### 9.1.3 Unit status

*9702.2 Axis status*

Value range:

- 0 = Not ready
- 1 = Ready, output stage inhibited
- 2 = Ready, output stage enabled

Displays axis status.

*9702.3 Current FCB*

Displays currently active FCB.

*9702.6 Current FCB instance*

Displays the currently active FCB instance.

The following FCBs offer more than one instance:

- FCB09 Positioning (64 instances)
- FCB05 Speed control
- FCB Torque control

*9702.4 Active parameter set*

Displays current parameter set 1 – 3.

*9873.1 Active factory setting*

Value range:

- 0 = No factory setting (cannot be selected via parameter tree)
- 1 = Basic initialization
- 2 = Delivery state
- 3 = Factory setting
- 4 = Customer set 1
- 5 = Customer set 2

This parameter indicates whether and what type of initialization is currently active.

For a description of the individual initialization options, see section "Unit Functions / Setup" (page 400).

*9702.1 Status display*

- Bit 0 Output stage enabled

  "Output stage enabled" is a subset of "Ready for operation" which is set to "1" in all FCBs except for *FCB 01 Output stage* inhibit.

- Bit 1 Ready

  0 signal: The axis is currently not ready for operation. Reasons can be error states or operating states outside FCB processing (supply voltage off, supply module not ready). All errors are "locked" in the final state.

  1 signal: The axis is in FCB processing. If no FCB is selected, the default *FCB 13 Stop at application limits* will become active. The 7-segment display will show the number "13". The "ready" signal alone does not indicate that the axis module is error-free. The signals refers to the module itself. For example: When a drive is located at the limit switch, the axis module signals "ready" although an error is present.

All errors are "locked" in the final state. See also the operating instructions "MOVIAXIS® MX Multi-Axis Servo Inverters", chapter "Operating Displays and Errors".

- Bit 2 Setpoints active

  This signal is active in all setpoint processing FCBs when setpoints are being processed. This is FCB 05 – FCB 10. The signal is set to "0" in all stop FCBs as well as in the default FCB.

  The signal is still 0 during the brake release time.

- Bit 5 Error response display only

  This signal is a subset of "Fault" and displays error responses that are configured to "Display fault". The drive continuous to operate normally.

- Bit 6 Error response is not equal to output stage inhibit

  This signal is a subset of "Fault" and indicates that the drive can be decelerated using a ramp (motor does not coast to a halt / mechanical brake is not applied). This bit is also set when "Signal displayed error".

- Bit 7 Error response output stage inhibit

  This signal is a subset of "Fault" and indicates that the motor coasts to a halt or, if installed, the mechanical brake is applied.

- Bit 8 24 V standby mode

  Is set when the power supply is removed.

  The threshold for this is a parameterizable DC link voltage. See parameter *9617.7 DC link voltage - one level default* and subsequent.

- Bit 9 Supply module not ready for operation.

  If the supply module does not send a ready signal, e.g. due to brake resistor overload or supply system undervoltage.

- Bit 10 Axis module not ready

  This parameter is a subset of "Bit 1 Ready" and refers only to the axis module.

- Bit 11 STO Safe Torque Off 1

  Indicates whether a safety relay 1 has detected a safe stop. Only active in conjunction with optional safety relays (device type MXA81A - or MXA82A -..).

- Bit 12 STO Safe Torque Off 2

  Indicates whether a safety relay 2 has detected a safe stop. Only active in conjunction with two optional safety relays (MXA82A -..).

- Bit 13 Process data not ready "C3"

  Is displayed when one of the 16 "In buffers" is set to communication and the corresponding PDO has never been received. This signal is not generated any longer once the PDO was received once. Instead, a timeout error is generated when the communication is disconnected.

- Bit 19 Encoder not ready

  Displays whether the encoder is communicating. No communication means the encoder or wiring might be defective or that motor startup was not executed.

- Bit 20 Parameter download active

  Indicates whether parameters are currently being downloaded.

- Bit 22 Synchronization missing

  If a synchronization source is set in parameter *9836.1 Synchronization source*, but the synchronization signal has not been received yet after a reboot.

- Bit 30 Line voltage on

  Shows whether the supply voltage is present at the supply module.

  - Line voltage present = TRUE
  - Line voltage not present = FALSE

  You can parameterize how fast a power failure is detected. See parameter *9746.1 Power off response*.

- Bit 31 Line voltage off

  Shows whether the supply voltage is present at the supply module.

  - Line voltage present = FALSE
  - Line voltage not present = TRUE

  You can parameterize how fast a power failure is detected. See parameter *9746.1 Power off response*.

*9950.1 Error end status*

Displays the currently pending error status:

- Bit 0 Displaying

  The axis only displays the error in the 7-segment display. The axis continues to run in normal operation.

- Bit 1 Waiting

  The axis waits for a manual reset. The error is reset and operation is continued without boot reset of the firmware.

- Bit 2 Locked

  The axis waits for a manual reset. The axis then reboots (like when it is switched on).

*9702.5 Error code*

Displays the pending error code. See also list of faults in the MOVIAXIS® operating instructions.

*10071.1 Suberror code*

Displays the pending suberror code. See also list of faults in the MOVIAXIS® operating instructions.

*8617.0 Manual reset*

Value range:

- 0 = No
- 1 = Yes

Manual reset to reset the error.

### 9.1.4 Unit data

*9701.1 – 5 Axis type*

Displays the order designation of the unit, e.g. MXA-80A-004-503-00.

*9701.10 Unit series*

Displays the unit series, e.g. MOVIAXIS®.

*9701.11 Unit variant*

Displays the unit variant.

*9701.13 Nominal unit voltage*

Unit: mV

Value range: 0 – 2000000, step 1

Displays the nominal unit voltage.

*9701.14 Number of input phases*

Value range:

- 1 = Single-phase
- 3 = Three phase

Displays the number of input phases.

*9701.15 Radio interference suppression on mains end*

Value range:

- 1 = none
- 2 = A
- 3 = B

Displays the implemented radio interference suppression compliant with the EMC product standard EN 61800-3.

*9617.1 Maximum possible output speed*

Unit: $10^{-3}$/min

Value range: 0 – 1000000, step 1

Maximum possible output speed that the axis module can control.

*9617.6 Nominal unit current*

Unit: mA

Value range: 0 – 30000 – 1000000, step 1

Nominal unit current, r.m.s. value.

*9617.2 Maximum output current*

Unit: mA

Value range: 0 – 12000 – 1000000, step 1

Maximum possible output current, r.m.s. value.

*9701.17 Standard encoder system*

Value range:

- 13 = Hiperface®/resolver

Displays the SEW standard encoder for the unit.

*9701.18 Device serial number*

Value range: 0 – 4294967295, step 1

Displays the serial number.

| | |
|---|---|
| *9823.1 – 5 Unit signature* | Display and entry of the unit signature. You can assign a name to the device to have it displayed in the hardware tree and the visualization components. |
| *9701.30 Firmware part number basic unit* | Displays the firmware part number of the basic unit. |
| *9701.31 Firmware status basic unit* | Displays the firmware status of the basic unit. |
| *9701.32 Firmware version number basic unit* | Displays the firmware version number of the basic unit. |
| *9880.3 Initial boot loader part number* | Value range: 0 – 4294967295, step 1<br>Initial boot loader part number. |
| *9880.5 Initial boot loader status* | Value range: 0 – 4294967295, step 1<br>Initial boot loader status. |
| *9881.3 Boot loader part number* | Value range: 0 – 4294967295, step 1<br>Bootloader part number. |
| *9881.5 Boot loader status* | Value range: 0 – 4294967295, step 1<br>Boot loader status. |
| *9701.33 DSP firmware part number* | Value range: 0 – 4294967295, step 1<br>DSP firmware part number. |
| *9701.34 DSP firmware status* | Value range: 0 – 4294967295, step 1<br>DSP firmware status. |
| *9701.35 DSP firmware version number* | Value range: 0 – 4294967295, step 1<br>DSP firmware version number. |
| *9701.37 FPGA status* | Value range: 0 – 4294967295, step 1<br>FPGA firmware status. |

*9701.38 FPGA status*

Value range: 0 – 4294967295, step 1

FPGA firmware status.

*9701.41 Signal electronics*

Value range: 0 – 4294967295, step 1

Hardware status (computer card).

*9701.50 Option in slot 1*

Value range:

- 0 = No option
- 1 = Unknown option
- 2 = XIO11A (Digital I/O)
- 3 = XIA11A (Analog-Digital I/O)
- 4 = XHE41A (Plug-in control)
- 5 = XHC41A (Plug-in control)
- 6 = XHA41A (Plug-in control)
- 7 = XGS11A (Multi-encoder card)
- 8 = XGH11A (Multi-encoder card)
- 9 = XFE24A (EtherCAT card)
- 13 = XFA11A (K-Net)

*9701.60 Option in slot 2*

Value range:

See parameter *9701.50 "Option in slot 1"* (page 246).

*9701.70 Option in slot 3*

Value range:

See parameter *9701.50 "Option in slot 1"* (page 246).

*9701.53 Option in slot 1, firmware part number*

Displays firmware part number of option 1.

*9701.63 Option in slot 2, firmware part number*

Displays firmware part number of option 2.

*9701.73 Option in slot 3, firmware part number*

Displays firmware part number of option 3.

*9701.54 Option in slot 1, firmware status*

Displays firmware status of option 1.

*9701.64 Option in slot 2, firmware status* Displays firmware status of option 2.

*9701.74 Option in slot 3, firmware status* Displays firmware status of option 3.

### 9.1.5 Unit nameplate

The electronic motor nameplate with the corresponding motor data is supported.

*9701.110 Status 1* Delivery state unit status field 1: Unit firmware.

*9701.111 Status 2* Delivery state unit status field 2: FPGA/DSP firmware.

*9701.113 Status 4* Delivery state unit status field 4: Control electronics.

*9701.114 Status 5* Delivery state unit status field 5: Power section.

*9701.115 Status 6* Delivery state unit status field 6: Switched-mode power supply.

*9701.116 Status 7* Delivery state unit status field 7: Attenuation.

*9701.117 Status 8* Delivery state unit status field 8: Safe technology.

*9701.118 Status 9* Delivery state unit status field 9: Reserve.

*9701.125 Option 1 software status* Delivery state option 1: Status field 1 software.

*9701.126 Option 1 hardware status* Delivery state option 1: Status field 2 hardware.

*9701.135 Option 2 software status* Delivery state option 2: Status field 1 software.

*9701.136 Option 2 hardware status* Delivery state option 2: Status field 2 hardware.

*9701.145 Option 3 software status* Delivery state option 3: Status field 1 software.

*9701.146 Option 3 hardware status* Delivery state option 3: Status field 2 hardware.

*9701.155 Option 4 software status* Delivery state option 4: Status field 1 software.

*9701.156 Option 4 hardware status* Delivery state option 4: Status field 2 hardware.

*9701.165 Option 5 software status* Delivery state option 5: Status field 1 software.

*9701.166 Option 5 hardware status* Delivery state option 5: Status field 2 hardware.

### 9.1.6 Error history 0 – 5

MOVIAXIS® stores the last 6 error states in a ring memory. A certain number of parameters are "frozen" here. Parameter *9626.1 Pointer to error memory t0 – t5* (page 248) points to the last error saved. Another index range is described each time an error is saved.

The parameter tree adapts the interface so that the error ring memory 0 – 5 is always sorted chronologically. Error ring memory 0 is the last one saved.

Error memory t5 is described below.

*9626.1 Error memory pointer* Value range: 0 – 5, step 1

Pointer to error memory t0 – t5.

*9628.1 Inputs* Value range: 0 – 4294967295, step 1

Displays binary inputs of basic unit t5.

*9630.1 Outputs* Value range: 0 – 4294967295, step 1

Displays binary outputs of basic unit t5.

*9629.1 Inputs* Value range: 0 – 4294967295, step 1

Displays binary inputs of option 1 t5.

*9631.1 Outputs* Value range: 0 – 4294967295, step 1

Displays binary outputs option 1 t5.

*9629.2 Inputs* Value range: 0 – 4294967295, step 1

Displays binary inputs of option 2 t5.

*9631.2 Outputs* Value range: 0 – 4294967295, step 1

Displays binary outputs option 2 t5.

*9508.1 Resolution* Value range: 0 – 4294967295, step 1

User-defined unit position resolution t5.

*9509.10 Denominator* Value range: 0 – 4294967295, step 1

User-defined unit position denominator t5.

*9509.1 Numerator*
Value range: 0 – 4294967295, step 1
User-defined unit position numerator t5.

*9507.50 Position*
Value range: 0 – 4294967295, step 1
User-defined unit position t5.

*9502.1 Resolution*
Value range: 0 – 4294967295, step 1
User-defined unit speed resolution t5.

*9503.10 Denominator*
Value range: 0 – 4294967295, step 1
User-defined unit speed denominator t5.

*9503.1 Numerator*
Value range: 0 – 4294967295, step 1
User-defined unit speed numerator t5.

*9501.50 Velocity*
Value range: 0 – 4294967295, step 1
User-defined unit speed characters 0 – 3 t5.

*9501.51 Velocity*
Value range: 0 – 4294967295, step 1
User-defined unit speed characters 4 – 7 t5.

*9501.52 Velocity*
Value range: 0 – 4294967295, step 1
User-defined unit speed characters 8 – 11 t5.

*9501.53 Velocity*
Value range: 0 – 4294967295, step 1
User-defined unit speed characters 12 – 15 t5.

*9812.1 Rel.*
Unit: %
Resolution: $10^{-3}$
Value range: 0 – 300000, step 1
Dynamic utilization relative t5.

*9623.1 Abs.*
Unit: %
Resolution: $10^{-3}$
Value range: 0 – 300000, step 1
Dynamic utilization absolute t5.

*10069.1 Model*
Unit: %
Resolution: $10^{-3}$
Value range: 0 – 300000, step 1
Motor utilization current motor model t5.

*9538.1 KTY*
Unit: %
Resolution: $10^{-3}$
Value range: 0 – 300000, step 1
Motor utilization current motor KTY t5.

*9622.1 Heat exchanger*
Unit: %
Resolution: $10^{-3}$
Value range: 0 – 300000, step 1
Cooling unit utilization t5.

*9624.1 Thermal*
Unit: %
Resolution: $10^{-3}$
Value range: 0 – 300000, step 1
Thermal utilization t5.

*9635.1 Device*
Unit: %
Resolution: $10^{-3}$
Value range: 0 – 300000, step 1
Unit utilization t5.

*9627.1 Error*
Value range: 0 – 99, step 1
Display error code t5.

*10072.1 Suberror*
Value range: 0 – 32767, step 1
Suberror code t5.

*9636.1 DC link voltage*
Unit: mV
Value range: 0 – 1000000, step 1
DC link voltage t5.

*9505.1 Output voltage*
Unit: mV
Value range: 0 – 1000000, step 1
Output voltage t5.

*9500.6 Actual speed*
Unit: $10^{-3}$/min
Value range: -11000000 – 11000000, step 1
Displays actual velocity current parameter set in t5.

*10070.1 Model*
Unit: °C
Resolution: $10^{-3}$
Value range: -2147483648 – 0 – 2147483647, step 1
Motor temperature current motor model t5.

*9545.1 KTY*

Unit: °C

Resolution: $10^{-3}$

Value range: -2147483648 – 0 – 2147483647, step 1

Motor temperature current motor KTY t5.

*9505.30 ON hours*

Unit: h

Resolution: $10^{-2}$

The ON hours are recorded every minute as long as the 24 V control voltage is present and then stored in a non-volatile memory. The quantification in minutes means that a maximum of one minute of ON hours can be lost in case the unit is switched off or rebooted as error acknowledgement.

The value is displayed in hours with 2 decimal places. The ON hours are reset via the parameter *8596.0 Reset statistics data* or *9727.3 Delivery status*.

When an axis error occurs, the ON hours are written to the error memory (see error memory parameter) to better diagnose the time at which the error occurred.

For more thorough SEW internal diagnostics, there is an additional ON hours counter that cannot be reset.

*9505.40 Enable hours*

Unit: h

Resolution: $10^{-2}$

In contrast to the ON hours, the enable hours are counted only when the output stage is active. This is based on the status parameter *9702.1 Bit 0 output stage enabled*.

The enable hours are recorded every minute and stored in a non-volatile memory. The quantification in minutes means that a maximum of one minute of enable hours can be lost in case the unit is switched off or rebooted as error acknowledgement.

The value is displayed in hours with 2 decimal places. The enable hours are reset via the parameter *8596.0 Reset statistics data* or *9727.3 Delivery status*.

When an axis error occurs, the enable hours are written to the error memory (see *error memory* parameter) to better diagnose the time at which the error occurred.

*9632.1 Unit status*

Value range: 0 – 4294967295, step 1

Displays unit status t5.

*9506.6 Actual position*

Unit: U

Resolution: 1/65536

Value range: -2147483648 – 0 – 2147483647, step 1

Actual position t5.

*9633.1 Output current*

Unit: % nominal axis current
Resolution: $10^{-3}$
Value range: 0 – 300000, step 1
Output current t5.

*9852.1 Phase failure detection*

Value range: see index 8617.0 (page 409).
Line phase failure t5.

*9504.1 Frequency*

Unit: Hz
Resolution: $10^{-3}$
Value range: 0 – 1000000, step 1
Frequency t5.

*9634.1 Active current*

Unit: % nominal axis current
Resolution: $10^{-3}$
Value range: 0 – 300000, step 1
Active current t5.

## 9.2 Parameter description of drive data

| | INFORMATION |
|---|---|
| | Sections and chapters that contain "P1 / P2 / P3" apply to all 3 parameter sets. |

MOVIAXIS® operates with the CFC control mode for asynchronous and synchronous motors with encoder feedback. MOVIAXIS® can be operated in the basic control types torque, speed and position control. This means that the customer can activate closed-loop control circuits where they are most suitable for the application. MOVIAXIS® can be implemented in a wide range of applications and, in many cases, can take on all the tasks of a motion controller.

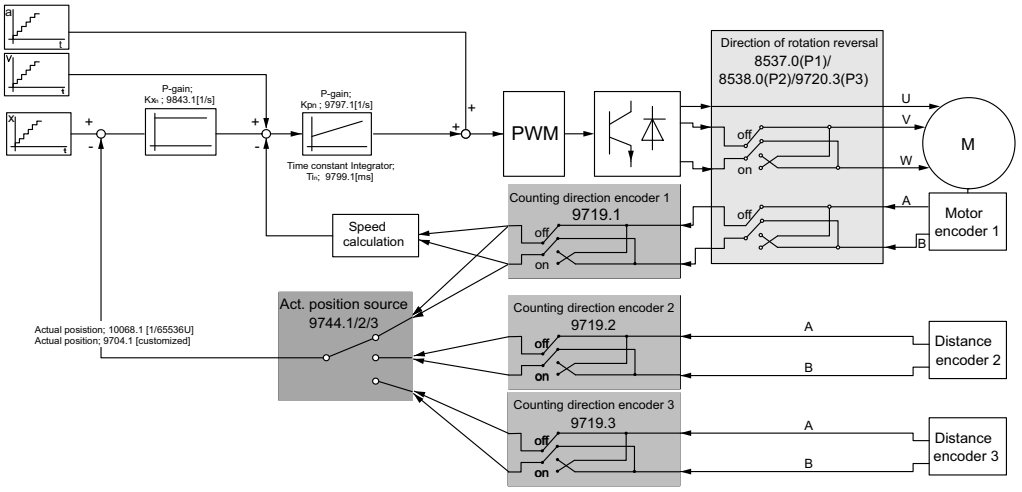
### 9.2.1 Controller parameter P1 / P2 / P3

*8537.0 / 8538.0 / 9720.0 Direction of rotation reversal*

Value range:

- 0 = Off
- 1 = On

Direction of rotation reversal P1.

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The SEW-EURODRIVE standard defines that the motor rotates in clockwise direction (right) when the speed is positive and with increasing positions when viewed onto the motor shaft. Reversing the direction of rotation changes the sense of rotation of the motor without having to reverse the setpoint. Activating a reversal of the direction of rotation will invert the direction of rotation of the motor phases and encoder evaluation.

| Direction of rotation reversal | Speed setpoint | Direction of rotation motor shaft (looking onto the drive-end bearing shield) | Position | Actual speed value | Actual acceleration value |
|---|---|---|---|---|---|
| 0=Off; standard | Positive | Clockwise, "right" | increases | Positive | Derived from the actual speed value |
| | Negative | Counterclockwise, "left" | Decreases | Negative | Derived from the actual speed value |
| 1=On; inverted | Positive | Counterclockwise, "left" | increases | Positive | Derived from the actual speed value |
| | Negative | Clockwise, "right" | Decreases | Negative | Derived from the actual speed value |

The assignment of limit switches to the system is maintained.

When using this parameter, it is important to carefully check that the limit switch is connected properly and the reference point and travel positions are defined correctly.

*Direction of rotation reversal and limit switch evaluation*

Example: **Reversal of direction of rotation 8537.0=0 (off) (page 253)**

When the motor turns in **clockwise** direction, the drive will be properly stopped once it hits the **positive** limit switch. If it reaches the negative limit switch, the drive will respond with error code "27" (limit switches reversed).

Example: **Reversal of direction of rotation 8537.0=1 (ON) (page 253)**

When the motor turns in **counterclockwise** direction, the drive will be properly stopped once it hits the **positive** limit switch. If it reaches the negative limit switch, the drive will respond with error code "27" (limit switches reversed).

Do not mistake the parameter "**Direction of rotation reversal P1; P8537.0 (page 253)**" for the parameter "**Counting direction encoder 1; P9719.1** (page 341)", see the "Encoders" chapter.

*Current controller*

*9813.1 Activate I×t current reduction*

Value range:

- 0 = Off
- 1 = On

The parameter cannot be edited in the parameter tree.

A current limit is set using the parameter setting "On" to ensure reliable operation of the axes even in the case of an overload.

The switch is only implemented in "Controller inhibit active" status.

| Function | Feature | Consistency |
|---|---|---|
| "On" default setting | Current is reduced before heat sink or power semiconductor triggers shutdown. Maximum available current < 250%. | Possibility of compensating load peaks that occur once.<br>Might trigger subsequent errors because the required torque is not delivered any longer (e.g. lag error). |
| "Off" | Maximum available current = 250% | Immediate shutdown in the event of overload (results in controller inhibit).<br>The entire device performance can be utilized. |

*9748.1 / 9748.2 / 9748.3 PWM frequency*

Value range:

- 0 = 4 kHz
- 1 = 8 kHz
- 2 = 16 kHz

PWM frequency P1 / P2 / P3

The **PWM frequency** is used to set the switching frequency at the inverter output. The cycle frequency is set to a fixed value and is not automatically reduced with high unit utilization.

A smaller modulation frequency reduces the switching losses in the output stage and, consequently, unit utilization. The motor noise, however, will increase.

*Control structures*

The FCBs use different control structures.

The following table gives an overview of control structures activated by the FCBs.

| FCB No. | Name | Torque control "MXDrehmomentStromreglerV1_5.vsd" | Speed control | Position control | External profile generation | Internal profile generation |
|---|---|---|---|---|---|---|
| 0 | No function block selected (starts FCB 13) | | X | | | |
| 1 | Controller inhibit | Controller inhibited | | | | |
| 5 | Speed control | | X | | | Var1+4 |
| 6 | Speed control, interpolated | | X | | Var1+4 | |
| 7 | Torque control | X | | | | Var 4 |
| 8 | Torque control, interpolated | X | | | Var4 | |
| 9 | Positioning | | | X | | Var2+4 |
| 10 | Positioning, interpolated | | | X | Var2+4 | |
| 12 | Referencing | | Referencing | Basic setting | | |
| 13 | Stop (application limits) | | X | | | Var1+4 |
| 14 | Stop (emergency stop limit) | | X | | | Var1+4 |
| 15 | Stop (system limits | | X | | | Var1+4 |
| 16 | Electronic cam | | | X | | Var2+4 |
| 17 | Sychronous operation | | | X | | Var2+4 |
| 18 | Encoder adjustment | Current control | | | | |
| 19 | Hold control | | Stop | Hold | | |
| 20 | Jog | | | X | | Var2+4 |
| 21 | Brake test | Mode 1 | | Modes 2-4 | | |
| 22 | Double drive | | X | | | |

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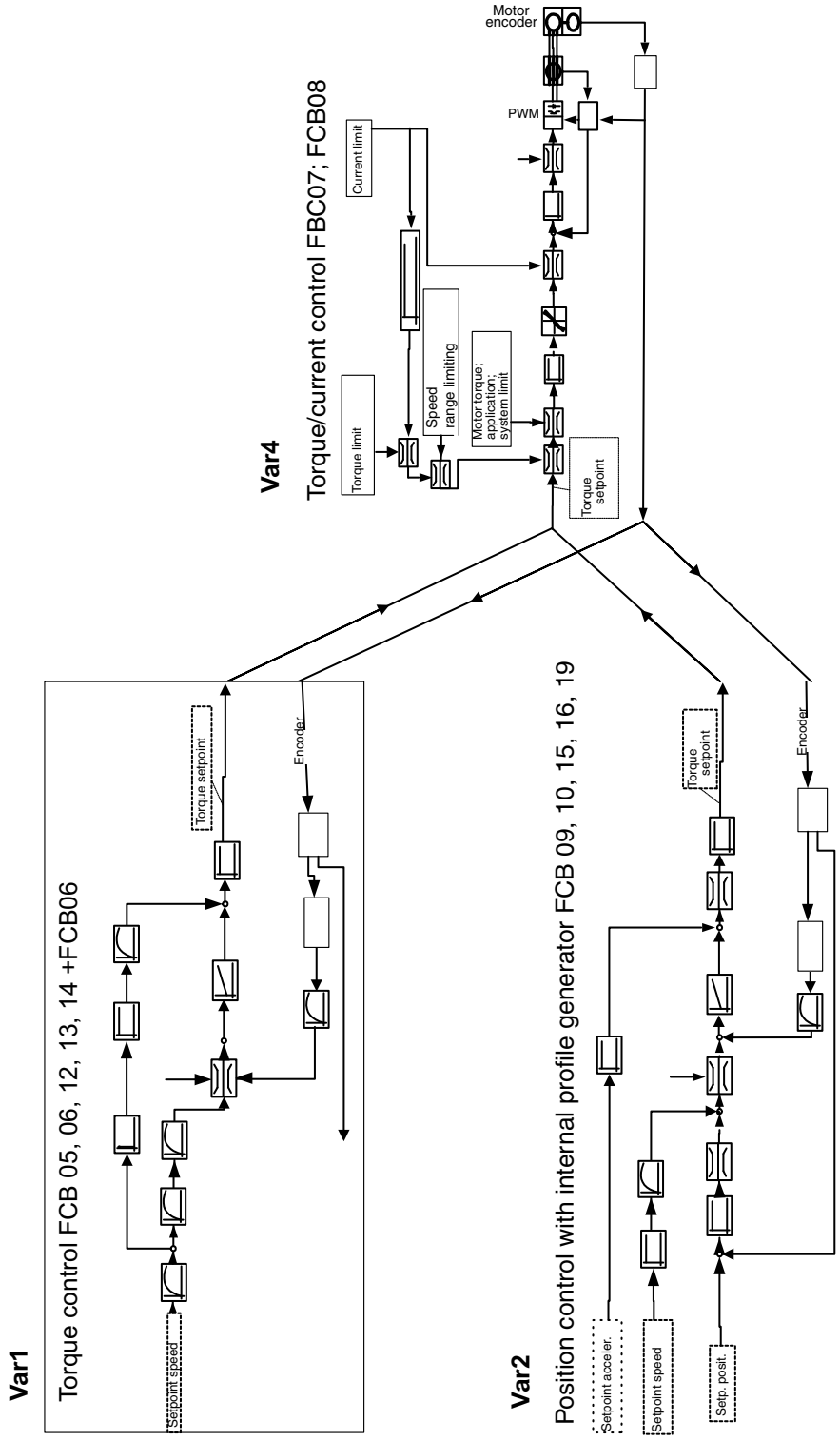
The variants "Var 1 - 4" are depicted in the figure "Control structure overview" (page 257).

*Control structure overview*

The control structure is cascaded (position, speed, current-torque controller). The following diagram shows an overview of the control structures described in detail on the following pages.

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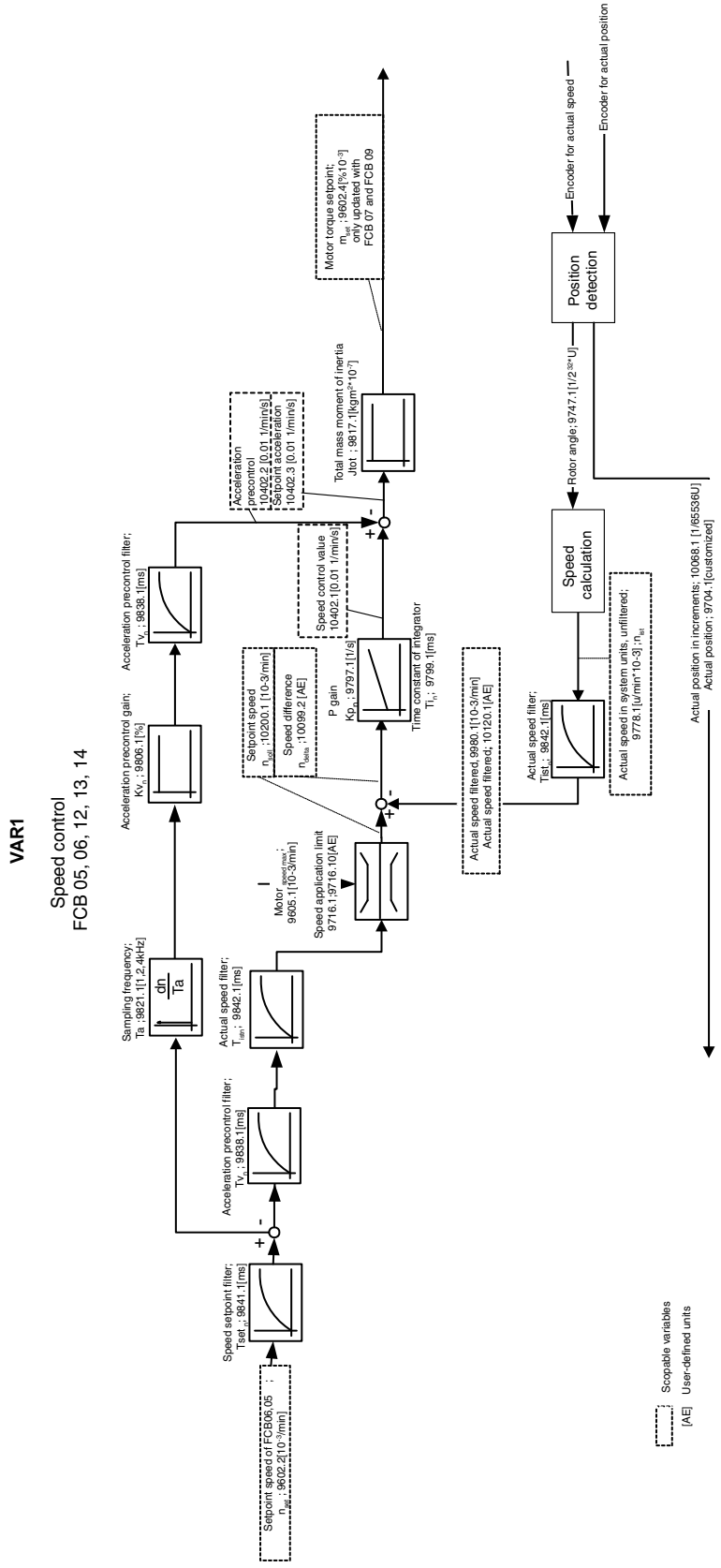
See also the control structure table. (page 256)

*Speed control FCB 05 (page 351), 06 (page 354), 12 (page 373), 13, 14*

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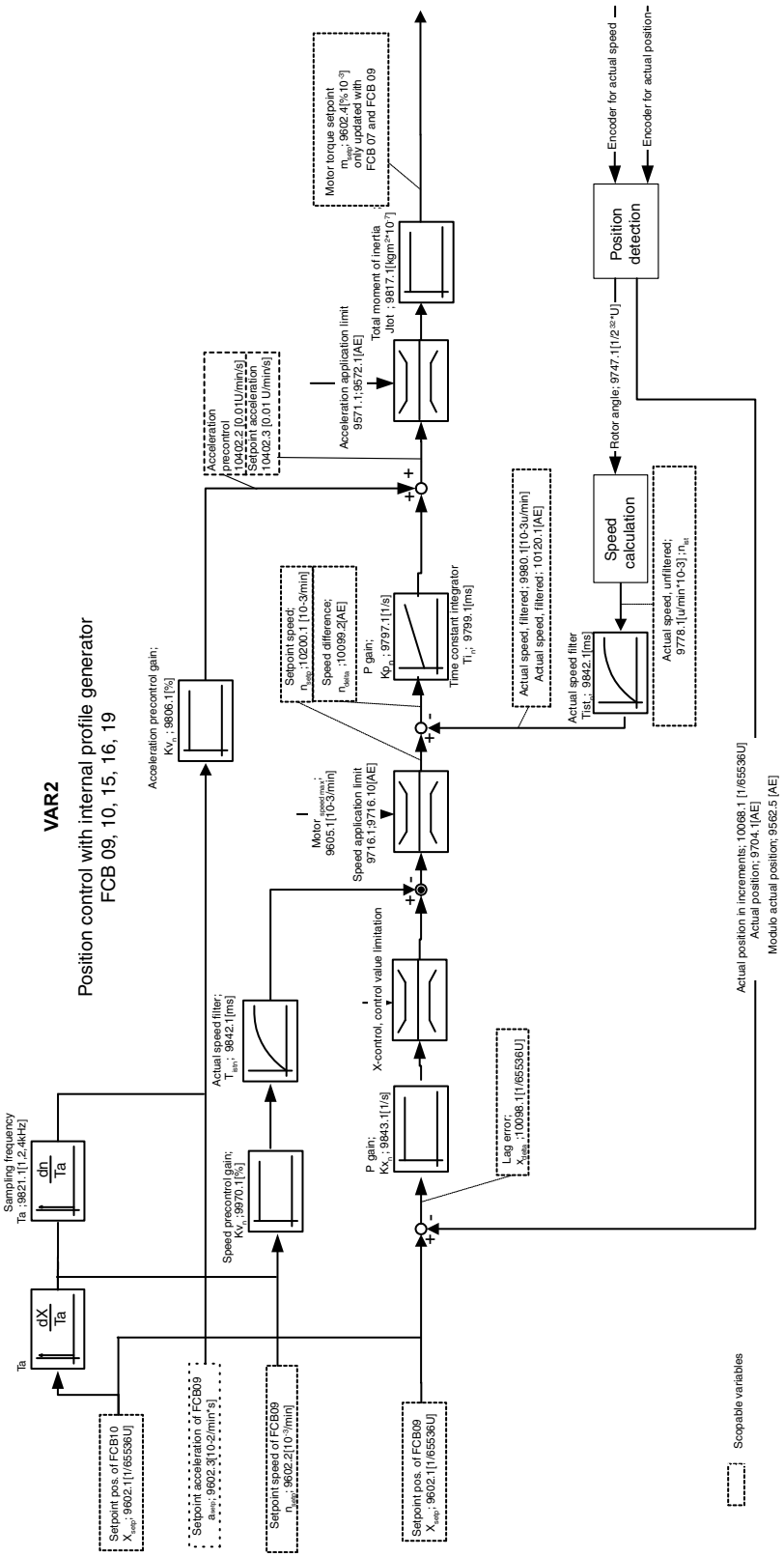
*Position control with internal profile generator FCB 09 (page 363), 10 (page 371), 15, 16, 19*

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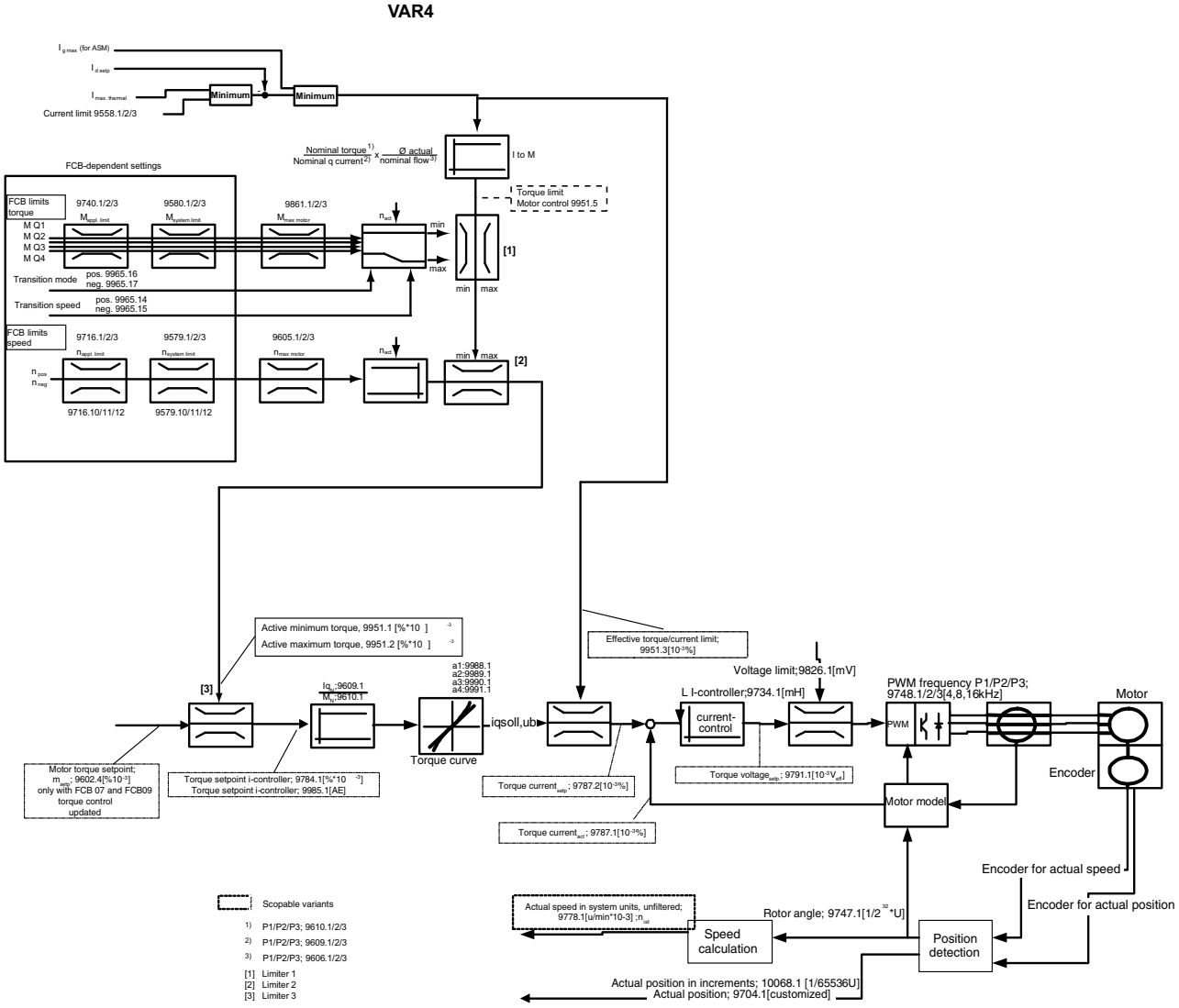
*Torque/current controller*

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Refer to the illustration for limits that are activated.

The relationship between the min/max delimiters 1 – 3 and the specific limit statement is listed in the following table.

Significance "1" means that this delimiter limits the input parameters and sets the limit values to its output. Vice versa with "0".

The speed limits are then clearly implemented using the limited torque specifications.

| Delimiter 1 | Delimiter 2 | Delimiter 3 | Limitation information |
|---|---|---|---|
| 0 | 0 | 0 | No $M_{setp}$ limit |
| 0 | 0 | 1 | $M_{setp}$ is limited by the specified speed |
| 0 | 1 | 0 | No $M_{setp}$ limit |
| 0 | 1 | 1 | $M_{setp}$ is limited by motor control (max. motor current, $I_{max.\ thermal}$, current limit) |
| 1 | 0 | 0 | No $M_{setp}$ limit |
| 1 | 0 | 1 | $M_{setp}$ is limited by the specified speed |
| 1 | 1 | 0 | No $M_{setp}$ limit |
| 1 | 1 | 1 | $M_{setp}$ is limited by the torque limit |

*9734.1 / 9734.2 / 9734.3 LI controller*

Unit: H

Resolution: $10^{-7}$

Value range: 0 – 214748367, step 1

Branch inductance of the motor.

Is used to set the parameters of the current controller (I controller) (P1/P2/P3). The integrative time and the gain are set using this parameter.

*9558.1 / 9558.2 / 9558.3 Current limit*

Unit: mA

Value range: 0 – 2000000, step 1

Current limit P1 / P2 / P3.

The current limit indirectly limits the torque-generating current (Q current), see figure "Torque/current controller" (page 260). This is the only value in MOVIAXIS® that is directly entered in [mA]. All other "current" values refer to the nominal current of the device.

*9826.1 / 9826.2 / 9826.3 Voltage limit*

Unit: mV

Value range: 0 – 230000 – 1000000, step 1

Control limit output voltage P1/P2/P3.

The value $V_{rms}$ is the phase unit, the default value is 230 V.

This parameter limits the maximum output voltage, see figure "Torque/current controller" (page 260).

*Scanning frequency*

*9821.1 / 9821.2 / 9821.3 Scanning frequency*

Value range:

- 0 = 1 ms
- 1 = 0,5 ms
- 2 = 0.25 ms

Scanning frequency n-/X control P1 / P2 /P3

Is used to set the scanning frequency of the speed and position controller.

A high scanning frequency is only needed when the desired dynamic response requires it. This is only needed for drives with fast cycle times (<100 ms positioning time).

A higher scanning frequency results in a rougher actual speed value resolution. This means the scanning frequency should be set to a lower value for applications that require a very even speed.

These effects are more likely to occur in encoder systems with unfavorable resolution. See encoder resolution, chapter "Encoder" (page 340).

With the same stiffness and clearance settings, the scanning frequency has no influence on the gain, integrative time and control technology filter settings that are suggested at startup.

*9797.1 / 9797.2 / 9797.3 P-gain*

Unit: $10^{-3}$/s

Value range: 0 – 100000 – 10000000, step 1

P-gain N controller P1/P2/P3.

The unit of the gain is chosen in such a way that the velocity difference (speed setpoint/ actual speed value) results in acceleration.

Controller configuration is independent of the used inverter and connected mass moment of inertia because the control operates in SI units (revolution; rpm; rpm/s). Of course, you need to enter the current total mass moment of inertia "9817.1/2/3 (page 265)" to ensure the conversion of acceleration into torque.

*9970.1 / 9970.2 / 9970.3 Speed precontrol gain*

Unit: %

Resolution: $10^{-3}$

Value range: 0 – 100000 – 10000000, step 1

Velocity precontrol gain P1/P2/P3

100% is the optimum value. This gain multiplies the theoretically calculated velocity precontrol values.

*9806.1 / 9806.2 / 9806.3 Acceleration precontrol gain*

Unit: %

Resolution: $10^{-3}$

Value range: 0 – 100000 – 10000000, step 1

Acceleration precontrol gain P1/P2/P3.

100% is the optimum value. This gain multiplies the theoretically calculated acceleration precontrol values.

*9841.1 / 9841.2 / 9841.3 Speed setpoint filter*

Unit: µs

Value range: 0 – 10000000, step 1

FCB 05 Speed control (page 351) Speed setpoint filter P1/P2/P3.

Is only active in all speed controlled operating modes. It filters the received speed setpoint.

It is important that the "cycle time of the external controller" is set to "0 ms" at startup when the internal speed profile generator is used.

*9842.1 / 9842.2 / 9842.3 Actual speed value filter*

Unit: µs

Value range: 0 – 1000 – 10000000, step 1

Actual speed value filter P1/P2/P3.

This filter is active in the actual speed branch and also in the speed precontrol branch to smoothen the noise of the actual speed value information.

*9838.1 / 9838.2 / 9838.3 Acceleration precontrol filter*

Unit: µs

Value range: 0 – 5000 – 10000000, step 1

Acceleration precontrol filter P1/P2/P3.

Acceleration precontrol filter P1/P2/P3 is only active in all speed controlled FCBs.

It is important that the "cycle time of the external controller" is set to "0 ms" at startup when the internal speed profile generator is used.

*10058.1 / 10058.2 / 10058.3 Switched integrator*

Value range:

- 0 = Switched

  The integrator is stopped when the control limit is reached to achieve a low overshoot of the actual speed value when reentering the control range.

- 1 = Not switched

  Is required for the "dual drive" special control function.

Closed-loop speed controller switched integrator P1/P2/P3

The control limit can be reached with very large setpoint changes at the speed control input. The control limit is characterized by various specified limits that are calculated online (current limit, acceleration limits, motor limits, inverter limits, voltage limit, etc.).

*9994.1 / 9994.2 / 9994.3 Integrator mode*

Value range:

- 0 = Hold
- 1 = Delete
- 2 = "Initialize" using the source of parameter *9995. Integrator initialization* (page 265).

Speed control integrator mode P1/P2/P3.

The start value of the integrator behavior can be influenced by this parameter.

The changes are naturally very much dependent on the "Integrator integrative time; P9799.1".

The higher the integrative time, the longer lasts the adjustment of the start value to the actual disturbance.

The integrator behavior depends on the selected parameter set.

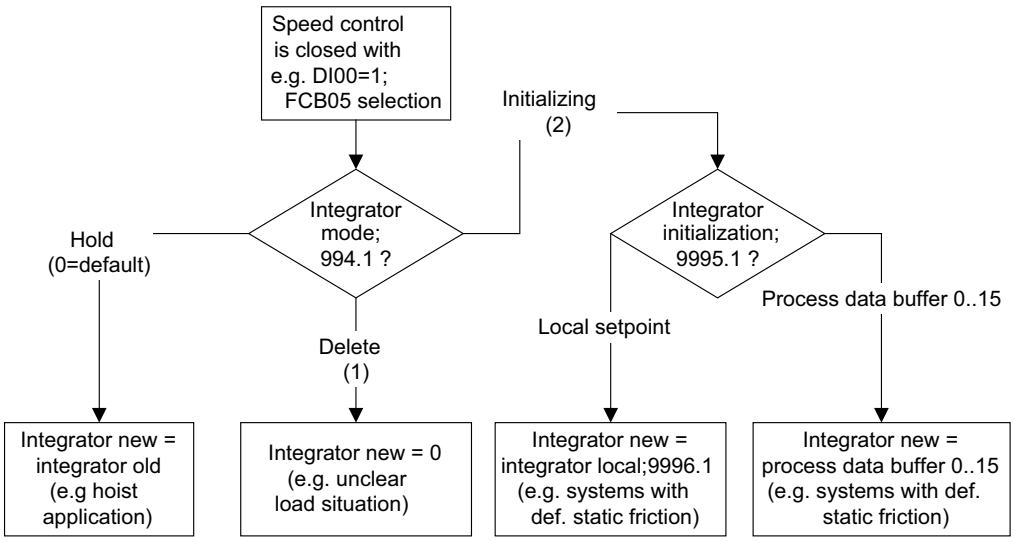
**Hold**: The content of the integrator is maintained when the speed control loop opens. When the speed control loop closes again, the torque previously contained in the integrator is directly adjusted at the motor shaft again. This operating mode is particularly useful in hoists to prevent the load from sagging when the brake is released.

The speed control loop can be closed by selecting *FCB 05 speed control (page 351)* or any other FCB (e.g. *FCB 09 Positioning (page 363)*) that activates the speed controller.

At a software reset, the content of the integrator is stored in non-volatile memory from where it is loaded again. With a software cold start (after power off/on), the integrator will always be cleared because the values are not saved when switching the power supply off.

**Delete**: The content of the integrator is set to zero when the speed control loop opens. When the speed control loop closes once again, the integral component is set to zero and adjusted to a torque of "zero".

**Initialize**: This setting lets you set the I component of the speed controller (torque) to a predefined value. The source of this value is defined in parameter *9995.1 Integrator initialization* (page 265). This value takes effect when the speed control loop closes.

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*9995.1 / 9995.2 / 9995.3 Integrator initialization*

Value range:

- 0 = Local setpoint

  from parameter *9996.1 Local integrator*.
- 1 – 16 = Process data buffer, channel 0 – 15

Speed control integrator initialization source P1/P2/P3.

Takes effect when parameter *9994.1 Integrator mode* (page 264) is set to "Initialize".

*9996.1 / 9996.2 / 9996.3 Local integrator*

Unit: %

Resolution: $10^{-3}$

Value range: -1000000 – 0 – 1000000, step 1

Speed control integrator initialization local P1/P2/P3.

When the speed control loop closes, the torque of parameter 9996.1 "Local integrator" is directly adjusted at the motor shaft.

It only takes effect if parameter *9994.1 Integrator mode* (page 264) is set to "Initialize" and parameter *9995.1 Integrator initialization* (page 265) is set to "local".

This parameter must also be specified in the user-defined unit.

For default setting of the user-defined unit torque

- Parameter *9555.1 Torque resolution* (page 287) = 10E-3.
- Parameter *9556.1 Torque numerator* (page 287) = 1.

Is the unit [$\%_{\text{Nominal torque\_motor}}$ ×10E-3; Parameter *9610.1* (page 266)].

This setting can also be made using the bus, see the description on setting the torque, parameter *9555.1* (page 287); parameter *9556.1* (page 287); parameter *9557.1* (page 288).

*9817.1 / 9817.2 / 9817.3 Total mass moment of inertia*

Unit: $kgm^2$

Resolution: $10^{-7}$

Value range: 0 – 2147483647, step 1

Total mass moment of inertia P1.

*Position controller*

*9843.1 / 9843.2 / 9843.3 P-gain*

Unit: $10^{-3}/s$

Value range: 0 – 50000 – 10000000, step 1

Gain X controller P1/P2/P3.

*10201.1 / 10201.2 / 10201.3 Setpoint limit position controller*

Value range:

- 0 = Off
- 1 = On

*Equalizing controller*

*(10060.1) / 10060.2 / 10060.3 NMin source*

Value range: See parameter *9995.1 Integrator initialization* (page 265).

Equalizing controller NMin source P1.

For details, see *FCB 22 Dual drive* (page 387).

*(10062.1) / 10062.2 / 10062.3 NMin local*

Unit: $10^{-3}$/min

Value range: -2147483648 – 2147483647, step 1

Equalizing controller NMin local P1.

For details, see *FCB 22 Dual drive* (page 387).

*(10059.1) / 10059.2 / 10059.3 NMax source*

Value range: See parameter *9995.1 Integrator initialization* (page 265).

Equalizing controller NMax source P1.

For details, see *FCB 22 Dual drive* (page 387).

*(10061.1) / 10061.2 / 10061.3 NMax local*

Unit: $10^{-3}$/min

Value range: -2147483648 – 2147483647, step 1

Equalizing controller NMax local P1.

For details, see *FCB 22 Dual drive* (page 387).

### 9.2.2 Motor parameter P1/P2/P3

*9820.1 / 9820.2 / 9820.3 Motor type*

Value range:

- 0 = Asynchronous motor
- 1 = Synchronous motor

Motor type P1/P2/P3.

*9732.1 / 9732.2 / 9732.3 Number of pole pairs*

Value range: 1 – 3 – 64, step 1

Number of pole pairs P1/P2/P3.

The number of motor pole pairs is set here.

*9610.1 / 9610.2 / 9610.3 Nominal torque*

Unit: Nm

Resolution: $10^{-5}$

Value range: 0 – 100000 – 2147483647, step 1

Nominal motor torque P1/P2/P3.

The values specified in "torque" in MOVIAXIS® refer to this nominal torque value.

All values specified in "current" in MOVIAXIS® refer to the nominal current of the unit.

*9861.1 / 9861.2 / 9861.3 Maximum torque*

Unit: Nm
Resolution: $10^{-5}$
Value range: 0 – 2147483647, step 1
Maximum motor torque P1/P2/P3.

*9605.1 / 9605.2 / 9605.3 Maximum speed*

Unit: $10^{-3}$/min
Value range: 0 – 3000000 – 10000000, step 1
Maximum permitted motor speed P1/P2/P3.

*9987.1 / 9987.2 / 9987.3 Maximum current*

Unit: mA
Value range: 0 – 2000000, step 1
Maximum motor current P1/P2/P3.

*9609.1 / 9609.2 / 9609.3 Nominal current $I_q$*

Unit: mA
Value range: 0 – 2000000, step 1
$I_q$ nominal current P1/P2/P3.

*9819.1 / 9819.2 / 9819.3 Nominal current $I_d$*

Unit: mA
Value range: 0 – 2000000, step 1
$I_d$ nominal current P1/P2/P3.

*9606.1 / 9606.2 / 9606.3 Nominal flow*

Unit: µVs
Value range: 0 – 2147483647, step 1
Nominal flow P1/P2/P3.

*9736.1 / 9736.2 / 9736.3 Leakage inductance*

Unit: H
Value range: 0 – 2147483647, step 1
CFC LSigma P1/P2/P3.

*9738.1 / 9738.2 / 9738.3 Rotor resistance*

Unit: µΩ
Value range: 0 – 2147483647, step 1
Rotor resistance P1/P2/P3.

*9737.1 / 9737.2 / 9737.3 Flow time constant*

Unit: µs
Value range: 0 – 10000000, step 1
Flow time constant P1/P2/P3.

*9816.1 / 9816.2 / 9816.3 Rotor time constant*

Unit: µs

Value range: 0 – 4294967295, step 1

Time constant rotor P1/P2/P3.

*9834.1 / 9834.2 / 9834.3 Encoder offset*

Unit: U

Resolution: $1/2^{32}$

Value range: 0 – 2147483647, step 1

Encoder offset P1/P2/P3 is indicated in angular degrees in MotionStudio ($2^{32}$ = 360 000 degrees).

The encoder offset refers to the mechanical revolution of the motor. A mechanical revolution is the electrical revolution multiplied by the number of poles specified in parameter *9732.1* (page 266).

*Encoder*

*9597.1 / 9597.2 / 9597.3 Actual speed source*

Value range:

- 0 = No encoder
- 1 = Encoder 1
- 2 = Encoder 2
- 3 = Encoder 3

Source actual speed P1/P2/P3

The parameter is set in the parameter tree folder "Motor data".

This parameter is used to select the encoder that provides the information for the speed controller, current controller and commutation of the motor control.

The source of the actual speed may **not** be switched to another source during controller enable.

Only the encoder assigned to the parameter set number can be chosen as source. This is verified when activating controller enable.

See also parameter *9595.2 Connected to drive no.* in the "Encoder" chapter (page 346).

*9744.1 / 9744.2 / 9744.3 Actual position source*

Value range:

- 0 = No encoder
- 1 = Encoder 1
- 2 = Encoder 2
- 3 = Encoder 3

Actual position source P1/P2/P3.

The parameter is set in the parameter tree folder "Motor data".

This parameter is used to select the encoder that provides the actual position information for the position controller of the motor control.

The source of the actual position may be switched to another source during controller enable.

Only the encoder assigned to the parameter set number can be chosen as source. This is verified as long as the controller is enabled.

See also parameter *9595.2 Connected to drive no.* in the "Encoder" chapter (page 346).

*Brake*

*Brake control*

The parameters for the brake function are usually set by the startup process when the connected motor is entered or the data is read from the electronic nameplate.

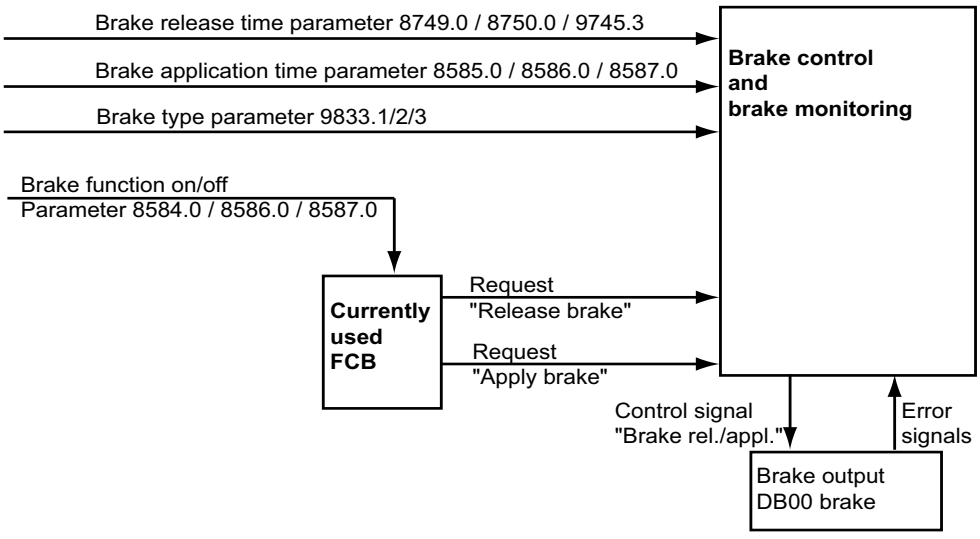
The brake control is an independent function that is called up directly after the FCBs. It processes the requests of the FCB currently used and controls the control terminal for the brake accordingly.

