

7. MAC 112

7.1. Technical Data

Designation	Symbol	Unit	Motor type MAC ...			
			112 A - - - Z •	112 B - - - P •	112 C - - - K •	112 D - - - H •
Nominal motor speed ¹⁾	n	min ⁻¹	1500	1500	1500	1500
Continuous torque at standstill ²⁾	M _{dN}	Nm	10.7 (13.0) ⁵⁾	18.2 (29) ⁵⁾	28.0 (44.0) ⁵⁾	38.0 (57.0) ⁵⁾
Continuous current at standstill	I _{dN}	A	14.5 (17.2) ⁵⁾	21.0 (33.0) ⁵⁾	31.0 (49.0) ⁵⁾	42.0 (63) ⁵⁾
Rotor moment of inertia ³⁾	J _M	kgm ²	61 x 10 ⁻⁴	120 x 10 ⁻⁴	170 x 10 ⁻⁴	230 x 10 ⁻⁴
Torque constant at 20 °C	K _m	Nm/A	0.820	0.910	1.000	1.010
Windings resistance at 20 °C	R _A	Ohm	0.990	0.450	0.270	0.176
Windings inductance	L _A	mH	10.0	6.3	4.5	3.2
Maximum peak of pulse current	I _{peak}	A	54	97	141	195
Thermal time constant	T _{th}	min	100 (75) ⁵⁾	90 (60) ⁵⁾	100 (75) ⁵⁾	120 (90) ⁵⁾
Mass ⁴⁾	m _M	kg	25	36	48	59
			112 A - - - V •	112 B - - - L •	112 C - - - H •	112 D - - - F •
Nominal motor speed ¹⁾	n	min ⁻¹	2000	2000	2000	2000
Continuous torque at standstill ²⁾	M _{dN}	Nm	10.5 (13.0) ⁵⁾	17.5 (29) ⁵⁾	27.0 (44.0) ⁵⁾	38.0 (57.0) ⁵⁾
Continuous current at standstill	I _{dN}	A	18.5 (22.9) ⁵⁾	26.3 (43.5) ⁵⁾	41.0 (67.0) ⁵⁾	56.0 (83) ⁵⁾
Rotor moment of inertia ³⁾	J _M	kgm ²	61 x 10 ⁻⁴	120 x 10 ⁻⁴	170 x 10 ⁻⁴	230 x 10 ⁻⁴
Torque constant at 20 °C	K _m	Nm/A	0.630	0.740	0.730	0.760
Windings resistance at 20 °C	R _A	Ohm	0.650	0.260	0.150	0.110
Windings inductance	L _A	mH	6.0	3.5	2.5	1.8
Maximum peak of pulse current	I _{peak}	A	71	130	195	260
Thermal time constant	T _{th}	min	100 (75) ⁵⁾	90 (60) ⁵⁾	100 (75) ⁵⁾	120 (90) ⁵⁾
Mass ⁴⁾	m _M	kg	25	36	48	59
			112 A - - - L •	112 B - - - G •	112 C - - - E •	112 D - - - E •
Nominal motor speed ¹⁾	n	min ⁻¹	3000	3000	3000	3000
Continuous torque at standstill ²⁾	M _{dN}	Nm	9.8 (13.0) ⁵⁾	16.0 (29) ⁵⁾	24.0 (44.0) ⁵⁾	35.0 (57.0) ⁵⁾
Continuous current at standstill	I _{dN}	A	31.0 (41.3) ⁵⁾	41.0 (75.0) ⁵⁾	57.0 (104) ⁵⁾	63.0 (102) ⁵⁾
Rotor moment of inertia ³⁾	J _M	kgm ²	61 x 10 ⁻⁴	120 x 10 ⁻⁴	170 x 10 ⁻⁴	230 x 10 ⁻⁴
Torque constant at 20 °C	K _m	Nm/A	0.350	0.430	0.470	0.620
Windings resistance at 20 °C	R _A	Ohm	0.180	0.090	0.060	0.070
Windings inductance	L _A	mH	1.9	1.2	1.0	1.3
Maximum peak of pulse current	I _{peak}	A	130	223	312	312
Thermal time constant	T _{th}	min	100 (75) ⁵⁾	90 (60) ⁵⁾	100 (75) ⁵⁾	120 (90) ⁵⁾
Mass ⁴⁾	m _M	kg	25	36	48	59
					112 C - - - C •	
Nominal motor speed ¹⁾	n	min ⁻¹			5000	
Continuous torque at standstill ²⁾	M _{dN}	Nm			27.0	
Continuous current at standstill	I _{dN}	A			87.5	
Rotor moment of inertia ³⁾	J _M	kgm ²			170 x 10 ⁻⁴	
Torque constant at 20 °C	K _m	Nm/A			0.330	
Windings resistance at 20 °C	R _A	Ohm			0.030	
Windings inductance	L _A	mH			0.5	
Maximum peak of pulse current	I _{peak}	A			400	
Thermal time constant	T _{th}	min			100	
Mass ⁴⁾	m _M	kg			48	

¹⁾ The usable motor speed is determined by the drive used.

Only those usable speeds n_{max} found in the selection lists of the motor-drive combinations are binding.

²⁾ With 60K overtemperature at the motor housing.

Continuous torque can be limited by the drive. See selection data.

³⁾ With tacho-generator, without holding brake

⁴⁾ With tacho-generator, without holding brake, without blower.

⁵⁾ Parenthetical values apply to versions with surface cooling.

Fig 7.1: Type-dependent motor data

Designation	Symbol	Unit	Data		
Permissible ambient temperature	T_{um}	°C	0 ... + 45		
Permissible storage and transport temperature	T_L	°C	-20 ... +80		
Maximum installation elevation		m	1000 m. above sea level		
Protection category			IP 65		
Insulation classification			F		
Housing coat			Black prime coat (RAL9005)		
Voltage constant of the tachogenerator ¹⁾	C_w	Vs/rad V/min ⁻¹	0.0143 1.5/1000	0.0286 3/1000	0.0572 6/1000 ²⁾

¹⁾ Tachovoltage can be selected application-related.
²⁾ If 6 V/1000 min⁻¹ tachometer is used, then usable speed is limited to 1600 min⁻¹.

Fig 7.2: General data MAC 112

Designation	Symbol	Unit	Data holding brake		
			Standard	heavy-duty ¹⁾ electrically released	extra heavy-duty ¹⁾
Principle of action					
Holding torque	M_H	Nm		40	
Nominal voltage	U_N	V	14	DC 24 ± 10%	60
Nominal current	I_N	A	0.75	1.35	1.35
Moment of inertia	J_B	kgm ²	3.6×10^{-4}	32×10^{-4}	32×10^{-4}
Release delay	t_L	ms	70	150	150
Clamping delay	t_K	ms	30	30	30
Mass	m_B	kg	1.1	3.5	3.5

¹⁾ Not available with MAC 112A .

Fig 7.3: Technical data - holding brake

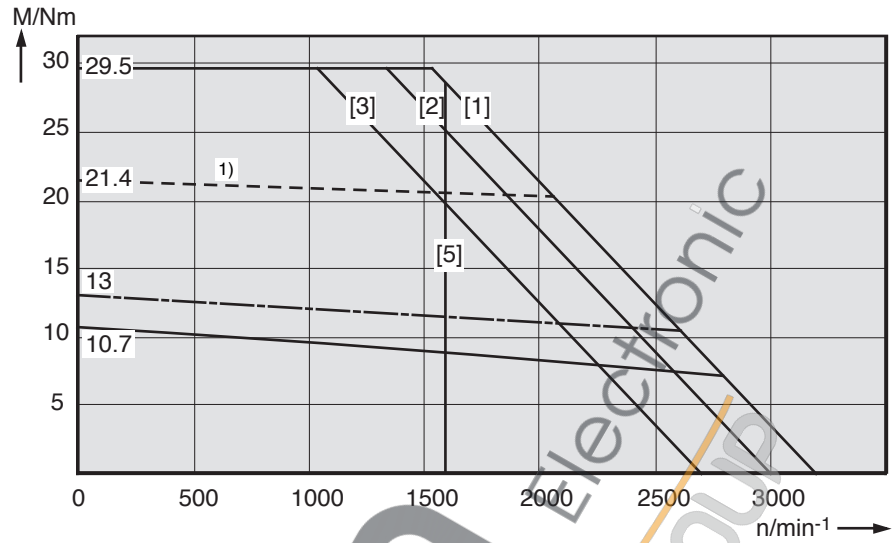
Designation	Symbol	Unit	Axial cooling	Radial cooling
Power consumption	S_N	VA	40/42	40/42
Nominal voltage	U_N	V	AC 230 or 115 ¹⁾	AC 230 or 115 ¹⁾
Frequency	f	Hz	50/60	50/60
Mass	m_L	kg	approx. 3.3 ²⁾	approx. 3.2 ²⁾
Protection category blower unit			IP 24	IP 24
Protection category blower motor			IP 44	IP 44

¹⁾ 115 V special design
²⁾ Blower shroud for motor with tacho feedback.

