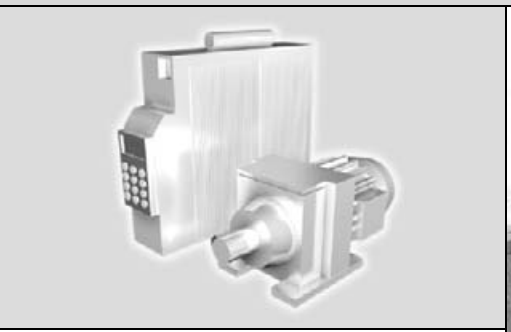
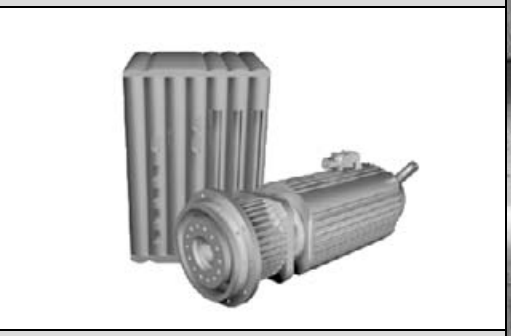
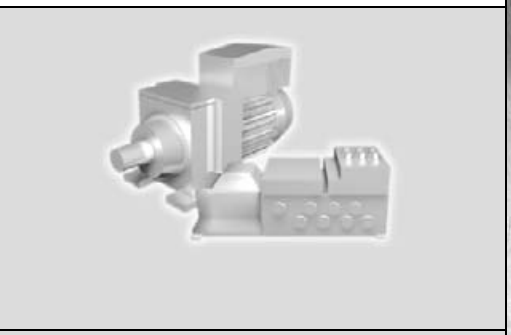
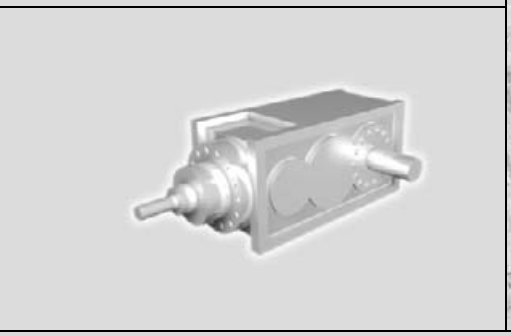
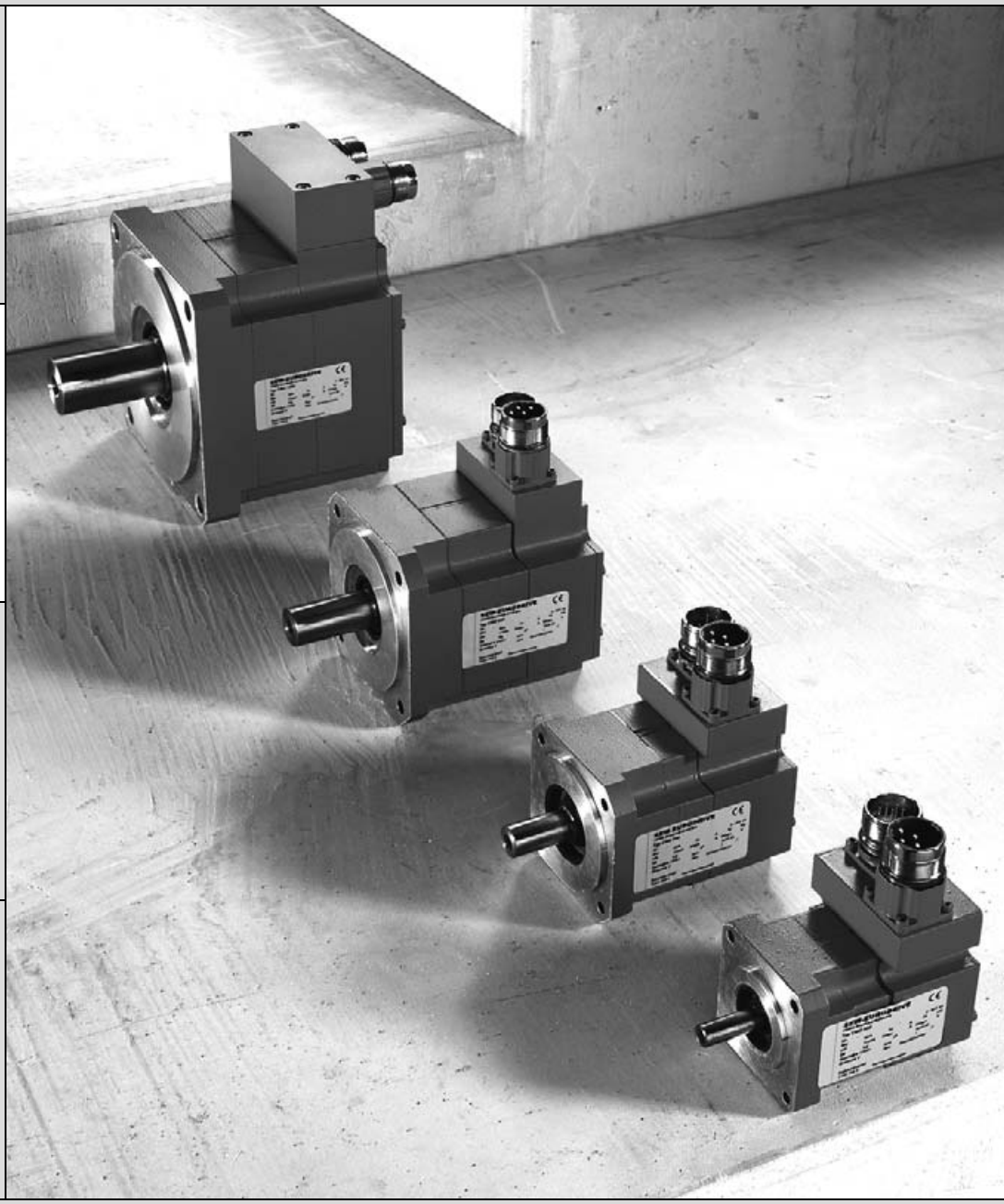
SEW EURODRIVE











Synchronous Compact Servomotors CMD55/70/93/138

GB250000

Edition 05/2005

11302410 / EN

Operating Instructions

SEW
EURODRIVE

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1 Important Information on Operating Instructions

1.1 Important information and designated use

Integral part of the product

The operating instructions are part of the CMD synchronous compact servomotor and contain important information for operation and service. The operating instructions are written for assembly, installation, startup and service employees who are involved in the installation and maintenance of CMD synchronous compact servomotors.

Designated use

The designated use refers to the procedure specified in the operating instructions.

CMD synchronous compact servomotors are drive motors for use in industrial and commercial systems. Motor utilizations other than that specified and areas of application other than industrial and commercial systems can only be used after consultation with SEW-EURODRIVE.

CMD synchronous compact servomotors meet the requirements set forth in the Low-Voltage Directive 73/23/EEC. You must not take the machinery into operation in the designated fashion until you have established that the end product complies with the Machinery Directive 98/37/EC.

Qualified personnel

CMD synchronous compact servomotors represent a potential hazard for persons and material. Consequently, assembly, installation, startup and service work may only be performed by trained personnel who are aware of the potential hazards.

The personnel must be appropriately qualified for the task in hand and must be familiar with the assembly, installation, startup and operation of the product. The personnel must read the operating instructions, in particular the safety notes section, carefully and ensure that they understand and comply with them.

Liability for defects

Incorrect handling or any action performed that is not specified in these operating instructions could impair the properties of the product. In this case, you lose any right to claim under limited warranty against SEW-EURODRIVE GmbH & Co KG.

Product names and trademarks

The brands and product names contained within these operating instructions are trademarks or registered trademarks of the titleholders.

1.2 Explanation of the icons

Hazard

Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.

Warning

Indicates an imminently hazardous situation caused by the product which, if not avoided, WILL result in death or serious injury. You will also find this signal to indicate the potential for damage to property.

Caution

Indicates a potentially hazardous situation which, if not avoided, MAY result in minor injury or damage to products.

Note

Indicates a reference to useful information, e.g. on startup.

Documentation reference

Indicates a reference to a document, such as operating instructions, catalog, data sheet.

2 Safety Instructions

General information

The following safety instructions are primarily concerned with the use of CMD synchronous compact servomotors.

If using **gear units**, also refer to the safety instructions for gear units in the corresponding operating instructions.

Danger of burns!

Touching the CMD synchronous compact servomotor when it has not been cooled will result in burns. **The motor may have a surface temperature of over 100 °C.**

Never touch the CMD synchronous compact servomotor during operation or in the cool down phase once it has been switched off.

3 Unit Design

3.1 Unit designation and nameplates

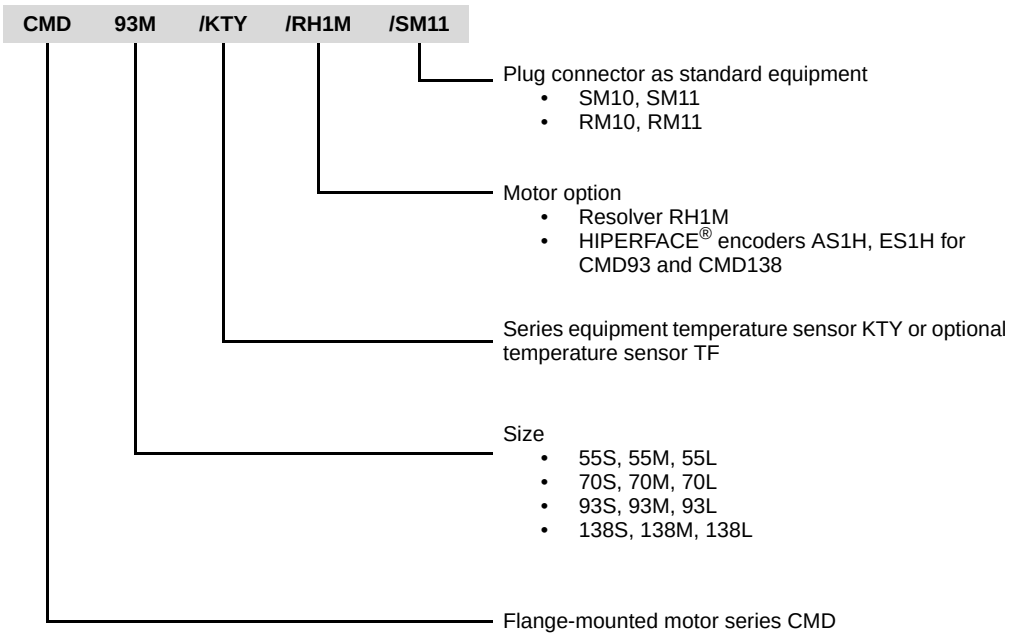
Example: Synchronous compact servomotor CMD93M / KTY / RH1M / SM11

Nameplate on the motor

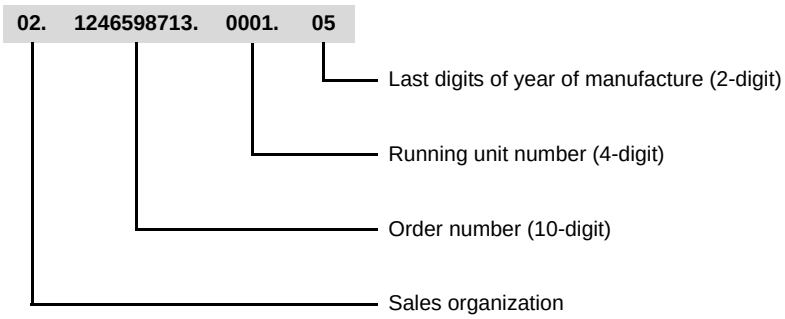
54900ADE

Figure 1: Nameplate: CMD synchronous compact servomotor

Unit designation



Serial number



3.2 Design of CMD synchronous compact servomotor

The following illustration is intended to explain the general structure. It serves as an assignment aid to the spare parts list. Discrepancies are possible depending on the motor size and version.

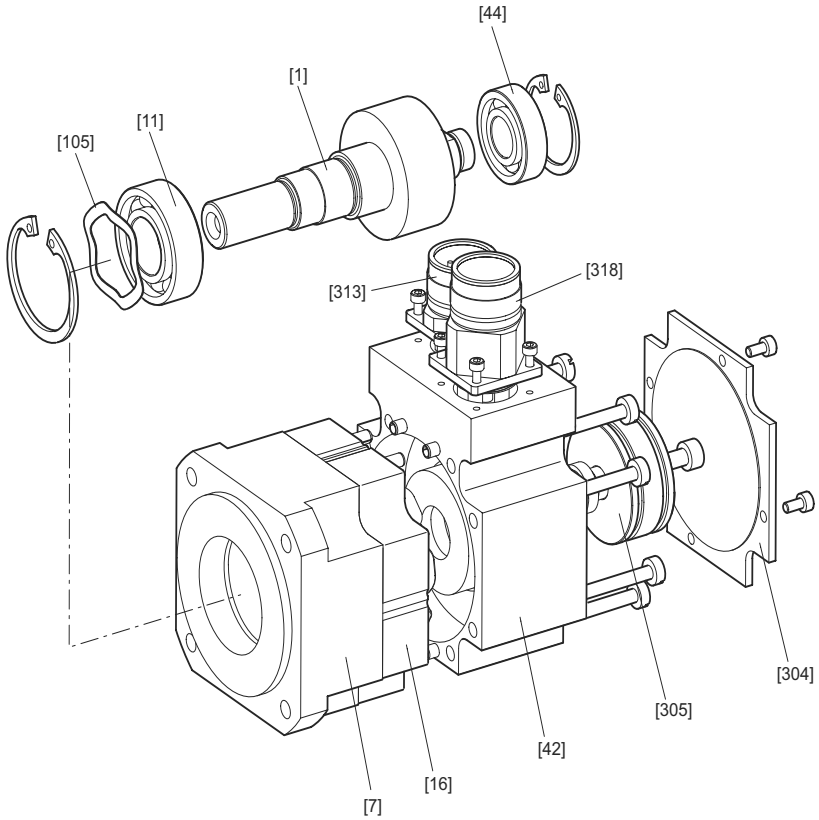


Figure 2: Basic design of the CMD synchronous compact servomotor

[1]	Rotor
[7]	Flanged end shield
[11]	Grooved ball bearing
[16]	Stator
[42]	Non drive-end bearing shield
[44]	Grooved ball bearing
[105]	Equalizing ring
[304]	Housing cover
[305]	Resolver
[313]	Signal plug connector
[318]	Power plug connector

4 Mechanical Installation

It is essential to comply with the safety instructions in Sec. 2 during installation.

4.1 Required tools / aids

- Standard tool
- Crimping tool for plug connectors, used for self-fabrication
- For conversion of the connector, removal tool for insulating elements

4.2 Before you begin, make sure that:

- The entries on the nameplate of the drive and/or the output voltage of the frequency inverter match the voltage supply system.
- The drive is undamaged (no damage caused by transportation or storage).
- The ambient temperature is between -20 °C and +40 °C.
- No oil, acid, gas, vapors, radiation, etc.
- The altitude does not exceed 1000 m above sea level, otherwise the drive must be configured in accordance with the special ambient conditions.

4.3 Preliminary work

Motor shaft ends must be thoroughly cleaned of anti-corrosion agents, contamination or similar. Use a commercially available solvent for this purpose. Do not allow the solvent to penetrate the bearings or shaft seals, since this could cause material damage.

4.3.1 Extended storage of motors

- Please note the reduced grease utilization period of the ball bearings after storage periods exceeding one year.
- Check whether the motor has absorbed moisture as a result of being stored for a long time. Measure the insulation resistance to do this (measuring voltage DC 500 V).

The insulation resistance varies greatly depending on the temperature, refer to Figure 3. The motor must be dried if the insulation resistance is not adequate.

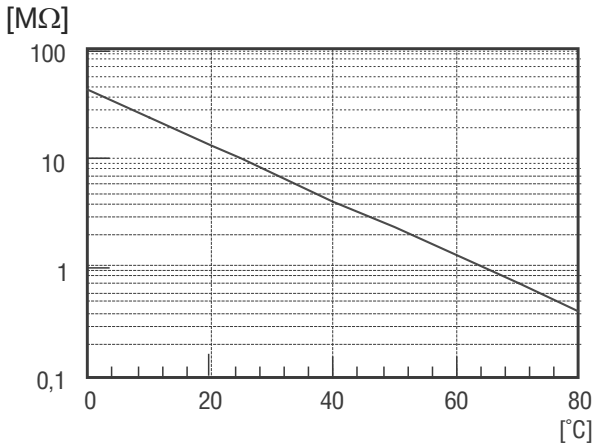


Figure 3: Insulation resistance depending on the temperature

4.3.2 Drying the motor

Insulation resistance too low:

→ Motor has absorbed moisture.

Action: Send the motor to SEW-EURODRIVE Service with a description of the error.

4.4 Installing the motor

The motor may only be mounted in the specified position on a level, vibration-free and torsionally rigid support structure. The mounting position must dissipate heat in order for the rated power to be achieved.