The brake terminal is monitored for supply voltage and control signal level during the same time interval and depends on the relevant requirements of the FCBs on brake control.

**⚠ CAUTION**

When output stage enable is revoked or output stage inhibit is set, the brake signal is immediately set to "close" and the output stage is disabled => A moving motor makes an emergency stop using the installed brake, or coasts to a halt.

CMP, CMD, DS motors can be equipped with a servo holding brake. In this case, only a very limited number of emergency stops is possible.

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*10230.1 / 10230.2 / 10230.3 Brake name*

Unit:

Value range:

*9833.1 / 9833.2 / 9833.3 Brakes*

Value range:

- 0 = None
- 1 = Brake connected to brake rectifier
- 2 = Brake directly connected

Brake type P1.

The control terminal and supply voltage for the brake are monitored:

1. Supply voltage within the specified tolerances or not => Error message "E13 Brake supply". Monitoring is only active when the brake is released or while the brake is being released.
2. No brake connected or brake control output overloaded => Error message "E12 Brake output". The brake message signal is monitored with a delay of t = 150 ms after the signal to release the brake has been issued. The current rise time is bridged until the required brake current is reached. Monitoring is active as long as the brake is released.

**⚠ CAUTION**

Monitoring is only active when the brake type parameter is set to "Brake directly connected".

The three- or two-wire brake from SEW-EURODRIVE is **not** monitored (setting: "Brake connected to brake rectifier" or "None").

**INFORMATION**

If parameter *9833.1 / 2 / 3 Brake type* is set to "No brake", the brake output is set to "Brake applied".

This means that the setting of parameter *8584.0/8586.0/8587.0 Brake function* (page 273) has no effect on the brake output.

*8749.0 / 8750.0 / 9745.3 Brake release time*

Unit: ms

Value range: 0 – 2000, step 1

Brake release time P1/P2/P3.

During the brake release time, the drive is moved with speed control at the setpoint speed "zero", for example to prevent the load from sagging.

*8585.0 / 8587.0 / 9726.3 Brake application time*

Unit: ms

Value range: 0 – 200 – 2000, step 1

Brake application time P1/P2/P3

During the brake application time, the output stage is enabled and speed control with the set value "zero" is active, for example to prevent the load from sagging.

*Temperature sensor*

*10046.11 / 10046.12 / 10046.13 Temperature sensor type*

Value range:

- 0 = No sensor
- 1 = TF / TH
- 2 = KTY(84 – 130)

Temperature sensor type P1/P2/P3.

This parameter is used to set the temperature sensor to ensure it is evaluated properly.

### 9.2.3 Control functions P1 / P2 / P3

*Speed monitoring*

*8557.0 / 8559.0 / 9721.3 Speed monitoring*

Value range:

- 0 = Off
- 1 = Motor mode
- 2 = Regenerative mode
- 3 = Motor / regenerative mode

Speed monitoring P1/P2/P3.

Is set by the motor startup procedure.

If speed monitoring is not set to "off", the control variable limit of the speed controller are monitored. If a certain adjustable delay time is set for parameter *8558.0 Delay time* (page 272), an error response will be triggered. Events in which the control limit is reached for a short time period while the drive is accelerating or decelerating can be blocked using the appropriate setting in parameter *8558.0 Delay time* (page 272).

The control variable limit is based on all acceleration limit values. This includes data such as system limits, application limits, FCB limits, maximum motor torque limits as well as maximum axis current and thermally limited axis current.

Also see figure "Torque/current controller" (page 260).

Motor / regenerative modes are distinguished as follows:

- Sign of (speed × torque) = positive → motor speed limit → results in E08: Suberror code 1.
- Sign of (speed × torque) = negative → regenerative speed limit → results in E08: Suberror code 2.

Monitoring is always activated at speeds lower than 10 rpm (if parameter 88557 ≠ 0). This is independent of whether the cause is regenerative or associated with the motor. This is because the actual speed value information is distorted by noise during resolver evaluations and at small actual speeds. In this way, it cannot be clearly defined whether a motor or regenerative load is present.

| | **INFORMATION** |
|---|---|
| | If the actual speed exceeds the maximum permitted system limits of parameter *9579.1* (page 281) "positive" and parameter *9579.10* (page 281) "negative", a unit error will be triggered. Unlike monitoring of the control limit, this type of monitoring cannot be deactivated or limited by setting speed monitoring to "off". |

*8558.0 / 8560.0 / 9722.3 Speed monitoring delay time*

Unit: ms

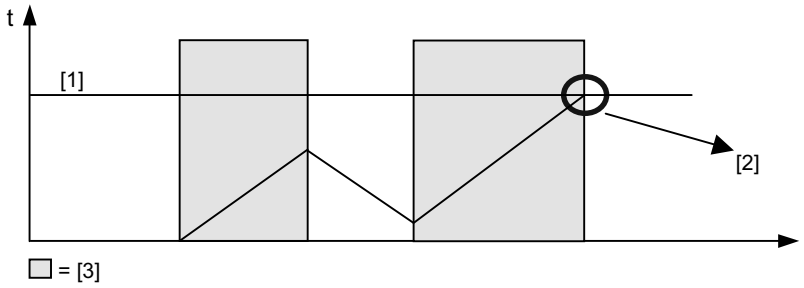
Value range: 0 – 50 – 1000, step 1

N monitoring delay time P1/P2/P3.

Is set by the motor startup procedure.

When the control limit of the speed controller is reached, a timer responsible for the delay time is started. Once the delay time is exceeded, a unit error is triggered. If the speed controller leaves its control limit before the delay time expires, the timer will be decremented until "zero" is reached.

Also see the following figure.

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[1] Parameter "8558.0 Delay time"
[2] Trigger error E08
[3] Control limit

*9718.1 / 9718.2 / 9718.3 Speed monitoring reset time factor*

Unit: ms

Value range: 0 – 1000, step 1

N monitoring reset time factor P1/P2/P3.

Is set by the motor startup procedure.

Use the "Speed monitoring reset time" factor to set how fast the timer decrements when leaving the control limit compared to the delay time. Usually this factor is equal to 1. For example, a factor of 3 means the counter decrements three times faster.

*Brake function*

*8584.0 / 8586.0 / 9725.3 Brake function*

Value range:

- 0 = Off
- 1 = On

Brake function P1.

This parameter has an effect when stopping in STOP FCBs 14, 13 and 12, and when starting in the other FCBs (for example, FCB 05 (page 351), 09 (page 363) )

See figure "Brake control" (page 269).

This parameter can be used to activate or deactivate the brake function regardless of whether a brake is connected (parameter *9833.1/2/3 Brake type* (page 270)).

- **0 = Off**

When the drive is stopped, the brake is not applied if motor standstill is detected. The output stage remains enabled and the drive adjusts to the speed setpoint "zero", unless hold control is active.

Upon enable, the drive starts running without delay caused by a brake release time.

- **1 = On**

When the drive is stopped, the brake is applied if motor standstill is detected. The brake application time is taken into account. The output stage is blocked and the drive is electrically connected with no torque if this brake application time has expired.

When the motor brake is applied, asynchronous motors are premagnetized upon receiving an enable signal.

If synchronous motors are connected, the output stage and control will be activated.

Then the brake is released taking the brake release time into account with activated control. Once the brake release time has elapsed, the selected FCB is activated with the set setpoint.

| | **INFORMATION** |
|---|---|
| | The "Brake function" parameter has no effect on the brake output if parameter *9833.1/2/3 Brake type"* (page 270) is set to "no brake". This way, the brake output is permanently set to the status "Apply brake". |

*Standstill current function*

*9826.11 / 9826.12 / 9826.13 Standstill current function*

Value range:

- 0 = Off
- 1 = On

Activates/deactivates the standtill current function. This function is only effective for asynchronous motors. In a synchronous motor, **no** current is impressed even if the standstill current function is activated. A prerequisite for the standstill current function is that the motor has a brake and that the brake function is activated. Another prerequisite for the standstill current function is the activated controller enable (DI00 = "1").

In case of an activated stop (FCB00, FCB13, FCB14, FCB15), the standstill current function automatically impresses a current which is defined in the parameter "standstill current value". In case of a travel command, the activated standstill current function shortens the premagnetization time in the standstill phase until the motor begins to turn. If a standstill current of 100% is set, the premagnetization time is reduced to zero, as in this case the standstill current equals the magnetization current.

*9826.21 / 9826.22 / 9826.23 Standstill current value*

Unit: %

Value range: 0 – 100 – 200, step 1

Defines the magnitude of the standstill current of the motor in [%], based on the nominal magnetization current "Nominal current Id" of the motor, also see parameter *9819.1 – 3* (page 267).

*Limit switch evaluation*

A certain travel range of a drive can be monitored using hardware limit switches. Software limit switch monitoring can be activated if there are no hardware limit switches or for early detection purposes. Each limit switch (positive or negative software limit switch) can be activated/deactivated independently of one another.

Furthermore, the source of the software limit switches (encoder1 – encoder3) can also be set. A prerequisite for software limit switch monitoring is that the selected encoder is referenced.

The acknowledgement behavior applies both to software and hardware limit switches. You can set whether acknowledgement is required in the error response. You can choose between "Auto-reset" or "Waiting".

When a limit switch was hit, the error must be acknowledged depending on the programmed limit switch response before the drive moves clear of the limit switch. The acknowledgement is accepted even if the drive has not yet reached standstill. In this case, movement clear of the limit switch will be triggered immediately once the axis stop was detected.

Limit switch processing checks the sign of the currently present setpoint (e.g. target position of positioning). The drive moves along with the currently set ramp of the currently set FCB if this setpoint results in leaving the limit switch.

If the setpoint makes the drive move further into the limit switch, the drive will remain stopped. This "moving clear" is caused by *FCB 11 Limit switch*.

Once the drive has moved clear of the limit switch, the currently selected FCB is chosen and the drive continues to move using the setpoints and limits of this FCB.

| | INFORMATION |
|---|---|
| | For influencing limit switches by reversing the direction of rotation, see parameter *8537.0 Direction of rotation reversal* (page 253). |

The limit switch signals are debounced by the software (debouncing time 200 ms).

*Moving clear of hardware limit switches*

A certain travel range of a drive can be monitored using hardware limit switches.

If hardware limit switches are not used or, for example, an early warning alarm should be activated when a specific position is exceeded, the software limit switches integrated in MOVIAXIS® can be activated.

Each limit switch (positive or negative software limit switch) can be activated/ deactivated independently of one another. Furthermore, the source of the software limit switches (encoder1 – encoder3) can also be set. If the drive hits one of the two software or hardware limit switches, it reacts using one of the responses set by the user.

Software and hardware limit switches basically react in the same way. In order to enable the monitoring function, the appropriate encoder must be referenced.

*9729.6 / 9729.7 / 9729.8 Hardware limit switch response*

Value range:

- 0 = No response
- 6 = Emergency stop / waiting
- 10 = Stop at system limit / waiting
- 18 = Emergency stop / auto reset
- 19 = Stop at system limit / auto reset

Hardware limit switch response P1/P2/P3.

The hardware limit switch response sets the error response for the event that a hardware limit switch is hit.

- **No response**

Error is ignored

- **Emergency stop/waiting**

The motor is stopped along the emergency stop ramp. After a restart, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at system limit/waiting**

The motor is stopped at the system limit. After a restart, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Emergency stop / auto reset**

The motor is stopped along the emergency stop ramp. No reset is expected.

- **Stop at system limit / auto reset**

The motor is stopped at the system limit. No reset is expected.

For detailed information about this topic, refer to the operating instructions in the "Operation" chapter.

*9824.1 / 9824.2 / 9824.3 Software limit switch monitoring source*

Value range: See parameter *9744.1 Actual speed source* (page 347).

Software limit switch monitoring source P1/P2/P3.

*9729.13 / 9729.14 / 9729.15 Software limit switch response*

Value range: see parameter *9729.6 Hardware limit switch response* (page 275).

Software limit switch response P1/P2/P3.

*9798.1 / 9798.2 / 9798.3 Monitor software limit switch negative*

Value range:

- 0 = Off
- 1 = On

Monitor software limit switch negative P1/P2/P3.

- Off

Software limit switch is not monitored.

- On

Software limit switch is monitored.

*9961.1 / 9961.2 / 9961.3 Software limit switch negative*

Unit: U

Resolution: 1/65536

Value range: -2147483648 – 2147483647, step 1

Negative software limit switch P1/P2/P3.

*9801.1 / 9801.2 / 9801.3 Monitor software limit switch positive*

Value range:

- 0 = Off
- 1 = On

Monitor software limit switch positive P1/P2/P3.

- Off

Software limit switch is not monitored.

- On

Software limit switch is monitored.

*10064.1 / 10064.2 / 10064.3 Software limit switch positive*

Unit: U

Resolution: 1/65536

Value range: -2147483648 – 2147483647, step 1

Positive software limit switch P1/P2/P3.

*"Motor at standstill" signal*

*10056.1 / 10056.2 / 10056.3 Velocity threshold "Motor at standstill" – status bit*

Unit: $10^{-3}$/min

Value range: 10000 – 50000, step 1

Velocity threshold motor at standstill P1/P2/P3

If the actual velocity is lower than this value, the "Motor at standstill" bit is set once the filter time of parameter "100057.1" has expired. If the velocity threshold is exceeded during the filter time, the filter will be reset to "zero" and starts again when the actual velocity drops below the velocity threshold again.

*10057.1 / 10057.2 / 10057.3 Filter time "Motor at standstill" – status bit*

Unit: ms

Value range: 0 – 25, step 1

Filter time motor at standstill P1/P2/P3

See parameter *10056.1 Velocity threshold motor at standstill* (page 277).

***Motor protection***

When MOVIAXIS® detects that the maximum temperature of the motor is exceeded, it can respond in five different ways. These responses can be configured at startup. The responses range from "No response", through "Display", to different stop types.

MOVIAXIS® has a total of four different types / options to monitor the thermal properties of a motor and protect it from overload / irreparable damage. The types differ in quality and response capability.

*1. Motor monitoring with TF / TH sensor*

With this method, the configured action is executed when the limit temperature is exceeded.

*2. Motor monitoring for types CMP, CM, CMD with KTY sensor*

With this method, the configured action is triggered using temperature recording (in °C) and evaluation of the warning threshold of the motor when a limit temperature is exceeded. For all specified SEW-EURODRIVE motors, a KTY is used as a temperature sensor (initial values) to calculate the amount and time of the motor currents (history and course) in a motor-specific, thermal motor model in MOVIAXIS®.

The KTY also protects motors, e.g. CMP40, for which a purely mechanical temperature detection function would be too slow so that the motor might be damaged as a result. This functionality is only available for the specified SEW-EURODRIVE motors. It is the best way to ensure thermal protection for SEW-EURODRIVE servomotors.

*3. Motor monitoring with KTY sensor*

With this method, the configured action is executed when the limit temperature is exceeded.

*4. Motor monitoring with KTY sensor and $I^2t$ table*

With this method, the KTY sensor is used to read initial temperature values. A torque/speed curve point table (max. 8 curve points) supplied by the motor manufacturer can be used to adjust the dynamic behavior, or the values can be calculated in the inverter.

The combination of the two values can be used to offer better protection for the motor than is available with a KTY alone.

This is the best way to protect a non-SEW motor connected to MOVIAXIS®.

The motor protection / connected motor temperature sensor is set at startup.

**KTY is set**: The implementation monitors wire breakage (> 1767 Ω; approx. 196 °C with KTY84 – 130) and short circuit (< 305 Ω; approx. -52 °C with KTY).

**TF/TH is set**: Implementation switches at 1725 Ω (approx. 117 mV).

*8904.0 / 8905.0 / 10046.1 (not in parameter tree)*

Value range:

- 0 = No sensor
- 1 = TF / TH
- 2 = KTY84 – 130

Temperature sensor type TMU1/TMU2/TMU3.

*10063.1 / 10063.2 / 10063.3 (not in parameter tree)*

Value range:

- 0 = TMU1
- 1 = TMU2
- 2 = TMU3

Thermal motor monitoring used in parameter set P1/P2/P3.

Three thermal monitoring functions are available to being able to operate three motors alternately on one inverter. As default, parameter set 1 is assigned monitoring 1, parameter set 2 is assigned monitoring 2, etc.

For example, the thermal monitoring used in parameter set 2 should be set to "1" if the same motor as in parameter set 1 is used in parameter set 2. When using a model, doing so will prevent that heat drawn into the motor is distributed to several models and distorts the model values.

*9872.1 / 9872.2 / 9872.3 Temperature KTY sensor*

Unit: °C

Resolution: $10^{-6}$

KTY temperature sensor TMU1/TMU2/TMU3.

Temperature of the sensor TMUx accurate within ±5.7 °C.

*9800.1 / 9800.2 / 9800.3 Thermal motor model temperature*

Unit: °C

Resolution: $10^{-6}$

Winding temperature model P1/P2/P3

Temperature of the thermal motor model P1/P2/P3

*9705.1 / 9705.2 / 9705.3 KTY sensor motor utilization*

Unit: %

Resolution: $10^{-3}$

KTY TMU1/TMU2/TMU3 motor utilization

The following applies to the relative utilization values:

$$\text{Motor utilization KTY sensor} = \frac{\text{Temperature KTY sensor - 40 °C}}{T_{Motor\_max} - 40\ °C}$$

A temperature of 40 °C corresponds to a utilization of 0%.

*9874.1 / 9874.2 / 9874.3 Thermal motor model motor utilization*

Unit: %

Resolution: $10^{-3}$

Motor utilization model P1/P2/P3.

The motor utilization uses a motor model to calculate the temperature transition of the motor to the KTY sensor. The injected current is also taken into account. The display is output in % and starts at a motor model temperature of 40 °C = 0% and a shutdown temperature = 100%.

$$\text{Motor utilization thermal model} = \frac{\text{Thermal motor model - 40 °C}}{T_{Motor\_max} - 40\ °C}$$

*9962.1 / 9962.2 / 9962.3 Motor utilization pre-warning threshold*

Unit: %

Resolution: $10^{-3}$

Value range: 0 – 80000 – 100000, step 1

Motor utilization prewarning threshold TMU1/TMU2/TMU3

The prewarning threshold refers to parameter *9705.1 KTY sensor motor utilization* (page 279) and parameter *9874.1 Thermal motor model motor utilization* (page 279) (if calculated). If one of the parameters exceeds this threshold, an error is triggered with the error response "Display only".

The 7-segment display shows the "E69" status but the axis does not respond (continues to operate).

- E69.1 KTY: Warning threshold exceeded,
- E69.2 Synchronous model: Warning threshold exceeded,
- E69.3 $I^2t$-model: Warning threshold exceeded.

The function "Prewarning motor temperature (KTY)" can be applied to a status word and consequently also to an output to allow a timely response in the machine controller.

*9729.9 / 9729.10 / 9729.11 TF / TH / KTY signal response*

Value range:

- 0 = No response
- 1 = Display only
- 2 = Output stage inhibit / locked
- 3 = Stop at emergency stop limit / locked
- 5 = Output stage inhibit / waiting
- 6 = Stop at emergency stop limit / waiting
- 8 = Stop at application limit / waiting
- 9 = Stop at application limit / locked
- 10 = Stop at system limit / waiting
- 11 = Stop at system limit / locked

If the parameter *9705.1 KTY sensor motor utilization* (page 279) and parameter *9874.1 Thermal motor model motor utilization* (page 279) (if calculated) exceed 100%, error message E31.x will be issued. The error response to this message is set in response TF/TH/KTY message.

- **No response**

Error is ignored

- **Display only**

The 7-segment display shows the "E031" status but the axis does not respond (continues to operate).

- **Output stage inhibit / locked**

The axis changes to the controller inhibit state and applies the mechanical brake, if installed. If no brake is installed, the motor will coast to a halt. After a reset, the axis performs a system restart.

- **Stop at emergency stop limit / locked**

The motor is stopped along the emergency stop ramp. After a reset, the axis performs a system restart.

- **Output stage inhibit/waiting**

The axis changes to the controller inhibit state and applies the mechanical brake, if installed. If no brake is installed, the motor will coast to a halt. After a reset, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at emergency stop limit / waiting**

The motor is stopped along the emergency stop ramp. After a reset, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at application limit/waiting**

The motor is stopped at the application limit. After a reset, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at application limit / locked**

The motor is stopped at the application limit. After a reset, the axis performs a system restart.

- **Stop at system limit/waiting**

The motor is stopped at the system limit. After a reset, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at system limit / locked**

The motor is stopped at the system limit. After a reset, the axis performs a system restart.

For detailed information about this topic, refer to the operating instructions in the "Operation" chapter.

### 9.2.4 Limit values P1/P2/P3

System values can only be changed when the controller is disabled.

Application limits can be changed when the controller is enabled.

*System limits*

*9573.1 / 9573.2 / 9573.3 Maximum acceleration*

Unit: $10^{-2}$/(min×s)

Value range: 0 – 300000 – 2147483647, step 1

Maximum velocity within the system limits in user-defined units.

**Special handling with FCB 00, 05 (page 351), 11, 12 (page 373), 13, 14, 15, 20 (page 381)** for system limit acceleration = 0: The value 0 completely deactivates the acceleration limit. The application or emergency stop limits as well as local values are **not effective**.

*9574.1 / 9574.2 / 9574.3 Maximum deceleration*

Unit: $10^{-2}$/(min×s)

Value range: 0 – 300000 – 2147483647, step 1

Maximum deceleration within the system limits in user-defined units.

**Special handling with FCB 00, 05 (page 351), 11, 12 (page 373), 13, 14, 15, 20 (page 381)** for system limit acceleration = 0: The value 0 completely deactivates the acceleration limit. The application or emergency stop limits as well as local values are **not effective**.

*9579.1 / 9579.2 / 9579.3 Maximum positive velocity*

Unit: $10^{-3}$/min

Value range: 0 – 10000000, step 10

Maximum positive speed within the system limits in user-defined units.

*9579.10 / 9579.11 / 9579.12 Maximum negative velocity*

Unit: $10^{-3}$/min

Value range: 0 – 10000000, step 10

Maximum negative speed within the system limits in user-defined units.

*9580.1 / 9580.2 / 9580.3 Maximum torque*

Unit: %

Resolution: $10^{-3}$

Value range: 0 – 100000 – 100000, step 1

Torque limit within the system limits in user-defined units.

*9583.1 / 9583.2 / 9583.3 Maximum jerk*

Unit: 1/(min×s$^2$)

Value range: 1 – 2147483647, Step 1

Maximum jerk limit within the system limits.

**Special handling with FCB 00, 07 (page 360), 13, 14, 15** for jerk = 0: The value 0 completely deactivates the acceleration limit. Application or emergency stop limits as well as local values are **not effective**.

*Emergency stop*

*9576.1 / 9576.2 / 9576.3 Emergency stop deceleration*

Unit: 10$^{-2}$/(min×s)

Value range: 0 – 300000 – 2147483647, step 1

Emergency stop deceleration in user-defined units.

*Application limits*

*9571.11 / 9571.12 / 9571.13 Maximum acceleration source*

Value range: See parameter *9598.1 / 10440.1 Velocity setpoint source* (page 352).

Description: See parameter *9598.1 / 10440.1 Velocity setpoint source* (page 352).

*9571.1 / 9571.2 / 9571.3 Maximum acceleration*

Unit: 10$^{-2}$/(min×s)

Value range: 0 – 300000 – 2147483647, step 1

Maximum acceleration within the application limits in user-defined units.

*9572.11 / 9572.12 / 9572.13 Maximum deceleration source*

Value range: See parameter *9598.1 / 10440.1 Velocity setpoint source* (page 352).

Description: See parameter *9598.1 / 10440.1 Velocity setpoint source* (page 352).

*9572.1 / 9572.2 / 9572.3 Maximum deceleration*

Unit: 10$^{-2}$/(min×s)

Value range: 0 – 300000 – 2147483647, step 1

Maximum deceleration within the application limits in user-defined units.

*9716.21 / 9716.22 / 9716.23 Maximum positive velocity source*

Value range: See parameter *9598.1 / 10440.1 Velocity setpoint source* (page 352).

Description: See parameter *9598.1 / 10440.1 Velocity setpoint source* (page 352).

*9716.1 / 9716.2 / 9716.3 Maximum positive velocity*

Unit: 10$^{-3}$/min

Value range: 0 – 10000000, step 10

Maximum positive speed within the application limits in user-defined units.

*9716.31 / 9716.32 / 9716.33 Maximum negative velocity source*

Value range: See parameter *9598.1 / 10440.1 Velocity setpoint source* (page 352).

Description: See parameter *9598.1 / 10440.1 Velocity setpoint source* (page 352).

*9716.10 / 9716.11 / 9716.12 Maximum negative velocity*

Unit: $10^{-3}$/min

Value range: 0 – 10000000, step 10

Maximum negative speed within the application limits in user-defined units.

*9740.11 / 9740.12 / 9740.13 Maximum torque source*

Value range: See parameter *9598.1 / 10440.1 Velocity setpoint source* (page 352).

Description: See parameter *9598.1 / 10440.1 Velocity setpoint source* (page 352).

*9740.1 / 9740.2 / 9740.3 Maximum torque*

Unit: %

Resolution: $10^{-3}$

Value range: 0 – 100000 – 100000, step 1

Torque limit within the application limits in user-defined units.

*9582.11 / 9582.12 / 9582.13 Maximum jerk source*

Value range: See parameter *9598.1 / 10440.1 Velocity setpoint source* (page 352).

Description: See parameter *9598.1 / 10440.1 Velocity setpoint source* (page 352).

*9582.1 / 9582.2 / 9582.3 Maximum jerk*

Unit: 1/(min×$s^2$)

Value range: 1 – 2147483647, Step 1

Maximum jerk limit within the application limits.

*Modulo limits*

*9594.10 / 9594.11 / 9594.12 Modulo overflow*

Unit: U

Resolution: 1/65536

Value range: -2147483648 – 2147483647, step 1

Modulo overflow is needed in all modulo operating modes, e.g. in *FCB 09 Positioning* (page 363).

Modulo overflow specifies the position from which an overflow takes place. The parameter is set in the user-defined units and has residual management for infinite gear ratios (set using the user-defined unit numerator / denominator factor at motor startup), for example.

Parameter *9998.1 Positioning mode* (page 344) should be set to "ON". This means endless positioning is possible in one direction without losing positions within the modulo travel range.

*9594.1 / 9594.2 / 9594.3 Modulo underflow*

Unit: U

Resolution: 1/65536

Value range: -2147483648 – 2147483647, step 1

Modulo underflow is the opposite of modulo overflow. This means it is the start of the modulo travel range. In many applications it is "0" but can also range between -180° and + 180°.

### 9.2.5 User-defined units P1/P2/P3

MOVIAXIS® offers customers the option of using the controller to send process output data for the position, speed, acceleration and torque to MOVIAXIS® in user-defined units.

In the axis, this process data is converted into internal units (basis: increments) in the setpoint cycle of a minimum of 500 µs.

The same process applies to the process input data returned from MOVIAXIS ® to the controller. The data for position, speed, or acceleration are converted into the customer's user units.

The big advantage for customers / PLC programmers is that they do not have to convert the complex physical conditions in the machine into SEW-EURODRIVE-specific units in their programs. Customers can simply select the units most suitable for their applications and send them as specifications to MOVIAXIS®.

For example, customers can specify the following:

- For the position
  - "Compartments", "Packages", "Bottles", etc.
- For the speed
  - "Bottles / minute", "Pouches / second", etc.
- For the acceleration
  - "Pouches / seconds$^2$", "Compartments/ min×s", etc.

*Position*

*9539.1 – 4*
*9540.1 – 4*
*9541.1 – 4 Position unit text*

Displays the unit text of the position entered by the user. The text consists of a maximum of 16 characters and is set to "Rev." as default, which corresponds to one motor revolution. It is set at motor startup.

*9542.1 / 9542.2 / 9542.3 Position resolution*

Value range:

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4
- 5 = 5
- 6 = 6

The position resolution interprets the decimal places because communication buses communicate using integers only.

Example: The position resolution is "3", the user-defined unit is millimeters. This means that the number "1000" is interpreted via the bus as "1.000" mm.

The parameter tree in MotionStudio displays all values already with decimal point.

*9543.1 / 9543.2 / 9543.3 Position numerator*

Value range: 1 – 65536 – 16777215, step 1

The numerator/denominator factor is used for converting user-defined units into MOVIAXIS® basic units. The basic unit is "revolution" with four decimal places. It is set at motor startup.

*9544.1 / 9544.2 / 9544.3 Position denominator*

See parameter *9543.1 Position numerator* (page 285). Default value: 1000.

*Velocity*

*9532.1 – 4*
*9533.1 – 4*
*9534.1 – 4 Velocity unit text*

Displays the unit text of the velocity entered by the user. The text consists of a maximum of 16 characters and is set to "rpm". It is set at motor startup.

*9535.1 / 9535.2 / 9535.3 Velocity resolution*

Value range:

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4
- 5 = 5
- 6 = 6

The velocity resolution interprets the decimal places because communication buses communicate using integers only.

Example: The velocity resolution is "3" and the user-defined unit is "rpm". This means that the number "1000" is interpreted via the bus as "1.000 rpm".

The parameter tree in MotionStudio displays all values already with decimal point.

*9536.1 / 9536.2 / 9536.3 Velocity numerator*

Value range: 1 – 16777215, step 1

The numerator/denominator factor is used for converting user-defined units into MOVIAXIS® basic units. The basic unit is "rpm" with three decimal places. It is set at motor startup.

*9537.1 / 9537.2 / 9537.3 Velocity denominator*

See parameter *9536.1 Velocity numerator* (page 286).

*Acceleration*

*9546.1 – 4*
*9547.1 – 4*
*9548.1 – 4*
*Acceleration unit text*

Displays the unit text for the acceleration entered by the user. The text consists of a maximum of 16 characters and is set to "rpm". It is set at motor startup.

*9549.1 / 9549.2 / 9549.3 Acceleration resolution*

Value range:

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4
- 5 = 5
- 6 = 6

The acceleration resolution interprets the decimal places because communication buses communicate using integers only.

Example: The acceleration resolution is "3" and the user-defined unit is "rpm×s". This means that the number "1000" is interpreted via the bus as "1.000 rpm×s".

The parameter tree in MotionStudio displays all values already with decimal point.

*9550.1 / 9550.2 / 9550.3 Acceleration numerator*

Value range: 1 – 16777215, step 1

The numerator/denominator factor is used for converting user-defined units into MOVIAXIS® basic units. The basic unit is "rpm×s" with three decimal places. This means one speed change per second. It is set at motor startup.

*9551.1 / 9551.2 / 9551.3 Acceleration denominator*

See parameter *9550.1 Acceleration numerator* (page 286).

*Torque*

Torque setting:

The default setting displays the torque in "%" of the rated motor torque selected at startup.

- Torque resolution = 3
- Torque numerator = 1
- Torque denominator = 1
- Torque unit text = "%"

Example:

Set user-defined unit "Newton meter":

- Torque parameter "9552.1 – 4 unit text" = "Nm",
- Torque parameter "9555.1 Resolution" = 3.

$$\frac{\text{Parameter "9556.1 Torque numerator"}}{\text{Parameter "9557.1 Torque denominator"}} = \frac{100}{\text{Parameter "9610.1 Nominal torque}}$$

→ In the parameter tree, torques are entered in "Nm" with three decimal places.

→ The torque has the unit [$10^{-3}$ Nm] via the bus to the PDOs.

*9552.1 – 4*
*9553.1 – 4*
*9554.1 – 4 Torque unit text*

Displays the customer's unit text for torque. The text consists of a maximum of 16 characters and is set to "%" as default. It is set at motor startup.

*9555.1 / 9555.2 / 9555.3 Torque resolution*

Value range:

- 0 = 0
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4
- 5 = 5
- 6 = 6

The torque resolution interprets the decimal places only for the MotionStudio user interface because communication buses communicate using integers only.

Example: The torque resolution is "3" and the user-defined unit is Nm. This means that the number "1000" is interpreted via the bus as "1 Nm".

The parameter tree in MotionStudio displays all values already with decimal point.

*9556.1 / 9556.2 / 9556.3 Torque numerator*

Value range: 1 – 16777215, step 1

The numerator/denominator factor is used for converting user-defined units into MOVIAXIS® basic units. The basic unit is "%" of the motor torque with three decimal places. It is set at motor startup.

*9557.1 / 9557.2 / 9557.3 Torque denominator*

See parameter *9550.1 Acceleration numerator* (page 286).

### 9.2.6 Reference travel P1/P2/P3

MOVIAXIS® offers a number of options for reference travel. The reference travel type "Reference to fixed stop" is new.

The aim of reference travel is to reference / match the drive and its position data with the machine design. Referencing is used to identify the real zero point of the drive. This value is then used to define distances necessary for positioning processes.

MOVIAXIS® offers the following reference travel types:

- Deactivated
- Zero pulse negative direction
- Negative end reference cam
- Positive end reference cam
- Positive limit switch
- Negative limit switch
- No reference travel
- Reference cam flush limit switch positive
- Reference cam flush limit switch negative
- Fixed stop positive
- Fixed stop negative

The reference travel types differ according to the first search direction or the switching contact (reference cam, limit switch or fixed stop) used for referencing. Reference travel can apply to all three encoders.

Using the reference point determined by reference travel, the machine zero point can be changed using the reference offset according to the following equation.

**Machine zero = reference position - reference offset**

*9658.2 / 10442.1 / 10443.1 Reference travel type*

Value range:

- 0 = Deactivated
- 1 = Zero pulse negative direction
- 2 = Negative end reference cam
- 3 = Positive end reference cam
- 4 = Positive limit switch
- 5 = Negative limit switch
- 6 = No reference travel
- 7 = Reference cam flush with positive limit switch
- 8 = Reference cam flush with negative limit switch
- 9 = Fixed stop positive
- 10 = Fixed stop negative

**Reference travel types:**

- General information about reference travel

For applications using absolute positioning commands, you must define the reference point (machine zero). When using absolute encoders, the reference point must be defined once at initial startup. With all other encoder types, machine zero must be defined each time the machine is switched on.

MOVIAXIS® supports 10 different reference travel types that are set via the parameter *9658.2 Reference travel type*.

If referencing is set to the hardware limit switches and/or the reference cam, these must be set as binary inputs in the control word.

If a hardware limit switch is hit during reference travel type 1 or 2 and the reference point has not yet been found, the drive turns and continues reference travel in the other direction.

**Machine zero = reference point + reference offset.**

The status "Referenced" is reset when the servo inverter is switched off or if error messages relating to the position measuring system are issued.

An exception are absolute encoders, see below section. For Hiperface® and SSI absolute encoders, the status "referenced" is always set and is only reset during reference travel. The status "not referenced" remains if the reference travel is canceled.

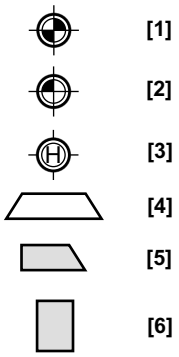
When deciding whether to reference to the reference cam or zero pulse, note the following points:

- The zero pulse shifts when the motor is replaced.
- The reference cam could become inaccurate as a result of age, wear or switching hysteresis.
- If the reference point is determined using the zero pulse and reference cam, and the zero pulse is located exactly at the end of the reference cam, the switching transition of the reference cam might be detected before or after the zero pulse (switching hysteresis). This can result in a reference position that varies by a motor revolution from one time to the next. The situation can be remedied by shifting the reference cam by about half a motor revolution.

- Unidirectional drives can only be referenced using a reference cam. Also note that there is no defined distance between the reference cam and zero pulse of the encoder for non-integer ratios. This means that in this case only the end of the reference cam can be selected as the reference point.
- The length of the reference cam and the reference velocities must be selected so the drive can reliably decelerate to the slower reference velocity (reference velocity 2) on the reference cam. The end of the reference cam or the closest zero pulse of the encoder system can be used as reference point.
- The zero pulse can only be used as a reference point when the encoder has a zero pulse and the zero track is connected to the servo inverter.

As an option, travel to the start position can be selected after the reference procedure for each reference travel type using the parameter *9656.1 Travel to start position* (page 300). This allows you to freely define the drive position regardless of the reference point using *FCB 12 Reference travel* (page 373). This dispenses with the controller performing a positioning travel procedure. The start position is set using parameter *9730.2 Start position* (page 301). The travel speed to the start position is set using parameter *9731.1 Start position velocity* (page 301).

**Explanation of symbols used in the "reference travel types" figures**

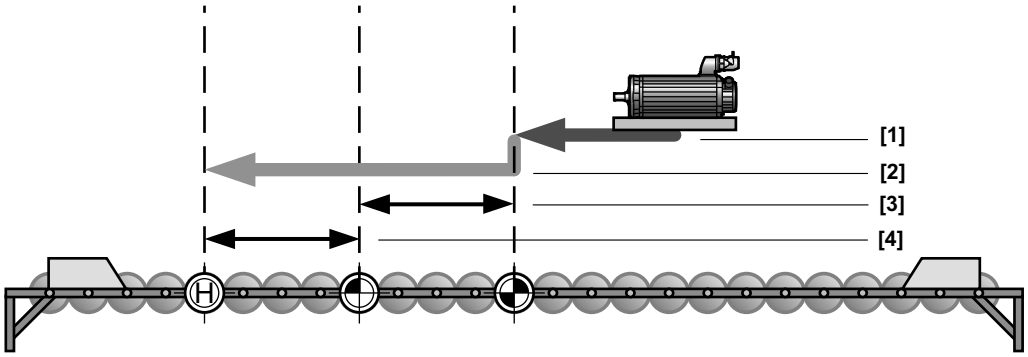



1240575627

[1] Reference point
[2] Machine zero
[3] Stop position after travel to home position (optional)
[4] Reference cam
[5] Hardware limit switch
[6] Fixed stop

- Left zero pulse

For this reference travel type, it is mandatory to set parameter "*9750.1 Referencing to zero pulse*" (page 300) to "YES".



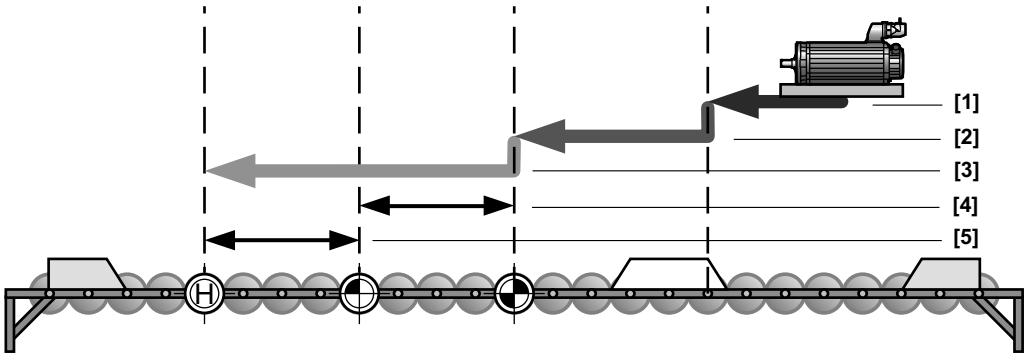

1240733707

[1] 9731.2 Clear velocity (page 301)
[2] 9731.1 Start position velocity (page 301)
[3] 9730.1 Reference offset (page 301)
[4] 9730.2 Start position (page 301)

The reference position is the first zero pulse CCW of the starting position of reference travel. A reference cam is not required. Only parameter *9731.2 Clear velocity* (page 301) (reference speed 2) is used for reference travel.

- Negative end reference cam

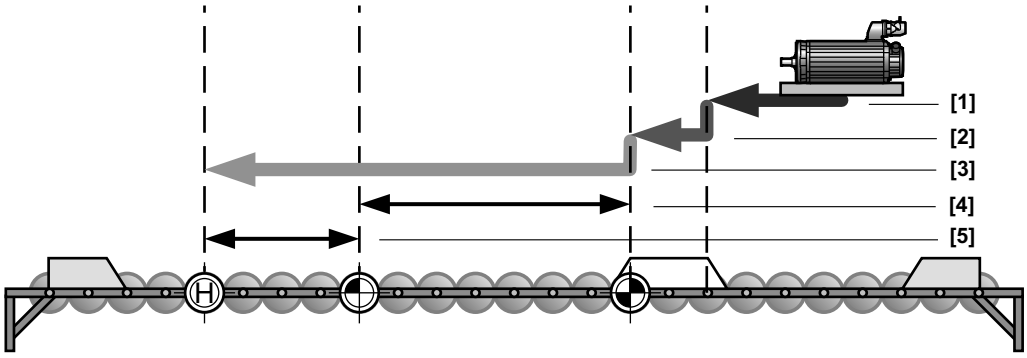
Parameter *9750.1 Reference to zero pulse* (page 300) is set to "YES".




1240736139

[1] 9731.3 Search velocity (page 301)
[2] 9731.2 Clear velocity (page 301)
[3] 9731.1 Start position velocity (page 301)
[4] 9730.1 Reference offset (page 301)
[5] 9730.2 Start position (page 301)

Parameter *9750.1 Reference to zero pulse* (page 300) is set to "NO".




1240738571

[1] 9731.3 Search velocity (page 301)
[2] 9731.2 Clear velocity (page 301)
[3] 9731.1 Start position velocity (page 301)
[4] 9730.1 Reference offset (page 301)
[5] 9730.2 Start position (page 301)

The reference position is the negative end of the reference cam or the first negative zero pulse after the end of the reference cam.

A bit in control word 0 – 3 must be set to "REFERENCE CAM".

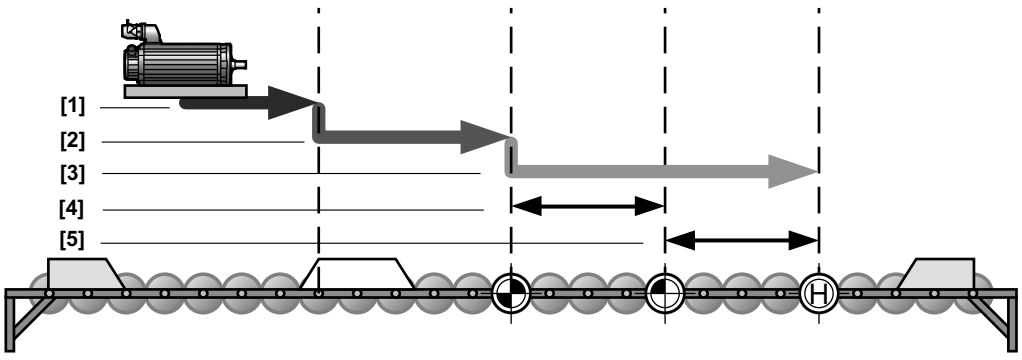
The reference travel starts with the search velocity in a negative rotational direction up to the first positive edge of the reference cam. Search velocity changes to clear velocity once the reference cam is detected.

The reference point will then be the falling edge (negative end) of the reference cam without "Referencing to zero pulse". If "Reference to zero pulse = yes", the reference point will be the first zero pulse after the falling edge of the reference cam.

Parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is not relevant for this reference travel type.

- Positive end reference cam

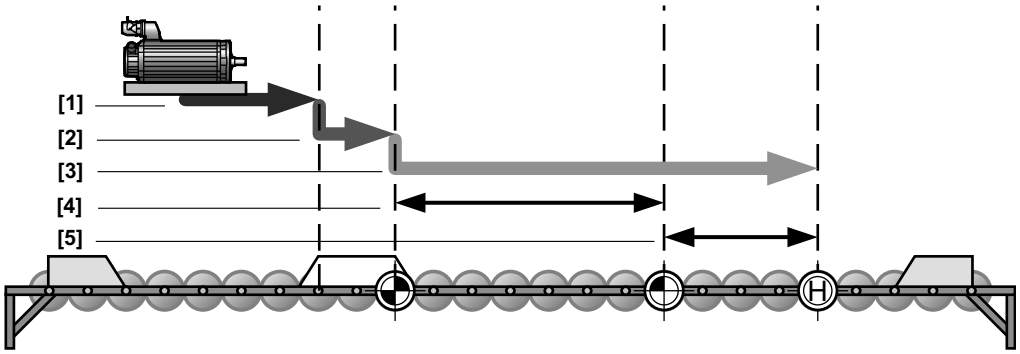
Parameter *9750.1 Reference to zero pulse* (page 300) is set to "YES".




1240741387

[1] 9731.3 Search velocity (page 301)
[2] 9731.2 Clear velocity (page 301)
[3] 9731.1 Start position velocity (page 301)
[4] 9730.1 Reference offset (page 301)
[5] 9730.2 Start position (page 301)

Parameter *9750.1 Reference to zero pulse* (page 300) is set to "NO".




1240743819

[1] 9731.3 Search velocity (page 301)
[2] 9731.2 Clear velocity (page 301)
[3] 9731.1 Start position velocity (page 301)
[4] 9730.1 Reference offset (page 301)
[5] 9730.2 Start position (page 301)

The reference position is the positive end of the reference cam or the first positive zero pulse after the end of the reference cam.

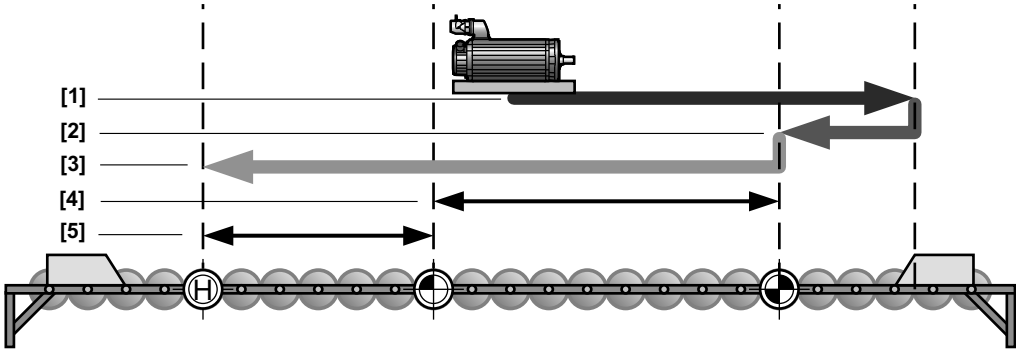
A bit in control word 0 – 3 must be set to "REFERENCE CAM".

Reference travel starts in positive direction. The search velocity is used up to the first positive edge of the reference cam. Search velocity changes to clear velocity once the reference cam is detected.

The reference point will then be the falling edge (right end) of the reference cam without "Referencing to zero pulse". If "Reference to zero pulse = yes", the reference point will be the first zero pulse after the falling edge of the reference cam.

Parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is not relevant for this reference travel type.

- Limit switch positive




1240746251

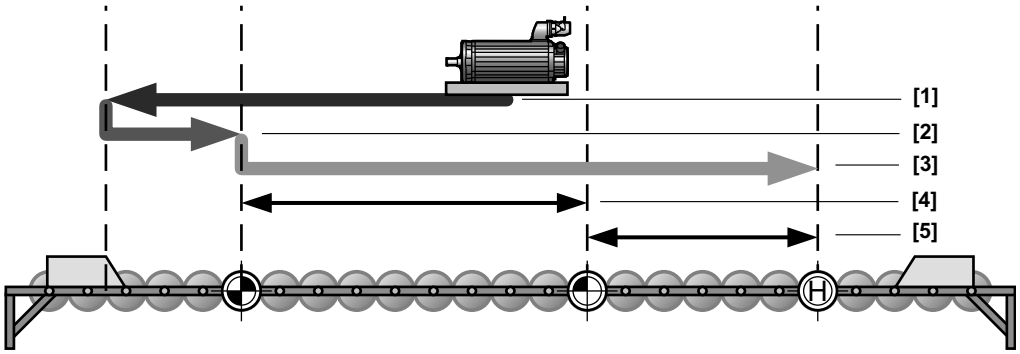
[1] 9731.3 Search velocity (page 301)
[2] 9731.2 Clear velocity (page 301)
[3] 9731.1 Start position velocity (page 301)
[4] 9730.1 Reference offset (page 301)
[5] 9730.2 Start position (page 301)

The reference position is the first zero pulse to the left of the positive limit switch.

Reference travel starts in positive direction. Search velocity is used up to the falling edge of the positive limit switch, then clear velocity is used.

Parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is not relevant for this reference travel type.

- Negative limit switch




1240966283

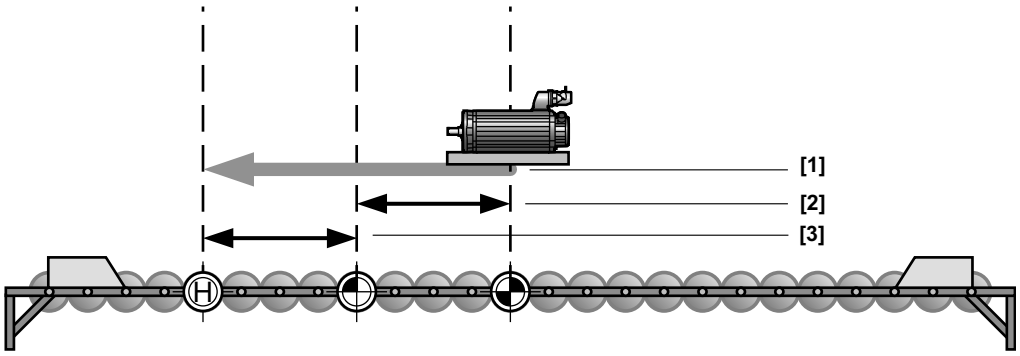
[1] 9731.3 Search velocity (page 301)
[2] 9731.2 Clear velocity (page 301)
[3] 9731.1 Start position velocity (page 301)
[4] 9730.1 Reference offset (page 301)
[5] 9730.2 Start position (page 301)

The reference point is the first zero pulse to the right of the negative limit switch.

Reference travel starts in negative direction. Search velocity is used up to the falling edge of the negative limit switch, then clear velocity is used.

Parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is not relevant for this reference travel type.

- No reference travel




1240968715

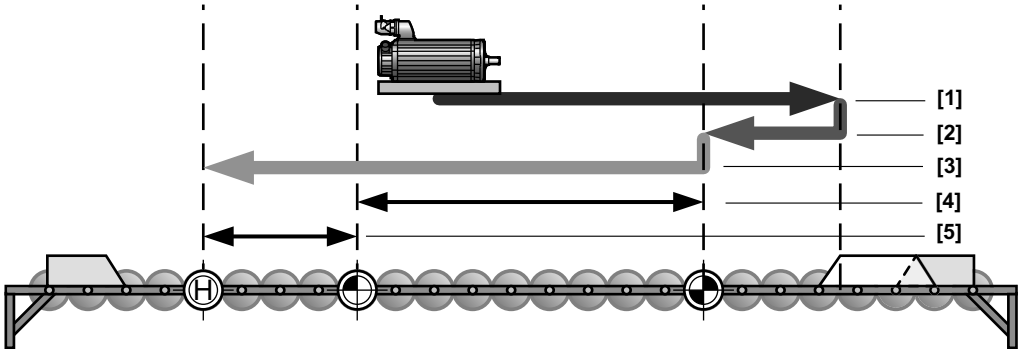
[1] 9731.1 Start position velocity (page 301)
[2] 9730.1 Reference offset (page 301)
[3] 9730.2 Start position (page 301)

The reference position is the current position. It makes sense to use this type of reference travel with absolute encoders and for drives that are to be referenced at standstill. For example, the position of a feed axis can be set to "zero" when the drive is at stand-

still. In this way, the machine operator can tell where the drive is located within each feed movement.

- Reference cam flush with positive limit switch

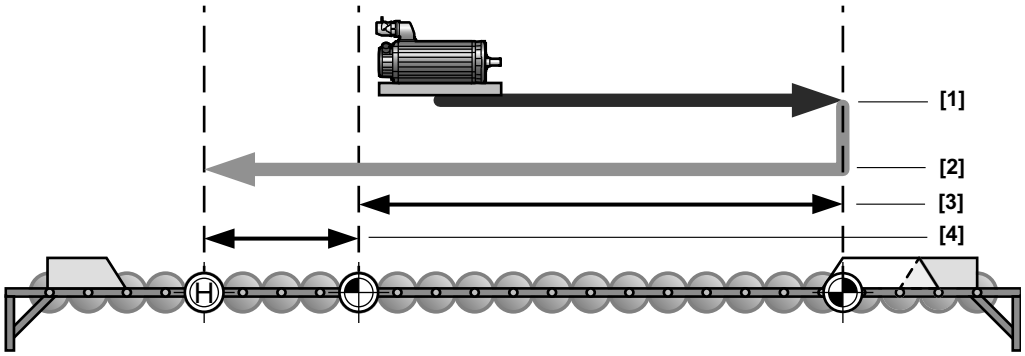
Parameter *9750.1 Reference to zero pulse* (page 300) is set to "YES".




1240971147

[1] 9731.3 Search velocity (page 301)
[2] 9731.2 Clear velocity (page 301)
[3] 9731.1 Start position velocity (page 301)
[4] 9730.1 Reference offset (page 301)
[5] 9730.2 Start position (page 301)

Parameter *9750.1 Reference to zero pulse* (page 300) is set to "NO".




1240973579

[1] 9731.3 Search velocity (page 301)
[2] 9731.1 Start position velocity (page 301)
[3] 9730.1 Reference offset (page 301)
[4] 9730.2 Start position (page 301)

The reference position is the negative end of the reference cam or the first zero pulse to the left after the end of the reference cam.

A bit in control word 0 – 3 must be set to "REFERENCE CAM".

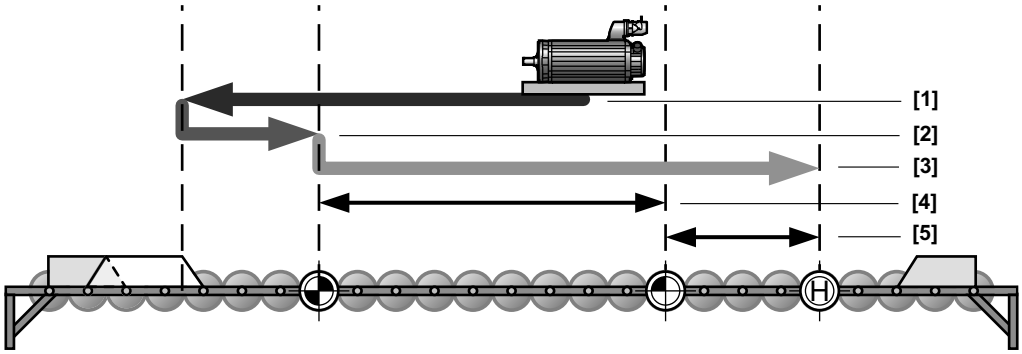
Reference travel starts in positive direction. Search velocity is used up to the first positive edge of the reference cam, then clear velocity is used. In contrast to the type "Negative end reference cam", the drive starts to the right and turns on the reference cam.

Depending on the setting "Reference to zero pulse", referencing takes place to the falling edge of the reference cam or to the zero pulse following the falling edge of the reference cam.

The reference cam must start just before or in line with the positive hardware limit switch and must project into the limit switch. This ensures that no hardware limit switch is hit during reference travel. Parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is not relevant for this reference travel type.

- Reference cam flush with negative limit switch

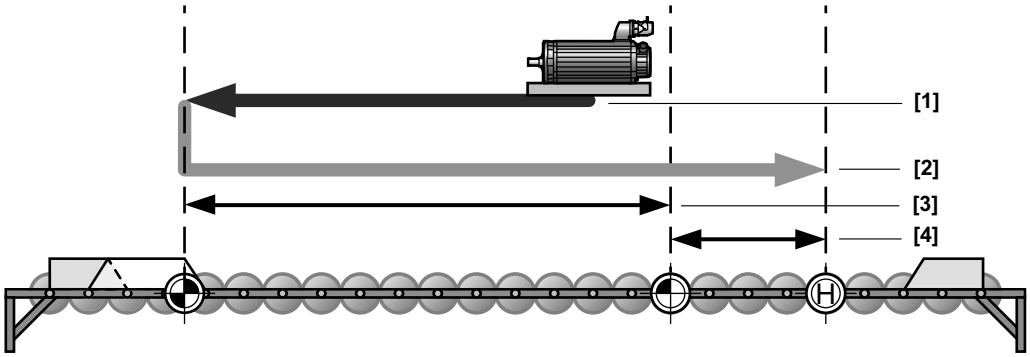
Parameter *9750.1 Reference to zero pulse* (page 300) is set to "YES".




1240976907

[1] 9731.3 Search velocity (page 301)
[2] 9731.2 Clear velocity (page 301)
[3] 9731.1 Start position velocity (page 301)
[4] 9730.1 Reference offset (page 301)
[5] 9730.2 Start position (page 301)

Parameter *9750.1 Reference to zero pulse* (page 300) is set to "NO".




1241043339

[1] 9731.3 Search velocity (page 301)
[2] 9731.1 Start position velocity (page 301)
[3] 9730.1 Reference offset (page 301)
[4] 9730.2 Start position (page 301)

The reference position is the right end of the reference cam or the first zero pulse to the right after the end of the reference cam.

A bit in control word 0 – 3 must be set to "REFERENCE CAM".

Reference travel starts in negative direction. Search velocity is used up to the first positive edge of the reference cam, then clear velocity is used. In contrast to the type "Positive end reference cam", the drive starts to the left and turns on the reference cam.

