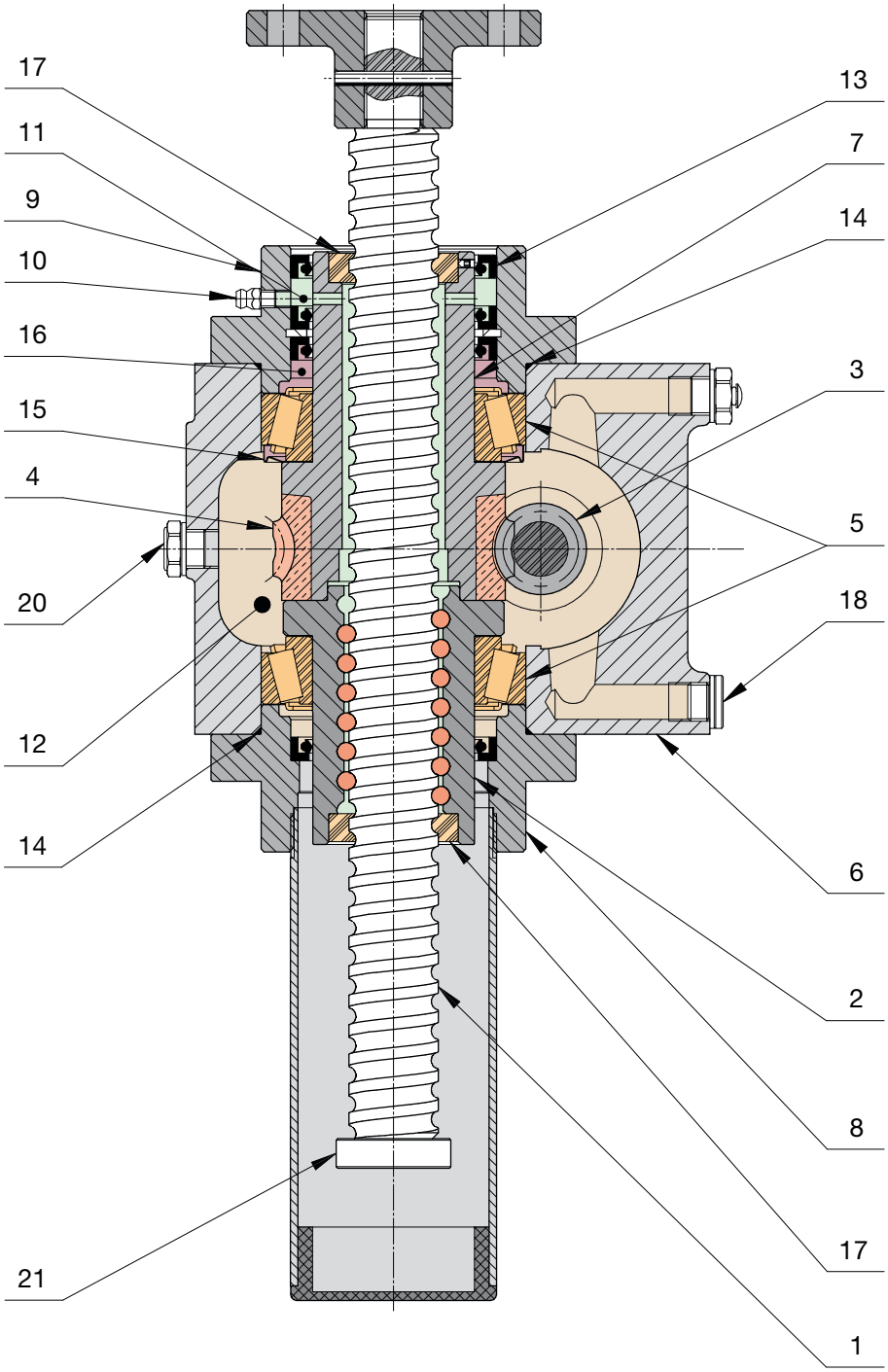
Screw Jacks with travelling ball screw (Mod.A)

2.1 MA BS Series Mod.A - STRUCTURAL ELEMENTS



DESIGN PATENTED

2.1 MA BS Series Mod.A - STRUCTURAL ELEMENTS

1 - ball screw in quenched and tempered alloy steel
2 - ball nut in case-hardened and ground steel with frontal recirculation system that ensures higher performances compared to the radial system, because of greater number of balls which transmit the load
3 - worm with ground ZI involute thread profile (UNI 4760) in case-hardened steel
4 - bronze wormwheel with true involute profile ZI (UNI 4760)
5 - taper roller bearings that provide system high stiffness and allow to maximize the ball screw diameter thanks to the minimum radial size
6 - gear box shape which allows effective heat dissipation and 100 % duty cycle
7 - cast iron support of the worm wheel rim
8 - bottom cover with outer diameter in tolerance **g7**, it can be used for the screw jack centring
9 - top cover with re-lubrication system for the ball screw: through the grease nipple (10) it is possible to put in grease which goes through the lubrication pipe (11) and reaches the ball nut. The radial lubricant seals (13) and the sealing scrapers (17) ensure the seal and create a lubricant reserve for the ball nut. This system allows to keep the ball nut constantly lubricated increasing its life.
10 - grease nipple
11 - lubrication pipe
12 - synthetic oil lubricated worm gearbox for a better heat dissipation; this allows higher input speed, improved efficiency and a longer life
13 - radial lubricant seal
14 - O-ring as lubricant seal
15 - NILOS seal which allows to create a chamber for the lubricant (16) of the upper bearing, that would otherwise be sparsely lubricated because not reached by the gear oil; the seal is used only in case of vertical mounting position
16 - bearing lubricant chamber
17 - sealing scraper
18 - oil drain plug
19 - breather
20 - oil level plug
21 - ball screw stop nut

2.2 MA BS Series Mod.A - TECHNICAL DATA

SIZE			MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS
Load capacity [kN], (push - pull)			**5**	**10**	**25**	**50**
Ball screw diameter [mm]			20	25	32	40
Worm gear centre distance [mm]			30	40	50	63
Ratio	fast	RV	1 : 4 (4 : 16)	1 : 5 (4 : 20)	1 : 6 (4 : 24)	1 : 7 (4 : 28)
	normal	RN	1 : 16 (2 : 32)	1 : 20	1 : 18 (2 : 36)	1 : 14 (2 : 28)
	slow	RL	1 : 24	1 : 25	1 : 24	1 : 28
Ball screw code “1”	Diameter × Lead		16 × 5	25 × 5	32 × 10	40 × 10
	Ball [mm]		3.175 (1/8”)	3.175 (1/8”)	6.350 (1/4”)	6.350 (1/4”)
	Accuracy grade (1)		IT 7	IT 7	IT 7	IT 7
	Number of starts		1	1	1	1
	Number of circuits		5	5	5	5
	C_a [kN]		12.9	16.9	44.8	52
	C_{0a} [kN]		20.9	36.4	83	111
Stroke [mm] for 1 input shaft revolution	Ratio	RV	1.25	1.00	1.67	1.43
		RN	0.31	0.25	0.56	0.71
		RL	0.21	0.20	0.42	0.36
Ball screw code “2”	Diameter × Lead		16 × 10	25 × 10	32 × 20	40 × 20
	Ball [mm]		3.175 (1/8”)	3.969 (5/32”)	6.350 (1/4”)	6.350 (1/4”)
	Accuracy grade (1)		IT 7	IT 7	IT 7	IT 7
	Number of starts		1	1	1	1
	Number of circuits		3	3	3	3
	C_a [kN]		8.6	14.2	29.8	34.3
	C_{0a} [kN]		13.3	25.8	53	70
Stroke [mm] for 1 input shaft revolution	Ratio	RV	2.50	2	3.33	2.86
		RN	0.63	0.50	1.11	1.43
		RL	0.42	0.40	0.83	0.71
Housing material			casting in aluminium alloy EN 1706 - AC-AlSi10Mg T6		casting in spheroidal graphite iron EN-GJS-500-7 (UNI EN 1563)	
Mass of screw jack without ball screw [kg]			2.2	4.3	13	26
Mass for every 100 mm of ball screw [kg]			0.14	0.35	0.57	0.91

(1) - on request, ball screws with accuracy grade IT 5 or IT 3 can be supplied

Ball screw code “3” **on request**	Diameter × Lead	16 × 16	25 × 25	32 × 32	40 × 40
	Ball [mm]	3.175 (1/8”)	3.175 (1/8”)	6.35 (1/4”)	6.35 (1/4”)
	Accuracy grade	IT 7	IT 7	IT 7	IT 7
	Number of starts	2	2	2	2
	Number of circuits	2	2	2	2
	C_a [kN]	10.0	13.1	35.0	40.3
	C_{0a} [kN]	14.5	25.2	58	77

2.2 MA BS Series Mod.A - TECHNICAL DATA

MA 100 BS	MA 150 BS	MA 200 BS	MA 350 BS	SIZE	
100	150	200	350	Load capacity [kN], (push - pull)	
50	63	80	100	Ball screw diameter [mm]	
80	80	100	125	Worm gear centre distance [mm]	
1 : 8 (4 : 32)	1 : 8 (4 : 32)	1 : 8 (4 : 32)	3 : 32	RV fast	Ratio
1 : 24	1 : 24	1 : 24	1 : 16 (2 : 32)	RN normal	
1 : 32	1 : 32	1 : 32	1 : 32	RL slow	
50 × 10	63 × 10	80 × 10	100 × 16	Diameter × Lead	Ball screw code “1”
7.144 (9/32”)	7.144 (9/32”)	7.144 (9/32”)	9.525 (3/8”)	Ball [mm]	
IT 5	IT 5	IT 5	IT 5	Accuracy grade ([1])	
1	1	1	1	Number of starts	
7	6	6	6	Number of circuits	
107	117	132	189	C_a [kN]	
271	340	448	638	C_{0a} [kN]	
1.25	1.25	1.25	1.50	RV	Stroke [mm] for 1 input shaft revolution
0.42	0.42	0.42	1.00	RN Ratio	
0.31	0.31	0.31	0.50	RL	
50 ×20	63 × 20	80 × 20	100 × 20	Diameter × Lead	Ball screw code “2”
7.144 (9/32”)	9.525 (3/8”)	12.700 (1/2”)	12.700 (1/2”)	Ball [mm]	
IT 5	IT 5	IT 5	IT 5	Accuracy grade ([1])	
1	1	1	1	Number of starts	
4	5	5	6	Number of circuits	
64	122	228	312	C_a [kN]	
147	292	585	963	C_{0a} [kN]	
2.50	2.50	2.50	1.87	RV	Stroke [mm] for 1 input shaft revolution
0.83	0.83	0.83	1.25	RN Ratio	
0.63	0.63	0.63	0.62	RL	
casting in spheroidal graphite iron EN-GJS-500-7 (UNI EN 1563)				Housing material	
48	48	75	145	Mass of screw jack without ball screw [kg]	
1.44	2.26	3.70	6.16	Mass for every 100 mm of ball screw [kg]	

([1]) - on request, ball screws with accuracy grade IT 3 can be supplied

2.3 MA 5 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v, torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 16 × 5							LOAD																	
							5 kN						4 kN						3 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	62.5	15.6	10.4	1.20	0.38	0.32	1.45	0.46	0.41	0.13	0.30	0.09	1.16	0.37	0.33	0.10	0.24	0.08	0.87	0.27	0.24	0.08	0.18	0.06
1 500	31.3	7.8	5.2	0.87	0.25	0.23	1.50	0.24	0.43	0.07	0.33	0.05	1.20	0.19	0.34	0.05	0.26	0.04	0.90	0.14	0.26	0.04	0.20	0.03
1 000	20.8	5.2	3.5	0.67	0.20	0.17	1.52	0.16	0.44	0.05	0.34	0.04	1.21	0.13	0.36	0.04	0.27	0.03	0.91	0.10	0.27	0.03	0.20	0.02
750	15.6	3.9	2.6	0.57	0.17	0.15	1.54	0.12	0.46	0.04	0.35	0.03	1.23	0.10	0.37	0.03	0.28	0.02	0.92	0.07	0.27	0.02	0.21	0.02
500	10.4	2.6	1.7	0.43	0.13	0.12	1.55	0.08	0.47	0.02	0.36	0.02	1.24	0.07	0.38	0.02	0.29	0.02	0.93	0.05	0.28	0.01	0.22	0.01
300	6.3	1.6	1.0	0.33	0.09	0.09	1.59	0.05	0.48	0.02	0.38	0.01	1.27	0.04	0.39	0.01	0.31	0.01	0.95	0.03	0.29	0.01	0.23	0.01
100	2.1	0.5	0.3	0.15	0.04	0.04	1.67	0.02	0.52	0.01	0.42	0.00	1.33	0.01	0.42	0.00	0.34	0.00	1.00	0.01	0.31	0.00	0.25	0.00
START.	-	-	-	-	-	-	1.79	-	0.57	-	0.49	-	1.43	-	0.46	-	0.39	-	1.07	-	0.34	-	0.29	-

BS 16 × 10							LOAD																	
							5 kN						4 kN						3 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	125.0	31.3	20.8	1.20	0.38	0.32	2.82	0.89	0.79	0.25	0.58	0.18	2.26	0.71	0.63	0.20	0.47	0.15	1.69	0.53	0.47	0.15	0.35	0.11
1 500	62.5	15.6	10.4	0.87	0.25	0.23	2.92	0.46	0.83	0.13	0.63	0.10	2.33	0.37	0.66	0.10	0.51	0.08	1.75	0.27	0.50	0.08	0.38	0.06
1 000	41.7	10.4	6.9	0.67	0.20	0.17	2.95	0.31	0.86	0.09	0.65	0.07	2.36	0.25	0.69	0.07	0.52	0.05	1.77	0.19	0.52	0.05	0.39	0.04
750	31.3	7.8	5.2	0.57	0.17	0.15	2.98	0.23	0.89	0.07	0.68	0.05	2.39	0.19	0.71	0.06	0.55	0.04	1.79	0.14	0.53	0.04	0.41	0.03
500	20.8	5.2	3.5	0.43	0.13	0.12	3.02	0.16	0.91	0.05	0.71	0.04	2.41	0.13	0.73	0.04	0.56	0.03	1.81	0.09	0.55	0.03	0.42	0.02
300	12.5	3.1	2.1	0.33	0.09	0.09	3.09	0.10	0.94	0.03	0.74	0.02	2.47	0.08	0.75	0.02	0.59	0.02	1.85	0.06	0.56	0.02	0.44	0.01
100	4.2	1.0	0.7	0.15	0.04	0.04	3.24	0.03	1.01	0.01	0.83	0.01	2.59	0.03	0.81	0.01	0.66	0.01	1.94	0.02	0.61	0.01	0.50	0.01
START.	-	-	-	-	-	-	3.47	-	1.11	-	0.95	-	2.78	-	0.89	-	0.76	-	2.08	-	0.67	-	0.57	-

BS 16 × 16							LOAD																	
							5 kN						4 kN						3 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	200.0	50.0	33.3	1.20	0.38	0.32					0.92	0.29	3.58	1.12	1.00	0.31	0.74	0.23	2.68	0.84	0.75	0.24	0.55	0.17
1 500	100.0	25.0	16.7	0.87	0.25	0.23	4.62	0.73	1.32	0.21	1.00	0.16	3.69	0.58	1.05	0.17	0.80	0.13	2.77	0.44	0.79	0.12	0.60	0.09
1 000	66.7	16.7	11.1	0.67	0.20	0.17	4.67	0.49	1.37	0.14	1.03	0.11	3.74	0.39	1.09	0.11	0.83	0.09	2.80	0.29	0.82	0.09	0.62	0.06
750	50.0	12.5	8.3	0.57	0.17	0.15	4.72	0.37	1.40	0.11	1.08	0.09	3.78	0.30	1.12	0.09	0.87	0.07	2.83	0.22	0.84	0.07	0.65	0.05
500	33.3	8.3	5.6	0.43	0.13	0.12	4.78	0.25	1.44	0.08	1.12	0.06	3.82	0.20	1.15	0.06	0.89	0.05	2.87	0.15	0.87	0.05	0.67	0.04
300	20.0	5.0	3.3	0.33	0.09	0.09	4.89	0.15	1.48	0.05	1.17	0.04	3.91	0.12	1.19	0.04	0.94	0.03	2.93	0.09	0.89	0.03	0.70	0.02
100	6.7	1.7	1.1	0.15	0.04	0.04	5.13	0.05	1.60	0.02	1.31	0.01	4.11	0.04	1.28	0.01	1.05	0.01	3.08	0.03	0.96	0.01	0.78	0.01
START.	-	-	-	-	-	-	5.50	-	1.76	-	1.51	-	4.40	-	1.41	-	1.20	-	3.30	-	1.06	-	0.90	-

([1]) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

2.3 MA 5 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:
η_{BS} : ball screw theoretical efficiency
η_R : worm - wormwheel efficiency
η_{CT} : bearings and seals total efficiency

η_{tot}	BS 16 x 5			BS 16 x 10			BS 16 x 16		
n_1 [rpm]	RATIO			RATIO			RATIO		
	RV	RN	RL	RV	RN	RL	RV	RN	RL
3 000	0.74	0.66	0.60	0.77	0.68	0.62	0.77	0.69	0.62
1 500	0.72	0.63	0.55	0.74	0.65	0.57	0.75	0.66	0.57
1 000	0.71	0.61	0.54	0.73	0.63	0.55	0.74	0.63	0.56
750	0.70	0.59	0.51	0.72	0.61	0.53	0.73	0.62	0.53
500	0.70	0.58	0.50	0.72	0.59	0.51	0.72	0.60	0.52
300	0.68	0.56	0.47	0.70	0.58	0.49	0.71	0.58	0.49
100	0.65	0.52	0.42	0.67	0.54	0.44	0.67	0.54	0.44
START.	0.61	0.47	0.37	0.62	0.49	0.38	0.63	0.49	0.38

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (5 kN).

