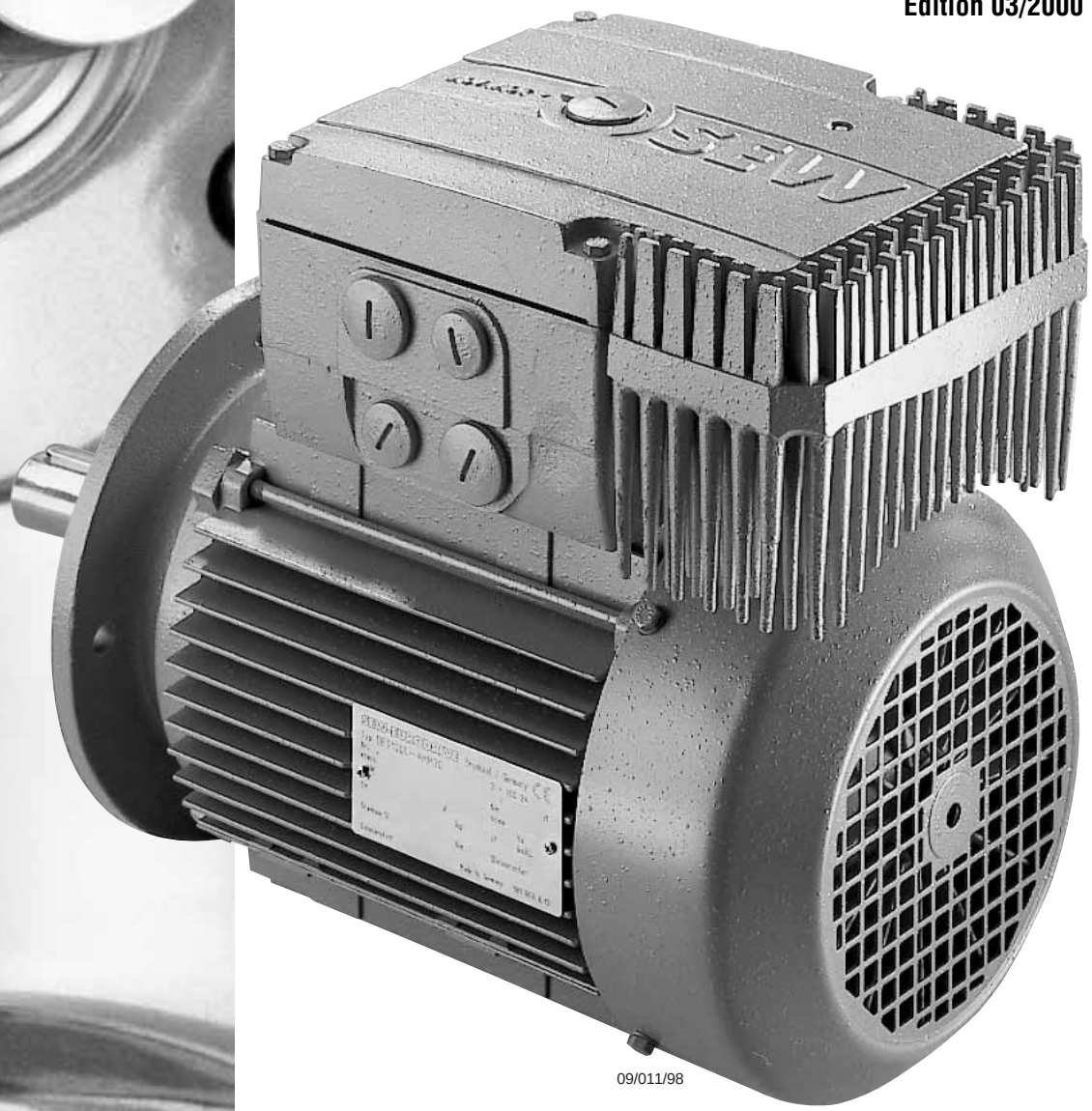
MOVIMOT®

Operating Instructions

Category 3D
(Dust Explosion Protection)

Edition 03/2000



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TÜV CERT DIN EN ISO 9001

SEW EURODRIVE

1 Important Notes

Always following the safety and warning instructions contained in this publication!

Electrical hazard

Possible consequences: Severe or fatal injuries.

Hazard

Possible consequences: Severe or fatal injuries.

Hazardous situation

Possible consequences: Slight or minor injuries.

Harmful situation

Possible consequences: Damage to the unit and the environment.

Tips and useful information

Important information about explosion protection

A requirement of fault-free operation and fulfillment of any rights to claim under guarantee is that the information in the operating instructions is adhered to. Consequently, read the operating instructions before you start working with the unit!

The operating instructions contain important information about servicing; as a result, they should be kept in the vicinity of the unit.

Waste disposal

This product consists of

- Iron
- Aluminum
- Copper
- Plastic
- Electronics components

Please dispose of the parts in accordance with the applicable regulations.

2 Safety Notes

- **Never install damaged products or take them into operation.** Please submit a complaint to the transport company immediately in the event of damage.
- Only **electrical specialists** with the relevant accident prevention training are allowed to perform **installation, startup and service work** on the unit. They must also comply with the regulations in force (e.g. EN 60204, VBG 4, DIN-VDE 0100/ 0113/0160).
- Make sure that **preventive measures** and **protection devices** correspond to the **applicable regulations** (e.g. EN 60204 or EN 50178).
  Necessary protective measures: Grounding the unit
- **Disconnect the unit from the supply system** prior to **removing the connection box cover**. **Dangerous voltages** may still be present for up to **1 minute after mains disconnection**.
- Keep the connection box cover closed during operation.
- Just because the **status LED and other display elements** have gone out **does not mean** that the unit has been disconnected from the power supply and is **de-energized**.
- **Mechanical blockage** or unit internal **safety functions** of MOVIMOT® can lead to a **motor standstill**. The removal of the source of the interruption or a reset of MOVIMOT® can result in an **automatic restart of the motor**. If, for safety reasons, this is not permissible for the driven machine, the MOVIMOT® must be disconnected from the supply system **before correcting the fault**.
- **Important:** MOVIMOT® is not suitable for hoist applications!
- **Important – Danger of burns:** The surface temperature of MOVIMOT® units (in particular that of the heat sink) may exceed 60° C during operation!

2.1 Information for using MOVIMOT® in category 3D

Standards

MOVIMOT® units in category 3D comply with EN 50014 ("Electrical apparatus for potentially explosive atmospheres; general requirements", 2nd edition) and EN 50281-1-1:1998 ("Electrical apparatus for use in atmospheres containing flammable dust"), and therefore conform to Directive 94/9/EC (ATEX 100a).

Enclosure of the housing

MOVIMOT® units in category 3D are supplied with enclosure IP54 at least. The enclosure has to be maintained over the complete operating time as a precondition for satisfying the requirements for devices in category 3D. For this reason, particular care must be taken even when connecting the units.

The unit must not be operated in zone 22 atmospheres if the enclosure type is not assured!

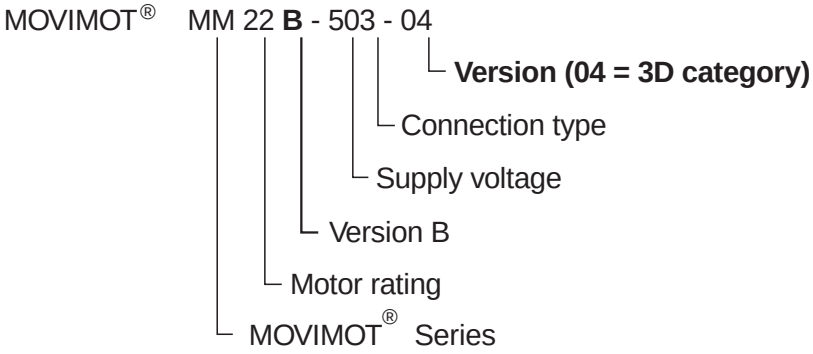
Applications

- Unit group II
- Category 3D
- For use in zone 22
- Surface temperature 140 °C
- Ambient temperature -20 to +40 °C

3 Structure of the Unit

3.1 Type designation, nameplates

Type designation example



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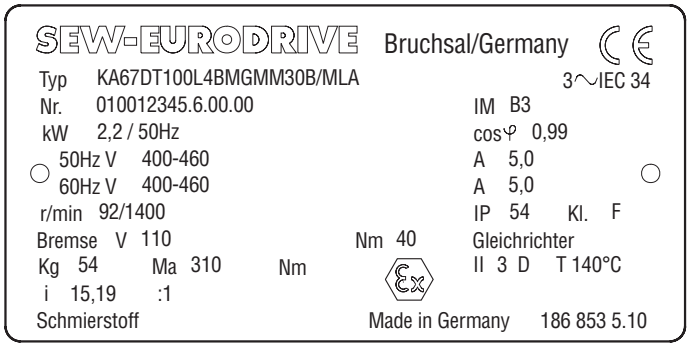
MOVIMOT® nameplate (example)



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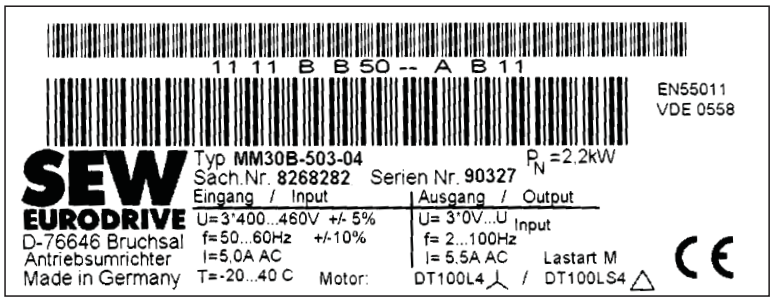
Electronics nameplate (example)



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3.2 Structure of the inverter unit

