METAL WORK PNEUMATIC

ELECTRIC CYLINDER
SERIES ELEKTRO ISO 15552

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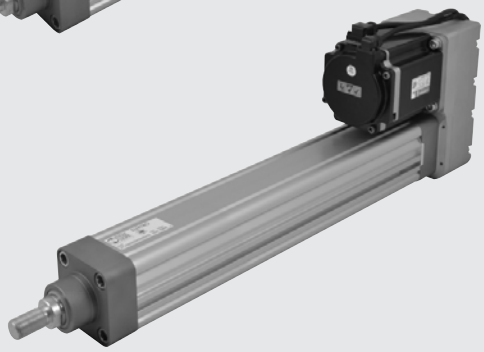
An electric cylinder with a connection interface in accordance with ISO 15552.
The piston rod extension is controlled by a system with a hardened screw and recirculating ball screw. The piston has a guide strip calibrated to reduce to a minimum play with the barrel and hence vibration during ball screw rotation.
The cylinder can be equipped with a built-in non-rotating system featuring two opposing slides that run in separate longitudinal slots in the barrel. The piston comes with magnets and the barrel has longitudinal slots for housing sensors. The piston rod has increased outside diameter and thickness to make it extra rigid and more resistant to radial and peak loads.
A system for greasing the screws is included. Numerous standard accessories for pneumatic cylinders, including intermediate hinge, can be used for mounting the cylinder.
The motor can be selected from an optimised range, which encompasses both STEPPING and BRUSHLESS motors.
There is a version for in-line assembly, where the drive shaft is jointed directly onto the screw. There is also a geared motor version, where transmission is provided by pulleys and a cog belt with a transmission ratio of 1:1.
Suitable motor drives are provided.
Special adaptor flanges and joints can be provided if the customer wishes to use a particular make of motor.

in-line version

geared version



TECHNICAL DATA		32	50	63
Piston rod thread		M10x1.25	M16x1.5	M16x1.5
Environmental temperature range for STEPPING motors	°C	from -10 to +50		
BRUSHLESS motors	°C	from 0 to +40		
Electrical protection rating with STEPPING motors		IP40 or IP55 (see key to codes on page 29)		
BRUSHLESS motors		IP40 or IP65 (see key to codes on page 29)		
Maximum relative humidity of the air for IP55 STEPPING motor		90% at 40°C; 57% at 50°C (no condensate)		
IP55 BRUSHLESS motor		90% (no condensate)		
Minimum stroke for version with non-rotating		Twice the screw pitch (to guarantee ball lubrication)		
Minimum stroke for version without non-rotating	mm	80		
Maximum stroke	mm	1500		
Overall radial oscillation of the piston rod (without load) per 100 mm of stroke	mm	0.4		
Versions		With or without piston rod non-rotating		
Uncontrolled impact at the end of stroke		NOT ALLOWED		
Sensor magnet		YES		
Maximum angle of twist of the piston rod for non-rotating version		1°30′	1°	0°45′
Work position		Any		

MECHANICAL FEATURES		32		50			63		
Worm screw pitch (p)	mm	4	12.7	5	10	16	5	10	20
Worm screw diameter	mm	12	12.7	16	16	16	20	20	20
Static axial load (F_o)	N	3200		4000			6500		
Dynamic axial load (F)	N	5000	5300	7600	6670	4330	10010	12800	4880
		Calculate mean axial load and the calculate life (see graphs on pages 5 and 6)							
Maximum number of revs with STEPPING motor	1/min	6000		3000			2550		
Maximum number of revs with BRUSHLESS motor	1/min	6000		6000			6000		
Maximum speed with with STEPPING motor (V_{max})	mm/s	400	1270	250	500	800	212.5	425	850
Maximum speed with BRUSHLESS motor (V_{max})	mm/s	400	1270	500	1000	1600	500	1000	2000

WEIGHTS		32		50			63		
Worm screw pitch (p)	mm	4	12.7	5	10	16	5	10	20
Weight at stroke 0	g	875	928	1990	2084	2086	2942	3209	3056
Additional weight per mm of stroke	g	3.94		6.64	6.56	6.55	6.25	6.32	6.32
Moving mass at stroke 0 (non-rotating version)	g	246	304	586	696	703	956	1215	1067
Additional moving mass per mm of stroke	g	1.25		1.84			1.98		

MASS MOMENTS OF INERTIA		32		50			63		
Worm screw pitch	mm	4	12.7	5	10	16	5	10	20
J0 at stroke 0	kgmm²	1.3262	2.7700	4.7542	6.1360	9.1113	12.4043	14.8767	23.5427
J1 per metre of stroke	kgmm²/m	10.4223	19.4430	33.9380	38.5264	49.1936	86.2990	96.6652	116.3671
J2 per kg of load	kgmm²/kg	0.4053	4.0858	0.6333	2.5332	6.4849	0.6333	2.5332	10.1327

Total mass moment o inertia Jtot = J0 + J1 · stroke [m] + J2 · load [kg]

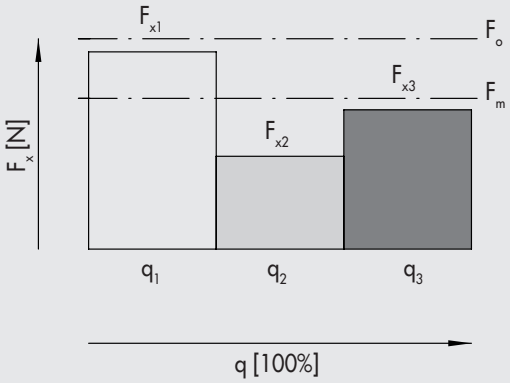
CALCULATION OF MEAN AXIAL LOAD F_m AND VERIFICATION

Peak axial load in a work cycle must not exceed the static axial load F_o. The peak value is usually achieved during upward acceleration in vertical installation. Exceeding this value leads to greater wear and hence shorter life of the recirculating ball screw.

Mean axial load F_m

$$F_m = \sqrt[3]{\sum F_x^3 \times \frac{V_x}{V_m} \times \frac{q}{100}} =$$

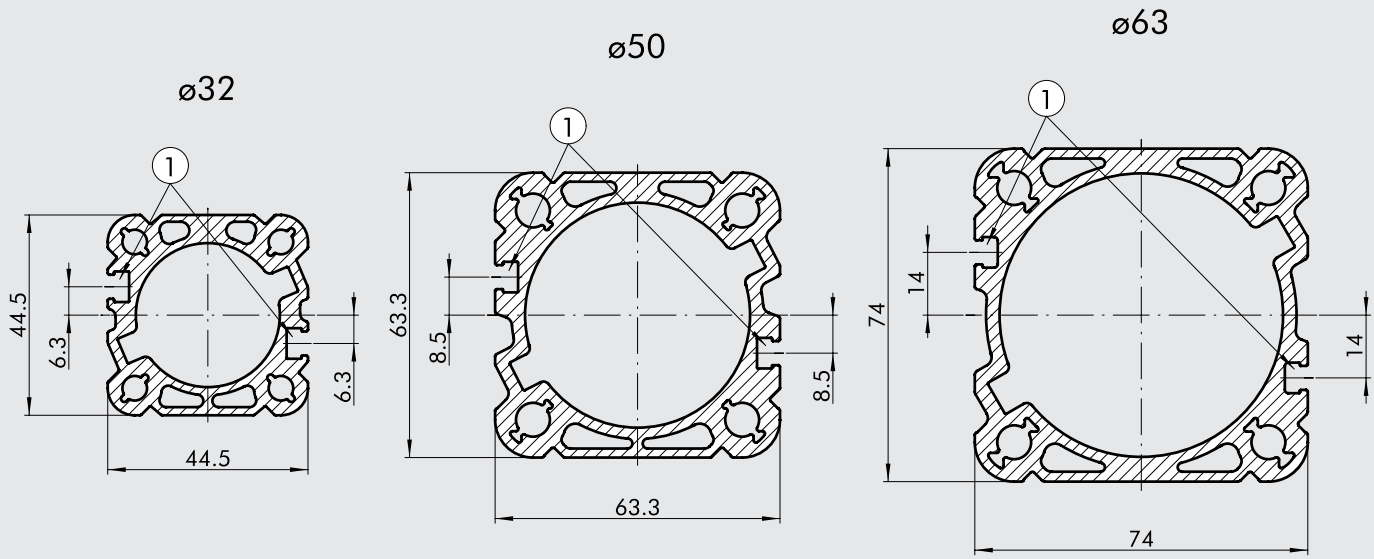
$$F_m = \sqrt[3]{F_{x1}^3 \times \frac{V_{x1}}{V_m} \times \frac{q_1}{100} + F_{x2}^3 \times \frac{V_{x2}}{V_m} + \frac{q_2}{100} + F_{x3}^3 \times \frac{V_{x3}}{V_m} \times \frac{q_3}{100} + \ldots}$$



F_x = Axial load at stage x
F_m = Mean axial load during extension
F_o = Static axial load
q = Time segment

The mean axial load must not exceed the dynamic axial load: $F_m \leq F$
The graphs on pages 5 and 6 show screw life as a function of F_m

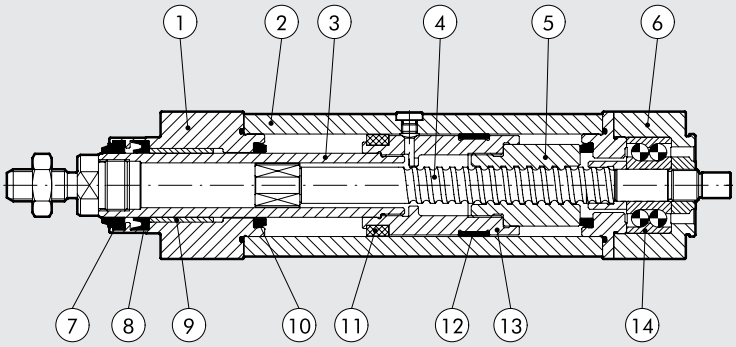
BARREL CROSS SECTION



① Slots for sensors

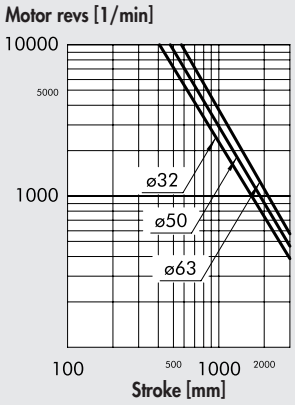
COMPONENTS

① FRONT CYLINDER HEAD: anodised aluminium
② BARREL: extruded and anodised aluminium alloy
③ PISTON ROD: ground chrome steel
④ WORM SCREW: hardened steel
⑤ BALL SCREW: steel
⑥ REAR CYLINDER HEAD: anodised aluminium
⑦ WIPER RING: polyurethane
⑧ PISTON ROD GASKET: NBR (IP55/ IP65 version only)
⑨ GUIDE BUSHING: steel strip with bronze and PTFE insert
⑩ BUFFER: technopolymer
⑪ MAGNET: plastoferrite
⑫ GUIDE STRIP: self-lubricated calibrated technopolymer
⑬ PISTON: alumunium
⑭ BEARING: oblique with two ball rings

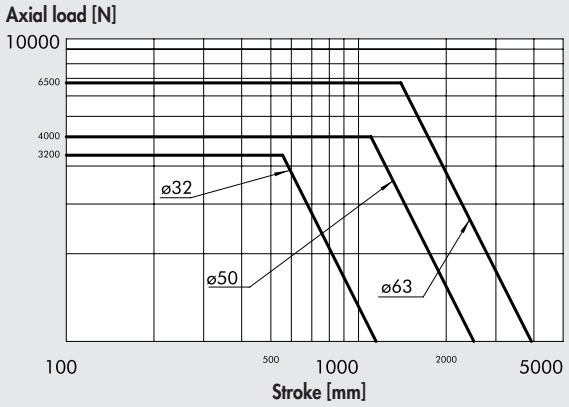


CRITICAL VELOCITY – PEAK LOADS

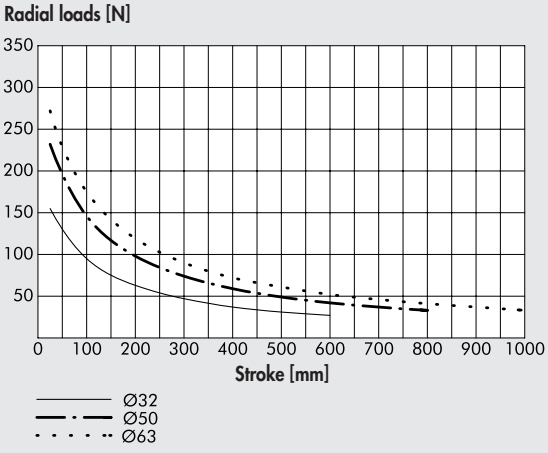
The two variables (stroke and motor revs) must meet the conditions in the graph below, otherwise resonance could be generated and affect the system.



With vertical installations, the following load conditions applied to the piston rod must be met.

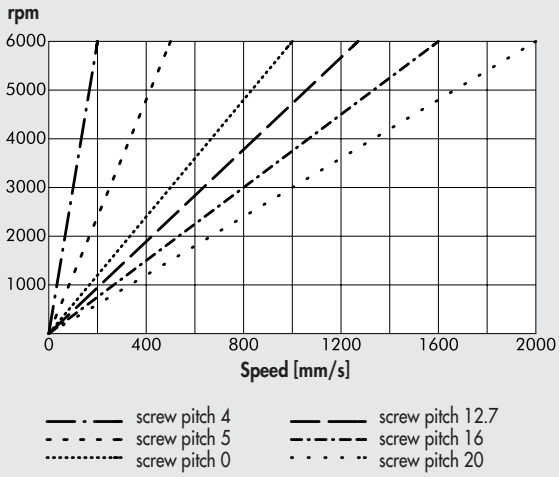


MAXIMUM RADIAL LOADS ON PISTON ROD



Radial loads can be applied to the piston rod.
They must not exceed the values in the table above, otherwise the guides on the piston rod and piston will be subjected to excessive wear.

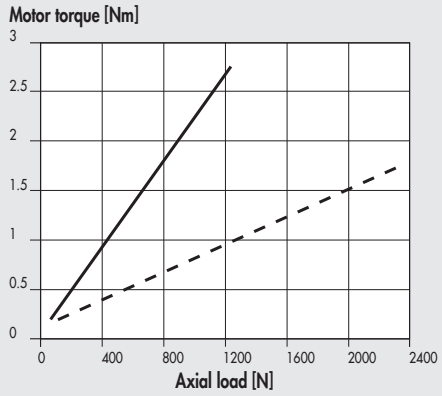
PISTON ROD SPEED AS A FUNCTION OF rpm



DRIVE TORQUE AS A FUNCTION OF THE AXIAL LOAD APPLIED TO THE PISTON ROD

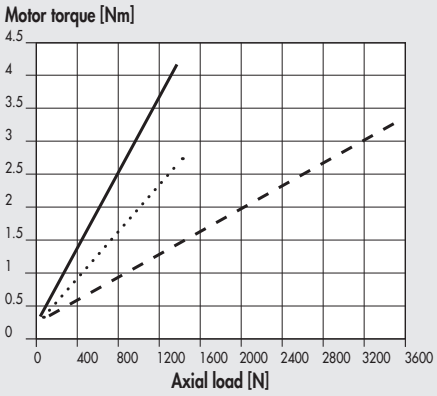
The friction generated in the mechanical system is taken into account.

Ø 32



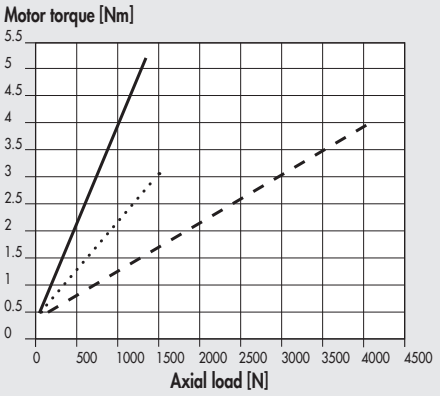
screw pitch 4
screw pitch 12.7

Ø 50



screw pitch 5
Screw pitch 16
screw pitch 10

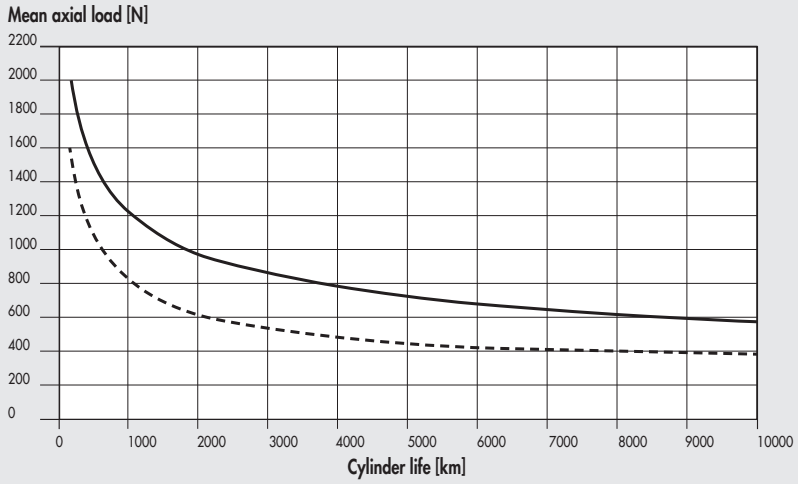
Ø 63



screw pitch 5
screw pitch 20
screw pitch 10

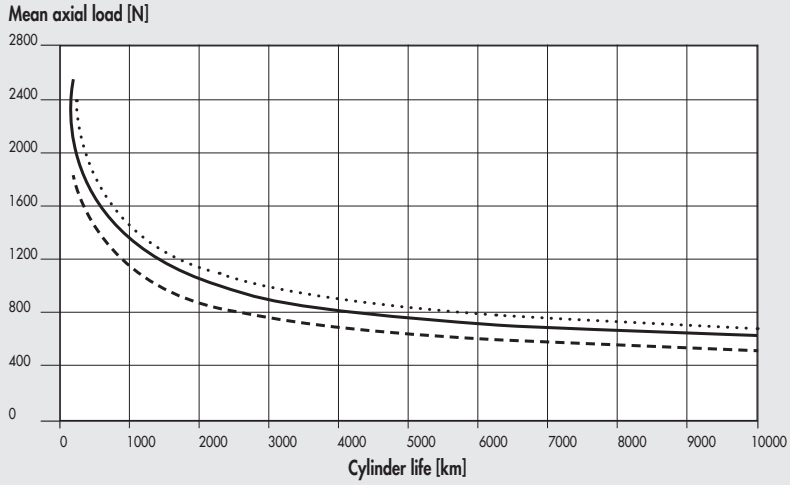
LIFE CHARACTERISTICS AS A FUNCTION OF THE MEAN AXIAL LOAD

Ø 32



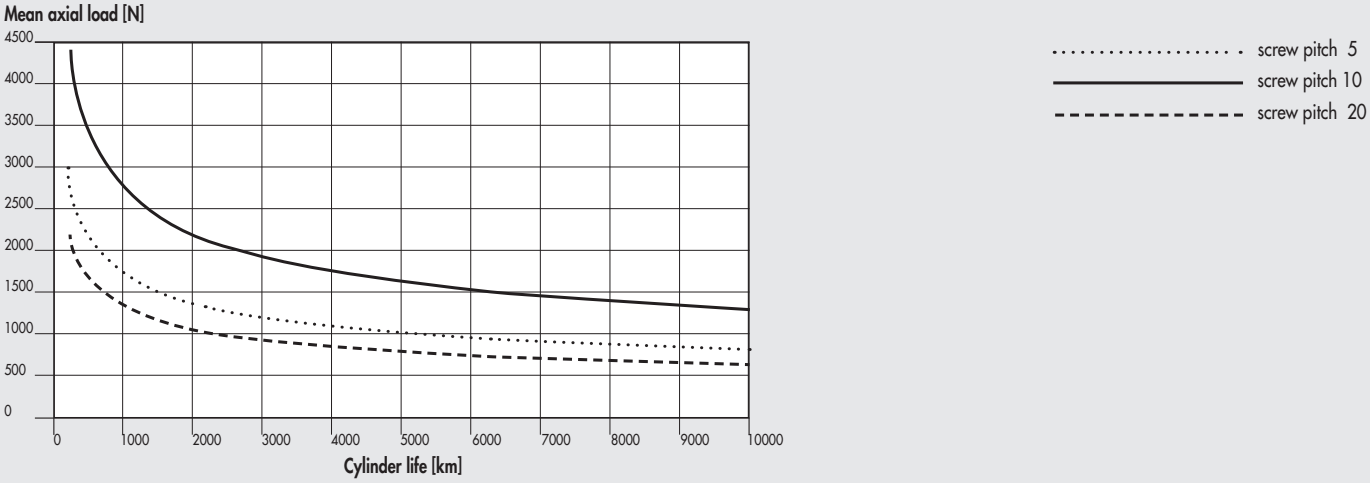
screw pitch 4
screw pitch 12.7

Ø 50



screw pitch 5
screw pitch 10
screw pitch 16

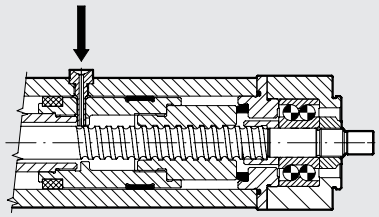
Ø 63



Life characteristics can vary considerably from those indicated in the graphs due to different operating conditions (radial loads, temperature, lubrication status, etc.).