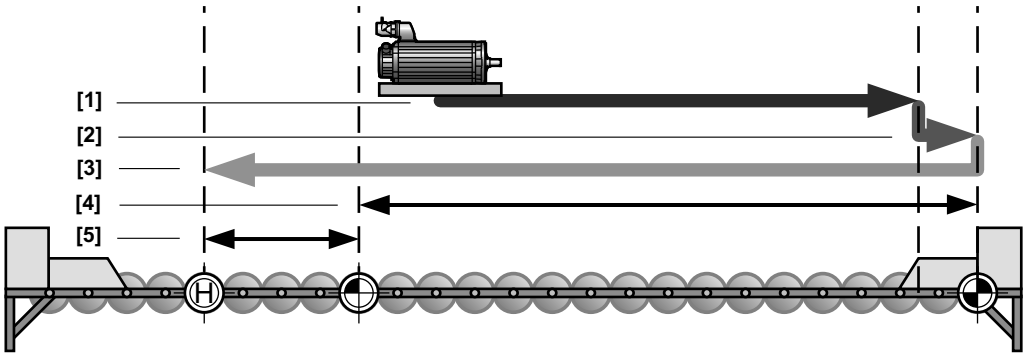
Depending on the setting "Reference to zero pulse", referencing takes place to the falling edge of the reference cam or to the zero pulse following the falling edge of the reference cam.

The reference cam must start just before or in line with the positive hardware limit switch and must project into the limit switch. This ensures that no contact is made with the hardware limit switch during reference travel.

Parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is not relevant for this reference travel type.

- Fixed stop positive

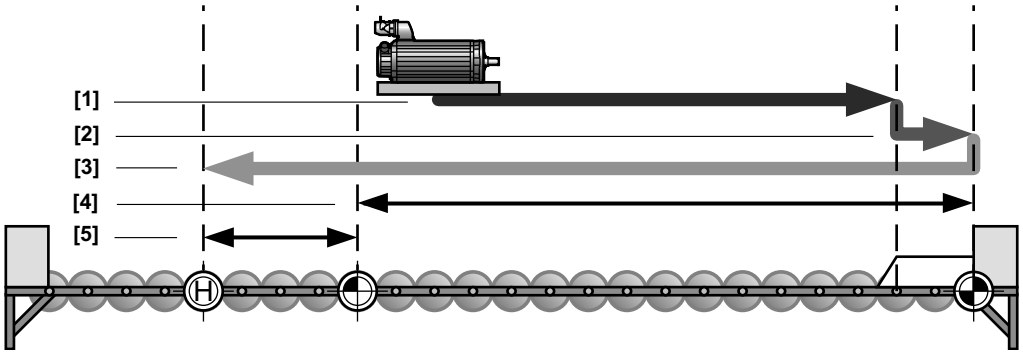
Parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is set to "Hardware limit switch".




1241045771

[1] 9731.3 Search velocity (page 301)
[2] 9731.2 Clear velocity (page 301)
[3] 9731.1 Start position velocity (page 301)
[4] 9730.1 Reference offset (page 301)
[5] 9730.2 Start position (page 301)

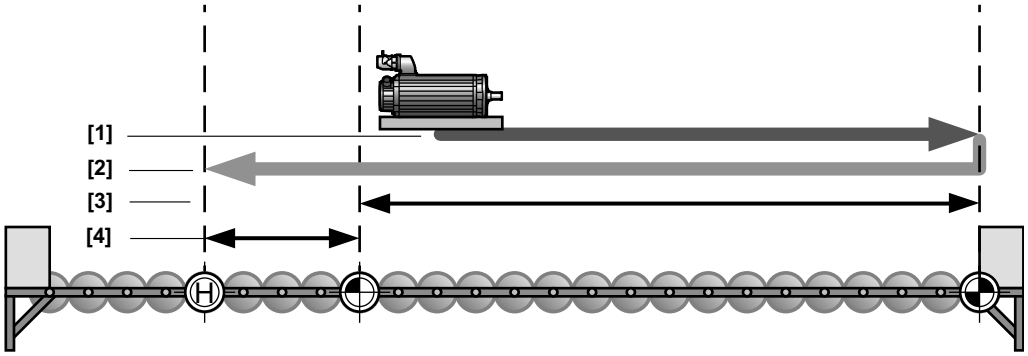
Parameter "*9657.1 Hardware limit switch for velocity changeover*" (page 301) is set to "Reference cam".




1241048203

[1] 9731.3 Search velocity (page 301)
[2] 9731.2 Clear velocity (page 301)
[3] 9731.1 Start position velocity (page 301)
[4] 9730.1 Reference offset (page 301)
[5] 9730.2 Start position (page 301)

Parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is set to "without".




1242546699

[1] 9731.2 Clear velocity (page 301)
[2] 9731.1 Start position velocity (page 301)
[3] 9730.1 Reference offset (page 301)
[4] 9730.2 Start position (page 301)

The reference position is the positive fixed stop. The machine must be designed so that the fixed stop withstands the impact of the respective velocity without any damage.

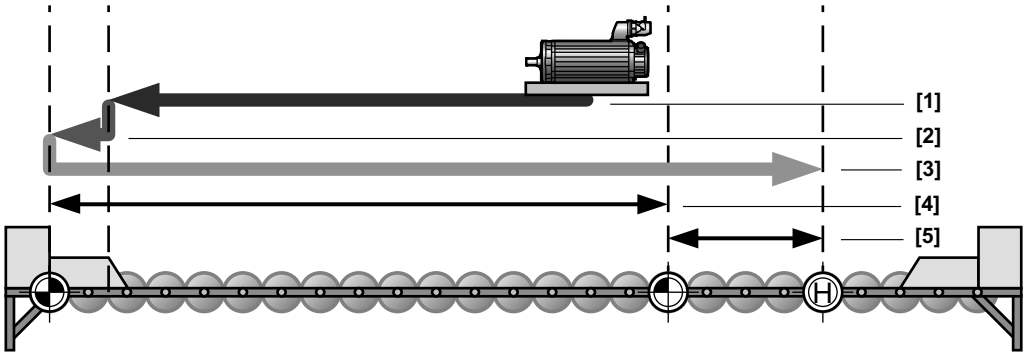
Reference travel starts in positive direction. If parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is set to "without", reference travel will start with clear velocity.

With the setting "Hardware limit switch" or "Reference cam", the reference travel starts with the search speed and reduces to the clear velocity when coming into contact with the hardware switch or reference cam.

Parameter *9655.1 Reference dwell time* (page 302) can be used to set the duration for which the torque (parameter *9654.4 Torque reference travel* (page 302)) is maintained on the fixed stop until referencing.

- Fixed stop negative

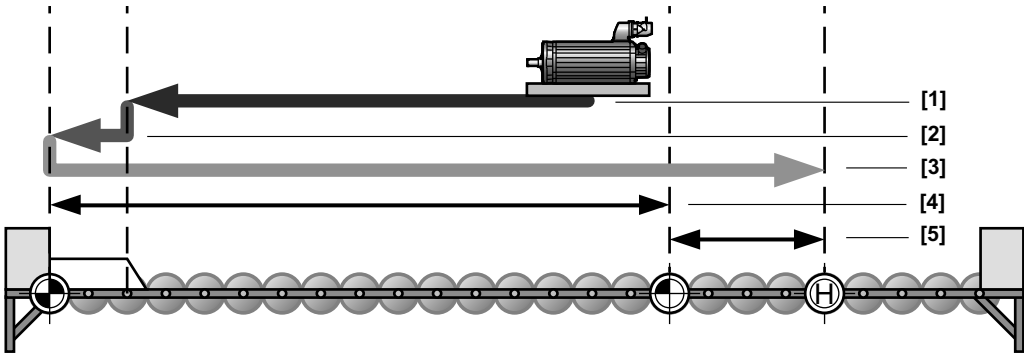
Parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is set to "Hardware limit switch".




1242549131

[1] 9731.3 Search velocity (page 301)
[2] 9731.2 Clear velocity (page 301)
[3] 9731.1 Start position velocity (page 301)
[4] 9730.1 Reference offset (page 301)
[5] 9730.2 Start position (page 301)

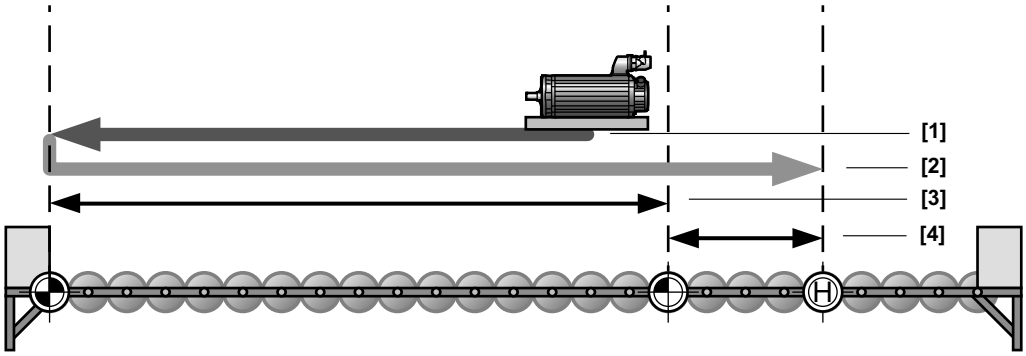
Parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is set to "Reference cam".




1242551819

[1] 9731.3 Search velocity (page 301)
[2] 9731.2 Clear velocity (page 301)
[3] 9731.1 Start position velocity (page 301)
[4] 9730.1 Reference offset (page 301)
[5] 9730.2 Start position (page 301)

Parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is set to "without".




1242554251

[1] 9731.2 Clear velocity (page 301)
[2] 9731.1 Start position velocity (page 301)
[3] 9730.1 Reference offset (page 301)
[4] 9730.2 Start position (page 301)

The reference position is the negative fixed stop. The machine must be designed in such a way that it is not damaged when the fixed stop is reached at the respective speed.

Reference travel starts in negative direction. If parameter *9657.1 Hardware limit switch for velocity changeover* (page 301) is set to "without", reference travel will start with clear velocity.

With the setting "Hardware limit switch" or "Reference cam", the reference travel starts with the search speed and reduces to the clear velocity when coming into contact with the hardware switch or reference cam.

Parameter *9655.1 Reference dwell time* (page 302) can be used to set the duration for which the torque (parameter *9654.4 Torque reference travel* (page 302)) is maintained on the fixed stop until referencing.

*9750.1 / 10442.2 / 10443.2 Referencing to zero pulse*

Value range:

- No
- Yes

Reference to zero pulse, see reference travel type parameter *9658.2* (page 289).

*9656.1 / 10442.3 / 10443.3 Travel to start position*

Value range:

- No
- Yes

Here is set whether the function "Travel to start position" is basically required.

*9657.1 / 10442.4 / 10443.4 HW limit switch for velocity changeover*

Value range:

- 0 = Without
- 1 = Hardware limit switches
- 2 = Reference cam

Hardware switch for velocity change during reference travel, see reference travel type parameter *9658.2* (page 289).

*9730.2 / 10442.7 / 10443.7 Start position*

Unit: U.

Resolution: 1/65536.

Value range: -2147483648 – 0 – 2147483647, step 1.

Start position in user-defined units, see reference travel type parameter *9658.2* (page 289).

*9730.1 / 10442.5 / 10443.5 Reference offset*

Unit: U.

Resolution: 1/65536.

Value range: -2147483648 – 0 – 2147483647, step 1.

Reference offset in user-defined units, see reference travel type parameter *9658.2* (page 289).

*9730.3 / 10442.6 / 10443.6 Reference offset modulo*

Unit: U.

Resolution: 1/65536.

Value range: -2147483648 – 0 – 2147483647, step 1.

Reference offset modulo

*Limit values*

*9731.3 / 10442.8 / 10443.8 Search velocity reference speed 1*

Unit: $10^{-3}$/min.

Value range: 0 – 10000000, step 1.

Search velocity in user-defined units (reference velocity 1), see reference travel type -parameter *9658.2* (page 289).

*9731.2 / 10442.9 / 10443.9 Clear velocity reference speed 2*

Unit: $10^{-3}$/min.

Value range: 0 – 10000000, step 1.

Clear velocity in user-defined units (reference velocity 2), see reference travel type parameter *9658.2* (page 289).

*9731.1 / 10442.10 / 10443.10 Start position reference speed 3*

Unit: $10^{-3}$/min.

Value range: 0 – 10000000, step 1.

Start position velocity in user-defined units (reference velocity 3), see reference travel type parameter *9658.2* (page 289).

*9654.1 / 10442.11 / 10443.11 Acceleration reference travel*

Unit: $10^{-2}$/min×s.

Value range: 0 – 300000 – 2147483647, step 1.

Acceleration reference travel in user-defined units.

*9654.2 / 10442.12 / 104432.12 Deceleration reference travel*

Unit: $10^{-2}$/min×s.

Value range: 0 – 300000 – 2147483647, step 1.

Deceleration reference travel in user-defined units.

*9654.3 / 10442.13 / 10443.13 Jerk reference travel*

Unit: 1/(min×$s^2$).

Value range: 1 – 2147483647, Step 1.

Maximum jerk reference travel.

*9654.4 / 10442.14 / 10442.14 Torque reference travel*

Unit: %.

Resolution: $10^{-3}$.

Value range: 0 – 100000 – 1000000, step 1.

Torque limit reference travel in user-defined units.

*9655.1 / 10442.15 / 10443.15 Reference dwell time fixed stop*

Unit: ms.

Value range: 0 – 100000, step 1.

Reference dwell time fixed stop.

## *9.3 Communication parameter description*

### 9.3.1 PDO Editor Process Data Object Editor

The PDO Editor is the central, graphical software tool for editing and configuring FCBs and the entire unit functionality.

The tool can be used to determine where and which data packages should be retrieved from buses or I/Os, how they should be interpreted (control/process data) and how they are used in the unit functions and, in the same way, to determine how this data is output (buses or I/O).

This feature makes for maximum flexibility when using the MOVIAXIS® functions without the user having to perform any programming. The graphical structure makes it easy for users to familiarize themselves with the tool using the intuitive interface.

### 9.3.2 Basic settings

*9831.1 Stop process data*

Value range:

- No
- Yes

Parameter changes that affect communication (all parameters described in the "Communication" section) will trigger error 66 and stop the process data. The parameter "Stop process data" = "YES" is also used to stop process data but no error message is generated.

The effect of parameter and error 66 is that the drive can only be enabled again when all parameters have been set and the drive does not rotate in a non-controlled manner at the upper speed limit.

*9603.1 PDO time-out response*

Value range:

- 0 = No response
- 1 = Display only
- 5 = Output stage inhibit / waiting
- 6 = Emergency stop / waiting
- 8 = Stop at application limit / waiting
- 10 = Stop at system limit / waiting
- 17 = Stop at application limits / auto reset
- 18 = Emergency stop / auto reset
- 19 = Stop at system limit / auto reset
- 20 = Output stage inhibit / auto reset
- 21 = Stop at application limits / auto reset without error memory
- 22 = Emergency stop / auto reset without error memory
- 23 = Stop at system limit / auto reset without error memory
- 24 = Output stage inhibit / auto reset without error memory

The PDO timeout response sets the error response for the case that the IN buffer does not receive an expected process data. The process data was already received and is then absent before the error message is issued. The axis is in state C3 "Waiting for process data" after a reset. This is not an error but a state.

**0 = No response:**

Error is ignored

**1 = Display only:**

The 7-segment display shows the error but the axis does not respond (continues to operate).

**5 = Output stage inhibit / waiting:**

The axis changes to controller inhibit state and activates the mechanical brake, if installed. If no brake is installed, the motor will coast to a halt. After a reset, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

**6 = Emergency stop / waiting:**

The motor is stopped along the emergency stop ramp. After a reset, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

**8 = Stop at application limit / waiting (default):**

The motor is stopped at the application limit. After a reset, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

**10 = Stop at system limit / waiting:**

The motor is stopped at the system limit. After a reset, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

**17 = Stop at application limits / auto reset**

The motor is stopped at the application limit. The axis runs again without a reset when the error is no longer present.

**18 = Emergency stop / auto reset**

The motor is stopped at the emergency stop limit. The axis runs again without a reset when the error is no longer present.

**19 = Stop at system limit / auto reset**

The motor is stopped at the system limit. The axis runs again without a reset when the error is no longer present.

**20 = Output stage inhibit / auto reset**

The motor is stopped by the output stage inhibit. The axis runs again without a reset when the error is no longer present.

**21 = Stop at application limits / auto reset without error memory**

The motor is stopped at the application limit. The axis runs again without a reset when the error is no longer present. Furthermore, no entry is generated in the error memory.

**22 = Emergency stop / auto reset** without error memory

The motor is stopped at the emergency stop limit. The axis runs again without a reset when the error is no longer present. Furthermore, no entry is generated in the error memory.

**23 = Stop at system limit / auto reset** without error memory

The motor is stopped at the system limit. The axis runs again without a reset when the error is no longer present. Furthermore, no entry is generated in the error memory.

**20 = Output stage inhibit / auto reset** without error memory

The motor is stopped by the output stage inhibit. The axis runs again without a reset when the error is no longer present. Furthermore, no entry is generated in the error memory.

For more information, refer to the operating instructions section "Operation and Service".

*9729.16 Response to external error*

Value range:

- No response
- Display only
- Output stage inhibit/waiting
- Stop at application limit/waiting
- Stop at system limit/waiting

Descriptive text see parameter *9603.1 PDO timeout response* (page 303)

This parameter sets the corresponding response if a bit was set to "External error" in control word 0 – 3.

*Standard communication*

*8937.0 CAN1 protocol selection*

Value range:

- 0=MOVILINK

*8938.0 CAN2 protocol selection*

Value range:

- 0=MOVILINK
- CANopen

CAN2 protocol selection.

“CANopen” provides the following functionality for the CAN2 interface:

- NMT bootup bessage (according to CANopen DS301 V4)
- NMT state machine (only affecting the SDO communication)
- SDO parameter channel
  - NMT state "stopped" when switched off, "preoperational" and "operational" when switched on.
  - Allows for accessing all parameters with expedited upload/download and non-expedited upload/download".
- Minimal object dictionary with the CAnopen parameters [0×1008,0], [0×1018,0], [0×1018,1].
- CANopen error register index [0×1001,0] according to DS301 V4.
- Life guarding protocol via indices [0×100C,0], [0×100D,0] according to DS301 V4.
  - The error response of the life guarding protocolc can be controlled using parameter *9729.19* in the same way as parameter *9729.17 Fieldbus timeout response*.
- The CANopen stack can trigger the following errors:
  - When violating the CANopen lifetime: error 46, subcode 1
  - Invalid CANopen address (0 or > 127): Error 66, subcode 2001.
- Writable CANopen indices in the range of 0×1000 – 0×2000 are not stored in the event of power off. They are usually initialized by controllers when booting the CANopen system.

The indices required to configure the PDO communication according to the CANopen specification DS301 V4 are **not** implemented, and the NMT state machine does not affect R×PDO and T×PDO via CAN2.

An EDS file matching this scope is available from SEW-EURODRIVE.

The PDOs for process data communication must therefore be set to match the configuration of the PLC. The PDO Editor in MotionStudio is used for this purpose. The COB IDs and transfer mode are of particular significance.

The COB IDs should be assigned according to CANopen specification DS301 V4.

Example: RX-PDO1 of the axis with address 2 (from PLC to MX) 180hex + address = 182hex, TX-PDO1 = 202hex.

The sync message of the axes should be set to 80hex as required by CANopen.

*8603.0 CAN1 baud rate*

Value range:

- 0=125 kBaud
- 1=250 kBaud
- 2=500 kBaud
- 3=1 MBaud

CAN1 baud rate. This is only a display value. It is set using the automatic addressing function of the supply module.

*8939.0 CAN2 baud rate*

Value range:

- 0=125 kBaud
- 1=250 kBaud
- 2=500 kBaud
- 3=1 MBaud

CAN2 baud rate.

*8600.0 CAN1 address*

Value range: 0 – 63, step 1

Present CAN1 address. This is only a display value. It is set using the automatic addressing function of the supply module.

*8932.0 CAN2 address*

Value range: 0 – 99, step 1

CAN2 address

*9825.1 Scope ID CAN1*

Value range: 0 – 120 – 1073741823, step 1

This CAN message ID is used for all axis scope recordings (multi-axis scope).

*9883.1 Synchronization ID CAN1*

Value range: 0 – 128 – 1073741823, step 1

This synchronization ID is used for CAN1 for sending and receiving.

*9882.1 Synchronization ID CAN2*

Value range: 0 – 128 – 1073741823, step 1

This synchronization ID is used for CAN2 for sending and receiving.

*9877.5 Setpoint cycle CAN1*

You can handle poorer sync messages (with large jitter) by increasing the CAN setpoint cycle. This is especially needed for baud rates below 500 kBaud.

The maximum sync jitter can be ± (setpoint cycle CAN/4). Long-term deviation must not exceed an average of ± 0.4 % of the CAN setpoint cycle.

The CAN setpoint cycle can be increased if the controller cannot maintain the tolerance of the sync. The value must be a whole-number multiple of the sync cycle.

The default value of "1 ms" is the optimum setting for axis-axis communication within MOVIAXIS® and a minimum baud rate of 500 kBaud.

*9878.5 Setpoint cycle CAN2*

Descriptive text see parameter *9877.5 Setpoint cycle CAN1* (page 306).

*10118.1 Sync mode CAN1*

Value range:

- 0=Consumer
- 1=Producer

Is used to set whether the axis receives (consumes) or sends (produces) a synchronization protocol on CAN1.

Observe the parameter *9836.1 Synchronization source* (page 310) when setting "Consumer".

Observe the parameters "*9877.1 Sync period (page 307)*, *9877.2 Sync offset (page 307)* and *9877.3 Sync start mode (page 308)*" when setting "Producer".

*10118.2 Sync mode CAN2*

Value range:

- 0=Consumer
- 1=Producer

Is used to set whether the axis receives (consumes) or sends (produces) a synchronization protocol on CAN2.

Observe the parameter *9836.1 Synchronization source* (page 310) when setting "Consumer".

Observe the parameters *9878.1 Sync period* (page 307), *9878.2 Sync offset (page 308)* and *9878.3 Sync start mode (page 308)* when setting "Producer".

*9877.1 Sync period CAN1*

Unit: µs

Value range: 0 – 5000 – 100000000, step 1000

Sync period CAN1.

Only if *10118.1 Sync mode CAN1* (page 307) is set to "Producer".

*9878.1 Sync period CAN2*

Unit: µs

Value range: 0 – 5000 – 100000000, step 1000

Sync period CAN2.

Only if *10118.2 Sync mode CAN2* (page 307) is set to "Producer".

*9877.2 Sync offset CAN1*

Unit: µs

Value range: 0 – 5000 – 100000000, step 1000

Sync offset CAN1.

Only if *10118.1 Sync mode CAN1* (page 307) is set to "Producer".

The offset causes a start delay on the parameter *9877.3 Sync start mode CAN1* (page 308).

*9878.2 Sync offset CAN2*

Unit: µs

Value range: 0 – 5000 – 100000000, step 1000

Sync offset CAN2.

Only if *10118.2 Sync mode CAN2* (page 307) is set to "Producer".

*9877.3 Sync start mode CAN1*

Value range:

- 0 = Off
- 1 = when receiving PDO00
- 2 = PDO01
- 3 = PDO02
- 4 = PDO03
- 5 = PDO04
- 6 = PDO05
- 7 = PDO06
- 8 = PDO07
- 9 = PDO08
- 10 = PDO09
- 11 = PDO10
- 12 = PDO11
- 13 = PDO12
- 14 = PDO13
- 15 = PDO14
- 16 = PDO15
- 100 = Direct

The sync start mode CAN1 describes when the axis should start with the sync protocols.

**OFF**

No sync protocols are sent. The module is disabled.

**PDO00 to PDO15**

The synchronization protocols are started if the corresponding PDO00 to PDO15 was received once.

**Direct**

The synchronization protocols are started immediately after booting.

*9878.3 Sync start mode CAN2*

Sync start mode CAN2.

See parameter *9877.3 Sync start mode CAN1* (page 308).

*9992.1 Sync jitter compensation CAN1*

Value range:

- No
- Yes

The sync jitter compensation function informs the sync protocol how much later it can place the sync protocol on the CAN. There are always delays if another protocol is being processed during sync (approx. 200 µs).

The receiver will process this offset.

This is a SEW particularity and always has to be set when MOVIAXIS® units are sync master and sync slave in relation to one another. In this case, the sync jitter compensation for the two other units must be set to "YES".

With external sync master, the sync jitter compensation must be set to "NO".

*9993.1 Sync jitter compensation CAN2*

Value range:

- No
- Yes

CAN2 sync jitter compensation.

See parameter *9992.1 Sync jitter compensation CAN1* (page 309)

*Communication option*

*8453.0 Fieldbus baud rate*

Value range: 0 – 4294967295, step 1

The baud rate of the fieldbus is specified by the master depending on the fieldbus type. In some cases this is only a display value (e.g. PROFIBUS) or an input value.

*8454.0 Fieldbus address*

Value range: 0 – 4294967295, step 1

Current fieldbus address (e.g. for PROFIBUS this is a hardware setting on the option card). In some cases this is only a display value or an input value, just like the fieldbus baud rate.

*8606.0 Timeout*

Unit: ms

Value range: 0 – 500 – 650000, step 10

Fieldbus timeout interval.

An error will be triggered after this timeout interval when the fieldbus is interrupted.

*9729.17 Fieldbus timeout response*

Value range: See parameter *9729.16 Response external error* (page 304).

Fieldbus timeout response.

For a description of the setting options, see parameter "*9603.1 PDO timeout response*" (page 303).

*Gateway*

*9879.1 Sync period gateway*

Unit: µs

Value range: 0 – 5000 – 100000000, step 1000

Sync period gateway.

This value is used for transferring the sync signal from the fieldbus to the system bus. This currently works only with the K-Net fieldbus. In case of questions please contact SEW-EURODRIVE.

*9879.2 Sync offset gateway*

Unit: µs

Value range: 0 – 5000 – 100000000, step 1000

Sync offset gateway.

This value is used for transferring the sync signal from the fieldbus to the system bus. This currently works only with the K-Net fieldbus. In case of questions please contact SEW-EURODRIVE.

*9879.3 Sync start mode gateway*

Value range: See parameter *9877.3 Sync start mode CAN1*

Sync start mode gateway.

This value is used for transferring the sync signal from the fieldbus to the system bus. This currently works only with the K-Net fieldbus. In case of questions please contact SEW-EURODRIVE.

*Synchronization*

*9836.1 Synchronization source*

Value range:

- 0=No source
- 1=CAN2
- 2=CAN1
- 3=Communication option

If the CAN1 or CAN2 sync mode is set to consumer, then this parameter sets the source of the sync signal.

*9835.1 Time interval between sync signals*

Unit: µs

If the axis is the consumer of a sync signal, all incoming signals will be recorded with respect to time and displayed here.

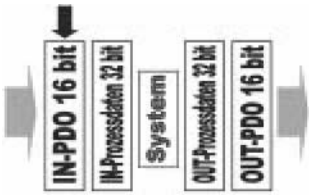
*9951.4 Time interval between base periods*

Value range: -2147483648 – 0 – 2147483647, step 1

For in-house use only!

The time interval between base periods is a display value for internal error diagnostics purposes. All other tasks are derived from the base period.

### 9.3.3 IN buffer

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***IN buffer 0***

*Basic settings*

*9514.1 Data source*

Value range:

- 0=No source
- 1=CAN2
- 2=CAN1
- 3=Communication option

The setting in the data source defines the bus system responsible for reading the data.

*9514.3 Data block start*

The data block start describes from which data block within a message the IN buffer is loaded. Whether a value unequal to 0 may be entered depends on the bus system (e.g. the data block start for CAN is always 0).

*9514.4 Data block length*

Value range: 0 – 4 – 16, step 1.

The data block length also depends on the bus system, e.g. for CAN = maximum 4.

*9514.19 Timeout interval*

Unit: µs

Value range: 0 – 100000000, step 1000.

Timeout interval IN buffer 0. The value 0 deactivates the timeout.

*9514.5 Update*

Value range:

- 1=ON
- 0=OFF

The update indicates whether the value in the IN buffer is updated with the values from the bus or not. This parameter can be used to separate the PDO from the bus.

*9514.16 Configuration error*

Value range: 0 – 4294967295, step 1

- 0=No error

The Config error indicates any error.

*Specific CAN parameters*

*9514.2 Message ID*

Value range: 0 – 1073741823, step 1

The message ID is a CAN-specific parameter. It numbers or prioritizes the messages.

*9514.14 Data acceptance with sync.*

Value range:

- 1=No
- 0=Yes

Here you can set whether the data is transferred to the IN buffer after receiving the first sync message. This is a CAN-specific parameter.

| | **INFORMATION** |
|---|---|
| | The sync must be sent exactly as often as the process data when set to "Yes". |

*9514.20 Endianess IN buffer 0*

Value range:

- 0=Big Endian
- 1=Little Endian

This parameter is used to set whether the first of the two bytes from the bus is interpreted as high or low byte.

- **Big Endian**

The first byte from the bus is interpreted as high byte.

- **Little Endian**

The first byte from the bus is interpreted as low byte.

This is a CAN-specific parameter.

*Specific communication option parameters*

*9514.18 Address sender IN buffer 0*

Value range: 0 – 255, step 1.

This parameter only applies to the K-Net bus system and sets the PDO address.

This parameter is usually set in the PDO Editor.

*9514.17 PDO ID*

Value range: 0 – 255, step 1.

K-Net IN buffer ID 0.

*Data*

*9754.1 – 16 data word 0 – 15*

Value range: 0 – 65535, step 1.

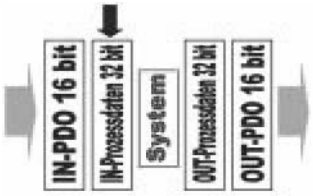
Data word 0 – 15 IN buffer 0.

Displays the current data in the IN buffer 0 – 15.

***IN buffer 1 – 15***

See IN buffer 0 (page 311) for a description of the parameter.

### 9.3.4 Control words 0 – 3

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*9510.1 Actual value source*

Displays the actual value of control word 0.

*Control word 0*

The control word is the control center that activates or deactivates functions in the axis module via binary inputs or process data.

*9512.1 Source control word 0*

Value range:

- 0=No source
- 8334=Standard binary inputs
- 75339=Local control word
- 730515=Opt 1 DI
- 730521=Opt 2 DI
- Or "IN 0-15" word 0 – 15

Several sources can be set for control word 0:

- **No source**

The control word is inactive.

- **Standard binary inputs**

The binary inputs on the basic unit are transferred to the control word. All FCBs 1 = active via bus communication (1 on FCB 13 triggers a stop at the application limits). To implement wire breakage protection via binary inputs, the following FCBs or functions are 0 = active:

- FCB 01 Output stage inhibit
- FCB 13 Stop at application limits
- FCB 14 Emergency stop
- FCB 15 Stop at system limits

- External error (no FCB but message)
- Limit switch positive
- Limit switch offset (0 on FCB 13 negative triggers a stop at the application limits). This only applies to the standard binary input source.

- **Local control word**

Parameter *9803.1 Local value* (page 314) specifies the control word.

- **Opt 1 DI**

If a digital terminal expansion XIO or XIA is plugged in option slot 1, then the control word is specified by the option.

- **Opt 2 DI**

If a digital terminal expansion XIO or XIA is plugged in option card slot 3, the control word is specified by the option.

- **IN**

If you want to specify the control word via bus, set IN 0 – 15 and word 0 – 15.

This parameter is usually set in the PDO Editor.

*9803.1 Local value*

Value range: 0 – 4294967295, step 1

If the source control word 0 is set to "local control word", this parameter will be control word 0. This must only be used for test purposes, as the parameter is set to 0 after a reset.

This parameter is usually set in the PDO Editor.

*9513.1 Layout*

Value range:

- 0=No layout
- 1=Programmable layout
- 2 = FCB/ instance
- 3 = Programmable layout / FCB / instance

Layout control word 0

- **No layout**

The control word is inactive.

- **Programmable layout**

Each bit of the control word is freely configurable.

- **FCB/instance**

The control word has a fixed assignment. The 8 low bits (low byte) are used for selecting the FCB and the 8 high bits (high byte) for selecting the instance. See also parameter "9804.1 Select FCB with instance".

- **Programmable layout / FCB / instance**

Part of the control word has a fixed assignment. Bit 0 to 4 is freely configurable: Bits 5 to 9 select the FCB. Bits 10 to 15 select the instance.

This parameter is usually set in the PDO Editor.

*9513.10 Bit 0*

Value range:

- 0 = No function
- 1 = FCB final stage lock
- 2 = FCB stop at system limits
- 3 = FCB emergency stop
- 4 = FCB stop at application limits
- 5 = FCB reference travel
- 7 = FCB jog mode
- 8 = FCB hold control
- 9 = FCB brake test
- 10 = FCB encoder adjustment
- 11 = FCB electronic gear unit
- 12 = FCB electronic cam
- 13 = FCB interpolated position control
- 14 = FCB positioning
- 15 = FCB interpolated speed control
- 16 = FCB speed control
- 17 = FCB interpolated torque control
- 18 = FCB torque control
- 20 = FCB rotor position identification
- 21 = FCB stop at user limits
- 31 = Limit switch 1 positive
- 32 = Limit switch 1 negative
- 33 = External error
- 34 = Fault reset
- 35 = Reference cam
- 36 = Parameter selection bit 0
- 37 = Parameter selection bit 1
- 38 = IEC input
- 39 = Jog negative
- 40 = Jog positive
- 41 = Feed enable
- 42 = Accept position
- 46 = Limit switch 2 positive
- 47 = Limit switch 2 negative
- 48 = Limit switch 3 positive
- 49 = Limit switch 3 negative
- 50 = Start synchronous operation
- 51 = Event control FCB reset

- 52 = Jog velocity selection
- 53 = Release brake with inhibited output stage
- 54 = Control bit stop with position control

Programmable control word 0 layout bit 0.

Determines the function of bit 0 of control word 0.

- **No function**

The bit is inactive.

- **FCBs**

Activating the bit selects the corresponding FCB. The corresponding FCB is active if "1" is present. The only exception is if binary inputs are the source of the control word. The stop FCB 0 is then active for wire breakage protection. See also parameter "9512.1 Source control word 0" (page 313).

- **Limit switch**

**Via binary inputs:**

Signal 0 → Positive limit switch reached

Signal 1 → Limit switch not approached

**Via IN buffer:**

Signal 0 → Limit switch not approached

Signal 1 → Positive limit switch reached

- **External fault**

Signal 0 → External error is present

Signal 1 → External error not present → enable

- **Error reset**

The axis is performing an error reset. A CPU reset, system restart or warm start is performed depending on the type of error. An error of the type display only (warning) will also be reset.

- **Reference cam**

Is required for reference travel.

- **Parameter selection bit 0**

Selecting another parameter set switches to a second or third connected motor. For this purpose, the motors have to be specified in the startup routine.

Bit 0 = 0 and bit 1 = 0 → No function

Bit 0 = 1 and bit 1 = 0 → motor 1

Bit 0 = 0 and bit 1 = 1 → motor 2

Bit 0 = 1 and bit 1 = 1 → motor 3

- **Parameter selection bit 1**

See parameter selection bit 0

- **IEC input**

This bit can be used for a master MOVI-PLC®.

- **Jog negative**

This bit is only active in conjunction with *FCB 20 Jog* (page 381) active and jogging occurs in the corresponding direction when a "1" is present at the input.

- **Jog positive**

This bit is only active in conjunction with *FCB 20 Jog* (page 381) active and jogging occurs in the corresponding direction when a "1" is present at the input.

- **Jog velocity selection**

Switching between jog speeds 1 and 2.

- **Feed enable**

This bit is only active in conjunction with *FCB 09 positioning (page 363)*. If you have selected feed enable, it must be set to "1" during the entire positioning procedure. Revoking feed enable will decelerate the axis using the maximum deceleration of *FCB 09 Positioning* (page 363). Another enable continues the positioning travel to the last target at the acceleration specified in *FCB 09 Positioning* (page 363). Feed enable must be activated in parameter *9885.1 Use control bit "feed enable"* (page 364).

- **Accept position**

This bit is only active in conjunction with *FCB 09 Positioning* (page 363) and is particularly useful for relative operating modes. This bit must have received a positive edge once to trigger the positioning process. This can be used to relatively synchronize forward without changing the target. This function is also effective in absolute operating modes. Accepting the position must be activated in parameter *9885.2 Control bit "accept position"* (page 364).

- **Event control FCB reset**

This bit resets a FCB selection of event processing for the duration of the bit selection. For information about event control, refer to the MOVIAXIS® technology manual.

This parameter is usually set in the PDO Editor.

- **Release brake with inhibited output stage**

This bit releases the brake within the *FCB 01 Output stage inhibit*. This function is edge-triggered, i.e. the brake is only released with a positive edge while *FCB 01 Output stage inhibit* has already been selected.

Exceeding the limit switches is only displayed via software and does not cause the brake to be applied.

*9513.xx Bit 1 – 15* See description of parameter *9513.xx Bit 0*.

*9510.1 Actual value source* Displays the current control word 0.

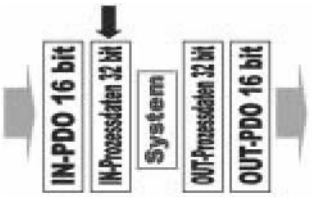
*Control word 1* See control word 0 (page 313) for a description of the parameter.

*Control word 2* See control word 0 (page 313) for a description of the parameter.

*Control word 3* See control word 0 (page 313) for a description of the parameter.

### 9.3.5 Error message words

Error message word can forward error states across different axes. For example, an error in the main drive can cause all auxiliary drives to go to error status. This is realized via lateral axis communication and for this reason only possible with the CAN system bus.

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*9979.1 Source error message word 0*

Value range:

- 0=No source
- 8334=Standard binary inputs
- 75339=Local control word
- 730515=Option 1
- 730521=Option 2
- Or "IN buffer 0 – 15" word 0 –15

This parameter is usually set in the PDO Editor.

*9977.1 Response error message word 0*

Value range:

- No response
- Display only
- Stop at application limit/waiting
- Emergency stop/waiting
- Stop at system limit/waiting
- Output stage inhibit/waiting
- System-internal/waiting (no function)

The error message word response defines the response upon receiving an error message.

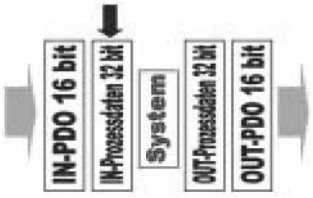
This parameter is usually set in the PDO Editor.

*9978.1 Response error message word 0*

The error message word is triggered when the high byte of the current value is not equal to zero. This allows for direct transmission of a status word of another axes with the layout *FCB Error code*.

This parameter is usually set in the PDO Editor.

### 9.3.6 IN process data

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***Channel 0***

*9822.1 Source process data channel 0*

Value range:

- 0=No source
- 8334=Standard binary inputs
- 75339=Local control word
- 730515=Option 1
- 730521=Option 2
- Or "IN buffer 0 – 15" word 0 –15

Source of the IN process data channel 0

This parameter is usually set in the PDO Editor.

*9530.1 Access channel 0 32-bit*

Value range:

- 0=16-bit
- 1=32 Bit Big Endian
- 2=32 Bit Little Endian

IN process data channel 0 access 32 bit.

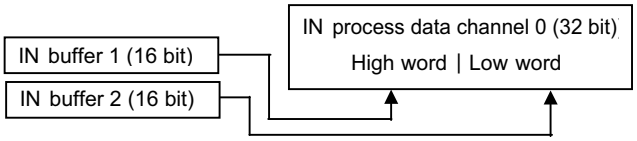
- **16 bit**

Access to the value set in parameter *9822.1 Source process data channel 0* (page 319) is transferred.

- **32 Bit Big Endian**

The access to the value set in parameter *9822.1 Source process data channel 0* (page 319) is accepted as high word (16 high bits) and and source +1 as low word.

For example: IN BUFFER 1 set as source.

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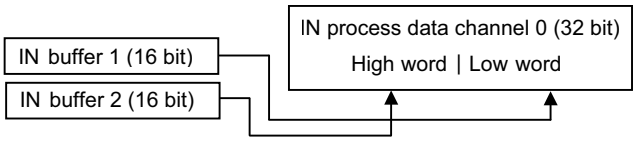
- **32 Bit Little Endian**

The access to the value set in parameter *"822.1 Source process data channel 0"* (page 319) is accepted as low word (16 high bits) and and source +1 as high word.

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This parameter is usually set in the PDO Editor.

*9531.1 System unit channel 0*

Value range:

- 0=Position
- 1=Speed
- 2=Acceleration
- 3=Torque
- 4=Not interpreted
- 5=System position

The system unit selection has to be set to specify the interpretation of channel 0 (what numerator / denominator factor should be used) so that the IN process data channels can be processed as user-defined units in the system.

This parameter is usually set in the PDO Editor.

*9876.1 Actual value channel 0*

Value range: -2147483648 – 0 – 2147483648, step 1.

The actual value of the IN process data channel 0 has a size of 32 bits in user-defined units.

This parameter is usually set in the PDO Editor.

***Channel 1 – 15***

*9822.2 – 16 Source process data channel 1*

Value range: See parameter *9822.1 Source process data channel 0* (page 319).

*9530.2 – 16 Access channel 1 – 15 32-bit*

Value range: See parameter *9530.1 Access channel 0 32-bit* (page 319).

*9531.2 – 16 System variable channel 1 – 15*

Value range: See parameter *9531.1 Channel 0 system variable* (page 320).

*9876.2 – 16 Actual value*

Value range: -2147483648 – 0 – 2147483647, step 1.

The actual value of IN process data channel 1 has a size of 32 bits in user-defined units.

This parameter is usually set in the PDO Editor.

### 9.3.7 Status words 0 – 3


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***Status word 0***

*9511.1 Actual value*

Value range: 0 – 4294967295, step 1.

Displays the current value of status word 0.

*Basic settings*

*9851.1 Source*

Value range:

- 0=No source
- 1=System
- 2=Local status word

Several sources can be set for status word 0:

- **No source**

The status word is inactive.

- **System**

The status word is composed of system variables that are based on the parameter *9856.1 Layout and function* (page 322).

- **Local control word**

Parameter *9844.1 Local value* (page 321) specifies the status word.

This parameter is usually set in the PDO Editor.

*9844.1 Local value*

Value range: 0 – 65535, step 1.

If the status word 0 source is set to "local control word", this parameter will be status word 0. This must only be used for test purposes, as the parameter is set to 0 after a reset.

This parameter is usually set in the PDO Editor.

*9856.1 Layout*

Value range:

- 0 = Programmable layout
- 1 = FCB/ instance
- 2 = FCB / error code
- 3 = Programmable layout / error code

Layout status word 0

- **No layout**

The status word is inactive

- **Programmable layout**

Each bit of the status word is freely configurable.

- **FCB/instance**

The status word has a fixed assignment. The 8 low bits (low byte) are used for displaying the currently active FCB and the 8 high bits (high byte) for displaying the currently active instance.

- **FCB/error code**

The status word has a fixed assignment. The 8 low bits (low byte) are used for displaying the currently active FCB and the 8 high bits (high byte) for displaying the current error. If the axis is not in error status, a 0 will be displayed in the upper error byte.

- **Programmable layout / error code**

The status word only has partial fixed assignment. The lower 8 bits (low byte) are freely configurable. The upper 8 bits (high byte) have fixed assignment with the error code in the event of an error.

This parameter is usually set in the PDO Editor.

*Programmable layout*

*9559.1 Bit 0*

Value range:

- 0=No function
- 1=Ready for operation
- 2=Output stage ON
- 3=Brake released
- 4=Brake applied
- 5=Motor standstill
- 6=Negative limit switch
- 7=Positive limit switch
- 8=Drive 1 referenced
- 9=Drive 2 referenced
- 10=Drive 3 referenced
- 11=Active drive referenced

- 12=In position
- 13=Parameter set bit 0
- 14=Parameter set bit 1
- 15=Setpoints active
- 16=Torque limit reached
- 17=Current limit reached
- 18=IEC control error
- 19=IEC output
- 20=Fault
- 21=Displayed fault signal
- 22=Error without immediate output stage inhibit
- 23=Error with immediate output stage inhibit
- 24=FCB Speed control active
- 25=FCB Interpolated speed control active
- 26=FCB Torque control active
- 27=FCB Interpolated torque control active
- 28=FCB Positioning active
- 29=FCB Interpolated positioning active
- 30=FCB Electronic gear unit
- 31=FCB Hold control active
- 32=FCB Jog mode active
- 33=FCB Brake test function active
- 34=Calibrate FCB encoder
- 36=FCB Electronic cam active
- 37=FCB Output stage inhibit active
- 38=FCB System stop active
- 39=FCB Emergency stop active
- 40=FCB Application stop active
- 41=FCB Standard (FCB13)
- 42=STO Safe Torque Off 1
- 43=STO Safe Torque Off 2
- 44=Prewarning motor temperature (KTY)
- 45=FCB Dual drive active
- 46=External fault reset
- 47=Software limit switch positive
- 48=Software limit switch negative

- 49=Process data valid (no function)
- 51=Brake tested OK
- 52=Brake tested not OK
- 53=DI-00 output stage enable
- 54 = FCB 25 Rotor position identification active
- 55 = FCB 26 Stop at user limits active
- 56 = FCB 26 Stop at user limits position controlled
- 57 = Motor commutated
- 58 = 24 V standby operation
- 59 = Process data not ready

Programmable status word 0 layout bit 0.

- **No function**

The bit is inactive.

- **Ready**

Signal 0 → The axis is currently not ready for operation. Reasons can be error states or operating states outside FCB processing (supply voltage off, power supply module not ready).

1 signal: The axis is in FCB processing. If no FCB is selected, the default *FCB 13 Stop at application limits* will become active. The 7-segment display will show the number "13". The "ready" signal alone does not indicate that the axis module is error-free. The signals refers to the module itself. For example: When a drive is located at the limit switch, the axis module signals "ready" although an error is present.

All errors are "locked" in the final state. See also the operating instructions "MOVIAXIS® MX Multi-Axis Servo Inverters", chapter "Operating Displays and Errors".

- **Output stage ON**

"Output stage enabled" is a subset of "Ready for operation" which is set to "1" in all FCBs except for FCB 01 Output stage inhibit.

- **Brake released**

Signal 0 → Brake output activated

Signal 1 → Brake output not activated

- **Brake applied**

Signal 0 → Brake output not activated

Signal 1 → Brake output activated

- **Motor standstill**

Signal 0 → Motor is turning

Signal 1 → Motor at standstill

The threshold from which motor standstill is indicated as such is set in parameters

– *10056.1 Velocity threshold motor at standstill - status bit* (page 277)

– *10057.1 Filter time motor at standstill - status bit* (page 277)

.

- **Limit switch negative**

Signal 0 → Limit switch not approached

Signal 1 → Limit switch approached

- **Limit switch positive**

Signal 0 → Limit switch not approached

Signal 1 → Limit switch approached

- **Axis 1 referenced**

This bit indicates whether axis 1 (parameter set 1) is referenced. Incremental encoders, resolvers and single-turn Hiperface® encoders loose their reference with each power-off. Absolute encoders must be referenced only once before use, or after a reset to the delivery state (parameter *9727.3 Delivery state d1* (page 401)). An additional function is integrated in motors with Hiperface® encoders. In case of service, a new motor is recognized and the referenced bit is reset.

- **Axis 2 referenced**

This bit indicates whether axis 2 (parameter set 2) is referenced. Incremental encoders, resolvers and single-turn Hiperface® encoders loose their reference with each power-off. Absolute encoders must be referenced only once before use, or after a reset to the delivery state (parameter *9727.3 Delivery state d1* (page 401)). An additional function is integrated in motors with Hiperface® encoders. In case of service, a new motor is recognized and the referenced bit is reset.

- **Axis 3 referenced**

This bit indicates whether axis 3 (parameter set 3) is referenced. Incremental encoders, resolvers and single-turn Hiperface® encoders loose their reference with each power-off. Absolute encoders must be referenced only once before use, or after a reset to the delivery state (parameter *9727.3 Delivery state d1* (page 401)). An additional function is integrated in motors with Hiperface® encoders. In case of service, a new motor is recognized and the referenced bit is reset.

- **Active drive referenced**

This bit indicates whether the active axis is referenced. Incremental encoders, resolvers and single-turn Hiperface® encoders loose their reference with each power-off. Absolute encoders must be referenced only once before use, or after a reset to the delivery state (parameter *9727.3 Delivery state d1* (page 401)). An additional function is integrated in motors with Hiperface® encoders. In case of service, a new motor is recognized and the referenced bit is reset.

- **In position**

The "In position signal" must only be used in conjunction with *FCB 09 Positioning* (page 363).

Signal from 0 to 1 → The axis is "In position" when it enters the range defined in parameter *9885.3 Window width for in position message* (page 365) relative to the specified target. If a travel command was aborted with an FCB changeover but the drive still arrives in the position window by chance, then **no** "In position "message will be generated.

Signal 1 to 1 → The axis **loses** "In position" when it is outside parameter *9885.3 "Window width for in position message* (page 365) + parameter *9885.4 Hysteresis range* (page 366) relative to the specified target. This avoids bouncing of the bit.

The IN position message does not disappear when changing from *FCB 09 Positioning* (page 363) as long as you are in the position window + hysteresis. However, the IN position message is only set within *FCB09 Positioning* (page 363).

**FCB change**

When changing to another FCB (e.g. FCB 13 Stop at application limits to activate the brake), the "In position" message at standstill will **not get lost**. When re-entering *FCB 09 Positioning* (page 363), the bit has remained unchanged.

The message is only removed when the position window + hysteresis range is exceeded relative to the last target. This applies to all FCBs. This means the message can **only** be generated within *FCB 09 Positioning* (page 363). The message is only removed when the position window + hysteresis range is left regardless of the current FCB.

- **Parameter set bit 0**

This bit is used for parameter set changeover (see also "Parameter set bit 1").

Bit 0 = 1 and bit 1 = 0 → Parameter set 1 active

Bit 0 = 0 and bit 1 = 1 → Parameter set 2 active

Bit 0 = 1 and bit 1 = 1 → Parameter set 3 active

MOVIAXIS® supports 3 physically connected motors with encoder feedback. An additional "XGK11A encoder card" option is required each for the second and third motor to connect the additional encoder feedback systems. The motor power cables must be distributed through a changeover switch (not included in the SEW scope of delivery) to the individual motors. The individual motors/parameter sets must first be entered in the startup routine.

- **Parameter set bit 1**

See "Parameter set bit 0"

- **Setpoints active**

This message is active in all setpoint processing FCBs when setpoints are being processed. These are *FCB 05 (page 351) – FCB 10 (page 371)*. The message is set to 0 in all stop FCBs and the default FCB. The message is still 0 during the brake release time.

- **Torque limit reached**

This message indicates when the torque limit is reached: *9580.1 System limit maximum torque (page 281) 9740.4 Application limit maximum torque (page 283)* or maximum torque of the respective FCB.

- **IEC control error**

This message is in preparation.

- **IEC output**

This message is in preparation.

- **Malfunction**

This message is issued when the MOVIAXIS® unit is in error state. It is not relevant for the fault bit whether the output stage is inhibited immediately or not.

- **Message displayed fault**

This signal is a subset of "Fault" and displays error responses that are configured to "Display fault". The drive continuous to operate normally.

- **Error without immediate output stage inhibit**

This signal is a subset of "Fault" and indicates that the drive can be decelerated using a ramp (motor does not coast to a halt or mechanical brake is not applied). This bit is also set when "Signal displayed error".

- **Error with immediate output stage inhibit**

This signal is a subset of "Fault" and indicates that the motor coasts to a halt or, if installed, the mechanical brake is applied.

- **FCBs**

The relevant message is set to 1 if the corresponding FCB is active.

- **Brake tested OK**

The FCB has successfully tested the brake and found it to be good according to the basic conditions set in FCB. Also see *FCB 21 brake test* (page 384).

- **Brake tested not OK**

The FCB brake test has assessed the brake as faulty. The higher-level controller now decides on the measures to be initiated. Also see *FCB 21 brake test* (page 384).

- **Output stage enable DI-00**

Displays the current status of the terminal DI00.

This parameter is usually set in the PDO Editor.

- **Motor commutated**

Shows whether the motor is commutated or not. In "Not commutated" status, the drive cannot be enabled.- This bit is only useful for synchronous motors with incremental encoders. For absolute encoders, the bit is always set to "TRUE".

- **24 V standby operation**

Mirrors the bit of the same name in the unit status (*9702.1 Bit 8*)

- **Process data not ready**

Mirrors the bit of the same name in the unit status (*9702.1 Bit 13*)

*9559.2 – 16*
*Bit 1 – 15*

Value range: See parameter "9559.1 Control word 0 bit 0" (page 322).

Programmable status word 0 layout bits 1 – 15.

***Status word 1 – 3***

Description of status words 1 – 3, see status word 0.

### 9.3.8 OUT process data


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***Channel 0***

*9560.1 System unit channel 0*

Value range:

- 0=No unit
- 1=Actual speed
- 2=Position
- 3=Acceleration
- 4=Torque
- 5=Apparent current
- 6=Active current
- 7=Net torque
- 8=Virtual encoder position
- 9=System position

- No unit

The channel is not assigned.

- Actual speed

Shows the current actual speed in user-defined units.

- Position

Shows the current actual position in user-defined units.

- Acceleration

Shows the current actual acceleration in user-defined units.

- Torque

Displays the currently applied torque in user-defined units.

- Apparent current

Shows the currently flowing output current in A with 3 decimal places.

- Active current

Shows the currently flowing torque current in A with 3 decimal places.

- System position

Position in increments.

Resolution: 65536/motor revolution.

- Modulo position

Displays the present modulo position.

- System position encoder 1/2/3

Shows the current position of the encoder 1/2/3 in increments.

Resolution: 65536/motor revolution.

This parameter is usually set in the PDO Editor.

*9561.1 Actual value high word channel 0*

Value range: -32768 – 0 – 32767, step 1.

OUT process data buffer (16 bit, high) 0 – 15.

*9562.1 Actual value low word channel 0*

Value range: -32768 – 0 – 32767, step 1.

OUT process data buffer (16 bit, low) 0 – 15.

***Channel 1 – 15***

*9560.2 – 9560.16 System variable channel 1 – 15*

Value range: See parameter "9560.1 System unit channel 0" (page 328).

System unit OUT process data buffer 1 – 15.

*9561.2 – 9561.16 Actual value high word channel 1 – 15*

Value range: -32768 – 0 – 32767, step 1.

OUT process data buffer (16 bit, high) 0 – 15.

*9562.2 – 9562.16 Actual value low word channel 1 – 15*

Value range: -32768 – 0 – 32767, step 1.

OUT process data buffer (16 bit, low) 0 – 15.

### 9.3.9 OUT buffer 0 – 7


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***OUT buffer 0***

*Basic settings*

*9563.3 Data sink OUT buffer 0*

Value range:

- 0=No sink
- 1=CAN2
- 2=CAN1
- 3=Communication option

The data sink is used to set the bus system on which the data is to be written.

This parameter is usually set in the PDO Editor.

*9563.5 Data block start*

The data block start describes beginning from which word data is to be written to the bus. Whether a value unequal to 0 may be entered depends on the bus system (e.g. the data block start for CAN is always 0).

This parameter is usually set in the PDO Editor.

*9563.6 Data block length*

Value range: 0 – 4 – 16, step 1.

The data block length also depends on the bus system, e.g. for CAN = maximum 4.

This parameter is usually set in the PDO Editor.

*9563.16 Config error*

Value range: 0 – 4294967295, step 1.

The config error indicates any error.

This parameter is usually set in the PDO Editor.

*Specific CAN parameters*

*9563.4 Message ID*

Value range: 0 – 1073741823, step 1.

The message ID is a CAN-specific parameter. It numbers or prioritizes the messages.

This parameter is usually set in the PDO Editor.

*9563.1 Send PDO after sync*

Value range:

- 0=No
- 1=Yes

This parameter allows for cyclical sending of PDOs that will be sent connected to the sync. For this purpose, parameter *9563.22 Send PDO after n syncs* (page 331) needs to know after how many syncs a new PDO is to be sent.

*9563.17 Blocking time*

Unit: µs

Value range: 0 – 100000000, step 1000.

This parameter applies in conjunction with parameter *9563.23 Send PDO following change (page 332)*; if the PDO changes permanently, the blocking time will still be maintained cyclically and the PDO will not be sent more often.

This parameter is usually set in the PDO Editor.

*9563.21 Endianess*

Value range: See parameter *9514.20 Endianess IN buffer 0* (page 312).

This parameter is used to set whether the first of the two bytes from the bus is interpreted as high or low byte.

- **Big Endian**

The first byte is interpreted as high byte.

- **Little Endian**

The first byte is interpreted as low byte. This is a CAN-specific parameter.

This parameter is usually set in the PDO Editor.

*9563.2 Send PDO cyclically*

Unit: µs

Value range: 0 – 65535000, step 1000.

This parameter sets the cycle time if the PDO is to be sent cyclically when parameter *9563.23 Send PDO following change* (page 332) is set to "No".