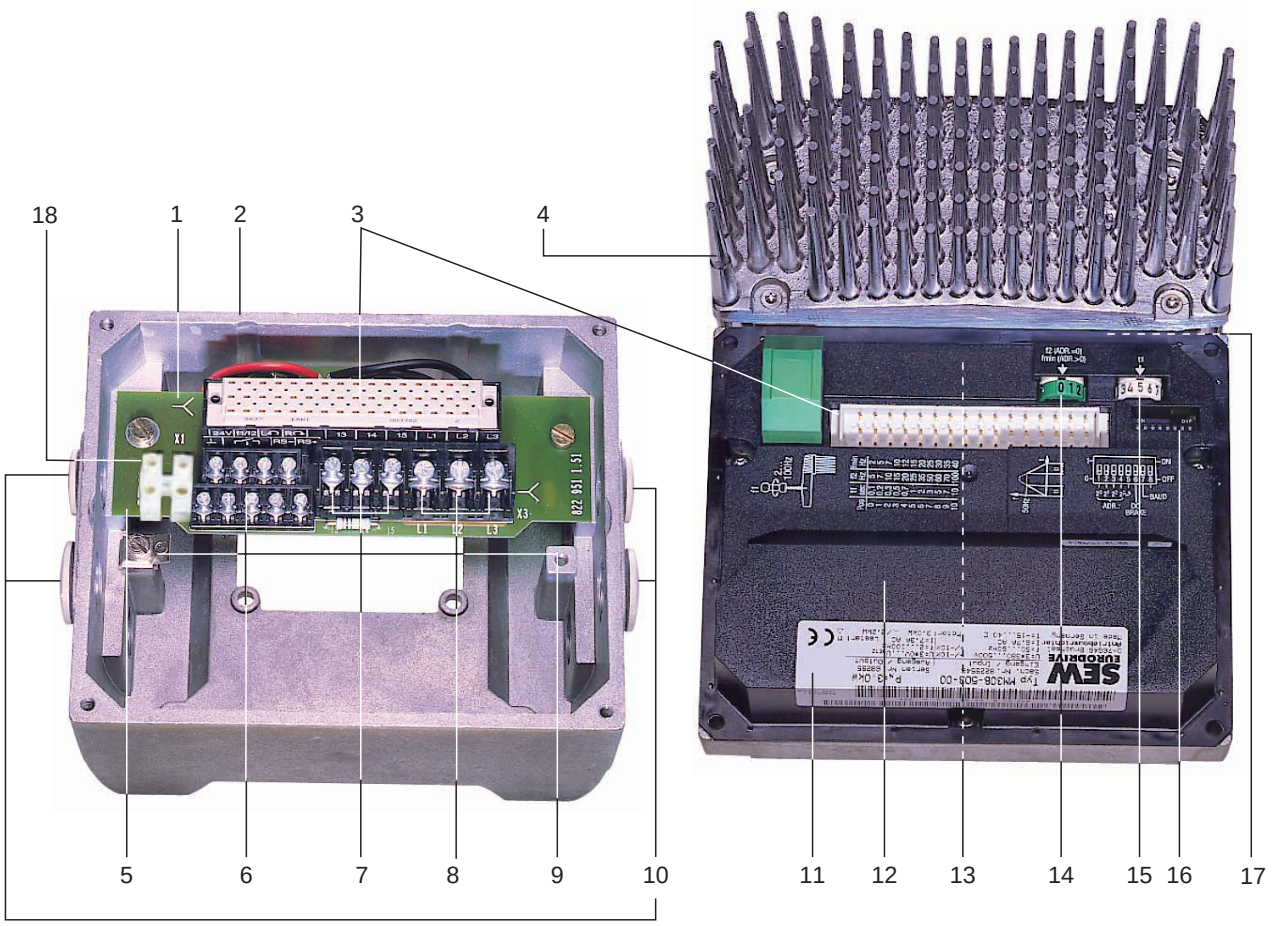

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Bild 1: Structure of the unit

1 Identification of the circuit type
2 Connection box
3 Connection plug, connection unit with inverter
4 Connection box cover with inverter and heat sink
5 Connection unit with terminals
6 Electronics terminal strip X2
7 Connection of brake coil (X3)
For motors without a brake: Connection of internal braking resistor BW1/BW2 (standard)
8 Power system connection L1, L2, L3 (X3) (suitable for 2 x 4 mm^2)
9 Screws for PE connection y
10 Cable screw fittings MM03**B**-MM15**B**: (2 x PG11 and 2 x PG16 / from start of 2000, 2 x M16 and 4 x M25)
(not all visible in picture) MM22**B**-MM30**B**: (4 x PG11 and 4 x PG16 / from start of 2000, 4 x M16 and 4 x M25)
11 Electronics nameplate
12 Safety hood for inverter electronics
13 Setpoint potentiometer f1 (not visible),
accessible from the top of the connection box cover by means of a PG screw fitting
14 Setpoint switch f2 (green)
15 Switch t1 for ramp generator (white)
16 DIP switch S1 for setting the bus address, motor protection, DC braking, PWM frequency
17 Status LED (visible from the top of the connection box cover, see “Status LED” on page 26)
18 Terminals for TH connection (arrangement of terminals varies according to the size of the MOVIMOT® unit)

3.3 Description of the controls

DIP SWITCH S1

S1/..	1	2	3	4	5	6	7	8
ON	2^0	2^1	2^2	2^3	Motor protection deactivated	DC braking	PWM frequency 16 kHz[1)] variable	No function
OFF	RS-485 address				**Motor protection active ***	**4Q operation ***	**PWM frequency 4 kHz fix ***	

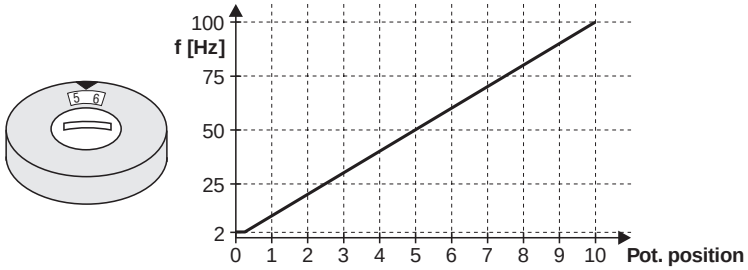
1) 16 kHz PWM frequency (low-noise)
When DIP SWITCH S1/7 = ON, the units operate with a 16 kHz PWM frequency (low noise) and switch back in steps to lower pulse frequencies depending on the heat sink temperature.

* Factory setting

Setpoint potentiometer f1

The function of the potentiometer changes depending on the unit's operating mode.

- **Control via terminals:** Setpoint f1 (selected by tl. f1/f2 = "0")
- **Control via RS-485:** Maximum frequency f_{max}



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Setpoint switch f2

The function of the switch changes depending on the unit's operating mode.

- **Control via terminals:** Setpoint f2 (selected by tl. f1/f2 = "1")
- **Control via RS-485:** Minimum frequency f_{min}

Setpoint switch f2											
Detent position	**0 ***	1	2	3	4	5	6	7	8	9	10
Setpoint f2 [Hz]	**5 ***	7	10	15	20	25	35	50	60	70	100
Minimum frequency f_{min} [Hz]	**2 ***	5	7	10	12	15	20	25	30	35	40

***** Factory setting

Switch t1

For ramp generator

Switch t1											
Detent position	0	1	2	3	4	5 *	6	7	8	9	10
Ramp time t1 [s]	0.1	0.2	0.3	0.5	0.7	1 *	2	3	5	7	10

***** Factory setting

4 Mechanical Installation

Before you begin

MOVIMOT® may not be installed unless:

- the entries on the name plate of the drive match the mains power supply,
- the drive is undamaged (no damage caused by transport or storage) and
- it is certain that the following requirements have been fulfilled:
  - ambient temperatures between -20 °C and +40 °C (remember that the temperature range of the gear unit may be restricted → operating instructions for the gear unit),
  - no oil, acid, gas, vapors, radiation, etc.,
  - installation altitude max. 1000 m above sea level.

Installation tolerances

Shaft end	Flanges
Diametric tolerance in accordance with DIN 748 • ISO k6 at ∅ ≤ 50 mm • ISO m6 at ∅ > 50 mm (Center hole in accordance with DIN 332, shape DR)	Centering shoulder tolerance in accordance with DIN 42948 • ISO j6 at ∅ ≤ 230 mm • ISO h6 at ∅ > 230 mm

→ "MOVIMOT® Geared Motors" catalog, section "Notes on Dimension Sheets."

Setting up MOVIMOT®

The MOVIMOT® may only be mounted or installed in the specified mounting position on a level, vibration-proof and torsionally rigid support structure.

- Thoroughly remove anti-corrosion agents from the shaft ends (use a commercially available solvent). Do not allow the solvent to penetrate the bearings and shaft seals – this could cause material damage!
- Carefully align MOVIMOT® and the driven machine to avoid placing any unacceptable strain on the motor shafts (observe permissible overhung load and axial thrust data!).
- Do not butt or hammer the shaft end.

- **Use an appropriate cover to protect motors in vertical mounting positions from accidental entering of objects or fluids ! (Protection cowl C)**
- Ensure an unobstructed cooling air supply and that air heated by other units cannot be drawn in or reused.
- Balance components for subsequent mounting on the shaft with a half key (output shafts are balanced with a half key).

5 Electrical Installation

It is essential to comply with the safety notes (see page 5) during installation!

5.1 Installation guidelines

When connecting up, comply with the following ElexV 1 provisions (or other nationally valid regulations) in addition to the generally applicable installation regulations:

- **EN 60 079-14 ("Installation of electrical systems in hazardous areas")**
- **EN 50281-1-2 ("Electrical tools and fixtures for use in atmospheres containing flammable dust")**
- **DIN VDE 0105-9 ("Operation of electrical systems")[1)]**
- **DIN VDE 0100 ("Setup of power installations up to 1000 V")[1)]**
- **and provisions specifically relating to the system**

Connecting supply system leads

Rated voltage and frequency

- The rated voltage and frequency of MOVIMOT® must correspond to the data for the mains supply.

Selecting the cables

- The cross sections of the cables used must be selected according to the rated current of the unit and the applicable installation regulations.
- The selection of the cable type is based on the applicable installation regulations and the requirements at the application location.

Permitted line cross section of the terminals

Power terminals	Control terminals
1.0 mm^2 – 4.0 mm^2 (2 x 4.0 mm^2)	0.25 mm^2 – 1.0 mm^2 (2 x 0.75 mm^2)
AWG17 – AWG10 (2 x AWG10)	AWG22 – AWG17 (2 x AWG18)

Conductor end sleeves

- Use conductor end sleeves without insulating shrouds (DIN 46228 part 1, material E-CU)

Cable entries

- All cable entries are supplied fitted with a closing plug. To connect the unit, replace the required number of plugs with suitable cable entries which are fitted with **strain relief**.
- **The cable entries must meet the requirements of EN 50 014, 2nd edition.**
- Select the cable entries on the basis of the diameter of the cables used. Please refer to the documentation provided by the manufacturer of the cable entry for further information.

Line protection

- Install the line protection at the start of the supply system lead behind the supply bus junction (*see section 5.4 to section 5.6:* F11/F12/F13). Use D, DO, NH or circuit breakers. The fusible rating should be selected in accordance with the cross section of the cable.

Residual-current-operated circuit breaker

- It is not permissible to use a conventional residual-current-operated circuit breaker (r.c.c.b.) as a protective device. Universal current-sensitive residual-current-operated circuit breakers (tripping current 300 mA) are permissible as a protective device. Earth-leakage currents > 3.5 mA may occur during normal operation of the MOVIMOT®.

Contactor switch contacts

- Contactor switch contacts in utilization category AC-3 to IEC 158 must be used for switching MOVIMOT®.

1. Or other national guidelines

IT systems

- SEW recommends using earth-leakage monitors with a pulse code measuring process in voltage power systems with a non-earthed star point (IT systems). This avoids faulty tripping of the earth-leakage monitor due to the earth capacitance of the inverter.

Connecting 24 V_{DC} supply

- The MOVIMOT® power supply should be either from an external 24 V_{DC} voltage or using the MLA12A options.

Conventional control (using binary commands)

- Connect the required electronic control leads (e.g. CW/STOP, CCW/STOP, setpoint changeover f1/f2).
- Use shielded cables as control leads and route them separately from power current cables.

Control via RS-485 interface

With PLC bus master or MLA12A option

- **Important: Only ever connect <u>one</u> bus master.**
- Use twisted pair shielded cables as control leads and route them separately from power current cables.

Cable screw fittings

- **All cable entries which are not required must be sealed properly using suitable closing plugs.**

5.2 Protection concept

In order to avoid exceeding the permitted temperature, only operation in accordance with the operating characteristics is permitted (see "Operating characteristics" on page 38)!

- MOVIMOT® units in category 3D are supplied with a temperature switch (TH). The TH switches off the motor if the winding temperature exceeds the maximum value.
- The switching off process by the TH must be monitored by an independent evaluation unit.
- **The independent evaluation unit must be equipped with a base insulation to securely separated electrical circuits.**
- **The drive must be disconnected from the supply power system when the TH trips.**
- **The TH automatically switches itself back on when the temperature drops below the maximum value! A restart interlock must prevent the drive from being energized.**
  Important: Do not switch the drive back on until the cause of the problem has been checked. This check must be performed by a trained specialist.

In conjunction with MLA12A

- The unit is supplied with the TH already wired up in conjunction with MLA12A. Consequently, the 24 V power supply of MOVIMOT® is interrupted when the TH trips and the drive is stopped. At the same time, the ready contact of the MOVIMOT® drops out (ready signal terminals). **A restart interlock must prevent the drive from being energized again automatically when the TH switches back on.**
  Important: Do not switch the drive back on until the cause of the problem has been checked. This check must be performed by a trained specialist.

