

5. MAC 090

5.1. Technical Data

Designation	Symbol	Unit	Motor type MAC ...			
			090 A - - - Z •	090 B - - - P •	090 C - - - K •	090 C - - - ED •
Nominal motor speed ¹⁾	n	min ⁻¹	2000	2000	2000	5000
Continuous torque at standstill ²⁾	M _{dN}	Nm	3.7 (5.0) ⁵⁾	7.2 (10.5) ⁵⁾	10.4 (16.0) ⁵⁾	10.0 (16.0) ⁵⁾
Continuous current at standstill	I _{dN}	A	8.1 (10.9) ⁵⁾	11.9 (17.4) ⁵⁾	17.0 (26.1) ⁵⁾	35.0 (52.0) ⁵⁾
Rotor moment of inertia ³⁾	J _M	kgm ²	20 x 10 ⁻⁴	36 x 10 ⁻⁴	53 x 10 ⁻⁴	53 x 10 ⁻⁴
Torque constant at 20 °C	K _m	Nm/A	0.51	0.67	0.68	0.31
Windings resistance at 20 °C	R _A	Ohm	1.85	0.97	0.60	0.12
Windings inductance	L _A	mH	1.9	5.1	3.6	0.8
Maximum peak of pulse current	I _{peak}	A	53	86	125	270
Thermal time constant	T _{th}	min	45 (30) ⁵⁾	60 (45) ⁵⁾	60 (45) ⁵⁾	60 (45) ⁵⁾
Mass ⁴⁾	m _M	kg	12.5	18	23	23
			090 A - - - R •	090 B - - - N •	090 B - - - J •	090 C - - - G •
Nominal motor speed ¹⁾	n	min ⁻¹	3000	3000	3000	3000
Continuous torque at standstill ²⁾	M _{dN}	Nm	3.5 (5.0) ⁵⁾	6.7 (10.5) ⁵⁾	6.7 (10.5) ⁵⁾	9.6 (16.0) ⁵⁾
Continuous current at standstill	I _{dN}	A	11.4 (16.3) ⁵⁾	13.0 (20.0) ⁵⁾	18.2 (28.5) ⁵⁾	24.8 (41.3) ⁵⁾
Rotor moment of inertia ³⁾	J _M	kgm ²	20 x 10 ⁻⁴	36 x 10 ⁻⁴	36 x 10 ⁻⁴	53 x 10 ⁻⁴
Torque constant at 20 °C	K _m	Nm/A	0.34	0.58	0.41	0.43
Windings resistance at 20 °C	R _A	Ohm	0.56	0.75	0.38	0.24
Windings inductance	L _A	mH	3.2	3.9	2.0	1.5
Maximum peak of pulse current	I _{peak}	A	76	98	137	196
Thermal time constant	T _{th}	min	45 (30) ⁵⁾	60 (45) ⁵⁾	60 (45) ⁵⁾	60 (45) ⁵⁾
Mass ⁴⁾	m _M	kg	12.5	18	18	23

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 5.1: 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 (RAL 9005)		
Voltage constant of the tachogenerator ¹⁾	C _w	Vs/rad	0.0143	0.0286	0.0572
		V/min ⁻¹	1.5/1000	3/1000	6/1000 ²⁾

1) Tachovoltage can be selected application-related.

2) If the 6 V/1000 min⁻¹ tachometer is used, then the maximum usable speed is limited to 1600 min⁻¹.

Fig 5.2: General data MAC 090

Designation	Symbol	Unit	Data holding brake	
			Standard	heavy-duty
Principle of action				electrically-actuated release
Holding torque	M_H	Nm	6.5	14
Nominal voltage	U_N	V		DC 24 ± 10%
Nominal current	I_N	A	0.7	0.7
Moment of inertia	J_B	kgm ²	1.06×10^{-4}	3.6×10^{-4}
Release delay	t_L	ms	60	70
Clamping delay	t_K	ms	20	30
Mass	m_B	kg	0.5	0.5

Fig 5.3: Technical data - holding brake

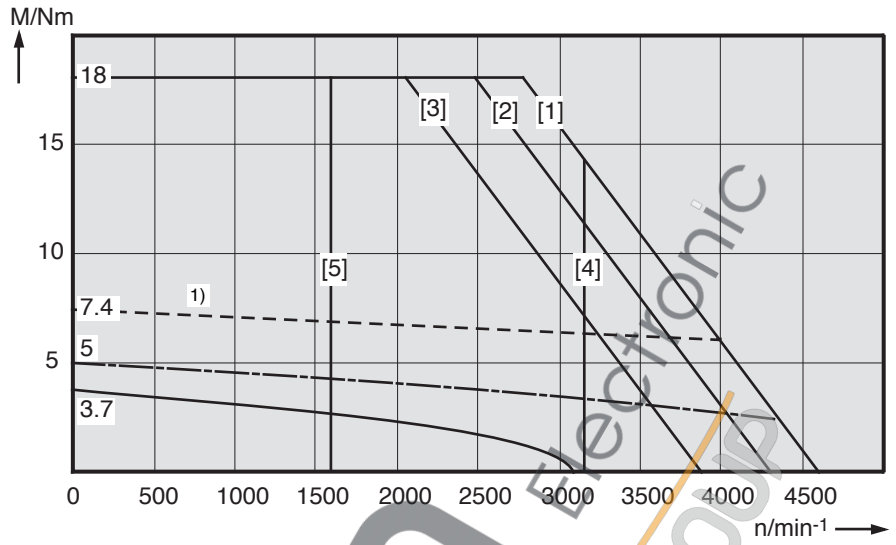
Designation	Symbol	Unit	Data surface cooling	
			Axial cooling	Radial cooling
Power consumption	S_N	VA	40/42	40/42
Nominal voltage	U_N	V	AC 230 or 115 ¹⁾	AC 230 or 115 ¹⁾
Frequency	f	Hz	50/60	50/60
Mass	m_L	kg	approx. 3.3 ²⁾	approx. 3.2 ²⁾
Protection category blower unit			IP 24	IP 24
Protection category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

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

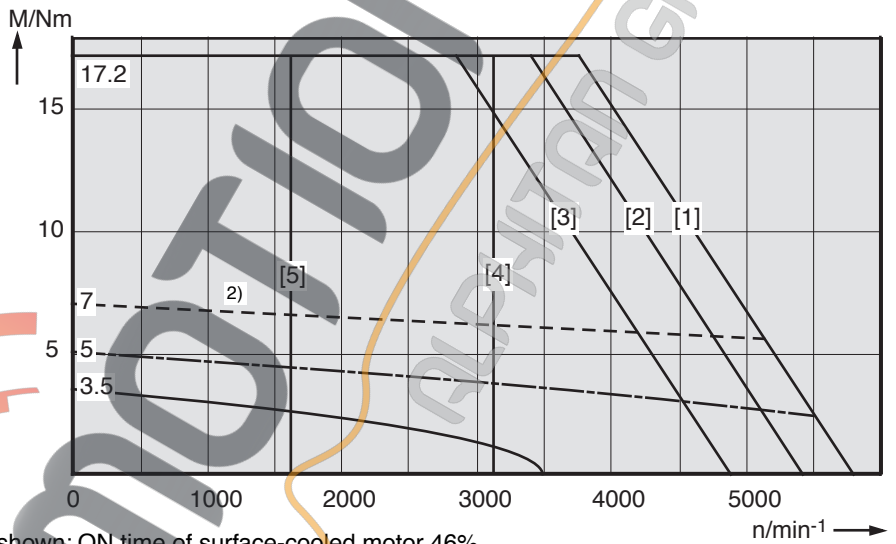
Fig 5.4: Technical data - surface cooling

