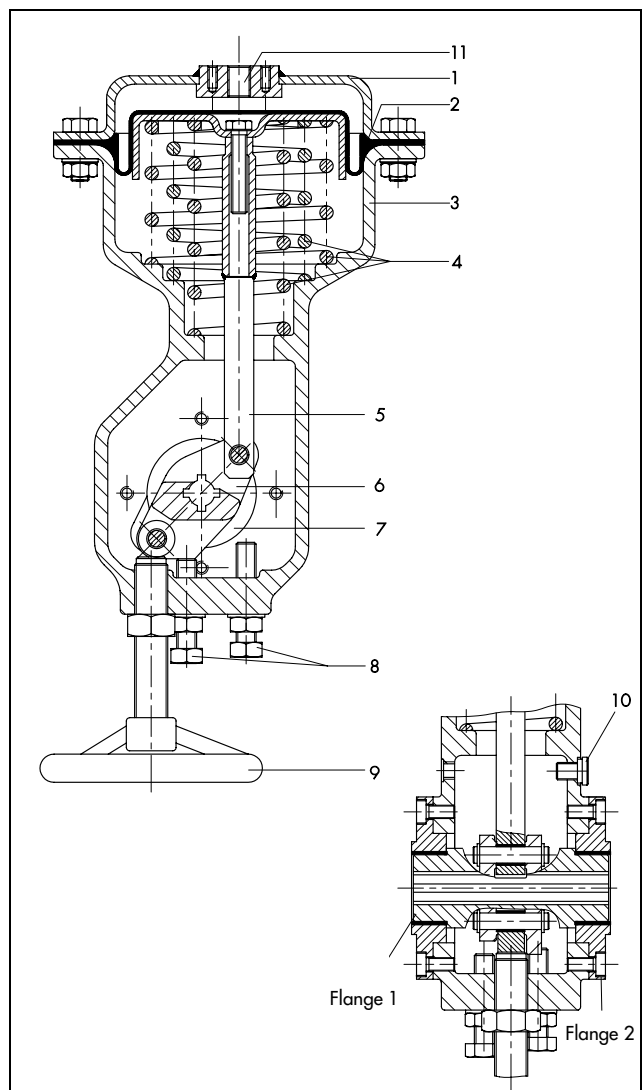
The characteristic of torque is determined by the lever design. Fig. 3 illustrates a typical example of the useable air torques M_{dL} and useable spring torques M_{dF} plotted versus the opening angle φ .

Table 1 · Technical data

| | |
|-----------------------|-------------------------------------------|
| Perm. supply pressure | 6 bar |
| Diaphragm area | 160 cm ² · 320 cm ² |
| Angle of rotation | 90° |
| Number of springs | 3 |
| Bench ranges | 7 (through different spring combinations) |
| Perm. temperatures | -35 to 90 °C in continuous operation |

Table 2 · Materials

| | |
|-------------------|-----------------------------------------------------|
| Housing | EN-JS1049, powder-varnish coated |
| Rolling diaphragm | NBR (nitrile rubber) with fabric insert (polyester) |
| Diaphragm plate | Sheet steel, zinc coated/chromized |
| Springs | 55 Si Cr 6 |
| Actuator stem | St 37, zinc coated/chromized |
| Actuator shaft | En-JS1049, zinc coated/chromized |



- 1 Cover plate
- 2 Diaphragm
- 3 Housing
- 4 Springs
- 5 Actuator stem
- 6 Lever system
- 7 Actuator shaft
- 8 Stop screws
- 9 Handwheel
- 10 Vent plug
- 11 Supply pressure connection

Fig. 2 · Type 3278 Rotary Actuator with handwheel

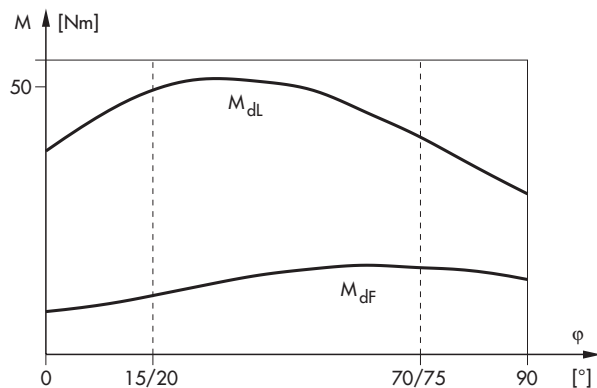


Fig. 3 · Example illustrating the torque characteristic

Table 3a · Usable air torques · Diaphragm area 160 cm², all pressures in bar (gauge)

| Bench range | Opening angle | Usable air torques M in Nm at maximum supply 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...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...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...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...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...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...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...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 |

Table 3b · Usable air torques · Diaphragm area 320 cm², all pressures in bar (gauge)

| Bench range | Opening angle | Usable air torques M in Nm at maximum supply 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...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...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...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...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...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...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...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 range

Table 4 · Usable spring torques

All pressures in bar (gauge)

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

¹⁾ Special range

Ordering text

Type 3278 Pneumatic Rotary Actuator
 Handwheel Without/with
 Diaphragm area 160/320 cm²
 Fail-safe action Actuator stem extends or retracts
 Bench range ... bar
 Adjusted to ... bar
 Shaft diameter ... mm
 Accessories Positioner and/or limit switch and/or solenoid valve

Optionally, special version

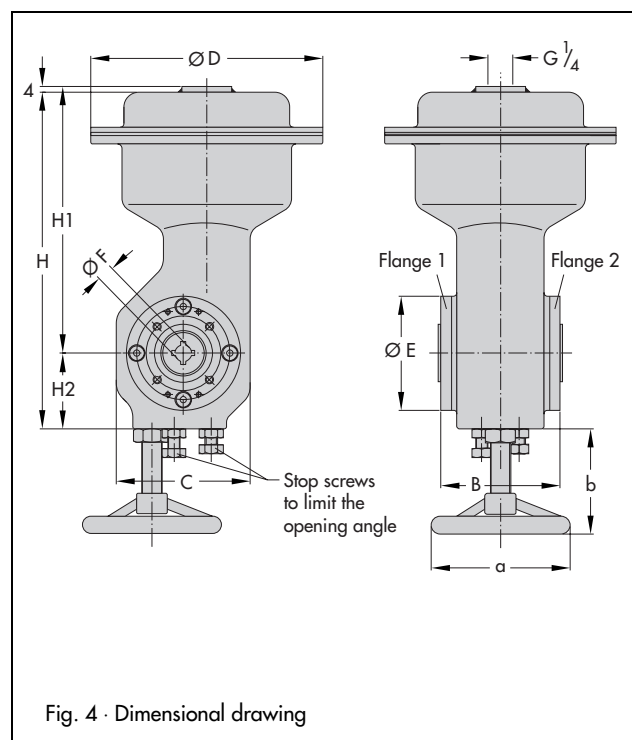


Fig. 4 · Dimensional drawing

Table 5 · Dimensions and weights

| Actuator size | Ø D | H | H1 | H2 | C | B | Ø E | Ø F ²⁾ | Ø a | b (approx.) | Connecting flanges acc. 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 3331 Butterfly Valve

²⁾ Sleeve shaft with 4 slots rotated by 90° to accommodate the shaft of the final control element (shaft end with feather key notch according to DIN 6885)

Specifications subject to change without notice.