Danger of burns!

Touching the CMD synchronous compact servomotor when it has not been cooled will result in burns. **The motor may have a surface temperature of over 100 °C.**

Never touch the CMD synchronous compact servomotor during operation or in the cool down phase once it has been switched off.

Carefully align the motor and the driven machine to avoid placing any unacceptable strain on the output shafts. Observe the permitted overhung load and axial load.

Do not butt or hammer the shaft end.

Use a half key to balance components with a keyway for subsequent mounting on the shaft. Motor shafts are balanced with a half key if necessary.

4.4.1 Installation in damp locations or in the open

- If possible, arrange the motor and encoder connection so the connector cables are not pointing upwards.
- Carefully clean the connectors (motor or encoder connection) before reinstalling.
- Install new gaskets to replace brittle ones.
- Restore the anticorrosion coating if necessary.
- Check the enclosure.

4.5 Installation tolerances

Shaft end	Flanges
Diameter tolerance in accordance with DIN 748 • ISO k6 • Center hole in accordance with DIN 332	Centering shoulder tolerance in accordance with DIN EN 50347 • ISO j6

5 Electrical Installation

It is essential to comply with the safety instructions in Sec. 2 during installation.

Switch contacts in utilization category AC-3 to EN 60947-4-1 must be used for switching the motor.

When motors are powered from inverters, you must adhere to the wiring instructions issued by the inverter manufacturer. It is essential to observe the operating instructions for the servo controller.

5.1 Connector installation

Incorrect installation can result in connector damage!

Tightening the connector in the incorrect insertion position causes the insulating element to come unclipped, leading to permanent damage.

Note the following when plugging in the power and signal connectors:

- Correct insertion position
- The locking lug must be in the correct position.
- It must be possible to turn the connector locking device without needing to apply great force.

5.2 Wiring instructions

5.2.1 EMC-compliant installation

Note the following points.

All cables except for the power supply line must be **shielded**. As an alternative to the shield, the HD.. option (output choke) can be used for the motor cable in order to comply with the interference emission limit values.

Connect the **shield by the shortest possible route and make sure it is grounded over a wide area at both ends**. You can ground one end of the shield via a suppression capacitor (220 nF / 50 V) to avoid ground loops. If using double-shielded cables, ground the outer shield on the inverter end and the inner shield on the other end.

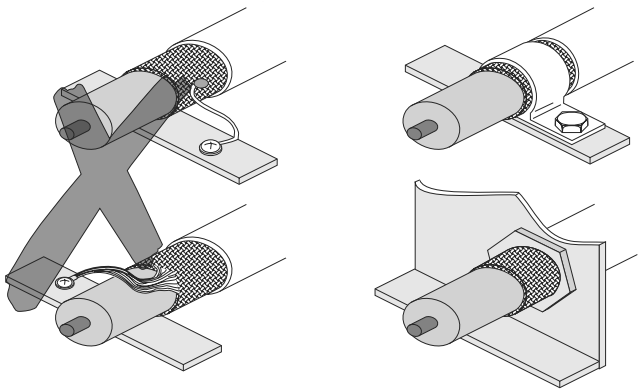


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Figure 4: Correct shield termination using metal clamp (shield clamp) or metal cable gland

You can also use **grounded sheet-metal ducts or metal pipes** to **shield the cables**. **Route** the **power and control cables separately**.

For detailed information on EMC compliant installation, refer to the publication "Electromagnetic Compatibility in Drive Engineering" from SEW-EURODRIVE.

5.2.2 Protection against interference from motor protection devices

Only separately shielded feeder cables and sensor feeder cables are allowed to be routed together with switch-mode power lines in one cable. This is in order to protect against interference from motor protection devices of type KTY or optionally TF.

Do not route unshielded feeder cables together with switched-mode power lines in one cable.

5.3 Connecting the motor and encoder system via plug connectors

CMD synchronous compact servomotors are supplied with the SM.. / RM.. plug connector system. In the basic version, SEW-EURODRIVE delivers CMD synchronous compact servomotors with flange-mounting socket on the motor end and without mating connector. The encoder system is connected using a 12-pin round plug connector.

The cable entry of the power and signal cables is via plug connectors. The direction of the plug connectors is defined in the order.

5.3.1 Line cross section

Make sure the type of line corresponds to the applicable regulations. The rated currents are specified on the motor nameplate. The line cross sections that can be used are listed in the following tables.

Type	Connector	Cable type	Line cross section
SM10 / SM11	Right-angle connector	Motor cable	4 x 1.5 mm^2
RM10 / RM11	Radial connector	Motor cable	4 x 1.5 mm^2

Power plug connectors

Motor type	Plug connector system	Plug connector	Socket contact
CMD55 ... 138	SM10	Delivered without mating connector	4 x 1.5 mm^2
CMD55 ... 138	SM11	BSTA078FR14080035056	4 x 1.5 mm^2

Signal plug connector

Resolver / encoder and thermal motor protection

Plug connector	Socket contact
Mating connector ASTA021FR18620035064	10 x 0.25 mm^2
Mating connector ASTA021FR18620035064	10 x 0.25 mm^2

5.3.2 Pre-fabricated cables

Pre-fabricated cables are available from SEW-EURODRIVE to connect the SM.. / RM.. plug connector systems. The core designation and contact assignment are listed in the following tables.

The plug connectors are depicted with the connector assignment on the cable at the connection side (back).

Please note the following if you are fabricating your cables yourself:

- Assembly of the signal plug connector is described in Sec. 5.4.
- The socket contacts for the motor connection are implemented as crimping contacts. Use only suitable tools for crimping.
- Strip the insulation from the leads in accordance with Sec. 5.4. Apply shrink tubing to connectors.
- Use only suitable removal tools to remove incorrectly installed socket contacts.

5.3.3 CMD synchronous compact servomotor wiring diagrams

The following applies to all wiring diagrams:

- View to the wiring side
- Colors according to SEW-EURODRIVE cable:

Color code	Color
BK	Black
BN	Brown
BU	Blue
GN	Green
GY	Gray
OG	Orange
PK	Pink
RD	Red
VT	Violet
WH	White
YE	Yellow
GY/PK	Gray / pink
RD/BU	Red / blue
BK/WH	Black / white
RD/WH	Red / white

Plug connectors

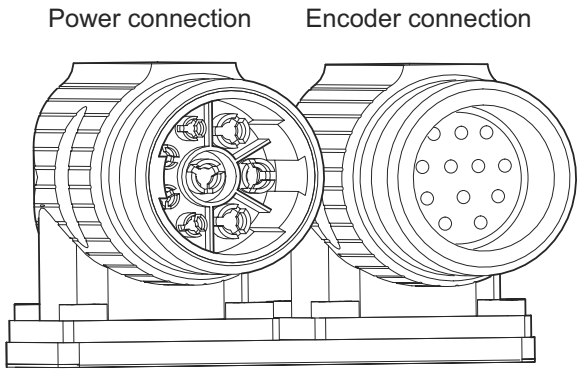

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Figure 5: SM.. plug connector drawn without pins Angled connector variant for CMD55/70/93

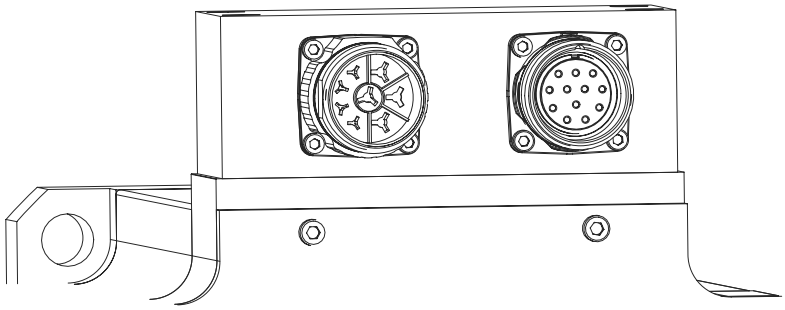

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Figure 6: SM.. plug connector without pins drawn for CMD138

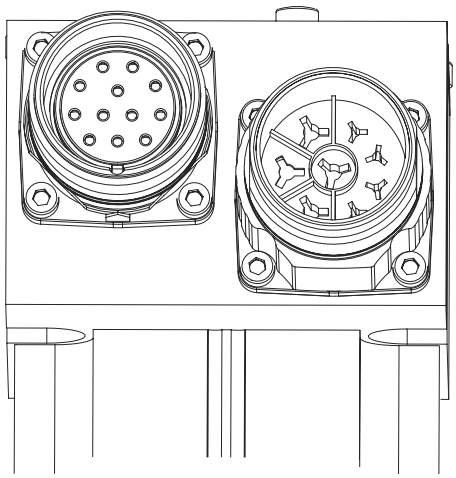

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Figure 7: RM.. plug connector drawn without pins Straight connector variant for CMD55/70/93/138

5.3.4 CMD motor cable

Design of motor cable

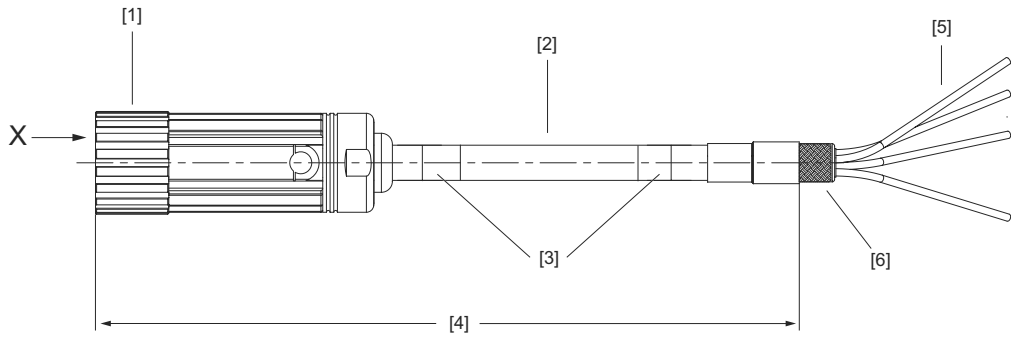

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Figure 8: CMD motor cable (power)

[1] Connector: Intercontec BSTA 078

[2] Printed on connector: SEW-EURODRIVE Bruchsal

[3] Nameplate

[4] Line length ≤ 10 m: +200 mm tolerance
Line length ≥ 10 m: +2 % tolerance
Permitted line length according to the technical documents

[5] Prefabricated cable end for inverter
Required loose parts are supplied with the cable

[6] Shielding 20 mm, pulled back approximately + 5 mm

Loose parts

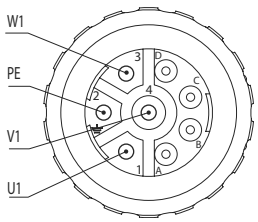
SEW-EURODRIVE supplies a bag of loose parts in accordance with the core cross sections for connection to the power terminals on the inverter.

Bag no.	Contents
1	4 x conductor end sleeves 1.5 mm^2, insulated 4 x M6 U-shaped cable lugs 1.5 mm^2
2	4 x conductor end sleeves 2.5 mm^2, insulated 4 x M6 U-shaped cable lugs 2.5 mm^2
3	4 x conductor end sleeves 4 mm^2, insulated 4 x M6 U-shaped cable lugs 4 mm^2 4 x M10 U-shaped cable lugs 4 mm^2

Pin assignment of the motor cables

Installation	Part number	
Fixed routing	0590 454 4	LAPP TPE/CY 303 027 1
Cable carrier installation	0590 477 3	NEXANS PSL11YC11-J 493 080 60

Plug connector	Contact	Core identification	Assigned
BSTA 078	1	(BK) Black	U
	2	(GN/YE) Green / yellow	PE
	3	(BK) Black	W
	4	(BK) Black	V
View X			



5.3.5 Resolver cables

Resolver cable for MOVIDRIVE® MDX60B/61B

Design of resolver cable for MOVIDRIVE® MDX60B/61B

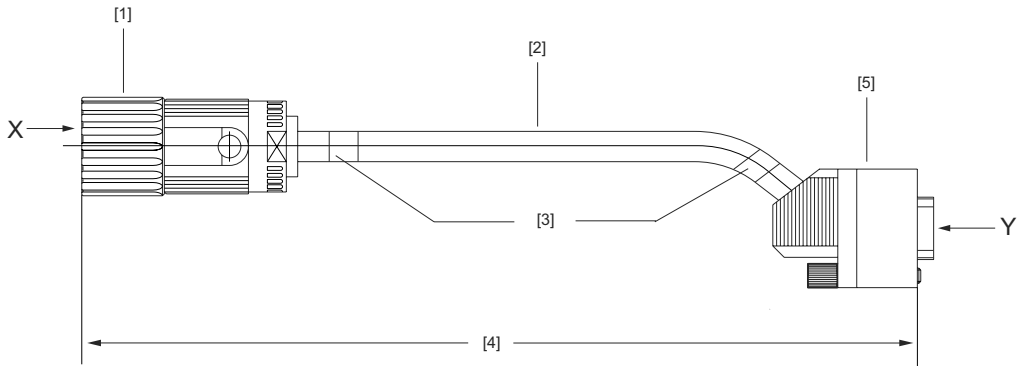


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Figure 9: Resolver cable for MOVIDRIVE® MDX60B/61B

[1] Connector: Intercontec ASTA 021

[2] Printed on connector: SEW-EURODRIVE Bruchsal

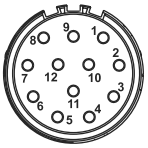
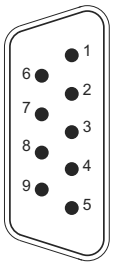
[3] Nameplate

[4] Line length ≤ 10 m: +200 mm tolerance
Line length ≥ 10 m: +2 % tolerance
Permitted line length according to the technical documents

[5] 9-pin sub D connector

Pin assignment of cable for RH1M resolver for MOVIDRIVE® MDX60B/61B

Installation	Part number	
Fixed routing	199 487 5	LAPP TPE/CY 303 042 0
Cable carrier installation	199 319 4	NEXANS 493 266 70

Plug connector	Contact	Core identification	Assigned	Contact	Connection type
ASTA 021 FR **198 673 2** 12-pin with socket contacts  View X	1	(PK) Pink	R1 (reference +)	3	Sub D plug 9-pole  View Y
	2	(GY) Gray	R2 (reference -)	8	
	3	(RD) Red	S1 (cosine +)	2	
	4	(BU) Blue	S3 (cosine -)	7	
	5	(YE) Yellow	S2 (sine +)	1	
	6	(GN) Green	S4 (sine -)	6	
	7	n.c.	–	–	
	8	n.c.	–	–	
	9	(BN) Brown (VT) Violet	KTY+ (TF)	9	
	10	(WH) White (BK) Black	KTY– (TF)	5	
	11	n.c.	–	–	
	12	n.c.	n.c.	4	

5.3.6 Encoder cables

The following notes must be observed when connecting the HIPERFACE® AS0H / ES0H / AS1H / ES1H encoder:

- Only use shielded cables with twisted pair conductors.
- Connect the shield to the PE potential on both ends over a large surface area.
- Route signal cables separately from power cables or brake cables (min. distance 200 mm).

Do not disconnect the signal plug connector of the HIPERFACE® encoder AS1H / ES1H when live.

Encoder cable for MOVIDRIVE® MDX60B/61B

The following section only applies to motor size CMD93 ... 138.

For operation with MOVIDRIVE® MDX60/61B, the encoder is connected via plug connector depending on motor type and motor design (see following figures, the colors correspond to the color code for SEW-EURODRIVE cables).

Connect the HIPERFACE® encoder to MOVIDRIVE® MDX60/61B as follows.