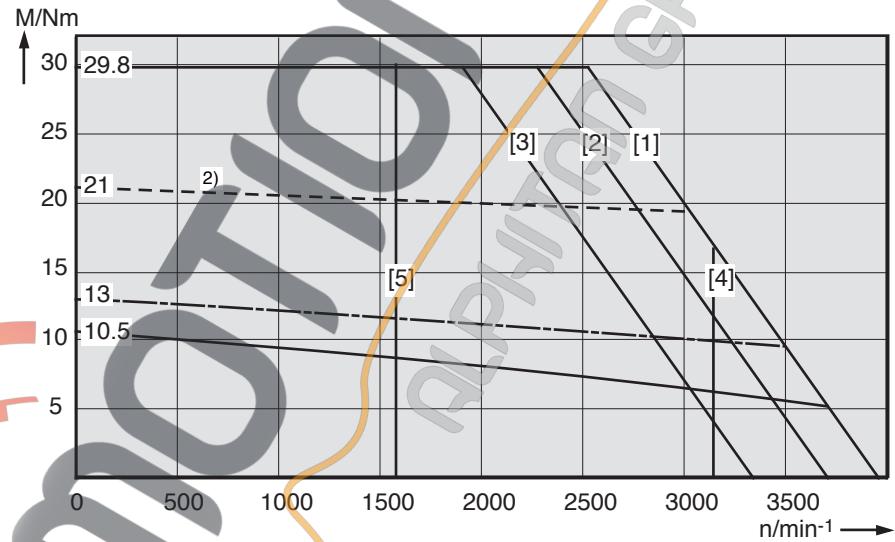
Fig 7.4: Technical data - surface cooling

7.2. Torque-Speed Characteristics

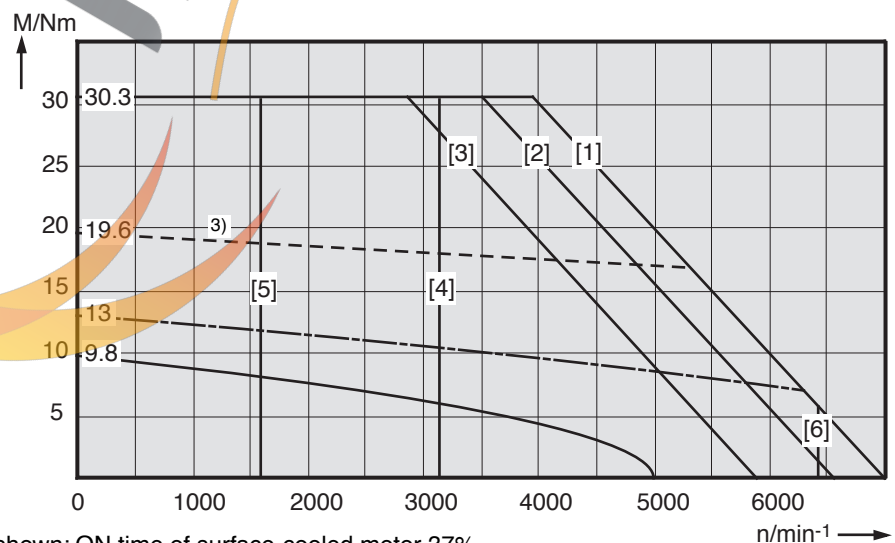
MAC 112 A - - - Z •
1500 min⁻¹



MAC 112 A - - - V •
2000 min⁻¹



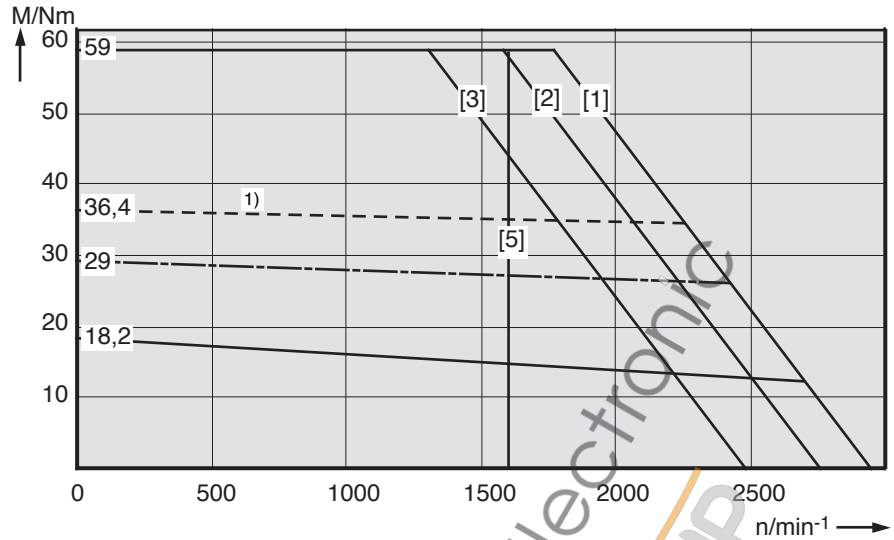
MAC 112 A - - - L •
3000 min⁻¹



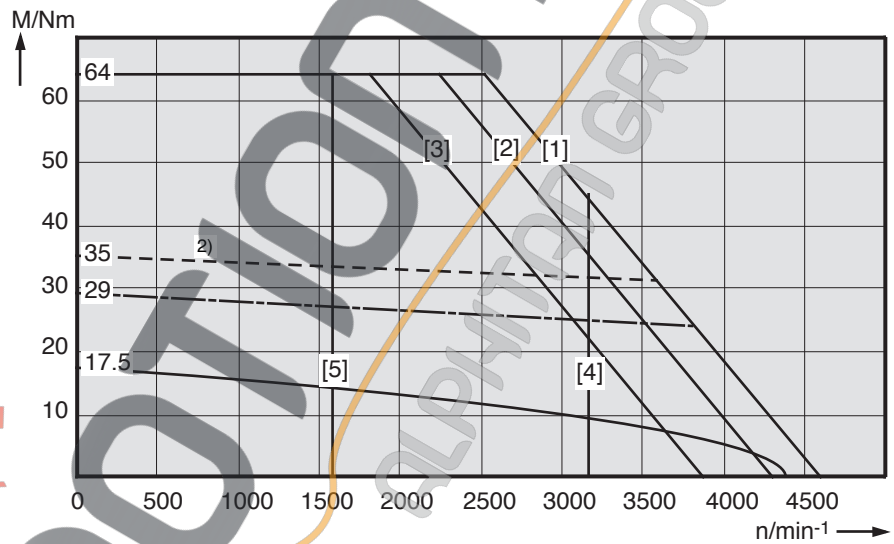
- 1) shown: ON time of surface-cooled motor 37%
- 2) shown: ON time of surface-cooled motor 38%
- 3) shown: ON time of surface-cooled motor 44%

