

System SLIO

FM | 054-1DA00 | Manual

HB300 | FM | 054-1DA00 | en | 18-07

Motion Module - Pulse Train RS422 - FM 054



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1 General

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1.2 About this manual

Objective and contents

This manual describes the FM 054-1DA00 of the System SLIO.

- It describes the structure, configuration and application.
- The manual is targeted at users who have a background in automation technology.
- The manual consists of chapters. Each chapter describes a completed topic.
- For guidance, the manual provides:
 - An overall table of contents at the beginning of the manual.
 - References with pages numbers.



To be able to return to the previous view from a reference in the PDF, you should activate the page navigation in your PDF viewer.

Validity of the documentation

| Product | Order no. | as of state: | |
|--------------------|-----------|--------------|------------|
| FM 054 Pulse Train | 054-1DA00 | HW: 01 | FW: V1.1.2 |

Icons Headings

Important passages in the text are highlighted by following icons and headings:



DANGER!

Immediate or likely danger. Personal injury is possible.



CAUTION!

Damages to property is likely if these warnings are not heeded.



Supplementary information and useful tips.

1.3 Safety information

Applications conforming with specifications

The system is constructed and produced for:

- communication and process control
- general control and automation tasks
- industrial applications
- operation within the environmental conditions specified in the technical data
- installation into a cubicle



DANGER!

This device is not certified for applications in

- in explosive environments (EX-zone)

Documentation

The manual must be available to all personnel in the

- project design department
- installation department
- commissioning
- operation

**CAUTION!**

The following conditions must be met before using or commissioning the components described in this manual:

- Hardware modifications to the process control system should only be carried out when the system has been disconnected from power!
- Installation and hardware modifications only by properly trained personnel.
- The national rules and regulations of the respective country must be satisfied (installation, safety, EMC ...)

Disposal

National rules and regulations apply to the disposal of the unit!

2 Basics and mounting

2.1 Safety notes for the user



DANGER!

Protection against dangerous voltages

- When using System SLIO modules, the user must be protected from touching hazardous voltage.
- You must therefore create an insulation concept for your system that includes safe separation of the potential areas of ELV and hazardous voltage.
- Here, observe the insulation voltages between the potential areas specified for the System SLIO modules and take suitable measures, such as using PELV/SELV power supplies for System SLIO modules.

Handling of electrostatic sensitive modules

The modules are equipped with highly integrated components in MOS technology. These components are highly sensitive to over-voltages that occur, e.g. with electrostatic discharge. The following symbol is used to identify these hazardous modules:



The symbol is located on modules, module racks or on packaging and thus indicates electrostatic sensitive modules. Electrostatic sensitive modules can be destroyed by energies and voltages that are far below the limits of human perception. If a person who is not electrically discharged handles electrostatic sensitive modules, voltages can occur and damage components and thus impair the functionality of the modules or render the modules unusable. Modules damaged in this way are in most cases not immediately recognized as faulty. The error can only appear after a long period of operation. Components damaged by static discharge can show temporary faults when exposed to temperature changes, vibrations or load changes. Only the consistent use of protective devices and responsible observance of the handling rules can effectively prevent malfunctions and failures on electrostatic sensitive modules.

Shipping of modules

Please always use the original packaging for shipping.

Measurement and modification of electrostatic sensitive modules

For measurements on electrostatic sensitive modules the following must be observed:

- Floating measuring instruments must be discharged before use.
- Measuring instruments used must be grounded.

When modifying electrostatic sensitive modules, ensure that a grounded soldering iron is used.



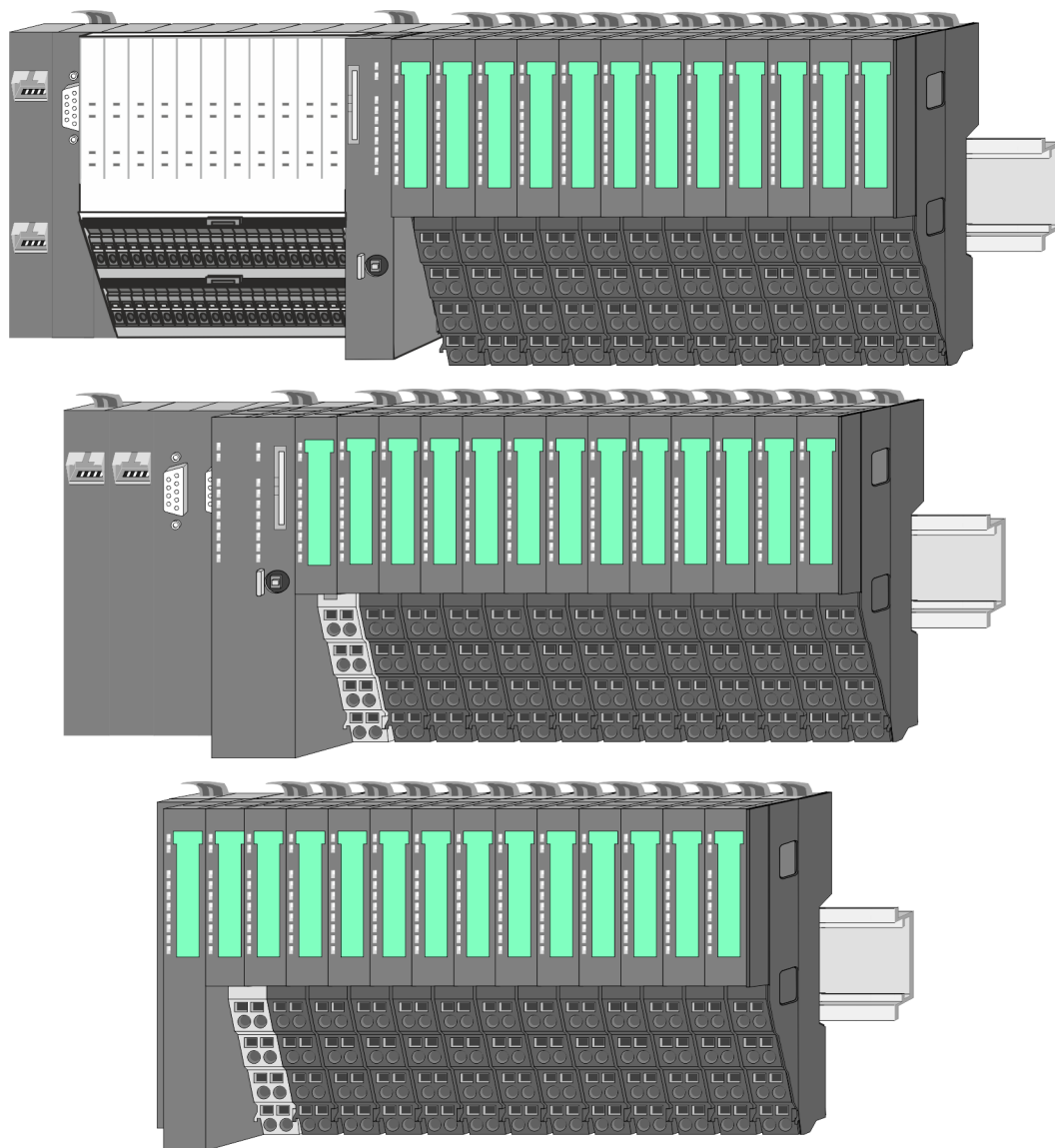
CAUTION!

When working with and on electrostatic sensitive modules, make sure that personnel and equipment are adequately grounded.

2.2 System conception

2.2.1 Overview

The System SLIO is a modular automation system for assembly on a 35mm mounting rail. By means of the periphery modules with 2, 4, 8 and 16 channels this system may properly be adapted matching to your automation tasks. The wiring complexity is low, because the supply of the DC 24V power section supply is integrated to the backplane bus and defective modules may be replaced with standing wiring. By deployment of the power modules in contrasting colors within the system, further isolated areas may be defined for the DC 24V power section supply, respectively the electronic power supply may be extended with 2A.



2.2.2 Components

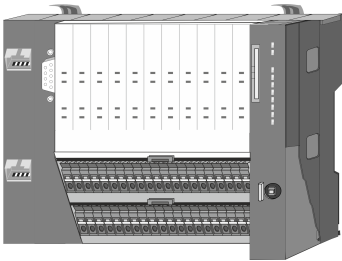
- CPU (head module)
- Bus coupler (head module)
- Line extension
- 8x periphery modules
- 16x periphery modules
- Power modules
- Accessories



CAUTION!

Only Yaskawa modules may be combined. A mixed operation with third-party modules is not allowed!

CPU 01xC



With the CPU 01xC electronic, input/output components and power supply are integrated to one casing. In addition, up to 64 periphery modules of the System SLIO can be connected to the backplane bus. As head module via the integrated power module for power supply CPU electronic and the I/O components are supplied as well as the electronic of the periphery modules, which are connected via backplane bus. To connect the power supply of the I/O components and for DC 24V power section supply of via backplane bus connected periphery modules, the CPU has removable connectors. By installing of up to 64 periphery modules at the backplane bus, these are electrically connected, this means these are assigned to the backplane bus, the electronic modules are power supplied and each periphery module is connected to the DC 24V power section supply.

CPU 01x



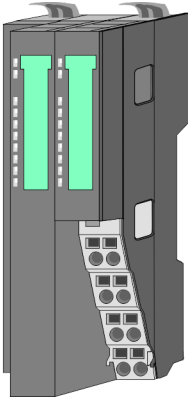
With this CPU 01x, CPU electronic and power supply are integrated to one casing. As head module, via the integrated power module for power supply, CPU electronic and the electronic of the connected periphery modules are supplied. The DC 24V power section supply for the linked periphery modules is established via a further connection of the power module. By installing of up to 64 periphery modules at the backplane bus, these are electrically connected, this means these are assigned to the backplane bus, the electronic modules are power supplied and each periphery module is connected to the DC 24V power section supply.



CAUTION!

CPU part and power module may not be separated!
Here you may only exchange the electronic module!

Bus coupler



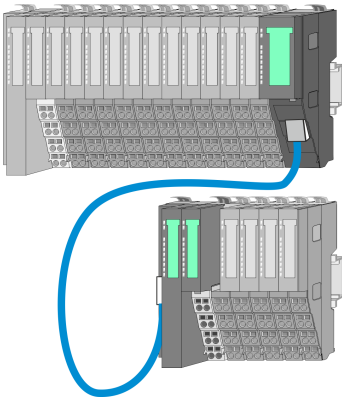
With a bus coupler bus interface and power module is integrated to one casing. With the bus interface you get access to a subordinated bus system. As head module, via the integrated power module for power supply, bus interface and the electronic of the connected periphery modules are supplied. The DC 24V power section supply for the linked periphery modules is established via a further connection of the power module. By installing of up to 64 periphery modules at the bus coupler, these are electrically connected, this means these are assigned to the backplane bus, the electronic modules are power supplied and each periphery module is connected to the DC 24V power section supply.



CAUTION!

Bus interface and power module may not be separated!
Here you may only exchange the electronic module!

Line extension

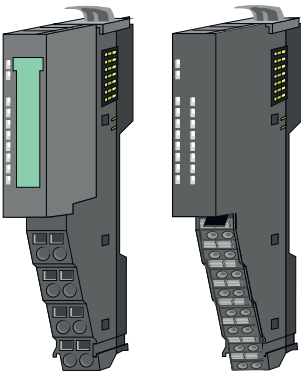


In the System SLIO there is the possibility to place up to 64 modules in on line. By means of the line extension you can divide this line into several lines. Here you have to place a line extension master at each end of a line and the subsequent line has to start with a line extension slave. Master and slave are to be connected via a special connecting cable. In this way, you can divide a line on up to 5 lines. For each line extension the maximum number of pluggable modules at the System SLIO bus is decreased by 1. To use the line extension no special configuration is required.



Please note that some modules do not support line extensions due to the system. For more information, see the 'System SLIO - Compatibility List' at www.yaskawa.eu.com

Periphery modules

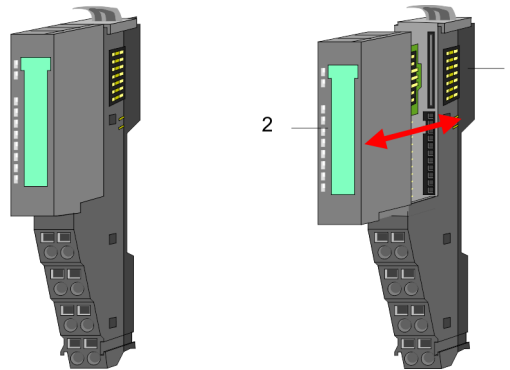


The periphery modules are available in the following 2 versions, whereby of each the electronic part can be replaced with standing wiring:

- 8x periphery module for a maximum of 8 channels.
- 16x periphery module for a maximum of 16 channels.

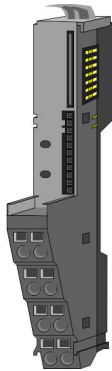
8x periphery modules

Each 8x periphery module consists of a *terminal* and an *electronic module*.



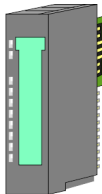
- 1 Terminal module
- 2 Electronic module

Terminal module



The *terminal* module serves to carry the electronic module, contains the backplane bus with power supply for the electronic, the DC 24V power section supply and the staircase-shaped terminal for wiring. Additionally the terminal module has a locking system for fixing at a mounting rail. By means of this locking system your system may be assembled outside of your switchgear cabinet to be later mounted there as whole system.

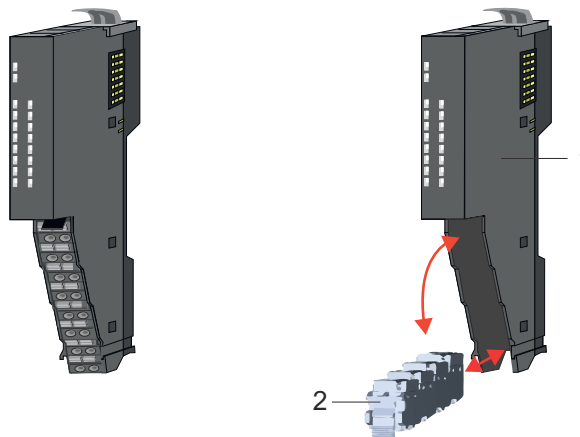
Electronic module



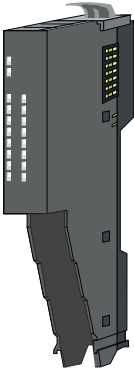
The functionality of a periphery module is defined by the *electronic module*, which is mounted to the terminal module by a sliding mechanism. With an error the defective electronic module may be exchanged for a functional module with standing installation. At the front side there are LEDs for status indication. For simple wiring each module shows corresponding connection information at the front and at the side.

16x periphery modules

Each 16x periphery module consists of an *electronic unit* and a *terminal block*.



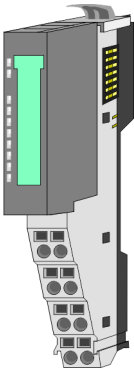
- 1 Electronic unit
- 2 Terminal block

Electronic unit

The functionality of a 16x periphery module is defined via the terminal block, which is connected to the *electronic unit* via a secure flap mechanism. In the case of an error you can exchange the defective electronic unit for a functional unit with standing wiring. At the front side there are LEDs for status indication. For easy wiring each electronic unit shows corresponding connection information at the side. The electronic unit provides the slot for the terminal block for the wiring and contains the backplane bus with power supply for the electronic and the connection to the DC 24V power section supply. Additionally the electronic unit has a locking system for fixing it at a mounting rail. By means of this locking system your system may be assembled outside of your switchgear cabinet to be later mounted there as whole system.

Terminal block

The *terminal block* provides the electrical interface for the signalling and supplies lines of the module. When mounting the terminal block, it is attached to the bottom of the electronic unit and turned towards the electronic unit until it clicks into place. With the wiring a "push-in" spring-clip technique is used. This allows a quick and easy connection of your signal and supply lines. The clamping off takes place by means of a screwdriver.

Power module

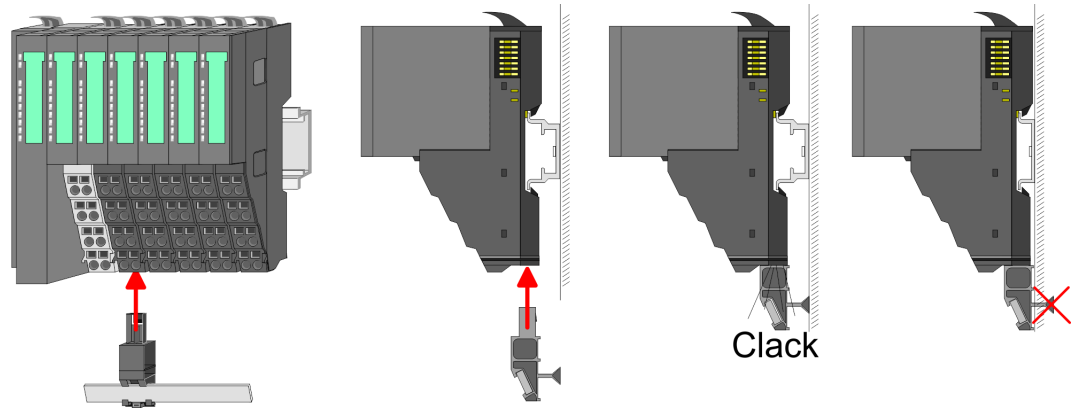
In the System SLIO the power supply is established by power modules. These are either integrated to the head module or may be installed between the periphery modules. Depending on the power module isolated areas of the DC 24V power section supply may be defined respectively the electronic power supply may be extended with 2A. For better recognition the colour of the power modules are contrasting to the periphery modules.

2.2.3 Accessories**Shield bus carrier**

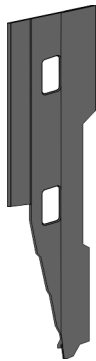
Please note that a shield bus carrier cannot be mounted on a 16x periphery module!



The shield bus carrier (order no.: 000-0AB00) serves to carry the shield bus (10mm x 3mm) to connect cable shields. Shield bus carriers, shield bus and shield fixings are not in the scope of delivery. They are only available as accessories. The shield bus carrier is mounted underneath the terminal of the terminal module. With a flat mounting rail for adaptation to a flat mounting rail you may remove the spacer of the shield bus carrier.



Bus cover



With each head module, to protect the backplane bus connectors, there is a mounted bus cover in the scope of delivery. You have to remove the bus cover of the head module before mounting a System SLIO module. For the protection of the backplane bus connector you always have to mount the bus cover at the last module of your system again. The bus cover has the order no. 000-0AA00.

Coding pins



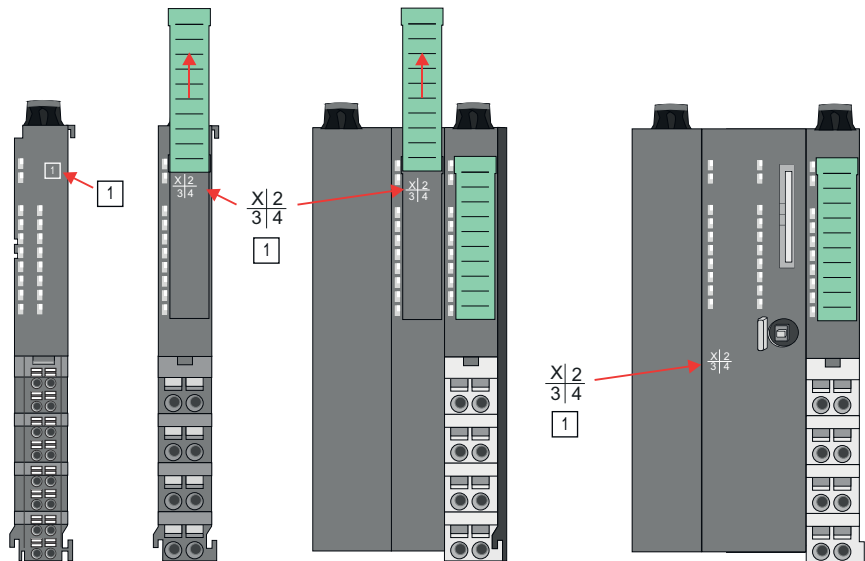
Please note that a coding pin cannot be installed on a 16x periphery module! Here you have to make sure that the associated terminal block is plugged again when the electronics unit is replaced.

There is the possibility to fix the assignment of electronic and terminal module. Here coding pins (order number 000-0AC00) can be used. The coding pin consists of a coding jack and a coding plug. By combining electronic and terminal module with coding pin, the coding jack remains in the electronic module and the coding plug in the terminal module. This ensures that after replacing the electronic module just another electronic module can be plugged with the same encoding.

2.2.4 Hardware revision

Hardware revision on the front

- The hardware revision is printed on every System SLIO module.
- Since a System SLIO 8x peripheral module consists of a terminal and electronic module, you will find a hardware revision printed on each of them.
- Authoritative for the hardware revision of a System SLIO module is the hardware revision of the electronic module. This is located under the labeling strip of the corresponding electronic module.
- Depending on the module type, there are the following 2 variants e.g. to indicate hardware revision 1:
 - Current modules have a 1 on the front.
 - With earlier modules, the 1 is marked with 'X' on a number grid.



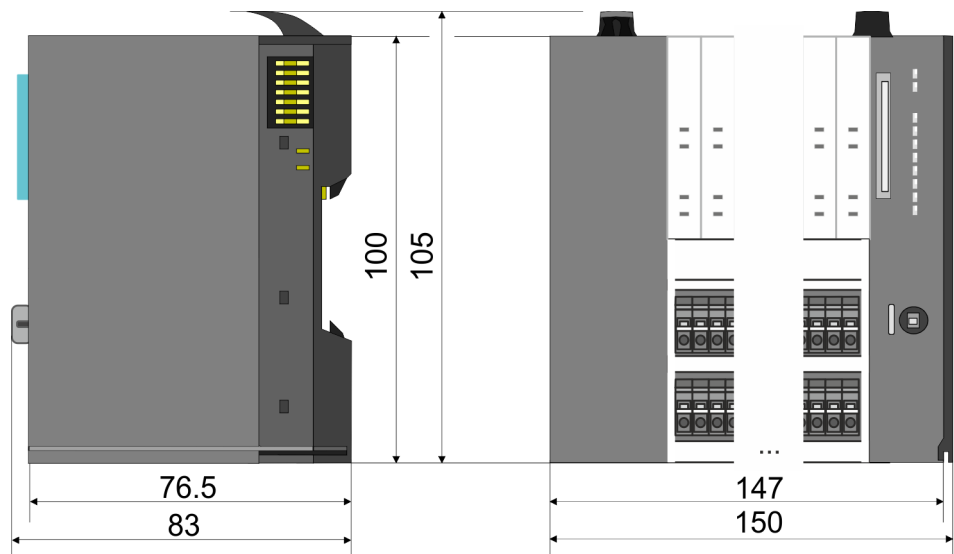
Hardware revision via web server

On the CPUs and some bus couplers, you can check the hardware revision 'HW Revision' via the integrated web server.

2.3 Dimensions

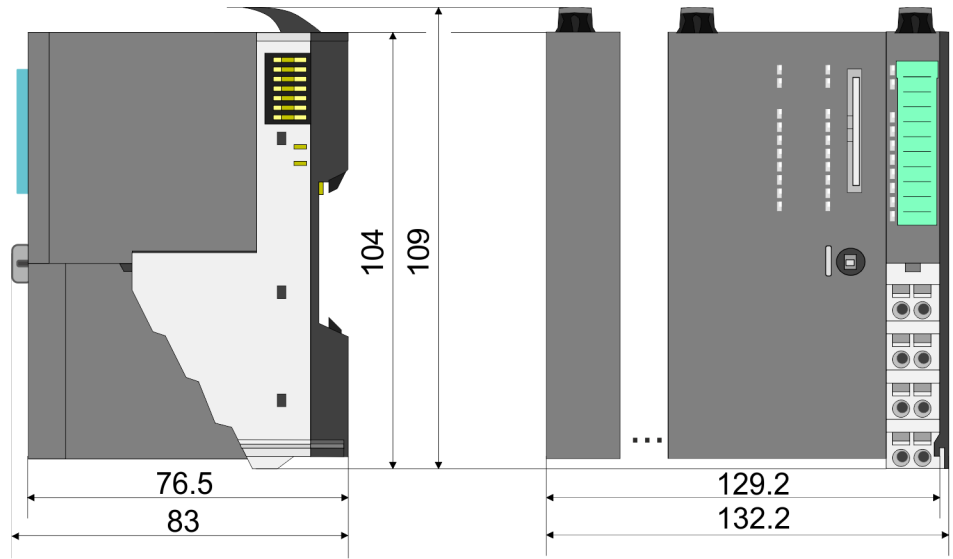
CPU 01xC

All dimensions are in mm.

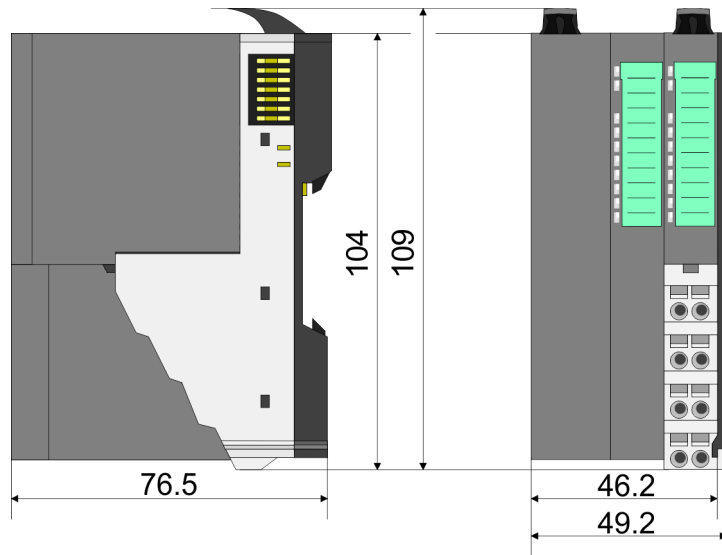


Dimensions

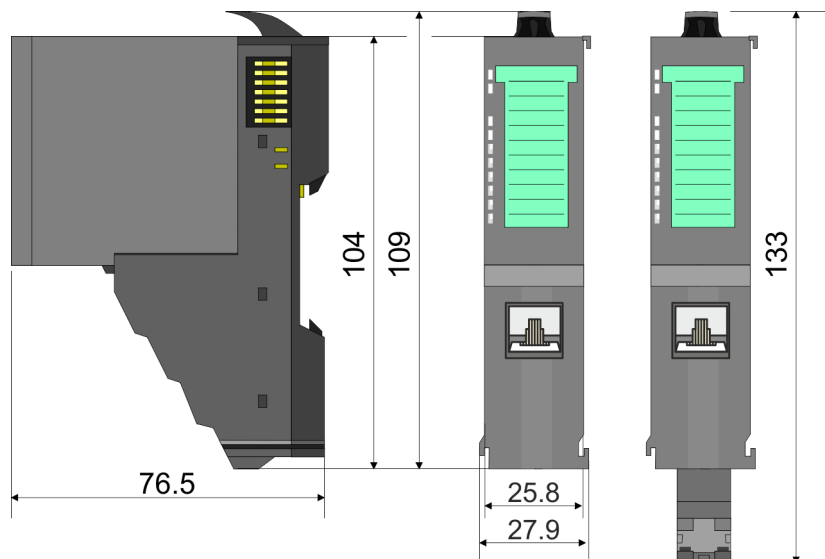
CPU 01x

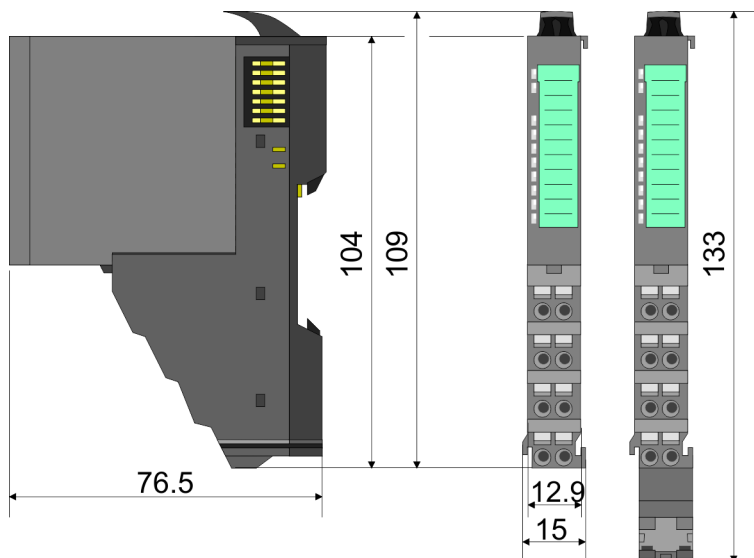
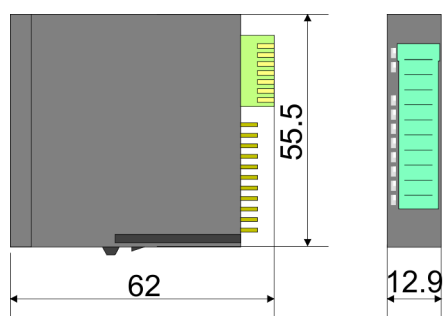
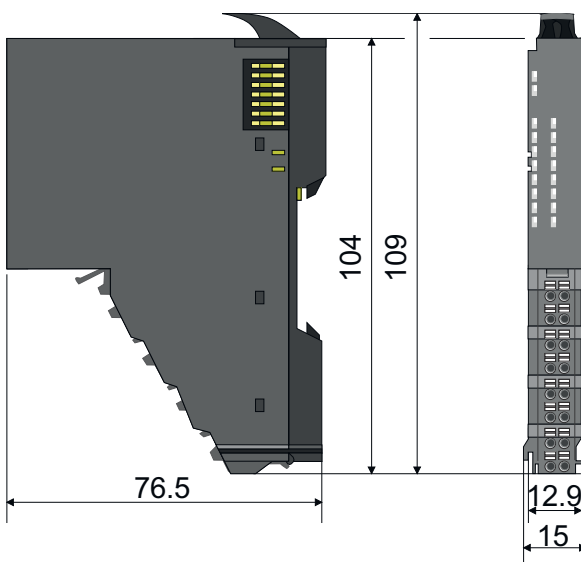


Bus coupler and line extension slave



Line extension master



8x periphery module**Electronic module****16x periphery module**

2.4 Mounting 8x periphery modules

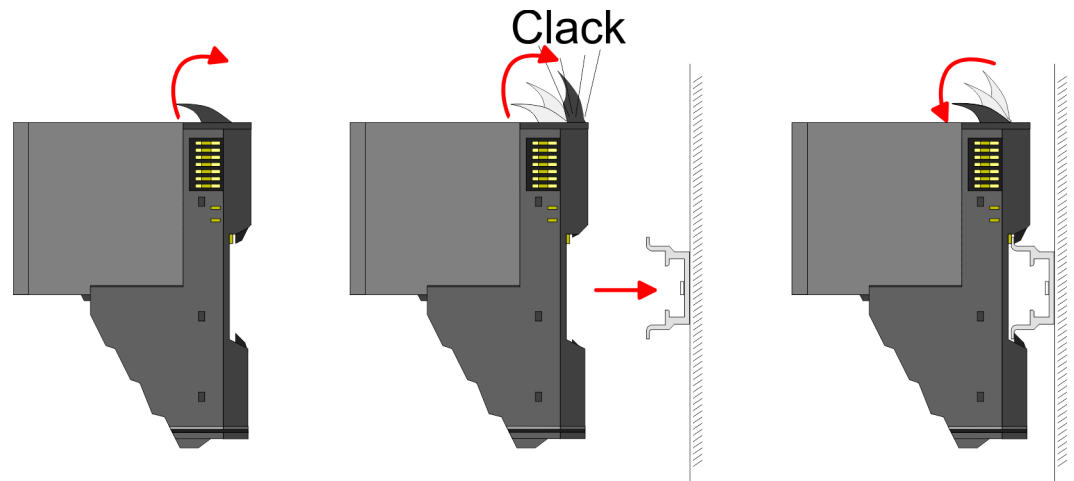


CAUTION!

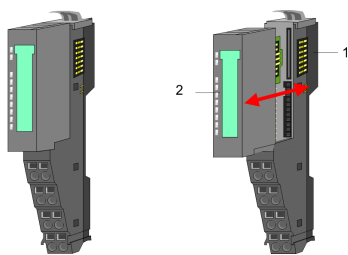
Requirements for UL compliance use

- Use for power supply exclusively SELV/PELV power supplies.
- The System SLIO must be installed and operated in a housing according to IEC 61010-1 9.3.2 c).

There is a locking lever at the top side of the module. For mounting and demounting this locking lever is to be turned upwards until this engages. For mounting place the module to the module installed before and push the module to the mounting rail guided by the strips at the upper and lower side of the module. The module is fixed to the mounting rail by pushing downward the locking lever. The modules may either separately be mounted to the mounting rail or as block. Here is to be considered that each locking lever is opened. The modules are each installed on a mounting rail. The electronic and power section supply are connected via the backplane bus. Up to 64 modules may be mounted. Please consider here that the sum current of the electronic power supply does not exceed the maximum value of 3A. By means of the power module 007-1AB10 the current of the electronic power supply may be expanded accordingly.



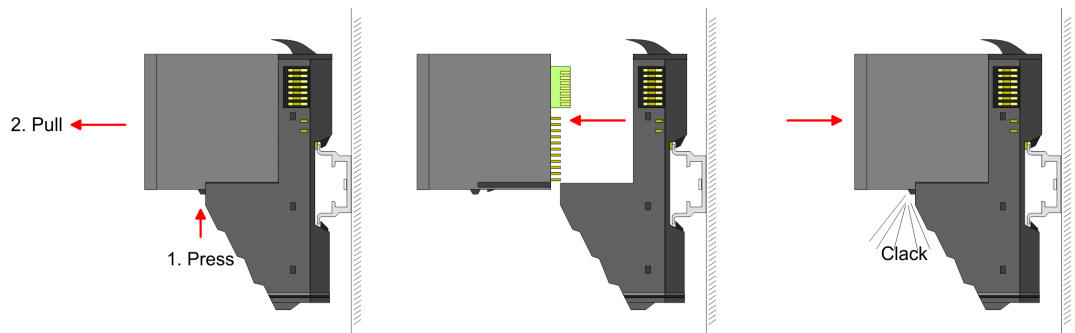
Terminal and electronic module



Each periphery module consists of a *terminal* and an *electronic module*.

- 1 Terminal module
- 2 Electronic module

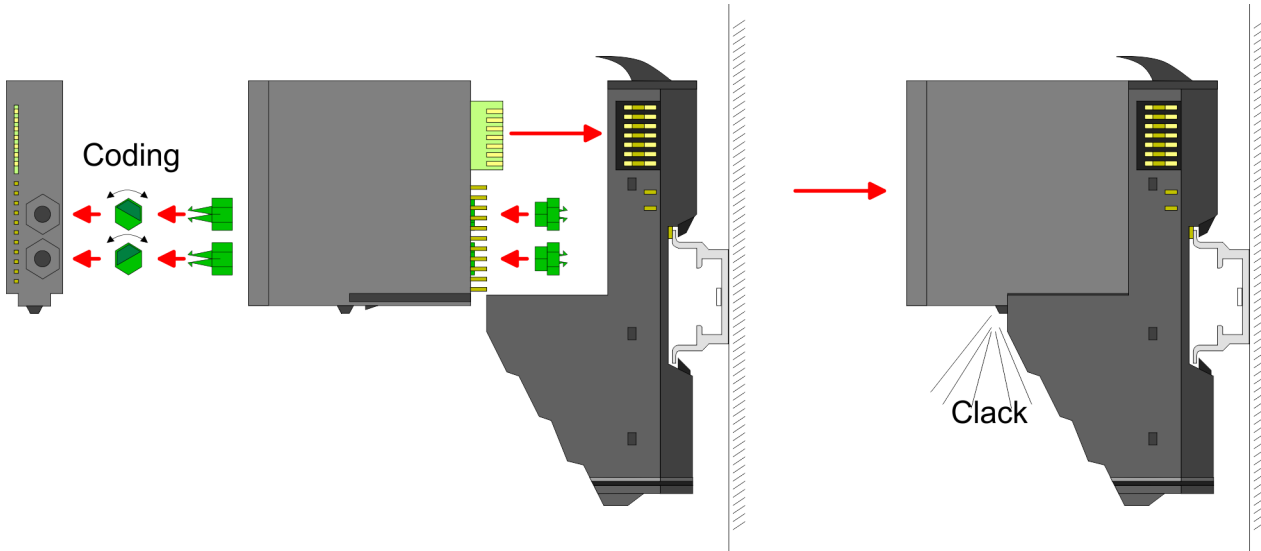
For the exchange of a electronic module, the electronic module may be pulled forward after pressing the unlocking lever at the lower side of the module. For installation plug the electronic module guided by the strips at the lower side until this engages audible to the terminal module.



Coding



There is the possibility to fix the assignment of electronic and terminal module. Here coding pins (order number 000-0AC00) can be used. The coding pin consists of a coding jack and a coding plug. By combining electronic and terminal module with coding pin, the coding jack remains in the electronic module and the coding plug in the terminal module. This ensures that after replacing the electronics module just another electronic module can be plugged with the same encoding.



Each electronic module has on its back 2 coding sockets for coding jacks. Due to the characteristics, with the coding jack 6 different positions can be plugged, each. Thus there are 36 possible combinations for coding with the use of both coding sockets.

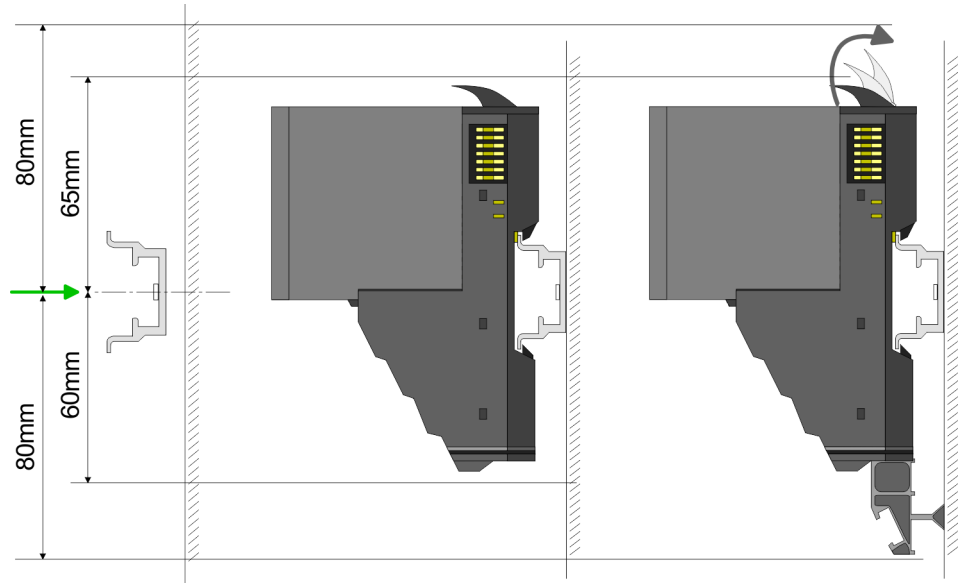
1. Plug, according to your coding, 2 coding jacks in the coding sockets of your electronic module until they lock
2. Now plug the according coding plugs into the coding jacks.
3. To fix the coding put both the electronic and terminal module together until they lock

**CAUTION!**

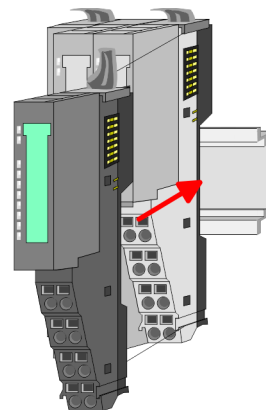
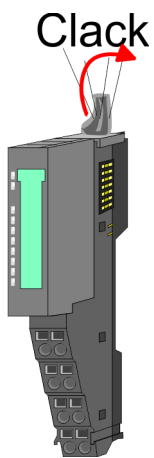
Please consider that when replacing an already coded electronic module, this is always be replaced by an electronic module with the same coding.

Even with an existing coding on the terminal module, you can plug an electronic module without coding. The user is responsible for the correct usage of the coding pins. Yaskawa assumes no liability for incorrectly attached electronic modules or for damages which arise due to incorrect coding!

