

 **MAVILOR**

INFRANOR GROUP COMPANY



Motors

DC Servo Motors MSS Series

DC Servo Motors MSS MSK Series

DC Servo Motors CML Series

DC Servo Motors EExdIIC Series

DC Servo Motors MSS Series

- Ratings to 6,000 RPM.
- Compact Length.
- Zero Cogging.
- Acceleration Torques to 10 x Rated.

MAVILOR's axial air gap dish armature is specially suited for high response servo drives. High torque to inertia ratio and smooth, non cogging torque low speed velocity control makes MAVILOR the motor of choice for the most exacting applications.

The MAVILOR MSS Series servomotors provide a 20% increase in power to weight and volume ratios and a 20% increase in power rate and acceleration capability over previous designs.

Incorporating an ironless rotor design, these industrial strength motors have an extremely long brush life and high efficiency.

MAVILOR MSS Series motors incorporate options of tachometers and fail-safe holding brakes within the motor structure, and in many cases are half the length of equivalently rated conventional motors.



Dimensions

	MSS-2	MSS-4	MSS-6	MSS-8	MSS-12	MSS-22	MSS-35	MSS-45
A	131.5	129.5		140	139.5	167.5		193
B	23		30			50		60
C	122.5	120.5		131	127.5	155.5		181
D			9				12	
E	4		3.5				4.5	
F (DIN 933)	M3x10		M4x16			M8x16		M10x22
G (DIN 6885)	A4x4x14		A5x5x20				A8x7x32	
H	3		2				3.5	
I	235	233		243.5	237.5	265.5		291
J (j6)	ø80		ø95			ø130		ø180
K (j6)	ø110		ø130		ø180	ø230		ø250
L	ø118	ø140	ø168	ø192	ø212	ø275		ø305
M	4xM6 ø100		4xM6 ø115		4xM8 ø165	4xM10 ø165		4xM12 ø215
N (h11)	ø149	ø200	ø210	ø205	ø250	ø300		ø350
O	□ 119	□ 154	□ 170	□ 176	□ 206	□ 258		□ 284
P	4xø9 ø130	4xø11 ø165		4xø11 ø180	4xø14 ø215	4xø14 ø265		4xø18 ø300
Q (h9)	4		5				8	
R (g6)	11		14			24		28
S (h9)	12.7		16			27		31
T					ø101			
V	8			10		11		14
W	10.5	13	13.5	14		12.5		14
X			35.5				33	
Z					77			

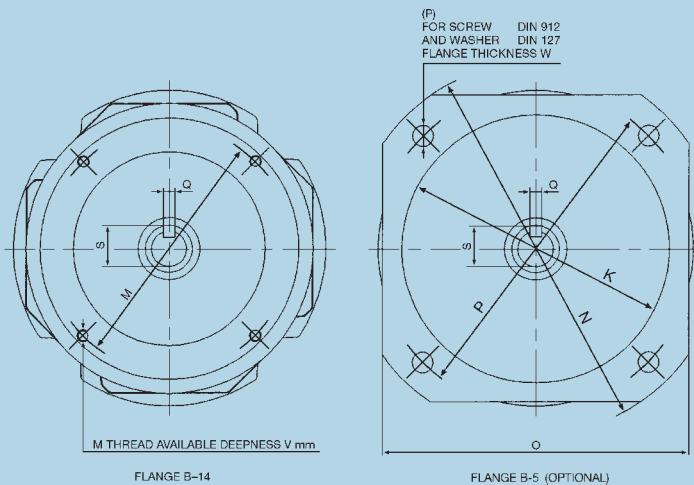
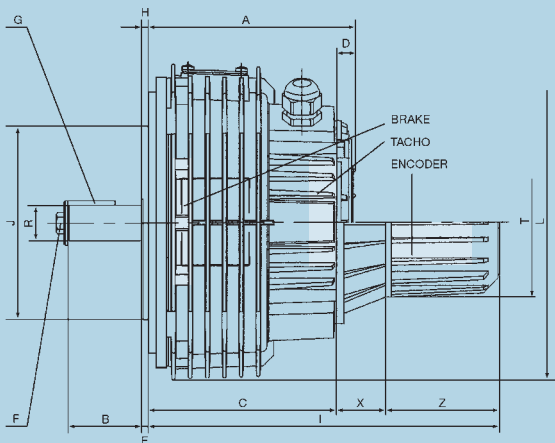


Available CSA-US certified

Technical Specifications

ALL CHARACTERISTICS MEASURED AT 40°C AMBIENT TEMPERATURE EXCEPT TERMINAL RESISTANCE (25°C)