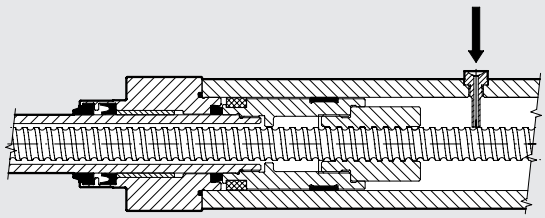
LUBRICATION DIAGRAMS

LUBRICATION OF VERSION WITH NON-ROTATING PISTON ROD



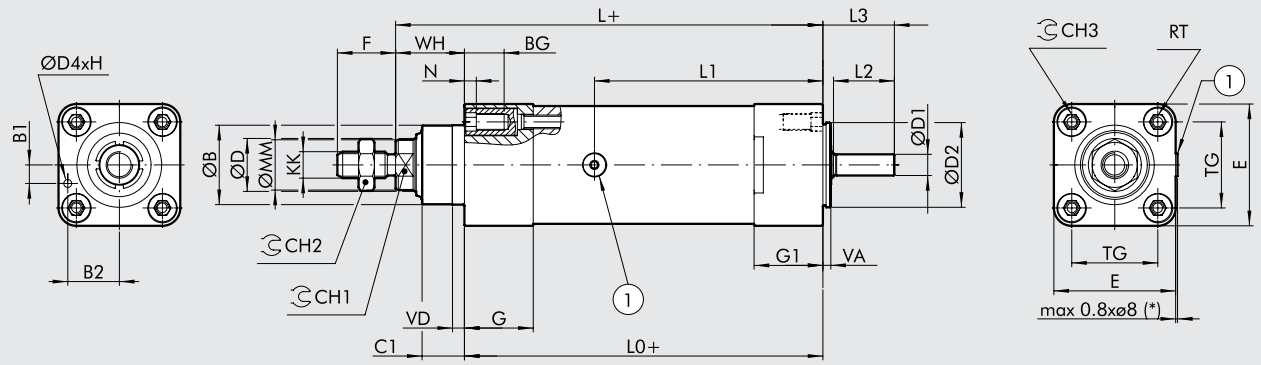
- Retract the piston rod towards the rear head. The piston rod/piston/ball screw/system must rest against the buffer of the rear head
- Unscrew the cap on the lubricator port (see note 1 to the drawing on page 7)
- Screw the lubricating pin (see accessory on page 32) into the thread. Make sure you enter the corresponding hole in the piston below
- Pump grease (code 9910506) in 4-5 times using a suitable lubricator
- Unscrew the lubricating pin and make the piston rod perform four complete strokes. The piston rod should end up in the initial (retracted) position
- Repeat the last two operations

LUBRICATION OF VERSION WITHOUT NON-ROTATING PISTON ROD



- Extend the piston rod completely. The piston rod/piston/ball screw/system must rest against the buffer of the front head
- Unscrew the cap on the lubricator port (see note 1 to the drawing on page 7)
- Screw the lubricating pin (see accessory on page 32) into the thread. Make sure you enter the corresponding hole in the piston below.
- Pump grease (code 9910506) in 4-5 times using a suitable lubricator
- Unscrew the lubricating pin and make the piston rod perform four complete strokes. The piston rod should end up in the initial (extended) position
- Repeat the last two operations

DIMENSIONS OF SINGLE CYLINDERS



1 = lubricator port
(*) = for Ø 63 only

Ø	ØB (d11)	B1	B2	BG	C1	CH1	CH2	CH3	ØD (f7)	ØD1 (h7)	ØD2	ØD4 (h7)	E	F	G	G1	H	KK	L	L0
32	30	7	19.5	14.5	16	17	17	6	20	8	32	3	46	22	26	26	9	M10x1.25	160	134
50	40	7	28	17.5	25	21	24	8	25	10	50	3	64.5	32	30	30	9	M16x1.5	194	157
63	45	9	34.5	17.5	25	24	26	8	30	12	63	3	75.5	32	32	32	9	M16x1.5	210	173

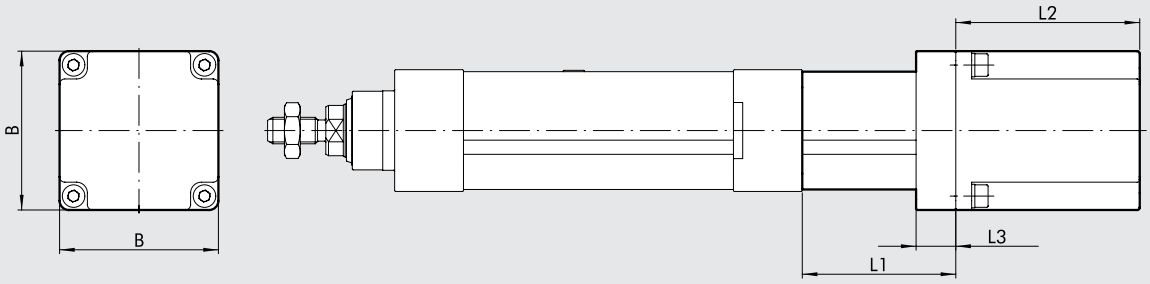
Ø	L1	L2	L3	ØMM	N	RT	TG	VA	VD	WH
32	86.3	23	27	19	4.5	M6	32.5	3	4.5	26
50	100.8	24	28.4	24	5.5	M8	46.5	5.5	5.5	37
63	112.3	34	39.5	29	5.5	M8	56.5	5.5	6.5	37

MOTOR-DRIVE COUPLINGS FOR VARIOUS CYLINDER BORES

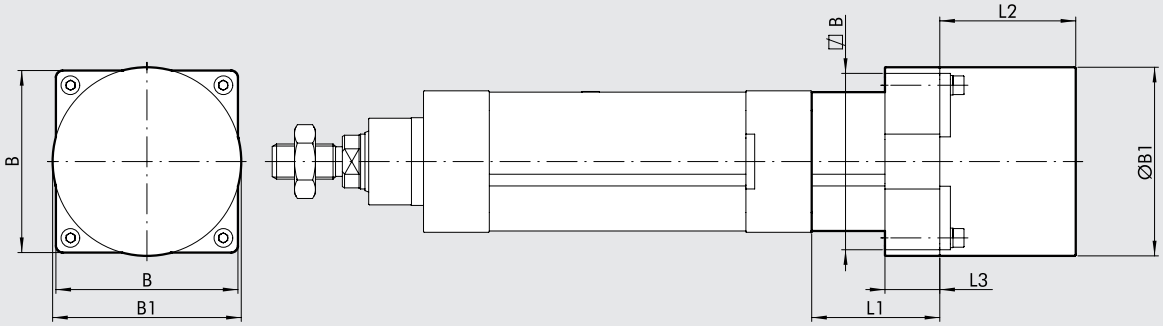
		DRIVES CODES		
		37D1221000 (4.4A from 24 to 45VDC)	37D1332000 (6A from 24 to 75VDC)	37D1442000 (6A from 77 to 140VDC)
STEPPING MOTOR CODES	**37M1110000**	Ø 32	-	-
	37M1120000	Ø 32	Ø 32	-
	37M1120001	-	Ø 32	-
	37M1430000	-	Ø 50	-
	37M1440000	-	Ø 50	Ø 50
	37M1450000	-	Ø 63	Ø 63

		DRIVES CODES	
		37D2200000 (200W)	37D2400000 (from 400 to 750W)
BRUSHLESS MOTOR CODES	**37M2200000**	Ø 32	-
	37M2220000	-	Ø 32
	37M2220000	-	Ø 50
	37M2330000	-	Ø 50
	37M2330000	-	Ø 63

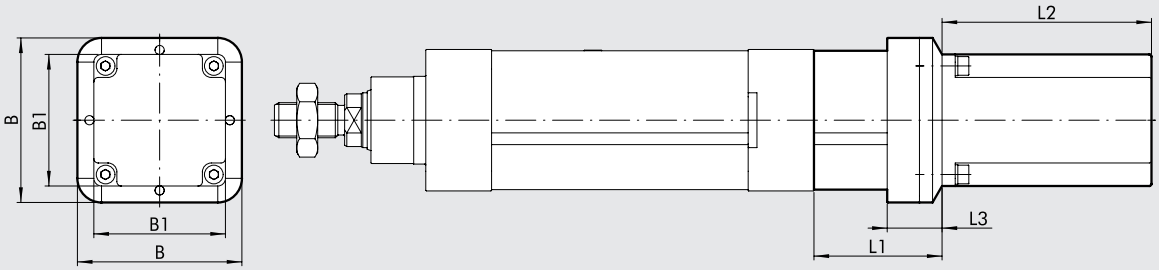
DIMENSIONS OF IN-LINE CYLINDERS



Size	Motor type	Code for cylinder complete with motor	Code for motor mounted on the cylinder	Motor torque [Nm]	Coupling flange	B	L1	L2	L3
32	BRUSHLESS	371032_ _ _ _ _ _2200	37M2200000	0.64	60	60	62	69.5	15
		371032_ _ _ _ _ _2220	37M2220000	1.27	60	60	62	95.5	15
	STEPPING	371032_ _ _ _ _ _1110	37M1110000	0.8	NEMA 23	56	45	53.8	12
		371032_ _ _ _ _ _1120	37M1120000	1.2	NEMA 23	56	45	75.8	12
		371032_ _ _ _ _ _1121	37M1120001	1.2	NEMA 23	56	45	75.8	12
50	BRUSHLESS	371050_ _ _ _ _ _2330	37M2330000	2.39	80	80	77.4	107.3	35
63	STEPPING	371063_ _ _ _ _ _1450	37M1450000	6.7	NEMA 34	85.5	63.5	127	16

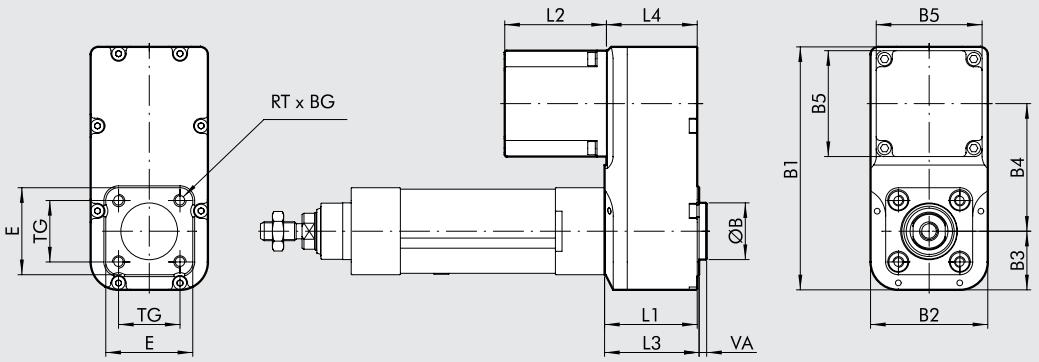


Size	Motor type	Code for cylinder complete with motor	Code for motor mounted on the cylinder	Motor torque [Nm]	Coupling flange	B	Ø B1	L1	L2	L3
50	STEPPING	371050_ _ _ _ _ _1430	37M1430000	2.4	NEMA 34	83	86	61.4	62	25
		371050_ _ _ _ _ _1440	37M1440000	4.2	NEMA 34	83	86	61.4	92.2	25

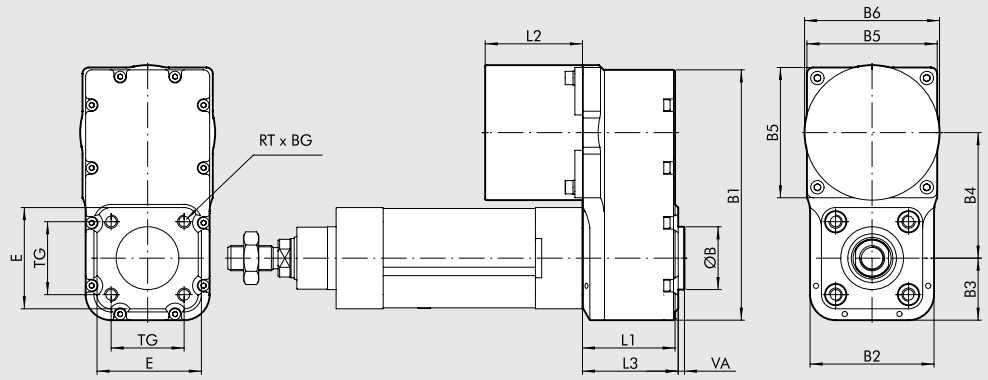


Size	Motor type	Code for cylinder complete with motor	Code for motor mounted on the cylinder	Motor torque [Nm]	Coupling flange	B	B1	L1	L2	L3
50	BRUSHLESS	371050_ _ _ _ _ _2220	37M2220000	1.27	60	74.5	60	61.4	95.5	25
63	BRUSHLESS	371063_ _ _ _ _ _2330	37M2330000	2.39	80	94	80	78.5	107.3	25

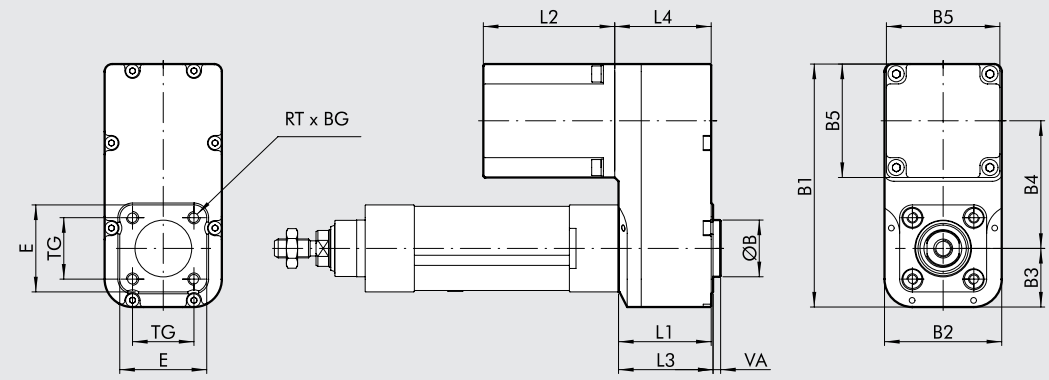
DIMENSIONS OF GEARED CYLINDERS



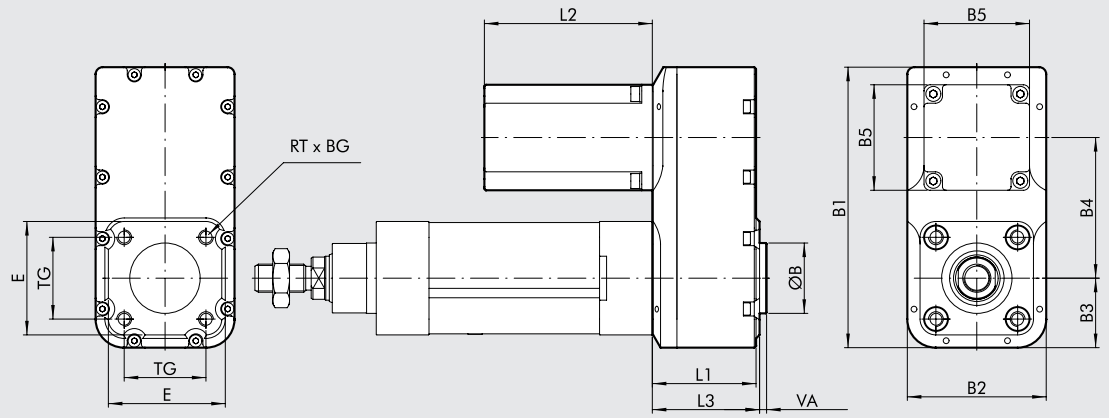
Size	Motor type	Code for cylinder complete with motor	Code for motor mounted on the cylinder	Motor torque [Nm]	Coupling flange	ØB (d11)	B1	B2	B3	B4	B5	BG	E	L1	L2	L3	L4	TG	RT	VA
32	STEPPING	371032_ _ _ _ _ _1110	37M1110000	0.8	NEMA 23	30	128.5	62	31	67.5	56	15	46	49	53.8	50	48	32.5	M6	4
		371032_ _ _ _ _ _1120	37M1120000	1.2	NEMA 23	30	128.5	62	31	67.5	56	15	46	49	75.8	50	48	32.5	M6	4
		371032_ _ _ _ _ _1121	37M1120001	1.2	NEMA 23	30	128.5	62	31	67.5	56	15	46	49	75.8	50	48	32.5	M6	4
63	STEPPING	371063_ _ _ _ _ _1450	37M1450000	6.7	NEMA 34	45	179.5	92	46	87.5	84.5	16.5	75.5	70	127	72	68	56.5	M6	4



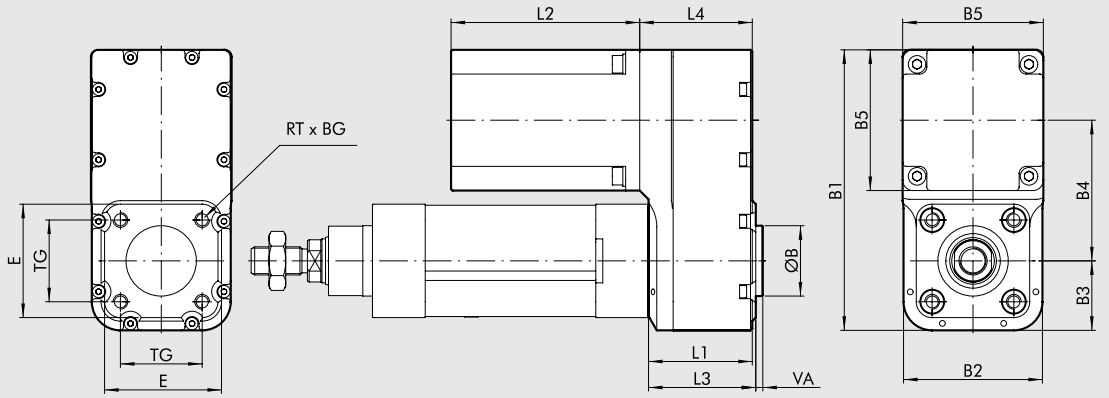
Size	Motor type	Code for cylinder complete with motor	Code for motor mounted on the cylinder	Motor torque [Nm]	Coupling flange	ØB (d11)	B1	B2	B3	B4	B5	ØB6	BG	E	L1	L2	L3	TG	RT	VA
50	STEPPING	371050_ _ _ _ _ _1430	37M1430000	2.4	NEMA 34	40	159.5	79	39.5	80	80	86	16.5	64.5	59	62	61	46.5	M8	4
		371050_ _ _ _ _ _1440	37M1440000	4.2	NEMA 34	40	159.5	79	39.5	80	83	86	16.5	64.5	59	92.2	61	46.5	M8	4



Size	Motor type	Code for cylinder complete with motor	Code for motor mounted on the cylinder	Motor torque [Nm]	Coupling flange	ØB (d11)	B1	B2	B3	B4	B5	BG	E	L1	L2	L3	L4	TG	RT	VA
32	BRUSHLESS	371032_ _ _ _ _ _2200	37M2200000	0.64	60	30	128.5	62	31	67.5	60	15	46	49	69.5	50	51	32.5	M6	4
		371032_ _ _ _ _ _2220	37M2220000	1.27	60	30	128.5	62	31	67.5	60	15	46	49	95.5	50	51	32.5	M6	4