5.3 Operating modes

The following operating modes are permitted with MOVIMOT® units in category 3D:

4Q operation

1. 4Q operation with motors with a mechanical brake

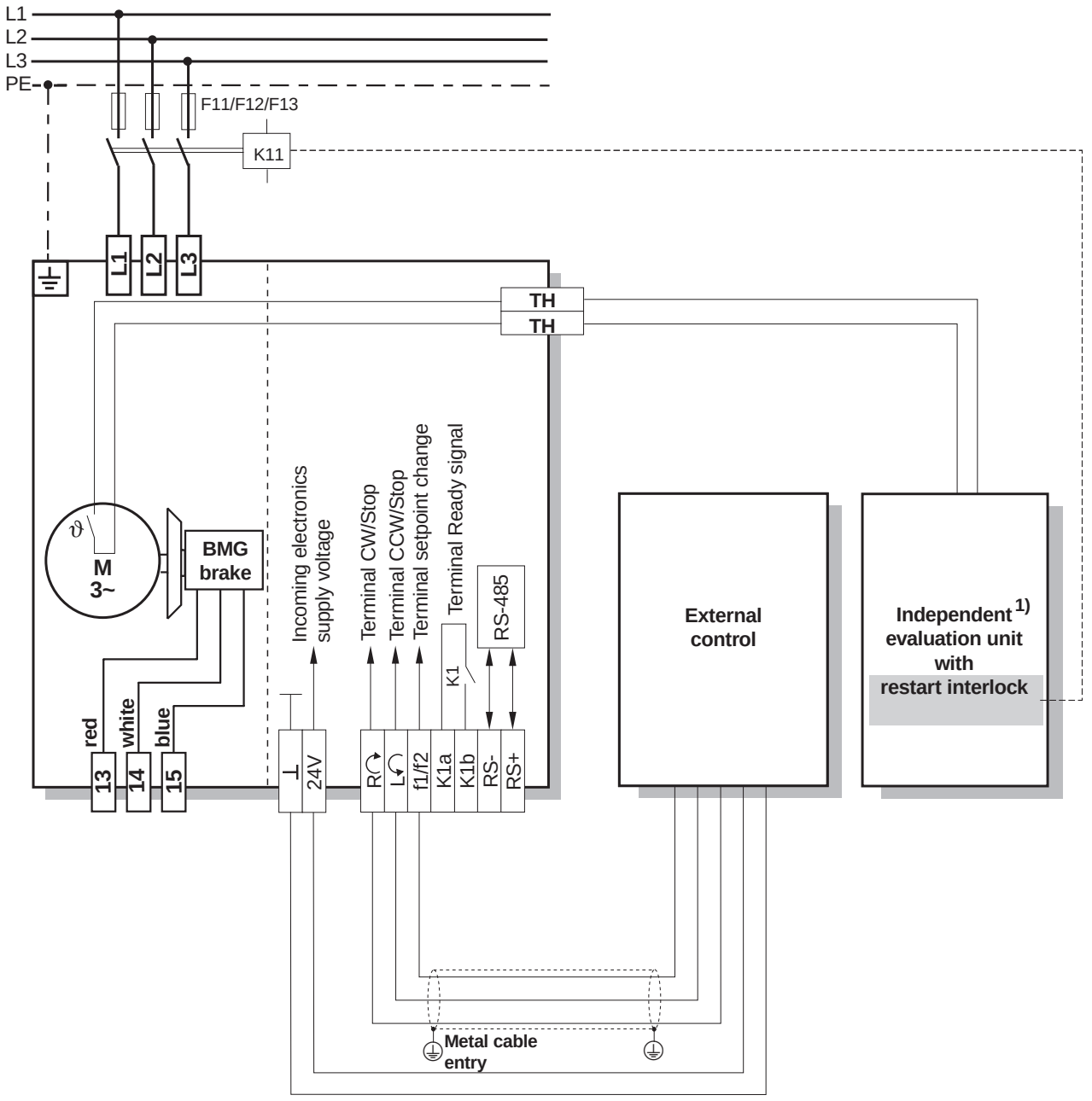
- The brake coil is used as a braking resistor in 4Q operation.
- No external braking resistor is allowed to be connected.
- Regenerative load capacity of the brake coil *(see page 37)*

1Q operation

2. 1Q operation with motors without a mechanical brake

Important:
Connecting an internal or external braking resistor is not permitted!

5.4 Connection with binary control



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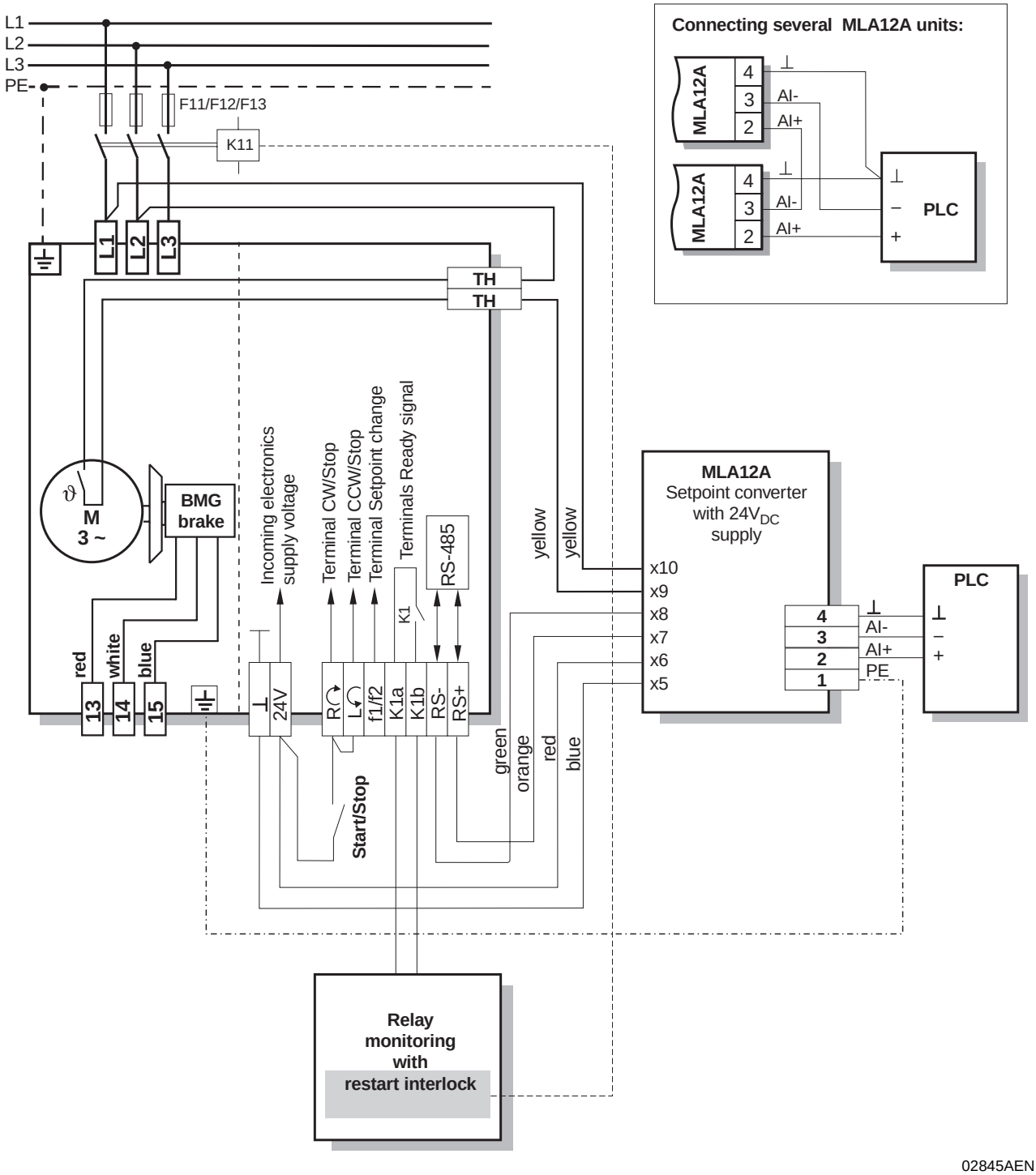
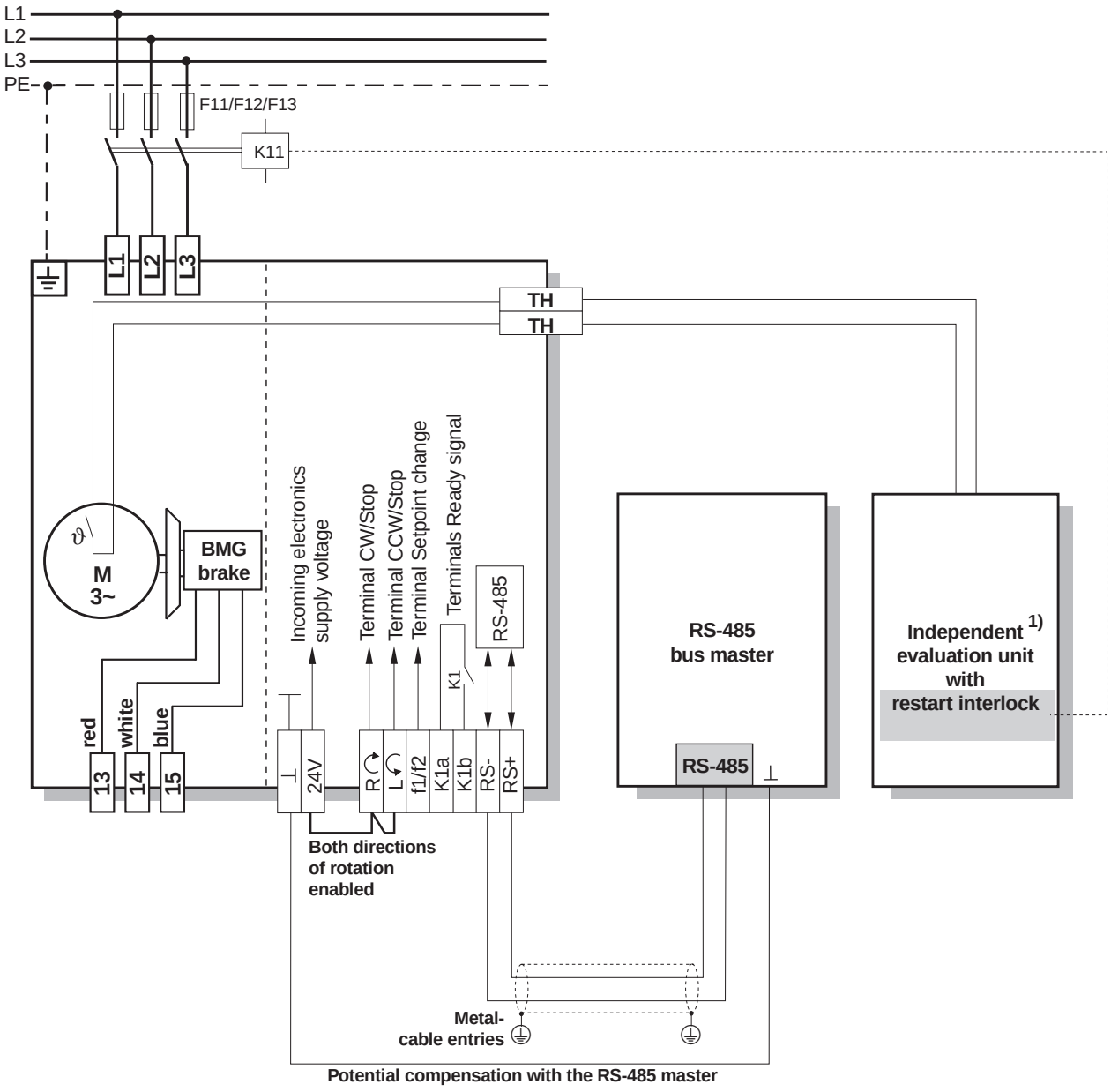
1) The independent evaluation unit must have a base insulation to securely separated electrical circuits.