Static braking torque T_F [Nm] with 5 kN			
RATIO	BS 16 x 5	BS 16 x 10	BS 16 x 16
RV	0.8	1.6	2.6
RN	0.2	0.2	0.2
RL	0.2	0.2	0.2

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value $T_{F\,min}$ which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{F\,min} = 0.2\ Nm$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

2.4 MA 10 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v, torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 25 × 5							LOAD																	
							10 kN						8 kN						6 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	50.0	12.5	10.0	2.05	0.85	0.67	2.40	0.75	0.69	0.22	0.56	0.18	1.92	0.60	0.55	0.17	0.45	0.14	1.44	0.45	0.41	0.13	0.34	0.11
1 500	25.0	6.3	5.0	1.49	0.60	0.48	2.45	0.39	0.73	0.12	0.61	0.10	1.96	0.31	0.59	0.09	0.49	0.08	1.47	0.23	0.44	0.07	0.37	0.06
1 000	16.7	4.2	3.3	1.15	0.47	0.38	2.48	0.26	0.77	0.08	0.64	0.07	1.98	0.21	0.62	0.06	0.51	0.05	1.49	0.16	0.46	0.05	0.38	0.04
750	12.5	3.1	2.5	1.08	0.40	0.31	2.51	0.20	0.79	0.06	0.66	0.05	2.01	0.16	0.63	0.05	0.53	0.04	1.50	0.12	0.47	0.04	0.39	0.03
500	8.3	2.1	1.7	0.78	0.32	0.25	2.56	0.13	0.82	0.04	0.69	0.04	2.05	0.11	0.66	0.03	0.55	0.03	1.54	0.08	0.49	0.03	0.41	0.02
300	5.0	1.3	1.0	0.55	0.22	0.18	2.59	0.08	0.87	0.03	0.72	0.02	2.08	0.07	0.70	0.02	0.58	0.02	1.56	0.05	0.52	0.02	0.43	0.01
100	1.7	0.4	0.3	0.26	0.10	0.08	2.72	0.03	0.96	0.01	0.80	0.01	2.18	0.02	0.77	0.01	0.64	0.01	1.63	0.02	0.58	0.01	0.48	0.01
START.	-	-	-	-	-	-	2.94	-	1.09	-	0.91	-	2.35	-	0.88	-	0.73	-	1.76	-	0.66	-	0.55	-

BS 25 × 10							LOAD																	
							10 kN						8 kN						6 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	100.0	25.0	20.0	2.05	0.85	0.67	4.59	1.44	1.32	0.41	1.08	0.34	3.67	1.15	1.05	0.33	0.86	0.27	2.75	0.87	0.79	0.25	0.65	0.20
1 500	50.0	12.5	10.0	1.49	0.60	0.48	4.69	0.74	1.40	0.22	1.17	0.18	3.75	0.59	1.12	0.18	0.94	0.15	2.81	0.44	0.84	0.13	0.70	0.11
1 000	33.3	8.3	6.7	1.15	0.47	0.38	4.74	0.50	1.48	0.16	1.22	0.13	3.79	0.40	1.19	0.12	0.98	0.10	2.85	0.30	0.89	0.09	0.73	0.08
750	25.0	6.3	5.0	1.08	0.40	0.31	4.80	0.38	1.50	0.12	1.26	0.10	3.84	0.30	1.20	0.09	1.00	0.08	2.88	0.23	0.90	0.07	0.75	0.06
500	16.7	4.2	3.3	0.78	0.32	0.25	4.91	0.26	1.57	0.08	1.31	0.07	3.93	0.21	1.26	0.07	1.05	0.06	2.94	0.15	0.94	0.05	0.79	0.04
300	10.0	2.5	2.0	0.55	0.22	0.18	4.96	0.16	1.67	0.05	1.38	0.04	3.97	0.12	1.33	0.04	1.10	0.03	2.98	0.09	1.00	0.03	0.83	0.03
100	3.3	0.8	0.7	0.26	0.10	0.08	5.21	0.05	1.84	0.02	1.52	0.02	4.16	0.04	1.47	0.02	1.22	0.01	3.12	0.03	1.10	0.01	0.91	0.01
START.	-	-	-	-	-	-	5.62	-	2.09	-	1.74	-	4.49	-	1.67	-	1.39	-	3.37	-	1.26	-	1.05	-

BS 25 × 25							LOAD																	
							10 kN						8 kN						6 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	250.0	62.5	50.0	2.05	0.85	0.67									2.57	0.81	2.10	0.66			1.92	0.60	1.58	0.50
1 500	125.0	31.3	25.0	1.49	0.60	0.48			3.42	0.54	2.85	0.45	9.14	1.44	2.73	0.43	2.28	0.36	6.85	1.08	2.05	0.32	1.71	0.27
1 000	83.3	20.8	16.7	1.15	0.47	0.38			3.61	0.38	2.97	0.31	9.24	0.97	2.89	0.30	2.38	0.25	6.93	0.73	2.16	0.23	1.78	0.19
750	62.5	15.6	12.5	1.08	0.40	0.31	11.7	0.92	3.66	0.29	3.06	0.24	9.34	0.73	2.93	0.23	2.45	0.19	7.01	0.55	2.20	0.17	1.83	0.14
500	41.7	10.4	8.3	0.78	0.32	0.25	12.0	0.63	3.82	0.20	3.20	0.17	9.56	0.50	3.06	0.16	2.56	0.13	7.17	0.38	2.29	0.12	1.92	0.10
300	25.0	6.3	5.0	0.55	0.22	0.18	12.1	0.38	4.06	0.13	3.35	0.11	9.67	0.30	3.25	0.10	2.68	0.08	7.25	0.23	2.44	0.08	2.01	0.06
100	8.3	2.1	1.7	0.26	0.10	0.08	12.7	0.13	4.48	0.05	3.71	0.04	10.2	0.11	3.58	0.04	2.97	0.03	7.60	0.08	2.69	0.03	2.23	0.02
START.	-	-	-	-	-	-	13.7	-	5.09	-	4.24	-	11.0	-	4.08	-	3.39	-	8.20	-	3.06	-	2.54	-

([1]) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

2.4 MA 10 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:
η_{BS} : ball screw theoretical efficiency
η_R : worm - wormwheel efficiency
η_{CT} : bearings and seals total efficiency

η_{tot}	BS 25 x 5			BS 25 x 10			BS 25 x 25		
n_1 [rpm]	RATIO			RATIO			RATIO		
	RV	RN	RL	RV	RN	RL	RV	RN	RL
3 000	0.72	0.63	0.61	0.75	0.66	0.64	0.77	0.67	0.66
1 500	0.71	0.59	0.57	0.74	0.62	0.59	0.76	0.63	0.61
1 000	0.70	0.56	0.54	0.73	0.58	0.57	0.75	0.60	0.58
750	0.69	0.55	0.53	0.72	0.58	0.55	0.74	0.59	0.57
500	0.67	0.53	0.50	0.71	0.55	0.53	0.72	0.57	0.54
300	0.67	0.50	0.48	0.70	0.52	0.50	0.72	0.53	0.52
100	0.64	0.45	0.43	0.66	0.47	0.45	0.68	0.48	0.47
START.	0.59	0.40	0.38	0.62	0.41	0.40	0.63	0.42	0.41

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (10 kN).

Static braking torque T_F [Nm] with 10 kN			
RATIO	BS 25 x 5	BS 25 x 20	BS 25 x 25
RV	1.2	2.5	6.5
RN	0.4	0.4	0.4
RL	0.4	0.4	0.4

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value $T_{F\,min}$ which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{F\,min} = 0.35\ Nm$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

2.5 MA 25 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v, torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 32 × 10							LOAD 25 kN						LOAD 20 kN						LOAD 15 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO RV		RATIO RN		RATIO RL		RATIO RV		RATIO RN		RATIO RL		RATIO RV		RATIO RN		RATIO RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	83.3	27.8	20.8	3.31	1.19	1.22	9.65	3.03	3.52	1.11	2.80	0.88	7.72	2.43	2.82	0.88	2.24	0.70	5.79	1.82	2.11	0.66	1.68	0.53
1 500	41.7	13.9	10.4	2.36	0.80	0.80	9.88	1.55	3.72	0.58	3.00	0.47	7.90	1.24	2.97	0.47	2.40	0.38	5.93	0.93	2.23	0.35	1.80	0.28
1 000	27.8	9.3	6.9	1.89	0.64	0.69	10.1	1.05	3.83	0.40	3.12	0.33	8.02	0.84	3.06	0.32	2.49	0.26	6.02	0.63	2.30	0.24	1.87	0.20
750	20.8	6.9	5.2	1.54	0.57	0.58	10.2	0.80	3.93	0.31	3.20	0.25	8.12	0.64	3.14	0.25	2.56	0.20	6.09	0.48	2.36	0.19	1.92	0.15
500	13.9	4.6	3.5	1.23	0.43	0.46	10.4	0.54	4.08	0.21	3.39	0.18	8.27	0.43	3.27	0.17	2.71	0.14	6.20	0.32	2.45	0.13	2.03	0.11
300	8.3	2.8	2.1	0.87	0.30	0.34	10.6	0.33	4.20	0.13	3.53	0.11	8.44	0.27	3.36	0.11	2.82	0.09	6.33	0.20	2.52	0.08	2.12	0.07
100	2.8	0.9	0.7	0.43	0.14	0.15	11.1	0.12	4.59	0.05	3.92	0.04	8.86	0.09	3.67	0.04	3.13	0.03	6.65	0.07	2.75	0.03	2.35	0.02
START.	-	-	-	-	-	-	12.0	-	5.23	-	4.58	-	9.57	-	4.18	-	3.66	-	7.18	-	3.14	-	2.75	-

BS 32 × 20							LOAD 20 kN						LOAD 15 kN						LOAD 12.5 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO RV		RATIO RN		RATIO RL		RATIO RV		RATIO RN		RATIO RL		RATIO RV		RATIO RN		RATIO RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	166.7	55.6	41.7	3.31	1.19	1.22											3.26	1.02	9.38	2.95	3.42	1.07	2.72	0.85
1 500	83.3	27.8	20.8	2.36	0.80	0.80					4.66	0.73	11.5	1.81	4.33	0.68	3.50	0.55	9.60	1.51	3.61	0.57	2.91	0.46
1 000	55.6	18.5	13.9	1.89	0.64	0.69	15.6	1.63	5.95	0.62	4.85	0.51	11.7	1.22	4.46	0.47	3.64	0.38	9.75	1.02	3.72	0.39	3.03	0.32
750	41.7	13.9	10.4	1.54	0.57	0.58	15.8	1.24	6.11	0.48	4.98	0.39	11.9	0.93	4.58	0.36	3.73	0.29	9.87	0.77	3.82	0.30	3.11	0.24
500	27.8	9.3	6.9	1.23	0.43	0.46	16.1	0.84	6.35	0.33	5.26	0.28	12.1	0.63	4.76	0.25	3.95	0.21	10.1	0.53	3.97	0.21	3.29	0.17
300	16.7	5.6	4.2	0.87	0.30	0.34	16.4	0.52	6.53	0.21	5.49	0.17	12.3	0.39	4.90	0.15	4.11	0.13	10.3	0.32	4.08	0.13	3.43	0.11
100	5.6	1.9	1.4	0.43	0.14	0.15	17.2	0.18	7.14	0.07	6.09	0.06	12.9	0.14	5.35	0.06	4.57	0.05	10.8	0.11	4.46	0.05	3.80	0.04
START.	-	-	-	-	-	-	18.6	-	8.13	-	7.11	-	14.0	-	6.10	-	5.34	-	11.6	-	5.08	-	4.45	-

BS 32 × 32							LOAD 15 kN						LOAD 12.5 kN						LOAD 10 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO RV		RATIO RN		RATIO RL		RATIO RV		RATIO RN		RATIO RL		RATIO RV		RATIO RN		RATIO RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	266.7	88.9	66.7	3.31	1.19	1.22																	3.44	1.08
1 500	133.3	44.4	33.3	2.36	0.80	0.80											4.61	0.72	12.2	1.91	4.57	0.72	3.69	0.58
1 000	88.9	29.6	22.2	1.89	0.64	0.69					5.76	0.60	15.5	1.62	5.89	0.62	4.80	0.50	12.4	1.29	4.71	0.49	3.84	0.40
750	66.7	22.2	16.7	1.54	0.57	0.58	18.7	1.47	7.25	0.57	5.91	0.46	15.6	1.23	6.05	0.47	4.93	0.39	12.5	0.98	4.84	0.38	3.94	0.31
500	44.4	14.8	11.1	1.23	0.43	0.46	19.1	1.00	7.54	0.39	6.25	0.33	15.9	0.83	6.28	0.33	5.21	0.27	12.8	0.67	5.03	0.26	4.17	0.22
300	26.7	8.9	6.7	0.87	0.30	0.34	19.5	0.61	7.75	0.24	6.52	0.20	16.2	0.51	6.46	0.20	5.43	0.17	13.0	0.41	5.17	0.16	4.34	0.14
100	8.9	3.0	2.2	0.43	0.14	0.15	20.5	0.21	8.47	0.09	7.23	0.08	17.1	0.18	7.06	0.07	6.02	0.06	13.7	0.14	5.65	0.06	4.82	0.05
START.	-	-	-	-	-	-	22.1	-	9.66	-	8.45	-	18.4	-	8.05	-	7.04	-	14.7	-	6.44	-	5.63	-

([1]) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

2.5 MA 25 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:
η_{BS} : ball screw theoretical efficiency
η_R : worm - wormwheel efficiency
η_{CT} : bearings and seals total efficiency

η_{tot}	BS 32 x 10			BS 32 x 20			BS 32 x 32		
n_1 [rpm]	RATIO			RATIO			RATIO		
	RV	RN	RL	RV	RN	RL	RV	RN	RL
3 000	0.75	0.68	0.64	0.77	0.70	0.66	0.78	0.71	0.67
1 500	0.73	0.65	0.60	0.75	0.67	0.62	0.76	0.67	0.63
1 000	0.72	0.63	0.58	0.74	0.65	0.59	0.75	0.65	0.60
750	0.71	0.61	0.56	0.73	0.63	0.58	0.74	0.64	0.59
500	0.70	0.59	0.53	0.72	0.61	0.55	0.72	0.61	0.55
300	0.68	0.57	0.51	0.70	0.59	0.53	0.71	0.60	0.53
100	0.65	0.52	0.46	0.67	0.54	0.47	0.68	0.54	0.48
START.	0.60	0.46	0.39	0.62	0.47	0.41	0.63	0.48	0.41

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (25 kN).