Fig 7.5: Torque-speed characteristics MAC 112

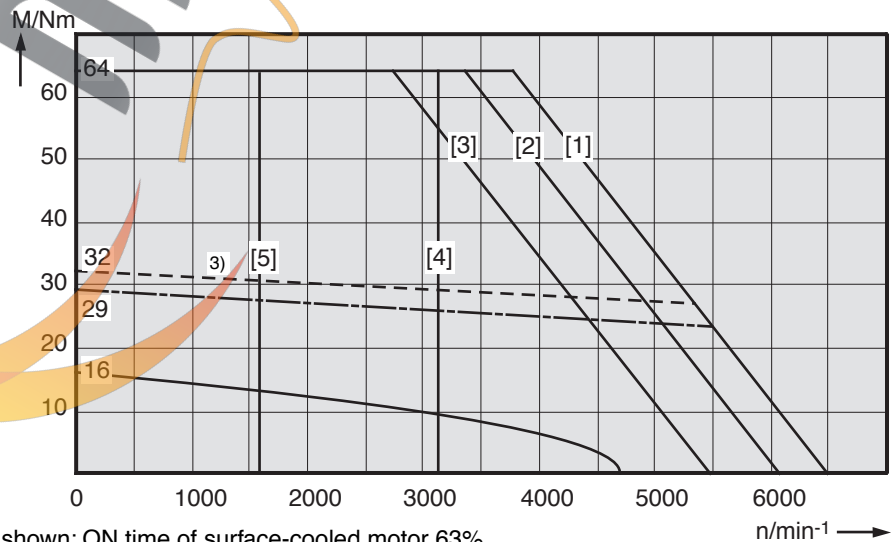
MAC 112 B - - - P •
1500 min⁻¹



MAC 112 B - - - L •
2000 min⁻¹



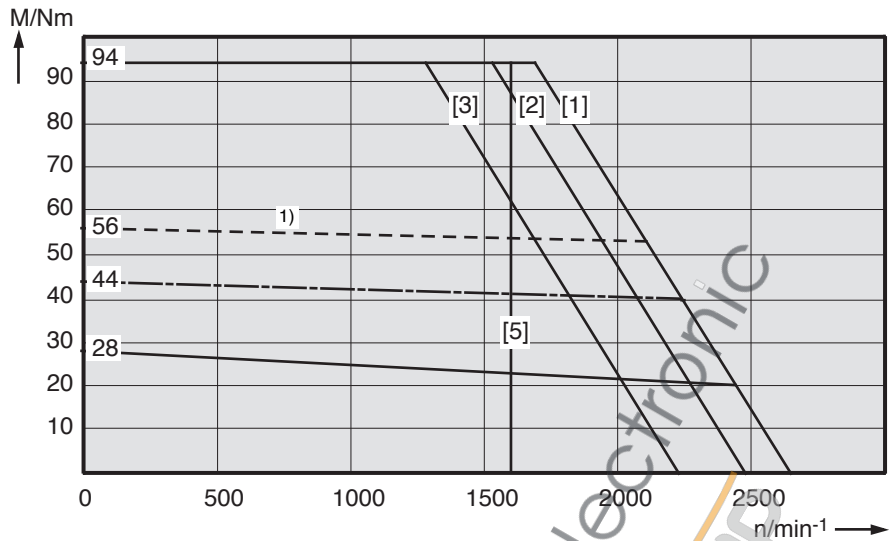
MAC 112 B - - - G •
3000 min⁻¹



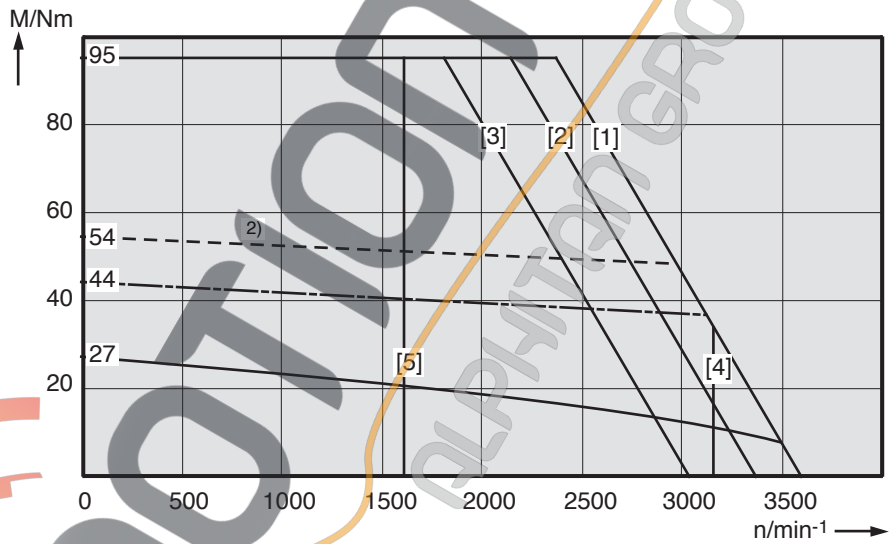
- 1) shown: ON time of surface-cooled motor 63%
- 2) shown: ON time of surface-cooled motor 69%
- 3) shown: ON time of surface-cooled motor 82%

Fig 7.6: Torque-speed characteristics MAC 112

MAC 112 C - - - K •
1500 min⁻¹



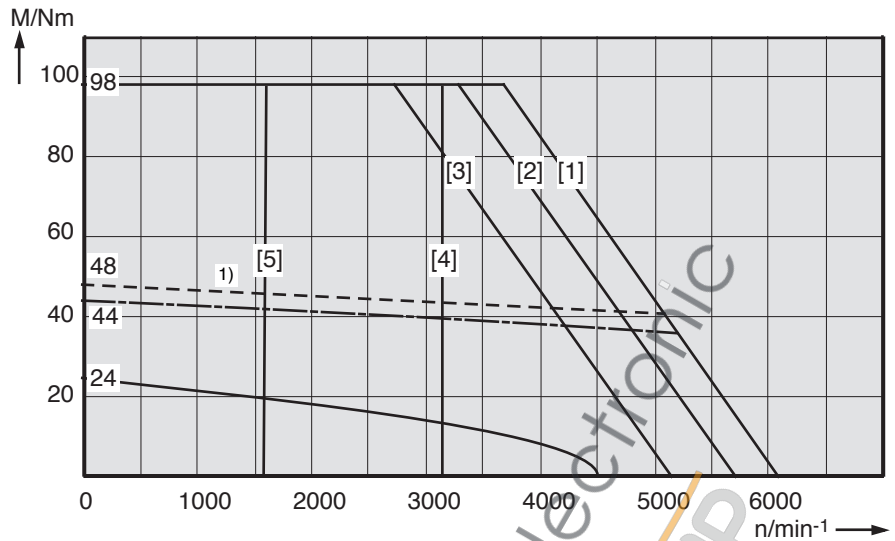
MAC 112 C - - - H •
2000 min⁻¹



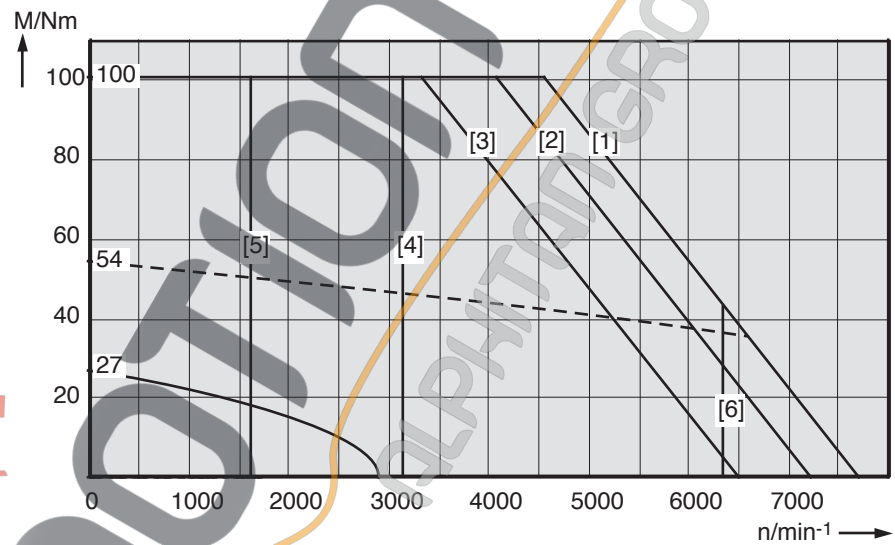
- 1) shown: ON time of surface-cooled motor 62%
- 2) shown: ON time of surface-cooled motor 66%

Fig 7.7: Torque-speed characteristics MAC 112

MAC 112 C - - - E •
3000 min⁻¹



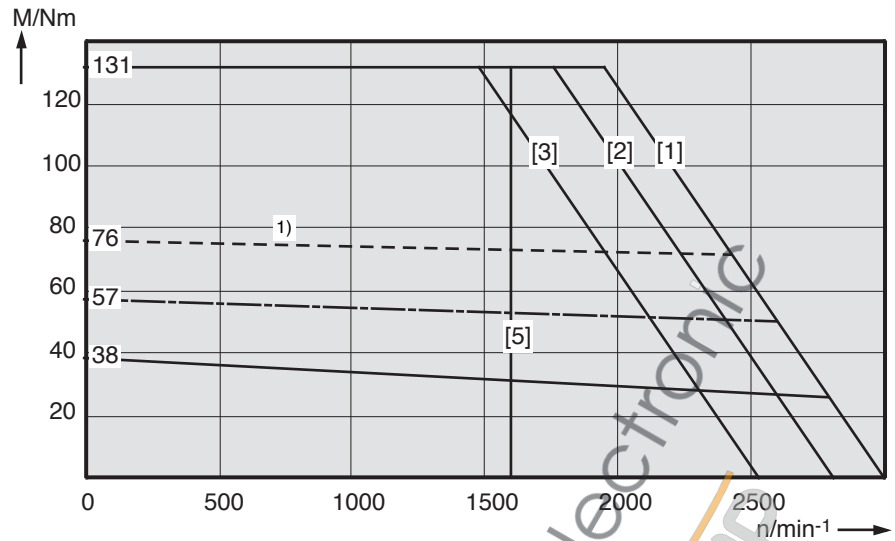
MAC 112 C - - - C •
5000 min⁻¹



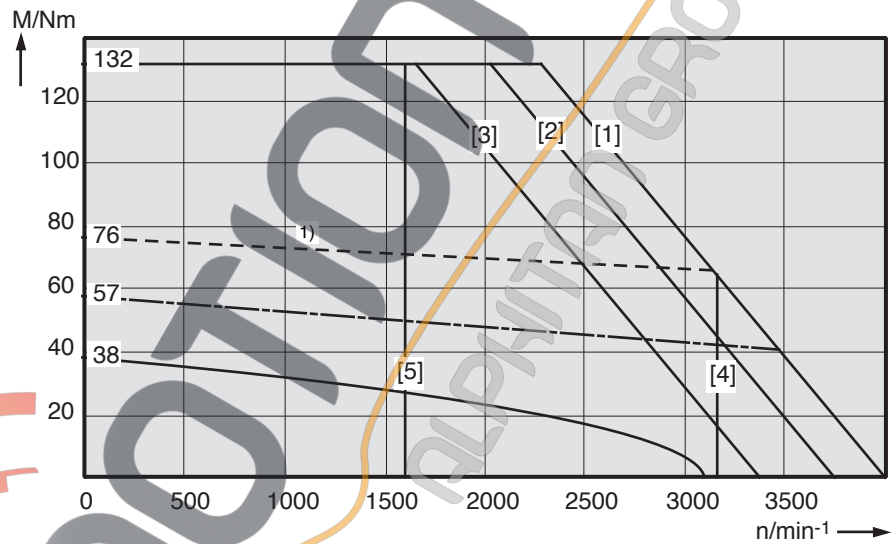
1) shown: ON time of surface-cooled motor 87%

