Baumer

Passion for Sensors



SIL3 PLe Safety Function

Safety Manual
GMM230S / GMM240S Series
Safety Monitors for SinCos and Incremental Encoders / Sensors

Product features:

- Monitoring of underspeed, overspeed, standstill and direction of rotation
- SIL3 and PLe certification
- Safety functions equivalent to EN 61800-5-2
  (SS1, SS2, SOS, SLS, SDI, SSM, SLI, SBC, STO, SMS)
- Inputs for: 2 SinCos encoders
  2 RS422 incremental encoders
  2 HTL/PNP incremental encoders, proximity switches or
  2 - 4 control signals
- Outputs: 1 relay output 5 ... 36 VDC (NO), (safety related)
  1 analog output 4 ... 20 mA, (safety related)
  4 HTL control outputs, (safety related)
- Signal splitter: 1 SinCos Splitter Output, (safety related)
  1 RS422 Splitter Output, (safety related)
- Mounting to 35 mm top hat rail (according to EN 60715)
- USB interface for simple parametrization by the OS6.0 operator surface
- Optionally available: display and programming unit GMI230S for parametrization and indication

Available Models:

- GMM230S: includes all inputs, all outputs and signal splitter
- GMM236S: includes all inputs, all outputs, but no signal splitter
- GMM240S: 1 SinCos input (SIL3/PLe), all control inputs, all outputs and signal splitter
- GMM246S: 1 SinCos input (SIL3/PLe), all control inputs, all outputs no signal splitter

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03b_oi/Oct-15/ag	Diverse adaptations and extensions
04a_oi/Dez.-15/af-ag	Adaptations and extensions of parameters
04b_oi/af-ag	Parameter description and list removed (separate manual). Extensive changes and extensions. New chapters added.
04c_oi/af-ag	Chapter 11. Monitoring Functions supplemented Supplementation in chapters 6.4 / 6.6 / 6.7 / 6.11 New images : 1 x in chapter 8.2 and 2 x in 8.3
04d_oi/af-ag	Changes in chapter “Runtime Test” Small corrections in chapter “Monitoring Functions” New chapter “Response times” added
04e_oi/af/hk	Various adaptions and modifications Additional chapter for wiring of inputs, outputs, EDM function Extensions and amendments in chapter „Setup“
04f_oi/sn	Adaptations of safety characteristic data
05a_oi/af	New parameters and functions
06coi/af-cn	New parameters and functions

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Important note about this document:

In addition to this manual, the separate parameter description **GMM230S_06x_pd** must be used.

It contains a detailed description and a list of all parameters for setup and operation.

Further important manuals:

- OS6.0 Operating Manual
- OS6.0 User Installation Manual
- GMI230S Operating Manual (optionally)

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1. Safety Instructions and Responsibility

1.1. General Safety Instructions

This operation manual is a significant component of the unit and includes important rules and hints about the installation, function and usage. Non-observance can result in damage and/or impairment of the functions to the unit or the machine or even in injury to persons using the equipment!

Please read the following instructions carefully before operating the device and observe all safety and warning instructions! Keep the manual for later use.

A pertinent qualification of the respective staff is a fundamental requirement in order to use these manual. The unit must be installed, configured, commissioned and serviced by a qualified electrician.

Liability exclusion: The manufacturer is not liable for personal injury and/or damage to property and for consequential damage, due to incorrect handling, installation, operation and maintaining. Further claims, due to errors in the operation manual as well as misinterpretations are excluded from liability.

In addition the manufacturer reserves the right to modify the hardware, software or operation manual at any time and without prior notice. Therefore, there might be minor differences between the unit and the descriptions in operation manual.

The raiser respectively positioner is exclusively responsible for the safety of the system and equipment where the unit will be integrated.

During installation, operation or maintenance all general and also all country- and application-specific safety rules and standards must be observed.

If the device is used in processes, where a failure or faulty operation could damage the system or injure persons, appropriate precautions to avoid such consequences must be taken.

1.2. Use according to the intended purpose

The unit is intended exclusively for use in industrial machines, constructions and systems. Non-conforming usage does not correspond to the provisions and lies within the sole responsibility of the user. The manufacturer is not liable for damages which are arisen through unsuitable and improper use. Please note that device may only be installed in proper form and used in a technically perfect condition in accordance to the technical Specifications. The device is not suitable for operation in explosion-proof areas or areas which are excluded by the EN 61010-1 standard.

1.3. Installation

The device is only allowed to be installed and operated within the permissible temperature range. Please ensure adequate ventilation and avoid all direct contact between the device and hot or aggressive gases and liquids.

Before installation or maintenance, the unit must be disconnected from all voltage-sources. Further it must be ensured that no danger can arise by touching the disconnected voltage-sources.

Devices which are supplied by AC-voltages, must be connected exclusively by switches, respectively circuit-breakers with the low voltage network. The switch or circuit-breaker must be placed as near as possible to the device and further indicated as separator.

Incoming as well as outgoing wires and wires for extra low voltages (ELV) must be separated from dangerous electrical cables (SELV circuits) by using double resp. increased isolation.

All selected wires and isolations must be conforming to the provided voltage- and temperature-ranges. Further all country- and application-specific standards, which are relevant for structure, form and quality of the wires, must be ensured. Indications about the permissible wire cross-sections for wiring are described in the technical specifications.

Before first Start-up it must be ensured that all connections and wires are firmly seated and secured in the screw terminals. All (inclusively unused) terminals must be fastened by turning the relevant screws clockwise up to the stop.

Overvoltage at the connections must be limited to values in accordance to the overvoltage category II.

For placement, wiring, environmental conditions as well as shielding and earthing / grounding of the supply lines the general standards of industrial automation industry and the specific shielding instructions of the manufacturer are valid. Please find all respective hints and rules on

www.baumer.com/download.html --> [General EMC Rules for Wiring, Screening and Earthing].

1.4. Cleaning, Maintenance and Service Notes

To clean the front of the unit please use only a slightly damp (not wet!), soft cloth. For the rear no cleaning is necessary. For an unscheduled, individual cleaning of the rear the maintenance staff or assembler is self-responsible.

During normal operation no maintenance is necessary. In case of unexpected problems, failures or malfunctions the device must be shipped for back to the manufacturer for checking, adjustment or reparation. Unauthorized opening and repairing can have negative effects or failures to the protection-measures of the unit.

In case of continuous operation the GMM2xxS unit must be switched on and off for at least 1 times a year.

2. Introduction

This series of speed monitors is suitable for safety-related monitoring tasks, e.g. over-speed, under-speed, standstill and direction of rotation. This SIL3/PLe certified generation of devices was developed to achieve functional safety by supporting a wide range of sensors and encoders in different combinations.

Due to parallel encoder inputs these devices are perfectly suitable for the retrofitting of existing plants and machines which are using “non-safe“ sensors. This offers a great opportunity to save costs for expensive and certified sensors. Also the costs for new installations and adjustments can be reduced significantly by using the existing components and wiring.

Typical examples are centrifuges, cranes, wind power or hauling plants.

Special features:

- Additionally suitable for use with setup operations,
  e. g. for manual settings in plants with open protection doors and reduced speed
- All models are safety-related and dually certified according to
  EN 61508, EN 62061 / SIL3 and EN ISO 13849-1 Cat. 3 / PLe,
  even when using “non-safety-related” standard sensors or encoders
- Generally, the use of 2 sensors / encoders is required because only then SIL3 / PLe can be achieved. The only exception is the use of a SIL3 PLe certified SinCos encoder.
- Wide input frequency range and fast response time
- Very versatile range of possible monitoring functions
- It is recommended to setup the GMM2xxS unit via the front USB port by using a PC and the OS6.0 operator software.
- The final Safety Integration Level (SIL) results from the selected configuration and from external components connected to the unit.
- The additional display and operating unit GMI230S (optional accessory, not included in the delivery) is used to display the encoder frequencies in converted operator units and further for visual monitoring of the GMM2xxS unit. The GMI230S can also be used for a simple configuration as well as for setup tasks.

3. Available Models

GMM230S

Housing for DIN rail mounting 35 mm into a control cabinet (according to EN 60715)
Inputs: 2x SinCos encoders
2x RS422/TTL encoders
2x HTL/PNP encoders, proximity switches or control signals
Outputs: 1x relay output (safety related)
1x analog output (safety related)
4x control HTL outputs (safety related)
1x SinCos splitter output (safety related)
1x RS422 splitter output (safety related)

GMM236S

Housing for DIN rail mounting 35 mm into a control cabinet (according to EN 60715)
Inputs: 2x SinCos encoders
2x RS422/TTL encoders
2x HTL/PNP encoders, proximity switches or control signals
Outputs: 1x relay output (safety related)
1x analog output (safety related)
4x control HTL outputs (safety related)

GMM240S

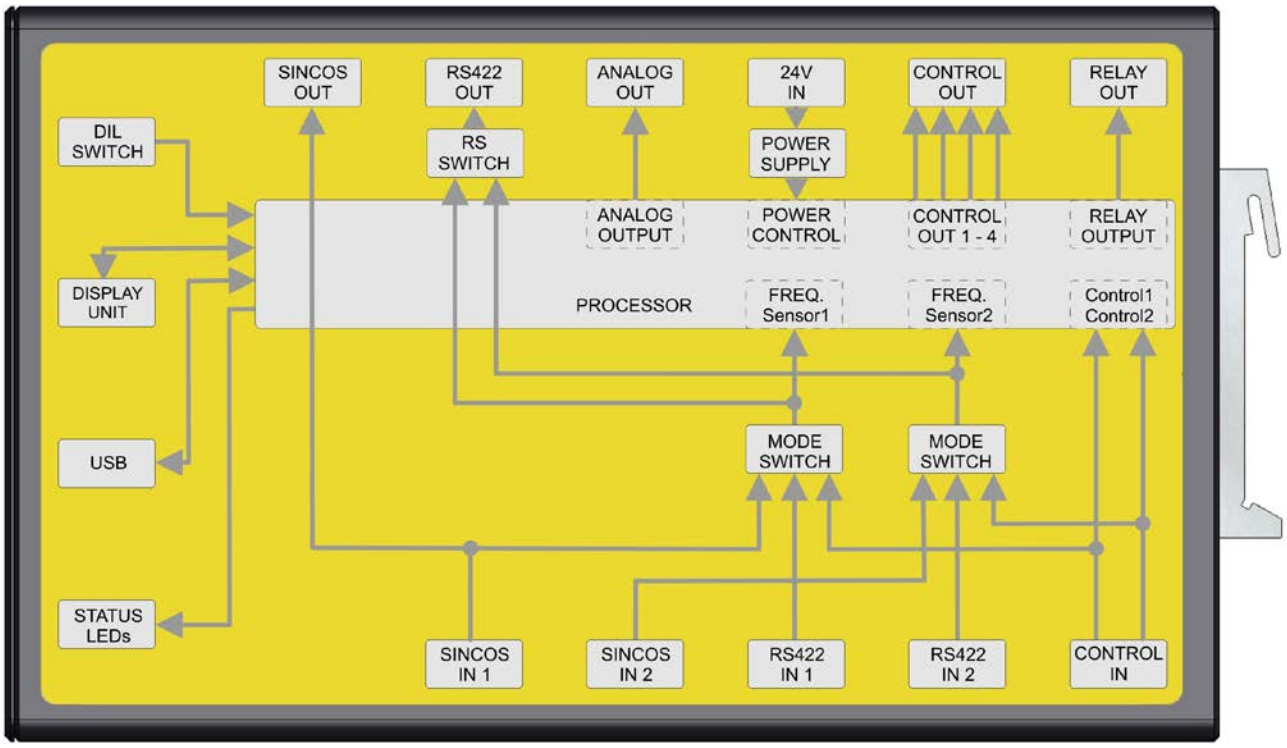
Housing for DIN rail mounting 35 mm into a control cabinet (according to EN 60715)
Inputs: 1x SinCos encoder with SIL3/PLe
2x HTL/PNP control signals
Outputs: 1x relay output (safety related)
1x analog output (safety related)
4x control HTL outputs (safety related)
1x SinCos splitter output (safety related)
1x RS422 splitter output (safety related)

GMM246S

Housing for DIN rail mounting 35 mm into a control cabinet (according to EN 60715)
Inputs: 1x SinCos encoder with SIL3/PLe
2x HTL/PNP control signals
Outputs: 1x relay output (safety related)
1x analog output (safety related)
4x control HTL outputs (safety related)

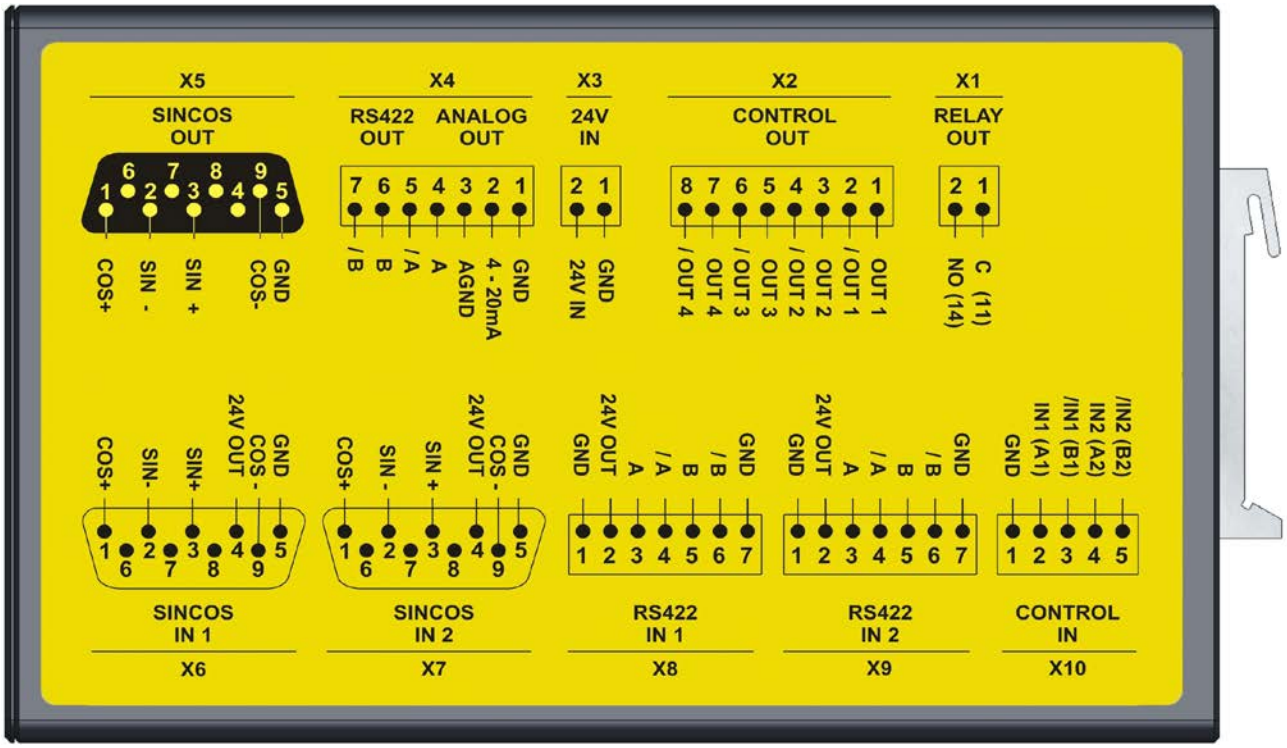
4. Block Diagrams and Connections

4.1. GMM230S Block Diagram

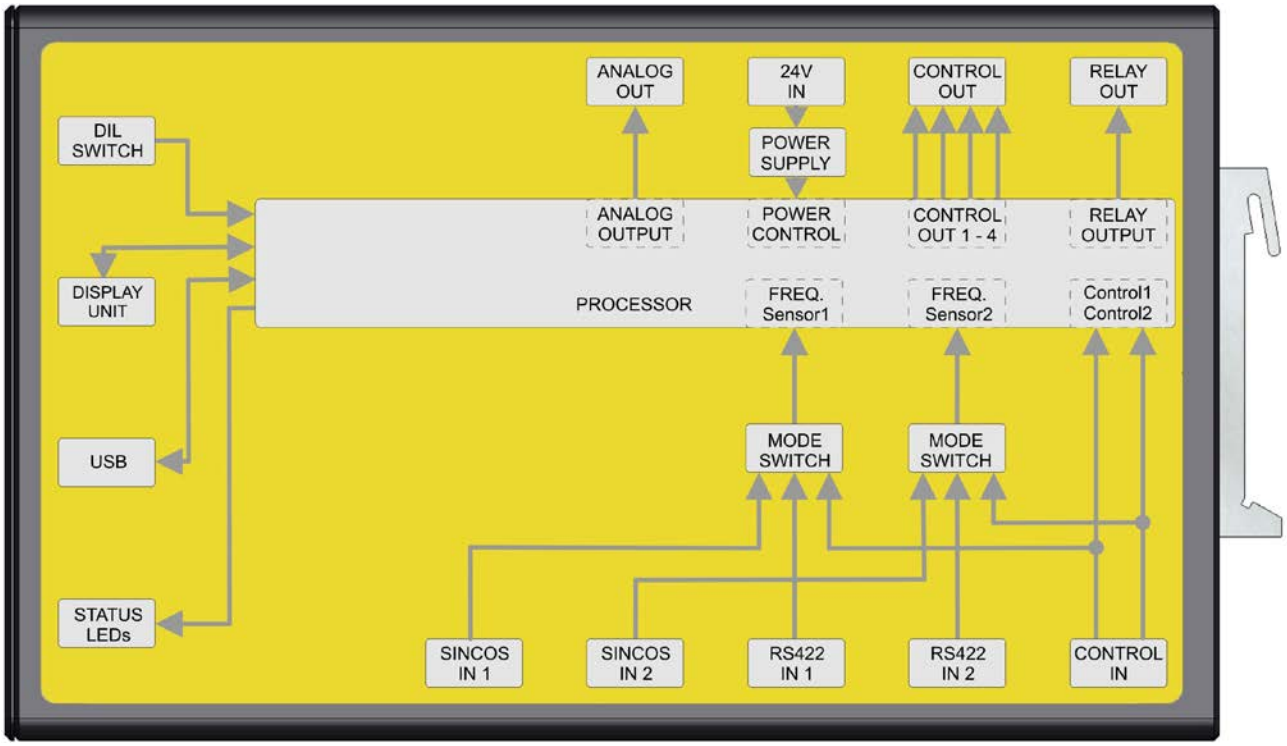


4.2. GMM230S Connections

(The figure shows the available ports)