Static braking torque T_F [Nm] with 25 kN			
RATIO	BS 32 x 10	BS 32 x 20	BS 32 x 32
RV	5.1	10.4	16.9
RN	1.5	1.5	1.8
RL	1.5	1.5	1.5

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value $T_{F\,min}$ which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{F\,min} = 1.5\ Nm$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

2.6 MA 50 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v, torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 40 × 10							LOAD															
							50 kN						35 kN						25 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	71.4	35.7	17.9	5.10	3.04	1.99			8.80	2.76	4.89	1.54	11.7	3.66	6.16	1.93	3.43	1.08	8.33	2.62	4.40	1.38	2.45	0.77
1 500	35.7	17.9	8.9	3.76	2.19	1.43	17.0	2.67	9.11	1.43	5.15	0.81	11.9	1.87	6.37	1.00	3.61	0.57	8.51	1.34	4.55	0.72	2.58	0.40
1 000	23.8	11.9	6.0	2.99	1.73	1.14	17.4	1.82	9.43	0.99	5.51	0.58	12.2	1.28	6.60	0.69	3.86	0.40	8.70	0.91	4.72	0.49	2.76	0.29
750	17.9	8.9	4.5	2.42	1.45	0.95	17.4	1.37	9.67	0.76	5.67	0.45	12.2	0.96	6.77	0.53	3.97	0.31	8.70	0.68	4.83	0.38	2.84	0.22
500	11.9	6.0	3.0	1.87	1.11	0.74	17.8	0.93	9.79	0.51	5.84	0.31	12.5	0.65	6.85	0.36	4.09	0.21	8.90	0.47	4.89	0.26	2.92	0.15
300	7.1	3.6	1.8	1.40	0.82	0.54	18.2	0.57	10.2	0.32	6.21	0.20	12.8	0.40	7.12	0.22	4.35	0.14	9.11	0.29	5.08	0.16	3.11	0.10
100	2.4	1.2	0.6	0.66	0.38	0.25	19.1	0.20	11.1	0.12	6.87	0.07	13.4	0.14	7.72	0.08	4.81	0.05	9.55	0.10	5.51	0.06	3.43	0.04
START.	-	-	-	-	-	-	20.6	-	12.5	-	7.39	-	14.4	-	8.70	-	5.17	-	10.3	-	6.21	-	3.69	-

BS 40 × 20							LOAD															
							40 kN						30 kN						20 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	142.9	71.4	35.7	5.10	3.04	1.99											5.67	1.78	12.9	4.04	6.79	2.13	3.78	1.19
1 500	71.4	35.7	17.9	3.76	2.19	1.43					7.95	1.25	19.7	3.10	10.6	1.66	5.96	0.94	13.2	2.06	7.03	1.10	3.98	0.62
1 000	47.6	23.8	11.9	2.99	1.73	1.14	26.9	2.81	14.6	1.53	8.51	0.89	20.2	2.11	10.9	1.14	6.38	0.67	13.5	1.41	7.28	0.76	4.26	0.45
750	35.7	17.9	8.9	2.42	1.45	0.95	26.9	2.11	14.9	1.17	8.76	0.69	20.2	1.58	11.2	0.88	6.57	0.52	13.5	1.05	7.46	0.59	4.38	0.34
500	23.8	11.9	6.0	1.87	1.11	0.74	27.5	1.44	15.1	0.79	9.02	0.47	20.6	1.08	11.4	0.59	6.77	0.35	13.8	0.72	7.56	0.40	4.51	0.24
300	14.3	7.1	3.6	1.40	0.82	0.54	28.1	0.88	15.7	0.49	9.59	0.30	21.1	0.66	11.8	0.37	7.20	0.23	14.1	0.44	7.85	0.25	4.80	0.15
100	4.8	2.4	1.2	0.66	0.38	0.25	29.5	0.31	17.1	0.18	10.6	0.11	22.1	0.23	12.8	0.13	7.95	0.08	14.8	0.15	8.51	0.09	5.30	0.06
START.	-	-	-	-	-	-	31.8	-	19.2	-	11.4	-	23.9	-	14.4	-	8.55	-	15.9	-	9.59	-	5.70	-

BS 40 × 40							LOAD															
							25 kN						20 kN						15 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	285.7	142.9	71.4	5.10	3.04	1.99																	5.57	1.75
1 500	142.9	71.4	35.7	3.76	2.19	1.43									13.8	2.17	7.81	1.23	19.4	3.04	10.4	1.63	5.86	0.92
1 000	95.2	47.6	23.8	2.99	1.73	1.14					10.5	1.09	26.4	2.76	14.3	1.50	8.36	0.88	19.8	2.07	10.8	1.12	6.27	0.66
750	71.4	35.7	17.9	2.42	1.45	0.95			18.4	1.44	10.8	0.84	26.4	2.07	14.7	1.15	8.61	0.68	19.8	1.55	11.0	0.86	6.45	0.51
500	47.6	23.8	11.9	1.87	1.11	0.74	33.8	1.77	18.6	0.97	11.1	0.58	27.0	1.41	14.9	0.78	8.86	0.46	20.3	1.06	11.2	0.58	6.65	0.35
300	28.6	14.3	7.1	1.40	0.82	0.54	34.5	1.08	19.3	0.61	11.8	0.37	27.6	0.87	15.4	0.48	9.43	0.30	20.7	0.65	11.6	0.36	7.07	0.22
100	9.5	4.8	2.4	0.66	0.38	0.25	36.2	0.38	20.9	0.22	13.0	0.14	29.0	0.30	16.8	0.18	10.4	0.11	21.7	0.23	12.6	0.13	7.81	0.08
START.	-	-	-	-	-	-	39.1	-	23.6	-	14.0	-	31.3	-	18.9	-	11.2	-	23.5	-	14.2	-	8.40	-

([1]) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

2.6 MA 50 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:
η_{BS} : ball screw theoretical efficiency
η_R : worm - wormwheel efficiency
η_{CT} : bearings and seals total efficiency

η_{tot}	BS 40 x 10			BS 40 x 20			BS 40 x 40		
n_1 [rpm]	RATIO			RATIO			RATIO		
	RV	RN	RL	RV	RN	RL	RV	RN	RL
3 000	0.74	0.70	0.63	0.77	0.73	0.65	0.78	0.74	0.67
1 500	0.73	0.68	0.60	0.75	0.70	0.62	0.77	0.72	0.63
1 000	0.71	0.65	0.56	0.74	0.68	0.58	0.75	0.69	0.59
750	0.71	0.64	0.54	0.74	0.66	0.56	0.75	0.67	0.57
500	0.69	0.63	0.53	0.72	0.65	0.55	0.73	0.67	0.56
300	0.68	0.61	0.50	0.70	0.63	0.52	0.72	0.64	0.52
100	0.65	0.56	0.45	0.67	0.58	0.47	0.68	0.59	0.47
START.	0.60	0.50	0.42	0.62	0.52	0.43	0.63	0.52	0.44

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (50 kN).

Static braking torque T_F [Nm] with 50 kN			
RATIO	BS 40 x 10	BS 40 x 20	BS 40 x 40
RV	8.6	17.9	36.5
RN	2.4	4.9	10.1
RL	2.4	2.4	2.4

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value $T_{F\,min}$ which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{F\,min} = 2.4\ Nm$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

2.7 MA 100 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v, torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 50 × 10							LOAD															
							100 kN						75 kN						50 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	62.5	20.8	15.6	9.10	4.36	3.10			11.1	3.48	8.61	2.70	22.3	6.99	8.30	2.61	6.46	2.03	14.9	4.66	5.53	1.74	4.30	1.35
1 500	31.3	10.4	7.8	6.32	2.90	2.21	30.3	4.76	11.5	1.80	9.18	1.44	22.8	3.57	8.61	1.35	6.88	1.08	15.2	2.38	5.74	0.90	4.59	0.72
1 000	20.8	6.9	5.2	5.16	2.38	1.70	31.0	3.25	12.1	1.26	9.68	1.01	23.3	2.43	9.06	0.95	7.26	0.76	15.5	1.62	6.04	0.63	4.84	0.51
750	15.6	5.2	3.9	4.21	2.04	1.41	31.4	2.46	12.4	0.97	9.82	0.77	23.5	1.85	9.30	0.73	7.37	0.58	15.7	1.23	6.20	0.49	4.91	0.39
500	10.4	3.5	2.6	3.23	1.53	1.10	31.7	1.66	12.8	0.67	10.3	0.54	23.8	1.24	9.55	0.50	7.69	0.40	15.9	0.83	6.37	0.33	5.13	0.27
300	6.3	2.1	1.6	2.42	1.15	0.82	32.5	1.02	13.5	0.42	11.1	0.35	24.3	0.76	10.1	0.32	8.30	0.26	16.2	0.51	6.74	0.21	5.53	0.17
100	2.1	0.7	0.5	1.16	0.52	0.39	34.0	0.36	14.8	0.15	12.3	0.13	25.5	0.27	11.1	0.12	9.18	0.10	17.0	0.18	7.38	0.08	6.12	0.06
START	-	-	-	-	-	-	37.7	-	17.9	-	14.9	-	28.3	-	13.4	-	11.2	-	18.9	-	8.94	-	7.42	-

BS 50 × 20							LOAD															
							80 kN						60 kN						40 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	125.0	41.7	31.3	9.10	4.36	3.10									12.7	3.99	9.88	3.10	22.7	7.13	8.47	2.66	6.59	2.07
1 500	62.5	20.8	15.6	6.32	2.90	2.21			17.6	2.76	14.1	2.21	34.8	5.47	13.2	2.07	10.6	1.65	23.2	3.64	8.78	1.38	7.02	1.10
1 000	41.7	13.9	10.4	5.16	2.38	1.70	47.5	4.97	18.5	1.94	14.8	1.55	35.6	3.73	13.9	1.45	11.1	1.16	23.7	2.48	9.24	0.97	7.41	0.78
750	31.3	10.4	7.8	4.21	2.04	1.41	48.0	3.77	19.0	1.49	15.1	1.18	36.0	2.83	14.3	1.12	11.3	0.89	24.0	1.88	9.49	0.75	7.52	0.59
500	20.8	6.9	5.2	3.23	1.53	1.10	48.5	2.54	19.5	1.02	15.7	0.82	36.4	1.91	14.6	0.77	11.8	0.62	24.3	1.27	9.75	0.51	7.85	0.41
300	12.5	4.2	3.1	2.42	1.15	0.82	49.7	1.56	20.6	0.65	17.0	0.53	37.3	1.17	15.5	0.49	12.7	0.40	24.8	0.78	10.3	0.32	8.47	0.27
100	4.2	1.4	1.0	1.16	0.52	0.39	52.1	0.55	22.6	0.24	18.7	0.20	39.1	0.41	17.0	0.18	14.1	0.15	26.1	0.27	11.3	0.12	9.36	0.10
START	-	-	-	-	-	-	57.7	-	27.4	-	22.7	-	43.3	-	20.5	-	17.1	-	28.9	-	13.7	-	11.4	-

([1]) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

2.7 MA 100 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:
η_{BS} : ball screw theoretical efficiency
η_R : worm - wormwheel efficiency
η_{CT} : bearings and seals total efficiency

η_{tot}	BS 50 x 10			BS 50 x 20		
n_1 [rpm]	RATIO			RATIO		
	RV	RN	RL	RV	RN	RL
3 000	0.73	0.65	0.63	0.76	0.68	0.66
1 500	0.71	0.63	0.59	0.75	0.66	0.62
1 000	0.70	0.60	0.56	0.73	0.62	0.58
750	0.69	0.58	0.55	0.72	0.61	0.58
500	0.68	0.57	0.53	0.71	0.59	0.55
300	0.67	0.53	0.49	0.70	0.56	0.51
100	0.64	0.49	0.44	0.66	0.51	0.46
START.	0.57	0.40	0.36	0.60	0.42	0.38

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (100 kN).

Static braking torque T_F [Nm] with 100 kN		
RATIO	BS 50 x 10	BS 50 x 20
RV	14.2	29.8
RN	4.0	4.0
RL	4.0	4.0

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value $T_{F\,min}$ which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{F\,min} = 4.0\ Nm$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

2.8 MA 150 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v, torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 63 × 10							LOAD 150 kN						LOAD 120 kN						LOAD 80 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO RV		RATIO RN		RATIO RL		RATIO RV		RATIO RN		RATIO RL		RATIO RV		RATIO RN		RATIO RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	62.5	20.8	15.6	9.10	4.36	3.32									13.6	4.27	10.6	3.32	24.3	7.63	9.06	2.84	7.04	2.21
1 500	31.3	10.4	7.8	6.32	2.90	2.23			17.6	2.77	14.1	2.21	37.2	5.84	14.1	2.21	11.3	1.77	24.8	3.90	9.39	1.48	7.51	1.18
1 000	20.8	6.9	5.2	5.16	2.38	1.70	47.6	4.98	18.5	1.94	14.9	1.56	38.1	3.98	14.8	1.55	11.9	1.24	25.4	2.66	9.88	1.03	7.92	0.83
750	15.6	5.2	3.9	4.21	2.04	1.49	48.1	3.78	19.0	1.49	15.1	1.18	38.5	3.02	15.2	1.19	12.1	0.95	25.7	2.01	10.2	0.80	8.04	0.63
500	10.4	3.5	2.6	3.23	1.53	1.10	48.6	2.55	19.6	1.02	15.8	0.82	38.9	2.04	15.7	0.82	12.6	0.66	26.0	1.36	10.4	0.55	8.39	0.44
300	6.3	2.1	1.6	2.42	1.15	0.82	49.8	1.56	20.7	0.65	17.0	0.53	39.8	1.25	16.6	0.52	13.6	0.43	26.6	0.83	11.0	0.35	9.06	0.28
100	2.1	0.7	0.5	1.16	0.52	0.39	52.2	0.55	22.7	0.24	18.8	0.20	41.8	0.44	18.1	0.19	15.0	0.16	27.9	0.29	12.1	0.13	10.0	0.10
START	-	-	-	-	-	-	57.8	-	27.5	-	22.8	-	46.3	-	22.0	-	18.2	-	30.9	-	14.7	-	12.2	-

BS 63 × 20							LOAD 100 kN						LOAD 80 kN						LOAD 50 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO RV		RATIO RN		RATIO RL		RATIO RV		RATIO RN		RATIO RL		RATIO RV		RATIO RN		RATIO RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	125.0	41.7	31.3	9.10	4.36	3.32													28.7	9.02	10.7	3.37	8.33	2.62
1 500	62.5	20.8	15.6	6.32	2.90	2.23									17.8	2.79	14.2	2.23	29.4	4.61	11.1	1.75	8.88	1.39
1 000	41.7	13.9	10.4	5.16	2.38	1.70							48.0	5.03	18.7	1.96	15.0	1.57	30.0	3.14	11.7	1.22	9.37	0.98
750	31.3	10.4	7.8	4.21	2.04	1.49			24.0	1.88	19.0	1.49	48.6	3.81	19.2	1.51	15.2	1.19	30.4	2.38	12.0	0.94	9.51	0.75
500	20.8	6.9	5.2	3.23	1.53	1.10	61.4	3.21	24.7	1.29	19.9	1.04	49.1	2.57	19.7	1.03	15.9	0.83	30.7	1.61	12.4	0.65	9.92	0.52
300	12.5	4.2	3.1	2.42	1.15	0.82	62.8	1.97	26.1	0.82	21.4	0.67	50.2	1.58	20.9	0.66	17.2	0.54	31.4	0.99	13.1	0.41	10.7	0.34
100	4.2	1.4	1.0	1.16	0.52	0.39	65.9	0.69	28.6	0.30	23.7	0.25	52.7	0.55	22.9	0.24	19.0	0.20	32.9	0.34	14.3	0.15	11.9	0.12
START	-	-	-	-	-	-	73.0	-	34.6	-	28.7	-	58.4	-	27.7	-	23.0	-	36.5	-	17.3	-	14.4	-

([1]) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

2.8 MA 150 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:
η_{BS} : ball screw theoretical efficiency
η_R : worm - wormwheel efficiency
η_{CT} : bearings and seals total efficiency

η_{tot}	BS 63 x 10			BS 63 x 20		
n_1 [rpm]	RATIO			RATIO		
	RV	RN	RL	RV	RN	RL
3 000	0.71	0.64	0.61	0.75	0.67	0.65
1 500	0.70	0.61	0.58	0.74	0.65	0.61
1 000	0.68	0.58	0.55	0.72	0.62	0.58
750	0.67	0.57	0.54	0.71	0.60	0.57
500	0.67	0.55	0.52	0.70	0.58	0.54
300	0.65	0.52	0.48	0.69	0.55	0.50
100	0.62	0.48	0.43	0.66	0.50	0.46
START.	0.56	0.39	0.36	0.59	0.42	0.38

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (150 kN).

