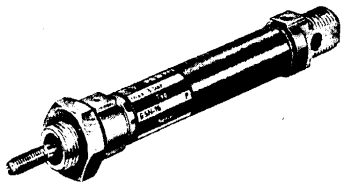
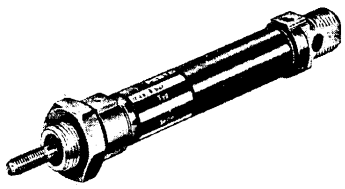
## Single-acting cylinders

FESTO



Type ESN-...-P

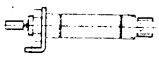


ESNU-...-P-A

**Designed to meet the specifications of ISO 6432 with stainless steel barrel and roller burnished stainless rod as standard.**

- Piston diameters from 8 to 25 mm
- Stroke lengths from 10 to 50 mm
- Extended spring guide
- Rolled piston rod threads for strength and precision
- Non-lubricated operation
- Magnetic sensing option with Type ESNU-...-P-A

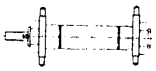
**Accessories:**



**Foot mounting**
Type HBN + piston dia. +1

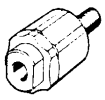
**Foot mounting** (pair)
Type HBN + piston dia. +2

**Flange mounting** (front or rear)
Type FBN + piston dia.



**Swivel mounting**
Type WBN + piston dia.

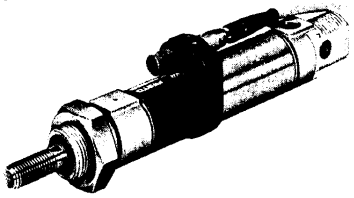
**Clevis foot mounting**
Type LBN + piston dia.



**Rod-end couplings**
Type FK, SG, SGS
(for details see page C.11/10)

**Proximity switches**
Type SME-8, SMT-8
SMEO, SMTO, SMPO
(for details see page F/1)

Position sensing with proximity switches



| Type | ESN-.../ESNU-... | | | | | |
|---|---|---|---|---|---|---|
| Piston dia. mm | 8 | 10 | 12 | 16 | 20 | 25 |
| Thrust N | 20 | 35 | 50 | 90 | 148 | 250 |
| Connection | M5 | M5 | M5 | M5 | G 1/8 | G 1/8 |
| Standard strokes mm | 10<br>25<br>50 | 10<br>25<br>50 | 10<br>25<br>50 | 10<br>25<br>50 | 10<br>25<br>50 | 10<br>25<br>50 |

Max. permissible operating pressure 10 bar.
Force figures quoted for 6 bar (theoretical value).

**Options:**
S3

**How to order:** Standard: ESN + piston dia. + stroke length + end position cushioning
With sensing: ESNU + piston dia. + stroke length + end position cushioning + sensing

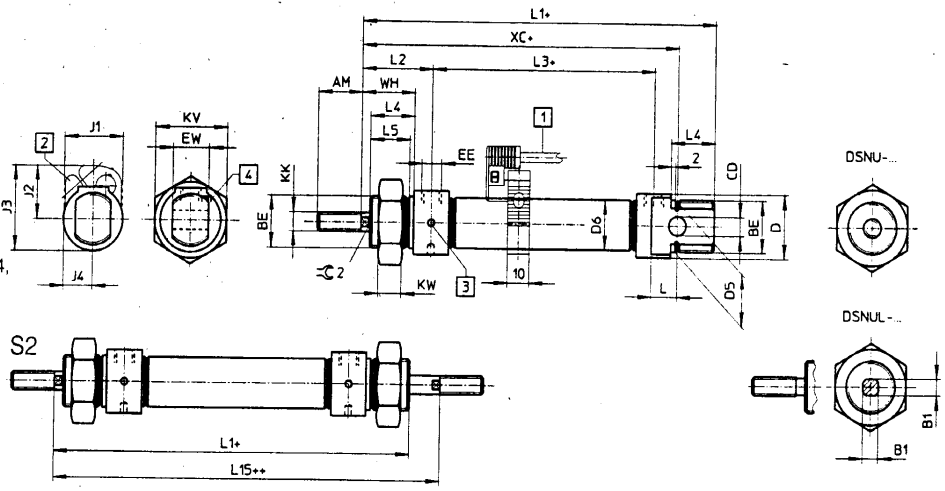
**Example:** Standard: Piston dia. 12 mm, stroke length 50 mm = ESN-12-50-P
With sensing = ESNU-12-50-P-A

