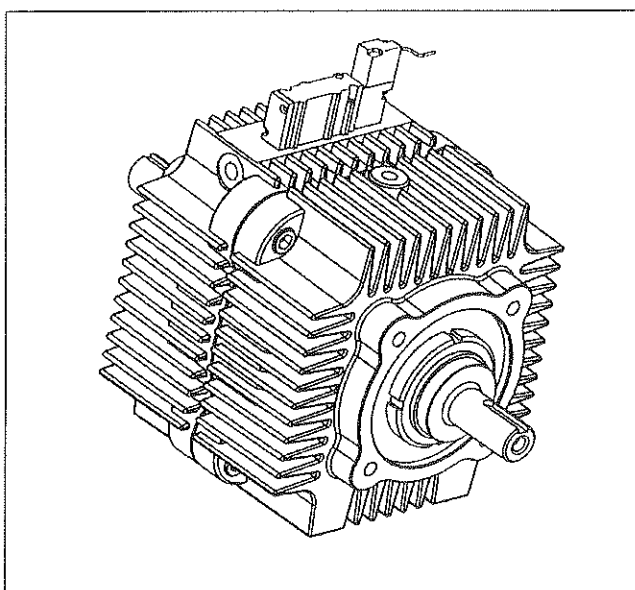


EasyStep

Pneumatically Operated Clutch/Brake Units

Data sheet PD.60.H1.02

01-1999



EasyStep generates cyclic stop/go motions via reciprocal clutching and braking actions while the driving motor operates at constant speed.

This unit is ideal for stop/start applications in machinery designed for cutting, packaging, printing, sorting and dosing.

- ◆ High cycling frequencies - maximises machinery capacity and production throughput
- ◆ Wide torque coverage to suit load - simple application design and setup
- ◆ Consistent repeat accuracy though service life - minimises operational maintenance or resetting
- ◆ standard 24VDC valve - compatible with common power supplies and PLC output driver modules
- ◆ Standard driven flanges - suitable for IEC/NEMA motors

Mode of Operation

Clutch/Brake

EasyStep clutch/brakes are operated by compressed air, which is directed into either the clutch side or the brake side by a pilot-operated spool valve.

The compressed air forces a friction disc mounted on the output shaft into contact either with the clutch disc or with the brake disc. The clutch disc is mounted on a shaft driven by the input power source, usually a direct drive motor rotating at a constant speed, and the brake disc is fixed/non-rotating. In clutch mode, the output shaft is rapidly accelerated to full input shaft speed and driven by the motor power. In brake mode, the output shaft is disconnected from the driven input and brought rapidly to a standstill.

EasyStep applications are therefore typically machines where rapid and consistent stop/start cycles are required, where EasyStep units can efficiently cycle motor-driven loads such as feed conveyors, positioning rollers, product cutters, etc. at high speed and repeatable accuracy.

EasyStep is operated by a balanced 4-way pilot valve which provides maximum forces in both directions by supplying compressed air to either end of the valve spool under external command, typically from PLC outputs with standard 24Vdc driver modules.

EasyStep requires an oil-free and well-filtered compressed air supply. The valve operates at nominal line pressure, typically 6 bar (90psi) and the EasyStep unit is driven via a regulated branch line at between 1 and 4 bar (14.5 to 58 psi)