Static braking torque T_F [Nm] with 150 kN		
RATIO	BS 63 x 10	BS 63 x 20
RV	19.0	40.6
RN	5.3	5.3
RL	5.3	5.3

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value $T_{F\,min}$ which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{F\,min} = 5.3\ Nm$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

2.9 MA 200 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v, torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 80 × 10							LOAD															
							200 kN						150 kN						100 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	62.5	20.8	15.6	15.88	7.82	5.84			23.0	7.22	17.9	5.61	46.8	14.7	17.3	5.42	13.4	4.21	31.2	9.80	11.5	3.61	8.94	2.81
1 500	31.3	10.4	7.8	11.36	5.29	4.09	63.1	9.90	23.9	3.74	18.6	2.91	47.3	7.43	17.9	2.81	13.9	2.19	31.5	4.95	11.9	1.87	9.28	1.46
1 000	20.8	6.9	5.2	8.76	4.27	3.12	64.4	6.75	24.8	2.59	19.6	2.05	48.3	5.06	18.6	1.94	14.7	1.53	32.2	3.37	12.4	1.30	9.77	1.02
750	15.6	5.2	3.9	7.44	3.59	2.72	65.2	5.12	25.4	1.99	20.4	1.60	48.9	3.84	19.1	1.49	15.3	1.20	32.6	2.56	12.7	1.00	10.2	0.80
500	10.4	3.5	2.6	5.95	2.79	2.14	65.9	3.45	26.8	1.40	21.0	1.10	49.4	2.59	20.1	1.05	15.7	0.82	33.0	1.72	13.4	0.70	10.5	0.55
300	6.3	2.1	1.6	4.20	1.98	1.56	67.4	2.12	27.9	0.88	22.2	0.70	50.6	1.59	21.0	0.66	16.7	0.52	33.7	1.06	14.0	0.44	11.1	0.35
100	2.1	0.7	0.5	2.08	0.95	0.72	70.7	0.74	30.6	0.32	24.9	0.26	53.0	0.55	22.9	0.24	18.7	0.20	35.3	0.37	15.3	0.16	12.4	0.13
START	-	-	-	-	-	-	78.2	-	37.6	-	30.6	-	58.6	-	28.2	-	22.9	-	39.1	-	18.8	-	15.3	-

BS 80 × 20							LOAD															
							150 kN						100 kN						75 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	125.0	41.7	31.3	15.88	7.82	5.84									21.5	6.75	16.7	5.25	43.8	13.8	16.1	5.06	12.6	3.94
1 500	62.5	20.8	15.6	11.36	5.29	4.09			33.4	5.25	26.0	4.09	59.0	9.26	22.3	3.50	17.4	2.72	44.2	6.94	16.7	2.63	13.0	2.04
1 000	41.7	13.9	10.4	8.76	4.27	3.12			34.7	3.63	27.4	2.87	60.3	6.31	23.2	2.42	18.3	1.91	45.2	4.73	17.4	1.82	13.7	1.44
750	31.3	10.4	7.8	7.44	3.59	2.72	91.4	7.18	35.6	2.80	28.6	2.24	60.9	4.78	23.8	1.86	19.1	1.49	45.7	3.59	17.8	1.40	14.3	1.12
500	20.8	6.9	5.2	5.95	2.79	2.14	92.4	4.84	37.6	1.97	29.4	1.54	61.6	3.22	25.1	1.31	19.6	1.03	46.2	2.42	18.8	0.98	14.7	0.77
300	12.5	4.2	3.1	4.20	1.98	1.56	94.5	2.97	39.2	1.23	31.2	0.98	63.0	1.98	26.1	0.82	20.8	0.65	47.3	1.48	19.6	0.62	15.6	0.49
100	4.2	1.4	1.0	2.08	0.95	0.72	99.1	1.04	42.8	0.45	34.9	0.36	66.	0.69	28.6	0.30	23.3	0.24	49.6	0.52	21.4	0.22	17.4	0.18
START	-	-	-	-	-	-	110	-	52.7	-	42.8	-	73.1	-	35.2	-	28.6	-	54.8	-	26.4	-	21.4	-

([1]) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

2.9 MA 200 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:
η_{BS} : ball screw theoretical efficiency
η_R : worm - wormwheel efficiency
η_{CT} : bearings and seals total efficiency

η_{tot}	BS 80 x 10			BS 80 x 20		
n_1 [rpm]	RATIO			RATIO		
	RV	RN	RL	RV	RN	RL
3 000	0.69	0.63	0.60	0.74	0.67	0.65
1 500	0.69	0.60	0.58	0.73	0.65	0.62
1 000	0.67	0.58	0.55	0.72	0.62	0.59
750	0.66	0.57	0.53	0.71	0.61	0.57
500	0.66	0.54	0.52	0.70	0.58	0.55
300	0.64	0.52	0.49	0.69	0.55	0.52
100	0.61	0.47	0.44	0.65	0.50	0.47
START.	0.55	0.38	0.35	0.59	0.41	0.38

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (200 kN).

Static braking torque T_F [Nm] with 200 kN		
RATIO	BS 80 x 10	BS 80 x 20
RV	24.7	53.7
RN	6.8	6.8
RL	6.8	6.8

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value $T_{F\,min}$ which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

$$T_{F\,min} = 6.8\ Nm$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

2.10 MA 350 BS Mod.A

Performances

Following tables show the screw jack LINEAR SPEED v [mm/s] and relative TORQUE T_1 [Nm] and POWER P_1 [kW] on input shaft, with reference to the INPUT SPEED n_1 [rpm], the RATIO (RV, RN, RL) and the LOAD [kN] applied on the screw jack. Please, note that LOAD [kN] here means the equivalent load applied on the ball screw (see Chapter 1.11, page 18: "Ball screw life calculation").

Intermediate figures for linear speed v, torque T_1 and power P_1 corresponding to different input speeds can be calculated by linear interpolation of the figures stated in the table.

BS 100 × 16							LOAD																	
							350 kN						250 kN						200 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	75.0	50.0	25.0	22.94	16.11	9.87													50.3	15.8	27.2	8.55		
1 500	37.5	25.0	12.5	15.65	11.35	6.57							93.2	14.7	64.2	10.1	35.7	5.61	74.6	11.7	51.4	8.07	28.6	4.49
1 000	25.0	16.7	8.3	12.68	8.81	5.27							94.2	9.87	65.7	6.88	36.7	3.84	75.4	7.89	52.6	5.50	29.3	3.07
750	18.8	12.5	6.3	10.20	7.57	4.53			94.2	7.39	53.4	4.19	96.4	7.57	67.3	5.28	38.1	2.99	77.1	6.05	53.8	4.22	30.5	2.39
500	12.5	8.3	4.2	8.28	5.98	3.60	138	7.22	96.4	5.05	55.6	2.91	98.6	5.16	68.9	3.61	39.7	2.08	78.9	4.13	55.1	2.88	31.8	1.66
300	7.5	5.0	2.5	5.97	4.20	2.57	140	4.38	98.8	3.10	58.0	1.82	99.7	3.13	70.6	2.22	41.4	1.30	79.8	2.51	56.5	1.77	33.2	1.04
100	2.5	1.7	0.8	2.76	1.93	1.23	145	1.51	107	1.12	65.6	0.69	104	1.08	76.2	0.80	46.9	0.49	82.7	0.87	61.0	0.64	37.5	0.39
AVV.	-	-	-	-	-	-	167	-	123	-	81.7	-	119	-	88.0	-	58.3	-	95.3	-	70.4	-	46.7	-

BS 100 × 20							LOAD																	
							300 kN						200 kN						150 kN					
n_1 [rpm]	LINEAR SPEED v [mm/s]			Max. input power [1] P_{max} [kW]			RATIO						RATIO						RATIO					
							RV		RN		RL		RV		RN		RL		RV		RN		RL	
	RV	RN	RL	RV	RN	RL	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW	T_1 Nm	P_1 kW
3 000	93.8	62.5	31.3	22.94	16.11	9.87													67.7	21.3	46.1	14.5	25.0	7.84
1 500	46.9	31.3	15.6	15.65	11.35	6.57							91.2	14.3	62.8	9.87	35.0	5.49	68.4	10.8	47.1	7.40	26.2	4.12
1 000	31.3	20.8	10.4	12.68	8.81	5.27							92.2	9.65	64.3	6.73	35.9	3.75	69.1	7.24	48.2	5.05	26.9	2.81
750	23.4	15.6	7.8	10.20	7.57	4.53					55.9	4.39	94.2	7.40	65.8	5.17	37.3	2.93	70.7	5.55	49.4	3.87	28.0	2.20
500	15.6	10.4	5.2	8.28	5.98	3.60	145	7.57	101	5.29	58.3	3.05	96.4	5.05	67.4	3.53	38.8	2.03	72.3	3.79	50.5	2.65	29.1	1.52
300	9.4	6.3	3.1	5.97	4.20	2.57	147	4.60	104	3.25	60.8	1.91	97.5	3.06	69.0	2.17	40.5	1.27	73.2	2.30	51.8	1.63	30.4	0.95
100	3.1	2.1	1.0	2.76	1.93	1.23	152	1.59	112	1.17	68.8	0.72	101	1.06	74.6	0.78	45.8	0.48	75.8	0.79	55.9	0.59	34.4	0.36
AVV.	-	-	-	-	-	-	175	-	129	-	85.6	-	117	-	86.0	-	57.1	-	87.4	-	64.5	-	42.8	-

([1]) - Max. screw jack input power, calculated for worm - wormwheel life of 10 000 hours

2.10 MA 350 BS Mod.A

Screw jack total efficiency

The screw jack total efficiency is calculated as follows:

$$\eta_{tot} = \eta_{BS} \cdot \eta_R \cdot \eta_{CT}$$

where:
η_{BS} : ball screw theoretical efficiency
η_R : worm - wormwheel efficiency
η_{CT} : bearings and seals total efficiency

η_{tot}	BS 100 x 16			BS 100 x 20		
n_1 [rpm]	RATIO			RATIO		
	RV	RN	RL	RV	RN	RL
3 000	0.70	0.69	0.64	0.72	0.70	0.65
1 500	0.70	0.67	0.61	0.71	0.69	0.62
1 000	0.69	0.66	0.59	0.70	0.67	0.60
750	0.67	0.64	0.57	0.69	0.66	0.58
500	0.66	0.63	0.54	0.67	0.64	0.56
300	0.65	0.61	0.52	0.67	0.63	0.53
100	0.63	0.57	0.46	0.64	0.58	0.47
START.	0.54	0.49	0.37	0.56	0.50	0.38

NOTE: the efficiency values in the above table do not take into account the factor 0.92 for η_{BS}

The theoretical efficiency of the ball screw depends on the geometry of the ball tracks only. For a conservative calculation, it is recommended to apply a factor of 0.92 on the given efficiency in order to take into consideration also load and speed:

$$\eta'_{BS} = 0.92 \cdot \eta_{BS}$$

Static braking torque on input shaft

The next table show the static braking torques, i.e. the braking torques necessary to keep the load on the screw jack in a static position. The braking torque shall be applied with a brake on the screw jack input shaft and it is calculated for an applied load equal to the max. supportable load (350 kN).

Static braking torque T_F [Nm] with 350 kN		
RATIO	BS 100 x 16	BS 100 x 20
RV	48.2	62.0
RN	22.9	29.4
RL	13.4	13.4

For braking torques with loads lower than the maximum one, it is possible to make a linear proportion with the values stated in the table and the required load.

The resulting braking torque value shall then be compared to the min. threshold value $T_{F\,min}$ which considers vibrations and shocks that could increase the not self-locking condition of the system. It is equal to:

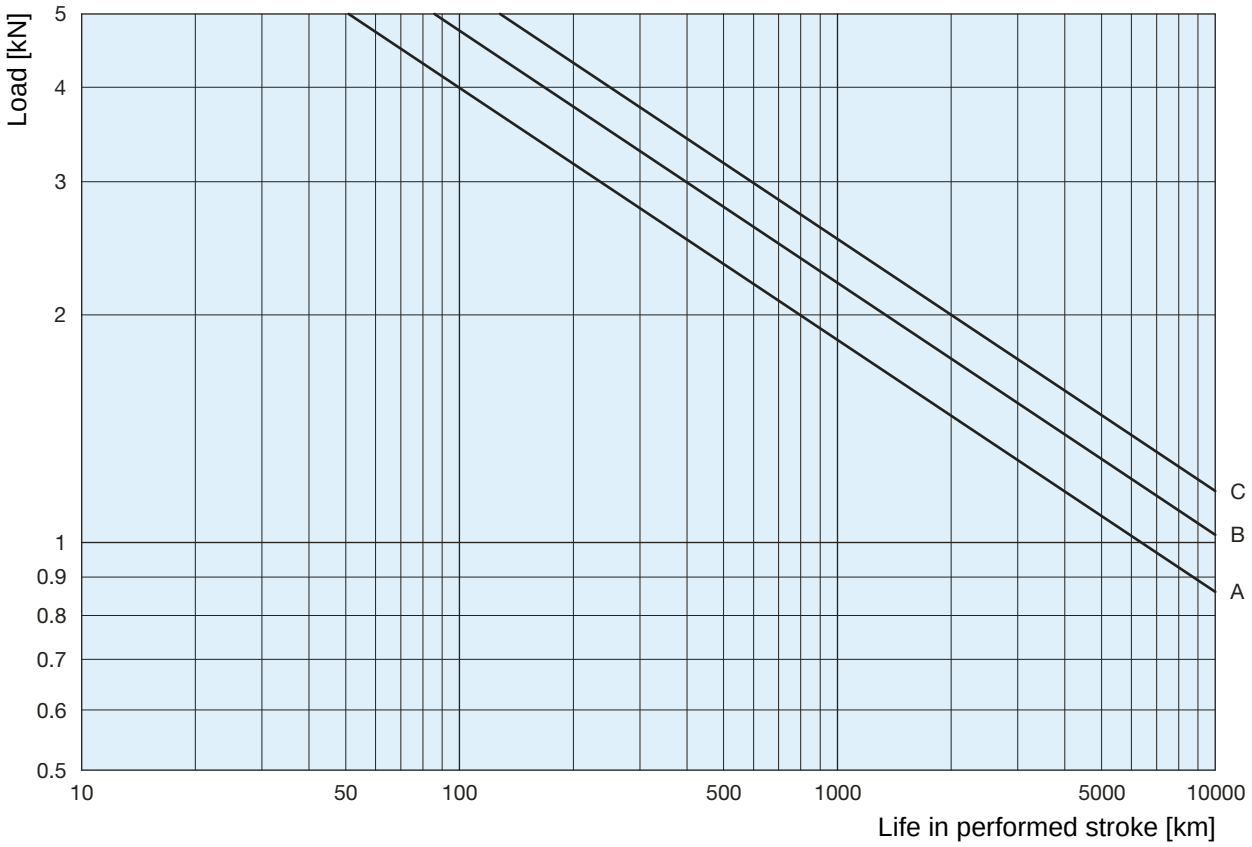
$$T_{F\,min} = 13.4\ Nm$$

The real braking torque to be applied on the input shaft for the generic load applied on the screw jack (lower than the maximum one) is therefore the highest of the two values.

2.11 Ball nut life

MA 5 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 “Ball screws life calculation” on page 18 or contact SERVOMECH.

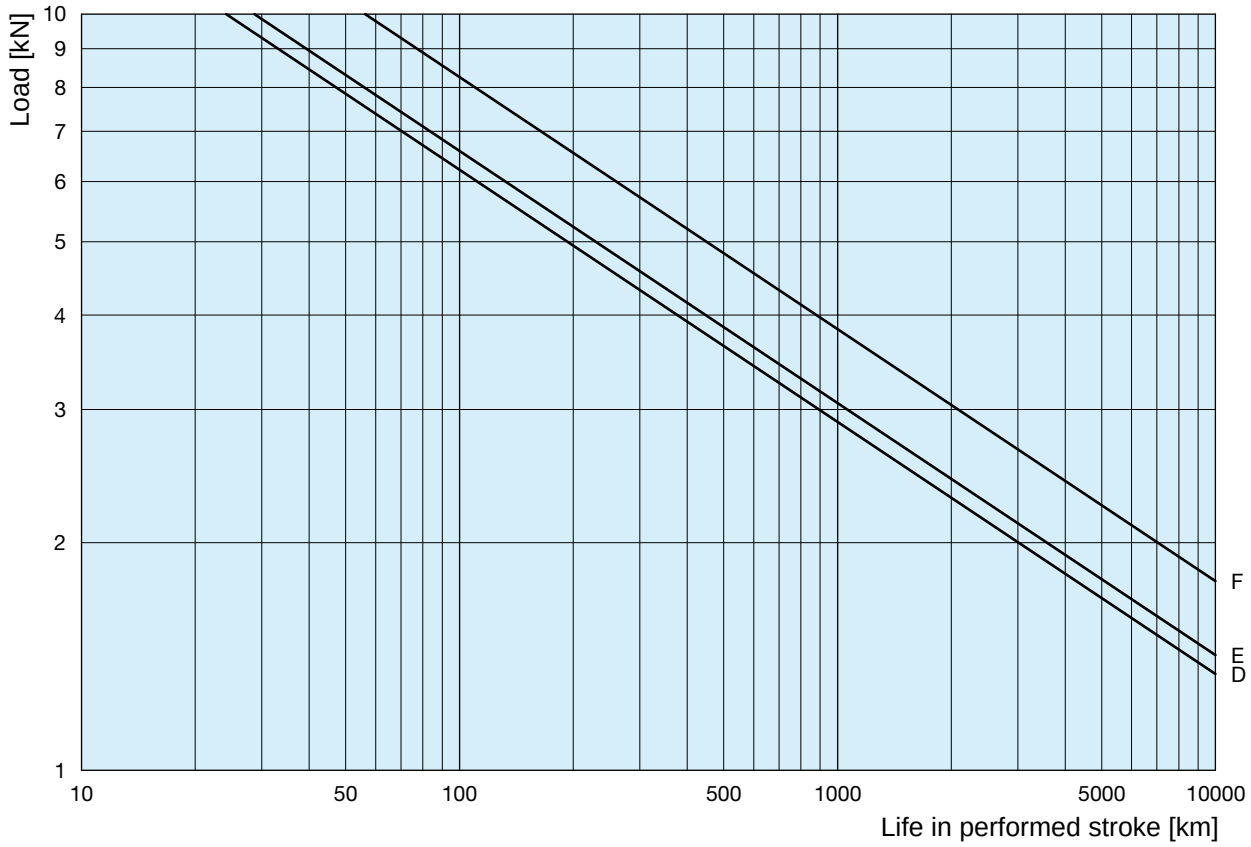


BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C_a [kN]	C_{0a} [kN]	CURVE
BS 16×5	3.175	1	5	12.9	20.9	**B**
BS 16×10	3.175	1	3	8.6	13.3	**A**
BS 16×16	3.175	2	2	10.0	14.5	**C**

2.11 Ball nut life

MA 10 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 “Ball screws life calculation” on page 18 or contact SERVOMECH.