Fig 7.8: Torque-speed characteristics MAC 112

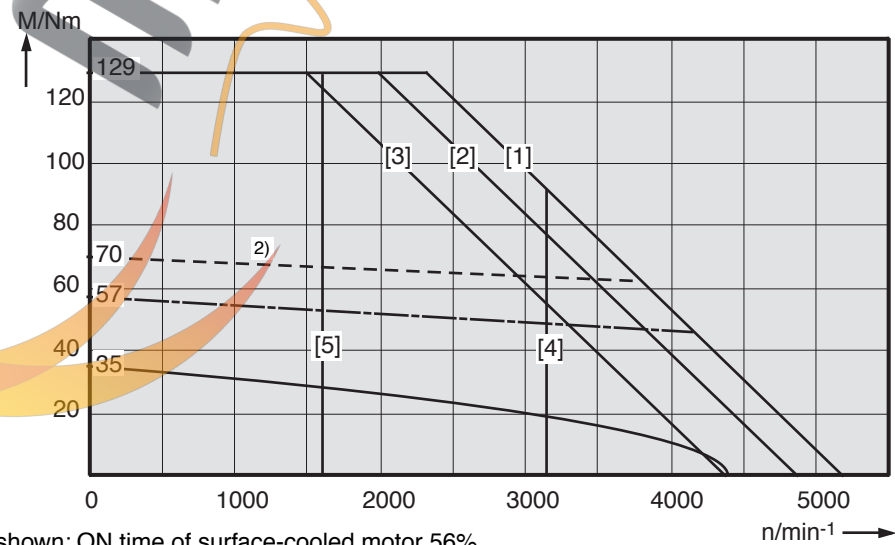
MAC 112 D - - - H •
1500 min⁻¹



MAC 112 D - - - F •
2000 min⁻¹



MAC 112 D - - - E •
3000 min⁻¹



1) shown: ON time of surface-cooled motor 56%
2) shown: ON time of surface-cooled motor 66%