	SYMBOLS	UNITS	MSS-2	MSS-4	MSS-6	MSS-8	MSS-12	MSS-22	MSS-35	MSS-45
RATED SPEED	n	rpm	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
RATED VOLTAGE ±5%	U	V	39.4	67	67.8	89.7	106.7	181	200	224
RATED CURRENT	I	A	6.5	7.8	10.7	10.7	14	16	19.5	21
RATED OUTPUT POWER (1)	P	W	190.3	397	575	805	1,240	2,573	3,525	4,274
EFFICIENCY	η	%	74	76	80	84	83	89	90	91
RATED TORQUE	T	Nm	0.6	1.26	1.83	2.56	3.95	8.19	11.23	13.6
MAXIMUM TORQUE (2)	T _{max}	Nm	3.6	7.58	11	15.38	23.7	49.14	67.38	81.6
MAXIMUM SPEED (3)	n max	rpm	7,000	6,000	6,000	5,000	4,500	4,000	4,000	4,000
EMF CONSTANT ±5%	K _E	V/1000 rpm	10.4	18	19	26.3	30.85	55.6	62.53	70
TORQUE CONSTANT ±5%	K _T	Nm/A	0.099	0.172	0.181	0.251	0.295	0.53	0.597	0.668
FRICTION TORQUE	T _F	Nm	0.03	0.05	0.05	0.06	0.09	0.09	0.11	0.11
DAMPING CONSTANT	K _D	Nm/1000 rpm	0.003	0.009	0.018	0.021	0.02	0.05	0.1	0.11
TERMINAL RESISTANCE (25°C)	R	Ω	1	1.25	0.75	0.82	0.75	0.67	0.51	0.51
ARMATURE INDUCTANCE	L	μH	<102	<130	<120	<150	<200	<250	<300	<300
INERTIA	J	kg m ² 10 ⁻³	0.15	0.37	0.40	0.82	1.7	5.1	8.5	8.5
MECHANICAL TIME CONSTANT	T _M	ms	14.38	15	9	10.17	14	11.6	11.6	9.3
TRANSITORY POWER	P _S	kW/s	89	155	300	288	330	473	534	783
THERMAL TIME CONSTANT ROTOR TO HOUSING	T _{AC}	s	170	180	190	200	300	360	650	650
THERMAL TIME CONSTANT (1) HOUSING TO AMBIENT	T _{CA}	s	1,700	1,750	1,800	2,000	2,700	3,000	4,000	4,000
THERMAL RESISTANCE ROTOR TO HOUSING	R _{AC}	°C/W	0.8	0.5	0.5	0.5	0.3	0.2	0.13	0.15
THERMAL RESISTANCE (1) HOUSING TO AMBIENT	R _{CA}	°C/W	0.5	0.3	0.4	0.4	0.3	0.2	0.14	0.15
RADIAL LOAD (at mid-length of shaft)	F _R	N	200	200	300	300	500	600	700	700
AXIAL LOAD	F _A	N	150	200	200	200	250	400	400	400
MASS (Only motor. No options)	M	kg	3.3	4.5	5.8	8	10	16	22	24
(1) With an aluminium heat sink plate			300x300x10			400x400x10			500x500x10	
(2) For an S3 cycle			3	3.5	4	7		10		
(3) Maximum speed in continuous service. During a very short time (r.p.m.)			9,000		6,000			4,500		



Options

MODEL	Tachometer Type	Brake Type
MSS-2	D40	04
MSS-4	D40	06
MSS-6	D40	06
MSS-8	D40	06
MSS-12	D40	07
MSS-22	D26	09
MSS-35	D26	11
MSS-45	D26	11

Tachometer Specifications

	UNITS	TYPE	
		D40	D26
Voltage Constant	V/krpm	10 ± 5%*	10 ± 5%*
Ripple @ 1000 rpm (pp)	%	<1.5	<1.2
Linearity @ 6000 rpm	%	≤0.1	≤0.1
Reversing Error	%	≤0.12	≤0.12
Temperature Coefficient	%/°C	0.03	0.02
Rotor Inertia	kg m ² 10 ⁻³	0.004	0.024
Resistance	Ω	86	90
Inductance	mH	13	25
Current	mA	2	4
Maximum Current	mA	8	17
Maximum Speed	rpm	9,000	8,000
Mass	kg	0.105	0.295