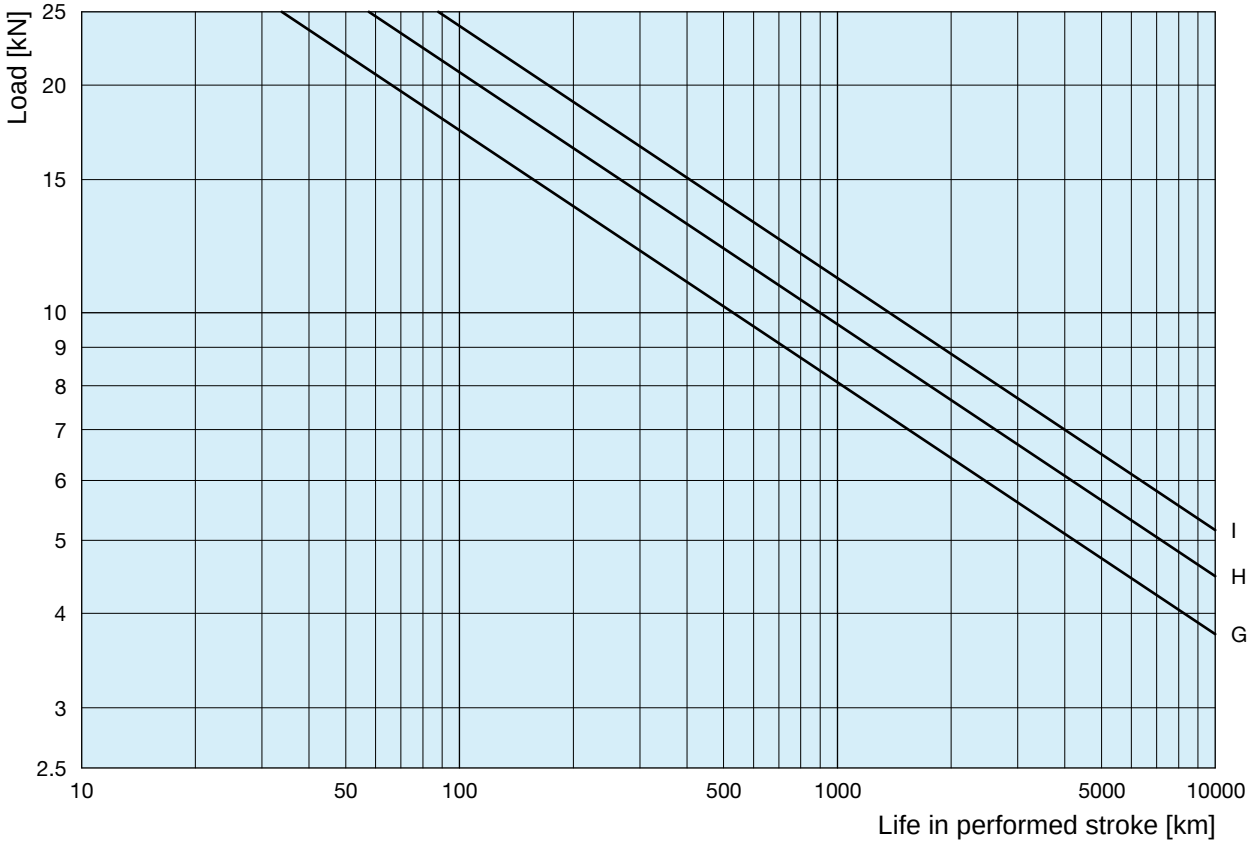


BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C_a [kN]	C_{0a} [kN]	CURVE
BS 25×5	3.175	1	5	16.9	36.4	**D**
BS 25×10	3.969	1	3	14.2	25.8	**E**
BS 25×25	3.175	2	2	13.1	25.2	**F**

2.11 Ball nut life

MA 25 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 “Ball screws life calculation” on page 18 or contact SERVOMECH.

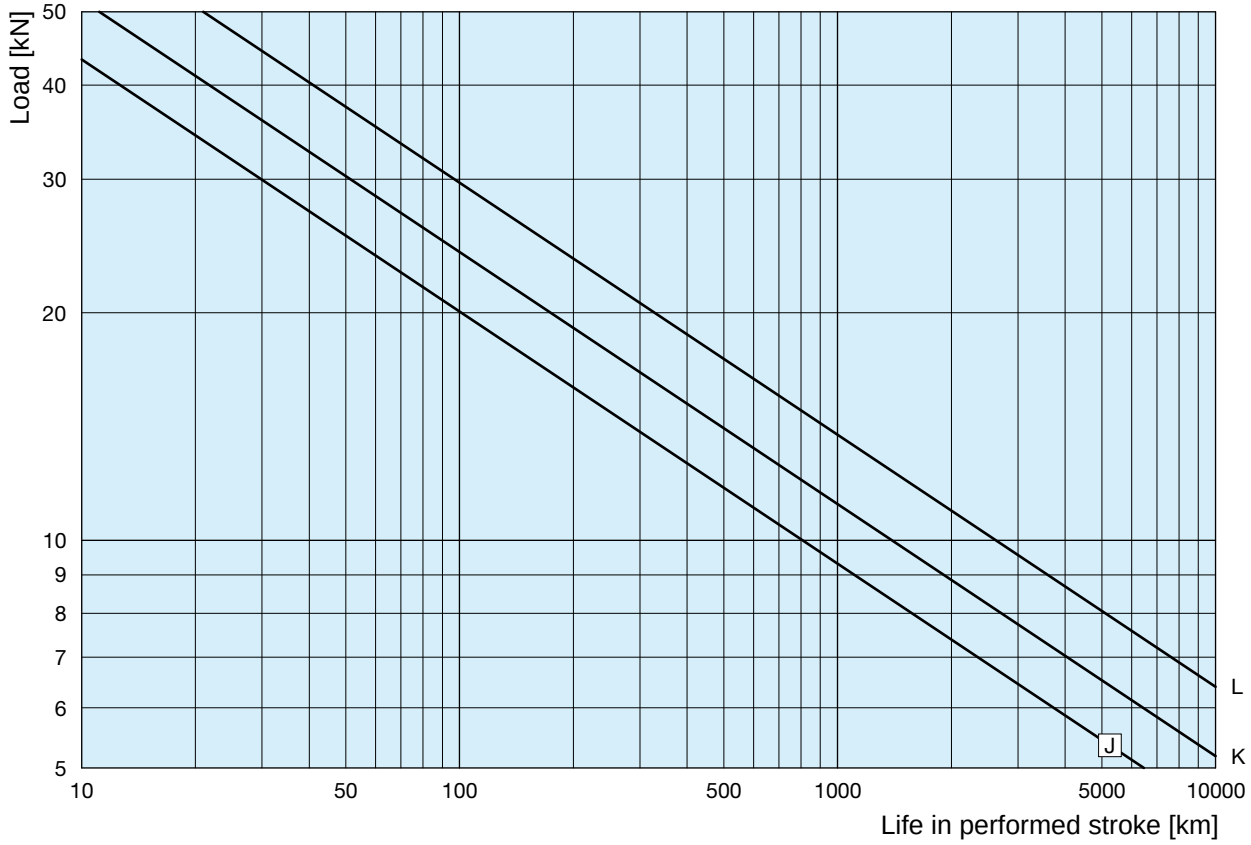


BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C_a [kN]	C_{0a} [kN]	CURVE
BS 32×10	6.35	1	5	44.8	83.5	**H**
BS 32×20	6.35	1	3	29.8	53.2	**G**
BS 32×32	6.35	2	2	35.0	58.1	**I**

2.11 Ball nut life

MA 50 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 “Ball screws life calculation” on page 18 or contact SERVOMECH.

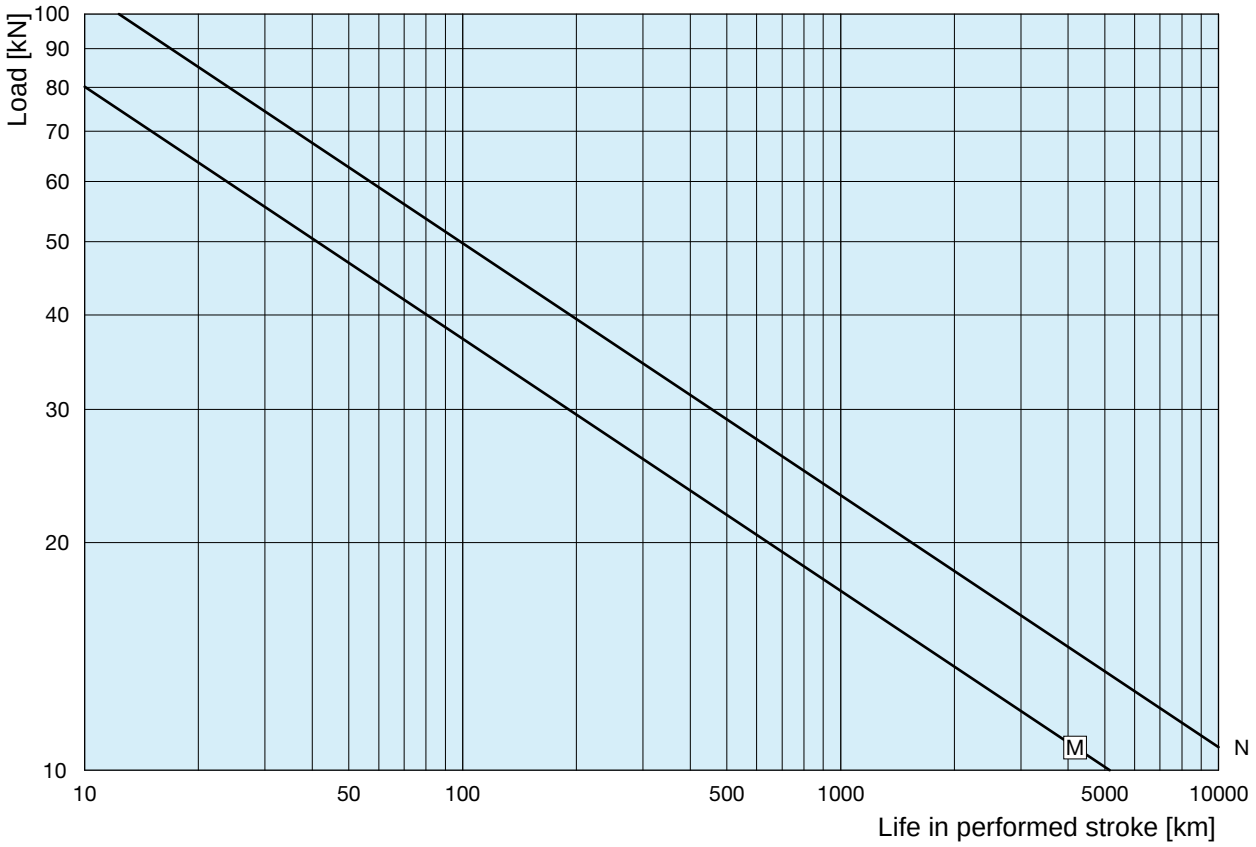


BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C_a [kN]	C_{0a} [kN]	CURVE
BS 40×10	6.35	1	5	51.8	111.1	**K**
BS 40×20	6.35	1	3	34.3	69.9	**J**
BS 40×40	6.35	2	2	40.3	77.1	**L**

2.11 Ball nut life

MA 100 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 “Ball screws life calculation” on page 18 or contact SERVOMECH.

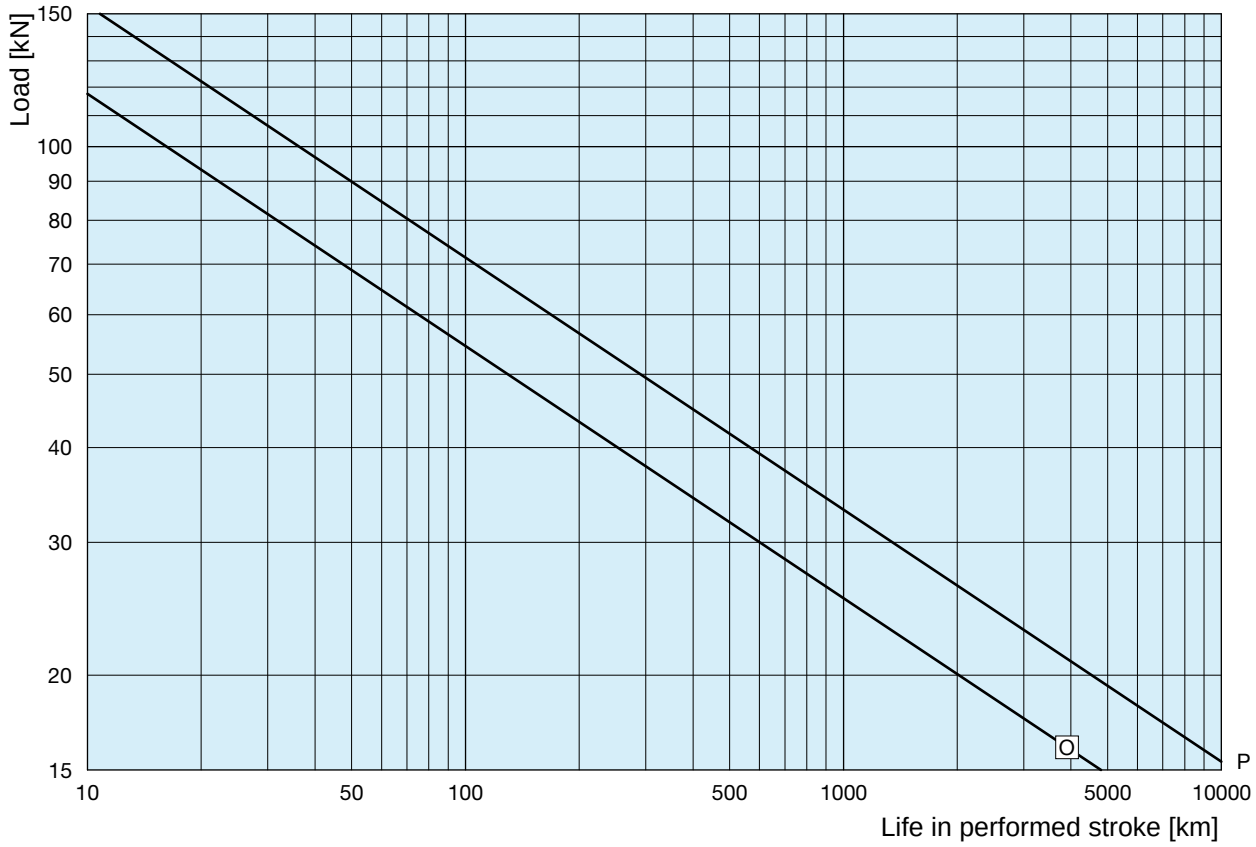


BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C_a [kN]	C_{0a} [kN]	CURVE
BS 50×10	6.35	1	7	107.2	271.3	**N**
BS 50×20	6.35	1	4	63.6	146.8	**M**

2.11 Ball nut life

MA 150 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 “Ball screws life calculation” on page 18 or contact SERVOMECH.