Size	Motor type	Code for cylinder complete with motor	Code for motor mounted on the cylinder	Motor torque [Nm]	Coupling flange	ØB (d11)	B1	B2	B3	B4	B5	BG	E	L1	L2	L3	TG	RT	VA
50	BRUSHLESS	**371050_ _ _ _ _2220**	**37M2220000**	**1.27**	**60**	40	159.5	79	39.5	80	60	16.5	64.5	59	95.5	61	46.5	M8	4
63	BRUSHLESS	**371063_ _ _ _ _2330**	**37M2330000**	**2.39**	**80**	45	179.5	92	46	87.5	80	16.5	75.5	70	107.3	72	56.5	M8	4

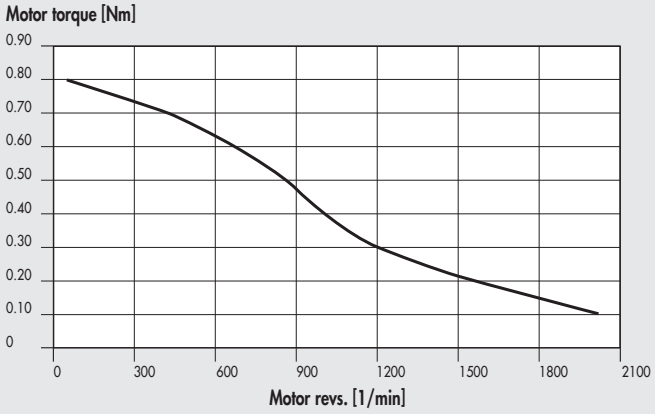


Size	Motor type	Code for cylinder complete with motor	Code for motor mounted on the cylinder	Motor torque [Nm]	Coupling flange	ØB (d11)	B1	B2	B3	B4	B5	BG	E	L1	L2	L3	L4	TG	RT	VA
50	BRUSHLESS	**371050_ _ _ _ _2330**	**37M2330000**	**2.39**	**80**	40	159.5	79	39.5	80	80	16.5	64.5	59	107.3	61	64	46.5	M8	4

NOTES

TORQUE CURVES / TECHNICAL FEATURES OF ELECTRIC STEPPING MOTORS

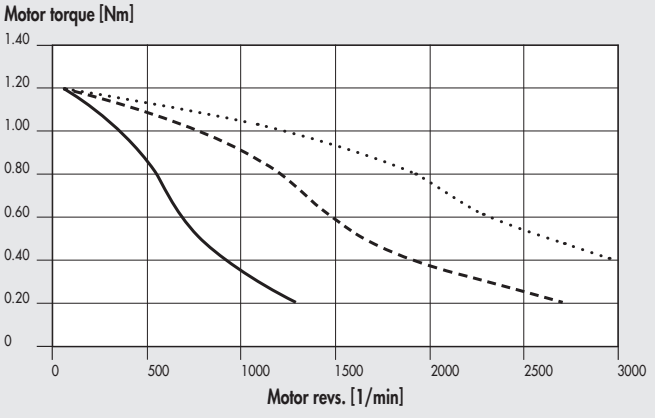
STEPPING motor code **37M1110000** + drive code **37D1221000** (24 VDC)



—— 37M1110000 + 37D1221000 (24VDC)

MOTOR SPECIFICATIONS		
Motor code		**37M1110000**
Motor type		STEPPING
Seal torque (with motor stopped)	Nm	**0.8**
Coupling flange		**NEMA 23**
Base step angle		1.8°±0.09°
Bipolar current	A	4
Resistance	Ω	0.41
Inductance	mH	1.6
Bipolar retaining torque	Nm	1.1
Rotor inertia	$kgmm^2$	21
Theoretical acceleration	$rad \cdot s^{-2}$	50000
Back E.M.F.	V/krpm	20
Mass	kg	0.65
Degree of protection		IP40
24VDC drive code		**37D1221000**

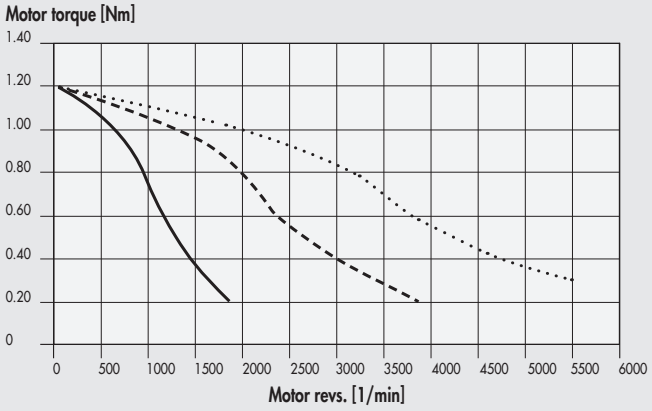
STEPPING motor code **37M1120000** + drive code **37D1221000** (24VDC);
STEPPING motor code **37M1120000** + drive code **37D1332000** (from 48 to 75VDC)



—— 37M1120000 + 37D1221000 (24VDC) ····· 37M1120000 + 37D1332000 (75VDC)
- - - 37M1120000 + 37D1332000 (48VDC)

MOTOR SPECIFICATIONS		
Motor code		**37M1120000**
Motor type		STEPPING
Seal torque (with motor stopped)	Nm	**1.2**
Coupling flange		**NEMA 23**
Base step angle		1.8°±0.09°
Bipolar current	A	4
Resistance	Ω	0.48
Inductance	mH	2.2
Bipolar retaining torque	Nm	1.65
Rotor inertia	$kgmm^2$	36
Theoretical acceleration	$rad \cdot s^{-2}$	45800
Back E.M.F.	V/krpm	31
Mass	kg	1
Degree of protection		IP40
24VDC drive code		**37D1221000**
from 48 to 75VDC drive code		**37D1332000**

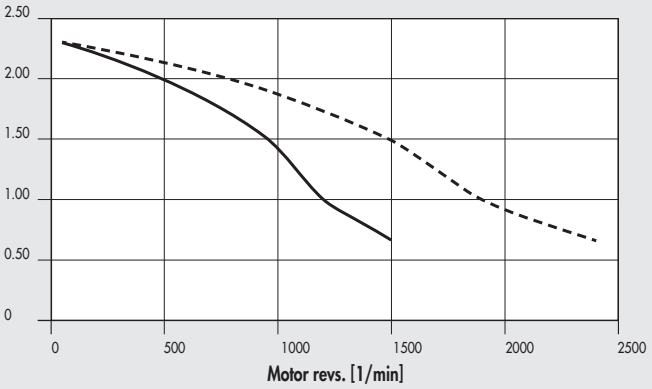
STEPPING motor code **37M1120001** + drive code **37D1332000** (24-48-75VDC)



—— 37M1120001 + 37D1332000 (24VDC) ····· 37M1120001 + 37D1332000 (75VDC)
– – – 37M1120001 + 37D1332000 (48VDC)

MOTOR SPECIFICATIONS		
Motor code		**37M1120001**
Motor type		STEPPING
Seal torque (with motor stopped)	Nm	**1.2**
Coupling flange		**NEMA 23**
Base step angle		1.8°±0.09°
Bipolar current	A	5.6
Resistance	Ω	0.3
Inductance	mH	0.85
Bipolar retaining torque	Nm	1.65
Rotor inertia	kgmm²	36
Theoretical acceleration	rad · s⁻²	45800
Back E.M.F.	V/krpm	23
Mass	kg	1
Degree of protection		IP43
from 24 to 75VDC drive code		**37D1332000**

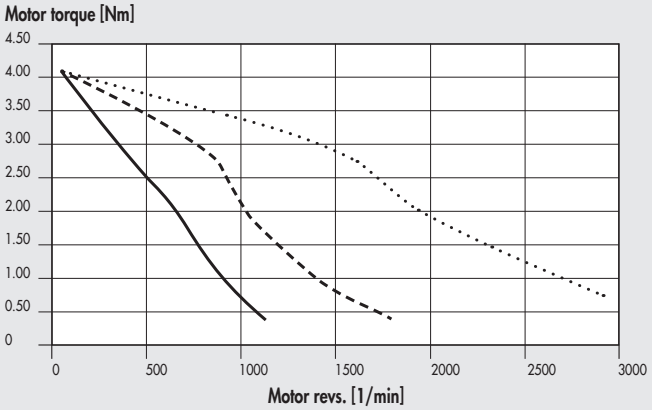
STEPPING motor code **37M1430000** + drive code **37D1332000** (from 48 to 75VDC)



—— 37M1430000 + 37D1332000 (48VDC)
– – – 37M1430000 + 37D1332000 (75VDC)

MOTOR SPECIFICATIONS		
Motor code		**37M1430000**
Motor type		STEPPING
Seal torque (with motor stopped)	Nm	**2.4**
Coupling flange		**NEMA 34**
Base step angle		1.8°±0.09°
Bipolar current	A	6
Resistance	Ω	0.3
Inductance	mH	1.65
Bipolar retaining torque	Nm	3
Rotor inertia	kgmm²	145
Theoretical acceleration	rad · s⁻²	20600
Back E.M.F.	V/krpm	50
Mass	kg	1.5
Degree of protection		IP43
from 48 to 75VDC drive code		**37D1332000**

STEPPING motor code **37M1440000** + drive code **37D1332000** (from 48 to 75VDC);
STEPPING motor code **37M1440000** + drive code **37D1442000** (140VDC)

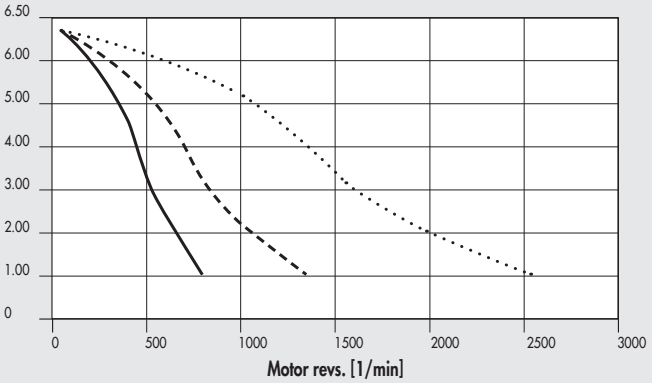


—— 37M1440000 + 37D1332000 (48VDC)
– – – 37M1440000 + 37D1332000 (75VDC)
····· 37M1440000 + 37D1442000 (140VDC)

MOTOR SPECIFICATIONS		
Motor code		**37M1440000**
Motor type		STEPPING
Seal torque (with motor stopped)	Nm	**4.2**
Coupling flange		**NEMA 34**
Base step angle		1.8°±0.09°
Bipolar current	A	6
Resistance	Ω	0.35
Inductance	mH	2.7
Bipolar retaining torque	Nm	5.6
Rotor inertia	kgmm²	290
Theoretical acceleration	rad · s⁻²	19300
Back E.M.F.	V/krpm	93
Mass	kg	2.5
Degree of protection		IP43
from 48 to 75VDC drive code		**37D1332000**
140VDC drive code		**37D1442000**

STEPPING motor code **37M1450000** + drive code **37D1332000** (from 48 to 75VDC);
STEPPING motor code **37M1450000** + drive code **37D1442000** (140VDC)

Motor torque [Nm]



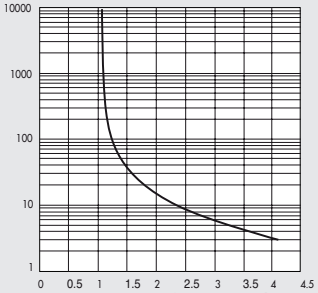
—— 37M1450000 + 37D1332000 (48VDC) ..... 37M1450000 + 37D1442000 (140VDC)
– – – 37M1450000 + 37D1332000 (75VDC)

MOTOR SPECIFICATIONS		
Motor code		**37M1450000**
Motor type		STEPPING
Seal torque (with motor stopped)	Nm	**6.7**
Coupling flange		**NEMA 34**
Base step angle		1.8°±0.09°
Bipolar current	A	6
Resistance	Ω	0.46
Inductance	mH	3.8
Bipolar retaining torque	Nm	9.2
Rotor inertia	kgmm²	450
Theoretical acceleration	rad · s⁻²	20500
Back E.M.F.	V/krpm	161
Mass	kg	4
Certifications		UL, CSA, CE, RoHS
Tension d'isolement		250VAC (350VDC)
Degree of protection		IP43 - F
from 24 to 75VDC drive code		**37D1332000**
140VDC drive code		**37D1442000**

OVERLOAD CURVES FOR ELECTRIC BRUSHLESS MOTORS

The torque used can exceed the nominal torque within the time limits shown in the diagram. Never exceed the maximum torque.

Time (s)



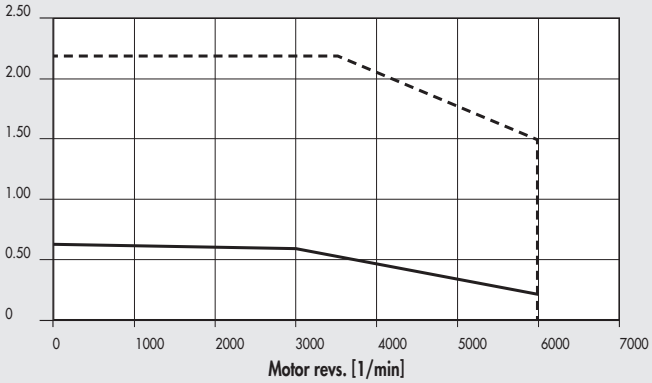
TORQUE CURVES / TECHNICAL FEATURES OF ELECTRIC BRUSHLESS MOTORS

The following diagrams show the torque delivered by the motor with changing speed (rpm). Each diagram shows two separate curves:

- **NOMINAL TORQUE** curve: the nominal torque delivered by the motor with a duty cycle of 100%
- **MAXIMUM TORQUE** curve: the torque delivered by the motor with a duty cycle of less than 100%

BRUSHLESS motor code **37M2200000** + drive code **37D2200000** (200W)

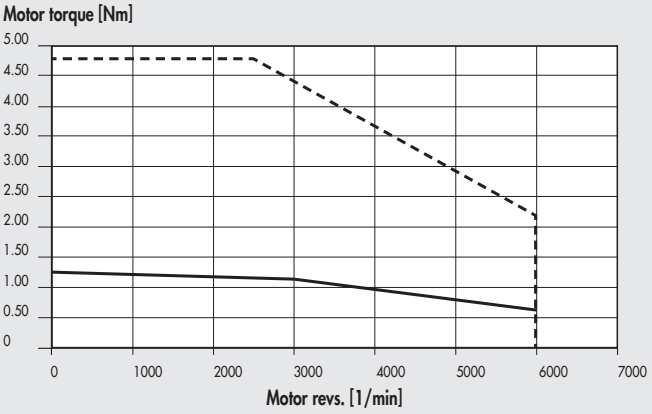
Motor torque [Nm]



—— Nominal torque 37M2200000 + 37D2200000 (200W)
– – – Max torque 37M2200000 + 37D2200000 (200W)

MOTOR SPECIFICATIONS		
Motor code		**37M2200000**
Motor type		BRUSHLESS
Nominal torque	Nm	**0.64**
Coupling flange (square)	mm	**60**
Nominal power	W	200
Nominal speed	rpm	3000
Maximum speed	rpm	6000
Stall torque	Nm	0.686
Maximum torque	Nm	2.2
Inertia	kgmm²	21.9
Encoder	impulse/rev	131072 (17 bit)
Mass	kg	0.84
Degree of protection		IP65
Drive code		**37D2200000**
Motor-drive connecting cable code		**37C2130000**
3 metres series R (fixed)		
Motor-drive encoder cable code		**37C2230000**
3 metres series R (fixed)		
Motor-drive connecting cable code		**37C2150000**
5 metres series R (fixed)		
Motor-drive encoder cable code		**37C2250000**
5 metres series R (fixed)		

BRUSHLESS motor code **37M2220000** + drive code **37D2400000** (400W)

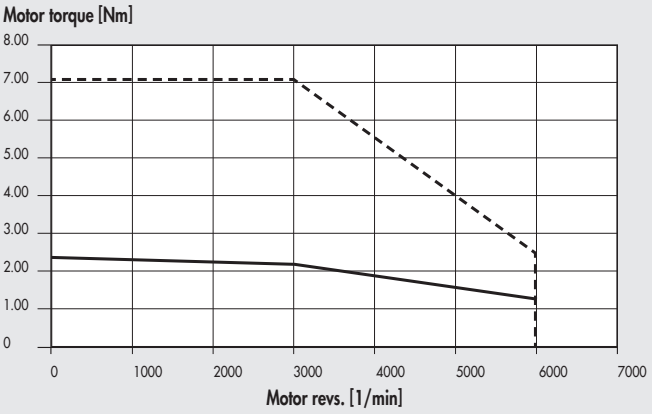


—— nominal torque 37M2220000 + 37D2400000 (400W)

- - - max torque 37M2220000 + 37D2400000 (400W)

MOTOR SPECIFICATIONS		
Motor code		**37M2220000**
Motor type		BRUSHLESS
Nominal torque	Nm	**1.27**
Coupling flange (square)	mm	**60**
Nominal power	W	400
Nominal speed	rpm	3000
Maximum speed	rpm	6000
Stall torque	Nm	1.37
Maximum torque	Nm	4.8
Inertia	kgmm²	41.2
Encoder	impulse/rev	131072 (17 bit)
Mass	kg	1.3
Degree of protection		IP65
Drive code		**37D2400000**
Motor-drive connecting cable code		**37C2130000**
3 metres series R (fixed)		
Motor-drive encoder cable code		**37C2230000**
3 metres series R (fixed)		
Motor-drive connecting cable code		**37C2150000**
5 metres series R (fixed)		
Motor-drive encoder cable code		**37C2150000**
5 metres series R (fixed)		

Motore BRUSHLESS cod. **37M2330000** + drive code **37D2400000** (750W)



—— nominal torque 37M2330000 + 37D2400000 (750W)

- - - max torque 37M2330000 + 37D2400000 (750W)

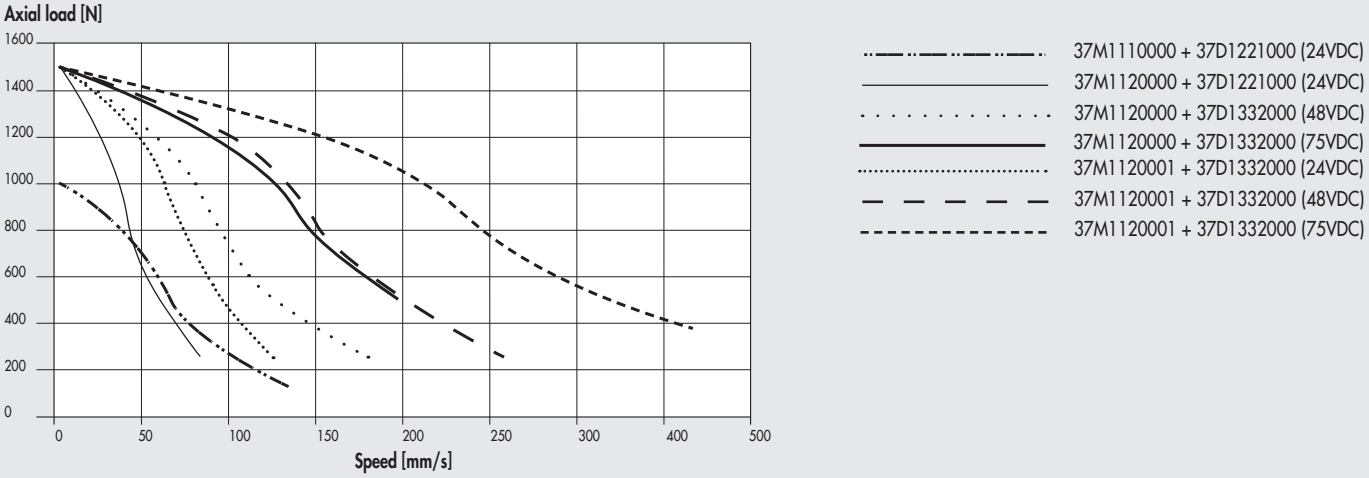
MOTOR SPECIFICATIONS		
Motor code		**37M2330000**
Motor type		BRUSHLESS
Nominal torque	Nm	**2.39**
Coupling flange (square)	mm	**80**
Nominal power	W	750
Nominal speed	rpm	3000
Maximum speed	rpm	6000
Stall torque	Nm	2.55
Maximum torque	Nm	7.1
Inertia	kgmm²	182
Encoder	impulse/rev	131072 (17 bit)
Mass	kg	1.3
Degree of protection		IP65
Drive code		**37D2400000**
Motor-drive connecting cable code		**37C2130000**
3 metres series R (fixed)		
Motor-drive encoder cable code		**37C2230000**
3 metres series R (fixed)		
Motor-drive connecting cable code		**37C2150000**
5 metres series R (fixed)		
Motor-drive encoder cable code		**37C2250000**
5 metres series R (fixed)		

NOTES

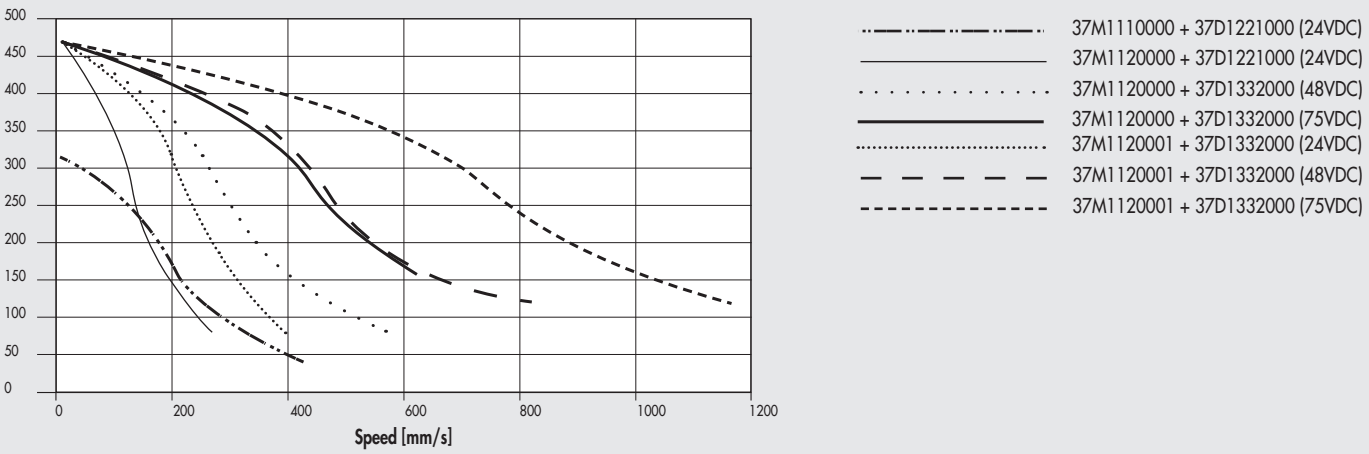
AXIAL LOAD CURVES AS A FUNCTION OF SPEED (CYLINDER COMPELTE WITH MOTOR AND DRIVE)

N.B.: The load values already take into account the efficiency of the system.