5.2. Torque-Speed Characteristics

MAC 090 A - - - Z •
2000 min⁻¹



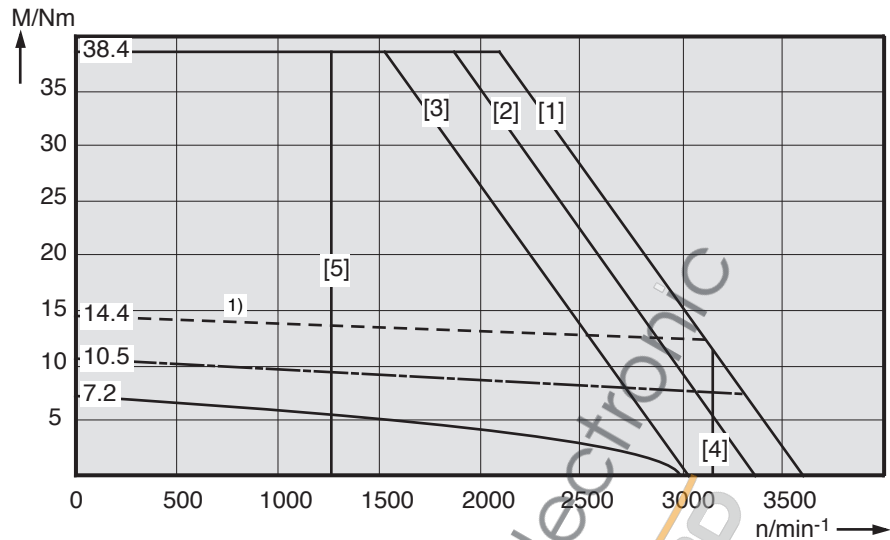
MAC 090 A - - - R •
3000 min⁻¹



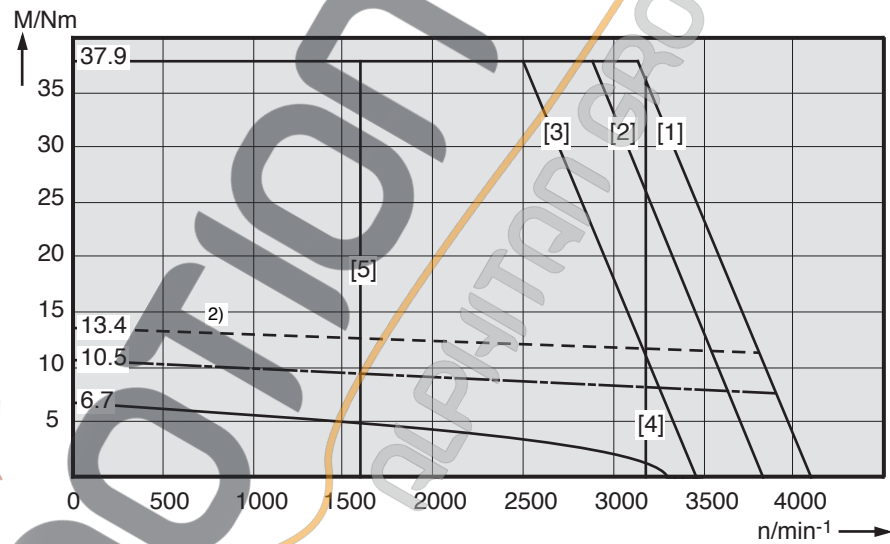
1) shown: ON time of surface-cooled motor 46%
2) shown: ON time of surface-cooled motor 51%