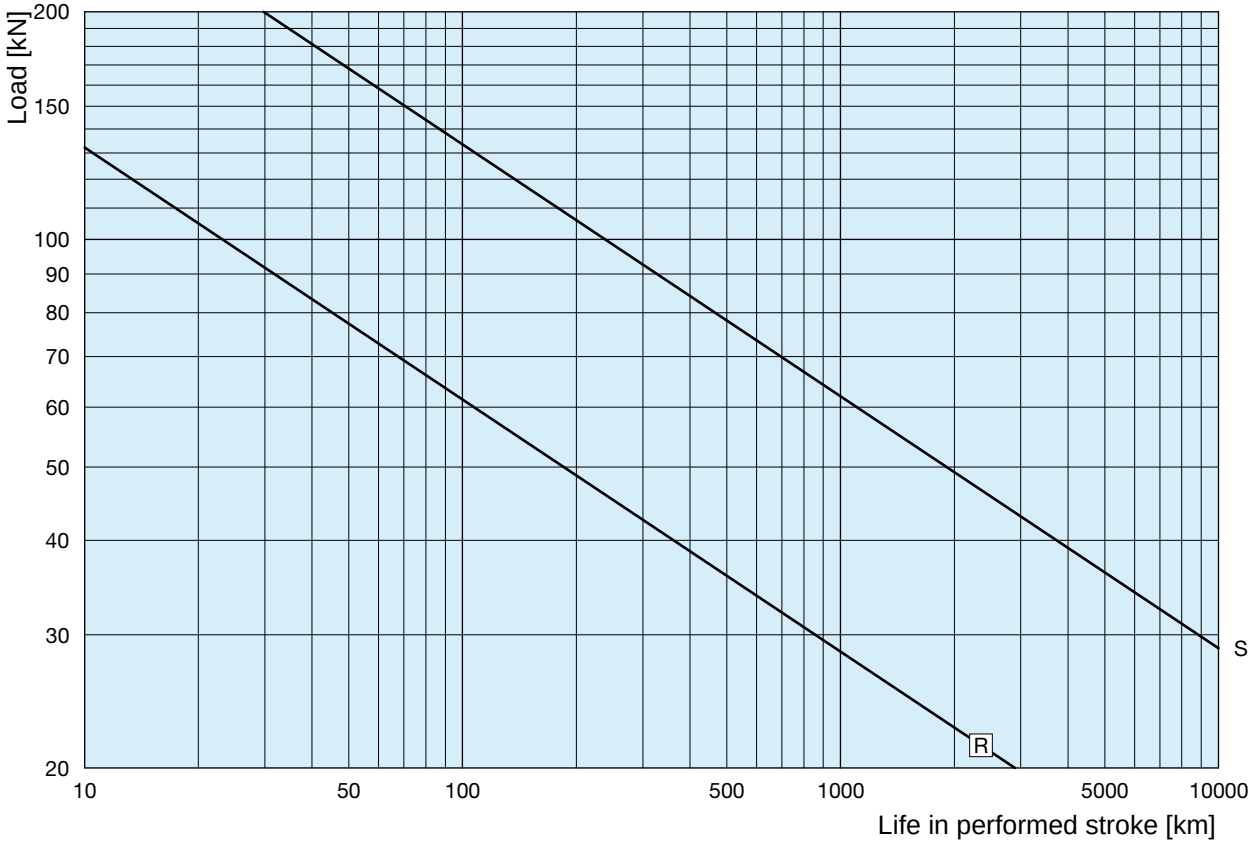


BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C_a [kN]	C_{0a} [kN]	CURVE
BS 63×10	7.144	1	6	117.5	339.8	**O**
BS 63×20	9.525	1	4	122.1	291.8	**P**

2.11 Ball nut life

MA 200 BS Mod.A

The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 “Ball screws life calculation” on page 18 or contact SERVOMECH.

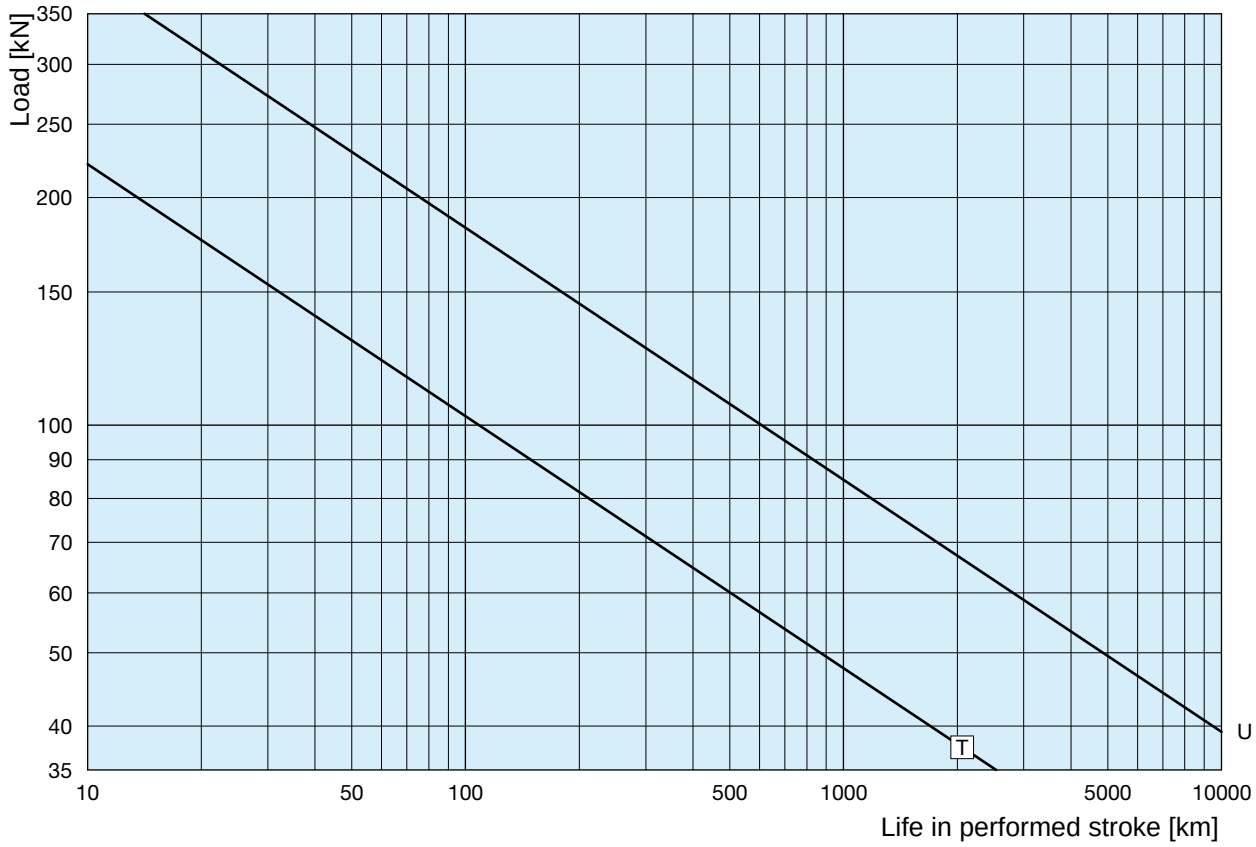


BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C_a [kN]	C_{0a} [kN]	CURVE
BS 80×10	7.144	1	7	132.3	448.5	**R**
BS 80×20	12.7	1	5	228.4	585.6	**S**

2.11 Ball nut life

MA 350 BS Mod.A

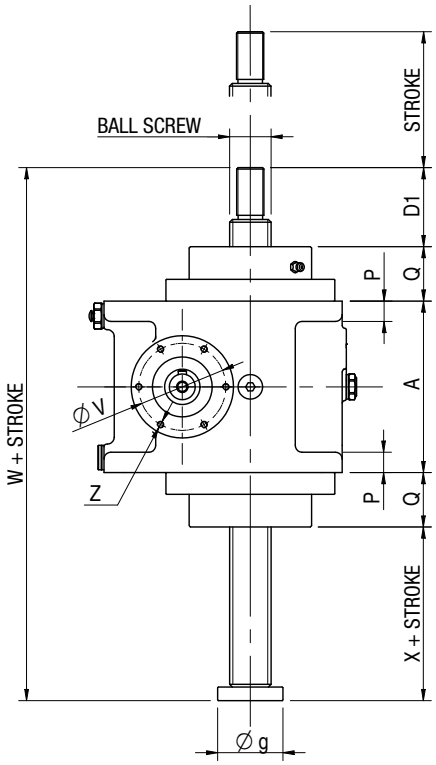
The life graphs below refer to constant applied load, without shocks, with ball screws reliability of 90 %. For different load and/or reliability conditions, see ch. 1.11 “Ball screws life calculation” on page 18 or contact SERVOMECH.

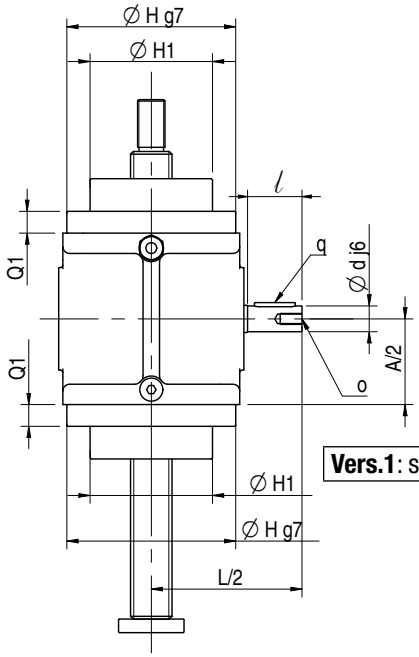


BALL SCREW	Ball [mm]	n° of starts	n° of circuits	C_a [kN]	C_{0a} [kN]	CURVE
BS 100×16	9.525	1	6	189.3	637.9	**T**
BS 100×20	12.7	1	6	311.9	962.8	**U**

2.12 Overall dimensions

MA BS Series Mod.A, size 5 - 10 - 25 - 50 - 100 - 150

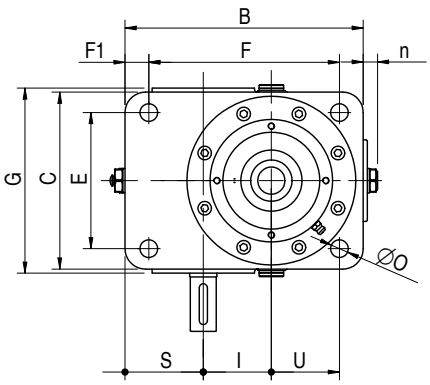


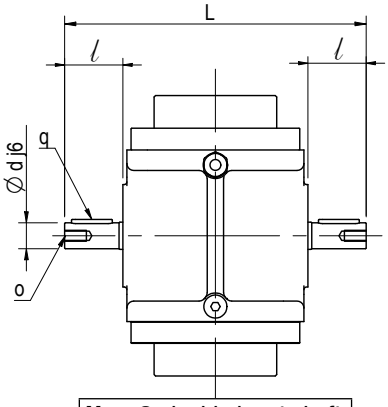


Vers.1: single input shaft

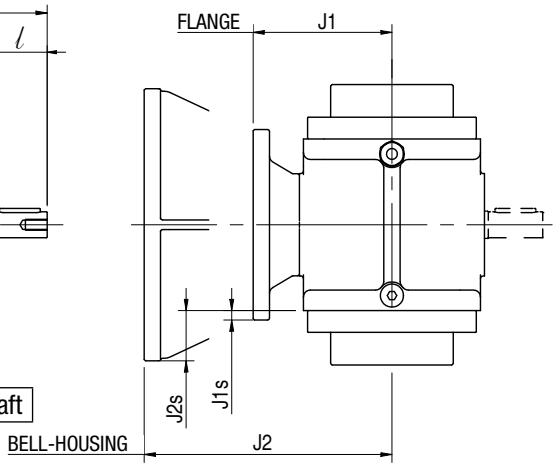
Vers.3: flange and hollow shaft IEC

Vers.4: flange and hollow shaft IEC + 2nd shaft



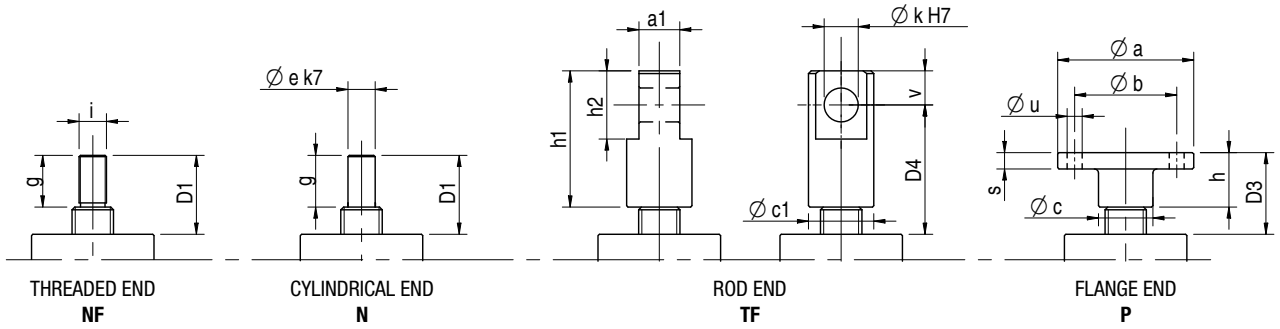


Vers.2: double input shaft



Vers.5: Vers.1 with bell-housing and coupling IEC

Vers.6: Vers.2 with bell-housing and coupling IEC



THREADED END **NF** | CYLINDRICAL END **N** | ROD END **TF** | FLANGE END **P**

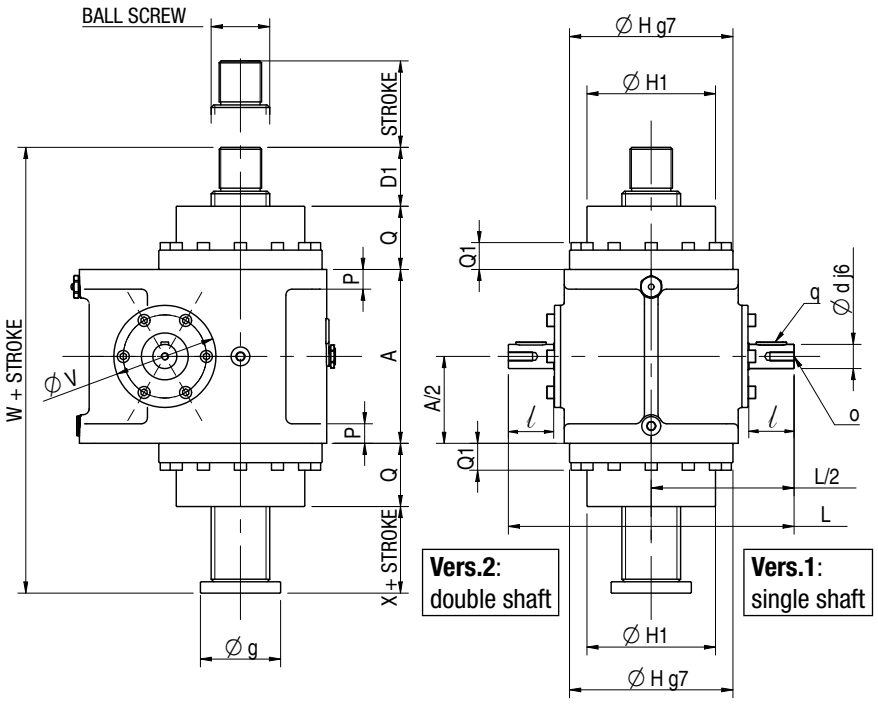
2.12 Overall dimensions

MA BS Series Mod.A, size 5 - 10 - 25 - 50 - 100 - 150

SIZE	MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 100 BS	MA 150 BS
BALL SCREW	BS 16 × P_h	BS 25 × P_h	BS 32 × P_h	BS 40 × P_h	BS 50 × P_h	BS 63 × P_h
A	80	100	126	160	200	200
B	124	140	175	235	276	276
C	80	105	130	160	200	200
D1 (min.)	39	44	58	58	68	68
D3 (min.)	40	45	60	60	70	70
D4 (min.)	65	75	95	105	150	150
E	62	80	100	120	150	150
F	95	110	140	190	220	220
F1	12.5	14	17.5	23	26	26
G	100	114	136	165	205	205
∅ H	75	95	124	145	185	185
∅ H1	54	65	90	109	150	150
I	30	40	50	63	80	80
L	149	179	221.5	269	330	330
∅ O	9	9	13	17	21	21
P	10	12	15	19	22	22
Q	29.5	32	40	41.5	64	64
Q1	11	12	16	25	29	29
S	46.5	46	57.5	80	91	91
U	31	38	50	70	75	75
∅ V	42	46	64	63	74	74
W	191.5	229	291.5	330.5	394.5	424.5
X	13.5	21	27.5	29.5	-1.5	28.5
Z	M5, depth 10	M5, depth 12	M5, depth 10	M6, depth 14	M6, depth 14	M6, depth 14
∅ a	68	75	100	120	150	150
a1	20	25	30	40	60	60
∅ b	45	55	75	85	110	110
∅ c	25	30	40	50	70	70
∅ c1	32	38	48	68	90	90
∅ d	10	14	19	24	28	28
∅ e	12	15	20	30	40	40
∅ g	30	38	48	70	82	96
g	19	24	38	38	48	48
h	20	25	40	40	50	50
h1	60	75	100	120	180	180
h2	30	40	50	70	100	100
i	M12×1.75	M16×1.5	M20×1.5	M30×2	M42×3	M42×3
∅ k	14	20	25	35	50	50
l	22	30	40	50	60	60
n	—	—	10	10	12	12
o	M5, depth 10	M6, depth 14	M8, depth 16	M8, depth 16	M8, depth 16	M8, depth 16
q	3×3×15	5×5×20	6×6×30	8×7×40	8×7×40	8×7×40
s	8	10	12	15	20	20
∅ u, n° holes	∅ 7, 4 holes	∅ 9, 4 holes	∅ 11, 4 holes	∅ 17, 4 holes	∅ 21, 4 holes	∅ 21, 4 holes
v	15	20	25	35	50	50
J1	63 B5/B14: 62	63 B5/B14: 69	63/71 B5: 102	80 B5: 100	80/90 B5: 120	80/90 B5: 120
J1s	63 B5: 30 63 B14: 5	63 B5: 20 63 B14: —	63 B5: 7 71 B5: 17	80 B5: 20	80/90 B5: —	80/90 B5: —
J2	71 B5: 122 71 B14: 131	71 B5: 129 71 B14: 138	80 B5: 182 80 B14: 176 90 B5: 182 90 B14: 182	90 B5: 200 90 B14: 200 100 B5: 220 100 B14: 220	100/112 B5 240 100/112 B14: 240	100/112 B5 240 100/112 B14: 240
J2s	71 B5: 40 71 B14: 12.5	71 B5: 30 71 B14: 3	80 B5: 37 80 B14: — 90 B5: 37 90 B14: 7	90 B5: 20 90 B14: — 100 B5: 45 100 B14: —	100/112 B5 25 100/112 B14: —	100/112 B5 25 100/112 B14: —