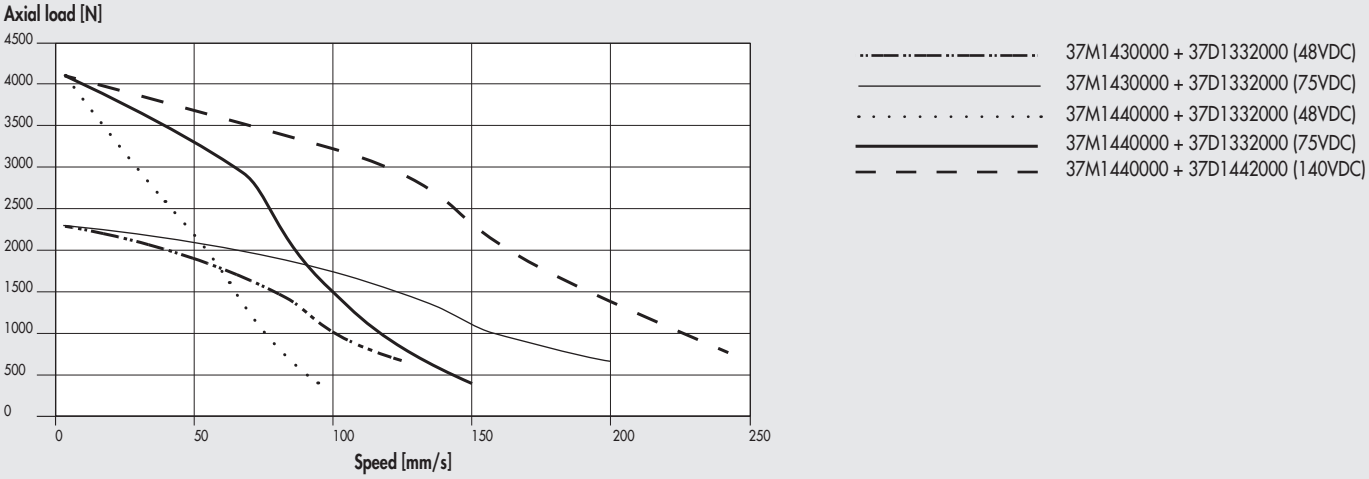
Ø 32 with pitch 4 screw, STEPPING motors



Ø 32 with pitch 12.7 screw, STEPPING motors

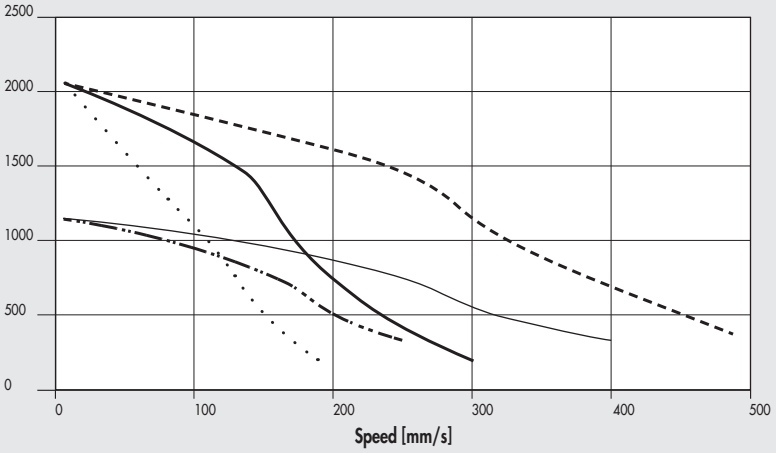


Ø 50 with pitch 5 screw, STEPPING motors



Ø 50 with pitch 10 screw, STEPPING motors

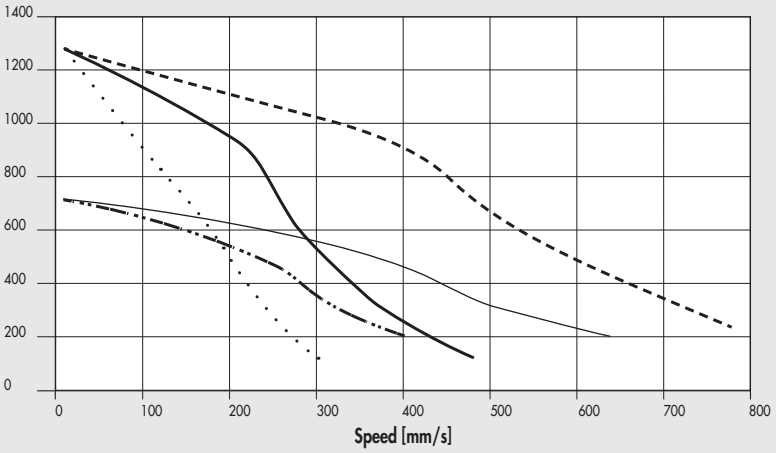
Axial load [N]



37M1430000 + 37D1332000 (48VDC)
37M1430000 + 37D1332000 (75VDC)
37M1440000 + 37D1332000 (48VDC)
37M1440000 + 37D1332000 (75VDC)
37M1440000 + 37D1442000 (140VDC)

Ø 50 with pitch 16 screw, STEPPING motors

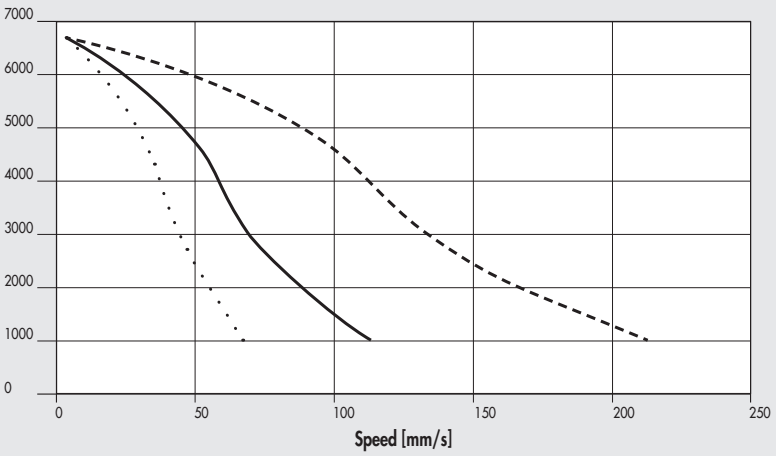
Axial load [N]



37M1430000 + 37D1332000 (48VDC)
37M1430000 + 37D1332000 (75VDC)
37M1440000 + 37D1332000 (48VDC)
37M1440000 + 37D1332000 (75VDC)
37M1440000 + 37D1442000 (140VDC)

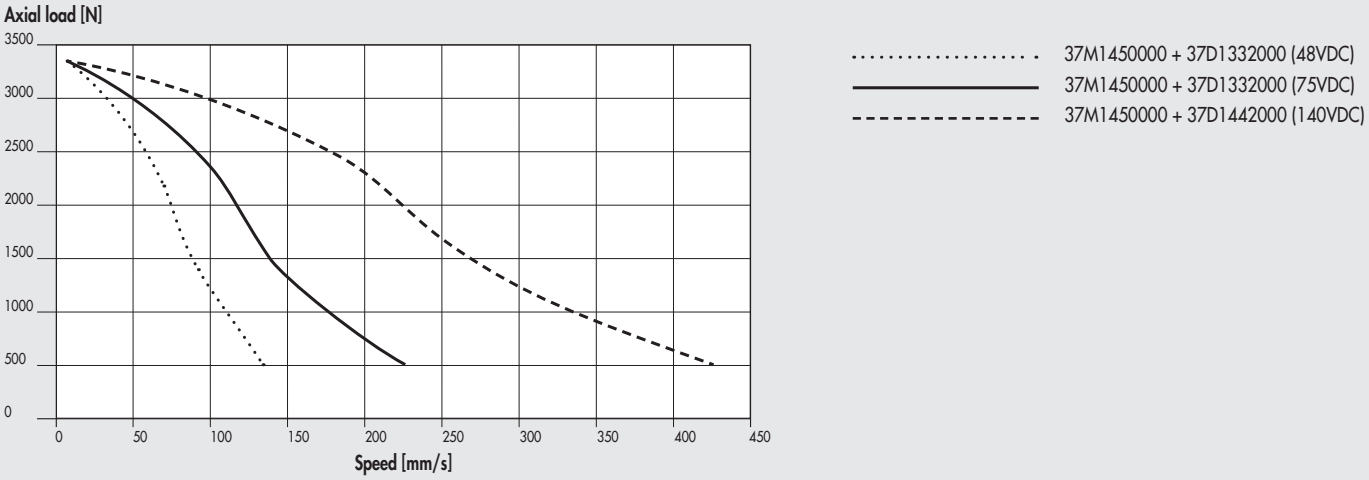
Ø 63 with pitch 5 screw, STEPPING motors

Axial load [N]

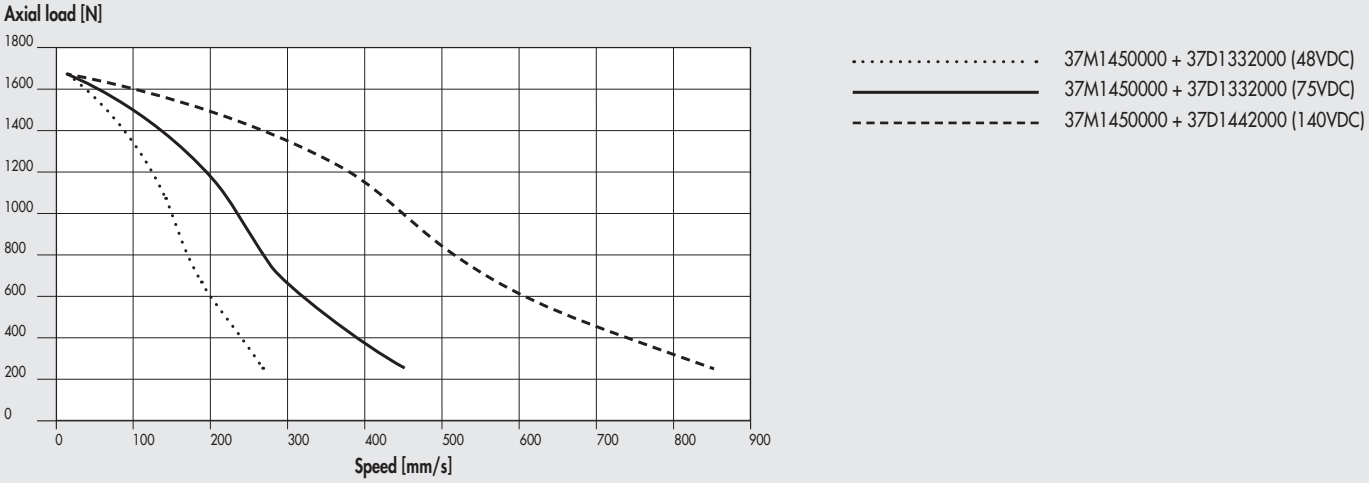


37M1450000 + 37D1332000 (48VDC)
37M1450000 + 37D1332000 (75VDC)
37M1450000 + 37D1442000 (140VDC)

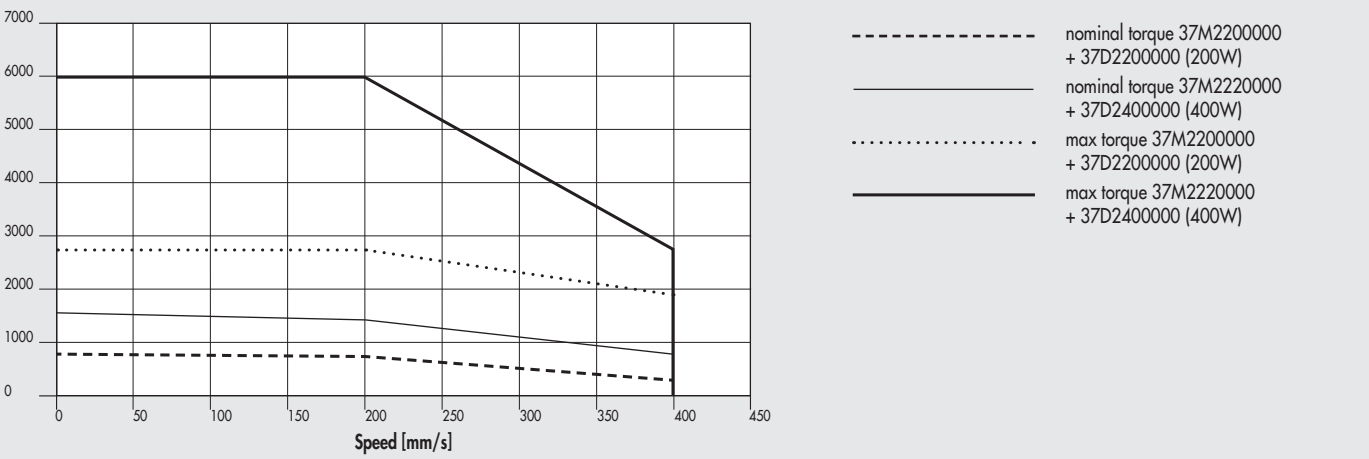
Ø 63 with pitch 10 screw, STEPPING motors



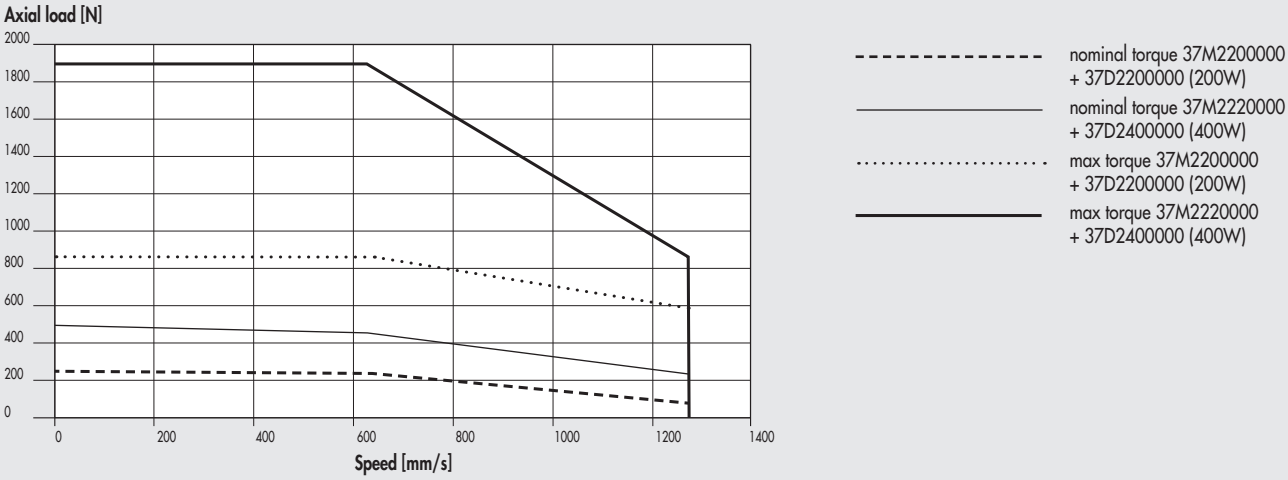
Ø 63 with pitch 20 screw, STEPPING motors



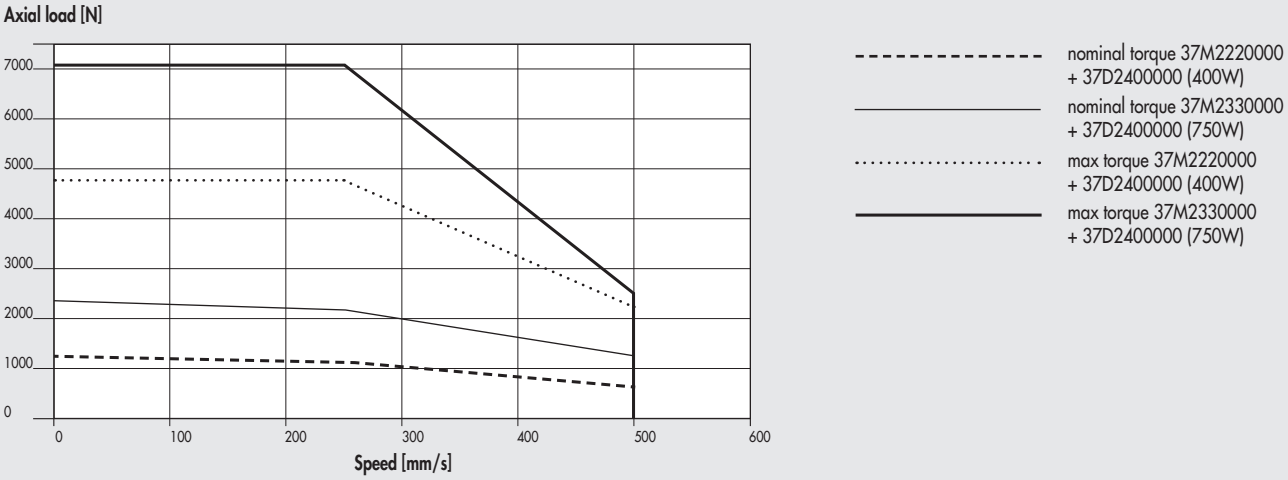
Ø 32 with pitch 4 screw, BRUSHLESS motors