Fig 5.5: Torque-speed characteristics MAC 090

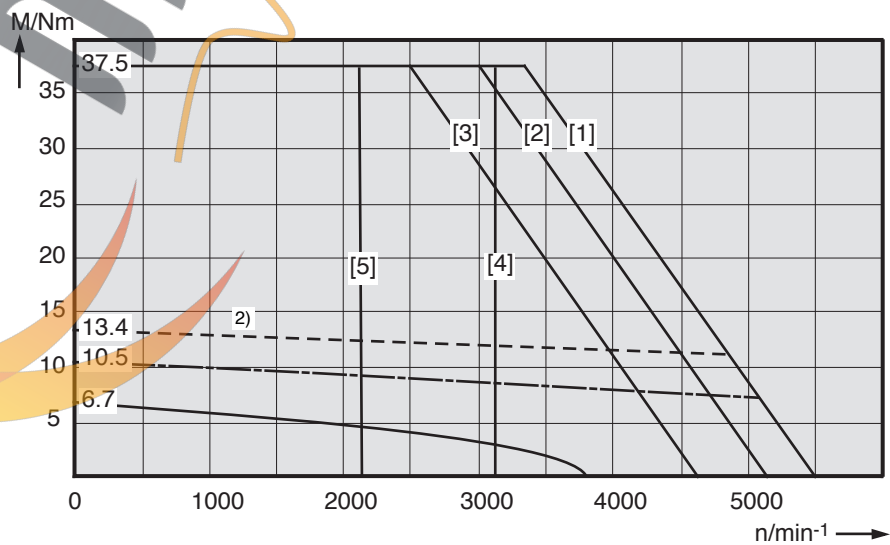
MAC 090 B - - - P •
2000 min⁻¹



MAC 090 B - - - N •
3000 min⁻¹



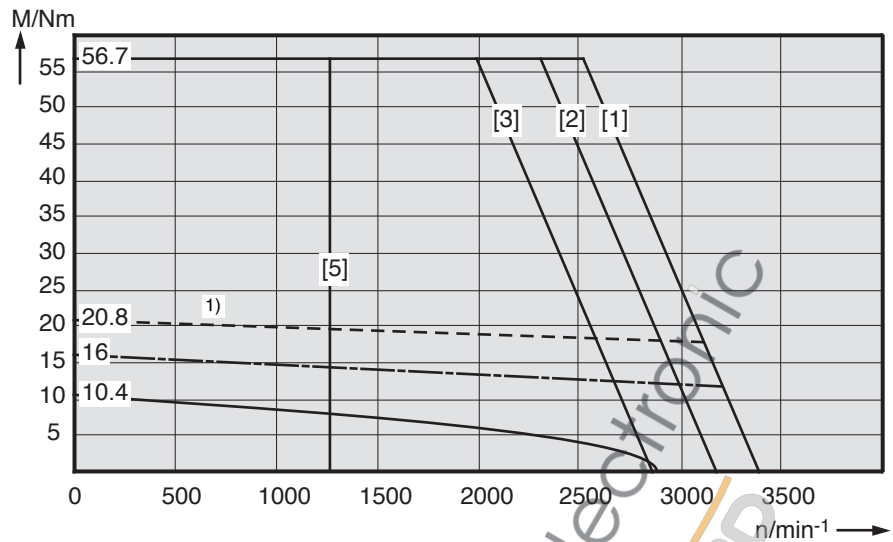
MAC 090 B - - - J •
3000 min⁻¹



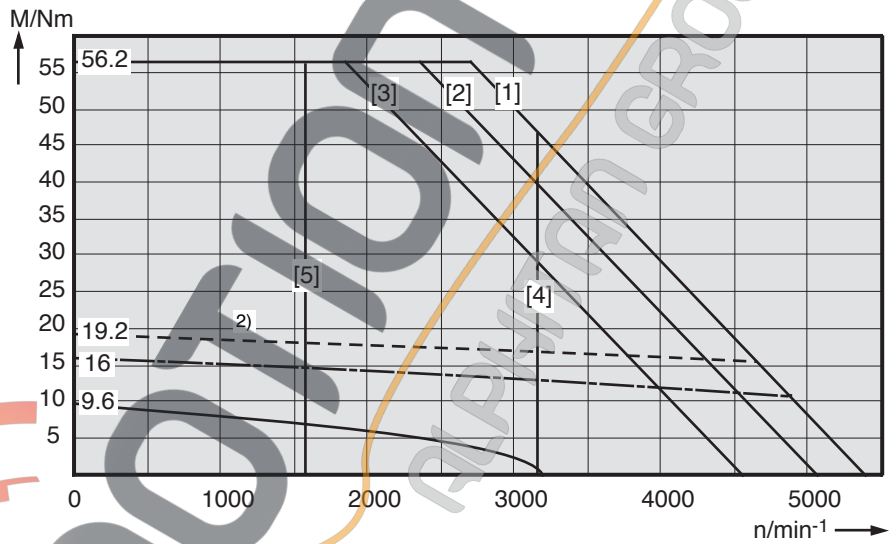
1) shown: ON time of surface-cooled motor 53%
2) shown: ON time of surface-cooled motor 61%

Fig 5.6: Torque-speed characteristics MAC 090

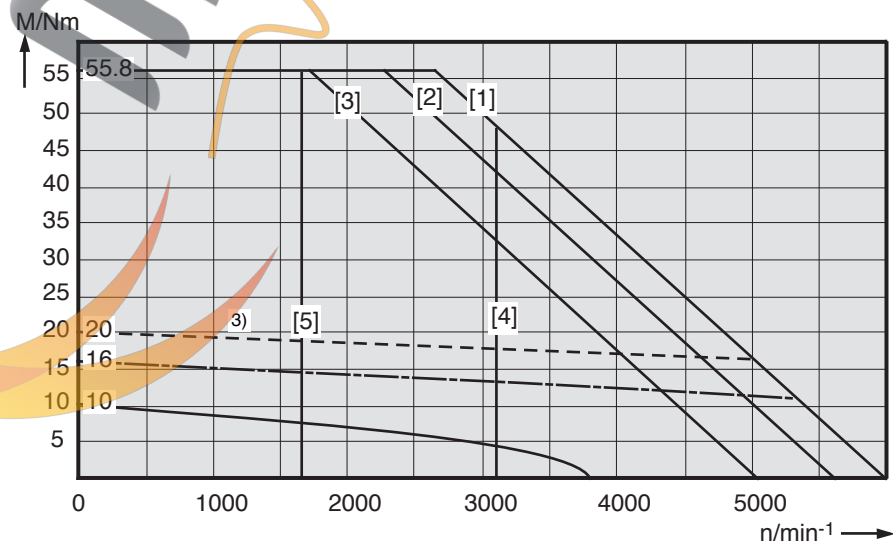
MAC 090 C - - - K •
2000 min⁻¹



MAC 090 C - - - G •
3000 min⁻¹



MAC 090 C - - - E •
5000 min⁻¹



- 1) shown: ON time of surface-cooled motor 59%
- 2) shown: ON time of surface-cooled motor 69%
- 3) shown: ON time of surface-cooled motor 64%