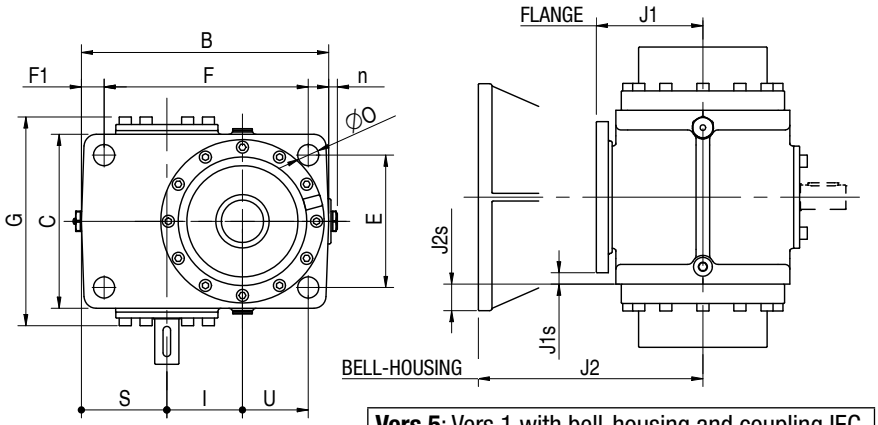
2.12 Overall dimensions

MA BS Series Mod.A, size 200 - 350



Vers.3: flange and hollow shaft IEC

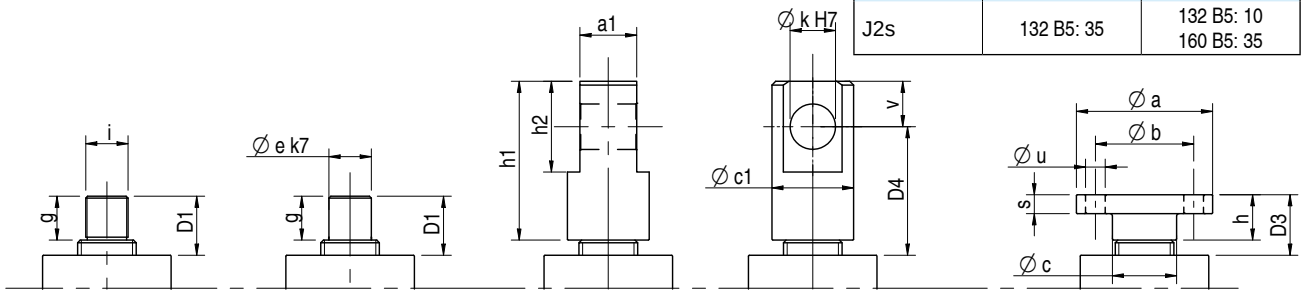
Vers.4: flange and hollow shaft IEC + 2nd shaft



Vers.5: Vers.1 with bell-housing and coupling IEC

Vers.6: Vers.2 with bell-housing and coupling IEC

SIZE	MA 200 BS	MA 350 BS
BALL SCR.	BS 80 × P_h	BS 100 × P_h
A	230	280
B	330	415
C	230	330
D1 (min.)	78	98
D3 (min.)	80	100
D4 (min.)	170	220
E	175	230
F	270	330
F1	30	42
G	256	326
∅ H	216	290
∅ H1	170	220
I	100	125
L	378	490
∅ O	28	34
P	26	30
Q	83.5	84
Q1	35.5	46
S	113	121
U	87	126
∅ V	110	118
W	489.5	549
X	14.5	3
Z	M10, depth 20	M10, depth 25
∅ a	180	250
a1	75	100
∅ b	130	180
∅ c	85	115
∅ c1	108	138
∅ d	32	38
∅ e	50	70
∅ g	106	146
g	58	78
h	60	80
h1	210	280
h2	120	160
i	M56×3	M80×3
∅ k	60	80
l	60	80
n	10	10
o	M10, depth 24	M12, depth 32
q	10×8×40	10×8×60
s	25	35
∅ u, n° holes	∅ 26, 6 holes	∅ 30, 6 holes
v	60	80
J1	90 B5: 142 100/112 B5: 142	—
J1s	90 B5: — 100/112 B5: 10	—
J2	132 B5: 297	132 B5: 353 160 B5: 365
J2s	132 B5: 35	132 B5: 10 160 B5: 35

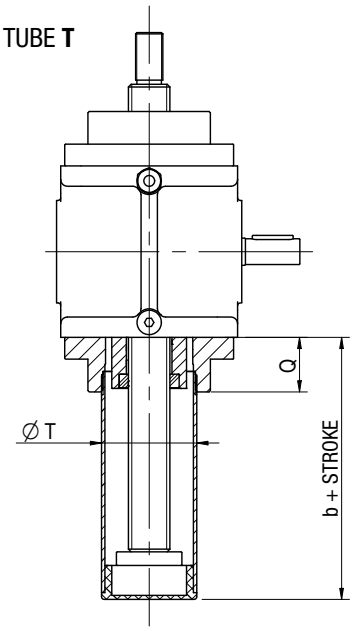


THREADED END **NF** | CYLINDRICAL END **N** | ROD END **TF** | FLANGE END **P**

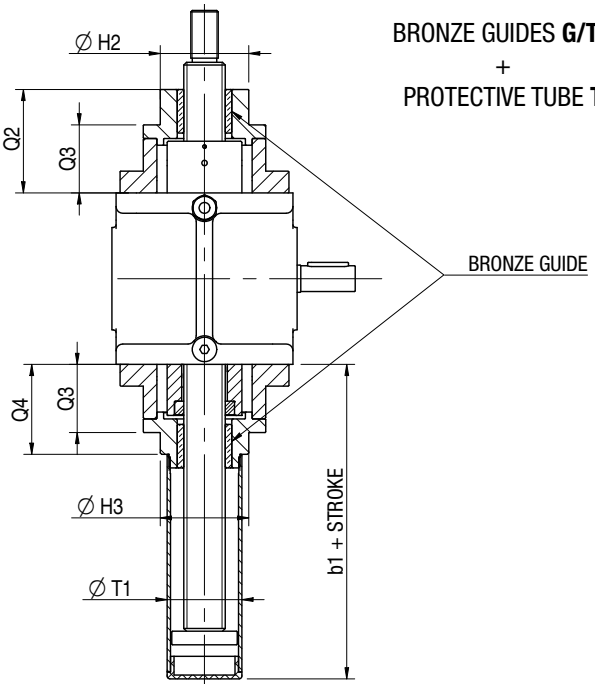
2.12 Overall dimensions

MA BS Series Mod.A with protective tube T

PROTECTIVE TUBE **T**



BRONZE GUIDES **G/TG**
+
PROTECTIVE TUBE **T**



SIZE		MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 100 BS	MA 150 BS	MA 200 BS	MA 350 BS
BALL SCREW		BS 16 × P_h	BS 25 × P_h	BS 32 × P_h	BS 40 × P_h	BS 50 × P_h	BS 63 × P_h	BS 80 × P_h	BS 100 × P_h
∅ H2		34	48	65	85	100	100	150	160
Q2		47.5	60	76	82.5	114	128	147.5	184
Q3		37.5	41	50	58.5	84	98	83.5	123
Q4		–	50	66	72.5	103	117	127.5	123
∅ T	exec. T	45	55	70	90	110	110	150	180
	exec. T+SN								
	exec. T+AR								
	exec. T+FCP								
	exec. T+AR+FCP								
	exec. T+FCM	45	55	55	55	–	–	–	–
Q	exec. T	29.5	32	40	41.5	64	64	83.5	50
	exec. T+SN								
	exec. T+AR								
	exec. T+FCP								
	exec. T+AR+FCP								
	exec. T+FCM	29.5	32	50	54.5	–	–	–	–
b	exec. T	68	78	92.5	96	107.5	137.5	143	152
	exec. T+SN	74	84	127.5	136	132.5	162.5	168	182
	exec. T+AR	97	110	132.5	136	127.5	157	164	178
	exec. T+FCP	103.5	106	112.5	116	139	137	161.5	161
	exec. T+AR+FCP	107.5	110	132.5	136	152	157	177.5	190
	exec. T+FCM	96.5	106	140	144.5	–	–	–	–
∅ T1	exec. TG	36	45	55	55	90	90	130	170
	exec. TG+FCM					–	–	–	–
	exec. TG+FCP	40	50	55	60	100	100	130	170
	exec. TG+AR	45	55	70	90	110	110	150	180
∅ H3	exec. TG	36	48	65	85	100	100	150	170
	exec. TG+FCP								
	exec. TG+FCM					–	–	–	–
	exec. TG+AR	45	55	70	90	110	110	150	180
b1	exec. TG	98.5	113	131	157.5	169	183	233.5	275
	exec. TG+FCP	122.5	135	151	157.5	188	202	238.5	269
	exec. TG+FCM	122.5	135	156	162.5	–	–	–	–
	exec. TG+AR	137.5	145	171	177.5	209	223	248.5	294

2.13 Electric motor fitting

IEC elettric motors

		MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 100 BS	MA 150 BS	MA 200 BS	MA 350 BS
63	B5	F	F	F					
	B14	F	F						
71	B5	B	B	F	F				
	B14	B	B	F					
80	B5			B	F	F	F		
	B14			B					
90	B5			B	B	F	F	F	
	B14			B	B				
100 - 112	B5				B	B	B	F	
	B14				B	B	B		
132	B5							B	B
160	B5								B

F - flange with hollow shaft IEC

B - bell-housing + coupling IEC

LINEARMECH Brushless Servomotors

Ball screw jacks can be equipped with Linearmech Brushless Servomotors BM Series with metric flange dimensions, according to IEC 34-7, UNEL 05513 regulations. Possible fittings are described bellow:

Servomotor	MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 100 BS	MA 150 BS	MA 200 BS	MA 350 BS
BM 45 L IEC								
BM 63 S IEC	•	•						
BM 63 L IEC	•	•	•					
BM 82 S IEC			•					
BM 82 L IEC			•					
BM 102 S IEC			•	•				
BM 102 L6 IEC			•	•				
BM 102 L8 IEC			•	•				

For technical data of servomotors, please refer to Chapter 5 “Servo motors” on page 115.

Flanges and bell-housings to specific drawing for hydraulic motors or servo motors are available on request.

2.14 Accessories

Bronze guides

The bronze guide ensures the coaxial position of the ball screw with the its nut. This is extremely important to have the optimal contact between balls and ball tracks for a longer screw life. Guides are mounted **on both sides** of the screw jack housing.

Bronze guides are mostly recommended in case no other external guiding system is used.

Ordering code: **G-G**

If the screw jack needs a protective tube in addition to the bronze guides, it is possible to have a combination of the two accessories.

Ordering code: **G-TG**

In applications with trunnion mount SC, bronze guides are absolutely necessary!

Stop nut

The stop nut prevents the ball screw travelling out of the screw jack housing. It is a washer pinned at the screw end (opposite the attachment side) that blocks the screw translation when reaching the related stop. Unlike the standard washer, made of tecnopolimer, which prevents unscrewing, the stop nut is made of steel and can sustain the load in case it should reach the related mechanical stop.

The ball screw length is defined to have, during normal working condition, at its extreme (extended or retracted) position an extra-stroke (safety stroke) of at least 20 mm.

If the stop nut reaches accidentally the related stop, it is necessary to check the screw jack's components to verify possible damages.

Ordering code: **SN**

2.14 Accessories

Protective tube

The protective tube is screwed in the cover and protects the ball screw from damages and/or environment pollution such as dust, water, etc. Furthermore, it allows the fitting of other options such as limit switches and/or anti-turn device.

The protective tube is in aluminium alloy or in steel in case of screw jack fitted with anti-turn device.

Ordering code: **T**

Anti-turn device

The anti-turn device is necessary when the load to be lifted is not guided and therefore the ball screw rotation is not prevented, or in case the application does not properly allow the screw reaction to permit the translation.

Functioning: a steel key is fitted along the protective tube, and a keyed bronze washer is fixed at the end of the ball screw; this prevents the screw rotation and forces the screw translation.

Up to screw jack size 50 (ball screw BS 40 × P_h) included, the anti-turn device has only one key; from size 100 (ball screw BS 50 × P_h) on, it has two keys mounted on opposite sides.

The bronze washer also acts as a stop nut against ball screw unthreading.

Ordering code: **AR**

Fixing attachments in stainless steel

For applications in particular environment conditions or in food industry, on request screw jacks can be supplied with end attachment in stainless steel. Available standard steels are AISI 303, AISI 304, on request AISI 316.

Ordering code: **P inox** stainless steel flange end P, for screw jacks Mod.A

Ordering code: **TF inox** stainless steel rod end TF, for screw jacks Mod.A

2.14 Accessories

Magnetic limit switches

Available for screw jacks size 5, 10 or 25 only. Not supplied with anti-turn device AR.

Functioning: magnetic limit switches are sensors with reed contact and are fitted with a clamp on the aluminium, or other non-magnetic metal, protective tube T. They are activated by the magnetic field generated by a magnetic ring fitted on the travelling ball screw end.

In case the screw jack is not stopped after the sensor activation, without magnetic field the sensor restores the original state. In case the limit switches are used to stop the screw jack, we recommend to provide an electric connection in order to latch the signal and prevent the screw jack from moving again in the same direction.

Screw jacks with magnetic limit switches are supplied with two sensors for the ball screw extreme positions. On request, extra switches for intermediate positions can be supplied.

The position of the sensors along the tube is adjustable.

Technical details:

Contact:	normally CLOSED (NC)	normally OPEN (NO)
Voltage range:	(3 ... 130) Vdc / (3 ... 130) Vac	
Switching capacity:	20 W / 20 VA	
Max. switching current at 25°C:	300 mA (resistive load)	
Max. inductive load:	3 W (simple coil)	—
Wires:	2 × 0.25 mm^2	
Cable length:	2 m	

Ordering code: **FCM-NC** for screw jacks with normally closed magnetic switches FCM

Ordering code: **FCM-NO** for screw jacks with normally open magnetic switches FCM

2.14 Accessories

Inductive proximity limit switches

Functioning: the limit switches are proximity sensors fixed on the protective tube and activated by the metallic ring placed on the ball screw end.

In case the screw jack is not stopped after the sensor activation, when the metallic ring moves away the sensor restores the original state (is deactivated). In case the limit switches are used to stop the screw jack, we recommend to provide an electric connection in order to latch the signal and to prevent the screw jack from moving again in the same direction.

Screw jacks with proximity limit switches are supplied with two sensors for the ball screw extreme positions. Extra switches for intermediate positions available on request.