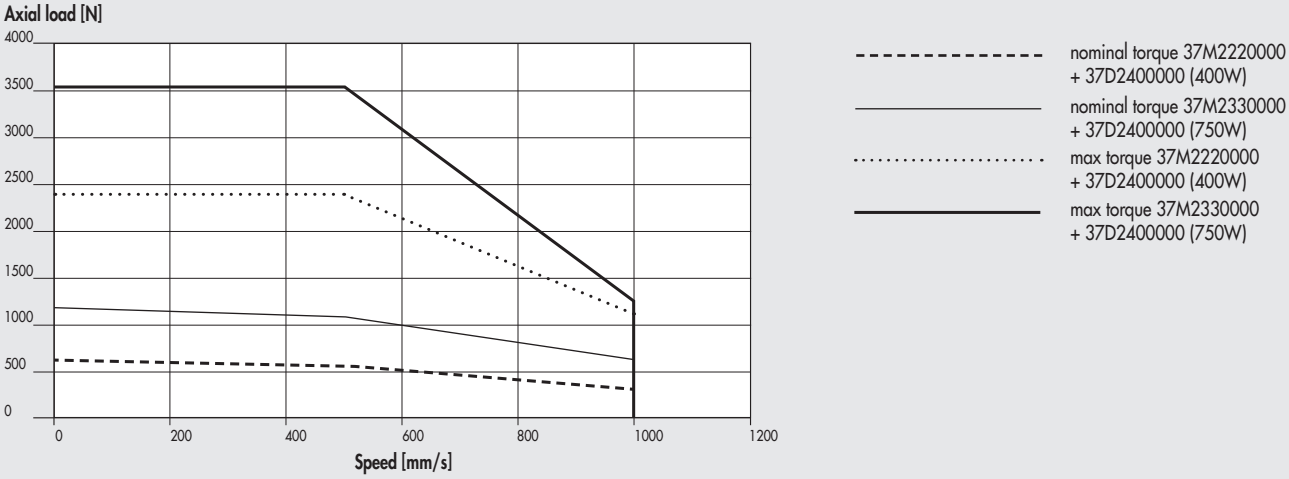
Ø 32 with pitch 12.7 screw, BRUSHLESS motors



Ø 50 with pitch 5 screw, BRUSHLESS motors

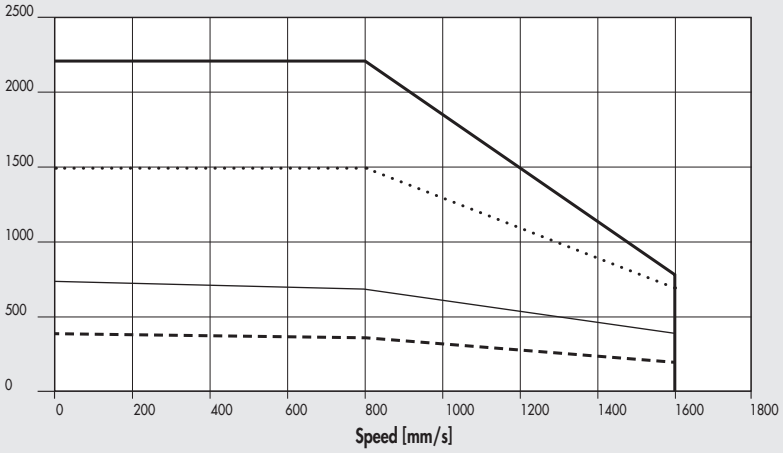


Ø 50 with pitch 10 screw, BRUSHLESS motors



Ø 50 with pitch 16 screw, BRUSHLESS motors

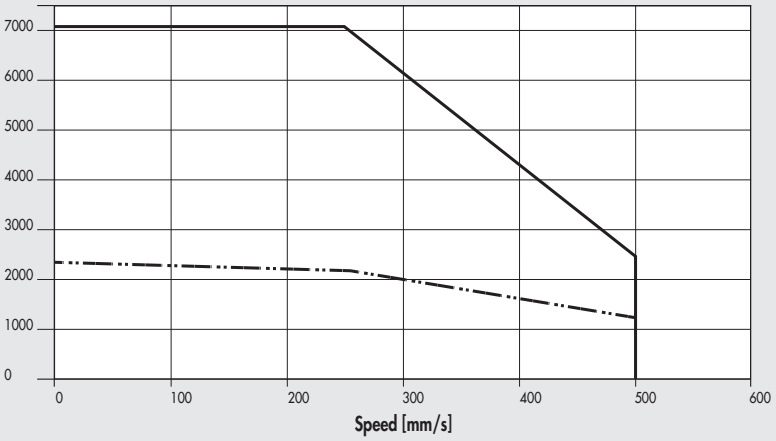
Axial load [N]



- nominal torque 37M2220000 + 37D2400000 (400W)
- nominal torque 37M2330000 + 37D2400000 (750W)
- max torque 37M2220000 + 37D2400000 (400W)
- max torque 37M2330000 + 37D2400000 (750W)

Ø 63 with pitch 5 screw, BRUSHLESS motors

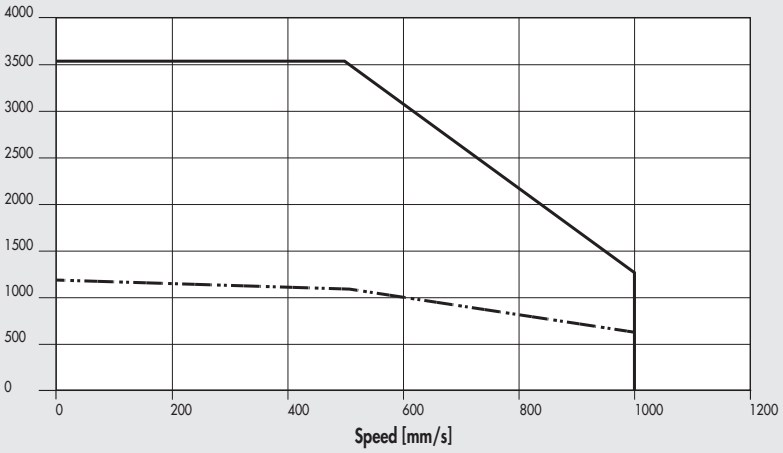
Axial load [N]



- nominal torque 37M2330000 + 37D2400000 (750W)
- max torque 37M2330000 + 37D2400000 (750W)

Ø 63 with pitch 10 screw, BRUSHLESS motors

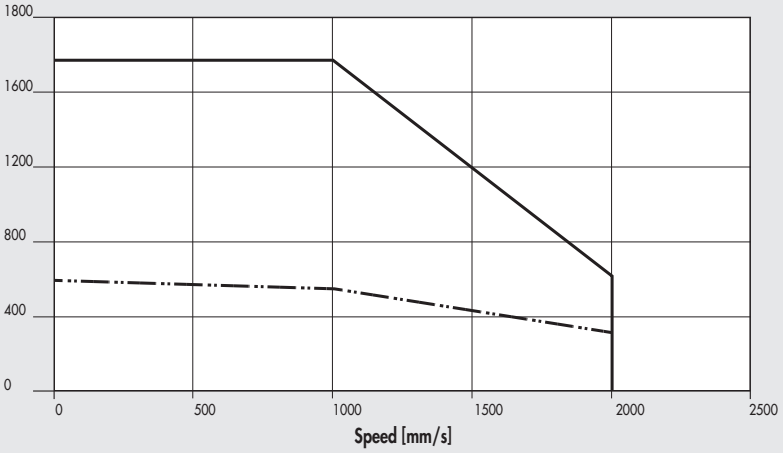
Axial load [N]



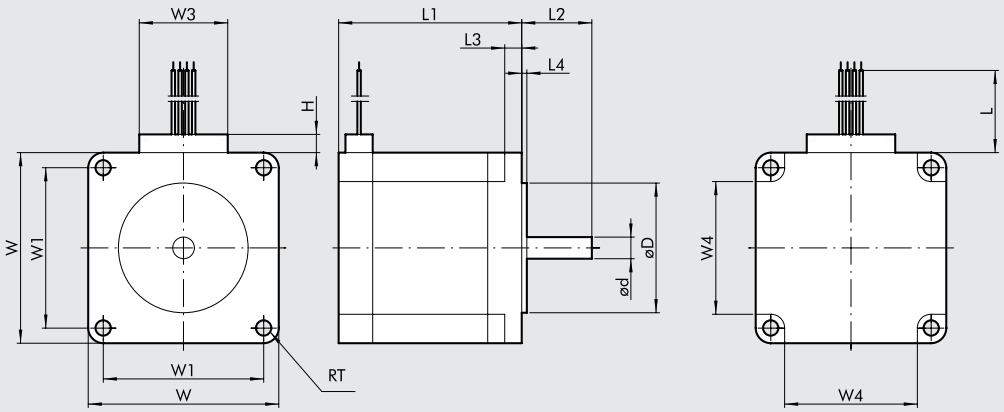
- nominal torque 37M2330000 + 37D2400000 (750W)
- max torque 37M2330000 + 37D2400000 (750W)

Ø 63 with pitch 20 screw, BRUSHLESS motors

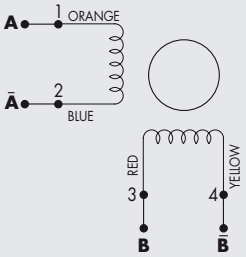
Axial load [N]



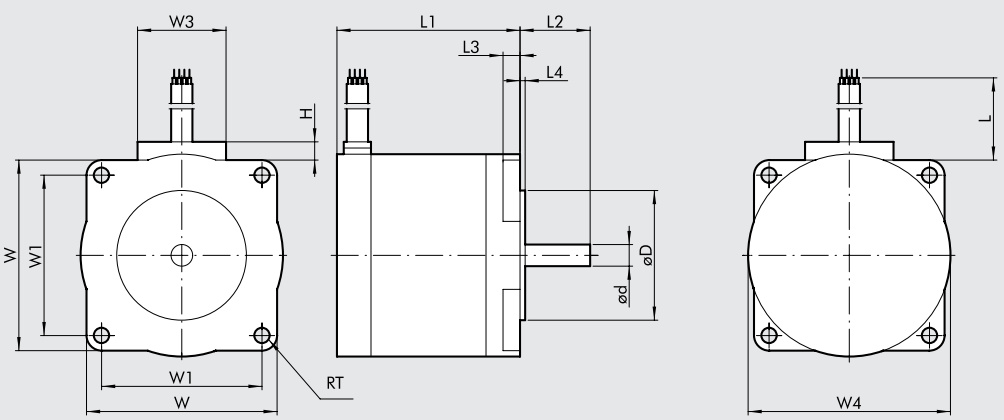
DIMENSIONS OF ELECTRIC MOTORS



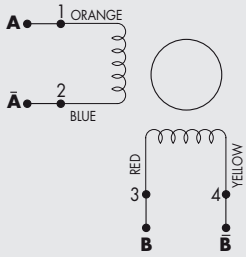
WIRING DIAGRAM



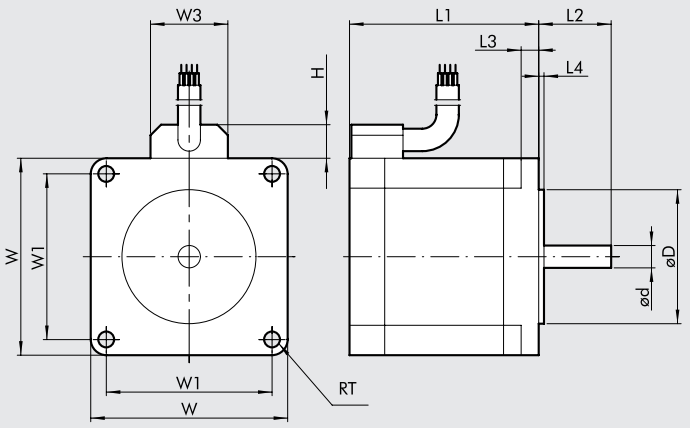
Motor type	Motor code	Motor torque [Nm]	Coupling flange	ød 0/-0.013	øD ±0.025	H	L min	L1 ±0.8	L2 ±0.5	L3 ±0.25	L4 ±0.25	RT +0.5/0	W ±0.5	W1 ±0.13	W3 max	W4 ±0.5
STEPPING	**37M1110000**	**0.8**	**NEMA 23**	6.35	38.1	7	305	53.8	20.6	5	1.5	4.5	56	47.14	26	39
	37M1120000	**1.2**	**NEMA 23**	6.35	38.1	7	305	75.8	20.6	5	1.5	4.5	56	47.14	26	39
	37M1120001	**1.2**	**NEMA 23**	6.35	38.1	10	305	75.8	20.6	5	1.5	4.5	56	47.14	39	39



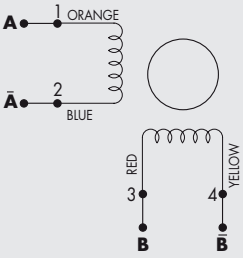
WIRING DIAGRAM



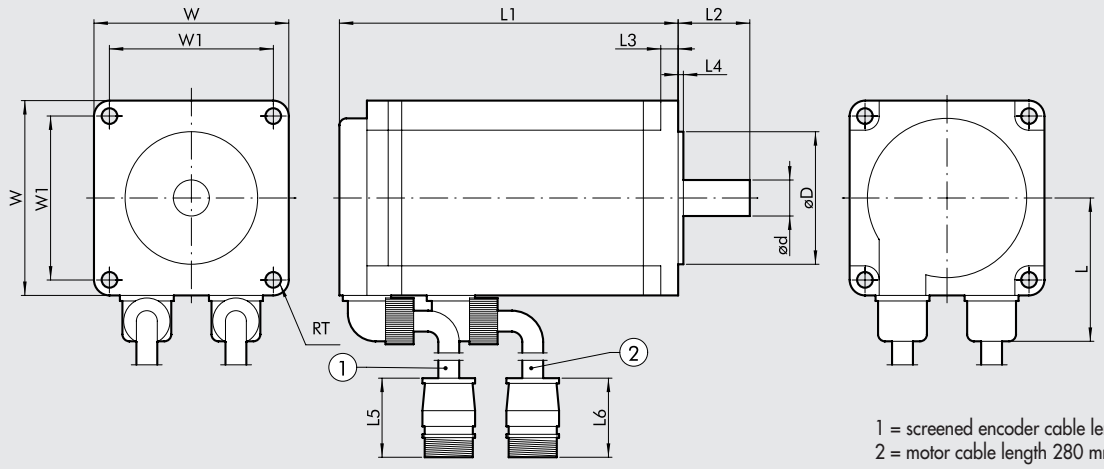
Motor type	Motor code	Motor torque [Nm]	Coupling flange	ød 0/-0.018	øD ±0.025	H	L min	L1	L2 ±0.5	L3 ±0.50	L4 ±0.25	RT +0.5/0	W ±0.5	W1 ±0.2	W3	W4 ±0.5
STEPPING	**37M1430000**	**2.4**	**NEMA 34**	9.525	73.025	10	305	62	30	4.8	1.5	5.4	82.5	69.6	37	85.8
	37M1440000	**4.2**	**NEMA 34**	12	73.025	10	305	92.2	30	4.8	1.5	5.4	82.5	69.6	37	85.8



WIRING DIAGRAM



Motor type	Motor code	Motor torque [Nm]	Coupling flange	ød 0/-0.018	øD ±0.025	H max	L min	L1 ±1	L2 ±0.5	L3 ±0.50	L4 ±0.25	L5	RT +0.2	W ±0.5	W1 ±0.25	W3 max
STEPPING	**37M1450000**	**6.7**	**NEMA 34**	14	73.025	12	305	127	30	8	1.5	50	5.6	85.5	69.6	27



1 = screened encoder cable length 280 mm
2 = motor cable length 280 mm

Motor type	Motor code	Motor torque [Nm]	Coupling flange	ød 0/-0.011	øD h7	L	L1 ±1	L2 ±1	L3	L4	L5	L6	RT	W	W1
BRUSHLESS	**37M2200000**	**0.64**	**60**	14	50	44.6	69.5	30	6	3	55	58	5.5	60	49.5
	37M2220000	**1.27**	**60**	14	50	44.6	95.5	30	6	3	55	58	5.5	60	49.5
	37M2330000	**2.39**	**80**	16	70	54.4	107.3	40	8	3	55	58	6.6	80	63.6

TABLE OF METAL WORK CODES AND SANYO DENKI MOTORS

Metal Work code	Description
37M1110000	STEPPING motor 103-H7123-1749
37M1120000	STEPPING motor 103-H7126-1740
37M1120001	STEPPING motor 103-H7126-6640
37M1430000	STEPPING motor 103-H8221-6241
37M1440000	STEPPING motor 03-H8222-6340
37M1450000	STEPPING motor SM-2863-5255
37M2200000	BRUSHLESS motor R2AA06020F
37M2220000	BRUSHLESS motor R2AA06040F
37M2330000	BRUSHLESS motor R2AA08075F

DRIVES FOR STEPPING MOTORS

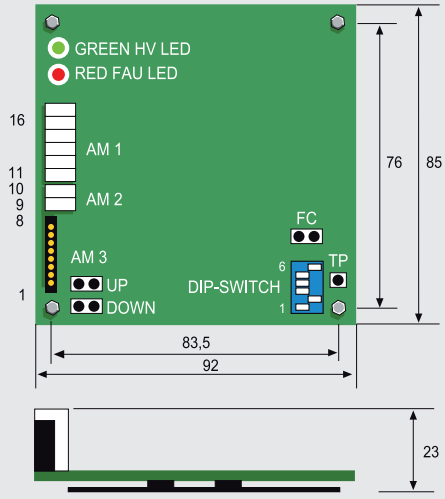
4.4A 45V DC DRIVE FOR STEPPING MOTORS, CODE 37D1221000

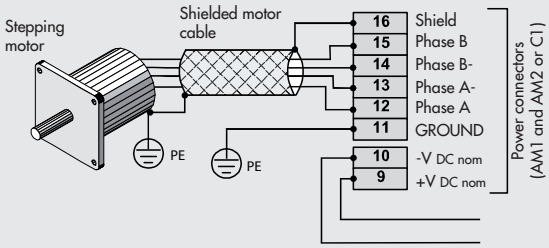
The 37D1221000 is a ministep bipolar chopper drive made by RTA Srl.
It comes with a STEP & DIRECTION interface for piloting medium-low power two-stage STEPPING motors with four, six or eight terminals.
It has a supply voltage range of 45V DC. It comprises an open frame board and comes with separate logic and power screw connectors.
It can control STEPPING motors with a nominal current up to 4.4A, the perfect choice for medium-low power applications using small motors.

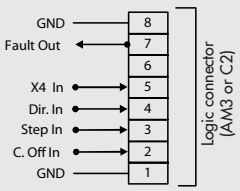
DRIVE TECHNICAL DATA

Drive code		**37D1221000**
Type of STEPPING motor drive		Board
Dimensions	mm	92 x 85 x 23
Connectors		Screw type
Onboard power supply		NO
Control		Step and direction
Operating voltage range	VDC	24 - 45
Current range	A	2.6 - 4.4
Current values selected via a dip-switch		8
Pulses per rev values selected by dip-switch	pul/rev	400, 800, 1600, 3200
Automatic current reduction with motor off		YES (50%)
Type of inputs		Pull-up or Pull-down, settable
Protections		Maximum and minimum voltage.
		Motor output short-circuiting.
		Thermal protection.
		Electronic damping circuit for maximum control of noise and vibration.
Suitable for motors code		**37M1110000; 37M1120000**

OVERALL DIMENSIONS AND WIRING DIAGRAM





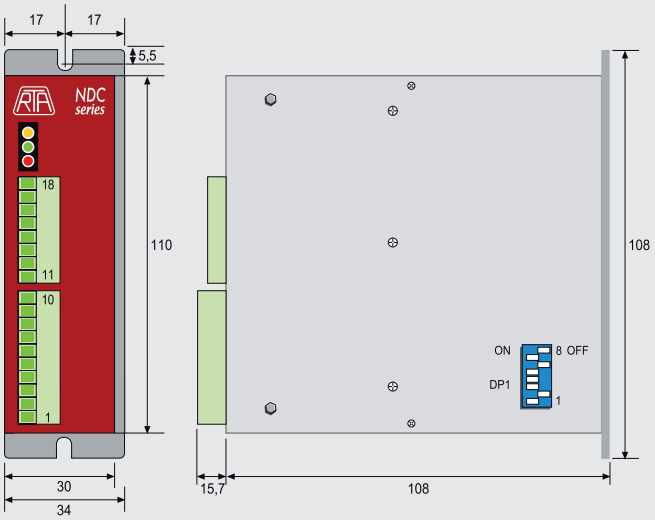


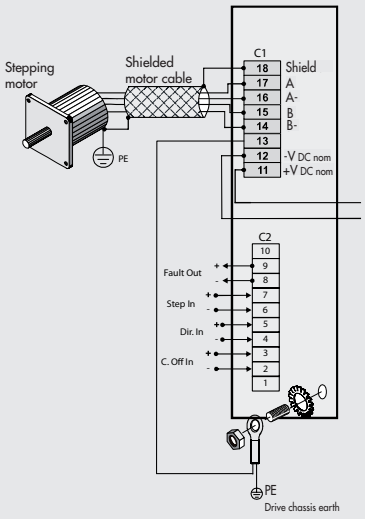
6A 75V DC DRIVE FOR STEPPING MOTORS, CODE 37D1332000

This is a ministep bipolar chopper drive made by RTA Srl. It comes with a STEP & DIRECTION interface for piloting medium-low power two-stage STEPPING motors with four, six or eight terminals.
It has a supply voltage range up to 75V DC, compact dimensions and considerable operating flexibility. It consists of a board housed in a metal box and comes with separate logic and power pull-out screw connectors. It can control STEPPING motors with a nominal current up to 6A, the perfect choice for medium power applications using small and medium-size motors.