EasyStep Data

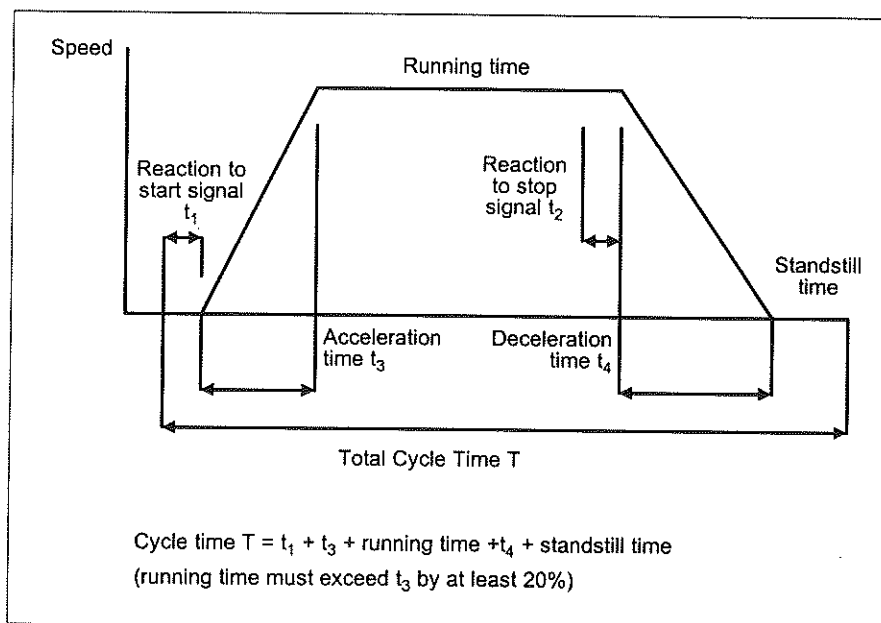
Specification	EasyStep size		
	1	2	3
Static torque M_s (Nm)	7 - 27	22 - 88	72 - 288
Dynamic torque M_k (Nm)	6 - 24	22 - 88	50 - 200
Pressure range (Bar) ¹	1 - 4	1 - 4	1 - 4
Static torque M_s (Lbft)	5 - 39	16 - 65	53 - 212
Dynamic torque M_k (Lbft)	4 - 39	16 - 65	37 - 148
Pressure range (psi) ¹	14.5 - 58	14.5 - 58	14.5 - 58
Max ^m rotational speed N_{max} (rpm)	1800 ²	1800	1800
Output inertia I_r (Kgm ² x 10 ⁻³)	0.2475	1.627	7.156
Repeat accuracy Δt (ms) ³	±1.0	±1.0	±1.0
Max ^m cycling frequency (min ⁻¹)	1670	1325	495
Nominal friction work W_r (Jx10 ⁶)	144	324	350
Internal volume V_r (10 ⁻⁶ m ³)	68	100	330
Ambient temperature (°C) ⁴	0 - 40	0 - 40	0 - 40
Enclosure	IP54	IP54	IP54
Weight (kg)	5.3	13.7	32.9

- 1 Adjusting the operating pressure varies the torque level, allowing a wide range of torque requirements to be covered by the same unit.
- 2 Operation speeds of up to 3600rpm are achievable under certain conditions
- 3 Unit repeat accuracy is consistent throughout service life
- 4 Ambient temperatures up to 65°C can be tolerated depending upon actual heat dissipation, with a maximum permissible surface temperature of 85°C.