Fig 5.7: Torque-speed characteristics MAC 090

5.3. Shaft load capacity

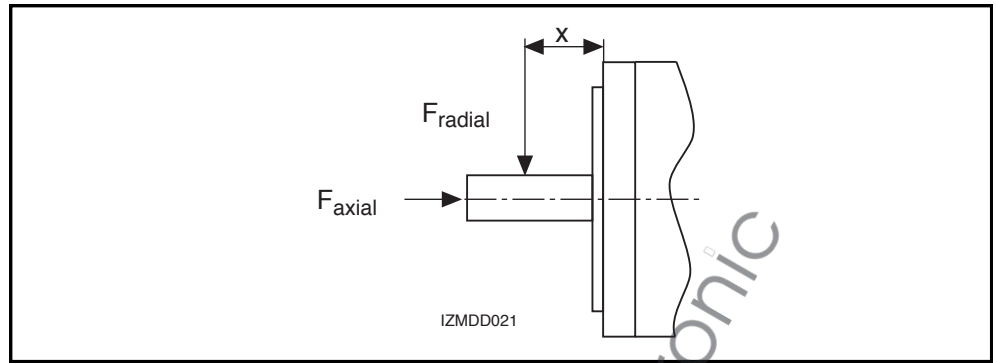


Fig 5.8: Shaft load

Permissible radial force
 F_{radial}

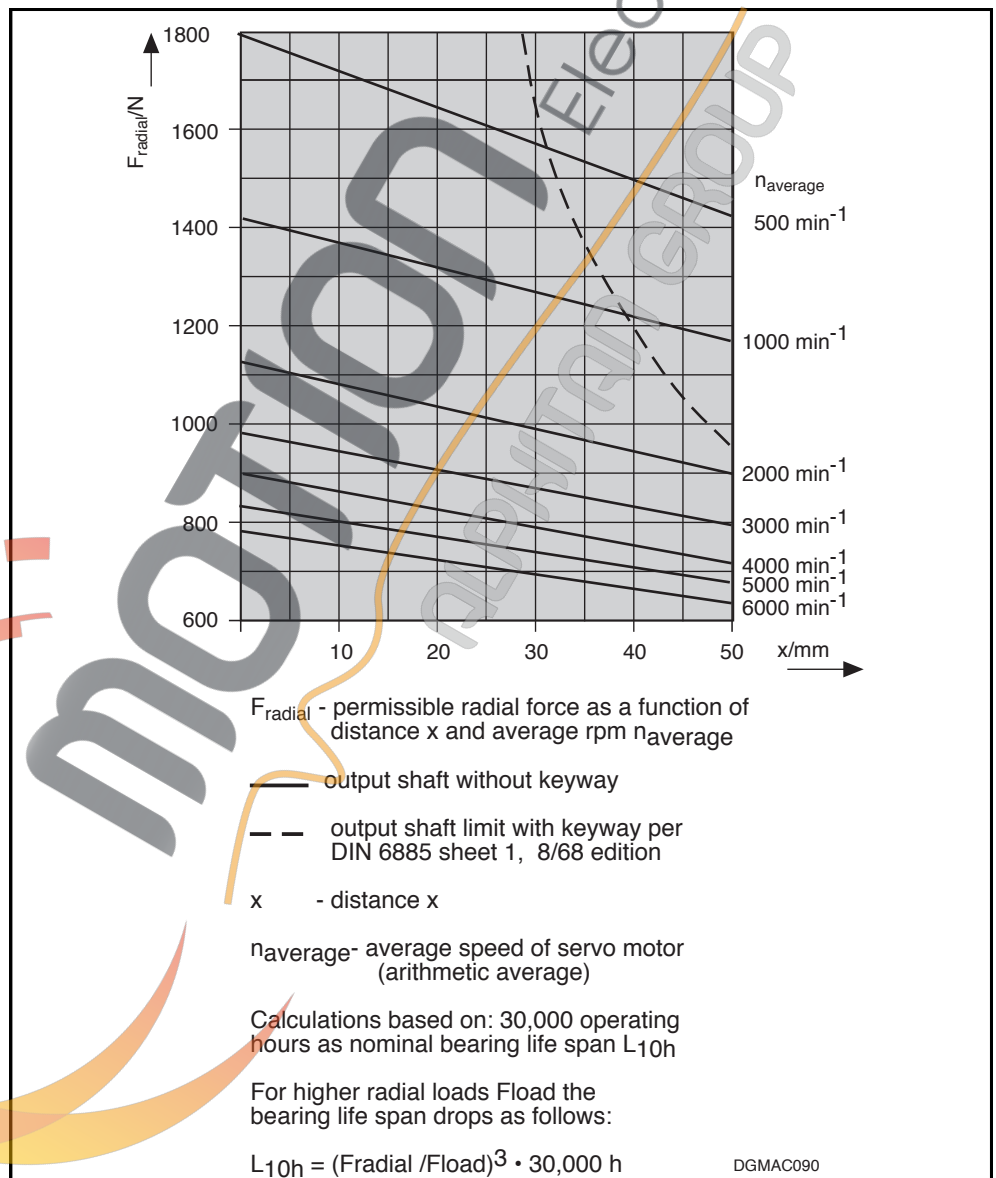


Fig 5.9: Permissible radial force

Permissible axial force
 F_{axial}

$$F_{\text{axial}} = 0.34 \cdot F_{\text{radial}}$$

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

5.4. Dimensional data - natural convection

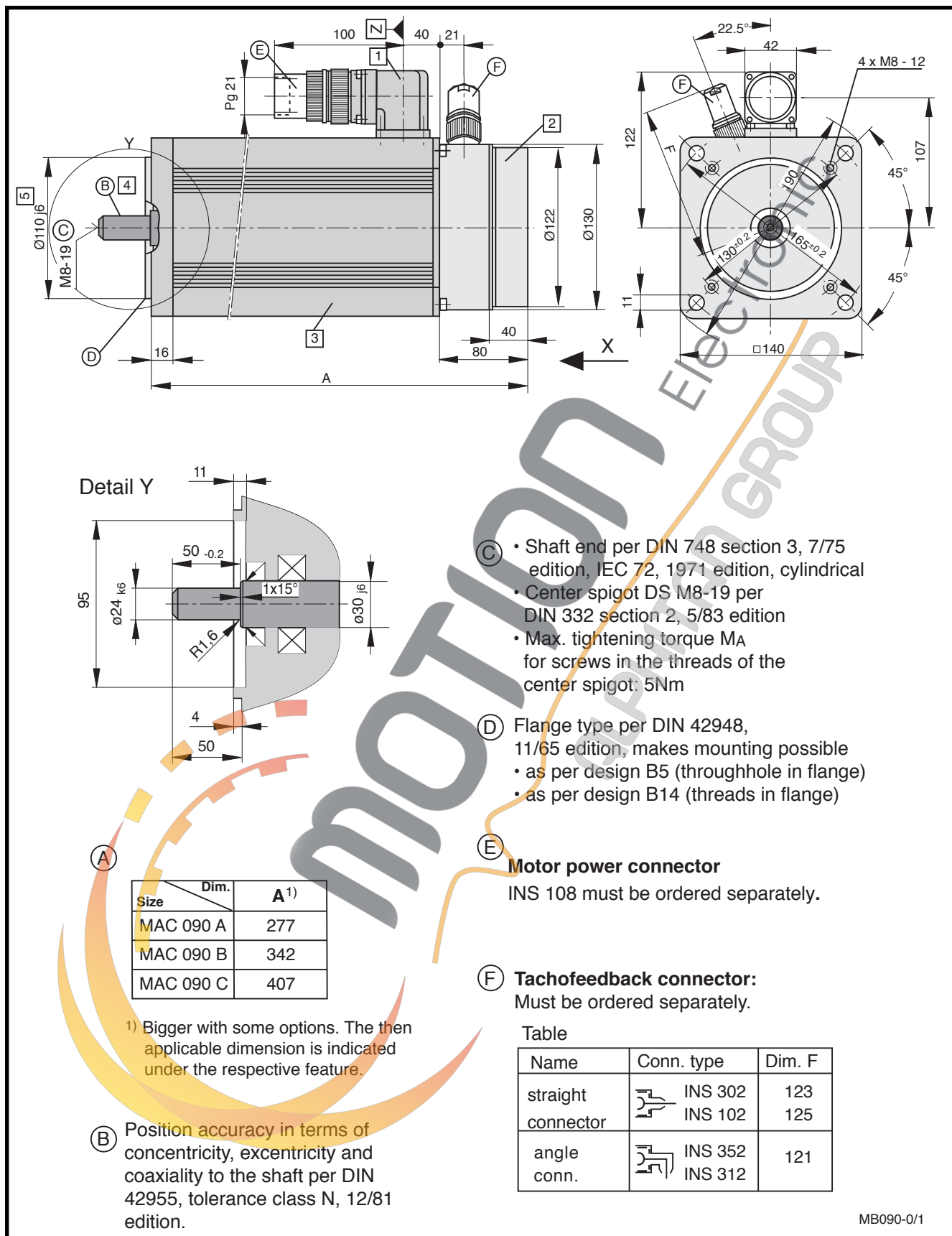


Fig 5.10: Dimensional data - MAC 090 (natural convection)

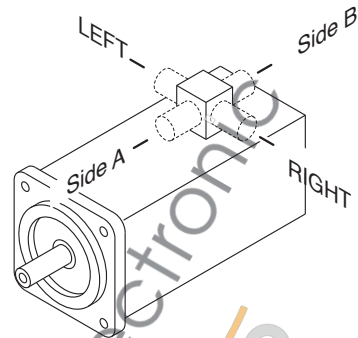
Available options

1 Power connection

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

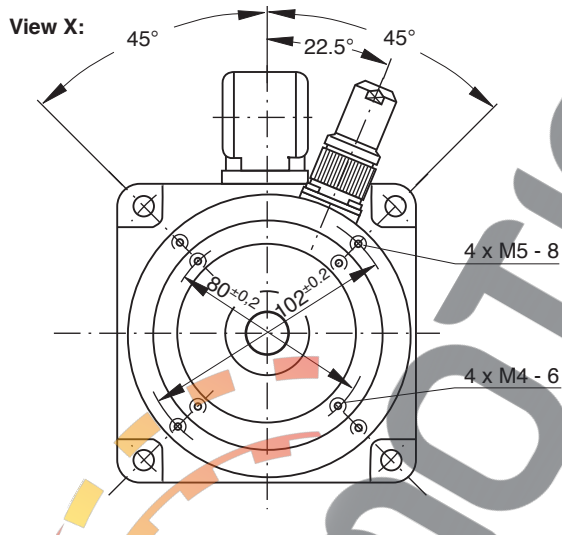
- to side A
- to side B
- to the right
- to the left

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.