...act Festo

For dimensions see page D.1/21

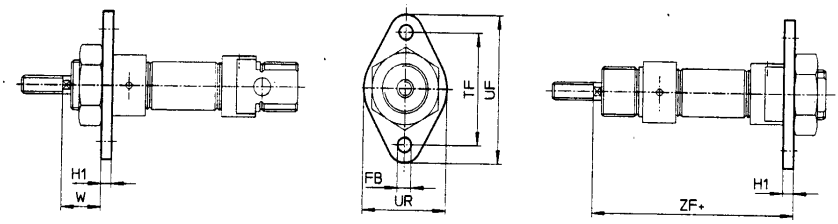
DSNU-...-A
ESNU-...-P-A
DSNUL-12-...-P-A
DSNUL-...-A
DSN-...-P
ESN-...-P

1 Proximity sensors Type SMEO-4/SMTO-4, SMEO-4U/SMTO-4U
2 Mounting kit Type SMBR-...
3 Locating hole for hook spanner when tightening
4 Regulating screw for adjustable end position cushioning with Type DSNU-...-PPV-A/DSNUL-...-PPV-A (Ø 16, 20, 25 mm)

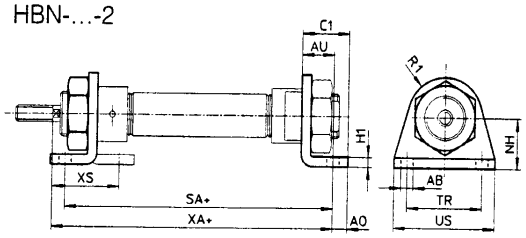



| Ø | AM | B1 f8 | BE | CD Ø | D Ø | D5 Ø h9 | D6 Ø | EE | EW | J1 | J2 | J3 | J4 | KK | KV | KW | L | L1 | L2 | L3 | L4 | L5 | L15 | ℄2 | WH | XC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 12 | – | M12x1.25 | 4 | 15 | 12 | 9.3 | M5 | 8 | 20.4 | 16.5 | 23.2 | 13.9 | M4 | 19 | 6 | 6 | 74 | 22 | 34 | 12 | 10 | 78.4 | – | 16 | 64 |
| 10 | 12 | – | M12x1.25 | 4 | 15 | 12 | 11.3 | M5 | 8 | 22 | 18.2 | 25.9 | 13.8 | M4 | 19 | 6 | 6 | 74 | 22 | 34 | 12 | 10 | 78.4 | – | 16 | 64 |
| 12 | 16 | 5.5 | M16x1.5 | 6 | 20 | 16 | 13.3 | M5 | 12 | 22 | 20 | 28.6 | 11 | M6 | 24 | 8 | 9 | 89 | 28 | 38 | 17 | 15 | 94 | 5 | 22 | 75 |
| 16 | 16 | 5.5 | M16x1.5 | 6 | 20 | 16 | 17.3 | M5 | 12 | 22.5 | 22.5 | 33.2 | 11 | M6 | 24 | 8 | 9 | 95 | 28 | 44 | 17 | 15 | 100 | 5 | 22 | 82 |
| 20 | 20 | 7 | M22x1.5 | 8 | 27 | 22 | 21.3 | G⅛ | 16 | 26.5 | 22.5 | 35.3 | 13 | M8 | 32 | 11 | 12 | 112 | 32 | 51.6 | 20 | 18 | 116.4 | 7 | 24 | 95 |
| 25 | 22 | 9 | M22x1.5 | 8 | 27 | 22 | 26.5 | G⅛ | 16 | 31.5 | 25 | 40.2 | 16 | M10x1.25 | 32 | 11 | 12 | 119.5 | 36 | 53.1 | 22 | 20 | 125.4 | 9 | 28 | 104 |