5.5 Connection with MLA12A option



5.6 Connection with RS-485 bus mode



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1) The independent evaluation unit must have a base insulation to safely separated electrical circuits.

6 Startup

6.1 *Important startup instructions*

- **It is essential to comply with the safety notes (see page 5) during startup!**
- **Disconnect MOVIMOT® from the supply system before removing/replacing the terminal box cover.**
- **Before startup, make sure that**
  - **the drive is not damaged and**
  - **all protective covers have been fitted correctly.**
- MOVIMOT® is optimally adapted to the motor by means of parameters stored in the unit. As a result, the parameter settings are fixed.
- Use CW/STOP or CCW/STOP for jog mode.
- A minimum switch-off time of **2 seconds** must be maintained for the supply system contactor K11.

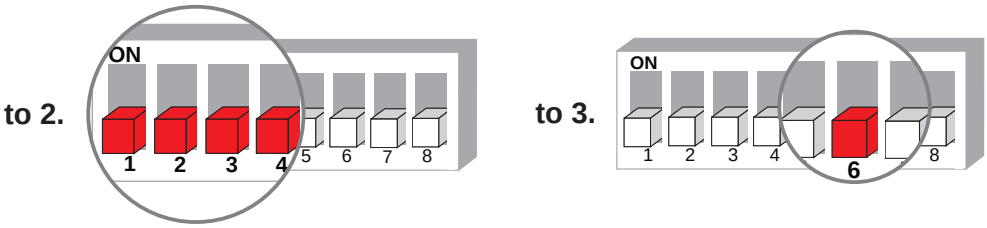
6.2 Startup with binary control

Check connection

1. Check MOVIMOT® to see that it is connected correctly (see “Connection with binary control” on page 14).

Set the DIP switches

2. Make sure DIP switches S1/1 – S1/4 are set to OFF (= address 0).
3. Check the setting for 4Q operation / 1Q operation (DIP switch S1/6 = Off).



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Set the first speed

4. Set the first speed with setpoint potentiometer f1 (active when tl. f1/f2 = “0”) (factory setting: approx. 50 Hz).

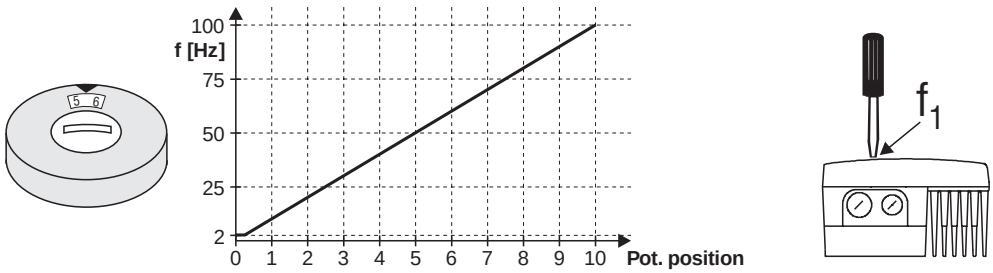

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Fig. 2: Frequency response of setpoint potentiometer f1

- **The first speed is infinitely variable and can be set by using the setpoint potentiometer f1 which is accessible externally.**
- **The opening above potentiometer f1 must be closed properly during operation by means of the supplied closing plug. This is the only way in which explosion-protection can be guaranteed.**
- **The plug must not be removed, even for adjusting the speed, unless there is no dangerous dust/air mixture present.**

Set the second speed

5. Set the second speed with switch f2 (active when tl. f1/f2 = “1”).

Switch f2											* Factory setting
Detent position	**0 ***	1	2	3	4	5	6	7	8	9	10
Setpoint f2 [Hz]	**5 ***	7	10	15	20	25	35	50	60	70	100

Setting the ramp time

6. Set the ramp time with switch t1.

Switch t1											* Factory setting
Detent position	**0**	1	2	3	4	5 *	6	7	8	9	10
Ramp time t1 [s]	**0.1**	0.2	0.3	0.5	0.7	1 *	2	3	5	7	10

7. Put on the terminal box cover and secure with bolts.
8. Make sure the cover has a seal and fit the cover back in.

Important

The opening above potentiometer f1 must be closed properly during operation by means of the supplied closing plug. This is the only way in which explosion protection may be guaranteed. The plug must not be removed, even for adjusting the speed, unless there is no dangerous dust/air mixture present.

9. Switch on the 24 V_{DC} control voltage and supply system.

Inverter response according to the terminal level

Network	24 V	f1/f2	CW/STOP	CCW/STOP	Status LED	Inverter response
0	0	X	X	X	Off	**Inverter off**
1	0	X	X	X	Off	**Inverter off**
1	1	X	0	0	Yellow	**Stop**
1	1	0	1	0	Green	**Clockwise with f1**
1	1	0	0	1	Green	**Counterclockwise with f1**
1	1	1	1	0	Green	**Clockwise with f2**
1	1	1	0	1	Green	**Counterclockwise with f2**
1	1	X	1	1	Yellow	**Stop**

Key:

0 = No voltage
1 = Voltage
X = Any

Evaluation of the TH

- The TH switch-off must be monitored by an independent evaluation unit.
- The drive must be disconnected from the power supply system when the TH trips.
- The TH automatically switches itself back on when the temperature drops below the maximum value! An automatic restart must be prevented (restart interlock).
- Do not switch the drive back on until the cause of the problem has been checked. This check must be performed by a trained specialist.

Functional check

Check the brake for proper function when brake motors are used. This step will prevent brake friction and the associated generation of excess heat.

6.3 Startup with the MLA12A option

Checking connection

1. Check to see that MOVIMOT® is connected correctly (see "Connection with MLA12A option" on page 15).

Set the DIP switches

2. Set DIP switch S1/1 (on MOVIMOT®) to ON (= address 1).
3. Check the setting for 4Q operation / 1Q operation (DIP switch S1/6 = Off).

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Setting the minimum frequency

4. Set the minimum frequency f_{min} with switch f2

Switch f2											* Factory setting
Detent position	**0 ***	1	2	3	4	5	6	7	8	9	10
Minimum frequency f_{min} [Hz]	**2 ***	5	7	10	12	15	20	25	30	35	40

Setting the ramp time

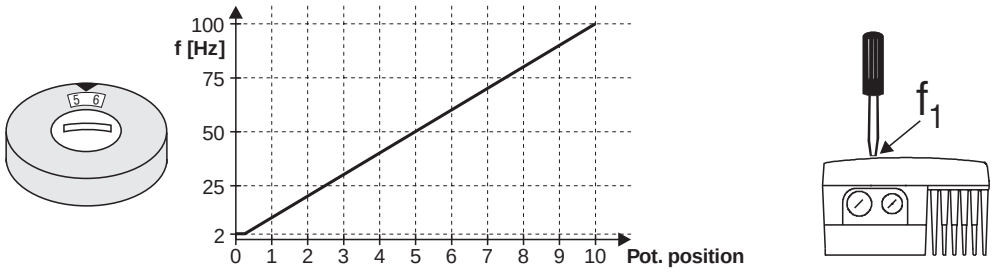
5. Set the ramp time with switch t1.

Switch t1											* Factory setting
Detent position	0	1	2	3	4	5 *	6	7	8	9	10
Ramp time t1 [s]	0.1	0.2	0.3	0.5	0.7	1 *	2	3	5	7	10

6. Replace terminal box cover and secure with bolts.

Setting the maximum speed

7. Set the required maximum speed using setpoint potentiometer f1.



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Important

The opening above potentiometer f1 must be closed properly during operation by means of the supplied closing plug. This is the only way in which explosion protection may be guaranteed. The plug must not be removed unless there is no dangerous dust/air mixture present.

8. Make sure the cover has a seal and fit it back in place.

Selecting the direction of rotation

9. Select the sign (direction of rotation) for the analog input (tl. 2 and tl. 3) on the MWA12A option using switch S1.

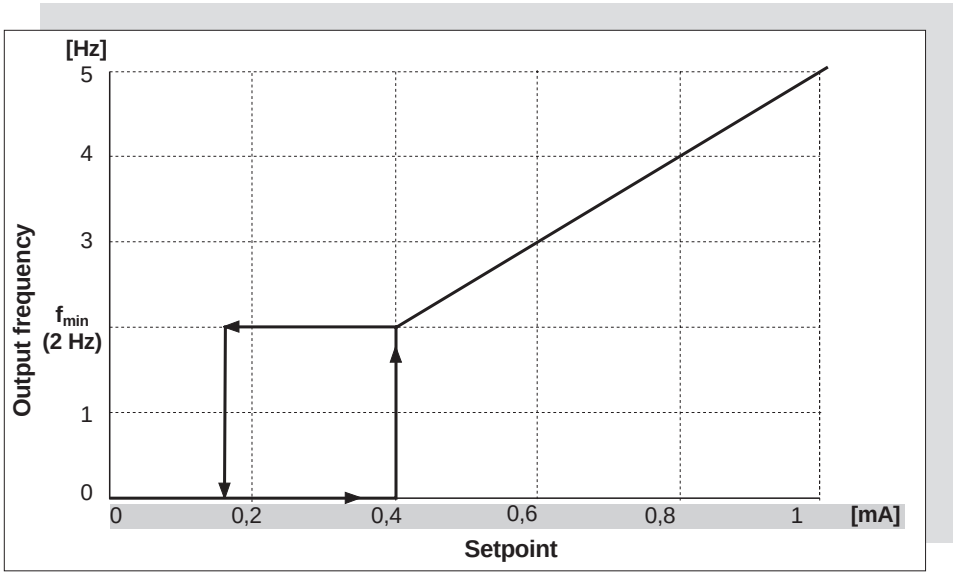
	S1	**S2**
Clockwise	OFF	N.C.
Counterclockwise	ON	N.C.

10. Switch on the voltage.

Control

MOVIMOT® is controlled from f_{min} to f_{max} using the analog signal at terminal 2 and terminal 3.

Setpoint stop function



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Evaluation of the TH

- The unit is supplied with the TH already wired up in conjunction with the MLA12A option. Consequently, the 24 V power supply of MOVIMOT® is interrupted when the TH trips and the drive is stopped. At the same time, the "Ready contact" of MOVIMOT® drops out ("Ready contact" terminals). An automatic restart must be secured by evaluation of the ready contact!
- Do not switch the drive back on until the cause of the problem has been checked. This check must be performed by a trained specialist.

Functional check

Check proper brake function when using brake motors. This step will prevent brake friction and the associated generation of excess heat.

6.4 Startup with RS-485 bus operation

Checking connection

1. Check to see that MOVIMOT® is connected correctly (see "Connection with RS-485 bus mode" on page 16).

Setting the RS-485 address

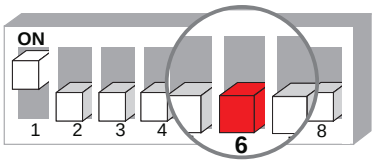
2. Set the correct RS-485 address on DIP switches S1/1 – S1/4

Address	- *	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
S1/1	**OFF**	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON
S1/2	**OFF**	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON
S1/3	**OFF**	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON
S1/4	**OFF**	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON

** Factory setting*

3. Check the setting for 4Q operation / 1Q operation (DIP switch S1/6 = Off).

to 3.