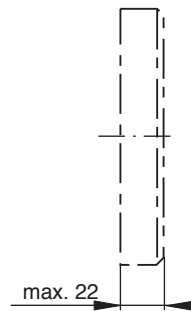


2 Motor version

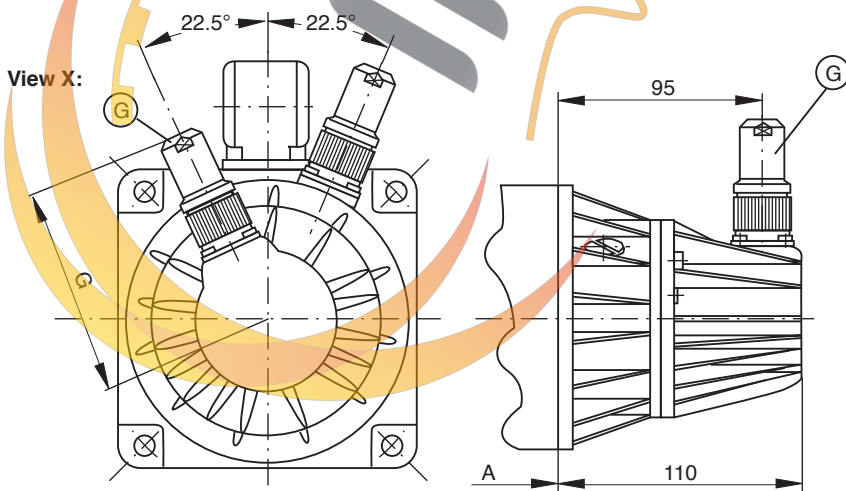
- Tachofeedback and second shaft end



Cover mounted at delivery.



- 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	86
	INS 311	

- Tachofeedback and mounted absolute encoder (see following page)

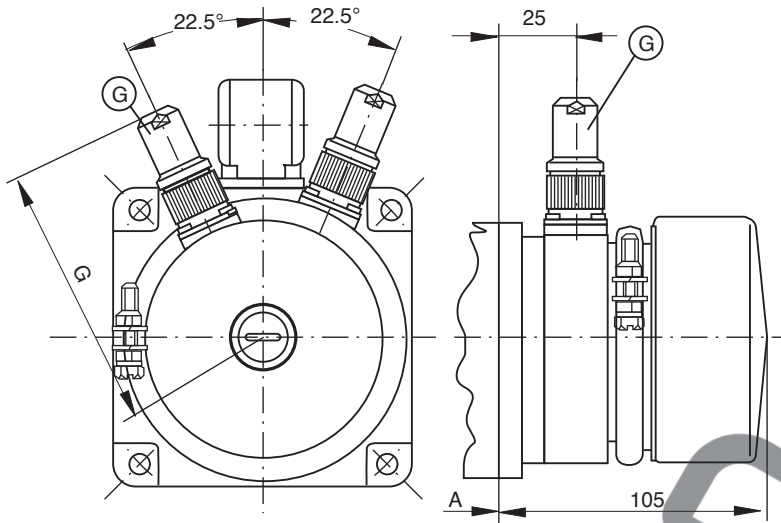
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Fig 5.11: Dimensional data - MAC 090 - available options - (natural convection)

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

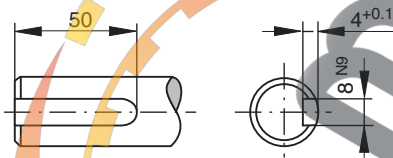
- without blocking brake
Dim. A retained
- Standard blocking brake: 6.5 Nm
Dim. A retained
- heavy-duty blocking brake: 14.0 Nm

Table for 14 Nm blocking brake

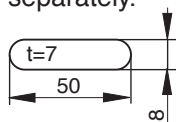
Size	Dim.	A
MAC 090 A		327
MAC 090 B		392
MAC 090 C		457

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 5 x 5 x 22
Must be ordered separately.



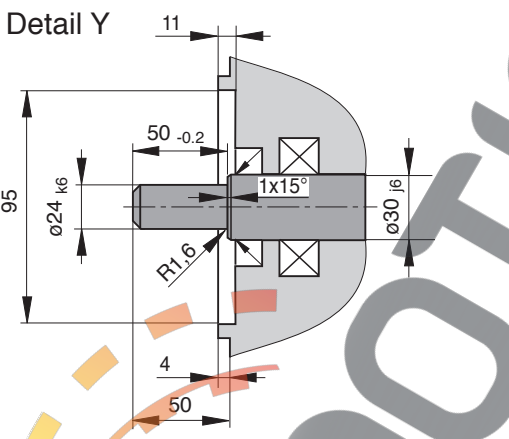
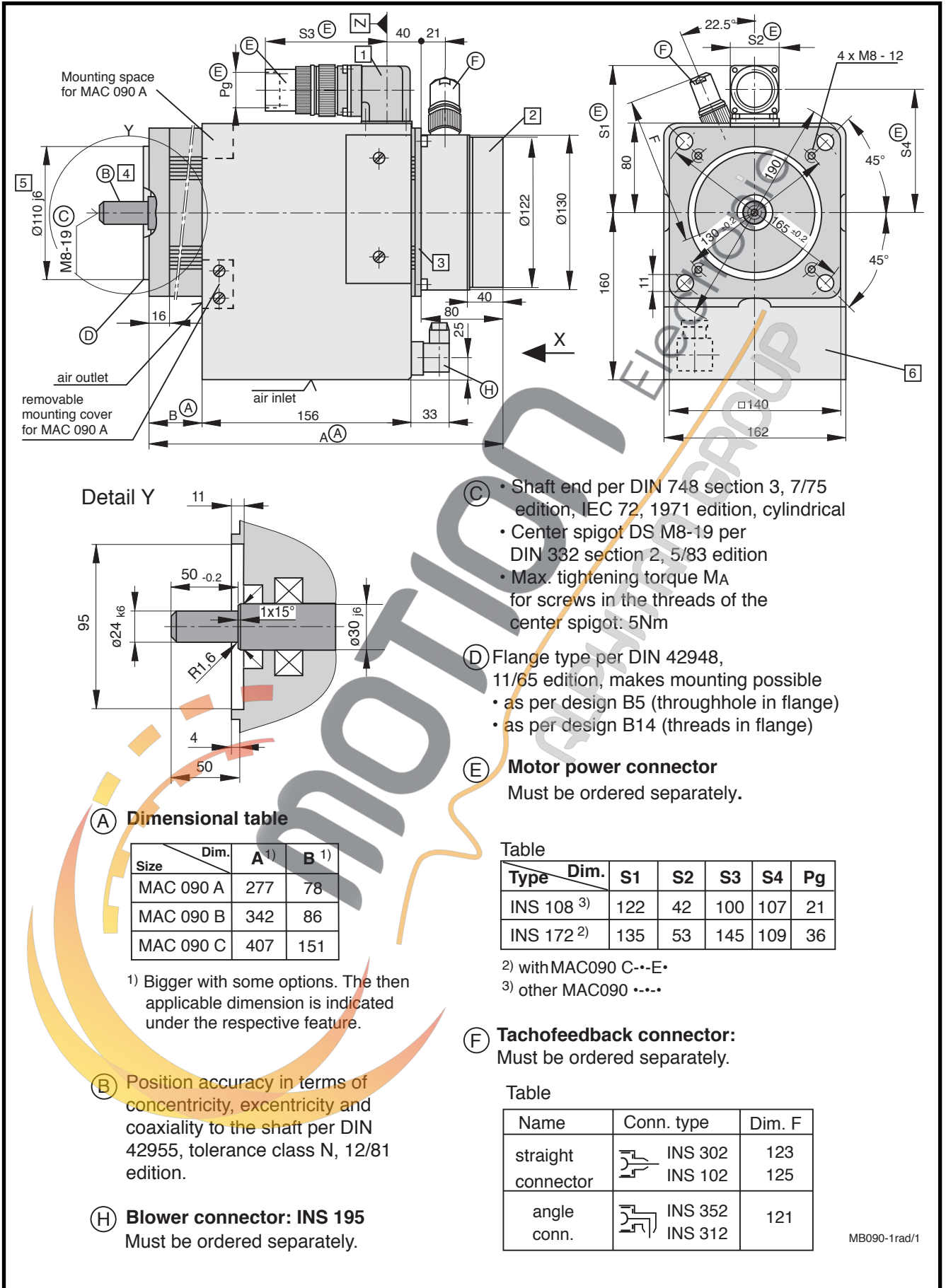
5 Special centering diameter