DRIVE TECHNICAL DATA		
Drive code		**37D1332000**
Type of STEPPING motor drive		Metal box
Dimensions	mm	110 x 108 x 34
Connectors		Screw type, pull-out
Onboard power supply		NO
Control		Step and direction
Operating voltage range	VDC	24 - 75
Current range	A	1.9 - 6
Current values selected via a dip-switch		8
Pulses per rev values selected by dip-switch	pul/rev	400, 500, 800, 1000, 1600, 2000, 3200, 4000
Automatic current reduction with motor off		YES (50%)
Type of inputs		Opto-isolated
Protections		Maximum and minimum voltage.
		Motor output short-circuiting.
		Thermal protection.
		Electronic damping circuit for maximum control of noise and vibration.
Suitable for motors code		**37M1120000; 37M1120001; 37M1430000; 37M1440000; 37M1450000**

OVERALL DIMENSIONS AND WIRING DIAGRAM





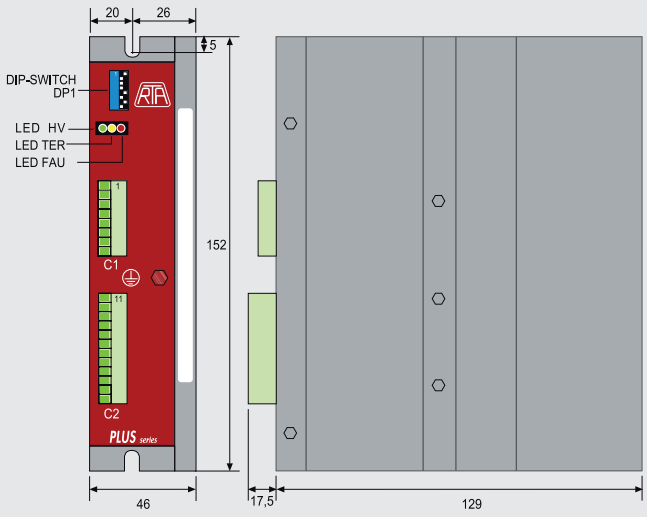
6A 140V DC DRIVE FOR STEPPING MOTORS, CODE 37D1442000

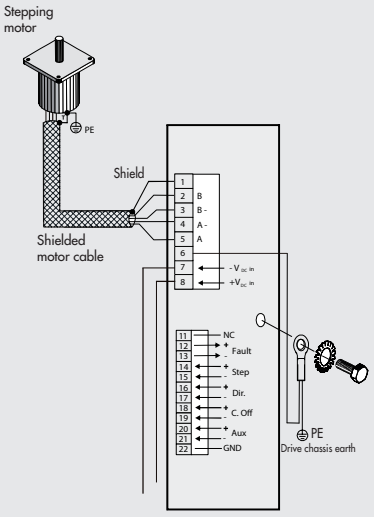
This is a ministep bipolar chopper drive made by RTA Srl. It comes with a STEP & DIRECTION interface for piloting medium-high power two-stage STEPPING motors with four, six or eight terminals.
It has a supply voltage range up to 140V DC, compact dimensions and considerable operating flexibility. It consists of a board housed in a metal box. It does not require external ventilation and comes with separate logic and power pull-out screw connectors. It can control STEPPING motors with a nominal current up to 6A, the perfect choice for medium power applications requiring a DC supply.

DRIVE TECHNICAL DATA

Drive code		**37D1442000**
Type of STEPPING motor drive		Metal box
Dimensions	mm	152 x 129 x 46
Connectors		Screw type, pull-out
Onboard power supply		NO
Control		Step and direction
Operating voltage range	VDC	77 - 140
Current range	A	1.9 - 6
Current values selected via a dip-switch		8
Pulses per rev values selected by dip-switch	pul/rev	400, 500, 800, 1000, 1600, 2000, 3200, 4000
Automatic current reduction with motor off		YES (50%)
Type of inputs		Opto-isolated
Protections		Maximum and minimum voltage.
		Motor output short-circuiting.
		Thermal protection.
		Electronic damping circuit for maximum control of noise and vibration.
Suitable for motors code		**37M1440000; 37M1450000**

OVERALL DIMENSIONS AND WIRING DIAGRAM





15A DRIVE FOR BRUSHLESS MOTORS, CODE 37D2200000

This drive made by RTA Srl is suitable for piloting BRUSHLESS motors.
It features compact dimensions and considerable operating flexibility.
It consists of a board housed in a metal box. It comes with pull-out screw connectors for power and plug connectors for logic. It can control BRUSHLESS motors with a nominal current up to 15A.

DRIVE TECHNICAL DATA		
Drive code		**37D2200000**
Type of drive for BRUSHLESS motors		Metal box
Dimensions	mm	45 x 168 x 130
Power connectors and motor power		Screw-type, pull-out
Encoder connectors and signals		Plug-type 3M
Max output current	A	15
Motor output stage		IGBT, PWM control, sinusoidal current
Power voltage		Single-phase or three-phase (user configurable) 200-230VAC (+10%, -15%) 50/60 Hz (± 3 Hz)
Logic voltage		Single-phase 200-230VAC (+10%, -15%) 50/60 Hz (± 3 Hz)
Control		With analogue signal (proportional to speed and torque). Pulse-train (clock + direction; forward + backward pulse; 90° phase difference) 8 inputs and 8 outputs, user configurable
Auto-tuning		Yes
Communication interface		RS232 for settings and monitoring via a personal computer
Protections		Integrated against overloads, input extra-voltages, incorporated filters for suppressing the system's own resonance frequencies.
Standards		CE, UL and CSA.
Other features		5-digit display and programming keypad.
		Integrated closed-loop system with position, speed and torque control modes.
		Instant changeover option: position + speed; position + torque; speed + torque.
		Automatic dynamic braking circuit in a alarm and power-off conditions.
		Connector for external braking resistance (optional).
		Configuration and control software (optional).
Code for 3-metre motor-drive connecting cable series R (fixed position)		**37C2130000**
Code for 3-metre motor-drive encoder cable series R (fixed position)		**37C2230000**
Code for 5-metre motor-drive connecting cable series R (fixed position)		**37C2150000**
Code for 5-metre motor-drive encoder cable series R (fixed position)		**37C2250000**
Suitable for motors code		**37M2200000**

30A DRIVE FOR BRUSHLESS MOTORS, CODE 37D2400000

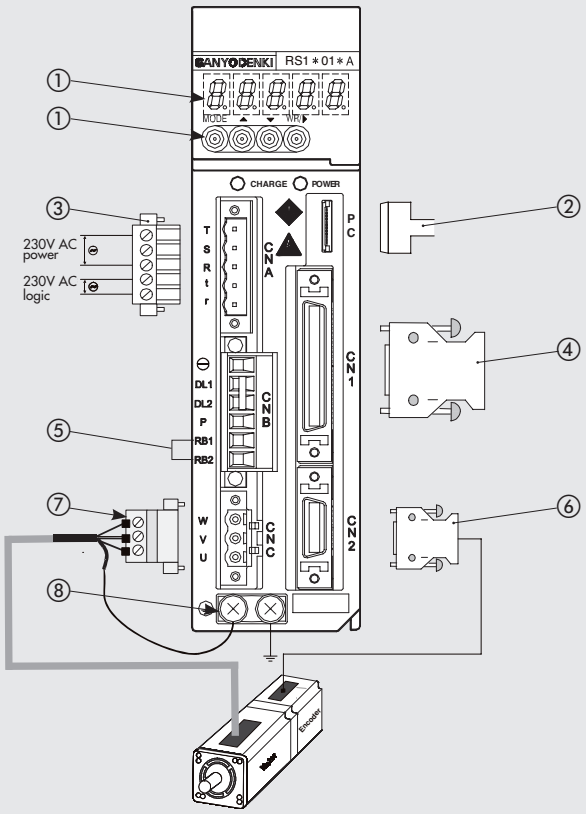
This drive made by RTA Srl is suitable for piloting BRUSHLESS motors.
It features compact dimensions and considerable operating flexibility.
It consists of a board housed in a metal box. It comes with pull-out screw connectors for power and plug connectors for logic.
It can control BRUSHLESS motors with a nominal current up to 30A.
All the system parameters can be configured and controlled using (optional) R-Set up software.

DRIVE TECHNICAL DATA		
Drive code		**37D2400000**
Type of drive for BRUSHLESS motors		Metal box
Dimensions	mm	50 x 168 x 130
Power connectors and motor power		Screw-type, pull-out
Encoder connectors and signals		Plug-type 3M
Max output current	A	30
Motor output stage		IGBT, PWM control, sinusoidal current
Power voltage		Single-phase or three-phase (user configurable) 200-230VAC (+10%, -15%) 50/60 Hz (± 3 Hz)
Logic voltage		Single-phase 200-230VAC (+10%, -15%) 50/60 Hz (± 3 Hz)
Control		With analogue signal (proportional to speed and torque).
		Pulse-train (clock + direction; forward + backward pulse; 90° phase difference)
		8 inputs and 8 outputs, user configurable.
Auto-tuning		Yes
Communication interface		RS232 for settings and monitoring via a personal computer.
Protections		Integrated against overloads, input extra-voltages,
		incorporated filters for suppressing the system's own resonance frequencies
Standards		CE, UL and CSA.
Other features		5-digit display and programming keypad.
		Integrated closed-loop system with position, speed and torque control modes.
		Instant changeover option: position + speed; position + torque; speed + torque.
		Automatic dynamic braking circuit in a alarm and power-off conditions.
		Connector for external braking resistance (optional).
		Configuration and control software (optional).
Code for 3-metre motor-drive connecting cable series R (fixed position)		**37C2130000**
Code for 3-metre motor-drive encoder cable series R (fixed position)		**37C2230000**
Code for 5-metre motor-drive connecting cable series R (fixed position)		**37C2150000**
Code for 5-metre motor-drive encoder cable series R (fixed position)		**37C2250000**
Suitable for motors code		**37M2220000; 37M2330000**

WIRING DIAGRAM FOR BRUSHLESS MOTOR DRIVES

① 5-DIGIT DISPLAY and PROGRAMMING KEYPAD:
to display and modify parameters and monitor system operation in real time.
② PC CONNECTOR: settings and monitoring by PC via RS232 (supplied with configuration software kit)
③ POWER CONNECTOR: 230VAC, single-phase and three-phase (user configurable). **Included in the supply**.
Separate supply section for logic/signal and power electronics. Integrated circuits protecting against overloads and input extra-voltages.
④ SIGNAL CONNECTOR: pulse-train command (clock + direction; forward + backward pulse; 90° phase difference) or with analogue signal (proportional to speed or torque) 8 inputs and 8 outputs, user configurable. **Included in the supply**.
⑤ CONNECTOR: for external braking resistance (optional)
⑥ ENCODER CONNECTOR: compatible with any type of Sanyo Denki encorder
⑦ MOTOR POWER CONNECTOR
⑧ EARTH CONNECTION

Log on to www.metalwork.it to view the instruction manual.



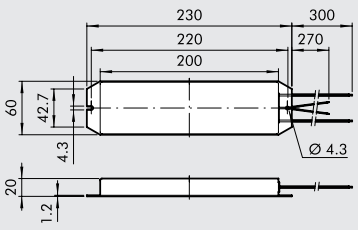
⑥ ENCODER CABLE

Code	Description
37C2230000	Motor-encoder connecting cable 3 m series R
37C2250000	Motor-encoder connecting cable 5 m series R

⑦ MOTOR POWER CABLE

Code	Description
37C2130000	Motor-drive connecting cable 3 m series R
37C2150000	Motor-drive connecting cable 5 m series R

EXTERNAL BRAKING RESISTANCES



Code	Description
37D2R00000	220W 50 Ω braking resistance for RS1A03

Under certain operating conditions, such as sudden deceleration with high inertial load, it may be necessary to dissipate externally the reverse energy generated by the motor. The drive indicates this requirement via a specific alarm. Excess energy is dissipated externally via a braking resistance.

TABLE OF METAL WORK CODES FOR RTA OR SANYO DENKI DRIVES

Metal Work code	Description		
37D1221000	RTA CSD04V	4.4A	from 24 to 45VDC
37D1332000	RTA NDC96 (box type)	6A	from 24 to 75VDC
37D1442000	RTA PLUS A4	6A	from 77 to 140VDC
37D1220000	SANYO DENKI RS1A01		
37D1240000	SANYO DENKI RS1A03		

CONFIGURATION SOFTWARE + PC CONNECTING CABLE KIT

R-SETUP SOFTWARE CODE 37D2S00000

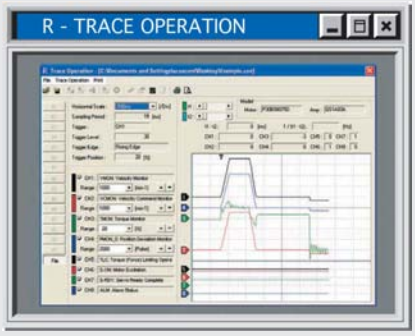
R-Setup communication software is used for parameter setting and complete control of all functions of the system.
Access to parameter configuration can take place at three levels: basic level, standard level, advanced level.
The software includes a detailed description of each parameter.
In addition to parameter setting R-Setup software can accurately analyse operation of the system via the following functions.

- Monitor Display: real-time display of all details about the system.
- Trace Operation: a complete oscilloscope with 4 analogue channels and 4 digital channels. Use to save and print traces and settings.
- System Analysis: used to study the system's frequency response to identify and correct any mechancal resonance phenomena.

JOG modes for speed (Jogging Operation) and position (Operation Pulse Feed Jogging) are also available.

GRAPHIC MONITOR

Thanks to the integrated oscilloscope function, some important system parameters, such as speed and torque, can be displayed on the PC monitor.
Data can be downloaded and saved in compatible Excel format.
The time setting range is 10 ms to 2 s. Single values acquired and displayed can be read using the cursor.



NOTES

KEY TO CODES – SINGLE CYLINDER

CIL	37 TYPE	1	0	32 BORE	0100 STROKE	1 SCREW PITCH	5 VERSION
	37 Electric actuators	**1** ISO 15552 electric cylinder	**0** STD	32 50 63		**1** Screw pitch 4 **2** Screw pitch 5 **4** Screw pitch 10 **5** Screw pitch 12.7 **6** Screw pitch 16 **7** Screw pitch 20	**5** Geared without antirotation IP40 **6** Geared with antirotation IP40 **7** Geared without antirotation IP55/IP65 **8** Geared with antirotation IP55/IP65

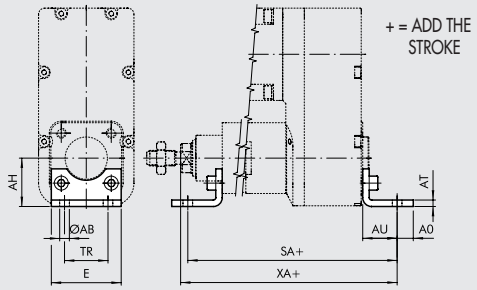
KEY TO CODES - ELECTRIC CYLINDER WITH MOTOR

CIL	37 TYPE	1	0	32 BORE	0100 STROKE	1 SCREW PITCH	1 VERSION	1	1 DRIVE	1	0
	37 Electric actuators	**1** ISO 15552 electric cylinder	**0** STD	32 50 63		**1** Screw pitch 4 **2** Screw pitch 5 **4** Screw pitch 10 **5** Screw pitch 12.7 **6** Screw pitch 16 **7** Screw pitch 20	● **1** In-line without antirotation IP40 ● **2** In-line with antirotation IP40 ■ **3** In-line without antirotation IP55/IP65 ■ **4** In-line with antirotation IP55/IP65 ● **5** Geared without antirotation IP40 ● **6** Geared with antirotation IP40 ■ **7** Geared without antirotation IP55/IP65 ■ **8** Geared with antirotation IP55/IP65	**1** STEPPING motor **2** BRUSHLESS motor	**1** NEMA flange 23 **2** Flange 60 **3** Flange 80 **4** NEMA flange 34	**0** Torque 0.64 Nm **1** Torque 0.8 Nm **2** Torque 1.2 to 1.3 Nm **3** Torque 2.2 to 2.4 Nm **4** Torque 4.2 Nm **5** Torque 6.7 Nm	**0** Base **1** Greater rpm

● version available for all STEPPING and BRUSHLESS motors, all sizes
■ version IP55 available for STEPPING motors, sizes 50 and 63 only; version IP65 available for BRUSHLESS motors, all sizes

ACCESSORIES FOR ELECTRIC CYLINDER SERIES ELEKTRO ISO 15552: FIXINGS

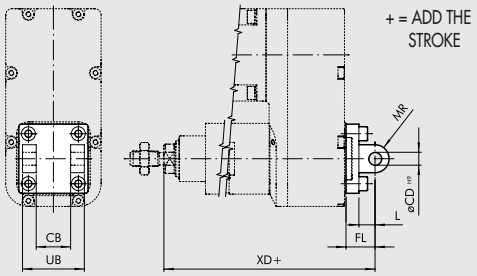
FOOT - MODEL A



Code	Ø	Ø AB	AH	AO	AT	AU	TR	E	XA	SA	Weight [g]
W0950322001	32	7	32	11	4	24	32	45	234	232	76
W0950502001	50	9	45	15	4	32	45	45	287	282	162
W0950632001	63	9	50	15	6	32	50	75	314	309	266

Note: Individually packed with 2 screws

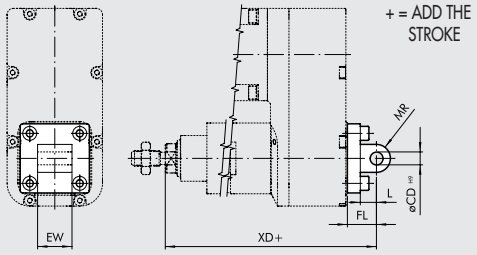
FEMALE HINGE - MODEL B



Code	Ø	UB	CB	FL	øCD	XD	MR	L	Weight [g]
W0950322003	32	45	26	22	10	232	10	12	116
W0950502003	50	60	32	27	12	282	12	15	252
W0950632003	63	70	40	32	16	314	16	20	394

Note: Supplied with 4 screws, 4 washers, 2 snap-rings, 1 pin

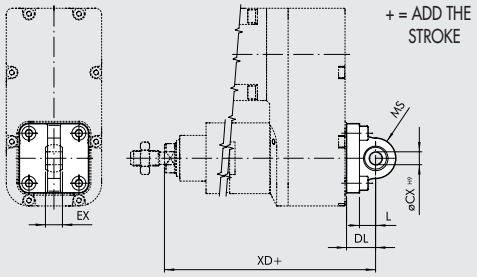
MALE HINGE - MODEL BA



Code	Ø	EW	FL	MR	øCD	L	XD	Weight [g]
W0950322004	32	26	22	11	10	12	232	94
W0950502004	50	32	27	13	12	15	282	220
W0950632004	63	40	32	17	16	20	314	316

Note: Supplied with 4 screws, 4 washers

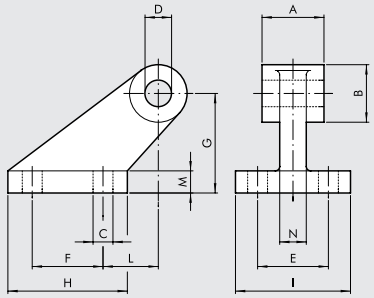
ARTICULATED MALE HINGE - MODEL BAS



Code	Ø	DL	MS	L	XN	øCX	EX	Weight [g]
W0950322006	32	22	16	12	232	10	14	106
W0950502006	50	27	19	15	282	12	16	236
W0950632006	63	32	24	20	314	16	21	336