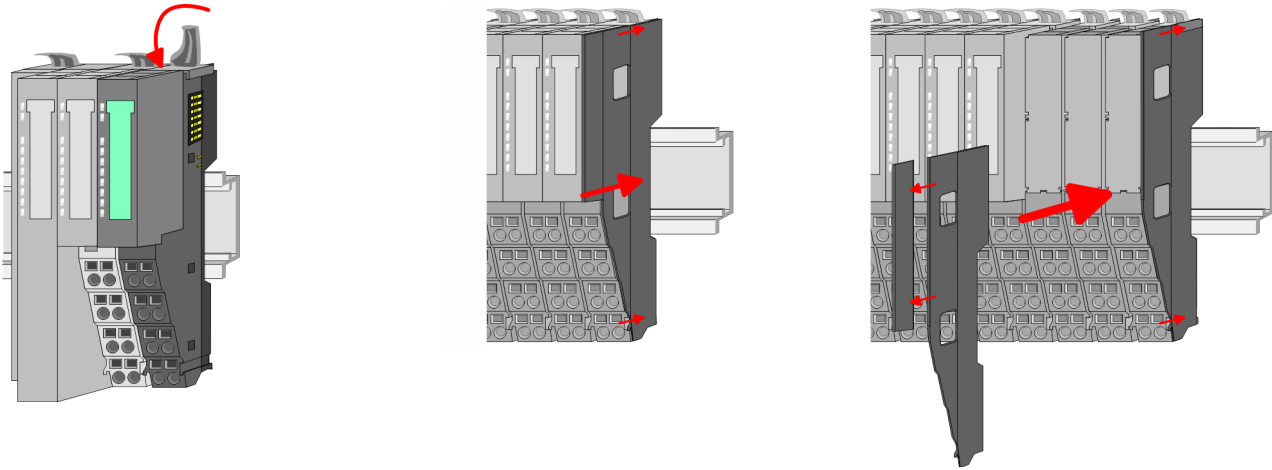
Mounting periphery modules



1. ➤ Mount the mounting rail! Please consider that a clearance from the middle of the mounting rail of at least 80mm above and 60mm below, respectively 80mm by deployment of shield bus carriers, exist.
2. ➤ Mount your head module such as CPU or field bus coupler.
3. ➤ Before mounting the periphery modules you have to remove the bus cover at the right side of the head module by pulling it forward. Keep the cover for later mounting.



4. ➤ For mounting turn the locking lever of the module upwards until it engages.
5. ➤ For mounting place the module to the module installed before and push the module to the mounting rail guided by the strips at the upper and lower side of the module.
6. ➤ Turn the locking lever of the periphery module downward, again.



7. After mounting the whole system, to protect the backplane bus connectors at the last module you have to mount the bus cover, now. If the last module is a clamp module, for adaptation the upper part of the bus cover is to be removed.

2.5 Mounting 16x peripheral modules

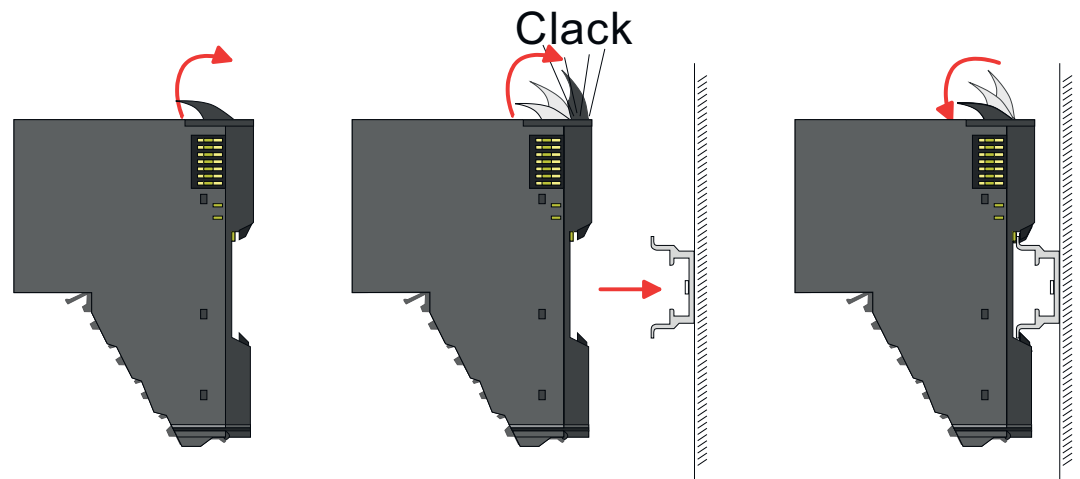


CAUTION!

Requirements for UL compliance use

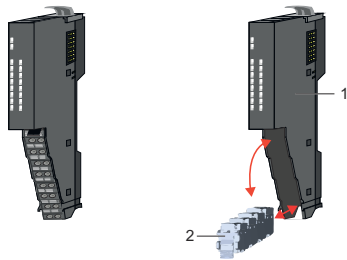
- Use for power supply exclusively SELV/PELV power supplies.
- The System SLIO must be installed and operated in a housing according to IEC 61010-1 9.3.2 c).

There is a locking lever at the top side of the module. For mounting and demounting this locking lever is to be turned upwards until this engages. For mounting place the module to the module installed before and push the module to the mounting rail guided by the strips at the upper and lower side of the module. The module is fixed to the mounting rail by pushing downward the locking lever. The modules may either separately be mounted to the mounting rail or as block. Here is to be considered that each locking lever is opened. The modules are each installed on a mounting rail. The electronic and power section supply are connected via the backplane bus. Up to 64 modules may be mounted. Please consider here that the sum current of the electronic power supply does not exceed the maximum value of 3A. By means of the power module 007-1AB10 the current of the electronic power supply may be expanded accordingly.



Mounting 16x periphery modules

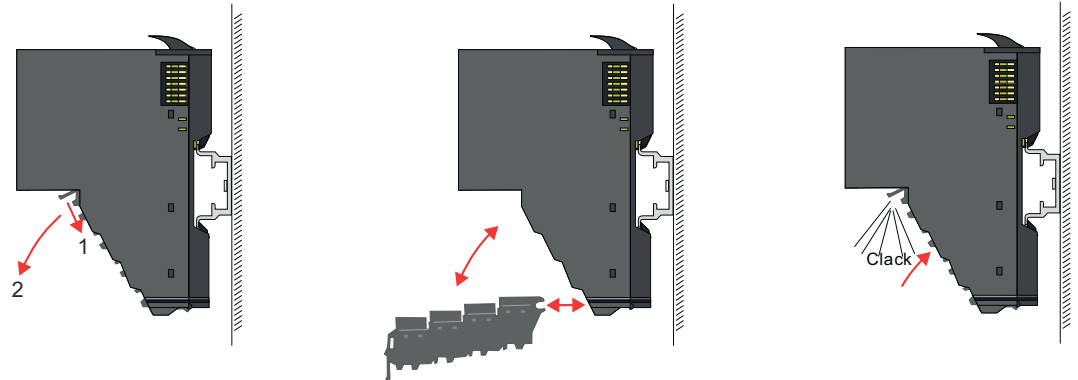
Electronic unit and terminal block



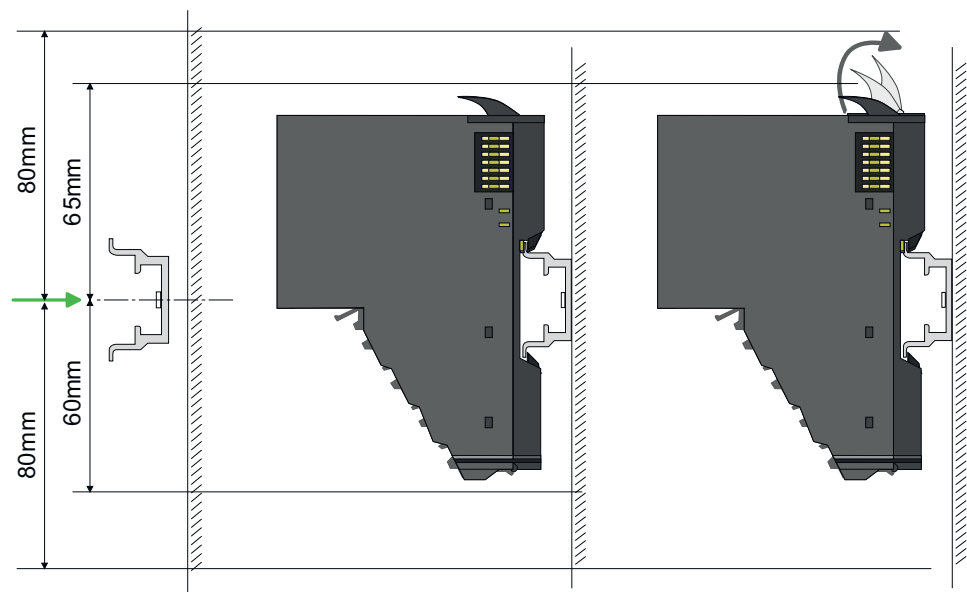
Each 16x periphery module consists of an *electronic unit* and a *terminal block*.

- 1 Electronic unit
- 2 Terminal block

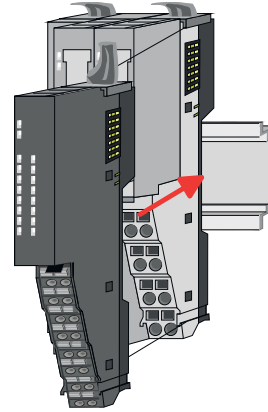
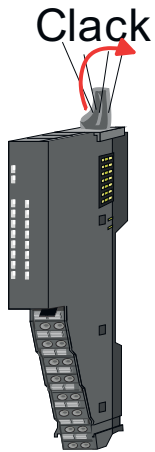
To replace an electronic unit, you can push down and pull off the terminal block after releasing the lock. To mount the terminal block, place it horizontally on the lower side of the electronic unit and push it towards the electronic unit until it clicks into place.



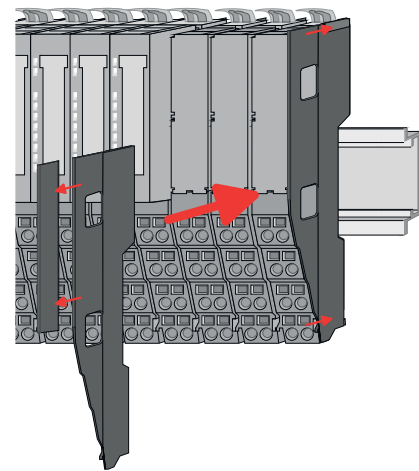
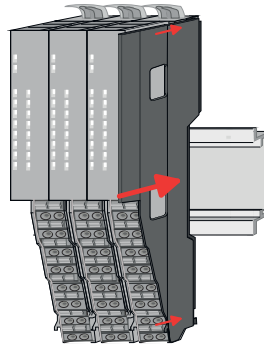
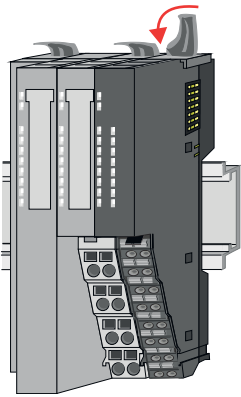
Mounting periphery module



1. ➤ Mount the mounting rail! Please consider that a clearance from the middle of the mounting rail of at least 80mm above and 80mm below exist.
2. ➤ Mount your head module such as CPU or field bus coupler.
3. ➤ Before mounting the periphery modules you have to remove the bus cover at the right side of the head module by pulling it forward. Keep the cover for later mounting.



4. For mounting turn the locking lever of the module upwards until it engages.
5. For mounting place the module to the module installed before and push the module to the mounting rail guided by the strips at the upper and lower side of the module.
6. Turn the locking lever of the periphery module downward, again.



7. After mounting the whole system, to protect the backplane bus connectors at the last module you have to mount the bus cover, now. If the last module is a clamp module, for adaptation the upper part of the bus cover is to be removed.

2.6 Wiring 8x periphery modules

Terminal module terminals



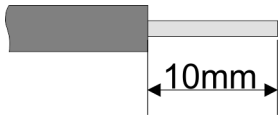
CAUTION!

Do not connect hazardous voltages!

If this is not explicitly stated in the corresponding module description, hazardous voltages are not allowed to be connected to the corresponding terminal module!

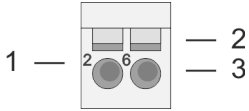
- With wiring the terminal modules, terminals with spring clamp technology are used for wiring. The spring clamp technology allows quick and easy connection of your signal and supply lines. In contrast to screw terminal connections this type of connection is vibration proof.

Data

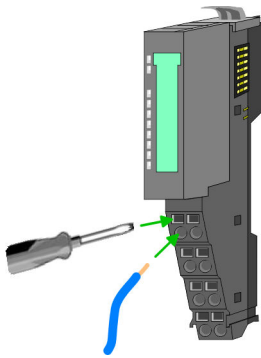
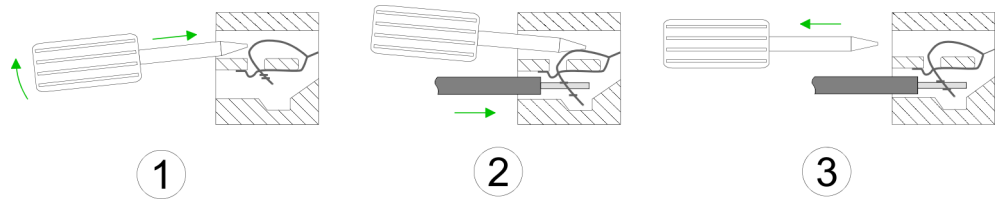


U_{max} 240V AC / 30V DC
 I_{max} 10A
 Cross section 0.08 ... 1.5mm² (AWG 28 ... 16)
 Stripping length 10mm

Wiring procedure

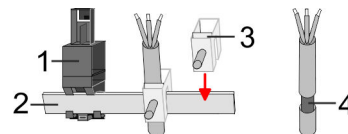


- 1 Pin number at the connector
- 2 Opening for screwdriver
- 3 Connection hole for wire



- 1. Insert a suited screwdriver at an angle into the square opening as shown. Press and hold the screwdriver in the opposite direction to open the contact spring.
- 2. Insert the stripped end of wire into the round opening. You can use wires with a cross section of 0.08mm² up to 1.5mm²
- 3. By removing the screwdriver, the wire is securely fixed via the spring contact to the terminal.

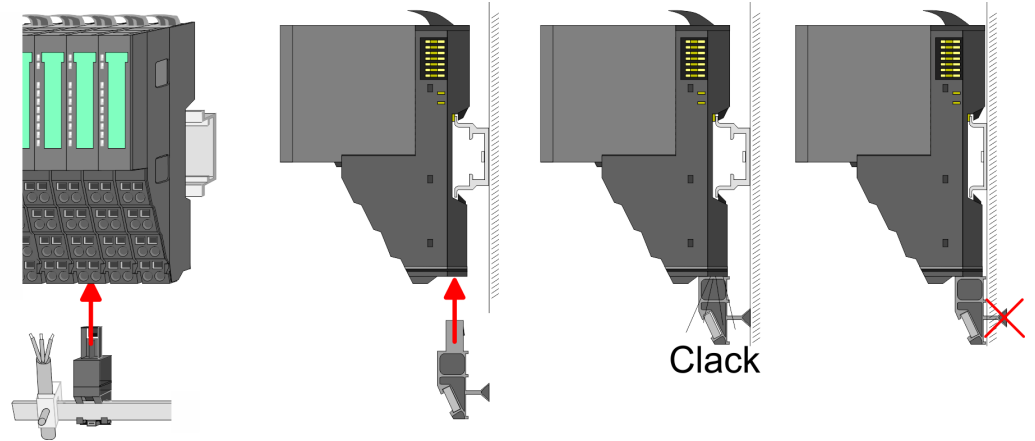
Shield attachment



- 1 Shield bus carrier
- 2 Shield bus (10mm x 3mm)
- 3 Shield clamp
- 4 Cable shield

To attach the shield the mounting of shield bus carriers are necessary. The shield bus carrier (available as accessory) serves to carry the shield bus to connect cable shields.

- 1. Each System SLIO 8x periphery module has a carrier hole for the shield bus carrier. Push the shield bus carrier, until they engage into the module. With a flat mounting rail for adaptation to a flat mounting rail you may remove the spacer of the shield bus carrier.
- 2. Put your shield bus into the shield bus carrier.



3. Attach the cables with the accordingly stripped cable screen and fix it by the shield clamp with the shield bus.

2.7 Wiring 16x periphery modules

Terminal block connectors



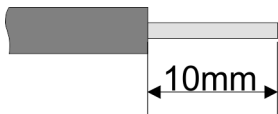
CAUTION!

Do not connect hazardous voltages!

If this is not explicitly stated in the corresponding module description, hazardous voltages are not allowed to be connected to the corresponding terminal block!

- The 16x periphery module has a removable terminal block for wiring.
- With the wiring of the terminal block a "push-in" spring-clip technique is used. This allows a quick and easy connection of your signal and supply lines.
- The clamping off takes place by means of a screwdriver.
- Please use copper wire only!

Data



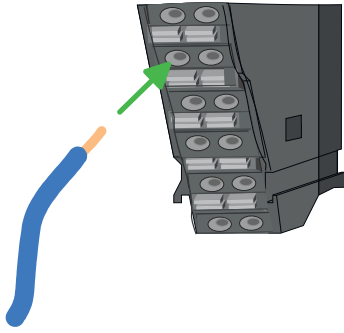
| | |
|----------------------------|------------------------------|
| U_{max} | 30V DC |
| I_{max} | 10A |
| Cross section solid wire | 0.25 ... 0.75mm ² |
| Cross section with ferrule | 0.14 ... 0.75mm ² |
| Wire type | CU |
| AWG | 24 ... 16 |
| Stripping length | 10mm |

Wiring procedure



- 1 Release area
- 2 Connection hole for wire

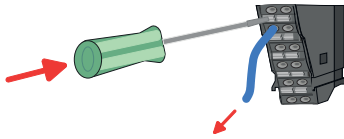
Insert wire



The wiring happens without a tool.

1. Determine according to the casing labelling the connection position.
2. Insert through the round connection hole of the according contact your prepared wire until it stops, so that it is fixed.
 - ⇒ By pushing the contact spring opens, thus ensuring the necessary contact pressure.

Remove wire



The wire is to be removed by means of a screwdriver with 2.5mm blade width.

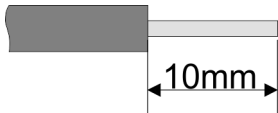
1. Press with your screwdriver vertically at the release button.
 - ⇒ The contact spring releases the wire.
2. Pull the wire from the round hole.

2.8 Wiring power modules

Terminal module terminals

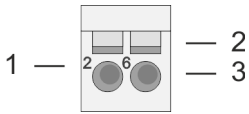
Power modules are either integrated to the head module or may be installed between the periphery modules. With power modules, terminals with spring clamp technology are used for wiring. The spring clamp technology allows quick and easy connection of your signal and supply lines. In contrast to screw terminal connections this type of connection is vibration proof.

Data

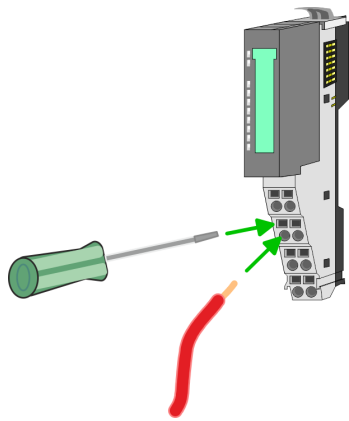
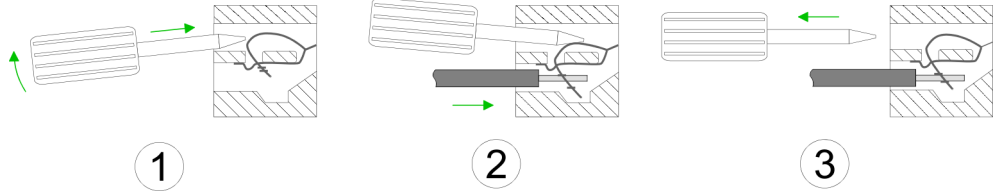


| | |
|------------------|---|
| U_{max} | 30V DC |
| I_{max} | 10A |
| Cross section | 0.08 ... 1.5mm ² (AWG 28 ... 16) |
| Stripping length | 10mm |

Wiring procedure

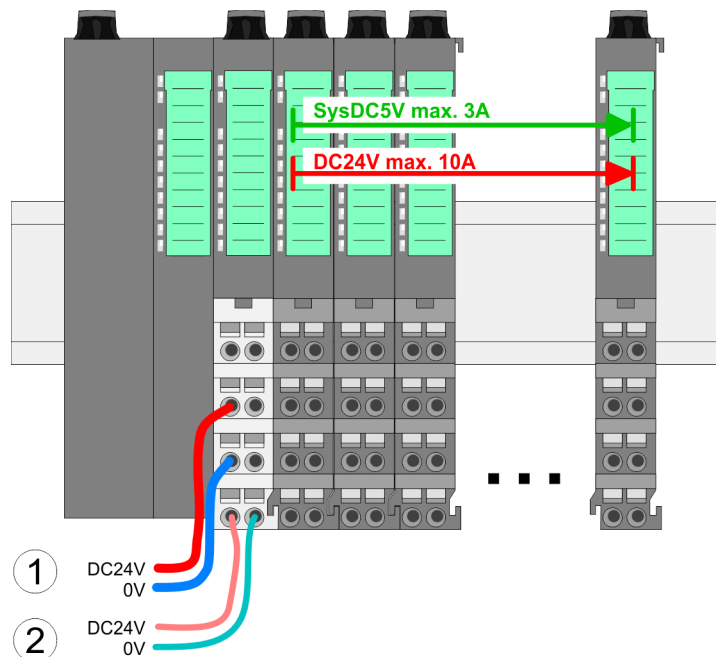


- 1 Pin number at the connector
- 2 Opening for screwdriver
- 3 Connection hole for wire



- 1. Insert a suited screwdriver at an angle into the square opening as shown. Press and hold the screwdriver in the opposite direction to open the contact spring.
- 2. Insert the stripped end of wire into the round opening. You can use wires with a cross section of 0.08mm² up to 1.5mm²
- 3. By removing the screwdriver, the wire is securely fixed via the spring contact to the terminal.

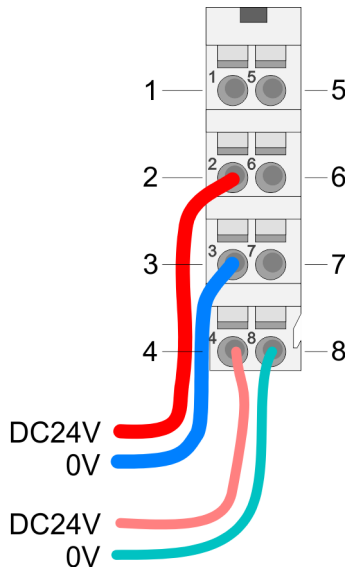
Standard wiring



- (1) DC 24V for power section supply I/O area (max. 10A)
- (2) DC 24V for electronic power supply bus coupler and I/O area

Wiring power modules

PM - Power module



For wires with a core cross-section of 0.08mm² up to 1.5mm².

| Pos. | Function | Type | Description |
|------|------------|------|--------------------------------------|
| 1 | --- | --- | not connected |
| 2 | DC 24V | I | DC 24V for power section supply |
| 3 | 0V | I | GND for power section supply |
| 4 | Sys DC 24V | I | DC 24V for electronic section supply |
| 5 | --- | --- | not connected |
| 6 | DC 24V | I | DC 24V for power section supply |
| 7 | 0V | I | GND for power section supply |
| 8 | Sys 0V | I | GND for electronic section supply |

I: Input



CAUTION!

Since the power section supply is not internally protected, it is to be externally protected with a fuse, which corresponds to the maximum current. This means max. 10A is to be protected by a 10A fuse (fast) respectively by a line circuit breaker 10A characteristics Z!



The electronic power section supply is internally protected against higher voltage by fuse. The fuse is within the power module. If the fuse releases, its electronic module must be exchanged!

Fusing

- The power section supply is to be externally protected with a fuse, which corresponds to the maximum current. This means max. 10A is to be protected with a 10A fuse (fast) respectively by a line circuit breaker 10A characteristics Z!
- It is recommended to externally protect the electronic power supply for head modules and I/O area with a 2A fuse (fast) respectively by a line circuit breaker 2A characteristics Z.
- The electronic power supply for the I/O area of the power module 007-1AB10 should also be externally protected with a 1A fuse (fast) respectively by a line circuit breaker 1A characteristics Z.

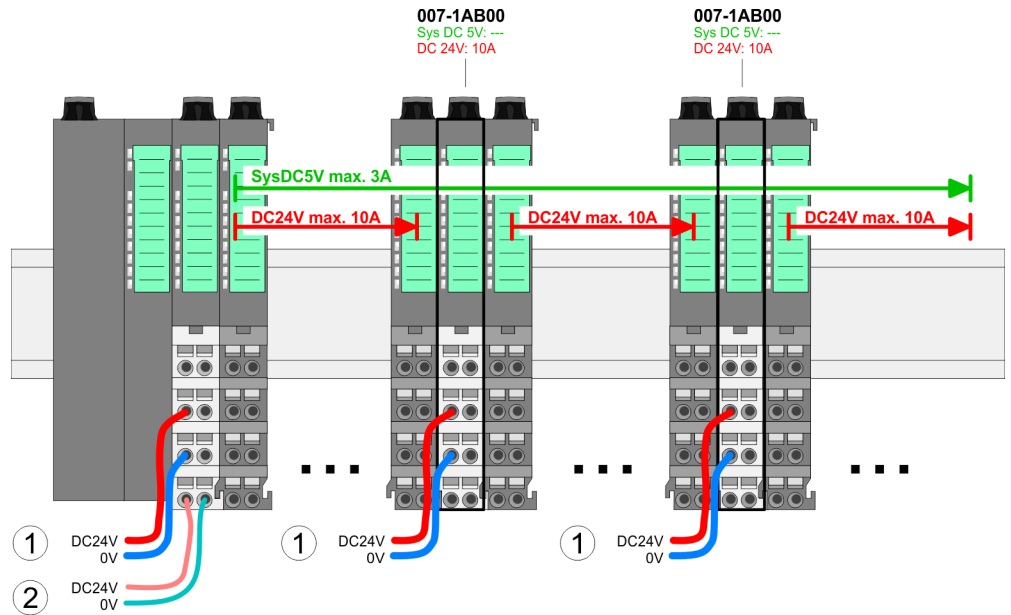
State of the electronic power supply via LEDs

After PowerON of the System SLIO the LEDs RUN respectively MF get on so far as the sum current does not exceed 3A. With a sum current greater than 3A the LEDs may not be activated. Here the power module with the order number 007-1AB10 is to be placed between the peripheral modules.

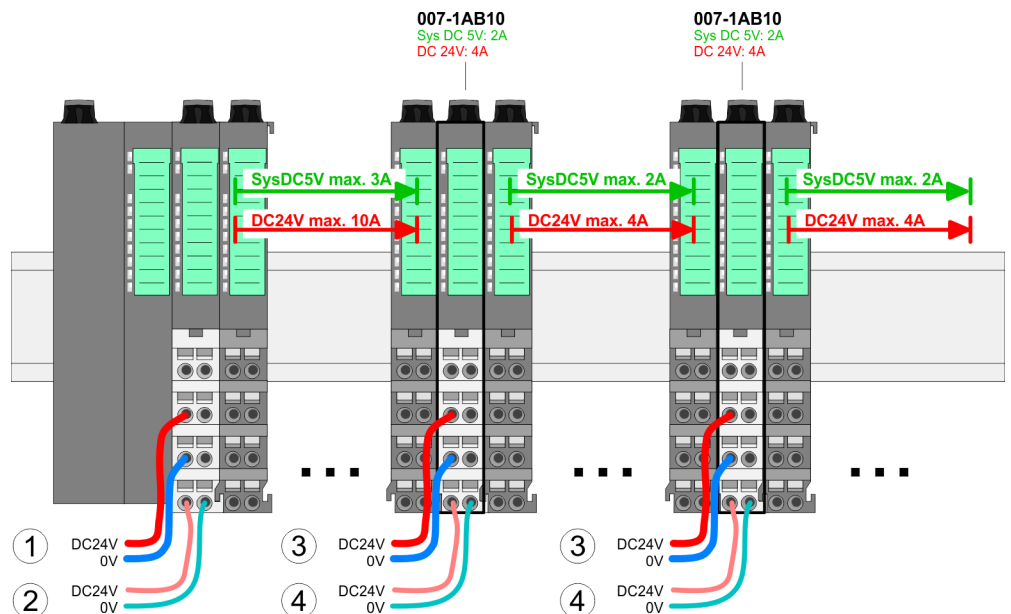
Deployment of the power modules

- If the 10A for the power section supply is no longer sufficient, you may use the power module with the order number 007-1AB00. So you have also the possibility to define isolated groups.
- The power module with the order number 007-1AB10 is to be used if the 3A for the electronic power supply at the backplane bus is no longer sufficient. Additionally you get an isolated group for the DC 24V power section supply with max. 4A.
- By placing the power module 007-1AB10 at the following backplane bus modules may be placed with a sum current of max. 2A. Afterwards a power module is to be placed again. To secure the power supply, the power modules may be mixed used.

Power module 007-1AB00

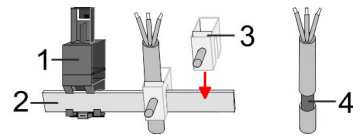


Power module 007-1AB10



- (1) DC 24V for power section supply I/O area (max. 10A)
- (2) DC 24V for electronic power supply bus coupler and I/O area
- (3) DC 24V for power section supply I/O area (max. 4A)
- (4) DC 24V for electronic power supply I/O area

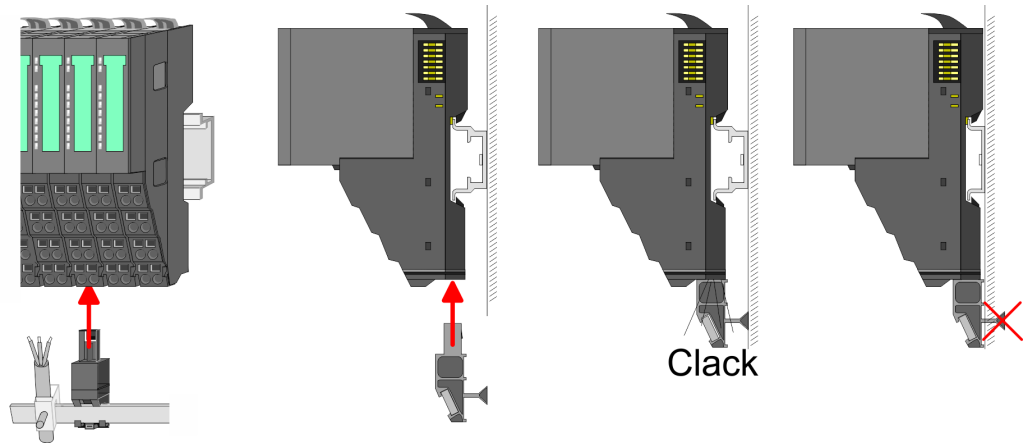
Shield attachment



- 1 Shield bus carrier
- 2 Shield bus (10mm x 3mm)
- 3 Shield clamp
- 4 Cable shield

To attach the shield the mounting of shield bus carriers are necessary. The shield bus carrier (available as accessory) serves to carry the shield bus to connect cable shields.

1. Each System SLIO 8x peripheral module has a carrier hole for the shield bus carrier. Push the shield bus carrier, until they engage into the module. With a flat mounting rail for adaptation to a flat mounting rail you may remove the spacer of the shield bus carrier.
2. Put your shield bus into the shield bus carrier.



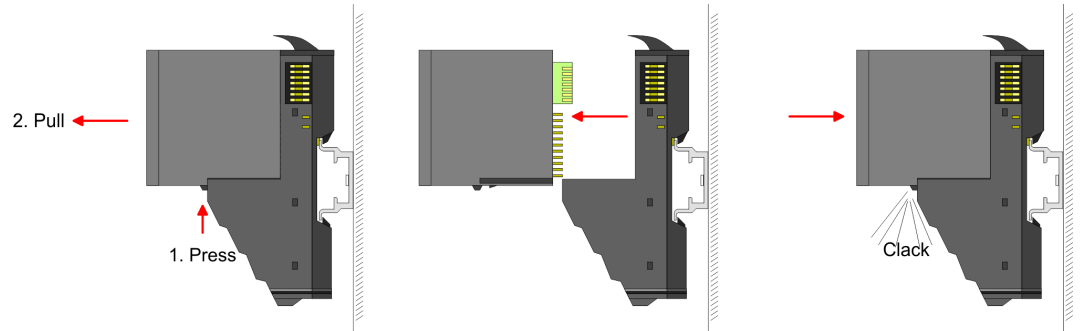
3. Attach the cables with the accordingly stripped cable screen and fix it by the shield clamp with the shield bus.

2.9 Demounting 8x periphery modules

Proceeding

Exchange of an electronic module

1. ➤ Power-off your system.



2. ➤ For the exchange of a electronic module, the electronic module may be pulled forward after pressing the unlocking lever at the lower side of the module.
3. ➤ For installation plug the new electronic module guided by the strips at the lower side until this engages to the terminal module.
 - ⇒ Now you can bring your system back into operation.

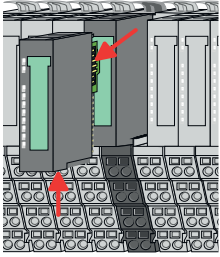


Easy Maintenance

'Easy Maintenance' means the support for adding and removing electronic modules during operation without having to restart the system. If this is supported by your head module, you will find more detailed information on this in the "Deployment" chapter. ↪ Chap. 2.11 'Easy Maintenance' page 37

Demounting 8x periphery modules

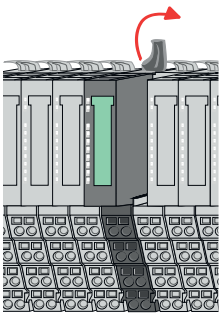
Exchange of a periphery module



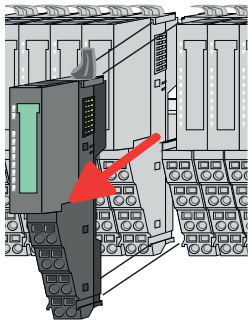
1. ➤ Power-off your system.
2. ➤ Remove if exists the wiring of the module.
3. ➤

i For demounting and exchange of a (head) module or a group of modules, due to mounting reasons you always have to remove the electronic module right beside. After mounting it may be plugged again.

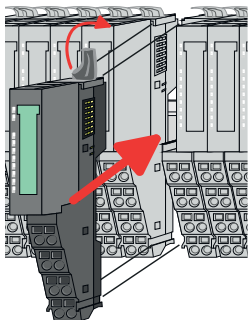
Press the unlocking lever at the lower side of the just mounted right module and pull it forward.



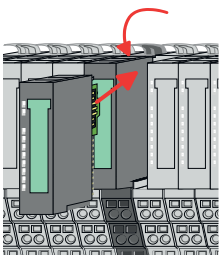
4. ➤ Turn the locking lever of the module to be exchanged upwards.



5. ➤ Pull the module.
6. ➤ For mounting turn the locking lever of the module to be mounted upwards.

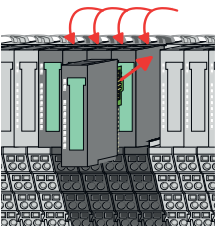
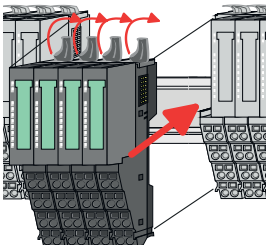
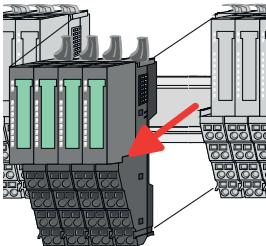
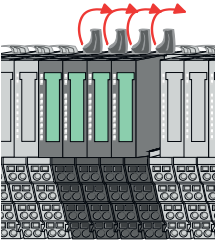
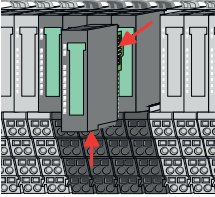


7. ➤ To mount the module put it to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.
8. ➤ Turn the locking lever downward, again.



9. ➤ Plug again the electronic module, which you have removed before.
10. ➤ Wire your module.
 - ⇒ Now you can bring your system back into operation.

Exchange of a module group



1. ➤ Power-off your system.
2. ➤ Remove if exists the wiring of the module group.

3. ➤



For demounting and exchange of a (head) module or a group of modules, due to mounting reasons you always have to remove the electronic module right beside. After mounting it may be plugged again.

Press the unlocking lever at the lower side of the just mounted right module near the module group and pull it forward.

4. ➤ Turn all the locking lever of the module group to be exchanged upwards.

5. ➤ Pull the module group forward.

6. ➤ For mounting turn all the locking lever of the module group to be mounted upwards.

7. ➤ To mount the module group put it to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.

8. ➤ Turn all the locking lever downward, again.

9. ➤ Plug again the electronic module, which you have removed before.

10. ➤ Wire your module group.

⇒ Now you can bring your system back into operation.

2.10 Demounting 16x periphery modules

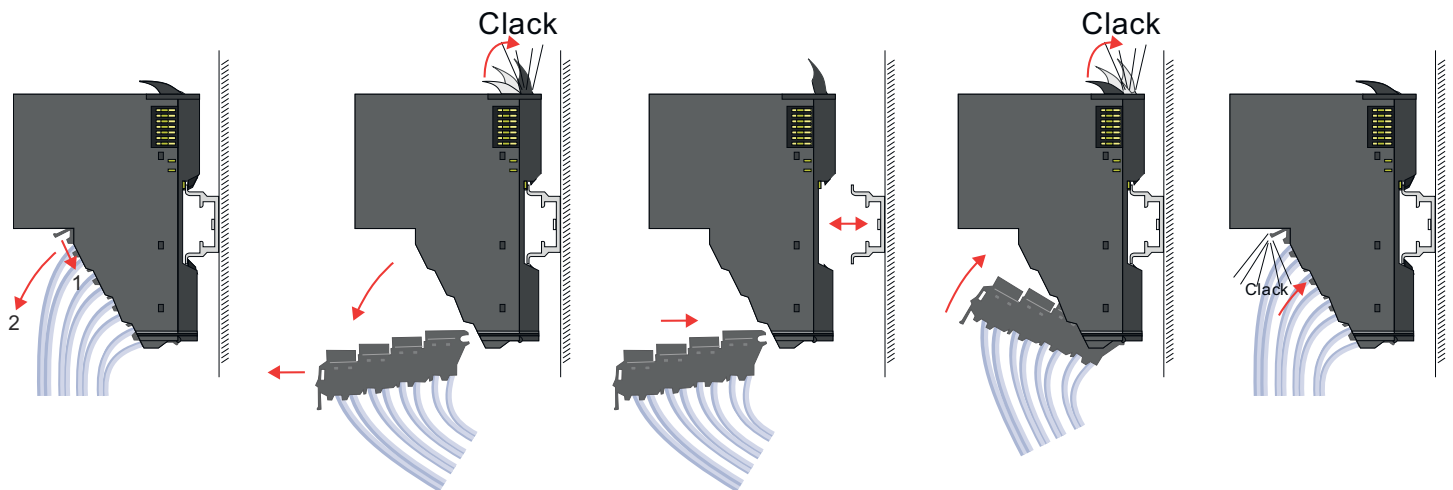
Proceeding

Exchange of an electronic unit

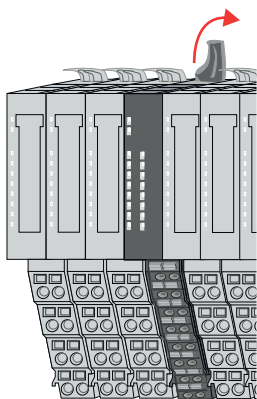
1. ➤ Power-off your system.
2. ➤ To replace an electronic unit, you can push down and pull off the terminal block after releasing the lock.

To mount the terminal block, place it horizontally on the lower side of the electronic unit and push it towards the electronic unit until it clicks into place.

⇒ Now you can bring your system back into operation.



Exchange of a 16x periphery module

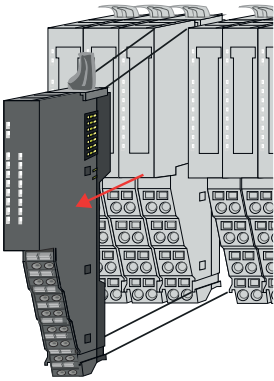


1. ➤ Power-off your system.
2. ➤ Remove if exists the wiring of the module respectively the wired terminal block.
3. ➤

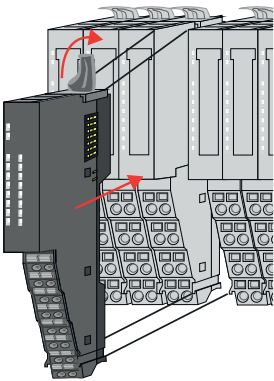


In contrast to 8x periphery modules, you can directly demount and mount 16x periphery modules.

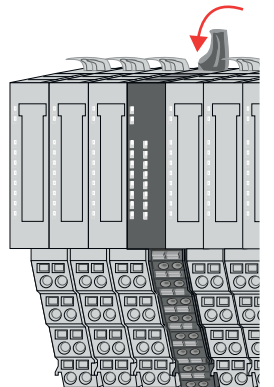
Turn the locking lever of the module to be exchanged upwards.



4. ➤ Pull the module.
5. ➤ For mounting turn the locking lever of the module to be mounted upwards.