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Setting the minimum frequency

4. Set the minimum frequency f_{min} with switch f2

Switch f2											* Factory setting
Detent position	**0 ***	1	2	3	4	5	6	7	8	9	10
Minimum frequency f_{min}	**2 ***	5	7	10	12	15	20	25	30	35	40

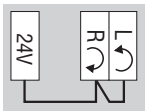
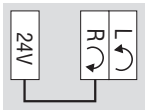
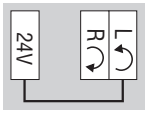
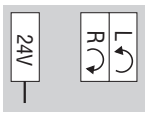
Setting the ramp time

5. Set the ramp time with switch t1 unless it is specified via RS-485.

Switch t1											* Factory setting
Detent position	0	1	2	3	4	5 *	6	7	8	9	10
Ramp time t1 [s]	0.1	0.2	0.3	0.5	0.7	1 *	2	3	5	7	10

Enabling the direction of rotation

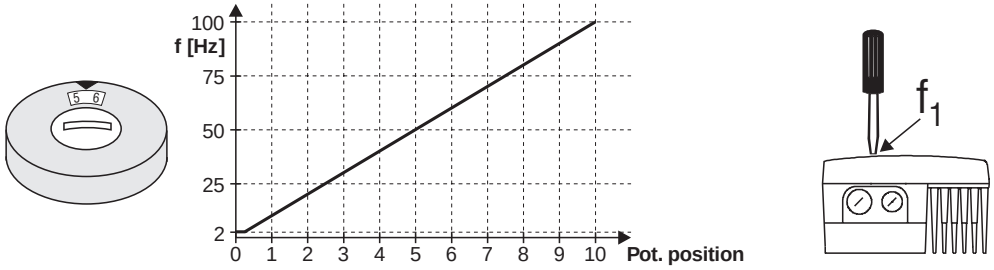
6. Check whether the required direction of rotation is enabled.

Terminal R	**Terminals L**	**Meaning**
Activated	**Activated**	• Both directions of rotation are enabled
a) 		
Activated	**Not activated**	• Only clockwise direction of rotation is enabled • Setpoint entries for counterclockwise lead to the drive being stopped
b) 		
Not activated	**Activated**	• Only counterclockwise direction of rotation is enabled • Setpoint entries for clockwise lead to the drive being stopped
c) 		
Not activated	**Not activated**	• Unit is blocked or the drive is stopped
d) 		

7. Replace terminal box cover and secure with bolts.

Setting the maximum speed

8. Set the required maximum speed using setpoint potentiometer f1.



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Important:

The opening above potentiometer f1 must be closed properly during operation by means of the supplied closing plug. This is the only way in which explosion protection may be guaranteed. The plug must not be removed unless there is no dangerous dust/air mixture present.

9. Make sure the cover has a seal and fit cover back in.
10. Switch on the voltage.

Evaluation of the TH

- The TH switch-off must be monitored by an independent evaluation unit.
- The drive must be disconnected from the power suuply system when the TH trips.
- The TH automatically switches itself back on when the temperature drops below the maximum value! An automatic restart must be prevented (restart interlock).
- Do not switch the drive back on until the cause of the problem has been checked. This check must be performed by a trained specialist.

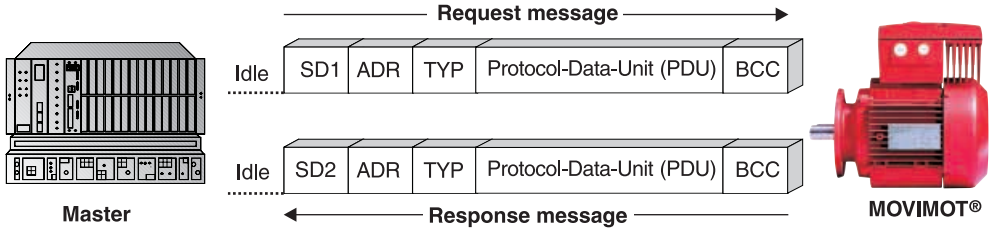
Functional check

Check proper brake function when brake motors are used. This step will prevent brake friction and the associated generation of excess heat.

6.5 Serial communication

- The control (e.g. PLC) is the master, MOVIMOT® is the slave.
- 1 start bit, 1 stop bit and 1 parity bit (even parity) are used.
- Transmission conforms to the SEW-MOVILINK® protocol with a fixed transfer rate of 9600 baud.

Message structure



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Key

Idle = Start pause at least 3.44 ms

SD1 = Start delimiter (start character) 1: Master → MOVIMOT®: 02_{hex}

SD2 = Start delimiter (start character) 2: MOVIMOT® → Master: $1D_{hex}$

ADR = Address 1 – 15
Group address 101 – 115
254 = Point-to-point
255 = Broadcast

TYPE = User data type

TYPE	Transfer variant	Process data length	User data
03_{hex}	Cyclical	2 words	Control word / Speed [%] Status word 1 / Output current
83_{hex}	Acyclical	2 words	
05_{hex}	Cyclical	3 words	Control word / Speed [%] / Ramp Status word 1 / Output current / Status word 2
85_{hex}	Acyclical	3 words	

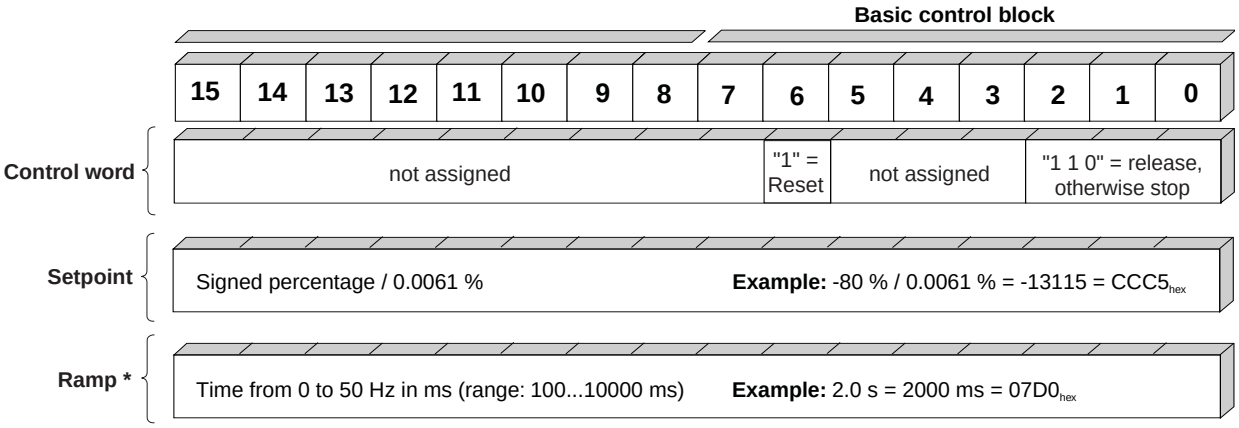
PDU = User data

BCC = Block check character: XOR all bytes

Note:

If the “cyclic” type is selected, MOVIMOT® expects the next bus activity after maximum one second (master protocol). If this bus activity is not detected, MOVIMOT® rests automatically (time-out monitoring).
There is no time-out monitoring if the “acyclical” type is selected.

User data master → Slave



* only with 3 word protocol

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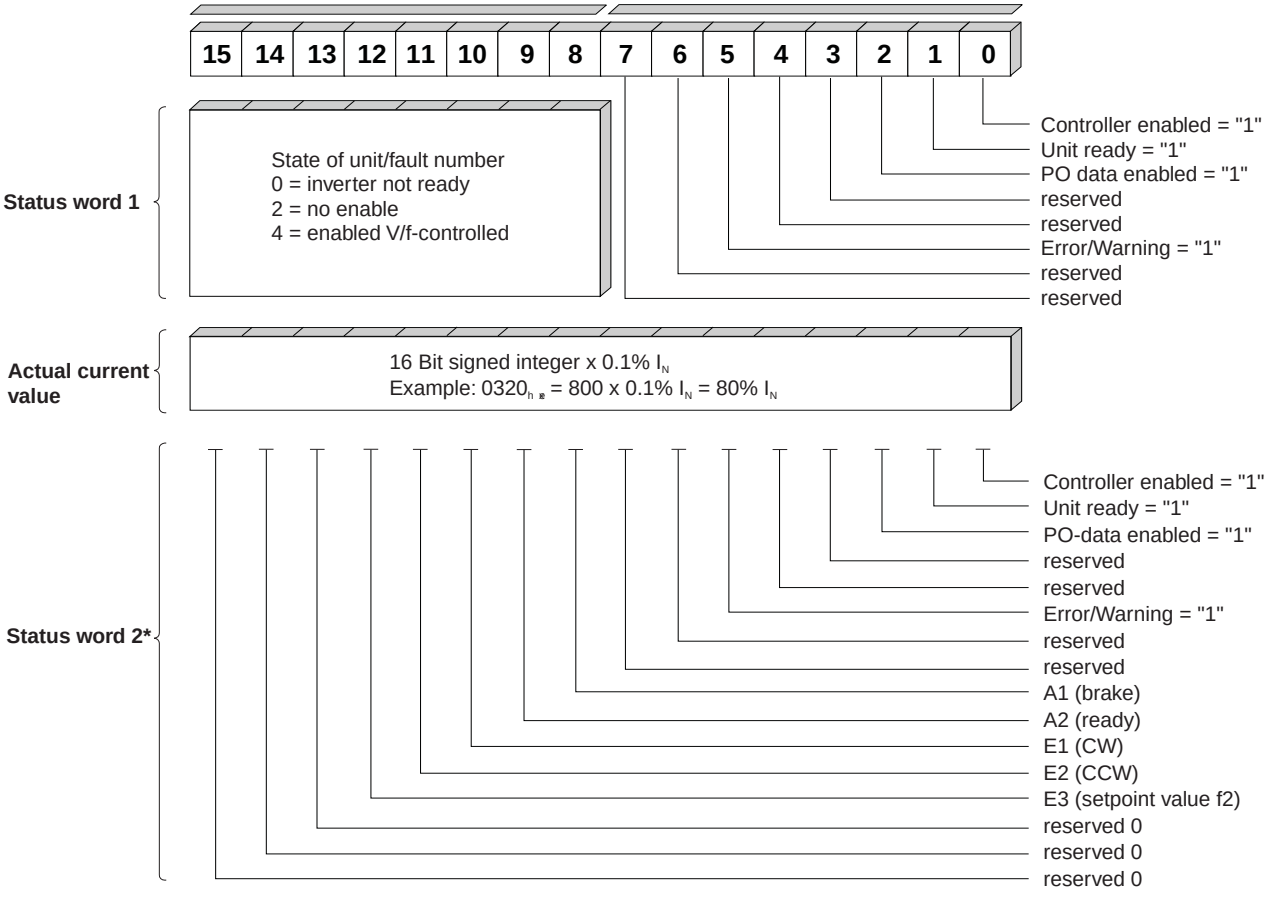
User data slave → Master



* (only with 3 word protocol)

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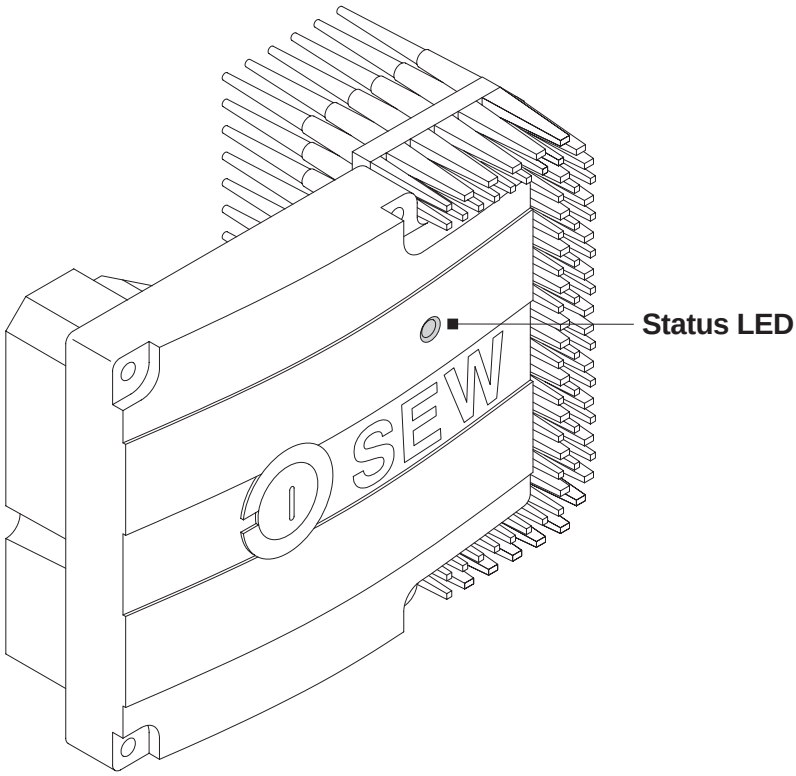
The following manuals provide more detailed information about startup with RS-485 bus operation and about the MOVILINK® unit profile: MOVIMOT® System Manual and MOVILINK® Unit Profile, Communication and Fieldbus Interfaces.