Design of HIPERFACE® cable for MOVIDRIVE® MDX60B/61B

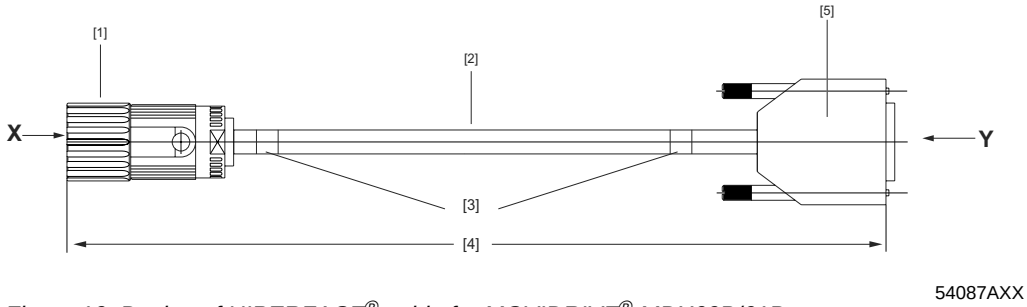


Figure 10: Design of HIPERFACE® cable for MOVIDRIVE® MDX60B/61B

[1] Connector: Intercontec ASTA 021

[2] Printed on connector: SEW-EURODRIVE Bruchsal

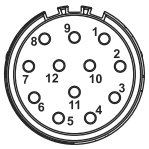
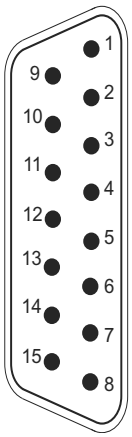
[3] Nameplate

[4] Length is order-specific in ±200 meter steps

[5] 15-pin sub D connector

Pin assignment of HIPERFACE® cable for encoder AS1H / ES1H for MOVIDRIVE® MDX60B/61B

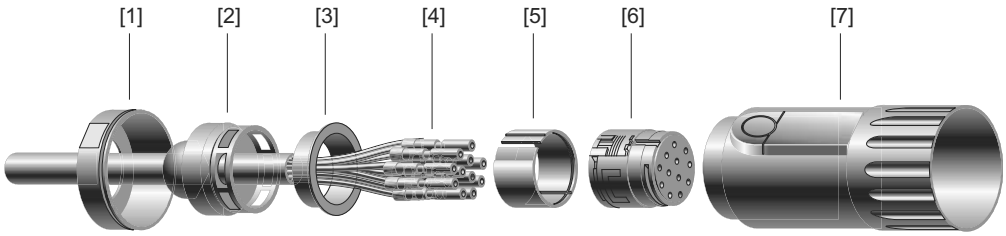
Installation	Part number	
Fixed routing	199 488 3	LAPP TPE/CY 303 028 1
Cable carrier installation	199 320 8	NEXANS 493 290 70

Plug connector	Contact	Core identification	Assigned	Contact	Connection type
ASTA 021 FR **198 673 2** 12-pin with socket contacts  View X	1	n.c.	n.c.	3	Sub D plug 15-pole  View Y
	2	n.c.	n.c.	5	
	3	(RD) Red	S1 (cosine +)	1	
	4	(BU) Blue	S3 (cosine –)	9	
	5	(YE) Yellow	S2 (sine +)	2	
	6	(GN) Green	S4 (sine –)	10	
	7	(VT) Violet	Data –	12	
	8	(BK) Black	Data +	4	
	9	(BN) Brown	KTY+ (TF)	14	
	10	(WH) White	KTY– (TF)	6	
	11	(GY/PK) Gray / pink (PK) Pink	GND	8	
	12	(RD/BU) Red / blue (GY) Gray	US	15	
	–	–	n.c.	7	
	–	–	n.c.	11	
	–	–	n.c.	13	

5.4 Installation of resolver / HIPERFACE® plug connectors

5.4.1 Scope of supply for resolver / HIPERFACE® plug connectors

The following parts are supplied for installing resolver / HIPERFACE® plug connectors. The SEW part number is 198 673 2.



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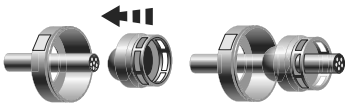
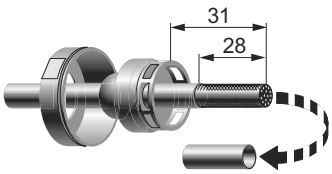
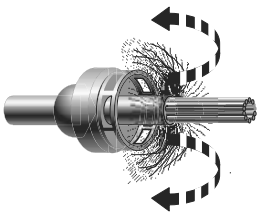
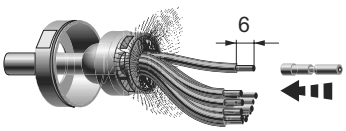
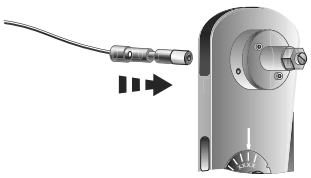
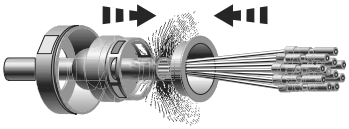
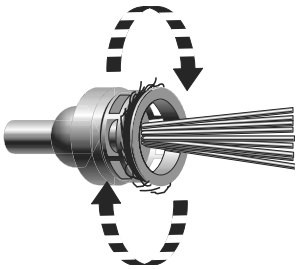
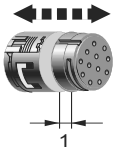
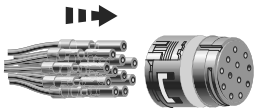
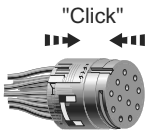
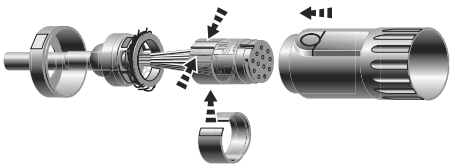
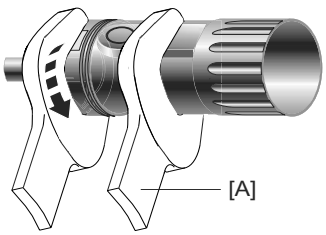
[1] Fitting
[2] Seal with strain relief
[3] Shield ring
[4] Socket contacts
[5] Insulating sleeve
[6] Insulating element
[7] Connector housing

Hold the cable firmly when you are tightening the cable and the plug.

5.4.2 Installation instructions for resolver / HIPERFACE® plug connectors

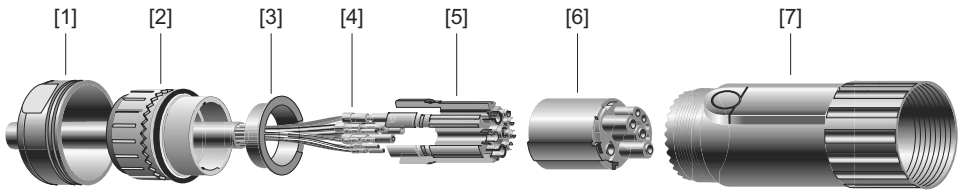
1		• Pull the screw fitting and the seal with strain relief 31 mm over the cable.
2		• Strip 28 mm cable insulation off the end of the cable.
3		• Lay the braid shield backwards and fan it out.
4		• Strip 6 mm insulation off the leads. • Push the socket contacts onto the ends of the leads.
5		• Insert the small-diameter positioning tool (SEW part number 019 244 9) into the crimping tool until the green mark appears in viewing aperture [A]. • Set press thickness [B] to 24 on the crimping tool.
6		• Insert a lead with socket contact into the crimping tool and press the crimping tool together fully. The tool then opens automatically. • Repeat this procedure for each lead.
7		• Guide the shield ring over the leads and press the shield against the seal.

8		• Turn the shield ring until the braid shield is flush with the shield ring.
9		• Pull the insulating element apart evenly by 1 mm.
10		• Insert the socket contacts into the insulating elements according to the wiring diagrams in Sec. 5.3.
11		• Press the insulating elements together until the "click".
12		• Fold open the insulating sleeve. • Position the side of the insulating sleeve with the recess against the groove in the insulating element so that the opening in the insulating sleeve is pointing in the same direction as the double-headed arrow on the insulating element. • Then press the insulating sleeve together until it engages. • Insert the insulating element into the connector housing in the middle position.
13		• Brace the connector housing using a wrench and use a second wrench to tighten the screw fitting. • [A] = Brace

5.5 Power connector installation

5.5.1 Scope of delivery of power connectors

The following parts are supplied for installing the power connectors. The SEW part number is 198 674 0.



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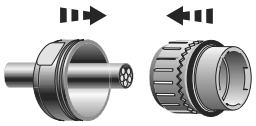
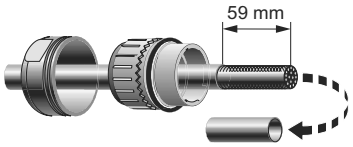
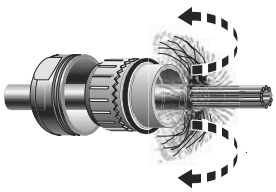
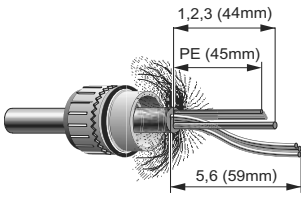
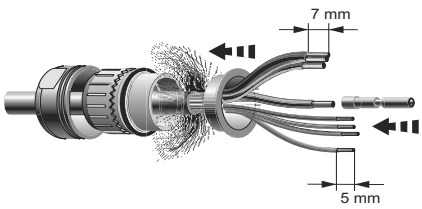
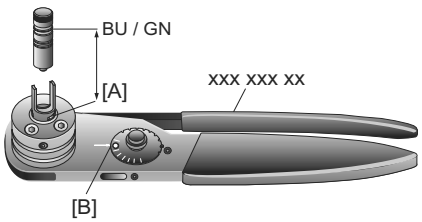
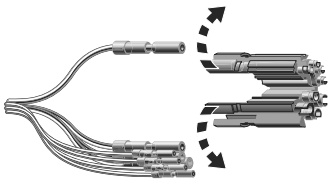
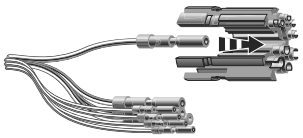
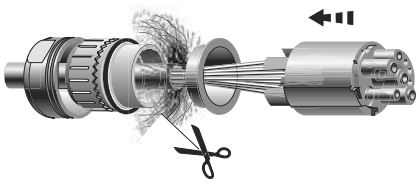
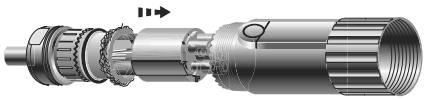
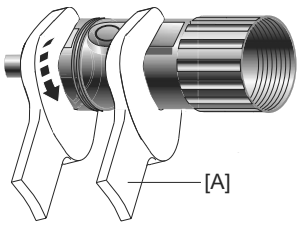
[1] Fitting
[2] Seal with strain relief
[3] Shield ring
[4] Socket contacts
[5] Insulating sleeve
[6] Insulating element
[7] Connector housing

Hold the cable firmly when you are tightening the cable and the plug.

5.5.2 Power connector installation instructions

<table>
<tr><td>1</td><td>  </td><td>• Pull the screw fitting and the seal with strain relief over the cable.</td></tr>
<tr><td>2</td><td> 
</td><td>• Strip 59 mm cable insulation off the end of the cable.</td></tr>
<tr><td>3</td><td>  </td><td>• Lay the braid shield backwards and fan it out.</td></tr>
<tr><td>4</td><td> 
</td><td>• Shorten the power leads (1, 2 and 3) to 44 mm.
• Shorten the PE lead (GN/YE) to 45 mm.
• Do not shorten lead pair 5 and 6.
• Cut off lead pair 7 and 8 flush with the end of the cable.</td></tr>
<tr><td>5</td><td> 
</td><td>• Guide the shield ring over the leads.
• Strip 7 mm of insulation off leads 1, 2, 3 and PE.
• Strip 5 mm of insulation off leads 5 and 6.</td></tr>
<tr><td>6</td><td> 
</td><td>• Insert the positioning tool in the crimping tool until the marking (color) appears in viewing aperture [A] (see table below).
• Set press thickness [B] on the crimping tool according to the table.
<table>
<tr><th>Lead</th><th>a [mm^2]</th><th>Positioning tool Part number xxx xxx x</th><th>Marking (Color)</th><th>Press thickness</th></tr>
<tr><td>5 and 6</td><td>0.14 ... 1.0</td><td>019 244 9</td><td>Green (GN)</td><td>24</td></tr>
<tr><td>1, 2, 3 and PE</td><td>0.35 ... 4.0</td><td>019 245 7</td><td>Blue (BU)</td><td>6</td></tr>
</table></td></tr>
<tr><td>7</td><td>  </td><td>• Insert a lead with socket contact into the crimping tool and press the crimping tool together fully. The tool then opens automatically.
• Repeat this procedure for each lead in accordance with the table in step 6.</td></tr>
</table>

8		• Open the insulating sleeve.
9		• Insert the middle socket contact into the insulating element according to the wiring diagram in Sec. 5.3. • Close the insulating sleeve until the "click". • Insert the remaining socket contacts into the insulating elements according to the wiring diagram in Sec. 5.3.
10		• Shorten the braid shield as shown. • Insert the shield ring into the seal so that the shield and the end of the cable are flush. Make sure the braid shield is routed cleanly between the shield ring and seal.
11		• Insert the insulating element into the connector housing until the seal is located against its stop in the connector housing.
12		• Brace the connector housing using a wrench and use a second wrench to tighten the screw fitting. • [A] = Brace

5.6 Standard equipment

Connect the supplied optional equipment according to the wiring diagrams in Sec. 5.3.

Possible damage to the motor winding!

Due to the low thermal time constant of the winding, thermistor-type protection of CMD servomotors is only provided if current monitoring (I^2t-, r.m.s. current monitoring) or a motor model like in SEW inverters is activated, in addition to the KTY temperature sensor or the TF temperature sensor.

5.6.1 KTY temperature sensor type KTY84 ... 130

Possible damage to the temperature sensor as well as the motor winding!

Avoid currents > 4 mA in the circuit of the KTY sensor since excessively high self-heating of the temperature sensor can damage its insulation and the motor winding.

It is absolutely essential to observe the correct connection of the KTY to ensure a correct evaluation of the temperature sensor.

The characteristic curve in the following figure shows the resistance curve with a measuring current of 2 mA and a correct polarity connection.

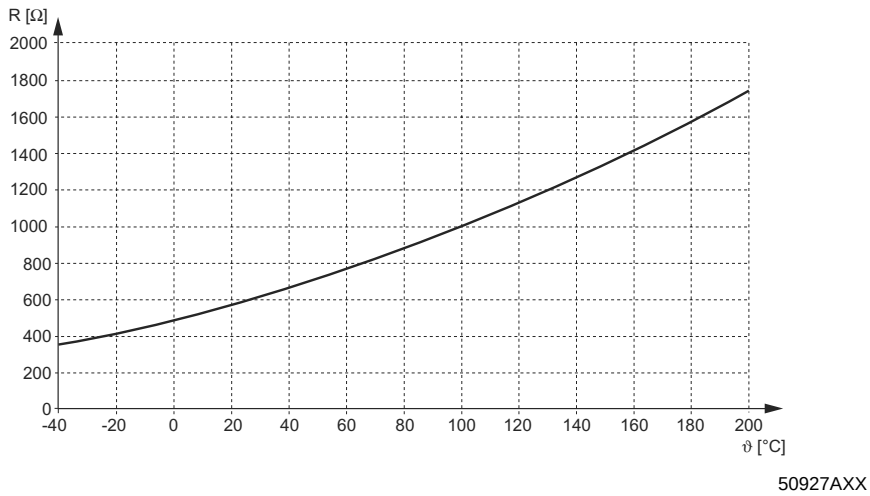


Figure 11: Resistance depending on the temperature

Refer to the pin assignments of the resolver / encoder cables for precise information about connecting the KTY. Please make sure the polarity is correct.

Thermistor-type motor protection in conjunction with the KTY sensor is provided by a thermal motor model in the servo controller. The thermistor-type motor protection function is exclusively available with the MOVIDRIVE® MDX60B / 61B servo controller.

5.6.2 TF temperature sensor option

Thermistor-type motor protection in conjunction with TF is not 100 % assured due to the response time of the PTC semiconductor, in particular with small, highly dynamic servomotors. As a result, SEW-EURODRIVE advises using only KTY sensors for thermistor-type motor protection in conjunction with MOVIDRIVE® MDX60B / 61B. Please contact SEW-EURODRIVE if you would like to use TF temperature sensors for thermistor-type motor protection with CMD servomotors.

Possible damage to the temperature sensor as well as the motor winding!

An excessively high input voltage at the temperature sensor can damage its insulation as well as the motor winding, and may cause irreparable damage to the semiconductor.

Make sure the connection to a TF evaluation unit is correct.

Do not apply a voltage > 10 V!

The positive temperature coefficient (PTC) thermistors comply with DIN 44082.

Resistance measurement (measuring instrument with U = 2.5 V or I < 1 mA):

- Standard measured values: 20 ... 500 Ω, thermal resistance > 4000 Ω

6 Startup

6.1 Prerequisites for startup

It is essential to comply with the safety notes in Sec. 2 during startup.

6.1.1 Before startup

- The drive must be undamaged and is not allowed to be blocked.
- The measures stipulated in Sec. 4.3 "Preliminary work" must be performed after extended storage.
- All connections must have been made properly.
- The direction of rotation of the motor / gearmotor must be correct.
- All protective covers must have been fitted correctly.
- All motor protection devices must be active.
- No other sources of danger are allowed to be present.
- No materials which are sensitive to high temperatures and no thermally insulating materials are allowed to cover the motor surface.

6.1.2 During startup

- The motor must run correctly (no overload, no inadvertent speed fluctuation, no loud noises, etc.).
- In case of problems, first refer to Sec. 7 "Malfunctions."