This parameter is usually set in the PDO Editor.

*9563.22 Send PDO after n syncs*

Value range: 0 – 255, step 1.

See parameter *9563.1 Send PDO after sync* (page 331).

This parameter is usually set in the PDO Editor.

*9563.23 Send PDO following change*

Value range:

- 0=No
- <u>1=Yes</u>

The setting "Yes" means PDOs are only sent following a change, see also parameter *9563.17 Blocking time* (page 331).

This parameter is usually set in the PDO Editor.

*9563.19 Send PDO following change of IN buffer*

Value range:

- <u>0=No RxPDO</u>
- 1=from IN PDO1
- 2=from IN PDO1
- 3=from IN PDO2
- 4=from IN PDO3
- 5=from IN PDO4
- 6=from IN PDO5
- 7=from IN PDO6
- 8=from IN PDO7
- 9=from IN PDO8
- 10=from IN PDO9
- 11=from IN PDO10
- 12=from IN PDO11
- 13=from IN PDO12
- 14=from IN PDO13
- 15=from IN PDO14
- 16=from IN PDO15

This parameter allows for sending a PDO only if the IN PDO has changed. Parameter *9563.17 Blocking time* (page 331) can be used to prevent that PDOs are sent permanently.

This parameter is usually set in the PDO Editor.

*Specific communication option parameters*

*9563.18 PDO ID*

Value range: 0 – 255, step 1.

This parameter only applies to the K-Net bus system and sets the PDO address.

This parameter is usually set in the PDO Editor.

*9563.24 Transmission cycle*

Value range:

- 0=Bus cycle
- 1=Gateway cycle

In preparation.

This parameter is usually set in the PDO Editor.

*Data sources*

*9770.1 Data source word 0*

This parameter is usually set in the PDO Editor because of the many setting options.

*9864.1 – 9864.16 Actual value word 0 – 15*

Value range: 0 – 65535, step 1.

Actual data word 0 – 15 OUT buffer 0.

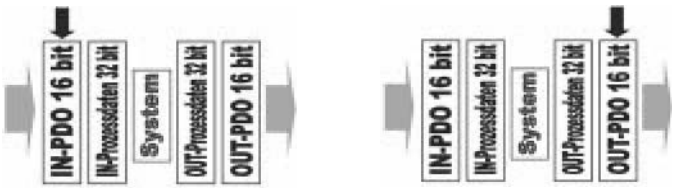
*9770.2 – 9770.16 Data source word 1 – 15*

Value range: See parameter *9770.1 Data source word 0* (page 333).

***OUT buffer 1 – 7***

Description see OUT buffer 0

### 9.3.10 I/O basic unit

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*9585.1 Source*

Value range: This parameter is usually set in the PDO Editor because of the many setting options.

Source binary outputs basic unit.

*8334.0 Actual value digital inputs*

Actual value digital inputs.

*8349.0 Actual value digital outputs*

Actual value digital outputs.

### 9.3.11 I/O option 1


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*9619.1 I/O PDO 1 slot*

Value range:

- 0=Not connected
- 1=Option 1
- 2=Option 2
- 3=Option 3

I/O PDO 1 slot

*9619.111 PDO source*

Value range: This parameter is usually set in the PDO Editor because of the many setting options.

I/O PDO 1 PDO 1 source

*Analog inputs*

*9619.21 AI0 input voltage*

Unit: mV

IO PDO 1 AI0 input voltage.

*9619.31 AI1 input voltage*

Unit: mV

I/O PDO 1 AI1 input voltage.

*9619.22 AI0 offset*

Unit: mV

Value range: -10000 – 0 – 10000, step 1.

I/O PDO 1 AI0 offset

*9619.32 AI1 offset*

Unit: mV

Value range: -10000 – 0 – 10000, step 1.

I/O PDO 1 AI1 offset

*9619.23 AI0 scaling numerator*

Value range: 1 – 2097151, step 1.

I/O PDO 1 AI0 scaling numerator.

*9619.33 AI1 scaling numerator*

Value range: 1 – 2097151, step 1.

I/O PDO 1 AI1 scaling numerator.

*9619.24 AI1 scaling denominator*
Value range: 1 – 2097151, step 1.
I/O PDO 1 AI1 scaling denominator.

*9619.34 AI2 scaling denominator*
Value range: 1 – 2097151, step 1.
I/O PDO 1 AI2 scaling denominator.

*9619.25 AI1 scaled value 32 bit*
I/O PDO 1 AI1 scaled value 32 bit.

*9619.35 AI1 scaled value 32 bit*
I/O PDO 1 AI2 scaled value 32 bit.

*9619.27 AI1 scaled value high word*
I/O PDO 1 AI1 scaled value high word.

*9619.37 AI2 scaled value high word*
I/O PDO 1 AI2 scaled value high word.

*9619.26 AI1 scaled value low word*
I/O PDO 1 AI1 scaled value low word.

*9619.36 AI2 scaled value low word*
I/O PDO 1 AI2 scaled value low word.

*Analog outputs*

*9619.122 AO1 high word source*
Value range: See parameter *9770.1 Data source word 0* (page 333).
I/O PDO 1 AO1 high word source.

*9619.132 AO2 high word source*
Value range: See parameter *9770.1 Data source word 0* (page 333).
I/O PDO 1 AO2 high word source.

*9619.121 AO1 low word source*
Value range: See parameter *9770.1 Data source word 0* (page 333).
I/O PDO 1 AO1 low word source.

*9619.131 AO2 low word source*
Value range: See parameter *9770.1 Data source word 0* (page 333).
I/O PDO 1 AO2 low word source.

*9619.123 AO1 value source 32 bit*
I/O PDO 1 AO1 actual value 32 bit.

*9619.133 AO2 value source 32 bit*
I/O PDO 1 AO2 actual value 32 bit.

*9619.124 AO1 scaling to V numerator*
Value range: 1 – 2097151, step 1.
I/O PDO 1 AO1 scaling numerator.

*9619.134 AO2 scaling to V numerator*
Value range: 1 – 2097151, step 1.
I/O PDO 1 AO2 scaling numerator.

*9619.125 AO1 scaling to V denominator*
Value range: 1 – 2097151, step 1.
I/O PDO 1 AO1 scaling denominator.

*9619.135 AO2 scaling to V denominator*
Value range: 1 – 2097151, step 1.
I/O PDO 1 AO2 scaling denominator.

*9619.126 AO1 offset*
Unit: mV
Value range: -10000 – 0 – 10000, step 1.
I/O PDO 1 AO1 offset

*9619.136 AO2 offset*
Unit: mV
Value range: -10000 – 0 – 10000, step 1.
I/O PDO 1 AO2 offset.

*9619.127 AO1 output voltage*
Unit: mV
I/O PDO 1 AO1 output voltage.

*9619.137 AO2 output voltage*
Unit: mV
I/O PDO 1 AO2 output voltage.

### 9.3.12 I/O option 2


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*9625.1 I/O PDO 2 slot*
Value range: See parameter "9585.1 Source I/O basic unit" (page 333).
I/O PDO 2 slot

*9625.111 PDO source*
Value range: This parameter is usually set in the PDO Editor because of the many setting options.
I/O PDO 2 PDO 2 source

*Analog inputs*

*9625.21 AI1 input voltage*
Unit: mV
I/O PDO 2 AI1 input voltage.

*9625.31 AI2 input voltage*
Unit: mV
I/O PDO 2 AI2 input voltage.

*9625.22 AI1 offset*
Unit: mV
Value range: -10000 – 0 – 10000, step 1.
I/O PDO 2 AI1 offset

*9625.32 AI2 offset*
Unit: mV
Value range: -10000 – 0 – 10000, step 1.
I/O PDO 2 AI2 offset

*9625.23 AI1 scaling numerator*
Value range: 1 – 2097151, step 1.
I/O PDO 2 AI1 scaling numerator.

*9625.33 AI2 scaling numerator*
Value range: 1 – 2097151, step 1.
I/O PDO 2 AI2 scaling numerator.

*9625.24 AI1 scaling denominator*
Value range: 1 – 2097151, step 1.
I/O PDO 2 AI1 scaling denominator.

*9625.34 AI2 scaling denominator*
Value range: 1 – 2097151, step 1.
I/O PDO 2 AI2 scaling denominator.

*9625.25 AI1 scaled value 32 bit*
I/O PDO 2 AI1 scaled value 32 bit.

*9625.35 AI2 scaled value 32 bit*
I/O PDO 2 AI2 scaled value 32 bit.

*9625.27 AI1 scaled value high word*
I/O PDO 2 AI1 scaled value high word.

*9625.37 AI2 scaled value high word*
I/O PDO 2 AI2 scaled value high word.

*9625.26 AI1 scaled value low word*
I/O PDO 2 AI1 scaled value low word.

*9625.36 AI2 scaled value low word*
I/O PDO 2 AI2 scaled value low word.

*Analog outputs*

*9625.122 AO1 high word source*
Value range: See parameter *9770.1 Data source word 0* (page 333).
I/O PDO 2 AO1 high word source.

*9625.132 AO2 high word source*
Value range: See parameter *9770.1 Data source word 0* (page 333).
I/O PDO 2 AO2 high word source.

*9625.121 AO1 low word source*
Value range: See parameter *9770.1 Data source word 0* (page 333).
I/O PDO 2 AO1 low word source.

*9625.131 AO2 low word source*
Value range: See parameter *9770.1 Data source word 0* (page 333).
I/O PDO 2 AO2 low word source.

*9625.123 AO1 value source 32 bit*
I/O PDO 2 AO1 actual value 32 bit.

*9625.133 AO2 value source 32 bit*
I/O PDO 2 AO2 actual value 32 bit.

*9625.124 AO1 scaling to V numerator*
Value range: 1 – 2097151, step 1.
I/O PDO 2 AO1 scaling numerator.

*9625.134 AO2 scaling to V numerator*
Value range: 1 – 2097151, step 1.
I/O PDO 2 AO2 scaling numerator.

*9625.125 AO1 scaling to V denominator*
Value range: 1 – 2097151, step 1.
I/O PDO 2 AO1 scaling denominator.

*9625.135 AO2 scaling to V denominator*
Value range: 1 – 2097151, step 1.
I/O PDO 2 AO2 scaling denominator.

*9625.126 AO1 offset*
Unit: mV
Value range: -10000 – 0 – 10000, step 1.
I/O PDO 2 AO1 offset

*9625.136 AO2 offset*
Unit: mV
Value range: -10000 – 0 – 10000, step 1.
I/O PDO 2 AO2 offset.

*9625.127 AO1 output voltage*
Unit: mV
I/O PDO 2 AO1 output voltage.

*9625.137 AO2 output voltage*
Unit: mV
I/O PDO 2 AO2 output voltage.

## 9.4 Encoder parameter description

The following encoders can be evaluated using the encoder evaluation function integrated in the MOVIAXIS® basic unit:

- HIPERFACE® encoder
- Sin/cos encoder
- TTL encoder
- Resolver (2 – 12 pole pairs)

With resolver, sin/cos and TTL encoders, MOVIAXIS® monitors the failure of track signals caused by faults or cable problems (amplitude monitoring).

If MOVIAXIS® detects an error, the output stage inhibit and brake are activated.

With the "Encoder calibration and adjustment" function, a fixed rotating field space vector is impressed in the motor. If the rotor aligns itself according to this space vector, the encoder angle is "0" with the SEW encoder setting.

If this is not the case, the encoder offset can be calibrated with MOVIAXIS® and/or

- Entered in encoder offset parameter,
- The encoder can be aligned accordingly (resolver),
- The encoder offset can be written to the encoder (Hiperface®).

### 9.4.1 Encoder input of basic unit

*9818.34 / 9818.24 / 9818.20 Encoder part number/ encoder name*

Value range: 0 – $2^{32}$ step 1

Encoder part number; encoder 1 / encoder 2 / encoder 3

The part number of the selected encoder is displayed in parameter 9818.34.

MotionStudio generates the encoder name from this. Encoders that are not from SEW are assigned a part number smaller than 8 digits.

*9733.1 / 9733.2 / 9733.3 Encoder type*

Value range:

- 0 = No encoder
- 1 = RS422
- 3 = Sin / cos XXXS
- 4 = Hiperface® XXXH
- 5 = Resolver RHXX

Type encoder 1 / encoder 2 / encoder 3.

With encoder 1 (encoder input X13 on the axis module), only settings 0 – 5 are possible.

The multi encoder card (MGK) can select all settings except for the Resolver (5) setting.

*9719.1 / 9719.2 / 9719.3 Counting direction*

Value range:

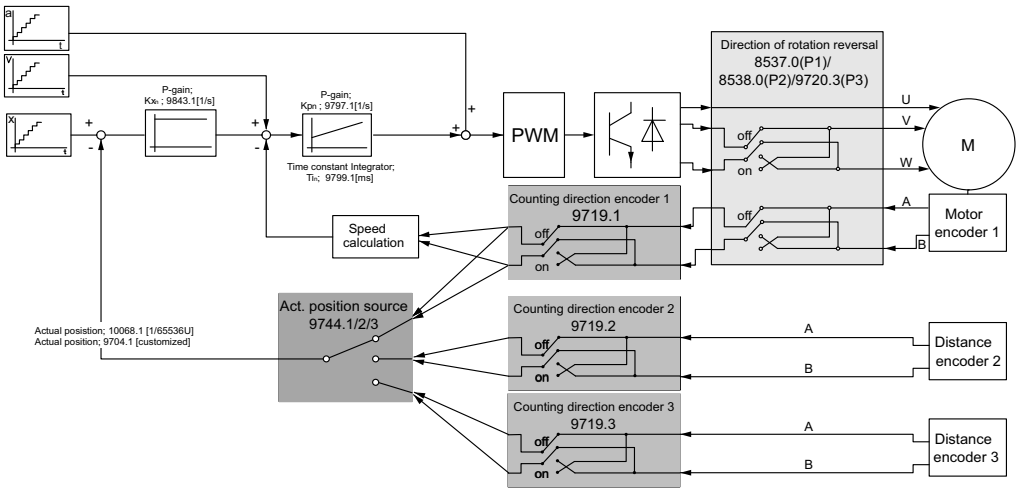
- 0 = Up
- 1 = Down

Counting direction encoder 1 / encoder 2 / encoder 3.

The parameter depends on the installation position of the encoder and is independent of the setting of parameter *8537.0 Direction of rotation reversal* (page 253). Do not confuse the two parameters. The counting direction of the encoder is reversed which means also the actual values of position, speed and acceleration for this encoder are reversed.

This parameter can be used to support encoders that are installed other than the standard installation. Changing the counting direction generally causes de-referencing of the drive.

The encoder system is reinitialized when this parameter is changed.

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- **Setting the parameter**

The following notes for setting the parameters apply provided that the parameter *8537.0 Direction of rotation reversal* (page 253) is set to "OFF". If the parameter for changing the direction of rotation is set to "ON", the direction of rotation of the motor shaft is inverted.

- **Setting for rotary motors**
  - If the encoder provides a positive increasing position when the motor shaft turns in CW (right) direction (SEW definition as viewed onto the motor shaft), then the counting direction must be set to "UP" (default setting).
  - If the encoder provides a negative decreasing position when the motor shaft turns in CW (right) direction, then the counting direction must be set to "DOWN".

- **Setting for linear motors**
  - If the encoder provides a negative increasing position when the motor moves in positive direction (SEW definition: first movement for commutation travel following motor alignment), the counting direction must be set to "UP" (default setting).
  - If the encoder provides a negative increasing position when the motor moves in positive direction (SEW definition: first movement for commutation travel following motor alignment), the counting direction must be set to "DOWN" (default setting).

*9749.11 / 9749.12 / 9749.13 Encoder monitoring*

Value range:

- 0 = OFF
- 1 = ON

Monitoring encoder 1/2/3.

- **SIN / COS signal:**

The C track is not monitored for MOVIAXIS®.

Monitoring responds when the amplitude falls below 10 % of the measuring range. Wire breakage monitoring is not completely possible when the motor is at standstill. The error criterion is not fulfilled if the undamaged track has a high positive or negative value. Monitoring will always trigger if both tracks are damaged.

- **TTL signal:**

The track signals are monitored by measuring the differential voltages of the two tracks A and B.

When the motor is at standstill, wire breakage monitoring is not possible when only one wire pair of a track is damaged.

- **Hiperface® signal:**

During operation, a positioning request is sent to the Hiperface® encoder every second. The position value in the response message is compared with a TTL track signal. If the position deviates by more than 20 increments, an error ("error 15") will be issued. The encoder status is queried after every position request (see section "Encoder status" (page 345)).

A check is still made to assess whether an encoder is physically present when the encoder setting "0 = OFF".

*9593.1 / 9593.2 / 9593.3 Numerator factor*

Value range: 0 – 1024 – 2147483647, step 1.

Factor numerator encoder 1 encoder 2 / encoder 3.

**Numerator / denominator factor**

This factor determines the encoder resolution. Enter the value in parameter *9733.1 Encoder type* (page 340):

- Encoder (encoder type = 1, 3, 4)

$$\frac{\text{Factor numerator encoder 1}}{\text{Factor denominator encoder 1}} = \frac{\text{Encoder resolution}}{\text{Revolution}}$$

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Example: SinCos AS1H encoder

Factor numerator encoder 1 = 1024

Factor denominator encoder 1 = 1

- Resolver (encoder type = 5)

$$\frac{\text{Factor numerator encoder 1}}{\text{Factor denominator encoder 1}} = \frac{\text{Pole pair number resolver}}{1}$$

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Example: Resolver, number of pole pairs = 1

Factor numerator encoder 1 = 1

Factor denominator encoder 1 = 1

- Linear motor (encoder type = 1, 3, 4)

$$\frac{\text{Factor numerator encoder 1}}{\text{Factor denominator encoder 1}} = \frac{\text{Signal period [mm]}}{\text{Pole pair width [mm]}}$$

1243037707

Example: AL1H (Lincoder, signal period 5 mm), with SL2 motor (pole distance 32 mm)

Factor numerator encoder 1 = 32

Factor denominator encoder 1 = 5

*9593.10 / 9593.11 / 9593.12 Denominator factor*

Value range: 1 – 2147483647, step 1.

Factor denominator encoder 1 / encoder 2 / encoder 3.

See parameter *9593.1 Numerator factor* (page 343).

*9828.2 / 9828.3 Numerator emulation*

Value range: 0 – 1024 – 2147483647, step 1.

Numerator emulation encoder 2 / encoder 3.

*9829.2 / 9829.3 Denominator emulation*

Value range: 1 – 2147483647, step 1.

Denominator emulation encoder 2 / encoder 3.

### 9.4.2 Position mode settings

*9998.1 / 9998.2 / 9998.3 Position mode*

Value range:

- 0 = Without overflow counter
- 1 = With overflow counter

Position mode

The reset behavior of parameter *9998.1 Position mode* in conjunction with absolute encoders depends on the following settings:

- If set to "**without overflow counter**", the unit will always be positioned in the absolute range of the encoder following a CPU reset and system restart, e.g. with Hiperface® 4096 motor revolutions. This means a position loss in the event of encoder overflow. If the position range of the absolute encoder is not exceeded, no reference travel is required when replacing MOVIAXIS® because no overflows can be stored in the MOVIAXIS®. Reference travel is only required when the motor is replaced. With this setting, the parameter *9999.11 Relative position of reference point* (page 344) must be set.
- When set to "**With overflow counter**", the complete ± 32768 motor revolutions are utilized despite overflow in an absolute manner. MOVIAXIS® stores absolute encoder overflows internally. This also functions when the axis is moved to overflow without electrical current. This is ensured by checking the travel range. Reference travel must always be performed when replacing MOVIAXIS® or the motor.

  The maximum target position must not exceed the total from the current target position ±16000 revolutions.

*9999.11 / 9999.12 / 9999.13 Relative position of the reference point*

Value range: 0 – 50000 – 100000, step 1.

Relative position of reference point encoder 1/2/3.

The parameter is required if parameter *9998.1 Position mode* (page 344) is set to "without overflow counter".

With parameter *Relative position of reference point*, the position of the reference point (e.g. reference cam) should be specified in relation to the required total travel range in percent.

The valid travel range depends on the absolute encoder range and the relative position of the reference point.

Leaving the valid travel range is reported for MOVIAXIS® units supplied by 24 V.

- **Required travel range < 50% absolute encoder range:**

You can use the default setting (50%) if the required travel range is less than half the absolute range of the encoder.

- **Required travel range > 50% absolute encoder range:**

If the reference point is located within the first quarter of the travel distance, then the value should be set to 25%. Never set the value to 0% or 100% even if the reference point is located at the beginning/end of the travel distance as this might result in travel range monitoring errors. In this case, the values should be set to 5% or 95%.

### 9.4.3 Actual values

*9596.1 / 9596.2 / 9596.3 Referenced (encoder status bit 7)*

Reference status encoder 1/2/3.

The encoder status bit 7 indicates whether an encoder is referenced or not. This value is read only and is set when reference travel is complete. The status bit is cleared when 24 V supply is off and no multi-turn encoder is used.

The status is also cleared in the event of write access to parameters that have an influence on the positions.

These are:

- Encoder type
- Direction of motor rotation
- Counting direction of the encoder
- Machine zero offset
- Position detection mode (encoder referencing only for multi-turn absolute encoder)
- Position offset (only if position detection mode 1 is active and the encoder is a multi-turn absolute encoder).
- Numerator factor (system unit) / denominator factor (system unit
- Numerator factor (system unit) / denominator factor (system unit) for encoder emulation
- Numerator factor (user-defined unit) / denominator factor (user-defined unit)
- Modulo overflow / underflow value
- All SSI setting parameters and Endat setting parameters.

*9595.1 / 9595.2 / 9595.3 Connected to drive no.*

Value range: 0 – 1 – 7, step 1.

Parameter set selection for encoder 1/2/3.

This parameter is used to assign a parameter set number to encoder 1/2/3. This means the user-defined unit for this encoder information is also defined.

| | **INFORMATION** |
|---|---|
|  | The parameters *9744.1/2/3 Actual position source* (page 347) and *9597.1/2/3 Actual speed source* (page 347) can only be switched to the encoder that was assigned to the parameter set here. |

*9782.1 / 9782.2 / 9782.3 Encoder identification*

Value range: 0 – 4294967295, step 1.

Encoder identification of encoder 1/2/3.

With Hiperface® encoders, the encoder identification is read from the electronic nameplate.

The number identifies the encoder type and is described in the Hiperface® documentation from SICK Stegmann.

*9751.11 / 9751.12 / 9751.13 Machine zero offset*

Value range: -2147483648 – 0 – 2147483647, step 1.

Zero point correction encoder 1/2/3.

When using multi-turn encoders, another offset value (machine zero offset) has to be calculated and stored non-volatile following referencing. This offset allows for recovering all positions after a power failure. No reference travel is necessary in this case.

The controller sets this parameter by itself during referencing.

*9704.1 Actual position*

Displays the actual position in user defined units for the position controller.

Is suited for output in the scope but is not consistent with the motor control parameters.

Corresponds to parameters *9704.2/3 or 4* according to which one was switched with parameter *9744.1 Source actual position* (page 347) for the position controller.

*10444.1 / 10444.2 / 10444.3 Actual position*

Displays actual position of encoder 1/2//3 in system units.

Is suited for output in the scope but is not consistent with the motor control parameters.

*9704.2 / 9704.3 / 9704.4 Actual position*

Display actual position of encoder 1/2/3 in user-defined units.

Is suited for output in the scope but is not consistent with the motor control parameters.

*9839.2 / 9839.3 / 9839.4 Actual position modulo*

Value range: -2147483648 – 0 – 2147483647, step 1.

Display of Modulo position encoder 1/2/3 in user-defined units.

The display is filtered in MotionStudio.

*9744.1 / 9744.2 / 9744.3 Actual position source*

Value range:

- 0 = No encoder
- 1 = Encoder 1
- 2 = Encoder 2
- 3 = Encoder 3

Actual position source P1/P2/P3.

The parameter is set in the parameter tree folder "Motor data".

This parameter is used to select the encoder that provides the actual position information for the position controller of the motor control.

The source of the actual position can also be switched to another source **during** controller enable.

Only the encoder assigned to the parameter set number can be chosen as source.

This is verified as long as the controller is enabled.

See also parameter *9595.2 Connected to drive no.* (page 346).

*9597.1 / 9597.2 / 9597.3 Actual speed source*

Value range:

- 0 = No encoder
- 1 = Encoder 1
- 2 = Encoder 2
- 3 = Encoder 3

Source actual speed P1/P2/P3

The parameter is set in the parameter tree folder "Motor data".

This parameter is used to select the encoder that provides the information for the speed controller, current controller and commutation of the motor control.

The source of the actual speed **cannot** be switched to another source during controller enable.

Only the encoder assigned to the parameter set number can be chosen as source.

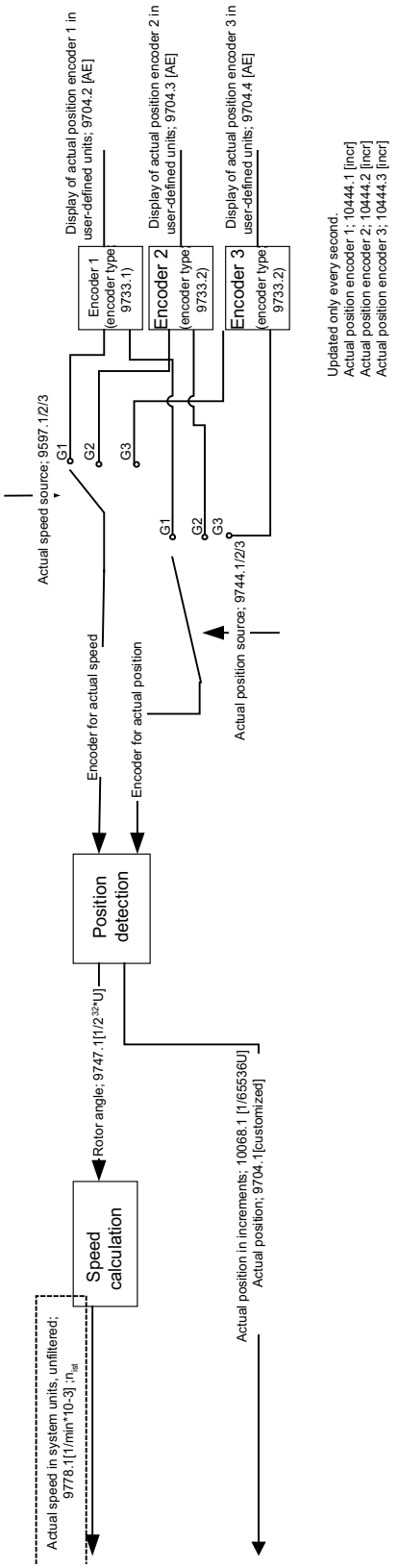
This is verified when activating controller enable.

See also parameter *9595.2 Connected to drive no.* (page 346).

*10068.1 Actual position*

Displays the actual position of motor control for the position controller.

Is suited for output in the scope and is consistent with the motor control parameters.

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## 9.5 Parameter description for FCB parameter setting

### 9.5.1 FCB Function Control Block

The term "FCB concept" describes the modular firmware design of MOVIAXIS®. This feature ensures that a wide range of functions can be selected or deselected quickly and easily using control words without having to perform any programming.

All primary functions, i.e. functions that move or control the motors, are designed as individual FCBs that only have to be selected, for example, to perform positioning tasks.

The user can switch between FCBs at any time depending on the requested function.

### 9.5.2 Basic settings

*9702.3 Current FCB* — Currently active FCB number.

*9702.6 Current FCB instance* — Currently active FCB instance.

*9804.1 Select FCB with instance* — Low word definition (bits 0-15)

- 00 = FCB 00 Standard
- 01 = FCB 01 Output stage inhibited
- 05 = FCB 05 Speed control (page 351)
- 06 = FCB 06 Interpolated speed control (page 354)
- 07 = FCB 07 Torque control (page 360)
- 08 = FCB 08 Interpolated torque control (page 361)
- 09 = FCB 09 Position control instance 00 (page 363)
- 10 = FCB 10 Interpolated position control (page 371)
- 11 = Not assigned
- 12 = FCB 12 Reference travel (page 373)
- 13 = FCB 13 Stop
- 14 = FCB 14 Emergency stop
- 15 = FCB 15 Stop at system limits
- 16 = FCB 16 Electronic cam
- 17 = FCB 17 Electronic gear unit
- 18 = FCB 18 Encoder adjustment (page 373)
- 19 = FCB 19 Hold control
- 20 = FCB 20 Jog mode (page 381)
- 21 = FCB 21 Brake test function (page 384)
- 22 = FCB22 Multi-drive
- 25 = FCB25 Rotor position identification
- 26 = FCB26 Stop at user limits

High word definition (bits 16 – 31).

Instance 0 - 63 is selected in the high word.

Direct selection of FCB number and FCB instance.

This parameter is one of several ways to select an FCB or instance. If several FCBs are selected at the same time, the FCB with highest priority will be activated.

The FCBs have the following priorities (starting with the highest priority):

- FCB 01 Output stage inhibited
- FCB 15 Stop at system limits
- FCB 14 Emergency stop
- FCB 13 Stop at application limits
- FCB 18 Encoder adjustment (page 373)
- FCB 25 Rotor position identification (page 393)
- FCB 12 Reference travel (page 373)
- FCB 20 Jog mode (page 381)
- FCB 19 Hold control
- FCB 21 Brake test function (page 384)
- FCB 22 Multi-drive (page 387)
- FCB 17 Electronic gear unit – see "Technology functions" manual
- FCB 16 Electronic cam – see "Technology functions" manual
- FCB 10 Interpolated position control (page 371)
- FCB 09 Position control (page 363)
- FCB 06 Interpolated speed control (page 354)
- FCB 05 Speed control (page 351)
- FCB 08 Interpolated torque control (page 361)
- FCB 07 Torque control (page 360)
- FCB 26 Stop at user limits (page 398)
- FCB 00 Standard (-> FCB 13 Stop at application limits)

If two instances are selected at the same time, the higher instance will be activated.

The following FCBs can be assigned to an instance:

- FCB 09 Positioning (page 363)
- FCB 05 Speed control
- FCB 07 Torque control

This parameter is reset to *FCB 00 Standard* at a CPU reset or system restart, which is equivalent with *FCB 13 Stop at application limits.* At warm start, the set parameter is maintained.

*9982.11 Stop FCB initialization*

Value range: 0 – 3

This parameter influences the jerk limitation for a transition to one of the *stop FCBs 13 / 14 / 15 / 26*.

- Acceleration = 0

When switching over to a stop FCB from a speed higher than zero, the jerk limitation is set up anew, i.e. the current acceleration or deceleration becomes zero. Depending on the extent of the set jerk limit, the deceleration is set anew. This behavior results in a longer braking distance and can only be set for compatibility reasons. During an initial startup, select the setting "current acceleration".

- Current acceleration = 3

When switching over to a stop FCB from a speed higher than zero, the jerk limitation is not set up anew, i.e. the current deceleration is forwarded to the selected stop FCB. Deceleration ramps are not interrupted and braking distances are not extended.

This setting must be selected for every initial startup.

### 9.5.3 FCB 05 Speed control

MOVIAXIS® can be run as a speed-controlled axis.

The user can specify limit values for acceleration, deceleration and jerk as the basic conditions for speed control. The actual speed setpoint for the drive controller is generated in the controller cycle by a ramp generator integrated in MOVIAXIS® using the specified limit values.

You can configure several data sets (instances - and therefore various speed setpoints) for the "Speed control" function. You can switch between the instances using process data or parameter access.

In this way, for example, a process, in which speed controllers with different settings are used, is simple to implement using the instance switchover function.

*Setpoints*

*9598.1 / 10440.1 Velocity setpoint source*

Value range:

- 0 = Local setpoint
- 1 = Process data buffer channel 0
- 2 = Process data buffer channel 1
- 3 = Process data buffer channel 2
- 4 = Process data buffer channel 3
- 5 = Process data buffer channel 4
- 6 = Process data buffer channel 5
- 7 = Process data buffer channel 6
- 8 = Process data buffer channel 7
- 9 = Process data buffer channel 8
- 10 = Process data buffer channel 9
- 11 = Process data buffer channel 10
- 12 = Process data buffer channel 11
- 13 = Process data buffer channel 12
- 14 = Process data buffer channel 13
- 15 = Process data buffer channel 14
- 16 = Process data buffer channel 15

This parameter sets the source for the setpoint speed of FCB speed control.

If the parameter is set to "Local setpoint", the setpoint source will be parameter *9598.2 Local velocity setpoint* (page 352).

*9598.2 / 10440.2 Local velocity setpoint*

Unit: $10^{-3}$/min.

Value range: -10000000 – 0 – 10000000, step 1.

If the parameter *9598.1 Velocity setpoint source* (page 352) is set to "Local setpoint", this parameter will be the setpoint speed for *FCB 05 Speed control* (page 351).

*Limit values*

*9598.3 / 10440.3 Torque limit source*

Value range: See parameter *9598.1 Setpoint source velocity* (page 352).

This parameter sets the source for the torque limit of *FCB speed control*.

If the parameter is set to "Local setpoint", the torque limit will be parameter *9598.4 Local torque limit* (page 352).

*9598.4 / 10440.4 Local setpoint torque limit*

Unit: %.

Resolution: $10^{-3}$.

Value range: 0 – 10000 – 1000000, step 1.

If parameter *9598.3 Torque limit source* (page 352) is set to "local setpoint", this parameter will be the torque limit for *FCB 05 Speed control* (page 351).

*9598.5 / 10440.5 Acceleration source*

Value range: See parameter *9598.1 Setpoint source velocity* (page 352).

This parameter sets the source for the acceleration of *FCB speed control*.

If the parameter is set to "Local setpoint", the acceleration ramp will be parameter *9598.6 Acceleration local* (page 353).

*9598.6 / 10440.6 Local acceleration setpoint*

Unit: $10^{-2}$/min×s.

Value range: 0 – 300000 – 2147483647, step 1.

If parameter *9598.5 Acceleration source* (page 353) is set to "local setpoint", this parameter will be the acceleration ramp for *FCB 05 Speed control (page 351)*.

*9598.7 / 10440.7 Deceleration source*

Value range: See parameter *9598.1 Setpoint source velocity* (page 352).

This parameter sets the source for the deceleration of *FCB speed control*.

If the parameter is set to "Local setpoint", the deceleration ramp will be parameter *9598.8 Deceleration local* (page 353).

*9598.8 / 10440.8 Local deceleration setpoint*

Unit: $10^{-2}$/min×s.

Value range: 0 – 300000 – 2147483647, step 1.

If parameter *9598.7 Deceleration source* (page 353) is set to "local setpoint", this parameter will be the deceleration ramp for *FCB 05 Speed control* (page 351).

*9598.9 / 10440.9 Jerk source*

Value range: See parameter *9598.1 Setpoint source velocity* (page 352).

This parameter sets the source for the maximum jerk of FCB speed control.

If the parameter is set to "local setpoint", the maximum jerk will be parameter *9598.10 Local jerk* (page 353).

*9598.10 / 10440.10 Local jerk setpoint*

Unit: 1/(min×$s^2$).

Value range: 0 – 2147483647, Step 1.

If parameter *9598.9 Jerk source* (page 353) is set to "local setpoint", this parameter will be the maximum jerk for *FCB 05 Speed control (page 351)*.

*Actual values*

*9703.1 / 10120.1 Velocity*

Unit: $10^{-3}$/min

Current actual velocity (in user-defined units, filtered for display).

### 9.5.4 FCB 06 Interpolated speed control

FCB 06 interpolated speed control is used for cyclic preselected speed setpoints of higher-level controllers. The higher-level controller is responsible for the following limits:

- Jerk,
- Acceleration,
- Speed.

Only the speed and torque system limits take effect in MOVIAXIS®.

Prerequisite is a synchronized bus system. This means that incoming process data has a fixed time reference for the control system of the axis.

The new process data is sent within a fixed cycle time. This time must be a multiple of the cycle time of the speed control loop (parameter *9821.1 Scanning frequency n/X control* (page 262); 250 µs, 500 µs or 1 ms).

MOVIAXIS® now has the task of forwarding the incoming speed setpoints with a rough time reference to the speed controller that operates with the shortest time reference. Intermediate values must be interpolated for this purpose. The setpoint flow is delayed by one communication cycle to carry out this interpolation.

The incoming position over two process data is interpreted in user-defined units.

*General parameters*

*9963.1 Setpoint cycle control*

Unit: µs.

Value range: 500 – 20000, step 500.

The setpoint cycle of the controller indicates the time intervals used by the higher-level controller to send speed setpoints. The time intervals must be a multiple of the cycle time of the speed control loop (parameter *9821.1 Scanning frequency n/X control* (page 262)).

*Setpoints*

*9965.1 Speed setpoint source*

This parameter sets the source for the speed setpoint of *FCB 06 Interpolated speed -control* (page 354).

If the parameter is set to "local setpoint", the source will be parameter *9965.2 Local speed setpoint* (page 354).

*9965.2 Local speed setpoint*

Unit: $10^{-3}$/min

Value range: -10000000 – 0 – 10000000, step 1.

If parameter *9965.1 Speed setpoint source* (page 354) is set to "local setpoint", this parameter will be the speed setpoint for *FCB 06 Interpolated speed control* (page 354).

*Limit values*

*9965.5 Torque limit mode*

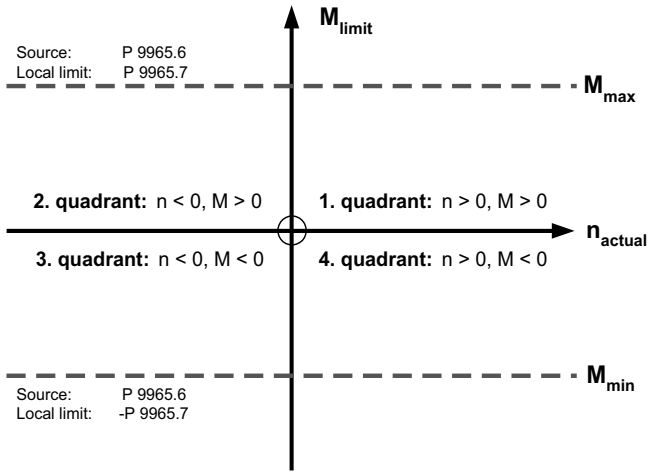
Value range:

- 0 = Single channel
- 1 = Two channels
- 2 = Four channels

The following modes can be set for limiting the torque:

- **0 = Single channel**

  A limit value for all quadrants of the N-M diagram (parameter *9965.6 Torque limit Q1 abs. source* (page 356)).

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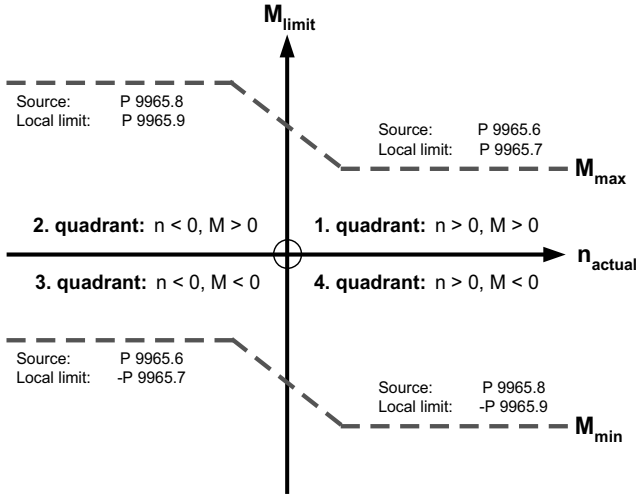
- **1 = Two channels**

  One value each for regenerative and motor range (parameter *9965.6 Torque limit Q1 abs. source* (page 356) and parameter *9965.8 Torque limit Q2 abs. source* (page 356)).

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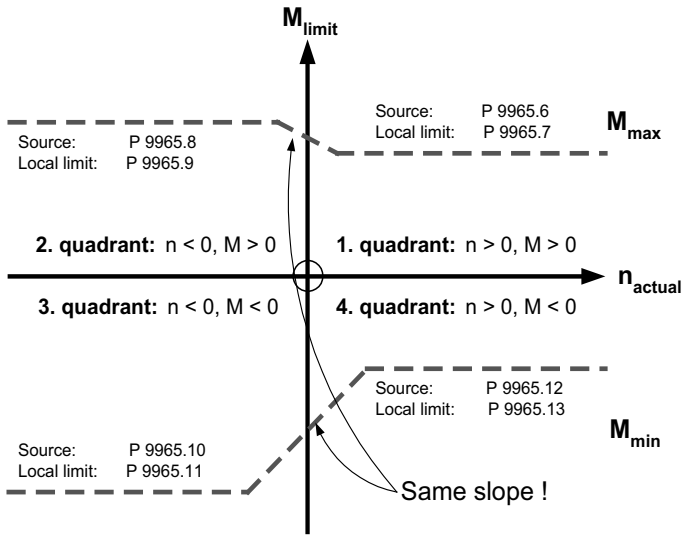
- **2 = Four channels**

  Every quadrant, whether regenerative, motor, positive or negative direction of rotation receives its own limit value.

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*9965.6 Abs. source torque limit Q1*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the torque limit of the first quadrant (positive direction of rotation, motor mode) of *FCB 06 Interpolated speed control* (page 354).

If the parameter is set to "local setpoint", the source will be parameter *9965.7 Torque limit Q1 abs. local* (page 356).

*9965.7 Abs. local torque limit Q1*

Unit: %

Resolution: $10^{-3}$.

Value range: 0 – 10000 – 1000000, step 1.

If the parameter *9965.6 Torque limit Q1 abs. source* (page 356) is set to "Local setpoint", this parameter will be the torque limit for *FCB 06 Interpolated speed control (page 354)* in the relevant quadrant.

*9965.8 Abs. source torque limit Q2*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the torque limit of the second quadrant (negative direction of rotation, motor mode) of *FCB 06 Interpolated speed control* (page 354).

If the parameter is set to "local setpoint", the source will be parameter *9965.9 Torque limit Q2 abs. local* (page 357).

*9965.9 Abs. local torque limit Q2*

Unit: %

Resolution: $10^{-3}$.

Value range: 0 – 10000 – 1000000, step 1.

If the parameter *9965.8 Torque limit Q2 abs. source* (page 356) is set to "Local setpoint", this parameter will be the torque limit for *FCB 06 Interpolated speed control (page 354)* in the relevant quadrant.

*9965.10 Abs. source torque limit Q3*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the torque limit of the third quadrant (negative direction of rotation, regenerative mode) of *FCB 06 Interpolated speed control* (page 354).

If the parameter is set to "local setpoint", the source will be parameter *9965.11 Torque limit Q3 abs. local* (page 357).

*9965.11 Abs. local torque limit Q3*

Unit: %

Resolution: $10^{-3}$.

Value range: 0 – 10000 – 1000000, step 1.

If the parameter *9965.10 Torque limit Q3 abs. source* (page 357) is set to "Local setpoint", this parameter will be the torque limit for *FCB 06 Interpolated speed control* (page 354) in the relevant quadrant.

*9965.12 Abs. source torque limit Q4*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the torque limit of the fourth quadrant (positive direction of rotation, regenerative) of *FCB 06 Interpolated speed control* (page 354).

If the parameter is set to "local setpoint", the source will be parameter *9965.13 Torque limit Q4 abs. local* (page 357).

*9965.13 Abs. local torque limit Q4*

Unit: %

Resolution: $10^{-3}$.

Value range: 0 – 10000 – 1000000, step 1.

If the parameter *9965.12 Torque limit Q4 abs. source* (page 357) is set to "Local setpoint", this parameter will be the torque limit for *FCB 06 Interpolated speed control* (page 354) in the relevant quadrant.

*9965.16 Positive transition mode*

- 0 = Center
- 1 = Motor mode
- 2 = Regenerative mode

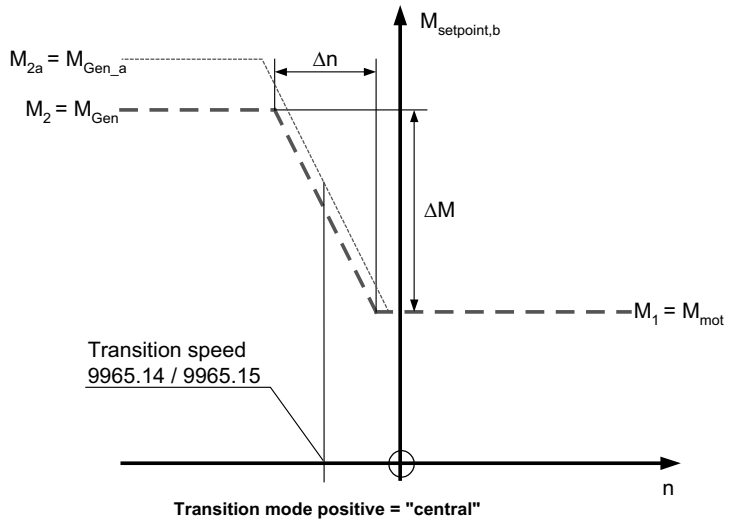
The transition cannot take place suddenly between quadrants 1 and 2, or 3 and 4. For this reason, a linear transition is used with the slope of the P-component of the speed controller, see formula on the following page.

The transition will usually take place between quadrants 1 and 2, or 3 and 4 with speed 0. The effective limit torque for speed 0 is the average of the set limit torques of the adjacent quadrants (central transition mode and transition speed 0).

It may be required not to place the transition in the center with speed zero. In this case, the speeds can be set using parameters for which the limit torques merge. The parameter *9965.14 Transition speed positive (page 359)* defines the transition speed for the positive torque limit, which means between quadrants 1 and 2. Parameter *9965.15 Transition speed negative (page 360)* is used to set the transition speed for the negative torque limit between quadrants 3 and 4.

The specified transition speed can refer to the center of the transition area or to the motor or generative transition point of the transition area. The parameter *9965.16 Positive transition mode* determines the mode for the transition of the positive torque limit between quadrants 1 and 2. *9965.17 Negative transition mode (page 359)* refers to the transition between quadrants 3 and 4.

You can leave one of the two transition points at a specified speed by changing the amount of the torque limits and the resulting change of width of the transition area.

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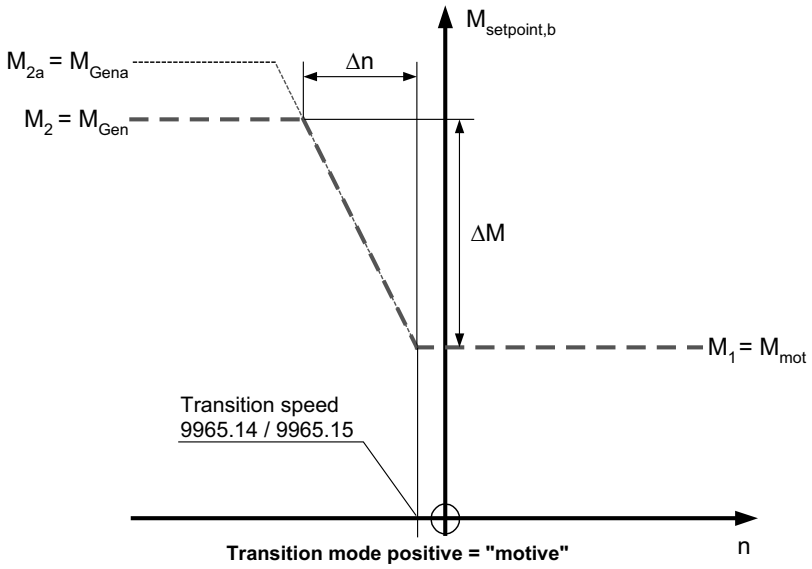
When increasing from M2 to M2a, the transition line moves up (Δn becomes larger), while the slope remains the same.

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When increasing from M2 to M2a, only the transition curve is extended (Δn also becomes larger) while the slope remains the same.

Calculating Δn:

$$\Delta n = \frac{(M_1 - M_2) \times Z \times M_{motor\_nominal}}{N \times 200 \times \pi \times J_{total} \times P_{gain}}$$

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M1 = Parameter 9965.6 Torque limit Q1 abs. source (page 356) or parameter *9965.12 Torque limit Q4 abs. source* (page 357) by taking account of decimal places.

M2 = Parameter *9965.8 Torque limit Q2 abs. source* (page 356) or parameter *9965.10 Torque limit Q3 abs. source* (page 357) by taking account of decimal places.

Z = Parameter *9556.1 Torque numerator* (page 287) (conversion of user-defined units to nominal motor torque)

$M_{Motor\_nominal}$ = Parameter *9610.1 Nominal motor torque* (page 266)

N = Parameter *9557.1 Torque denominator* (page 288) (conversion of user-defined units to nominal motor torque)

$J_{total}$ = Parameter *9817.1 Total moment of inertia* (page 265)

$P_{gain}$ = Parameter *9797.1 P-gain speed controller* (page 262)

*9965.14 Positive transition speed*

Unit: $10^{-3}$/min

Value range: -10000000 – 0 – 10000000, step 1.

Positive transition speed (quadrants 1 and 2).

*9965.17 Negative transition mode*

Value range: See parameter *9965.16 Positive transition mode* (page 358).

Negative transition mode (quadrants 3 and 4).

*9965.15 Negative transition speed*

Unit: $10^{-3}$/min

Value range: -10000000 – 0 – 10000000, step 1.

Negative transition speed (quadrants 3 and 4).

*Actual values*

*9703.1 Velocity*

Unit: $10^{-3}$/min

Current actual velocity; in user-defined units, filtered for display.

### 9.5.5 FCB 07 Torque control

MOVIAXIS® can be run as a torque-controlled axis.

The user can specify limit values for speed, acceleration and jerk as the basic conditions for torque control. The actual torque setpoint for the drive controller is generated in the controller cycle by a ramp generator integrated in MOVIAXIS® using the specified limit values.

The maximum speed can be limited during torque control. The speed limit can be changed dynamically using process data.

*Setpoints*

*9599.1 / 10441.1 Torque setpoint source*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the setpoint torque of FCB torque control.

If the parameter is set to "local setpoint", the source will be parameter *9599.2 Local torque setpoint* (page 360).

*9599.2 / 10441.2 Local torque setpoint*

Unit: %

Resolution: $10^{-3}$.

Value range: -1000000 – 0 – 1000000, step 1.

If parameter *9599.1 Torque setpoint source* (page 360) is set to "local setpoint", this parameter will be the torque setpoint for *FCB 07 Torque control* (page 360).

*Limit values*

*9599.3 / 10441.3 Source velocity limit*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the velocity limit of *FCB 07 Torque control* (page 360).

If the parameter is set to "local setpoint", the torque limit will be parameter *9599.4 Local velocity limit* (page 361).

*9599.4 / 10441.4 Local velocity limit*

Unit: $10^{-3}$/min.

Value range: 0 – 1000000, Step 1.

If parameter *9599.3 Velocity limit source* (page 360) is set to "local setpoint", this parameter will be the velocity limit for *FCB 07 Torque control* (page 360).

*9599.5 / 10441.5 Jerk source*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the maximum jerk of the *FCB 07 Torque control (page 360)*.

If the parameter is set to "local setpoint", the maximum jerk will be parameter *9599.6 Local jerk* (page 361).

*9599.6 / 10441.6 Local jerk*

Unit: 1/(min×$s^2$).

Value range: 0 – 2147483647, step 1.

If parameter *9599.5 Jerk source* (page 361) is set to "local setpoint", this parameter will be the maximum jerk for *FCB 07 Torque control (page 360)*.

*Actual values*

*9985.1 User-defined unit torque*

Unit: %

Resolution: $10^{-3}$.

Value range: -2147483648 – 2147483647, step 1.

Current torque; in user-defined units, filtered for display.

### 9.5.6 FCB 08 Interpolated torque control

For applications with a higher-level (motion control) controller, this controller usually calculates a track profile (x, y, z) for several drive axes. The axis is then assigned one setpoint (position, speed, torque) that it has to follow. MOVIAXIS® only limits the setpoints using the unit's internal system limits. The application limits for speed, acceleration and jerk must be taken from the track curve and are then controlled by the controller.

The cycle in which the controller sends the setpoints to the axes does not usually correspond with the setpoint processing cycle of MOVIAXIS® (500 µs). If MOVIAXIS® were to "see" the same controller setpoint for several cycles, a step-shaped actual torque value would result. To prevent this from happening, the axis can calculate intermediate values (interpolate) if it knows the controller cycle – interpolated speed control. MOVIAXIS® can be set to different cycles of higher-level controllers.

The FCB 08 interpolated torque control is used for cyclic preselected speed setpoints of higher-level controllers. The higher-level controller is responsible for the following limits:

- Jerk,
- Acceleration,
- Speed.

Only the speed and torque system limits take effect in MOVIAXIS®. Prerequisite is a synchronized bus system. This means that incoming process data has a fixed time reference for the control system of the axis.

The new process data is sent within a fixed cycle time. This time must be a multiple of the cycle time of the speed control loop (parameter *9821.1 Scanning frequency n/X control* (page 262); 250 µs, 500 µs or 1 ms).

MOVIAXIS® now has the task of forwarding the incoming torque setpoints with a rough time reference to the speed controller that operates with the shortest time reference. Intermediate values must be interpolated for this purpose. The setpoint flow is delayed by one communication cycle to carry out this interpolation.

The incoming position over two process data is interpreted in user-defined units.

*General parameters*

*9963.1 Setpoint cycle control*

Unit: µs.

Value range: 500 – 20000, step 500.

The setpoint cycle of the controller indicates the time intervals used by the higher-level controller to send torque setpoints. The time intervals must be a multiple of the cycle time of the speed control loop (parameter *9821.1 Scanning frequency n/X control"* (page 262)).

*Setpoints*

*9964.1 Torque setpoint source*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the torque setpoint of *FCB 08 interpolated torque control (page 361)*.

If the parameter is set to "local setpoint", the source will be parameter *9964.2 Local torque setpoint* (page 362).

*9964.2 Local torque setpoint*

Unit: %

Resolution: $10^{-3}$.

Value range: -1000000 – 0 – 1000000, step 1.

If parameter *9964.1 Speed torque source* (page 362) is set to "local setpoint", this parameter will be the speed setpoint for *FCB 06 Interpolated speed control* (page 354).

*9964.4 Velocity limit source*

Unit:

Resolution:

Value range:

*9964.3 Local velocity limit*

Unit: rpm

Resolution:

Value range:

*Actual values*

*9985.1 User-defined unit torque*

Unit: %

Resolution: $10^{-3}$.

Value range: -2147483648 – 0 – 2147483647, step 1.

Current torque; in user-defined units, filtered for display.

### 9.5.7 FCB 09 Positioning

MOVIAXIS® has a number of positioning mode types. These types are described briefly in the following section. FCB "Positioning" can be instanced to a maximum of 64 times.

*Absolute positioning*

The position setpoint in user units is interpreted as an absolute target and is converted and executed in system units.

The travel range in system units is ± ($2^{31}$ -2). If this travel range is exceeded after the conversion, the FCB issues an error.

*Relative positioning*

The position setpoint in user units is interpreted as the offset for the last setpoint that was transferred. After it has been converted into system units, it is added to the last setpoint.

If the time calculated in system units is outside the travel range of ± ($2^{32}$ -2), the FCB issues an error.

*Modulo in positive direction with absolute position specification*

The position setpoint in user-defined units is interpreted as the absolute position. It must be within the modulo range of the active drive:

Lower limit = "Modulo underflow"

Upper limit = "Modulo overflow"

If the position setpoint is outside this range, an error is issued. The drive always turns in a positive direction to reach the specified position.

*Modulo in positive direction with relative position specification*

The position setpoint in user-defined units is interpreted as the offset for the last setpoint that was transferred. After it has been converted into system units, it is added to the last setpoint.

The position setpoint must be **positive**, otherwise an error is issued.

The drive always turns in a positive direction to reach the new position.

*Modulo in negative direction with absolute position specification*

The position setpoint in user-defined units is interpreted as the absolute position. It must be within the modulo range of the active drive:

Lower limit = "Modulo underflow"

Upper limit = "Modulo overflow"

If the position setpoint is outside this range, an error is issued. The drive always turns in a negative direction to reach the new position.

*Modulo in negative direction with relative position specification*

The position setpoint in user-defined units is interpreted as the offset for the last setpoint that was transferred. After it has been converted into system units, it is added to the last setpoint.

The position setpoint must be **negative**, otherwise an error is issued.

The drive always turns in a negative direction to reach the new position.

*Modulo with shortest distance with absolute position specification*

The position setpoint in user-defined units is interpreted as the absolute position. It must be within the modulo range of the active drive:

Lower limit = "Modulo underflow"

Upper limit = "Modulo overflow"

If the position setpoint is outside this range, an error is issued.

The direction of the drive is determined using the last setpoint position ( = current actual position after activation without an "In position" message) and the current setpoint position. This value is used to determine the shortest possible route and, therefore, the direction of rotation for positioning.

*Modulo with relative position specification*

The position setpoint in user-defined units is interpreted as the offset for the last setpoint that was transferred. After it has been converted into system units, it is added to the last setpoint.

The sign of the position setpoint determines the direction of rotation of the drive.

*9885.1 Use control bit "feed enable"*

Value range:

- 0 = No
- 1 = Yes

This parameter specifies whether "Feed enable" is to be used in the control word or not.