- Ø130 j6

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Fig 5.12: Dimensional data - MAC 090 - available options - (natural convection)

5.5. Dimensional data - radial cooling



(A) Dimensional table

Size	Dim.	A ¹⁾	B ¹⁾
MAC 090 A		277	78
MAC 090 B		342	86
MAC 090 C		407	151

1) Bigger with some options. The then applicable dimension is indicated under the respective feature.

(B) Position accuracy in terms of concentricity, excentricity and coaxiality to the shaft per DIN 42955, tolerance class N, 12/81 edition.

(H) **Blower connector: INS 195**
Must be ordered separately.

Table

Type	Dim.	S1	S2	S3	S4	Pg
INS 108 ³⁾		122	42	100	107	21
INS 172 ²⁾		135	53	145	109	36

2) with MAC090 C--E•
3) other MAC090•

Table

Name	Conn. type	Dim. F
straight connector	INS 302	123
	INS 102	125
angle conn.	INS 352 INS 312	121

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Fig 5.13: Dimensional data - MAC 090 (radial cooling)

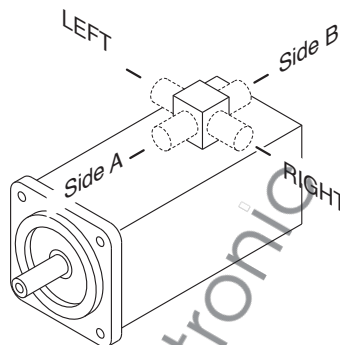
Available options

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

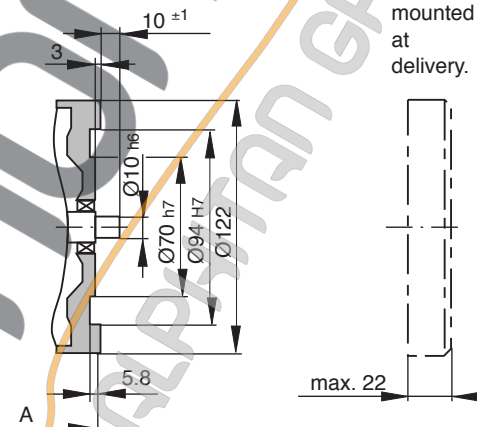
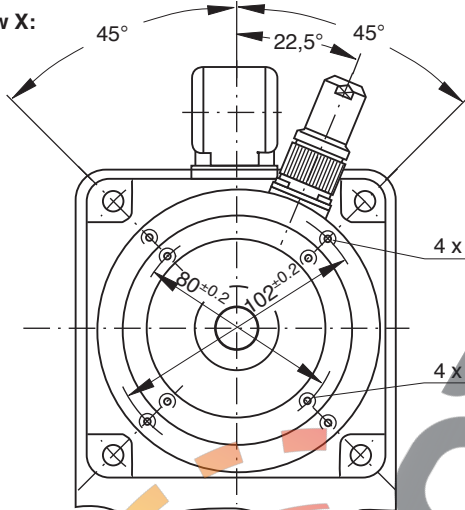
The drawing depicts side A as output direction. The dimensions of any other direction are obtained by a virtual turning of the connector housing around the Z axis.



2 Motor version

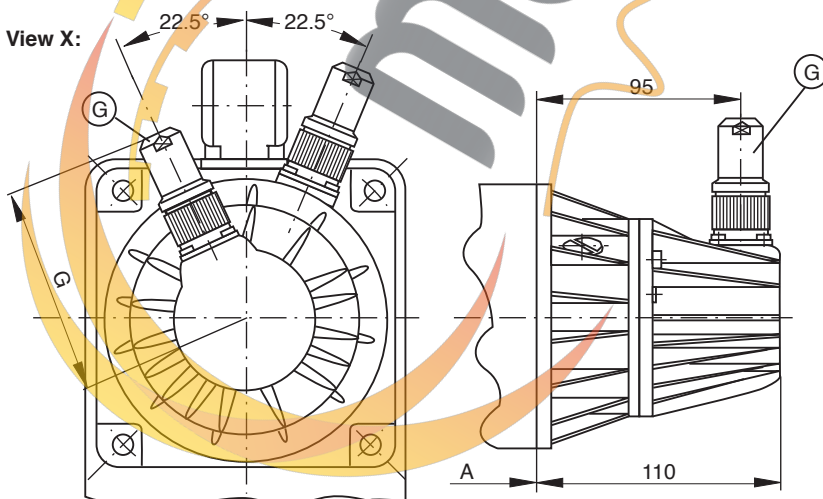
- Tachofeedback and second shaft end

View X:



- Tachofeedback and mounted incremental encoder

View X:



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)

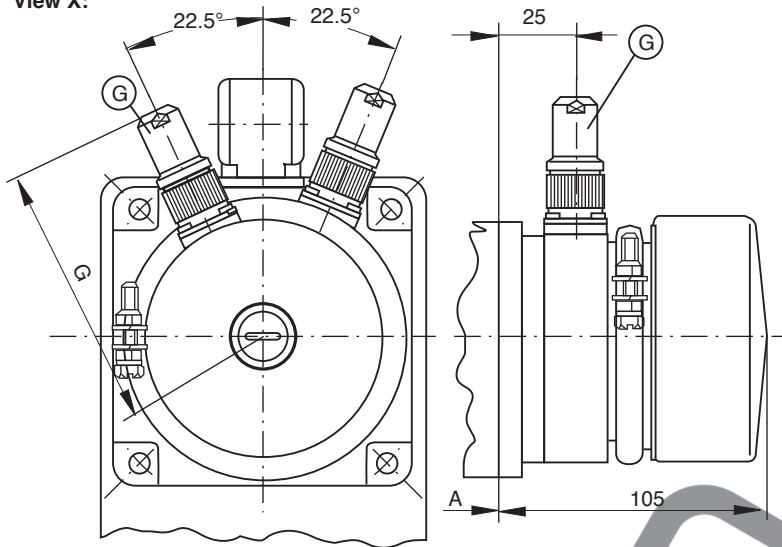
MB090-1rad/2

Fig 5.14: Dimensional data - MAC 090 - 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	
angle conn.	INS 322	102