7 Malfunctions

7.1 Motor problems

Problem	Possible cause	Remedy
Motor does not start up	Interruption in connecting lead	Check connections, correct if necessary
	Fuse blown	Replace fuse
	Motor protection has tripped	Check motor protection for correct setting, correct error if necessary.
Incorrect direction of rotation	Motor connected incorrectly	Check inverter, check setpoints
Motor hums and has high current consumption	Drive is blocked	Check drive
	Fault on encoder cable	Check encoder cable
Motor heats up excessively (measure temperature, significantly above 110 °C)	Overload	Perform power measurement, use larger motor or reduce load if necessary
	Ambient temperature is too high	Adhere to permitted temperature range
	Rated operation type (S1 to S10, EN 60034) exceeded, e.g. through excessive r.m.s. torque	Adjust rated operation type of motor to required operating conditions; if necessary call in a specialist to determine correct drive
Running noise on motor	Bearing damage	• Consult with SEW-EURODRIVE customer service • Replace the motor

7.2 Malfunctions when operating with a servo controller

The symptoms described in Sec. 7.1 "Motor problems" may also occur when the motor is operated with a servo controller. Please refer to the servo controller operating instructions for the significance of the problems which occur and to find information about rectifying the problems.

Please have the following information to hand if you require the assistance of our customer service:

- Data from the nameplate (complete)
- Nature and extent of the fault
- Time and peripheral circumstances of the fault
- Presumed cause

8 Inspection / Maintenance

Use only genuine spare parts in accordance with the valid parts list.

Disconnect the motor from the power supply before starting work and protect it against unintentional re-start.

Danger of burns!

Touching the CMD servomotor when it has not been cooled will result in burns. **The motor may have a surface temperature of over 100 °C.**

Never touch the CMD synchronous compact servomotor during operation or in the cool down phase once it has been switched off.

8.1 Inspection intervals

The periods of wear are affected by many factors and may be short. The machine designer must calculate the required inspection intervals individually in accordance with the project planning documents (e.g. Drive Engineering - Practical Implementation – Drive Project Planning, Geared Servomotors catalog).

9 Technical Data

9.1 CMD motor data

Motor type	n_N [1] [rpm]	M_0 [Nm]	I_0 [A]	M_{max} [Nm]	I_{max} [A]	R_1 [Ω]	L_1 [mH]	V_{p0} [rpm]	J [kgcm^2]	m [kg]	n_{max} [rpm]
CMD 55 S	4500	0.25	0.7	1.2	4	28.65	28.4	26	0.076	0.9	8000
CMD 55 M		0.45	0.95	2.3	6	18.44	21.6	33	0.15	1.2	8000
CMD 55 L		0.9	1.5	6	12	10.18	14.8	39	0.3	1.7	8000
CMD 70 S	3000	0.7	1.04	3	6	17.44	32.3	43	0.21	1.4	6000
CMD 70 M		1.1	1.36	5	8	10.89	25.2	56	0.4	1.9	5000
CMD 70 L		1.9	1.96	11	18	5.85	17.0	64	0.76	2.7	5000
CMD 93 S	1200	2.4	1.55	10	8	10.64	43.0	93	1.16	3.2	2750
CMD 93 M		4.2	2.5	22	16	3.63	19.1	110	2.25	4.7	2750
CMD 93 L		6	3.5	33	23	3.14	18.0	106	3.35	6.3	2750
CMD 93 S	3000	2.4	2.32	10	12	4.60	19.2	62	1.16	3.2	4000
CMD 93 M		4.2	3.6	22	23	2.27	9.3	77	2.25	4.7	4000
CMD 93 L		6	6	33	40	1.02	6.0	61	3.35	6.3	4000
CMD 138 S	1200	6.7	3.9	17	13	1.97	25.0	117	6.5	8.4	2500
CMD 138 M		12.1	5.5	39	26	1.29	20.6	148	12.4	12.1	2000
CMD 138 L		16.5	8	62	40	0.66	11.8	138	18.1	15.8	2000
CMD 138 S	2000	6.7	7.4	17	25	0.60	7.0	62	6.5	8.4	3000
CMD 138 M		12.1	11.4	39	53	0.30	4.8	71	12.4	12.1	2000
CMD 138 L		16.5	15.1	62	76	0.20	3.3	73	18.1	15.8	2000

1) n_N = Rated speed [rpm]

M_0 is the thermal continuous torque for speeds between 5 and 200 rpm.
The permitted continuous torque at standstill is 90 % of M_0.

9.1.1 Torque-current characteristic

Torque-current characteristic CMD55

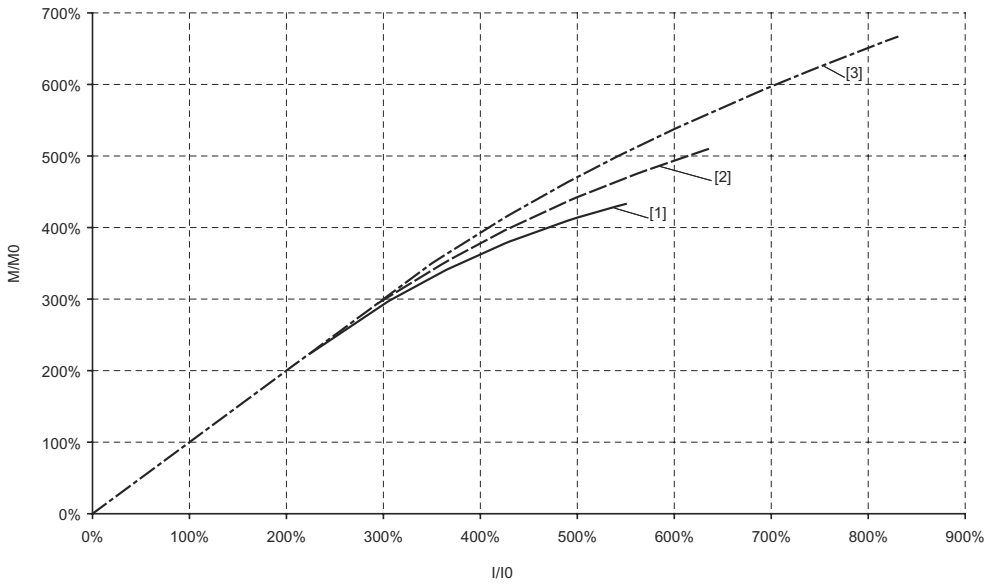


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Figure 12: Torque-current characteristic CMD55

[1] CMD55S

[2] CMD55M

[3] CMD55L

Torque-current characteristic CMD70

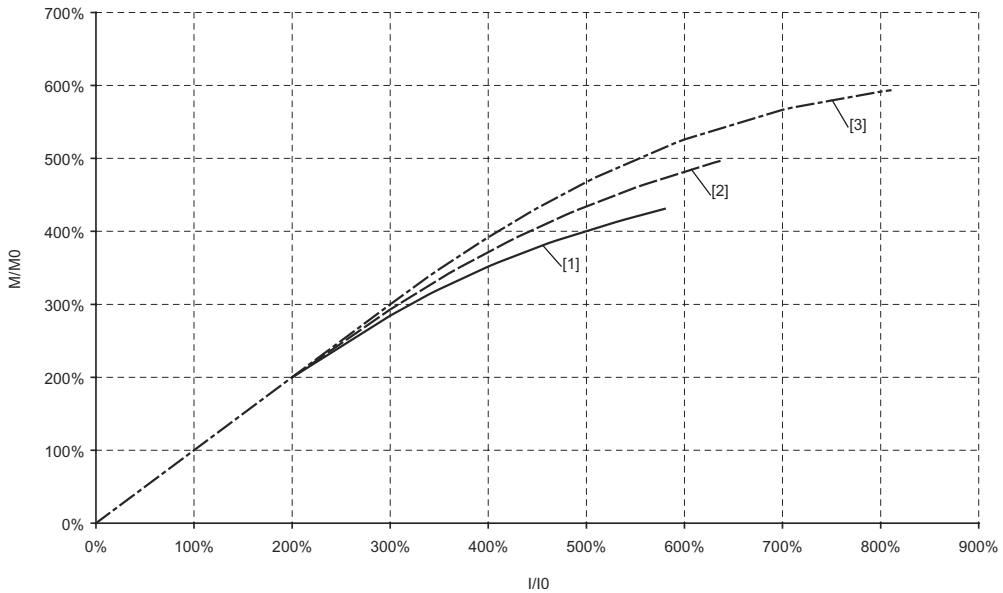

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Figure 13: Torque-current characteristic CMD70

[1] CMD70S

[2] CMD70M

[3] CMD70L

Torque-current characteristic CMD93

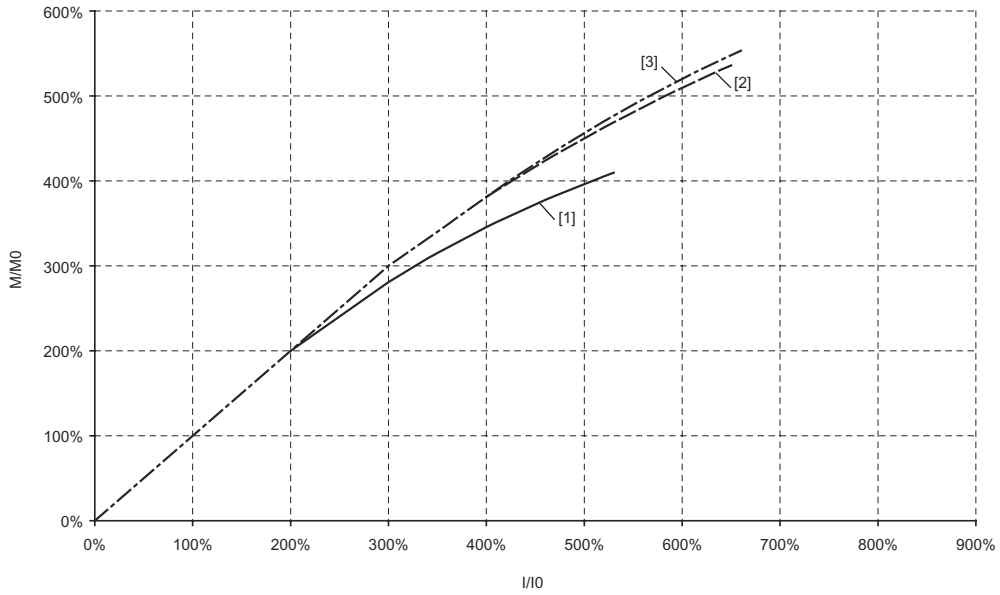

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Figure 14: Torque-current characteristic CMD93

[1] CMD93S
[2] CMD93M
[3] CMD93L

Torque-current characteristic CMD138

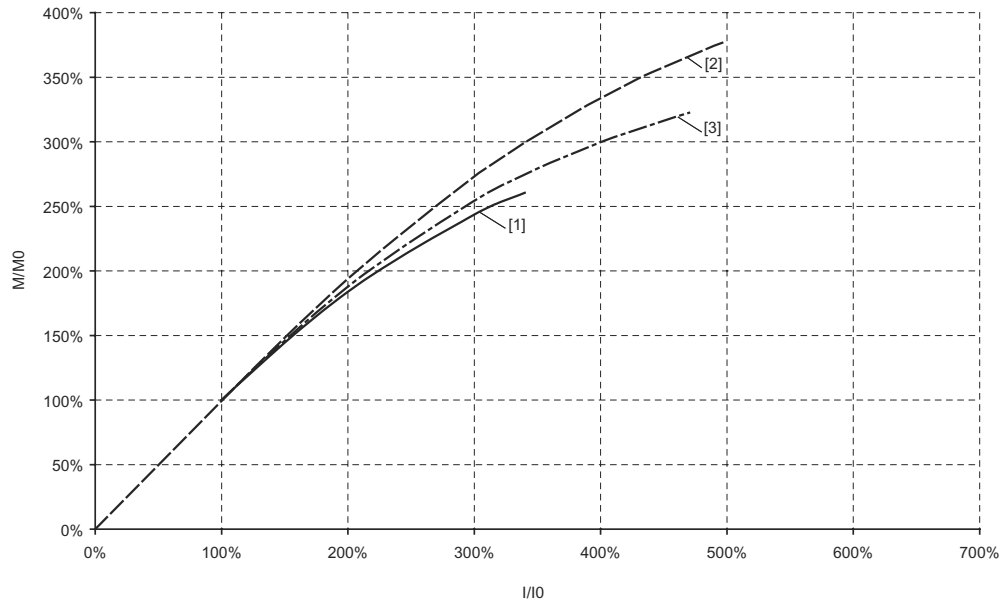

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Figure 15: Torque-current characteristic CMD138

[1] CMD138S
[2] CMD138M
[3] CMD138L

9.1.2 Dynamic limit characteristic curves

***Dynamic limit characteristic curve CMD55S n_N = 4500** min^{-1}*

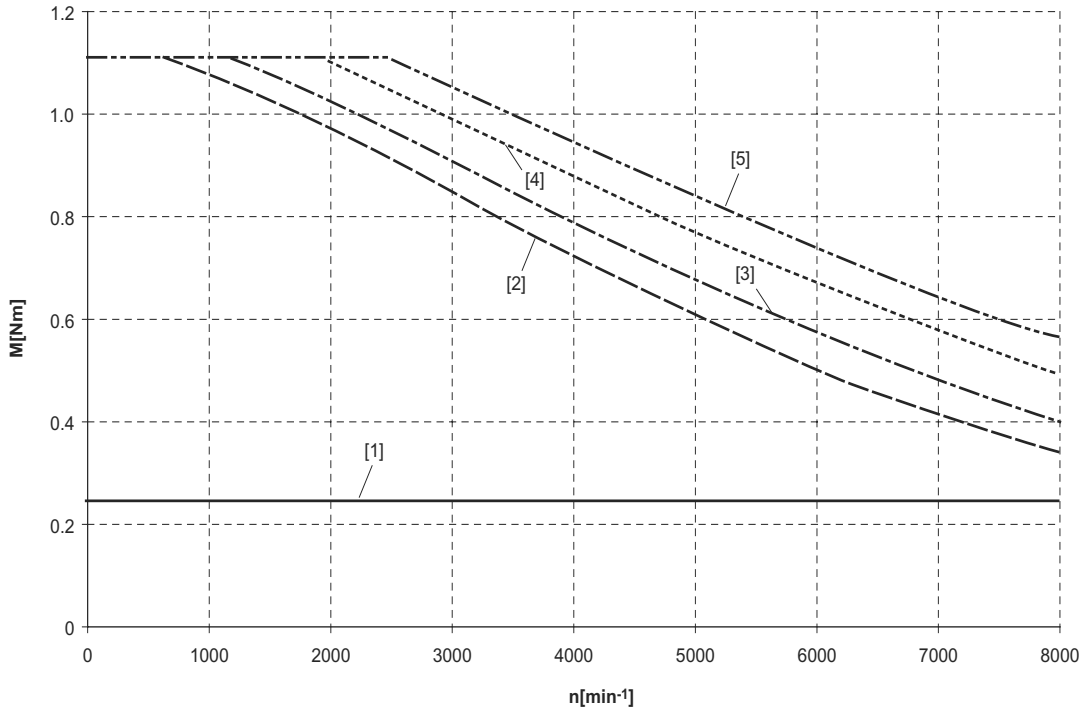

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Figure 16: Dynamic limit characteristic curve CMD55S n_N = 4500 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD55M n_N = 4500 *min^{-1}*

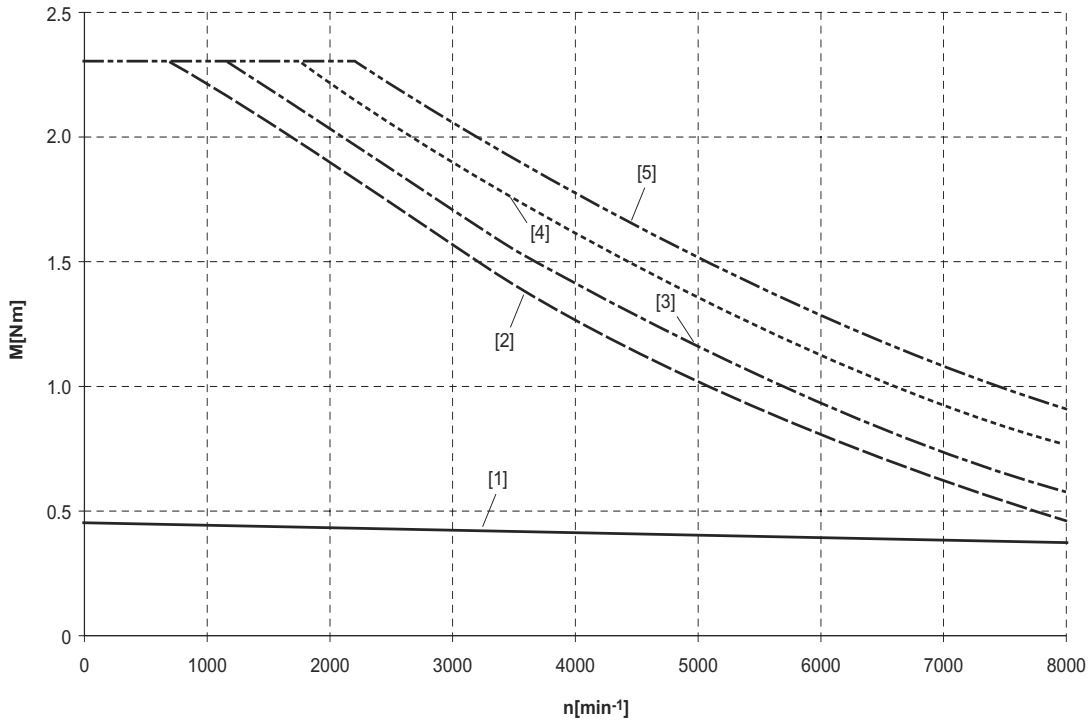

Figure 17: Dynamic limit characteristic curve CMD55M n_N = 4500 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD55L n_N = 4500 min^{-1}