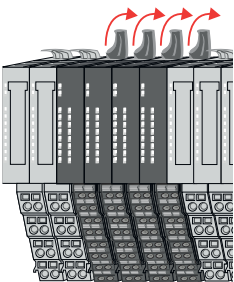


6. ➤ To mount the module put it to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.



7. ➤ Turn the locking lever downward, again.
8. ➤ Wire your module respectively plug the wired terminal block again.
 - ⇒ Now you can bring your system back into operation.

Exchange of a module group

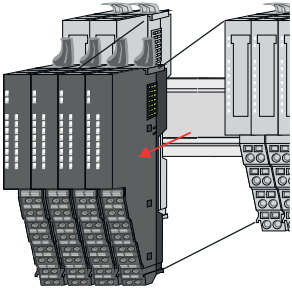


1. ➤ Power-off your system.
2. ➤ Remove if exists the wiring of the module group respectively the wired terminal blocks.
3. ➤

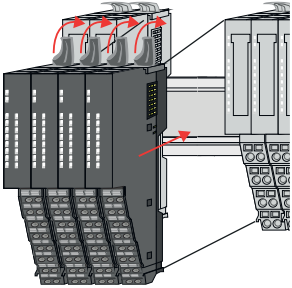
i *In contrast to 8x periphery modules, you can directly demount and mount 16x periphery modules.*

Turn all the locking lever of the module group to be exchanged upwards.

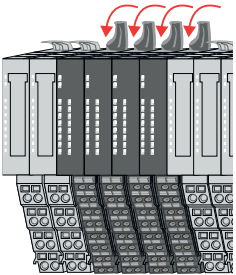
Demounting 16x periphery modules



- 4. ➤ Pull the module group forward.
- 5. ➤ For mounting turn all the locking lever of the module group to be mounted upwards.



- 6. ➤ To mount the module group put it to the gap between the both modules and push it, guided by the stripes at both sides, to the mounting rail.



- 7. ➤ Turn all the locking lever downward, again.
- 8. ➤ Wire your module group respectively plug the wired terminal blocks again.
⇒ Now you can bring your system back into operation.

2.11 Easy Maintenance

Overview

Easy Maintenance means the support for adding and removing an electronic module during operation without having to restart the system. Here the following behavior is shown by the example of a CPU:

- Electronic module is removed
 - The CPU detects a module failure on the backplane bus.
 - Diagnostic message ‘*System SLIO bus failure*’ (0x39D0) is triggered.
 - OB 86 is called. If this is not available, the CPU switches to STOP otherwise it remains in RUN.
 - The SF LED of the CPU lights up.
 - The I/O data of all modules become invalid.
- Identical electronic module is plugged
 - The CPU detects the module return on the backplane bus.
 - The SF-LED of the CPU gets off.
 - All RUN LEDs on the modules get on and the MF LEDs get off.
 - Diagnostic message ‘*System SLIO bus recovery*’ (0x38D0) is triggered.
 - OB 86 is called. If this is not available, the CPU switches to STOP otherwise it remains in RUN.
 - The I/O data of all modules become valid again.
- Wrong electronic module is plugged
 - The CPU detects the wrong module.
 - Diagnostic message ‘*System SLIO bus recovery, but expected configuration does not match actual configuration*’ (0x38D1) is triggered.
 - The SF LED of the CPU remains on.
 - The MF LED of the wrong module flashes.
 - OB 86 is called. If this is not available, the CPU switches to STOP otherwise it remains in RUN.
 - With the exception of the wrong module, the I/O data of all modules become valid again.



CAUTION!

Please note that only electronic modules may be exchanged during operation! Replacing an 8x or 16x periphery module during operation can damage the module and the system!



Please note that the CPU switches to STOP, if there is no OB 86 configured when adding or removing System SLIO modules!

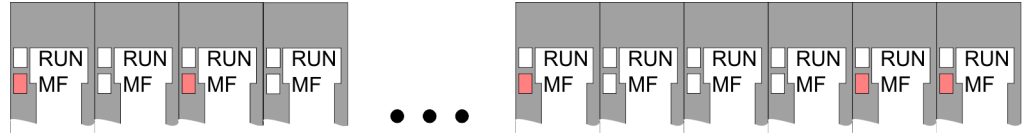
2.12 Trouble shooting - LEDs

General

Each module has the LEDs RUN and MF on its front side. Errors or incorrect modules may be located by means of these LEDs.

In the following illustrations flashing LEDs are marked by ☼.

Sum current of the electronic power supply exceeded

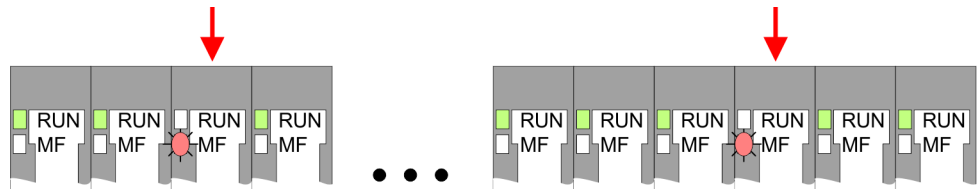


Behaviour: After PowerON the RUN LED of each module is off and the MF LED of each module is sporadically on.

Reason: The maximum current for the electronic power supply is exceeded.

Remedy: As soon as the sum current of the electronic power supply is exceeded, always place the power module 007-1AB10. ↪ Chap. 2.8 'Wiring power modules' page 26

Error in configuration

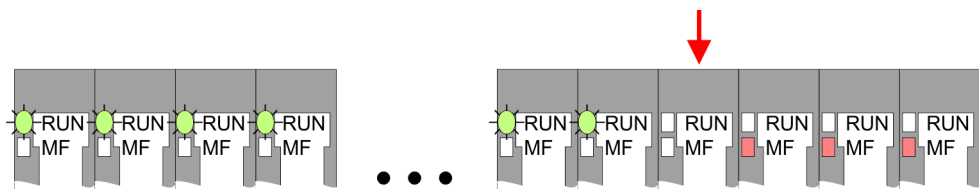


Behaviour: After PowerON the MF LED of one module respectively more modules flashes. The RUN LED remains off.

Reason: At this position a module is placed, which does not correspond to the configured module.

Remedy: Match configuration and hardware structure.

Module failure



Behaviour: After PowerON all of the RUN LEDs up to the defective module are flashing. With all following modules the MF LED is on and the RUN LED is off.

Reason: The module on the right of the flashing modules is defective.

Remedy: Replace the defective module.

2.13 Industrial security and installation guidelines

2.13.1 Industrial security in information technology

Latest version

This chapter can also be found as a guide '*Industrial IT Security*' at www.yaskawa.eu.com

Hazards

The topic of data security and access protection has become increasingly important in the industrial environment. The increased networking of entire industrial systems to the network levels within the company together with the functions of remote maintenance have all served to increase vulnerability. Hazards can arise from:

- Internal manipulation such as technical errors, operating and program errors and deliberate program or data manipulation.
- External manipulation such as software viruses, worms and Trojans.
- Human carelessness such as password phishing.

Precautions

The most important precautions to prevent manipulation and loss of data security in the industrial environment are:

- Encrypting the data traffic by means of certificates.
- Filtering and inspection of the traffic by means of VPN - "Virtual Private Networks".
- Identification of the user by "Authentication" via safe channels.
- Segmenting in protected automation cells, so that only devices in the same group can exchange data.
- Deactivation of unnecessary hardware and software.

Further Information

You can find more information about the measures on the following websites:

- Federal Office for Information Technology www.bsi.bund.de
- Cybersecurity & Infrastructure Security Agency us-cert.cisa.gov
- VDI / VDE Society for Measurement and Automation Technology www.vdi.de

2.13.1.1 Protection of hardware and applications

Precautions

- Do not integrate any components or systems into public networks.
 - Use VPN "Virtual Private Networks" for use in public networks. This allows you to control and filter the data traffic accordingly.
- Always keep your system up-to-date.
 - Always use the latest firmware version for all devices.
 - Update your user software regularly.
- Protect your systems with a firewall.
 - The firewall protects your infrastructure internally and externally.
 - This allows you to segment your network and isolate entire areas.
- Secure access to your plants via user accounts.
 - If possible, use a central user management system.
 - Create a user account for each user for whom authorization is essential.
 - Always keep user accounts up-to-date and deactivate unused user accounts.
- Secure access to your plants via secure passwords.
 - Change the password of a standard login after the first start.
 - Use strong passwords consisting of upper/lower case, numbers and special characters. The use of a password generator or manager is recommended.
 - Change the passwords according to the rules and guidelines that apply to your application.
- Deactivate inactive communication ports respectively protocols.
 - Only the communication ports that are used for communication should be activated.
 - Only the communication protocols that are used for communication should be activated.
- Consider possible defence strategies when planning and securing the system.
 - The isolation of components alone is not sufficient for comprehensive protection. An overall concept is to be drawn up here, which also provides defensive measures in the event of a cyber attack.
 - Periodically carry out threat assessments. Among others, a comparison is made here between the protective measures taken and those required.
- Limit the use of external storage media.
 - Via external storage media such as USB memory sticks or SD memory cards, malware can get directly into a system while bypassing a firewall.
 - External storage media or their slots must be protected against unauthorized physical access, e.g. by using a lockable control cabinet.
 - Make sure that only authorized persons have access.
 - When disposing of storage media, make sure that they are safely destroyed.
- Use secure access paths such as HTTPS or VPN for remote access to your plant.
- Enable security-related event logging in accordance with the applicable security policy and legal requirements for data protection.

2.13.1.2 Protection of PC-based software

Precautions

Since PC-based software is used for programming, configuration and monitoring, it can also be used to manipulate entire systems or individual components. Particular caution is required here!

- Use user accounts on your PC systems.
 - If possible, use a central user management system.
 - Create a user account for each user for whom authorization is essential.
 - Always keep user accounts up-to-date and deactivate unused user accounts.
- Protect your PC systems with secure passwords.
 - Change the password of a standard login after the first start.
 - Use strong passwords consisting of upper/lower case, numbers and special characters. The use of a password generator or manager is recommended.
 - Change the passwords according to the rules and guidelines that apply to your application.
- Enable security-related event logging in accordance with the applicable security policy and legal requirements for data protection.
- Protect your PC systems by security software.
 - Install virus scanners on your PC systems to identify viruses, trojans and other malware.
 - Install software that can detect phishing attacks and actively prevent them.
- Always keep your software up-to-date.
 - Update your operating system regularly.
 - Update your software regularly.
- Make regular backups and store the media at a safe place.
- Regularly restart your PC systems. Only boot from storage media that are protected against manipulation.
- Use encryption systems on your storage media.
- Perform security assessments regularly to reduce the risk of manipulation.
- Use only data and software from approved sources.
- Uninstall software which is not used.
- Disable unused services.
- Activate a password-protected screen lock on your PC systems.
- Always lock your PC systems as soon as you leave your PC workstation.
- Do not click any links that come from unknown sources. If necessary ask, e.g. on e-mails.
- Use secure access paths such as HTTPS or VPN for remote access to your PC system.

2.13.2 Installation guidelines

General

The installation guidelines contain information about the interference free deployment of a PLC system. There is the description of the ways, interference may occur in your PLC, how you can make sure the electromagnetic compatibility (EMC), and how you manage the isolation.

What does EMC mean?

Electromagnetic compatibility (EMC) means the ability of an electrical device, to function error free in an electromagnetic environment without being interfered respectively without interfering the environment.

The components are developed for the deployment in industrial environments and meets high demands on the EMC. Nevertheless you should project an EMC planning before installing the components and take conceivable interference causes into account.

Possible interference causes

Electromagnetic interferences may interfere your control via different ways:

- Electromagnetic fields (RF coupling)
- Magnetic fields with power frequency
- Bus system
- Power supply
- Protected earth conductor

Depending on the spreading medium (lead bound or lead free) and the distance to the interference cause, interferences to your control occur by means of different coupling mechanisms.

There are:

- galvanic coupling
- capacitive coupling
- inductive coupling
- radiant coupling

Basic rules for EMC

In the most times it is enough to take care of some elementary rules to guarantee the EMC. Please regard the following basic rules when installing your PLC.

- Take care of a correct area-wide grounding of the inactive metal parts when installing your components.
 - Install a central connection between the ground and the protected earth conductor system.
 - Connect all inactive metal extensive and impedance-low.
 - Please try not to use aluminium parts. Aluminium is easily oxidizing and is therefore less suitable for grounding.
- When cabling, take care of the correct line routing.
 - Organize your cabling in line groups (high voltage, current supply, signal and data lines).
 - Always lay your high voltage lines and signal respectively data lines in separate channels or bundles.
 - Route the signal and data lines as near as possible beside ground areas (e.g. suspension bars, metal rails, tin cabinet).
- Proof the correct fixing of the lead isolation.
 - Data lines must be shielded.
 - Analog lines must be shielded. When transmitting signals with small amplitudes the one sided laying of the isolation may be favourable.
 - Cables for frequency inverters, servo and stepper motors must be shielded.
 - Lay the line isolation extensively on an isolation/protected earth conductor rail directly after the cabinet entry and fix the isolation with cable clamps.
 - Make sure that the isolation/protected earth conductor rail is connected impedance-low with the cabinet.
 - Use metallic or metallised plug cases for isolated data lines.
- In special use cases you should appoint special EMC actions.
 - Consider to wire all inductivities with erase links.
 - Please consider luminescent lamps can influence signal lines.
- Create a homogeneous reference potential and ground all electrical operating supplies when possible.
 - Please take care for the targeted employment of the grounding actions. The grounding of the PLC serves for protection and functionality activity.
 - Connect installation parts and cabinets with your PLC in star topology with the isolation/protected earth conductor system. So you avoid ground loops.
 - If there are potential differences between installation parts and cabinets, lay sufficiently dimensioned potential compensation lines.

Isolation of conductors

Electrical, magnetically and electromagnetic interference fields are weakened by means of an isolation, one talks of absorption. Via the isolation rail, that is connected conductive with the rack, interference currents are shunt via cable isolation to the ground. Here you have to make sure, that the connection to the protected earth conductor is impedance-low, because otherwise the interference currents may appear as interference cause.

When isolating cables you have to regard the following:

- If possible, use only cables with isolation tangle.
- The hiding power of the isolation should be higher than 80%.
- Normally you should always lay the isolation of cables on both sides. Only by means of the both-sided connection of the isolation you achieve high quality interference suppression in the higher frequency area. Only as exception you may also lay the isolation one-sided. Then you only achieve the absorption of the lower frequencies. A one-sided isolation connection may be convenient, if:
 - the conduction of a potential compensating line is not possible.
 - analog signals (some mV respectively μA) are transferred.
 - foil isolations (static isolations) are used.
- With data lines always use metallic or metallised plugs for serial couplings. Fix the isolation of the data line at the plug rack. Do not lay the isolation on the PIN 1 of the plug bar!
- At stationary operation it is convenient to strip the insulated cable interruption free and lay it on the isolation/protected earth conductor line.
- To fix the isolation tangles use cable clamps out of metal. The clamps must clasp the isolation extensively and have well contact.
- Lay the isolation on an isolation rail directly after the entry of the cable in the cabinet. Lead the isolation further on to your PLC and don't lay it on there again!

**CAUTION!****Please regard at installation!**

At potential differences between the grounding points, there may be a compensation current via the isolation connected at both sides.

Remedy: Potential compensation line

2.14 General data for the System SLIO**Conformity and approval**

| | | |
|------------|------------|---|
| Conformity | | |
| CE | 2014/35/EU | Low-voltage directive |
| | 2014/30/EU | EMC directive |
| Approval | | |
| UL | - | Refer to Technical data |
| Others | | |
| RoHS | 2011/65/EU | Restriction of the use of certain hazardous substances in electrical and electronic equipment |

General data for the System SLIO

Protection of persons and device protection

| | | |
|---------------------------------------|---|-----------------------------------|
| Type of protection | - | IP20 |
| Electrical isolation | | |
| to the field bus | - | electrically isolated |
| to the process level | - | electrically isolated |
| Insulation resistance | - | - |
| Insulation voltage to reference earth | | |
| Inputs / outputs | - | AC / DC 50V, test voltage AC 500V |
| Protective measures | - | against short circuit |

Environmental conditions to EN 61131-2

| | | |
|---------------------------------|---------------|--|
| Climatic | | |
| Storage / transport | EN 60068-2-14 | -25...+70°C |
| Operation | | |
| Horizontal installation hanging | EN 61131-2 | 0...+60°C |
| Horizontal installation lying | EN 61131-2 | 0...+55°C |
| Vertical installation | EN 61131-2 | 0...+50°C |
| Air humidity | EN 60068-2-30 | RH1 (without condensation, rel. humidity 10...95%) |
| Pollution | EN 61131-2 | Degree of pollution 2 |
| Installation altitude max. | - | 2000m |
| Mechanical | | |
| Oscillation | EN 60068-2-6 | 1g, 9Hz ... 150Hz |
| Shock | EN 60068-2-27 | 15g, 11ms |

Mounting conditions

| | | |
|-------------------|---|-------------------------|
| Mounting place | - | In the control cabinet |
| Mounting position | - | Horizontal and vertical |

| EMC | Standard | Comment | |
|-----------------------|--------------|--|---|
| Emitted interference | EN 61000-6-4 | Class A (Industrial area) | |
| Noise immunity zone B | EN 61000-6-2 | Industrial area | |
| | | EN 61000-4-2 | ESD 8kV at air discharge (degree of severity 3), 4kV at contact discharge (degree of severity 2) |
| | | EN 61000-4-3 | HF field immunity (casing) 80MHz ... 1000MHz, 10V/m, 80% AM (1kHz) 1.4GHz ... 2.0GHz, 3V/m, 80% AM (1kHz) 2GHz ... 2.7GHz, 1V/m, 80% AM (1kHz) |
| | | EN 61000-4-6 | HF conducted 150kHz ... 80MHz, 10V, 80% AM (1kHz) |
| | | EN 61000-4-4 | Burst, degree of severity 3 |
| | EN 61000-4-5 | Surge, degree of severity 3 ¹ | |

1) Due to the high-energetic single pulses with Surge an appropriate external protective circuit with lightning protection elements like conductors for lightning and overvoltage is necessary.

2.14.1 Use in difficult operating conditions



Without additional protective measures, the products must not be used in locations with difficult operating conditions; e.g. due to:

- *dust generation*
- *chemically active substances (corrosive vapors or gases)*
- *strong electric or magnetic fields*

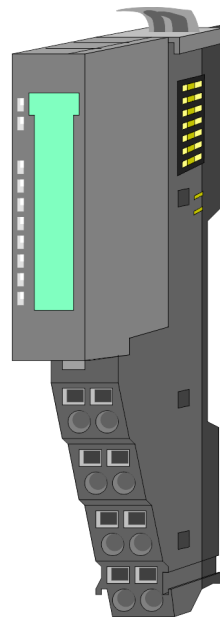
3 Hardware description

3.1 Properties

054-1DA00

The FM 054-1DA00 integrates a compact motion control solution for direct connection with a power stage with motor. The motion module outputs a specified pulse sequence with RS422 level via differential outputs.

- Pulse train output module
- Operating modes: CW/CCW, PLS/DIR, ENC/SIM
- Motor types:
 - YASKAWA Sigma 5 mini
 - YASKAWA Sigma 5/7
 - YASKAWA A1000, V1000
- 1 channel RS422
- 4 configurable in-/outputs I/O1 ... I/O4



Compatibility list

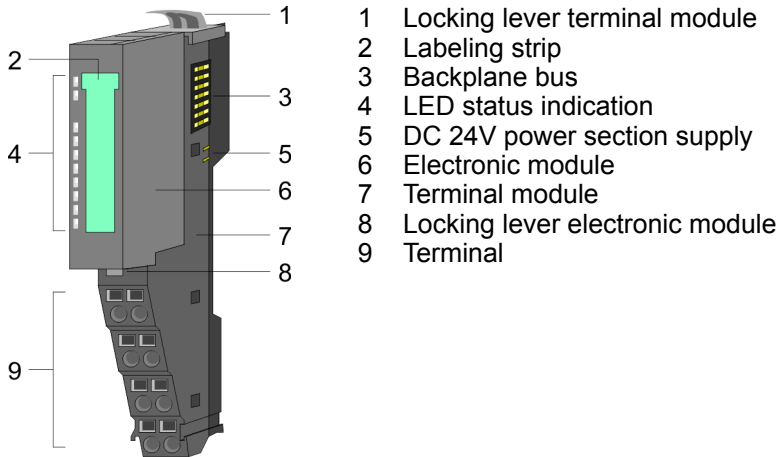
An overview of CPU and bus coupler, which support the 054-1DA00, can be found at www.yaskawa.eu.com at the download area of the System SLIO manuals.

Ordering data

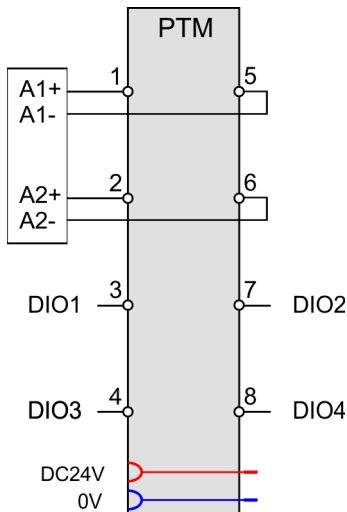
| Type | Order number | Description |
|--------------------|--------------|---|
| FM 054 Pulse Train | 054-1DA00 | System SLIO 1xPulseTrain RS422 0 ... 1000kHz, DC 24V, feedback (2DI) |

3.2 Structure

054-1DA00



Connections



CAUTION!

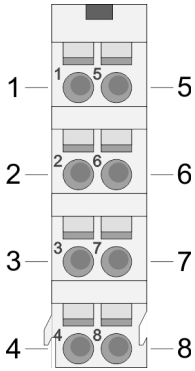
Danger of injury from electrical shock and damage to the unit!

Put the System SLIO in a safe, powered down state before starting installation, disassembly or wiring of the System SLIO modules!

You can use wires with a cross section of 0.08mm^2 up to 1.5mm^2 . For the connection lines the following requirements apply:

- For the digital I/O connection with DIO operation single lines can be used.
- A power stage must be connected via shielded lines.
- Generally, lines for power supply and signal lines must be laid separately.
- The motion module outputs a specified pulse sequence with RS422 level via differential outputs. The frequency pattern can be specified via the object dictionary.
- The digital connections I/O1...I/O4 are freely configurable via the object dictionary.

Structure



Default assignment

| Pos. | Function | Type | 🔗 '0x8E00-01 - Pulse train configuration' page 139 | | |
|------|----------|------|--|--------|-----|
| | | | P/D | CW/CCW | A/B |
| 1 | A1+ | O | P | CW | A |
| 2 | A2+ | O | D | CCW | B |
| 3 | I/O1 | I/O | Digital input | | |
| 4 | I/O3 | I/O | Digital input | | |
| 5 | A1- | O | /P | /CW | /A |
| 6 | A2- | O | /D | /CCW | /B |
| 7 | I/O2 | I/O | Digital input | | |
| 8 | I/O4 | I/O | Digital input | | |

I: Input, O: Output



In this module, the state machine emulates the states of the connected power stage. It does not represent its current states. Only by adjusting the DIO signals on the signals of the power stage as e.g. S-ON, ALM-RST, S-RDY and COIN, you can control its states.

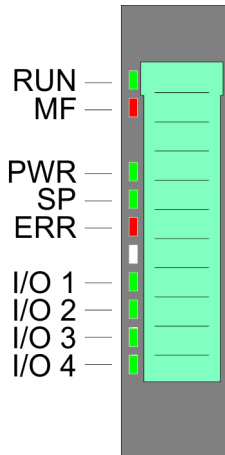
🔗 Chap. 4.8 'Deployment I/O1...I/O4' page 82

Assignment for YASKAWA Sigma 5mini via pulse train

| Pos. | Function | Type | P/D | CW/CCW | A/B |
|------|----------|------|---------------------------|--------|-----|
| 1 | A1+ | O | P | CW | A |
| 2 | A2+ | O | D | CCW | B |
| 3 | I/O1 | I/O | S-ON: Servo drive On/Off | | |
| 4 | I/O3 | I/O | ALM-RST: Reset Interrupts | | |
| 5 | A1- | O | /P | /CW | /A |
| 6 | A2- | O | /D | /CCW | /B |
| 7 | I/O2 | I/O | S-RDY: Servo ready | | |
| 8 | I/O4 | I/O | COIN: Position reached | | |

I: Input, O: Output

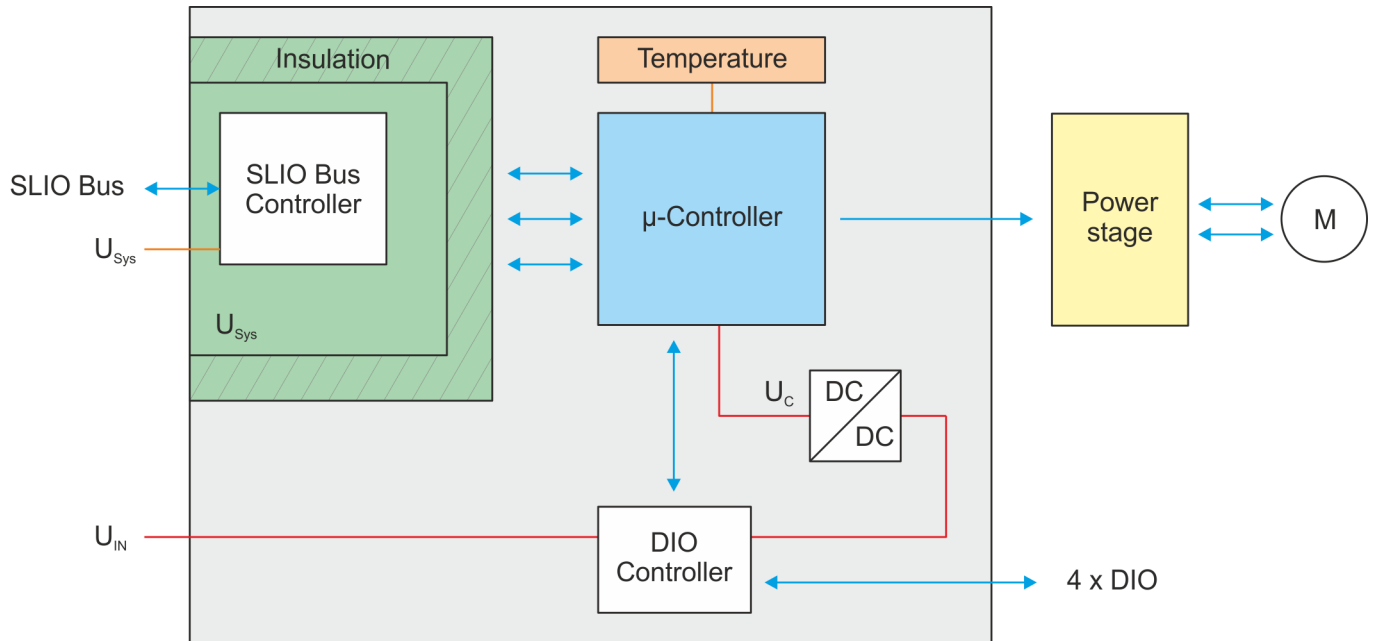
Status indication



| RUN | MF | Description | |
|-----------------|-----------|---|--|
| green | red | | |
| | | Bus communication is OK | Module status is OK |
| | | Bus communication is OK | Module status reports an error |
| | | Bus communication is not possible | Module status reports an error |
| | | Error at bus power supply | |
| X | | Error in configuration ↗ Chap. 2.12 'Trouble shooting - LEDs' page 38 | |
| PWR | green | | The state of the module is beyond 'Switched on' and 'Operation enabled' ↗ Chap. 4.4.2 'States' page 61 |
| | | | Module is in state 'Switched on' |
| | | | Module is in state 'Operation enabled' |
| SP | green | | Velocity set point value is 0. In state 'Operation enabled' there is no reaction of the motor. |
| | | | Velocity set point value > 0. In state 'Operation enabled' there is a reaction of the motor. |
| ERR | red | | No Error |
| | | | Warning: 0x80 in ↗ '0x8100-02 - Status word' page 117 |
| | | | Error: 0x08 in ↗ '0x8100-02 - Status word' page 117 |
| I/O1 | green | | Digital input/output 1 has "0" signal |
| | | | Digital input/output 1 has "1" signal |
| I/O2 | green | | Digital input/output 2 has "0" signal |
| | | | Digital input/output 2 has "1" signal |
| I/O3 | green | | Digital input/output 3 has "0" signal |
| | | | Digital input/output 3 has "1" signal |
| I/O4 | green | | Digital input/output 4 has "0" signal |
| | | | Digital input/output 4 has "1" signal |
| not relevant: X | | | |

3.3 Block diagram

Structure



Voltages

- U_{Sys} - DC 24V electronic section supply
Power supply for electronic and back plane bus communication
- U_{IN} - DC 24V power section supply
Power supply for the I/O area
Area: DC 20.4 ... 28.8V
- U_C - DC 3.3V μ -controller supply
The power supply is built via U_{IN} via a DC-DC converter.
ON: Edge 0-1 at 16V from U_{IN}
OFF: Edge 1-0 at 14V from U_{IN}

Temperature monitoring

The motion module has an internal temperature monitoring of the μ -controller. Via the object dictionary limit temperatures can be defined. If the temperature over or under runs the limit values, there is an error reaction of the motion module, which can be configured.
 ↪ '0x8780-02 - Temperature μ -Controller actual value' page 137

3.4 Technical data

| Order no. | 054-1DA00 |
|---|---------------------|
| Type | FM 054 |
| Module ID | 0983 6800 |
| Current consumption/power loss | |
| Current consumption from backplane bus | 50 mA |
| Power loss | 1 W |
| Technical data digital inputs | |
| Number of inputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | - |
| Current consumption from load voltage L+ (without load) | - |
| Rated value | DC 20.4...28.8 V |
| Input voltage for signal "0" | DC 0...5 V |
| Input voltage for signal "1" | DC 11...28.8 V |
| Input voltage hysteresis | - |
| Frequency range | - |
| Input resistance | - |
| Input current for signal "1" | 3 mA |
| Connection of Two-Wire-BEROs possible | ✓ |
| Max. permissible BERO quiescent current | 1.5 mA |
| Input delay of "0" to "1" | 1.5 ms |
| Input delay of "1" to "0" | 1.5 ms |
| Number of simultaneously utilizable inputs horizontal configuration | 4 |
| Number of simultaneously utilizable inputs vertical configuration | 4 |
| Input characteristic curve | IEC 61131-2, type 3 |
| Initial data size | 4 Bit |
| Technical data digital outputs | |
| Number of outputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.4...28.8 V |
| Reverse polarity protection of rated load voltage | - |
| Current consumption from load voltage L+ (without load) | - |
| Output current at signal "1", rated value | 500 mA |

Technical data

| | |
|---|-----------------------|
| Order no. | 054-1DA00 |
| Output delay of "0" to "1" | 1.5 ms |
| Output delay of "1" to "0" | 1.5 ms |
| Minimum load current | - |
| Lamp load | 10 W |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | ✓ |
| Switching frequency with resistive load | max. 300 Hz |
| Switching frequency with inductive load | max. 0.5 Hz |
| Switching frequency on lamp load | max. 10 Hz |
| Internal limitation of inductive shut-off voltage | L+ (-45 V) |
| Short-circuit protection of output | yes, electronic |
| Trigger level | 1 A |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | - |
| Output data size | - |
| Status information, alarms, diagnostics | |
| Status display | green LED per channel |
| Interrupts | yes, parameterizable |
| Process alarm | no |
| Diagnostic interrupt | yes, parameterizable |
| Diagnostic functions | yes |
| Diagnostics information read-out | possible |
| Supply voltage display | green LED |
| Group error display | red LED |
| Channel error display | red LED per channel |
| Isolation | |
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✓ |
| Insulation tested with | AC 500 V |
| Technical data positioning module | |
| Number of channels | 1 |
| Input voltage (rated value) | DC 24 V |
| Input voltage (permitted range) | DC 20.4...28.8 V |
| Motor current | - |

| | |
|---|----------------------------|
| Order no. | 054-1DA00 |
| Power stage | RS422 |
| Short-circuit protection | ✓ |
| Brake-Chopper required | - |
| PWM frequency | - |
| Pulse train frequency | 1 MHz |
| Micro steps | - |
| Steps per rotation | - |
| Type of encoder | A/B phase 24V single ended |
| Encoder frequency | 100 kHz |
| Encoder resolution | 24 Bit |
| Control type | open loop |
| Temperature sensor | ✓ |
| Operating modes position functions | |
| Homing via homing switch | ✓ |
| Positioning via torque | - |
| Positioning without encoder | ✓ |
| Positioning with encoder | - |
| Speed control | ✓ |
| Torque control | - |
| Housing | |
| Material | PPE / PPE GF10 |
| Mounting | Profile rail 35 mm |
| Mechanical data | |
| Dimensions (WxHxD) | 12.9 mm x 109 mm x 76.5 mm |
| Net weight | 61 g |
| Weight including accessories | 61 g |
| Gross weight | 76 g |
| Environmental conditions | |
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |
| Certifications | |
| UL certification | yes |
| KC certification | yes |

4 Deployment

4.1 Basics

Addressing

The System SLIO motion module provides its data, such as "Profiling target position" via an object dictionary. In this object dictionary the objects are organized and addressable a unique number consisting of *Index* and *Subindex*. The number is specified as follows:

| | | | |
|--------------------|---------------------|---|--------------------|
| 0x | Index (hexadecimal) | - | Subindex (decimal) |
| Example: 0x8400-03 | | | |



To improve the structure and for expansion at System SLIO Motion Module another object numbering (index-assignment) is used besides the standard CiA 402.

Index area

By separating into index and subindex a grouping is possible. The individual areas are divided into groups of related objects. With the System SLIO motion module this object directory is structured as follows:

| Index area | Content |
|---------------------|---|
| 0x1000 up to 0x6FFF | General data and system data |
| 0x7000 up to 0x7FFF | Data of the digital input and output part |
| 0x8000 up to 0x8FFF | Data of the axis |



Each object has a subindex 0. Calling an object with subindex 0, the number of available subindexes of the corresponding object is returned.

Accessing the object dictionary

You have the following options for accessing the objects in the object dictionary:

- Access via acyclic channel
 - Any access to the object dictionary is acknowledged by the motion module.
 - ↪ *Chap. 4.11 'Acyclic channel' page 88*
- Access via I/O area
 - The main objects are mapped in the I/O area.
 - The mapping cannot be changed.
 - ↪ *Chap. 4.10 'In-/Output area' page 86*



Please note if you write via the Acyclic Channel to objects, which are mapped in the I/O area, these values are overwritten with the next cycle.

Overview

The motion module uses 36byte input and 36byte output data.

| Head module | Backplane bus | Motion module | |
|------------------------------|---------------|---------------|-----------------|
| CPU respectively bus coupler | → | Process data | Acyclic channel |
| | ← | 36byte | |

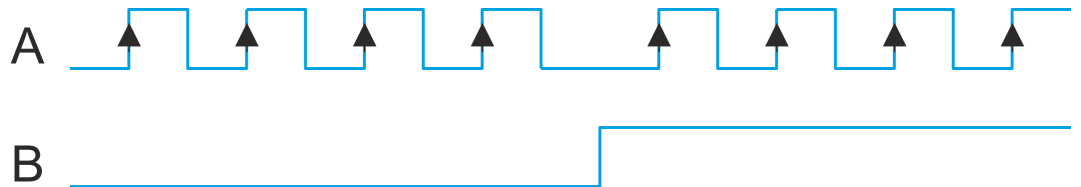


The data exchange with the motion module must be consistent across the 36 bytes! It is recommended to control it via the process image.

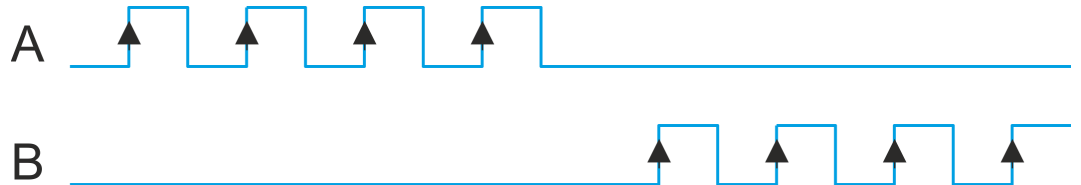
4.1.1 Pulse train module**Frequency pattern**

The FM 054-1DA00 integrates a compact motion control solution for direct connection with a power stage with motor. The motion module outputs a specified pulse sequence with RS422 level via differential outputs to the power stage. A feedback of the position from the power stage back to the motion module does not take place. For output you can preset the following frequency pattern via the object ↗ '0x8E00-01 - Pulse train configuration' page 139:

- Pulse and direction (P/D)
- Frequency modulation (CW/CCW)
- Incremental encoder simulation (A/B)

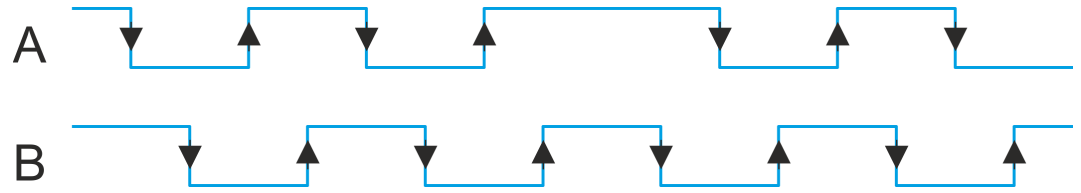
Pulse and direction (P/D)

- 0x8E00-01 = 1
- The output of the frequency pattern happens by output A1 (P)
- The direction of rotation marks A2 (D) with "high" level for clockwise and "low" level for counter-clockwise rotation.

Frequency modulation (CW/CCW)

- 0x8E00-01 = 2
- With clockwise rotation the frequency signal is output at A1 (CW) respectively counter-clockwise rotation at A2 (CCW).
- The inactive channel is always at logic "low".

Incremental encoder simulation (A/B)

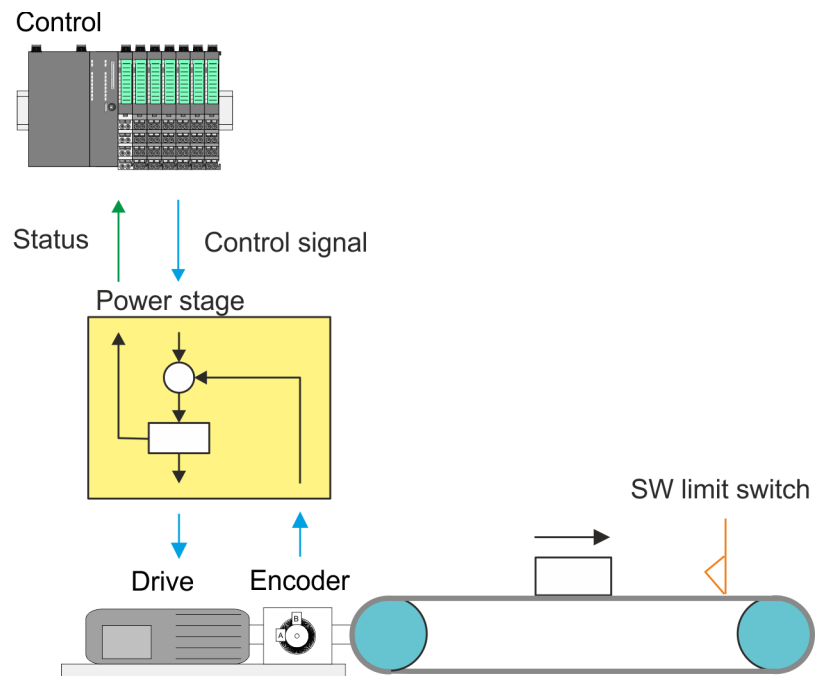


- 0x8E00-01 = 3
- Signal corresponds to the signal of an incremental encoder. By direct connection to a power stage synchronous axes in the master/slave structure can be realized.
- A1 (A) and A2 (B) output a phase-shifted by 90° signal.
- The shift from A1 to A2 is positive for clockwise rotation and negative for counter-clockwise rotation.

4.1.2 Structure of a positioning control

Structure

The figure below shows the structure of a typical positioning control




Control

The *Control* consists of the PLC with the user program for the processing and the motion module to control the power stage. The control of the power stage happens via RS422 signals. You can define a software limit switch in the motion module and react in the user program on the overrun.

Power stage with motor

The power stage receives from the motion module the corresponding control commands and controls automatically the connected motor. A *motor* is a engine for high-precision positioning. Motor and power stage are to be harmonized

 **CAUTION!** Please provide for track limits (general position limit) respectively to avoid damages besides software limit switch hardware limit switches and also consider this in your safety concept.

Encoder

- The encoder respectively rotation encoder provides the controller with the position of the motor by means of digital signals. This can accordingly be evaluated by the PLC.
- The encoder respectively rotation encoder supply a certain number of pulses per revolution.
- The value generation is done by counting the pulses.