Heat Dissipation

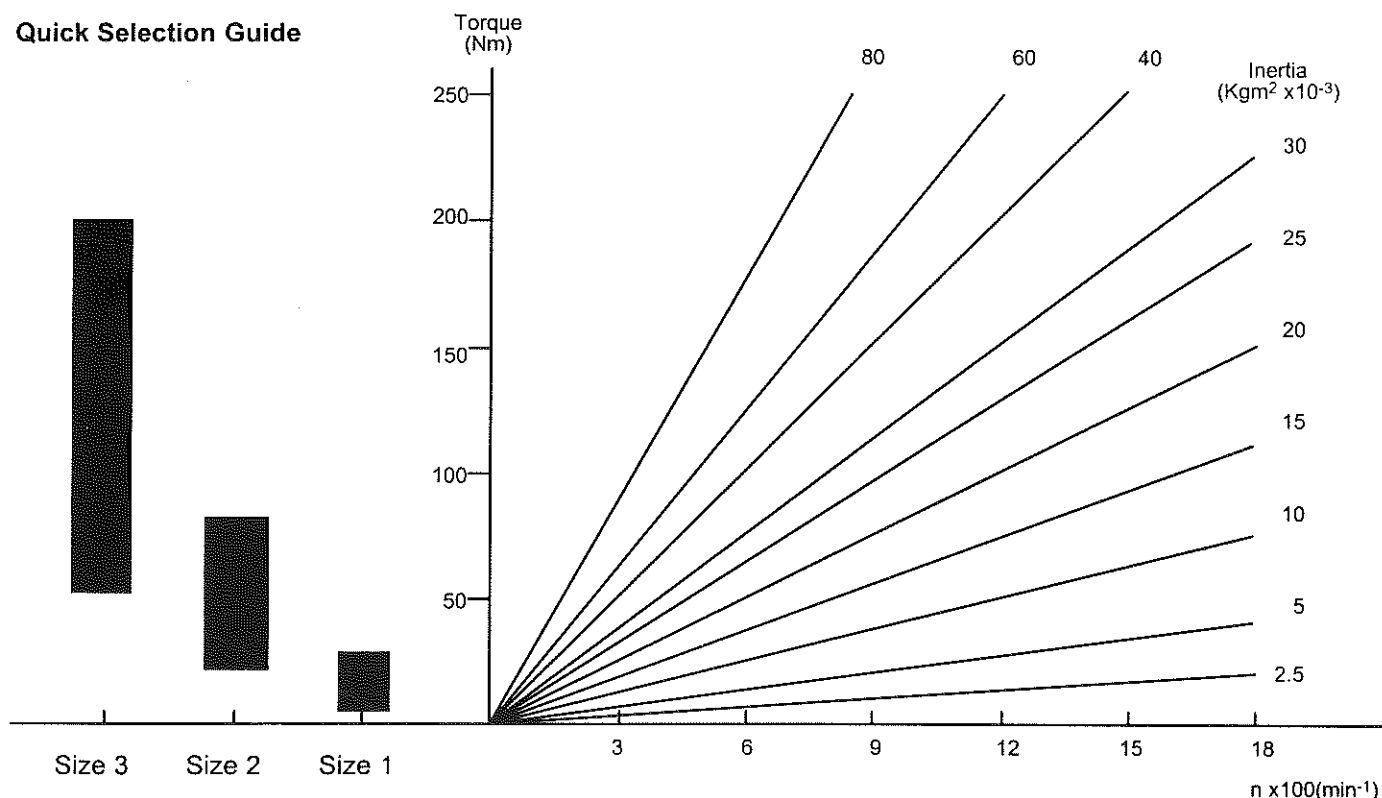
Max ^m heat dissipation (W)	EasyStep size		
	1	2	3
@ 1800 rpm	175	175	175
@ 1200 rpm	195	230	295
@ 600 rpm	215	270	415

Timing



Reaction times	EasyStep size		
	1	2	3
From application of clutch signal t_1 (ms)	16	18	50
From application of stop signal t_2 (ms)	14	18	50

Quick Selection Guide



Note

The dynamic torque requirement is calculated on the basis of a 25ms acceleration or deceleration period.

The cycles per minute curves are calculated at inertia values as shown.

Unit internal inertia has been disregarded in all instances.

It is recommended that a basic unit size is determined initially using dynamic torque sizing, and that the sizing exercise is performed again with internal and output inertia values of the selected unit.

Selection

To select the correct EasyStep size, the following parameters are required;

n	=	revolutions per minute (rpm)
I	=	inertia to be overcome (kgm ²)
t ₃ & t ₄	=	acceleration/deceleration time (ms) (max 25ms for longest life/best accuracy)
F	=	friction force (N)
r	=	radius of feed ing roller (m)

This data can be established from the plant specifications such as feed roller dimensions, chains sizes, cycling frequency required, maximum feeding lengths, turning angle and time available per cycle.