7 Operation and Service

7.1 Status LED



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7.2 Status LED messages

The 3-color LED indicates the operating and error states.

Color		Operational status	Description
-	Off	Not ready to operate	No 24 V power supply
Yellow	Steady flashing	Not ready to operate	Self-test phase active or 24 V power supply present but supply system voltage not OK
Yellow	Steady light	Ready to operate but unit blocked	24 V power supply and power system supply OK, but no enable signal
Green/ yellow	Flashing with alternating colors	Ready to operate but timeout	Communication via RS-485 interrupted
Green	Steady light	Unit enabled	Motor operating
Green	Steady, flashing rapidly	Current limit active	Drive has reached the current limit
Red	flashing twice, pause	Fault 07	DC link voltage too high
Red	flashing 3x, pause	Fault 11	Excessive temperature in output stage
Red	flashing 4x, pause	Fault 84	Excessive temperature in motor
Red	flashing 5x, pause	Fault 89	Excessive temperature in brake
Red	flashing 6x, pause	Fault 06	Mains phase fault

7.3 List of errors

Error codes can be evaluated by communicating with the external control using the MOVILINK® profile[1)] or by means of the status LED *(see page 26)*.

Errors	Cause/Remedy
Communication timeout[1)] (motor stops without error code)	**a) No connection ⊥, RS+, RS- between MOVIMOT® and RS-485 master.** Check the connection, in particular the ground, and repair.
	b) EMC effects Check the shielding of the data cables and improve if necessary.
	c) Incorrect type (cyclical) in acyclical protocol Time between the individual messages >1 s for protocol type "cyclical". Shorten message cycle or select "acyclical".
DC link voltage too low, supply system off detected (motor stops without error code)	Check supply system leads and supply voltage for interruption. Motor restarts automatically as soon as the supply voltage reaches normal values.
Error code 06 Phase fault	Check the supply system leads for phase fault. **Reset the fault by switching off the 24 V_{DC} supply voltage or use MOVILINK®**[1)]
Error code 07 DC link voltage too high	**a) Ramp time too short** → Increase ramp time
	b) Faulty connection between brake coil and braking resistor → Check connection between braking resistor and brake coil. Correct if necessary.
	c) Incorrect internal resistance brake coil / braking resistor → Check internal resistance of brake coil / braking resistor (see page 37)
	d) Thermal overload in braking resistor → Wrong size of braking resistor selected
	Reset error by switching off the 24 V_{DC} supply voltage or use MOVILINK®[1)]
Error code 11 Thermal overload of the output stage or internal unit fault	• Clean heat sink • Reduce ambient temperature • Prevent heat accumulation • Reduce load on drive **Reset error by switching off the 24 V_{DC} supply voltage or use MOVILINK®**[1)]
Error code 84 Thermal overload of motor	• Reduce ambient temperature • Prevent heat accumulation • Reduce load on the motor • Increase speed **Reset error by switching off the 24 V_{DC} supply voltage or use MOVILINK®**[1)]
Error code 89 Thermal overload of brake coil or brake coil defective	• Extend set ramp time • Inspect brake (See "Inspection and maintenance of the brake" on page 31) • Contact SEW service
	Reset error by switching off the 24 V_{DC} supply voltage or use MOVILINK®[1)]

1) See the "MOVILINK® Unit Profile, Communication and Fieldbus Interfaces" manual for detailed information about communication.

If you require assistance from our customer service staff, please state the following:

- Nameplate data
- Time and accompanying circumstances of error
- Type and extent of error
- Presumed cause

8 Inspection and Maintenance

Notes:

- **Only use genuine spare parts in accordance with the valid spare parts list!**
- **Important – Danger of burns: Motors can become very hot during operation!**
- **The IP enclosure of the housing must be maintained in order to ensure protection against explosions. It is therefore very important to make sure that the housing parts are assembled correctly in accordance with the spare parts list for all maintenance and inspection work. Elastomer and plastic seals must be replaced with genuine spare parts.**

8.1 Inspection and maintenance periods

Frequency	Unit/unit component	What to do?
depending on loading conditions: every 2 to 4 years (The wear periods are affected by many factors and may be short. Calculate the required inspection/maintenance intervals individually in accordance with the project planning documents.)	Brake	• Inspect the brake (working air gap, brake disk, pressure plate, carrier / gearing, pressure rings) • Remove abraded matter
every 10,000 hours of operation	Motor	• Inspect the motor (fit new ball bearings/oil seal) • Clean the cooling air passages
variable (depending on external factors)		• Touch up or renew the anticorrosion coating

Checks following maintenance or repair work

Perform a safety and functional check after all maintenance or repair work. This check should be the same as the functional check described for startup.

Perform another routine test prior to startup if you have replaced any parts on the motor which may affect its explosion-proof qualities.

8.2 Inspection and maintenance work on the motor

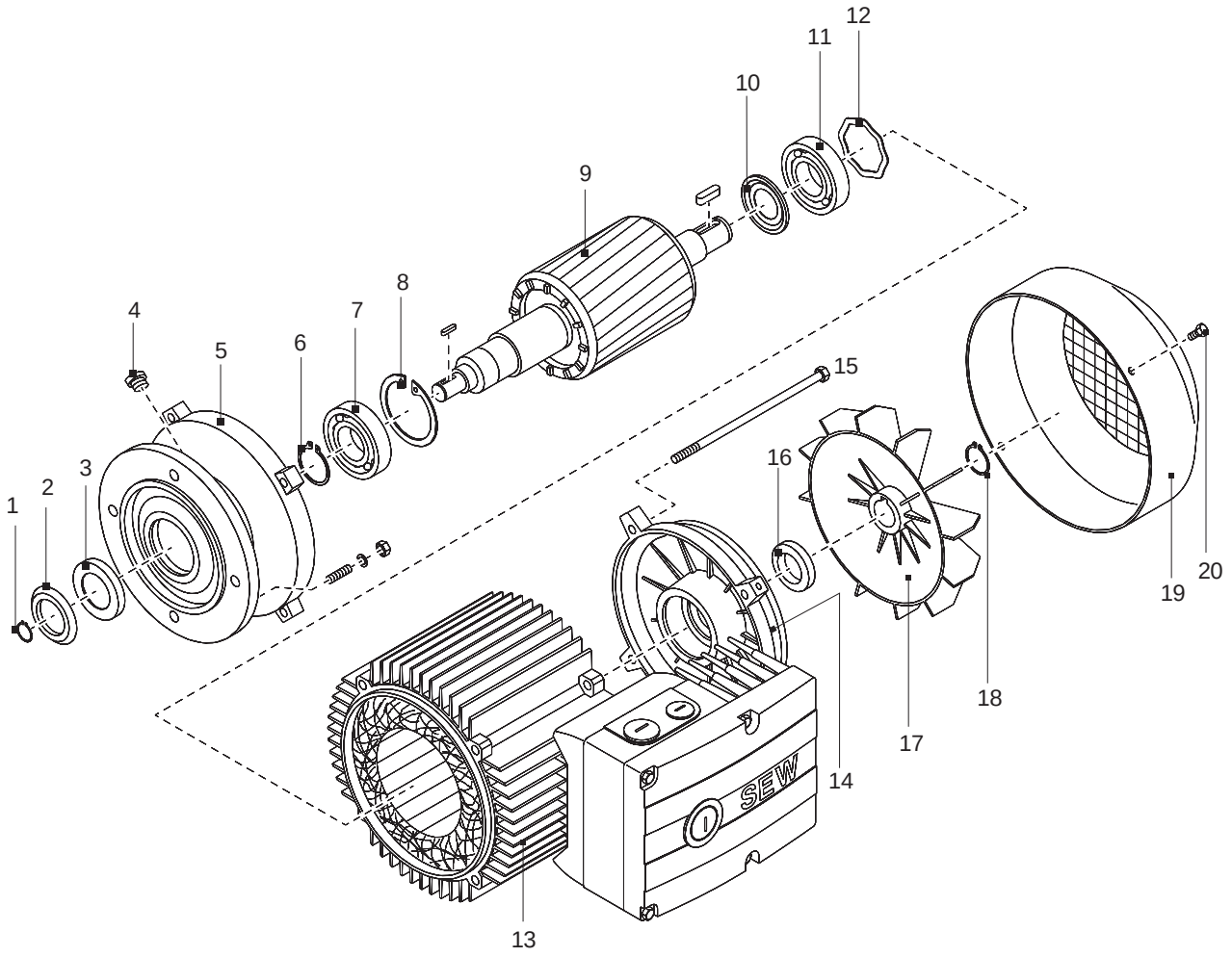

Fig. 3: Example: motor DFT.. MM..

1	Circlip	6	Circlip	12	Equalizing ring	17	Fan
2	Oil flinger	7	Ball bearing	13	Stator	18	Circlip
3	Oil seal	8	Circlip	14	Non-drive end bearing shield	19	Fan guard
4	Screw plug	9	Rotor	15	Hexagon screw	20	Housing screw
5	Drive end bearing shield	10	Nilos ring	16	V ring		
		11	Ball bearing				

Inspecting the motor
(Fig. 3)

1. **Important: Interrupt power supply to MOVIMOT®, safeguarding it against unintentional power-up.**
2. Remove proximity sensor NV16 / NV26 if fitted.
3. Remove the flange cover or fan guard (19).
4. Remove the hexagon head screws (15) from the drive end bearing shield (5) and the non-drive end bearing shield (14), release the stator (13) from the drive end bearing shield.
5. a) Motors with a brake:
   – open the terminal box cover, remove brake cable from terminals
   – push the non-drive end bearing shield and the brake off the stator and carefully lift them off (if necessary, run the brake cable along with trailing wire)
   b) Pull the stator back by approx. 3 to 4 cm.
6. Visual check:
   Are there traces of gear oil or condensation inside the stator?
   – no, continue with 9.
   – if there is moisture, continue with 7.
   – if there is gear oil, have the motor repaired by a specialist workshop
7. a) Geared motors: remove the motor from the gear unit.
   b) Motors without a gear unit: remove the drive end flange.
   c) Remove the rotor (9).
8. Clean the winding, dry it and check it electrically.
9. Fit new ball bearings (7, 11) (only use approved ball bearings see page 38).
10. Fit new oil seal (3) in the drive end bearing shield.
11. Reseal the stator seat, reassemble the motor, brake, etc.

Then check gear unit, if applicable *(see the gear unit operating instructions)*.

8.3 Inspection and maintenance of the brake

Parts of the brake are subject to wear during operation. As a result, regular inspection and maintenance are essential.

Using the brake as a working brake

If the brake is used as a working brake, the brake pad wear is the determining factor governing when to service the brake.
Do not allow the maximum permitted working air gap to be exceeded (see “Work done until adjustment, working air gap, braking torque of brake” on page 37). The inspection and maintenance intervals can be calculated on the basis of the work done by the brake in each braking operation and the entire work done until adjustment (see “Work done until adjustment, working air gap, braking torque of brake” on page 37).