4.2 Commissioning

4.2.1 Installation

1. ➤ Build your System SLIO and connect it. ↪ *Chap. 2 'Basics and mounting' page 8.*
2. ➤ Connect your drive. ↪ *Chap. 4.3 'Connecting a power stage' page 59*

4.2.2 Inspections and tests before the test operation

Preparation

Please check the following items, and take appropriate measures in the event of an error, before you start the test operation.

- Are all wiring and connections correct?
- Are all nuts and bolts at the drive properly tightened?
- For a motor with oil seal: Is the seal not damaged and is the motor lubricated? Please always regard the start-up instructions of your motor!

4.2.3 Start-up of the System SLIO motion module

Preparation

Please check the following items, and take appropriate measures in the event of an error, before you start the test operation.

- Check the correct setting of the set points for the drive and the I/O signals from the superordinate control.
- Check wiring between the superordinate control and your drive as well as the polarity of the wires.
- Check all operational settings of your drive.

Setting the limits

Set the respective system limits, the system behavior and characteristics in the object dictionary via the *Acyclic channel* ↪ 88. These are e.g.:

- Behavior at quick stop and on error
- Velocity limit values
- Position limitations
- Assignment of the digital inputs and outputs

Steps of commissioning

**Always adapt parameters to the operating mode!**

Please ensure that the module always has the correct parameters according to the selected operating mode!

Start parameter

- ↪ 'Start - Start parameter homing' page 64
- ↪ 'Start - Start parameter PtP position profile' page 69
- ↪ 'Start - Start parameter velocity profile' page 80

1. ➤ Perform for your System SLIO and your motion module a hardware configuration and create your application program.
2. ➤ Enter the parameters that are to be loaded at start-up in the motion module. Otherwise you can parametrize during operation via the *Acyclic channel*.
3. ➤

**Power supply**

The module is to be power supplied with the both DC 24V voltages power section supply I/O area and electronic power supply. When commissioning these may simultaneously or electronic power supply must be switched on first. When commissioning these may simultaneously or power section supply I/O area must be switched on first. ↪ 'Standard wiring' page 27

Transfer your project into your CPU.

4. ➤ Set the power stage in operation.



The settings in the power stage to be controlled are important for the safe and proper operation of your drive. More information may be found in the manual of the power stage.

5. ➤ Thus, the signals are scaled correctly at the power stage, you need to set a transmission ratio of the power stage.
6. ➤ Switch your CPU to RUN state.
7. ➤ Switch on the drive.
 - ⇒ Your system is now ready for communication and you can establish parameter setting via the *Acyclic channel*.
8. ➤ Send the command "Shutdown".
 - Bit 3...0: x110 ↪ '0x8100-01 - Control word' page 116
 - ⇒ The motion module shows the state 'Ready to switch on'.
9. ➤ Send the command "Switch on".
 - Bit 3...0: 0111 ↪ '0x8100-01 - Control word' page 116
 - ⇒ The motion module shows the state 'Switched on'.
10. ➤ Reset by edge 0-1 of bit 7 in ↪ '0x8100-01 - Control word' page 116 a previously encountered possible error.
11. ➤ Send the command "Enable operation".
 - Bit 3...0: 1111 ↪ '0x8100-01 - Control word' page 116
 - ⇒ The motion module shows the state 'Operation enabled'. The drive is now ready for your move commands.

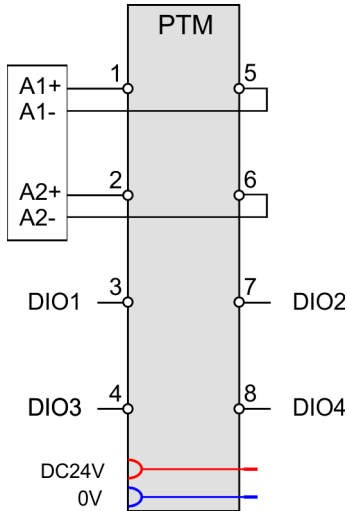
Application example


↳ Chap. 4.16 'Example: 054-1DA00 with YASKAWA Sigma 5 mini' page 96

4.3 Connecting a power stage

4.3.1 Connection options

Connections





CAUTION!
Danger of injury from electrical shock and damage to the unit!
 Put the System SLIO in a safe, powered down state before starting installation, disassembly or wiring of the System SLIO modules!


You can use wires with a cross section of 0.08mm² up to 1.5mm². For the connection lines the following requirements apply:

- For the digital I/O connection with DIO operation single lines can be used.
- A power stage must be connected via shielded lines.
- Generally, lines for power supply and signal lines must be laid separately.
- The motion module outputs a specified pulse sequence with RS422 level via differential outputs. The frequency pattern can be specified via the object dictionary.
- The digital connections I/O1...I/O4 are freely configurable via the object dictionary.

Default assignment

| Pos. | Function | Type | ↳ '0x8E00-01 - Pulse train configuration' page 139 | | |
|------|----------|------|--|--------|-----|
| | | | P/D | CW/CCW | A/B |
| 1 | A1+ | O | P | CW | A |
| 2 | A2+ | O | D | CCW | B |
| 3 | I/O1 | I/O | Digital input | | |
| 4 | I/O3 | I/O | Digital input | | |
| 5 | A1- | O | /P | /CW | /A |
| 6 | A2- | O | /D | /CCW | /B |
| 7 | I/O2 | I/O | Digital input | | |
| 8 | I/O4 | I/O | Digital input | | |

I: Input, O: Output



In this module, the state machine emulates the states of the connected power stage. It does not represent its current states. Only by adjusting the DIO signals on the signals of the power stage as e.g. S-ON, ALM-RST, S-RDY and COIN, you can control its states.

↳ Chap. 4.8 'Deployment I/O1...I/O4' page 82

Assignment for YASKAWA Sigma 5mini via pulse train

| Pos. | Function | Type | P/D | CW/CCW | A/B |
|------|----------|------|---------------------------|--------|-----|
| 1 | A1+ | O | P | CW | A |
| 2 | A2+ | O | D | CCW | B |
| 3 | I/O1 | I/O | S-ON: Servo drive On/Off | | |
| 4 | I/O3 | I/O | ALM-RST: Reset Interrupts | | |
| 5 | A1- | O | /P | /CW | /A |
| 6 | A2- | O | /D | /CCW | /B |
| 7 | I/O2 | I/O | S-RDY: Servo ready | | |
| 8 | I/O4 | I/O | COIN: Position reached | | |

I: Input, O: Output

4.4 Drive profile

4.4.1 Overview

Drive profile CiA 402

- The System SLIO motion module FM 054-1DA00 is based largely on the drive profile *CiA 402*.
- The drive profile *CiA 402* defines state machine, operating modes and objects (parameters) of components for the drive technology.
- Here significant objects for control and evaluation of the state machine are *Control word*, *Status word* and *Operation mode*.
- Further object serve for configuration and diagnostics of the motion module.
- All the object are summarized in ↗ *Chap. 5 'Object dictionary' page 103*.
- The most important objects can be found in ↗ *Chap. 4.10 'In-/Output area' page 86*.
- The access of the objects during runtime happens via ↗ *Chap. 4.11 'Acyclic channel' page 88*.

Term definitions

- State machine - The motion module has a state machine implemented. The status of the state machine can be controlled by means of commands.
- State change - The relevant command or any errors cause a state change.
- State - The state is the current state of the state machine. Via the *Status word* ↗ *'0x8100-02 - Status word' page 117* you can access the state. Here the state is output via appropriate combinations of bits.
- Command - For triggering of state transitions, certain combinations of bits must be set in the *Control word* ↗ *'0x8100-01 - Control word' page 116*. Such a combination is called *Command*.

Addressing

The System SLIO motion module provides its data, such as "Profiling target position" via an object dictionary. In this object dictionary the objects are organized and addressable a unique number consisting of *Index* and *Subindex*. The number is specified as follows:

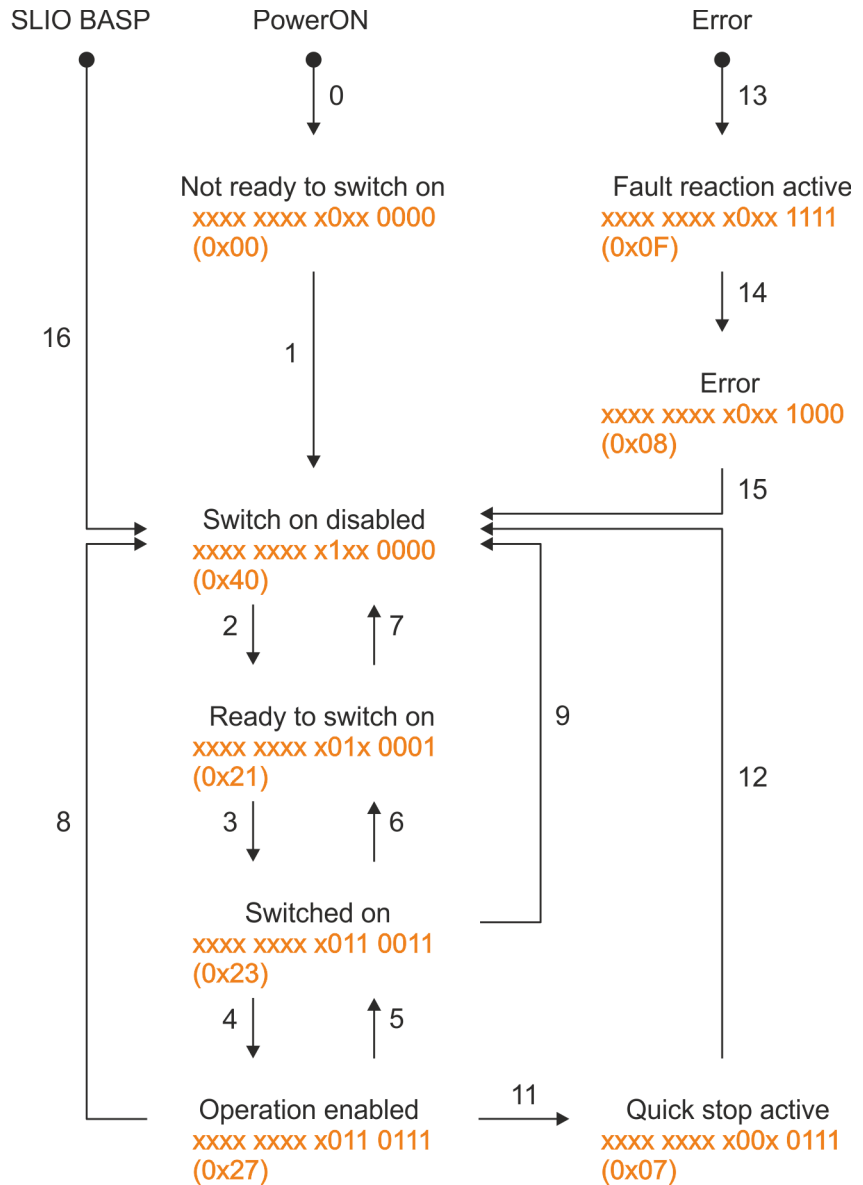
| | | | |
|--------------------|---------------------|---|--------------------|
| 0x | Index (hexadecimal) | - | Subindex (decimal) |
| Example: 0x8400-03 | | | |



To improve the structure and for expansion at System SLIO Motion Module another object numbering (index-assignment) is used besides the standard CiA 402.

4.4.2 States

State machine according to CiA 402



Transition by:
 0,1 Device start-up and self-test after PowerON
 13 Drive or communication error

Drive profile > Operating modes

| | |
|----------|---|
| 14 | Internal fault reaction |
| 16 | Disabling command output disable (BASP) ↳ '0x8100-01 - Control word' page 116: |
| 2,6 | Bit 3...0: x110: Command "Shutdown" |
| 3 | Bit 3...0: 0111: Command "Switch on" |
| 4 | Bit 3...0: 1111: Command "Enable operation". According to CiA 402 the automatic transition from <i>Ready to switch on</i> to <i>Operation enabled</i> is possible. |
| 5 | Bit 3...0: 0111: Command "Disable operation" |
| 11 | Bit 3...0: x01x: Command "Quick stop" |
| 7,8,9,12 | Bit 3...0: xx0x: Command "Disable voltage" |
| 15 | Bit 7: Edge 0-1: Command "Fault reset" |



In this module, the state machine emulates the states of the connected power stage. It does not represent its current states. Only by adjusting the DIO signals on the signals of the power stage as e.g. S-ON, ALM-RST, S-RDY and COIN, you can control its states.

↳ Chap. 4.8 'Deployment I/O1...I/O4' page 82

Accessing the state machine

At CiA 402 the total control is realized via the following two objects. Both objects are mapped in the cyclic data exchange:

↳ '0x8100-01 - Control word' page 116



State machine



↳ '0x8100-02 - Status word' page 117

4.4.3 Operating modes

4.4.3.1 Overview

Operating modes

The communication takes place via the I/O area. The main data of the object dictionary are mapped into the I/O area.

↳ Chap. 4.10 'In-/Output area' page 86

The objects, which are not mapped, can be accessed by the *Acyclic channel*.

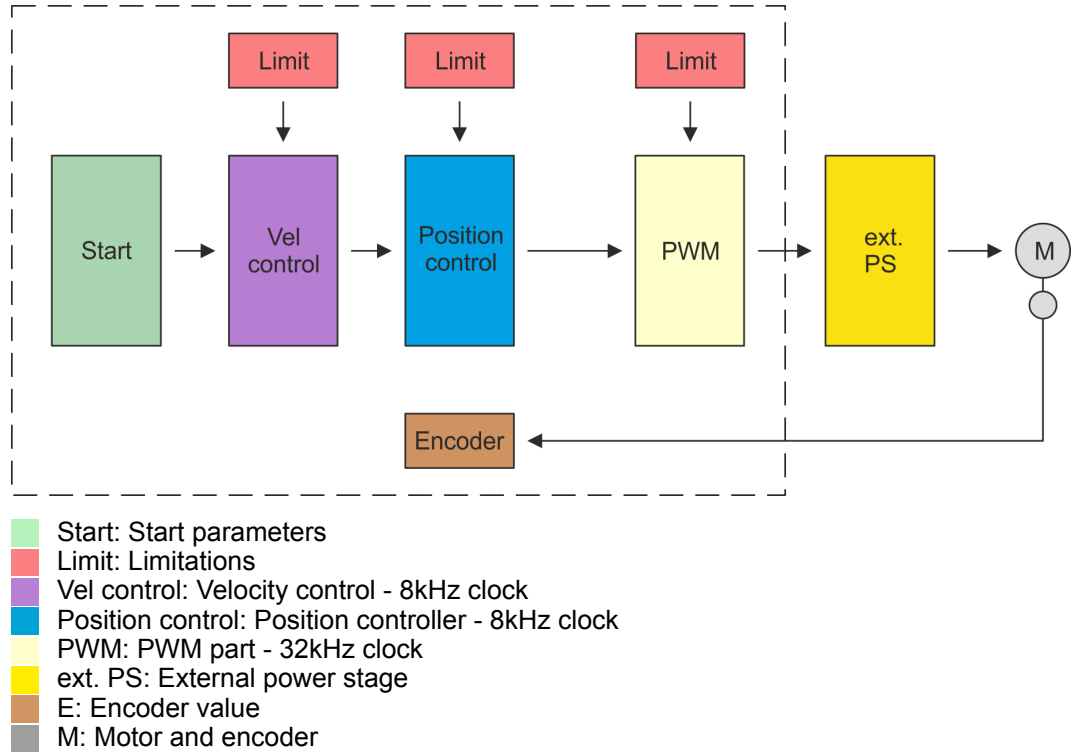
↳ Chap. 4.11 'Acyclic channel' page 88

The following modes according to the device profile CiA 402 are available:

- ↳ Chap. 4.5 'Homing' page 64
- ↳ Chap. 4.6 'PtP positioning profile' page 68
- ↳ Chap. 4.7 'Velocity profile' page 79

Controller structure and controller parameters

Basis of the individual modes is the cascaded controller structure of the System SLIO motion module. This will give you a high dynamic and position precision. The set point for the higher-level position controller is generated by the profile generators of the individual modes. Position and velocity control loop are not closed, i.e. a feedback of the position from the power stage back to the motion module does not take place. This structure consists of the following components:



Application data

In addition to the control parameters you have to specify the data from your application, consisting of the nominal drive data and scaling.

| | | |
|--|---|------------------|
| ↪ '0x8180-02 - Gear factor' page 122 | → | Application data |
| ↪ '0x8E00-02 - Pulse train pulses per revolution' page 140 | → | |

Homing


4.5 Homing

Overview

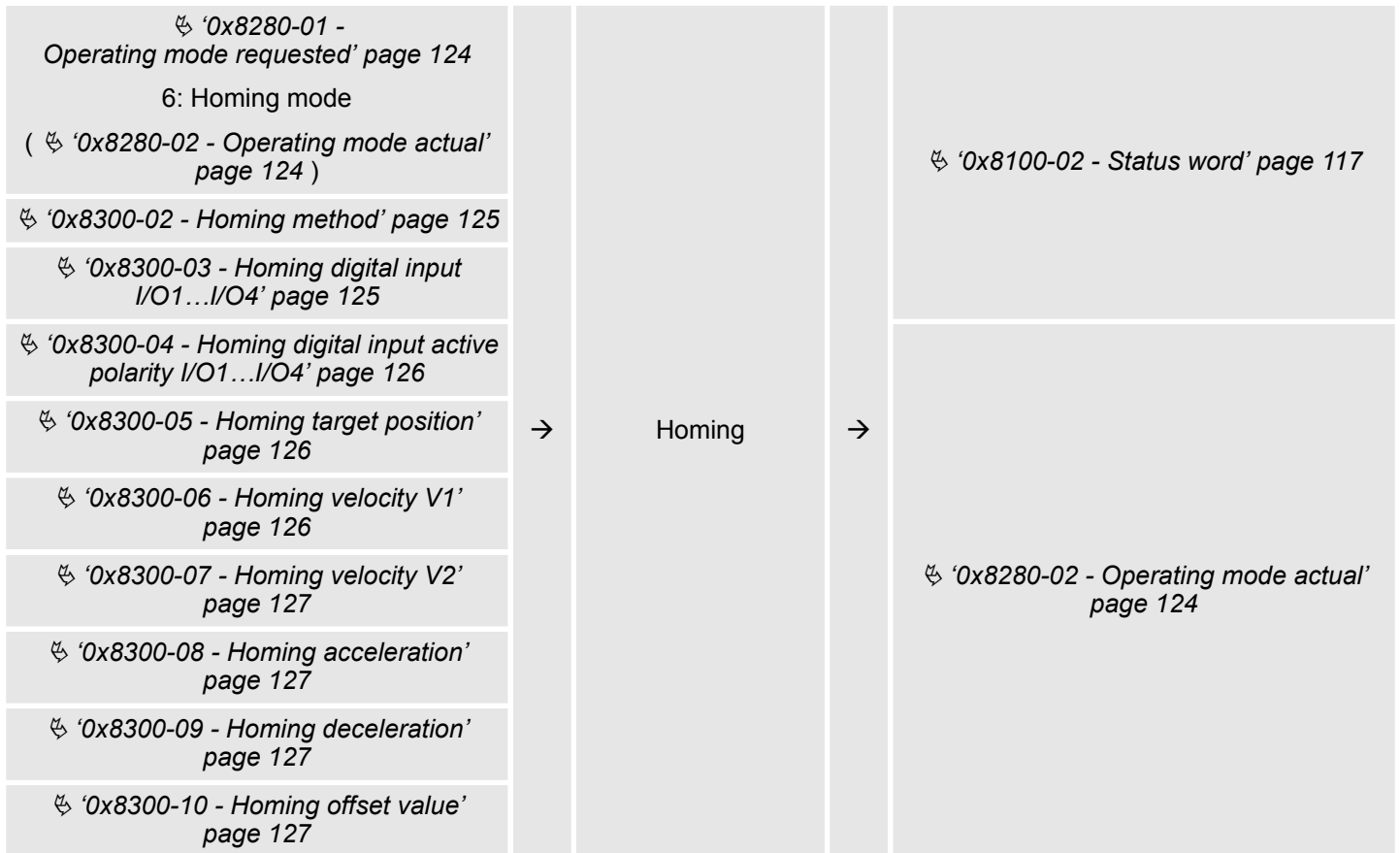
Here you will find information on how the System SLIO motion module searches the *reference position*. The reference position is also called "basic position", "start position" or "home position". *Homing* is an initialisation drive of an axis, where the correct position is determined by means of an reference signal. This process is called "referencing", "home drive" or "homing". When referencing you can determine velocity, acceleration, deceleration and type of homing. The FM 054-1DA00 supports the following homing types:

- [↪ Chap. 4.5.1 'Homing by means of a homing switch' page 65](#)
- [↪ Chap. 4.5.2 'Homing to current position' page 67](#)

Start - Start parameter homing

 **Please note:**

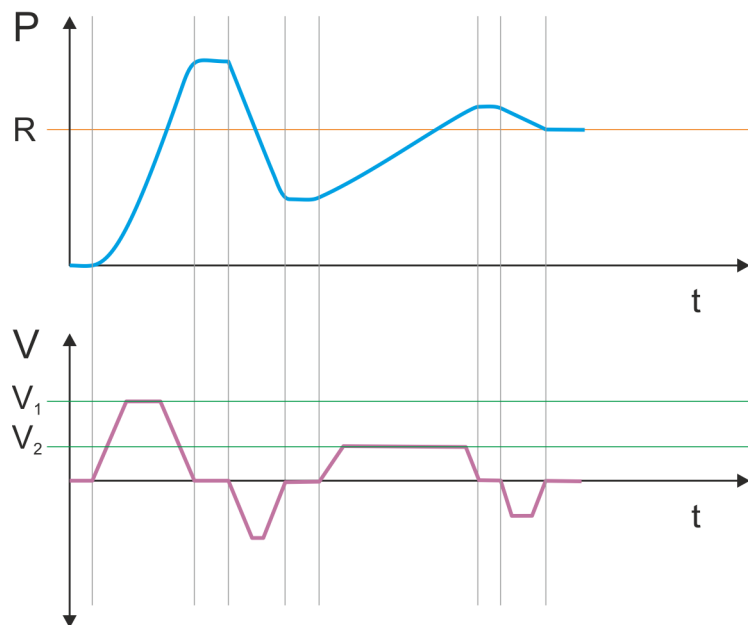
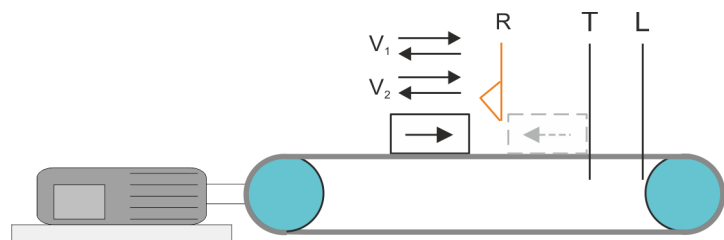
- [↪ Chap. 4.2 'Commissioning' page 57](#)
- [↪ 'Application data' page 63](#)



4.5.1 Homing by means of a homing switch

Homing by means of a homing switch

- Homing can only be accessed from the *PtP positioning profile* mode.
- The *target position* is the reference position, which is maximally moved to. This is to be specified with sign.
- The homing happens according to the following steps:
 - It is traversed with the high *velocity V1* toward the target position *T* until the homing switch *R* is overrun.
 - Then it is decelerated and traversed in the opposite direction with *velocity V1*.
 - If the homing value *R* is overrun again, it is again decelerated and it is again accelerated in the positive direction with slower *velocity V2*.
 - With the next overrun of the homing switch the reference position *R* is set and moved to with *velocity V2*.
- Use To connect the home switch one of the digital inputs of the motion module and specify the polarity of the switch with the parametrization.



- V_1 High velocity
- V_2 Low velocity
- R Homing switch respectively homing value
- T Target position
- L General position limit

Proceeding

1. ➤ For commissioning ↪ *Chap. 4.2 'Commissioning' page 57*
Homing objects ↪ *Chap. 5.2.11 'Homing - 0x8300' page 125*
2. ➤ ■ Switch the state machine to state 'Switch on disabled' ↪ *Chap. 4.4.2 'States' page 61*
 - Send the command "Disable voltage"
↪ '0x8100-01 - Control word' page 116 Bit 3...0: xx0x:
 - ⇒ The motion module shows the state 'Switch on disabled'.
3. ➤ Set the following parameters:
 - ↪ '0x8300-02 - Homing method' page 125
 - Enter the value 17.
 - ↪ '0x8300-03 - Homing digital input I/O1...I/O4' page 125
 - Select the input to which the homing switch is connected.
 - ↪ '0x8300-04 - Homing digital input active polarity I/O1...I/O4' page 126
 - Define the polarity of the switch
 - ↪ '0x8300-05 - Homing target position' page 126
 - Define by specifying a target position the maximum axis movement path, that during movement the homing switch is passed over.
 - ↪ '0x8300-06 - Homing velocity V1' page 126
 - Specify the high velocity for the movement to the homing switch.
 - ↪ '0x8300-07 - Homing velocity V2' page 127
 - Specify the low velocity for the movement to the homing switch.
 - ↪ '0x8300-08 - Homing acceleration' page 127
 - Specify the acceleration for homing.
 - ↪ '0x8300-09 - Homing deceleration' page 127
 - Specify the deceleration for homing.
 - ↪ '0x8300-10 - Homing offset value' page 127
 - If necessary specify an offset for the homing position.
4. ➤ ■ ↪ '0x8400-03 - Positioning profile target velocity' page 128
 - Enter the value 0.
5. ➤ ■ Switch your motion module to the *Positioning* mode. ↪ '0x8280-01 - Operating mode requested' page 124
 - Enter the value 1.
6. ➤ Send the command "Shutdown"
↪ '0x8100-01 - Control word' page 116 Bit 3...0: x110:
⇒ The motion module shows the state 'Ready to switch on'.
7. ➤ Send the command "Switch on".
↪ '0x8100-01 - Control word' page 116 Bit 3...0: 0111
⇒ The motion module shows the state 'Switched on'.
8. ➤ Send the command "Enable operation".
↪ '0x8100-01 - Control word' page 116 Bit 3...0: 1111
⇒ The motion module shows the state 'Operation enabled'. The drive is now ready for your move commands.
9. ➤ ■ Switch your motion module to the *Homing* mode. ↪ '0x8280-01 - Operating mode requested' page 124
 - Enter the value 6.
 - ⇒ The drive starts homing. Upon completion of the homing, the position of the reference switch is used as the reference point.

4.5.2 Homing to current position

Proceeding

1. ➤ For commissioning ↪ *Chap. 4.2 'Commissioning' page 57*
Homing objects ↪ *Chap. 5.2.11 'Homing - 0x8300' page 125*
2. ➤ ■ Switch the state machine to state 'Switch on disabled' ↪ *Chap. 4.4.2 'States' page 61*
 - Send the command "Disable voltage"
↪ '0x8100-01 - Control word' page 116 Bit 3...0: xx0x:
 - ⇒ The motion module shows the state 'Switch on disabled'.
3. ➤ Set the following parameters:
 - ↪ '0x8300-02 - Homing method' page 125
 - Enter the value 37.
 - ↪ '0x8300-10 - Homing offset value' page 127
 - If necessary specify an offset for the homing position.
4. ➤ ■ ↪ '0x8400-03 - Positioning profile target velocity' page 128
 - Enter the value 0.
5. ➤ ■ Switch your motion module to the *Positioning* mode. ↪ '0x8280-01 - Operating mode requested' page 124
 - Enter the value 1.
6. ➤ Send the command "Shutdown"
↪ '0x8100-01 - Control word' page 116 Bit 3...0: x110:
⇒ The motion module shows the state 'Ready to switch on'.
7. ➤ Send the command "Switch on".
↪ '0x8100-01 - Control word' page 116 Bit 3...0: 0111
⇒ The motion module shows the state 'Switched on'.
8. ➤ Send the command "Enable operation".
↪ '0x8100-01 - Control word' page 116 Bit 3...0: 1111
⇒ The motion module shows the state 'Operation enabled'. The drive is now ready for your move commands.
9. ➤ ■ Switch your motion module to the *Homing* mode.
↪ '0x8280-01 - Operating mode requested' page 124
 - Enter the value 6.
 - ⇒ The current position is directly taken as a reference point in consideration to the offset.
↪ '0x8300-10 - Homing offset value' page 127

The motion module then automatically switches back to the *Positioning* mode.

4.6 PtP positioning profile

Overview



Always adapt parameters to the operating mode!

Please ensure that the module always has the correct parameters according to the selected operating mode!

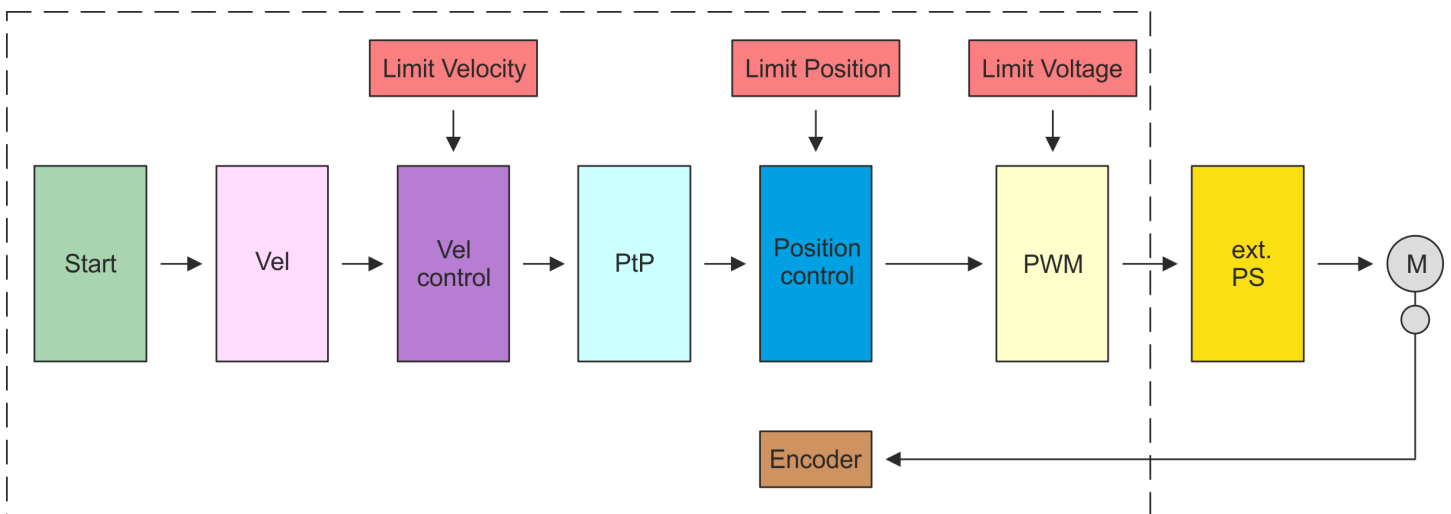
Start parameter

- [Start - Start parameter homing](#) page 64
- [Start - Start parameter PtP position profile](#) page 69
- [Start - Start parameter velocity profile](#) page 80

With the PtP positioning profile, you can move to target positions by specifying profile velocity, profile acceleration and profile deceleration. Here, the limits for velocity and maximum traversing position are always be considered. Due to changes of values are immediately used and activated, "on the fly" changes of the move process are possible.

- Changes in acceleration respectively deceleration are directly used with the profile generation.
- Deceleration and reversing is automatically executed when a new target position requires a change of direction. A separated activation by starting the job in the *control word* is not necessary.
- If a specified target position is reached or a limit is activated during the traversing, this is indicated in [0x8100-02 - Status word](#) page 117.
- The System SLIO motion module works in a controlled mode. Here, the position and velocity control loop are open and there is no evaluation of the encoder feedback.
- Current values of position, velocity, acceleration and deceleration are calculated by the System SLIO motion module itself.

Structure



- | | |
|--|--|
| <ul style="list-style-type: none"> Start: Start parameters Limit Velocity: Limitation velocity Limit Position: Limitation position Limit Voltage: Limitation voltage Vel: Velocity profile Vel control: Velocity control | <ul style="list-style-type: none"> PtP: PtP positioning profile Position control: Position controller PWM: PWM stage ext. PS: External power stage M: Motor and encoder Encoder: Encoder current value |
|--|--|

Start - Start parameter PtP position profile

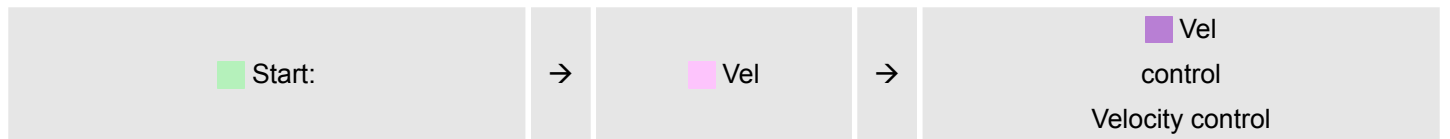


Please note:

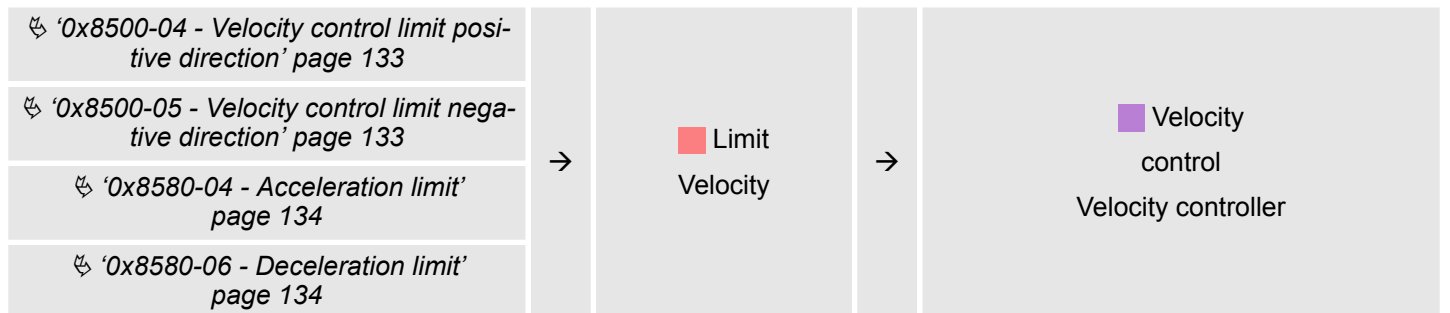
- ↪ Chap. 4.2 'Commissioning' page 57
- ↪ 'Application data' page 63