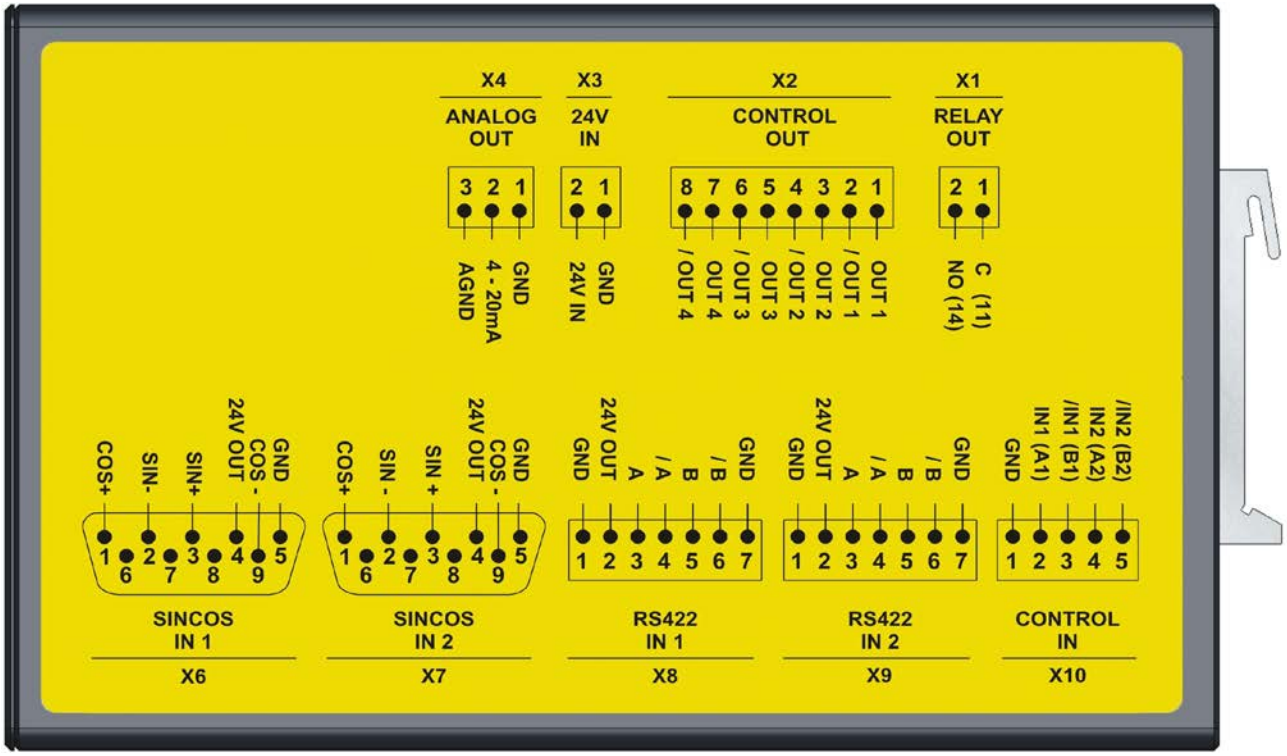


4.3. GMM236S Block Diagram

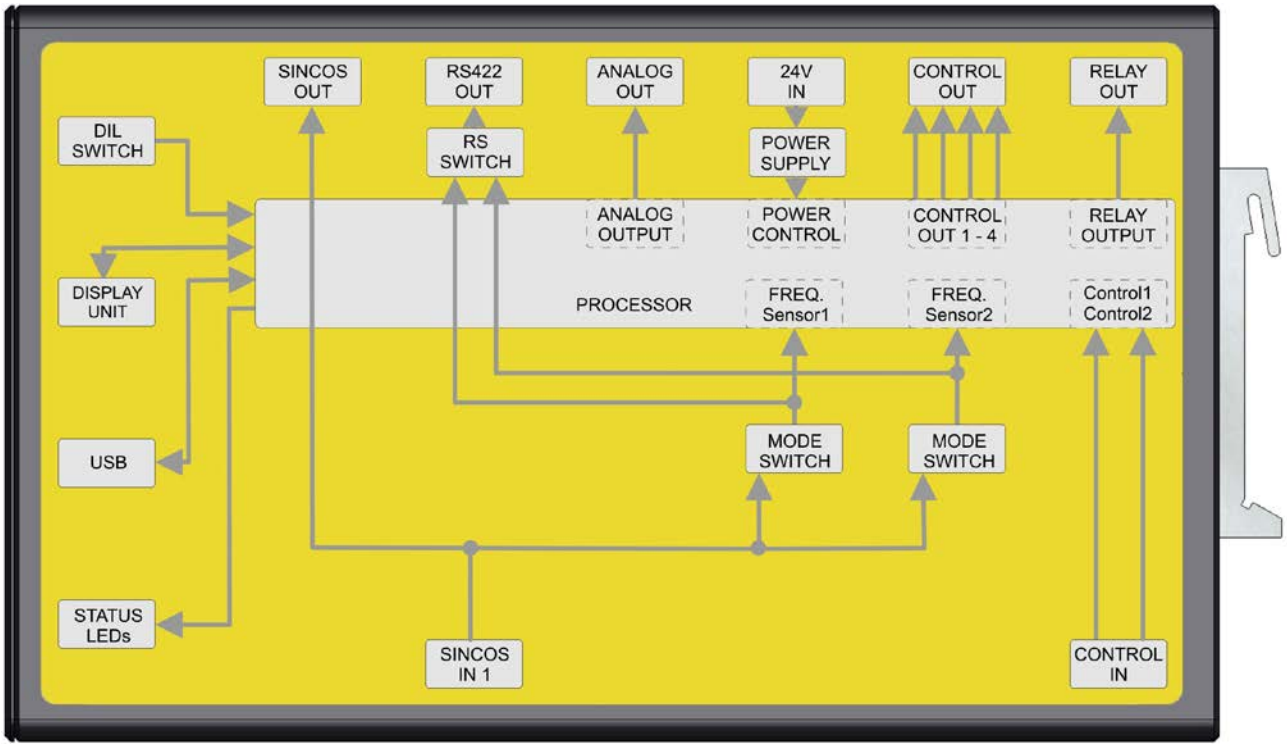


4.4. GMM236S Connections

(The figure shows the available ports)

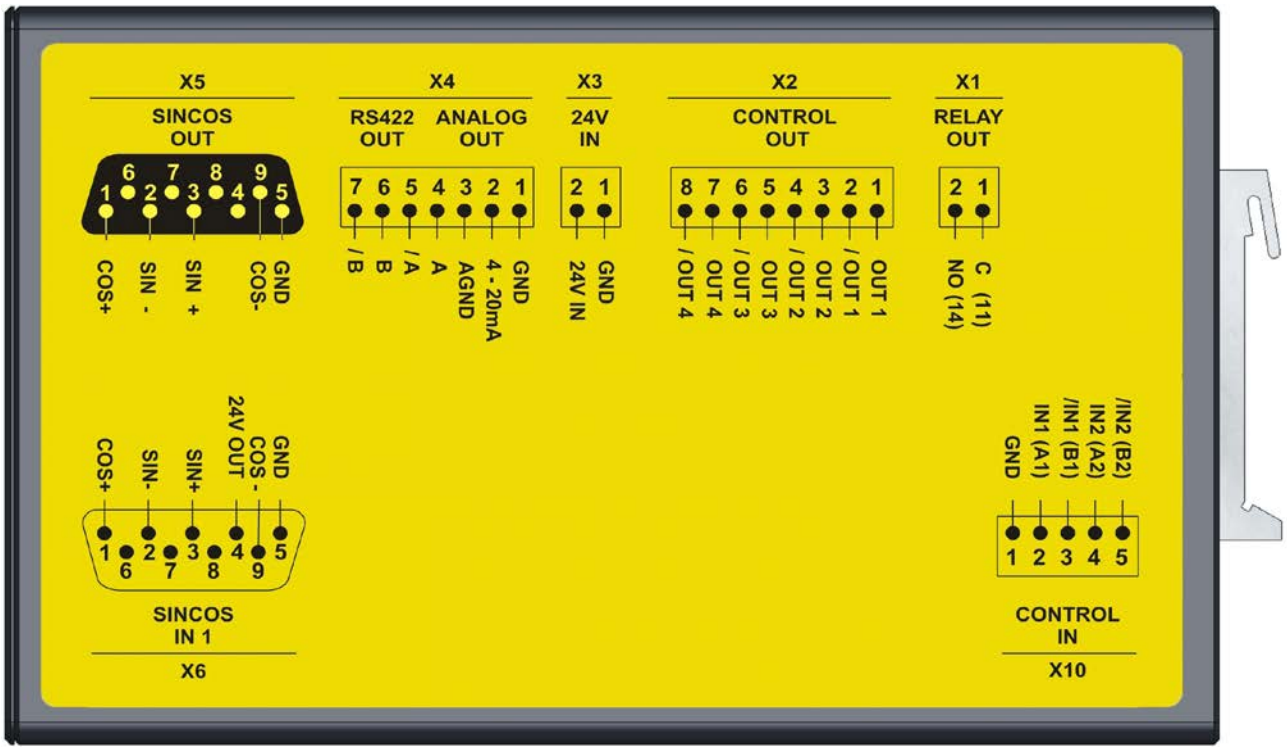


4.5. GMM240S Block Diagram

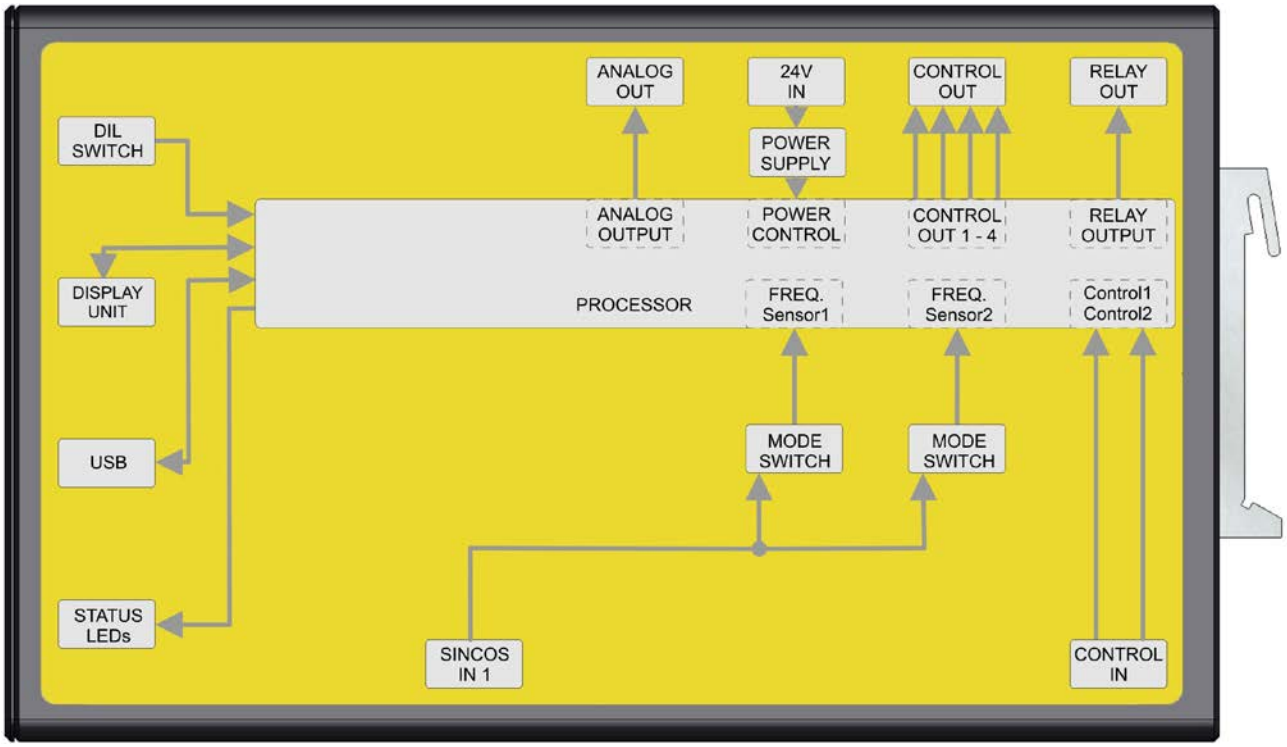


4.6. GMM240S Connections

(The figure shows the available ports)

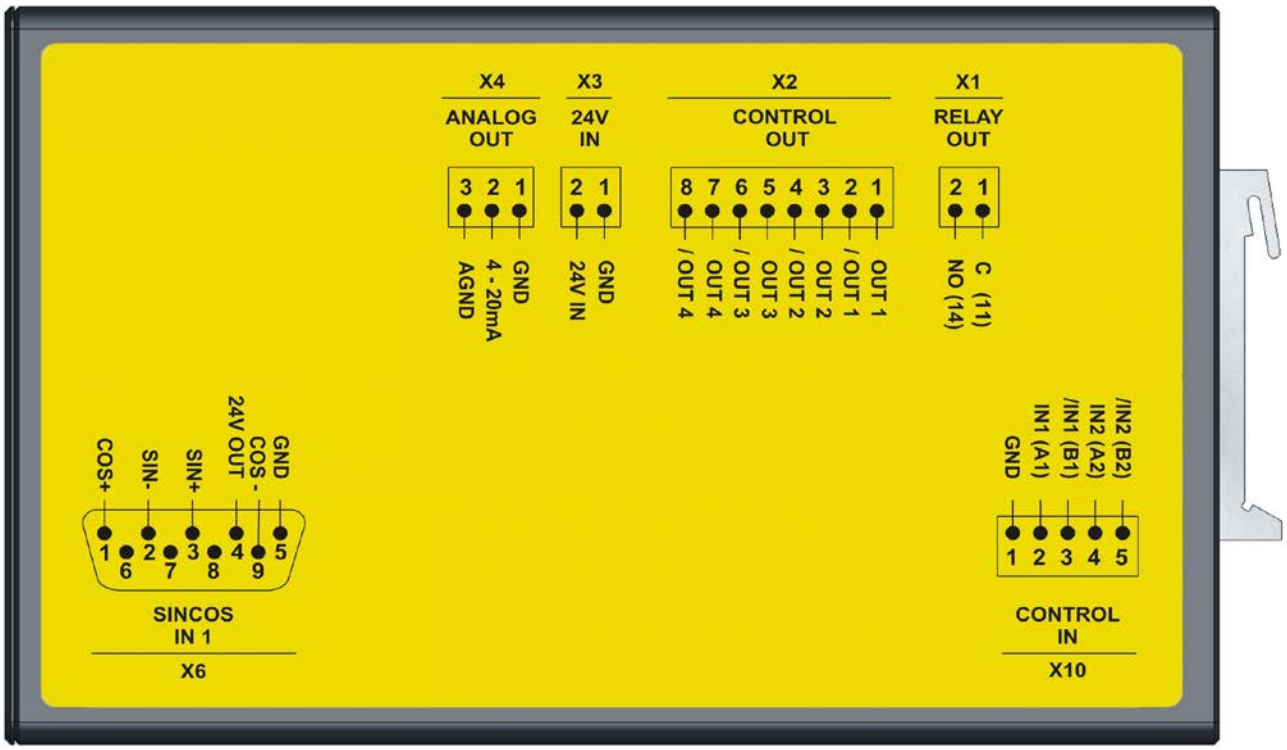


4.7. GMM246S Block Diagram



4.8. GMM246S Connections

(The figure shows the available ports)



5. Description of Connections

This chapter describes only the electrical connections and their general function.

Name	Description see chapter
X1 | RELAY OUT	5.10 Relay Output
X2 | CONTROL OUT	5.9 Control Outputs
X3 | 24V IN	5.1 Power Supply
X4 | ANALOG OUT	5.8 Analog-Output 4 to 20 mA
X4 | RS 422 OUT	5.7 RS422-Splitter-Output
X5 | SINCOS OUT	5.6 SinCos-Splitter-Output
X6 | SINCOS IN 1	5.3 SinCos Encoder Inputs
X7 | SINCOS IN 2	5.3 SinCos Encoder Inputs
X8 | RS422 IN 1	5.4 RS422 Encoder Inputs
X9 | RS422 IN 2	5.4 RS422 Encoder Inputs
X10 | CONTROL IN	5.5 HTL Encoder Inputs / Control Inputs
X11	5.12 GMI230S Operator Interface
X12	5.13 USB Interface for the OS6.0 Operator Surface
S1	5.11 DIL Switch
ERROR - ON	5.14 LEDs / Status Indication



The connection to the outputs is only safe when the follower unit is able to detect the fault status of each output and when the outputs are configured accordingly.



In order to prevent simultaneous damages to the cables by external influences, the encoder resp. sensor lines must be kept physically apart from each other.

5.1. Power Supply

If the unit is connected to a DC power supply network which also supplies further devices or systems, it must be ensured that no voltages ≥ 60 V can occur at the terminals [X3:1] und [X3:2].

If this cannot be ensured, the unit must be supplied by a separate DC power pack, which must not be connected to further devices or systems.

The requirements for both kinds of power supplies are:

- Nominal voltage range from 18 ... 30 VDC
- Ripple < 10% @ 24 V
- External fuse (2.5 A, medium time lag) required

A separate power pack must cover the following requirements:

- The switch-on current of the unit is not higher than 2.5 A
- The consumption of the unit is approx. 23 W (at permissible load and without short-circuit)

The 18 ... 30 VDC power supply must be connected via the pluggable 2-position screw terminal strip [X3]. The power supply input is protected by an internal reverse polarity protection.

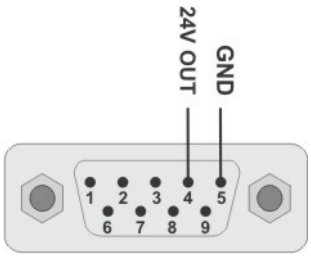


pluggable 2-position screw terminal [X3]

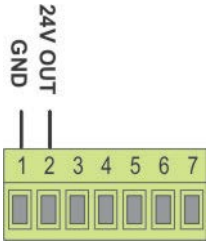
- **The DC input must be protected by an external fuse (type and value see technical specifications).**
- **The GMM2xxS unit has no internal galvanic isolation, thus all GNDs are interconnected. Please avoid any GND loops to the power supply input [X3].**
- **Even with use of a SIL3 certified power supply (U_{FAIL} < 60 V), an external fuse must be installed.**

5.2. Encoder Supply

The unit offers an auxiliary voltage output for separate supply of the encoders or sensors in use. The encoder supply must be taken directly from the safety monitor, or via relay contact when using an indirect power supply.



Encoder supply: SinCos inputs [X6] [X7]



Encoder supply: RS422 inputs [X8] [X9]
HTL encoders or sensors must also be connected to the encoder supply terminals of the RS422 inputs

The maximum load of the encoder supply is 200 mA per channel (Sensor 1 and Sensor 2). The unit provides an auxiliary encoder supply for each sensor channel (HTL encoders will be supplied by the encoder supply of the RS422 inputs). The level of the supply voltage is approximately by 2 V lower than the 18 ... 30 VDC power supply at terminal [X3].