*other voltages available

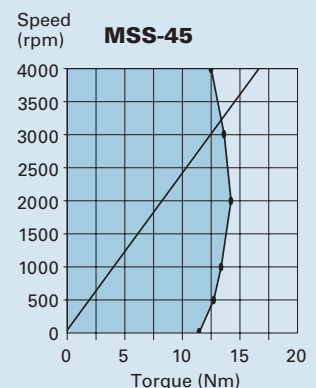
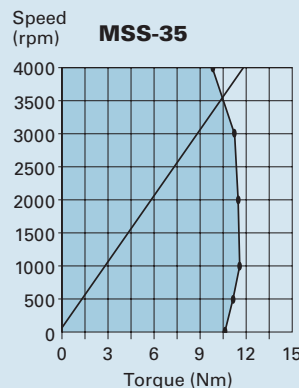
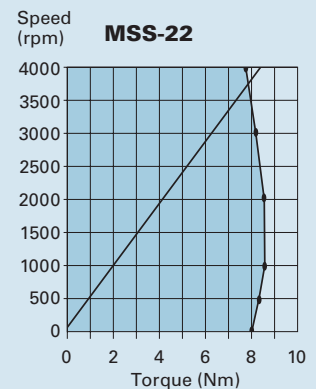
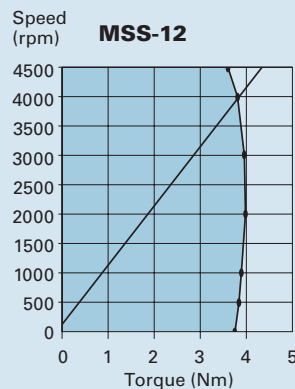
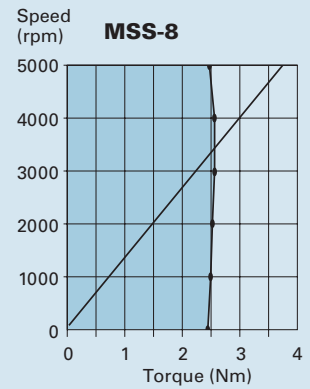
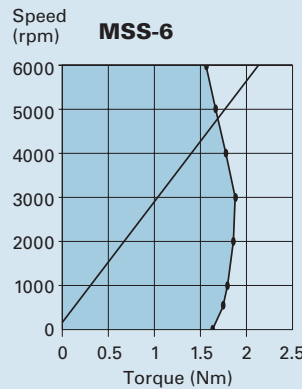
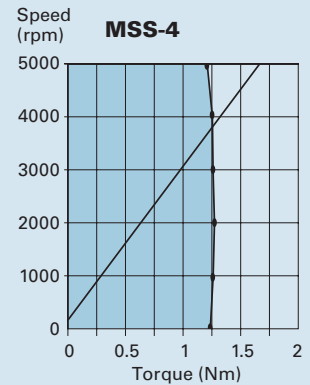
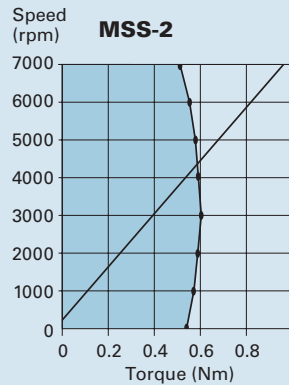
Brake Specifications

	UNITS	TYPE				
		04	06	07	09	11
Holding Torque	Nm	1.2	2.5	5	12	20
DC Voltage	V	24	24	24	24	24
Input Power	W	8	12	16	18	22
Inertia	kg cm ²	0.05	0.23	0.65	2.14	5.7
Response Time						
Disengagement	ms	4	7	15	30	55
Engagement	ms	3	5	7	13	18
Mass	kg	0.19	0.3	0.6	1.1	1.9

Performance curves shown right indicate the continuous operating zone or torque-speed envelope for 40°C ambient conditions. For MAVILOR motors, the torque that the motor can produce continuously at rated speed (3000 rpm for most MSS Series motors) exceeds the stall torque rating of the motor. The continuous torque rating (T) is the value used for sizing motors once the RMS torque requirement has been determined.

Acceleration torques to 10X rated torque can be obtained. The S3 curves for each motor should be consulted to ascertain time duration vs duty cycle for peak torques.