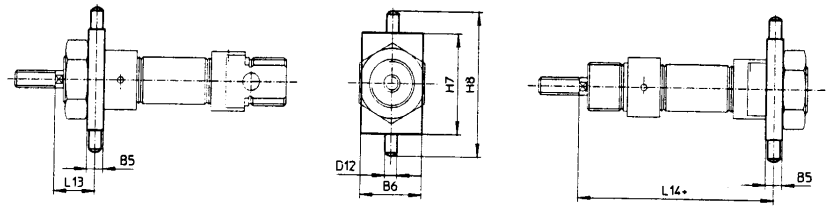
FBN-...



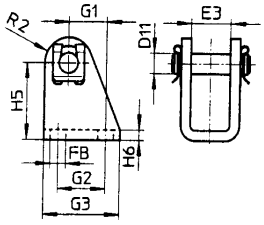

HBN-...-1
HBN-...-2




WBN-...




LBN-...




| Ø | AB Ø | AO | AU | B5 | B6 | C1 | D11 | D12 Ø m6 | E3 | FB Ø | G1 | G2 | G3 | H1 | H5 | H6 | H7 | H8 | L13 | L14 | NH | R1 | R2 | SA | TR | TF | UF | US | UR | W | XA | XS | ZF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 4.5 | 5 | 11 | 6 | 20 | 16 | 4 | 4 | 8.1 | 4.5 | 13.8 | 12.5 | 20 | 3 | 24 | 2.5 | 26 | 38 | 13 | 65 | 16 | 10 | 5 | 68 | 25 | 30 | 40 | 35 | 25 | 13 | 73 | 24 | 65 |
| 10 | 4.5 | 5 | 11 | 6 | 20 | 16 | 4 | 4 | 8.1 | 4.5 | 13.8 | 12.5 | 20 | 3 | 24 | 2.5 | 26 | 38 | 13 | 65 | 16 | 10 | 5 | 68 | 25 | 30 | 40 | 35 | 25 | 13 | 73 | 24 | 65 |
| 12 | 5.5 | 6 | 14 | 8 | 25 | 20 | 6 | 6 | 12.1 | 5.5 | 13 | 15 | 25 | 4 | 27 | 3 | 38 | 58 | 18 | 76 | 20 | 13 | 7 | 78 | 32 | 40 | 53 | 42 | 30 | 18 | 86 | 32 | 76 |
| 16 | 5.5 | 6 | 14 | 8 | 25 | 20 | 6 | 6 | 12.1 | 5.5 | 13 | 15 | 25 | 4 | 27 | 3 | 38 | 58 | 18 | 82 | 20 | 13 | 7 | 84 | 32 | 40 | 53 | 42 | 30 | 18 | 92 | 32 | 82 |
| 20 | 6.6 | 8 | 17 | 8 | 30 | 25 | 8 | 6 | 16.1 | 6.6 | 16 | 20 | 32 | 5 | 30 | 4 | 46 | 66 | 21 | 96 | 25 | 20 | 10 | 102 | 40 | 50 | 66 | 54 | 40 | 19 | 109 | 36 | 97 |
| 25 | 6.6 | 8 | 17 | 8 | 30 | 25 | 8 | 6 | 16.1 | 6.6 | 16 | 20 | 32 | 5 | 30 | 4 | 46 | 66 | 24 | 101.5 | 25 | 20 | 10 | 103.5 | 40 | 50 | 66 | 54 | 40 | 23 | 114.5 | 40 | 102.5 |