If this parameter is set to "Yes", a "Feed enable" bit must also be set in the layout of the control word. If the control word does not contain such a bit, this parameter must be set to "No", else the drive will not start.

The "Feed enable" bit in the control word must be set during the entire positioning distance. Deactivating feed enable results in standstill of the drive with the maximum deceleration of *FCB 09 positioning* (page 363) (*parameters 9886.8 – 9949.8*, depending on the instance). *FCB 09* (page 363) is not exited. Positioning is continued by setting feed enable again.

*9885.2 Control bit "Accept position"*

Value range:

- 0 = No
- 1 = Yes

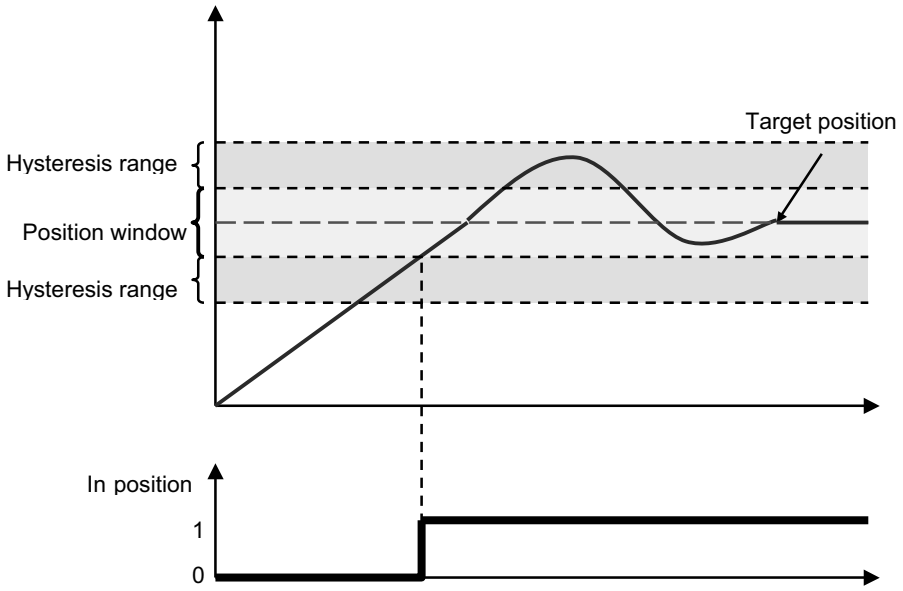
This parameter specifies whether the "Accept position" bit is to be used in the control word or not.

If this parameter is set to "Yes", an "Accept position" bit must also be set in the layout of the control word. If the control word does not contain such a bit, this parameter must be set to "No", else the drive will not start.

The "Accept position" bit must receive a positive edge for each new positioning procedure to accept the position. This is especially advantageous in the relative operating modes (index operating mode 9886.1 – 9949.1) → Relative cycles of the same position widths. The number of positive edges is saved and immediately processed. Example: Setpoint position relative to 100 revolutions. 220 revolutions are traveled by two quick successive changeovers (toggle) of the "Accept position" bit in the control word.

*9885.3 In Position window*

The window width for the "In position" message indicates when MOVIAXIS® sends back the information that the target position is reached to the PLC in the status word. The position window can now also be provided with a hysteresis using the parameter *9885.4 In position message hysteresis range* (page 366). The actual position can dip into the hysteresis range when it has entered the position window without losing the "In position". This prevents the bit from "bouncing".

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The "In position" message operates in the FCB according to the following rules:

- It is only set by *FCB 09 Positioning (page 363)* or *FCB 12 Referencing (page 373)* when traveling to start position.
- It will not be lost if there is a change from *FCB 09 (page 363)* to any other FCB, e.g. have brake applied with *FCB 13 Stop at application limit*. The change must occur within the position window and the hysteresis range.
- Goes to "0" when:
  - Leaving the position window and the hysteresis range
  - There is a new travel instruction within *FCB 09* (page 363)
  - There is a change to another FCB and it leaves the window

*9885.4 In Position hysteresis*

See parameter *9885.3 In Position window* (page 365).

*9885.5 Positioning lag error window*

The positioning lag error specifies as of which lag distance (offset of setpoint position to actual position) an error should be triggered. The maximum lag distance is then divided by 2 in the positioning lag error window. The parameter only takes effect in *FCB 09 Positioning* (page 363).

*9729.18 Response to positioning lag error*

Value range:

- 0 = No response
- 1 = Display only
- 5 = Output stage inhibit / waiting
- 6 = Stop at emergency stop limit / waiting
- 8 = Stop at application limit / waiting
- 10 = Stop at system limit / waiting

- **No response**

Error is ignored

- **Display only**

The 7-segment display shows the status but the axis does not respond.

- **Output stage inhibit/waiting**

The axis changes to the state output stage inhibited and applies a mechanical brake, if installed. If no brake is installed, the motor will coast to a halt. After a reset, the axis performs a warm start and is ready to operate again without delay.

- **Stop at emergency stop limit / waiting**

The motor is stopped along the emergency stop ramp. After a reset, the axis performs a warm start and is ready to operate again without delay.

- **Stop at application limit/waiting**

The motor is stopped at the application limit. After a reset, the axis performs a warm start and is ready to operate again without delay.

- **Stop at system limit/waiting**

The motor is stopped at the system limit. After a reset, the axis performs a warm start and is ready to operate again without delay.

The response is set to position lag error window exceeded.

*Instance data*

*FCB Positioning* (page 363) can be assigned to an instance 64 times, e.g. for table positioning. Each instance can be then selected in the control word. This means all subsequent parameters exist 64 times in ascending order sorted by index.

This means

- instance 0 has the basic index 9886,
- instance 63 has the basic index 9949.

*9886.1 – 9949.1 Operating mode*

Value range:

- 0 = Absolute
- 1 = Relative
- 2 = Modulo absolute positive direction
- 3 = Modulo relative positive direction
- 4 = Modulo absolute negative direction
- 5 = Modulo relative negative direction
- 6 = Modulo shortest distance absolute
- 7 = Modulo shortest distance relative

**Absolute**: In this operating mode, an incoming setpoint position is approached in an absolute manner. In this case, the maximum travel range is ± 32768 motor revolutions. If higher values are specified, MOVIAXIS® will issue error 18 (internal software error).

**Relative:** In this operating mode, an incoming setpoint position is traveled to in a relative manner. It is recommended to use the "Accept position" bit on the control word. In this way, the position is approached in a relative manner for each edge even when the relative setpoint position does not change.

In this case, the maximum travel range is ± 32768 motor revolutions. If higher values are specified, from an absolute perspective, MOVIAXIS® will issue error 18 (internal software error). The maximum relative setpoint position that can be specified in a travel command is 32768 motor revolutions.

**Modulo operating modes:** In the modulo operating modes, the travel range of *9594.1 Modulo underflow* (page 284) to *9594.10 Modulo overflow* (page 283) is mapped in parameter *9839.1 Modulo position (page 370)*.

Using the user-defined units (see motor startup), odd-numbered ratios can be represented infinitely, e.g. a turntable with infinite gear ratio that always moves in one direction. The modulo absolute position is always maintained between overflow and underflow independent of the drive revolutions. Reference travel must always be performed when replacing MOVIAXIS® or the motor.

- **Modulo absolute positive direction:** In this operating mode, an incoming setpoint position is approached in an absolute manner within the modulo travel range. The travel direction is always positive (looking onto the motor shaft: positive direction of rotation). The setpoint position is only valid within the modulo limits. If higher or lower values are specified, MOVIAXIS® will issue error 18 (internal software error). No more than one revolution per travel command can be moved in this operating mode. This is not a complete revolution but a revolution minus the resolution of the set user-defined unit.

- **Modulo relative positive direction:** In this operating mode, an incoming setpoint position is approached in a relative manner within the modulo travel range. The travel direction is always positive (looking onto the motor shaft: Positive direction of rotation for parameter *8537.0 Direction of rotation reversal* (page 253) set to "OFF"). Several modulo travel ranges can be specified here (up to a maximum ± 32768 motor revolutions).
- **Modulo absolute negative direction:** Like the "Modulo absolute positive direction" operating mode but in negative direction.
- **Modulo relative negative direction:** Like the "Modulo relative positive direction" operating mode but in negative direction.
- **Modulo absolute shortest distance:** In this operating mode, the drive always travels the shortest distance within the modulo travel range. This can mean a positive or negative direction. The setpoint position is only valid within the modulo limits. If higher or lower values are specified, MOVIAXIS® will issue error 18 (internal software error).
- **Modulo relative shortest distance.**

**The following settings apply to all operating modes**.

The reset behavior of parameter *9998.1 Position mode* (page 344) in conjunction with absolute encoders depends on the following settings:

- If set to "**Without overflow counter**", the unit will always be positioned in the absolute range of the encoder following a CPU reset and system restart, e.g. with Hiperface® 4096 motor revolutions. This means a position loss in the event of encoder overflow. If the position range of the absolute encoder is not exceeded, no reference travel is required when replacing MOVIAXIS® because no overflows can be stored in the MOVIAXIS®. Reference travel is only required when the motor is replaced.
- When set to "**With overflow counter**", the complete ± 32768 motor revolutions are utilized despite overflow. MOVIAXIS® internally stores absolute encoder overflows. This also functions when the axis is moved to overflow without electrical current. This is ensured by checking the travel range. Reference travel must always be performed when replacing MOVIAXIS® or the motor.

*9886.2 – 9949.2 Positioning setpoint source*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the positioning setpoint of *FCB 09 Positioning (page 363)*.

If set to "local setpoint", the source will be parameter *9886.3 – 9949.3 Positioning setpoint local* (page 369).

*9886.3 – 9949.3 Local positioning setpoint*

Unit: U.

Resolution: 1/65536.

Value range: -2147483648 – 0 – 2147483647, step 1.

If the parameter *9886.2 – 9949.2 Positioning setpoint source* (page 368) is set to "Local setpoint", this parameter will be the positioning setpoint for *FCB 09 Positioning (page 363)*.

*9886.4 – 9949.4 Max. positioning velocity positive source*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the positive positioning velocity of *FCB 09 Positioning* (page 363).

If set to "local setpoint", the source will be parameter *9886.5 – 9949.5 Local max. positioning velocity positive* (page 369).

*9886.5 – 9949.5 Local max. positioning velocity positive*

Unit: $10^{-3}$/min.

Value range: 0 – 10000000, step 1.

If parameter *9886.4 – 9949.4 Positioning velocity positive source* (page 369) is set to "local setpoint", this parameter will be the positive velocity for *FCB 09 Positioning* (page 363).

*9886.12 – 9949.12 Max. positioning velocity negative source*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the positioning velocity negative of *FCB 09 Positioning (page 363)*.

If set to "local setpoint", the source will be parameter *9886.13 – 9949.13 Positioning velocity negative local* (page 369).

*9886.13 – 9949.13 Local max. positioning velocity negative*

Unit: $10^{-3}$/min.

Value range: 0 – 10000000, step 1.

If parameter *9886.12 – 9949.12 Positioning velocity negative source* (page 369) is set to "local setpoint", this parameter will be the negative velocity for *FCB 09 Positioning* (page 363).

*9886.6 – 9949.6 Max. acceleration source*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the positive acceleration of *FCB 09 positioning* (page 363).

If set to "local setpoint", the source will be parameter *9886.7 – 9949.7 Acceleration positive local* (page 370).

*9886.7 – 9949.7 Local max. velocity*

Unit: $10^{-2}$/min×s.

Value range: 0 – 300000 .. 2147483647, step 1.

If parameter *9886.6 – 9949.6 Max. acceleration source* (page 369) is set to "local setpoint", this parameter will be the positive acceleration for *FCB 09 Positioning* (page 363).

*9886.8 – 9949.8 Max. deceleration source*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the deceleration of *FCB 09 positioning (page 363)*.

If set to "local setpoint", the source will be parameter *9886.9 – 9949.9 Local max. deceleration* (page 370).

*9886.9 – 9949.9 Local max. deceleration*

Unit: $10^{-2}$/min×s.

Value range: 0 – 300000 .. 2147483647, step 1.

If parameter *9886.8 – 9949.8 Deceleration source* (page 370) is set to "local setpoint", this parameter will be the deceleration for *FCB 09 Positioning* (page 363).

*9886.10 – 9949.10 Jerk source*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the jerk of *FCB 09 Positioning (page 363)*.

If set to "local setpoint", the source will be parameter *9886.11 – 9949.11 Local jerk* (page 370).

*9886.11 – 9949.11 Local jerk*

Unit: 1/(min×$s^2$).

Value range: 1 – 2147483647, Step 1.

If parameter *9886.10 – 9949.10 Jerk source* (page 370) is set to "local setpoint", this parameter will be the jerk for *FCB 09 Positioning* (page 363).

*9704.1 Position*

Unit: U.

Resolution: 1/65536.

Value range: -2147483648 – 0 – 2147483647, step 1.

Current actual position in user-defined units, filtered for display.

*9839.1 Modulo position*

Unit: U.

Resolution: 1/65536.

Value range: -2147483648 – 0 – 2147483647, step 1.

Current actual modulo position in user-defined units, filtered for display.

*10098.2 Lag error*

Unit: U.

Resolution: 1/65536

Value range: -2147483648 – 0 – 2147483647, step 1

### 9.5.8 FCB 10 Interpolated positioning

The FCB 10 Interpolated positioning is used for cyclic preselected position setpoints of higher-level controllers, e.g. MotionControl.

The higher-level controller is responsible for the following limits:

- Jerk,
- Acceleration,
- Speed.

Only the speed and torque system limits take effect in MOVIAXIS®.

Prerequisite is a synchronized bus system. This means that incoming process data has a fixed time reference for the control system of the axis.

The new process data is sent within a fixed cycle time. This time must be a multiple of the cycle time of the speed control loop (parameter *9821.1 Scanning frequency n/X control* (page 262); 250µs, 500µs or 1ms).

MOVIAXIS® now has the task of forwarding the incoming positions with a rough time reference to the operating position controller with the shortest time reference. Intermediate values must be interpolated for this purpose. The setpoint flow is delayed by one communication cycle to carry out this interpolation.

The incoming position over two process data is interpreted in user-defined units.

*9963.1 Setpoint cycle control*

Unit: µs.

Value range: 500 – 20000, step 500.

The setpoint cycle of the controller indicates the time intervals used by the higher-level controller to send position setpoints. This time must be a multiple of the cycle time of the position control loop (parameter *9821.1 Scanning frequency n/X control* (page 262)).

*9966.5 Setpoint position filter*

Unit: µs

Value range: 500 – 30000, step 500

*9729.18 Response to positioning lag error*

- 0 = No response
- 1 = Display only
- 2 = Output stage inhibit / locked
- 3 = Stop at emergency stop limit / locked
- <u>5 = Output stage inhibit / waiting</u>
- 6 = Stop at emergency stop limit / waiting
- 8 = Stop at application limit / waiting
- 9 = Stop at application limit / locked
- 10 = Stop at system limit / waiting
- 11 = Stop at system limit / locked

The response is set to position lag error window exceeded.

*9966.1 Setpoint position source*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the positioning setpoint of *FCB 10 Interpolated positioning* (page 371).

If the parameter is set to "local setpoint", the source will be parameter *9966.2 Local position setpoint* (page 372).

*9966.2 Local position setpoint*

Unit: U.

Resolution: 1/65536.

Value range: -2147483648 – 0 – 2147483647, step 1.

If the parameter "Setpoint position source" is set to "local setpoint", this parameter will be the position setpoint for *FCB 10 Interpolated positioning* (page 371).

*9966.4 Positioning lag error window*

Unit: U.

Resolution: 1/65536.

Value range: 0 – 65536 – 2147483647, step 1.

The lag error window for positioning specifies the allowed dynamic deviation of the setpoint from the actual value in user-defined units until an error is triggered. The error response is set in parameter *9729.18 Response lag error positioning* (page 371).

*9704.1 Position*

Unit: U.

Resolution: 1/65536.

Value range: -2147483648 – 0 – 2147483647, step 1.

Current actual position in user-defined units, filtered for display.

*9839.1 Modulo position*

Unit: U.

Resolution: 1/65536.

Value range: -2147483648 – 0 – 2147483647, step 1.

Current actual modulo position in user-defined units, filtered for display.

*10098.2 Lag error*

Unit: U.

Resolution: 1/65536

Value range: -2147483648 – 0 – 2147483647, step 1

### 9.5.9 FCB 12 Reference travel

*Actual values*

*9857.1 Reference travel status* — Indicates the state that the reference travel is currently in.

*9703.1 Velocity* — Unit: $10^{-3}$/min.

Current actual velocity in user-defined units, filtered for display.

*9704.1 Position* — Unit: U.

Resolution: 1/65536.

Value range: -2147483648 – 0 – 2147483647, step 1.

Current actual position in user-defined units, filtered for display.

*9839.1 Modulo position* — Current actual modulo position in user-defined units, filtered for display.

Unit: U.

Resolution: 1/65536.

Value range: -2147483648 – 0 – 2147483647, step 1.

### 9.5.10 FCB 18 Encoder adjustment

*FCB 18 Encoder adjustment* is used for commutation detection for synchronous AC motors (linear and rotary). The drive must be disconnected from the load and from the gear unit. If this is not possible, or only with considerable effort, see *FCB25 Rotor position identification*. The motor must first be started up electrically.

When changing to *FCB 18 encoder adjustment*, calibration (exception: "Automatically write preset offset angle to parameter" mode) is immediately started and runs through the following states:

| | **INFORMATION** |
|---|---|
| | FCB18 should be selected directly from controller inhibit (FCB01) because all other stop FCBs (including the default FCB13) set the speed to 0. Without proper commutation, this might result in a non-controlled movement of the axis. |

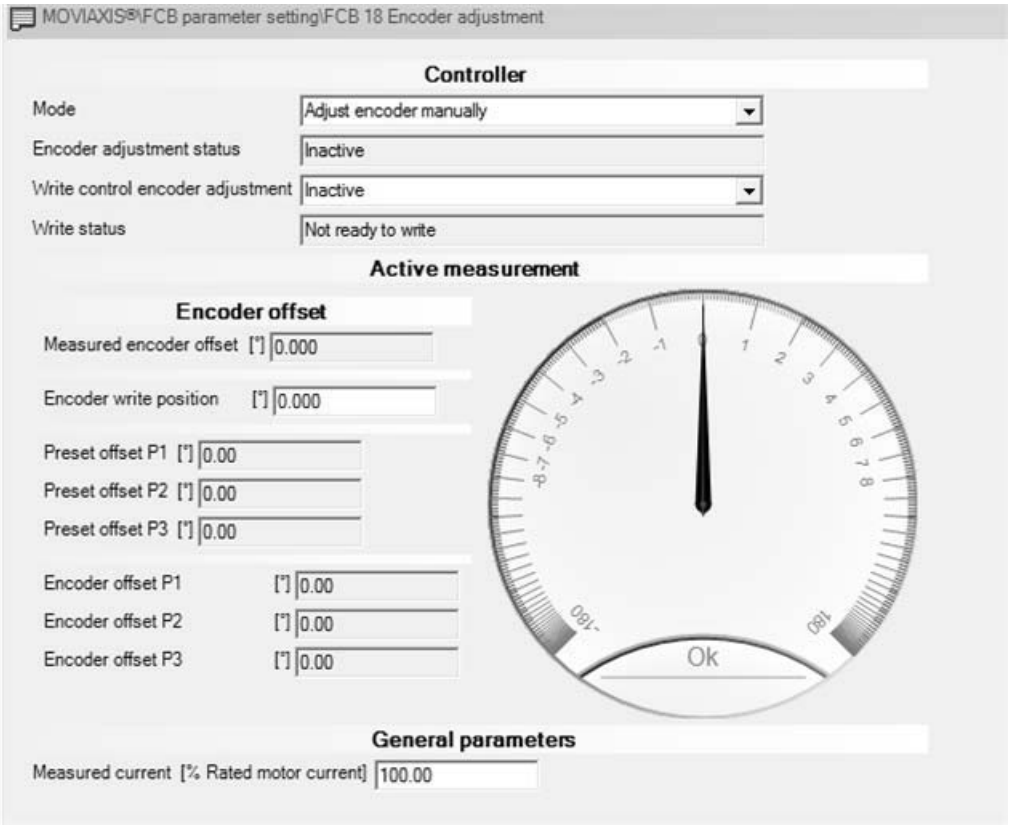
1. **Inactive**: FCB is not selected.
2. **Current build-up**: Adjustment is started by selecting the FCB. Parameter *10054.1 Write control encoder alignment* (page 381) is set to "inactive".
3. **Wait 1**: The motor waits until the mechanical transient process at the motor shafts is finished.

4. **Turn forward**: The drive now rotates forward one revolution (as viewed from the motor shaft, positive direction of rotation). The revolution in the positive direction of rotation is very important, else the wiring may be incorrect and parameter *10054.3 Encoder adjustment status* (page 380) changes to status 10 error. The parameter *8537.0 Change direction of rotation* (page 253) reverses the direction of rotation (first negative then positive direction of rotation).
5. **Wait 2**: The motor waits until the mechanical transient process at the motor shaft is finished.
6. **Turn backward**: The motor shaft turns back to the old position.
7. **Wait 3**: The motor waits until the mechanical transient process at the motor shaft is finished.
8. **Finished**: In this condition, MOVIAXIS® now waits for a response from the user or higher-level controller depending on the connected motor. In the meantime, parameter *10054.1 Measured encoder offset* (page 381) is permanently compared with the position of the motor shaft. Parameter *10054.2 Write position encoder offset* (page 381) contains the result of the measurement. There are several ways to adjust the encoder:

| Mode | Description |
|---|---|
| Adjust encoder manually | → SEW synchronous motor with resolver<br>This mode is for manual adjustment of the encoder on the motor shaft. |
| Write encoder offset to Hiperface® encoder | → SEW synchronous motor with Hiperface®<br>After executing this mode, the data is written to the Hiperface® encoder. It is not necessary to open the motor. |
| Write encoder offset to parameter | → Non-SEW synchronous motor<br>After executing this mode, the measured offset is written to a parameter in MOVIAXIS®.<br>This mode is independent of the encoder, as non-SEW motors are not to be changed. This ensures that it is not necessary to measure the motor again in case of service is required for the motor. |
| Write encoder offset to parameter automatically | → Synchronous motor without absolute information (rotary and linear)<br>This mode is for synchronous motors that do not have any single-turn absolute information in the encoder (e.g. Sin/Cos encoders or incremental encoders).<br>The higher-level controller must select the *FCB18 Encoder adjustment* and perform a calibration run each time the unit is switched on. The application must allow the motor to move freely → direct drive (rotary and linear). |
| Automatically write preset offset angle to parameter | See mode *Determine preset offset angle*. |
| Determine preset offset angle | → Synchronous motor without absolute information (rotary and linear) with always the same wake-up position (such as locked), which is ensured mechanically.<br>This mode is intended for synchronous motors that do not have any single-turn absolute information in the encoder (e.g. sin/cos encoders or incremental encoders) and are always switched off/on in the same positions. Application examples are locking bolts upon switch-on, or hoists at the lower buffer position.<br>During initial startup, the offset must be determined using the mode "Determine preset offset angle" and the subsequent calibration run.<br>During each switch-on sequence, the higher-level controller must then call *FCB18 Encoder adjustment* with the mode *Automatically write preset offset angle to parameter*.<br>This does not start calibration travel, but only copies a parameter. |

*Mode description*

*10054.6 Mode* **Mode 1: Adjust encoder manually**

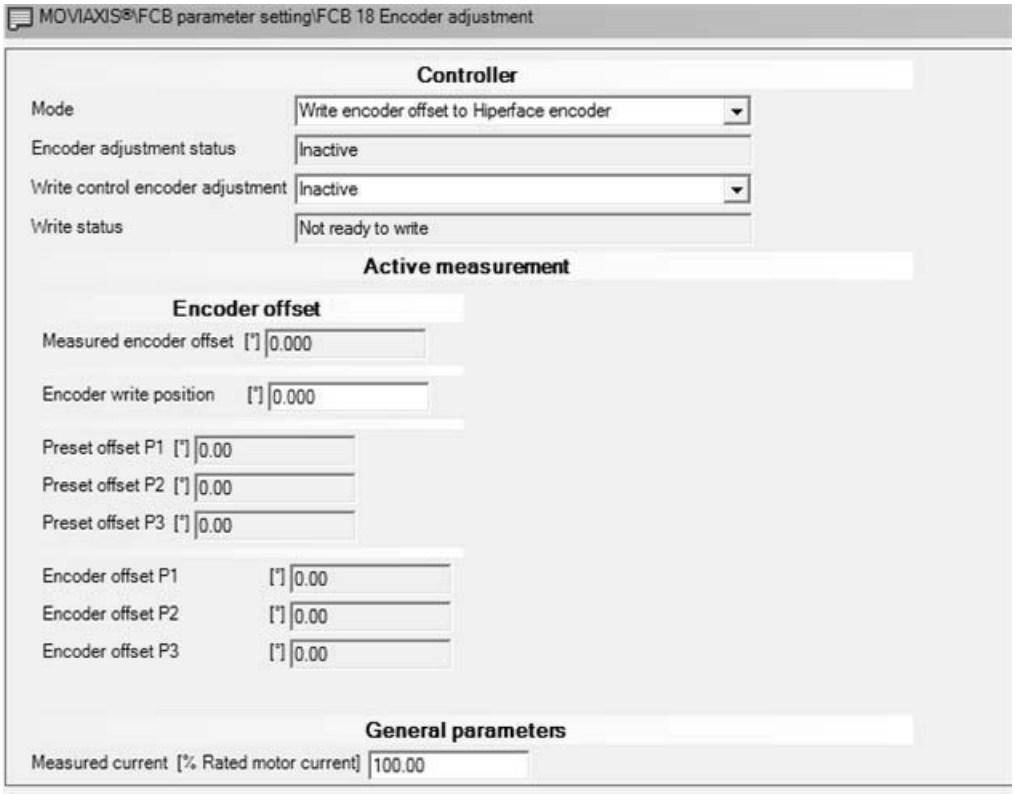



1. Set measuring current.

   SEW-EURODRIVE recommends nominal motor torque as starting value (100% for basic user-defined unit torque).

   Notice: During the measurement, the measuring current is continuously supplied to the motor.
2. Select "Adjust encoder manually" mode
3. Select *FCB 18 Encoder adjustment* (directly from controller inhibit)
4. The encoder adjustment status runs through the states described above.
5. After the encoder adjustment status "Completed" is displayed, you can set the resolver manually to "0" using the shown clock.
6. Checking the setting by calling *FCB 18 Encoder adjustment* again.

**Mode 2: Write encoder offset to Hiperface® encoder**

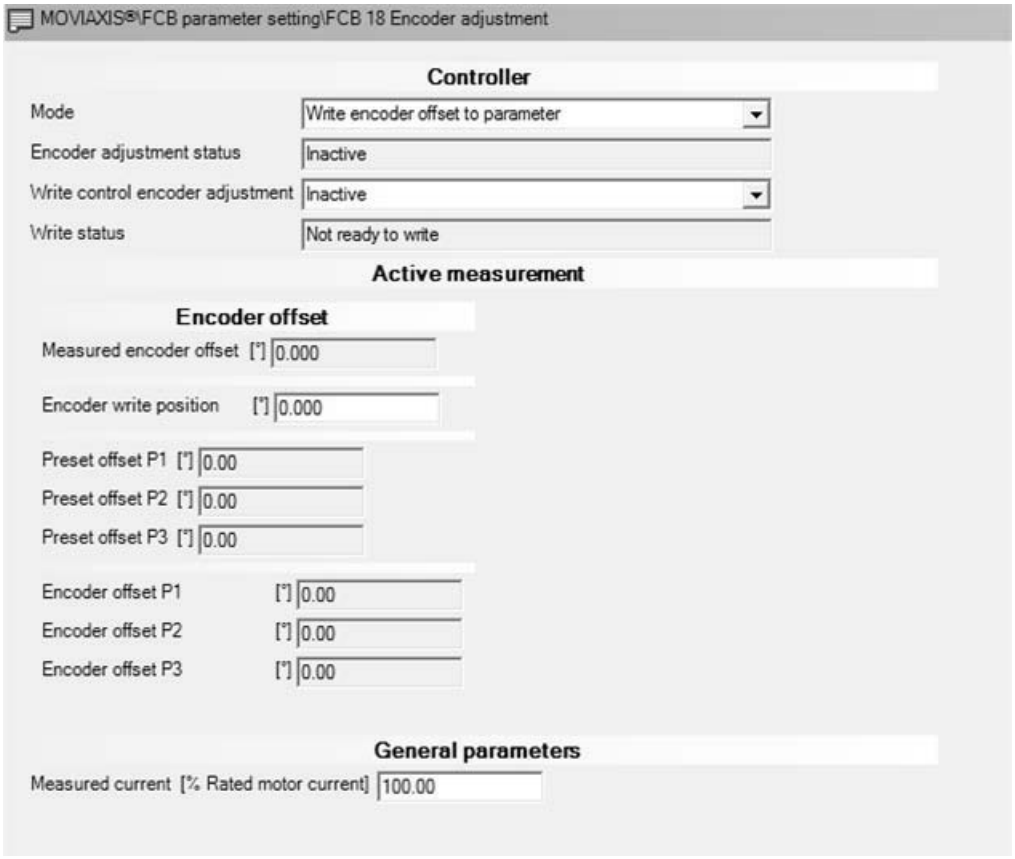



1. Set measuring current.

   SEW-EURODRIVE recommends nominal motor torque as starting value (100% for basic user-defined unit torque).

   Notice: During the measurement, the measuring current is continuously supplied to the motor.
2. Select "Write encoder offset to Hiperface®" mode
3. Select *FCB 18 Encoder adjustment* (directly from controller inhibit)
4. The encoder adjustment status runs through the states described above.
5. After the encoder adjustment status "Completed" is displayed, the parameter write status changes to "Ready to write".
6. Now, the parameter *Encoder adjustment write control* must be set to "Write". MOVIAXIS® now writes the value displayed in parameter *Encoder write position* to the Hiperface® encoder. The value is not exactly zero. The difference is the friction caused by turning forwards and backwards.
7. MOVIAXIS® starts the calibration process again to check the settings.

**Mode 3: Write encoder offset to parameter**

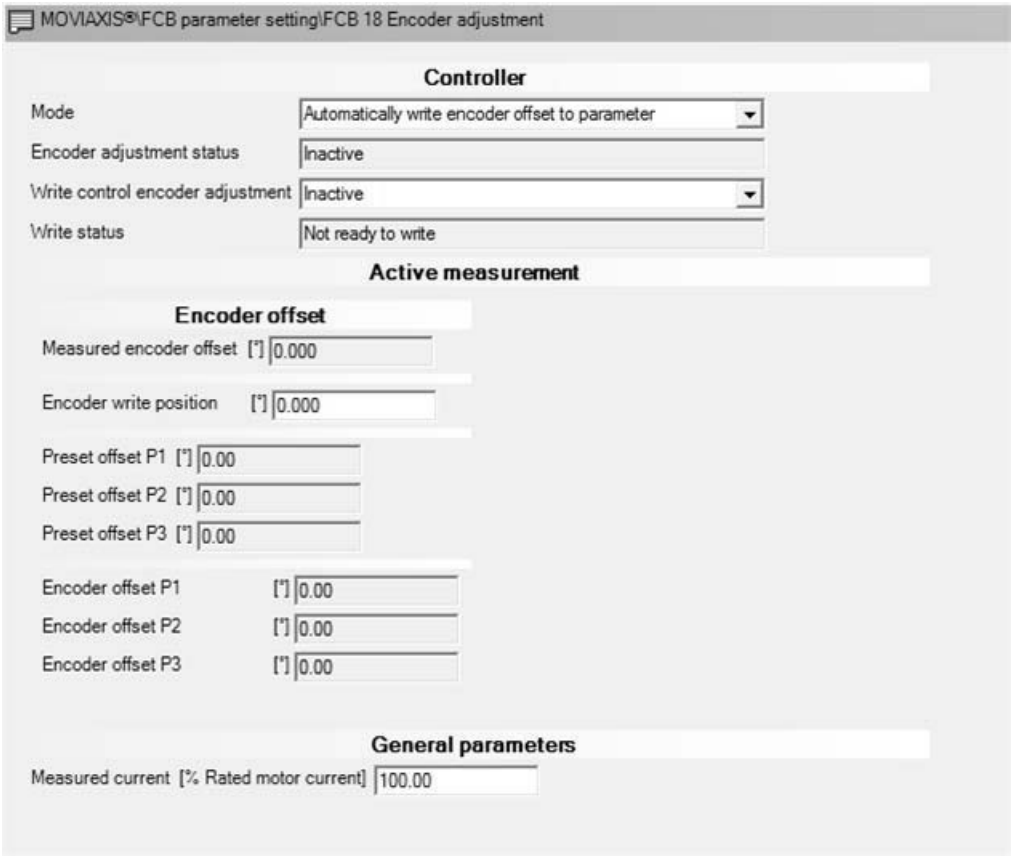



1. Set measuring current.

   SEW-EURODRIVE recommends nominal motor torque as starting value (100% for basic user-defined unit torque).

   Notice: During the measurement, the measuring current is continuously supplied to the motor.
2. Select "Write encoder offset to parameter" mode
3. Select *FCB 18 Encoder adjustment* (directly from controller inhibit)
4. The encoder adjustment status runs through the states described above.
5. After the encoder adjustment status "Completed" is displayed, the parameter write status changes to "Ready to write".
6. Now, the parameter *Encoder adjustment write control* must be set to "Write". MOVIAXIS® now writes data to the parameter *Encoder offset P1 – P3* (depending on the parameter set).
7. MOVIAXIS® starts the calibration process again to check the settings.

**Mode 4: Write encoder offset to parameter automatically**




The mode *Write encoder offset to parameter automatically* has the same function as the mode *Write encoder offset to parameter*.

The difference is point 6. Data is not written to the parameter *Encoder offset P1 – P3* by *Encoder adjustment write control*, but automatically after calibration has been completed.

**Mode 5: Write preset offset to parameter automatically**

A prerequisite for this mode is that the *preset offset* has been determined once with the mode *Determine preset offset angle*. After that, *FCB 18 Encoder adjustment* must be selected once after each switch-on sequence with this mode.

See mode "Determine preset offset angle".

**Mode 6: Determine preset offset angle**


1. Move drive to wake-up position (the wake-up position should be always the same to use this mode)
2. Switch the unit on (apply 24 V)
3. Set measuring current

   SEW-EURODRIVE recommends nominal motor torque as starting value (100% for basic user-defined unit torque).

   Notice: During the measurement, the measuring current is continuously supplied to the motor.
4. Select *Determine preset offset angle* mode
5. You can now move the drive away from the wake-up position to an area in which it can move freely for commutation travel. It is important that the axis remains switched on (distance measuring by encoder must be ensured). The commutation travel can be executed at any point.
6. Select *FCB 18 Encoder adjustment* (directly from controller inhibit)
7. The encoder adjustment status runs through the states described above.
8. The measured encoder offset is copied to the parameter *Preset offset* before the encoder adjustment status "Completed" is displayed.

It must be ensured before each switch-on that the drive is in the defined wake-up position. Then, a higher-level controller must select FCB18 Encoder adjustment with mode "Write preset offset angle to parameter automatically". Now, the axis is ready for operation.

The status bit *Motor commutated* can deliver feedback.

*Parameter description*

*10054.3 Encoder adjustment status*

Value range:

- 0 = Inactive
- 1 = Current generation
- 2 = Waiting 1
- 3 = Rotate forward
- 4 = Waiting 2
- 5 = Rotate backwards
- 6 = Waiting 3
- 7 = Copy
- 8 = Do not copy
- 9 = Finished
- 10 = Error

*10054.4 Write control encoder adjustment*

Value range:

- 0 = Inactive
- 1 = Do not copy
- 2 = Write

**Inactive**: The FCB basically starts with this setting. If the parameter is set to another setting, it will be reset to "inactive".

**No copy**: This setting is only used for special purposes to write an arbitrary encoder offset to the Hiperface® encoder.

**Write**: With this setting, the parameter *10054.1 Measured encoder offset* (page 381) will be written to the Hiperface® encoder.

*10054.7 Write status*

Value range:

- Not ready to write
- Ready to write
- Writing in progress
- Write process finished

*10054.1 Measured encoder offset*

Unit: U.

Resolution: $1/2^{32}$.

Currently measured encoder offset for which the encoder shaft has an incorrect setpoint setting. (360° corresponds to one mechanical revolution).

*10054.2 Encoder write position*

Unit: U.

Resolution: 1/65536.

Value range: 0 – 4294967295, step 1.

This value is written for "Encoder adjustment write control = Write" to a Hiperface® encoder. The inaccuracy of "0" is determined by the friction compensation.

*10054.11 / 12 / 13 Preset offset P1 – P3*

See table above on the *Determine preset offset angle* mode.

*9834.1 / 2 / 3 Encoder offset P1 – P3*

See table above on the *Write encoder offset to parameter* mode.

*10054.5 Measuring current*

Unit: %.

Resolution: $10^{-3}$.

Value range: 0 – 100000 – 1000000, step 1.

The measuring current must be set in the user-defined units of the torque. It must not exceed the nominal motor torque.

### 9.5.11 FCB 20 Jog mode

MOVIAXIS® has a position-controlled jog mode function; this means it is possible to move an axis in positive or negative direction, for example, for alignment purposes in **position-controlled** mode using two adjustable speeds for each. The advantage of this function is that it can be used with hoist applications for which the position is not permitted to change when a change in load occurs when the drive is at a standstill.

*Setpoints*

*9604.10 Select set of jog velocities*

Value range: Velocity 1, velocity 2

*9604.12 Velocity 1 positive source*

Value range:

- Local setpoint
- IN process data channel 00 – 15
- Application limit acceleration

FCB Speed control

*9604.1 Velocity 1 positive local*

Unit: rpm

Resolution: $10^{-3}$.

Value range: 0 – 1000000, step 1.

Positive speed setpoint in user-defined units (as seen onto the motor shaft, positive direction of rotation).

*9604.13 Velocity 1 negative source*

Value range:

- Local setpoint
- IN process data channel 00 – 15
- Application limit deceleration

*9604.2 Velocity 1 negative local*

Unit: rpm

Resolution: $10^{-3}$.

Value range: 0 – 1000000, step 1.

Negative speed setpoint in user-defined units (as seen onto the motor shaft, negative direction of rotation).

*9604.8 Velocity 2 positive*

Unit: rpm

Resolution: $10^{-3}$.

Value range: 0 – 1000000, step 1.

Positive speed setpoint in user-defined units (as seen onto the motor shaft, positive direction of rotation).

*9604.9 Velocity 2 negative*

Unit: rpm

Resolution: $10^{-3}$.

Value range: 0 – 1000000, step 1.

Negative speed setpoint in user-defined units (as seen onto the motor shaft, negative direction of rotation).

*Limit values*

*9604.14 Acceleration source*

Value range:

- Local setpoint
- IN process data channel 00 – 15
- Application limit acceleration

*9604.5 Acceleration*

Resolution: $10^{-2}$/(min×s).

Value range: 0 – 300000 – 2147483647, step 1.

Jog acceleration in user-defined unit.

*9604.15 Deceleration source*

Value range:
- Local setpoint
- IN process data channel 00 – 15
- Application limit deceleration

*9604.6 Deceleration*

Resolution: $10^{-2}$/(min×s).

Value range: 0 – 300000 – 2147483647, step 1.

Jog acceleration in user-defined unit.

*9604.16 Jerk source*

Value range:
- Local setpoint
- IN process data channel 00 – 15
- Application limit jerk

*9604.7 Jerk*

Resolution: $10^{-2}$/(min×$s^2$).

Value range: 1 – 2147483647, Step 1.

Jerk in user-defined unit for jog mode.

*9604.17 Lag error window*

The *Jog* lag error window specifies as of which lag distance (offset of setpoint position to actual position) an error will be triggered. The maximum lag distance is then *lag error window divided by 2*. The parameter is only effective in *FCB20 Jog*.

*9604.18 Jog lag error response*

Value range: 0 – 1 – 5
- 0 = No response
- 1 = Display only
- 5 = Output stage inhibit / waiting

*Actual values*

*10120.1.1 Velocity*

Unit: $10^{-3}$/min

Current actual velocity in user-defined units, filtered for display.

*9704.1 Position*

Unit: U.

Resolution: 1/65536.

Current actual position in user-defined units, filtered for display.

*9839.1 Modulo position*

Unit: U.

Resolution: 1/65536.

Value range: -2147483648 – 0 – 2147483647, step 1.

Current actual modulo position in user-defined units, filtered for display.

### 9.5.12 FCB 21 Brake test

This function is used to check the braking capability of a brake connected to MOVIAXIS®. A test torque is applied electrically via the motor when the brake is applied.

Even when the brake has passed the brake test, it does not take on any safety functions as far as machine safety is concerned in combination with MOVIAXIS®.

The brake is only tested in accordance with the set brake test torque. The actual "brake breakaway torque" is not measured.

MOVIAXIS® supports four test modes:

1. A higher-level controller provides the setpoints and monitoring function for the test.
2. MOVIAXIS® performs a check in both directions compared to the set limit torques.
3. MOVIAXIS® performs a check in positive direction compared to the set limit torques.
4. MOVIAXIS® performs a check in negative direction compared to the set limit torques.

The test torque, test time and the direction of rotation of the test can be set. If a test is not passed, the breakaway torque is documented.

The braking torque is limited by the set *Torque system limit*. Note: The application torque must be considered for calculating the test torque, e.g. hoist test "downward".

| | **INFORMATION** |
|---|---|
| | When the brake has passed the brake test, it does not take on any safety functions as far as machine safety is concerned in combination with MOVIAXIS®.<br>A check is not made to determine whether a brake is physically present. This means that the brake test would also be performed without a brake.<br>This allows for the testing of external brakes. |

*9600.1 Test*

Value range:

- 1 = External setpoint selection
- 2 = Bipolar torque
- 3 = Positive torque
- 4 = Negative torque

**External setpoint selection**

In this mode, the brake test is completely evaluated by a higher-level controller / PLC. The brake test is running as long as the FCB is active. Possible travel movements are not monitored.

Only the parameters for the speed setpoint "9600.4 (page 385) and 9600.5 (page 386)" and test torque "9600.2 (page 386) and 9600.3 (page 386)" are used. All other parameters are used in test modes 2 to 4 only.

A negative test torque is implemented by specifying a negative speed. System limits take effect including the jerk limits.

**Bipolar, positive and negative torque mode**

The brake is considered to be "ok" when the motor shaft does not move more than 10°. This is a fixed value. The position source is the active position encoder.

In this mode, the brake test is completely evaluated and reported back by MOVIAXIS®.

Brake slipping, even when minimal, generates axis movement in the test direction. Only the system limits are effective for the *FCB brake test* (page 384). System jerk is not effective.

Use the test mode "bipolar", "positive" or "negative" depending on the application.

The duration of the set test torque can be set using parameter *9600.6 Test duration* (page 386). The test result is stored in parameter *9600.8 Status* (page 385) after successful completion of the test.

Parameter *9600.4 Setpoint speed* (page 385) is not effective.

If a brake test is interrupted, an error message will be issued. Speed monitoring is deactivated for the duration of the brake test.

- Bipolar: Positive and negative test torque (brake test is performed twice, which means twice the test period),
- Positive: Operated only with a positive test torque
- Negative: Operated only with a negative test torque

*9600.8 Status*

Value range: 0 – 4294967295, step 1.

The following statuses can be displayed:

- No calibration.
- Calibration in progress.
- Calibration was aborted.
- Brake OK.
- Brake faulty.

Brake "ok" or "faulty" can also be read in the status word.

*Setpoints*

*9600.4 Speed setpoint source*

Only mode 1.

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the speed setpoint of *FCB 21 brake test (page 384)*.

If the parameter is set to "local setpoint", the source will be parameter *9600.4 Local speed setpoint*.

*9600.5 Local speed setpoint*

Only mode 1.

Resolution: $10^{-3}$.

Value range: -1000000 – 0 – 1000000, step 1.

If parameter *9600.4 Speed setpoint source* (page 385) is set to "local setpoint", this parameter will be the speed setpoint for the *FCB 21 Brake test (page 384)*.

*Limit values*

*9600.2 Test torque source*

Value range: see parameter *9598.1 Velocity setpoint source* (page 352) *FCB Speed control*.

This parameter sets the source for the test torque of *FCB 21 Brake test* (page 384).

If the parameter is set to "local setpoint", the source will be parameter *9600.3 Local test torque* (page 386).

The test torque cannot be changed during the test run. The test torque should be based on the brake torque in conjunction with the static load torque.

*9600.3 Local test torque*

Unit: %.

Resolution: $10^{-3}$.

Value range: 0 – 100000 – 1000000, step 1.

If parameter *9600.2 Test torque source* (page 386) is set to "local setpoint", this parameter will be the test torque for *FCB 21 Brake test* (page 384) in user-defined units.

*9600.6 Test duration*

Only modes 2 – 4.

Unit: ms.

Value range: 0 – 1000 – 5000, step 1.

The test time is indicated in mode 2 – 4 for the duration of the test. Afterwards "ok" or "faulty" is displayed in brake status.

SEW-EURODRIVE recommends a test time of 1 second.

*9600.9 Protocol torque*

Only modes 2 – 4.

Unit: %.

Resolution: $10^{-3}$.

Value range: 0 – 1000000, step 1.

If the brake is faulty, the protocol torque shows the slip torque in user-defined units in mode 2 – 4.

*Actual values*

*9985.1 User-defined unit torque*

Unit: %.

Resolution: $10^{-3}$.

Value range: -2147483648 – 2147483647, step 1.

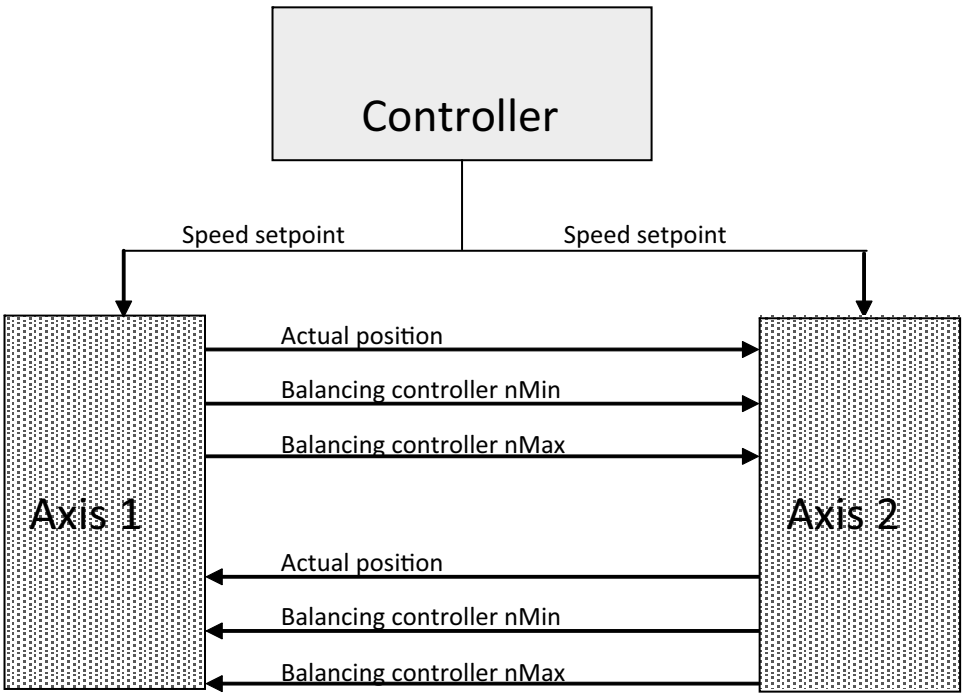
Current torque in user-defined units, filtered for the display.

### 9.5.13 FCB 22 Multi-drive

*FCB Multi-drive* is used to operate 2, 3 or 4 motors on a load in the mode "interpolated speed control" (like FCB 6). The drives can be mechanically coupled or not. The mechanical coupling can also be temporary. Working against each other like rigidly coupled synchronized drives is not possible due to the functional principle.

The *FCB Multi-drive* does not work according to the master-slave principle, but all drives are equal. They receive the same speed setpoint from a higher-level controller and the balance their position via lateral axis-to-axis communication. This position balancing is given priority, even in case an axis (due to an error) or several axes (due to the torque control limit) can no longer follow the preset speed setpoint. This can mean, for example, that 3 axes coast to a halt along the one axis that is in error status.

*Process data exchange for two motors (dual drive)*




The process data exchange is configured via the PDO Editor. Each axis sends its data synchronously via the system bus. In the same cycle, each axis receives the data of the respective remote axis.

*Triple or quadruple injection*

The process data exchange of triple or quadruple injection is similar to that of the dual drive.

The speed setpoint is addressed to 3 or 4 axes accordingly. In contrast to double injection, the lateral communication is designed in such a way that each of the 4 axes sends and receives the "actual position", "balancing controller nMin" and "balancing controller nMax".

This means that the balancing controller data of each axis is cyclically available to all 3 other axes. For balancing control, the average is determined from this data.

*Position balancing controller*

A position balancing controller is implemented to ensure position synchronicity. A prerequisite for useful operation is that all axes are referenced correctly.

Each axis determines the differences between its own position and the positions of each of the other axes. The positions of the two axes can be offset from each other by a defined value via an offset parameter (10052.7). The leading axis must receive the offset as a negative value, the lagging axis as a positive value.

The parameters on both axes must receive the same amount, but a different sign. If this is not the case, the actual speed can deviate from the speed setpoint.

If more than two axes are used as multi-drive, the sum of the offset parameters (10052.7) across all axes must be zero.

*Speed setpoint limit*

The position balancing controller can only work properly as long as the drive are not at the control limit. If the setpoint speed deviates from the actual speed, the control variable of the position balancing controller is no longer fully effective, or not at all. Position balancing is no longer fully realized. To prevent this, the speed setpoint is limited before the control value of the position balancing controller is activated.

The speed setpoints are limited in such a way that the drive with the higher torque demand is operating exactly at the torque control limit. For this purpose, all axes determine the minima (maxima) of nmax (nmin) of the local values and the remote values.

*Initialization phase of FCB 22 Multidrive*

After activating FCB22 in the control word, this FCB is in *Position balancing* mode. Here, it checks whether the position is outside the *Lag error window dual drive adjustment phase* (10052.26). If this is true, the following error is reported:

E21.1: "Lag error during adjustment phase".

If this is not true, the position deviation is corrected. The required maximum travel speed can be set in parameter *Maximum synchronization speed* (10052.27). The synchronization speed is superimposed on the specified speed setpoint.

If the lag error falls below the value of the *Lag error window* parameter (10052.9), the unit changes to *Standard* mode. As of this moment, the *Lag error window dual drive adjustment phase* (10052.26) becomes inactive, and the *Lag error window* (10052.9) becomes effective.

If the position deviation exceeds this value, the following error is triggered:

E21.2: "Lag error in standard operation".

The response of the axis to this error can be parameterized via *Lag error response* (10052.8).

The parameters for defining the lag error windows are checked for plausibility. The following errors can occur:

E 16.1034: *Lag error window position adjustment* (10052.26) must be larger than *Lag error window dual drive* (10052.9).

E 16.1035: *Lag error window dual drive* (10052.9) must be larger than *Position adjustment threshold* (10052.25).

*Parameter description*

*9963.1 Setpoint cycle control*

Unit: µs

Value range: <u>500</u> – 20000, step 500

Cycle of speed setpoints from the higher-level controller.

*10052.1 Setpoint cycle lateral communication for position balancing*

Unit: ms

Value range: 1 ms is fixed, cannot be selected

*10052.2 P-gain position balancing controller*

Unit: 1/s

Resolution: 0.001 1/s

Value range: 0 – <u>20</u> – 10000

*10052.27 Maximum synchronizing speed*

Unit: User-defined unit (default: rpm)

Resolution: $10^{-3}$

Value range: -2147483648 – 0 – 2147483647, step 1

*10052.25 Threshold position adjustment*

Unit: User-defined unit (default: rev)

Resolution: 1/65536

Value range: -2147483648 – 0 – 2147483647, step 1

*10052.26 Lag error window dual drive adjustment phase*

Unit: User-defined unit (default: rev)

Resolution: 1/65536

Value range: -2147483648 – 0 – 2147483647, step 1

*10052.3 Velocity setpoint source*

Value range:

- Local setpoint
- IN process data channel 00 – 15
- Application limit torque

*10052.4 Local velocity setpoint*

Unit: User-defined unit (default: rpm)

Resolution: $10^{-3}$

Value range: -2147483648 – 0 – 2147483647, step 1

*10052.7 Position difference*

Unit: User-defined unit (default: rev)

Resolution: 1/65536

Value range: -2147483648 – 0 – 2147483647, step 1

*10052.28 FCB 22 Mode*

Value range:

- Deactivated
- 2-axis mode
- 3-axis mode
- 4-axis mode

*10060.1 / 2 / 3 Source of minimum speed balancing controller remote axis 1/2/3*

Value range:

- Local setpoint
- IN process data channel 00 – 15

*10059.1 / 2 / 3 Source of maximum speed balancing controller remote axis 1/2/3*

Value range:

- Local setpoint
- IN process data channel 00 – 15

*10052.5 Position balancing setpoint source*

Value range:

- Local setpoint
- IN process data channel 00 – 15

*10052.30 / 32 FCB Position balancing source*

Value range:
- Local setpoint
- IN process data channel 00 – 15

*10052.8 Lag error response*

Value range:
- No response
- Display only
- Stop at application limit/waiting
- Emergency stop/waiting
- Stop at system limit/waiting
- Output stage inhibit/waiting

*10052.9 Lag error*

Unit: User-defined unit (default: rev)

Resolution: 1/65536

Value range: -2147483648 – 0 – 2147483647, step 1

*10052.10 Current lag error dual drive*

Unit: User-defined unit (default: rev)

Resolution: 1/65536

Value range: -2147483648 – 0 – 2147483647, step 1

*10052.11 Torque limitation mode*

Value range:
- Single channel
- Dual channel
- Quadruple channel

*10052.12 / 14 / 16 / 18 Torque limit 1 / 2 / 3 / 4 source*

Value range:
- Local setpoint
- IN process data channel 00 – 15

*10052.13 / 15 / 17 / 19 Torque limit 1 / 2 / 3 / 4 local*

Unit: User-defined unit (default: % nominal motor torque)

Resolution: $10^{-3}$

Value range: -2147483648 – 0 – 2147483647, step 1

*10052.22 Positive transition mode*

Value range:
- Center
- Motor
- Regenerative

*10052.20 Positive transition speed*

Unit: User-defined unit (default: rpm)

Resolution: $10^{-3}$

Value range: -2147483648 – 0 – 2147483647, step 1

*10052.23 Negative transition mode*

Value range:

- Center
- Motor
- Regenerative

*10052.21 Negative transition speed*

Unit: User-defined unit (default: rpm)

Resolution: $10^{-3}$

Value range: -2147483648 – 0 – 2147483647, step 1

*10120.1 Velocity*

Unit: User-defined unit (default: rpm)

Resolution: $10^{-3}$

Value range: -2147483648 – 0 – 2147483647, step 1

### 9.5.14 FCB 25 Rotor position identification

*FCB25 Rotor position identification* is used for commutation detection for synchronous AC motors (linear and rotary). In contrast to *FCB18 Encoder adjustment*, it is not necessary to separate the drive from the load or the gear unit. *FCB25 Rotor position identification* is a commutation at standstill that can be performed even when the brake is applied.

FCB25 can only be used with certain types of SEW-EURODRIVE motors:

- CMP71, CMP80, and CMP100
- CFM motors
- DS motors

Another requirement for using this function is that you have to determine correction factors for the individual motors which are written to MOVIAXIS® during motor startup.

The complete list of correction factors of the determined motors was not available when this publication went to press. Please contact SEW-EURODRIVE for a copy. However, without this information, you can simply select FCB25 for any motor.

If no correction factors are available in MOVIAXIS®, the axis will change to error status. There is no risk of an operating error.

The motor must first be started up electrically.

When switching to *FCB25 Rotor position identification*, the calibration process is started immediately!