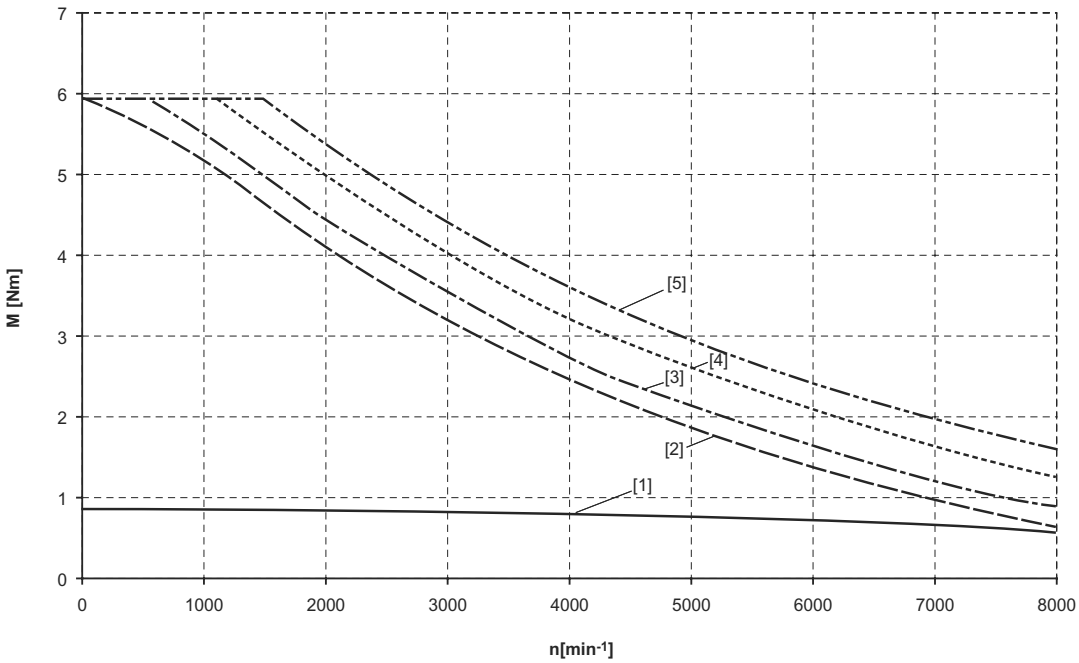

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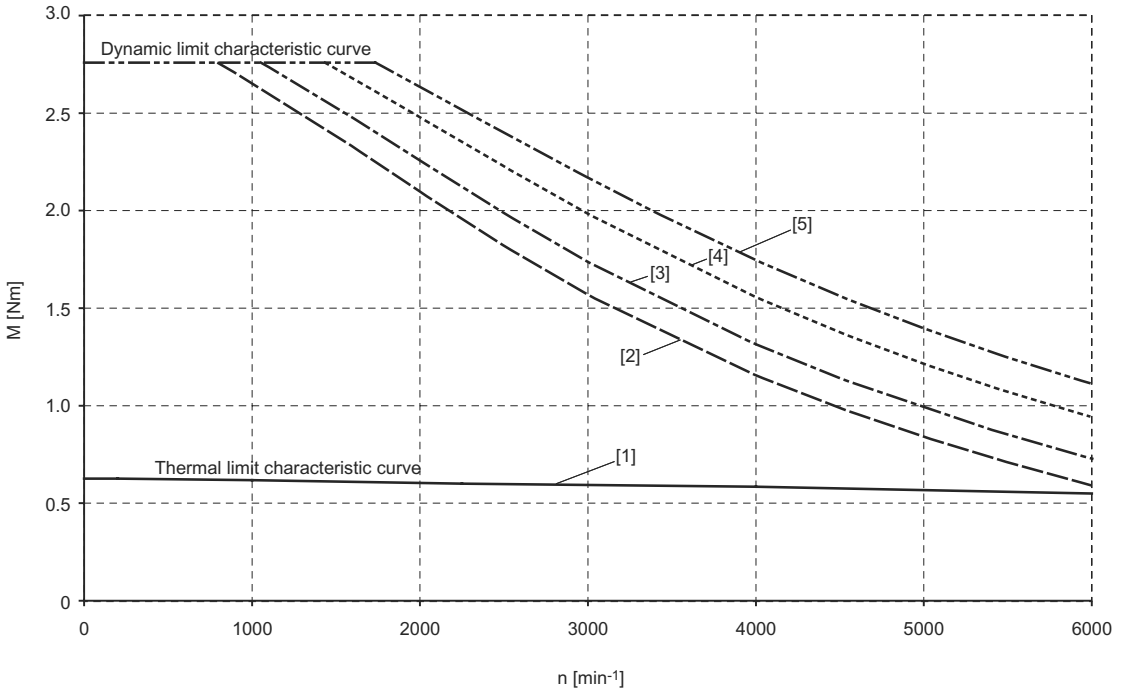
Figure 18: Dynamic limit characteristic curve CMD55L n_N = 4500 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD70S n_N = 3000 min^{-1}



55963AEN

Figure 19: Dynamic limit characteristic curve CMD70S n_N = 3000 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD70M n_N = 3000 *min^{-1}*

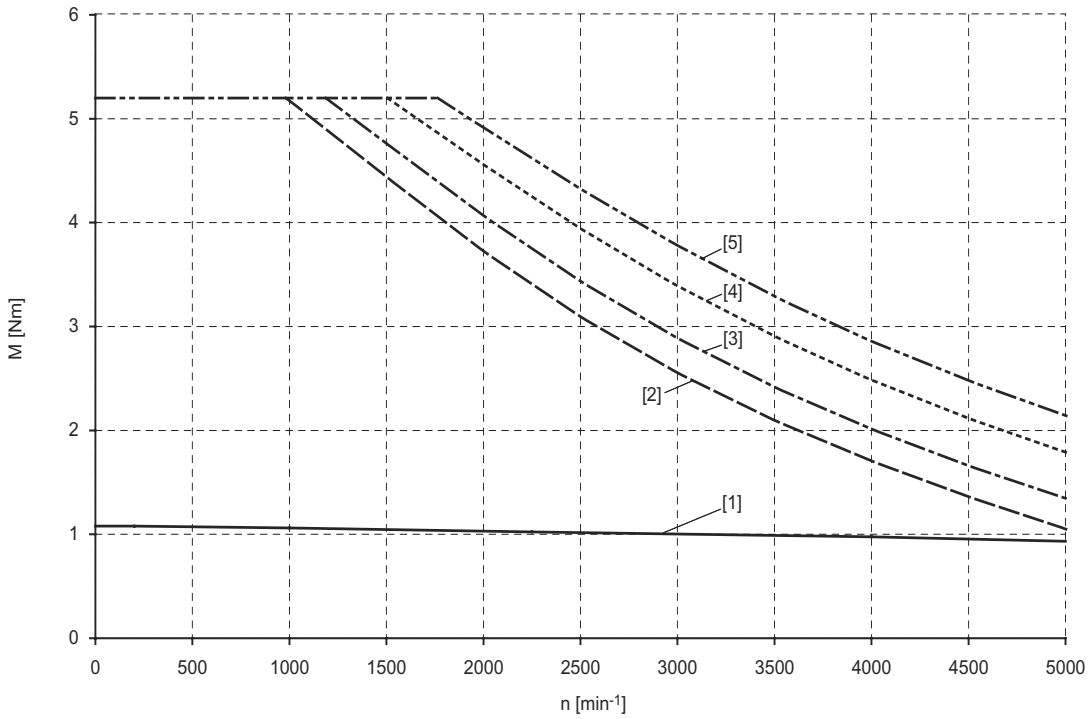


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Figure 20: Dynamic limit characteristic curve CMD70M n_N = 3000 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD70L n_N = 3000 *min^{-1}*

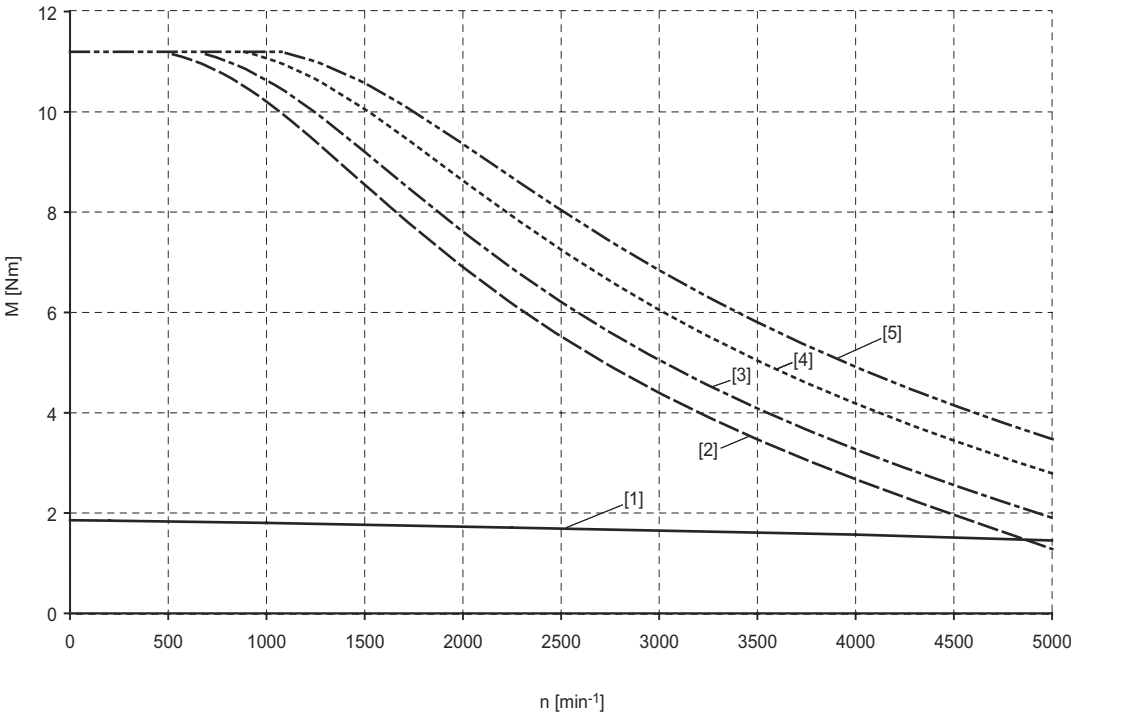

Figure 21: Dynamic limit characteristic curve CMD70L n_N = 3000 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD93S n_N = 1200 min^{-1}

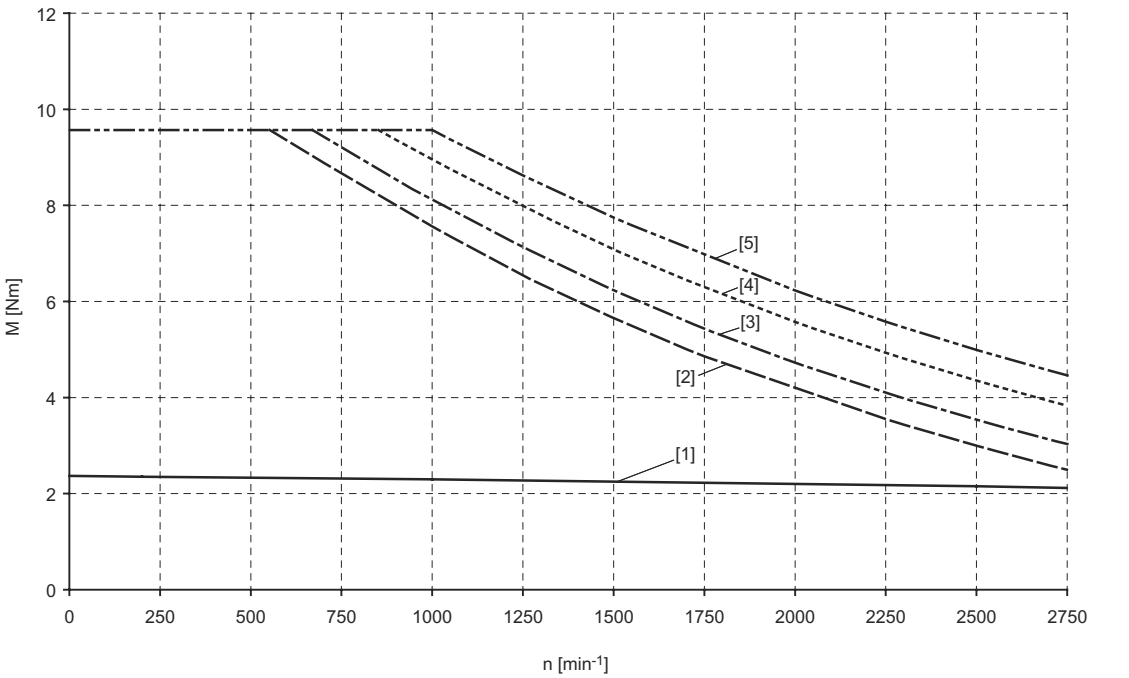

Figure 22: Dynamic limit characteristic curve CMD93S n_N = 1200 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD93S n_N = 3000 *min^{-1}*

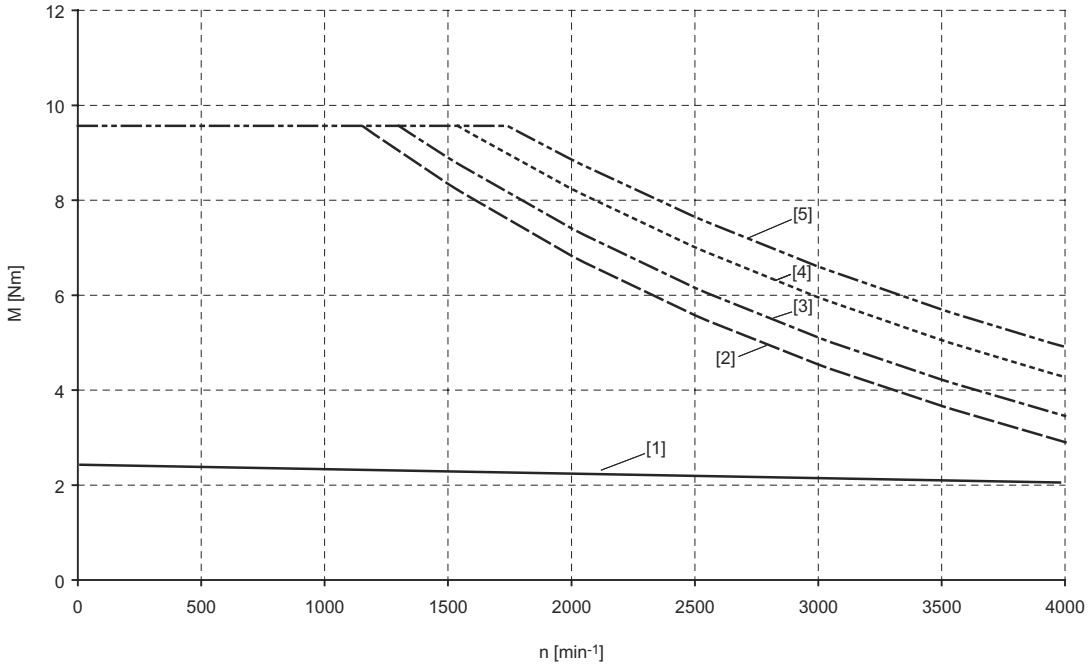

Figure 23: Dynamic limit characteristic curve CMD93S n_N = 3000 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD93M n_N = 1200 min^{-1}