| Cylinder Piston force and air consumption for double acting cylinders | | | | Operating pressure p [bar] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Piston diameter [mm] | Piston rod diameter [mm] | Stroke length [mm] | Force [N]* Air consumption [l/2 x stroke] | 2 | 3 | 4 | 5 | **6** | 7 | 8 | 9 | 10 |
| 6 | 3 | 100 | Thrust | 5.7 | 8.5 | 11.3 | 14.1 | **17.0** | 19.8 | 22.6 | 25.5 | 28.3 |
| | | | Return force | 4.2 | 6.4 | 8.5 | 10.6 | **12.7** | 14.9 | 17.0 | 19.1 | 21.2 |
| | | | Air consumption | 0.01 | 0.02 | 0.02 | 0.03 | **0.03** | 0.04 | 0.04 | 0.05 | 0.05 |
| 8 | 4 | 100 | Thrust | 10.1 | 15.1 | 20.1 | 25.1 | **30.2** | 35.2 | 40.2 | 45.3 | 50.3 |
| | | | Return force | 7.5 | 11.3 | 15.1 | 18.9 | **22.6** | 26.4 | 30.2 | 33.9 | 37.7 |
| | | | Air consumption | 0.03 | 0.03 | 0.04 | 0.05 | **0.06** | 0.07 | 0.08 | 0.09 | 0.10 |
| 10 | 4 | 100 | Thrust | 15.7 | 23.6 | 31.4 | 39.3 | **47.1** | 55.0 | 62.9 | 70.7 | 78.6 |
| | | | Return force | 13.2 | 19.8 | 26.4 | 33.0 | **39.6** | 46.2 | 52.8 | 59.4 | 66.0 |
| | | | Air consumption | 0.04 | 0.06 | 0.07 | 0.09 | **0.10** | 0.11 | 0.13 | 0.14 | 0.16 |
| 12 | 6 | 100 | Thrust | 23 | 34 | 45 | 57 | **68** | 79 | 91 | 102 | 113 |
| | | | Return force | 17 | 25 | 34 | 42 | **51** | 59 | 68 | 76 | 85 |
| | | | Air consumption | 0.06 | 0.08 | 0.10 | 0.12 | **0.14** | 0.16 | 0.18 | 0.20 | 0.22 |
| 16 | 6 | 100 | Thrust | 40 | 60 | 80 | 101 | **121** | 141 | 161 | 181 | 201 |
| | | | Return force | 35 | 52 | 69 | 86 | **104** | 121 | 138 | 156 | 173 |
| | | | Air consumption | 0.11 | 0.15 | 0.19 | 0.22 | **0.26** | 0.30 | 0.33 | 0.37 | 0.41 |
| 18 | 8 | 100 | Thrust | 51 | 76 | 102 | 127 | **153** | 178 | 204 | 229 | 255 |
| | | | Return force | 41 | 61 | 82 | 102 | **123** | 143 | 163 | 184 | 204 |
| | | | Air consumption | 0.14 | 0.18 | 0.23 | 0.27 | **0.32** | 0.36 | 0.41 | 0.45 | 0.50 |
| 20 | 8 | 100 | Thrust | 63 | 94 | 126 | 157 | **189** | 220 | 251 | 283 | 314 |
| | | | Return force | 53 | 79 | 106 | 132 | **158** | 185 | 211 | 238 | 264 |
| | | | Air consumption | 0.17 | 0.23 | 0.29 | 0.34 | **0.40** | 0.46 | 0.51 | 0.57 | 0.63 |
| 25 | 10 | 100 | Thrust | 98 | 147 | 196 | 246 | **295** | 344 | 393 | 442 | 491 |
| | | | Return force | 83 | 124 | 165 | 206 | **248** | 289 | 330 | 371 | 413 |
| | | | Air consumption | 0.27 | 0.36 | 0.45 | 0.54 | **0.63** | 0.71 | 0.80 | 0.89 | 1.0 |
| 32 | 12 | 100 | Thrust | 161 | 241 | 322 | 402 | **483** | 563 | 644 | 724 | 805 |
| | | | Return force | 138 | 207 | 277 | 346 | **415** | 484 | 553 | 622 | 691 |