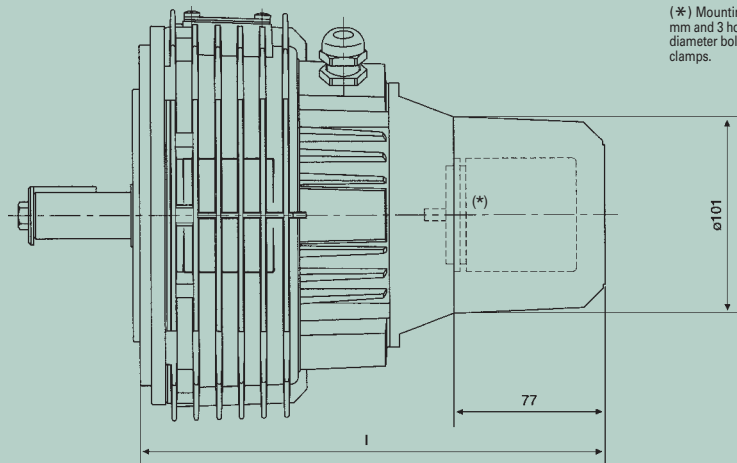
Performance Curves



Optional Accesories

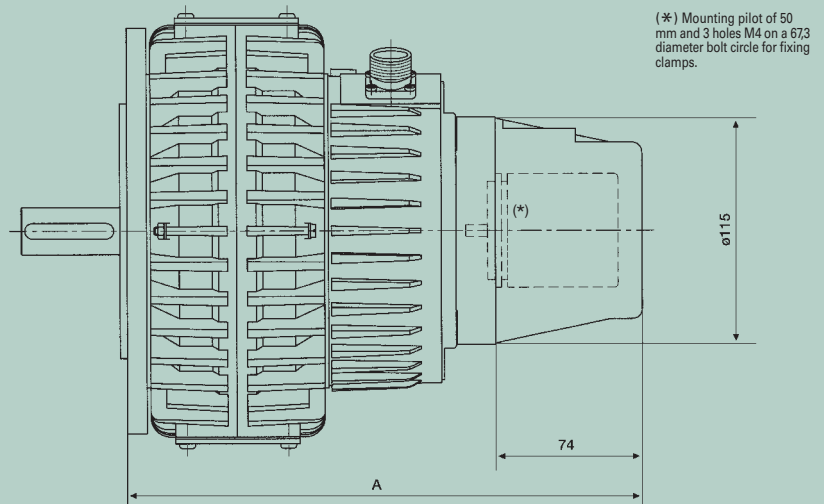
MSS Encoder Kit (no encoder)

	I
MSS-2	235
MSS-4	233
MSS-6	233
MSS-8	243.5
MSS-12	237.5
MSS-22	265.5
MSS-35	291
MSS-45	291



MA Encoder Kit (no encoder)

	A
MA-6	237.5
MA-10	237.5
MA-20	252.5
MA-30	261.5
MA-45	274
MA-55	274



BL 110/140 Encoder Kit (no encoder)

	A
BL-111	282
BL-112	307
BL-113	332
BL-114	357
BL-115	382
BL-141	346
BL-142	367
BL-143	411
BL-144	453



DC Servo Motors MSS Series



MSK

Available as "kit" motor (shaftless version) for direct mounting on the shaft of a machine.

Characteristics and curves correspond to Kit Option.

Technical Specifications

	SYMBOLS	UNITS	MSK-8
RATED SPEED	n	rpm	6,000
RATED VOLTAGE $\pm 5\%$	U	V	40
RATED CURRENT	I	A	5.2
RATED OUTPUT POWER (1)	P	W	149
EFFICIENCY	η	%	71.6
RATED TORQUE	T	Nm	0.24
MAXIMUM TORQUE (2)	T _{max}	Nm	1.2
MAXIMUM SPEED (3)	n max	rpm	10,000
EMF CONSTANT $\pm 5\%$	K _E	V/1000 rpm	5.5
TORQUE CONSTANT $\pm 5\%$	K _T	Nm/A	0.053
FRICTION TORQUE	T _F	Nm	0.01
DAMPING CONSTANT	K _D	Nm/1000 rpm	0.004
TERMINAL RESISTANCE (25°C)	R	Ω	1.04
ARMATURE INDUCTANCE	L	μ H	>60
INERTIA	J	kg m ² 10 ⁻³	0.031
MECHANICAL TIME CONSTANT	T _M	ms	11.2
TRANSITORY POWER	P _S	kW/s	46
THERMAL TIME CONSTANT ROTOR TO HOUSING	T _{AC}	s	110
THERMAL TIME CONSTANT (1) HOUSING TO AMBIENT	T _{CA}	s	1,000
THERMAL RESISTANCE ROTOR TO HOUSING	R _{AC}	°C/W	0.66
THERMAL RESISTANCE (1) HOUSING TO AMBIENT	R _{CA}	°C/W	1
RADIAL LOAD (at mid-length of shaft)	F _R	N	220
AXIAL LOAD	F _A	N	150
MASS (Only motor. No options)	M	kg	1.178

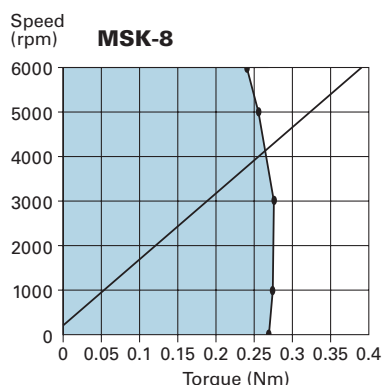
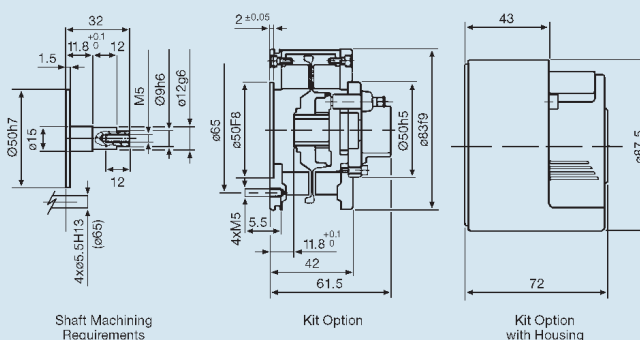
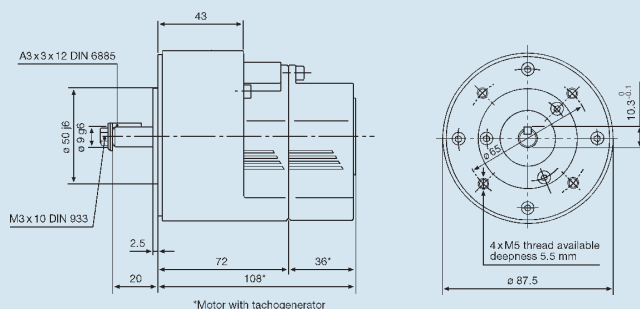
(1) With a 300x300x10 aluminium heat sink plate