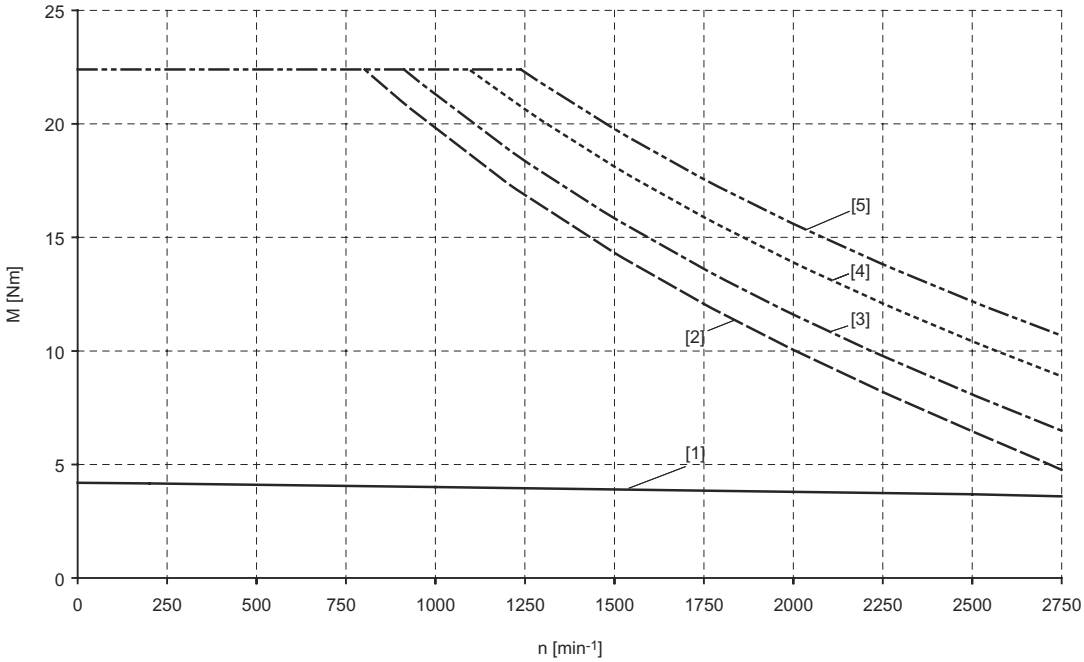

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Figure 24: Dynamic limit characteristic curve CMD93M n_N = 1200 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD93M n_N = 3000 *min^{-1}*

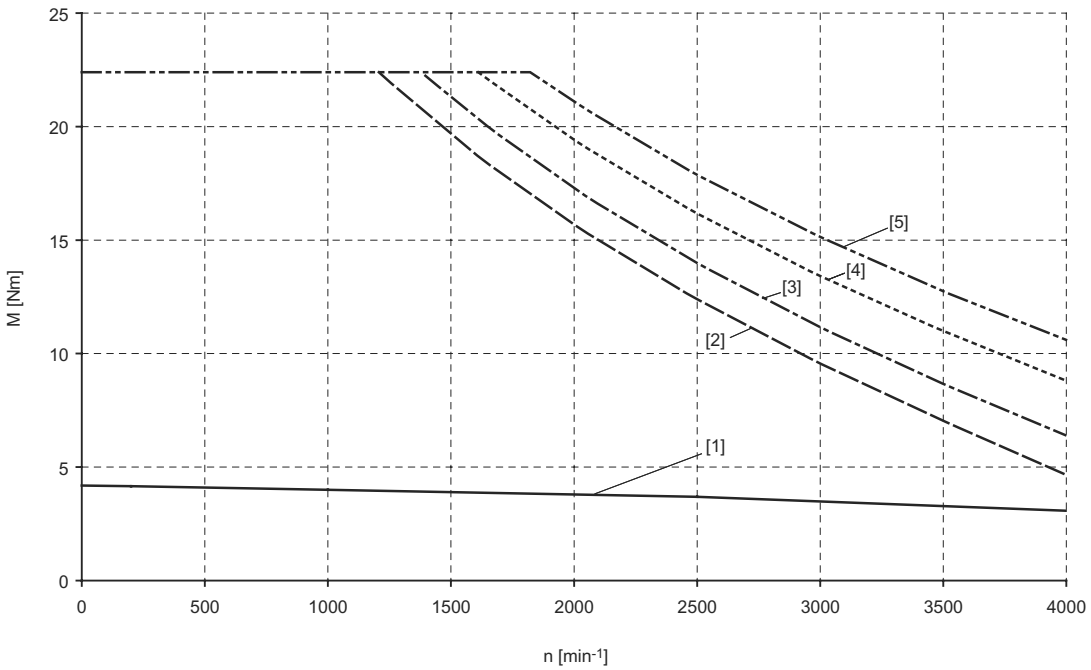

Figure 25: Dynamic limit characteristic curve CMD93M n_N = 3000 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD93L n_N = 1200 min^{-1}

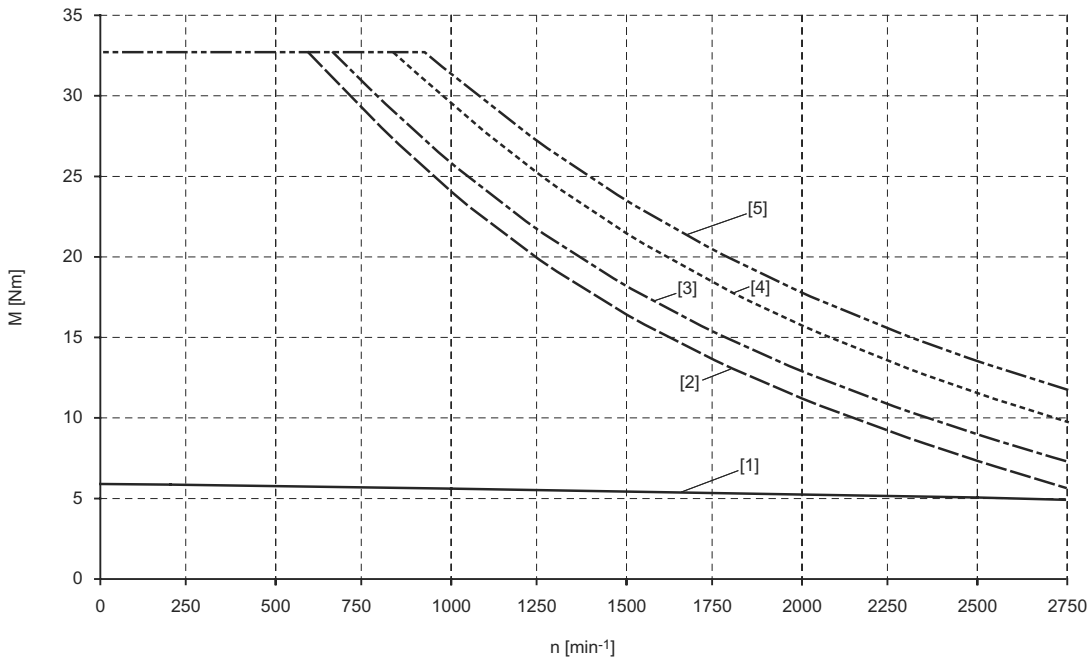

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Figure 26: Dynamic limit characteristic curve CMD93L n_N = 1200 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD93L n_N = 3000 *min^{-1}*

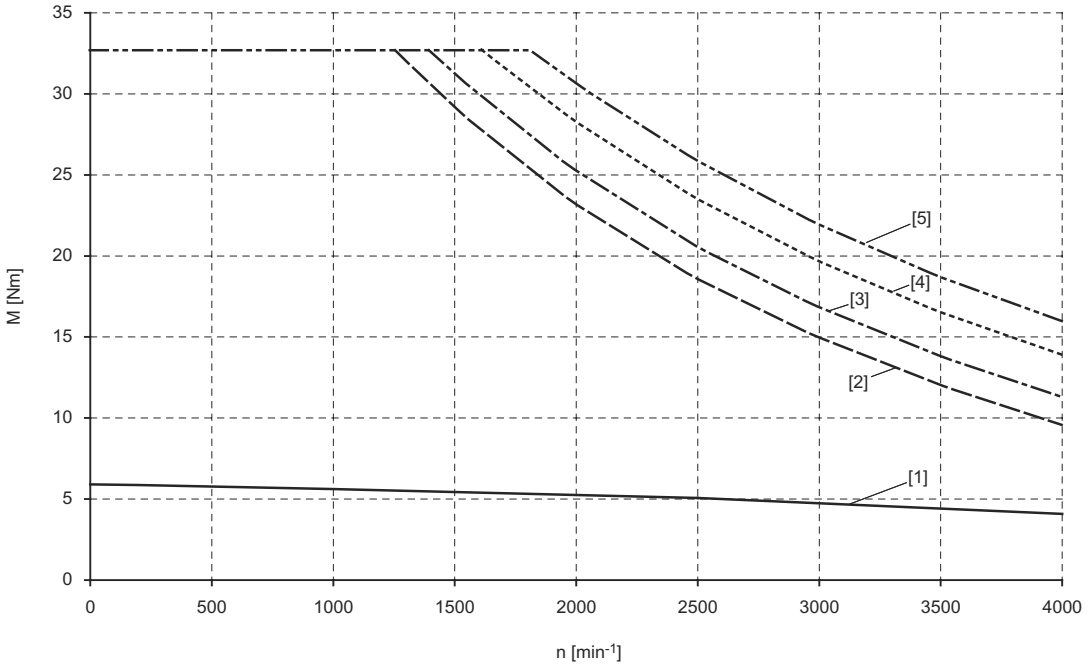


Figure 27: Dynamic limit characteristic curve CMD93L n_N = 3000 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD138S n_N = 1200 min^{-1}

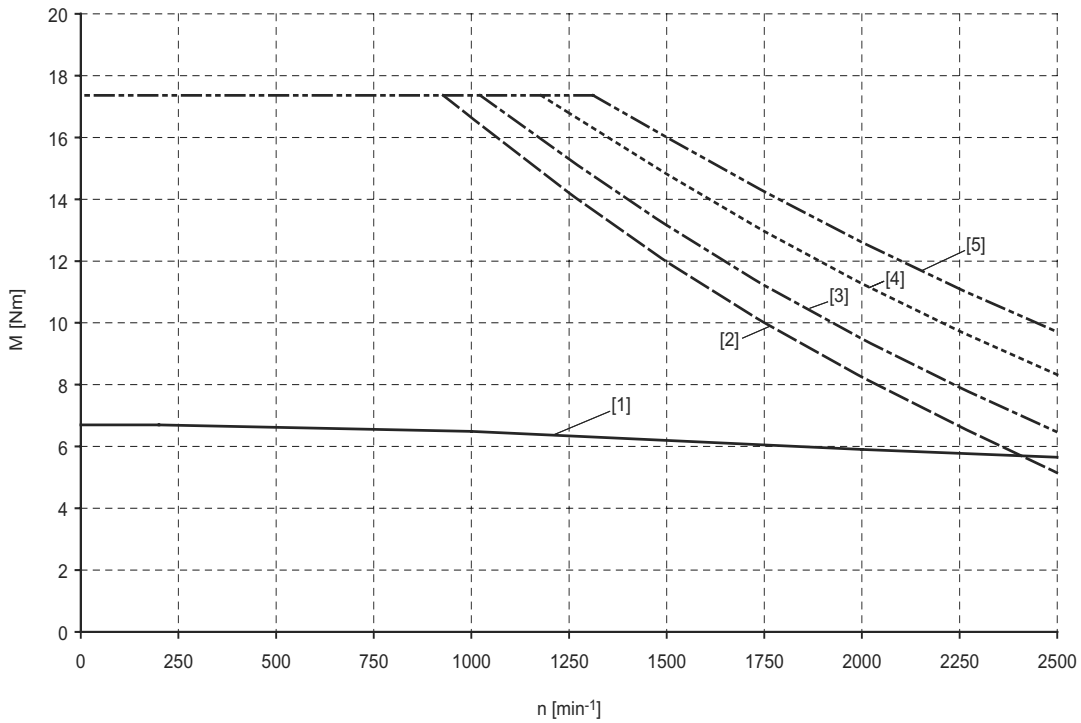


Figure 28: Dynamic limit characteristic curve CMD138S n_N = 1200 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

***Dynamic limit characteristic curve CMD138S n_N = 2000** min^{-1}*

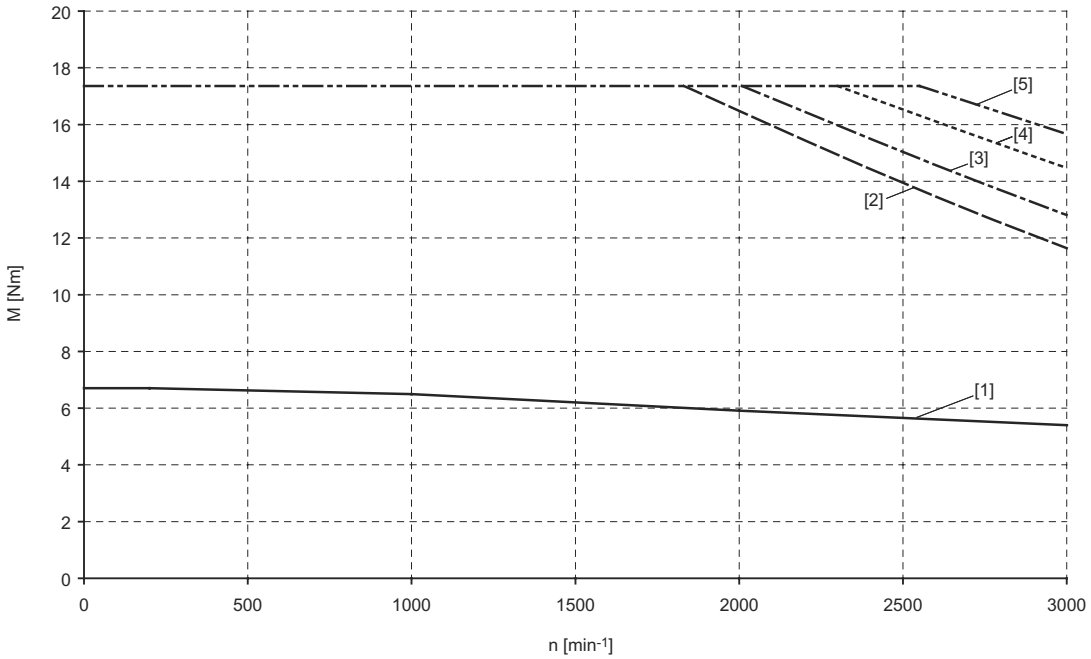


Figure 29: Dynamic limit characteristic curve CMD138S n_N = 2000 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD138M n_N = 1200 min^{-1}

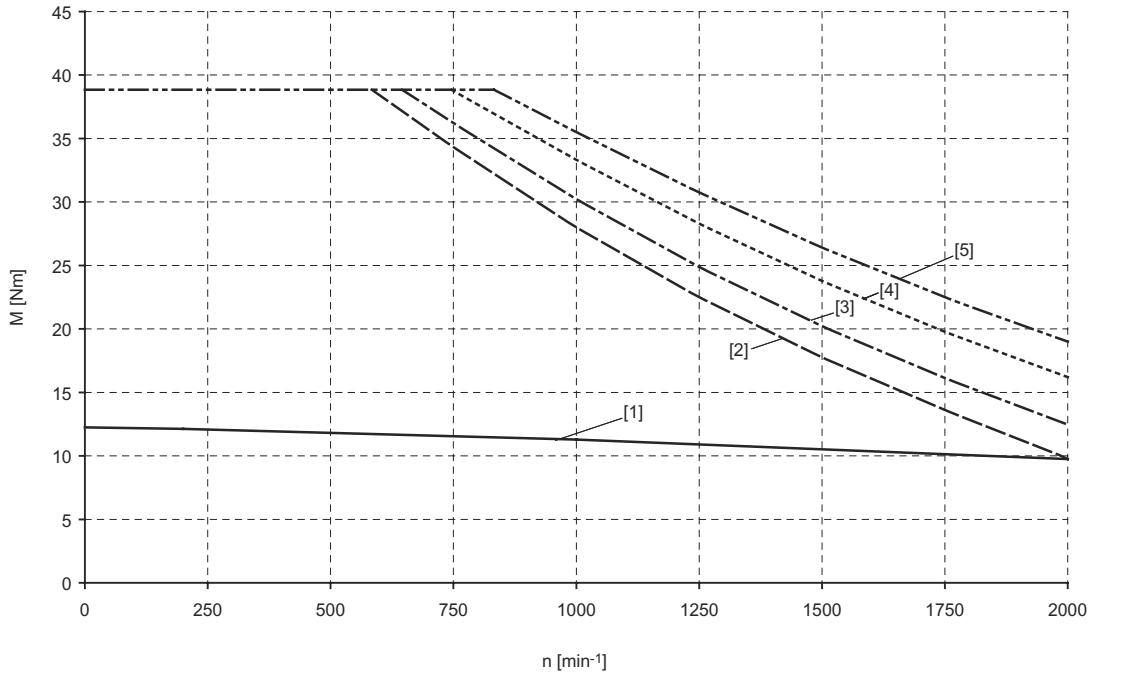


Figure 30: Dynamic limit characteristic curve CMD138M n_N = 1200 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD138M n_N = 2000 min^{-1}