| | | | Air consumption | 0.44 | 0.59 | 0.74 | 0.89 | **1.0** | 1.2 | 1.3 | 1.5 | 1.6 |
| 40 | 16 | 100 | Thrust | 251 | 377 | 503 | 629 | **754** | 880 | 1006 | 1131 | 1257 |
| | | | Return force | 211 | 317 | 422 | 528 | **634** | 739 | 845 | 950 | 1056 |
| | | | Air consumption | 0.69 | 0.92 | 1.1 | 1.4 | **1.6** | 1.8 | 2.1 | 2.3 | 2.5 |
| 50 | 20 | 100 | Thrust | 393 | 589 | 786 | 982 | **1179** | 1375 | 1571 | 1768 | 1964 |
| | | | Return force | 330 | 495 | 660 | 825 | **990** | 1155 | 1320 | 1485 | 1650 |
| | | | Air consumption | 1.1 | 1.4 | 1.8 | 2.1 | **2.5** | 2.9 | 3.2 | 3.6 | 3.9 |
| 63 | 20 | 100 | Thrust | 624 | 936 | 1247 | 1559 | **1871** | 2183 | 2495 | 2807 | 3119 |
| | | | Return force | 561 | 841 | 1122 | 1402 | **1683** | 1963 | 2243 | 2524 | 2804 |
| | | | Air consumption | 1.8 | 2.3 | 2.9 | 3.5 | **4.1** | 4.7 | 5.3 | 5.9 | 6.4 |
| 80 | 25 | 100 | Thrust | 1006 | 1509 | 2011 | 2514 | **3017** | 3520 | 4023 | 4526 | 5029 |
| | | | Return force | 908 | 1361 | 1815 | 2269 | **2723** | 3176 | 3630 | 4084 | 4538 |
| | | | Air consumption | 2.8 | 3.8 | 4.7 | 5.7 | **6.6** | 7.6 | 8.5 | 9.5 | 10.4 |
| 100 | 25 | 100 | Thrust | 1571 | 2357 | 3143 | 3929 | **4714** | 5500 | 6286 | 7071 | 7857 |
| | | | Return force | 1473 | 2210 | 2946 | 3683 | **4420** | 5156 | 5893 | 6629 | 7366 |
| | | | Air consumption | 4.5 | 6.0 | 7.5 | 9.0 | **10.5** | 12.0 | 13.5 | 15.0 | 16.6 |
| 125 | 32 | 100 | Thrust | 2455 | 3683 | 4911 | 6138 | **7366** | 8594 | 9821 | 11049 | 12277 |
| | | | Return force | 2294 | 3442 | 4589 | 5736 | **6883** | 8031 | 9178 | 10325 | 11472 |
| | | | Air consumption | 7.1 | 9.4 | 11.8 | 14.1 | **16.4** | 18.8 | 21.1 | 23.5 | 25.8 |

* theoretical values

Air consumption calculation

$Q_1$ = air consumption, cylinder piston advanced

$Q_2$ = air consumption, cylinder piston returned

$Q_G$ = air consumption at 2 x stroke length ($Q_1 + Q_2$)

$A_1$ = piston surface $\left(\frac{(\text{piston dia.})^2 \times \pi}{4}\right)$

$A_2$ = annular surface $\left(\frac{((\text{piston dia.})^2 - (\text{piston rod dia.})^2) \times \pi}{4}\right)$

s = stroke length (100 mm)

n = number of strokes (1)

$p_e$ = operating pressure

ar)

$$Q_1 = A_1 \times s \times n \times \frac{p_e + p_{amb}}{p_{amb}}$$

$$Q_2 = (A_1 - A_2) \times s \times n \times \frac{p_e + p_{amb}}{p_{amb}}$$

$Q_G = Q_1 + Q_2$

Thrust calculation

F = piston force

$A_1$ = piston area

p = operating pressure

$F = A_1 \times p$

Return force calculation

$A_2$ = annular surface

$F = A_2 \times p$