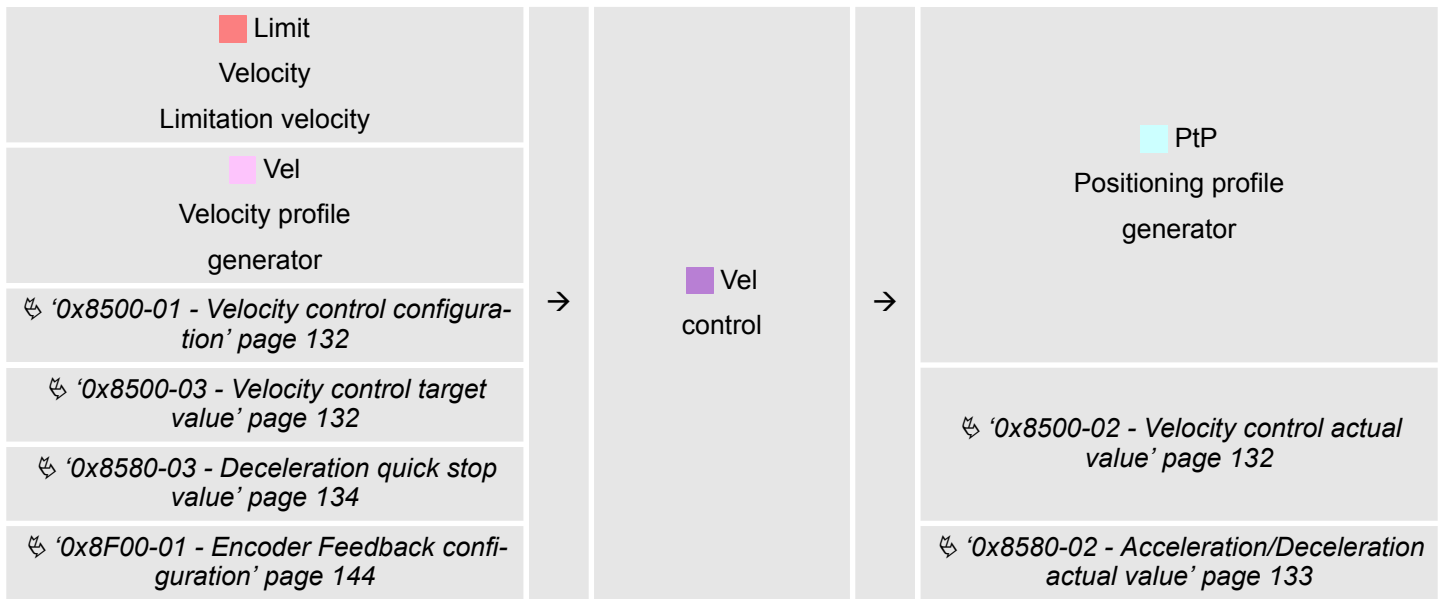
Vel - velocity profile



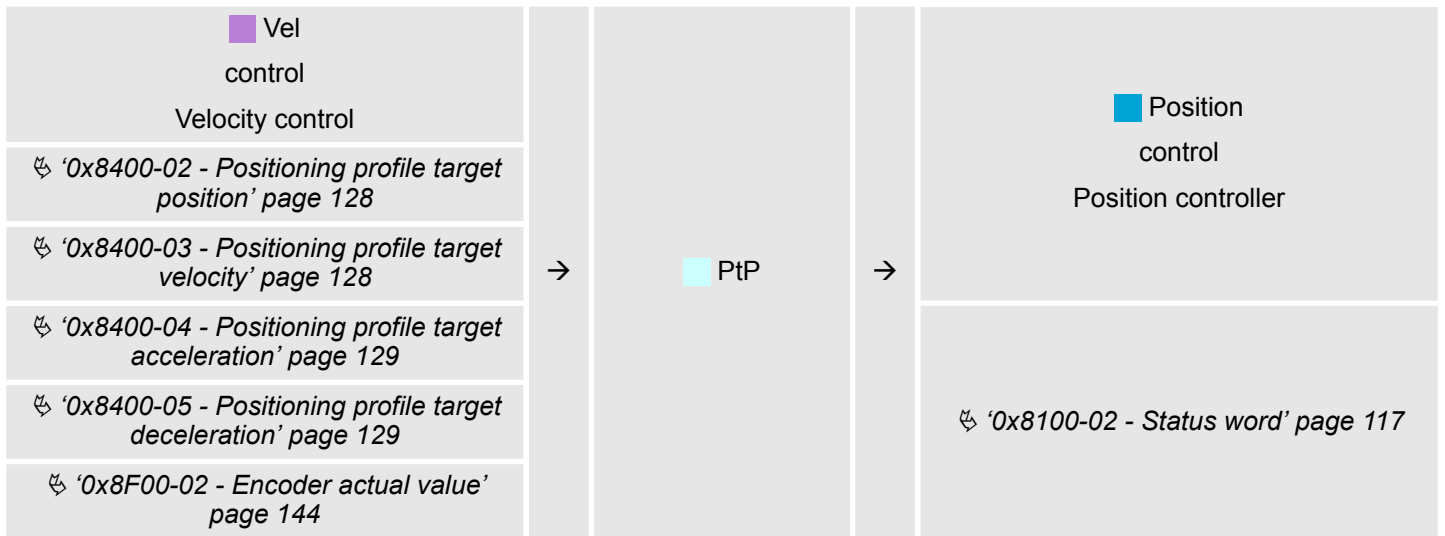
Limit - limitation velocity



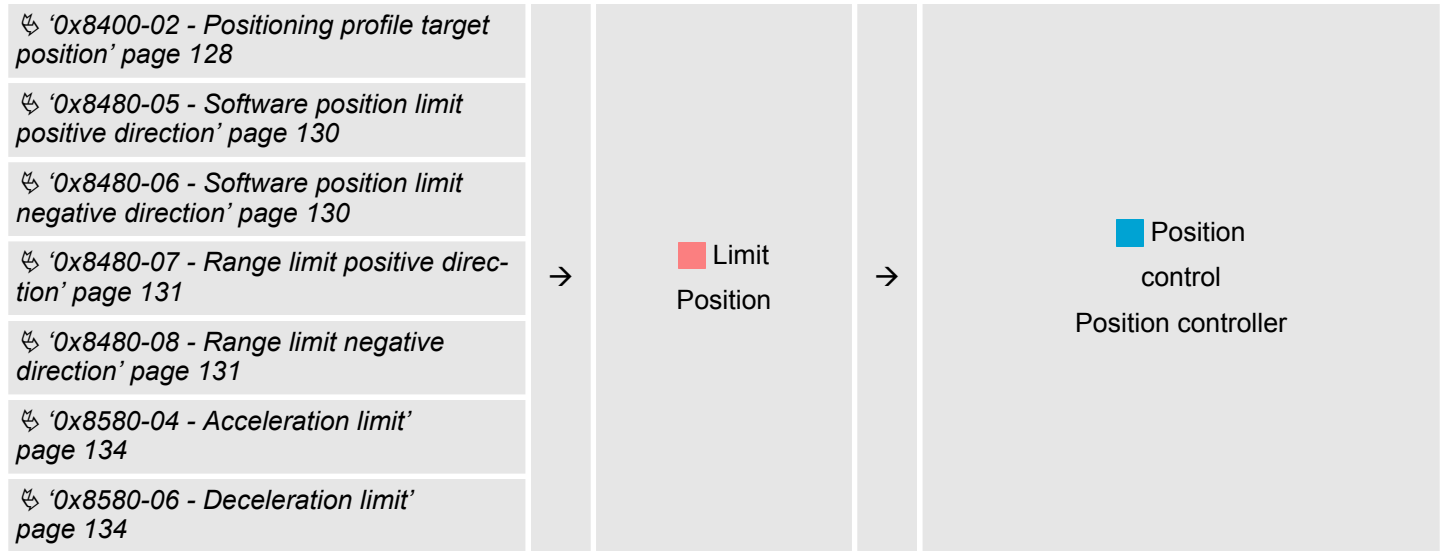
Velocity control - Velocity control



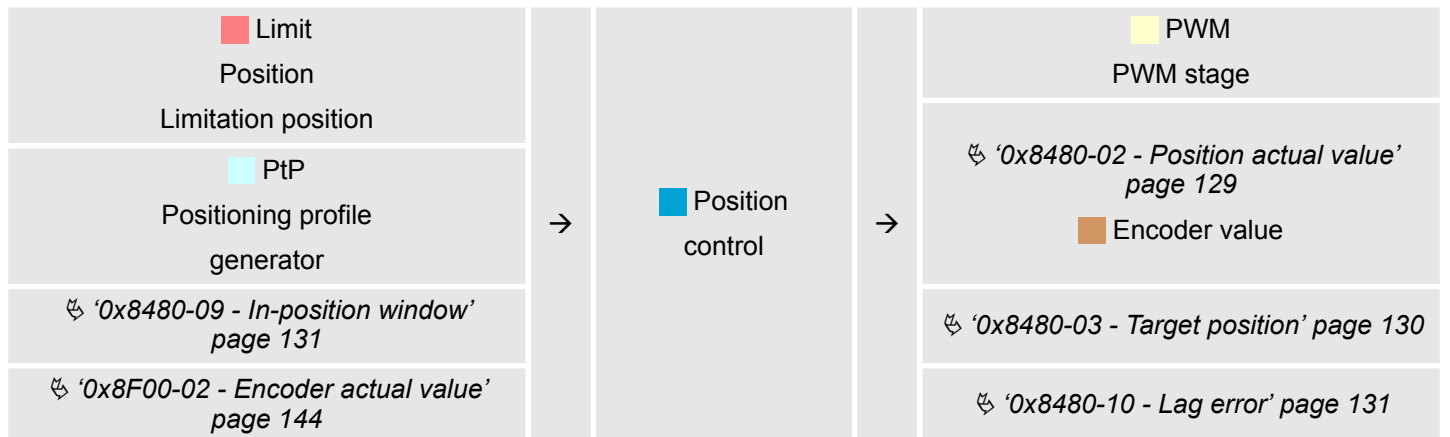
PtP - Positioning profile generator



Limit Position - Limitation position

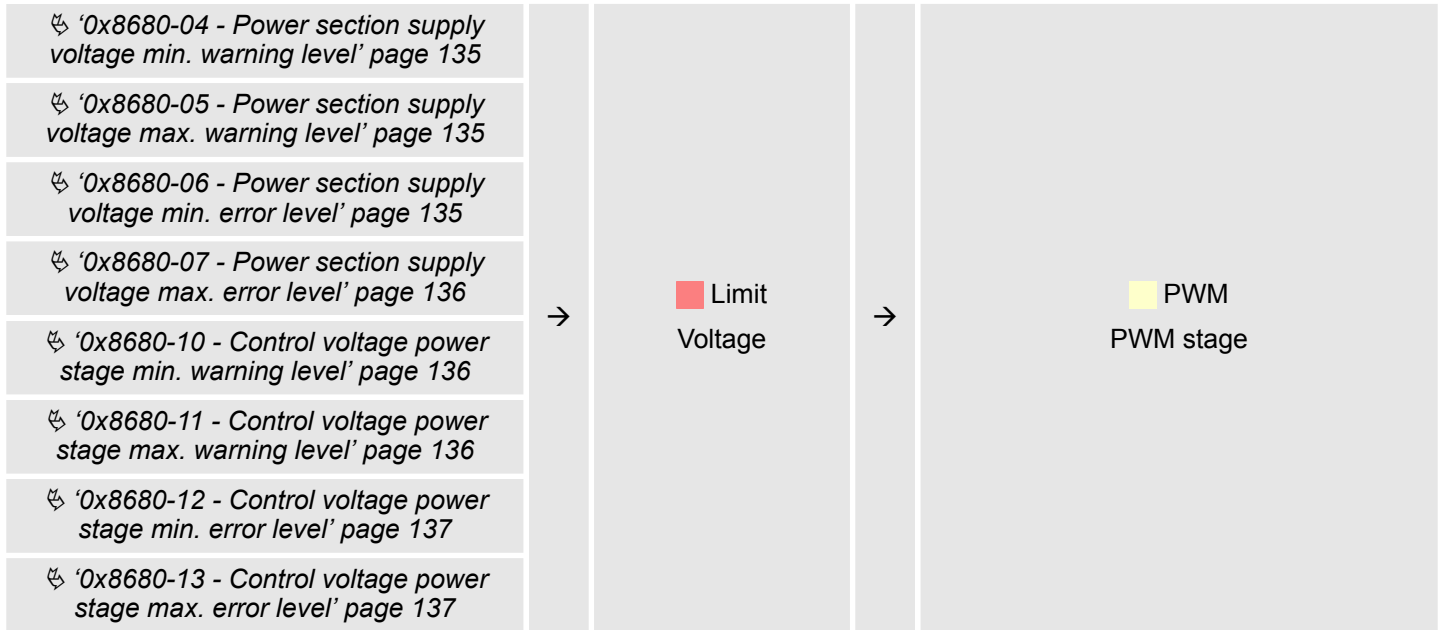


Position control - Position controller

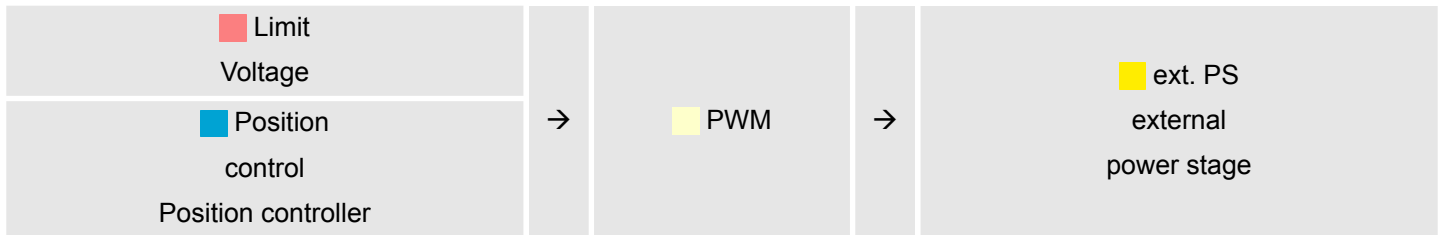


PtP positioning profile

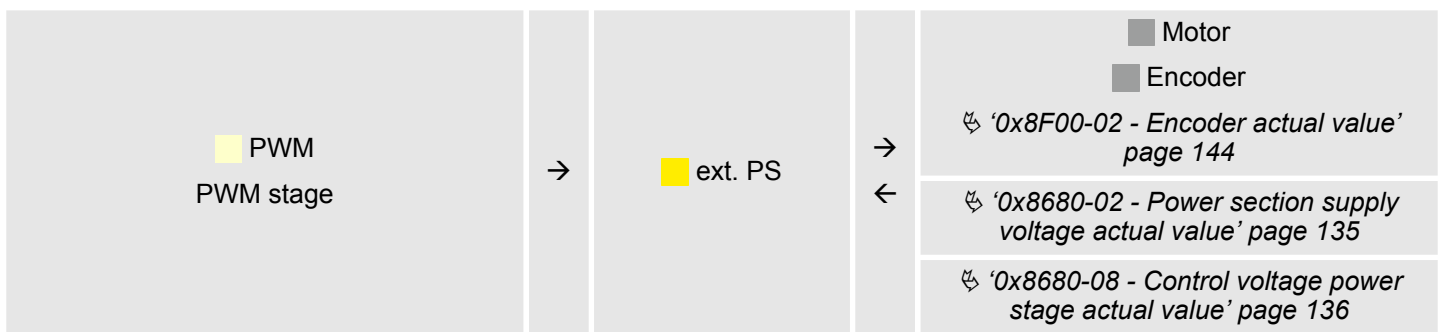
Limit Voltage - Limitation voltage



PWM - PWM stage



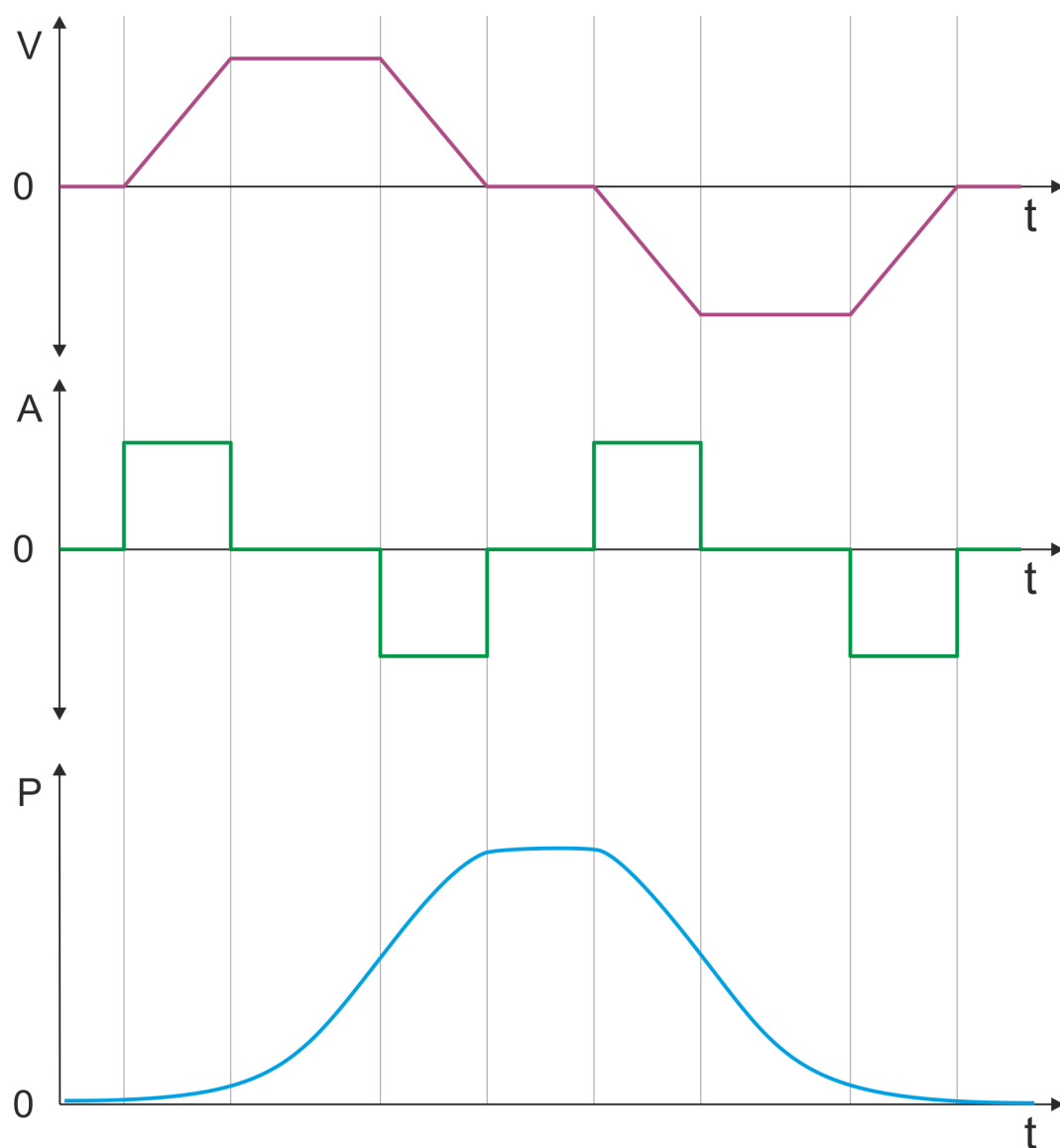
Ext. PS - External power stage, motor, encoder



4.6.1 Examples

Symmetrical acceleration and deceleration with reaching the target velocity

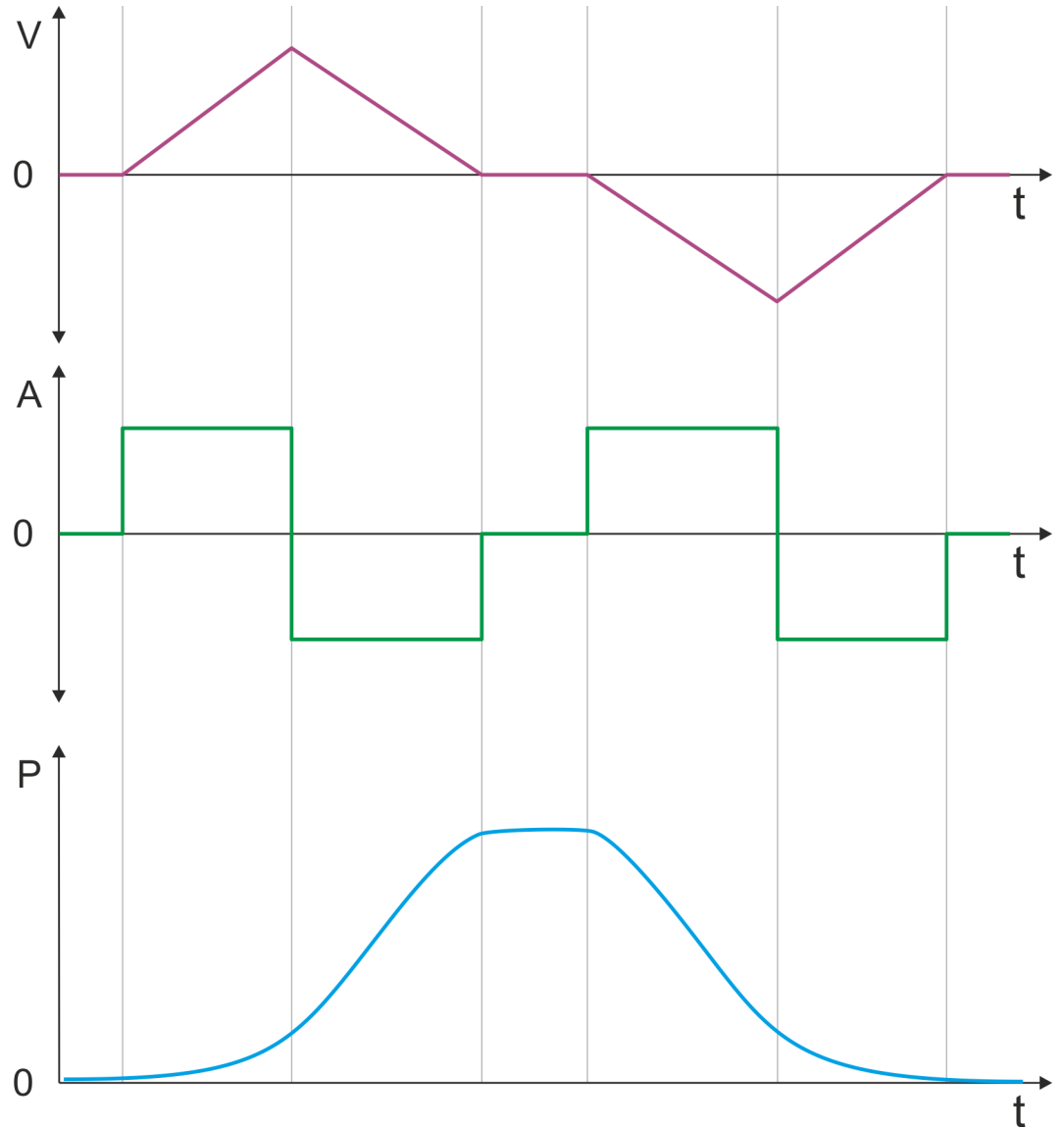
- Setting
 - Target position
 - Profile velocity
 - Profile acceleration
 - Profile deceleration
- Target velocity is reached.
- Specifying a new target position as starting position.



V Velocity
 A Acceleration
 P Position
 t Time

Symmetrical acceleration and deceleration without reaching the target velocity

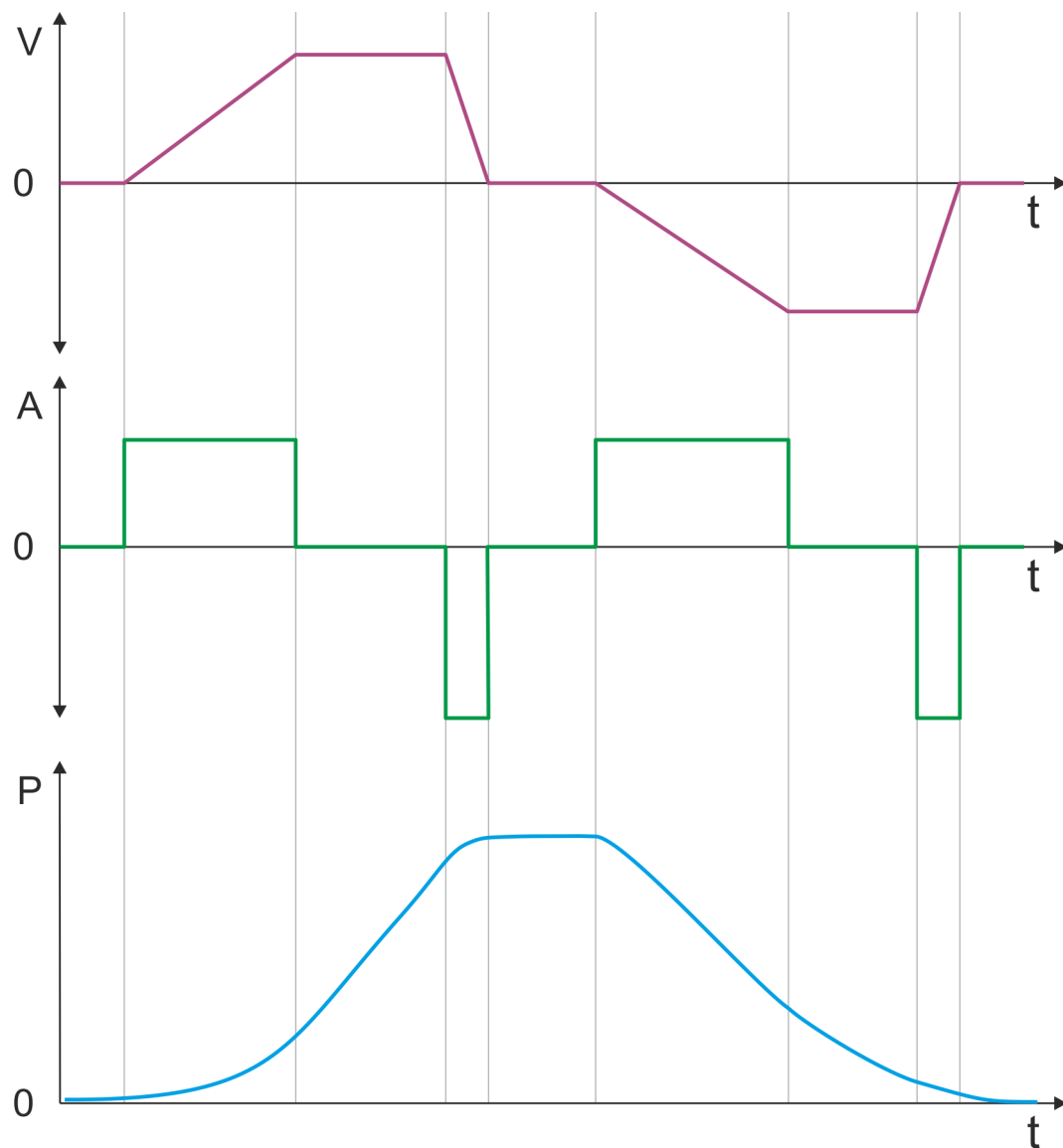
- Setting
 - Target position
 - Profile velocity
 - Profile acceleration
 - Profile deceleration
- Target velocity is not reached, since before deceleration is initiated to reach the target position.
- Specifying a new target position as starting position.



V Velocity
 A Acceleration
 P Position
 t Time

Asymmetrical acceleration and deceleration with reaching the target velocity

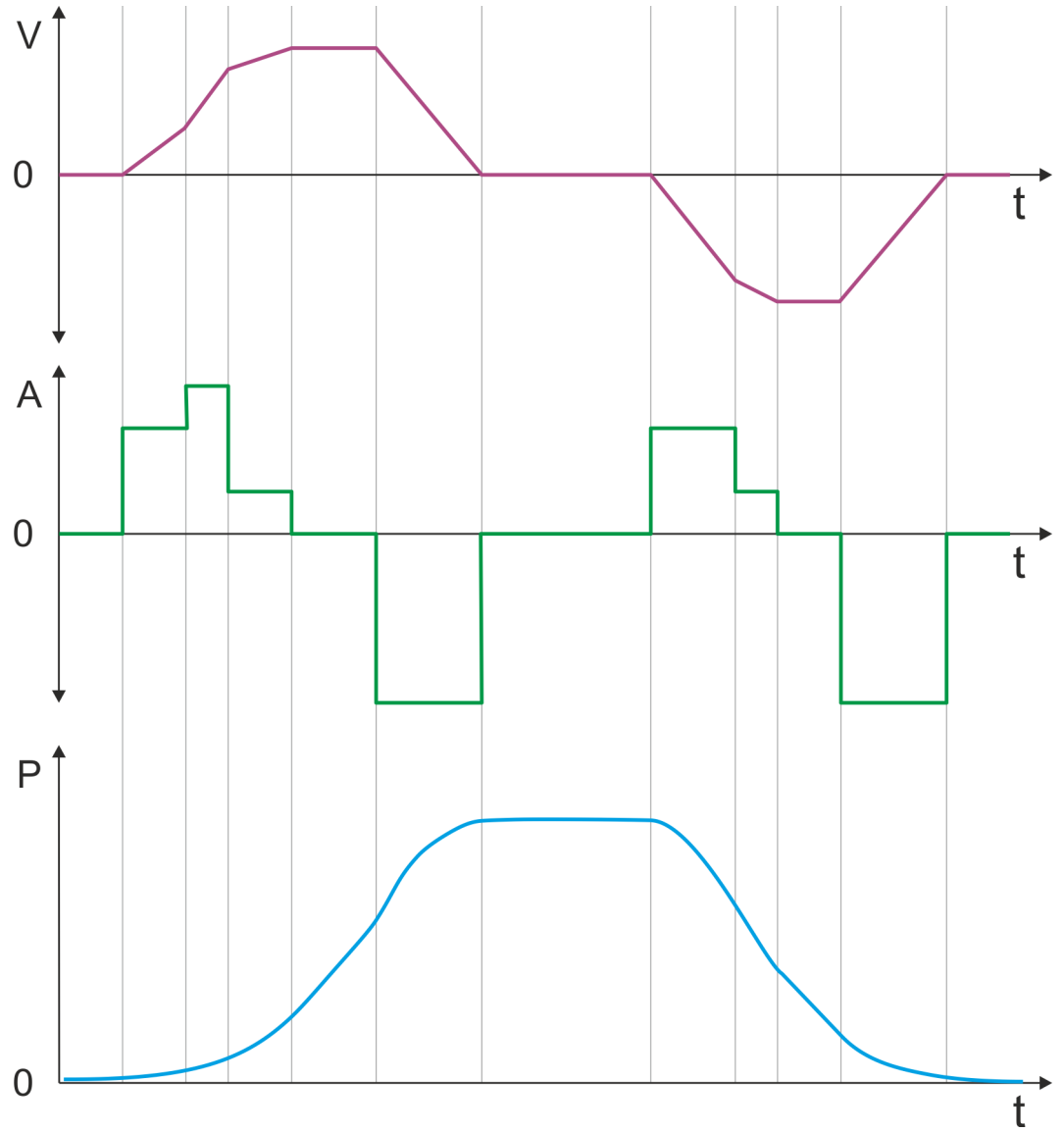
- Setting
 - Target position
 - Profile velocity
 - Profile acceleration
 - Profile deceleration
- Target velocity is reached.
- Specifying a new target position as starting position.



V Velocity
 A Acceleration
 P Position
 t Time

Asymmetrical acceleration and deceleration with reducing the acceleration during the move

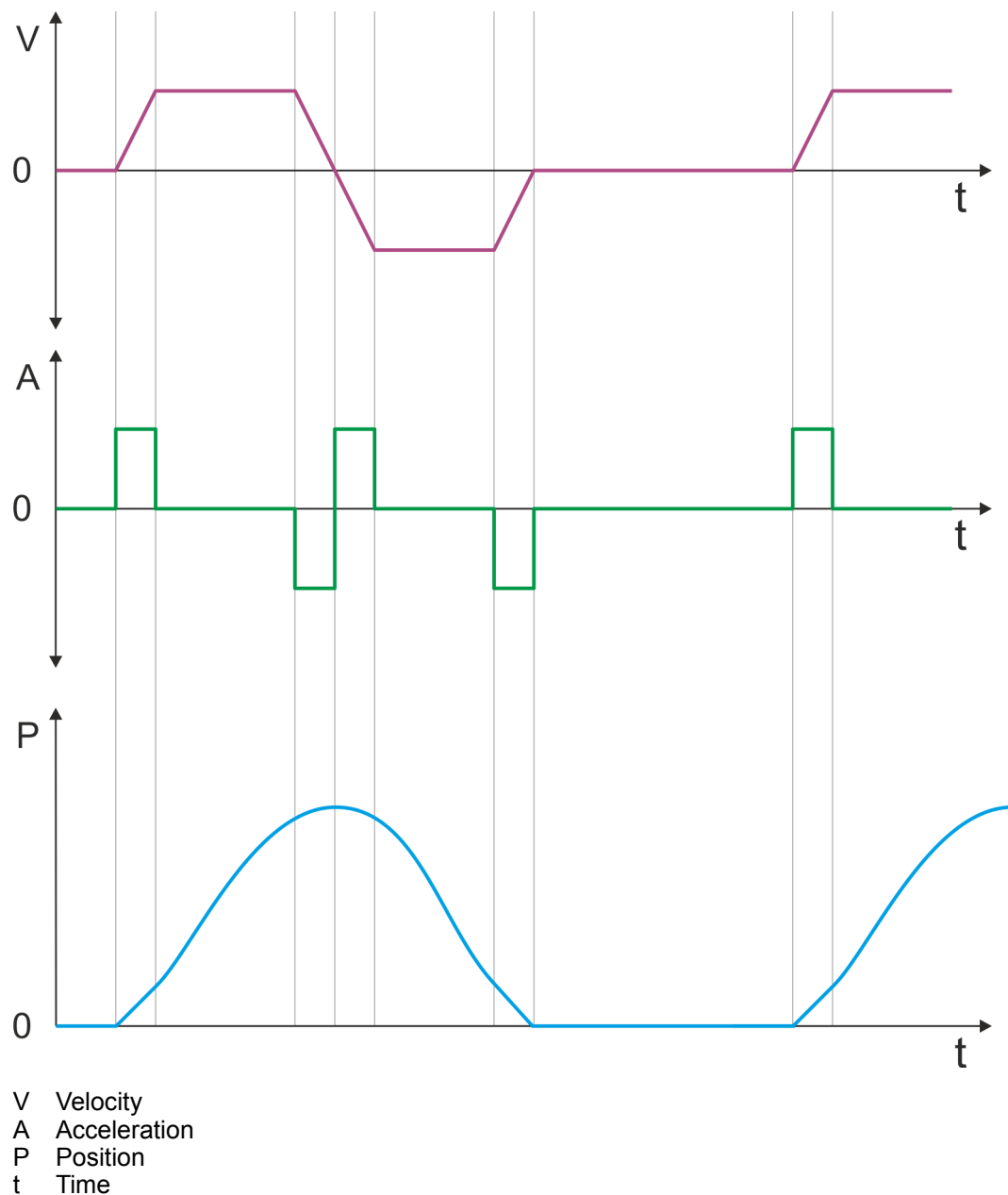
- Setting
 - Target position
 - Profile velocity
 - Profile acceleration
 - Profile deceleration
- Target velocity is reached.
- Specifying a new target position as starting position.



V Velocity
 A Acceleration
 P Position
 t Time

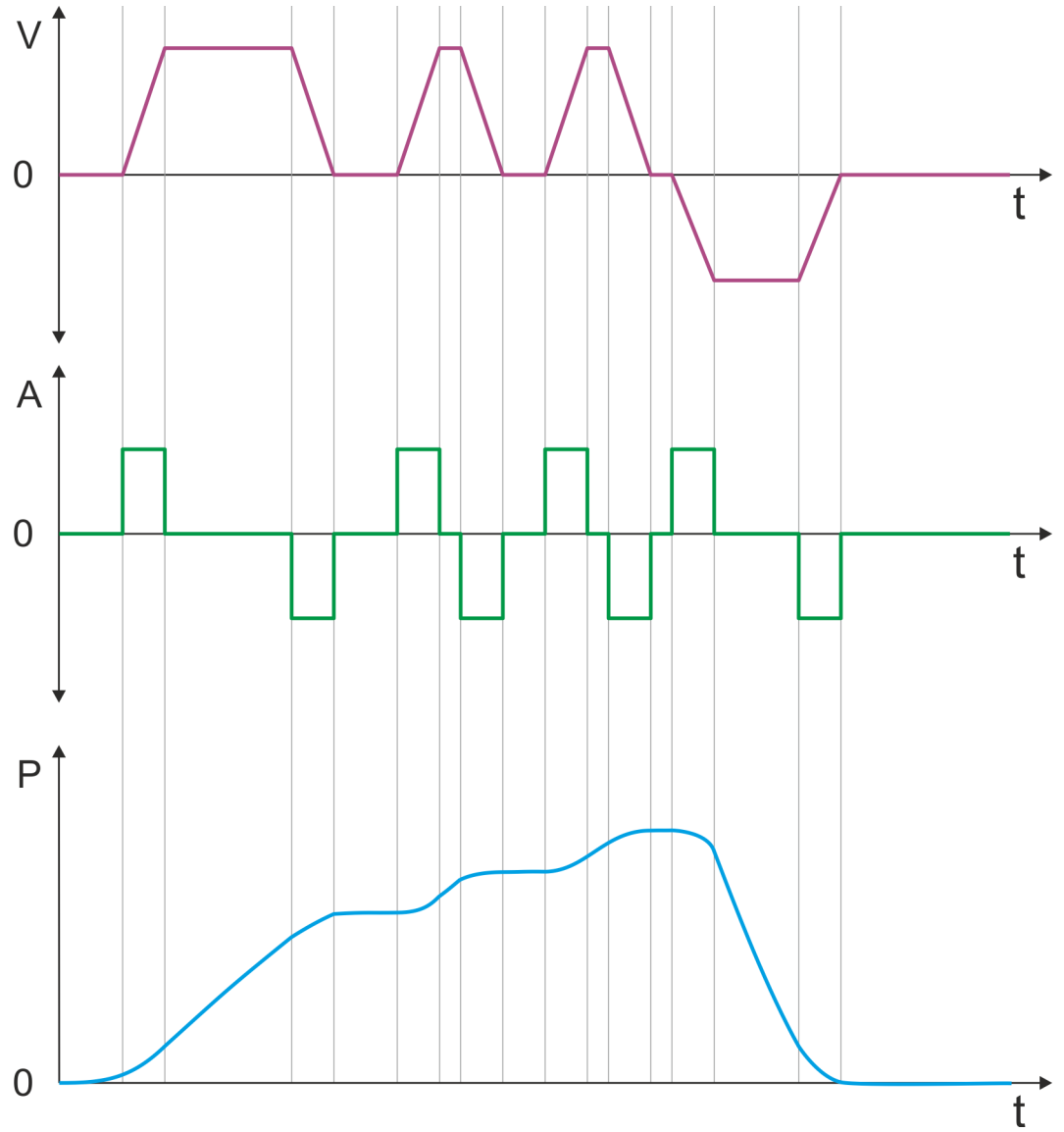
Symmetrical acceleration and deceleration with reaching the target velocity

- Setting
 - Target position
 - Profile velocity
 - Profile acceleration
 - Profile deceleration
- Target velocity is reached.
- Specifying a new target position as starting position during deceleration.



Symmetrical acceleration and deceleration with specifying a target position, twice

- Setting
 - Target position
 - Profile velocity
 - Profile acceleration
 - Profile deceleration
- Target velocity is reached.
- Specifying a new target position, after the previous target position was reached.



V Velocity
 A Acceleration
 P Position
 t Time

4.7 Velocity profile

Structure



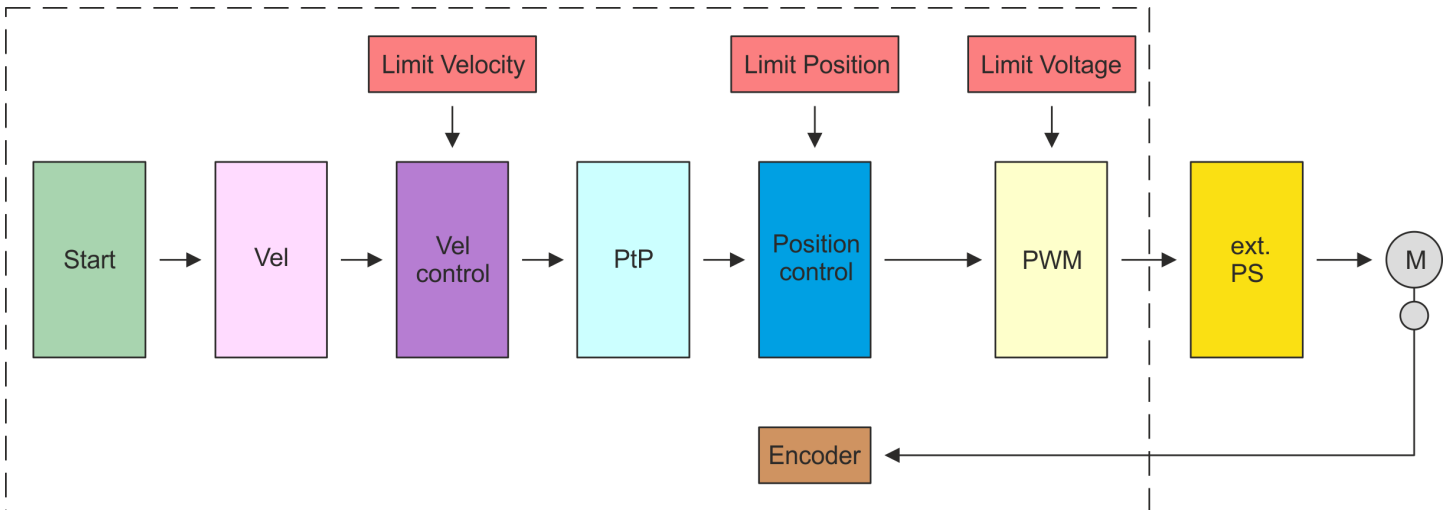
Always adapt parameters to the operating mode!

Please ensure that the module always has the correct parameters according to the selected operating mode!

Start parameter

- [Start - Start parameter homing](#) page 64
- [Start - Start parameter PtP position profile](#) page 69
- [Start - Start parameter velocity profile](#) page 80

In the operation mode *Velocity profile* the velocity is output according to profile acceleration and profile deceleration until the target velocity is reached. This operation mode bases on the *PtP positioning profile*, except that position settings such as target and limit values have no effect. With this object [0x8500-01 - Velocity control configuration](#) page 132, you can specify the frequency pulse patterns.