Supply	SinCos inputs	RS422 inputs	HTL inputs
Sensor 1	[X6:4] [X6:5]	[X8:1] [X8:2]	[X8:1] [X8:2]
Sensor 2	[X7:4] [X7:5]	[X9:1] [X9:2]	[X9:1] [X9:2]

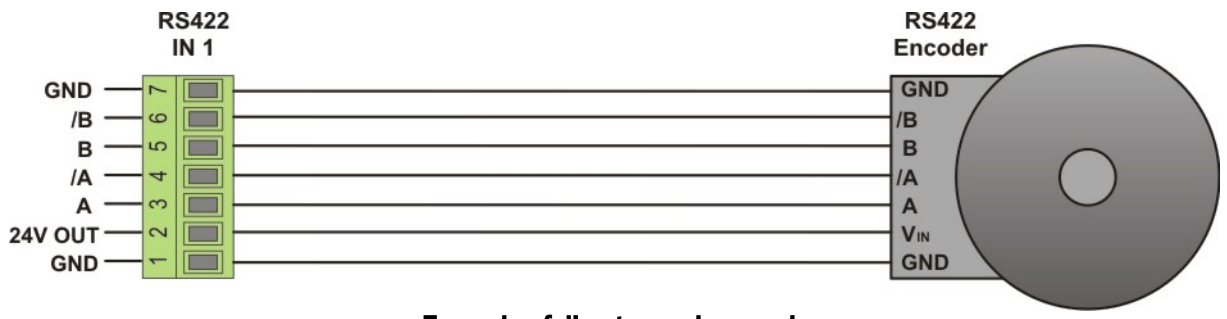
When powering up the encoder supply, the maximum input current of the safety unit could be exceeded, depending on the encoders in use. In this case, the encoder supply would not be enabled and an error appears.

In case of such problems, or if another voltage level is required, the encoder supply can be switched on from an external voltage source via remote relay. In this case, it is mandatory to energize the relay from the internal encoder supply of the GMM2xxS unit.

- **In case of a direct encoder supply it is mandatory to operate the encoders with the auxiliary voltage from the unit.**
- **Indirect encoder supply must in any case be carried out via relay, energized by the auxiliary voltage of the GMM2xxS unit.**

5.2.1. Direct Encoder Supply

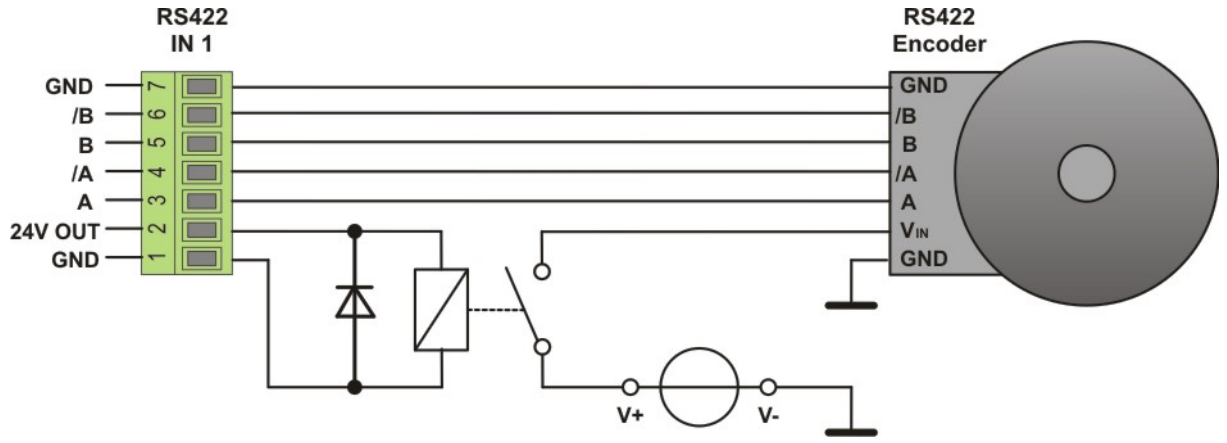
With direct encoder supply, the encoder must be connected as shown in the figure below:



Example of direct encoder supply

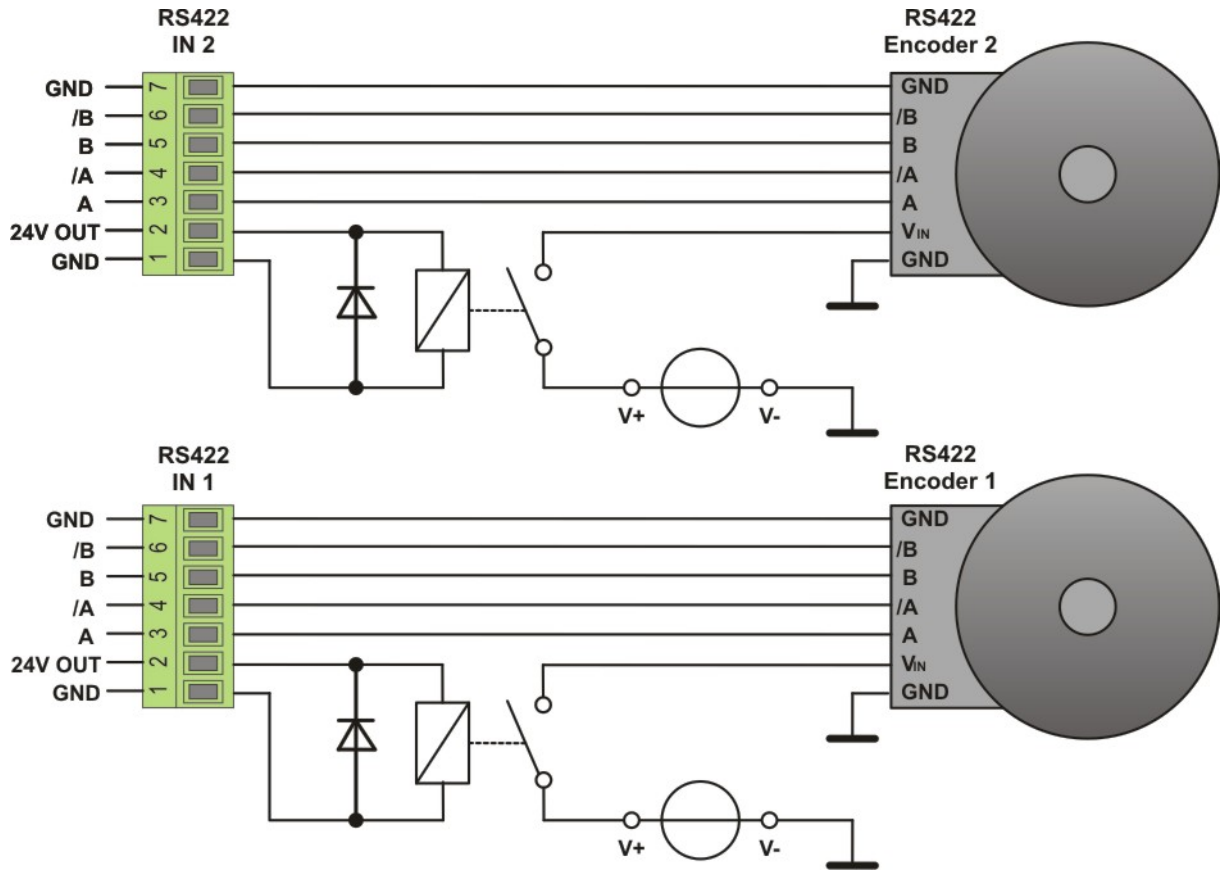
5.2.2. Indirect Encoder Supply

Indirect encoder supply must necessarily, and each separately, be switched on by use of a relay, energized with the auxiliary voltage of the unit. This is necessary, because no encoder signals must be applied to the safety monitor before the unit has successfully completed its initialization and self-test.



Example of indirect encoder supply (1 encoder is switched via 1 relay)

Continuation “External Encoder Supply”



Example of indirect encoder supply (2 encoders are switched via 2 relays)

- Indirect encoder supply must necessarily and each separately be switched on via relay, energized by the auxiliary voltage of the unit.
- In case of indirect supply of both encoders, two independent supply sources and two separate relays must be used.

5.3. SinCos Encoder Inputs

The unit is suitable for operation with SinCos sensors or encoders using differential sine-cosine signal outputs of 1 Vpp and 2.5 V DC offset.

- **GMM23xS:** Parameter "Operational Mode" must be set to 0, 1, 2 or 6. The SinCos encoder can be connected by one of the two or by both 9-pin SUB-D connectors [X6] and [X7].
- **GMM24xS:** Parameter "Operational Mode" must be set to 0.
  Connections use connector [X6] only.

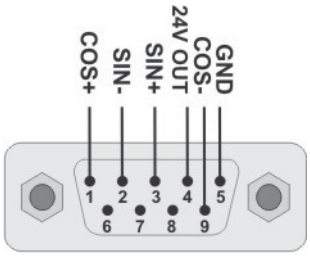
It is mandatory to wire all available signal lines (SIN+, SIN-, COS+ and COS-).

The internal SinCos signal monitor checks the offset range of the signals as well as the Lissajous figure resulting from the signals.

There is no option for evaluating any zero or index pulses.

All input lines are already terminated by internal 120 Ohm load resistors.

The SinCos encoder must use the corresponding encoder supply at pins 4 and 5 of the connector.



Male SUB-D connectors [X6], [X7]



Activating SIN/COS error is preferable to de-activating SIN/COS Error to avoid any subsequent errors. The parameter SIN Err TimeX can suppress SIN/COS error in 20 ms intervals. Disturbed SinCos signals can produce SIN/COS errors and frequency errors.

<u>With models GMM23xS only:</u>

In following cases you must switch off the SIN/COS error detection in order to avoid continuous SIN/COS error indications:

- **with use of SinCos encoders providing a different DC offset than specified**
- **with use of encoders providing a sine output and a sine-reference-output instead of two sine and two cosine signals**

In these cases the encoders are suitable for frequency evaluation only, but not for signal forwarding, i.e. the SinCos output cannot be used.

5.4. RS422 Encoder Inputs

(GMM230S and GMM236S only)

If parameter “Operational Mode” is set to 7, 8 or 9, the unit will accept signals from incremental encoders with complementary TTL or differential RS422 levels.

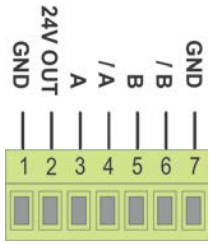
Incremental encoders must be connected by one or both of the pluggable 7-pin screw terminals [X8] and [X9].

The RS422 input channels (A and /A resp. B and /B) are internally terminated by a dynamic terminating circuit (220 pF / 120 Ohm).

It is mandatory to connect up all signal lines (A, /A, B and /B).

There is no option for evaluation of any existing zero pulses (Z / Z).

It is mandatory to supply the RS422 encoder from terminals 1 and 2 of the respective terminal strip.



Pluggable 7-position screw terminal [X8], [X9]

5.5. HTL Encoder Inputs / Control Inputs

Screw terminal strip [X10 | CONTROL IN] provides 2 - 4 inputs for signals with HTL level and PNP switching characteristics.

Depending on the setting of parameter "Operational Mode" the control inputs [X10 | CONTROL IN] can be configured as frequency inputs or as control inputs:

Frequency input for HTL encoders (A / B / 90°):

Sensor 1	[X10 | CONTROL IN]	incremental HTL encoder	[X10:2] [X10:3]	channel A channel B
Sensor 2	[X10 | CONTROL IN]	incremental HTL encoder	[X10:4] [X10:5]	channel A channel B

HTL encoders must be supplied by the encoder supply of the RS422 inputs.
Please observe the permissible frequency ranges (see Technical Specifications).

Frequency input for HTL encoders (A) or a proximity switch:

Sensor 1	[X10 | CONTROL IN]	incremental HTL encoder	[X10:2] [X10:3]	channel A unconnected / direction signal
Sensor 2	[X10 | CONTROL IN]	incremental HTL encoder	[X10:4] [X10:5]	channel A unconnected / direction signal

The inputs [X10:3] resp. [X10:5] may remain unconnected (internal pull-down) or can be used for a static direction signal. HTL encoders must be supplied by the encoder supply of the RS422 inputs. Please observe the permissible frequency ranges (see Technical Specifications).

Two inverse control inputs for HTL commands:

Signal pair 1	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:2] [X10:3]	control signal 1 inverse control signal 1
Signal pair 2	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:4] [X10:5]	control signal 2 inverse control signal 2

Strictly always the inverse signals must be applied to the inverted inputs. Any other signal conditions are illegal and will be detected as an error. Please use the separate parameter description to find more information about the control inputs. The configuration of the inputs will affect the Safety Integration Level (SIL).

Two homogenous control inputs for HTL commands:

Signal pair 1	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:2] [X10:3]	control signal 1 homogenous control signal 1
Signal pair 2	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:4] [X10:5]	control signal 2 homogenous control signal 2

Strictly the inverted input must always receive the same signal as the non-inverted input. Any other signal conditions are illegal and will be detected as an error. Please use the separate parameter description to find more information about the control inputs. The configuration of the inputs will affect the Safety Integration Level (SIL).

Four single control inputs HTL commands:

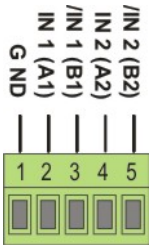
Signal 1	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:2]	control signal 1
Signal 2	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:3]	control signal 2
Signal 3	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:4]	control signal 3
Signal 4	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:5]	control signal 4

Please use the separate parameter description to find more information about the control inputs. The configuration of the inputs will affect the Safety Integration Level (SIL).

One homogenous/inverse control input and two single control inputs for HTL commands:

Signal pair 1	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:2] [X10:3]	control signal 1 homogenous/inverse signal 1
Signal 2	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:4]	control signal 2
Signal 3	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:5]	control signal 3

Strictly always the homogenous or inverse signal must be applied to the inverted input. Any other signal conditions are illegal and will be detected as an error. Please use the separate parameter description to find more information about the control inputs. The configuration of the inputs will affect the Safety Integration Level (SIL).



Pluggable 5-pin screw terminal [X10]

- **It does not make sense to configure the unit for connection of 2 HTL encoders simultaneously, since then no more inputs for external commands would be available.**
- **With GMM24xS units, all 4 channels can be used as control-inputs for external commands.**
- **When using a single-channel encoder, the associated second input is <u>not</u> suitable**
- **Transitionally, on some housing prints IN1... IN4 can be found as designation for the CONTROL IN signals of terminal X10.**
  The correspondences of these terms are:
  IN1 = IN1, / IN1 = IN2, IN2 = IN3 and / IN2 = IN4.

5.6. SinCos-Splitter-Output

(GMM230S and GMM240S only)

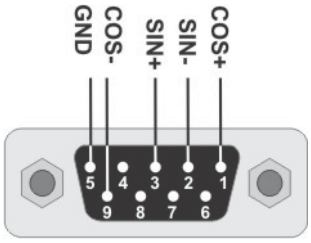
GMM230S and GMM240S units provide a safety-related SinCos-Splitter-Output. Depending on the setting of parameter “Operational Mode” (0, 1, 2 or 6), the integrated splitter function allows to reproduce the signal of input terminal [X6 | SINCOS IN1] to the female 9-pin SUB-D connector [X5 | SINCOS OUT]. Thus the encoder signal connected to [X6 | SINCOS IN1] can be processed by a further target device.

The signal delay time between SinCos input and SinCos output is approx. 200 ns.

The channels SIN+ and SIN- resp. COS+ and COS- must be terminated by 120 Ohm load resistors on site of the target device.

In case of errors, the DC-offset of the SinCos output will be shifted in order to signalize the error condition to the target device.

The connection to the SinCos splitter output is only safe, when the follower unit includes a SinCos monitoring system which can detect offset errors.



Female SUB-D Connector [X5]

- **It is mandatory to terminate the SIN+ and SIN- resp. COS+ and COS- channels by a 120 Ohm resistor on the target device.**
- **SinCos input signals must consist of two sine-shaped and two cosine-shaped signal pairs.**
- **On the output site the DC offset value is typically 2.5 V, fully independent of the input offset.**
- **A SIN/COS error at the input can also produce an error at the SinCos output.**

5.7. RS422-Splitter-Output

(GMM230S and GMM240S only)

GMM230S and GMM240S units provide a safety-related RS422-Splitter-Output.

The monitor evaluates two frequency channels (Sensor 1 and Sensor 2), which are determined by "Operational Mode".

The splitter-output allows reproducing the input frequency of Sensor 1 or Sensor 2.

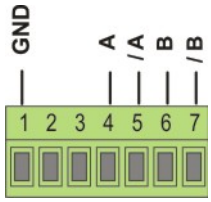
Regardless of the input signal (SinCos or HTL), the output [X4 | RS422 OUT] always delivers incremental RS422 square-wave signals.

The signal delay between the RS422 input and the RS422 output is approx. 600 ns.

In case of an error, no more incremental signals will be available at the RS422 output (Tri-State, internally with 1 kOhm pull-down resistors).

Connections to the RS422 Splitter output are only safe if the following device is capable to detect the error state of the monitor.

SinCos input signals are reproduced as 1:1 square wave output.



Pluggable 7-pin screw terminal [X4]

Screw terminal [X4] provides 7 connections:

[X4 | ANALOG OUT]	analog output	[X4:1-3]
[X4 | RS422 OUT]	RS422 output	[X4:4-7]

- **When using the converted SinCos input as a RS422 output, a SIN/COS error at the input can also produce an error at the RS422 output.**

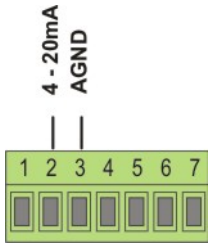
5.8. Analog-Output 4 to 20 mA

A safety-related analog output is available at terminal strip [X4]. The current output is freely scalable by setting parameters “Analog Start” and “Analog End”. It delivers an output signal, which is proportional to one of the two input frequencies. Where the analog output is not used, terminals [X4:2] and [X4:3] must be bridged. An open analog output (e.g. wire fracture) will produce an error status.

During normal operation, the output moves in a proportional range between 4 and 20 mA.
In case of errors, the analog output delivers 0 mA.

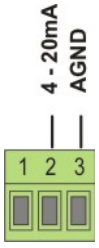
The connection to the analog output is only safe if the follower unit is capable to detect the error state of the safety monitor.

With versions GMM230S / GMM240S, screw terminal [X4] provides 7 connections:
[X4 | ANALOG OUT] analog output [X4:2-3]
[X4 | RS422 OUT] RS422 output [X4:4-7]



Pluggable 7-position screw terminal [X4] at GMM230S/GMM240S

With unit versions GMM236S / GMM246S, screw terminal [X4] provides only 3 connections:
[X4 | ANALOG OUT] analog output [X4:2-3]
[X4 | RS422 OUT] not available!



Pluggable 3-position screw terminal [X4] at GMM236S/GMM246S

- **In case of an unused analog output [X4:2] and [X4:3] must be bridged.**
- **An open analog output (e.g. wire fracture) will produce an error status.**

5.9. Control Outputs

Four inverse/homogeneous HTL control outputs are available at the screw terminal [X2 | CONTROL OUT].

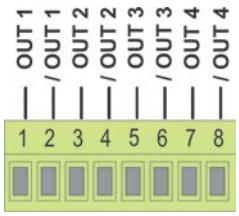
The switching points and switching conditions can be programmed by parameters.

