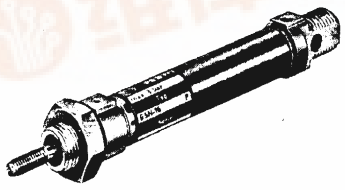
ISO standard
Festo quality

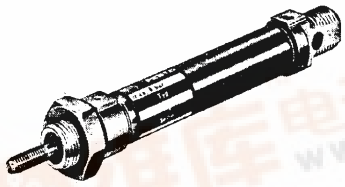
Standard cylinders

Single-acting cylinders

FESTO



Type ESN-...-P

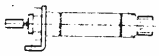


ESNU-...-P-A

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

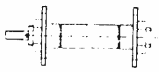
- Piston diameters from 8 to 25 mm
- Stroke lengths from 10 to 50 mm
- Extended spring guide
- Rolled piston rod threads for strength and precision
- Non-lubricated operation
- Magnetic sensing option with Type ESNU-...-P-A

Accessories:



Foot mounting
Type HBN + piston dia. +1

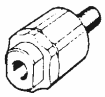
Foot mounting (pair)
Type HBN + piston dia. +2



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

Swivel mounting
Type WBN + piston dia.

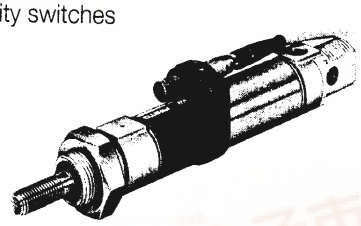
Clevis foot mounting
Type LBN + piston dia.



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 25 50	10 25 50	10 25 50	10 25 50	10 25 50	10 25 50

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

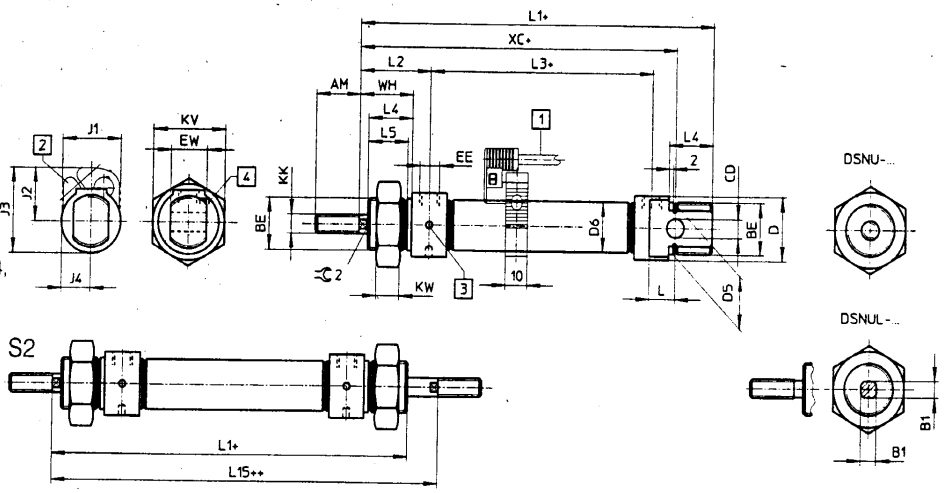
Options:
S3

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

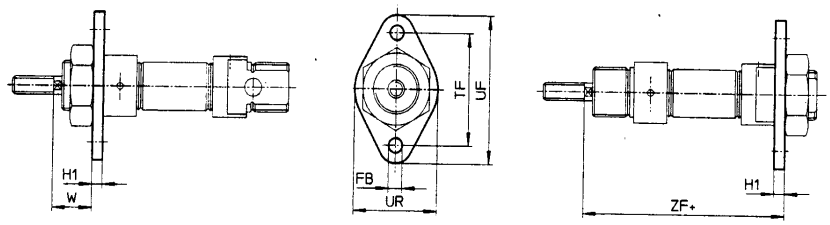
DSNU-...-A
ESNU-...-P-A
DSNUL-12-...-P-A
DSNUL-...-A
DSN-...-P
ESN-...-P

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)

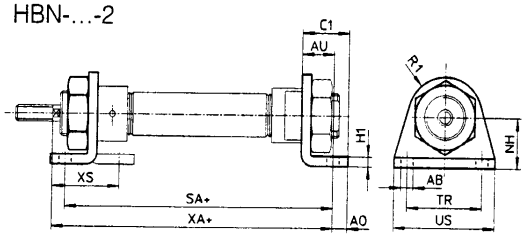


Ø	AM	B1 f8	BE	CD Ø	D Ø	D5 Ø h9	D6 Ø	EE	EW	J1	J2	J3	J4	KK	KV	KW	L	L1	L2	L3	L4	L5	L15	⌀2	WH	XC
8	12	–	M12x1.25	4	15	12	9.3	M5	8	20.4	16.5	23.2	13.9	M4	19	6	6	74	22	34	12	10	78.4	–	16	64
10	12	–	M12x1.25	4	15	12	11.3	M5	8	22	18.2	25.9	13.8	M4	19	6	6	74	22	34	12	10	78.4	–	16	64
12	16	5.5	M16x1.5	6	20	16	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

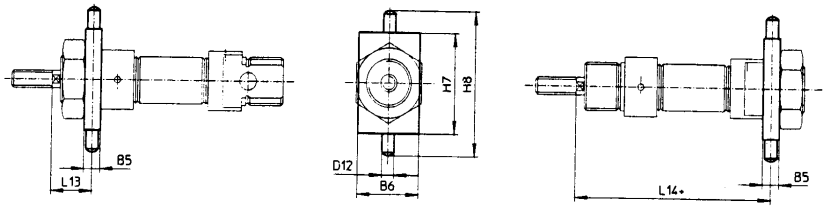
FBN-...



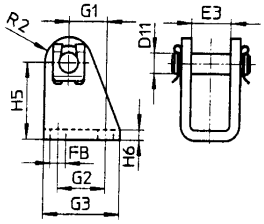
HBN-...-1
HBN-...-2



WBN-...



LBN-...



Ø	AB Ø	AO	AU	B5	B6	C1	D11	D12 Ø e6	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

Cylinder piston force and air consumption

FESTO

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 = $A_2 \times p$