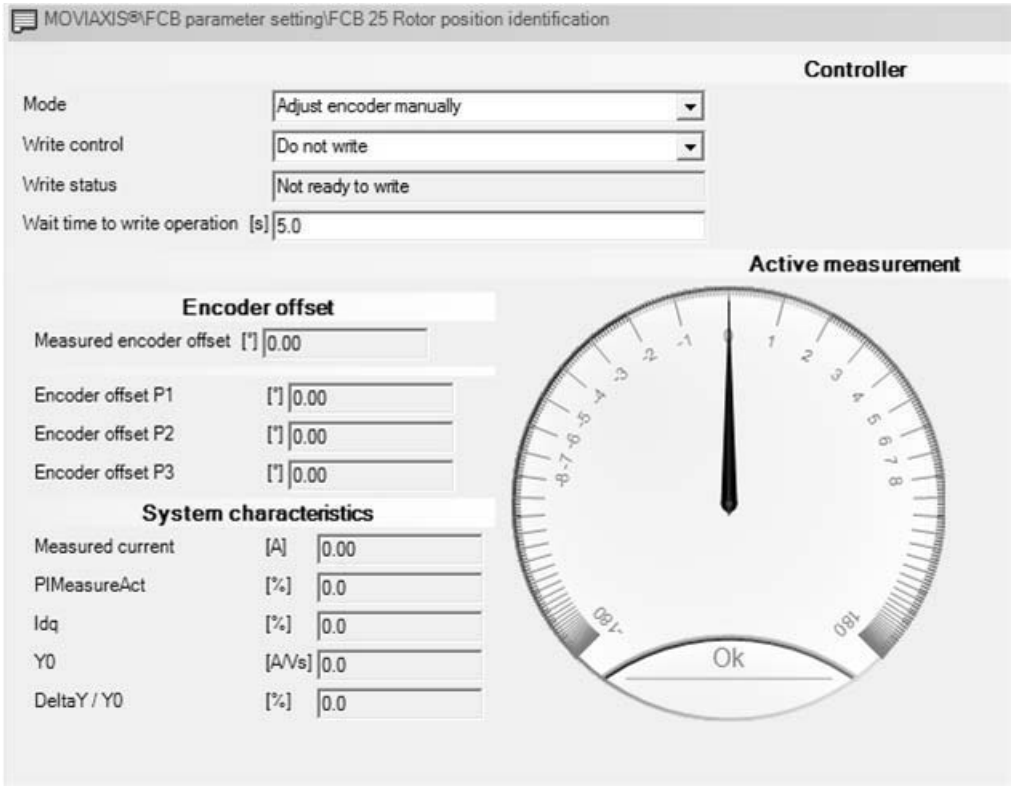
**INFORMATION**

FCB25 should be selected directly from controller inhibit (FCB01) because all other stop FCBs (including the default FCB13) set the speed to 0. Without proper commutation, this might result in a non-controlled movement of the axis.

| Mode | Description |
|---|---|
| Adjust encoder manually | → SEW synchronous motor with resolver<br>This mode is for manual adjustment of the encoder on the motor shaft. |
| Write encoder offset to Hiperface® encoder | → SEW synchronous motor with Hiperface®<br>After executing this mode, the data is written to the Hiperface® encoder. It is not necessary to open the motor. |
| Write encoder offset to parameter | → Non-SEW synchronous motor<br>After executing this mode, the measured offset is written to a parameter in MOVIAXIS®.<br>This mode is independent of the encoder, as non-SEW motors are not to be changed. This ensures that it is not necessary to measure the motor again in case of service is required for the motor. |
| Write encoder offset to parameter automatically | → Synchronous motor without absolute information (rotary and linear)<br>This mode is for synchronous motors that do not have any single-turn absolute information in the encoder (e.g. Sin/Cos encoders or incremental encoders).<br>The higher-level controller must select the *FCB18 Encoder adjustment* and perform a calibration run each time the unit is switched on. The application must allow the motor to move freely → direct drive (rotary and linear). |

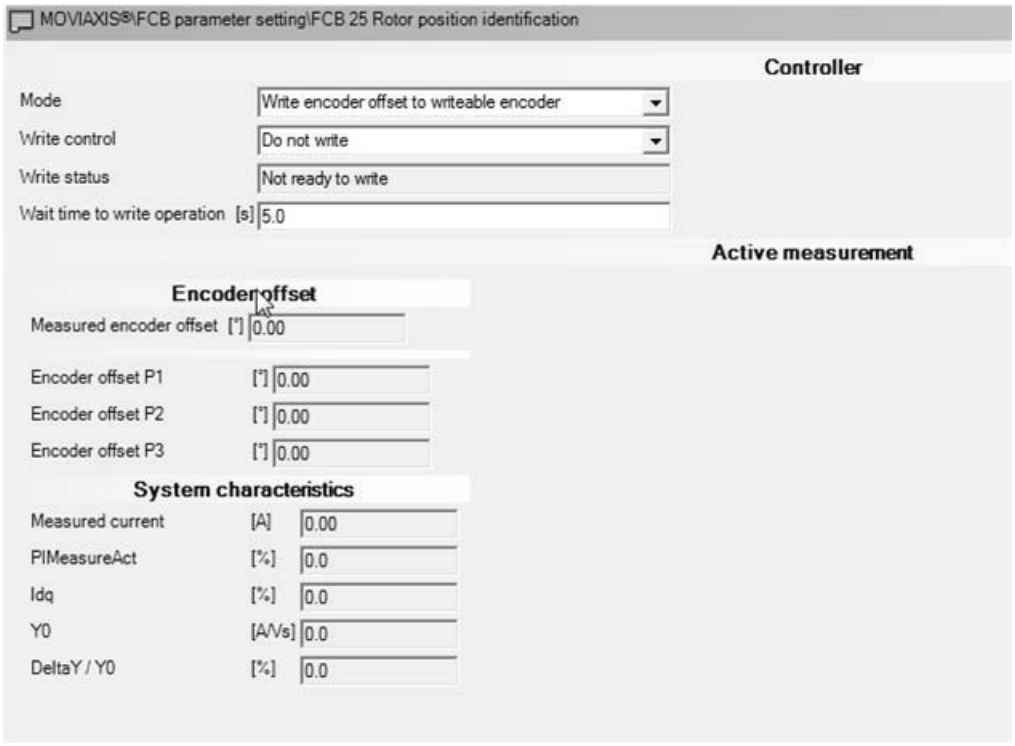
*Mode description*

*10438.3 Mode* **Mode 1: Adjust encoder manually**



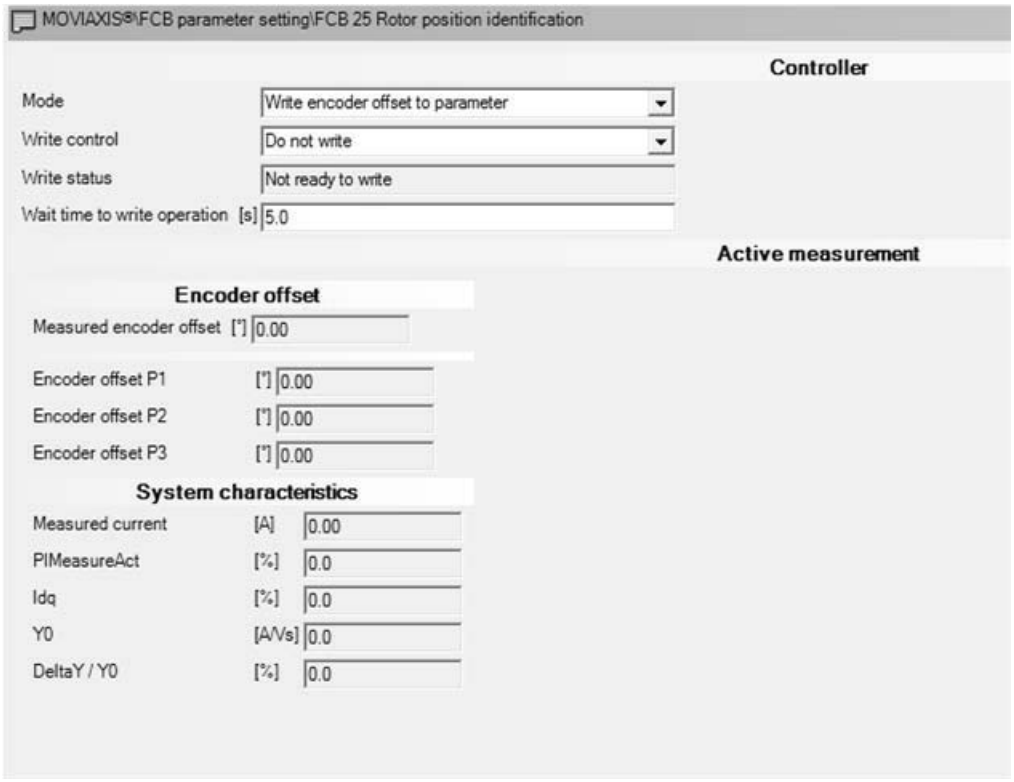

1. Select *Adjust encoder manually* mode
2. Select *FCB25 Rotor position identification* (directly from controller inhibit)
3. After the status *Encoder adjustment completed* is displayed, you can set the resolver manually to "0" using the shown clock.
4. Check the setting by calling *FCB25 Rotor position identification* again.

**Mode 2: Write encoder offset to writeable encoder**



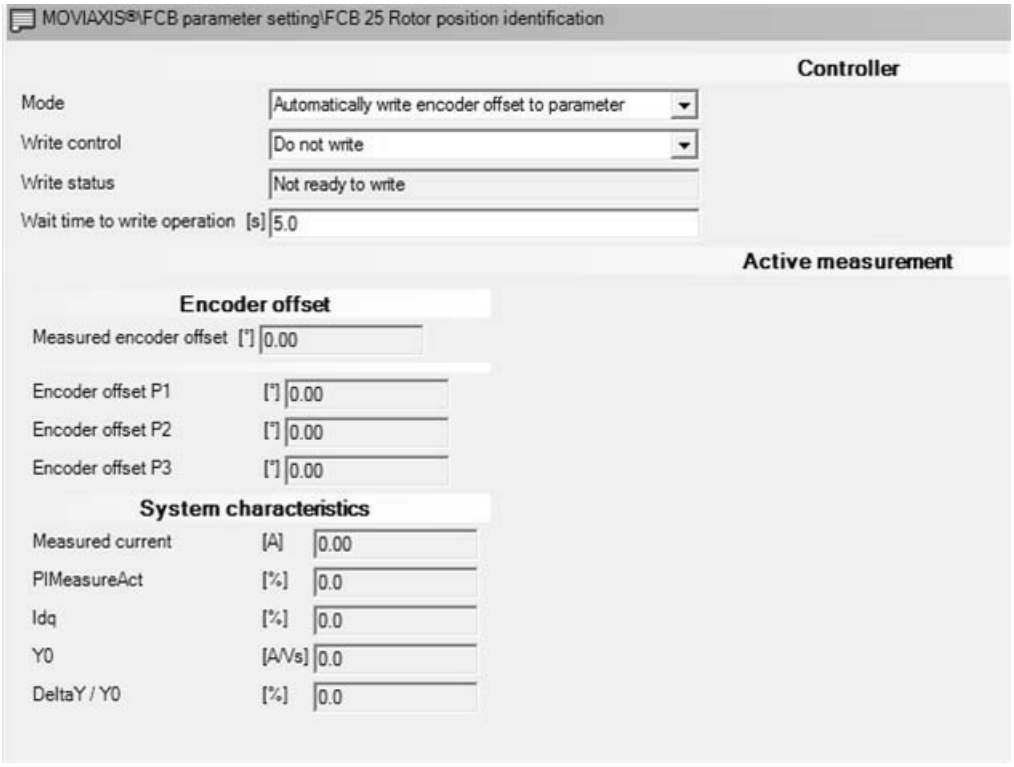

1. Select *Write encoder offset to writeable encoder* mode
2. Select *Adjust encoder manually* mode
3. Select *FCB25 Rotor position identification* (directly from controller inhibit)
4. After the status *Encoder adjustment completed* is displayed, you can set the resolver manually to "0" using the shown clock.
5. Check the setting by calling *FCB25 Rotor position identification* again.

**Mode 3: Write encoder offset to parameter**




- Select *Write encoder offset to parameter* mode
- Select *Adjust encoder manually* mode
- Select *FCB25 Rotor position identification* (directly from controller inhibit)
- After the status *Encoder adjustment completed* is displayed, you can set the resolver manually to "0" using the shown clock.
- Check the setting by calling *FCB25 Rotor position identification* again.

**Mode 4: Write encoder offset to parameter automatically**




The mode *Write encoder offset to parameter automatically* has the same function as the mode *Write encoder offset to parameter*.

The difference is that data is not written to the parameter *Encoder offset P1 – P3* by *Encoder adjustment write control*, but automatically after the calibration has been completed.

*Parameter description*

*10438.4 Write control*

Value range:

- 0 = Inactive

  The FCB always starts with this setting. If the parameter is set to another setting, it will be reset to "inactive".

- 1 = Do not copy

  This setting is only used for special purposes to write an arbitrary encoder offset to the writeable encoder.

- 2 = Write

  With this setting, the parameter "10438.1 Measured encoder offset" will be written to the writeable encoder.

*10438.10 Write status*

Value range:

- Not ready to write
- Ready to write
- Writing in progress
- Write process finished

*10438.3 Wait until write operation*

Value range:

*10438.1 Measured encoder offset*

Unit: ° mechanical motor revolution

Currently measured encoder offset for which the encoder shaft has an incorrect setpoint setting (360° corresponds to one mechanical turn).

*9834.1 / 2 / 3 Encoder offset P1 – P3*

Unit: ° mechanical motor revolution

Resolution:

Value range:

See *Write encoder offset to parameter* mode.

### 9.5.15 FCB 26 Stop at user limits

*FCB26 Stop at user limits* is used for stops at user limits that initiate the deceleration ramp, either as a local setpoint or set via fieldbus.

You can choose between a speed-controlled ramp and a position-controlled ramp. In contrast to other stop FCBs, this *FCB26 Stop at user limits* has a very low priority.

This allows you to select FCB26 as standard (e.g. bit in the control word that selects this FCB is always TRUE). If all other FCBs are deactivated, FCB26 always becomes active. This makes is possible to always stop with position control.

The *FCB26 Stop at user limits* has lag error monitoring in position-controlled mode. The size of the maximum lag error window and error response 9885.5 is adopted from *FCB09 Positioning (page 363)*.

*Parameter description*

*10445.5 Stop with position control*

Value range:

- Yes

  The drive decelerates with position control and then stops in hold control mode
- No

  The drive decelerates with position control and then stops at zero speed.

*10445.1 Deceleration source*

Value range:

- Local setpoint
- IN process data channel 00 – 15
- Application limit deceleration

This parameter sets the source for the deceleration of *FCB Stop at user limits*.

If the parameter is set to "Local setpoint", the deceleration ramp will be parameter *10445.2 Deceleration local*.

*10445.2 Deceleration local*

Unit: $10^{-2}$/min×s

Value range: 0 – 300000 – 2147483647, step 1

Maximum deceleration in user-defined units.

*10445.3 Jerk source*

Value range:

- Local setpoint
- IN process data channel 00 – 15
- Application limit jerk

This parameter sets the source for the jerk of *FCB 26 Stop at user limits*.

If set to "local setpoint", the source will be parameter *10445.4 Local jerk*.

*10445.4 Local jerk*

Unit: 1/min×$s^2$

Resolution:

Value range: 1 – 2147483647, step 1

Maximum jerk.

*10445.6 Bit 0 stop with position control active*

Status information about parameter *10445.5 Stop with position control* (mirror).

*10120.1 Velocity*

Unit: User-defined units (default: rpm)

Resolution: $10^{-3}$

Value range: -2147483648 – 0 – 2147483647, step 1

Current actual velocity in user-defined units.

*9704.1 Position*

Unit: User-defined units (default: rev)

Resolution: 1/65536

Value range: -2147483648 – 0 – 2147483647, step 1

Current actual position in user-defined units.

*9839.1 Position modulo*

Unit: User-defined units (default: rev)

Resolution: 1/65536

Value range: -2147483648 – 0 – 2147483647, step 1

Current actual modulo position n in user-defined units.

## 9.6 Parameter description for unit functions

### 9.6.1 Setup

*9702.4 Active parameter set*

Value range:

- 0 = None
- 1 = Parameter set 1
- 2 = Parameter set 2
- 3 = Parameter set 3

Displays current parameter set.

*10065.1 Select parameter set*

Value range:

- 0 = No action
- 1 = Data set 1
- 2 = Data set 2
- 3 = Data set 3

Select parameter set.

*9982.1 Software activation*

Value range:

- 0 = Standard
- 1 = Special function

Software activation.

This parameter is currently without function. Preparations are being made to differentiate between different software functions in the future.

The aim is to switch functions, which require a lot of computer processor power, on and off.

*Reset unit parameters*

*9873.1 Active factory setting*

Value range:

- 0 = None
- 1 = Basic initialization
- 2 = Delivery state
- 3 = Factory setting
- 4 = Customer set 1
- 5 = Customer set 2

Active factory setting.

This parameter shows the currently processed reset setting.

*9727.3 Delivery state "d1"*

Value range:

- 0 = No
- 1 = Yes

Delivery state

Activating this function will restore the delivery state of all parameters.

*9727.4 Factory setting "d2"*

Value range:

- 0 = No
- 1 = Yes

Factory setting.

Same as parameter "9727.3 Delivery state d1" (page 401) however, the parameters set at motor startup are not set to default values.

The factory setting does not include:

- Motor data (for example, inductances)
- Both lists of the customer-specific factory setting, see parameter "9727.2 Customer-specific factory setting d3/d4" (page 401).

The setting can be used to not having to start up the motor again.

*8596.0 Reset statistics data*

Value range: 0 – 3

- 0 = No action
- 3 = Operating hours

The parameter *Reset statistics data* resets the two parameters *8328.0 ON hours* and *8329.0 Enable hours* back to zero.

*Passwords*

MOVIAXIS® offers a range of access levels for access to the unit parameters. These levels include write and read authorization or, for example, read only authorization. The different levels can be protected by passwords.

The passwords can be changed, for example, to allow end customers access to specific parameters only.

At present, the following access levels are available:

1. Observer

   The parameters can only be read and displayed.

2. Planning engineer

   A PLANNING ENGINEER is a specialist who has complete access to all unit functions.

3. OEM

   The authorization level OEM-SERVICE can be used, for example, to reset internal counters, program serial numbers, or import new firmware.

*9591.50 Current password level*

Value range: 0 – 4294967295, step 1.

- 20 = Lowest (observer)

  Is activated if the "planning engineer" password is active, see parameter *9591.20 Change planning engineer password* (page 402).

- 40 = Medium level (operator = planning engineer)

  If the "planning engineer" password is not activated or the "planning engineer" password was entered after a reset.

- 60 = Highest (OEM service)

  Is reached by entering the OEM password. The OEM password can also be used to change a forgotten "planning engineer" password, see parameter *9591.20 Change planning engineer password* (page 402).

Current password level.

This level is used to influence the write capability of parameters. When the product leaves the plant, the "planning engineer" password is deactivated. This means that the password level is automatically set to "40" = "planning engineer".

*9591.40 – 43 Enter password to set current level*

Password level selection.

Once you have entered the password, the current password level is set according to the password. After a reset, the system always selects the highest level which is not password protected.

*9591.20 - 23 Password for level 40 (set planning engineer)*

The "planning engineer" password can only be written when the current password level of parameter 9591.50 (page 402) is ≥ 40. This means that the "planning engineer" password can only be set if parameter *9591.50 Password level* (page 402) is at least set to "planning engineer" using the password selection parameter 9591.40 (page 402).

The "planning engineer" password is deactivated by entering an empty field.

### 9.6.2 Output stage error response

*Axis module*

*9729.1 Overtemperature response*

Value range:

- 2 = Output stage inhibit / locked
- 3 = Stop at emergency stop limit / locked
- 5 = Output stage inhibit / waiting
- 6 = Stop at emergency stop limit / waiting
- 8 = Stop at application limit / waiting
- 9 = Stop at application limit / locked
- 10 = Stop at system limit / waiting
- 11 = Stop at system limit / locked

The overtemperature error of the axis will be triggered if parameter *9811.5 Total utilization* (page 239) exceeds 100%.

Overtemperature response of the axis module.

- **Output stage inhibit / locked**

The axis changes to controller inhibit state and activates the mechanical brake, if installed. If no brake is installed, the motor will coast to a halt. After a reset, the axis performs a system restart.

- **Stop at emergency stop limit / locked**

The motor is stopped along the emergency stop ramp. After a reset, the axis performs a system restart.

- **Output stage inhibit/waiting**

The axis changes to controller inhibit state and activates the mechanical brake, if installed. If no brake is installed, the motor will coast to a halt. After a restart, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at emergency stop limit / waiting**

The motor is stopped along the emergency stop ramp. After a restart, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at application limit/waiting**

The motor is stopped at the application limit. After a restart, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at application limit / locked**

The motor is stopped at the application limit. After a reset, the axis performs a system restart.

- **Stop at system limit/waiting**

The motor is stopped at the system limit. After a restart, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at system limit / locked**

The motor is stopped at the system limit. After a reset, the axis performs a system restart.

For more information, refer to the operating instructions section "Operation and service".

*Supply module*

*9729.2 Temperature pre-warning response*

Value range:

- 0 = No response
- 1 = Display only
- 2 = Output stage inhibit / locked
- 3 = Stop at emergency stop limit / locked
- 5 = Output stage inhibit / waiting
- 6 = Stop at emergency stop limit / waiting
- 8 = Stop at application limit / waiting
- 9 = Stop at application limit / locked
- 10 = Stop at system limit / waiting
- 11 = Stop at system limit / locked

Response to temperature prewarning of supply module

The temperature prewarning error is triggered when the temperature of the supply module exceeds 85 °C.

The cut-off threshold is reached at 95 °C.

- **No response**

Error is ignored

- **Display only**

The 7-segment display shows the error but the axis does not respond (continues to operate).

- **Output stage inhibit / locked**

The axis changes to controller inhibit state and activates the mechanical brake, if installed. If no brake is installed, the motor will coast to a halt. After a reset, the axis performs a system restart.

- **Stop at emergency stop limit / locked**

The motor is stopped along the emergency stop ramp. After a reset, the axis performs a system restart.

- **Output stage inhibit/waiting**

The axis changes to controller inhibit state and activates the mechanical brake, if installed. If no brake is installed, the motor will coast to a halt. After a restart, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at emergency stop limit / waiting**

The motor is stopped along the emergency stop ramp. After a restart, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at application limit/waiting**

The motor is stopped at the application limit. After a restart, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at application limit / locked**

The motor is stopped at the application limit. After a reset, the axis performs a system restart.

- **Stop at system limit/waiting**

The motor is stopped at the system limit. After a restart, the axis performs a warm start. This means that the axis is immediately ready to operate again (without delay).

- **Stop at system limit / locked**

The motor is stopped at the system limit. After a reset, the axis performs a system restart.

For more information, refer to the operating instructions section "Operation and service".

*9729.5 Response I×t prewarning*

Value range: See parameter *9729.2 Temperature prewarning response* (page 404)

Response I×t prewarning supply module.

The prewarning level is reached when the "current DC link current" × "time" equals 80% of the product "nominal DC link current" × "time".

| | |
|---|---|
|  | **INFORMATION** |
| | The error threshold is reached when the "current DC link current" ×"time" equals 110% of the product "nominal DC link current" × "time". |

*9729.12 Response I×t prewarning internal braking resistor*

Value range: See parameter *9729.9 Response TF / TH / KTY message* (page 280).

Response to I×t prewarning of the integrated braking resistor (with 10 kW supply module).

*9729.4 Response mains phase failure*

Value range: See parameter *9729.9 Response TF / TH / KTY message* (page 280)

Response to mains phase failure.

*9746.1 Response mains OFF*

Value range:

- 0 = DC link evaluation
- 1 = Supply system control with controller inhibit
- 2 = Supply system control and stop
- 3 = Supply system control and application stop
- 4 = Supply system control and system stop
- 5 = Mains control and emergency stop
- 6 = DC link control and no response
- 7 = Rapid supply system control with output stage inhibit
- 8 = Rapid supply system control with stop
- 9 = Rapid supply system control with application stop
- 10 = Rapid supply system control and system stop
- 11 = Rapid mains control and emergency stop
- 12 = Rapid supply system control and internal response

Supply system OFF response.

**General definition of terms:**

**DC link control (ignore supply system failures):**

See error response "0 = DC link evaluation" and "6 = DC link control and no response"

**´Normal´ supply system control:**

The *9702.1 Bit 30 "Power on"* signal of the supply module is set when the DC link voltage is 240 V for the duration of 200 ms.

The *9702.1 Bit 30 "Power on"* signal of the supply module is deleted when 2 half waves of the supply system are absent. This will cause a delay of > 10 ms.

**Rapid supply system control:**

As the DC link will loose nearly the entire load within milliseconds in the event of supply system disconnection and full motor load, you have the option to use rapid supply system control.

Rapid supply system control directly refers to the threshold parameter "9973.1 Power off limit value" (page 409). The set response will be triggered immediately if the value falls below this limit. The response will take effect within 0.5 ms. The status bit *9702.1 Bit 30 "Power on"* is set to "FALSE" within 0.5 ms.

This function enables power-off responses that are gentle on the mechanical components. This is realized by switching motors to regenerative operation very quickly. The energy generated by the motors then backs up the DC link, which causes an electrical deceleration ramp.

The brake is only applied when the actual speed is close to zero (bit "Motor at standstill"). It is also monitored whether the drive truly decelerates. If not, the brake is applied immediately.

- **0 = DC link evaluation**

If the DC link voltage drops below the limit value 80 V and the unit is in "Power_on" state, the DC link voltage will be averaged during 100 ms.

If the averaged DC link voltage reaches the limit value of 240 V after expiry of 100 ms, the status will revert to *9702.1 Bit 30 "Power on"*. A system failure is compensated in this way.

If the averaged DC link voltage drops below the limit value of 240 V after expiry of 100 ms, the state will change to "Power_off".

The ready signal changes to "not ready" when the *9702.1 Bit 30 "Power on"* signal of the supply module is not present any longer and the "Power_off" state is detected.

The output stage is also inhibited as response to Power_off.

- **1 = Supply system control with controller inhibit**

Once the *9702.1 Bit 30 "Power on"* signal of the supply module disappears, the brake is applied and the output stage is inhibited immediately. The ready signal changes to "not ready".

- **2 = Supply system control and stop**

When the *9702.1 Bit 30 "Power on"* signal disappears, the drive is stopped immediately at the set normal limits for torque and deceleration of the active FCB. The ready signal is removed when the drive has come to a stop.

If the *9702.1 Bit 30 "Power on"* signal appears again while the drive decelerates to a stop, the stopping process will not be continued. The drive remains in "READY" state and the current FCB will be active again.

- **3 = Supply system control and application stop**

When the *9702.1 Bit 30 "Power on"* signal disappears, the drive is stopped immediately at the set application limits for torque and deceleration. The ready signal is removed when the drive has come to a stop.

If the *9702.1 Bit 30 "Power on"* signal appears again while the drive decelerates to a stop, the stopping process will not be continued. The drive remains in "READY" state and the current FCB will be active again.

- **4 = Supply system control and system stop**

When the *9702.1 Bit 30 "Power on"* signal disappears, the drive is stopped immediately at the set system limits for torque and deceleration. The ready signal is removed when the drive has come to a stop.

If the *9702.1 Bit 30 "Power on"* signal appears again while the drive decelerates to a stop, the stopping process will not be continued. The drive remains in "READY" state and the current FCB will be active again.

- **5 = Mains control and emergency stop**

When the *9702.1 Bit 30 "Power on"* signal disappears, the drive is stopped immediately with the set emergency stop ramp for torque and deceleration. The ready signal is removed when the drive has come to a stop.

If the *9702.1 Bit 30 "Power on"* signal appears again while the drive decelerates to a stop, the stopping process will not be continued. The drive remains in "READY" state and the current FCB will be active again.

- **6 = DC link control and no response**

The DC link voltage is monitored as described under "0 = DC link evaluation". However, the level 80 V is not used for power off detection but a level of 20 V. The monitoring type can be used when the power off detection is to occur for a DC link that is almost empty.

- **7 = Rapid supply system control with output stage inhibit**

The output stage is inhibited immediately if the DC link voltage falls below the value set in parameter *9973.1 Adjustable power off limit value* (page 409).

- **8 = Rapid supply system control and stop**

If the DC link voltage falls below the value set in *parameter "9973.1 Adjustable power off limit value" (page 409)*, the drive will be stopped immediately using the limit set for torque and deceleration of the active FCB. The ready signal is removed when the drive has come to a stop.

- **9 = Rapid supply system control and application stop**

If the DC link voltage falls below the value set in *parameter "9973.1 Adjustable power off limit value" (page 409)*, the drive will be stopped immediately using the set application limit. The ready signal is removed when the drive has come to a stop.

- **10 = Rapid supply system control and system stop**

If the DC link voltage falls below the value set in parameter *9973.1 Adjustable power off limit value* (page 409), the drive will be stopped immediately using the set system limit. The ready signal is removed when the drive has come to a stop.

- **11 = Rapid mains control and emergency stop**

If the DC link voltage falls below the value set in parameter *9973.1 Adjustable power off limit value* (page 409), the drive will be stopped immediately using the deceleration set for emergency stop. The ready signal is removed when the drive has come to a stop.

- **12 = Rapid supply system control and internal response**

If the DC link voltage falls below the parameter *9973.1 Adjustable power off limit value* (page 409), there will be no direct response. The status bit *9702.1 Bit 30 "Power on"* must be evaluated by a higher-level controller (note bus runtimes).

*9973.1 Power off limit value "$U_z$ threshold for rapid supply system control"*

Resolution: $10^{-3}$.

Value range: 0 – <u>450</u> – 2048.

Rapid supply system control is triggered at the set value.

See response parameter *9746.1 Power off* (page 406).

### 9.6.3 Reset behavior

*8617.0 Manual reset*

Value range:

- <u>0 = No</u>
- 1 = Yes

The current error is acknowledged when manual reset is set to Yes.

The error response of this current error defines the response to be triggered after a reset.

The error response can be "warm start", "system restart" and "CPU reset". For a detailed description of these responses, refer to the operating instructions.

Automatically reset to "No" after performing reset (by setting to "Yes").

# 10 Project Planning

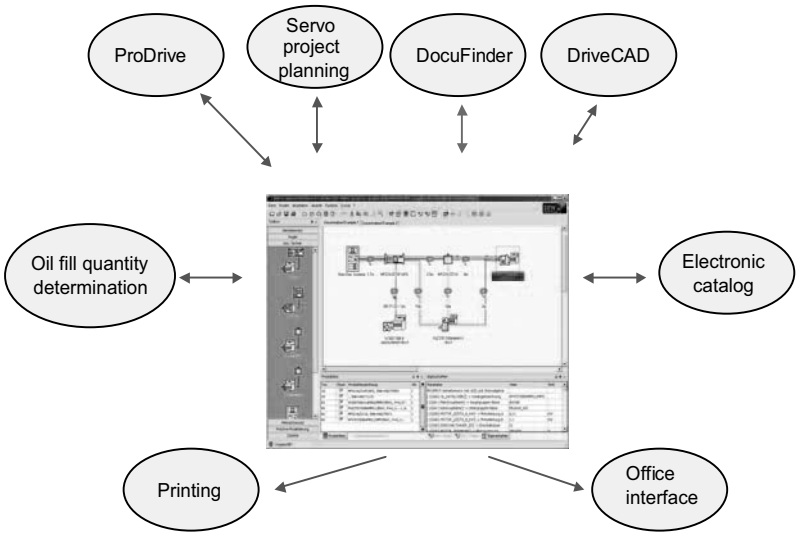
## *10.1 SEW Workbench*

"SEW Workbench" provides the user with a central interface to compile complex drive systems from individual SEW components. It allows the user to create complex drive systems for "control cabinet technology" or "decentralized technology" from SEW components such as drives, servo inverters, cables, field distributors, etc. using the drag and drop function.

Basic features of "SEW Workbench":

- Application selection
- Calculation of gear unit and motor
- Price-optimized project planning
- Comparison of different solutions
- Recommendation of "best drive" solution
- Inverter calculation
- Multi-axis optimization
- Configuration of cables and accessories
- Configuration error check
- Parts list generation
- Electronic catalog with all products

The user has the option to access existing functions and programs such as EKAT, SAP Configurator and ProDrive as well as to use new functions.

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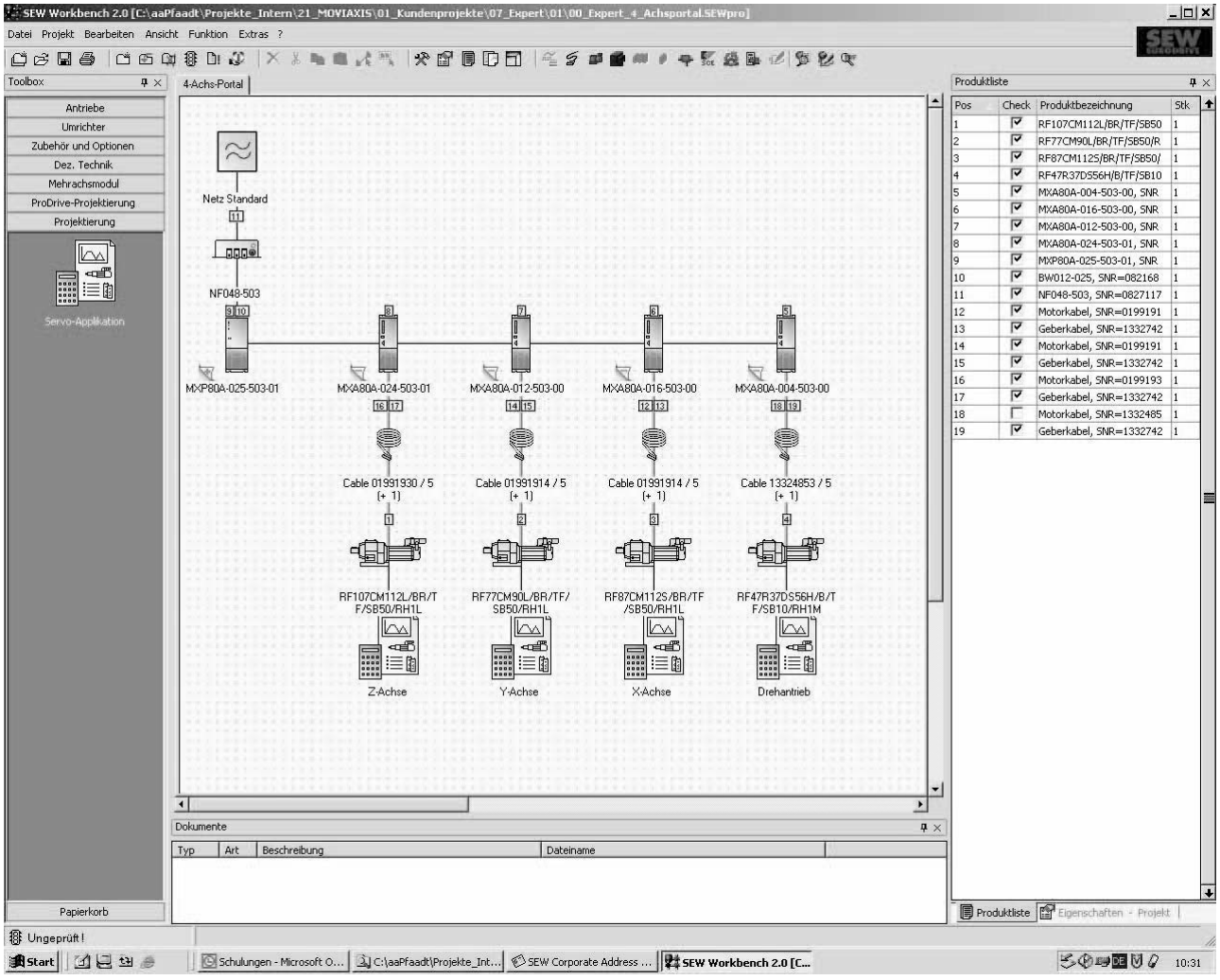
"SEW Workbench" allows you to perform an initial compatibility check of different components, i.e. to determine whether a servo inverter, cable and drive can be configured and designed for this combination.

### 10.1.1 SEW Workbench functions

Different catalog functions and project planning functions are available for selecting individual components. Each component is represented in the work area by a graphical object, see figure 2. The sum of the objects is the drive system. A complete check is performed for all products after the user has created the complete drive system.

The "SEW Workbench" generates a drive system including a product list tested and approved according to SEW rules.

The drive systems (product lists) created in the "SEW Workbench" can be saved as a project file and called up again. This allows data exchange and further processing by another "Workbench user".

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## 10.2 Project planning information

The following text describes the procedure for projecting a MOVIAXIS® MX multi-axis servo inverter.

For detailed information about project planning for a supply and regenerative module, refer to the "MXR Supply and Regenerative Module" manual.

### 10.2.1 Project planning for a supply module

The size of a supply module is determined by the

- Maximum operating point: $P_{max} < 250\% P_N$.
- The total actual power of all axis modules: $P_{rms} < P_N$, motor and regenerative.
- Continuous power toward the braking resistor. The continuous power must not exceed 50% or the nominal power of the supply module.
- The sum rule: The total sum of all nominal currents of the axis modules must not exceed two times, or under certain circumstances three times, the nominal DC link current of the supply module. Also see chapter "Selection table for supply module with/without line choke" on (page 413).
- Assignment of maximum axis modules to the supply modules:
  - 10 kW module (MXP80A-010): 16 A axis
  - 25 kW module (MXP80A-025): 48 A axis
  - 50 kW module (MXP80A-050): 100 A axis
  - 75 kW module (MXP80A-075): 100 A axis

The nominal power of the supply module refers to the effective power; that is, the magnetization currents of the motors need not be taken into account in this case.

| | **INFORMATION** |
|---|---|
| | Important: The total power (DC link power) results from the overlapping cycles of the individual connected axis modules.<br>Changing the assignment of cycles with respect to time strongly influences the motor and regenerative load of the supply module.<br>It is necessary to take a worst-case scenario into account. |

Certain supply system conditions make a line choke necessary. See table in the following chapter.

Due to the complexity, the calculation can only be made using software. The software is a tool of the "SEW Workbench".

*Selection table for supply module with/without line choke*

The specified supply system conditions require a line choke:

| Line voltage | Project planning to % of the nominal axis currents | Applies to supply module | Line choke required |
|---|---|---|---|
| 380 - 400 V ± 10% | 300% | All | No |
| > 400 - 500 V ± 10% | 300% | All | Yes |
| 380 - 500 V ± 10% | 200% | All | No |

### 10.2.2 Project planning for axis module

The size of an axis module is determined by the

- Maximum operating point.
- The individual utilization curves are:
  - Dynamic utilization,
  - Electromechanical utilization,
  - Thermal utilization.

The utilization is indicated in percent and has to be < 100%. Due to the complexity of the curves, the calculation can only be made using software. The software is a tool of the "SEW Workbench".

The following values can be assumed as corner points for overload behavior:

**2 – 16 A axes (4 kHz PWM frequency, rotating field of unit > 2 Hz)**

| Nominal axis current | Overload time | Repeatability[1)] |
|---|---|---|
| 250% | For 1 s | Every 8 s |
| 200% | For 2 s | Every 12 s |
| 150% | For 6 s | Every 20 s |

1) Overload can occur again after this rest period.

**24 – 100 A axes (4 kHz PWM frequency, rotating field of unit > 2 Hz)**

| Nominal axis current | Overload time | Repeatability[1)] |
|---|---|---|
| 250% | For 1 s | Every 4 s |
| 200% | For 8 s | Every 25 s |
| 150% | For 30 s | Every 60 s |

1) Overload can occur again after this rest period.

*Output currents for low rotational field frequencies*

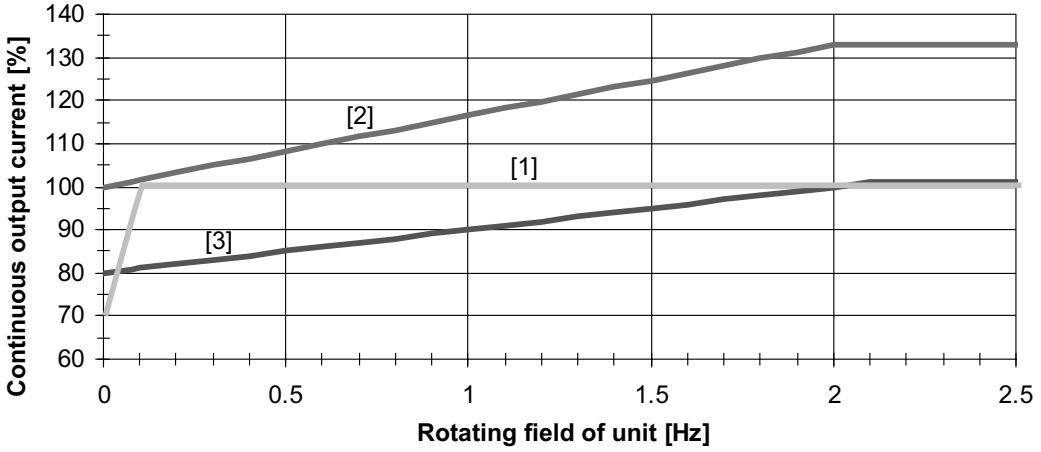
The thermal model of MOVIAXIS® dynamically limits the maximum output current. The maximum continuous output current $I_D$ is dependent on the PWM cycle frequency and the output frequency $f_A$.

It is particularly important to take output frequencies $f_A$ < 2 Hz into account for:

- Electrically stopping hoists.
- Torque control at low speeds or at a standstill

| | INFORMATION |
|---|---|
| | The output frequency of the servo inverter when used with asynchronous motors is made up of the rotational frequency (= speed) and the slip frequency.<br>With synchronous motors, the output frequency of the servo inverter is the same as the rotational frequency of the synchronous motor. |

*PWM 4 kHz and 8 kHz*

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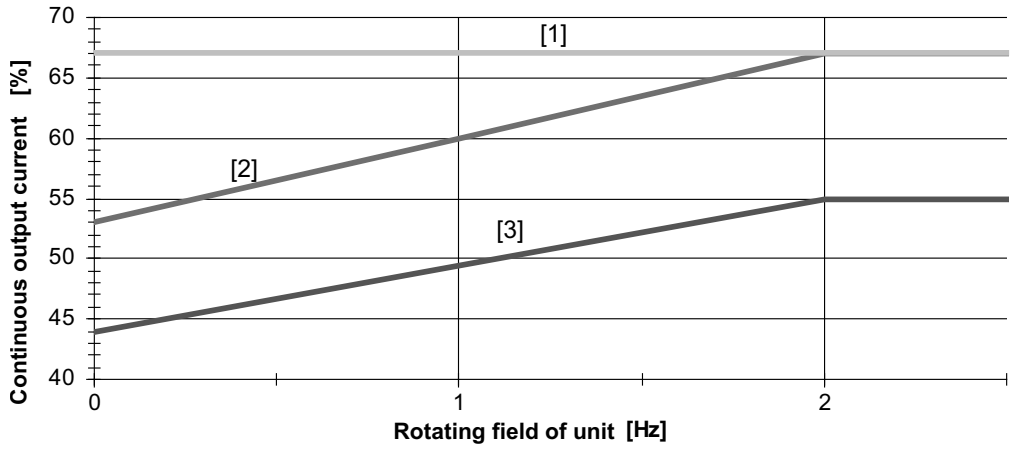
[1] Axis modules sizes 1 and 2 for PWM 4 kHz and 8 kHz
[2] Axis modules sizes 3, 4, 5, 6 for PWM 4 kHz
[3] Axis modules sizes 3, 4, 5, 6 for PWM 8 kHz

*PWM 16 kHz*

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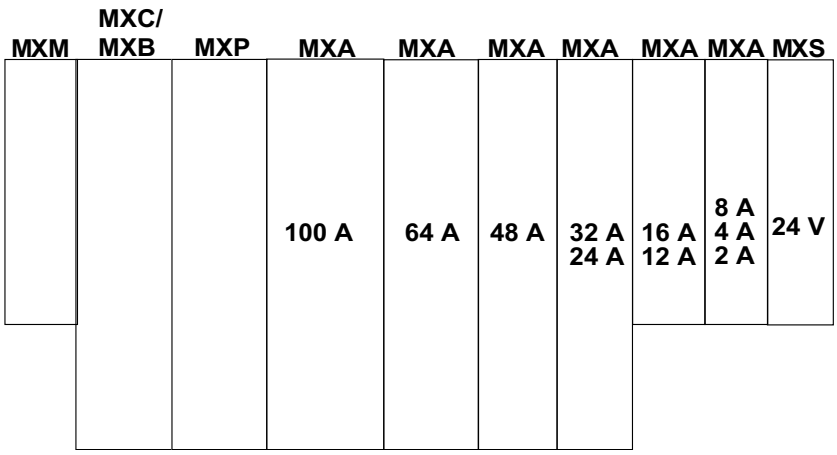
[1] Axis modules sizes 1 and 2
[2] 24 A (size)
[3] 32 A (size)

### 10.2.3 Arrangement of modules in a network of units

*Arrangement of axes*

| | |
|---|---|
| | **CAUTION** |
| | Please note that no more than 8 axis modules can be used in a network. |

Arrangement example of an axis system:

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| | | | |
|---|---|---|---|
| MXM | Master module, component | MXP | Supply module, BG1-3 |
| MXC | Capacitor module, component | MXA | Axis modules, sizes 1-6 |
| MXB | Buffer module, component | MXS | 24 V switched-mode power supply module, component |

*MXM master module*

Arrange the master module as the first unit in the axis system.

The master module is a component.

*MXC capacitor module*

Arrange the capacitor module to the left of the supply module in the axis system.

The capacitor module is an additional component.

*MXB buffer module*

Arrange the buffer module to the left of the supply module in the axis system.

The buffer module is a component.

*MXP supply module*

Arrange the supply module to the left of the axis module in the axis system.

*MXR supply and regenerative module*

For detailed information about arranging a supply and regenerative module, refer to the "MXR Supply and Regenerative Module" manual.

*MXA axis modules*

**NOTICE**

Note that the electric performance of the axes has to decrease from left to right.

The following applies:

$I_{MXA\ 1} \geq I_{MXA\ 2} \geq I_{MXA\ 3} \geq I_{MXA\ 4} \ldots \geq I_{MXA\ 8}$

The axis modules have to be arranged according to their nominal current, starting on the right side of the supply module so that their nominal current decreases from left to right (page 415).

*MXS 24 V switched-mode power supply module*

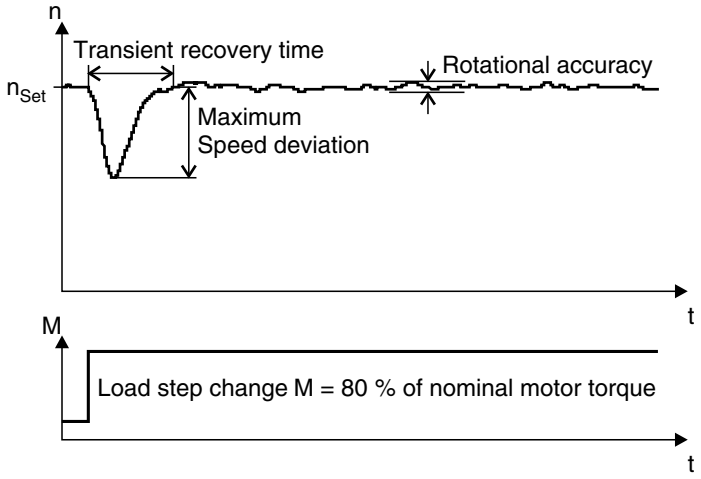
Arrange the 24 V switched-mode power supply module to the right of the last axis module in the axis system (page 415).

The 24 V switched-mode power supply is a component.

## 10.3 Control characteristics of the axis modules

### 10.3.1 Characteristic values of the controllers

MOVIAXIS® multi-axis servo inverters achieve excellent control characteristics thanks to their optimally adapted control algorithms. The following characteristic features apply to operation of synchronous servomotors from SEW-EURODRIVE.

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The following applies to MOVIAXIS® multi-axis servo inverters in combination with motor of the same power rating:

| MOVIAXIS® type | Continuous setting range $n_{max}$ = 3000 rpm | Static control accuracy[1] based on $n_{max}$ = 3000 rpm |
|---|---|---|
| MXA80A with resolver | > 1:3000 | 0.01% |
| MXA80A with Hiperface encoder | 1:5000 | 0.01% |

1) = Deviation of actual speed value / average speed value from speed setpoint

The defined control characteristics are maintained in the specified speed range.

### 10.3.2 Control response

The following assignment is an example of the different control responses.

| MOVIAXIS® type | Max. speed deviation at ΔM = 80%, based on n = 3000 rpm | Rotational accuracy at M = constant, based on n = 3000 rpm |
|---|---|---|
| MXA80A with TTL sensor (1024 increments) | 1.0% | ≤ 0.07% |
| MXA80A with sin/cos encoder | 0.7% | ≤ 0.03% |

*Specifications*

- Setpoint speed $n_{set}$ = 1000 rpm.
- Step change in load ΔM = 80% of motor torque.
- Torsion-free load with mass moment of inertia ratio $J_L/J_M$ = 1.8.

## 10.4 Servomotor selection

| | NOTICE |
|---|---|
| | The torque limit (M limit) is set automatically by the startup function of the MOVITOOLS® MotionStudio engineering software.<br>**Do not increase this automatically set value.**<br>Setting a torque limit that is too high can damage the servomotor.<br>We recommend always using the latest version of MOVITOOLS® MotionStudio for startup. The latest MOVITOOLS® version can be downloaded from our homepage at "www.sew-eurodrive.com". |

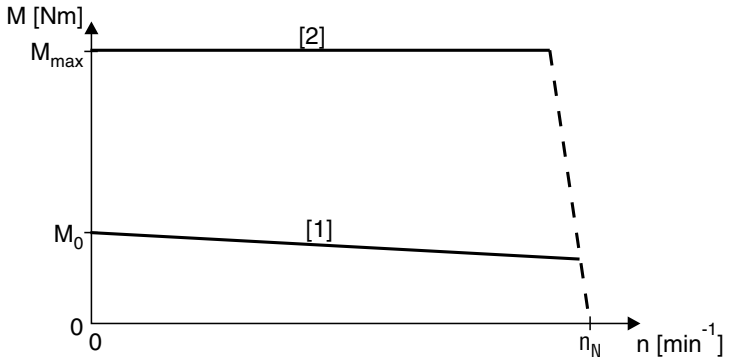
### 10.4.1 Characteristics of synchronous servomotors

The demands made on a servo drive include speed dynamics, stable speed, and positioning accuracy. The synchronous servomotors CMP and CMDV and the asynchronous servomotors DRL fulfill these requirements in connection with MOVIAXIS®.

Technically speaking, these are synchronous motors with permanent magnets on the rotor and an integrated encoder. Required characteristics:

- Constant torque over a broad speed range (up to 6000 rpm)
- High speed and control range
- High overload capacity

This is achieved with MOVIAXIS® control. The mass moment of inertia of the synchronous servomotor is lower than that of the asynchronous motor. For this reason, these motors are optimally suited to applications requiring dynamic speeds.

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[1] Continuous torque
[2] Maximum torque

$M_0$ and $M_{max}$ are determined by the motor. The attainable $M_{max}$ can also be less, depending on the servo inverter.

Refer to the motor tables of this system manual for the values for $M_0$ (page 200).

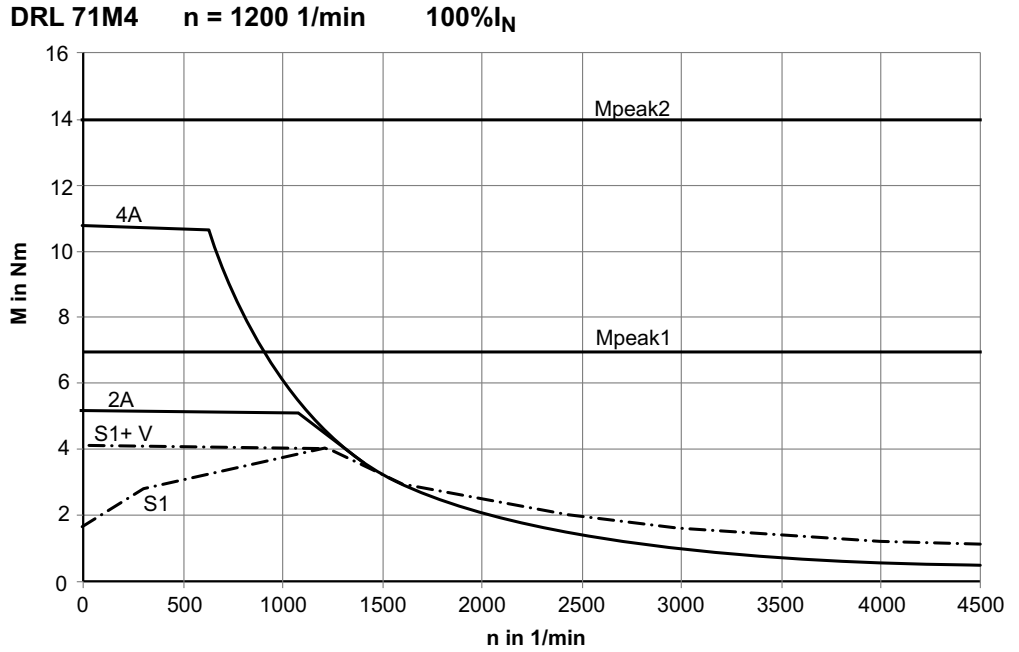
Refer to the motor selection tables for the values for $M_{max}$ (page 422).

### 10.4.2 Features of asynchronous servomotors

Asynchronous servomotors of the DRL series are a drive package made up from the many options of the modular DR motor system.

Typical speed-torque characteristics:

$M_N$ is determined by the motor. $M_{max}$ and $n_{trans}$ depend on the motor/servo inverter combination. You can refer to the motor selection tables for the values of $n_{trans}$, $M_N$ and $M_{max}$ (page 431).




*Magnetization current*

Dynamic drives that have to accelerate without a delay are also energized at standstill without load. The magnetizing current $I_d$ flows at standstill.

The servo inverter must be able to supply this current constantly in applications in which the output stage is permanently enabled, for example in "Hold control" mode.

Particularly in the case of large motors with a slip frequency ≤ 2 Hz, you have to refer to the diagrams in chapter "Output currents for low rotational field frequencies" (page 413) to check whether the servo inverter can supply the current.

Also check whether the thermal characteristics of the motor are suitable (forced cooling fan) for this. The magnetization current $I_d$ is listed in the "SEW Workbench".

*Dynamics*

AC motors operated on the supply system usually have an overload capacity of 160% – 180% of the nominal torque during startup.

If the motor is operated on an inverter of the same power, the inverter usually provides 150% current, and thus roughly 150% torque, for 60 seconds during startup. If a larger inverter is selected, the inverter can provide a higher current and theoretically a greater torque as well. In this case, the mechanical resistance of the motor against the overload, which might reach or exceed the permitted limit values, must be checked.

The mechanical design of asynchronous servomotors of the DRL series is of such a high quality that dynamic overload values can be reached which exceed the classical values of an asynchronous motor operated on a supply system or inverter and almost match the values of a synchronous servomotor.

SEW-EURODRIVE offers the DRL motors in two dynamics packages:

| Package | Overload capacity to nominal torque |
|---|---|
| Dynamics 1 (D1) | 190 % – 220 % |
| Dynamics 2 (D2) | 300 % – 350 % |

The nameplate of the motor specifies the data of the respective dynamics package.

*Speeds*

SEW-EURODRIVE offers the DRL servomotors with 4 rated speeds:

- 1200 rpm
- 1700 rpm
- 2100 rpm
- 3000 rpm

In inverter operation, field weakening begins at the rated speed.

*Inverter combinations*

The DRL motors are optimally adapted to operation on MOVIAXIS® servo inverters.

Usually, the selection diagrams offer several inverter sizes. The size of the inverter which fits perfectly is based on the application data and project planning.

### 10.4.3 Project planning for a synchronous servomotor

Project planning for a synchronous motor is carried out in accordance with the following requirements:

**1. Effective torque requirement at effective application speed**

$M_{r.m.s.} < M_{N\_mot}$

The operating point must lie below the characteristic curve for the continuous torque. The continuous torque can be increased by forced cooling if the operating point lies above the characteristic curve for self-cooling.

**2. Maximum torque required across the speed curve**

$M_{max} < M_{dyn\_mot}$

This operating point must lie below the characteristic curve for the maximum torque of the motor/MOVIAXIS® combination.

**3. Maximum speed**

The maximum speed must not be dimensioned higher than the rated speed of the motor. Planetary gear units should be used for speeds greater than 3000 rpm as a result of the high input speed.

$n_{max} \leq n_N$

### 10.4.4 Project planning for an asynchronous servomotor

Project planning for an asynchronous motor is carried out in accordance with the following requirements:

**1. Effective torque requirement at average application speed**

$M_{r.m.s.} < M_{N\_mot}$

The operating point must lie below the characteristic curve for the continuous torque. No forced cooling is required if this operating point lies below the characteristic curve for self-cooling (S1).

**2. Maximum torque required across the speed curve**

$M_{max} < M_{dyn\_mot}$

This operating point must lie below the characteristic curve for the maximum torque of the motor/MOVIAXIS® combination.

**3. Maximum speed**

Do not configure the maximum speed of the motor higher than 1.4 times the transition speed. The maximum torque available will then still be approx. 110% of the continuous nominal torque of the motor; also, the input speed for the gear unit connected to the motor output will still be less than 3000 rpm with delta connection.