In HIGH state, the output level is approximately 2 V lower than the supply voltage at terminal [X3 | 24V IN]. The outputs are short-circuit proof push-pull outputs. When switching inductive loads, additional external suppression measures are recommended.

In case of errors all outputs go to LOW state (no more inversion).

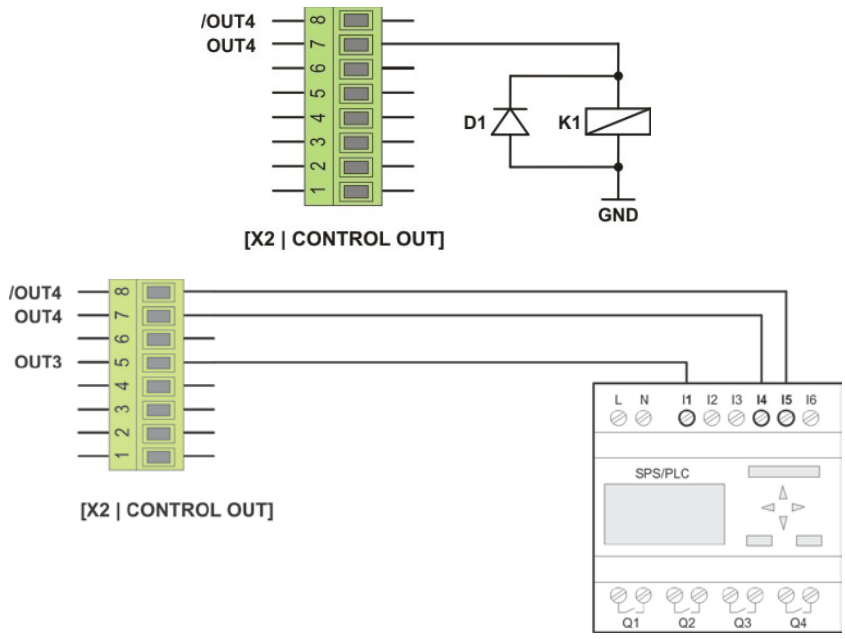
Connections to the analog output are only safe if the target device is able to detect the error state of the safety monitor.

The output configuration will affect the Safety Integrity Level (SIL).



Pluggable 8-position screw terminal [X2]

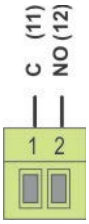
Wiring example:



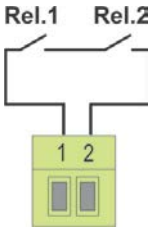
5.10. Relay Output

The safety-related relay output consists of two independent relays with forcibly guided contacts. The normally open contacts of the two relays (NO) are internally connected in series. This series-relay-contact is accessible by the 2-pin screw terminal [X1 | RELAY OUT], for integration into a Safety Circuit.

- The contacts are only closed during normal and disturbance-free operation. They will open to a safety state in case of errors or when the programmed switching condition occurs.
- In the de-energized state of the unit the contacts are also open.
- Switching points and switching conditions can be set by the corresponding parameters.
- An internal, forcibly guided opener of the relay is used to monitor the relay status by the unit itself.
- In case of an error the contact will change to the open and safe switching state.



Pluggable 2-position screw terminal [X1]

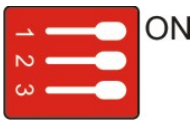


Internal connection [X1]

- **The operator is responsible to ensure a safe state of all relevant parts and components of the equipment, whenever the relay contact is open.**
- **The target unit must be able to evaluate edges, in order to determine dynamical conditions of the relay output, too.**
- **With frequencies close to the switching point, relay bouncing may occur in consequence of variation of the frequency measurement. To prevent this, a hysteresis should be set.**
- **If also short overshoots of the switching point should be detected, a lock function should be set to the output.**

5.11. DIL Switch

A 3-position DIL switch [S1] is located at the front of the unit
(only accessible when no display and programming unit GMI230S is connected).



3-pos DIL switch [S1]

The DIL switch is used to set the operation state of the monitor:

DIL1	DIL3	Status	LED
ON	**ON**	Normal Operation	Off (lights up permanently at error state)
ON	**OFF**	Programming / Test - Mode	Flashes slowly (lights up permanently at error state)
OFF	**ON**	Factory Settings	Flashes slowly (lights up permanently at error state)
OFF	**OFF**	Factory Settings	Flashes slowly (lights up permanently at error state)

DIL2	Status	Operational readiness
ON	Normal Operation	Ready for operation approx. 2 s after power up
OFF	Self-Test Message	Ready for operation approx. 8 s after power up



- **The Programming Mode (DIL switch) is used for Start-up and testing**
- **All DIL switch sliders must be set to „ON“ after Start-up and testing**
- **After Start-up the DIL switch sliders should be protected against manipulation (e. g. by covering with an adhesive tape)**
- **Normal operation is only permitted when the yellow LED is permanently off**
- **The safety function of the unit cannot be guaranteed before the commissioning has been completed.**

5.12. GMI230S Operator Interface

On the front site the unit provides a serial interface for communication with GMI230S operator units (optional accessory), allowing display and parameter setting.



8-pin female connector [X11]

The GMI230S unit and the safety monitor are connected by plugging the GMI230S directly onto the female 8-pin connector [X11] at the front.

This operator unit is intended for display of the encoder signals (in user units) and for visual monitoring of the GMM2xxS unit. Although parameters can be set or changed by using the GMI230S, it is recommended to use the OS6.0 PC software for Start-up and commissioning purpose.

The female connector [X11] is reserved for exclusive use with a GMI230S unit.

5.13. USB Interface for the OS6.0 Operator Surface

For communication between the unit and a PC or a superordinate controller, a virtual COM port is accessible at the USB connector. A standard USB-cable with a Type B connector is used for connection. This USB cable is available as an option. The USB port serves for PC setup of the GMM2xxS monitors.



USB type B

A separate manual is available describing the installation procedure of the USB driver
(see page 2).

5.14. LEDs / Status Indication

Two status LEDs are located on the front of the unit.
The green one is marked as [ON] and the yellow one as [ERROR].



Status LEDs

The green status LED uses the following conditions:

Green LED	Status
OFF	Power off (no power supply voltage)
ON	Power on (power supply voltage ok)

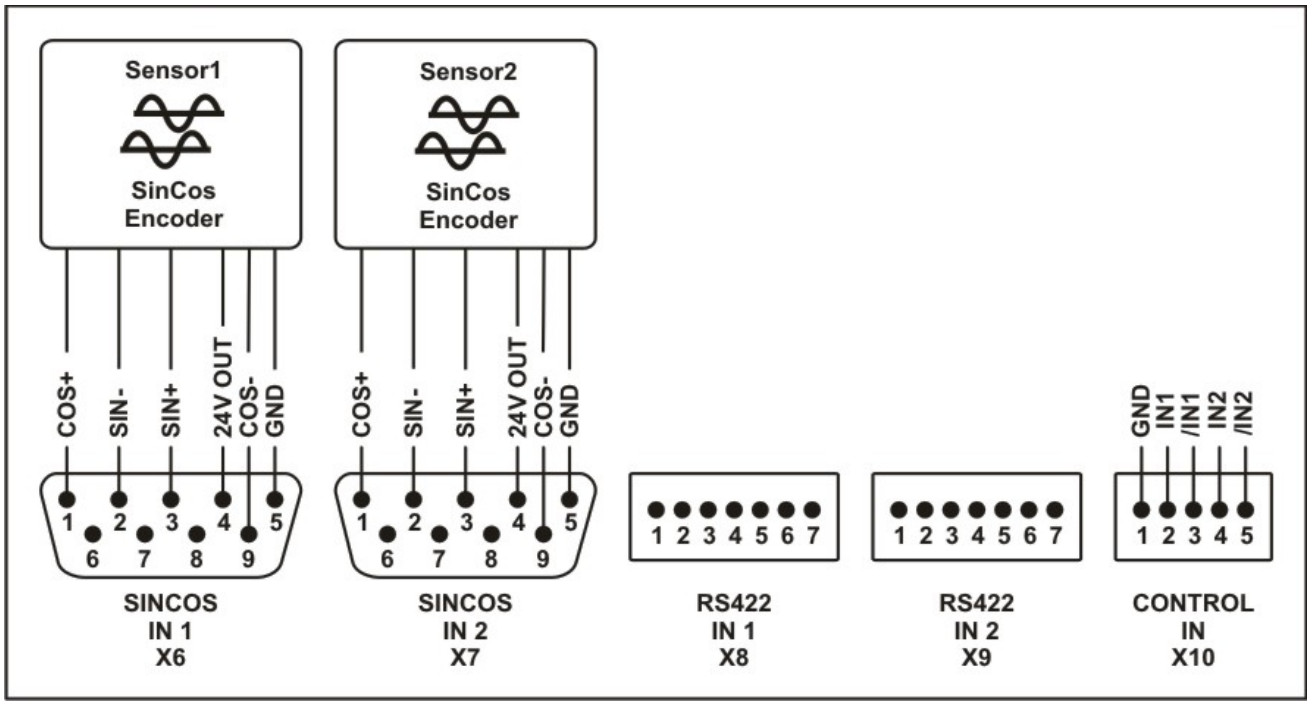
The yellow status LED uses the following conditions:

Yellow LED	Status
OFF	Normal operation, self-test successfully completed, no error messages
ON	During the self-test or with error state
Flashes slowly	Factory Settings or Programming / Test - Mode

6. Operational Modes

6.1. Application: 2 SinCos Encoders

Device	GMM23xS		
Operational Mode	0		
Sensor 1	[X6 | SINCOS IN 1]	SinCos encoder	SIN+, SIN-, COS+, COS-
Sensor 2	[X7 | SINCOS IN 2]	SinCos encoder	SIN+, SIN-, COS+, COS-
Control Inputs	[X10 | CONTROL IN]	HTL/PNP control signal	2 - 4 available
Safety Level	Speed → SIL3 / PLe achievable (see below) Direction → SIL3 / PLe achievable (see below) Standstill → SIL3 / PLe achievable (see below)		

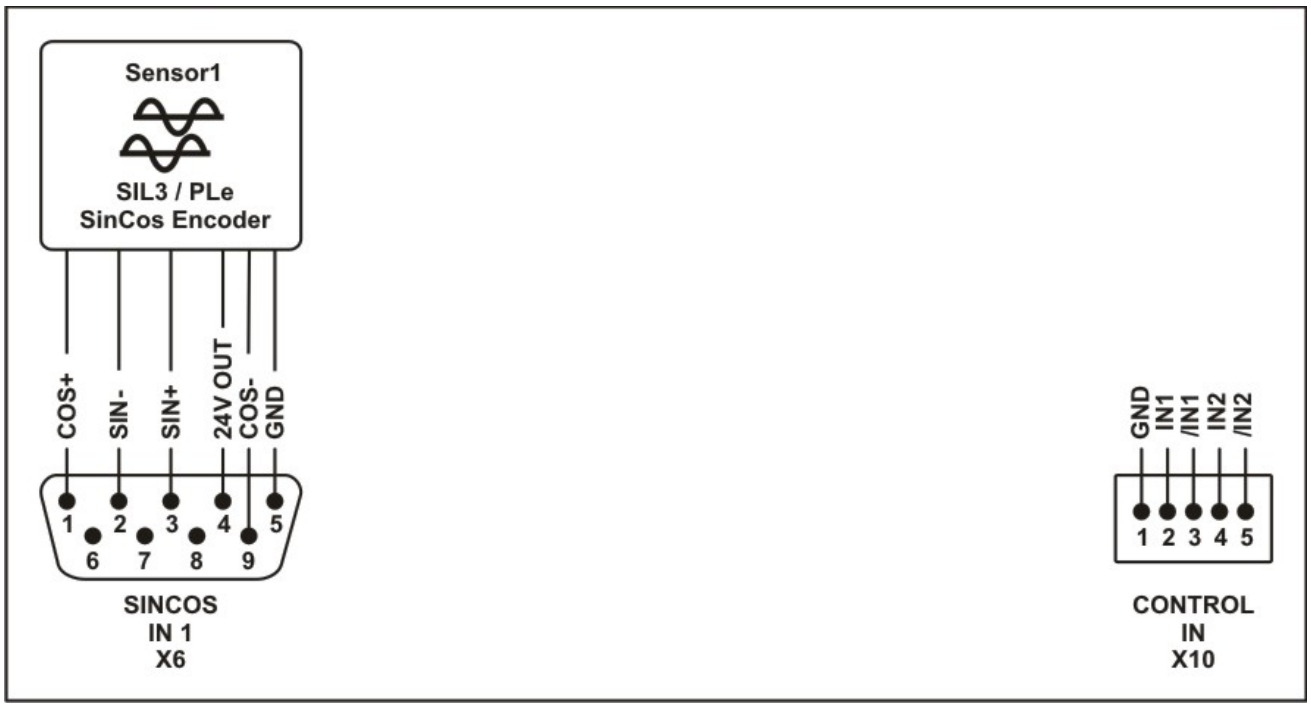


This mode is used to evaluate a dual channel system equipped with two SinCos sensors /encoders.

- **With GMM23OS models this mode can be used to reproduce the input frequency of [X6 | SINCOS IN1] to the splitter output [X5 | SINCOS OUT].**
- **2 - 4 inputs for control signals are available at terminal [X10 | CONTROL IN].**
- **The final Safety Integrity Level (SIL) depends on the selected configuration and on external components connected to the unit.**

6.2. Application: 1 SIL3 SinCos Encoder only

Device	GMM24xS		
Operational Mode	0		
Sensor 1	[X6 | SINCOS IN 1]	SIL3 SinCos encoder	SIN+, SIN-, COS+, COS-
Sensor 2	Sensor 1 and Sensor 2 are bridged internally		
Control Inputs	[X10 | CONTROL IN]	HTL/PNP control signal	2 - 4 available
Safety Level	Speed → SIL3 / PLe achievable (see below) Direction → SIL3 / PLe achievable (see below) Standstill → SIL3 / PLe achievable (see below)		

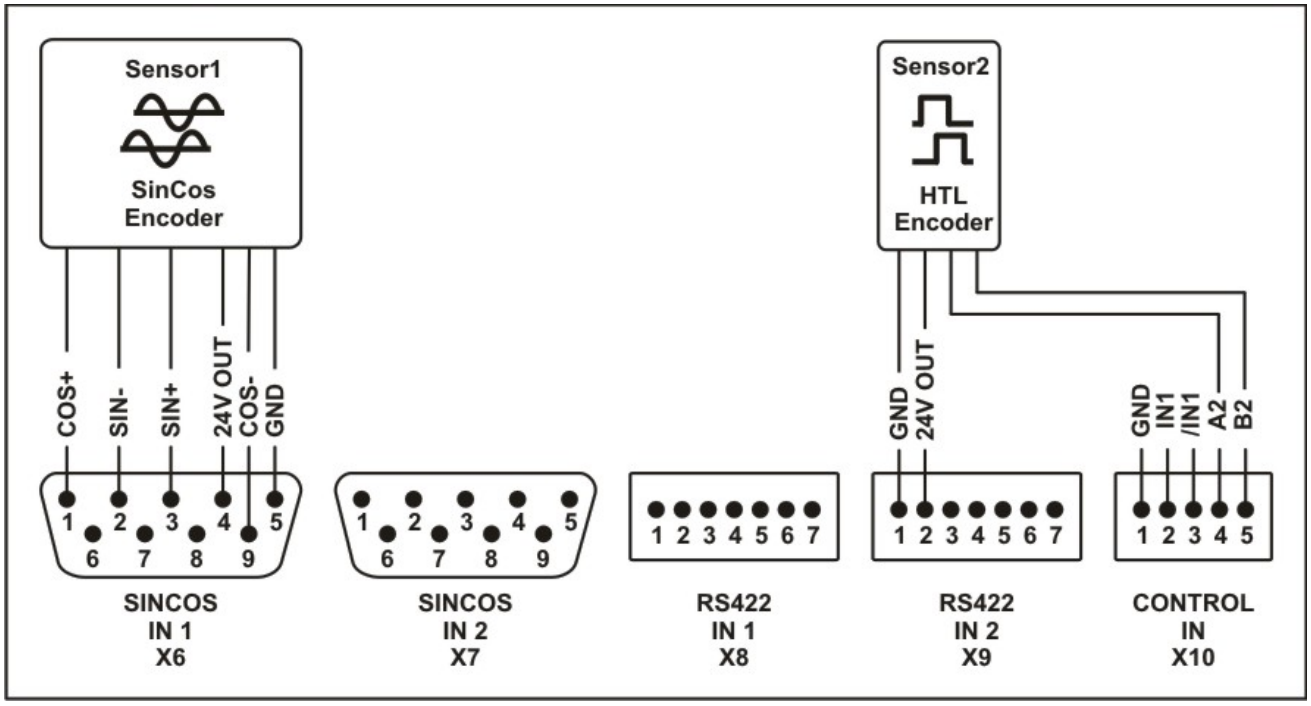


This mode is exclusively used for connection of a SIL3-certified or a PLe-certified SinCos sensor / encoder.