Sizing is calculated using the formula

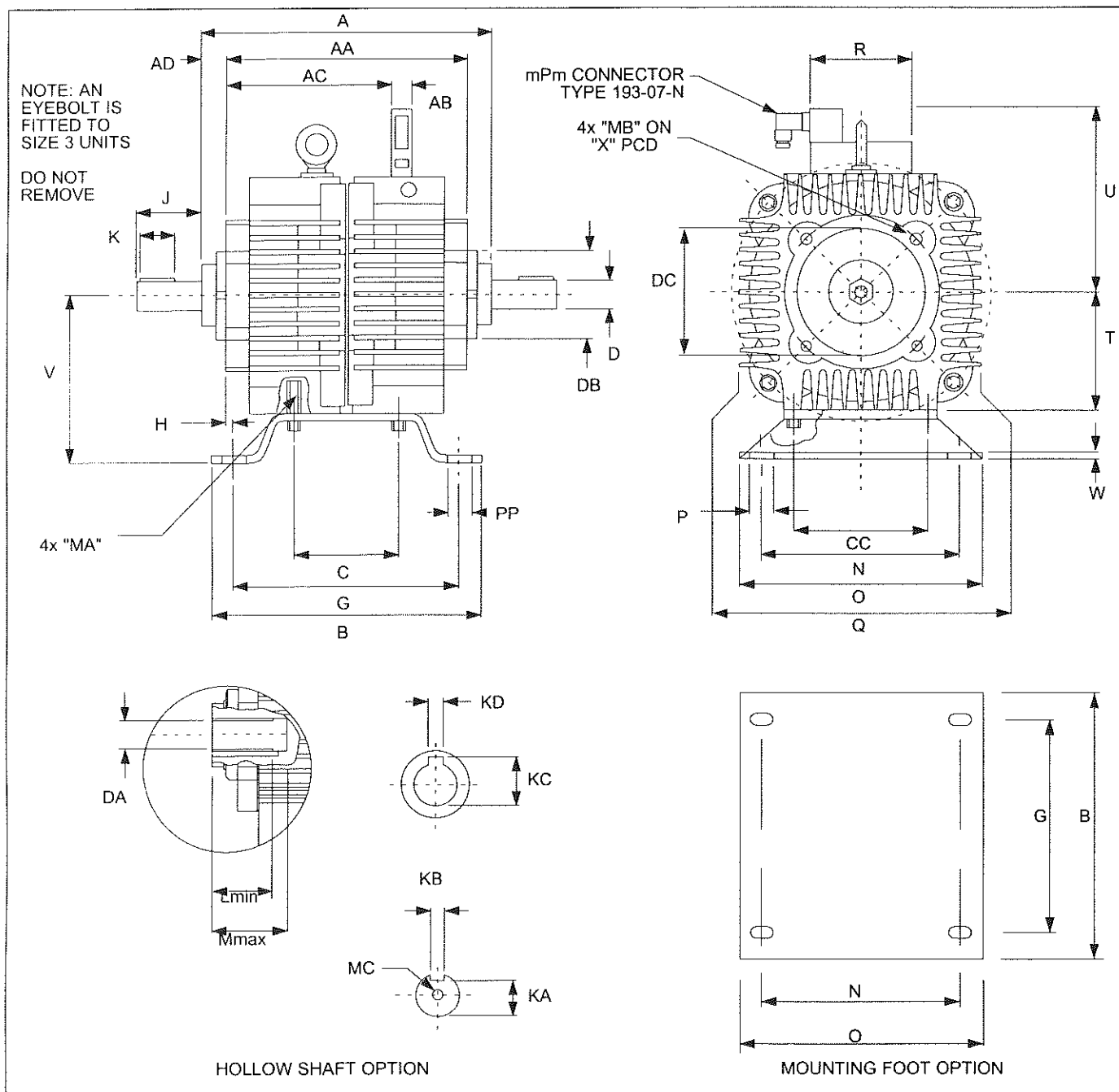
$$M = \frac{(\Sigma I \times 2 \times \pi \times n)}{60 \times t_3} + (F \times r) \quad [\text{Nm}]$$

Repeat accuracy of EasyStep is expressed in terms of ms, and therefore the positioning accuracy depends upon feed rates.