Fig 7.9: Torque-speed characteristics MAC 112

7.3. Shaft load capacity

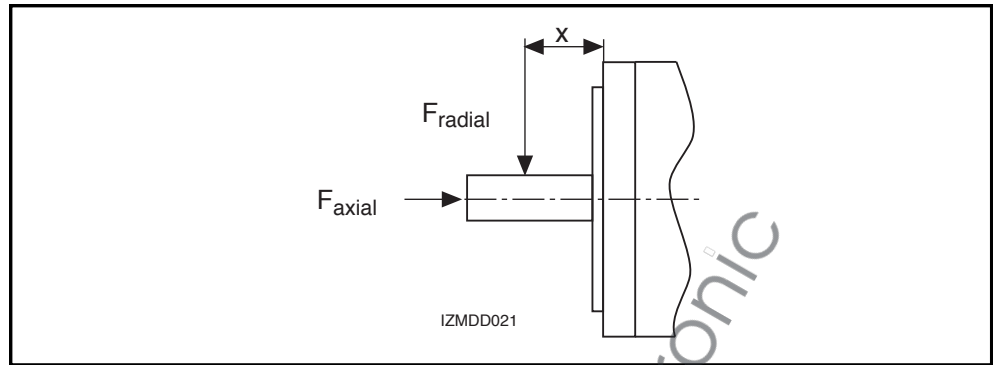


Fig 7.10: Shaft load

Permissible radial force
 F_{radial}

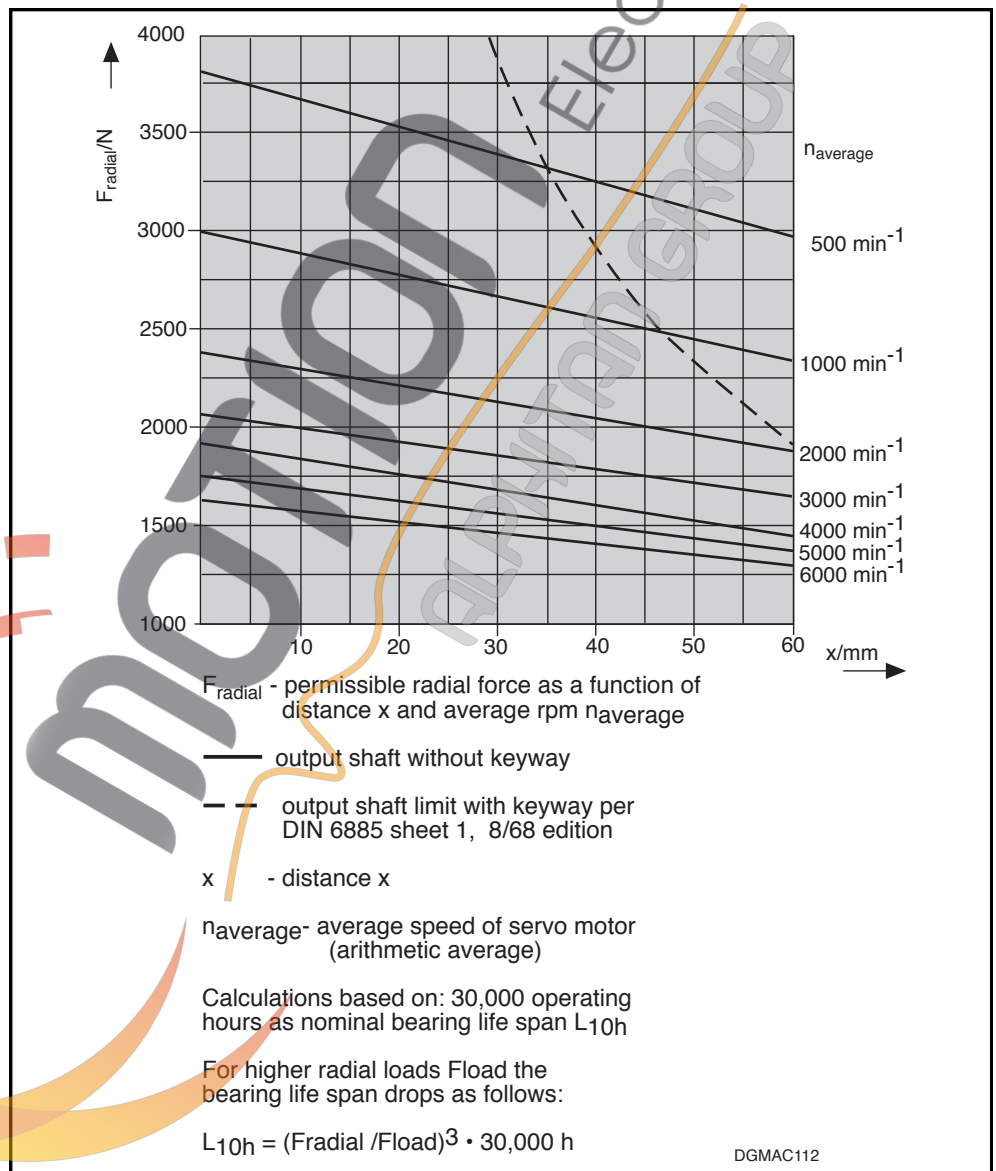


Fig 7.11: Permissible radial force

Permissible axial force
 F_{axial}

$$F_{axial} = 0.35 \cdot F_{radial}$$

F_{axial} - Permissible axial force
 F_{radial} - Permissible radial force

7.4. Dimensional data - natural convection

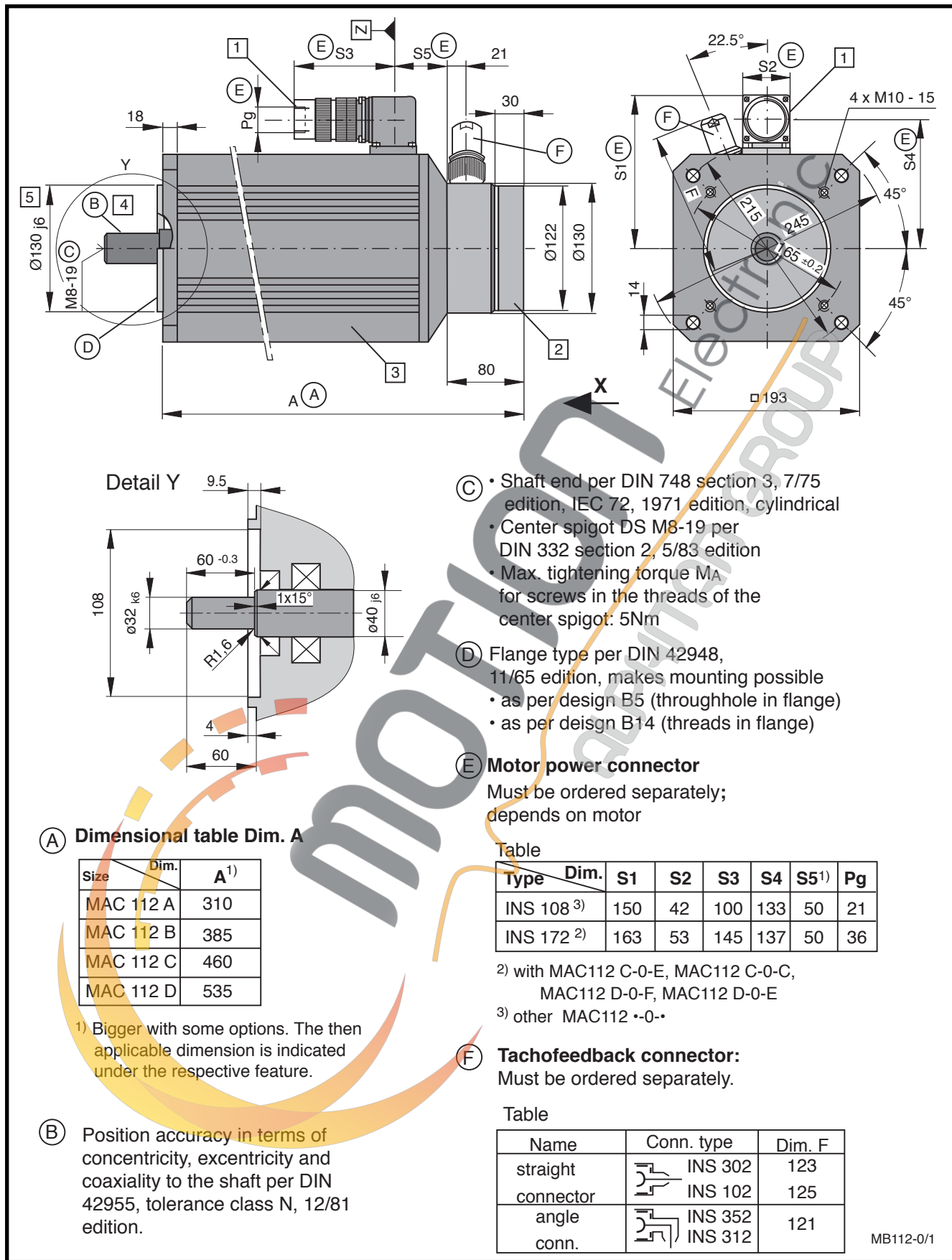


Fig 7.12: Dimensional data - MAC 112 (natural convection)

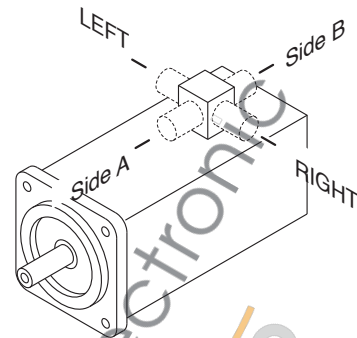
Available options

1 Power connection

The output direction of the electrical power connector is selected at the time the order is placed. Possible output directions are:

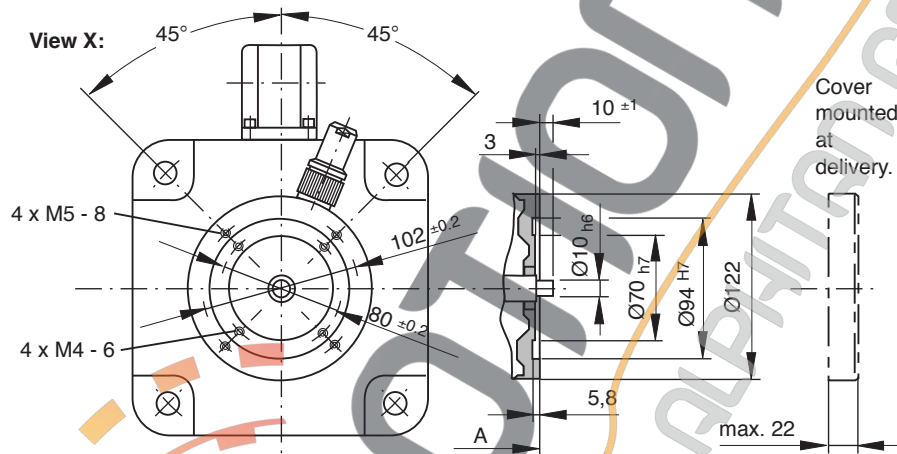
- to side A
- to side B
- to the right
- to the left

The drawing depicts side A as output direction. The dimensions of any other direction are obtained by a virtual turning of the connector housing around the Z axis.

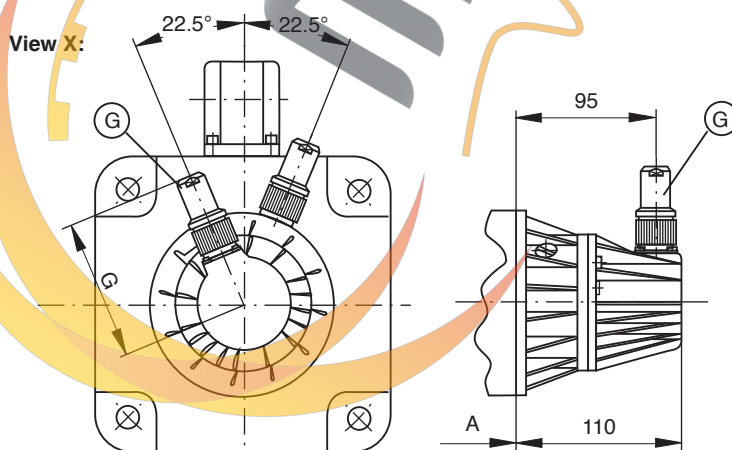


2 Motor version

- Tachofeedback and second shaft end



- Tachofeedback and mounted incremental encoder



G Incremental encoder connector

Must be ordered separately.

Name	Conn. type	Dim. G
straight conn.	INS 301	88
	INS 101	90
angle conn.	INS 351 INS 311	86

- Tachofeedback and mounted absolute encoder (see following page)

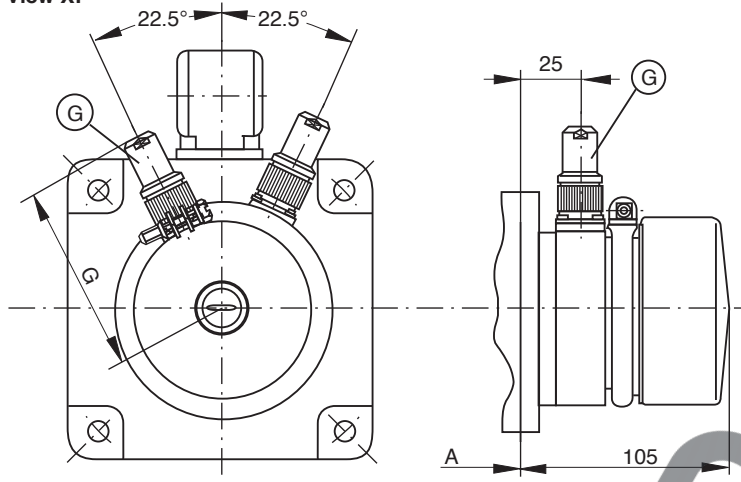
MB112-0/2

Fig 7.13: Dimensional data - MAC 112 - available options - (natural convection)

Available options

- Tachofeedback and mounted absolute encoder

View X:



(G) **Absolute encoder conn.**
Must be ordered separately.

Name	Conn. type	Dim. G
straight conn.	INS 326	104
	INS 92	106
angle conn.	INS 322	102

3 Blocking brake

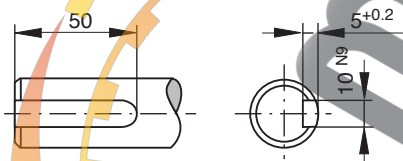
- without blocking brake
Dim. A and S5 retained
- Standard blocking brake: 14 Nm
Dim. A and S5 retained
- heavy-duty blocking brake: 40 Nm
(not available with MAC 112 A ...)
- extra heavy-duty blocking brake: 60 Nm
(not available with MAC 112 A ...)