- **With GMM23OS models, this mode can be used to reproduce the input frequency of [X6 | SINCOS IN1] to the splitter output [X5 | SINCOS OUT].**
- **2 - 4 inputs for control signals are available at terminal [X10 | CONTROL IN].**
- **The final Safety Integrity Level (SIL) depends on the selected configuration and on external components connected to the unit.**

6.3. Application: 1 SinCos Encoder and 1 HTL Encoder (quadrature)

Device	GMM23xS		
Operational Mode	1		
Sensor 1	[X6 | SINCOS IN 1]	SinCos encoder	SIN+, SIN-, COS+, COS-
Sensor 2	[X10 | CONTROL IN]	Incremental HTL encoder	A, B, 90°
Control Inputs	[X10 | CONTROL IN]	HTL/PNP control signal	1 - 2 available
Safety Level	Speed → SIL3 / PLe achievable (see below) Direction → SIL3 / PLe achievable (see below) Standstill → SIL3 / PLe achievable (see below)		

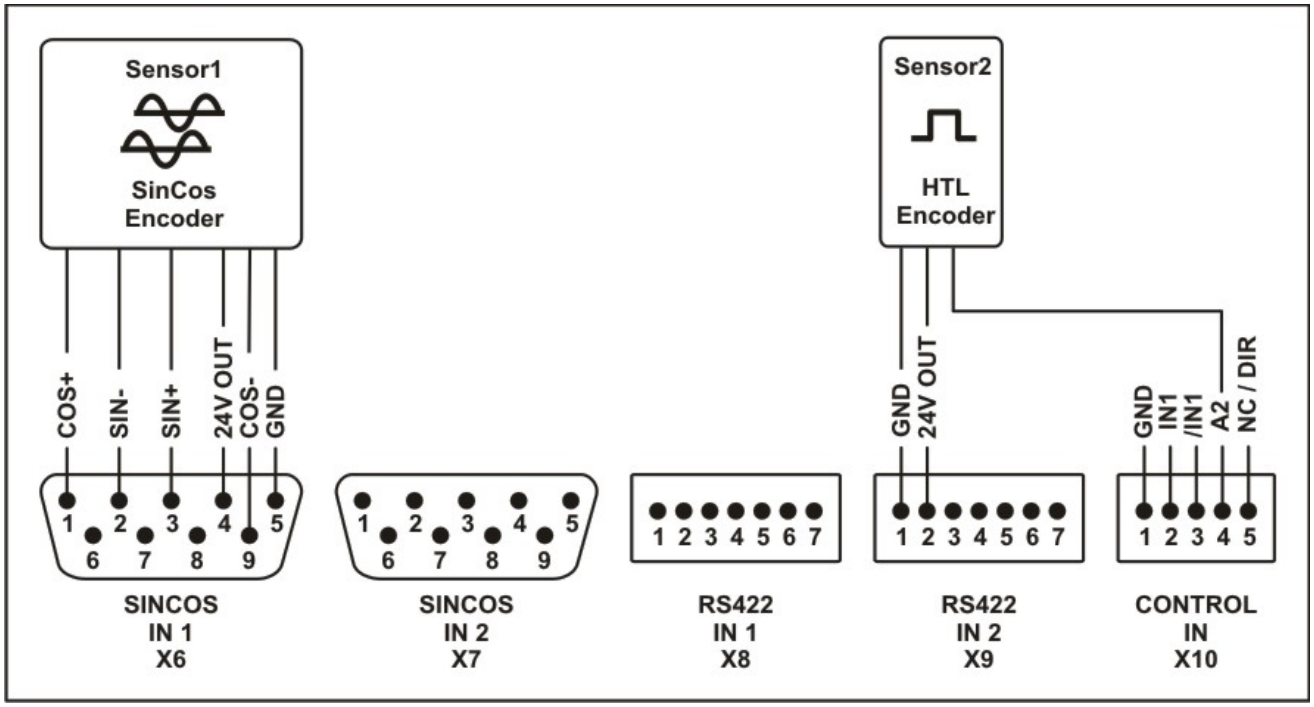


This mode allows evaluation of a dual channel system, equipped with a combination of one SinCos encoder and one incremental quadrature HTL encoder.

- **With GMM230S models this mode can be used to reproduce the input frequency of [X6 | SINCOS IN1] to the splitter output [X5 | SINCOS OUT].**
- **1 - 2 inputs for control signals are available at terminal [X10 | CONTROL IN].**
- **The final Safety Integrity Level (SIL) depends on the selected configuration and on external components connected to the unit.**

6.4. Application: 1 SinCos Encoder and 1 HTL Encoder (single channel)

Device	GMM23xS		
Operational Mode	2		
Sensor 1	[X6 | SINCOS IN 1]	SinCos encoder	SIN+, SIN-, COS+, COS-
Sensor 2	[X10 | CONTROL IN]	Incremental HTL encoder	A, single channel
Control Inputs	[X10 | CONTROL IN]	HTL/PNP control signal	1 - 2 available
Safety Level	Speed → SIL3 / PLe achievable (see below) Direction → SIL3 / PLe* achievable (see below) Standstill → SIL3 / PLe* achievable (see below). With single channel encoders, jitter around an edge can be misinterpreted as a frequency.		



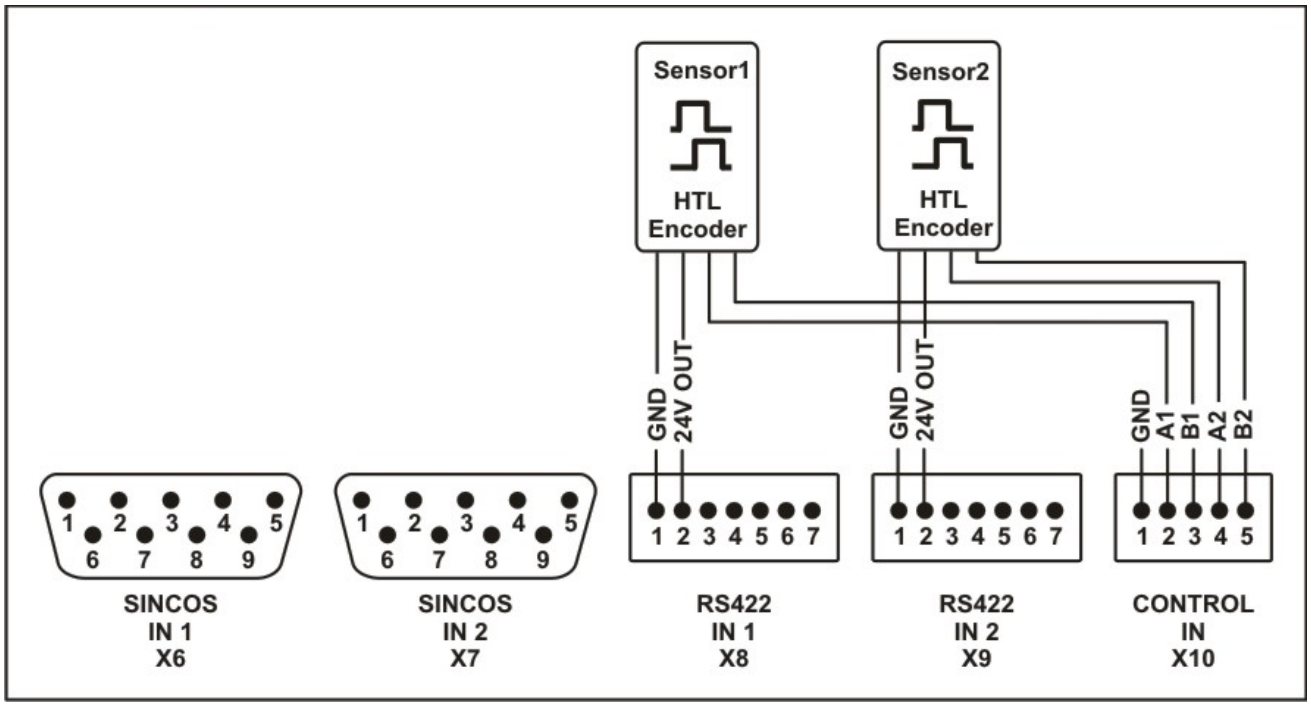
This mode allows evaluation of a dual channel system, equipped with a combination of one SinCos encoder and one incremental single channel HTL encoder.

- **With GMM230S models this mode can be used to reproduce the input frequency of [X6 | SINCOS IN1] to the splitter output [X5 | SINCOS OUT].**
- **1 - 2 inputs for control signals are available at terminal [X10 | CONTROL IN].**
- **The final Safety Integrity Level (SIL) depends on the selected configuration and on external components connected to the unit.**
- **For unbalanced single channel signals, the parameter A-Edge 2/1 must be set to 1, so that a stable frequency can be detected.**

***) To achieve a safety level with this configuration, the user must be sure that the equipment will physically be able to rotate or move in one direction only (no reversals!). This could e.g. be ensured by use of a self-locking gearbox.**

6.5. Application: 2 Quadrature HTL Encoders

Device	GMM23xS		
Operational Mode	3		
Sensor 1	[X10 | CONTROL IN]	Incremental HTL encoder	A, B, 90°
Sensor 2	[X10 | CONTROL IN]	Incremental HTL encoder	A, B, 90°
Control Inputs	[X10 | CONTROL IN]	HTL/PNP control signals	not available
Safety Level	Speed → SIL3 / PLe achievable (see below) Direction → SIL3 / PLe achievable (see below) Standstill → SIL3 / PLe achievable (see below)		

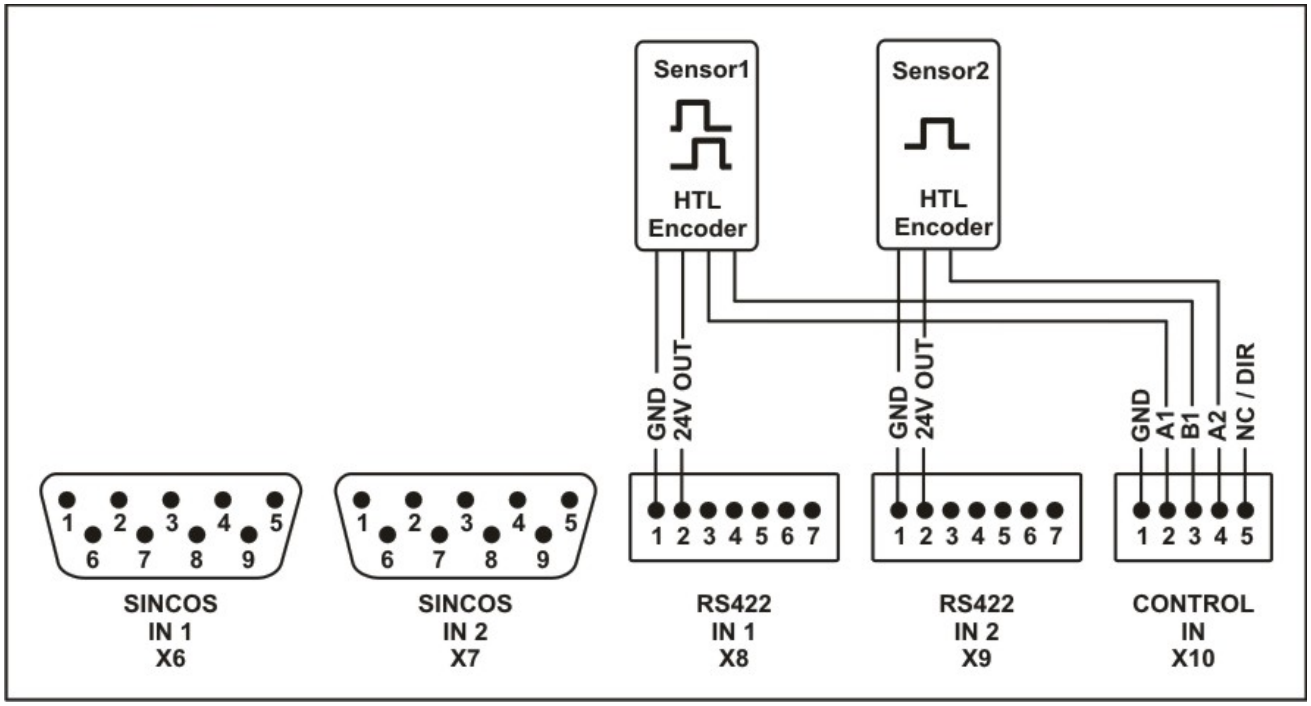


This mode allows evaluation of a dual channel system, equipped with two incremental dual channel HTL encoders.

- **No inputs for control signals are available at terminal [X10 | CONTROL IN].**
- **The final Safety Integrity Level (SIL) depends on the selected configuration and on external components connected to the unit.**

6.6. Application: 1 Quadrature Encoder and 1 Single Channel HTL Encoder

Device	GMM23xS		
Operational Mode	4		
Sensor 1	[X10 | CONTROL IN]	Incremental HTL encoder	A, B, 90°
Sensor 2	[X10 | CONTROL IN]	Incremental HTL encoder	A, single channel
Control Inputs	[X10 | CONTROL IN]	HTL/PNP control signal	not available
Safety Level	Speed → SIL3 / PLe achievable (see below) Direction → SIL3 / PLe* achievable (see below) Standstill → SIL3 / PLe* achievable (see below). With single channel encoders, jitter around an edge can be misinterpreted as a frequency.		



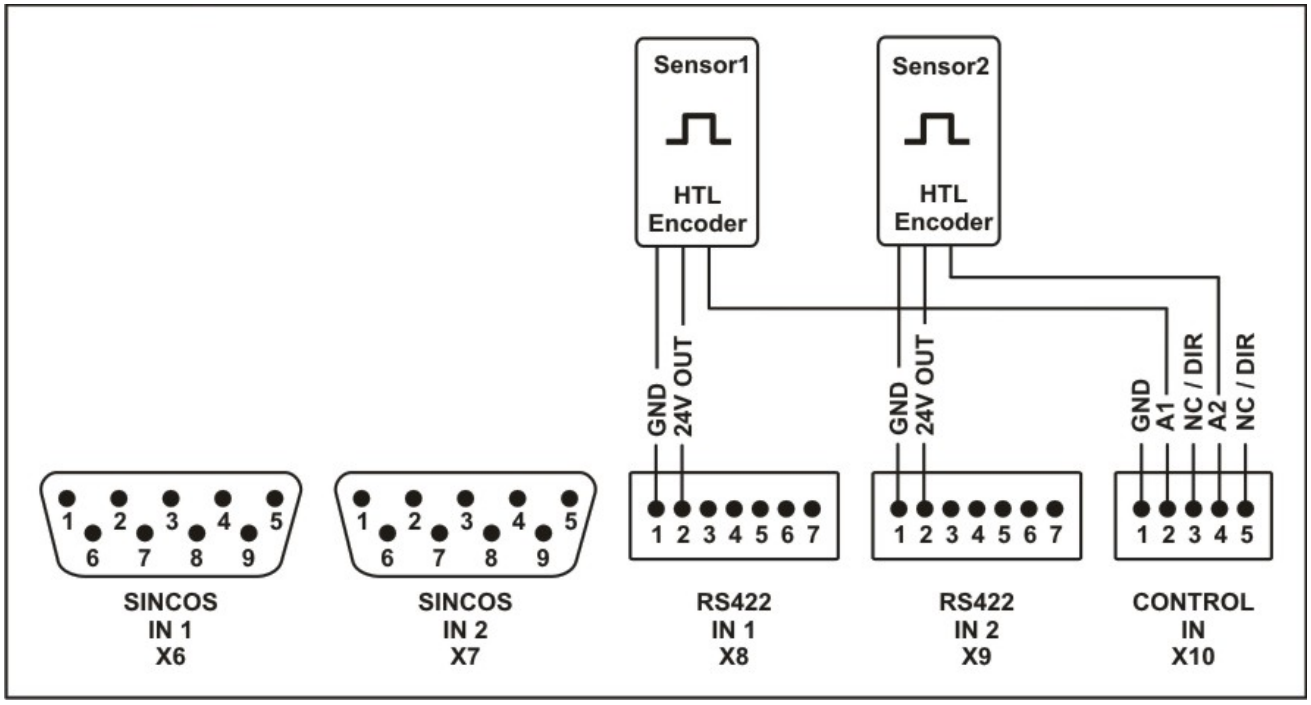
This mode allows evaluation of a dual channel system, equipped with a combination of one incremental quadrature HTL encoder and one single channel HTL encoder.

- **No inputs for control signals are available at terminal [X10 | CONTROL IN].**
- **The final Safety Integrity Level (SIL) depends on the selected configuration and on external components connected to the unit.**
- **For unbalanced single channel signals, the parameter A-Edge 2/1 must be set to 1, so that a stable frequency can be detected.**

***) To achieve a safety level with this configuration, the user must be sure that the equipment will physically be able to rotate or move in one direction only (no reversals!). This could e.g. be ensured by use of a self-locking gearbox.**

6.7. Application: 2 Single Channel HTL Encoders

Device	GMM23xS		
Operational Mode	5		
Sensor 1	[X10 | CONTROL IN]	Incremental HTL encoder	A, single channel
Sensor 2	[X10 | CONTROL IN]	Incremental HTL encoder	A, single channel
Control Inputs	[X10 | CONTROL IN]	HTL/PNP control signal	not available
Safety Level	Speed → SIL3 / PLe achievable (see below) Direction → SIL3 / PLe* achievable (see below) Standstill → SIL3 / PLe* achievable (see below). With single channel encoders, jitter around an edge can be misinterpreted as a frequency		



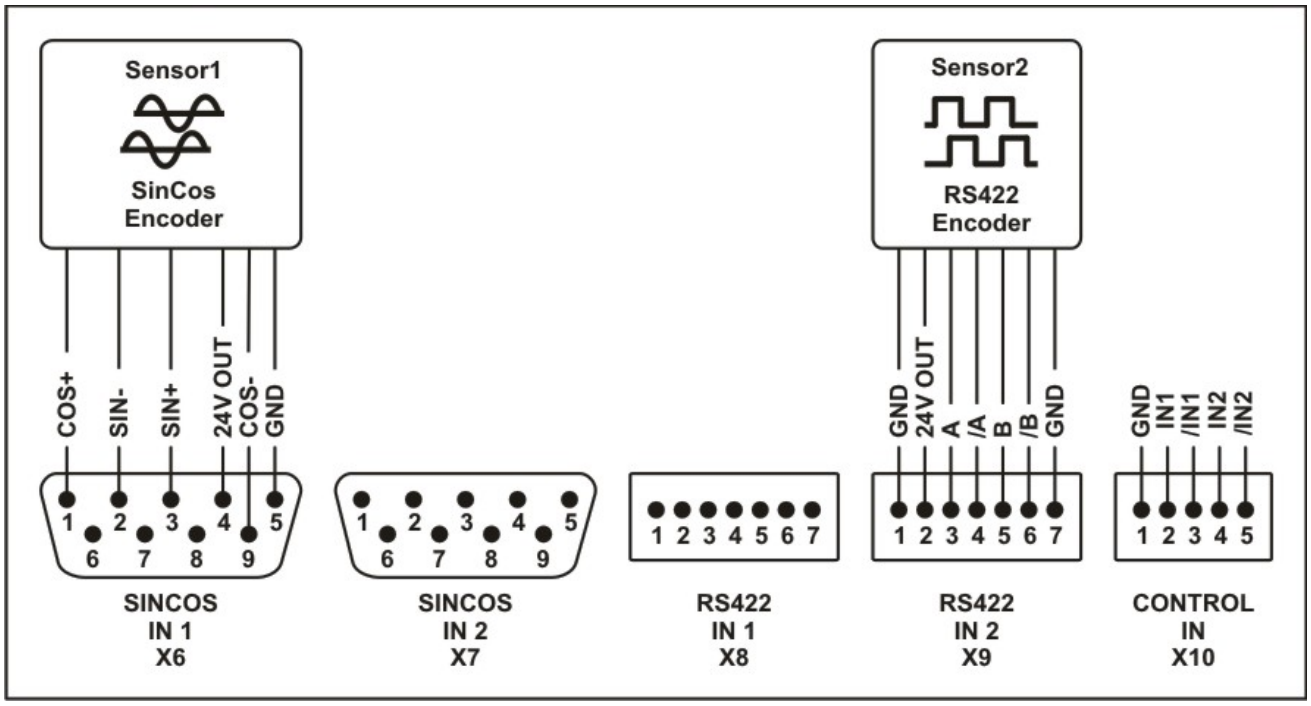
This mode allows evaluation of a dual channel system, equipped with two single-channel HTL encoders.