$n_{max} < 1.4 \times n_{base} < 3000$ rpm

### 10.4.5 Motor selection – CMP synchronous servomotors

*Assignment of CMP servomotors to MOVIAXIS® with 400 V system voltage*

*1. Rated speed $n_N$ = 2000 rpm*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| CMP71S | $I_{max}$ | % $I_N$ | | 250 | 218 | | | | | | | |
| | $M_{pk}$ | Nm | | 15.6 | 19.2 | | | | | | | |
| CMP71M | $I_{max}$ | % $I_N$ | | 250 | 250 | 218 | | | | | | |
| | $M_{pk}$ | Nm | | 17.6 | 27.4 | 30.8 | | | | | | |
| CMP71L | $I_{max}$ | % $I_N$ | | | 250 | 250 | 243 | | | | | |
| | $M_{pk}$ | Nm | | | 36 | 43.8 | 46.9 | | | | | |
| CMP80S | $I_{max}$ | % $I_N$ | | | 250 | 250 | 203 | | | | | |
| | $M_{pk}$ | Nm | | | 34 | 40.5 | 42.1 | | | | | |
| CMP80M | $I_{max}$ | % $I_N$ | | | 250 | 250 | 250 | 198 | | | | |
| | $M_{pk}$ | Nm | | | 38.1 | 51.1 | 58.6 | 62.6 | | | | |
| CMP80L | $I_{max}$ | % $I_N$ | | | | 250 | 250 | 250 | 224 | | | |
| | $M_{pk}$ | Nm | | | | 61.4 | 77.2 | 98.8 | 106.9 | | | |
| CMP100S | $I_{max}$ | % $I_N$ | | | | 250 | 250 | 206 | | | | |
| | $M_{pk}$ | Nm | | | | 52.2 | 62.1 | 68.3 | | | | |
| CMP100M | $I_{max}$ | % $I_N$ | | | | 250 | 250 | 250 | 215 | | | |
| | $M_{pk}$ | Nm | | | | 61.5 | 78.1 | 101.2 | 108.2 | | | |
| CMP100L | $I_{max}$ | % $I_N$ | | | | | | 250 | 250 | 235 | | |
| | $M_{pk}$ | Nm | | | | | | 120.7 | 148 | 178.8 | | |

*1. Rated speed $n_N$ = 3000 rpm*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| CMP40S | $I_{max}$ | % $I_N$ | 250 | 153 | | | | | | | | |
| | $M_{pk}$ | Nm | 1.7 | 1.9 | | | | | | | | |
| CMP40M | $I_{max}$ | % $I_N$ | 250 | 150 | | | | | | | | |
| | $M_{pk}$ | Nm | 3.4 | 3.8 | | | | | | | | |
| CMP50S | $I_{max}$ | % $I_N$ | 250 | 128 | | | | | | | | |
| | $M_{pk}$ | Nm | 5.1 | 5.2 | | | | | | | | |
| CMP50M | $I_{max}$ | % $I_N$ | 250 | 240 | | | | | | | | |
| | $M_{pk}$ | Nm | 6.5 | 10.3 | | | | | | | | |
| CMP50L | $I_{max}$ | % $I_N$ | 250 | 250 | 170 | | | | | | | |
| | $M_{pk}$ | Nm | 7.2 | 12.7 | 15.4 | | | | | | | |
| CMP63S | $I_{max}$ | % $I_N$ | 250 | 250 | 161 | | | | | | | |
| | $M_{pk}$ | Nm | 6.2 | 9.9 | 11.1 | | | | | | | |
| CMP63M | $I_{max}$ | % $I_N$ | | 250 | 250 | 180 | | | | | | |
| | $M_{pk}$ | Nm | | 13.2 | 20.6 | 21.4 | | | | | | |
| CMP63L | $I_{max}$ | % $I_N$ | | 250 | 250 | 248 | | | | | | |
| | $M_{pk}$ | Nm | | 13.8 | 24 | 30.4 | | | | | | |
| CMP71S | $I_{max}$ | % $I_N$ | | 250 | 250 | 212 | | | | | | |
| | $M_{pk}$ | Nm | | 12.1 | 18 | 19.2 | | | | | | |
| CMP71M | $I_{max}$ | % $I_N$ | | | 250 | 250 | 244 | | | | | |
| | $M_{pk}$ | Nm | | | 22 | 27.5 | 30.8 | | | | | |
| CMP71L | $I_{max}$ | % $I_N$ | | | 250 | 250 | 250 | 241 | | | | |
| | $M_{pk}$ | Nm | | | 26.5 | 36.3 | 42.2 | 46.9 | | | | |
| CMP80S | $I_{max}$ | % $I_N$ | | | 250 | 250 | 250 | 198 | | | | |
| | $M_{pk}$ | Nm | | | 25.8 | 34.6 | 39.2 | 42.1 | | | | |
| CMP80M | $I_{max}$ | % $I_N$ | | | | 250 | 250 | 250 | 215 | | | |
| | $M_{pk}$ | Nm | | | | 39.3 | 48.6 | 59.4 | 62.6 | | | |
| CMP80L | $I_{max}$ | % $I_N$ | | | | | 250 | 250 | 250 | 224 | | |
| | $M_{pk}$ | Nm | | | | | 55.5 | 77.2 | 93 | 106.9 | | |
| CMP100S | $I_{max}$ | % $I_N$ | | | | | 250 | 250 | 228 | | | |
| | $M_{pk}$ | Nm | | | | | 48.5 | 62.7 | 68.3 | | | |
| CMP100M | $I_{max}$ | % $I_N$ | | | | | | 250 | 250 | 212 | | |
| | $M_{pk}$ | Nm | | | | | | 79 | 95.7 | 108.2 | | |
| CMP100L | $I_{max}$ | % $I_N$ | | | | | | | 250 | 250 | 250 | 167 |
| | $M_{pk}$ | Nm | | | | | | | 110.8 | 149.2 | 174.8 | 178.8 |

*2. Rated speed $n_N$ = 4500 rpm*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| CMP40S | $I_{max}$ | % $I_N$ | 250 | 153 | | | | | | | | |
| | $M_{pk}$ | Nm | 1.7 | 1.9 | | | | | | | | |
| CMP40M | $I_{max}$ | % $I_N$ | 250 | 150 | | | | | | | | |
| | $M_{pk}$ | Nm | 3.4 | 3.8 | | | | | | | | |
| CMP50S | $I_{max}$ | % $I_N$ | 250 | 175 | | | | | | | | |
| | $M_{pk}$ | Nm | 4.2 | 5.2 | | | | | | | | |
| CMP50M | $I_{max}$ | % $I_N$ | 250 | 250 | 164 | | | | | | | |
| | $M_{pk}$ | Nm | 5 | 8.7 | 10.3 | | | | | | | |
| CMP50L | $I_{max}$ | % $I_N$ | | 250 | 244 | | | | | | | |
| | $M_{pk}$ | Nm | | 9.6 | 15.4 | | | | | | | |
| CMP63S | $I_{max}$ | % $I_N$ | | 250 | 229 | | | | | | | |
| | $M_{pk}$ | Nm | | 8 | 11.1 | | | | | | | |
| CMP63M | $I_{max}$ | % $I_N$ | | | 250 | 250 | 203 | | | | | |
| | $M_{pk}$ | Nm | | | 16.3 | 20.6 | 21.4 | | | | | |
| CMP63L | $I_{max}$ | % $I_N$ | | | 250 | 250 | 250 | 173 | | | | |
| | $M_{pk}$ | Nm | | | 18.7 | 25.2 | 29.9 | 30.4 | | | | |
| CMP71S | $I_{max}$ | % $I_N$ | | | 250 | 250 | 237 | | | | | |
| | $M_{pk}$ | Nm | | | 14.9 | 18 | 19.2 | | | | | |
| CMP71M | $I_{max}$ | % $I_N$ | | | | 250 | 250 | 238 | | | | |
| | $M_{pk}$ | Nm | | | | 22.4 | 26.4 | 30.8 | | | | |
| CMP71L | $I_{max}$ | % $I_N$ | | | | 250 | 250 | 250 | 250 | 180 | | |
| | $M_{pk}$ | Nm | | | | 25.6 | 33.4 | 42.2 | 45.8 | 46.9 | | |
| CMP80S | $I_{max}$ | % $I_N$ | | | | 250 | 250 | 250 | 227 | | | |
| | $M_{pk}$ | Nm | | | | 25.3 | 31.7 | 38.9 | 42.1 | | | |
| CMP80M | $I_{max}$ | % $I_N$ | | | | | 250 | 250 | 250 | 215 | | |
| | $M_{pk}$ | Nm | | | | | 35.7 | 48.6 | 56.7 | 62.6 | | |
| CMP80L | $I_{max}$ | % $I_N$ | | | | | | 250 | 250 | 250 | 248 | |
| | $M_{pk}$ | Nm | | | | | | 56.1 | 71.3 | 93.6 | 106.9 | |
| CMP100S | $I_{max}$ | % $I_N$ | | | | | | 250 | 250 | 232 | | |
| | $M_{pk}$ | Nm | | | | | | 47.9 | 58.3 | 68.3 | | |
| CMP100M | $I_{max}$ | % $I_N$ | | | | | | | 250 | 250 | 241 | |
| | $M_{pk}$ | Nm | | | | | | | 71.3 | 95.1 | 108.1 | |
| CMP100L | $I_{max}$ | % $I_N$ | | | | | | | | 250 | 250 | 250 |
| | $M_{pk}$ | Nm | | | | | | | | 110.8 | 138.1 | 178.5 |

*3. Rated speed $n_N$ = 6000 rpm*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| CMP40S | $I_{max}$ | % $I_N$ | 250 | 153 | | | | | | | | |
| | $M_{pk}$ | Nm | 1.7 | 1.9 | | | | | | | | |
| CMP40M | $I_{max}$ | % $I_N$ | 250 | 173 | | | | | | | | |
| | $M_{pk}$ | Nm | 3.1 | 3.8 | | | | | | | | |
| CMP50S | $I_{max}$ | % $I_N$ | 250 | 225 | | | | | | | | |
| | $M_{pk}$ | Nm | 3.5 | 5.2 | | | | | | | | |
| CMP50M | $I_{max}$ | % $I_N$ | | 250 | 241 | | | | | | | |
| | $M_{pk}$ | Nm | | 7.2 | 10.3 | | | | | | | |
| CMP50L | $I_{max}$ | % $I_N$ | | 250 | 250 | 217 | | | | | | |
| | $M_{pk}$ | Nm | | 7.5 | 13.1 | 15.4 | | | | | | |
| CMP63S | $I_{max}$ | % $I_N$ | | 250 | 250 | 195 | | | | | | |
| | $M_{pk}$ | Nm | | 6.7 | 10.4 | 11.1 | | | | | | |
| CMP63M | $I_{max}$ | % $I_N$ | | | 250 | 250 | 250 | 173 | | | | |
| | $M_{pk}$ | Nm | | | 13.7 | 18 | 21 | 21.4 | | | | |
| CMP63L | $I_{max}$ | % $I_N$ | | | 250 | 250 | 250 | 233 | | | | |
| | $M_{pk}$ | Nm | | | 14.6 | 20.4 | 25.1 | 30.4 | | | | |
| CMP71S | $I_{max}$ | % $I_N$ | | | 250 | 250 | 250 | 207 | | | | |
| | $M_{pk}$ | Nm | | | 12.3 | 16.1 | 18.1 | 19.2 | | | | |
| CMP71M | $I_{max}$ | % $I_N$ | | | | 250 | 250 | 250 | 239 | | | |
| | $M_{pk}$ | Nm | | | | 18 | 22.3 | 27.7 | 30.8 | | | |
| CMP71L | $I_{max}$ | % $I_N$ | | | | | 250 | 250 | 250 | 241 | | |
| | $M_{pk}$ | Nm | | | | | 26.5 | 36.3 | 42.2 | 46.9 | | |
| CMP80S | $I_{max}$ | % $I_N$ | | | | | 250 | 250 | 250 | 198 | | |
| | $M_{pk}$ | Nm | | | | | 25.8 | 34.6 | 39.2 | 42.1 | | |
| CMP80M | $I_{max}$ | % $I_N$ | | | | | | 250 | 250 | 250 | 211 | |
| | $M_{pk}$ | Nm | | | | | | 39.8 | 49.1 | 59.8 | 62.8 | |
| CMP80L | $I_{max}$ | % $I_N$ | | | | | | | 250 | 250 | 250 | 215 |
| | $M_{pk}$ | Nm | | | | | | | 55.5 | 77.2 | 93 | 106.9 |

### 10.4.6 Motor selection – CMDV synchronous servomotors

*Pulse width modulation 8 kHz (standard), system voltage 400 V, peak torque in Nm.*

*Rated speed $n_N$ = 400 rpm*

| | | MOVIAXIS® MX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size 1 | | | Size 2 | | Size 3 | | Size 4 | Size 5 | Size 6 |
| | $I_N$ [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| Motor | $I_{max}$ [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| CMDV162K | $I_{max}$ [%$I_N$] | 250 | 128 | | | | | | | | |
| | $M_{max}$[Nm] | 11.01 | 11.1 | | | | | | | | |
| CMDV162S | $I_{max}$ [%$I_N$] | | 228 | | | | | | | | |
| | $M_{max}$[Nm] | | 27.16 | | | | | | | | |
| CMDV162M | $I_{max}$ [%$I_N$] | | 250 | 216 | | | | | | | |
| | $M_{max}$[Nm] | | 39.03 | 57.12 | | | | | | | |
| CMDV162L | $I_{max}$ [%$I_N$] | | | 250 | 225 | | | | | | |
| | $M_{max}$[Nm] | | | 87.98 | 105.38 | | | | | | |

*Rated speed $n_N$ = 600 rpm*

| | | MOVIAXIS® MX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size 1 | | | Size 2 | | Size 3 | | Size 4 | Size 5 | Size 6 |
| | $I_N$ [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| Motor | $I_{max}$ [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| CMDV138K | $I_{max}$ [%$I_N$] | 250 | 145 | | | | | | | | |
| | $M_{max}$[Nm] | 7.13 | 7.71 | | | | | | | | |
| CMDV138S | $I_{max}$ [%$I_N$] | | 245 | | | | | | | | |
| | $M_{max}$[Nm] | | 19.28 | | | | | | | | |
| CMDV138M | $I_{max}$ [%$I_N$] | | 250 | 248 | | | | | | | |
| | $M_{max}$[Nm] | | 31.18 | 48.76 | | | | | | | |
| CMDV138L | $I_{max}$ [%$I_N$] | | | 250 | 204 | | | | | | |
| | $M_{max}$[Nm] | | | 62.15 | 70.15 | | | | | | |

*Rated speed $n_N$ = 800 rpm*

| | | MOVIAXIS® MX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size 1 | | | Size 2 | | Size 3 | | Size 4 | Size 5 | Size 6 |
| | $I_N$ [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| Motor | $I_{max}$ [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| CMDV93K | $I_{max}$ [%$I_N$] | 205 | | | | | | | | | |
| | $M_{max}$[Nm] | 4.5 | | | | | | | | | |
| CMDV93S | $I_{max}$ [%$I_N$] | 250 | 140 | | | | | | | | |
| | $M_{max}$[Nm] | 9.7 | 10.3 | | | | | | | | |
| CMDV93M | $I_{max}$ [%$I_N$] | 250 | 250 | 139 | | | | | | | |
| | $M_{max}$[Nm] | 12 | 20 | 21.2 | | | | | | | |
| CMDV93L | $I_{max}$ [%$I_N$] | 250 | 250 | 203 | | | | | | | |
| | $M_{max}$[Nm] | 14.4 | 26.9 | 38.1 | | | | | | | |
| CMDV162K | $I_{max}$ [%$I_N$] | | 230 | | | | | | | | |
| | $M_{max}$[Nm] | | 11.08 | | | | | | | | |
| CMDV162S | $I_{max}$ [%$I_N$] | | | 191 | | | | | | | |
| | $M_{max}$[Nm] | | | 27.2 | | | | | | | |
| CMDV162M | $I_{max}$ [%$I_N$] | | | 250 | 250 | 203 | | | | | |
| | $M_{max}$[Nm] | | | 40.83 | 53.75 | 56.97 | | | | | |
| CMDV162L | $I_{max}$ [%$I_N$] | | | | 250 | 250 | 250 | | | | |
| | $M_{max}$[Nm] | | | | 64.57 | 81.57 | 105.46 | | | | |

*Rated speed $n_N$ = 1200 rpm*

| | | MOVIAXIS® MX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size 1 | | | Size 2 | | Size 3 | | Size 4 | Size 5 | Size 6 |
| | $I_N$ [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| Motor | $I_{max}$ [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| CMDV70S | $I_{max}$ [%$I_N$] | 250 | 130 | | | | | | | | |
| | $M_{max}$[Nm] | 2.9 | 3 | | | | | | | | |
| CMDV70M | $I_{max}$ [%$I_N$] | 250 | 138 | | | | | | | | |
| | $M_{max}$[Nm] | 5 | 5.3 | | | | | | | | |
| CMDV70L | $I_{max}$ [%$I_N$] | 250 | 200 | | | | | | | | |
| | $M_{max}$[Nm] | 7.5 | 11.3 | | | | | | | | |
| CMDV93K | $I_{max}$ [%$I_N$] | 245 | | | | | | | | | |
| | $M_{max}$[Nm] | 4.5 | | | | | | | | | |
| CMDV93S | $I_{max}$ [%$I_N$] | 250 | 205 | | | | | | | | |
| | $M_{max}$[Nm] | 7.5 | 10.3 | | | | | | | | |
| CMDV93M | $I_{max}$ [%$I_N$] | 250 | 250 | 201 | | | | | | | |
| | $M_{max}$[Nm] | 8.4 | 15.6 | 21.2 | | | | | | | |
| CMDV93L | $I_{max}$ [%$I_N$] | | 250 | 250 | 196 | | | | | | |
| | $M_{max}$[Nm] | | 19.8 | 34.4 | 38.5 | | | | | | |
| CMDV138K | $I_{max}$ [%$I_N$] | | 205 | | | | | | | | |
| | $M_{max}$[Nm] | | 7.69 | | | | | | | | |
| CMDV138S | $I_{max}$ [%$I_N$] | | 250 | 169 | | | | | | | |
| | $M_{max}$[Nm] | | 16.13 | 19.25 | | | | | | | |
| CMDV138M | $I_{max}$ [%$I_N$] | | | 250 | 221 | | | | | | |
| | $M_{max}$[Nm] | | | 41.67 | 48.72 | | | | | | |
| CMDV138L | $I_{max}$ [%$I_N$] | | | 250 | 250 | 247 | | | | | |
| | $M_{max}$[Nm] | | | 43.45 | 59.33 | 70.18 | | | | | |
| CMDV162K | $I_{max}$ [%$I_N$] | | | 184 | | | | | | | |
| | $M_{max}$[Nm] | | | 11.15 | | | | | | | |
| CMDV162S | $I_{max}$ [%$I_N$] | | | 250 | 188 | | | | | | |
| | $M_{max}$[Nm] | | | 25.74 | 27.34 | | | | | | |
| CMDV162M | $I_{max}$ [%$I_N$] | | | | | 250 | 233 | | | | |
| | $M_{max}$[Nm] | | | | | 45.56 | 57.2 | | | | |
| CMDV162L | $I_{max}$ [%$I_N$] | | | | 250 | 250 | 250 | 206 | | | |
| | $M_{max}$[Nm] | | | | 59.14 | 75.45 | 100.01 | 105.19 | | | |

*Rated speed $n_N$ = 2000 rpm*

| | | MOVIAXIS® MX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size 1 | | | Size 2 | | Size 3 | | Size 4 | Size 5 | Size 6 |
| | $I_N$ [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| Motor | $I_{max}$ [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| CMDV138K | $I_{max}$ [%$I_N$] | | 250 | | | | | | | | |
| | $M_{max}$[Nm] | | 7.65 | | | | | | | | |
| CMDV138S | $I_{max}$ [%$I_N$] | | | 250 | 213 | | | | | | |
| | $M_{max}$[Nm] | | | 16.73 | 19.22 | | | | | | |
| CMDV138M | $I_{max}$ [%$I_N$] | | | | 250 | 250 | 229 | | | | |
| | $M_{max}$[Nm] | | | | 33.11 | 40.69 | 48.7 | | | | |
| CMDV138L | $I_{max}$ [%$I_N$] | | | | | 250 | 250 | 231 | | | |
| | $M_{max}$[Nm] | | | | | 45.67 | 61.67 | 69.93 | | | |

*Rated speed $n_N$ = 3000 rpm*

| | | MOVIAXIS® MX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size 1 | | | Size 2 | | Size 3 | | Size 4 | Size 5 | Size 6 |
| | $I_N$ [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| Motor | $I_{max}$ [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| CMDV70S | $I_{max}$ [%$I_N$] | 250 | 150 | | | | | | | | |
| | $M_{max}$[Nm] | 2.7 | 3 | | | | | | | | |
| CMDV70M | $I_{max}$ [%$I_N$] | 250 | 200 | | | | | | | | |
| | $M_{max}$[Nm] | 3.8 | 5.3 | | | | | | | | |
| CMDV70L | $I_{max}$ [%$I_N$] | 250 | 250 | 140 | | | | | | | |
| | $M_{max}$[Nm] | 5.4 | 10.4 | 11.3 | | | | | | | |
| CMDV93K | $I_{max}$ [%$I_N$] | 250 | 180 | | | | | | | | |
| | $M_{max}$[Nm] | 3.6 | 4.47 | | | | | | | | |
| CMDV93S | $I_{max}$ [%$I_N$] | 250 | 250 | 154 | | | | | | | |
| | $M_{max}$[Nm] | 5.3 | 9.2 | 10.3 | | | | | | | |
| CMDV93M | $I_{max}$ [%$I_N$] | | 250 | 250 | 192 | | | | | | |
| | $M_{max}$[Nm] | | 11.7 | 19.6 | 21.3 | | | | | | |
| CMDV93L | $I_{max}$ [%$I_N$] | | | 250 | 250 | 250 | 169 | | | | |
| | $M_{max}$[Nm] | | | 22.7 | 31.4 | 38.3 | 38.7 | | | | |

*Rated speed $n_N$ = 4500 rpm*

| | | MOVIAXIS® MX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size 1 | | | Size 2 | | Size 3 | | Size 4 | Size 5 | Size 6 |
| | $I_N$ [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| Motor | $I_{max}$ [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| CMDV55S | $I_{max}$ [%$I_N$] | 203 | | | | | | | | | |
| | $M_{max}$[Nm] | 1.26 | | | | | | | | | |
| CMDV55M | $I_{max}$ [%$I_N$] | 250 | 150 | | | | | | | | |
| | $M_{max}$[Nm] | 2 | 2.2 | | | | | | | | |
| CMDV55L | $I_{max}$ [%$I_N$] | 250 | 250 | 140 | | | | | | | |
| | $M_{max}$[Nm] | 3.2 | 5.5 | 5.9 | | | | | | | |

*Pulse width modulation 4 kHz, system voltage 400 V, peak torque in Nm.*

| | |
|---|---|
| | **INFORMATION** |
| | Changes to the values in the combination overviews with PWM 8 kHz only occur as of MOVIAXIS® size 3. The following section shows only those motor tables that contain values which differ from PWM 8 kHz. |

*Rated speed $n_N$ = 800 rpm*

| | | MOVIAXIS® MX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size 1 | | | Size 2 | | Size 3 | | Size 4 | Size 5 | Size 6 |
| | $I_N$ [A] | 2 | 4 | 8 | 12 | 16 | 32 | 42 | 64 | 85 | 133 |
| Motor | $I_{max}$ [A] | 5 | 10 | 20 | 30 | 40 | 80 | 105 | 160 | 213 | 333 |
| CMDV162K | $I_{max}$ [%$I_N$] | | 230 | | | | | | | | |
| | $M_{max}$[Nm] | | 11.08 | | | | | | | | |
| CMDV162S | $I_{max}$ [%$I_N$] | | | 191 | | | | | | | |
| | $M_{max}$[Nm] | | | 27.2 | | | | | | | |
| CMDV162M | $I_{max}$ [%$I_N$] | | | 250 | 250 | 203 | | | | | |
| | $M_{max}$[Nm] | | | 40.83 | 53.75 | 56.97 | | | | | |
| CMDV162L | $I_{max}$ [%$I_N$] | | | | 250 | 250 | 188 | | | | |
| | $M_{max}$[Nm] | | | | 64.57 | 81.57 | 105.46 | | | | |

*Rated speed $n_N$ = 1200 rpm*

| | | MOVIAXIS® MX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size 1 | | | Size 2 | | Size 3 | | Size 4 | Size 5 | Size 6 |
| | $I_N$ [A] | 2 | 4 | 8 | 12 | 16 | 32 | 42 | 64 | 85 | 133 |
| Motor | $I_{max}$ [A] | 5 | 10 | 20 | 30 | 40 | 80 | 105 | 160 | 213 | 333 |
| CMDV162K | $I_{max}$ [%$I_N$] | | | 184 | | | | | | | |
| | $M_{max}$[Nm] | | | 11.15 | | | | | | | |
| CMDV162S | $I_{max}$ [%$I_N$] | | | 250 | 188 | | | | | | |
| | $M_{max}$[Nm] | | | 25.74 | 27.34 | | | | | | |
| CMDV162M | $I_{max}$ [%$I_N$] | | | | | 250 | 175 | | | | |
| | $M_{max}$[Nm] | | | | | 45.56 | 57.2 | | | | |
| CMDV162L | $I_{max}$ [%$I_N$] | | | | 250 | 250 | 208 | | | | |
| | $M_{max}$[Nm] | | | | 59.14 | 75.45 | 105.19 | | | | |

*Rated speed $n_N$ = 2000 rpm*

| | | MOVIAXIS® MX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size 1 | | | Size 2 | | Size 3 | | Size 4 | Size 5 | Size 6 |
| | $I_N$ [A] | 2 | 4 | 8 | 12 | 16 | 32 | 42 | 64 | 85 | 133 |
| Motor | $I_{max}$ [A] | 5 | 10 | 20 | 30 | 40 | 80 | 105 | 160 | 213 | 333 |
| CMDV138K | $I_{max}$ [%$I_N$] | | 250 | | | | | | | | |
| | $M_{max}$[Nm] | | 7.65 | | | | | | | | |
| CMDV138S | $I_{max}$ [%$I_N$] | | | 250 | 213 | | | | | | |
| | $M_{max}$[Nm] | | | 16.73 | 19.22 | | | | | | |
| CMDV138M | $I_{max}$ [%$I_N$] | | | | 250 | 250 | 172 | | | | |
| | $M_{max}$[Nm] | | | | 33.11 | 40.69 | 48.7 | | | | |
| CMDV138L | $I_{max}$ [%$I_N$] | | | | | 250 | 231 | | | | |
| | $M_{max}$[Nm] | | | | | 45.67 | 69,93 | | | | |

*Rated speed $n_N$ = 3000 rpm*

| | | MOVIAXIS® MX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size 1 | | | Size 2 | | Size 3 | | Size 4 | Size 5 | Size 6 |
| | $I_N$ [A] | 2 | 4 | 8 | 12 | 16 | 32 | 42 | 64 | 85 | 133 |
| Motor | $I_{max}$ [A] | 5 | 10 | 20 | 30 | 40 | 80 | 105 | 160 | 213 | 333 |
| **CMDV93K** | $I_{max}$ [%$I_N$] | 250 | 180 | | | | | | | | |
| | $M_{max}$[Nm] | 3.6 | 4.47 | | | | | | | | |
| **CMDV93S** | $I_{max}$ [%$I_N$] | 250 | 250 | 154 | | | | | | | |
| | $M_{max}$[Nm] | 5.3 | 9.2 | 10.3 | | | | | | | |
| **CMDV93M** | $I_{max}$ [%$I_N$] | | 250 | 250 | 192 | | | | | | |
| | $M_{max}$[Nm] | | 11.7 | 19.6 | 21.3 | | | | | | |
| **CMDV93L** | $I_{max}$ [%$I_N$] | | | 250 | 250 | 250 | 127 | | | | |
| | $M_{max}$[Nm] | | | 22.7 | 31.4 | 38.3 | 38.7 | | | | |

### 10.4.7 Motor selection – DRL asynchronous servomotors

*Assignment of DRL servomotors to MOVIAXIS®, PWM = 8 kHz*

*Rated speed $n_N$ = 1200 rpm, dynamics package 1, PWM = 8 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm (lb in) | 5.00 (44.3) | | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 956 | | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1505 | | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm (lb in) | 7.00 (62.0) | | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 998 | | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1526 | | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm (lb in) | 10.00 (88.6) | 10.00 (88.6) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 970 | 991 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1505 | 1540 | | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm (lb in) | 14.0 (124) | 14.0 (124) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1034 | 1076 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1526 | 1638 | | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm (lb in) | | 25.0 (221) | 25.0 (221) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 1181 | 1273 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 1695 | 1877 | | | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm (lb in) | | | 40.0 (354) | 40.0 (354) | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1301 | 1350 | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 1905 | 1976 | | | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm (lb in) | | | 67.4 (597) | 80.0 (709) | 80.0 (709) | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1037 | 1090 | 1119 | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 1424 | 1529 | 1594 | | | | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm (lb in) | | | | 100 (886) | 130 (1151) | 130 (1151) | 130 (1151) | | | |
| | $n_{base}$ (400 V) | rpm | | | | 1090 | 1055 | 1230 | 1277 | | | |
| | $n_{base}$ (530 V) | rpm | | | | 1477 | 1447 | 1711 | 1775 | | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm (lb in) | | | | | 137 (1213) | 165 (1461) | 165 (1461) | | | |
| | $n_{base}$ (400 V) | rpm | | | | | 1065 | 1129 | 1176 | | | |
| | $n_{base}$ (530 V) | rpm | | | | | 1450 | 1556 | 1635 | | | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm (lb in) | | | | | | 185 (1638) | 185 (1638) | 185 (1638) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1123 | 1260 | 1308 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1524 | 1730 | 1825 | | |
| DRL180S4 15.0 kW | $M_{max}$ | Nm (lb in) | | | | | | 210 (1860) | 210 (1860) | 210 (1860) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1055 | 1176 | 1202 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1440 | 1619 | 1656 | | |
| DRL180M4 18.5 kW | $M_{max}$ | Nm (lb in) | | | | | | 217 (1922) | 250 (2214) | 250 (2214) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1113 | 1165 | 1255 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1503 | 1593 | 1724 | | |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | 293 | 320 | 320 | |
| | | (lb in) | | | | | | | (2595) | (2834) | (2834) | |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1081 | 1208 | 1223 | |
| | $n_{base}$ (530 V) | rpm | | | | | | | 1466 | 1656 | 1682 | |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | 282 | 420 | 420 | 420 |
| | | (lb in) | | | | | | | (2498) | (3720) | (3720) | (3720) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1113 | 1023 | 1107 | 1134 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 1498 | 1392 | 1508 | 1545 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 426 | 475 | 475 |
| | | (lb in) | | | | | | | | (3773) | (4207) | (4207) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1064 | 1116 | 1167 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 1434 | 1519 | 1612 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | 430 | 520 | 520 |
| | | (lb in) | | | | | | | | (3808) | (4605) | (4605) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1116 | 1148 | 1280 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 1500 | 1547 | 1739 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | | 549 | 770 |
| | | (lb in) | | | | | | | | | (4862) | (6820) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 1125 | 1111 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 1505 | 1500 |

*Rated speed $n_N$ = 1200 rpm, dynamics package 2, PWM = 8 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 8.50 | | | | | | | | | |
| | | (lb in) | (75.3) | | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 555 | | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 963 | | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | 14.0 | | | | | | | | | |
| | | (lb in) | (124) | | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 478 | | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 865 | | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | 16.4 | 25.0 | | | | | | | | |
| | | (lb in) | (145) | (221) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 619 | 225 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1027 | 612 | | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | 16.9 | 30.0 | | | | | | | | |
| | | (lb in) | (150) | (266) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 886 | 506 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1308 | 900 | | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | 33.7 | 46.0 | | | | | | | |
| | | (lb in) | | (298) | (407) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 921 | 788 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 1329 | 1223 | | | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | 63.0 | 85.0 | 85.0 | | | | | |
| | | (lb in) | | | (558) | (753) | (753) | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 928 | 738 | 752 | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 1364 | 1174 | 1188 | | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | 67.4 | 102 | 137 | 150 | | | | |
| | | (lb in) | | | (597) | (903) | (1213) | (1328) | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1037 | 914 | 791 | 762 | | | | |
| | $n_{base}$ (530 V) | rpm | | | 1424 | 1277 | 1137 | 1107 | | | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | 100 | 135 | 200 | 200 | | | |
| | | (lb in) | | | | (886) | (1196) | (1771) | (1771) | | | |
| | $n_{base}$ (400 V) | rpm | | | | 1090 | 1025 | 914 | 973 | | | |
| | $n_{base}$ (530 V) | rpm | | | | 1477 | 1406 | 1283 | 1377 | | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | 137 | 209 | 279 | 280 | | |
| | | (lb in) | | | | | (1213) | (1851) | (2471) | (2480) | | |
| | $n_{base}$ (400 V) | rpm | | | | | 1065 | 954 | 844 | 875 | | |
| | $n_{base}$ (530 V) | rpm | | | | | 1450 | 1318 | 1192 | 1239 | | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | 203 | 272 | 320 | | |
| | | (lb in) | | | | | | (1798) | (2409) | (2834) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1044 | 965 | 944 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1424 | 1329 | 1329 | | |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | 216 | 290 | 380 | 380 | |
| | | (lb in) | | | | | | (1913) | (2568) | (3366) | (3366) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1039 | 944 | 838 | 849 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1419 | 1308 | 1181 | 1208 | |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | 217 | 292 | 430 | 430 | |
| | | (lb in) | | | | | | (1922) | (2586) | (3808) | (3808) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1113 | 1039 | 907 | 928 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1503 | 1419 | 1260 | 1287 | |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | 293 | 444 | 520 | 520 |
| | | (lb in) | | | | | | | (2595) | (3932) | (4605) | (4605) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1081 | 965 | 918 | 933 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 1466 | 1324 | 1276 | 1297 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | 282 | 428 | 573 | 600 |
| | | (lb in) | | | | | | | (2498) | (3791) | (5075) | (5314) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1113 | 1012 | 918 | 918 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 1498 | 1376 | 1260 | 1260 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 426 | 571 | 680 |
| | | (lb in) | | | | | | | | (3773) | (5057) | (6023) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1064 | 984 | 947 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 1434 | 1341 | 1322 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | 430 | 579 | 770 |
| | | (lb in) | | | | | | | | (3808) | (5128) | (6820) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1116 | 1059 | 1027 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 1500 | 1430 | 1402 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | | 549 | 866 |
| | | (lb in) | | | | | | | | | (4862) | (7670) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 1125 | 1022 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 1505 | 1383 |

*Rated speed $n_N$ = 1700 rpm, dynamics package 1, PWM = 8 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 5.00 | | | | | | | | | |
| | | (lb in) | (44.3) | | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1554 | | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2292 | | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | 7.00 | 7.00 | | | | | | | | |
| | | (lb in) | (62.0) | (62.0) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1568 | 1709 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2257 | 2524 | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | 10.00 | 10.00 | | | | | | | | |
| | | (lb in) | (88.6) | (88.6) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1533 | 1638 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2201 | 2398 | | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | | 14.0 | | | | | | | | |
| | | (lb in) | | (124) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 1709 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 2503 | | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | | 25.0 | | | | | | | |
| | | (lb in) | | | (221) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1891 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 2714 | | | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | 40.0 | 40.0 | | | | | | |
| | | (lb in) | | | (354) | (354) | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1758 | 2004 | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 2433 | 2834 | | | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | | 71.7 | 80.0 | 80.0 | | | | |
| | | (lb in) | | | | (635) | (709) | (709) | | | | |
| | $n_{base}$ (400 V) | rpm | | | | 1512 | 1611 | 1729 | | | | |
| | $n_{base}$ (530 V) | rpm | | | | 2057 | 2215 | 2379 | | | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | | 93.6 | 130 | 130 | 130 | | |
| | | (lb in) | | | | | (829) | (1151) | (1151) | (1151) | | |
| | $n_{base}$ (400 V) | rpm | | | | | 1600 | 1617 | 1840 | 1928 | | |
| | $n_{base}$ (530 V) | rpm | | | | | 2156 | 2191 | 2508 | 2643 | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | | 149 | 165 | 165 | | |
| | | (lb in) | | | | | | (1320) | (1461) | (1461) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1498 | 1614 | 1730 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2025 | 2194 | 2362 | | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | 156 | 185 | 185 | | |
| | | (lb in) | | | | | | (1382) | (1638) | (1638) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1440 | 1508 | 1703 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1935 | 2041 | 2315 | | |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | | 208 | 210 | 210 | |
| | | (lb in) | | | | | | | (1842) | (1860) | (1860) | |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1492 | 1703 | 1730 | |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2020 | 2315 | 2394 | |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | | 208 | 250 | 250 | |
| | | (lb in) | | | | | | | (1842) | (2214) | (2214) | |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1593 | 1730 | 1809 | |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2136 | 2341 | 2457 | |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | | 320 | 320 | 320 |
| | | (lb in) | | | | | | | | (2834) | (2834) | (2834) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1482 | 1709 | 1751 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2004 | 2326 | 2415 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 302 | 406 | 420 |
| | | (lb in) | | | | | | | | (2675) | (3596) | (3720) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1577 | 1487 | 1619 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2109 | 2004 | 2183 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 300 | 405 | 475 |
| | | (lb in) | | | | | | | | (2657) | (3587) | (4207) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1608 | 1542 | 1641 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2152 | 2067 | 2212 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | | 415 | 520 |
| | | (lb in) | | | | | | | | | (3676) | (4605) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 1575 | 1716 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 2105 | 2306 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | | | 571 |
| | | (lb in) | | | | | | | | | | (5057) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | | 1706 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | | 2283 |

*Rated speed $n_N$ = 1700 rpm, dynamics package 2, PWM = 8 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 8.50 | | | | | | | | | |
| | | (lb in) | (75.3) | | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1005 | | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1575 | | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | 10.1 | 14.0 | | | | | | | | |
| | | (lb in) | (89.5) | (124) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1202 | 984 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1758 | 1547 | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | 11.6 | 23.8 | | | | | | | | |
| | | (lb in) | (103) | (211) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1357 | 745 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1948 | 1273 | | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | | 24.8 | 30.0 | | | | | | | |
| | | (lb in) | | (220) | (266) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 1125 | 977 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 1680 | 1526 | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | | 46.0 | 46.0 | | | | | | |
| | | (lb in) | | | (407) | (407) | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1245 | 1294 | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 1807 | 1912 | | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | 45.7 | 69.2 | 85.0 | 85.0 | | | | |
| | | (lb in) | | | (405) | (613) | (753) | (753) | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1582 | 1364 | 1223 | 1259 | | | | |
| | $n_{base}$ (530 V) | rpm | | | 2194 | 1955 | 1821 | 1877 | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | | 71.7 | 96.4 | 146 | 150 | | | |
| | | (lb in) | | | | (635) | (854) | (1293) | (1328) | | | |
| | $n_{base}$ (400 V) | rpm | | | | 1512 | 1406 | 1201 | 1201 | | | |
| | $n_{base}$ (530 V) | rpm | | | | 2057 | 1934 | 1688 | 1688 | | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | | 93.6 | 143 | 192 | 200 | | |
| | | (lb in) | | | | | (829) | (1267) | (1700) | (1771) | | |
| | $n_{base}$ (400 V) | rpm | | | | | 1600 | 1500 | 1395 | 1500 | | |
| | $n_{base}$ (530 V) | rpm | | | | | 2156 | 2033 | 1916 | 2074 | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | | 149 | 201 | 280 | 280 | |
| | | (lb in) | | | | | | (1320) | (1780) | (2480) | (2480) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1498 | 1403 | 1266 | 1303 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2025 | 1909 | 1751 | 1830 | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | 156 | 210 | 318 | 320 | |
| | | (lb in) | | | | | | (1382) | (1860) | (2816) | (2834) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1440 | 1366 | 1223 | 1292 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1935 | 1851 | 1682 | 1777 | |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | | 208 | 315 | 380 | 380 |
| | | (lb in) | | | | | | | (1842) | (2790) | (3366) | (3366) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1492 | 1329 | 1234 | 1271 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2020 | 1819 | 1714 | 1756 |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | | 208 | 316 | 423 | 430 |
| | | (lb in) | | | | | | | (1842) | (2799) | (3746) | (3808) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1593 | 1461 | 1334 | 1371 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2136 | 1983 | 1825 | 1904 |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | | 323 | 433 | 520 |
| | | (lb in) | | | | | | | | (2861) | (3835) | (4605) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1482 | 1382 | 1329 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2004 | 1877 | 1846 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 302 | 406 | 600 |
| | | (lb in) | | | | | | | | (2675) | (3596) | (5314) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1577 | 1487 | 1324 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2109 | 2004 | 1793 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 300 | 405 | 637 |
| | | (lb in) | | | | | | | | (2657) | (3587) | (5642) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1608 | 1542 | 1388 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2152 | 2067 | 1875 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | | 415 | 657 |
| | | (lb in) | | | | | | | | | (3676) | (5819) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 1575 | 1453 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 2105 | 1959 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | | | 571 |
| | | (lb in) | | | | | | | | | | (5057) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | | 1706 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | | 2283 |

*Rated speed $n_N$ = 2100 rpm, dynamics package 1, PWM = 8 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 5.00 | 5.00 | | | | | | | | |
| | | (lb in) | (44.3) | (44.3) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 2088 | 2250 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2981 | 3284 | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | 7.00 | 7.00 | | | | | | | | |
| | | (lb in) | (62.0) | (62.0) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1962 | 2250 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2735 | 3241 | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | | 10.00 | | | | | | | | |
| | | (lb in) | | (88.6) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 2222 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 3192 | | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | | 14.0 | 14.0 | | | | | | | |
| | | (lb in) | | (124) | (124) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 2271 | 2398 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 3199 | 3403 | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | | 25.0 | 25.0 | | | | | | |
| | | (lb in) | | | (221) | (221) | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 2489 | 2616 | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 3452 | 3649 | | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | | 40.0 | 40.0 | | | | | |
| | | (lb in) | | | | (354) | (354) | | | | | |
| | $n_{base}$ (400 V) | rpm | | | | 2538 | 2714 | | | | | |
| | $n_{base}$ (530 V) | rpm | | | | 3502 | 3790 | | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | | | 78.0 | 80.0 | 80.0 | | | |
| | | (lb in) | | | | | (691) | (709) | (709) | | | |
| | $n_{base}$ (400 V) | rpm | | | | | 1869 | 2145 | 2197 | | | |
| | $n_{base}$ (530 V) | rpm | | | | | 2531 | 2930 | 3000 | | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | | | 116 | 130 | 130 | | |
| | | (lb in) | | | | | | (1027) | (1151) | (1151) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1934 | 2127 | 2391 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2607 | 2871 | 3246 | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | | | 159 | 165 | 165 | |
| | | (lb in) | | | | | | | (1408) | (1461) | (1461) | |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1893 | 2173 | 2236 | |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2552 | 2943 | 3080 | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | | 153 | 185 | 185 | |
| | | (lb in) | | | | | | | (1355) | (1638) | (1638) | |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1983 | 2204 | 2352 | |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2658 | 2964 | 3217 | |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | | | 210 | 210 | 210 |
| | | (lb in) | | | | | | | | (1860) | (1860) | (1860) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2088 | 2220 | 2273 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2805 | 3001 | 3069 |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | | | 250 | 250 | 250 |
| | | (lb in) | | | | | | | | (2214) | (2214) | (2214) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1956 | 2257 | 2373 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2626 | 3038 | 3201 |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | | 251 | 320 | 320 |
| | | (lb in) | | | | | | | | (2223) | (2834) | (2834) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1999 | 1978 | 2278 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2679 | 2647 | 3074 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | | | 326 | 420 |
| | | (lb in) | | | | | | | | | (2887) | (3720) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 1946 | 2004 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 2605 | 2689 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | | 324 | 475 |
| | | (lb in) | | | | | | | | | (2870) | (4207) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 1992 | 1936 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 2658 | 2588 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | | | 518 |
| | | (lb in) | | | | | | | | | | (4588) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | | 1941 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | | 2597 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | | | 491 |
| | | (lb in) | | | | | | | | | | (4349) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | | 2020 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | | 2695 |

*Rated speed $n_N$ = 2100 rpm, dynamics package 2, PWM = 8 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 7.47 | 8.50 | | | | | | | | |
| | | (lb in) | (66.2) | (75.3) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1561 | 1526 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2257 | 2306 | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | 7.91 | 14.0 | | | | | | | | |
| | | (lb in) | (70.1) | (124) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1786 | 1378 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2496 | 2060 | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | | 18.9 | | | | | | | | |
| | | (lb in) | | (167) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 1413 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 2102 | | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | | 19.5 | 30.0 | | | | | | | |
| | | (lb in) | | (173) | (266) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 1751 | 1399 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 2468 | 2095 | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | | 39.0 | 46.0 | 46.0 | | | | | |
| | | (lb in) | | | (345) | (407) | (407) | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1765 | 1772 | 1814 | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 2461 | 2538 | 2630 | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | | 54.4 | 73.0 | 85.0 | 85.0 | | | |
| | | (lb in) | | | | (482) | (647) | (753) | (753) | | | |
| | $n_{base}$ (400 V) | rpm | | | | 1997 | 1814 | 1737 | 1772 | | | |
| | $n_{base}$ (530 V) | rpm | | | | 2763 | 2552 | 2517 | 2573 | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | | | 78.0 | 118 | 150 | 150 | | |
| | | (lb in) | | | | | (691) | (1045) | (1328) | (1328) | | |
| | $n_{base}$ (400 V) | rpm | | | | | 1869 | 1676 | 1523 | 1576 | | |
| | $n_{base}$ (530 V) | rpm | | | | | 2531 | 2303 | 2115 | 2197 | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | | | 116 | 156 | 200 | | |
| | | (lb in) | | | | | | (1027) | (1382) | (1771) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1934 | 1840 | 1857 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2607 | 2496 | 2537 | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | | | 159 | 240 | 280 | |
| | | (lb in) | | | | | | | (1408) | (2126) | (2480) | |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1893 | 1719 | 1656 | |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2552 | 2341 | 2299 | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | | 153 | 234 | 314 | 320 |
| | | (lb in) | | | | | | | (1355) | (2072) | (2781) | (2834) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1983 | 1851 | 1724 | 1835 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2658 | 2500 | 2347 | 2494 |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | | | 249 | 334 | 380 |
| | | (lb in) | | | | | | | | (2205) | (2958) | (3366) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1840 | 1688 | 1624 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2489 | 2299 | 2220 |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | | | 251 | 337 | 430 |
| | | (lb in) | | | | | | | | (2223) | (2985) | (3808) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1956 | 1835 | 1756 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2626 | 2479 | 2389 |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | | 251 | 338 | 520 |
| | | (lb in) | | | | | | | | (2223) | (2994) | (4605) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1999 | 1904 | 1703 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2679 | 2563 | 2310 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | | | 326 | 514 |
| | | (lb in) | | | | | | | | | (2887) | (4552) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 1946 | 1756 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 2605 | 2368 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | | 324 | 513 |
| | | (lb in) | | | | | | | | | (2870) | (4543) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 1992 | 1842 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 2658 | 2475 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | | | 518 |
| | | (lb in) | | | | | | | | | | (4588) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | | 1941 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | | 2597 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | | | 491 |
| | | (lb in) | | | | | | | | | | (4349) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | | 2020 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | | 2695 |

*Rated speed $n_N$ = 3000 rpm, dynamics package 1, PWM = 8 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 5.00 | 5.00 | | | | | | | | |
| | | (lb in) | (44.3) | (44.3) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 2742 | 3291 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 3755 | 4669 | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | | 7.00 | | | | | | | | |
| | | (lb in) | | (62.0) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 3206 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 4500 | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | | 10.00 | 10.00 | | | | | | | |
| | | (lb in) | | (88.6) | (88.6) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 3241 | 3410 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 4486 | 4830 | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | | | 14.0 | | | | | | | |
| | | (lb in) | | | (124) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 3530 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 4901 | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | | 25.0 | 25.0 | 25.0 | | | | | |
| | | (lb in) | | | (221) | (221) | (221) | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 2988 | 3642 | 3797 | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 4029 | 4985 | 5203 | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | | 39.3 | 40.0 | 40.0 | | | | |
| | | (lb in) | | | | (348) | (354) | (354) | | | | |
| | $n_{base}$ (400 V) | rpm | | | | 3038 | 3586 | 3994 | | | | |
| | $n_{base}$ (530 V) | rpm | | | | 4113 | 4866 | 5477 | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | | | 54.4 | 80.0 | 80.0 | 80.0 | | |
| | | (lb in) | | | | | (482) | (709) | (709) | (709) | | |
| | $n_{base}$ (400 V) | rpm | | | | | 2842 | 2719 | 3111 | 3270 | | |
| | $n_{base}$ (530 V) | rpm | | | | | 3809 | 3645 | 4195 | 4418 | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | | | 80.1 | 109 | 130 | 130 | |
| | | (lb in) | | | | | | (709) | (965) | (1151) | (1151) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 2883 | 2801 | 3170 | 3428 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 3850 | 3750 | 4248 | 4611 | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | | | | 165 | 165 | 165 |
| | | (lb in) | | | | | | | | (1461) | (1461) | (1461) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2689 | 3032 | 3233 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3596 | 4071 | 4345 |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | | | 181 | 185 | 185 |
| | | (lb in) | | | | | | | | (1603) | (1638) | (1638) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2521 | 2921 | 3154 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3380 | 3908 | 4293 |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | | | 179 | 210 | 210 |
| | | (lb in) | | | | | | | | (1585) | (1860) | (1860) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2747 | 2874 | 3164 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3676 | 3834 | 4245 |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | | | 179 | 241 | 250 |
| | | (lb in) | | | | | | | | (1585) | (2134) | (2214) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2879 | 2769 | 3243 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3839 | 3707 | 4340 |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | | | 246 | 320 |
| | | (lb in) | | | | | | | | | (2179) | (2834) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 2758 | 2953 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 3686 | 3945 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | | | 228 | 364 |
| | | (lb in) | | | | | | | | | (2019) | (3224) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 2885 | 2711 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 3844 | 3623 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | | | 363 |
| | | (lb in) | | | | | | | | | | (3215) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | | 2780 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | | 3708 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | | | 372 |
| | | (lb in) | | | | | | | | | | (3295) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | | 2812 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | | 3741 |

*Rated speed $n_N$ = 3000 rpm, dynamics package 2, PWM = 8 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 5.31 | 8.50 | | | | | | | | |
| | | (lb in) | (47.0) | (75.3) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 2630 | 2334 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 3621 | 3382 | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | | 11.7 | | | | | | | | |
| | | (lb in) | | (104) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 2327 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 3270 | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | | 13.5 | 25.0 | | | | | | | |
| | | (lb in) | | (120) | (221) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 2573 | 1849 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 3579 | 2735 | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | | | 28.6 | 30.0 | | | | | | |
| | | (lb in) | | | (253) | (266) | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 2229 | 2215 | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 3171 | 3178 | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | | 28.0 | 42.9 | 46.0 | | | | | |
| | | (lb in) | | | (248) | (380) | (407) | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 2735 | 2489 | 2644 | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 3705 | 3431 | 3684 | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | | 39.3 | 52.9 | 79.9 | 85.0 | | | |
| | | (lb in) | | | | (348) | (469) | (708) | (753) | | | |
| | $n_{base}$ (400 V) | rpm | | | | 3038 | 2883 | 2580 | 2616 | | | |
| | $n_{base}$ (530 V) | rpm | | | | 4113 | 3938 | 3586 | 3698 | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | | | 54.4 | 83.0 | 111 | 150 | | |
| | | (lb in) | | | | | (482) | (735) | (983) | (1328) | | |
| | $n_{base}$ (400 V) | rpm | | | | | 2842 | 2678 | 2508 | 2291 | | |
| | $n_{base}$ (530 V) | rpm | | | | | 3809 | 3604 | 3398 | 3129 | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | | | 80.1 | 109 | 166 | 200 | |
| | | (lb in) | | | | | | (709) | (965) | (1470) | (1771) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 2883 | 2801 | 2637 | 2654 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 3850 | 3750 | 3551 | 3580 | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | | | | 174 | 233 | 280 |
| | | (lb in) | | | | | | | | (1541) | (2064) | (2480) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2621 | 2463 | 2415 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3517 | 3322 | 3275 |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | | | 181 | 243 | 320 |
| | | (lb in) | | | | | | | | (1603) | (2152) | (2834) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2521 | 2405 | 2341 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3380 | 3227 | 3206 |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | | | 179 | 241 | 379 |
| | | (lb in) | | | | | | | | (1585) | (2134) | (3357) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2747 | 2610 | 2294 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3676 | 3502 | 3106 |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | | | 179 | 241 | 380 |
| | | (lb in) | | | | | | | | (1585) | (2134) | (3366) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2879 | 2769 | 2521 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3839 | 3707 | 3391 |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | | | 246 | 390 |
| | | (lb in) | | | | | | | | | (2179) | (3454) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 2758 | 2563 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 3686 | 3444 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | | | 228 | 364 |
| | | (lb in) | | | | | | | | | (2019) | (3224) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 2885 | 2711 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 3844 | 3623 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | | | 363 |
| | | (lb in) | | | | | | | | | | (3215) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | | 2780 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | | 3708 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | | | 372 |
| | | (lb in) | | | | | | | | | | (3295) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | | 2812 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | | 3741 |

*Assignment of DRL servomotors to MOVIAXIS®, PWM = 4 kHz*

*Rated speed $n_N$ = 1200 rpm, dynamics package 1, PWM = 4 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm (lb in) | 5.00 (44.3) | | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 956 | | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1505 | | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm (lb in) | 7.00 (62.0) | | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 998 | | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1526 | | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm (lb in) | 10.00 (88.6) | 10.00 (88.6) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 970 | 991 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1505 | 1540 | | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm (lb in) | 14.0 (124) | 14.0 (124) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1034 | 1076 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1526 | 1638 | | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm (lb in) | | 25.0 (221) | 25.0 (221) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 1181 | 1273 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 1695 | 1877 | | | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm (lb in) | | | 40.0 (354) | 40.0 (354) | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1301 | 1350 | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 1905 | 1976 | | | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm (lb in) | | | 67.4 (597) | 80.0 (709) | 80.0 (709) | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1037 | 1090 | 1119 | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 1424 | 1529 | 1594 | | | | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm (lb in) | | | | 100 (886) | 130 (1151) | 130 (1151) | | | | |
| | $n_{base}$ (400 V) | rpm | | | | 1090 | 1055 | 1230 | | | | |
| | $n_{base}$ (530 V) | rpm | | | | 1477 | 1447 | 1711 | | | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm (lb in) | | | | | 137 (1213) | 165 (1461) | | | | |
| | $n_{base}$ (400 V) | rpm | | | | | 1065 | 1129 | | | | |
| | $n_{base}$ (530 V) | rpm | | | | | 1450 | 1556 | | | | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm (lb in) | | | | | | 185 (1638) | 185 (1638) | | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1123 | 1260 | | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1524 | 1730 | | | |
| DRL180S4 15.0 kW | $M_{max}$ | Nm (lb in) | | | | | | 210 (1860) | 210 (1860) | | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1055 | 1176 | | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1440 | 1619 | | | |
| DRL180M4 18.5 kW | $M_{max}$ | Nm (lb in) | | | | | | 217 (1922) | 250 (2214) | 250 (2214) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1113 | 1165 | 1255 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1503 | 1593 | 1724 | | |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | 217 | 293 | 320 | | |
| | | (lb in) | | | | | | (1922) | (2595) | (2834) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1134 | 1081 | 1208 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1529 | 1466 | 1656 | | |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | 207 | 282 | 420 | 420 | |
| | | (lb in) | | | | | | (1833) | (2498) | (3720) | (3720) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1160 | 1113 | 1023 | 1107 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1556 | 1498 | 1392 | 1508 | |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | 280 | 426 | 475 | 475 |
| | | (lb in) | | | | | | | (2480) | (3773) | (4207) | (4207) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1139 | 1064 | 1116 | 1167 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 1528 | 1434 | 1519 | 1612 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | 280 | 430 | 520 | 520 |
| | | (lb in) | | | | | | | (2480) | (3808) | (4605) | (4605) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1177 | 1116 | 1148 | 1280 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 1570 | 1500 | 1547 | 1739 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | 406 | 549 | 770 |
| | | (lb in) | | | | | | | | (3596) | (4862) | (6820) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1167 | 1125 | 1111 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 1561 | 1505 | 1500 |