Table for blocking brake
with 40 and 60 Nm

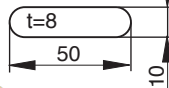
Size	Dim.	A	S5
MAC 112 B		435	98
MAC 112 C		510	98
MAC 112 D		585	98

4 Output shaft

- plain shaft (recommended type)
- with keyway per DIN 6885 sh. 1, 8/68 edition
(Note! balanced with entire key.)



Matching key: DIN 6885-A 10 x 8 x 50
Must be ordered separately.



5 Special centering diameter

- $\varnothing 180 \text{ j6}$

MB112-0/3

Fig 7.14: Dimensional data - MAC 112 - available options - (natural convection)

7.5. Dimensional data - radial cooling

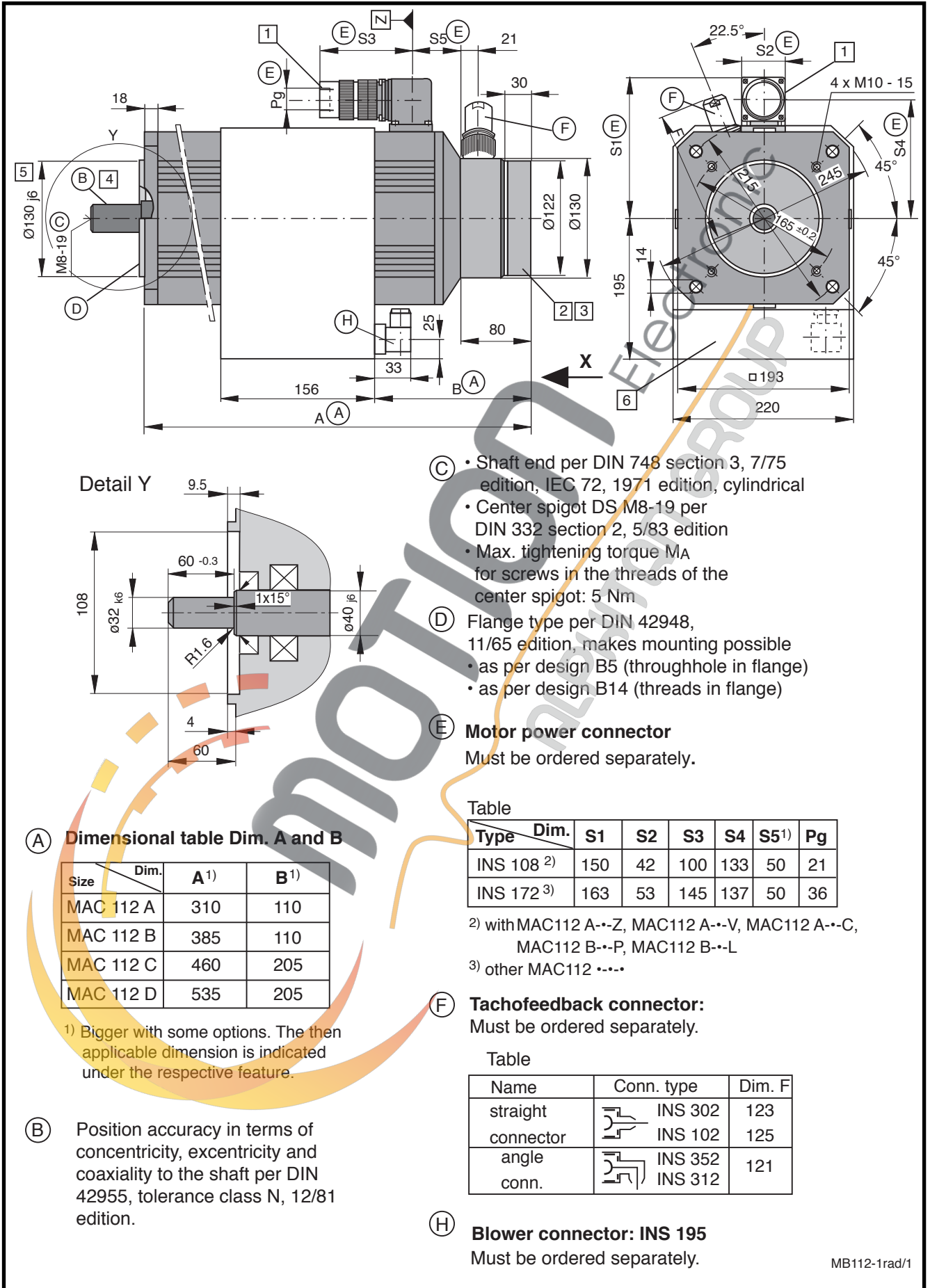


Fig 7.15: Dimensional data - MAC 112 (radial cooling)

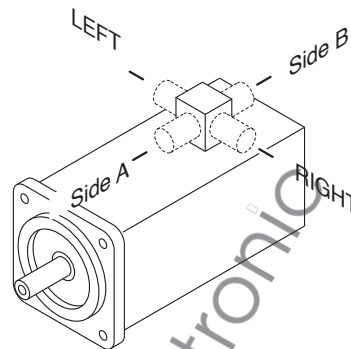
Available options

1 Power connection

The output direction of the electrical power connector is selected at the time the order is placed. Possible output directions are:

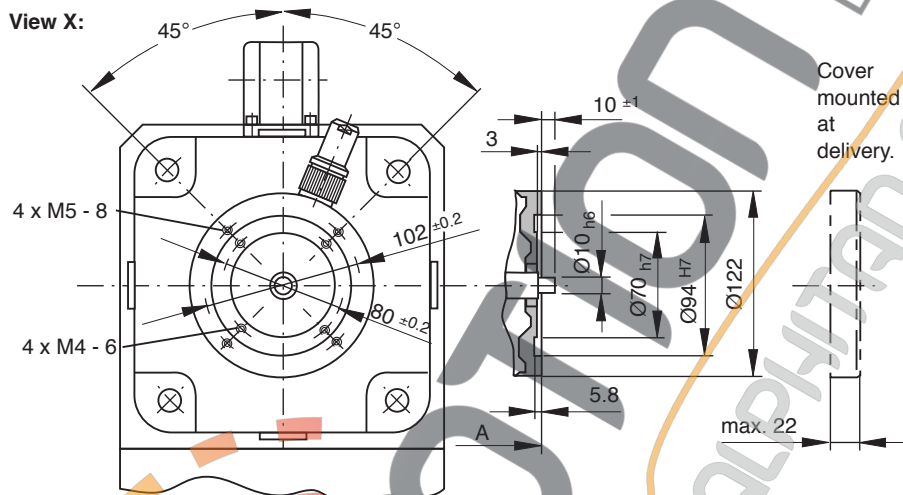
- to side A
- to side B
- to the right
- to the left

The drawing depicts side A as output direction. The dimensions of any other direction are obtained by a virtual turning of the connector housing around the Z axis.

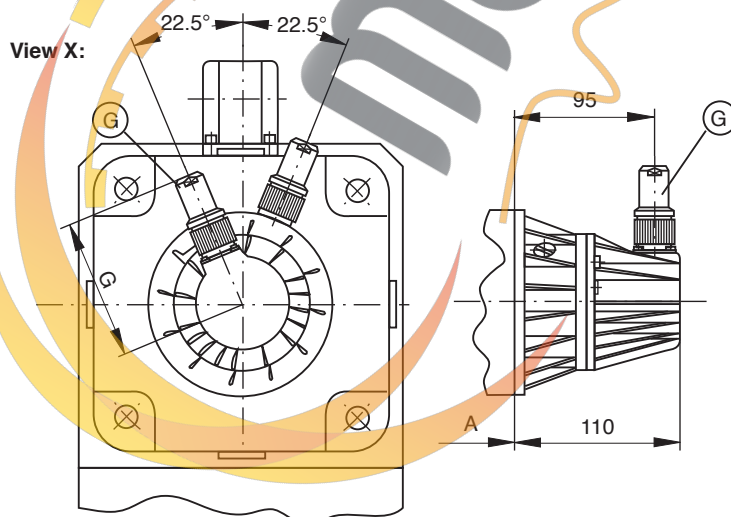


2 Motor version

- Tachofeedback and second shaft end



- Tachofeedback and mounted incremental encoder



G Incremental encoder connector

Must be ordered separately.