- **No inputs for control signals are available at terminal [X10 | CONTROL IN].**
- **The final Safety Integrity Level (SIL) depends on the selected configuration and on external components connected to the unit.**
- **For unbalanced single channel signals, the parameter A-Edge 2/1 must be set to 1, so that a stable frequency can be detected.**

***) To achieve a safety level with this configuration, the user must be sure that the equipment will physically be able to rotate or move in one direction only (no reversals!). This could e.g. be ensured by use of a self-locking gearbox.**

6.8. Application: 1 SinCos and 1 RS422 Encoder

Device	GMM23xS		
Operational Mode	6		
Sensor 1	[X6 | SINCOS IN 1]	Incremental HTL encoder	SIN+, SIN-, COS+, COS-
Sensor 2	[X9 | RS422 IN 2]	Incremental HTL encoder	A, /A, B, /B
Control Inputs	[X10 | CONTROL IN]	HTL/PNP control signal	2 - 4 available
Safety Level	Speed → SIL3 / PLe achievable (see below) Direction → SIL3 / PLe achievable (see below) Standstill → SIL3 / PLe achievable (see below)		

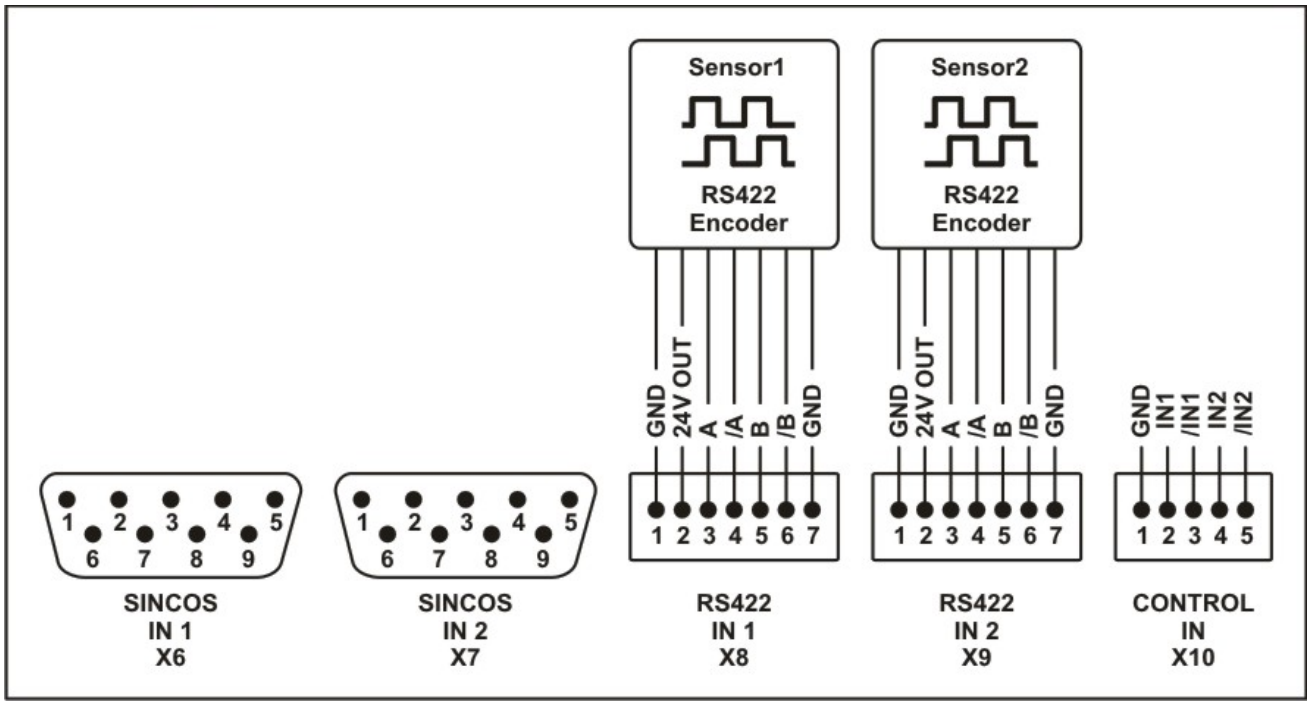


This mode allows evaluation of a dual channel system, equipped with a combination of one SinCos encoder and one RS422/TTL encoder.

- **With a GMM230S model this mode can be used to reproduce the input frequency of [X6 | SINCOS IN1] to the splitter output [X5 | SINCOS OUT].**
- **2 - 4 inputs for control signals are available at terminal [X10 | CONTROL IN].**
- **The final Safety Integrity Level (SIL) depends on the selected configuration and on external components connected to the unit.**

6.9. Application: 2 RS422 Encoders

Device	GMM23xS		
Operational Mode	7		
Sensor 1	[X8 | RS422 IN 1]	Incremental HTL encoder	A, /A, B, /B
Sensor 2	[X9 | RS422 IN 2]	Incremental HTL encoder	A, /A, B, /B
Control Inputs	[X10 | CONTROL IN]	HTL/PNP control signals	2 - 4 available
Safety Level	Speed → SIL3 / PLe achievable (see below) Direction → SIL3 / PLe achievable (see below) Standstill → SIL3 / PLe achievable (see below)		

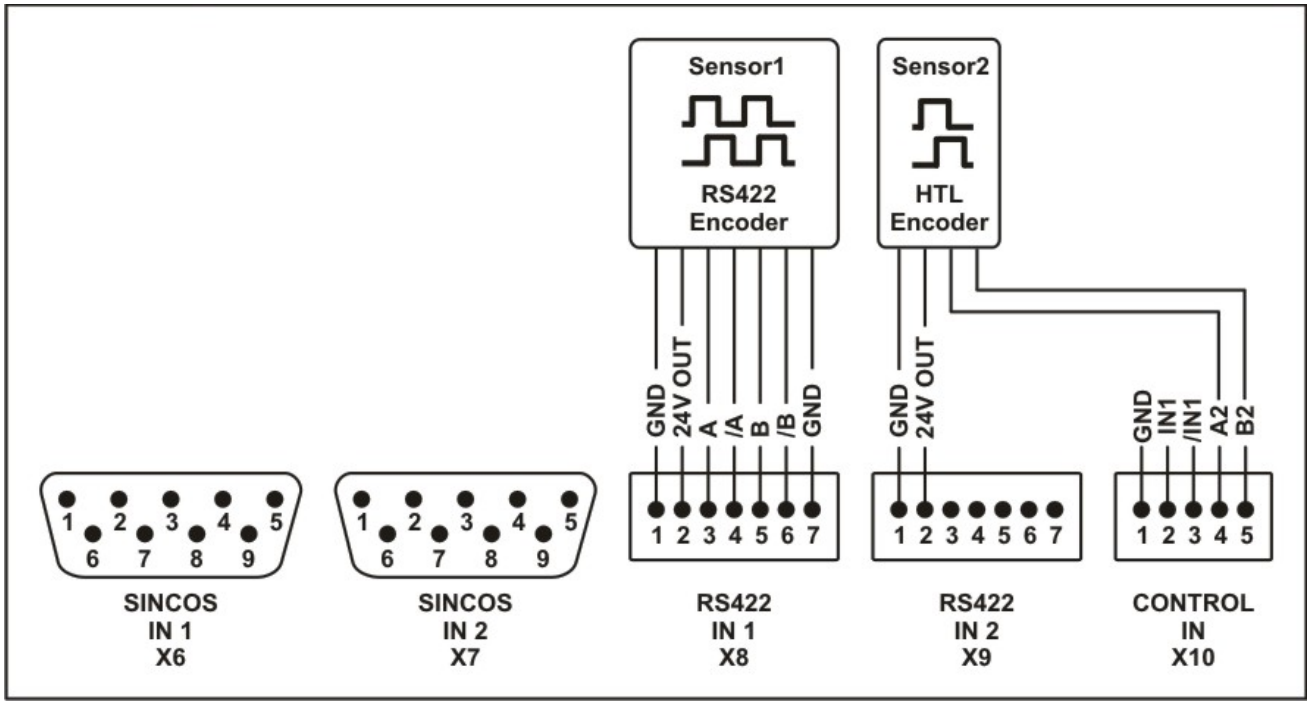


This mode (with GMM23xS models only) allows evaluation of a dual channel system, equipped with two identical RS422/TTL incremental encoders.

- **2 - 4 inputs for control signals are available at terminal block [X10 | (CONTROL IN).**
- **The final Safety Integrity Level (SIL) depends on the selected configuration and on external components connected to the unit.**

6.10. Application: 1 RS422 Encoder and 1 quadrature HTL Encoder

Device	GMM23xS		
Operational Mode	8		
Sensor 1	[X8 | RS422 IN 1]	Incremental RS422 / TTL encoder	A, /A, B, /B
Sensor 2	[X10 | CONTROL IN]	Incremental HTL encoder	A, B, 90°
Control Inputs	[X10 | CONTROL IN]	HTL/PNP control signal	1 - 2 available
Safety Level	Speed → SIL3 / PLe achievable (see below) Direction → SIL3 / PLe achievable (see below) Standstill → SIL3 / PLe achievable (see below)		

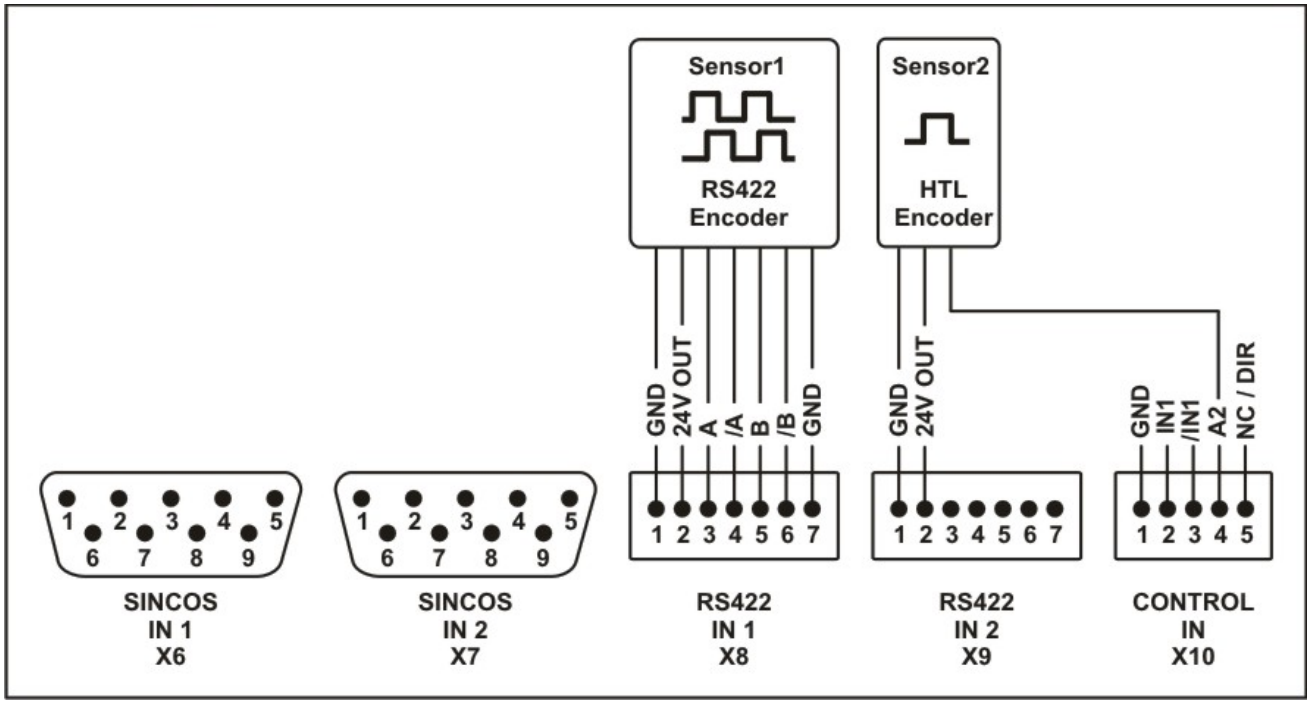


This mode is used for evaluation of a dual channel system, equipped with an incremental RS422/TTL encoder and a dual channel HTL encoder.

- **1 - 2 inputs for control signals are available at terminal block [X10 | (CONTROL IN).**
- **The final Safety Integrity Level (SIL) depends on the selected configuration and on external components connected to the unit.**

6.11. Application: 1 RS422 and 1 single channel HTL Encoder

Device	GMM23xS		
Operational Mode	9		
Sensor 1	[X8 | RS422 IN 1]	Incremental RS422 / TTL encoder	A, /A, B, /B
Sensor 2	[X10 | CONTROL IN]	Incremental HTL encoder	A, single channel
Control Inputs	[X10 | CONTROL IN]	HTL/PNP control signal	1 - 2 available
Safety Level	Speed → SIL3 / PLe achievable (see below) Direction → SIL3 / PLe* achievable (see below) Standstill → SIL3 / PLe* achievable (see below). With single channel encoders, jitter around an edge can be misinterpreted as a frequency		



This mode (applicable with GMM23xS models only) is used for evaluation of a dual channel system, equipped with an incremental RS422/TTL encoder and a single-channel HTL encoder.

- **1 - 2 inputs for control signals are available at terminal block [X10 | (CONTROL IN).**
- **The final Safety Integrity Level (SIL) depends on the selected configuration and on external components connected to the unit.**
- **For unbalanced single channel signals, the parameter A-Edge 2/1 must be set to 1, so that a stable frequency can be detected.**

***) To achieve a safety level with this configuration, the user must be sure that the equipment will physically be able to rotate or move in one direction only (no reversals!). This could e.g. be ensured by use of a self-locking gearbox.**

7. Commissioning

7.1. Cabinet installation

1. The unit must be in a mechanically and technically perfect condition.
2. The unit must be snapped onto a 35 mm DIN rail (according to EN 60715) by using the clip at the rear.
3. It must be ensured that the permissible environmental conditions of the specification are met accordingly.
4. All wirings must be executed in accordance with the general provisions for wiring (see www.baumer.com).
5. To choose and to connect the power supply unit, please refer to the section **Power Supply**.
6. To choose and to connect the encoders, please refer to sections **Encoder Supply**, **SinCos Encoder Inputs**, **RS422 Encoder Inputs** and **HTL Encoder Inputs**.
7. When control inputs, digital inputs or external relays are used, please note that the configuration will take part in the final Safety Integrity Level (SIL).
8. Analog output, digital outputs as well as the splitter output are only safe, if the follower unit is capable to detect and evaluate the error states of the monitor.
9. The relay contacts at terminal [X1] must be integrated into the safety circuit.



- **In order to prevent simultaneous damages to the cables by external influences, the encoder lines or sensor lines must be kept physically separate from one another.**
- **Installation, commissioning and maintenance must only be performed by qualified personnel.**
- **In order to prevent manipulations, the machine as well as the equipment must be protected from unauthorized access.**
- **The machine must be securely mounted and be ready to operate.**
- **The safety function of the unit cannot be guaranteed before the commissioning resp. parametrization procedure has been fully completed.**
- **Before commissioning and parametrization, the risk situation of the system must be analyzed and all precautions must be taken accordingly.**
  These are fundamental measures to protect persons and machinery.

7.2. Preparations for Setup and Testing

In order to put the GMM2xxS monitor into operation or to change settings and Parameters, the following measures must be taken:

- Connect the unit to a power supply source
- Set the DIL switch sliders 1, 2 ON and 3 to OFF (Programming and Testing Mode)
- Install the OS6.0 operating software properly on a PC and start the program
- Connect the unit to the OS6.0 operator surface via the USB port
  (alternatively you are free to use a GMI230S operator interface).

The parameterization and testing can be performed with the help of the OS6.0. Parameters can be changed on-the-fly and their behaviour can be verified immediately after changing. The Programming and Test-Mode contains the complete functionality of the Normal or Safety Mode, so that all tests in the Programming and Test-Mode are also valid in the Safety Mode.
The parameters Set Frequency X, Action Output, Action Polarity and the related commands Set Frequency and Freeze Frequency are an exception, they are intended only for the Test Mode.
During the test the switching of the DIL-switch is not necessary to activate the parameter changes.
For an efficient and fast parameterization the use of the OS6.0 is to be preferred to the GMI230S.

7.3. Parameter Setting by PC

For parameterization of the safety monitor by PC, the operator software OS6.0 is used. This software is included in delivery on CD and is also available for download from www.baumer.com. After successful installation of the operator software of and the USB driver (see page 2) the PC can be connected to the safety monitor via USB cable.

When starting the software, the following screen appears:



Parametrization via PC

All functions of the operator software OS6.0 are described in a separate manual (see page 2).

7.4. Visualization by the GMI230S Operator Unit

Visualization as well as configuration of the safety device also can be done with use of the Display- and Programming Module Type GMI230S. This optional operator unit is primarily used for visualization and diagnosis without PC, but can also be used for parameter setting. The module can be simply plugging onto the front of the GMM2xxS unit.

However it is recommended to use preferably the OS6.0 PC software for the commissioning and parametrization procedure.



Operator Module GMI230S

All functions of the GMI230S programming- and display module are described in a separate manual (see page 2).

8. Setup

In order to ensure proper functionality, the parameters must be set appropriate values. This section describes the most important parameters, which have to be set or checked in either case.

8.1. Operational Mode Settings

The setting of parameter “Operational Mode” is determined by the types of encoders in use, and by the respective connections. Encoder wirings and resulting mode settings are described in chapter **Operational Modes**.

No.	Parameter	Remark
000	Operational Mode	GMM24xS = 0, GMM23xS see chapter **Operational Modes**

With GMM24xS models, this parameter value must be left to default setting = 0.

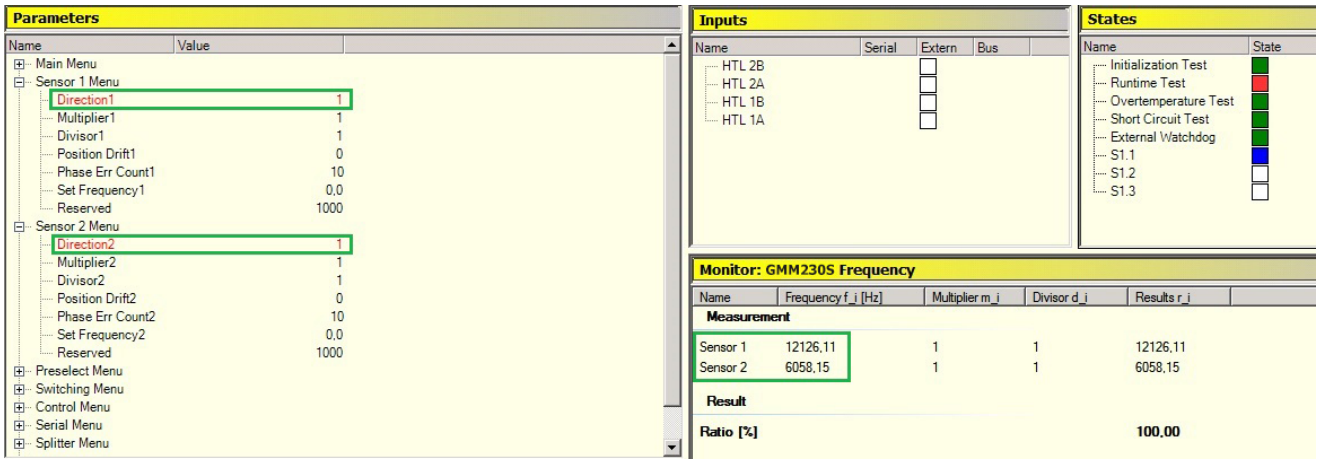
8.2. Direction Settings

In order to define the directions, the machine must move resp. turn in its working direction. As a first step, GMM230S: Frequency must be selected from the button bar of the operator screen.