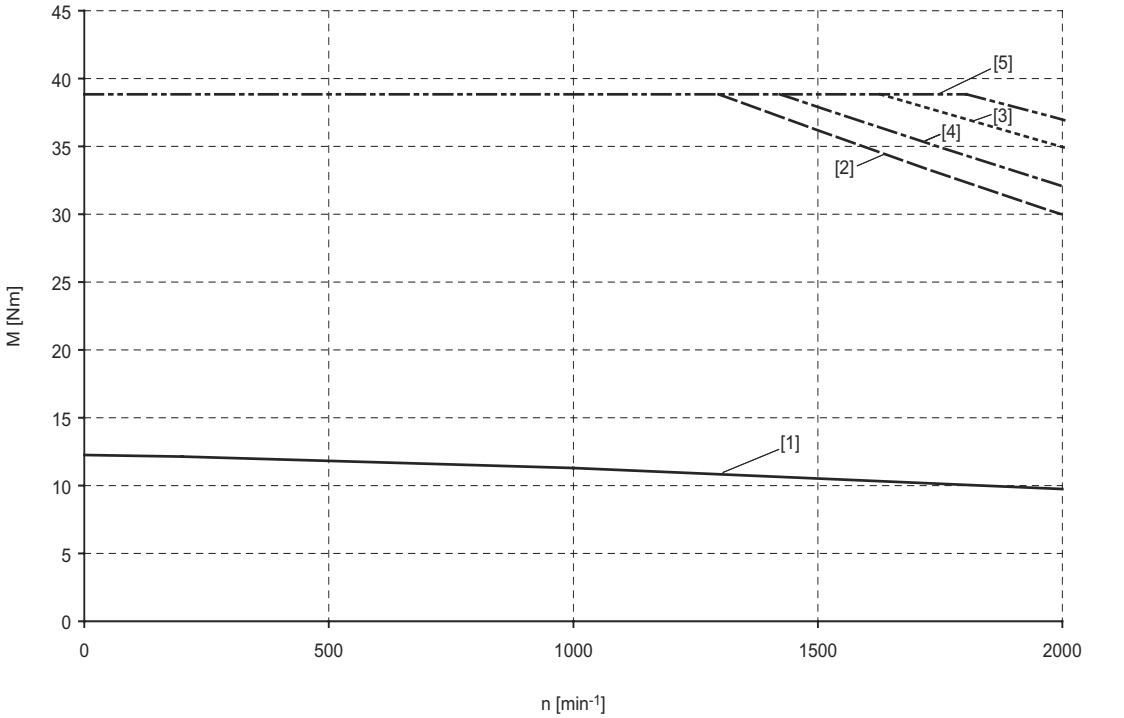


Figure 31: Dynamic limit characteristic curve CMD138M n_N = 2000 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

Dynamic limit characteristic curve CMD138L n_N = 1200 min^{-1}

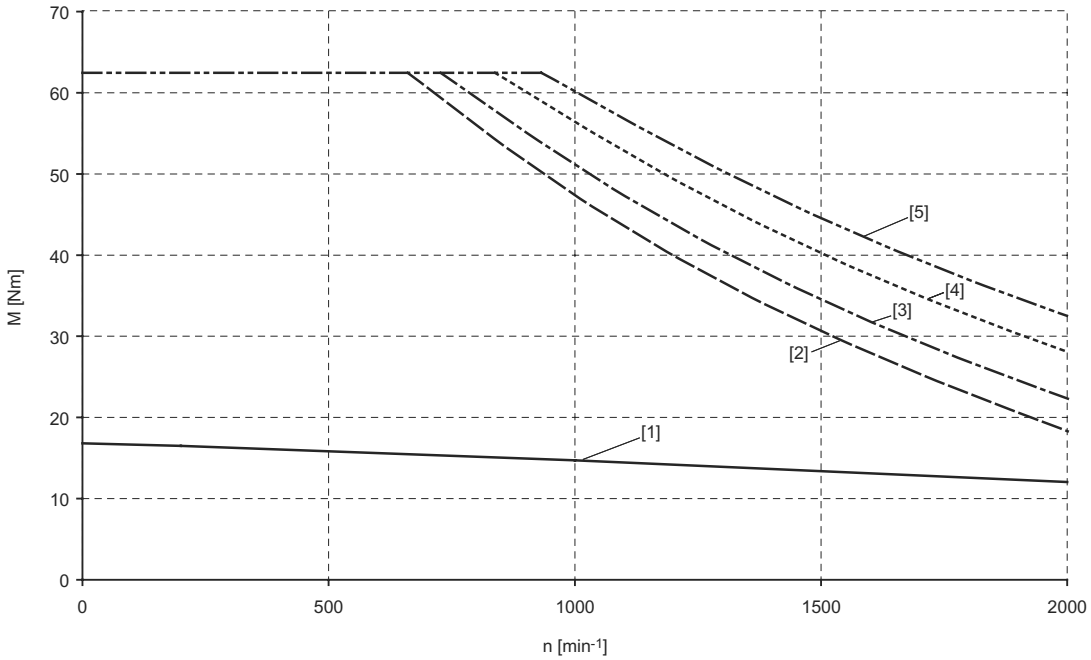


Figure 32: Dynamic limit characteristic curve CMD138L n_N = 1200 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

***Dynamic limit characteristic curve CMD138L n_N = 2000** min^{-1}*

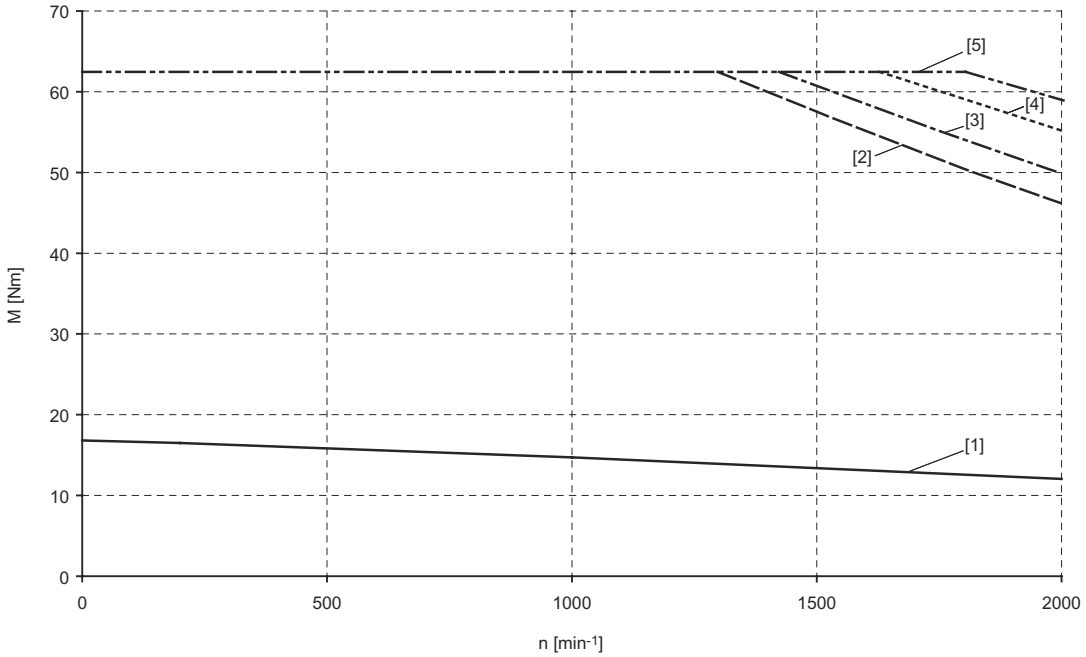


Figure 33: Dynamic limit characteristic curve CMD138L n_N = 2000 min^{-1}

[1] M_{S1} (derating)
[2] M (I_{max}, n) 360 V
[3] M (I_{max}, n) 400 V
[4] M (I_{max}, n) 460 V
[5] M (I_{max}, n) 500 V

The input voltage of the inverter is always specified.

9.1.3 Derating for increased ambient temperature

The following applies to determining a first approximation of a random thermal limit curve: The thermal limit curve for higher ambient temperatures must be reduced in all points (limit torque with reference to speed) by ΔM_{TH}:

$$\Delta M_{TH} = M_{TH} \times \left(1 - \sqrt{\frac{145 - T_U}{105}} \right)$$

$$M_{TH\_re} = M_{TH} - \Delta M_{TH}$$

Example CMD 93L with n_N = 3000 min^{-1}:

T_U = 60 °C

M_{TH} = 5 Nm

n = 2500 min^{-1}

$$\Delta M_{TH} = 5 \times \left(1 - \sqrt{\frac{145 - 60}{105}} \right) \text{ Nm}$$

ΔM_{TH} = 0.5 Nm

M_{TH_re} = 5.0 Nm – 0.5 Nm = 4.5 Nm

ΔM_{TH}	Thermal limit torque [Nm] difference
M_{TH}	Thermal limit torque [Nm]
T_U	Ambient temperature [°C]
M_{TH_re}	Reduced thermal limit torque [Nm]

9.1.4 Derating for high installation altitudes

No reduction in the thermal limit torque is required at installation altitudes up to 2000 m. For operation at altitudes above 2000 m above sea level, please contact SEW-EURODRIVE.

9.2 Thermal classifications and enclosure types of the motor

Thermal classifications according to IEC 60034-1 (EN 60034-1)

CMD series motors are delivered with thermal classification F as standard.

The following table lists the overtemperatures to IEC 60034-1 (EN 60034-1).

Thermal class	Overtemperature limit [K]
B	80 K
F[1)]	105 K
H	125 K

1) Motor standard

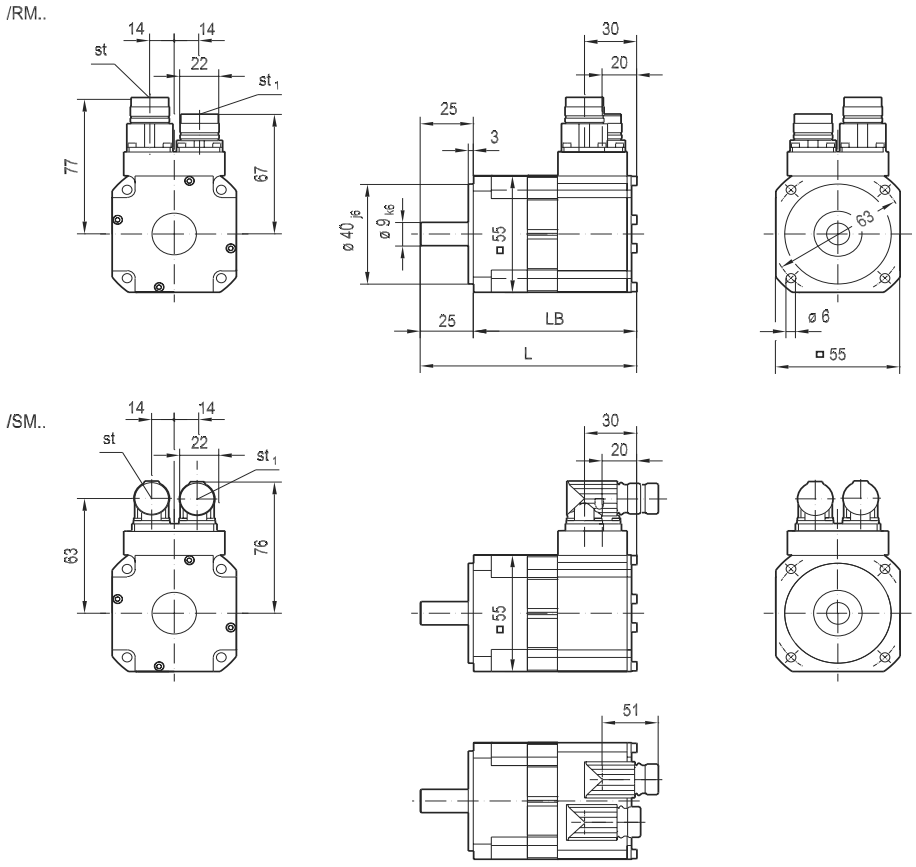
Enclosure types according to EN 60034 (IEC 60034-5)

CMD series motors are delivered with enclosure type IP65 as standard.

IP	1st digit Protection against foreign objects	2nd digit Protection against water
0	No protection	No protection
1	Protection against solid foreign objects ∅ 50 mm and larger	Protection against dripping water
2	Protection against solid foreign objects ∅ 12 mm and larger	Protection against dripping water when tilted up to 15°
3	Protection against solid foreign objects ∅ 2.5 mm and larger	Protection against spraying water
4	Protection against solid foreign objects ∅ 1 mm and larger	Protection against splashing water
5	Protection against dust	Protection against water jets
6	Dust-proof	Protection against powerful water jets
7	–	Protection against temporary immersion in water
8	–	Protection against permanent immersion in water

9.3 CMD dimensions

CMD55.. **08 029 00 04**



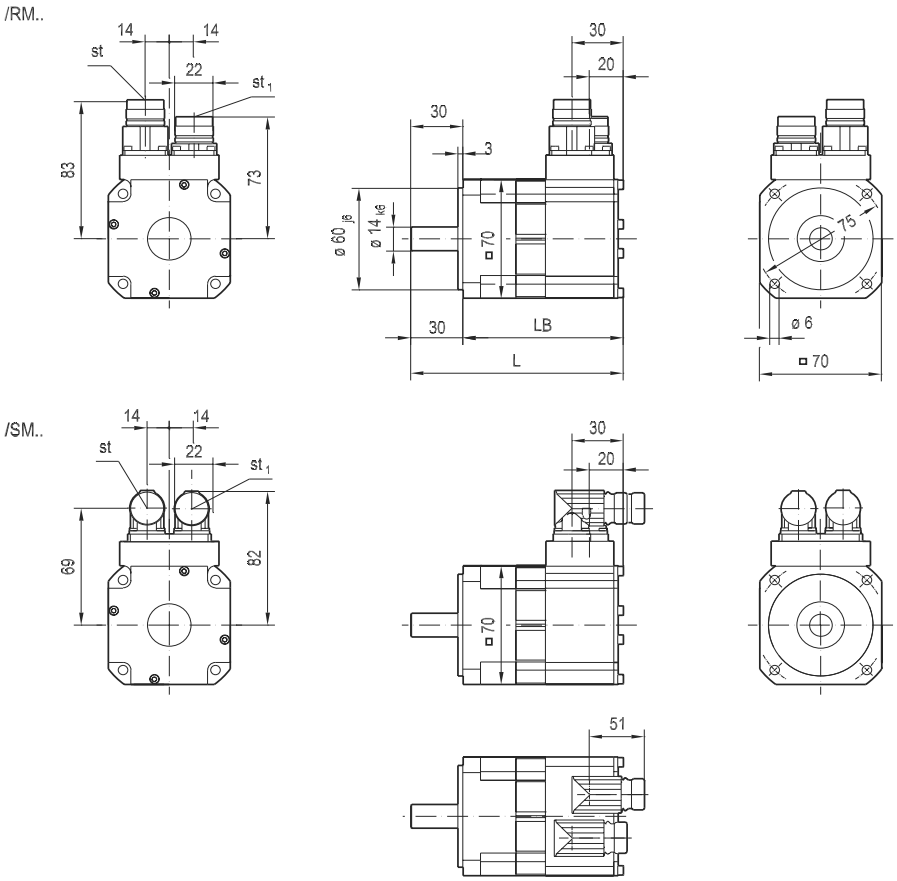
55327AXX

	CMD55S..	CMD55M..	CMD55L..
L	107	125	160
LB	82	100	135
st [1)]	9 ... 14	9 ... 14	9 ... 14
st_1 [2)]	5.5 ... 14	5.5 ... 14	5.5 ... 14

1) Round connecter, power

2) Round connector, signal

CMD70.. **08 030 00 04**



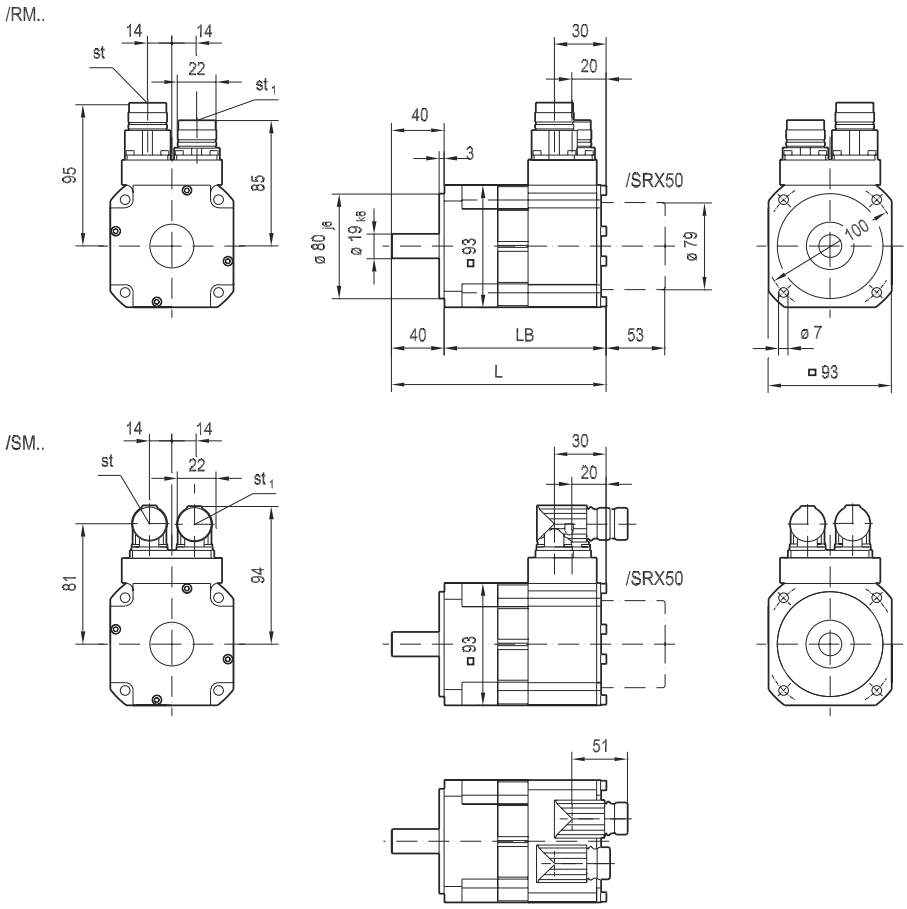
55328AXX

	CMD70S..	CMD70M..	CMD70L..
L	121	139	174
LB	91	109	144
st [1)]	9 ... 14	9 ... 14	9 ... 14
st_1 [2)]	5.5 ... 14	5.5 ... 14	5.5 ... 14