(2) For an S3 cycle

(3) Maximum speed in continuous service. During a very short time 12,000 rpm

REMARK: Characteristics could be altered by any additional assembling

Dimensions



Available Kit Option with housing + Tachogenerator

DC Servo Motors CML Series

- Small dimensions.
- Radial magnetic flux.
- High performances.
- Square format.



Encoder Specifications

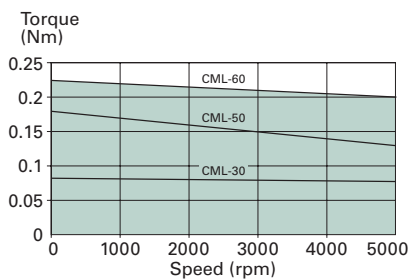
Waveform	Square Wave
Line Counts	1000 ppr
Channels	A, B, Z, \bar{A} , \bar{B} , \bar{Z} / U, V, W, \bar{U} , \bar{V} , \bar{W} Line drives (RS422)
Supply Voltage	5VDC \pm 10%
Frecuency Response	200 kHz
Operating Temperature	-40 °C ~ +120 °C

Tachometer Specifications

	UNITS	TYPE
		D40
Voltage Constant	V/krpm	10 \pm 5%*
Ripple @ 1000 rpm (pp)	%	<1.5
Linearity @ 6000 rpm	%	\leq 0.1
Reversing Error	%	\leq 0.12
Temperature Coeficient	%/°C	0.03
Rotor Inertia	kg m ² 10 ⁻³	0.004
Resistance	Ω	86
Inductance	mH	13
Current	mA	2
Maximum Current	mA	8
Maximum Speed	rpm	9,000
Mass	kg	0.105