- Start: Start parameters
- Limit Velocity: Limitation velocity
- Limit Position: Limitation position
- Limit Voltage: Limitation voltage
- Vel: Velocity profile
- Vel control: Velocity control

- PtP: PtP positioning profile
- Position control: Position controller
- PWM stage
- ext. PS: External power stage
- M: Motor and encoder
- Encoder: Encoder current value

Velocity profile

Start - Start parameter velocity profile



Please note:

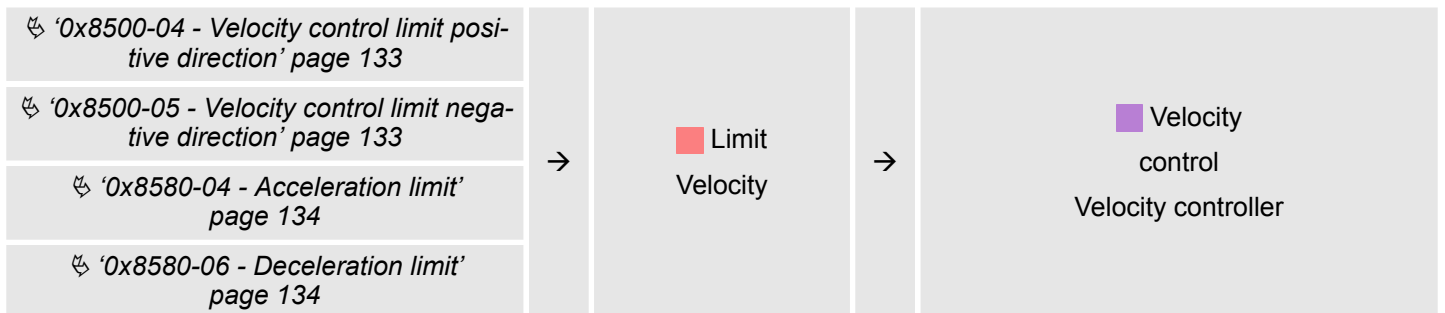
- ↪ Chap. 4.2 'Commissioning' page 57
- ↪ 'Application data' page 63



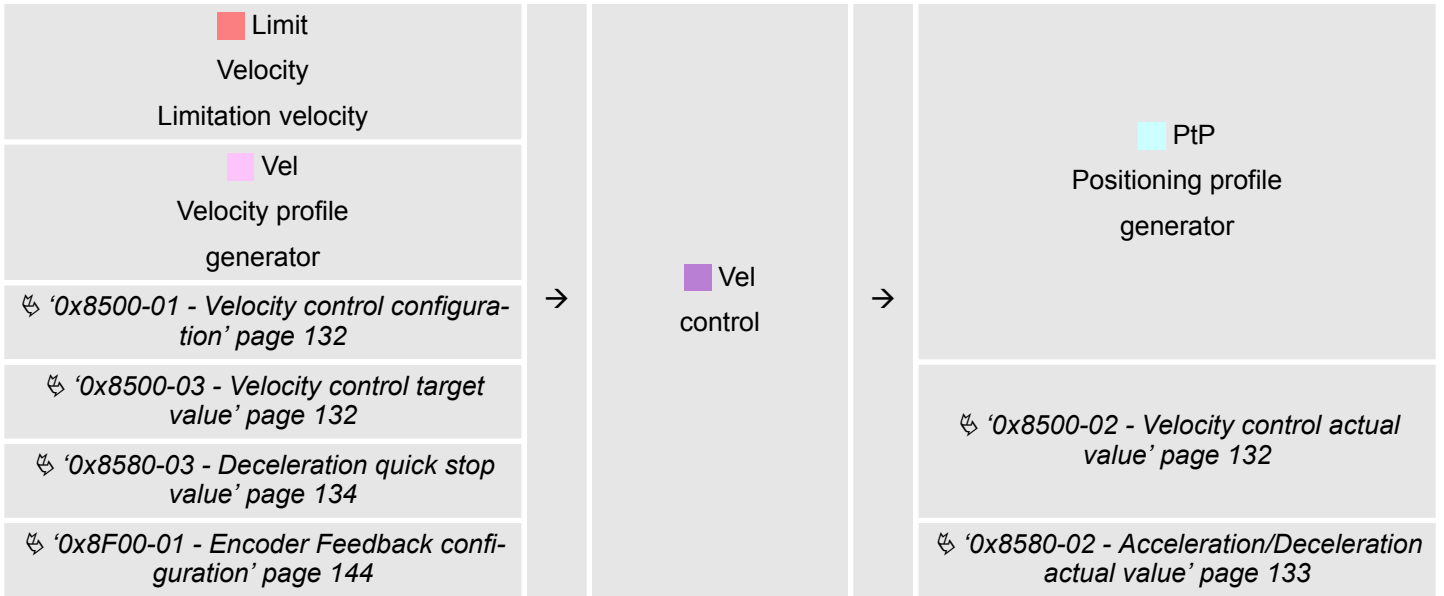
Vel - velocity profile



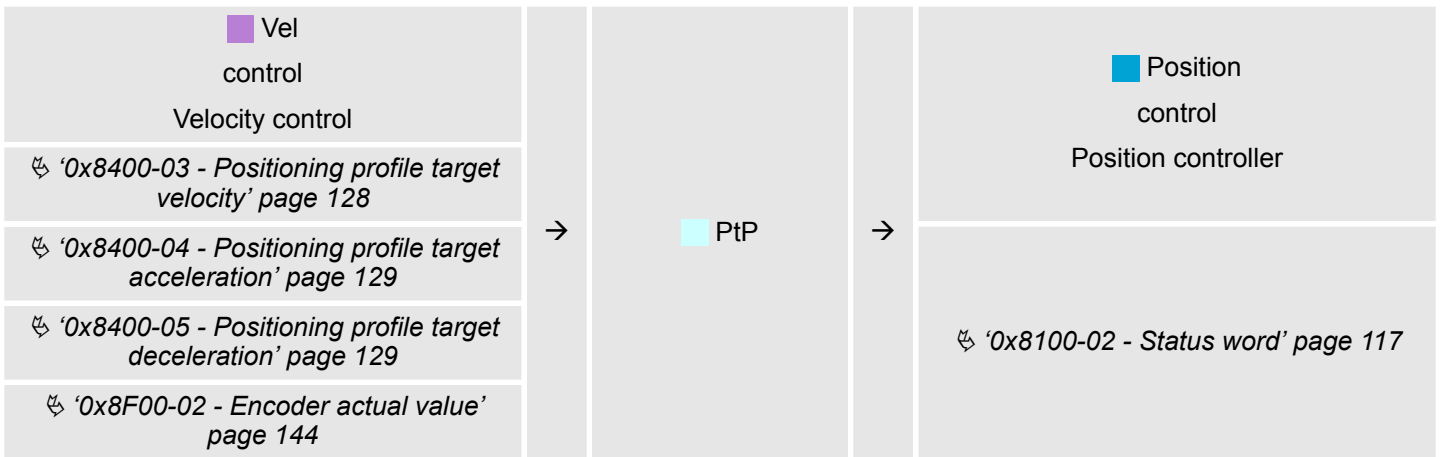
Limit - limitation velocity



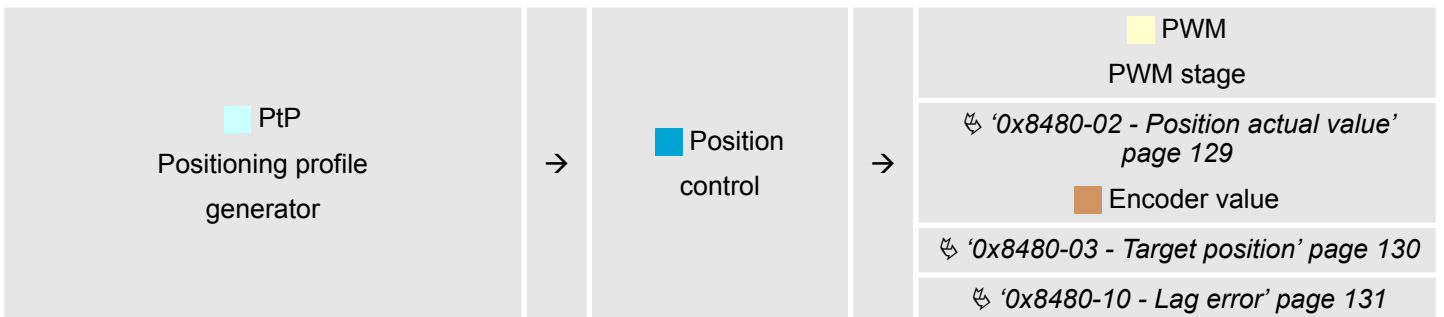
Velocity control - Velocity control



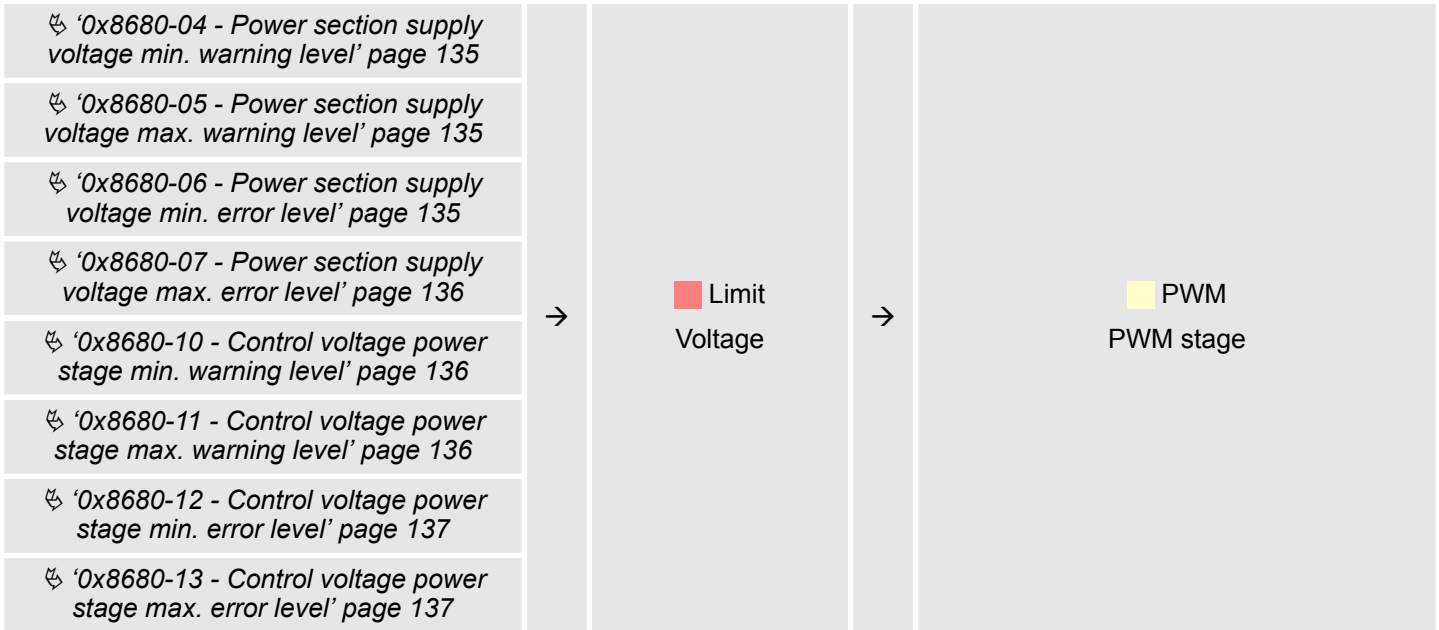
PtP - Positioning profile generator



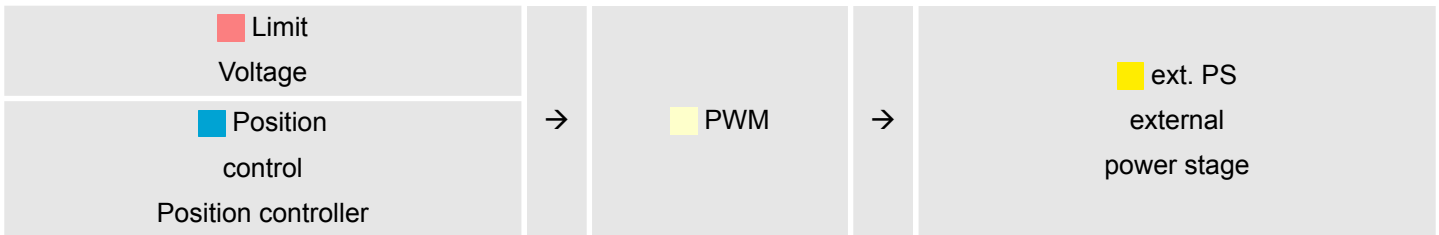
Position control - Position controller



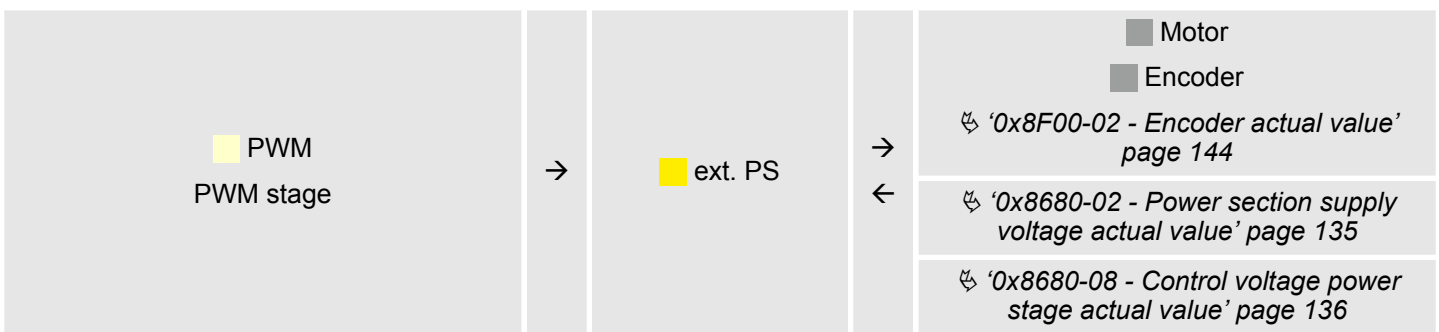
Limit Voltage - Limitation voltage



PWM - PWM stage



Ext. PS - External power stage, motor, encoder



4.8 Deployment I/O1...I/O4

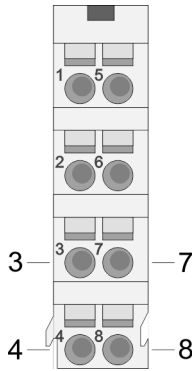
Overview

The module has 4 digital connectors I/O1...I/O4. The ports can be used with the following configurable modes:

- Used as digital input
- Used as digital output
- Pairs use as encoder input for 24V HTL signal

Default settings

The 4 digital ports of the motion module have the following default settings, which fit to the standard pin-out to connect a power stage via pulse train like e.g. YASKAWA Sigma 5mini:



Default setting

| Pos. | Function | Type | Description |
|------|----------|------|---------------|
| 3 | I/O1 | I | Digital input |
| 4 | I/O3 | I | Digital input |
| 7 | I/O2 | I | Digital input |
| 8 | I/O4 | I | Digital input |

I: Input, O: Output



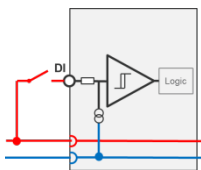
Via the Objects 0x8E00-08 ... 15 the I/O2 and I/O4 can be assigned to pre-defined signals. ↗ Chap. 5.2.18.1 '0x8E00-08 ... 15 - Signals of the power stage' page 140

Connecting a YASKAWA Sigma 5

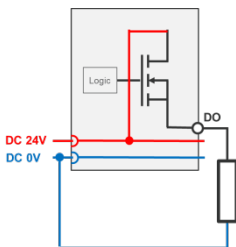
| Pos. | Function | Type | Description |
|------|----------|------|---------------------------|
| 3 | I/O1 | I/O | S-ON: Servo drive On/Off |
| 4 | I/O3 | I/O | S-RDY: Servo ready |
| 7 | I/O2 | I/O | ALM-RST: Reset Interrupts |
| 8 | I/O4 | I/O | COIN: Position reached |

I: Input, O: Output

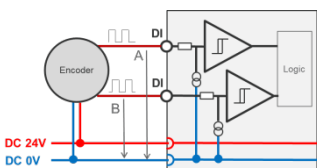
Connections



Digital input: DC 24V
IEC 61131-2 type 3
High-side (sink)



Digital output: DC 24V
500 mA
High-side (source)



Encoder mode: 24V HTL signal
Phase A and B
100 kHz
4-fold evaluation
↗ Chap. 4.8.2.2 'Encoder - deployment' page 85

4.8.1 Objects

Structure

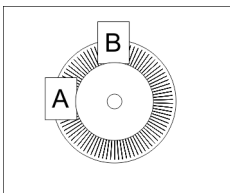
DIO Control



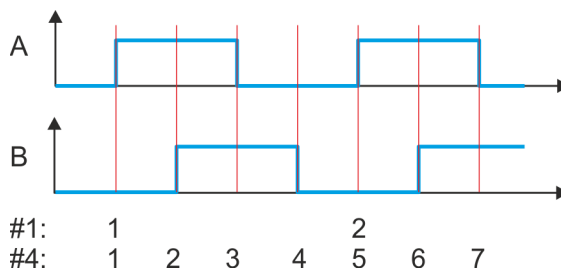
4.8.2 Usage as input for incremental encoder

4.8.2.1 Encoder - signal evaluation

Signal evaluation



- Incremental encoder are sensors for detecting angular or positional changes.
- Depending on the sensor type and the desired resolution, the scanning happens by sliding contact, photo electrically or magnetically.
 - The scanning via *sliding contact* works in principle like a switch, which is mechanically operated.
 - With the *optical scanning* a disk, which has a fine raster, is optically scanned.
 - With the magnetic scanning a pole wheel or magnetic band is scanned which has been written with a raster by a magnetization, before.
- The incremental encoder has two sensors *Track A* and *Track B* for scanning.
- The sensors are arranged at an angle of 90 degrees from each other on the system to be scanned.
- In a rotational movement of the system, the sensors generate a specific number of pulses. These are a measure of the covered angel or way. With the electrical phase shift of the two signals the direction of rotation can be determined.
 - If the axis rotates to the right, then the signal of *Track A* is leading 90° towards the signal of *Track B*.
 - If the axis rotates to the left, then the signal of *Track A* is lagging 90° towards the signal of *Track B*.
- During the sensor evaluation from the difference between two counter values the velocity and direction can be determined.
- With *1-fold* evaluation one signal edge 0-1 of *Track A* corresponds to one counter pulse respectively one division of the system to be scanned corresponds to one counter pulse.
- With *4-fold* evaluation one signal edge of *Track A* and *Track B* corresponds to one counter pulse. The 4-fold evaluation is very often used.



#1 1-fold evaluation
 #4 4-fold evaluation

4.8.2.2 Encoder - deployment

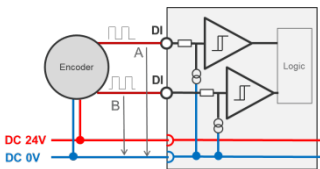
Connections

There is the possibility to connect an encoder via I/O1 and I/O3. With the value 1 of object ['0x8F00-01 - Encoder Feedback configuration' page 144](#) the encoder function for I/O1 and I/O3 is enabled. Please note that the determined encoder value is not further evaluated in the module. Via object ['0x8F00-02 - Encoder actual value' page 144](#) the encoder value can be read and further processed in you user program. The unused digital in-/outputs I/O2 and I/O4 are further free for usage.

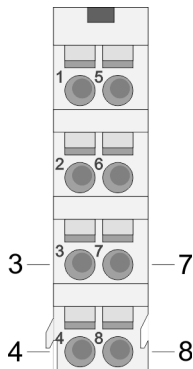
Objects



Connections



Encoder mode: 24V HTL signal
Phase A and B
100 kHz
4-fold evaluation



| Pos. | Function | Type | Description |
|------|----------|------|------------------|
| 3 | I/O1 | I | Encoder function |
| 4 | I/O3 | I | Encoder function |
| 7 | I/O2 | I/O | for free usage |
| 8 | I/O4 | I/O | for free usage |

I: Input, O: Output



Via the Objects [0x8E00-08 ... 15](#) the I/O2 and I/O4 can be assigned to pre-defined signals. [Chap. 5.2.18.1 '0x8E00-08 ... 15 - Signals of the power stage' page 140](#)

4.9 Brake control

Overview

With this motion module the break control is largely defined by the power stage and the connected motor. The brake control options, which are listed below, should only be used as a supplement to the brake control and not as replacement:

- Braking via external brake
- Quick stop via ramping

You have the possibility to control a brake via a digital input / output channel.

Braking via external brake

You have the possibility to control a brake via a digital input/output channel. By integration into your user program, you can control it if necessary.

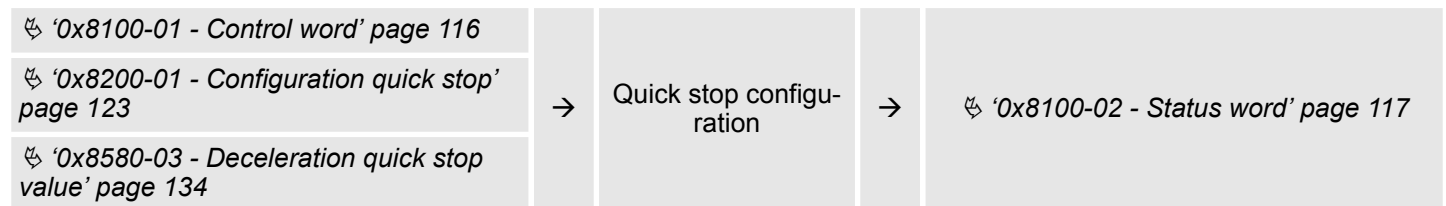
Quick stop

Quick stop is a ramp function, with which the connected motor can be decelerated and brought to stop. During normal operation it is not necessary to activate this brake functions manually, since normal braking operations are performed by the profile generator. Quick stop is used when the operating conditions require a rapid stopping.

For quick stop there are the following possibilities:

- Direct stop with short-circuit braking and subsequent state change to 'Switch on disabled'.
- Brake with quick stop deceleration and state change to 'Switch on disabled'.

Quick stop - objects



4.10 In-/Output area

Overview

The motion module uses 36byte input and 36byte output data.

| Head module | Backplane bus | Motion module | |
|------------------------------|---------------|---------------|-----------------|
| CPU respectively bus coupler | → | Process data | Acyclic channel |
| | ← | 36byte | |

The data exchange with the motion module must be consistent across the 36 bytes! It is recommended to control it via the process image.

Input area

| Offset | Size | Area | Description |
|--------|------|-------|--|
| 0 | 2 | Drive | ☞ '0x8100-02 - Status word' page 117 |
| 2 | 2 | Drive | ☞ '0x8280-02 - Operating mode actual' page 124 |
| 4 | 4 | Drive | ☞ '0x8480-02 - Position actual value' page 129 |
| 8 | 4 | Drive | ☞ '0x8500-02 - Velocity control actual value' page 132 |
| 12 | 4 | Drive | ☞ '0x8580-02 - Acceleration/Deceleration actual value' page 133 |
| 16 | 4 | Drive | ☞ '0x8480-10 - Lag error' page 131 |
| 20 | 2 | - | reserved |
| 22 | 2 | - | reserved |
| 24 | 1 | DIOs | ☞ '0x7100-05 - Digital input states I/O1...I/O4' page 112 |
| 25 | 1 | DIOs | ☞ '0x7200-05 - Digital output states I/O1...I/O4 actual states' page 114 |

| Offset | Size | Area | Description |
|--------|------|---------|---|
| 26 | 1 | Acyclic | Acyclic communication channel: Status |
| 27 | 1 | Acyclic | Acyclic communication channel: Subindex in the object dictionary |
| 28 | 2 | Acyclic | Acyclic communication channel: Index in the object dictionary |
| 30 | 4 | Acyclic | Acyclic communication channel: Data |
| 34 | 1 | - | reserved |
| 35 | 1 | - | reserved |



Please note if you write via the Acyclic Channel to objects, which are mapped in the I/O area, these values are overwritten with the next cycle.

Output area

| Offset | Size | Area | Description |
|--------|------|---------|---|
| 0 | 2 | Drive | ☞ '0x8100-01 - Control word' page 116 |
| 2 | 2 | Drive | ☞ '0x8280-01 - Operating mode requested' page 124 |
| 4 | 4 | Drive | ☞ '0x8400-02 - Positioning profile target position' page 128 |
| 8 | 4 | Drive | ☞ '0x8400-03 - Positioning profile target velocity' page 128 |
| 12 | 4 | Drive | ☞ '0x8400-04 - Positioning profile target acceleration' page 129 |
| 16 | 4 | Drive | ☞ '0x8400-05 - Positioning profile target deceleration' page 129 |
| 20 | 2 | - | reserved |
| 22 | 2 | - | reserved |
| 24 | 1 | - | reserved |
| 25 | 1 | Drive | ☞ '0x7200-06 - Digital output states I/O1...I/O4 requested states' page 115 |
| 26 | 1 | Acyclic | Acyclic communication channel: Command |
| 27 | 1 | Acyclic | Acyclic communication channel: Subindex in the object dictionary |
| 28 | 2 | Acyclic | Acyclic communication channel: Index in the object dictionary |
| 30 | 4 | Acyclic | Acyclic communication channel: Data |

Acyclic channel

| Offset | Size | Area | Description |
|--------|------|------|-------------|
| 34 | 1 | - | reserved |
| 35 | 1 | - | reserved |

4.11 Acyclic channel

Overview



Please note if you write via the Acyclic Channel to objects, which are mapped in the I/O area, these values are overwritten with the next cycle.

Via the *Acyclic channel* you can perform acyclic read and write commands. For this in the input/output area of the motion module a data area for the acyclic communication has been implemented. This area includes 8 bytes output and 8 bytes input data. These have the following assignment:

| Request | | Response |
|--|--------|---|
| Output data <ul style="list-style-type: none"> ■ Byte 0: CMD - Command ■ Byte 1: SUBIDX - Subindex ■ Byte 2: IDX0 - Index (low byte) ■ Byte 3: IDX1 - Index (high byte) ■ Byte 4: DATA0 - Data (low byte) ■ Byte 5: DATA1 - Data ■ Byte 6: DATA2 - Data ■ Byte 7: DATA3 - Data (high byte) | → ← | Input data <ul style="list-style-type: none"> ■ Byte 0: STATUS - Status ■ Byte 1: SUBIDX - Subindex ■ Byte 2: IDX0 - Index (low byte) ■ Byte 3: IDX1 - Index (high byte) ■ Byte 4: DATA0 - Data (low byte) ■ Byte 5: DATA1 - Data ■ Byte 6: DATA2 - Data ■ Byte 7: DATA3 - Data (high byte) |
| IDLE → Request → Response → IDLE | | |

CMD - Command

| Code | Name | Description |
|------|------------|---|
| 0x11 | READ_ONCE | Reading a data object With this command you can request the data once after the command has been recognized. |
| 0x21 | WRITE_ONCE | Writing a data object With this command data are written only once after the command has been recognized. |

SUBIDX - Subindex Subindex in the object dictionary

IDX0/IDX1 - Index Index in the object dictionary

DATA0 ... DATA3 - Data Data which are to be transmitted.

STATUS - Status

| Code | Name | Description |
|-------|-----------------|--|
| 0x00 | IDLE | Idle - waiting for commands |
| 0x14 | READ_ONCE | Command READ_ONCE has been recognized, data are valid. |
| 0x24 | WRITE_ONCE | Command WRITE_ONCE has been recognized, data were accepted. |
| 0x81: | READ_NOT_EXIST | Error - read access - data do not exist Command rejected! |
| 0x91 | WRITE_NOT_EXIST | Error - write access - data do not exist Command rejected! |
| 0x92 | WRITE_RNG_ERR | Error - write access - data out of range Command rejected! |
| 0x93 | WRITE_RDO_ERR | Error - write access - data can only be read Command rejected! |
| 0x94 | WRITE_WPR_ERR | Error - write access - data are write protected Command rejected! |
| 0x99 | ACYC_COM_ERR | Error during acyclic communication Command rejected! |

For the VIPA *SPEED7 Studio* and the Siemens SIMATIC Manager there is the block FB 320 ACYC_RW for simplified access available.



More information about the usage of this block may be found in the manual "SPEED7 Operation List" from Yaskawa.

4.12 Parameter data

Here via the parameters you may define among others:

- Interrupt behavior
- Universal parameter

4.12.1 Parameter

DS - Record set for access via CPU, PROFIBUS and PROFINET

IX - Index for access via CANopen

SX - Subindex for access via EtherCAT with Index 3100h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

Parameter data > Parameter

| Name | Bytes | Function | Default | DS | IX | SX |
|----------|-------|----------------------------------|---------|-----|---------------|-----|
| DIAG_EN | 1 | Diagnostic interrupt * | 00h | 00h | 3100h | 01h |
| IDX_1 | 2 | Universal parameter 1: Index | 00h | 80h | 3101h...3102h | 02h |
| SUBIDX_1 | 2 | Universal parameter 1: Sub-index | 00h | 80h | 3103h...3104h | 03h |
| DATA_1 | 4 | Universal parameter 1: Value | 00h | 80h | 3105h...3108h | 04h |
| IDX_2 | 2 | Universal parameter 2: Index | 00h | 81h | 3109h...310Ah | 05h |
| SUBIDX_2 | 2 | Universal parameter 2: Sub-index | 00h | 81h | 310Bh...310Ch | 06h |
| DATA_2 | 4 | Universal parameter 2: Value | 00h | 81h | 310Dh...3110h | 07h |
| IDX_3 | 2 | Universal parameter 3: Index | 00h | 82h | 3111h...3112h | 08h |
| SUBIDX_3 | 2 | Universal parameter 3: Sub-index | 00h | 82h | 3113h...3114h | 09h |
| DATA_3 | 4 | Universal parameter 3: Value | 00h | 82h | 3115h...3118h | 0Ah |
| IDX_4 | 2 | Universal parameter 4: Index | 00h | 83h | 3119h...311Ah | 0Bh |
| SUBIDX_4 | 2 | Universal parameter 4: Sub-index | 00h | 83h | 311Bh...311Ch | 0Ch |
| DATA_4 | 4 | Universal parameter 4: Value | 00h | 83h | 311Dh...3120h | 0Dh |
| IDX_5 | 2 | Universal parameter 5: Index | 00h | 84h | 3121h...3122h | 0Eh |
| SUBIDX_5 | 2 | Universal parameter 5: Sub-index | 00h | 84h | 3123h...3124h | 0Fh |
| DATA_5 | 4 | Universal parameter 5: Value | 00h | 84h | 3125h...3128h | 10h |
| IDX_6 | 2 | Universal parameter 6: Index | 00h | 85h | 3129h...312Ah | 11h |
| SUBIDX_6 | 2 | Universal parameter 6: Sub-index | 00h | 85h | 312Bh...312Ch | 12h |
| DATA_6 | 4 | Universal parameter 6: Value | 00h | 85h | 312Dh...3130h | 13h |
| IDX_7 | 2 | Universal parameter 7: Index | 00h | 86h | 3131h...3132h | 14h |
| SUBIDX_7 | 2 | Universal parameter 7: Sub-index | 00h | 86h | 3133h...3134h | 15h |
| DATA_7 | 4 | Universal parameter 7: Value | 00h | 86h | 3135h...3138h | 16h |

*) This record set may only be transferred at STOP state.

For the VIPA *SPEED7 Studio* and the Siemens SIMATIC Manager there is the block FB 321 - ACYC_DS for simplified access available.



More information about the usage of this block may be found in the manual "SPEED7 Operation List" from Yaskawa.

4.13 Scaling and units

Scaling and units

- As a "normalization" for position, velocity and acceleration, you can specify a *Gear factor* ↗ '0x8180-02 - Gear factor' page 122 in the object dictionary. This gear factor represents *units* in thousands with the rotary axis makes exactly one revolution.
- With the pulse train module the "normalization" should be the same as the "normalization" of the power stage.
- Depending on the "normalization" and the set frequency pattern the motion module sends pulses to the power stage.

Direction of rotation

Positive direction of rotation is turning to the right (clockwise) with view towards the motor flange.

Current unit

- All currents are normalized to the unit [mA].
- [User] is a user-defined unit, which depends on the *Gear factor*. ↗ '0x8180-02 - Gear factor' page 122

4.14 Monitoring and error reaction

4.14.1 Overview

General

The System SLIO motion module has monitor functions. The monitoring works in 3 steps:

- 1. Limitation
 - Status: ↗ '0x8100-04 - Limit active bits' page 119
 - Limitations within the normal operating range, adapted to the respective application.
- 2. Warning
 - Status: ↗ '0x8100-05 - Warnings active bits' page 120
 - The permissible operating range is almost exhausted and the system is about to initiate a fault response.
- 3. Error
 - Status: ↗ '0x8100-06 - Error active bits' page 121
 - The permissible operating range is exceeded and a configurable fault response is automatically triggered.
 - Error messages are also shown via ↗ '0x8100-02 - Status word' page 117.



CAUTION!

Please consider that incorrectly set monitoring functions can cause damages to persons and materials!

- Voltage monitoring** The DC 24V voltage of the module supply is monitored. If the voltage over or under runs the limit values, a warning or error is reported by ↪ *'0x8100-02 - Status word' page 117*. On an error, there is an error reaction of the motion module, which can be configured.
- Temperature monitoring** The motion module has an internal temperature monitoring of the μ -controller. Via the object dictionary limit temperatures can be defined. If the temperature over or under runs the limit values, there is an error reaction of the motion module, which can be configured. ↪ *'0x8780-02 - Temperature μ -Controller actual value' page 137*
- Position monitoring** The motion module monitors the traversing of a positioning. When specifying a target position, with exceeding a configurable limit in positive or negative direction of movement, the target position changed to a limit value. You will get a feedback on an active limitation via ↪ *'0x8100-02 - Status word' page 117*. Exceeds the actual position one of the configurable values in positive or negative direction of movement, this is also reported via ↪ *'0x8100-02 - Status word' page 117*. The module monitors the internally generated position set point and actual value.
- Velocity monitoring** The motion module monitors the velocity. The set velocity is limited to a configurable value and with active limitation reported via ↪ *'0x8100-02 - Status word' page 117*.
- Error reaction** The following errors can trigger an error reaction:
- Temperature error μ -Controller
↪ *'0x8780-02 - Temperature μ -Controller actual value' page 137* > ↪ *'0x8780-04 - Temperature μ -Controller error level' page 138*
 - Error system communication timeout
↪ *'0x6100-10 - System message timeout maximum' page 110*
 - Error command output disable (BASP)
- On error, the motion module starts an error reaction. The error reaction can be configured. Here you have the following possibilities:
- Immediate state change to *'Switch on disabled'*.
 - Break with quick stop deceleration ↪ *'0x8580-03 - Deceleration quick stop value' page 134* and subsequent state change to *'Switch on disabled'*.

4.14.2 Monitoring

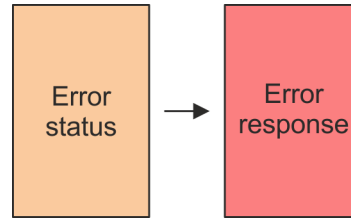
Monitoring limitation

| | | | | |
|---|---|--------------------------|---|--|
| ↳ '0x8400-02 - Positioning profile target position' page 128 | → | Monitoring Limitation | → | ↳ '0x8100-02 - Status word' page 117 |
| ↳ '0x8480-02 - Position actual value' page 129 | | | | |
| ↳ '0x8480-05 - Software position limit positive direction' page 130 | | | | |
| ↳ '0x8480-06 - Software position limit negative direction' page 130 | | | | |
| ↳ '0x8400-03 - Positioning profile target velocity' page 128 | | | | |
| ↳ '0x8500-04 - Velocity control limit positive direction' page 133 | | | | |
| ↳ '0x8500-05 - Velocity control limit negative direction' page 133 | | | | ↳ '0x8100-04 - Limit active bits' page 119 |

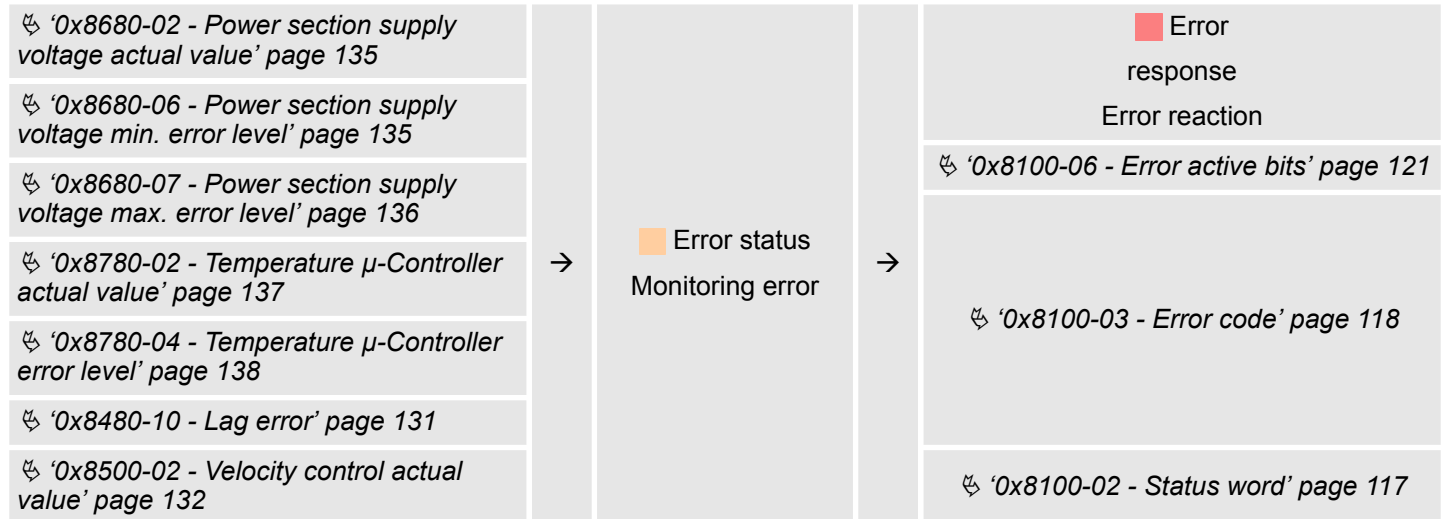
Monitoring warning

| | | | | |
|--|---|-----------------------|---|---|
| ↳ '0x8680-02 - Power section supply voltage actual value' page 135 | → | Monitoring Warning | → | ↳ '0x8100-02 - Status word' page 117 |
| ↳ '0x8680-04 - Power section supply voltage min. warning level' page 135 | | | | |
| ↳ '0x8680-05 - Power section supply voltage max. warning level' page 135 | | | | |
| ↳ '0x8780-02 - Temperature μ -Controller actual value' page 137 | | | | ↳ '0x8100-05 - Warnings active bits' page 120 |
| ↳ '0x8780-03 - Temperature μ -Controller warning level' page 138 | | | | |
| ↳ '0x8480-10 - Lag error' page 131 | | | | |

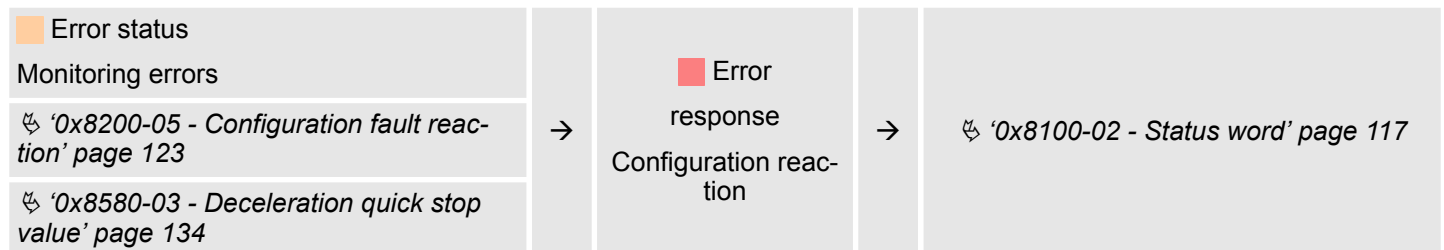
Monitoring error



Error status - monitoring error



Error response - error reaction



4.15 Diagnostics and interrupt

Diagnostic data

Via the parametrization you may activate a diagnostic interrupt for the module. With a diagnostics interrupt the module serves for diagnostics data for diagnostic interrupt_{incoming}. As soon as the reason for releasing a diagnostic interrupt is no longer present, the diagnostic interrupt_{going} automatically takes place. Within this time window (1. diagnostic interrupt_{incoming} until last diagnostic interrupt_{going}) the MF-LED of the module is on.

- DS - Record set for access via CPU, PROFIBUS and PROFINET. The access happens by DS 01h. Additionally the first 4 bytes may be accessed by DS 00h.
- IX - Index for access via CANopen. The access happens by IX 2F01h. Additionally the first 4 bytes may be accessed by IX 2F00h.
- SX - Subindex for access via EtherCAT with Index 5005h.