1) Round connecter, power

2) Round connector, signal

CMD93.. **08 031 00 04**



55329AXX

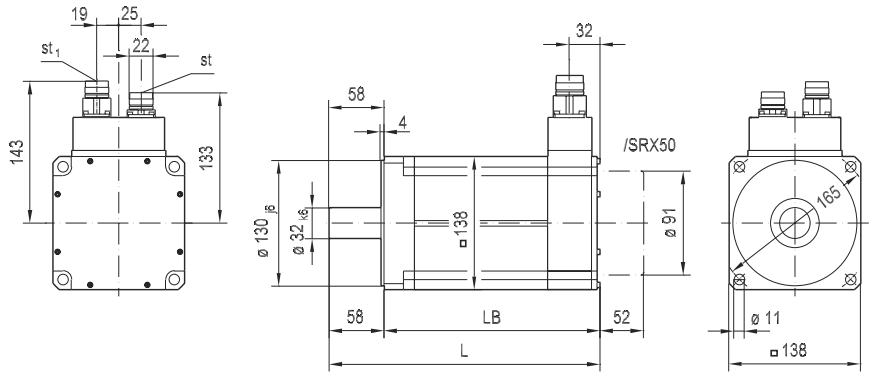
	CMD93S..	CMD93M..	CMD93L..
L	144	179	219
LB	104	139	174
st [1)]	9 ... 14	9 ... 14	9 ... 14
st_1 [2)]	5.5 ... 14	5.5 ... 14	5.5 ... 14

1) Round connecter, power

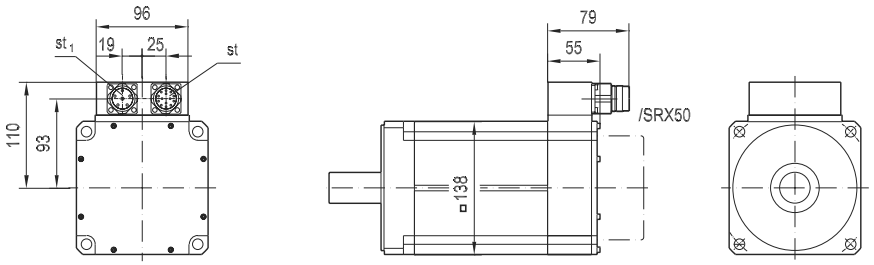
2) Round connector, signal

CMD138.. **08 032 00 04**

/RM..



/SM..



55330AXX

	CMD138S..	CMD138M..	CMD138L..
L	179	214	249
LB	121	156	191
st [1)]	9 ... 14	9 ... 14	9 ... 14
st_1 [2)]	5.5 ... 14	5.5 ... 14	5.5 ... 14

1) Round connecter, power

2) Round connector, signal

9.4 Inverter assignment MOVIDRIVE® MDX60B/61B

Sizes 0 and 1

Motor type	n_N [rpm]	M_0 [Nm]	Inverter I_{max} [A]	Size 0				Size 1			
				0005	0008	0011	0014	0015	0022	0030	0040
				4	4.8	6.2	8	6	8.25	10.5	14.25
			I_{max} [A]	Peak torque [Nm]							
CMD 55 S	4500	0.25	4	1.2							
CMD 55 M		0.45	6	1.8	2.0	*2.3*					
CMD 55 L		0.9	12	2.5	2.9	3.7	4.5	3.6	4.6	5.4	*5.9*
CMD 70 S	3000	0.7	6	2.2	2.5	*3*					
CMD 70 M		1.1	8	3.2	3.7	4.5	5	4.4	*5*		
CMD 70 L		1.9	18	3.8	4.5	5.8	7.4	5.7	7.6	9.1	10.6
CMD 93 S	1200	2.4	8	5.8	6.7	8.1	10	7.9	*10*		
CMD 93 M		4.2	16		8.2	10.5	13.3	10.2	13.6	16.6	20.6
CMD 93 L		6	23			10.5	13.5	10.1	14.0	17.6	23.1
CMD 93 S	3000	2.4	12		4.8	6.0	7.3	5.8	7.5	8.8	*10*
CMD 93 M		4.2	23				9.5	7.2	9.8	12.3	15.9
CMD 93 L		6	40								13.9
CMD 138 S	1200	6.7	13						12.8	15.2	*17*
CMD 138 M		12.1	26							21.9	27.9
CMD 138 L		16.5	40								
CMD 138 S	2000	6.7	25								11.9
CMD 138 M		12.1	53								
CMD 138 L		16.5	76								

Values in italics — Maximum torque M_{max} (limited by maximum motor current I_{max}) approximately. 3 times M_0

Sizes 2 and 3

Motor type	n_N [rpm]	M_0 [Nm]	Inverter I_{max} [A]	Size 2			Size 3		
				0055	0075	0110	0150	0220	0300
				18.75	24	36	48	69	90
			I_{max} [A]	Peak torque [Nm]					
CMD 55 S	4500	0.25	4						
CMD 55 M		0.45	6						
CMD 55 L		0.9	12						
CMD 70 S	3000	0.7	6						
CMD 70 M		1.1	8						
CMD 70 L		1.9	18	*11*					
CMD 93 S	1200	2.4	8						
CMD 93 M		4.2	16	*22*					
CMD 93 L		6	23	28.6	*33*				
CMD 93 S	3000	2.4	12						
CMD 93 M		4.2	23	19.5	*22*				
CMD 93 L		6	40	18.1	22.5	30.7	*33*		
CMD 138 S	1200	6.7	13						
CMD 138 M		12.1	26	33.3	37.8	*39*			
CMD 138 L		16.5	40	36.8	45.0	59.0	62		
CMD 138 S	2000	6.7	25	14.7	*17*				
CMD 138 M		12.1	53		23.7	31.8	37.2	39	
CMD 138 L		16.5	76			37.4	47.1	59.6	62

Values in italics

Maximum torque M_{max} (limited by maximum motor current I_{max}) approximately. 3 times M_0

9.5 External radial and axial shaft loads

The permitted overhung loads at point x (distance from the shaft shoulder to the application point) are determined using the diagrams below. The diagrams are based on a nominal bearing service life of L10h = 20,000 h.

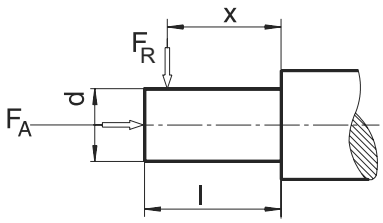


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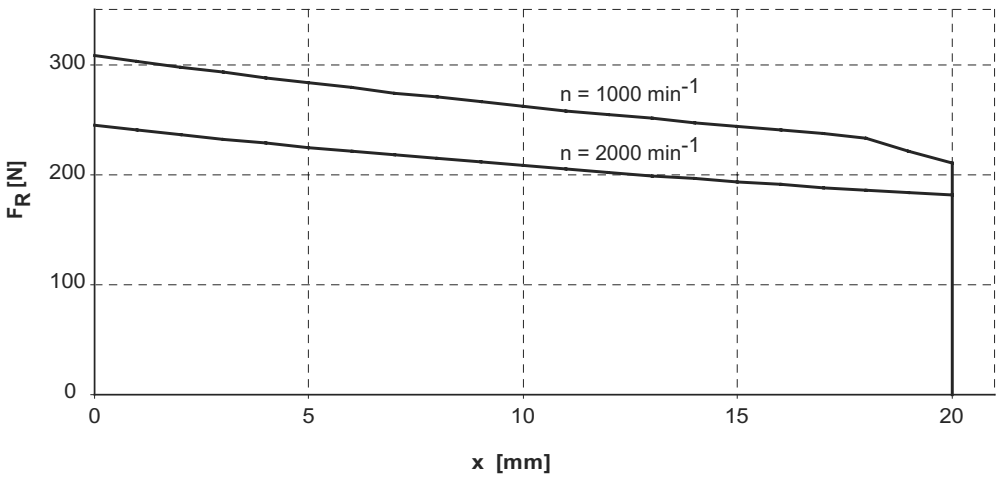
Figure 34: Representation of overhung load F_R and axial load F_A

CMD55



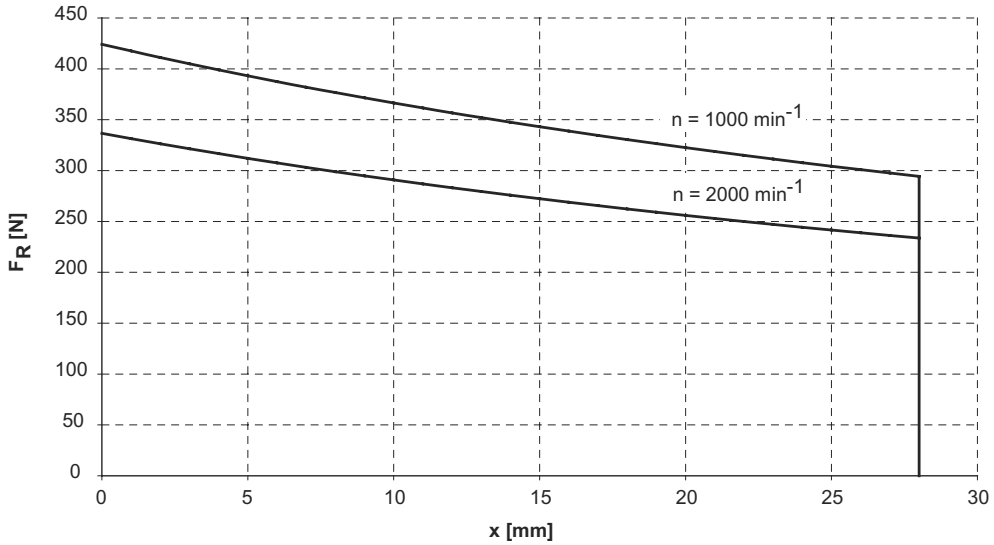
54913AXX

Figure 35: CMD55, permitted overhung load F_R at point x

Permitted axial load (F_A) at average speed n = 1000 rpm: F_A = 120 N.

Permitted axial load (F_A) at average speed n = 2000 rpm: F_A = 80 N.

CMD70

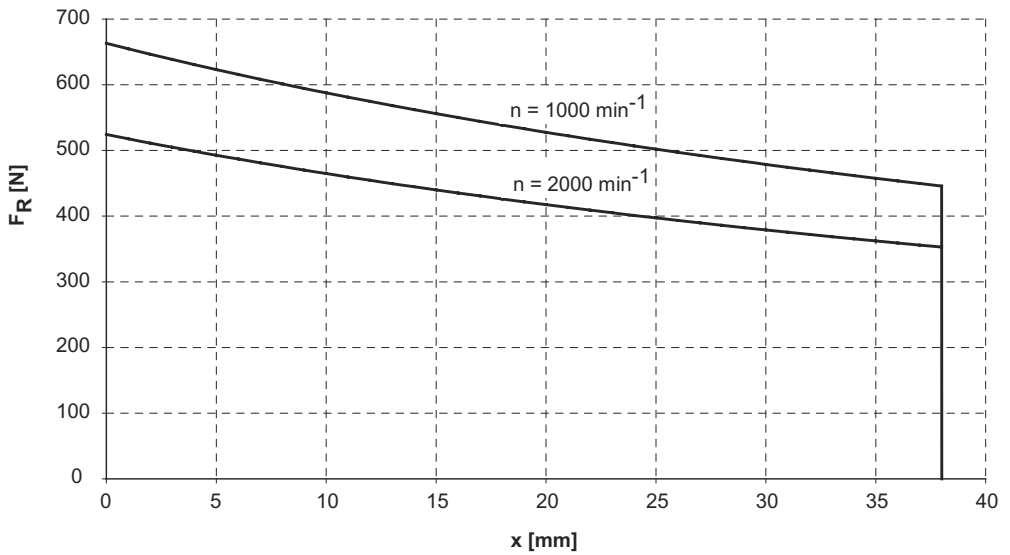


54914AXX

Figure 36: CMD70, permitted overhung load F_R at point x

Permitted axial load (F_A) at average speed n = 1000 rpm: F_A = 215 N.
Permitted axial load (F_A) at average speed n = 2000 rpm: F_A = 150 N.

CMD93

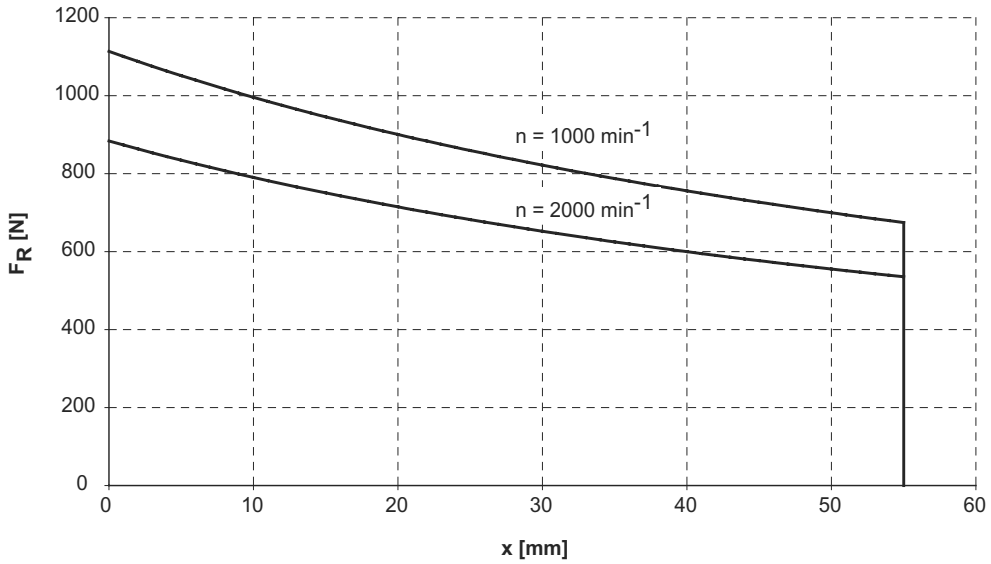


54922AXX

Figure 37: CMD93, permitted overhung load F_R at point x

Permitted axial load (F_A) at average speed n = 1000 rpm: F_A = 165 N.
Permitted axial load (F_A) at average speed n = 2000 rpm: F_A = 110 N.

CMD138



54923AXX

Figure 38: CMD138, permitted overhung load F_R at point x

Permitted axial load (F_A) at average speed n = 1000 rpm: F_A = 265 N.
Permitted axial load (F_A) at average speed n = 2000 rpm: F_A = 285 N.

10 Appendix

10.1 Appendix A: Abbreviations and unit designations

Abbreviation	Definition
BSF	Helical-bevel servo gear unit [Engl.: **B**evel **S**ervo **F**lange]
DIN	**D**eutsches **I**nstitut für **N**ormung e.V. [Engl.: German Standardization Group]
EN	**E**uropäische **N**orm [Engl.: European standard]
ISO	**I**nternational **O**rganization for **S**tandardization
SW	**S**chlüssel**w**eite [Engl.: wrench size]
PSF	Planetary gear unit [Engl.: **P**lanetary **S**ervo **F**lange]
M_0 [Nm]	Thermal continuous torque for speeds between 5 and 200 rpm
M_{S1}	Permitted continuous torque for speeds above 200 rpm
I_0 [Nm]	Continuous current
M_{max} [Nm]	Maximum torque
I_{max} [Nm]	Maximum current
M_N [Nm]	Rated torque
n_N [rpm]	Rated speed
n_{max} [rpm]	Maximum speed
R_1	Ohmic phase resistance of the stator winding
L_1	Phase inductance
V_{p0}	Rotor voltage (induced voltage, EMF)
J	Rotor mass moment of inertia
m	Weight (of the motor)
F_R [N]	Permitted overhung load
F_A [N]	Permitted axial load

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	Lyon	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 4 72 15 37 00 Fax +33 4 72 15 37 15
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Austria			
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Lebanon			
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Sweden			
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Ukraine			
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	Dallas	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
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