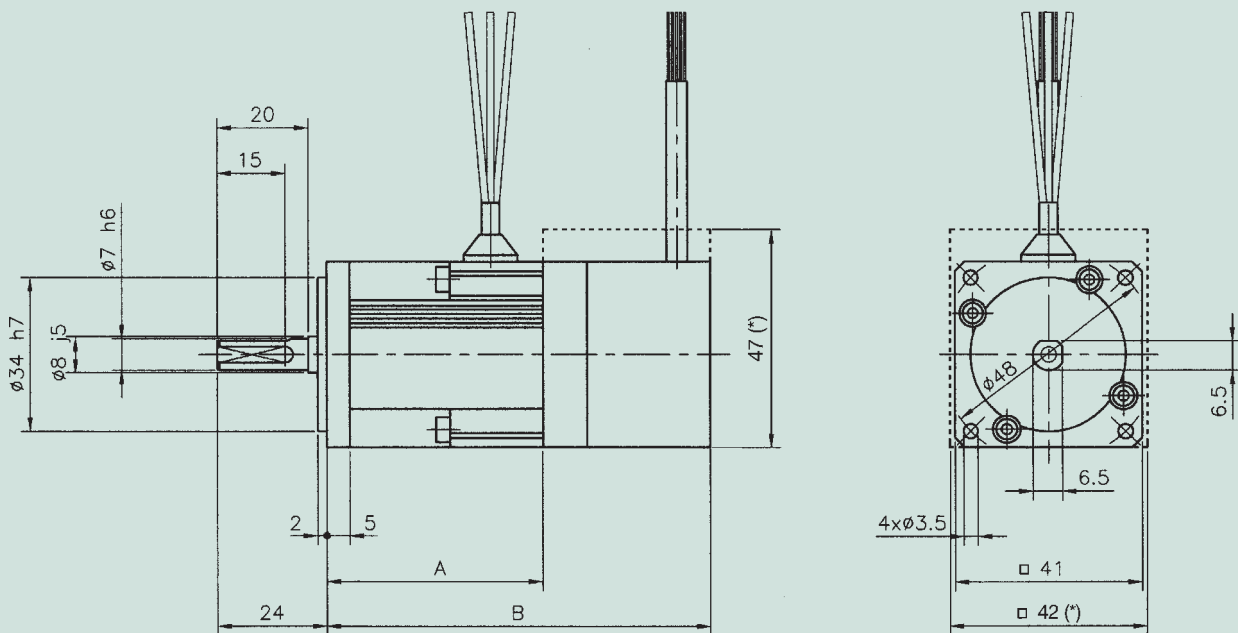
*other voltages available

Performance Curves



Technical Specifications

ALL CHARACTERISTICS MEASURED AT 25°C AMBIENT TEMPERATURE	SYMBOLS	UNITS	CML-30	CML-50	CML-60
RATED SPEED	n	rpm	3000	3000	3000
RATED VOLTAGE ±5%	U	V	24	24	34
RATED CURRENT	I	A	2.1	3.9	2.7
RATED OUTPUT POWER (1)	P	W	25	47	63
RATED TORQUE	T	Nm	0.08	0.15	0.2
MAX TORQUE	T _{max}	Nm	0.32	0.6	0.8
MAX SPEED WITHOUT LOAD	n _{max}	rpm	4750	5000	3550
EMF CONSTANT ±5%	K _E	V/1000 rpm	4.80	4.71	9.00
TORQUE CONSTANT ±5%	K _T	Nm/A	0.0458	0.0450	0.0859
FRICTION TORQUE	T _F	Nm	0.01	0.011	0.02
DAMPING CONSTANT	K _D	Nm/1000 rpm	0.002	0.005	0.004
TERMINAL RESISTANCE	R	Ω	3.1	1.45	2.45
ARMATURE INDUCTANCE	L	mH	1.1	0.4	0.95
ROTOR INERTIA	J	kg m ² 10 ⁻³	0.0039	0.0065	0.0094
MECHANICAL TIME CONSTANT	T _M	ms	5.75	4.66	3.12
ELECTRICAL TIME CONSTANT	T _E	ms	0.35	0.28	0.39
THERMAL TIME CONSTANT	T _{TH}	s	900	1260	1380
THERMAL RESISTANCE	R _{TH}	°C/W	3.8	2.0	1.5
MASS (Only motor. No system)	M	kg	0.38	0.50	0.62
RADIAL LOAD (at mid-length of shaft)	F _R	N	150	150	150
AXIAL LOAD	F _A	N	80	80	80
(1) With an aluminium heat sink plate			150x150x10	150x150x10	150x150x10



WITH ENCODER OPTION

	CML-30	CML-50	CML-60
A	47.5	62.5	77.5
B	84	99	114

WITH TACHO OPTION (*)

	CML-30	CML-50	CML-60
A	29	44	59
B	86	101	116

DC Servo Motors EExdIIC Series

EExdIIC Series are axial air-gap servomotors housed in an enclosure into which gas can gain access: the gas can be ignited within the enclosure without the explosion damaging the enclosure or being transmitted to any flammable atmosphere external to the enclosure. These motors comply with the requirements for Apparatus Group IIC specified in EN 50 018 (1977) + A1 to 3 and EN 50 014 (1977) + A1 to 5.

The temperature classification referred to an ambient temperature of 70°C is:

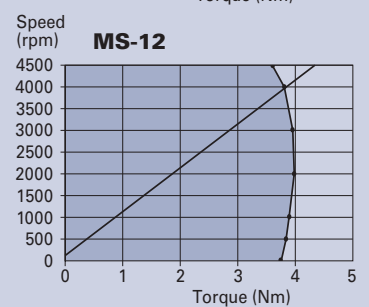
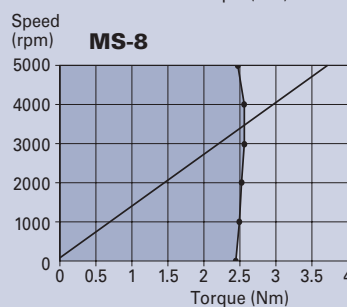
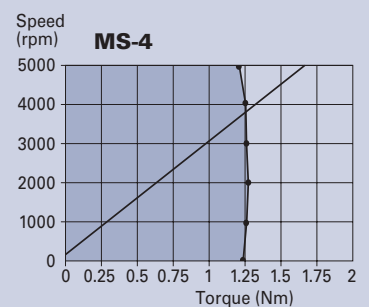
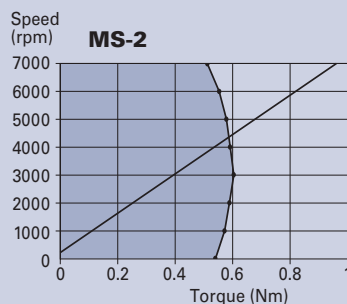
T5 for $\left\{ \begin{array}{l} \text{MS-2 / MS-12 / MS-22} \\ \text{MA-3 / MA-20 / MA-30} \end{array} \right.$

T3 for $\left\{ \begin{array}{l} \text{MS-4 / MS-6 / MS-8} \\ \text{MA-6 / MA-10} \end{array} \right.$

D.C. and A.C. "brushless" motors are included in EExdIIC Series, incorporating options of tachometer, resolver and parking brake fitted internally.