Name	Conn. type	Dim. G
straight conn.	INS 301	88
	INS 101	90
angle conn.	INS 351 INS 311	86

- Tachofeedback and mounted absolute encoder (see following page)

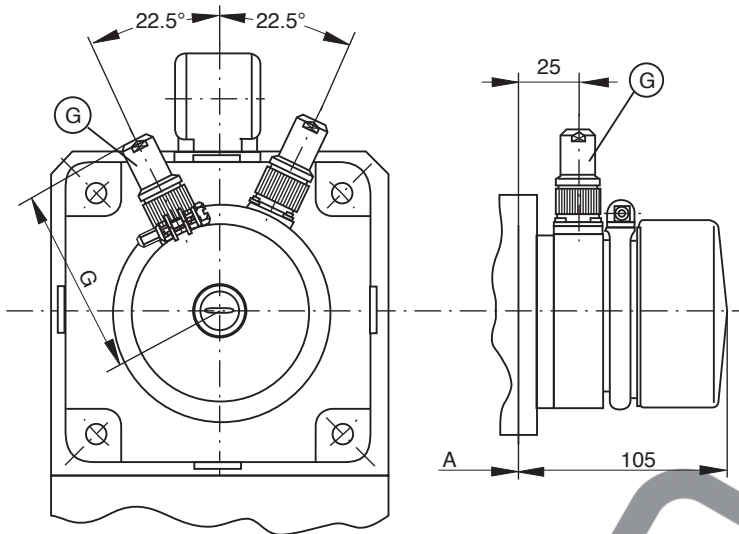
MB112-1rad/2

Fig 7.16: Dimensional data - MAC 112 - available options - (radial cooling)

Available options

- Tachofeedback and mounted absolute encoder

View X:



G Absolute encoder conn.
Must be ordered separately.

Name	Conn. type	Dim. G
straight conn.	INS 326	104
	INS 92	106
angle conn.	INS 322	102

3 Blocking brake

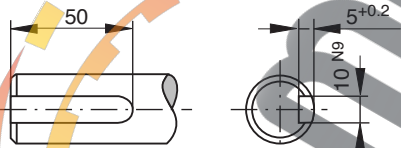
- without blocking brake
Dim. A, B and S5 retained
- Standard blocking brake: 14 Nm
Dim. A, B and S5 retained
- heavy-duty blocking brake: 40 Nm
(not available with MAC 112 A ...)
- extra heavy-duty blocking brake: 60 Nm
(not available with MAC 112 A ...)

Table for blocking brake with 40 and 60 Nm

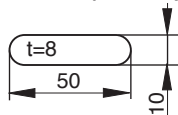
Size \ Dim.	A	S5	B
MAC 112 B	435	98	160
MAC 112 C	510	98	255
MAC 112 D	585	98	255

4 Output shaft

- plain shaft (recommended type)
- with keyway per DIN 6885 sh. 1, 8/68 edition
(Note! balanced with entire key.)



Matching key: DIN 6885-A 10 x 8 x 50
Must be ordered separately.

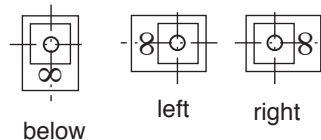


5 Special centering diameter

- $\varnothing 180 j6$

6 Blower arrangement

Looking towards motor shaft.



MB112-1rad/3

Fig 7.17: Dimensional data - MAC 112 - available options - (radial cooling)

7.6. Dimensional data - axial cooling

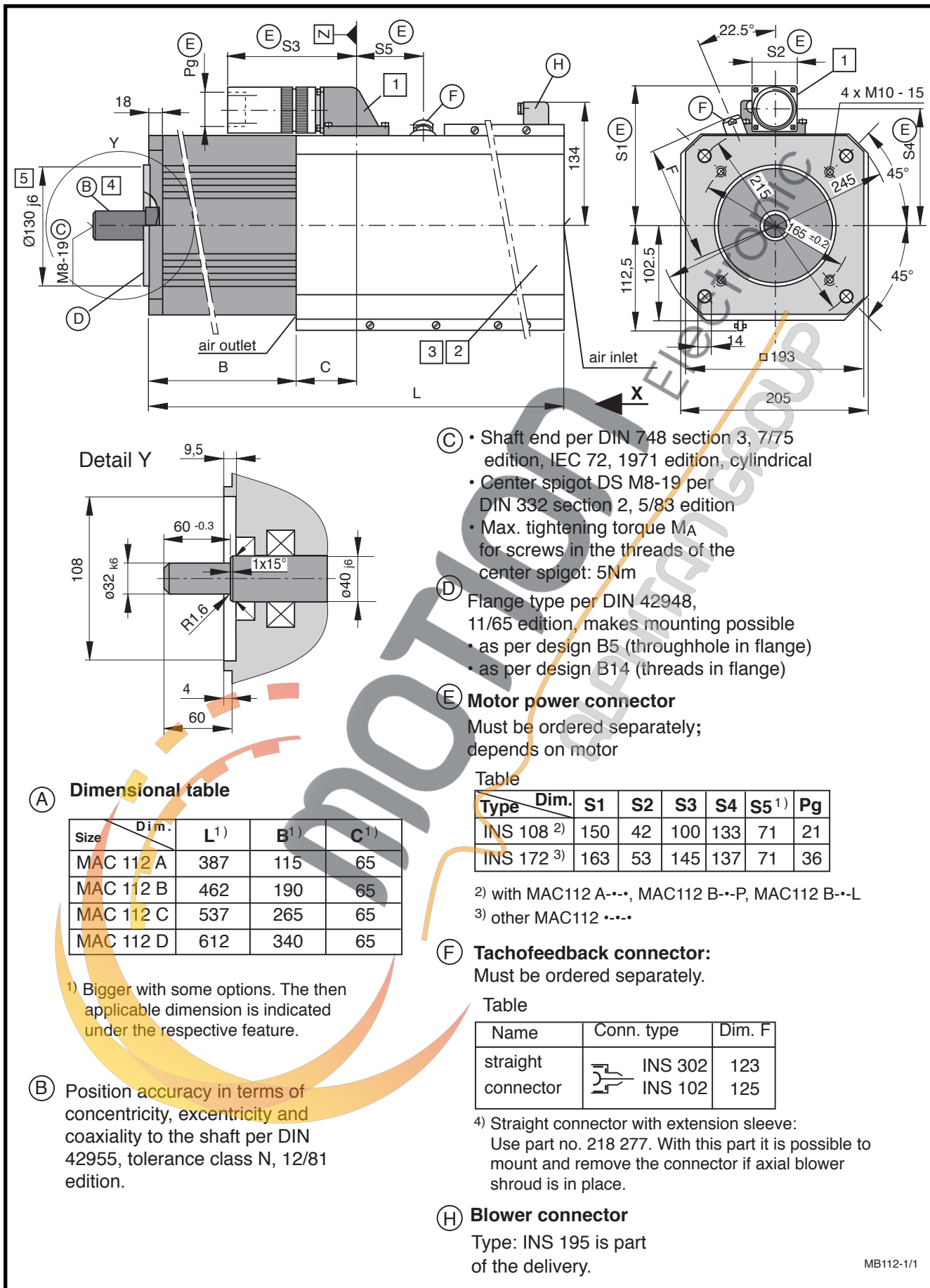


Fig 7.18: Dimensional data - MAC 112 (axial cooling)

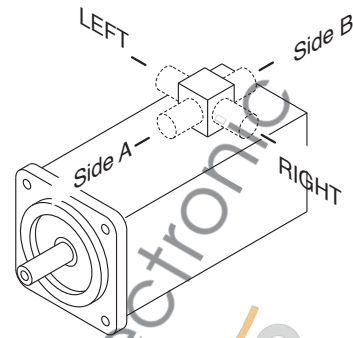
Available options

1 Power connection

The output direction of the electrical power connector is selected at the time the order is placed. Possible output directions are:

- to side A
- to side B
- to the right
- to the left

The drawing depicts side A as output direction. The dimensions of any other direction are obtained by a virtual turning of the connector housing around the Z axis.