To do this, please calculate the work done in each braking operation individually in accordance with the project planning documents. Check the brake at the latest when it has performed the amount of work until reset at which point an adjustment is due.

The following parts of the brake are subject to wear and should be replaced if necessary (see Fig. 4):

- Brake disk (7)
- Annular spring (6)
- Pressure plate (8)
- Pressure rings and counter springs (10 b, c)
- Brake springs (11)
- Also replace the self-locking hexagon nuts (10e) and the rubber sealing collar (5) after repeated disassembly/assembly.

Using the brake as a holding brake

Brakes used as holding brakes are only subject to a small amount of lining wear. However, their mechanical transmission elements must also be checked for wear.

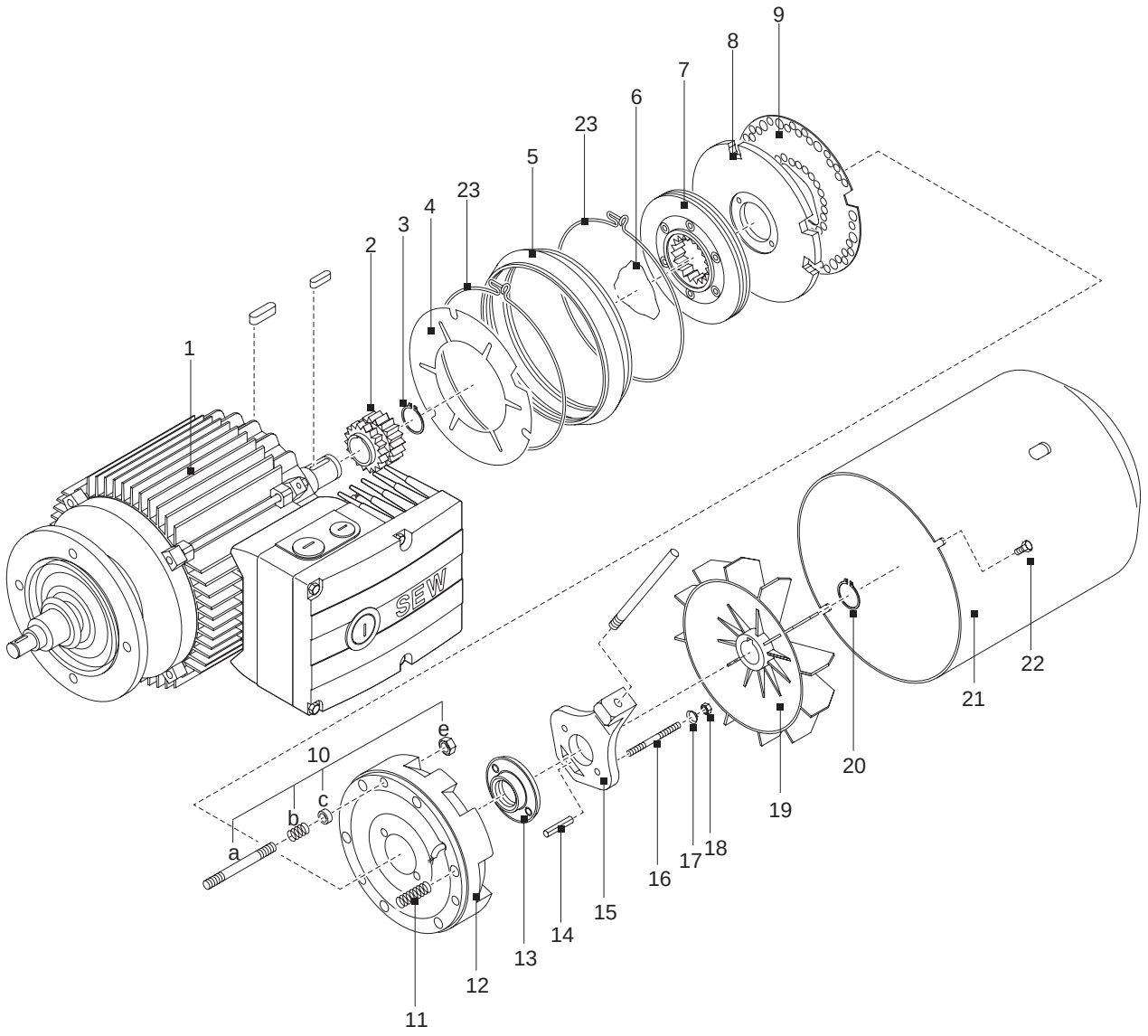

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Fig. 4: Type BMG 05 – BMG 4

1 Motor with brake bearing end shield
2 Carrier
3 Circlip
4 Niro disk (only BMG)
5 Rubber sealing collar
6 Annular spring
7 Brake disk
8 Pressure plate
9 Damping plate
10a Stud (3 pcs.)
10b Counter spring
10c Pressure ring
10e Hexagon nut
11 Brake spring
12 Brake coil body
13 Sealing washer
14 Dowel pin
15 Releasing lever with hand lever
16 Stud (2 pcs.)
17 Conical coil spring
18 Setting nut
19 Fan
20 Circlip
21 Fan guard
22 Housing screw
23 Clamping strap

Inspecting the brake
(Fig. 4 + Fig. 5)

Checking the brake disk

Setting the working air gap

1. **Interrupt MOVIMOT® power supply, safeguarding it against unintentional starting.**
2. Remove the following:
   – Proximity sensor NV16 / NV26, if fitted
   – Flange cover or fan guard (21)
3. Remove the clamping straps (23) and move the rubber sealing collar (5). Remove any abraded residue with vacuum.
4. Measure the brake disk (7):
   If the brake disk is ≤ 9 mm:
   Replace brake disk *(see page 34)*.
5. Measure the working air gap A *(see Fig. 5)*.
   – with feeler gauge at three points between thepressure plate and the damping plate (9)offset by approx. 120°.
6. Tighten the hexagon nuts (10e) until working air gap is set correctly *(see page 37)*.
7. Fit rubber sealing collar and clamping straps back in place and re-install removed parts.

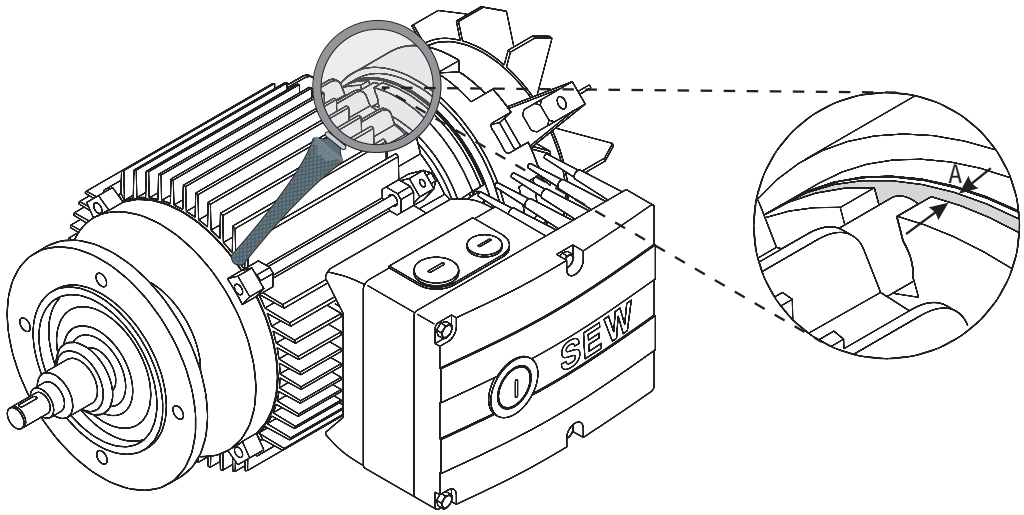

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Fig. 5: Measuring the working air gap

Installing new brake disk
(Fig. 4 + Fig. 5)

When installing a new brake disk, inspect the other removed parts as well and replace, if necessary.

1. **Interrupt power supply to MOVIMOT® unit, safeguarding it against unintentional starting.**
2. Remove the following:
   – proximity sensor NV16 / NV26, if fitted
   – flange cover or fan guard (21), circlip (20) and fan (19)
3. Remove the clamping straps (23) and rubber sealing collar (5).
   Remove the manual brake release: setting nuts (18), conical coil springs (17), studs (16), releasing lever (15), dowel pin (14).
4. Unscrew hexagon nuts (10e), carefully pull off the coil body (12) (brake cable!) and remove brake springs (11).
5. Remove the damping plate (9), pressure plate (8) and brake disk (7) and clean the brake components.
6. Install new brake disk.
7. Re-assemble the brake components (except for the rubber sealing collar, fan and fan guard).
   Set the working air gap *(see page 33 / points 5. to 7.)*.
8. For manual brake release (type HF or HR):
   Use setting nuts to set the floating clearance between the conical coil springs (pressed flat) and the setting nuts *(→ Fig. 6)*.

   Important: This floating clearance is necessary so that the pressure plate can move up as the brake lining wears.
9. Fit the rubber sealing collar and clamping straps back in place and re-install the dismantled parts.

Note:

The lockable manual brake release (type HF) has already been released if a resistance is encountered when operating the manual brake release screw.

The self-reengaging manual brake release (type HR) can be operated with normal hand pressure.

Important:

In brake motors with self-reengaging manual brake release, the manual brake release lever must be removed after startup/maintenance. A bracket is provided for storing it on the outside of the motor.

Brake	Floating clearance mm
BMG 05-1	1.5
BMG 2-BMG4	2

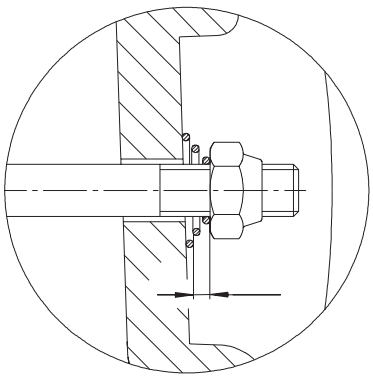

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Fig. 6

Changing the braking torque
(Fig. 4 + Fig. 5)

The braking torque can be altered in steps *(see page 37)*

- by installing different brake springs,
- by changing the number of brake springs.

1. **Interrupt power supply to MOVIMOT® unit, safeguarding it against unintentional start.**
2. Remove the following:
   – proximity sensor NV16 / NV26, if fitted
   – flange cover or fan guard (21), circlip (20) and fan (19)
3. Remove the clamping straps (23) and rubber sealing collar (5).
   Remove the manual brake release:
   setting nuts (18), conical coil springs (17), studs (16), releasing lever (15), dowel pin (14).
4. Unscrew the hexagon nuts (10e) and pull off the brake coil body (12) by about 50 mm (caution: brake cable!).
5. Replace or add brake springs (11).
   (Position the brake springs symmetrically.)
6. Re-assemble the brake components (except for the rubber sealing collar, fan and fan guard).
   Set the working air gap *(see page 33 / points 5. to 7.)*.
7. With manual brake release:
   Use setting nuts to set the floating clearance between the conical coil springs (pressed flat) and the releasing lever *(→ Fig. 6)*.

   Important: This floating clearance is necessary so that the pressure plate can move up as the brake lining wears.
8. Fit the rubber sealing collar back in place and re-install removed parts.

Note:
Install new setting nuts (18) and hexagon nuts (10e) if the removal procedure is repeated! (due to reduction in the self-locking effect of the nuts!)