3 Blocking brake

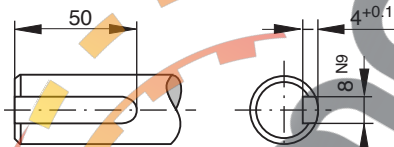
- without blocking brake
Dim. A and B retained
- Standard blocking brake: 6.5 Nm
Dim. A and B retained
- heavy-duty blocking brake: 14.0 Nm

Table for 14 Nm blocking brake

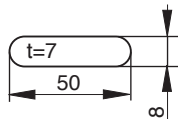
Size	Dim.	A	B
MAC 090 A		327	128
MAC 090 B		392	136
MAC 090 C		457	185

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 5 x 5 x 22
Must be ordered separately.

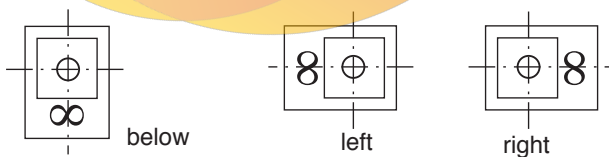


5 Special centering diameter

- $\varnothing 130 j6$

6 Blower arrangement

Looking towards motor shaft.



MB090-1rad/3

Fig 5.15: Dimensional data - MAC 090 - available options - (radial cooling)

5.6. Dimensional data - axial cooling

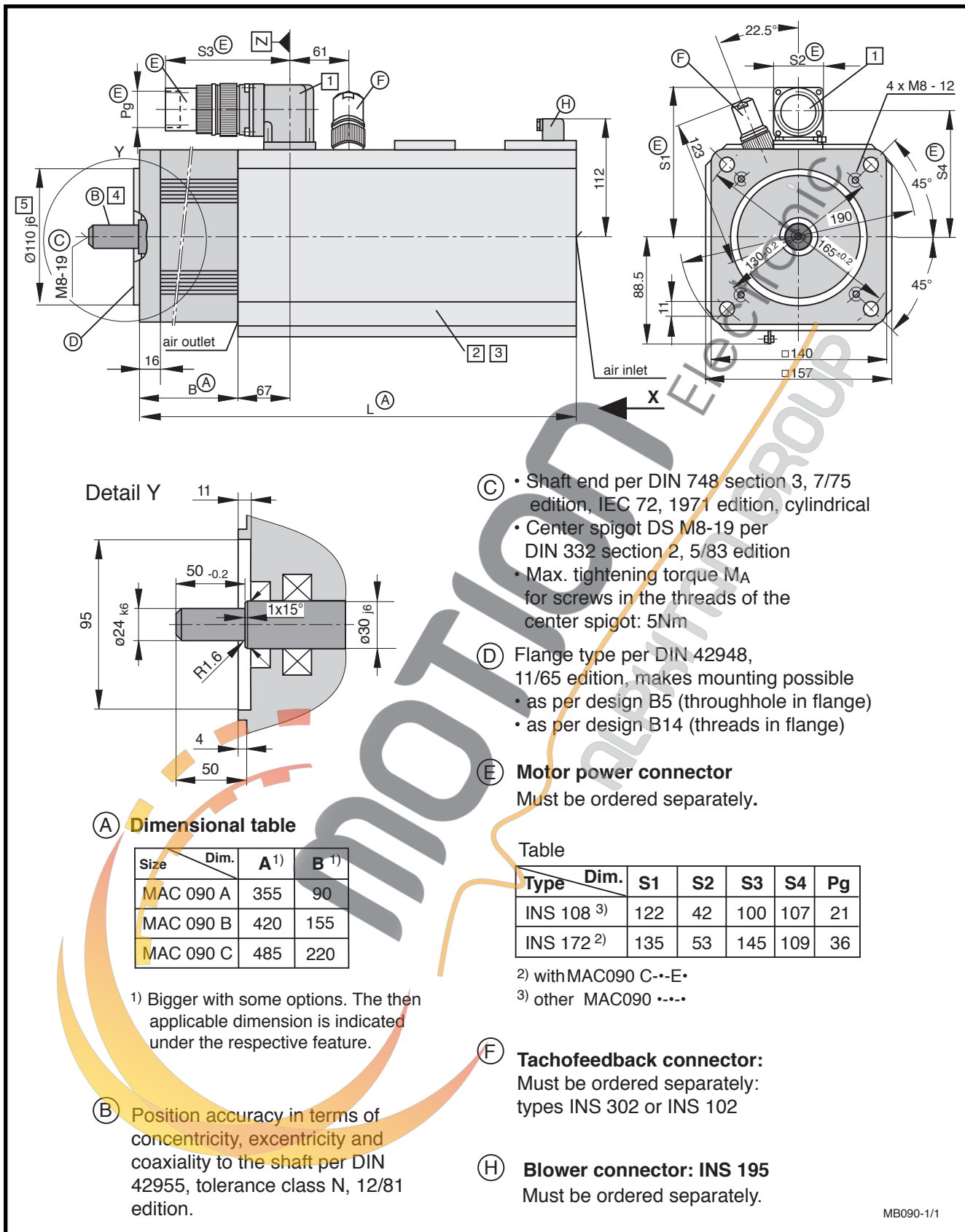


Fig 5.16: Dimensional data - MAC 090 (axial cooling)