2 Motor version

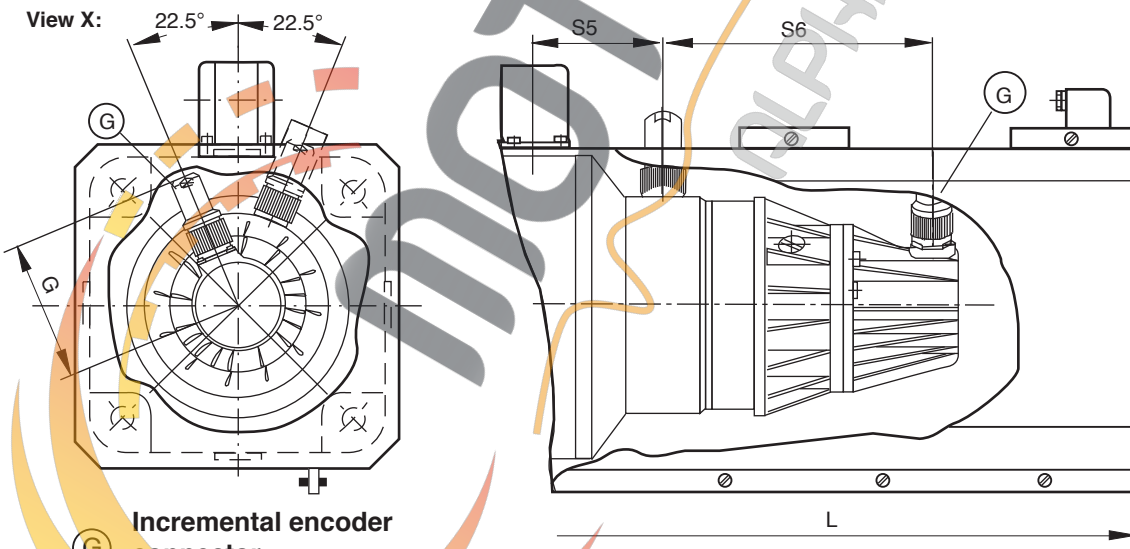
- Tachofeedback and incremental encoder

Table

Size	Dim.	L	B	C	S5	S6
MAC 112 A		497	115	65	71	154
MAC 112 B		572	190	65	71	154
MAC 112 C		647	265	65	71	154
MAC 112 D		722	340	65	71	154

Table for motors with blocking brakes of 40 Nm and 60 Nm

Size	Dim.	L	B	C	S5	S6
MAC 112 B		622	192	17	119	154
MAC 112 C		697	267	17	119	154
MAC 112 D		772	342	17	119	154



Incremental encoder connector

Must be ordered separately.

Name	Conn. type	Dim. G
straight	INS 301	123
conn. 1)	INS 101	125

1) Straight connector with extending sleeve:
part no.: 218 277

MB112-1/2

- Tachofeedback and mounted absolute encoder (see following page)

Fig 7.19: Dimensional data - MAC 112 - available options - (axial cooling)

Available options

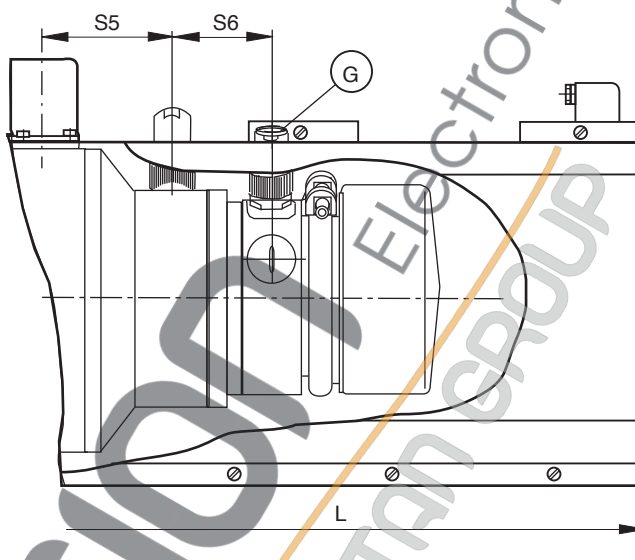
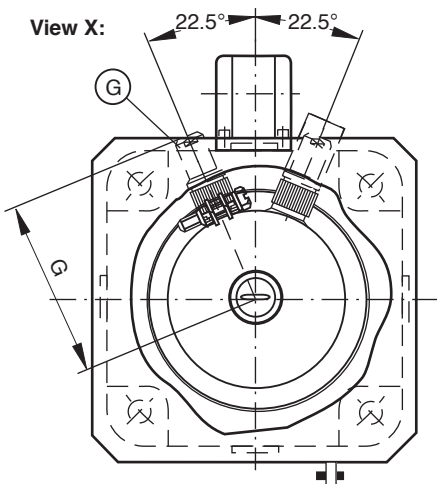
- Tachofeedback and mounted absolute encoder

Table

Size	Dim.	L	B	C	S5	S6
MAC 112 A		497	115	65	71	84
MAC 112 B		572	190	65	71	84
MAC 112 C		647	265	65	71	84
MAC 112 D		722	340	65	71	84

Table with blocking brake with 40 and 60 Nm holding torque

Size	Dim.	L	B	C	S5	S6
MAC 112 B		622	192	65	119	84
MAC 112 C		697	267	65	119	84
MAC 112 D		772	342	65	119	84



- G Absolute encoder conn.**
Must be ordered separately.

Name	Conn. type	Dim. G
straight conn.	INS 326	104
	INS 92	106

3 Blocking brake

- without blocking brake
Dim. L and B retained
- Standard blocking brake: 14 Nm
Dim. L and B retained
- heavy-duty blocking brake: 40 Nm
(not available with MAC 112A ...)
- extra heavy-duty blocking brake: 60 Nm
(not available with MAC 112A ...)

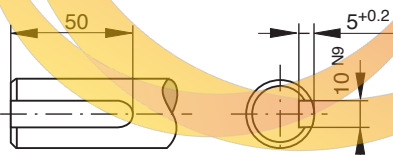
Table for blocking brake with 40 and 60 Nm

Size	Dim.	Vers. 2		Vers. 4	
		L	B	L	B
MAC 112 B		512	240	622	240
MAC 112 C		587	315	697	315
MAC 112 D		662	390	772	390

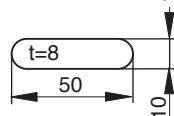
Vers. 2 = Motor with tachofeedback
Vers. 4 = Motor with tachofeedback and mounted encoder

4 Output shaft

- plain shaft (recommended type)
- with keyway per DIN 6885 sh. 1, 8/68 edition
(Note! balanced with entire key.)



Matching key: DIN 6885-A 10 x 8 x 50
Must be ordered separately.



5 Special centering diameter

- $\varnothing 180 j6$

MB112-1/3

Fig 7.20: Dimensional data - MAC 112 - available options - (axial cooling)

7.7. Available Options

Type code fields		Example:	MAC 112 A-0-LD-4 - C/130-A-0/WI 520LV/S000							
1. Motor for analogue drives	MAC									
2. Motor size	112									
3. Motor length	A, B, C, D									
4. Type of cooling:										
natural convection			surface cooling							
			axial				radial			
					blower right		blower below		blower left	
			AC	AC	AC	AC	AC	AC	AC	AC
			230 V	115 V	230 V	115 V	230 V	115 V	230 V	115 V
0			1 ¹⁾	2 ¹⁾	6	A	7	B	8	C
5. Type of windings										
			Standard applications				with increased smooth run quality			
Nominal rpm			motor length				motor length			
			A	B	C	D	A	B	C	D
1500 min ⁻¹			ZD	PD	KD	HD	ZG	PG	KG	HG
2000 min ⁻¹			VD	LD	HD	FD	VG	LG	HG	FG
3000 min ⁻¹			LD	GD	ED	ED	LG	GG	EG	EG
5000 min ⁻¹			--	--	CD ⁶⁾	--	--	--	CG ⁶⁾	--
6. Motor feedback										
Motor type										
with tachofeedback			2							
with tachofeedback and second shaft end			3							
with tachofeedback and mounted incremental or absolute encoder			4							
Tacho voltage										
set to nominal motor speed			-							
(nominal rpm > 3000 min ⁻¹ : 1,5 V/1000 min ⁻¹)										
(Nennzahl ≤ 3000 min ⁻¹ : 3 V/1000 min ⁻¹)										
1,5 V/1000 min ⁻¹			H							
6 V/1000 min ⁻¹ 3)			L							
Tacho type										
Standard			C							
increased smooth run quality			F							
7. Centering diameter										
for design B05 and B14			130							
for design B05 and B14			180 ²⁾							
8. Power connection										
connector to side A			A							
connector to side B			B							
connector to right (looking onto output shaft)			R							
connector to left (looking towards output shaft)			L							
9. Blocking brake										
without blocking brake			0							
with standard blocking brake (45 Nm)			1							
with heavy-duty blocking brake (60 Nm)			2 2) 5)							
extra heavy-duty blocking brake (60 Nm)			3 2) 5)							
10. Type ⁴⁾										
Mounted encoder	Incremental encoder with standard mounting		WI							
	Incremental encoder with shock-damped mounting		DI							
	Absolute encoder		AM							
11. Encoder code ⁴⁾										
For available types, see section 2.4 "Motor feedback"										
12. Special types										
Fixed and documented by INDRAMAT with special number (see Drawing no.: 106-0105-4301-XX)										
Does not apply to standard motors.										
1) For type 3 motors (with 2nd shaft end and tachofeedback). Not available with axial surface cooling.			4) type code fields 10 and 11 do not apply to motor types 2 and 3							
2) Type code fields 10 and 11 do not apply to motor types 2 and 3.			5) not available with motor length A							
3) only with tacho type "F"			6) not available with surface cooling							

Fig 7.21: Type codes - MAC 112

7.8. Special Options

Specification of Option	S003	S005	S011	S013	S018	S019	S029
Special centering diameter 180	X		X			X	X
heavy-duty blocking brake				X	X	X	X
with keyway per DIN 6885, sheet 1		X	X		X		X

Fig 7.22: Special options with a MAC 112