9 Technical data (relating to 4 kHz PWM frequency)

9.1 MOVIMOT® in category 3D

MOVIMOT® type		MM 03B-503-04	MM 05B-503-04	MM 07B-503-04	MM 11B-503-04	MM 15B-503-04	MM22B-503-04	MM 30B-503-04
Output power	P_N	0.8 kVA	1.1 kVA	1.4 kVA	1.8 kVA	2.2 kVA	2.8 kVA	3.8 kVA
Connection voltages **Approved range**	V_{in}	**3 x 400 V_{AC}** / 415 V_{AC} / 460 V_{AC} V_{in} = 400 V_{AC} -5 %...460 V_{AC} +5 %						
Supply frequency	f_{in}	50 Hz – 60 Hz ±10 %						
Supply system rated current (at V_{in} = 400 V_{AC})	I_{in}	1.0 A_{AC}	1.3 A_{AC}	1.6 A_{AC}	1.9 A_{AC}	2.4 A_{AC}	3.5 A_{AC}	5.0 A_{AC}
Output voltage	U_A	0 – V_{in}						
Output frequency **Resolution** **Operating point**	f_A	2...100 Hz 0.01 Hz 400 V at 50 Hz / 100 Hz						
Rated output current	I_N	1.2 A_{AC}	1.6 A_{AC}	2.0 A_{AC}	2.5 A_{AC}	3.2 A_{AC}	4.0 A_{AC}	5.5 A_{AC}
Motor power	P_{mot}	**0.25 kW**	**0.37 kW**	**0.55 kW**	**0.75 kW**	**1.1 kW**	**1.5 kW**	**2.2 kW**
PWM frequency		**4**[1] / 8 / 12 / 16[2] kHz						
Current limitation	I_{max}	**Motor:** 160 % at ⋎, 150 % at Δ **Regenerative:** 160 % at ⋎, 150 % at Δ						
External braking resistor	R_{min}	**Not permitted**						
Interference immunity		Complies with EN 50082 – Parts 1+2						
Emitted interference		In accordance with limit value class A to EN 55011 and EN 55014, complies with EN 50081 – Part 2						
Ambient temperature	ϑ_{amb}	**-20 °C...+40 °C**						
Enclosure (select and specify with order)		IP54, IP55, IP65						
Operating mode		DB (EN 60149-1-1 and 1-3)						
Type of cooling (DIN 41 751)		Self-cooling						
Altitude		h ≤ 1000 m (P_N reduction: 1 % per 100 m up to max. 2000 m)						
Ext. power supply to control electronics	Tl. 24 V	V = +24 V ± 25 % I_E ≤ 250 mA						
Binary inputs		Isolated by opto-coupler, PLC-compatible (EN 61131-2) R_i ≈ 3.0 kΩ, I_E ≈10 mA, sampling interval ≤ 5 ms						
Signal level		13 V...+30 V = "1" = Contact closed -3 V...+5 V = "0" = Contact open						
Control functions	Tl. R ↷ Tl. L ↶ Tl.f1/f2	CW/STOP CCW/STOP "0" = Setpoint 1 / "1" = Setpoint 2						
Output relay **Contact data**	Tl. K1a Tl. K1b	Response time ≤ 10 ms 24 V_{DC} / 0.6 A_{DC} / DC11 to IEC 337-1						
Signaling function		Normally open contact for ready signal						
Serial interface	Tl. RS + Tl. RS -	RS-485 (to EIA standard) Max. 32 stations (1 bus master[3] + 31 MOVIMOT® units) Max. cable length: 200 m (for transmission rate: 9600 baud) 30 m (for transmission rate: 31250 baud [4])						

1) Factory setting
2) **16 kHz PWM frequency (low-noise)**
When **DIP SWITCH S1/7 = ON**, the units operate with a 16 kHz PWM frequency (low noise) and switch back in steps to lower pulse frequencies depending on the heat sink temperature.
3) Ext. control or option MLA12A
4) Transmission rate of 31250 baud is set automatically for operation with the MLA12A option.

9.2 Technical data MLA12A option

MLA12A			
Part number		823 186 9	
Input voltage		X9 / X10	380...500 V_{AC} ±10 %
Output voltage		X6	24 V_{DC} ±25 % (max. 200 mA)
		X5	0 V reference potential
Terminals		Tl. 1	PE
	Analog input:	Tl. 2 / tl. 3	0...20 mA
		Tl. 4	⊥ Reference ground for analog input
Serial interface		X7 / X8	RS-485 (to EIA standard) Transmission rate: 9600 / 31250 baud
Enclosure		IP65	

9.3 Regenerative load capacity of brake coil

Load capacity for	Brake coil BMG05/1 (DT71/DT80)	Brake coil BMG2 (DT90)	Brake coil BMG4 (DT 100)
100 % cdf	30 W	57 W	70 W
50 % cdf	39 W	88 W	105 W
25 % cdf	56 W	150 W	175 W
12 % cdf	90 W	270 W	330 W
6 % cdf	150 W	480 W	620 W

9.4 Work done until adjustment, working air gap, braking torque of brake

Brake type	For motor size	Work done until adjustment [10^6 J]	Working air gap, mm		Braking torque settings					Resistance Brake[1)]
			min.[2)]	max.	Braking torque [Nm]	Type and number of springs		Order numbers of springs		
						Normal	Red	Normal	Red	
BMG 05	**DT 71**	60	0.25	0.6	5.0 4.0 2.5 1.6 1.2	3 2 - - -	- 2 6 4 3	135 017 X	135 018 8	277 Ω (230V)
BMG 1	**DT 80**	60			10 7.5 6.0	6 4 3	- 2 3			248 Ω (230V)
BMG 2	**DT 90**	130			20 16 10 6.6 5.0	3 2 - - -	- 2 6 4 3	135 150 8	135 151 6	216 Ω (230V)
BMG 4	**DT 100**	130			10 30 24	6 4 3	- 2 3			43.5 Ω (110V)

1) Rated value measured between the red connection (terminal 13) and the blue connection (terminal 15) at 20 °C, temperature-dependent fluctuations in the range of -25 % / +40 % are possible.
2) **Please note when checking the working air gap:**
Parallelism tolerances on the brake disk may give rise to deviations of ±0.1 mm after a test run.

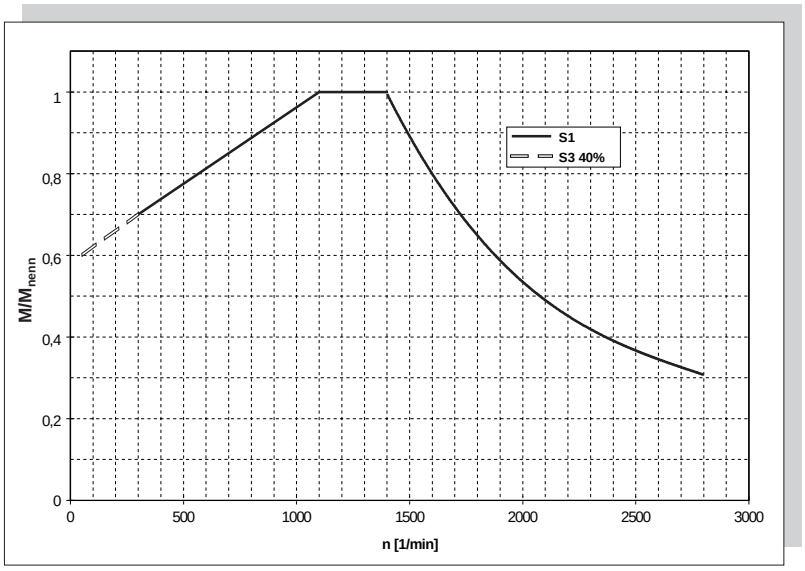
9.5 Approved ball bearing types

Motor type	Drive end bearing (AC motor, brake motor)			Non-drive end bearing (foot-mounted, flange-mounted, geared motors)	
	Flange-mounted motor	Geared motor	Foot-mounted motor	AC motor	Brake motor
DT 71-80	6204-Z-J	6303-Z-J	6204-Z-J	6203-J	6203-RS-J-C3
DT 90-100	6306-Z-J-C3			6205-J	6205-RS-J-C3

9.6 Operating characteristics

- The operating characteristics provide information about the torque values with which MOVIMOT® units may be loaded depending on the speed.
- **Exceeding these values over long periods gives rise to impermissible heat.**
- Brief periods above this value are permitted.

50 Hz ⅄



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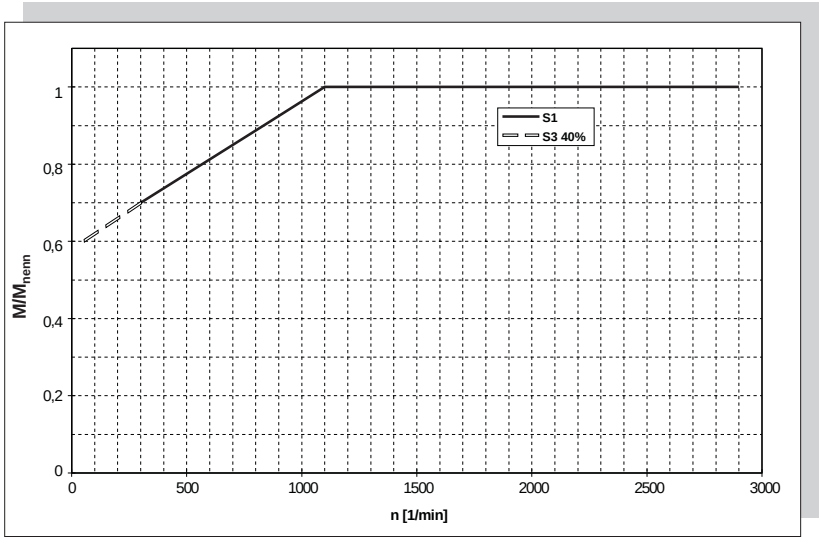
100 Hz △



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9.7 Declaration by the manufacturer

TÜV CERT DIN EN ISO 9001

SEW EURODRIVE

SEW-EURODRIVE GmbH & Co
Ernst-Blickle-Str. 42
D-76646 Bruchsal

Herstellererklärung
Manufacturer's Declaration

(im Sinne der EG-Richtlinie 94/9/EG, Anhang VIII)
(according to EC Directive 94/9/EC, Appendix VIII)

SEW-EURODRIVE erklärt in alleiniger Verantwortung, dass der MOVIMOT der Baureihe B, in Verbindung mit SEW Motoren und Bremsmotoren, in der Kategorie 3D, auf die sich diese Erklärung bezieht, mit der

EG Richtlinie 94/9/EG

übereinstimmt.

SEW-EURODRIVE hereby certifies, with sole responsibility, that the Series B MOVIMOT, in conjunction with SEW motors and brake motors in category 3D, to which this declaration refers, complies with the requirements of the

EC Directive 94/9/EC.

Angewandte harmonisierte Normen: **EN 50 014; EN 50 281-1-1**
Applicable harmonised standards: ***EN 50 014; EN 50 281-1-1***

SEW-EURODRIVE hält folgende technische Dokumentationen zur Einsicht bereit:
SEW-EURODRIVE has the following documentation available for inspection:

- vorschriftsmäßige Bedienungsanleitung
- *Installation and Operating Instructions in conformance with applicable regulations*
- techn. Bauunterlagen
- *Technical Design Documentation*

SEW-EURODRIVE GmbH & Co

Bruchsal, den 11.08.99

Ort und Datum der Ausstellung
Place an date of issue

i.V.

Funktion: Leiter Entwicklung Elektromotoren
Function: Head of Development, Electrical Motors

i.V.

Funktion: Leiter Entwicklung Elektronik
Function: Head of Development, Electronics

Herstellererklärunge.doc

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SEW-EURODRIVE GmbH & Co · P.O.Box 30 23 · D-76642 Bruchsal/Germany
Tel. +49-7251-75-0 · Fax +49-7251-75-19 70 · Telex 7 822 391
http://www.SEW-EURODRIVE.com · sew@sew-eurodrive.com