The corresponding frequencies of Sensor 1 and Sensor 2 will then be indicated in the Monitor field. In case of negative frequency values, the direction must be changed by using the associated “Direction“ register in the parameter field of the corresponding sensor menu.

No.	Parameter	Remark
017	Direction1	GMM24xS = 0 or 1, GMM23xS = X, positive frequency
024	Direction2	GMM24xS = 0 or 1, GMM23xS = X, positive frequency

With GMM24xS models, both parameter values must have equal setting (Direction1 = Direction2).

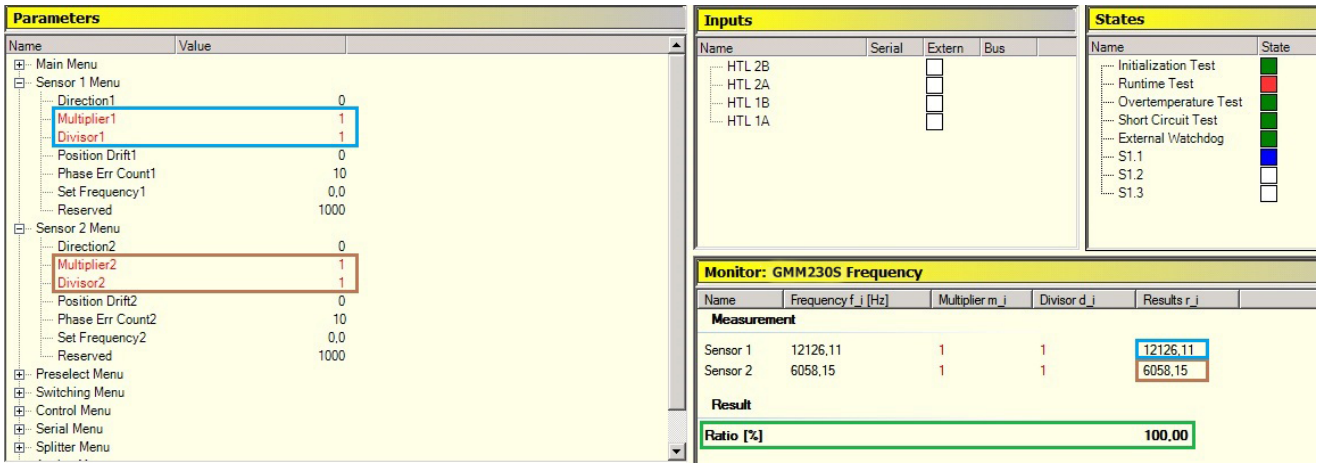


8.3. Frequency Ratio Settings

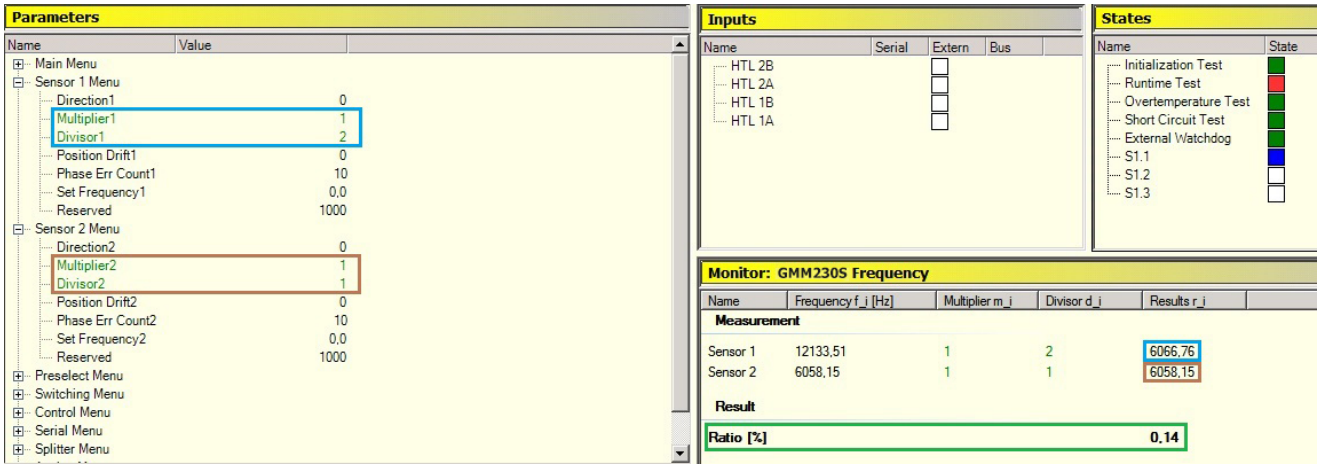
When using two sensors with different number of impulses, or in case of mechanical gear transmission ratio between both encoders, the higher one of the two frequencies must be adjusted to the lower one by corresponding setting of the scaling factors. Accurately calculated values are better than experimental results.

No.	Parameter	Remark
018	Multiplier1	GMM24xS = 1, GMM23xS Ratio = 0
019	Divisor1	GMM24xS = 1, GMM23xS Ratio = 0
025	Multiplier2	GMM24xS = 1, GMM23xS Ratio = 0
026	Divisor2	GMM24xS = 1, GMM23xS Ratio = 0

With GMM24xS models, both parameters must be left to default = 1.



In the example shown above, frequency 2 is by factor 0.0994 lower than frequency 1.
For alignment of both frequencies, “Multiplier1” can be set to 994 and “Divisor1” to 10.000.

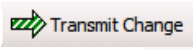


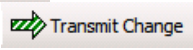
By this scaling procedure of frequency 1, internally both calculated frequencies are approximately equal and the calculated frequency ratio is close to 0.

8.4. Clear Errors

After parameter “Operational Mode” has been set correctly, the machine will move in working direction, with positive frequency indication of both, Sensor 1 and Sensor 2. Due to the frequency ratio setting, both frequencies are equal now, since the higher frequency has been scaled down to the lower frequency.

At this time, the indication boxes “Runtime Test” and “Initialization Test” in the **State** field can be set to green (green = no error, red = error). For this purpose, the following sequence of operations regarding parameter “Error Stimulation” must be observed:

- Set “Error Stimulation” to 2 and press 

- Set “Error Stimulation” back to 1 and press again 

Now, all **State** boxes, except the DIL switch States (S1.1, S1.2, S1.3) should light green.

In case a runtime error should be triggered again, please press 

of the button bar to find out more details about this error.

More information about errors can be found in the chapters **Runtime Test** and **Initialization Test**.

Error	Remark
GPI Error	If a GPI Error appears again after deleting without changing the input signal, check the setting of parameter “Input-Mode” and the signal status (High/Low) at the input. If a GPI Error appears, when changing the input signal, check the setting of parameter „GPI Err Time“.
SIN/COS Channel X Error	If a SIN/COS error appears again after deleting at standstill, check the wiring. If a SIN/COS error sporadically appears at normal operation mode, first eliminate the disturbance source. With the parameter “SIN Error” and “SIN Err Time X” a SIN/COS error can be tolerated for a certain time.
Frequency Error	If a Frequency Error appears at normal rotation speed, check the rotation direction and the ratio of the two encoders (see chapter Direction Settings and Frequency Ratio Setting). If the Frequency Error still appears, the rotations speeds are too different for a temporary or longer period of time. In case of temporary deviations, change the parameter settings of “Sampling Time” and “Filter” for smoothing the frequency or set the parameter “Div.Filter” to a higher value. In case of continual deviations, the permissible deviation can be increased by the parameter “Div %-Value”. In case of deviations in the low-frequency range, adjust the parameters „Div. f-Value“ and„Div. Switch“%-f“.
Position Error	If a Position error appears at normal rotation speed, check the rotation direction and the ratio of the encoders (see chapter Direction Settings and Frequency Ratio Setting). If the Position Error still appears, the encoder positions diverge. In this case, check the maximum permissible deviation of the encoder positons and adjust the parameter „Div. Inc-Value“. Do not use the Position comparison, when the encoders slip or no comparison is possible.

8.5. Sampling Time Settings

All **State** boxes (except DIL switch States S1.x) light green at this time. Now please select GMM230S: Frequency in the button bar. We must determine the operating range of the unit, comprising the frequency range from the lowest switching point to the highest switching point:

1. Find out, which of the sensor frequencies shows the highest instability and fluctuation.
2. Move through the frequency range and find out the point of maximum fluctuating. In general this will be around the lowest switching point (underspeed or frequency band).
3. The frequency can be smoothed by use of parameter "Sampling Time" and parameter "Filter". Higher settings result in smoother running, but increase the response time and the fault detection time.
4. A combination of Sampling Time and Filter achieve the best result for smoothing the complete frequency range of input frequencies. Frequencies out of the Sampling Time, regarding to lower frequency range, are smoothed by the parameter Filter.
5. Only exceptionally you should set the Sampling Time to smoothen frequencies below the lower switch point setting (under speed or frequency band).
6. The Sampling Time and the Filter setting may also affect the signal variation on the analog output.
7. The settings can be verified at the Monitor GMM230S Frequency.

No.	Parameter	Remark
001	Sampling Time	Control of frequency fluctuation
014	Filter	Control of frequency fluctuation

8.6. Wait Time Settings

The Wait Time parameter defines the frequency below which all frequencies will be taken as zero. Setting of e.g. 1.0 second will result in zeroizing all frequencies lower than 1 Hz. In this context it must be clarified whether the application requires a standstill- or drift-monitoring or not.

1. Where the application does not require any standstill or direction or drift control, you are free to set Standstill Time with regard of the expected minimum frequency and the required response time only.
2. Where the application uses standstill control, please observe also possible jitter during standstill and adjust Wait Time correspondingly.
3. Where the application uses forward/reverse direction control, also possible jitter should be considered while the system holds in closed loop position control.

No.	Parameter	Remark
002	Wait Time	Adjust the zero balancing window

8.7. Setting of F1 - F2 Selection

When the original frequency of sensor 1 is higher than the original frequency of sensor 2, please set parameter F1-F2-Selection to 0, otherwise please set to 1. In general the higher frequency should be the more stable one, and should therefore be used to set the switching points.

No.	Parameter	Remark
003	F1-F2 Selection	When F1 > F2, setting F1-F2 Selection = 0 (F1 selected). When F2 > F1, setting F1-F2 Selection = 1 (F2 selected).

8.8. Setting of the Divergence Parameters

The parameter "Div.Mode" defines the type of comparison: Frequency Comparison or Position Comparison. The setting of this parameter affects only on the error detection. The GMM24xS series use only one encoder, controlling the positions should be favored.

If the frequency ratio setting can not be set precisely, do not use the Position Comparison caused by cumulative position increments. If the encoders slip, Frequency Comparison has to be preferred.

Frequency comparison:

These parameters defines the maximum permissible frequency deviation between sensor 1 and sensor 2, based on percentaged values of Div Calculation. Parameter Div. Switch %-f defines the frequency threshold below which deviations are taken as absolute values, and above which deviations are taken as percentage. When the absolute difference of frequencies exceeds the setting of Div. f-Value below the threshold setting, a frequency error will be triggered. When the percentaged difference exceeds the setting of Div. %-Value above the threshold setting, also a frequency error will be triggered. Parameter Div. Filter provides an option for suppression of short-duration errors.

1. The facility of setting a frequency threshold provides suppression of possible frequency errors caused by jerking in the startup phase.
2. The threshold setting must be below the lower switchpoint setting (underspeed or frequency band).
3. It is an individual issue of the actual application to fix the deviation values under normal operating speed and under startup conditions that should trigger a frequency error signal.
4. Where no standstill nor drift nor direction control is needed, the frequency threshold can also serve as trigger threshold for error activation, by increasing the setting of Div. f-Value correspondingly (see 3.)
5. Where the application uses standstill control, possible jitter during closed-loop standstill should be observed to adjust Div. f-Value correspondingly.
6. Where forward/reverse direction control is used, please also observe possible jitter during standstill for best setting of Div. f-Value.

Sensor Position Comparison:
This parameter defines the maximum permissible position deviations between sensor 1 and sensor 2. Parameter DIV. Inc Value defines the position threshold. If deviation exceeds this threshold a frequency error will be triggered. This position threshold is implemented independent of the direction of rotation. If parameter DIV.Inc Value is set to zero, no error massage will be applied.

No.	Parameter	Remarks
004	Div. Switch %-f	Frequency threshold
005	Div. %-Value	Percentage of frequency deviation above the Div.Switch %.
006	Div. f-Value	Absolute frequency deviation (Hz) below the Div. Switch %-f threshold
007	Div. Calculation	0
008	Div. Filter	Filter (OFF = 0, MEDIUM = 5, HIGH = 10)
012	Div. Mode	**Type of comparison of encoder inputs**
013	Div. Inc-Value	Max. incremental deviation



Divergence parameters are relevant even with the GMM24xSx models, since also with only one SIL3 encoder frequency or position is splitted into two channels, where asynchronism during changes of the frequency may cause frequency divergence. Using GMM24xS position deviation has to be preffered.

8.9. Setting of Power-up Delay

After initialization, Power-up Delay defines a retardation time before the unit takes the normal control state.

1. During this delay time, the unit will not take care of any errors
2. The delay is important to allow the encoder signals to stabilize after power up.
3. In case of indirect encoder connection, the retardation must also include the switching time of the relays.
4. In case of different power-up times of the parts and components of the installation, adaption to the GMM2xxS unit can be achieved by the retardation time settings.

No.	Parameter	Remarks
010	Power-up Delay	delay time

8.10. Setting of the SinCos Output

There are no settings available for the SinCos output. At any time the signals of SinCos Input 1 [X6] will be routed to the output.
With models GMM2x6S, no SinCos output is available.

8.11. Setting of the RS422 Output

The output delivers the signals from Sensor 1 or Sensor 2 (regardless of the input configuration). Depending on the Operational Mode setting, the converted signals of a SinCos or of a HTL encoder will be forwarded.

No.	Parameter	Remark
107	RS Selector	Sensor 1 to output = 0, Sensor 2 to output = 1

With models GMM2x6S, no RS422 output is available.

8.12. Analog Output Settings

In case of an unused analog output the output terminals must be bridged. The parameters "Analog Start" and "Analog End" are related to the frequency which is selected by the "F1-F2 Selection" register. The "Analog Gain" setting should be changed only in exceptional cases (e.g. for limitation of the upper current value). The "Analog Offset" parameter serves for fine adjustment.

1. Fluctuation of the analog output signal can be reduced by corresponding setting of Sampling Time and Filter.
2. With very small span (between Analog Start and Analog End) the analog output signal can become stepped due to the low frequency resolution.
3. Analog Start and Analog End operate under control of F1-F2 Selection.

Nr.	Parameter	Remark
108	Analog Start	Input frequency to produce output of 4 mA
109	Analog End	Input frequency to produce output of 20 mA
110	Analog Gain	100 : fixed setting, change only in exceptional cases
111	Analog Offset	0 : fine astment

8.13. Digital Output Settings

The configuration of the outputs will affect the Safety Integrity Level (SIL).

1. Switching points are affected by the F1-F2 Selection setting
2. Output flattering caused by unstable frequencies must be eliminated by corresponding setting of a hysteresis.
3. No hysteresis setting is required with self-sustaining outputs.

No.	Parameter	Remark
031 - 046	Preselect Menu	Setting of the tripping points
047 - 084	Switching Menu	Configuration of the outputs

8.14. Relay Output Settings

The relay contacts must be embedded into the safety circuit.

1. Switching points are affected by the F1-F2 Selection setting
2. Output flattering caused by unstable frequencies must be eliminated by corresponding setting of a hysteresis.
3. No hysteresis setting is required with self-sustaining outputs.
4. It is mandatory to assign the most important and essential of all safety functions to the relay output.

No.	Parameter	Remark
031 - 046	Preselect Menu	Setting of the tripping points
047 - 084	Switching Menu	Configuration of the outputs

8.15. Digital Input Settings

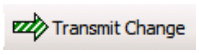
The configuration of the inputs will affect the Safety Integrity Level (SIL).

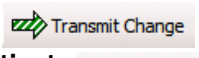
1. With 2-pole inputs please observe possible difference with regard of the transition times. Parameter “GPI Err Time” defines the permissible delay time during illegal conditions.
2. With 1-pole clocked inputs the static triggering characteristics (low/high) should be adapted to the dedicated command according to safety requirements.

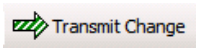
No.	Parameter	Remark
090 - 100	Control Menu	Configuration if the inputs

8.16. Producing an Error

After setting of all relevant parameters an error can be produced for testing purpose. This conduces to force the GMM2xxS outputs into the error state and to check function and behavior of the follower units.

- Set parameter „Error Stimulation“ to 0 and activate 

- The error state is set now.
- Set parameter „Error Stimulation“ to 2 and activate 

- Set parameter „Error Stimulation“ to 1 again and activate 

- The error state is released again

While in Error State, the safety monitor acts as follows:

- The analog output signal is set to 0 mA
- The relay contact is open
- Both channels of the digital outputs are in LOW state
- The offset of the SinCos output is displaced
- All channels of the RS422 output are in LOW state.

It is important to check for proper detection of these error indications on site of the target units connected to the monitor.

9. Completion of the Setup Procedure

Finally, all application-specific parameters should once more be reviewed for correctness and plausibility. The safety-relevant relay output falls back to its open state when an error occurs or when the programmed switching condition occurs. Of course the contact is also open in powerless state of the unit. It is mandatory to check the safety behavior of the monitor and all connected follower units carefully.



The following items must be verified:

- **plausibility and correctness of encoder signals**
- **sense of rotation and proper scaling of the encoder frequencies**
- **plausibility of the frequencies themselves**
- **correct settings of all necessary parameters**
- **plausibility of the parameter settings**
- **SinCos output signals with regard to frequency and error behavior**
- **RS422 output signals with regard to frequency and error behavior**
- **analog output signal under operation and error conditions**
- **scaling of the analog output with respect to the frequency range**
- **digital outputs and relay output as for error comportment**
- **switching points with regard to correct comportment**
- **response times and related parameter settings**
- **inputs regarding proper function and comportment**

It is on the responsibility of the operator to ensure that all relevant parts of the whole installation pass over to a safe state as soon as the relay contact of the safety monitor opens.

After commissioning (parameterization and testing), the Programming Mode of the unit must be left by setting slider 3 of the DIL switch back to its ON position. Please observe that for normal operation of the monitor always all
3 sliders of the DIL switch must be set to ON.