MB090-1/1

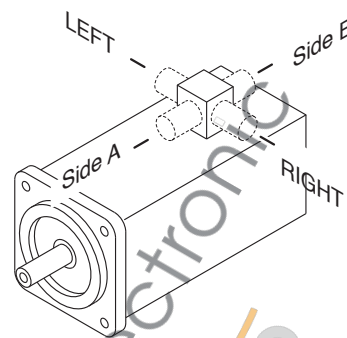
Available options

1 Power connection

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

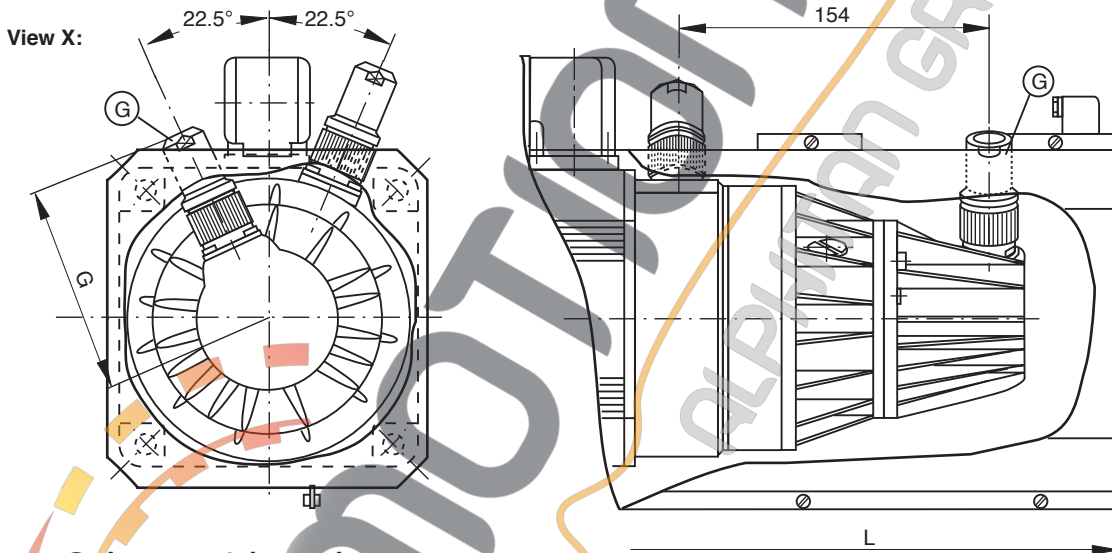
- to side A
- to side B
- to the right
- to the left

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 mounted incremental encoder



G Incremental encoder connector

Must be ordered separately.

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

Table:

Size	Dim.	L	B
MAC 090 A		455	90
MAC 090 B		520	155
MAC 090 C		585	220

- Tachofeedback and mounted absolute encoder (see following page)

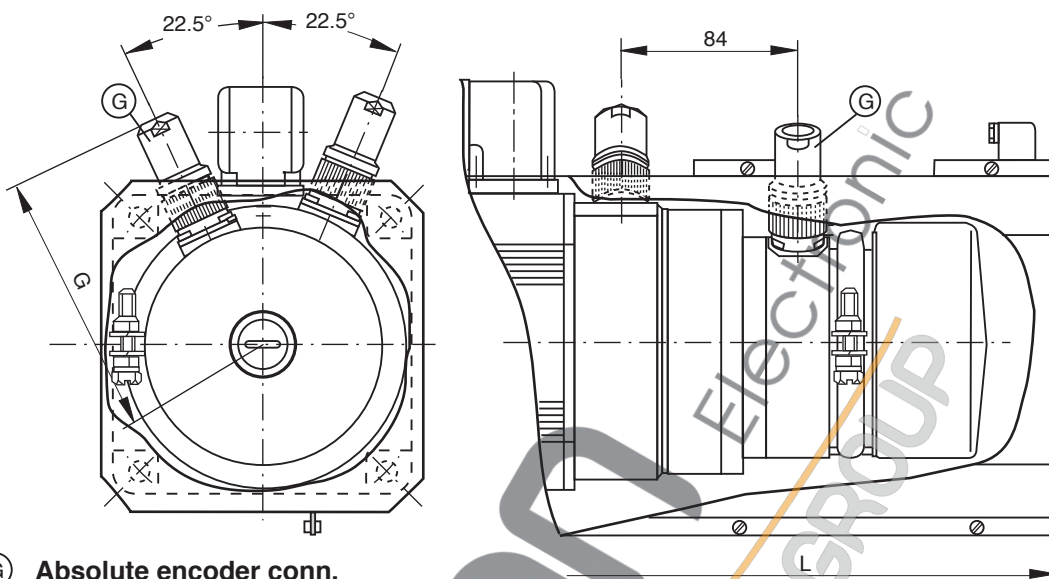
MB090-1/2

Fig 5.17: Dimensional data - MAC 090 - available options - (axial cooling)

Available options

- Tachofeedback and mounted absolute encoder

View X:



Ⓒ **Absolute encoder conn.**
Must be ordered separately.

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

Size	Dim.	L	B
MAC 090 A		455	90
MAC 090 B		520	155
MAC 090 C		585	220

3 Blocking brake

- without blocking brake
Dim. L and B retained
- Standard blocking brake: 6.5 Nm
Dim. L and B retained
- heavy-duty holding brake: 14.0 Nm

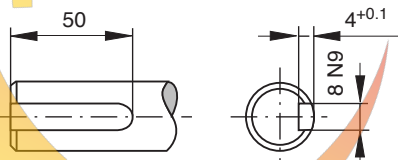
Table for blocking brake with 14.0 Nm holding torque

Size	Dim.		Vers. 2		Vers. 4	
	L	B	L	B	L	B
MAC 090 A	405	140	505	140		
MAC 090 B	470	205	570	205		
MAC 090 C	535	270	635	270		

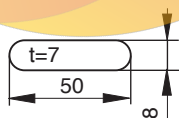
Vers. 2 = Motor with tachofeedback
Vers. 4 = Motor with tachofeedback and mounted encoder

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 8 x 7 x 50
Must be ordered separately.



5 Special centering diameter

- Ø130 j6

MB090-1/3

Fig 5.18: Dimensional data - MAC 090 -available options - (axial cooling)

5.7. Available Options

Type code fields Example: **MAC 090 A-0-ES-4 - C/110-A-0/WI 520LV/S000**

1. Motor for analogue drives		MAC	
2. Motor size		090	
3. Motor length		A, B, C	
4. Type of cooling:			
natural convection		surface cooling	
		axial	
		radial	
		blower right	
		blower below	
		blower left	
		AC 230 V	
		AC 115 V	
		AC 230 V	
		AC 115 V	
		AC 230 V	
		AC 115 V	
0		1 ¹⁾ 2 ¹⁾ 6 A 7 B 8 C	
5. Type of windings			
Nominal rpm		Standard applications	
		with increased smooth run quality	
		motor length	
		motor length	
		A B B C	
		A B B C	
2000 min ⁻¹		ZD PD -- KD ZG PG -- KG	
3000 min ⁻¹		RD ND JD GD RG NG JG GG	
5000 min ⁻¹		-- -- -- ED -- -- -- EG	
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)			
(nominal rpm ≤ 3000 min ⁻¹ : 3 V/1000 min ⁻¹)			
1.5 V/1000 min ⁻¹		H	
6 V/1000 min ⁻¹		L	
Tacho type Standard		C	
increased smooth run quality		F	
7. Centering diameter			
for design B05 and B14		110	
for design B05 and B14		130 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 onto output shaft)		L	
9. Blocking brake			
without blocking brake		0	
with standard blocking brake (6.5 Nm)		1	
with heavy-duty blocking brake (14 Nm)		2	
10. Type ³⁾			
Incremental encoder with standard mounting		WI	
Incremental encoder with shock-damped mounting		DI	
11. Encoder code ³⁾			
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.

2) additional S0 no. required (see Fig. 5.20)

3) type code fields 10 and 11 do not apply to motor types 2 and 3

TLMAC090

Fig 5.19: Type codes - MAC 090

5.8. Special Options

Specification of Option	S003	S005	S012	S013	S019	S023	S031
Special centering diameter 130	X		X		X		X
Heavy-duty blocking brake				X	X	X	X
output shaft with shaft sealing		X	X			X	X

Fig 5.20: Special options with a MAC 090