Standard execution:
not adjustable FCP

On request:
adjustable FCP

By standard execution, the sensors position along the tube is not adjustable and it is not angularly fixed. On request, it can be supplied with angular position at customer's requirement.

Execution with axial adjustment of the sensors position available on request.

Technical details:

Type:	inductive, PNP
Contact:	normally CLOSED (NC)
Voltage range:	(10 ... 30) Vdc
Max. output current:	200 mA
Voltage drop (activated sensor):	< 1.8 V
Wires:	3 × 0.2 mm^2
Cable length:	2 m

Ordering code: **FCP** **(standard, not adjustable)**
FCPR **(on request, adjustable)**

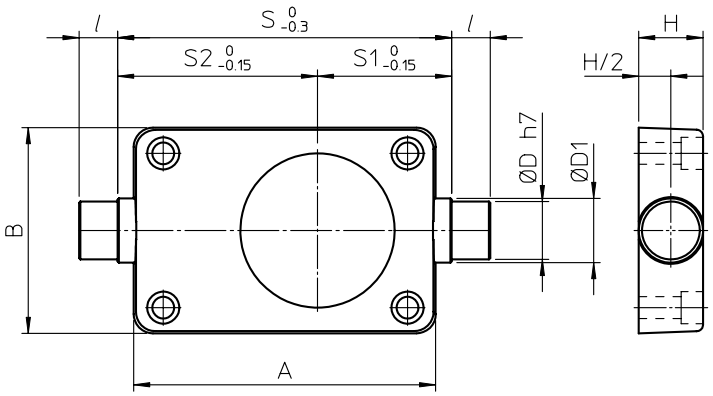
2.14 Accessories

Trunnion mount

The trunnion mount is bolted to either the top or the bottom of the screw jack housing and allows the screw jack pivoting around the axis defined by the trunnion mount's lateral pins.

NOTE: the attachment of the travelling ball screw must have a cylindrical hole with axes parallel to the trunnion mount pivots axis.

In applications with trunnion mount, bronze guides are absolutely necessary!



	MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 100 BS	MA 150 BS	MA 200 BS	MA 350 BS
A	134	155	199	260	301	301	360	465
B	90	120	154	185	225	225	260	350
ØD	15	20	25	45	50	50	70	80
$ØD_1$	20	25	30	50	60	60	80	90
H	20	25	30	50	60	60	80	90
l	15	20	20	30	40	40	45	60
S	140	160	225	285	330	330	390	490
S_1	55.5	64	92	117	132	132	147	206.5
S_2	84.5	96	132	168	198	198	243	283.5
mass [kg]	1.4	2.6	5.1	14.8	23.5	23.5	45.5	81.9

Ordering code: **SC (TF side)** screw jacks with SC fixed on the screw attachment side

Ordering code: **SC (opposite TF side)** screw jacks with SC fixed on side opposite to the screw attachment

Bellows

In applications with particular environment conditions, bellows protect the screw from contaminants.

The usually supplied bellows are circular, sewn (double seam), in NYLON with a PVC outside and inside coating. For special application requirements, different executions or materials can be supplied on request.

The bellows cause changes to the retracted and extended lengths and screw jack overall dimensions stated in the catalogue. On request, orders will be acknowledged with a screw jack drawing giving exact dimensions.

Usually, bellows are fitted between the screw jack housing and the ball screw attachment and the protective tube is fitted on the opposite side.

In case the screw jack shall have a ball screw without attachment, it is recommended to order it with a sketch of the required bellows attachment dimensions.

Codice: **B**

2.14 Accessories

Worm wheel rotation detector

Some applications require the possibility to verify if the worm wheel rotates while the worm shaft is moving in order to get information about the good condition and functioning of the worm wheel toothing.

A cylindrical element, machined in order to have a “crown” of empty and full spaces, is fixed to the worm wheel creating a phonic wheel that, while rotating, activates a corresponding proximity switches. As output of such proximity switch, activated and deactivated by the alternation of empty and full spaces, a “train” of impulses is generated which confirms the rotation of the worm wheel. On the contrary, the constant output signal of the proximity switch means the stop of the worm wheel.

The puls generator can be mounted on the screw end side or on the opposite side.

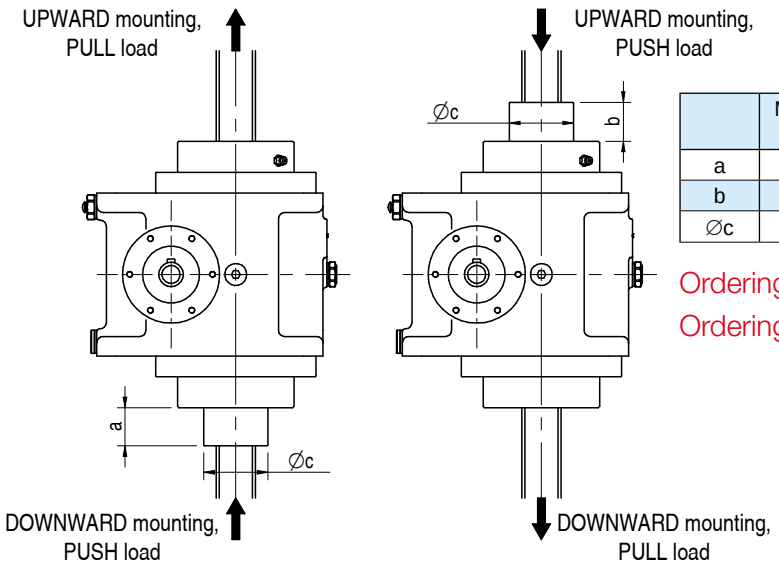
Safety nut

The safety nut is a back-up feature to prevent the load dropping in an un-controlled manner in case of working nut balls failure. This can be caused by overload or by achieving a critical wear level.

The safety nut is an extension to the main nut and changes the screw jack overall dimensions. It works with one particular load direction only. Its position as regards the main nut is therefore conditioned by the load direction: with pull load the safety nut is on the opposite side of the screw end, with push load it is on the screw end side.

The safety nut does not have balls inside, but a helical thread that traces the ball truck on the screw. With a not worn out main nut, the thread of the nut does not touch the screw; in case the balls of the main nut should fail, the safety nut will touch the screw and sustain the load, causing a slithering between the screw and the safety nut threads. The safety nut is made in steel and therefore, in case it is activated, it is then necessary to replace both screw and main nut.

Since the safety nut is a rotating component, if the screw jack is not provided with the protective tube, a protective device is supplied as standard.



	MA 5 BS	MA 10 BS	MA 25 BS	MA 50 BS	MA 100 BS	MA 150 BS	MA 200 BS	MA 350 BS
a	3.5	18	30	40	0	18.5	0	3
b	14.5	24	30	40	18	18.5	0	18
Øc	28	40	50	63	75	90	105	150

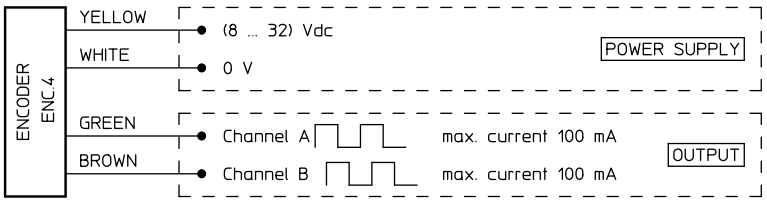
Ordering code: **MSA push** safety nut for push load

Ordering code: **MSA pull** safety nut for pull load

2.14 Accessories

ROTARY ENCODER Code ENC.4

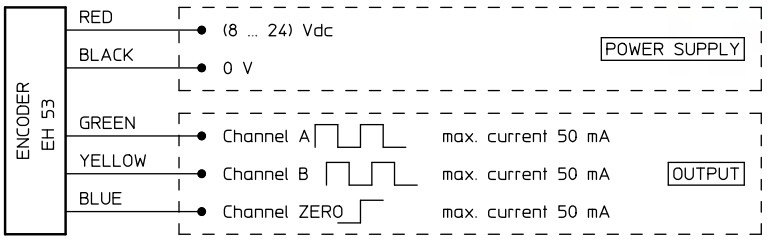
Hall-effect encoder, incremental, bi-directional
Resolution: 4 pulses per revolution
Output: PUSH-PULL
2 channels (A and B, phase difference 90°)
Input voltage: (8 ... 32) Vdc
Max. commutable current (I_{out}): 100 mA
Max output voltage drop:
with load connected to 0 and I_{out} = 100 mA: 4.6 V
with load connected to + V and I_{out} = 100 mA: 2 V
Protection:
against short circuit
against input polarity inversion
against any incorrect output connection
Cable length: 1.3 m
Protection: IP 55



Ordering code: **ENC.4**

ROTARY ENCODER Code EH53

Optical encoder, incremental, bi-directional
Resolution: 100 or 500 pulses per revolution
Output: PUSH-PULL
2 channels (A and B, phase difference 90°)
channel ZERO
Input voltage: (8 ... 24) Vcc
No-load current: 100 mA
Max. commutable current: 50 mA
Cable length: 0.5 m
Protection: IP 54



Ordering code: **EH 53**

Screw Jacks with travelling ball screw (Mod.A)

2.15 Ordering code MA BS Series Mod.A

MA	50	BS 40 × 10	Mod.A	RL	Vers. 3 (80 B5)	U-RH	C300
1	2	3	4	5	6	7	8

TF	B	G	MSA	/	G	SC	T	AR	FCP
9									

...
10

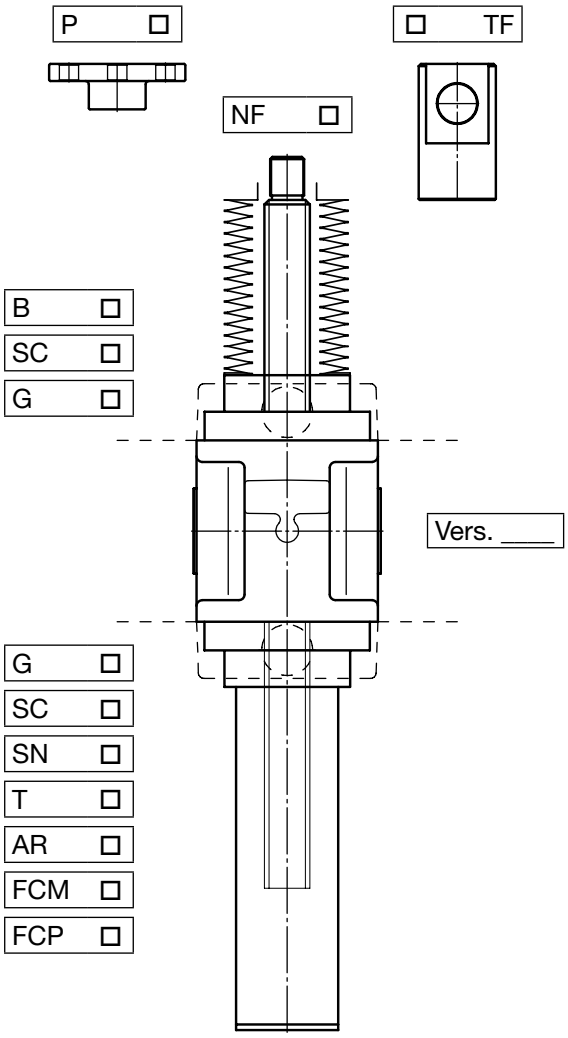
...
11

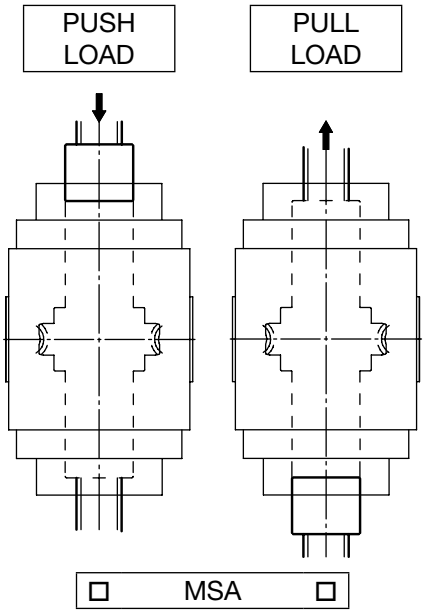
AC	3-phase	brake motor	0.75 kW	4-pole	230/400 V	50 Hz	IP 55	Ins. F
12								

1	MA (screw jack MA BS Series)		
2	Screw jack size		
	5 ... 350		page 22 - 23
3	Ball screw		
	BS diameter × lead		
4	Mod.A (model: travelling screw)		
5	Worm gear ratio		
	RV , RN , RL		page 22 - 23
6	Input version		
	Vers.1, Vers.2, Vers.3, Vers.4, Vers.5, Vers.6		page 9
7	Screw jack mounting and input shaft position		
	U-RH, U-LH, D-RH, D-LH, H-RH, H-LH		page 9
8	Screw jack stroke length (ex.: C300 = 300 mm stroke)		
9	Accessories		
	NF, P, TF, N	Screw end	page 48 - 49, 50
	B	Bellows	page 57
	SC	Trunnion mount	page 57
	G	Bronze guides	page 53
	SN	Stop nut	page 53
	T	Protective tube	page 54
	AR	Anti-turn device	page 54
	FCM-NC	Magnetic limit switches (normally closed)	page 55
	FCP-NC	Proximity limit switches (PNP, normally closed)	page 56
	MSA push (pull)	Safety nut for push (or pull) load	page 58
		Worm wheel rotation detector	page 58
10	Other accessories		
	example: encoder (with all relevant data)		page 59
11	Other specifications		
	example: lubricant for low temperature		
12	Motor data		
13	Filled in selection sheet		page 61
14	Application layout		

Screw Jacks with travelling ball screw (Mod.A)

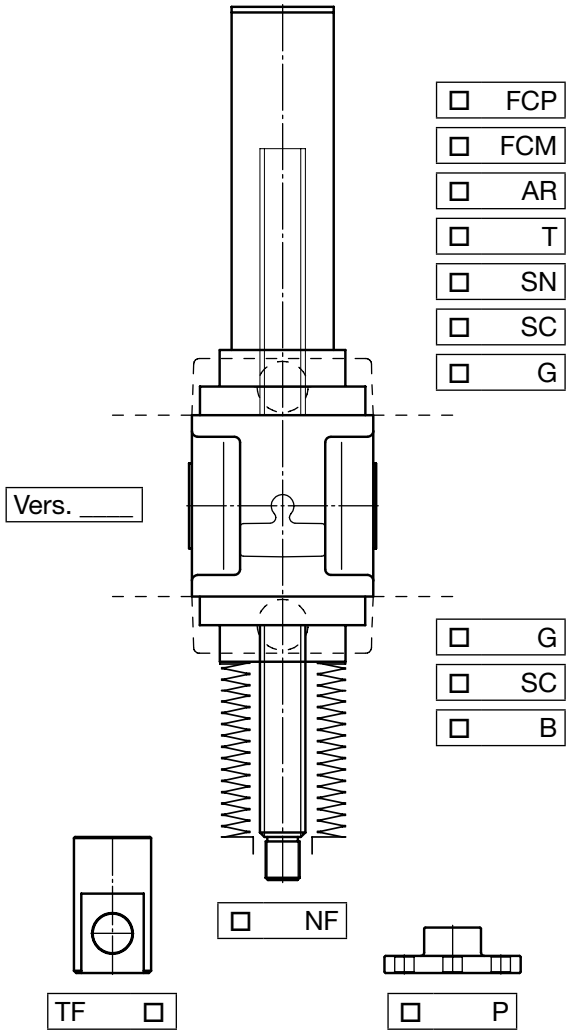
UPWARD mounting ☐

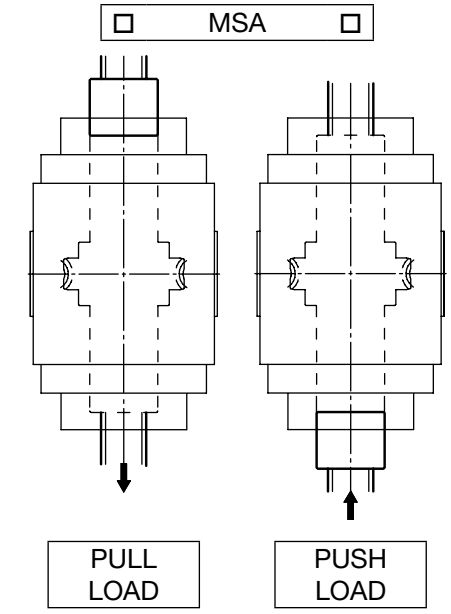




UPWARD mounting ☐

DOWNWARD mounting ☐





DOWNWARD mounting ☐