External factors, such as encoder accuracy, motor recovery times etc., cannot be taken into account at this stage.

LSE are pleased to offer assistance with all aspects of sizing calculations from information available

Dimensions (in mm unless stated otherwise)



Unit	A	AA	AB	AC	AD	B	C	D	H	J	K	L	M	MA	MB	MC
1	165.2	148.2	19	87	8.5	140	52.8	19	19.1	30	22	20	33	M5x13	4xM5	M5
2	205	177	19	97	14	185	70	28	11	50	40	25	54	M8x18G	4xM8	M6
3	266	220	19	125	23	260	100	38	-5	80	50	35	74	M12x25G	4xM12	M12

Negative values denote dimensions lie in the other direction

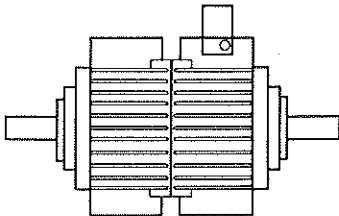
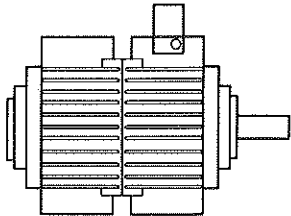
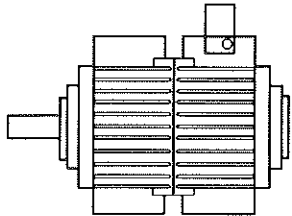
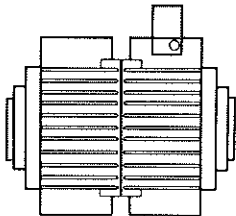
Unit	clutch side					brake side														
	KA	KB	KC	KD	DA	DB	DC	DB	DC	CC	O	P	PP	Q	R	T	U	W	X	
1	15.5	6	21.8	6	19	45	62	45	62	56	130	12	7	110	95	52	115	3	80	
2	20	8	27.3	8	28	71	80	57	68	87.5	180	17	12	170	95	85	145	4	110	
3	33	10	41.4	10	38	86	120	76	90	110	260	18	18	224	95	112	172	4	144	

Precision Step Systems

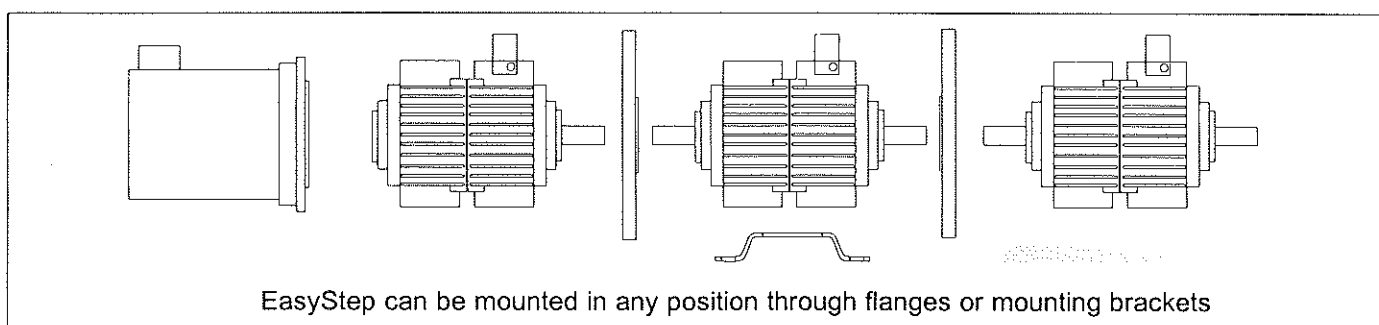
Data sheet PD.60.H1.02

Clutch/Brake module type EasyStep

EasyStep configurations

Type 10 Solid / Solid Shaft	Type 20 Hollow / Solid Shaft	Type 30 Solid / Hollow Shaft	Type 40 Hollow / Hollow Shaft
			