Note: Supplied with 4 screws, 4 washers

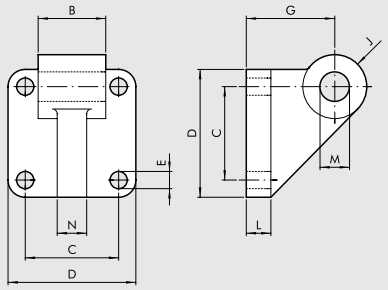
CETOP HINGE FOR MODEL B - MODEL GL



Code	Ø	A	B	C	D	E	F	G	H	I	L	M	N	Weight [g]
W0950322008	32	26	19	7	10	25	20	32	37	41	18	8	10	96
W0950502008	50	32	26	9	12	32	32	45	54	52	25	10	12	212
W0950632008	63	40	33	11	16	40	50	63	75	63	32	12	15	440

Note: Supplied with 4 screws, 4 washers

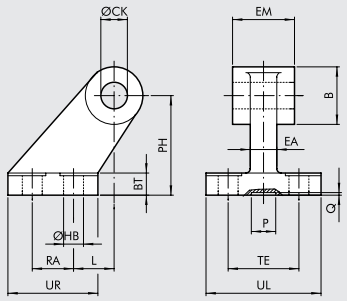
ISO HINGE FOR MODEL B - MODEL GS



Code	Ø	B	C	D	E	G	J	L	M	N	Weight [g]
W0950322108	32	25.5	32.5	45	7	32	11	10	10	10	106
W0950502108	50	31.5	46.5	65	9	45	13	12	12	12	252
W0950632108	63	39.5	56.5	75	9	50	17	12	16	15	350

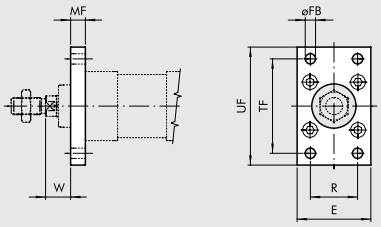
Note: Supplied with 4 screws, 4 washers

ISO 15552 HINGE FOR MODEL B - MODEL AB7



Code	Ø	EM	B	ØHB	ØCK	TE	RA	PH	UR	UL	L	M	EA	P	Q
W0950322017	32	26	20	6.6	10	38	18	32	31	51	3	8	10	21	3
W0950502017	50	32	26	9	12	50	30	45	45	65	3	12	16	21	3
W0950632017	63	40	30	9	16	52	35	50	50	67	2	12	16	21	3

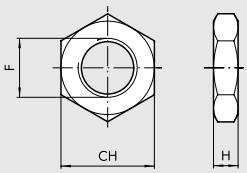
FRONT FLANGE - MODEL C



Code	Ø	TF	UF	E	MF	R	øFB	W	Weight [g]
W0950322002	32	64	80	50	10	32	7	16	246
W0950502002	50	90	110	65	12	45	9	25	522
W0950632002	63	100	120	75	12	50	9	25	670

Note: Supplied with 4 screws

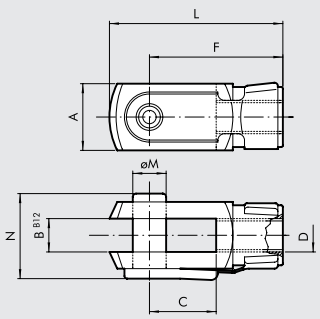
ROD NUT - MODEL S



Code	Ø	F	H	CH	Weight [g]
0950322010	32	M10x1.25	6	17	6
0950502010	50	M16x1.5	8	24	20
0950502010	63	M16x1.5	8	24	20

Note: Individually packed

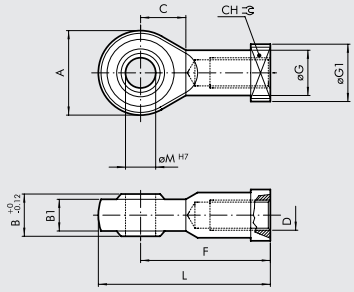
FORK MODEL GK-M



Code	Ø	øM	C	B	A	L	F	D	N	Weight [g]
W0950322020	32	10	20	10	20	52	40	M10x1.25	26	92
W0950502020	50	16	32	16	32	83	64	M16x1.5	40	340
W0950502020	63	16	32	16	32	83	64	M16x1.5	40	340

Note: Individually packed

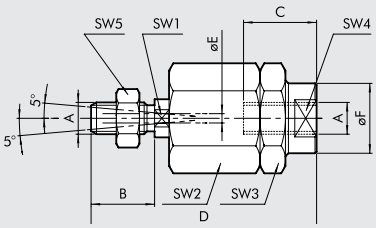
ROD EYE - MODEL GA-M



Code	Ø	øM	C	B1	B	A	L	F	D	øG	CH	øG1	Weight [g]
W0950322025	32	10	15	10.5	14	28	57	43	M10x1.25	15	17	19	78
W0950502025	50	16	22	15	21	42	85	64	M16x1.5	22	22	22	226
W0950502025	63	16	22	15	21	42	85	64	M16x1.5	22	22	22	226

Note: Individually packed

SELF ALIGNING ROD COUPLER - MODEL GA-K

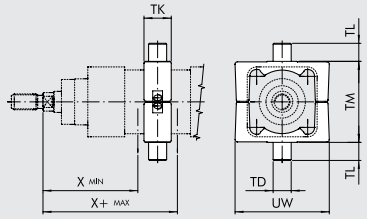


Code	Ø	A	B	C	D	øF	øE	SW_1	SW_2	SW_3	SW_4	SW_5	Weight [g]
W0950322030	32	M10x1.25	20	20	71	22	4	12	30	30	19	17	216
W0950502030	50	M16x1.5	32	32	103	32	4	20	41	41	30	24	620
W0950502030	63	M16x1.5	32	32	103	32	4	20	41	41	30	24	620

Note: Individually packed

INTERMEDIATE HINGE - MODEL EN

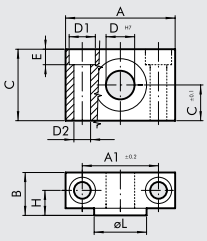
+ = ADD THE STROKE



Code	Ø	$X_{(min)}$	$X_{(max)}$ IN LINE	$X_{(max)}$ GEARED	TM	TL	TD_{e9}	TK	UW	Weight [g]
0950322107	32	63	123	*	50	12	12	22	65	170
0950502107	50	83	148	*	75	16	16	28	95	580
0950632107	63	88	163	*	90	20	20	36	105	950

* Depending on motor length
Note: Supplied with 8 grub screws, 2 pins

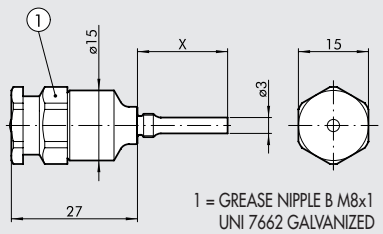
COUNTER-HINGE FOR MODEL EN - MODEL EL



Code	Ø	A	A_1	B	C	C_1	D_1	D_2	D	E	H	øL	Weight [g]
W0950322009	32	46	32	18	30	15	11	7	12	6.5	10.5	22	162
W0950402009	50	55	36	21	36	18	15	9	16	8.5	12	28	278
W0950632009	63	65	42	23	40	20	18	11	20	10.5	13	35	414

Note: Supplied with 4 securing screws

GREASING NEEDLE

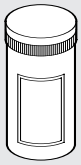


1 = GREASE NIPPLE B M8x1
UNI 7662 GALVANIZED

Code	Ø	X
0950327108	32	12
0950507108	50	19.3
0950637108	63	23.6

Note: Individually packed

GREASE



Code	Description	Weight [g]
9910506	Grease pipe RHEOLUBE 363 AX1	400

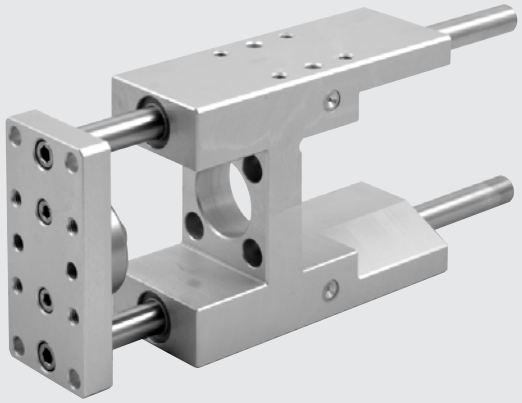
ACCESSORIES FOR ELECTRIC CYLINDER SERIES ELEKTRO ISO 15552: GUIDE UNITS

Guide units series DH-DM ensure optimal alignment and anti-rotation effect of the pneumatic cylinder connected to it. The guide units can be used separately or combined in order to get complete handling units, in which case the guide units can be coupled using the type A and C anchorage (pin and flange).
The guide units can be coupled to electric cylinder serie elektro ISO 15552.
The following versions are available:
H PROFILE*: for high loads (GDH)
H PROFILE**: for high speeds (GDM)

STANDARD STROKES: 50 - 100 - 150 - 200 - 250 - 320 - 400 - 500

NOTE: The guide units must only be used with anti-rotation cylinders.

* Bronze guide bushings
** Ball guide bushings



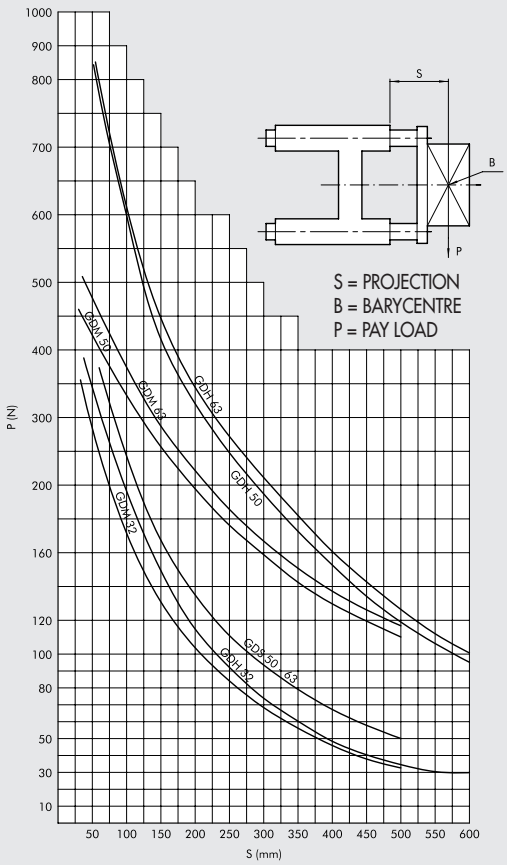
COMPONENTS

SERIES GDH	Body:	aluminium alloy
	Guide bushing:	self-lubricating sintered bronze and wiper rings
	Piston rod:	chromed rolled steel
SERIES GDM	Body:	aluminium alloy
	Guide bushing:	ball linear bearings and scraper ring
	Piston rod:	tempered stainless steel

WEIGHT

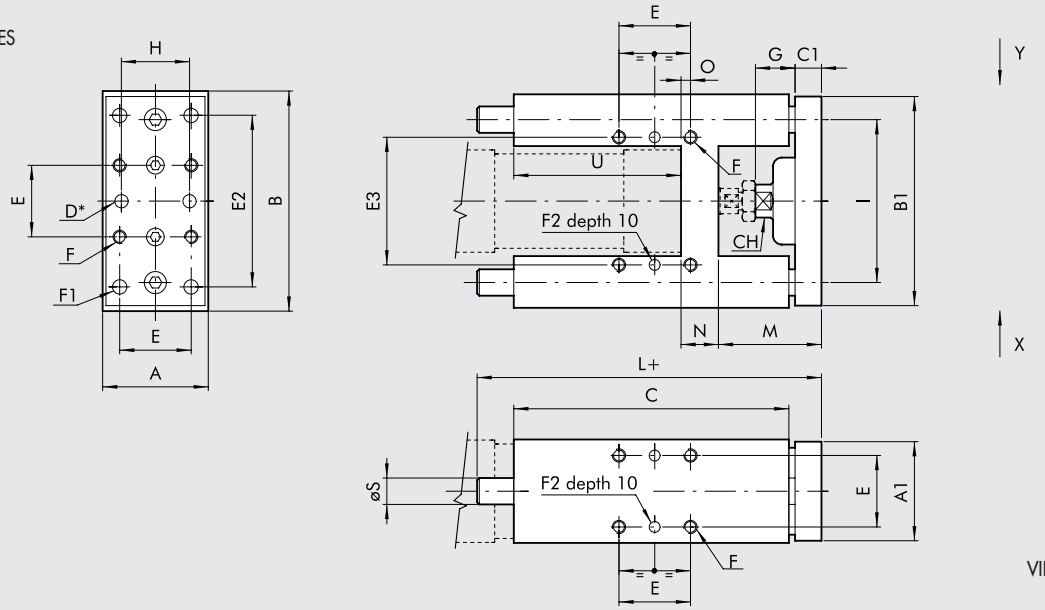
Ø	Weight [g] Stroke = 0	Weight [g] each mm
32	1200	1.76
50	3300	4.9
63	4750	4.9

GRAPH OF GUIDE UNIT LOADS



DIMENSIONS TYPE GDH-GDM

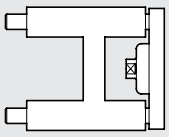
+ = ADD THE STROKE
✱ = CENTERING PINHOLES



Ø	A	A_1	B	B_1	C	C_1	CH	D^{H7}	E	E_2	E_3	F	F_1	F_2^{H7}	G	H	I	L	M	N	O	Ø S	U
32	49	45	97	90	125	12	13	6	32.5	78	61	M6	6.5	6	18	31	74	177	47	17	4.3	12	76
50	69	63	137	130	148	15	22	6	46.5	100	85	M8	8.5	6	24	45	104	205	63	26	18.5	20	78
63	85	79	152	145	182	15	22	6	56.5	105	100	M8	8.5	6	24	45	119	237	62	26	15.3	20	111

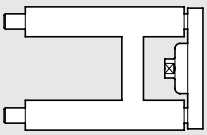
ORDER CODE GUIDE UNIT

Version	Code	Bore	Type
Sliding on bronze bushings (GDH)	**W 0700322...**	32	UNIT MW DH 032...
	W 0700502...	50	UNIT MW DH 050...
	W 0700632...	63	UNIT MW DH 063...



Note: To complete the type and code, add the 3-digit stroke (e.g. 50=050)

Sliding on ball bearing (GDM)	**W 0700323...**	32	UNIT MW DM 032...
	W 0700503...	50	UNIT MW DM 050...
	W 0700633...	63	UNIT MW DM 063...

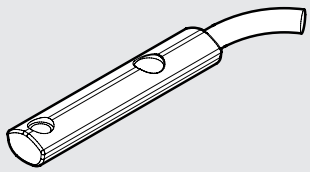


Note: To complete the type and code, add the 3-digit stroke (e.g. 50=050)

ACCESSORIES FOR ELECTRIC CYLINDER SERIES ELEKTRO ISO 15552: MAGNETIC SENSORS

RETRACTABLE SENSOR WITH INSERTION FROM ABOVE

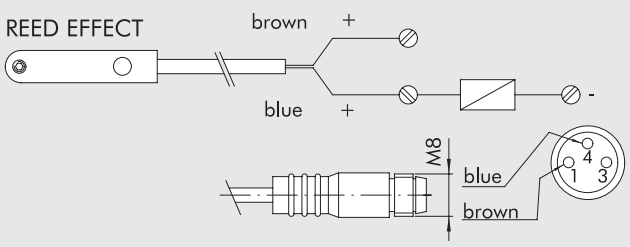
Code	Description
W0952025390	HALL NO sensor, vertical insertion 2.5 m
W0952029394	HALL NO sensor, vertical insertion 300 mm M8
W0952022180	REED NO sensor, vertical insertion 2.5 m
W0952028184	REED NO sensor, vertical insertion 300 mm M8
W0952125556	HALL NO sensor, vertical insertion 2 m ATEX
W0952025500*	HALL NO sensor, vertical insertion HS 2.5 m
W0952029504*	HALL NO sensor, vertical insertion HS 300 mm M8
W0952022500*	REED NO sensor, vertical insertion HS 2.5 m
W0952128184*	REED NO sensor, vertical insertion HS 300 mm M8

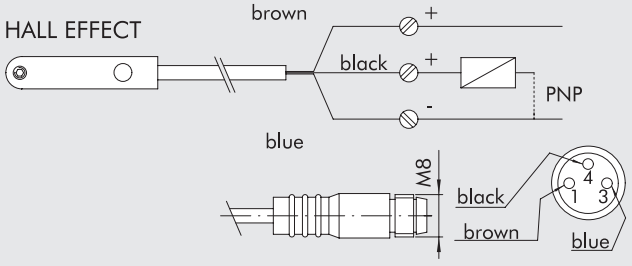


*** For use when standard sensors do not detect the magnet, e.g. near metal masses.**

TECHNICAL DATA				ATEX
		REED	HALL EFFECT	HALL EFFECT
Type of contact		N.O.	N.O.	N.O.
Switch		-	PNP	PNP
Supply voltage (Ub)	V	from 10 to 30 AC/DC	from 10 to 30 DC	from 18 to 30 DC
Power	W	3 (peak valve = 6)	3	≤ 1.7
Voltage variation		-	≤ 10% of Ub	≤ 10% of Ub
Voltage drop	V	-	≤ 2	≤ 2.2
Input current	mA	-	≤ 10	≤ 10
Output current	mA	≤ 100	≤ 100	≤ 70
Switching frequency	Hz	≤ 400	≤ 5000	1000
Short-circuit protection		-	Yes	Yes
Over-voltage suppression		-	Yes	Yes
Polarity inversion protection		-	Yes	Yes
EMC		EN 60 947-5-2	EN 60 947-5-2	EN 60 947-5-2
LED display		Yellow	Yellow	Yellow
Magnetic sensitivity		2.8 mT ± 25%	2.8 mT ± 25%	2.6
		1.9 mT ± 20% (for HS)	2.1 mT ± 20% (for HS)	-
Repeatability		≤ 0.1 mT	≤ 0.1 mT	≤ 0.1 (Ub and ta fixed)
Degree of protection (EN 60529)		IP 67	IP 67	IP 68, IP 69K
Vibration and shock resistance		30 g, 11 ms, from 10 to 55 Hz, 1 mm	30 g, 11 ms, from 10 to 55 Hz, 1 mm	30 g, 11 ms, 10 from to 55 Hz, 1 mm
Temperature range	°C	from -25 to +75	from -25 to +75	from -20 to +45
Sensor capsule material		PA66 + PA6I/6T	PA66 + PA6I/6T	PA
2.5 m/2 m connecting cable		PVC; 2 x 0.12 mm²	PVC; 3 x 0.14 mm²	PVC; 3 x 0.12 mm²
Connecting cable with M8x1		Polyurethane; 2 x 0.14 mm²	Polyurethane; 3 x 0.14 mm²	-
Wire NO.		2	3	3
Category ATEX		-	-	Ex II 3G EEx nA II T4 X/Ex II 3D T1 35°C IP 67
Certifications		CE	CE	CE cULus Ex

WIRING DIAGRAM

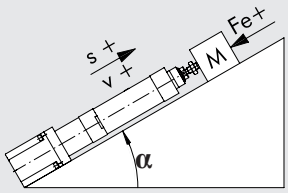




CALCULATIONS FOR CHOOSING AN ELECTRIC CYLINDER

When choosing an electric cylinder, it is necessary to follow a set procedure.
First you need to determine the following for each stage of the operating cycle (piston rod extension, any pause time, retraction, and so on):
- piston rod stroke
- stroke time available
- cylinder inclination with respect to the horizontal axis
- mass to move
- any coefficient of friction between mass and surface
- external forces to overcome

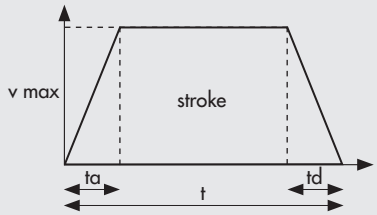
Using these values you can choose one or more cylinders suitable for the purpose based on piston rod thrust and load velocity.
When a force needs to be exerted with the piston rod still (e.g. to create a locking vice), a BRUSHLESS motor must be chosen, because STEPPING motors are not suitable. Both BRUSHLESS and STEPPING motors are suitable in other cases.
Once the electric cylinder (including motor and drive) has been chosen, you can make a detailed assessment of it based on the inertia of the moving part of the cylinder and the motor that are not known beforehand.