More can be found in the according manual of your bus coupler.

| Name | Bytes | Function | Default | DS | IX | SX |
|---------------------|-------|-------------------------------------|---------|-----|-------|-------------|
| ERR_A | 1 | Diagnostic | 00h | 01h | 2F01h | 02h |
| MODTYP | 1 | Module information | 18h | | | 03h |
| ERR_C | 1 | reserved | 00h | | | 04h |
| ERR_D | 1 | reserved | 00h | | | 05h |
| CHTYP | 1 | Channel type | 72h | | | 06h |
| NUMBIT | 1 | Number diagnostics bits per channel | 08h | | | 07h |
| NUMCH | 1 | Number channels of the module | 04h | | | 08h |
| CHERR | 1 | Channel error | 00h | | | 09h |
| CH0ERR | 1 | Channel-specific error | 00h | | | 0Ah |
| CH1ERR | 1 | Channel-specific error | 00h | | | 0Bh |
| CH2ERR | 1 | Channel-specific error | 00h | | | 0Ch |
| CH3ERR | 1 | Channel-specific error | 00h | | | 0Dh |
| CH4ERR... CH7ERR | 4 | reserved | 00h | | | 0Eh ... 11h |
| DIAG_US | 4 | µs ticker (32bit) | 00h | | | 13h |

ERR_A Diagnostic

| Byte | Bit 7 ... 0 |
|------|--|
| 0 | <ul style="list-style-type: none"> ■ Bit 0: set at module failure ■ Bit 1: set at internal error ■ Bit 2: set at external error ■ Bit 3: set at channel error ■ Bit 6 ... 4: reserved ■ Bit 7: set at error in parametrization |

MODTYP Module information

| Byte | Bit 7 ... 0 |
|------|---|
| 0 | <ul style="list-style-type: none"> ■ Bit 3 ... 0: Module class <ul style="list-style-type: none"> – 1000b: Function module ■ Bit 4: set at channel information present ■ Bit 7 ... 5: reserved |

CHTYP Channel type

| Byte | Bit 7 ... 0 |
|------|--|
| 0 | <ul style="list-style-type: none"> ■ Bit 6 ... 0: Channel type <ul style="list-style-type: none"> – 72h: Digital output ■ Bit 7: 0 (fix) |

NUMBIT Diagnostic bits

| Byte | Bit 7 ... 0 |
|------|--|
| 0 | Number of diagnostic bits per channel (here 08h) |

Example: 054-1DA00 with YASKAWA Sigma 5 mini > Job definition

NUMCH Channels

| Byte | Bit 7 ... 0 |
|------|---|
| 0 | Number of channels of a module (here 04h) |

CHERR - Channel error

| Byte | Bit 7 ... 0 |
|------|---|
| 0 | <ul style="list-style-type: none"> ■ Bit 0: set on error output I/O1 ■ Bit 1: set on error output I/O2 ■ Bit 2: set on error output I/O3 ■ Bit 3: set on error output I/O4 ■ Bit 7 ... 4: reserved |

**CH0ERR...CH3ERR
channel specific**

| Byte | Bit 7 ... 0 |
|------|---|
| 0 | Diagnostics interrupt due to ... <ul style="list-style-type: none"> ■ Bit 2 ... 0: reserved ■ Bit 3: Short circuit ■ Bit 7 ... 4: reserved |

DIAG_US μ s ticker

| Byte | Bit 7 ... 0 |
|---------|--|
| 0 ... 3 | Value μ s ticker at the moment of the diagnostic |

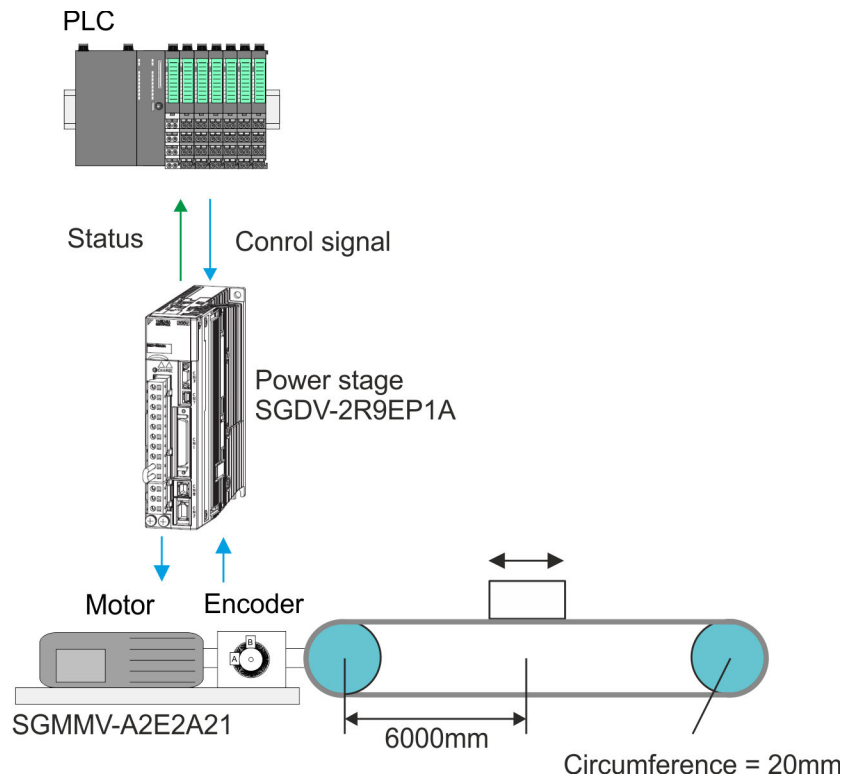
**ERR_C/D, CH4ERR ...
CH7ERR reserved**

| Byte | Bit 7 ... 0 |
|------|-------------|
| 0 | reserved |

4.16 Example: 054-1DA00 with YASKAWA Sigma 5 mini**4.16.1 Job definition**

In the following there is an example of the commissioning of the System SLIO motion module 054-1DA00 with a YASKAWA Sigma 5 mini power stage (servopack). In the example the motor is to be coupled 1:1 to a disk, which has a circumference of 20mm and drives a belt. Thus with one rotation of the motor a small load, coupled by the belt, is moved about 20mm. For this the following drive components are required:

- YASKAWA power stage SGD V-2R9EP1A (pulse train reference with 17bit encoder)
- YASKAWA Servo drive SGMMV-A2E2A21 (6000 U/min)



4.16.2 Wiring

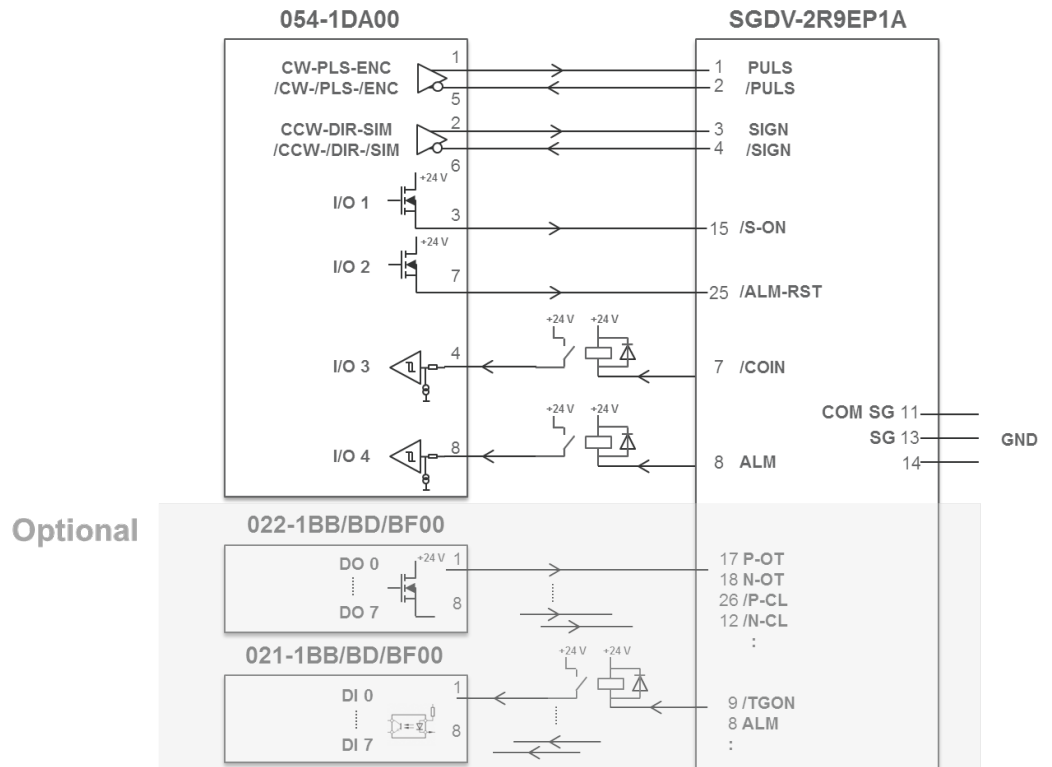
Basic structure

- Perform the wiring of the servo components as specified in the YASKAWA manual.
- Please regard the requirements for the wiring of the System SLIO
 - ↳ Chap. 2.6 'Wiring 8x periphery modules' page 23
 - ↳ 'Connections' page 59

Example: 054-1DA00 with YASKAWA Sigma 5 mini > Commissioning of the power stage

Connection power stage System SLIO

- Connect the power stage according to the following illustration to the System SLIO Motion module:



4.16.3 Commissioning of the power stage

Basic commissioning

- Perform the basic commissioning, configuration and optimization of the power stage according to the specifications in the YASKAWA manuals. For this the software SigmaWin+ from YASKAWA is required.

Configuration of the interface to the power stage for test operation

In the following the configuration of the interface to the power stage for test operation is described. First check whether this configuration is suitable for your application and does not cause any damages! Also consider the chapter trial operation in the YASKAWA manuals. Exemplary the interface between power stage and motion module is to be described as follows:

- Operating mode: Positioning
- Encoder resolution power stage: 17bit (131072 Encoder pulses / U)
- Pulse shape interface: Incremental encoder simulation (A/B) (freely chosen, other possible)
- The direct coupling between the motor shaft and belt pulley results in a 1:1 translation.
- The System SLIO motion module provides 40000 encoder pulses / revolution. Thus, the gear factor in the power stage results in: 131072 / 40000
- Controlling and evaluation of the signals /SO-N, /ALM-RST, COIN and ALM should directly take place via the System SLIO motion module.
- Set the following parameters in the power stage:

Example: 054-1DA00 with YASKAWA Sigma 5 mini > Commissioning of the power stage

Parameter of the power stage

| No. | Name | Value |
|----------|--|--|
| Pn000 | Basic Function Select Switch 0 | 0010H |
| 1. digit | Direction Selection | 0: Sets CCW as forward direction. |
| 2. digit | Control Method Selection | 1: Position control (pulse train reference) |
| 3. digit | Reserved (Do not change.) | 0: Reserved (Do not use.) |
| 4. digit | Reserved (Do not change.) | 0: Reserved (Do not use.) |
| Pn200 | Position Control Reference Form Selection Switch | 0014H |
| 1. digit | Reference Pulse Form | 4: Two-phase pulse train with 90° phase differential (phase A + phase B) ×4, positive logic. |
| 2. digit | Clear Signal Form | 1: Clears position error at the rising edge of the signal. |
| 3. digit | Clear Operation | 0: Clears position error at the baseblock (servomotor power OFF or alarm occurred). |
| 4. digit | Filter Selection | 0: Uses reference input filter 1 for line driver signal (to 1 Mpps). |
| Pn20E | Electronic Gear Ratio (Numerator) | 131072 (17 Bit Encoder) |
| Pn210 | Electronic Gear Ratio (Denominator) | 40000 (units) |
| Pn50A | Input Signal Selection 1 | x701H |
| 1. digit | Input Signal Allocation Mode | 1: Changes the sequence input signal allocation for each signal. |
| 2. digit | Servo ON (/S-ON) Signal Mapping | 0: Active when CN1-15 input signal is ON (L-level). |
| 3. digit | /P-CON Signal Mapping | 7: Always active (fixed). |
| 4. digit | P-OT Signal Mapping | x: Application specific |
| Pn50B | Input Signal Selection 2 | xx4xH |
| 1. digit | N-OT Signal Mapping | x: Application specific |
| 2. digit | /ALM-RST Signal Mapping | 4: Active on the falling edge of CN1-25 input signal. |
| 3. digit | /P-CL Signal Mapping | x: Application specific |
| 4. digit | /N-CL Signal Mapping | x: Application specific |
| Pn50E | Output Signal Selection 1 | 3xx1H |
| 1. digit | Positioning Completion Signal Mapping (/COIN) | 1: Outputs the signal from CN1-7 output terminal. |
| 2. digit | Speed Coincidence Detection Signal Mapping (/V-CMP) | x: Application specific |
| 3. digit | Servomotor Rotation Detection Signal Mapping (/TGON) | x: Application specific |
| 4. digit | Servo Ready Signal Mapping (/S-RDY) | x: Application specific |

Example: 054-1DA00 with YASKAWA Sigma 5 mini > Configuration of the System SLIO motion module

4.16.4 Configuration of the System SLIO motion module

Parameters for the operation

| | |
|--|--|
| Operating mode: | Positioning |
| Pulse shape: | Incremental encoder simulation (A/B), suitable to the setting of the power stage |
| Coupling motion module to power stage: | 1:1 |
| User unit: | 0.01mm |
| Traverse due to the mechanics: | $20 \frac{mm}{r}$ <p>with r: revolutions</p> |
| → | 2000 units $\hat{=}$ Traverse path of 20mm |
| Position limits: | $\pm 6000mm$ |
| → | $\frac{\pm 6000mm}{0.01mm} \hat{=} \pm 600000units$ |
| Max. Motor speed: | $\pm 6000 \frac{r}{min} = \pm 100 \frac{r}{s} \hat{=} \pm 2000 \frac{mm}{s}$ |
| → | $\frac{\pm 2000 \frac{mm}{s}}{0.01mm} \hat{=} 200000 \frac{units}{s}$ |
| Required max. Acceleration: | $100 \frac{mm}{s^2}$ |
| → | $\frac{100mm}{s^2} \hat{=} 10000 \frac{units}{s^2}$ |
| Required max. Deceleration: | $200 \frac{mm}{s^2}$ |
| → | $\frac{200mm}{s^2} \hat{=} 20000 \frac{units}{s^2}$ |
| Specific I/O signals of the power stage: | Controlling and evaluation is done via the System SLIO motion module |

4.16.5 Setting of the objects

According to the operation, the following object of the motion module are to be set. The initial setting can be done via up to 7 module parameters. After the module start-up the other objects are to be transmitted via the *Acyclic channel*.

Objects

| Index-subindex | Value |
|---|--|
| ↳ '0x8180-02 - Gear factor' page 122 | 2000000 (2000 units * 1000) |
| ↳ '0x8480-05 - Software position limit positive direction' page 130 | 600000 |
| ↳ '0x8480-06 - Software position limit negative direction' page 130 | -600000 |
| ↳ '0x8500-04 - Velocity control limit positive direction' page 133 | 200000 |
| ↳ '0x8500-05 - Velocity control limit negative direction' page 133 | -200000 |
| I/O1 ↳ '0x7100-01...04 - Digital input configuration I/O1...I/O4' page 111 | 0 (I/O1 is used as output) |
| I/O1 ↳ '0x7200-01...04 - Digital output configuration I/O1...I/O4' page 113 | 1 (I/O1 output is activated) |
| I/O2 ↳ '0x7100-01...04 - Digital input configuration I/O1...I/O4' page 111 | 0 (I/O2 is used as output) |
| I/O2 ↳ '0x7200-01...04 - Digital output configuration I/O1...I/O4' page 113 | 1 (I/O2 output is activated) |
| I/O3 ↳ '0x7200-01...04 - Digital output configuration I/O1...I/O4' page 113 | 0 (I/O3 output is de-activated) |
| I/O4 ↳ '0x7200-01...04 - Digital output configuration I/O1...I/O4' page 113 | 0 (I/O4 output is de-activated) |
| ↳ '0x8E00-01 - Pulse train configuration' page 139 | 3 (incremental encoder simulation (A/B)) |
| ↳ '0x8E00-08 - Pulse train Servo-On digital output I/O1...I/O4' page 141 | 1 (assigned to I/O1) |
| ↳ '0x8E00-09 - Pulse train Servo-On digital output active polarity I/O1...I/O4' page 141 | 1 (Low level with activated DO) |
| ↳ '0x8E00-10 - Pulse train Alarm-Reset digital output I/O1...I/O4' page 141 | 2 (assigned to I/O2) |
| ↳ '0x8E00-11 - Pulse train Alarm-Reset digital output active polarity I/O1...I/O4' page 142 | 1 (Low level with activated DO) |
| ↳ '0x8E00-12 - Pulse train In-Position digital input I/O1...I/O4' page 142 | 3 (assigned to I/O3) |
| ↳ '0x8E00-13 - Pulse train In-Position digital input active polarity I/O1...I/O4' page 142 | 1 (low level with activated DI) |
| ↳ '0x8E00-14 - Pulse train Alarm digital input I/O1...I/O4' page 143 | 4 (assigned to I/O4) |
| ↳ '0x8E00-15 - Pulse train Alarm digital input active polarity I/O1...I/O4' page 143 | 0 (high level with activated DI) |

Example: 054-1DA00 with YASKAWA Sigma 5 mini > Test operation

4.16.6 Test operation

Proceeding

The System SLIO motion module and the power stage are now ready for a test operation. The system can be controlled via the cyclic data and the state machine.

↳ *Chap. 4.10 'In-/Output area' page 86*

↳ *Chap. 4.4.2 'States' page 61*

1. ➤ Reset a previously encountered possible error with ↳ *'0x8100-01 - Control word' page 116.*
2. ➤ Switch the motion module to the status *Operation enabled* by means of ↳ *'0x8100-01 - Control word' page 116.*
3. ➤ Check in ↳ *'0x8100-02 - Status word' page 117* the individual responded status and switch to the next status only if the responded status corresponds to the expected status. ↳ *Chap. 4.4.2 'States' page 61*
4. ➤ In the status *Operation enabled* you can now specify additional setpoints like *Target position, Velocity, Acceleration* and *deceleration*.

5 Object dictionary

5.1 Use

Addressing

The System SLIO motion module provides its data, such as "Profiling target position" via an object dictionary. In this object dictionary the objects are organized and addressable a unique number consisting of *Index* and *Subindex*. The number is specified as follows:

| | | | |
|----|---------------------|---|--------------------|
| 0x | Index (hexadecimal) | - | Subindex (decimal) |
|----|---------------------|---|--------------------|

Example: 0x8400-03



To improve the structure and for expansion at System SLIO Motion Module another object numbering (index-assignment) is used besides the standard CiA 402.

Index area

By separating into index and subindex a grouping is possible. The individual areas are divided into groups of related objects. With the System SLIO motion module this object directory is structured as follows:

| Index area | Content |
|---------------------|---|
| 0x1000 up to 0x6FFF | General data and system data |
| 0x7000 up to 0x7FFF | Data of the digital input and output part |
| 0x8000 up to 0x8FFF | Data of the axis |



Each object has a subindex 0. Calling an object with subindex 0, the number of available subindexes of the corresponding object is returned.

Accessing the object dictionary

The communication takes place via the I/O area. The main data of the object dictionary are mapped into the I/O area. ↪ *Chap. 4.10 'In-/Output area' page 86*

Included in the mapping is also the *Acyclic Channel* through which you can acyclically access the objects of the motion module. With the acyclic access, any access to the object dictionary is acknowledged by the motion module. ↪ *Chap. 4.11 'Acyclic channel' page 88*

The mapping cannot be changed.



Please note if you write via the Acyclic Channel to objects, which are mapped in the I/O area, these values are overwritten with the next cycle.

5.2 Objects

5.2.1 Overview

Explanation of the elements

Explanation of the elements

Index-Sub - Index and subindex

Sx - Data type SIGNEDx

Ux - Data type UNSIGNEDx

STG - Data type STRING

RW - Read- write access

[degC] - Temperature in degree celsius (°C)

[inc] - Increment - pulse of an encoder

[User] - The unit [User] is a user defined unit, which can be set via ↗ *'0x8180-02 - Gear factor'* page 122.

* - Object, which is mapped in the ↗ *Chap. 4.10 'In-/Output area'* page 86. If you write via the *Acyclic Channel* to this object, the value is overwritten with the next cycle.

** - Object, which can be written in all states of the state machine. Otherwise objects can only be written in the state *'Switch on disabled'*. ↗ *'Accessing the state machine'* page 62

↗ *Chap. 5.2.3 'Passwords and security - 0x1100'* page 109

Available objects

- ↳ '0x1000-00 - Device type' page 107
- ↳ '0x1008-00 - Manufacturer device name' page 108
- ↳ '0x100A-00 - Manufacturer software version' page 108
- ↳ '0x1018-00 - Product - number of entries' page 108
- ↳ '0x1018-02 - Product ID' page 108
- ↳ '0x1018-03 - Revision number' page 108
- ↳ '0x1018-04 - Serial number' page 109
- ↳ '0x1018-05 - Module category' page 109
- ↳ '0x1100-00 - Passwords and security - number of entries' page 109
- ↳ '0x1100-01 - Password' page 109
- ↳ '0x6100-00 - System command - number of entries' page 109
- ↳ '0x6100-10 - System message timeout maximum' page 110
- ↳ '0x7100-00 - Digital inputs - number of entries' page 110
- ↳ '0x7100-01...04 - Digital input configuration I/O1...I/O4' page 111
- ↳ '0x7100-05 - Digital input states I/O1...I/O4' page 112
- ↳ '0x7200-00 - Digital outputs - number of entries' page 112
- ↳ '0x7200-01...04 - Digital output configuration I/O1...I/O4' page 113
- ↳ '0x7200-05 - Digital output states I/O1...I/O4 actual states' page 114
- ↳ '0x7200-06 - Digital output states I/O1...I/O4 requested states' page 115
- ↳ '0x8100-00 - Control drive - number of entries' page 115
- ↳ '0x8100-01 - Control word' page 116
- ↳ '0x8100-02 - Status word' page 117
- ↳ '0x8100-03 - Error code' page 118
- ↳ '0x8100-04 - Limit active bits' page 119
- ↳ '0x8100-05 - Warnings active bits' page 120
- ↳ '0x8100-06 - Error active bits' page 121
- ↳ '0x8180-00 - Configure drive - number of entries' page 121
- ↳ '0x8180-02 - Gear factor' page 122
- ↳ '0x8200-00 - Options - number of entries' page 122
- ↳ '0x8200-01 - Configuration quick stop' page 123
- ↳ '0x8200-05 - Configuration fault reaction' page 123
- ↳ '0x8280-00 - Operating mode - number of entries' page 123
- ↳ '0x8280-01 - Operating mode requested' page 124
- ↳ '0x8280-02 - Operating mode actual' page 124
- ↳ '0x8300-00 - Homing - number of entries' page 125
- ↳ '0x8300-02 - Homing method' page 125
- ↳ '0x8300-03 - Homing digital input I/O1...I/O4' page 125
- ↳ '0x8300-04 - Homing digital input active polarity I/O1...I/O4' page 126
- ↳ '0x8300-05 - Homing target position' page 126
- ↳ '0x8300-06 - Homing velocity V1' page 126

- [🔗 '0x8300-07 - Homing velocity V2' page 127](#)
- [🔗 '0x8300-08 - Homing acceleration' page 127](#)
- [🔗 '0x8300-09 - Homing deceleration' page 127](#)
- [🔗 '0x8300-10 - Homing offset value' page 127](#)
- [🔗 '0x8400-00 - Positioning profile - number of entries' page 128](#)
- [🔗 '0x8400-02 - Positioning profile target position' page 128](#)
- [🔗 '0x8400-03 - Positioning profile target velocity' page 128](#)
- [🔗 '0x8400-04 - Positioning profile target acceleration' page 129](#)
- [🔗 '0x8400-05 - Positioning profile target deceleration' page 129](#)
- [🔗 '0x8480-00 - Positions and limits - number of entries' page 129](#)
- [🔗 '0x8480-02 - Position actual value' page 129](#)
- [🔗 '0x8480-03 - Target position' page 130](#)
- [🔗 '0x8480-05 - Software position limit positive direction' page 130](#)
- [🔗 '0x8480-06 - Software position limit negative direction' page 130](#)
- [🔗 '0x8480-07 - Range limit positive direction' page 131](#)
- [🔗 '0x8480-08 - Range limit negative direction' page 131](#)
- [🔗 '0x8480-09 - In-position window' page 131](#)
- [🔗 '0x8480-10 - Lag error' page 131](#)
- [🔗 '0x8500-00 - Velocity - number of entries' page 132](#)
- [🔗 '0x8500-01 - Velocity control configuration' page 132](#)
- [🔗 '0x8500-02 - Velocity control actual value' page 132](#)
- [🔗 '0x8500-03 - Velocity control target value' page 132](#)
- [🔗 '0x8500-04 - Velocity control limit positive direction' page 133](#)
- [🔗 '0x8500-05 - Velocity control limit negative direction' page 133](#)
- [🔗 '0x8580-00 - Acceleration and deceleration - number entries' page 133](#)
- [🔗 '0x8580-02 - Acceleration/Deceleration actual value' page 133](#)
- [🔗 '0x8580-03 - Deceleration quick stop value' page 134](#)
- [🔗 '0x8580-04 - Acceleration limit' page 134](#)
- [🔗 '0x8580-06 - Deceleration limit' page 134](#)
- [🔗 '0x8680-00 - Voltages - number of entries' page 134](#)
- [🔗 '0x8680-02 - Power section supply voltage actual value' page 135](#)
- [🔗 '0x8680-04 - Power section supply voltage min. warning level' page 135](#)
- [🔗 '0x8680-05 - Power section supply voltage max. warning level' page 135](#)
- [🔗 '0x8680-06 - Power section supply voltage min. error level' page 135](#)
- [🔗 '0x8680-07 - Power section supply voltage max. error level' page 136](#)
- [🔗 '0x8680-08 - Control voltage power stage actual value' page 136](#)
- [🔗 '0x8680-10 - Control voltage power stage min. warning level' page 136](#)
- [🔗 '0x8680-11 - Control voltage power stage max. warning level' page 136](#)
- [🔗 '0x8680-12 - Control voltage power stage min. error level' page 137](#)
- [🔗 '0x8680-13 - Control voltage power stage max. error level' page 137](#)
- [🔗 '0x8780-00 - Temperatures - number of entries' page 137](#)

Objects > Information about the product - 0x1000...0x1018

0x1008-00 - Manufacturer device name

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|---------------------|------|--------------------------|
| 0x1008-00 | U32 | R | 0 | 0 ... 0xFFFFFFFF | | Manufacturer device name |

[↪ 'Explanation of the elements' page 104](#)

Here you can find the name of the motion module ASCII coded: 0x50544D31: 'PTM1'

0x100A-00 - Manufacturer software version

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|-----------------|---------------------|------|-------------------------------|
| 0x100A-00 | U32 | R | current version | 0 ... 0xFFFFFFFF | | Manufacturer software version |

[↪ 'Explanation of the elements' page 104](#)

Here you can find the software version of the motion module 8bit coded e.g. 0x01050300: V1.5.3.0

0x1018-00 - Product - number of entries

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|-----------------------------|
| 0x1018-00 | U08 | R | 5 | 5 | | Product - number of entries |

[↪ 'Explanation of the elements' page 104](#)

0x1018-02 - Product ID

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|------------|---------------------|------|-------------|
| 0x1018-02 | U32 | R | 0x534C494F | 0 ... 0xFFFFFFFF | | Product ID |

[↪ 'Explanation of the elements' page 104](#)

Here according to CiA 402 the product ID of the motion module can be found: 0x534C494F

0x1018-03 - Revision number

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|---------------------|------|-----------------|
| 0x1018-03 | U32 | R | 0 | 0 ... 0xFFFFFFFF | | Revision number |

[↪ 'Explanation of the elements' page 104](#)

Here according to CiA 402 the revision number of the module can be found. Currently this object is not used and returns 0.

0x1018-04 - Serial number

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|---------------------|------|---------------|
| 0x1018-04 | U32 | R | 0 | 0 ... 0xFFFFFFFF | | Serial number |

↳ *'Explanation of the elements' page 104*

Here according to CiA 402 the serial number of the module can be found. Currently this object is not used and returns 0.

0x1018-05 - Module category

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|-----------------|
| 0x1018-05 | U32 | R | 0 | 0 ... 200 | | Module category |

↳ *'Explanation of the elements' page 104*

Here according to CiA 402 you can find the module category of the motion module: 0x41: PTM

5.2.3 Passwords and security - 0x1100**0x1100-00 - Passwords and security - number of entries**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|--|
| 0x1100-00 | U08 | R | 2 | 2 | | Passwords and security - number of entries |

↳ *'Explanation of the elements' page 104*

0x1100-01 - Password

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|---------------------|------|-------------|
| 0x1100-01 | U32 | R/W** | 0 | 0 ... 0xFFFFFFFF | | Password |

↳ *'Explanation of the elements' page 104*

With this object you can enable the password, which allows to write objects in all states of the state machine. Otherwise objects can only be written in the state *'Switch on disabled'*. The password is: 0xABCDABCD and cannot be changed. ↳ *'Accessing the state machine' page 62*

5.2.4 System command - 0x6100**0x6100-00 - System command - number of entries**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|------------------------------------|
| 0x6100-00 | U08 | R | 17 | 17 | | System command - number of entries |

↳ *'Explanation of the elements' page 104*

Objects > Digital inputs I/O1...I/O4 - 0x7100

0x6100-10 - System message timeout maximum

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|---------------------|------|--------------------------------|
| 0x6100-10 | U32 | R/W | 0 | 0 ... 0xFFFFFFFF | [mS] | System message timeout maximum |

[↪ 'Explanation of the elements' page 104](#)

With this object, you can enable the monitoring of the cyclic communication to the System SLIO bus and thus to the fieldbus. If there is no communication within the specified time in ms, the motion module enters the error state. Should the application require a cyclic communication with the motion module but the monitoring of the cycle can not be ensured on the side of the fieldbus coupler or CPU, by means of this object a monitoring time should be entered. By default, no monitoring is active.

5.2.5 Digital inputs I/O1...I/O4 - 0x7100**0x7100-00 - Digital inputs - number of entries**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|------------------------------------|
| 0x7100-00 | U08 | R | 7 | 7 | | Digital inputs - number of entries |

[↪ 'Explanation of the elements' page 104](#)

[↪ Chap. 4.8 'Deployment I/O1...I/O4' page 82](#)

0x7100-01...04 - Digital input configuration I/O1...I/O4

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|-------------|------|----------------------------------|
| 0x7100-01 | U08 | R/W** | 1 | 0 ... 1 | | Digital input configuration I/O1 |
| 0x7100-02 | U08 | R/W** | 1 | 0 ... 1 | | Digital input configuration I/O2 |
| 0x7100-03 | U08 | R/W** | 1 | 0 ... 1 | | Digital input configuration I/O3 |
| 0x7100-04 | U08 | R/W** | 1 | 0 ... 1 | | Digital input configuration I/O4 |

🔗 [‘Explanation of the elements’ page 104](#)

With these objects, the four digital inputs/outputs I/O1...I/O4 are configured as inputs.

- 0: The I/Ox is used as digital output
 - DC 24V
 - 500 mA
 - High-side (source)
- 1: The I/Ox is used as digital input
 - DC 24V
 - IEC 61131-2 Typ 3
 - High-side (sink)
- The inputs can always be read, so its configuration is independent of the configuration as outputs (object 0x7200-01 ... -04).
- If a digital input/output is defined as output via object 0x7200, it can be read via the cyclic data *Status DO*. It is the really pending state at the digital driver part and not set point value, generated by the cyclic data *Status DI* or system.
- If a digital input/output is used by the system (set by object 0x8300 or 0x8E00), this also can be read via the cyclic data *Status DI*.

Objects > Digital output I/O1...I/O4 - 0x7200

0x7100-05 - Digital input states I/O1...I/O4

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|----|---------|-------------|------|----------------------------------|
| 0x7100-05* | U08 | R | 0 | 0 ... 0xFF | | Digital input states I/O1...I/O4 |

[↪ 'Explanation of the elements' page 104](#)

This object contains the current values of the digital inputs I/O1...I/O4. They also can be found in the I/O area.



Please note if you write via the Acyclic Channel to objects, which are mapped in the I/O area, these values are overwritten with the next cycle.

Bit 3 ... 0

| 3 | 2 | 1 | 0 | Description |
|---|---|---|---|---------------------------|
| x | x | x | 0 | Input I/O1 has signal "0" |
| x | x | x | 1 | Input I/O1 has signal "1" |
| x | x | 0 | x | Input I/O2 has signal "0" |
| x | x | 1 | x | Input I/O2 has signal "1" |
| x | 0 | x | x | Input I/O3 has signal "0" |
| x | 1 | x | x | Input I/O3 has signal "1" |
| 0 | x | x | x | Input I/O4 has signal "0" |
| 1 | x | x | x | Input I/O4 has signal "1" |

5.2.6 Digital output I/O1...I/O4 - 0x7200**0x7200-00 - Digital outputs - number of entries**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|-------------------------------------|
| 0x7200-00 | U08 | R | 6 | 6 | | Digital outputs - number of entries |

[↪ 'Explanation of the elements' page 104](#)

[↪ Chap. 4.8 'Deployment I/O1...I/O4' page 82](#)

**0x7200-01...04 - Digital
output configuration
I/O1...I/O4**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|-------------|------|-----------------------------------|
| 0x7200-01 | U08 | R/W** | 0 | 0 ... 1 | | Digital output configuration I/O1 |
| 0x7200-02 | U08 | R/W** | 0 | 0 ... 1 | | Digital output configuration I/O2 |
| 0x7200-03 | U08 | R/W** | 0 | 0 ... 1 | | Digital output configuration I/O3 |
| 0x7200-04 | U08 | R/W** | 0 | 0 ... 1 | | Digital output configuration I/O4 |

↪ *'Explanation of the elements' page 104*

With these objects, the four digital inputs/outputs I/O1...I/O4 are configured as outputs. If a digital input/output is defined as output, it can be read via the cyclic data. This is the really pending state at the digital driver part.

| Value | Description |
|-------|--|
| 0 | The output is de-activated. |
| 1 | The output is activated and can be controlled by the cyclic data ↪ <i>'0x7200-06 - Digital output states I/O1...I/O4 requested states' page 115.</i> |

Objects > Digital output I/O1...I/O4 - 0x7200

0x7200-05 - Digital output states I/O1...I/O4 actual states

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|----|---------|-------------|------|---|
| 0x7200-05* | U08 | R | 0 | 0 ... 0xFF | | Digital output states I/O1...I/O4 actual states |

[↩ 'Explanation of the elements' page 104](#)

This object contains the current values of the digital outputs. They also can be found in the I/O area.



Please note if you write via the Acyclic Channel to objects, which are mapped in the I/O area, these values are overwritten with the next cycle.

Bit 3 ... 0

| 3 | 2 | 1 | 0 | Description |
|---|---|---|---|---------------------|
| x | x | x | 0 | I/O1 has signal "0" |
| x | x | x | 1 | I/O1 has signal "1" |
| x | x | 0 | x | I/O2 has signal "0" |
| x | x | 1 | x | I/O2 has signal "1" |
| x | 0 | x | x | I/O3 has signal "0" |
| x | 1 | x | x | I/O3 has signal "1" |
| 0 | x | x | x | I/O4 has signal "0" |
| 1 | x | x | x | I/O4 has signal "1" |

0x7200-06 - Digital output states I/O1...I/O4 requested states

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|-------|---------|-------------|------|--|
| 0x7200-06* | U08 | R/W** | 0 | 0 ... 0xFF | | Digital output states I/O1...I/O4 requested states |

[↪ 'Explanation of the elements' page 104](#)

This object contains the set values of the digital outputs I/O1...I/O4. They also can be found in cyclic data in the I/O area.



Please note if you write via the Acyclic Channel to objects, which are mapped in the I/O area, these values are overwritten with the next cycle.

Bit 3 ... 0

| 3 | 2 | 1 | 0 | Description |
|---|---|---|---|----------------------------|
| x | x | x | 0 | Output I/O1 has signal "0" |
| x | x | x | 1 | Output I/O1 has signal "1" |
| x | x | 0 | x | Output I/O2 has signal "0" |
| x | x | 1 | x | Output I/O2 has signal "1" |
| x | 0 | x | x | Output I/O3 has signal "0" |
| x | 1 | x | x | Output I/O3 has signal "1" |
| 0 | x | x | x | Output I/O4 has signal "0" |
| 1 | x | x | x | Output I/O4 has signal "1" |

5.2.7 Control drive - 0x8100

0x8100-00 - Control drive - number of entries

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|-----------------------------------|
| 0x8100-00 | U08 | R | 6 | 6 | | Control drive - number of entries |

[↪ 'Explanation of the elements' page 104](#)



In this module, the state machine emulates the states of the connected power stage. It does not represent its current states. Only by adjusting the DIO signals on the signals of the power stage as e.g. S-ON, ALM-RST, S-RDY and COIN, you can control its states.

[↪ Chap. 4.8 'Deployment I/O1...I/O4' page 82](#)

Objects > Control drive - 0x8100

0x8100-01 - Control word

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|-------|---------|-------------|------|--------------|
| 0x8100-01* | U16 | R/W** | 0 | 0 ... 65535 | | Control word |

↳ 'Explanation of the elements' page 104

↳ Chap. 4.4.2 'States' page 61

With the *Control word* you can change the current state of the motor controller respectively reset all the error bits.

Bit 3 ... 0 - Control drive state

| 3 | 2 | 1 | 0 | Description |
|---|---|---|---|--------------------------------|
| x | 1 | 1 | 0 | Shutdown |
| 0 | 1 | 1 | 1 | Switch on |
| 1 | 1 | 1 | 1 | Switch on and enable operation |
| x | x | 0 | x | Disable voltage |
| 0 | 1 | 1 | 1 | Disable operation |
| 1 | 1 | 1 | 1 | Enable operation |
| x | 0 | 1 | x | Quick stop |

Bit 15 ... 4 - Reset error bits

| 15...8 | 7 | 6 | Description |
|----------|-----|----------|---|
| reserved | 0→1 | reserved | Edge 0-1 resets all error bits in ↳ '0x8100-06 - Error active bits' page 121. |

0x8100-02 - Status word

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|----|---------|-------------|------|-------------|
| 0x8100-02* | U16 | R | 0 | 0 ... 65535 | | Status word |

↳ *'Explanation of the elements'* page 104

↳ *Chap. 4.4.2 'States'* page 61



Please consider that the data bits are not latched and may need to be temporarily stored for further processing!

Bit 7 ... 0 - Control drive state

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Description |
|---|---|---|---|---|---|---|---|---|
| x | 0 | x | x | 0 | 0 | 0 | 0 | State 'Not ready to switch on' |
| x | 1 | x | x | 0 | 0 | 0 | 0 | State 'Switch on disabled' |
| x | 0 | 1 | x | 0 | 0 | 0 | 1 | State 'Ready to switch on' |
| x | 0 | 1 | x | 0 | 0 | 1 | 1 | State 'Switched on' |
| x | 0 | 1 | x | 0 | 1 | 1 | 1 | State 'Operation enabled' |
| x | 0 | 0 | x | 0 | 1 | 1 | 1 | State 'Quick stop active' |
| x | 0 | x | x | 1 | 1 | 1 | 1 | State 'Fault reaction active' |
| x | 0 | x | x | 1 | 0 | 0 | 0 | State 'Error' ↳ <i>'0x8100-03 - Error code'</i> page 118 |
| 1 | x | x | x | x | x | x | x | A warning has occurred ↳ <i>'0x8100-05 - Warnings active bits'</i> page 120 |

Bit 15 ... 8 - Operating mode state

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | Description |
|----|----|----|----|----|----|---|---|---|
| x | x | x | x | x | 0 | x | x | Target position not reached (axis is stopped) |
| x | x | x | x | x | 1 | x | x | Target position reached (axis velocity = 0) |
| x | x | x | x | 0 | x | x | x | There is no internal limitation |
| x | x | x | x | 1 | x | x | x | There is an internal limitation The type of limitation depends on the operating mode. |

Objects > Control drive - 0x8100

0x8100-03 - Error code

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|-------------|
| 0x8100-03 | U16 | R | 0 | 0 ... 65535 | | Error code |

↳ *'Explanation of the elements' page 104*

This object shows the most recent error code, which has occurred in the System SLIO motion module. A group message can be obtained from bit 3 in ↳ *'0x8100-02 - Status word' page 117*. There are the following error messages:

Error

| Code | Description |
|--------|---|
| 0x3210 | Power section supply overvoltage ↳ <i>'0x8680-07 - Power section supply voltage max. error level' page 136</i> |
| 0x3220 | Power section supply reduced voltage ↳ <i>'0x8680-12 - Control voltage power stage min. error level' page 137</i> |
| 0x4310 | Temperature μ -Controller exceeded ↳ <i>'0x8780-04 - Temperature μ-Controller error level' page 138</i> |
| 0x5115 | Control voltage power stage exceeds the range of values ↳ <i>'0x8680-12 - Control voltage power stage min. error level' page 137</i> ↳ <i>'0x8680-13 - Control voltage power stage max. error level' page 137</i> |
| 0xF010 | System communication timeout ↳ <i>'0x6100-10 - System message timeout maximum' page 110</i> |
| 0xF011 | Command output disable (BASP) is active. |
| 0xF020 | The selected Operation mode is not supported. ↳ <i>'0x8280-01 - Operating mode requested' page 124</i> |
| 0xF030 | The power stage reports an interrupt via I/Ox. ↳ <i>'0x8E00-14 - Pulse train Alarm digital input I/O1...I/O4' page 143</i> |
| 0xF080 | There is an internal error - please contact our support! |

0x8100-04 - Limit active bits

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|---------------------|------|-------------------|
| 0x8100-04 | U32 | R | 0 | 0 ... 0xFFFFFFFF | | Limit active bits |

0: de-activated, 1: activated

- Bit 3 ... 0: reserved
- Bit 4: Limit velocity
 - [↪ '0x8500-03 - Velocity control target value' page 132](#) > [↪ '0x8500-04 - Velocity control limit positive direction' page 133](#)
 - [↪ '0x8500-03 - Velocity control target value' page 132](#) < [↪ '0x8500-05 - Velocity control limit negative direction' page 133](#)
- Bit 7 ... 5: reserved
- Bit 8: Location of the set point position
 - 0: Position is out of the permissible limits
 - 1: Position is within the permissible limits
 - [↪ '0x8400-02 - Positioning profile target position' page 128](#) > [↪ '0x8480-05 - Software position limit positive direction' page 130](#)
 - [↪ '0x8400-02 - Positioning profile target position' page 128](#) < [↪ '0x8480-06 - Software position limit negative direction' page 130](#)
 - [↪ '0x8480-03 - Target position' page 130](#) > [↪ '0x8480-05 - Software position limit positive direction' page 130](#)
 - [↪ '0x8480-03 - Target position' page 130](#) < [↪ '0x8480-06 - Software position limit negative direction' page 130](#)
- Bit 9: Location of the current position
 - ↪ ['0x8480-07 - Range limit positive direction' page 131](#)
 - ↪ ['0x8480-08 - Range limit negative direction' page 131](#)
 - 0: Position is out of the permissible limits
 - 1: Position is within the permissible limits
 - [↪ '0x8480-02 - Position actual value' page 129](#) > [↪ '0x8480-05 - Software position limit positive direction' page 130](#)
 - [↪ '0x8480-02 - Position actual value' page 129](#) < [↪ '0x8480-06 - Software position limit negative direction' page 130](#)
- Bit 31 ... 10: reserved

↪ ['Explanation of the elements' page 104](#)

Objects > Control drive - 0x8100

0x8100-05 - Warnings active bits

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|---------------------|------|----------------------|
| 0x8100-05 | U32 | R | 0 | 0 ... 0xFFFFFFFF | | Warnings active bits |

0: de-activated, 1: activated

- Bit 11...0: reserved
- Bit 12: Temperature warning μ -Controller
 - [↗ '0x8780-02 - Temperature \$\mu\$ -Controller actual value' page 137](#) > [↗ '0x8780-03 - Temperature \$\mu\$ -Controller warning level' page 138](#)
- Bit 15 ... 13: reserved
- Bit 16: Warning under-voltage U_{IN} 24V_{DC}
 - [↗ '0x8680-02 - Power section supply voltage actual value' page 135](#) < [↗ '0x8680-04 - Power section supply voltage min. warning level' page 135](#)
- Bit 17: Warning over-voltage U_{IN} 24V_{DC}
 - [↗ '0x8680-02 - Power section supply voltage actual value' page 135](#) > [↗ '0x8680-05 - Power section supply voltage max. warning level' page 135](#)
- Bit 18: Warning under-voltage triggering power stage motion module
 - [↗ '0x8680-08 - Control voltage power stage actual value' page 136](#) < [↗ '0x8680-10 - Control voltage power stage min. warning level' page 136](#)
- Bit 19: Warning over-voltage triggering power stage motion module
 - [↗ '0x8680-08 - Control voltage power stage actual value' page 136](#) > [↗ '0x8680-11 - Control voltage power stage max. warning level' page 136](#)
- Bit 31...20: reserved

↗ ['Explanation of the elements' page 104](#)↗ [Chap. 4.14 'Monitoring and error reaction' page 91](#)

0x8100-06 - Error active bits

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|---------------------|------|-------------------|
| 0x8100-06 | U32 | R | 0 | 0 ... 0xFFFFFFFF | | Error active bits |

0: de-activated, 1: activated

- Bit 11 ... 0: reserved
- Bit 12: Temperature error μ -controller ¹⁾
 - [↪ '0x8780-02 - Temperature \$\mu\$ -Controller actual value' page 137](#) > [↪ '0x8780-04 - Temperature \$\mu\$ -Controller error level' page 138](#)
- Bit 15 ... 13: reserved
- Bit 16: Under-voltage U error_{IN} 24V_{DC}
 - [↪ '0x8680-02 - Power section supply voltage actual value' page 135](#) < [↪ '0x8680-06 - Power section supply voltage min. error level' page 135](#)
- Bit 17: Over-voltage U error_{IN} 24V_{DC}
 - [↪ '0x8680-02 - Power section supply voltage actual value' page 135](#) > [↪ '0x8680-07 - Power section supply voltage max. error level' page 136](#)
- Bit 18: Under-voltage triggering power stage error motion module
 - [↪ '0x8680-08 - Control voltage power stage actual value' page 136](#) < [↪ '0x8680-12 - Control voltage power stage min. error level' page 137](#)
- Bit 19: Over-voltage triggering power stage error motion module
 - [↪ '0x8680-08 - Control voltage power stage actual value' page 136](#) > [↪ '0x8680-13 - Control voltage power stage max. error level' page 137](#)
- Bit 20: reserved
- Bit 21: Error power stage reports an interrupt via I/Ox.
 - ↪ ['0x8E00-14 - Pulse train Alarm digital input I/O1...I/O4' page 143](#)
 - ↪ ['0x8E00-15 - Pulse train Alarm digital input active polarity I/O1...I/O4' page 143](#)
- Bit 22: Error system communication timeout ¹⁾
 - [↪ '0x6100-10 - System message timeout maximum' page 110](#)
- Bit 23: Error command output disable (BASP) active ¹⁾
- Bit 27 ... 24: reserved
- Bit 28: System error
 - There is an internal error - please contact our Yaskawa support!
- Bit 31...29: reserved

↪ ['Explanation of the elements' page 104](#)

¹⁾ Triggers an error reaction ↪ [Chap. 4.14 'Monitoring and error reaction' page 91](#)

5.2.8 Configure drive - 0x8180**0x8180-00 - Configure drive - number of entries**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|-------------------------------------|
| 0x8180-00 | U08 | R | 3 | 3 | | Configure drive - number of entries |

↪ ['Explanation of the elements' page 104](#)

0x8180-02 - Gear factor

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|----------|------------------------|------|-------------|
| 0x8180-02 | U32 | R/W | 10000000 | 800000 ... 16000000 | | Gear factor |

↳ 'Explanation of the elements' page 104

Gear factor for normalization of position, velocity and acceleration values. The value represents "units" in thousands with the rotary axis makes exactly one revolution. "Units" may thus be regarded as user units such as μm , mm, inch, degree angle and revolutions.