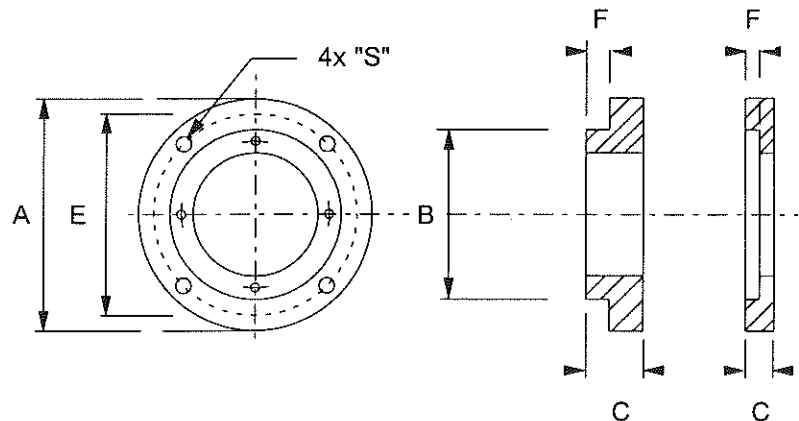
Unit	Type	Shaft Size (KEY: √ available I consult factory X not available)											
		11mm	14mm	19mm	22mm	24mm	28mm	32mm	38mm	5/8"	7/8"	9/8"	11/8"
1	10	√	√	√	X	X	X	X	X	√	X	X	X
1	20	√	√	√	X	X	X	X	X	√	X	X	X
1	30	√	√	X	X	X	X	X	X	√	X	X	X
1	40	√	√	X	X	X	X	X	X	√	X	X	X
2	10	X	√I	√	√	√	√	X	X	√I	√	X	X
2	20	X	√I	√	√	√	√	X	X	√I	√	X	X
2	30	X	√I	√	√	√	X	X	X	√I	√	X	X
2	40	X	√I	√	√	√	X	X	X	√I	√	X	X
3	10	X	X	X	X	X	√	√	√	X	X	√	√
3	20	X	X	X	X	X	√	√	√	X	X	√	√
3	30	X	X	X	X	X	√	√	√	X	X	√	√
3	40	X	X	X	X	X	√	√	√	X	X	√	√



Accessory Kit No.	EasyStep Unit	Resulting Shaft Height V	N (min/max)	G	Hole diam
ND080E0010	1	63	80/85	100	7
ND080E0012	1	71	105/110	120	9
ND080E0011	1	80	85/95	135.5	7
ND080E0013	1	88.9 (3.5")	123.9 (4.88")	127 (5")	4.6 (0.34")
ND080E0020	2	100	150/180	155	12
ND080E0021	2	112	150/160	155	12
ND080E0023	2	114.3 (4.5")	190.5 (7.5")	139.7 (5.5")	10.5 (0.41")
ND080E0031	3	132	185/195	185	11
ND080E0032	3	160	210	230	18
ND080E0033	3	133.35 (5.25")	215.9 (8.5")	177.8 (7")	10.5 (0.41")

Flange characteristics

(dimensions in mm)