Performance Curves



Technical Specifications

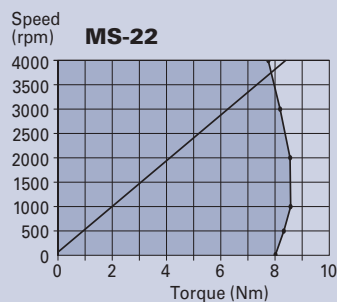
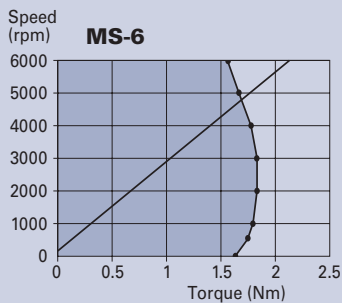
ALL CHARACTERISTICS MEASURED AT 40°C AMBIENT TEMPERATURE EXCEPT TERMINAL RESISTANCE (25°C)			MS-2	MS-4	MS-6	MS-8	MS-12	MS-22
	SYMBOLS	UNITS						
RATED SPEED	n	rpm	3,000	3,000	3,000	3,000	3,000	3,000
RATED VOLTAGE ±5%	U	V	39.4	67	67.8	89.7	106.7	181
RATED CURRENT	I	A	6.5	7.8	10.7	10.7	14	16
RATED OUTPUT POWER (1)	P	W	190.3	397	575	805	1,240	2,573
EFFICIENCY	η	%	74	76	80	84	83	89
RATED TORQUE	T	Nm	0.6	1.26	1.83	2.56	3.95	8.19
MAXIMUM TORQUE (2)	T _{max}	Nm	3.6	7.58	11	15.38	23.7	49.14
MAXIMUM SPEED (3)	n max	rpm	7,000	6,000	6,000	5,000	4,500	4,000
EMF CONSTANT ±5%	K _E	V/1000 rpm	10.4	18	19	26.3	30.85	55.6
TORQUE CONSTANT ±5%	K _T	Nm/A	0.099	0.172	0.181	0.251	0.295	0.53
FRICTION TORQUE	T _F	Nm	0.03	0.05	0.05	0.06	0.09	0.09
DAMPING CONSTANT	K _D	Nm/1000 rpm	0.003	0.009	0.018	0.021	0.02	0.05
TERMINAL RESISTANCE (25°C)	R	Ω	1	1.25	0.75	0.82	0.75	0.67
ARMATURE INDUCTANCE	L	μH	<102	<130	<120	<150	<200	<250
INERTIA	J	kg m ² 10 ⁻³	0.15	0.37	0.40	0.82	1.7	5.1
MECHANICAL TIME CONSTANT	T _M	ms	14.38	15	9	10.17	14	11.6
TRANSITORY POWER	P _S	kW/s	89	155	300	288	330	473
THERMAL TIME CONSTANT ROTOR TO HOUSING	T _{AC}	s	170	180	190	200	300	360
THERMAL TIME CONSTANT (1) HOUSING TO AMBIENT	T _{CA}	s	1,700	1,750	1,800	2,000	2,700	3,000
THERMAL RESISTANCE ROTOR TO HOUSING	R _{AC}	°C/W	0.8	0.5	0.5	0.5	0.3	0.2
THERMAL RESISTANCE (1) HOUSING TO AMBIENT	R _{CA}	°C/W	0.5	0.3	0.4	0.4	0.3	0.2
RADIAL LOAD (at mid-length of shaft)	F _R	N	200	200	300	300	500	600
AXIAL LOAD	F _A	N	150	200	200	200	250	400
MASS (Only motors. No options)	M	kg						28
			300x300x10			400x400x10		
			3	3.5	4	7	10	
			9,000		6,000		4,500	

(1) With an aluminium heat sink plate

(2) For an S3 cycle

(3) Maximum speed in continuous service. During a very short time (r.p.m.)

Tachometer Specifications

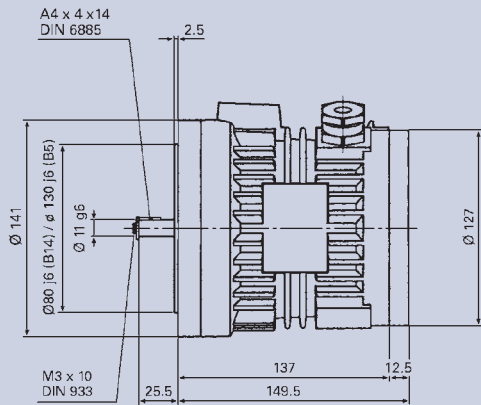


	UNITS	MS-2	MS-4	MS-6	MS-8	MS-12	MS-22
	SIZE	D40	D40	D40	D40	D40	D26
Voltage Constant	V/krpm	10 ± 5%*	10 ± 5%*	10 ± 5%*	10 ± 5%*	10 ± 5%*	10 ± 5%*
Ripple @ 1000 rpm (pp)	%	<1.5	<1.5	<1.5	<1.5	<1.5	<1.2
Linearity @ 6000 rpm	%	≤0.1	≤0.1	≤0.1	≤0.1	≤0.1	≤0.1
Reversing Error	%	≤0.12	≤0.12	≤0.12	≤0.12	≤0.12	≤0.12
Temperature Coefficient	%/°C	0.03	0.03	0.03	0.03	0.03	0.02
Rotor Inertia	kg m ² 10 ⁻³	0.004	0.004	0.004	0.004	0.004	0.024
Resistance	Ω	86	86	86	86	86	90
Inductance	mH	13	13	13	13	13	25
Current	mA	2	2	2	2	2	4
Maximum Current	mA	8	8	8	8	8	17
Maximum Speed	rpm	9,000	9,000	9,000	9,000	9,000	8,000
Mass	kg	0.105	0.105	0.105	0.105	0.105	0.295