*Rated speed $n_N$ = 1200 rpm, dynamics package 2, PWM = 4 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 8.50 | | | | | | | | | |
| | | (lb in) | (75.3) | | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 555 | | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 963 | | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | 14.0 | | | | | | | | | |
| | | (lb in) | (124) | | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 478 | | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 865 | | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | 16.4 | 25.0 | | | | | | | | |
| | | (lb in) | (145) | (221) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 619 | 225 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1027 | 612 | | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | 16.9 | 30.0 | | | | | | | | |
| | | (lb in) | (150) | (266) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 886 | 506 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1308 | 900 | | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | 33.7 | 46.0 | | | | | | | |
| | | (lb in) | | (298) | (407) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 921 | 788 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 1329 | 1223 | | | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | 63.0 | 85.0 | 85.0 | | | | | |
| | | (lb in) | | | (558) | (753) | (753) | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 928 | 738 | 752 | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 1364 | 1174 | 1188 | | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | 67.4 | 102 | 137 | 150 | | | | |
| | | (lb in) | | | (597) | (903) | (1213) | (1328) | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1037 | 914 | 791 | 762 | | | | |
| | $n_{base}$ (530 V) | rpm | | | 1424 | 1277 | 1137 | 1107 | | | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | 100 | 135 | 200 | 200 | | | |
| | | (lb in) | | | | (886) | (1196) | (1771) | (1771) | | | |
| | $n_{base}$ (400 V) | rpm | | | | 1090 | 1025 | 914 | 973 | | | |
| | $n_{base}$ (530 V) | rpm | | | | 1477 | 1406 | 1283 | 1377 | | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | 137 | 209 | 279 | 280 | | |
| | | (lb in) | | | | | (1213) | (1851) | (2471) | (2480) | | |
| | $n_{base}$ (400 V) | rpm | | | | | 1065 | 954 | 844 | 875 | | |
| | $n_{base}$ (530 V) | rpm | | | | | 1450 | 1318 | 1192 | 1239 | | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | 203 | 272 | 320 | | |
| | | (lb in) | | | | | | (1798) | (2409) | (2834) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1044 | 965 | 944 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1424 | 1329 | 1329 | | |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | 216 | 290 | 380 | 380 | |
| | | (lb in) | | | | | | (1913) | (2568) | (3366) | (3366) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1039 | 944 | 838 | 849 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1419 | 1308 | 1181 | 1208 | |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | 217 | 292 | 430 | 430 | |
| | | (lb in) | | | | | | (1922) | (2586) | (3808) | (3808) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1113 | 1039 | 907 | 928 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1503 | 1419 | 1260 | 1287 | |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | 217 | 293 | 444 | 520 | 520 |
| | | (lb in) | | | | | | (1922) | (2595) | (3932) | (4605) | (4605) |
| | $n_{base}$ (400 V) | rpm | | | | | | 1134 | 1081 | 965 | 918 | 933 |
| | $n_{base}$ (530 V) | rpm | | | | | | 1529 | 1466 | 1324 | 1276 | 1297 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | 207 | 282 | 428 | 573 | 600 |
| | | (lb in) | | | | | | (1833) | (2498) | (3791) | (5075) | (5314) |
| | $n_{base}$ (400 V) | rpm | | | | | | 1160 | 1113 | 1012 | 918 | 918 |
| | $n_{base}$ (530 V) | rpm | | | | | | 1556 | 1498 | 1376 | 1260 | 1260 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | 280 | 426 | 571 | 680 |
| | | (lb in) | | | | | | | (2480) | (3773) | (5057) | (6023) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1139 | 1064 | 984 | 947 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 1528 | 1434 | 1341 | 1322 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | 280 | 430 | 579 | 770 |
| | | (lb in) | | | | | | | (2480) | (3808) | (5128) | (6820) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1177 | 1116 | 1059 | 1027 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 1570 | 1500 | 1430 | 1402 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | 406 | 549 | 866 |
| | | (lb in) | | | | | | | | (3596) | (4862) | (7670) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1167 | 1125 | 1022 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 1561 | 1505 | 1383 |

*Rated speed $n_N$ = 1700 rpm, dynamics package 1, PWM = 4 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 5.00 | | | | | | | | | |
| | | (lb in) | (44.3) | | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1554 | | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2292 | | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | 7.00 | 7.00 | | | | | | | | |
| | | (lb in) | (62.0) | (62.0) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1568 | 1709 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2257 | 2524 | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | 10.00 | 10.00 | | | | | | | | |
| | | (lb in) | (88.6) | (88.6) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1533 | 1638 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2201 | 2398 | | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | | 14.0 | | | | | | | | |
| | | (lb in) | | (124) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 1709 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 2503 | | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | | 25.0 | | | | | | | |
| | | (lb in) | | | (221) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1891 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 2714 | | | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | 40.0 | 40.0 | | | | | | |
| | | (lb in) | | | (354) | (354) | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1758 | 2004 | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 2433 | 2834 | | | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | | 71.7 | 80.0 | 80.0 | | | | |
| | | (lb in) | | | | (635) | (709) | (709) | | | | |
| | $n_{base}$ (400 V) | rpm | | | | 1512 | 1611 | 1729 | | | | |
| | $n_{base}$ (530 V) | rpm | | | | 2057 | 2215 | 2379 | | | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | | 93.6 | 130 | 130 | | | |
| | | (lb in) | | | | | (829) | (1151) | (1151) | | | |
| | $n_{base}$ (400 V) | rpm | | | | | 1600 | 1617 | 1840 | | | |
| | $n_{base}$ (530 V) | rpm | | | | | 2156 | 2191 | 2508 | | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | | 149 | 165 | 165 | | |
| | | (lb in) | | | | | | (1320) | (1461) | (1461) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1498 | 1614 | 1730 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2025 | 2194 | 2362 | | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | 156 | 185 | 185 | | |
| | | (lb in) | | | | | | (1382) | (1638) | (1638) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1440 | 1508 | 1703 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1935 | 2041 | 2315 | | |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | 154 | 208 | 210 | | |
| | | (lb in) | | | | | | (1364) | (1842) | (1860) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1571 | 1492 | 1703 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2115 | 2020 | 2315 | | |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | 154 | 208 | 250 | | |
| | | (lb in) | | | | | | (1364) | (1842) | (2214) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1656 | 1593 | 1730 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2215 | 2136 | 2341 | | |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | 211 | 320 | 320 | |
| | | (lb in) | | | | | | | (1869) | (2834) | (2834) | |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1582 | 1482 | 1709 | |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2125 | 2004 | 2326 | |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | 196 | 302 | 406 | 420 |
| | | (lb in) | | | | | | | (1736) | (2675) | (3596) | (3720) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1661 | 1577 | 1487 | 1619 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2220 | 2109 | 2004 | 2183 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 300 | 405 | 475 |
| | | (lb in) | | | | | | | | (2657) | (3587) | (4207) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1608 | 1542 | 1641 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2152 | 2067 | 2212 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | 306 | 415 | 520 |
| | | (lb in) | | | | | | | | (2710) | (3676) | (4605) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1627 | 1575 | 1716 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2170 | 2105 | 2306 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | | 357 | 571 |
| | | (lb in) | | | | | | | | | (3162) | (5057) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 1800 | 1706 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 2395 | 2283 |

*Rated speed $n_N$ = 1700 rpm, dynamics package 2, PWM = 4 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 8.50 | | | | | | | | | |
| | | (lb in) | (75.3) | | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1005 | | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1575 | | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | 10.1 | 14.0 | | | | | | | | |
| | | (lb in) | (89.5) | (124) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1202 | 984 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1758 | 1547 | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | 11.6 | 23.8 | | | | | | | | |
| | | (lb in) | (103) | (211) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1357 | 745 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 1948 | 1273 | | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | | 24.8 | 30.0 | | | | | | | |
| | | (lb in) | | (220) | (266) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 1125 | 977 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 1680 | 1526 | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | | 46.0 | 46.0 | | | | | | |
| | | (lb in) | | | (407) | (407) | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1245 | 1294 | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 1807 | 1912 | | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | 45.7 | 69.2 | 85.0 | 85.0 | | | | |
| | | (lb in) | | | (405) | (613) | (753) | (753) | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1582 | 1364 | 1223 | 1259 | | | | |
| | $n_{base}$ (530 V) | rpm | | | 2194 | 1955 | 1821 | 1877 | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | | 71.7 | 96.4 | 146 | 150 | | | |
| | | (lb in) | | | | (635) | (854) | (1293) | (1328) | | | |
| | $n_{base}$ (400 V) | rpm | | | | 1512 | 1406 | 1201 | 1201 | | | |
| | $n_{base}$ (530 V) | rpm | | | | 2057 | 1934 | 1688 | 1688 | | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | | 93.6 | 143 | 192 | 200 | | |
| | | (lb in) | | | | | (829) | (1267) | (1700) | (1771) | | |
| | $n_{base}$ (400 V) | rpm | | | | | 1600 | 1500 | 1395 | 1500 | | |
| | $n_{base}$ (530 V) | rpm | | | | | 2156 | 2033 | 1916 | 2074 | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | | 149 | 201 | 280 | 280 | |
| | | (lb in) | | | | | | (1320) | (1780) | (2480) | (2480) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1498 | 1403 | 1266 | 1303 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2025 | 1909 | 1751 | 1830 | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | 156 | 210 | 318 | 320 | |
| | | (lb in) | | | | | | (1382) | (1860) | (2816) | (2834) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1440 | 1366 | 1223 | 1292 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 1935 | 1851 | 1682 | 1777 | |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | 154 | 208 | 315 | 380 | 380 |
| | | (lb in) | | | | | | (1364) | (1842) | (2790) | (3366) | (3366) |
| | $n_{base}$ (400 V) | rpm | | | | | | 1571 | 1492 | 1329 | 1234 | 1271 |
| | $n_{base}$ (530 V) | rpm | | | | | | 2115 | 2020 | 1819 | 1714 | 1756 |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | 154 | 208 | 316 | 423 | 430 |
| | | (lb in) | | | | | | (1364) | (1842) | (2799) | (3746) | (3808) |
| | $n_{base}$ (400 V) | rpm | | | | | | 1656 | 1593 | 1461 | 1334 | 1371 |
| | $n_{base}$ (530 V) | rpm | | | | | | 2215 | 2136 | 1983 | 1825 | 1904 |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | 211 | 323 | 433 | 520 |
| | | (lb in) | | | | | | | (1869) | (2861) | (3835) | (4605) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1582 | 1482 | 1382 | 1329 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2125 | 2004 | 1877 | 1846 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | 196 | 302 | 406 | 600 |
| | | (lb in) | | | | | | | (1736) | (2675) | (3596) | (5314) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1661 | 1577 | 1487 | 1324 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2220 | 2109 | 2004 | 1793 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 300 | 405 | 637 |
| | | (lb in) | | | | | | | | (2657) | (3587) | (5642) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1608 | 1542 | 1388 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2152 | 2067 | 1875 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | 306 | 415 | 657 |
| | | (lb in) | | | | | | | | (2710) | (3676) | (5819) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1627 | 1575 | 1453 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2170 | 2105 | 1959 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | | 357 | 571 |
| | | (lb in) | | | | | | | | | (3162) | (5057) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 1800 | 1706 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 2395 | 2283 |

*Rated speed $n_N$ = 2100 rpm, dynamics package 1, PWM = 4 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 5.00 | 5.00 | | | | | | | | |
| | | (lb in) | (44.3) | (44.3) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 2088 | 2250 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2981 | 3284 | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | 7.00 | 7.00 | | | | | | | | |
| | | (lb in) | (62.0) | (62.0) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1962 | 2250 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2735 | 3241 | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | | 10.00 | | | | | | | | |
| | | (lb in) | | (88.6) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 2222 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 3192 | | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | | 14.0 | 14.0 | | | | | | | |
| | | (lb in) | | (124) | (124) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 2271 | 2398 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 3199 | 3403 | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | | 25.0 | 25.0 | | | | | | |
| | | (lb in) | | | (221) | (221) | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 2489 | 2616 | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 3452 | 3649 | | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | | 40.0 | 40.0 | | | | | |
| | | (lb in) | | | | (354) | (354) | | | | | |
| | $n_{base}$ (400 V) | rpm | | | | 2538 | 2714 | | | | | |
| | $n_{base}$ (530 V) | rpm | | | | 3502 | 3790 | | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | | | 78.0 | 80.0 | | | | |
| | | (lb in) | | | | | (691) | (709) | | | | |
| | $n_{base}$ (400 V) | rpm | | | | | 1869 | 2145 | | | | |
| | $n_{base}$ (530 V) | rpm | | | | | 2531 | 2930 | | | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | | | 116 | 130 | 130 | | |
| | | (lb in) | | | | | | (1027) | (1151) | (1151) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1934 | 2127 | 2391 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2607 | 2871 | 3246 | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | | 118 | 159 | 165 | | |
| | | (lb in) | | | | | | (1045) | (1408) | (1461) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1988 | 1893 | 2173 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2663 | 2552 | 2943 | | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | 112 | 153 | 185 | | |
| | | (lb in) | | | | | | (992) | (1355) | (1638) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 2051 | 1983 | 2204 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2737 | 2658 | 2964 | | |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | | 163 | 210 | 210 | |
| | | (lb in) | | | | | | | (1444) | (1860) | (1860) | |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1993 | 2088 | 2220 | |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2674 | 2805 | 3001 | |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | | 164 | 250 | 250 | |
| | | (lb in) | | | | | | | (1452) | (2214) | (2214) | |
| | $n_{base}$ (400 V) | rpm | | | | | | | 2072 | 1956 | 2257 | |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2774 | 2626 | 3038 | |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | | 251 | 320 | 320 |
| | | (lb in) | | | | | | | | (2223) | (2834) | (2834) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1999 | 1978 | 2278 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2679 | 2647 | 3074 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 241 | 326 | 420 |
| | | (lb in) | | | | | | | | (2134) | (2887) | (3720) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2030 | 1946 | 2004 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2711 | 2605 | 2689 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 239 | 324 | 475 |
| | | (lb in) | | | | | | | | (2117) | (2870) | (4207) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2053 | 1992 | 1936 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2738 | 2658 | 2588 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | | 325 | 518 |
| | | (lb in) | | | | | | | | | (2878) | (4588) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 2053 | 1941 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 2733 | 2597 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | | 304 | 491 |
| | | (lb in) | | | | | | | | | (2692) | (4349) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 2109 | 2020 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 2803 | 2695 |

*Rated speed $n_N$ = 2100 rpm, dynamics package 2, PWM = 4 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 7.47 | 8.50 | | | | | | | | |
| | | (lb in) | (66.2) | (75.3) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1561 | 1526 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2257 | 2306 | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | 7.91 | 14.0 | | | | | | | | |
| | | (lb in) | (70.1) | (124) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 1786 | 1378 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 2496 | 2060 | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | | 18.9 | | | | | | | | |
| | | (lb in) | | (167) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 1413 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 2102 | | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | | 19.5 | 30.0 | | | | | | | |
| | | (lb in) | | (173) | (266) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 1751 | 1399 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 2468 | 2095 | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | | 39.0 | 46.0 | 46.0 | | | | | |
| | | (lb in) | | | (345) | (407) | (407) | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 1765 | 1772 | 1814 | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 2461 | 2538 | 2630 | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | | 54.4 | 73.0 | 85.0 | | | | |
| | | (lb in) | | | | (482) | (647) | (753) | | | | |
| | $n_{base}$ (400 V) | rpm | | | | 1997 | 1814 | 1737 | | | | |
| | $n_{base}$ (530 V) | rpm | | | | 2763 | 2552 | 2517 | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | | | 78.0 | 118 | 150 | 150 | | |
| | | (lb in) | | | | | (691) | (1045) | (1328) | (1328) | | |
| | $n_{base}$ (400 V) | rpm | | | | | 1869 | 1676 | 1523 | 1576 | | |
| | $n_{base}$ (530 V) | rpm | | | | | 2531 | 2303 | 2115 | 2197 | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | | | 116 | 156 | 200 | | |
| | | (lb in) | | | | | | (1027) | (1382) | (1771) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1934 | 1840 | 1857 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2607 | 2496 | 2537 | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | | 118 | 159 | 240 | 280 | |
| | | (lb in) | | | | | | (1045) | (1408) | (2126) | (2480) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 1988 | 1893 | 1719 | 1656 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 2663 | 2552 | 2341 | 2299 | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | 112 | 153 | 234 | 314 | 320 |
| | | (lb in) | | | | | | (992) | (1355) | (2072) | (2781) | (2834) |
| | $n_{base}$ (400 V) | rpm | | | | | | 2051 | 1983 | 1851 | 1724 | 1835 |
| | $n_{base}$ (530 V) | rpm | | | | | | 2737 | 2658 | 2500 | 2347 | 2494 |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | | 163 | 249 | 334 | 380 |
| | | (lb in) | | | | | | | (1444) | (2205) | (2958) | (3366) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 1993 | 1840 | 1688 | 1624 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2674 | 2489 | 2299 | 2220 |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | | 164 | 251 | 337 | 430 |
| | | (lb in) | | | | | | | (1452) | (2223) | (2985) | (3808) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 2072 | 1956 | 1835 | 1756 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 2774 | 2626 | 2479 | 2389 |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | | 251 | 338 | 520 |
| | | (lb in) | | | | | | | | (2223) | (2994) | (4605) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 1999 | 1904 | 1703 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2679 | 2563 | 2310 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 241 | 326 | 514 |
| | | (lb in) | | | | | | | | (2134) | (2887) | (4552) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2030 | 1946 | 1756 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2711 | 2605 | 2368 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 239 | 324 | 513 |
| | | (lb in) | | | | | | | | (2117) | (2870) | (4543) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2053 | 1992 | 1842 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 2738 | 2658 | 2475 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | | 325 | 518 |
| | | (lb in) | | | | | | | | | (2878) | (4588) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 2053 | 1941 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 2733 | 2597 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | | 304 | 491 |
| | | (lb in) | | | | | | | | | (2692) | (4349) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 2109 | 2020 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 2803 | 2695 |

*Rated speed $n_N$ = 3000 rpm, dynamics package 1, PWM = 4 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 5.00 | 5.00 | | | | | | | | |
| | | (lb in) | (44.3) | (44.3) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 2742 | 3291 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 3755 | 4669 | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | | 7.00 | | | | | | | | |
| | | (lb in) | | (62.0) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 3206 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 4500 | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | | 10.00 | 10.00 | | | | | | | |
| | | (lb in) | | (88.6) | (88.6) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 3241 | 3410 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 4486 | 4830 | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | | | 14.0 | | | | | | | |
| | | (lb in) | | | (124) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 3530 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 4901 | | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | | 25.0 | 25.0 | 25.0 | | | | | |
| | | (lb in) | | | (221) | (221) | (221) | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 2988 | 3642 | 3797 | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 4029 | 4985 | 5203 | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | | 39.3 | 40.0 | 40.0 | | | | |
| | | (lb in) | | | | (348) | (354) | (354) | | | | |
| | $n_{base}$ (400 V) | rpm | | | | 3038 | 3586 | 3994 | | | | |
| | $n_{base}$ (530 V) | rpm | | | | 4113 | 4866 | 5477 | | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | | | 54.4 | 80.0 | 80.0 | | | |
| | | (lb in) | | | | | (482) | (709) | (709) | | | |
| | $n_{base}$ (400 V) | rpm | | | | | 2842 | 2719 | 3111 | | | |
| | $n_{base}$ (530 V) | rpm | | | | | 3809 | 3645 | 4195 | | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | | | 80.1 | 109 | 130 | | |
| | | (lb in) | | | | | | (709) | (965) | (1151) | | |
| | $n_{base}$ (400 V) | rpm | | | | | | 2883 | 2801 | 3170 | | |
| | $n_{base}$ (530 V) | rpm | | | | | | 3850 | 3750 | 4248 | | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | | | 114 | 165 | 165 | |
| | | (lb in) | | | | | | | (1010) | (1461) | (1461) | |
| | $n_{base}$ (400 V) | rpm | | | | | | | 2784 | 2689 | 3032 | |
| | $n_{base}$ (530 V) | rpm | | | | | | | 3723 | 3596 | 4071 | |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | | 117 | 181 | 185 | |
| | | (lb in) | | | | | | | (1036) | (1603) | (1638) | |
| | $n_{base}$ (400 V) | rpm | | | | | | | 2642 | 2521 | 2921 | |
| | $n_{base}$ (530 V) | rpm | | | | | | | 3528 | 3380 | 3908 | |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | | 115 | 179 | 210 | 210 |
| | | (lb in) | | | | | | | (1019) | (1585) | (1860) | (1860) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 2879 | 2747 | 2874 | 3164 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 3839 | 3676 | 3834 | 4245 |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | | | 179 | 241 | 250 |
| | | (lb in) | | | | | | | | (1585) | (2134) | (2214) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2879 | 2769 | 3243 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3839 | 3707 | 4340 |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | | 181 | 246 | 320 |
| | | (lb in) | | | | | | | | (1603) | (2179) | (2834) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2837 | 2758 | 2953 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3781 | 3686 | 3945 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 166 | 228 | 364 |
| | | (lb in) | | | | | | | | (1470) | (2019) | (3224) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2958 | 2885 | 2711 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3934 | 3844 | 3623 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | | 227 | 363 |
| | | (lb in) | | | | | | | | | (2010) | (3215) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 2916 | 2780 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 3877 | 3708 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | | 229 | 372 |
| | | (lb in) | | | | | | | | | (2028) | (3295) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 2911 | 2812 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 3862 | 3741 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | | | 318 |
| | | (lb in) | | | | | | | | | | (2816) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | | 3178 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | | 4223 |

*Rated speed $n_N$ = 3000 rpm, dynamics package 2, PWM = 4 kHz*

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL71S4 370 W | $M_{max}$ | Nm | 5.31 | 8.50 | | | | | | | | |
| | | (lb in) | (47.0) | (75.3) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | 2630 | 2334 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | 3621 | 3382 | | | | | | | | |
| DRL71M4 550 W | $M_{max}$ | Nm | | 11.7 | | | | | | | | |
| | | (lb in) | | (104) | | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 2327 | | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 3270 | | | | | | | | |
| DRL80S4 750 W | $M_{max}$ | Nm | | 13.5 | 25.0 | | | | | | | |
| | | (lb in) | | (120) | (221) | | | | | | | |
| | $n_{base}$ (400 V) | rpm | | 2573 | 1849 | | | | | | | |
| | $n_{base}$ (530 V) | rpm | | 3579 | 2735 | | | | | | | |
| DRL80M4 1.1 kW | $M_{max}$ | Nm | | | 28.6 | 30.0 | | | | | | |
| | | (lb in) | | | (253) | (266) | | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 2229 | 2215 | | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 3171 | 3178 | | | | | | |
| DRL90L4 2.2 kW | $M_{max}$ | Nm | | | 28.0 | 42.9 | 46.0 | | | | | |
| | | (lb in) | | | (248) | (380) | (407) | | | | | |
| | $n_{base}$ (400 V) | rpm | | | 2735 | 2489 | 2644 | | | | | |
| | $n_{base}$ (530 V) | rpm | | | 3705 | 3431 | 3684 | | | | | |
| DRL100L4 2.2 kW | $M_{max}$ | Nm | | | | 39.3 | 52.9 | 79.9 | 85.0 | | | |
| | | (lb in) | | | | (348) | (469) | (708) | (753) | | | |
| | $n_{base}$ (400 V) | rpm | | | | 3038 | 2883 | 2580 | 2616 | | | |
| | $n_{base}$ (530 V) | rpm | | | | 4113 | 3938 | 3586 | 3698 | | | |
| DRL132S4 5.5 kW | $M_{max}$ | Nm | | | | | 54.4 | 83.0 | 111 | 150 | | |
| | | (lb in) | | | | | (482) | (735) | (983) | (1328) | | |
| | $n_{base}$ (400 V) | rpm | | | | | 2842 | 2678 | 2508 | 2291 | | |
| | $n_{base}$ (530 V) | rpm | | | | | 3809 | 3604 | 3398 | 3129 | | |
| DRL132MC4 9.2 kW | $M_{max}$ | Nm | | | | | | 80.1 | 109 | 166 | 200 | |
| | | (lb in) | | | | | | (709) | (965) | (1470) | (1771) | |
| | $n_{base}$ (400 V) | rpm | | | | | | 2883 | 2801 | 2637 | 2654 | |
| | $n_{base}$ (530 V) | rpm | | | | | | 3850 | 3750 | 3551 | 3580 | |
| DRL160M4 11.0 kW | $M_{max}$ | Nm | | | | | | | 114 | 174 | 233 | 280 |
| | | (lb in) | | | | | | | (1010) | (1541) | (2064) | (2480) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 2784 | 2621 | 2463 | 2415 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 3723 | 3517 | 3322 | 3275 |
| DRL160MC4 15.0 kW | $M_{max}$ | Nm | | | | | | | 117 | 181 | 243 | 320 |
| | | (lb in) | | | | | | | (1036) | (1603) | (2152) | (2834) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 2642 | 2521 | 2405 | 2341 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 3528 | 3380 | 3227 | 3206 |
| DRL180S4 15.0 kW | $M_{max}$ | Nm | | | | | | | 115 | 179 | 241 | 379 |
| | | (lb in) | | | | | | | (1019) | (1585) | (2134) | (3357) |
| | $n_{base}$ (400 V) | rpm | | | | | | | 2879 | 2747 | 2610 | 2294 |
| | $n_{base}$ (530 V) | rpm | | | | | | | 3839 | 3676 | 3502 | 3106 |
| DRL180M4 18.5 kW | $M_{max}$ | Nm | | | | | | | | 179 | 241 | 380 |
| | | (lb in) | | | | | | | | (1585) | (2134) | (3366) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2879 | 2769 | 2521 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3839 | 3707 | 3391 |

Table continued on next page.

| Motor | | | Assignment to MOVIAXIS® MXA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 1 | | | 2 | | 3 | | 4 | 5 | 6 |
| Type | $I_N$ | [A] | 2 | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 64 | 100 |
| | $I_{max}$ | [A] | 5 | 10 | 20 | 30 | 40 | 60 | 80 | 120 | 160 | 250 |
| DRL180L4 22.0 kW | $M_{max}$ | Nm | | | | | | | | 181 | 246 | 390 |
| | | (lb in) | | | | | | | | (1603) | (2179) | (3454) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2837 | 2758 | 2563 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3781 | 3686 | 3444 |
| DRL180LC4 30.0 kW | $M_{max}$ | Nm | | | | | | | | 166 | 228 | 364 |
| | | (lb in) | | | | | | | | (1470) | (2019) | (3224) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | 2958 | 2885 | 2711 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | 3934 | 3844 | 3623 |
| DRL200L4 30.0 kW | $M_{max}$ | Nm | | | | | | | | | 227 | 363 |
| | | (lb in) | | | | | | | | | (2010) | (3215) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 2916 | 2780 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 3877 | 3708 |
| DRL225S4 37.0 kW | $M_{max}$ | Nm | | | | | | | | | 229 | 372 |
| | | (lb in) | | | | | | | | | (2028) | (3295) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | 2911 | 2812 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | 3862 | 3741 |
| DRL225MC4 55.0 kW | $M_{max}$ | Nm | | | | | | | | | | 318 |
| | | (lb in) | | | | | | | | | | (2816) |
| | $n_{base}$ (400 V) | rpm | | | | | | | | | | 3178 |
| | $n_{base}$ (530 V) | rpm | | | | | | | | | | 4223 |

## 10.5 Braking resistor selection

**⚠ DANGER**

The supply cables to the braking resistor carry a **high DC voltage (about DC 900 V)**.

Severe or fatal injuries from electric shock.

- The braking resistor cables must be suitable for this high DC voltage.
- Install the braking resistor cables according to the regulations.

**⚠ WARNING**

The surfaces of the braking resistors get very hot when the braking resistors are loaded with $P_N$.

Risk of burns and fire.

- Choose a suitable installation location. Braking resistors are usually mounted on top of the control cabinet.
- Do not touch the braking resistors.

**INFORMATION**

- The data in this chapter apply to BW... braking resistors .
- The **maximum permitted line length** between **MOVIAXIS®** and the braking resistor is **100 m**.

**NOTICE**

A thermal overload relay is necessary to protect the braking resistor against overload. These relay types offer a setting option for the trip current. Set the trip current to the nominal current of the resistor.

Do not use a motor protection switch.

**Important: Do not open** the power contacts of the braking resistors in case of thermal overload. The connection between braking resistor DC link **must not be interrupted**. Instead, the control contact of the overload relay opens relay K11 (→ Operating instructions, section "Wiring diagrams").

### 10.5.1 Table of braking resistors

| MOVIAXIS® MX supply module | | | Size 1 | Size 2 | Size 3 | |
|---|---|---|---|---|---|---|
| | | | 10 kW | 25 kW | 50 kW | 75 kW |
| | | Minimum braking resistance R in Ω | 27 | 12 | 5.8 | 3.6 |
| Braking resistors | Trip current [1] | Part number | | | | |
| BW027-006 | $I_F$ = 4.7 A | 822 422 6 | **0.6 kW** continuous 34 kW $P_{max}$ 27 Ω | **0.6 kW** continuous 34 kW $P_{max}$ 27 Ω | **0.6 kW** continuous 34 kW $P_{max}$ 27 Ω | **0.6 kW** continuous 34 kW $P_{max}$ 27 Ω |
| BW027-012 | $I_F$ = 6.7 A | 822 423 4 | **1.2 kW** continuous 34 kW $P_{max}$ 27 Ω | **1.2 kW** continuous 34 kW $P_{max}$ 27 Ω | **1.2 kW** continuous 34 kW $P_{max}$ 27 Ω | **1.2 kW** continuous 34 kW $P_{max}$ 27 Ω |
| BW247 | $I_F$ = 6.5 A | 820 714 3 | **2 kW** continuous 20 kW $P_{max}$ 47 Ω | **2 kW** continuous 20 kW $P_{max}$ 47 Ω | **2 kW** continuous 20 kW $P_{max}$ 47 Ω | **2 kW** continuous 20 kW $P_{max}$ 47 Ω |
| BW247-T[2] | $I_F$ = 6.5 A | 1 820 048 2 | **2 kW** continuous 20 kW $P_{max}$ 47 Ω | **2 kW** continuous 20 kW $P_{max}$ 47 Ω | **2 kW** continuous 20 kW $P_{max}$x 47 Ω | **2 kW** continuous 20 kW $P_{max}$ 47 Ω |
| BW347 | $I_F$ = 9.2 A | 820 798 4 | **4 kW** continuous 20 kW $P_{max}$ 47 Ω | **4 kW** continuous 20 kW $P_{max}$ 47 Ω | **4 kW** continuous 20 kW $P_{max}$ 47 Ω | **4 kW** continuous 20 kW $P_{max}$ 47 Ω |
| BW347-T[2] | $I_F$ = 9.2 A | 1 820 135 0 | **4 kW** continuous 20 kW $P_{max}$ 47 Ω | **4 kW** continuous 20 kW $P_{max}$ 47 Ω | **4 kW** continuous 20 kW $P_{max}$ 47 Ω | **4 kW** continuous 20 kW $P_{max}$ 47 Ω |
| BW039-050-T[2] | $I_F$ = 11.3 A | 1 820 137 7 | **5 kW** continuous 24 kW $P_{max}$ 39 Ω | **5 kW** continuous 24 kW $P_{max}$ 39 Ω | **5 kW** continuous 24 kW $P_{max}$ 39 Ω | **5 kW** continuous 24 kW $P_{max}$ 39 Ω |
| BW012-015 | $I_F$ = 11.2 A | 821 679 7 | | **1.5 kW** continuous 62.5 kW $P_{max}$ 12 Ω | **1.5 kW** continuous 62.5 kW $P_{max}$ 12 Ω | **1.5 kW** continuous 62.5 kW $P_{max}$ 12 Ω |
| BW012-015 1 Ω central tap[3] | $I_F$ = 14.4 A | 1 820 010 9 | | **1.5 kW** continuous 62.5 kW $P_{max}$ 12 Ω | **1.5 kW** continuous 62.5 kW $P_{max}$ 12 Ω | **1.5 kW** continuous 62.5 kW $P_{max}$ 12 Ω |
| BW012-025 | $I_F$ = 14.4 A | 821 680 0 | | **2.5 kW** continuous 62.5 kW $P_{max}$ 12 Ω | **2.5 kW** continuous 62.5 kW $P_{max}$ 12 Ω | **2.5 kW** continuous 62.5 kW $P_{max}$ 12 Ω |
| BW012-025-P[4] | $I_F$ = 14.4 A | 1 820 414 7 | | **2.5 kW** continuous 62.5 kW $P_{max}$ 12 Ω | **2.5 kW** continuous 62.5 kW $P_{max}$ 12 Ω | **2.5 kW** continuous 62.5 kW $P_{max}$ 12 Ω |
| BW012-050 | $I_F$ = 20.4 A | 821 681 9 | | **5 kW** continuous 62.5 kW $P_{max}$ 12 Ω | **5 kW** continuous 62.5 kW $P_{max}$ 12 Ω | **5 kW** continuous 62.5 kW $P_{max}$ 12 Ω |
| BW012-100-T[2] | $I_F$ = 28.8 A | 1 820 141 5 | | **10 kW** continuous 62.5 kW $P_{max}$ 12 Ω | **10 kW** continuous 62.5 kW $P_{max}$ 12 Ω | **10 kW** continuous 62.5 kW $P_{max}$ 12 Ω |
| BW915-T[2] | $I_F$ = 31.6 A | 1 820 413 9 | | **16 kW** continuous 62.5 kW $P_{max}$ 15 Ω | **16 kW** continuous 62.5 kW $P_{max}$ 15 Ω | **16 kW** continuous 62.5 kW $P_{max}$ 15 Ω |

Table continued on next page. Footnotes on next page.

| MOVIAXIS® MX supply module | | | Size 1 | Size 2 | Size 3 | |
|---|---|---|---|---|---|---|
| | | | 10 kW | 25 kW | 50 kW | 75 kW |
| Minimum braking resistance R in Ω | | | 27 | 12 | 5.8 | 3.6 |
| Braking resistors | Trip current [1] | Part number | | | | |
| **BW006-025-01**<br>**1 Ω central tap[3]** | $I_F$ = 20.76 A | 1 820 011 7 | | | **2.5 kW** continuous<br>156 kW $P_{max}$<br>6 Ω | **2.5 kW** continuous<br>156 kW $P_{max}$<br>6 Ω |
| **BW006-050-01**<br>**1 Ω central tap[3]** | $I_F$ = 29.4 A | 1 820 012 5 | | | **5 kW** continuous<br>156 kW $P_{max}$<br>6 Ω | **5 kW** continuous<br>156 kW $P_{max}$<br>6 Ω |
| **BW004-050-01**<br>**1 Ω central tap[3]** | $I_F$ = 37.3 A | 1 820 013 3 | | | | **5 kW** continuous<br>235 kW $P_{max}$<br>4 Ω |
| **BW106-T[2]** | $I_F$ = 46.5 A | 1 820 083 4 | | | **13 kW** continuous<br>125 kW $P_{max}$<br>6 Ω | **13 kW** continuous<br>125 kW $P_{max}$<br>6 Ω |
| **BW206-T[2]** | $I_F$ = 54.7 A | 1 820 412 0 | | | **18 kW** continuous<br>125 kW $P_{max}$<br>6 Ω | **18 kW** continuous<br>125 kW $P_{max}$<br>6 Ω |
| **Internal braking resistor (MXP81A-010)** | | | **0.2 kW** continuous<br>25 kW $P_{max}$<br>27 Ω | | | |

1) See note on how to protect the braking resistor in the section "Overload protection of the braking resistor".

2) Braking resistor with temperature switch

3) Braking resistors with 1 Ω center tap are only required when a DC link discharge module is used

4) Braking resistor with temperature relay

### 10.5.2 Selection criteria

Selection of the braking resistor is based on the following criteria:

- Peak braking power
- Brake chopper
- Thermal braking power

### 10.5.3 Peak braking power

The DC link voltage and the braking resistor value determine the maximum braking power that the braking resistor can handle for a short period of time.

The peak braking power is determined as follows:

$$P_{max} = \frac{U^2_{DC}}{R}$$

1721694219

$V_{DC}$ is the maximum DC link voltage that is DC 970 V for MOVIAXIS®.

The peak braking power for each braking resistor is listed in the table of braking resistors.

### 10.5.4 Brake chopper

- Peak braking power

  The brake chopper has the same overload characteristics as the supply module and therefore does not have to be considered for project planning.

- Continuous braking power

  The brake chopper can cope with 50% of the nominal power of the supply module as continuous braking power. The value $P_{100\%cdf}$ described in the following section "Thermal braking power" is used as the basis for the calculation here.

$$P_{100\%cdf} < \frac{\text{Nominal power of supply module}}{2}$$

1721697803

### 10.5.5 Thermal braking power

The thermal braking power must be taken into account when carrying out project planning for the braking resistor.

This condition takes into account the heating of the braking resistor over the entire cycle.

The thermal braking power is calculated using the energy content of the entire cycle.

- **Determining the regenerative energy**

$$W_{tot} = P_{gen\ 1} \times t_1 + P_{gen\ 2} \times t_2 + ..... + P_{gen\ n} \times t_n$$

1721726475

| | |
|---|---|
| $W_{tot}$ | Regenerative energy during the entire cycle. |
| $P_{gen}$ | Power in the regenerative travel section (the constant average value of the peak power can be used for sections with deceleration). |
| $t_n$ | Duration of the individual travel sections |

The motor travel sections and pauses are not taken into account.

- **Determining the virtual braking time**

The virtual braking time is the time during which the regenerative energy $W_{tot}$ is reduced to a braking operation. The power value is based on the maximum occurring regenerative power.

$$t_{vB} = \frac{W_{tot}}{P_{gen\ max}}$$

1721729547

| | |
|---|---|
| $t_{vB}$ | Virtual braking time |
| $P_{gen\ max}$ | Maximum occurring regenerative power |

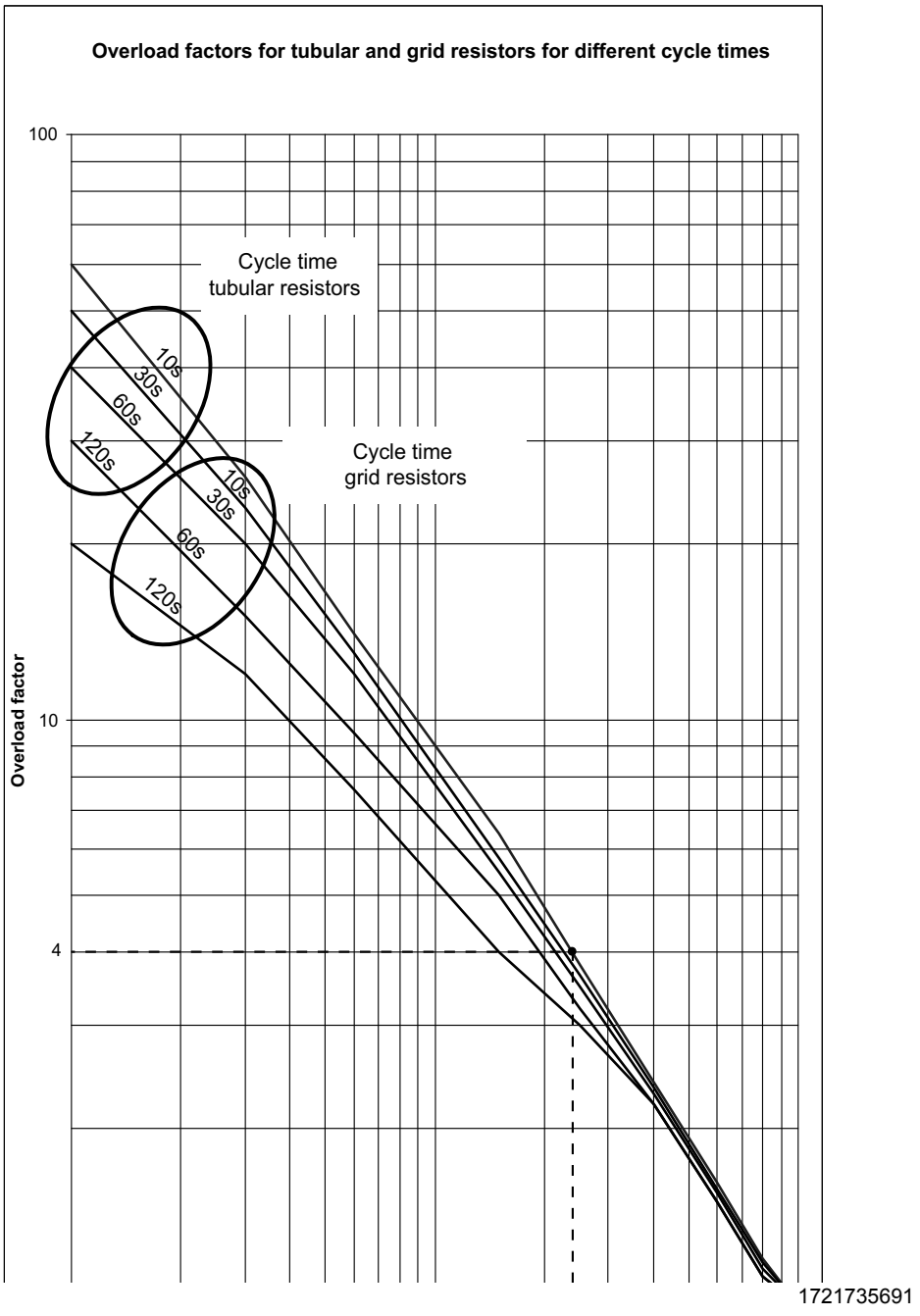
- **Determining the relative regenerative cyclic duration factor**

$$cdf_{regen} = \frac{t_{vB}}{T}$$

1721732619

| | |
|---|---|
| $CDF_{regen}$ | Relative regenerative cyclic duration factor with reference on the virtual braking time |
| T | Cycle time (cycle duration) (pauses and motor travel sections not included in calculation) |

- **Determining the overload factor**




- **Determining the required braking resistor power**

The overload factor can be used to calculate the required braking resistor power based on 100% CDF (catalog value).

$$P_{100\%cdf} = \frac{P_{gen\ max}}{\text{Overload factor}}$$

1721915787

$P_{100\%cdf}$ Braking resistor power based on 100% CDF

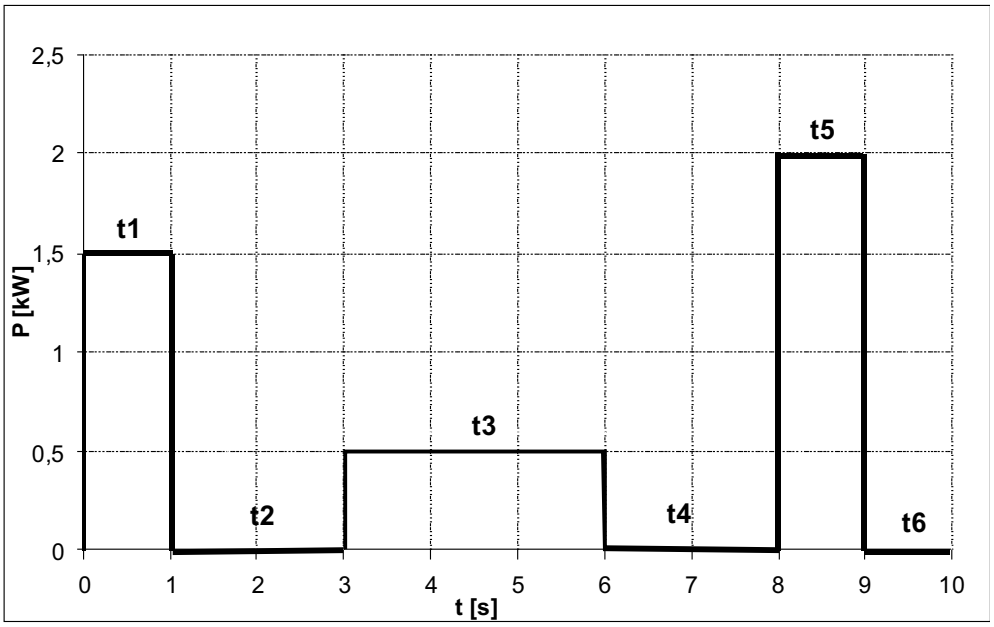
- **Selecting the braking resistor from the catalog**

With 100% CDF power, the braking resistor can be selected from the catalog.

### 10.5.6 Sample calculation for a 10 kW supply module

- Minimum permitted braking resistance: 27 Ω
- Seven braking resistors are assigned to the 10 kW supply module, see "Table of braking resistors".

The following figure shows the sum of the regenerative power of all axes.




1721970187

*Determining the fed back energy*

$$W_{tot} = P_{gen\ 1} \times t_1 + P_{gen\ 2} \times t_2 + ..... + P_{gen\ n} \times t_n$$

$$W_{tot} = 1.5\ kW \times 1\ s + 0.5\ kW \times 3\ s + 2\ kW \times 1\ s = 5\ kWs$$

1721973259

*Determining the virtual braking time*

$$t_{vB} = \frac{W_{tot}}{P_{gen\ max}}$$

$$t_{vB} = \frac{5\ kWs}{2\ kW} = 2.5\ s$$

1721975179

*Determining the relative regenerative cyclic duration factor*

$$cdf_{gen} = \frac{t_{vB}}{T}$$

$$cdf_{gen} = \frac{2.5\ s}{10\ s} = 25\ \%$$

1721977099

*Determining the overload factor*

Determining the factor using the "Overload factor" diagram.

Overload factor: 4 (with $cdf_{regen}$= 25%, laminated resistor and cycle time = 10 s).

*Determining the required braking resistor power*

$$P_{100\%cdf} = \frac{P_{gen\ max}}{\text{Overload factor}}$$

$$P_{100\%cdf} = \frac{2\ kW}{4} = 500\ W$$

1721984523

*Braking resistor selection*

The following braking resistor is selected from the catalog:

BW027-006 with 600 W continuous power.

### 10.5.7 Overload protection of the braking resistor

**NOTICE**

A thermal overload relay is necessary to protect the braking resistor against overload. These relay types offer a setting option for the trip current. Set the trip current to the nominal current of the resistor.

Do not use a motor protection switch.

**Important: Do not open** the power contacts of the braking resistors in case of thermal overload. The connection between braking resistor DC link **must not be interrupted**. Instead, the control contact of the overload relay opens relay K11 (→ Operating instructions, section "Wiring diagrams").

### 10.5.8 Unit temperature

**⚠ WARNING**

The surfaces of the braking resistors get very hot when the braking resistors are loaded with $P_N$.

Risk of burns and fire.

- Choose a suitable installation location. Braking resistors are usually mounted on top of the control cabinet.
- Do not touch the braking resistors.

**INFORMATION**

Braking resistors can become very hot during operation. The high temperatures can heat up the cage of the braking resistor to over 100 °C.

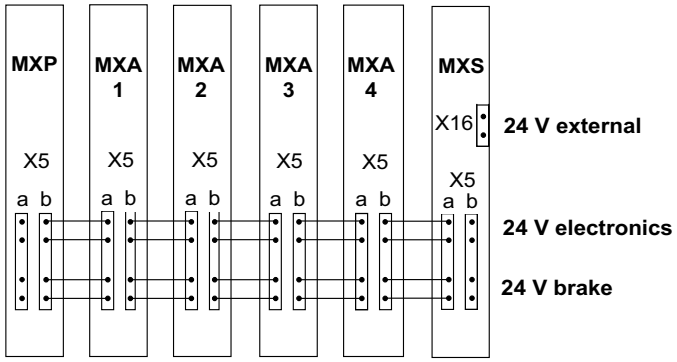
This means that the ventilation, size of the installation site and distance to components and parts at risk must be provided accordingly.

The braking resistor usually delivers its nominal power for an extended period of time.

## 10.6 Selecting the 24 V supply

The axis modules require a supply voltage of 24 V at two separate connection terminals:

- Supply of electronics,
- Supply of brakes.

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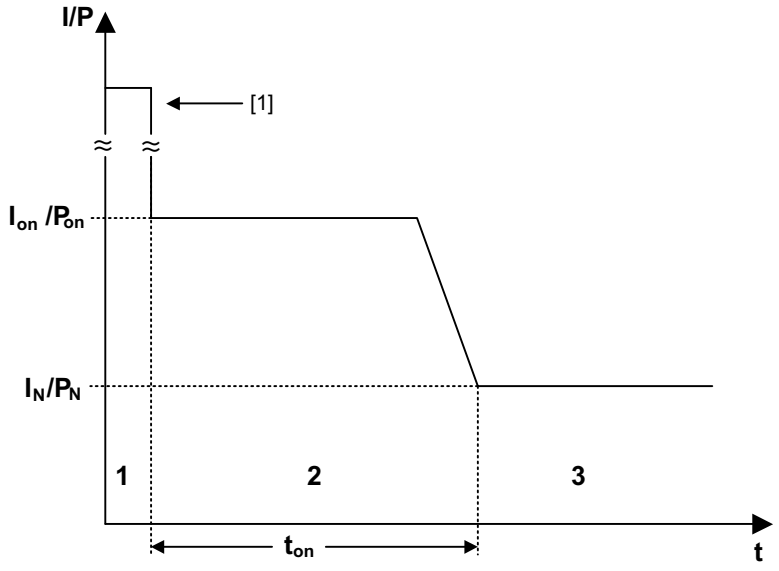
| | | | |
|---|---|---|---|
| **24 V** | DC 24 V voltage supply | **MXA 1 ... MXA 4** | Axis modules unit 1 to unit 8 |
| **MXP** | Supply module | **MXS** | 24 V switched-mode power supply |

| | |
|---|---|
| | **INFORMATION** |
| | MXS is equipped with two separate electronics supply voltage and one brake supply voltage. For information on the terminal assignment of the MXS, refer to the Installation chapter (page 560). |

### 10.6.1 Project planning for 24 V supply power

The current path and power ratios present when switching on the 24 V voltage supply are shown in the figure below.

The current path is basically divided into three time ranges.

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[1] Charging current due to internal input capacitance $C_{input}$

1. Describes the charging process of the input capacitors in each unit. A time period cannot be specified because the charging time is significantly influenced by the property of the power supply and the cable dimensioning. You therefore have to calculate the total of all unit capacitances using the table below. Manufacturers of switched-mode power supplies usually specify technical data about the loadable capacitances. The charging time 1 is very short in comparison with time range 2. The SEW switched-mode power supply module MXS is capable of reliably activating the combination of units with the highest possible capacitance.
2. This is the time interval when the unit's internal switched-mode power supplies start up. The total of the maximum power consumption must be calculated for this time period. The power supply must be capable of providing this total power for at least 100 ms. The SEW switched-mode power supply module MXS meets this requirement.
3. Nominal power range. The required rated power of the supply source results from the total rated power of all connected devices.

Table for project planning according to points 1 – 3.

| Unit type | Supply voltage for electronics [V] | Nominal current $I_N$ [A] / nominal power $P_N$ [W] (with fan) | Max. inrush current[1] [A] / Power $P_{on}$ [W] (Without fan) | Switch-on pulse duration $t_{on}$ [ms] | Input capacitance $C_{on}$ [µF] |
|---|---|---|---|---|---|
| MXA BG1 | 18 – 30 | 0.7 / 17 | 2 / 48 | 60 | 600 |
| MXA BG2 | | 0.95 / 23 | 2.2 / 53 | 70 | 600 |
| MXA BG3 | | 1.3 / 31.2 | 2.1 / 50 | 90 | 600 |
| MXA BG4 | | 2.2 / 53 | 2 / 48 | 80 | 700 |
| MXA BG5 | | 2.3 / 55 | 2 / 48 | 80 | 700 |
| MXA BG6 | | 3.2 / 77 | 2.5 / 60 | 60 | 1000 |
| | | | | | |
| MXP BG1 | 18 – 30 | 0.5 / 12 | 0.3 / 7 | 40 | 100 |
| MXP BG2 | | 0.7 / 17 | 1.2 / 29 | 20 | 300 |
| MXP BG3 | | 0.8 / 19 | 0.6 / 14 | 60 | 500 |
| MXP81 | | 0.7 / 17 | 0.4 / 10 | 50 | 100 |
| | | | | | |
| MXR | 18 – 30 | 3.8 / 91 | 3.5 / 84 | 90 | 1000 |
| | | | | | |
| MXZ | 18 – 30 | 0.1 / 2.5 | 0.3 / 7 | 60 | 50 |
| MXC | | 1 / 24 | 2.7 / 65 | 400 | 300 |
| | | | | | |
| MXM[2] | 18 – 30 | 0.6 / 14.4 | 0.6 / 14.4 | 30 | 50 |

Table continued on next page. Footnotes on next page.

| Unit type | Supply voltage for electronics [V] | Nominal current $I_N$ [A] / nominal power $P_N$ [W] (with fan) | Max. inrush current[1] [A] / Power $P_{on}$ [W] (Without fan) | Switch-on pulse duration $t_{on}$ [ms] | Input capacitance $C_{on}$ [µF] |
|---|---|---|---|---|---|
| | | **P [W]** | – | – | – |
| XSE | is part of the basic unit | | | – | – |
| XFE | Power supply via basic unit | 3 | – | – | – |
| XFP | | 3 | is taken into account in the specifications of the basic unit | – | – |
| XFA | | 2 | | – | – |
| XIO | | 1 | | – | – |
| XIA | | 1 | | – | – |
| XGH[3] | | 2 | | – | – |
| XGS[3] | | 2 | | – | – |

1) The maximum inrush current can be smaller than the nominal current in some cases, as there is no fan active yet when the unit is switched on.

2) Valid in combination with DHx and UFx

3) Specifications without encoder connected. Maximum power that can be connected: 12 W

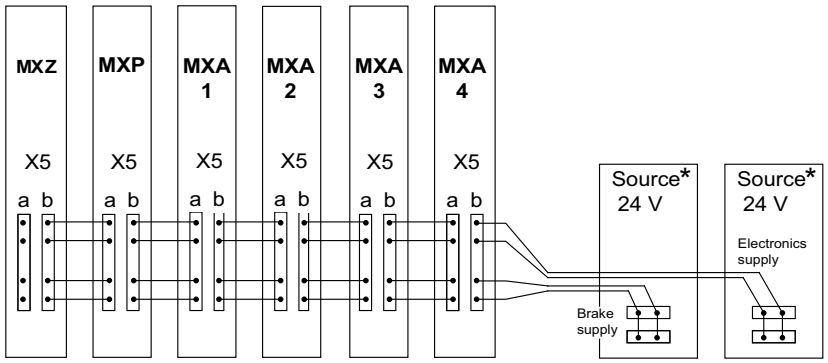
*MOVIAXIS® MXM electronics data*

*Power consumption of MOVIAXIS® MXM master module*

| Master module | |
|---|---|
| **Power** | See technical data of the integrated card. Due to the efficiency of 85% of the integrated switched-mode power supply unit, the power consumption of the integrated card must be multiplied by factor 1.2. |

### 10.6.2 Single- and dual-bus supply

The following figure shows a single-bus electronics and brake supply.

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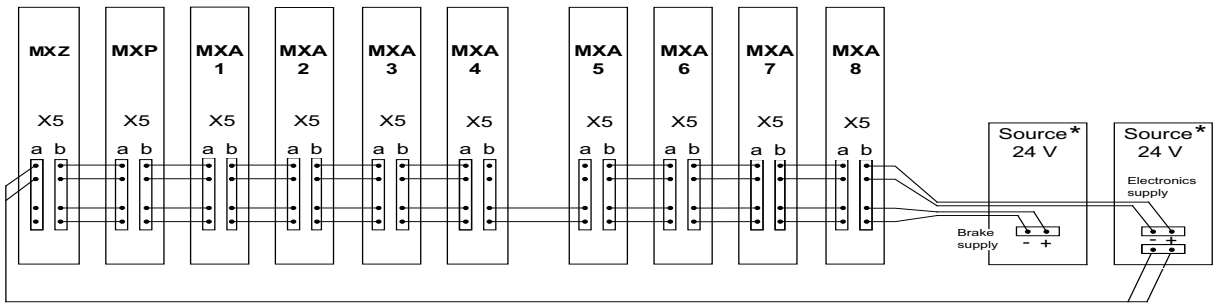
The figure "Dual-bus electronics and brake supply" shows the separation of the 24 V electronics supply between the MXA 4 axis module and the MXA 5 axis module and is a sample application for the current load at plug-in contacts > 10 A. If the anticipated current load >10 A, you must install the two-bus supply.

The breakpoint of the electronics supply with dual-bus supply must be arranged so that the current loads of the two segments are split evenly.

The following figure shows a dual-bus electronics and brake supply.

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* We recommend the 24 V switched-mode power supply module MXS from SEW-EURODRIVE

### 10.6.3 Requirements on the voltage tolerance of the 24 V supply

Three cases have to be distinguished when carrying out the project planning for the 24 V voltage supply.

1. The following servo brakemotors are connected to the MOVIAXIS® axis system, or combined operation with the motors mentioned in case 2.
   - CMP40 / 50 / 63 / 71: Cable length < 25 m
2. The brake output is used as control output (e.g. brake control via a BMK, BME brake rectifier); that is, only the following servo brakemotors are connected to the MOVIAXIS® axis system, or the brake cables have the specified lengths:
   - DRL
   - CT/CV
   - CFM,
   - For brake cable lengths larger than 25 m,
   - CMP40 / 50 / 63 / 71 for brake cable lengths larger than 25 m,
   - CMP80 / 100
3. No motor with brake is connected.

| Voltage supply | Case 1 | Case no. 2[1)] | Case 3 |
|---|---|---|---|
| Electronics voltage supply | 24 V ± 25% | 24 V ± 25% | 24 V ± 25% |
| Brake voltage supply | 24 V +10% / - 0% | | None |

1) Use a common voltage source

### 10.6.4 Brake control

Motor brakes must only be controlled via binary output X6, DB00 on the MOVIAXIS® axis module and not via other electronic devices, such as controllers.

### 10.6.5 Connecting AC brakemotors

For detailed information about the SEW brake system, refer to the "AC Motors" and "Synchronous Servomotors" catalogs, which you can order from SEW-EURODRIVE.