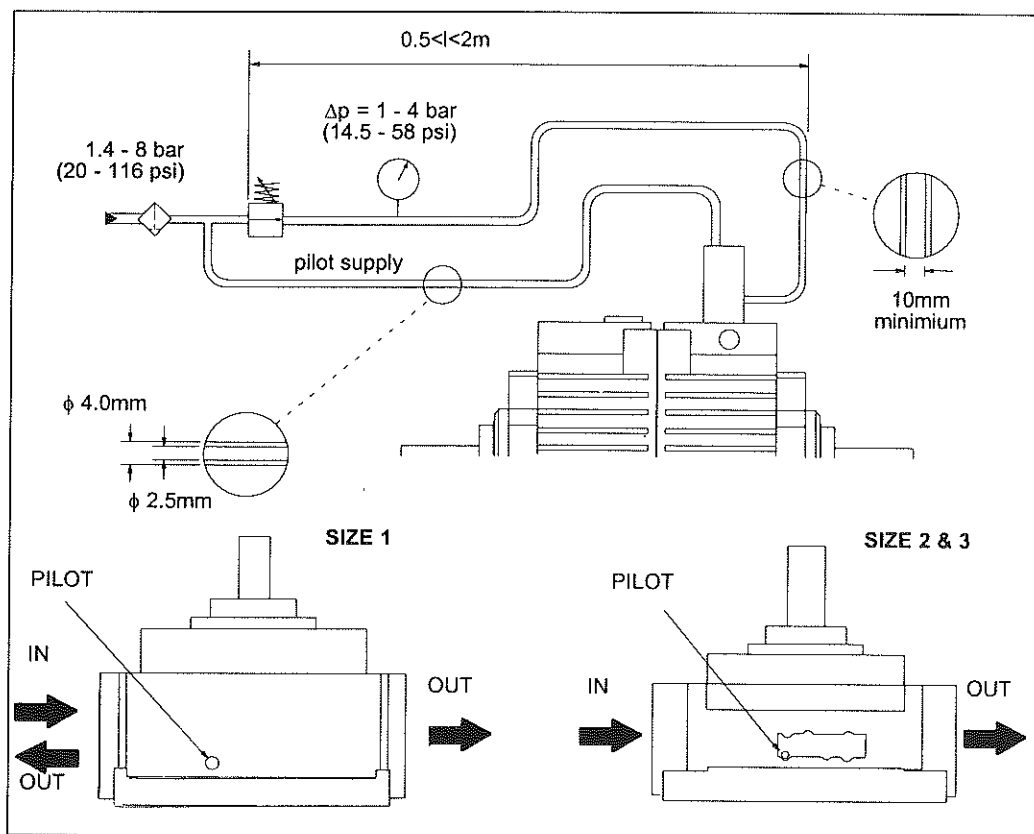
Unit	DIN 42948 Type	NEMA Type	IEC 72 Frame	Outer dia A	PCD E	Flange C	Spigot B	Spigot F	Fixing S	Thread
1	B5-A140 EXT	-	63	140	115	20.5	95	3	9	M8
	B5-A140 INT	-	63	140	115	21	95	4.5	9	M8
	B5-A160 EXT	-	71	160	130	21	110	3.5	9	M8
	B5-A160 INT	-	71	160	130	21	110	4.5	9	M8
	B5-A200 EXT	-	80/90	200	165	21	130	3.5	11	M10
	B5-A200 INT	-	80/90	200	165	21	130	4.5	11	M10
	-	56C INT	-	180	149.2	25	114.5	6	10.5	3/8-16UNC
	-	56C EXT	-	180	149.2	21	114.3	3.5	10.5	3/8-16UNC
2	B5-A200 EXT	-	80/90	200	165	20.5	130	3.5	11	M10
	B5-A200 INT	-	80/90	200	165	21	130	4	11	M10
	B5-A250 EXT	-	100/112	250	215	21	180	4	14	M12
	B5-A250 INT	-	100/112	250	215	21.5	180	4.5	14	M12
	-	145TC INT	-	180	149.2	21	114.5	4	10.5	3/8-16UNC
	-	145TC EXT	-	180	149.2	20.5	114.3	4.5	10.5	3/8-16UNC
	-	184TC INT	-	225	184.15	21	215.9	4.5	14	3/8-16UNC
	-	184TC EXT	-	225	184.15	20.5	216.1	4	14	3/8-16UNC
3	B5-A250 EXT	-	100/112	250	215	21	180	4	14	M12
	B5-A250 INT	-	100/112	250	215	21.5	180	4.5	14	M12
	B5-A300 EXT	-	132	300	265	31	230	4	14	M12
	B5-A300 INT	-	132	300	265	27	230	4.5	14	M12
	-	184TC INT	-	225	184.15	33	215.9	16	14	3/8-16UNC
	-	184TC EXT	-	225	184.15	33.3	216.1	4	14	3/8-16UNC
	-	215TC INT	-	225	184.15	33	215.9	16	14	3/8-16UNC
	-	215TC EXT	-	225	184.15	33.3	216.1	4	14	3/8-16UNC