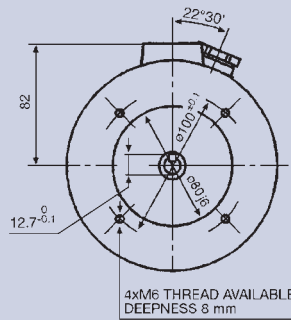
*other voltages available

MS-2 EExdIIC

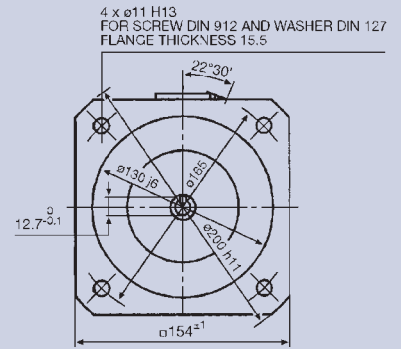
MA-3 EExdIIC



FLANGE B-14

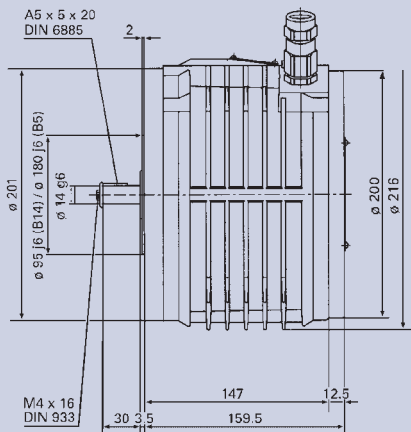


FLANGE B-5 (OPTIONAL)

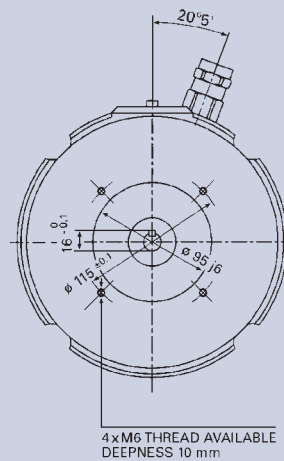


**MS-4 EExdIIC
MS-6 EExdIIC
MS-8 EExdIIC**

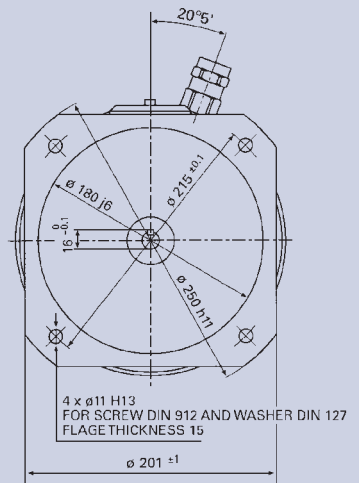
**MA-6 EExdIIC
MA-10 EExdIIC**



FLANGE B-14

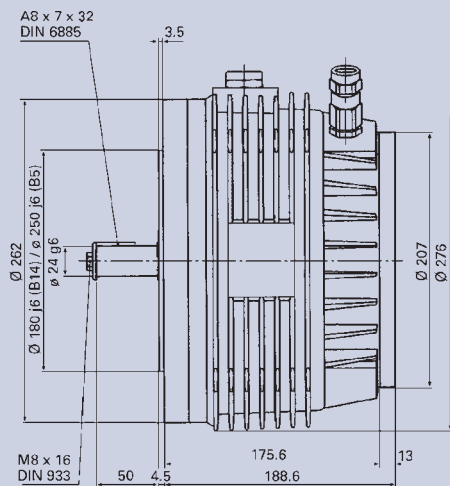


FLANGE B-5 (OPTIONAL)

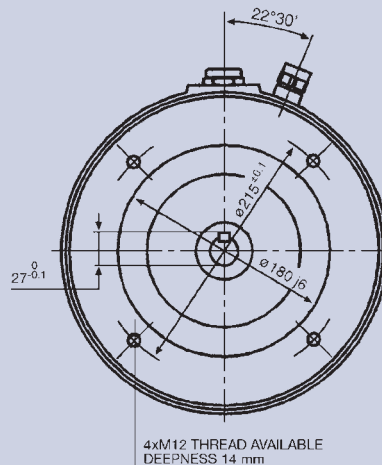


**MS-12 EExdIIC
MS-22 EExdIIC**

**MA-20 EExdIIC
MA-30 EExdIIC**



FLANGE B-14



FLANGE B-5 (OPTIONAL)