CALCULATION METHOD FOR BRUSHLESS MOTORS

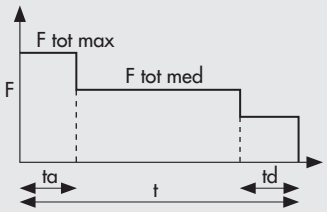
Denomination		Unit of measurement	Formula	Example
M	Mass to move	kg		60
s	Displacement	mm		300
t	Total time	s		1
ta	Acceleration time	s		0.2
td	Deceleration time	s		0.2
α	Angle of inclination	°		90
μ	Coefficient of friction			0
Fp	Weight force	N	$M \cdot 9.81 \cdot \text{sine } \alpha$	$60 \cdot 9.81 \cdot \text{sine } 90 = 590$
Fμ	Friction	N	$M \cdot 9.81 \cdot \mu \cdot \cos \alpha$	$60 \cdot 9.81 \cdot \cos 90 = 0$
Fe	Other external forces	N		40

1- Determination of maximum velocity and maximum acceleration



Denomination		Unit of measurement	Formula	Example
v max	Maximum piston rod velocity	mm/s	$\frac{s}{t - \frac{(ta + td)}{2}}$	$\frac{300}{1 - \frac{(0.2 + 0.2)}{2}} = 375$
a	Piston rod acceleration and deceleration	mm/s^2	$\frac{v\,max}{ta}$	$\frac{375}{0.2} = 1875$
Fi	Force of inertia of the mass	N	$\frac{M \cdot a}{1000}$	$\frac{60 \cdot 1875}{1000} = 113$
Ftot	Total force - In acceleration - At constant v - In deceleration	N	∑ F on the piston rod | Fp + Fe + Fi + Fμ | | Fp + Fe + Fμ | | Fp + Fe - Fi + Fμ |	 | 590 + 40 + 113 + 0 | = 743 | 590 + 40 + 0 | = 630 | 590 + 40 - 113 + 0 | = 517
The calculation assumes the load is raised. In descent it would be:				
Ftot	Total force - In acceleration - At constant v - In deceleration	N	∑ F on the piston rod | - Fp - Fe + Fi + Fμ | | - Fp - Fe + Fμ | | - Fp - Fe - Fi + Fμ |	 | - 590 - 40 + 113 + 0 | = 517 | - 590 - 40 + 0 | = 630 | - 590 - 40 - 113 + 0 | = 743

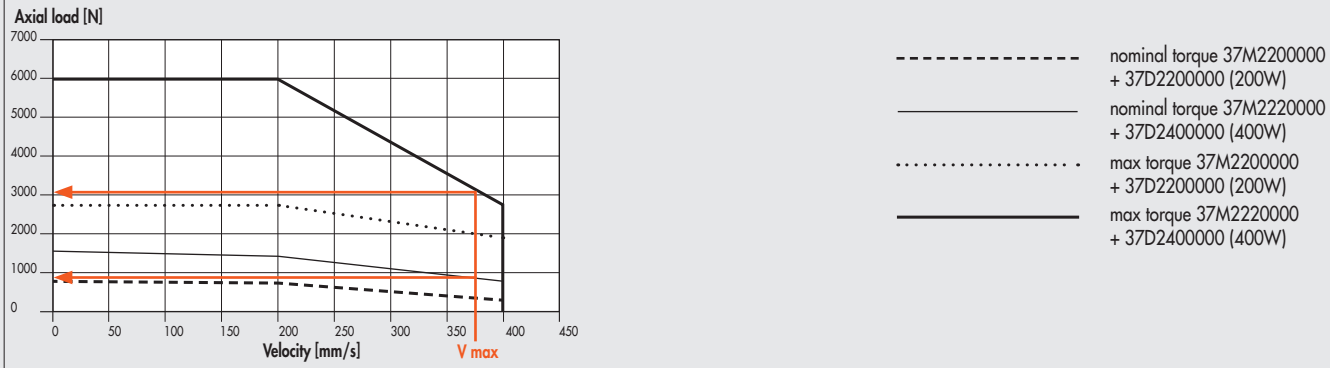
2 - Algebraic sum of the forces on the piston rod



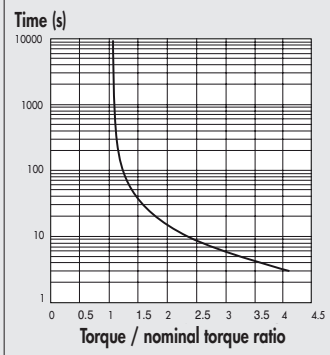
3 - Choosing an electric cylinder

The choice is made using the diagrams in the catalogue, which express the axial force as a function of velocity.
Check that:
- the electric cylinder can deliver the maximum total force (F tot max) during acceleration (short period)
- the electric cylinder can deliver the mean total force (F tot med) during movement at a constanct velocity
- the cylinder can reach the maximum velocity required

For example, you can choose the **Ø 32 cylinder with Ø 12 pitch 4 screw driven by a BRUSHLESS motor (37M2220000) and 400 W drive (37D2400000)**.



BRUSHLESS motors can, for short periods, deliver torques exceeding nominal torques.
The diagram below shows the ratio of maximum current and nominal input current (and hence maximum torque and nominal torque) and the duration of the possible overload.



Denomination	Unit of measurement	Formula	Example
Verification of F tot max	N	F available > Fp + Fe + Fi + Fμ (for a short period, upper curve)	3100 ≥ 743
Verification of F tot med	N	F available > Fp + Fe + Fμ (at steady rate, lower curve)	850 ≥ 630
Verification of v max	mm/s	v available > v max	400 ≥ 375

4 - Verification of the choice made

Having chosen the electric cylinder, you now know the data required to test it on the drive shaft.

Denomination data		Unit of measurement	Formula	Example
pitch	Screw pitch	mm		4
n max	Maximum number of motor revs	rpm	$\frac{v\ max \cdot 60}{pitch}$	$\frac{375 \cdot 60}{4} = 5625$
ώ	Maximum angular acceleration of the motor	rad/s²	$\frac{a \cdot 2\pi}{pitch}$	$\frac{1875 \cdot 2\pi}{4} = 2944$

Moments of mass inertia

		32		50			63		
Worm screw pitch	mm	4	12.7	5	10	16	5	10	20
J0 at stroke 0	kgmm²	1.3262	2.7700	4.7542	6.1360	9.1113	12.4043	14.8767	23.5427
J1 per metre of stroke	kgmm²/m	10.4223	19.4430	33.9380	38.5264	49.1936	86.9290	96.6652	116.3671
J2 per kg of load	kgmm²/kg	0.4053	4.0858	0.6333	2.5332	6.4849	0.6333	2.5332	10.1327

The moment of inertia of total mass Jtot is: Jtot = J0 + J1 x stroke [m] + J2 x load [kg]

Denomination data		Unit of measurement	Formula	Example
J tot'	Moment of inertia of the moving parts of the cylinder	kgmm²	$J0 + J1 \cdot \frac{s}{1000}$	$1.3 + 10.4 \cdot \frac{300}{1000} = 4.4$
J tot"	Moment of inertia for acceleration of the mass reduced at the motor	kgmm²	J2 · M	0.4 · 60 = 24
J mot.	Moment of inertia of the motor	kgmm²	Motor specifications	41.2
J rid	Total moment of inertia reduced at the motor	kgmm²	J tot' + J tot" + J mot.	4.4 + 24 + 41.2 = 69.6
C acc	Torque required to overcome inertia during acceleration	Nm	$\frac{J\ rid \cdot ώ}{1 \cdot 10E6}$	$\frac{69.6 \cdot 2944}{1 \cdot 10E6} = 0.2$

Weights

		32		50			63		
Worm screw pitch (p)	mm	4	12.7	5	10	16	5	10	20
Weight at stroke 0	g	875	928	1990	2084	2086	2942	3209	3056
Additional weight per mm of stroke	g	3.94		6.64	6.56	6.55	6.25	6.32	6.32
Moving mass at stroke 0 (non-rotating version)	g	246	304	591	696	703	956	1215	1067
Additional moving mass per mm of stroke	g	1.25		1.84			1.98		

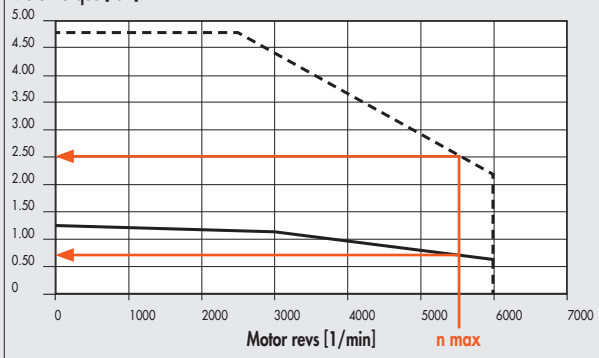
The weight of the moving parts of the cylinder (piston rod, piston, etc.) that the cylinder has to support must also be taken into consideration.

Denomination data		Unit of measurement	Formula	Example
Mc	Mass of the components	kg		0.246 + 0.00125 · 300 = 0.6
Fpc	Weight of the components	N	Mc · 9.81 · sine α	0.6 · 9.81 · sine 90 = 5.8
C car	Torque required to overcome friction, loads and external forces (consider a system efficiency of 0.8)	Nm	$\frac{pitch \cdot (Fp + Fpc + Fe + Fμ)}{2\pi \cdot 0.8 \cdot 1000}$	$\frac{4 \cdot (590 + 5.8 + 40 + 0)}{2\pi \cdot 0.8 \cdot 1000} = 0.5$
C tot	Total torque required	Nm	C acc + C car	0.2 + 0.5 = 0.7

At this stage just check that: - the motor can deliver C tot during acceleration (short period)
- the motor can deliver C car during movement at a constant velocity

BRUSHLESS motor code **37M2220000** + drive code **37D2400000** (400W)

Motor torque [Nm]



nominal torque 37M2220000 + 37D2400000 (400W)

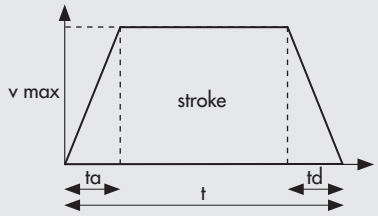
maximum torque 37M2220000 + 37D2400000 (400W)

Denomination data	Unit of measurement	Formula	Example
Verification of C tot	Nm	C available > C tot (for a short period, upper curve)	2.5 ≥ 0.7
Verification of C car	Nm	C available > C car (at steady rate, lower curve)	0.7 ≥ 0.5

CALCULATION METHOD FOR STEPPING MOTORS

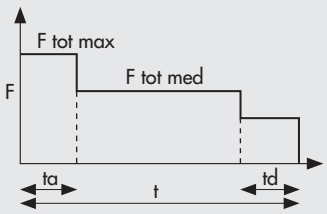
Denomination data		Unit of measurement	Formula	Example
M	Mass to move	kg		60
s	Displacement	mm		300
t	Total time	s		2
ta	Acceleration time	s		0.2
td	Deceleration time	s		0.2
α	Angle of inclination	°		0
μ	Coefficient of friction			0.1
Fp	Weight force	N	$M \cdot 9.81 \cdot \text{sine } \alpha$	$60 \cdot 9.81 \cdot \text{sine } 0 = 0$
Fμ	Friction	N	$M \cdot 9.81 \cdot \mu \cdot \cos \alpha$	$60 \cdot 9.81 \cdot 0.1 \cdot \cos 0 = 60$
Fe	Other external forces	N		40

1 - Determination of maximum velocity and maximum acceleration



Denomination data		Unit of measurement	Formula	Example
v max	Maximum piston rod velocity	mm/s	$\frac{s}{t - \frac{(ta + td)}{2}}$	$\frac{300}{2 - \frac{(0.2 + 0.2)}{2}} = 167$
a	Piston rod acceleration and deceleration	mm/s^2	$\frac{v\ max}{ta}$	$\frac{167}{0.2} = 835$
Fi	Force of inertia	N	$\frac{M \cdot a}{1000}$	$\frac{60 \cdot 835}{1000} = 50$
Ftot	Total force - In acceleration - At constant v - In deceleration	N	∑ F on the piston rod | Fp + Fe + Fi + Fμ | | Fp + Fe + Fμ | | Fp + Fe - Fi + Fμ |	 | 0 + 40 + 50 + 60 | = 150 | 0 + 40 + 60 | = 100 | 0 + 40 - 50 + 60 | = 50

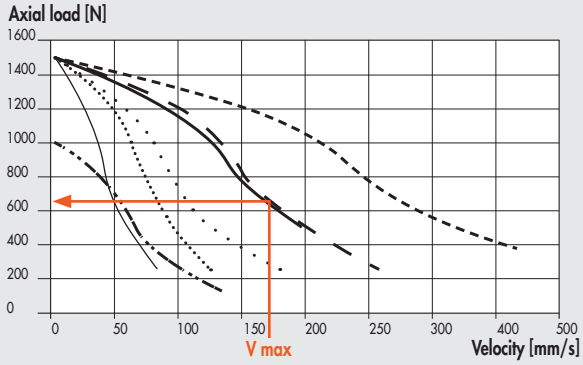
2 - Algebraic sum of the forces on the piston rod

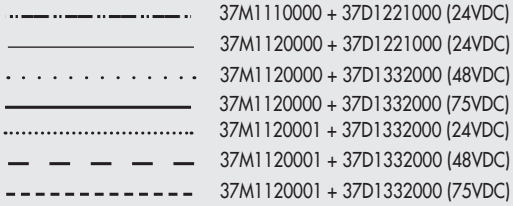


3 - Choosing an electric cylinder

The choice is made using the diagrams in the catalogue, which express the axial force as a function of velocity.
Check that: - the electric cylinder can deliver the maximum total force during acceleration (up to maximum speed)
- the cylinder can reach the maximum velocity required

For example, you can choose the **Ø 32 cylinder with Ø 12 pitch 4 screw driven by a STEPPING motor (37M1120001) and 48V DC drive (37D1332000)**.





Denomination data	Unit of measurement	Formula	Example
Verification of Ftot max	N	F available > Fp + Fe + Fi + Fμ	650 ≥ 150
Verification of v max	mm/s	v available > v max	250 ≥ 167

4 - Verification of the choice made

Having chosen the electric cylinder, you now know the data required to test it on the drive shaft.

Denomination data		Unit of measurement	Formula	Example
pitch	Screw pitch	mm		4
n max	Maximum number of motor revs	rpm	$\frac{v\ max \cdot 60}{pitch}$	$\frac{167 \cdot 60}{4} = 2505$
ώ	Maximum angular acceleration of the motor	rad/s²	$\frac{a \cdot 2\pi}{pitch}$	$\frac{835 \cdot 2\pi}{4} = 1311$

Moments of mass inertia

		32		50			63		
Worm screw pitch	mm	4	12.7	5	10	16	5	10	20
J0 at stroke 0	kgmm²	1.3262	2.7700	4.7542	6.1360	9.1113	12.4043	14.8767	23.5427
J1 per metre of stroke	kgmm²/m	10.4223	19.4430	33.9380	38.5264	49.1936	86.2990	96.6652	116.3671
J2 per kg of load	kgmm²/kg	0.4053	4.0858	0.6333	2.5332	6.4849	0.6333	2.5332	10.1327

The moment of inertia of total mass Jtot is: Jtot = J0 + J1 x stroke [m] + J2 x load [kg]

Denomination data		Unit of measurement	Formula	Example
J tot'	Moment of inertia of the moving parts of the cylinder	kgmm²	$J0 + J1 \cdot \frac{s}{1000}$	$1.3 + 10.4 \cdot \frac{300}{1000} = 4.4$
J tot"	Moment of inertia for acceleration of the mass reduced at the motor	kgmm²	J2 · M	0.4 · 60 = 24
J mot.	Moment of inertia of the motor	kgmm²	Motor specifications	36
J rid	Total moment of inertia reduced at the motor	kgmm²	J tot' + J tot" + J mot.	4.4 + 24 + 36 = 64.4
C acc	Torque required to overcome inertia during acceleration	Nm	$\frac{J\ rid \cdot ώ}{1 \cdot 10E6}$	$\frac{64.4 \cdot 1311}{1 \cdot 10E6} = 0.1$

Weights

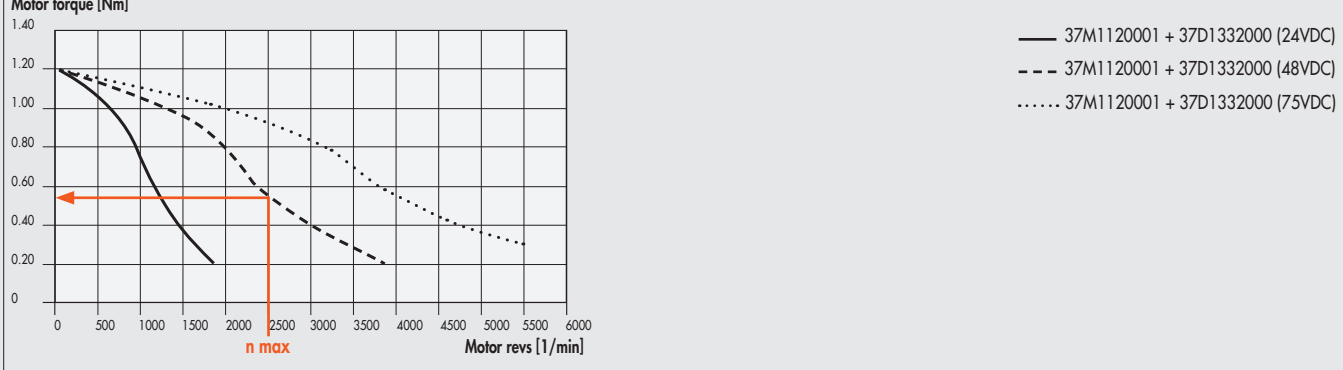
		32		50			63		
Worm screw pitch (p)	mm	4	12.7	5	10	16	5	10	20
Weight at stroke 0	g	875	928	1990	2084	2086	2942	3209	3056
Additional weight per mm of stroke	g	3.94		6.64	6.56	6.55	6.25	6.32	6.32
Moving mass at stroke 0 (non-rotating version	g	246	304	591	696	703	956	1215	1067
Additional moving mass per mm of stroke	g	1.25		1.84			1.98		

The weight of the moving parts of the cylinder (piston rod, piston, etc.) that the cylinder has to support must also be taken into consideration.

Denomination data		Unit of measurement	Formula	Example
Mc	Mass of the components	kg		0.246 + 0.00125 · 300 = 0.6
Fpc	Weight of the components	N	Mc · 9.81 · sine α	0.6 · 9.81 · sine 0 = 0
C car	Torque required to overcome friction, loads and external forces (consider a system efficiency of 0.8)	Nm	$\frac{pitch \cdot (Fp + Fpc + Fe + Fμ)}{2 \cdot \pi \cdot 0.8 \cdot 1000}$	$\frac{4 \cdot (0 + 0 + 40 + 60)}{2\pi \cdot 0.8 \cdot 1000} = 0.1$
C tot	Total torque required	Nm	C acc + C car	0.2

At this stage just check that the motor can deliver C tot during acceleration (up to maximum speed).

STEPPING motor code **37M1120001** + drive code **37D1332000** (24-48-75VDC)



Denomination data	Unit of measurement	Formula	Example
Verification of C tot	Nm	C available > Ctot	0.55 ≥ 0.2

VERIFICATION OF THE RECIRCULATING BALL SCREW AND THE BEARING

Verification of the recirculating ball screw takes into consideration the maximum axial load and the weighted average axial load.
The peak value of axial load in a movement cycle must not exceed the static axial load Fo shown on the data sheet.
The average axial load in a movement cycle must not exceed the dynamic axial load F shown on the data sheet.
If these conditions are not met, the recirculating ball screw and/or the bearing will be subject to greater wear and hence a shorter life.
The calculation of average axial load takes into consideration movements at constant speed during the cycle (nil acceleration and deceleration) and the respective axial loads on the piston rod.
The Fm value thus calculated is used in the diagrams on pages 5 - 6 – Life characteristics as a function of the mean axial load – to determine the expected life of the cylinder

$$F_m = \sqrt[3]{\sum F_x^3 \times \frac{V_X}{V_m} \times \frac{q}{100}} =$$

$$F_m = \sqrt[3]{F_{x1}^3 \times \frac{V_{X1}}{V_m} \times \frac{q_1}{100} + F_{x2}^3 \times \frac{V_{X2}}{V_m} + \frac{q_2}{100} + F_{x3}^3 \times \frac{V_{X3}}{V_m} \times \frac{q_3}{100} + \ldots}$$

F_x = Axial load at stage x
F_m = Mean forward axial load
F_o = Static axial load of the screw
q = Time segment