Noise

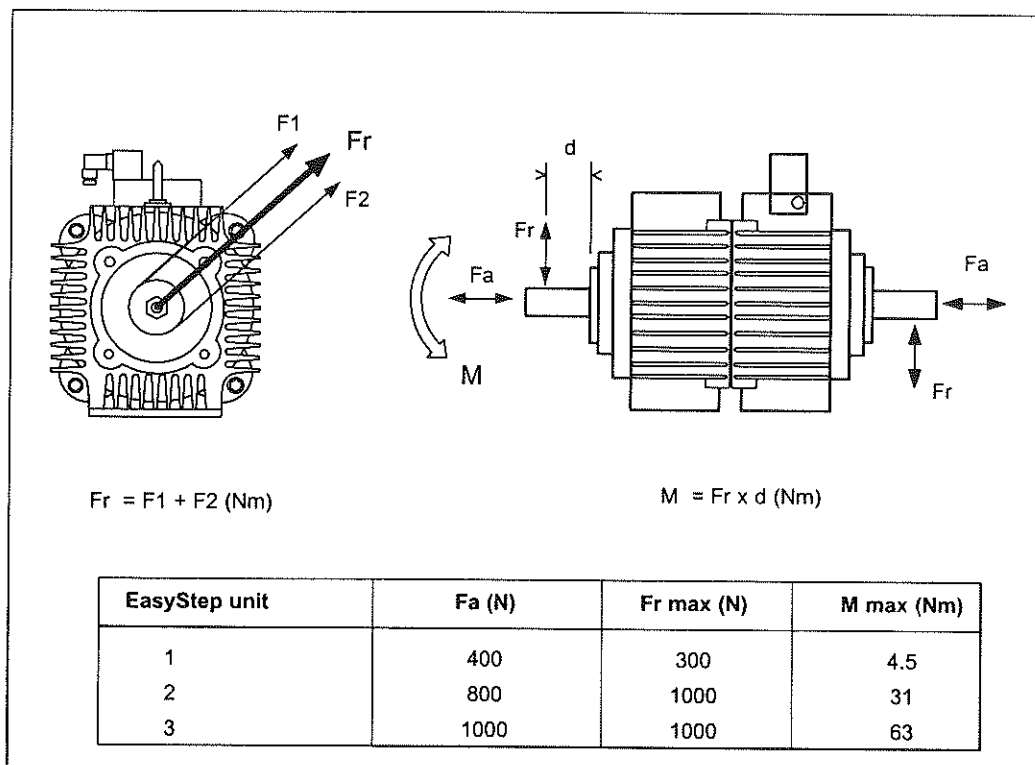
By its nature, the pneumatic clutch/brake produces an impulsive sound from its air exhaust. Under some conditions of operation the Mean Sound Pressure level or LEQ can exceed permissible limits for working environments. The conditions under which these limits are exceeded are very dependent on the unit's application and its position within the machinery of which it forms a part.

It is therefore difficult to define exactly when additional silencing will be necessary. Suitable silencers are available as a kit of parts which may be added to any installation, which will guarantee sound pressure level reduction of the exhaust to below 85dB(A) under all conditions of use.

Compressed Air Supply Connection



Maximum Permissible Shaft Loads



Bearing Life

Bearing life will generally exceed 10,000 operating hours, but is naturally dependent on many factors outside of our control. If a more precise figure is required for planned maintenance provision, full operation details need to be supplied: speed/operating rate, overhung/axially imposed loads, etc.