- Position
 - A to be traversed position thus results directly from the specified number of units.
- Velocity
 - The velocity is normalized to unit/s
- Acceleration and deceleration
 - Acceleration and deceleration are normalized to unit/s^2

Example 1:

A motor directly drives a toothed disk. Via a toothed belt, a drilling machine is 1:1 coupled. It is to be used with a resolution of 0.0001 U (= 1 unit). In order to drive a speed of 900 U/min, therefore, a value of 150000 must be reported.

$$\text{Units} = \frac{1U/U}{0.0001U} = 10000 \text{ 1/U}$$

$$\text{Gear factor} = 10000 \cdot 1000 = 10000000$$

Example 2:

A motor directly drives a spindle with a pitch of 20 mm/U. It is to be used with a resolution of 10 μm (= 1 unit). In order to traverse a difference in position of 7000 μm , 7000 can directly be specified (relative to the previous value).

$$\text{Units} = \frac{20\text{mm}/U}{10\mu\text{m}} = 20000 \text{ 1/U}$$

$$\text{Gear factor} = 20000 \cdot 1000 = 20000000$$

5.2.9 Options - 0x8200**0x8200-00 - Options - number of entries**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|-----------------------------|
| 0x8200-00 | U08 | R | 5 | 5 | | Options - number of entries |

↳ 'Explanation of the elements' page 104

0x8200-01 - Configuration quick stop

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|---------------------|------|--------------------------|
| 0x8200-01 | S16 | R/W** | 2 | -32768 ... 32767 | | Configuration quick stop |

↳ 'Explanation of the elements' page 104

↳ Chap. 4.9 'Brake control' page 85

The object contains the action to be used at a *Quick stop*.

| Mode | Description |
|------|--|
| 0 | Instant state change to 'Switch on disabled' |
| 1 | reserved |
| 2 | Break with quick stop deceleration 0x8580-03 and subsequent state change to 'Switch on disabled' |
| 4... | reserved |

0x8200-05 - Configuration fault reaction

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|-------------|------|------------------------------|
| 0x8200-05 | S16 | R/W** | 2 | 0 ... 2 | | Configuration fault reaction |

↳ 'Explanation of the elements' page 104

The object contains the action to be used on an error of the System SLIO motion module.

| Mode | Description |
|------|--|
| 0 | Instant state change to 'Switch on disabled' |
| 1 | reserved |
| 2 | Break with 0x8580-03 and subsequent state change to 'Switch on disabled' |
| 4... | reserved |

5.2.10 Operating modes - 0x8280

0x8280-00 - Operating mode - number of entries

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|------------------------------------|
| 0x8280-00 | U08 | R | 2 | 2 | | Operating mode - number of entries |

↳ 'Explanation of the elements' page 104

Objects > Operating modes - 0x8280

**0x8280-01 -
Operating mode requested**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|-----|---------|--------------|------|--------------------------|
| 0x8280-01* | S16 | R/W | 0 | -128 ... 127 | | Operating mode requested |

↳ 'Explanation of the elements' page 104

↳ Chap. 4.4.3 'Operating modes' page 62

With the object 0x8280-01 the mode of the motor controller can be set. The following operating modes are supported:

| Value | Description |
|-------|---|
| 0 | No operating mode |
| 1 | <p>↳ Chap. 4.6 'PtP positioning profile' page 68</p> <ul style="list-style-type: none"> ■ The <i>Homing mode</i> can be called during the operation, if you have previously set a homing method via ↳ '0x8300-02 - Homing method' page 125. ■ A change to the <i>Velocity profile</i> is only possible if the state machine is in state 'Switch on disabled'. |
| 3 | ↳ Chap. 4.7 'Velocity profile' page 79 |
| 4 | reserved |
| 6 | ↳ Chap. 4.5 'Homing' page 64 |

**0x8280-02 - Operating
mode actual**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|----|---------|--------------|------|-----------------------|
| 0x8280-02* | S16 | R | 0 | -128 ... 127 | | Operating mode actual |

↳ 'Explanation of the elements' page 104

↳ Chap. 4.4.3 'Operating modes' page 62

In object 0x8280-02 the current operating mode of the motor controller can be read. The following values are supported:

| Value | Description |
|-------|---|
| 0 | No operating mode selected |
| -1 | Invalid operating mode or operating mode change |
| 1 | ↳ Chap. 4.6 'PtP positioning profile' page 68 |
| 3 | ↳ Chap. 4.7 'Velocity profile' page 79 |
| 4 | reserved |
| 6 | ↳ Chap. 4.5 'Homing' page 64 |

5.2.11 Homing - 0x8300

0x8300-00 - Homing - number of entries

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|----------------------------|
| 0x8300-00 | U08 | R | 13 | 13 | | Homing - number of entries |

↳ 'Explanation of the elements' page 104

↳ Chap. 4.5 'Homing' page 64

0x8300-02 - Homing method

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|--------------|------|---------------|
| 0x8300-02 | S08 | R/W** | 0 | -128 ... 127 | | Homing method |

↳ 'Explanation of the elements' page 104

This object is used to select the homing method. Homing is an initialization drive of an axis, where the correct position is determined by means of an reference signal. For complete configuration of a homing run, all index 0x8300 associated objects are required.

Supported homing method

| Mode | Description |
|------|---|
| 17 | It is referenced to a switch at the end of the position area (= homing switch). For the evaluation of the reference switch, a digital input of the System SLIO motion module is used. A pulse signal is expected. |
| 37 | The current position is used as reference position and the position value is reset to zero. |



Please note that neither homing nor other operation modes of System SLIO motion module are monitored by limit switches, which cause a shut-down or stopping when reached. If you wish a surveillance and response, you have to ensure this through separate measures.

0x8300-03 - Homing digital input I/O1...I/O4

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|-------------|------|----------------------------------|
| 0x8300-03 | U08 | R/W** | 0 | 0 ... 4 | | Homing digital input I/O1...I/O4 |

↳ 'Explanation of the elements' page 104

This object sets for homing *Mode 17* the digital input I /O1 ... I /O4 to which the homing switch is connected.

Enter here number:

- 0: inactive
- 1: Input of DIO1
- 2: Input of DIO2
- 3: Input of DIO3
- 4: Input of DIO4

Objects > Homing - 0x8300

0x8300-04 - Homing digital input active polarity I/O1...I/O4

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|-------------|------|--|
| 0x8300-04 | U08 | R/W** | 1 | 0 ... 1 | | Homing digital input active polarity I/O1...I/O4 |

↳ 'Explanation of the elements' page 104

This object sets for homing *Mode 17* the polarity of the digital input I/O1...I/O4 of the System SLIO motion module. The internal logic of the System SLIO motion module evaluates a pulse signal from the reference switch. Please note in this case, the correct electrical connection!

| Value | Description |
|-------|---|
| 0 | The reference switch triggers a state change 1-0 at the end position. |
| 1 | The reference switch triggers a state change 0-1 at the end position. |

0x8300-05 - Homing target position

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|----------------------|--------|------------------------|
| 0x8300-05 | S32 | R/W** | 0 | -8388608 ... 8388607 | [user] | Homing target position |

↳ 'Explanation of the elements' page 104

This object defines the target position for the homing and is signed. If the homing and the mechanical structure are configured correctly, this position should not be reached during homing. It thus serves for:

- set a maximum traversing position, if the initial position is not reached
- to specify the traversing direction by the sign

0x8300-06 - Homing velocity V1

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|----------------------|--------|--------------------|
| 0x8300-06 | S32 | R/W** | 0 | -8388608 ... 8388607 | [user] | Homing velocity V1 |

↳ 'Explanation of the elements' page 104

This object specifies the search speed for traversing to the initial position. Homing *Mode 17* is a two step process.

1. ➤ With velocity V1 (0x8300-06) it is traversed toward the target position (0x8300-05) until the homing switch is overrun.
2. ➤ Then it is decelerated to speed 0 and again accelerated (0x8300-08 and 09) and moved in the negative direction at velocity V1.
3. ➤ If the reference switch is overrun again it is again slowed down and it is again accelerated in the positive direction at velocity V2 (0x8300-07).
4. ➤ With the third overrun of the homing switch the initial position (Offset: 0x8300-10) is set and moved to.

0x8300-07 - Homing velocity V2

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|-------------------------|--------|--------------------|
| 0x8300-07 | S32 | R/W** | 0 | -8388608 ... 8388607 | [user] | Homing velocity V2 |

↳ 'Explanation of the elements' page 104

This object specifies the velocity V2 for traversing to the initial position. The velocity V2 (0x8300-07) is used in the final stage of homing when approaching the initial position (offset: 0x8300-10).

0x8300-08 - Homing acceleration

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|----------------------|--------|---------------------|
| 0x8300-08 | S32 | R/W** | 0 | 1000 ... 10000000 | [user] | Homing acceleration |

↳ 'Explanation of the elements' page 104

This object specifies the value for the homing acceleration for traversing the initial position.

0x8300-09 - Homing deceleration

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|----------------------|--------|---------------------|
| 0x8300-09 | S32 | R/W** | 0 | 1000 ... 10000000 | [user] | Homing deceleration |

↳ 'Explanation of the elements' page 104

This object specifies the value for the homing deceleration for traversing the initial position.

0x8300-10 - Homing offset value

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|-------------------------|--------|---------------------|
| 0x8300-10 | S32 | R/W** | 0 | -8388608 ... 8388607 | [user] | Homing offset value |

↳ 'Explanation of the elements' page 104

This object specifies the offset between the zero position of the application and the reference point (by homing determined) of the drive. The value is to specify with sign. If the homing is completed and the initial position is reached, the offset is added to the initial position.

5.2.12 Parameter for the PtP positioning profile - 0x8400

0x8400-00 - Positioning profile - number of entries

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|---|
| 0x8400-00 | U08 | R | 5 | 5 | | Positioning profile - number of entries |

↪ *'Explanation of the elements' page 104*

↪ *Chap. 4.6 'PtP positioning profile' page 68*

0x8400-02 - Positioning profile target position

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|-------|---------|-------------------------|--------|-------------------------------------|
| 0x8400-02* | S32 | R/W** | 0 | -8388608 ... 8388607 | [user] | Positioning profile target position |

↪ *'Explanation of the elements' page 104*

For the "PtP positioning profile" in this object the new target position is to be specified in user units. ↪ *'0x8180-02 - Gear factor' page 122* You can find this object in the I/O area and it may not be written via the acyclic channel. The positioning is active, if:

- the operation mode "PtP positioning profile" is selected
- the System SLIO motion module is in state *'Operation enabled'*

The positioning must not be started specifically by ↪ *'0x8100-01 - Control word' page 116*. During an ongoing positioning or after reaching the target position 0x8400-02 can be changed and it starts positioning to the new target value. For complete configuration of a positioning and to execute other objects of the index group 0x8400 are required.

0x8400-03 - Positioning profile target velocity

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|-------|---------|-------------------------|--------|-------------------------------------|
| 0x8400-03* | S32 | R/W** | 0 | -8388608 ... 8388607 | [user] | Positioning profile target velocity |

↪ *'Explanation of the elements' page 104*

This object specifies the speed for traversing to the initial position and is processed as absolute value. You can find this object in the I/O area and it may not be written via the acyclic channel. During a running positioning 0x8400-03 can be changed. It is directly accelerated or decelerated, provided the remaining room allows the positioning to the new target value.

0x8400-04 - Positioning profile target acceleration

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|-------|---------|----------------------|--------|---|
| 0x8400-04* | S32 | R/W** | 10000 | 300 ... 100000000 | [user] | Positioning profile target acceleration |

↳ *'Explanation of the elements' page 104*

This object specifies the acceleration for traversing to the initial position and is processed as absolute value. You can find this object in the I/O area and it may not be written via the acyclic channel. During a running positioning 0x8400-04 can be changed and is immediately active.

0x8400-05 - Positioning profile target deceleration

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|-------|---------|----------------------|--------|---|
| 0x8400-05* | S32 | R/W** | 10000 | 300 ... 100000000 | [user] | Positioning profile target deceleration |

↳ *'Explanation of the elements' page 104*

This object specifies the deceleration for traversing to the initial position and is processed as absolute value. You can find this object in the I/O area and it may not be written via the acyclic channel. During a running positioning 0x8400-05 can be changed and is immediately active.

5.2.13 Positions and limit values - 0x8480**0x8480-00 - Positions and limits - number of entries**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|--|
| 0x8480-00 | U08 | R | 16 | 16 | | Positions and limits - number of entries |

↳ *'Explanation of the elements' page 104*

0x8480-02 - Position actual value

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|----|---------|-------------------------|--------|-----------------------|
| 0x8480-02* | S32 | R | 0 | -8388608 ... 8388607 | [user] | Position actual value |

↳ *'Explanation of the elements' page 104*

This object specifies the value of the actual position. You can find this object in the I/O area and it may not be written via the acyclic channel. In open-loop operation, the object has an internally calculated value, not the current encoder value.

0x8480-03 - Target position

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------------------|--------|-----------------|
| 0x8480-03 | S32 | R | 0 | -8388608 ... 8388607 | [user] | Target position |

↪ 'Explanation of the elements' page 104

This object specifies the internal value of the target position at the input of the position controller. It is generated by the superior modules (e.g. PtP ramp generator).

0x8480-05 - Software position limit positive direction

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|-------------------------|--------|--|
| 0x8480-05 | S32 | R/W** | 8388607 | -8388608 ... 8388607 | [user] | Software position limit positive direction |

↪ 'Explanation of the elements' page 104

This object indicates the positive limit for the target position. Each target position is checked against this limit. Before matching always the reference offset ↪ '0x8300-10 - Homing offset value' page 127 is subtracted.

- Is a specified target position above the positive limit:
 - the positioning process is not performed
 - Bit 11: "Internal limitation active" in ↪ '0x8100-02 - Status word' page 117 is set
 - Bit 10: "Target position" reached in ↪ '0x8100-02 - Status word' page 117 is **not** set
 - Bit 9: in ↪ '0x8100-04 - Limit active bits' page 119 is set
- Is a measured actual position above the positive limit:
 - Bit 8: in ↪ '0x8100-04 - Limit active bits' page 119 is set

0x8480-06 - Software position limit negative direction

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|----------|-------------------------|--------|--|
| 0x8480-06 | S32 | R/W** | -8388608 | -8388608 ... 8388607 | [user] | Software position limit negative direction |

↪ 'Explanation of the elements' page 104

This object indicates the negative limit for the target position. Each target position is checked against this limit. Before matching always the reference offset 0x8300-10 is subtracted.

- Is a specified target position below the negative limit:
 - the positioning process is not performed
 - Bit 11: "Internal limitation active" in ↪ '0x8100-02 - Status word' page 117 is set
 - Bit 10: "Target position" reached in ↪ '0x8100-02 - Status word' page 117 is **not** set
 - Bit 9: in ↪ '0x8100-04 - Limit active bits' page 119 is set
- Is a measured actual position below the negative limit:
 - Bit 8: in ↪ '0x8100-04 - Limit active bits' page 119 is set

0x8480-07 - Range limit positive direction

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|----------------------|--------|--------------------------------|
| 0x8480-07 | S32 | R/W | 8000000 | 10000 ... 8388607 | [user] | Range limit positive direction |

↳ *'Explanation of the elements' page 104*

This object defines the positive overflow limit for the processing of position values. When this value is exceeded, the position values are set to ↳ *'0x8480-08 - Range limit negative direction' page 131*. Together with the object 0x8480-07 you can define a position range. For example, by presetting ↳ *'0x8480-05 - Software position limit positive direction' page 130* and ↳ *'0x8480-06 - Software position limit negative direction' page 130* out of the range you will get an endless movement, since the software limits can never be reached during the movement.

0x8480-08 - Range limit negative direction

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|----------|------------------------|--------|--------------------------------|
| 0x8480-08 | S32 | R/W | -8000000 | -8388608 ... -10000 | [user] | Range limit negative direction |

↳ *'Explanation of the elements' page 104*

This object defines the negative overflow limit for the processing of position values. When this value is exceeded, the position values are set to ↳ *'0x8480-07 - Range limit positive direction' page 131*. Together with the object 0x8480-08 you can define a position range. For example, by presetting ↳ *'0x8480-05 - Software position limit positive direction' page 130* and ↳ *'0x8480-06 - Software position limit negative direction' page 130* out of the range you will get an endless movement, since the software limits can never be reached during the movement.

0x8480-09 - In-position window

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|-------------------------|--------|--------------------|
| 0x8480-09 | S32 | R/W** | 10 | -8388608 ... 8388607 | [user] | In-position window |

↳ *'Explanation of the elements' page 104*

This object specifies with relation to the target position a symmetrical range, within which the target position is reached.

0x8480-10 - Lag error

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|----|---------|-------------------------|--------|-------------|
| 0x8480-10* | S32 | R | 0 | -8388608 ... 8388607 | [user] | Lag error |

↳ *'Explanation of the elements' page 104*

This object contains the current system deviation as a deviation between target position and current value. This deviation is called *Lag error*. You can find this object in the I/O area.

5.2.14 Velocities and limit values - 0x8500

0x8500-00 - Velocity - number of entries

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|--|------|----|---------|-------------|------|------------------------------|
| 0x8500-00 | U08 | R | 13 | 13 | | Velocity - number of entries |
| ↪ 'Explanation of the elements' page 104 | | | | | | |

0x8500-01 - Velocity control configuration

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|--|------|-----|---------|---------------------|------|--------------------------------|
| 0x8500-01 | U32 | R/W | 0 | 0 ... 0xFFFFFFFF | | Velocity control configuration |
| ↪ 'Explanation of the elements' page 104 | | | | | | |

With this object, you can disable the PtP position profile respectively the velocity profile for the velocity control. Here, the target velocity setting happens by the following objects:

- 0: Velocity control via PtP position profile and velocity profile with set point velocity setting via [↪ '0x8400-03 - Positioning profile target velocity' page 128](#). This is the default setting.
- 1: Velocity control exclusively velocity profile with set point velocity setting via [↪ '0x8500-03 - Velocity control target value' page 132](#).
- 2: PtP position profile and velocity profile are disabled with set point velocity setting as set point frequency for the PWM stage.

0x8500-02 - Velocity control actual value

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|--|------|----|---------|---------------------------|--------|-------------------------------|
| 0x8500-02* | S32 | R | 0 | -10000000 ... 10000000 | [user] | Velocity control actual value |
| ↪ 'Explanation of the elements' page 104 | | | | | | |

This object specifies the value of the actual velocity. You can find this object in the I/O area and it may not be written via the acyclic channel. In open-loop operation, the object has an internally calculated value, not determined from the current encoder value.

0x8500-03 - Velocity control target value

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|--|------|-------|---------|---------------------------|--------|-------------------------------|
| 0x8500-03 | S32 | R/W** | 0 | -10000000 ... 10000000 | [user] | Velocity control target value |
| ↪ 'Explanation of the elements' page 104 | | | | | | |

This object specifies the internal value of the target velocity at the input of the velocity controller. It is generated by the superior modules (e.g. PtP ramp generator).

0x8500-04 - Velocity control limit positive direction

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|----------------|--------|---|
| 0x8500-04 | S32 | R/W** | 100000 | 0 ... 10000000 | [user] | Velocity control limit positive direction |

[↪ 'Explanation of the elements' page 104](#)

This object indicates the positive limit for velocity. Each target velocity is checked against this limit.

0x8500-05 - Velocity control limit negative direction

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|-----------------|--------|---|
| 0x8500-05 | S32 | R/W** | -100000 | -10000000 ... 0 | [user] | Velocity control limit negative direction |

[↪ 'Explanation of the elements' page 104](#)

This object indicates the negative limit for velocity. Each target velocity is checked against this limit.

5.2.15 Acceleration and deceleration - 0x8580**0x8580-00 - Acceleration and deceleration - number entries**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|--|
| 0x8580-00 | U08 | R | 6 | 6 | | Acceleration and deceleration - number entries |

[↪ 'Explanation of the elements' page 104](#)

0x8580-02 - Acceleration/Deceleration actual value

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|------------|------|----|---------|--------------------------|--------|--|
| 0x8580-02* | S32 | R | 0 | -100000000 ... 100000000 | [user] | Acceleration/Deceleration actual value |

[↪ 'Explanation of the elements' page 104](#)

This object specifies the value of the actual acceleration (positive sign) respectively deceleration (negative sign). You can find this object in the I/O area and it may not be written via the acyclic channel. In open-loop operation, the object has an internally calculated value, not determined from the current encoder value.

Objects > Voltages - 0x8680

0x8580-03 - Deceleration quick stop value

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|---------------------|--------|-------------------------------|
| 0x8580-03 | S32 | R/W** | 10000 | 10 ... 100000000 | [user] | Deceleration quick stop value |

[↪ 'Explanation of the elements' page 104](#)

This object specifies the value of the target deceleration in case of a *quick stop*.

0x8580-04 - Acceleration limit

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|---------------------|--------|--------------------|
| 0x8580-04 | S32 | R/W** | 10000 | 10 ... 100000000 | [user] | Acceleration limit |

[↪ 'Explanation of the elements' page 104](#)

This object indicates the bidirectional limit value for the set point acceleration value. Each set point acceleration value is checked against this limit value. Please note that the lower limit is unequal 0. As soon as a set point velocity value is active, the movement starts, although the set point acceleration is 0.

0x8580-06 - Deceleration limit

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-------|---------|---------------------|--------|--------------------|
| 0x8580-06 | S32 | R/W** | 10000 | 10 ... 100000000 | [user] | Deceleration limit |

[↪ 'Explanation of the elements' page 104](#)

This object indicates the bidirectional limit value for the set point deceleration value. Each set point deceleration value is checked against this limit value. Please note that the lower limit is unequal 0. As soon as a set point velocity value is active, the movement starts, although the set point deceleration is 0.

5.2.16 Voltages - 0x8680**0x8680-00 - Voltages - number of entries**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|------------------------------|
| 0x8680-00 | U08 | R | 7 | 7 | | Voltages - number of entries |

[↪ 'Explanation of the elements' page 104](#)

0x8680-02 - Power section supply voltage actual value

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|---------|---|
| 0x8680-02 | U16 | R | 0 | 0 ... 6000 | [0.01V] | Power section supply voltage actual value |

↳ [‘Explanation of the elements’ page 104](#)

This object specifies the level of the actual supply voltage.

0x8680-04 - Power section supply voltage min. warning level

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|---------|---|
| 0x8680-04 | U16 | R/W | 4100 | 0 ... 6000 | [0.01V] | Power section supply voltage min. warning level |

↳ [‘Explanation of the elements’ page 104](#)

This object specifies a lower limit for the supply voltage of the module. If the limit is exceeded, via [‘0x8100-02 - Status word’ page 117](#) respectively [‘0x8100-05 - Warnings active bits’ page 120](#) a warning is shown.

0x8680-05 - Power section supply voltage max. warning level

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|---------|---|
| 0x8680-05 | U16 | R/W | 5500 | 0 ... 6000 | [0.01V] | Power section supply voltage max. warning level |

↳ [‘Explanation of the elements’ page 104](#)

This object specifies an upper limit for the supply voltage of the module. If the limit is exceeded, via [‘0x8100-02 - Status word’ page 117](#) respectively [‘0x8100-05 - Warnings active bits’ page 120](#) a warning is shown.

0x8680-06 - Power section supply voltage min. error level

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|---------|---|
| 0x8680-06 | U16 | R/W | 3800 | 0 ... 6000 | [0.01V] | Power section supply voltage min. error level |

↳ [‘Explanation of the elements’ page 104](#)

This object specifies a lower limit for the supply voltage of the module. If the limit is under-shot, via [‘0x8100-02 - Status word’ page 117](#) respectively [‘0x8100-06 - Error active bits’ page 121](#) an error is shown.

Objects > Voltages - 0x8680

**0x8680-07 - Power section
supply voltage max. error
level**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|---------|---|
| 0x8680-07 | U16 | R/W | 5800 | 0 ... 6000 | [0.01V] | Power section supply voltage max. error level |

[↪ 'Explanation of the elements' page 104](#)

This object specifies an upper limit for the supply voltage of the module. If the limit is exceeded, via [↪ '0x8100-02 - Status word' page 117](#) respectively [↪ '0x8100-06 - Error active bits' page 121](#) an error is shown.

**0x8680-08 - Control
voltage power stage
actual value**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|---------|--|
| 0x8680-08 | U16 | R | 0 | 0 ... 4000 | [0.01V] | Control voltage power stage actual value |

[↪ 'Explanation of the elements' page 104](#)

This object specifies the level of the actual supply voltage of the power stage.

**0x8680-10 - Control
voltage power stage min.
warning level**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|---------|--|
| 0x8680-10 | U16 | R/W | 850 | 0 ... 4000 | [0.01V] | Control voltage power stage min. warning level |

[↪ 'Explanation of the elements' page 104](#)

This object specifies a lower limit for the control voltage of the power stage. If the limit is exceeded, via [↪ '0x8100-02 - Status word' page 117](#) respectively [↪ '0x8100-05 - Warnings active bits' page 120](#) a warning is shown.

**0x8680-11 - Control
voltage power stage max.
warning level**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|---------|--|
| 0x8680-11 | U16 | R/W | 1200 | 0 ... 4000 | [0.01V] | Control voltage power stage max. warning level |

[↪ 'Explanation of the elements' page 104](#)

This object specifies an upper limit for the control voltage of the power stage. If the limit is exceeded, via [↪ '0x8100-02 - Status word' page 117](#) respectively [↪ '0x8100-05 - Warnings active bits' page 120](#) a warning is shown.

0x8680-12 - Control voltage power stage min. error level

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|---------|--|
| 0x8680-12 | U16 | R/W | 800 | 0 ... 4000 | [0.01V] | Control voltage power stage min. error level |

↳ *'Explanation of the elements' page 104*

This object specifies a lower limit for the control voltage of the power stage. If the limit is undershot, via ↳ *'0x8100-02 - Status word' page 117* respectively ↳ *'0x8100-06 - Error active bits' page 121* an error is shown.

0x8680-13 - Control voltage power stage max. error level

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|---------|--|
| 0x8680-13 | U16 | R/W | 1400 | 0 ... 4000 | [0.01V] | Control voltage power stage max. error level |

↳ *'Explanation of the elements' page 104*

This object specifies an upper limit for the control voltage of the power stage. If the limit is exceeded, via ↳ *'0x8100-02 - Status word' page 117* respectively ↳ *'0x8100-06 - Error active bits' page 121* an error is shown.

5.2.17 Temperatures - 0x8780**0x8780-00 - Temperatures - number of entries**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|----------------------------------|
| 0x8780-00 | U08 | R | 12 | 12 | | Temperatures - number of entries |

↳ *'Explanation of the elements' page 104*

0x8780-02 - Temperature μ -Controller actual value

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|--------|--|
| 0x8780-02 | S16 | R | 0 | -50 ... 120 | [degC] | Temperature μ -Controller actual value |

↳ *'Explanation of the elements' page 104*

This object specifies the measured temperature of the μ -Controller of the motion module.

Objects > Pulse train parameter - 0x8E00

**0x8780-03 - Temperature
μ-Controller warning level**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|--------|--|
| 0x8780-03 | S16 | R/W | 90 | -50 ... 120 | [degC] | Temperature μ-Controller warning level |

↳ *'Explanation of the elements' page 104*

This object specifies the temperature limit of the μ-Controller of the motion module. If the temperature limit is exceeded, via ↳ *'0x8100-02 - Status word' page 117* respectively ↳ *'0x8100-05 - Warnings active bits' page 120* a warning is shown.

**0x8780-04 - Temperature
μ-Controller error level**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|--------|--------------------------------------|
| 0x8780-04 | S16 | R/W | 105 | -50 ... 120 | [degC] | Temperature μ-Controller error level |

↳ *'Explanation of the elements' page 104*

This object specifies the temperature limit of the μ-Controller of the motion module. If the limit is reached, via ↳ *'0x8100-02 - Status word' page 117* respectively ↳ *'0x8100-06 - Error active bits' page 121* an error is shown and the status of the motion module changes to *'Fault reaction active'*.

**0x8780-05 - Temperature
μ-Controller offset**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|--------------|------|---------------------------------|
| 0x8780-05 | S16 | R/W | 1173 | 900 ... 1500 | | Temperature μ-Controller offset |

↳ *'Explanation of the elements' page 104*

This object specifies an offset for the temperature of the μ-Controller.

**0x8780-06 - Temperature
μ-Controller gain**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|------|-------------------------------|
| 0x8780-06 | S16 | R/W | 386 | 300 ... 500 | | Temperature μ-Controller gain |

↳ *'Explanation of the elements' page 104*

This object specifies a gain for the temperature of the μ-Controller.

5.2.18 Pulse train parameter - 0x8E00**0x8E00-00 - Pulse train
parameter - number of
entries**

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|---|
| 0x8E00-00 | U08 | R | 15 | 15 | | Pulse train parameter - number of entries |

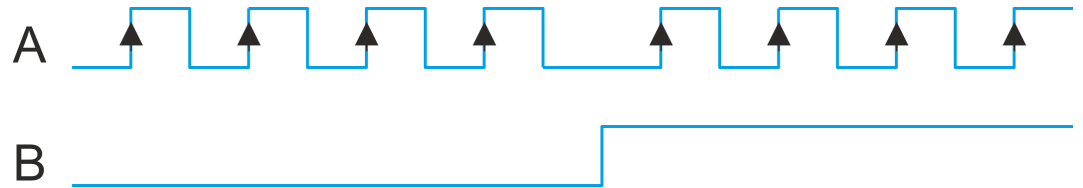
↳ *'Explanation of the elements' page 104*

0x8E00-01 - Pulse train configuration

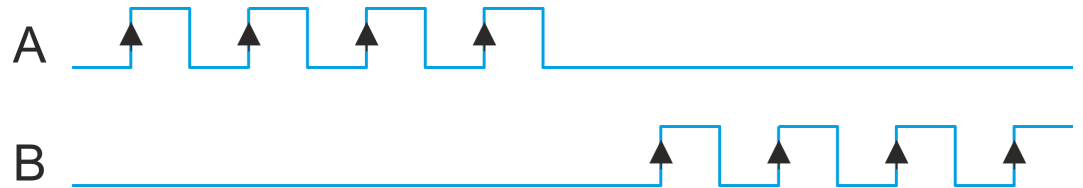
| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|------|---------------------------|
| 0x8E00-01 | U32 | R/W | 3 | 0 ... 3 | | Pulse train configuration |

🔗 'Explanation of the elements' page 104

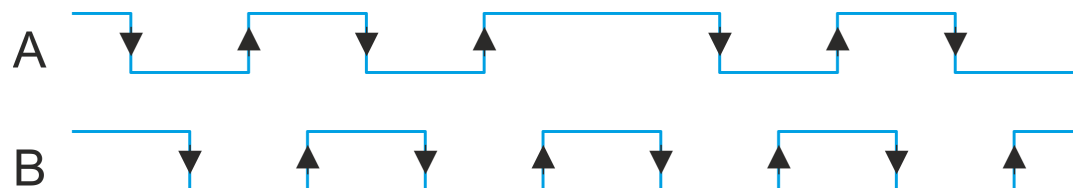
With this object, you can specify the frequency pulse patterns. There are the following possibilities:

Pulse and direction (P/D)

- 0x8E00-01 = 1
- The output of the frequency pattern happens by output A1 (P)
- The direction of rotation marks A2 (D) with "high" level for clockwise and "low" level for counter-clockwise rotation.

Frequency modulation (CW/CCW)

- 0x8E00-01 = 2
- With clockwise rotation the frequency signal is output at A1 (CW) respectively counter-clockwise rotation at A2 (CCW).
- The inactive channel is always at logic "low".

Incremental encoder simulation (A/B)

- 0x8E00-01 = 3
- Signal corresponds to the signal of an incremental encoder. By direct connection to a frequency converter synchronous axes in the master/slave structure can be realized.
- A1 (A) and A2 (B) output a phase-shifted by 90° signal.
- The shift from A1 to A2 is positive for clockwise rotation and negative for counter-clockwise rotation.

Objects > Pulse train parameter - 0x8E00

0x8E00-02 - Pulse train pulses per revolution

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|---------------|-------|-----------------------------------|
| 0x8E00-02 | U16 | R/W | 40000 | 100 ... 65535 | [pls] | Pulse train pulses per revolution |

↳ 'Explanation of the elements' page 104

This object specifies the number of pulses per rotation of the connected power stage. Please regard that usually the same settings are to be made at the power stage.

0x8E00-03 - Pulse train set frequency

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|----------------------|------|---------------------------|
| 0x8E00-03 | S32 | R/W | 0 | -5000000 ... 5000000 | [Hz] | Pulse train set frequency |

↳ 'Explanation of the elements' page 104

This object indicates the current set point of the pulse frequency, which is output to the connected power stage. It is generated by the superior modules (e.g. PtP ramp generator).

0x8E00-04 - Pulse train max. frequency

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|---------------|------|----------------------------|
| 0x8E00-04 | U32 | R/W | 5000000 | 0 ... 5000000 | [Hz] | Pulse train max. frequency |

↳ 'Explanation of the elements' page 104

This object specifies the maximum pulse frequency which is output to the connected power stage.

5.2.18.1 0x8E00-08 ... 15 - Signals of the power stage

The System SLIO motion module can directly control power stage via digital signals. These signals are generated and evaluated directly from the internal state machine. They no longer need to be processed by the user program. Via subindices -08...15 you can assign these signals to a digital input respectively output.

0x8E00-08 - Pulse train Servo-On digital output I/O1...I/O4

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|------|---|
| 0x8E00-08 | U08 | R/W | 0 | 0 ... 4 | | Pulse train Servo-On digital output I/O1...I/O4 |

↳ 'Explanation of the elements' page 104

Returns in state 'Operation enabled' this signal. The signal is used to enable the power stage for motor controlling. Here you have the following bit assignment:

- Bit 0: to set for de-activated
- Bit 1: to set for I/O1
- Bit 2: to set for I/O3
- Bit 3: to set for I/O2
- Bit 4: to set for I/O4

0x8E00-09 - Pulse train Servo-On digital output active polarity I/O1...I/O4

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|------|---|
| 0x8E00-09 | U08 | R/W | 0 | 0 ... 1 | | Pulse train Servo-On digital output active polarity I/O1...I/O4 |

↳ 'Explanation of the elements' page 104

Here you can specify the polarity for the output:

- 0: High level with activated DO
- 1: Low level with activated DO

0x8E00-10 - Pulse train Alarm-Reset digital output I/O1...I/O4

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|------|--|
| 0x8E00-10 | U08 | R/W | 0 | 0 ... 4 | | Pulse train Alarm-Reset digital output I/O1...I/O4 |

↳ 'Explanation of the elements' page 104

Returns in state 'Operation enabled' this signal. The signal is used to reset pending alarms in the power stage. Here you have the following bit assignment:

- Bit 0: to set for de-activated
- Bit 1: to set for I/O1
- Bit 2: to set for I/O3
- Bit 3: to set for I/O2
- Bit 4: to set for I/O4

Objects > Pulse train parameter - 0x8E00

0x8E00-11 - Pulse train Alarm-Reset digital output active polarity I/O1...I/O4

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|------|--|
| 0x8E00-11 | U08 | R/W | 0 | 0 ... 1 | | Pulse train Alarm-Reset digital output active polarity I/O1...I/O4 |

[↪ 'Explanation of the elements' page 104](#)

Here you can specify the polarity for the output:

- 0: High level with activated DO
- 1: Low level with activated DO

0x8E00-12 - Pulse train In- Position digital input I/O1...I/O4

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|------|---|
| 0x8E00-12 | U08 | R/W | 0 | 0 ... 4 | | Pulse train In-Position digital input I/O1...I/O4 |

[↪ 'Explanation of the elements' page 104](#)

This signal is expected as feedback from the power stage when it has completed the positioning. Here you have the following bit assignment:

- Bit 0: to set for de-activated
- Bit 1: to set for I/O1
- Bit 2: to set for I/O3
- Bit 3: to set for I/O2
- Bit 4: to set for I/O4

0x8E00-13 - Pulse train In- Position digital input active polarity I/O1...I/O4

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|------|---|
| 0x8E00-13 | U08 | R/W | 0 | 0 ... 1 | | Pulse train In-Position digital input active polarity I/O1...I/O4 |

[↪ 'Explanation of the elements' page 104](#)

Here you can specify the polarity for the output:

- 0: High level with activated DI
- 1: Low level with activated DI

0x8E00-14 - Pulse train Alarm digital input I/O1...I/O4

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|------|---|
| 0x8E00-14 | U08 | R/W | 0 | 0 ... 4 | | Pulse train Alarm digital input I/O1...I/O4 |

[↪ 'Explanation of the elements' page 104](#)

This signal is expected as feedback from the power stage when it has pending an alarm. Here you have the following bit assignment:

- Bit 0: to set for de-activated
- Bit 1: to set for I/O1
- Bit 2: to set for I/O3
- Bit 3: to set for I/O2
- Bit 4: to set for I/O4

0x8E00-15 - Pulse train Alarm digital input active polarity I/O1...I/O4

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|------|---|
| 0x8E00-15 | U08 | R/W | 0 | 0 ... 1 | | Pulse train Alarm digital input active polarity I/O1...I/O4 |

[↪ 'Explanation of the elements' page 104](#)

Here you can specify the polarity for the output:

- 0: High level with activated DI
- 1: Low level with activated DI

5.2.19 Encoder resolution - 0x8F00

0x8F00-00 - Encoder - number of entries

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|------|-----------------------------|
| 0x8F00-00 | U08 | R | 3 | 3 | | Encoder - number of entries |

[↪ 'Explanation of the elements' page 104](#)

Objects > Encoder resolution - 0x8F00

0x8F00-01 - Encoder Feed-back configuration

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|-----|---------|-------------|------|--------------------------------|
| 0x8F00-01 | U32 | R/W | 0 | 0 ... 1 | | Encoder Feedback configuration |

↳ *'Explanation of the elements' page 104*

With this object the digital in-/outputs I/O1 and I/O3 are physically configured as encoder input.

- 0: Encoder functionality for I/O1 and I/O3 is disabled
- 1: Encoder functionality for I/O1 and I/O3 is enabled
 - 24V HTL signal
 - Phase A and B
 - 100 kHz
 - 4-fold evaluation

0x8F00-02 - Encoder actual value

| Index-Sub | Type | RW | Default | Value range | Unit | Description |
|-----------|------|----|---------|-------------|-------|----------------------|
| 0x8F00-02 | U16 | R | 0 | 0 ... 65535 | [inc] | Encoder actual value |

↳ *'Explanation of the elements' page 104*

With this object you can get the actual value of a possibly connected encoder. Please note that this value is not further evaluated in the motion module. You can further process it in your user program.