- **Programming Mode (DIL switch setting) must only be used for Start-up (parameterization and testing)**
- **Set all DIL switch positions to ON after Start-up**
- **Protect the DIL switch against later manipulation after conclusion of the Start-up procedure (e. g. by covering with adhesive tape)**
- **Normal operation is only permitted while the yellow LED is permanently OFF**

10. Error Detection

In order to ensure a maximum of operational safety and reliability, the Safety Monitors are equipped with several and profound monitoring-functions. This monitoring allows immediate recognition and messaging of possible failures and malfunctions.



In case of errors:

- **the relay contact switches to its open (safety) condition (interruption of the safety circuit)**
- **the analog output (with GMM236S and GMM246S units) sets to 0 mA (which is out of the regular operating range of 4 ... 20 mA)**
- **all digital outputs are set to LOW. No more inversion between OUTx and /OUTx (Attention in case of homogenous configuration!)**
- **no more incremental signals are available at the RS422 output (Tri-State with pulldown cut off)**
- **the DC-offset of the SinCos output will be shifted (which signals an error to the target unit)**

The following types of error recognition are distinguished:

- Initialization Test Error
- Runtime Test Error

Both error types are described in detail on the following pages.

10.1. Error Representation

Error Representation	Reference
Front LED's	Yellow LED lights continuously
GMI230S Operator Unit	The bottom line displays the error when the GMI230S is not in the programming mode
Operator surface OS6.0	Initialization Test = red (State field) Runtime Test = red (State field)

10.2. Initialization Test

These self-monitoring tests are processed automatically when switching the unit on.

Error code GMI230S	Error OS6.0 operator software	Instruction
H' 0000 0001	ADC Error	Internal error
H' 0000 0002	I2C Error	Internal error
H' 0000 0004	OTH Error	Check the GMI230S power supply or the encoder supply (or internal error)
H' 0000 0008	SCI Error	Internal error
H' 0000 0010	DIO Error	Check the digital outputs for short circuit resp. other errors (or internal error)
H' 0000 0020	GPI Error	Check the connections of the digital inputs and the input configuration (or internal error)
H' 0000 0040	CAP Error	Internal error
H' 0000 0080	SPI Error	Check the connections of the analog output (or internal error)
H' 0000 0100	QEP Error	Check the separation or disconnection of the encoder supply at Self-Test (or internal error)
H' 0000 0200	SCO Error	Check the connections of the SinCos output (or internal error)
H' 0000 0400	CPU Error	Internal error
H' 0000 0800	RAM Error	Internal error
H' 0000 1000	WDO Error	Internal error



For all error messages, the following applies:
Switch the unit OFF and ON again.
If the error message continues, please contact the manufacturer of the unit.

10.3. Runtime Test

These internal monitoring procedures run automatically and continuously in the background:

From software version 5 the following error codes applies:

Error code GMI230S	Error Message on PC (Operator Software OS6.0)	Instruction
H' 0000 0001	SIN/COS Channel 1 Error	SinCos Encoder 1 signals at [X6] incorrect (Offset/Phase)
H' 0000 0002	SIN/COS Channel 2 Error	SinCos Encoder 2 signals at [X7] incorrect (Offset/Phase)
H' 0000 0004	Encoder Supply Error	Encoder Supply 1/2 at [X6-X9, X11]: short circuit resp. faulty circuit
H' 0000 0008	Position Error	Position error detected Parameter Div. Mode = 1, 2
H' 0000 0010	-	-
H' 0000 0020	-	-
H' 0000 0040	-	-
H' 0000 0080	-	-
H' 0000 0100	Temperature Error	Impermissible high temperature
H' 0000 0200	Readback Digital Output Error	Digital outputs [X2]: short circuit resp. faulty circuit
H' 0000 0400	Analog Error	Open analog output (
H' 0000 0800	Readback Relay Output Error	Relay control error, contact readback error
H' 0000 1000	-	-
H' 0000 2000	GPI Error	Illegal transition state at the inputs
H' 0000 4000	-	-
H' 0000 8000	-	-
H' 0001 0000	Phase Channel 1 Error	Illegal signal change at Encoder 1
H' 0002 0000	Phase Channel 2 Error	Illegal signal change at Encoder 2
H' 0004 0000	Frequency Error	Frequency error F1 $\neq$ F2 Parameter Div. Mode = 0, 2
H' 0008 0000	Drift Error 1	Drift error at Encoder 1
H' 0010 0000	Drift Error 2	Drift error at Encoder 2
H' 0020 0000	ESM Error	Internal error

Continuation „Runtime Test“:

Error code GMI230S	Error Message on PC (Operator Software OS6.0)	Instruction
H‘ 0040 0000	External RB Error	Setting or resetting of the external relay faulty
H‘ 0080 0000	Wrong Parameter Error Simulation	Parameter “Error Simulation“≠ 1 while DIL-switch setting „Normal Operation“
H‘ 0100 0000	Register Error	Internal error
H‘ 0200 0000	RTI/QEP Cycle Error	
H‘ 0400 0000	External Clock Error	
H‘ 0800 0000	Wrong Parameter Setting	Frequency too high with regard to “Sampling Time” setting (Overflow)
H‘ 1000 0000	ADC Error	Internal error
H‘ 2000 0000	I2C Error	
H‘ 4000 0000	Initialization Test Error	An initialization test error has been detected (see chapter **Initialization Test**)

Up to software version 4 the following error codes applies:

Error code GMI230S	Error Message on PC (Operator Software OS6.0)	Instruction
H‘ 0000 0001	SIN/COS Channel 1 Error	SinCos Encoder 1 signals at [X6] incorrect (Offset/Phase) or internal error
H‘ 0000 0002	SIN/COS Channel 2 Error	SinCos Encoder 2 signals at [X7] incorrect (Offset/Phase) or internal error
H‘ 0000 0004	External Supply Channel 1 Error	Encoder Supply 1: short circuit resp. faulty circuit at [X6] or [X8] or internal error
H‘ 0000 0008	External Supply Channel 2 Error	Encoder Supply 2: short circuit resp. faulty circuit at [X7] or [X9] or internal error
H‘ 0000 0010	External Supply BG Error	GMI230S Power Supply: short circuit resp. faulty circuit at [X11] or internal error
H‘ 0000 0020	External Supply BG Status Error	GMI230S Power Supply: short circuit resp. faulty circuit at [X11] or internal error
H‘ 0000 0040	External Supply GV Status Error	Encoder Supply: short circuit resp. faulty circuit or internal error
H‘ 0000 0080	External Supply Short Circuit Error	Encoder Supply: short circuit resp. faulty circuit internal error
H‘ 0000 0100	Temperature Error	Impermissible high temperature or internal error
H‘ 0000 0200	Readback Digital Output Error	Digital outputs [X2]: short circuit resp. faulty circuit or internal error
H‘ 0000 0400	Sequence Analog Output Error	Open analog output (mA) or internal error
H‘ 0000 0800	Readback Relay Output Error	Relay control error, contact readback error or internal error
H‘ 0000 1000	Readback Analog Output Error	Open analog output (mA), overheating or internal error
H‘ 0000 2000	GPI Error	Illegal transition state at the inputs

Continuation „Runtime Test“:

Error code GMI230S	Error Message on PC (Operator Software OS6.0)	Instruction
H‘ 0000 4000	Sequence DAC Output Error	Open analog output (mA), overheating or internal error
H‘ 0000 8000	DAC Output Error	Open analog output (mA), overheating or internal error
H‘ 0001 0000	Phase Channel 1 Error	Illegal signal change at Encoder 1
H‘ 0002 0000	Phase Channel 2 Error	Illegal signal change at Encoder 2
H‘ 0004 0000	Frequency Error	Frequency error F1 ≠ F2
H‘ 0008 0000	Drift Error 1	Drift error at Encoder 1
H‘ 0010 0000	Drift Error 2	Drift error at Encoder 2
H‘ 0020 0000	ESM Error	Internal error
H‘ 0040 0000	External RB Error	Setting or resetting of the external relay faulty or internal error
H‘ 0080 0000	Wrong Parameter Error Simulation	Parameter “Error Simulation“≠ 1 while DIL-switch setting „Normal Operation“
H‘ 0100 0000	Register Error	Internal error
H‘ 0200 0000	RTI/QEP Cycle Error	
H‘ 0400 0000	External Clock Error	
H‘ 0800 0000	Wrong Parameter Setting	Frequency too high with regard to “Sampling Time” setting (Overflow)
H‘ 1000 0000	ADC Error	Internal error
H‘ 2000 0000	I2C Error	
H‘ 4000 0000	Initialization Test Error	An initialization test error has been detected (see chapter **Initialization Test**)



With all error messages, the following applies:

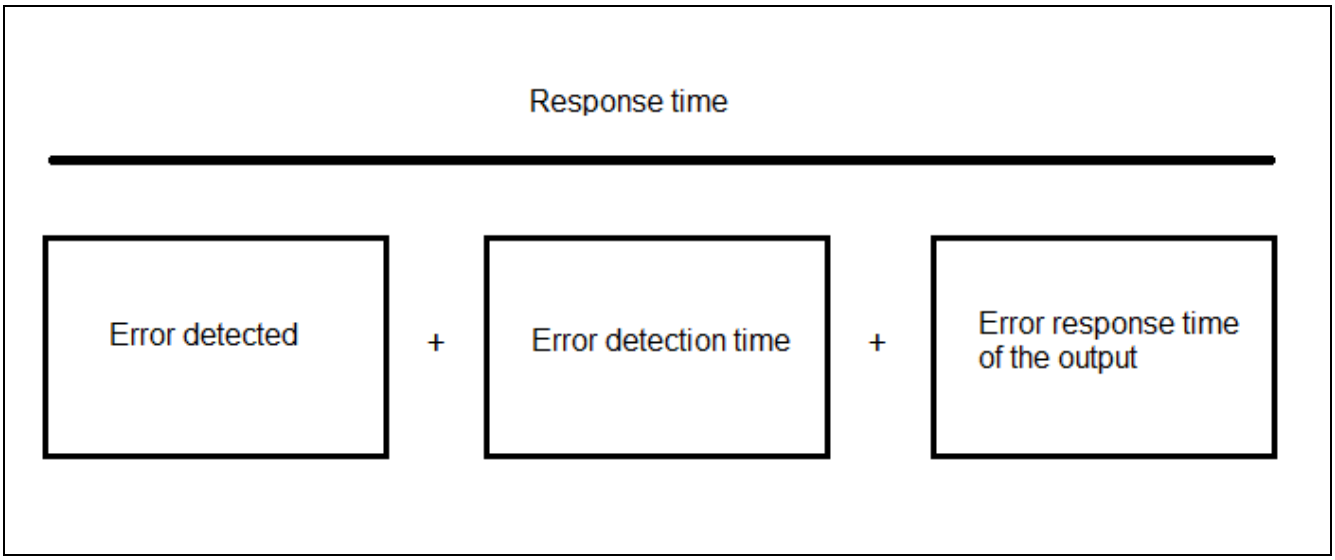
Switch the unit OFF and ON again. If the error message continues, please contact the manufacturer of the unit.

10.4. Error Clearing

Error states can generally be cleared by switching power off and on again (after the cause of the error has been removed). During commissioning only, errors can also be cleared as described under chapter **Setup / Clearing Errors**.

10.5. Error Detection Time

Basically it is not possible to specify an accurate error detection time, since times depend on many factors and error reasons. For example it makes a difference in time to detect either a SinCos error or an analog error. For simplification however we can assume that errors are recognized after a time of 85 ms plus the tripping time. As an exception of this, detection of frequency errors could also take longer, since these times are related to the input frequency and to parameter settings.
Typical respond times for various outputs and for frequency errors can be found in chapter **Response Times**.



The error detection time depends (amongst others) on the following factors:

- type of error
- parameter settings
- external events and actions
- internal events and actions
- respond time of the output

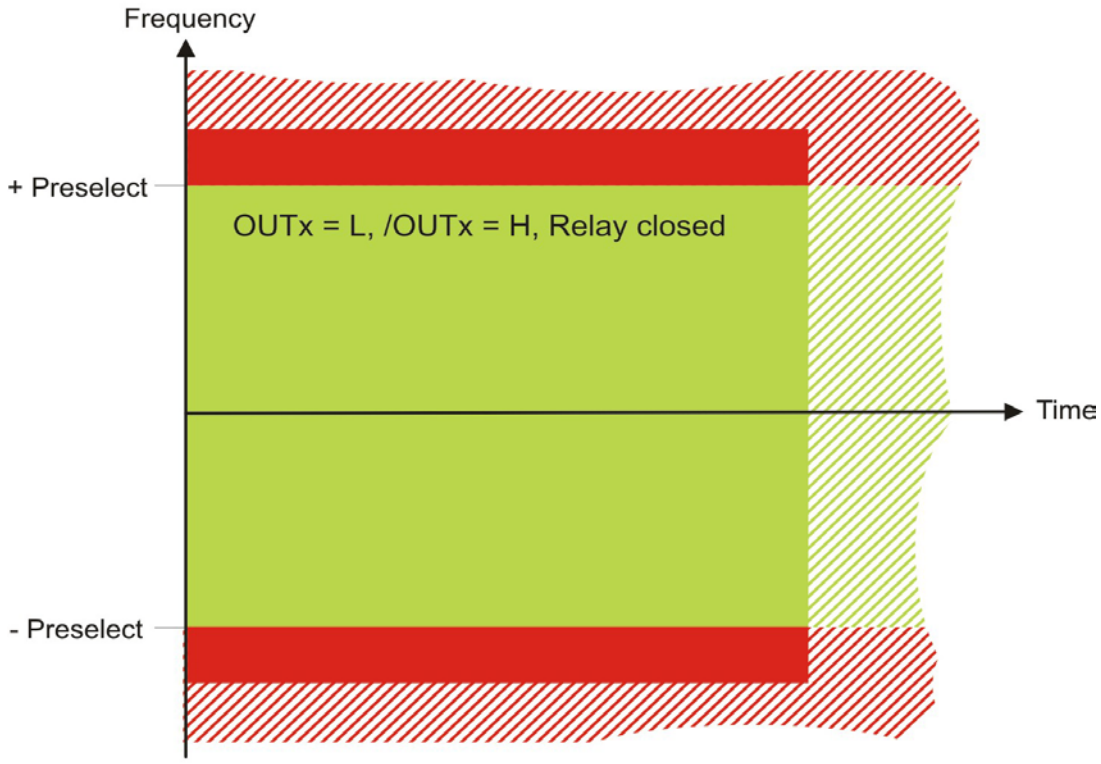
11. Monitoring Functions

The monitoring functions are used to set the properties of digital outputs and relay output.

11.1. Overspeed (Switch Mode = 0)

With parameter setting “Switch Mode” = 0, the frequency is monitored for overspeed.
The function is always active and independent of the direction of rotation. The switching point for overspeed is always at Frequency = Preselect (no matter if with or without hysteresis).

Relevant Parameters	Remark
Switch Mode XXXX	= 0
Pulse Time XXXX	statically = 0 or pulse duration in x seconds
Hysteresis XXXX	hysteresis
Lock Output	lock function
Output Mode	homogenous or inverse output configuration (affects the Safety Integrity Level SIL)
Preselect XXX.L/H	switching point
IN Function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions



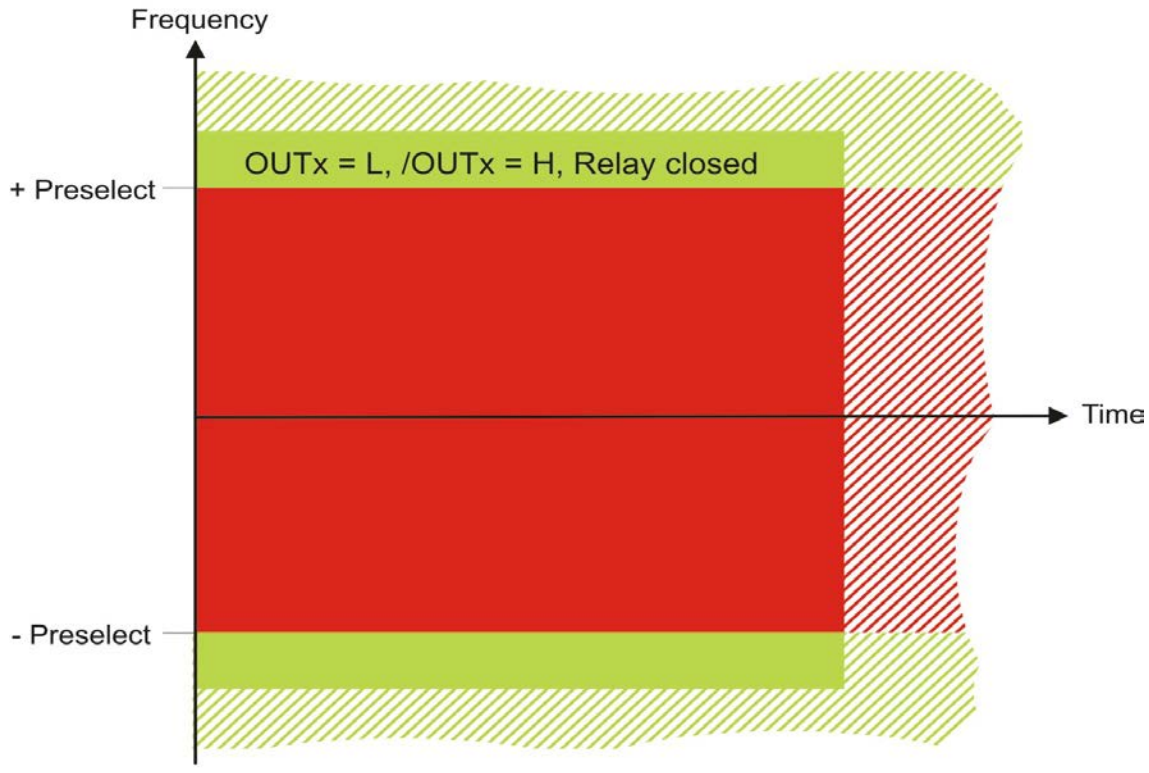
Relevant input functions	Remark
Clear lock function (function: 1-6)	when lock function is active only
Toggle switching points (function: 13)	When commutation is active only

Example:
With Preselect = 1000.0 Hz and Hysteresis = 10 %, frequencies $|f| \geq 1000$ Hz are detected as overspeed. The overspeed output will be cleared with frequencies $|f| < 900$ Hz.

11.2. Underspeed (Switch Mode = 1)

With parameter setting “Switch Mode” = 1, the frequency is monitored for underspeed.
The function is always active and independent of the direction of rotation. The switching point for underspeed is always at Frequency = Preselect (no matter if with or without hysteresis).

Relevant Parameters	Remark
Switch Mode XXXX	= 1
Pulse Time XXXX	statically = 0 or pulse duration in x seconds
Hysteresis XXXX	hysteresis
Startup Mode	type of start-up-delay
Startup Output	assignment of the outputs for start-up delay
Lock Output	lock function
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
Preselect XXX. L/H	switching point
IN function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions



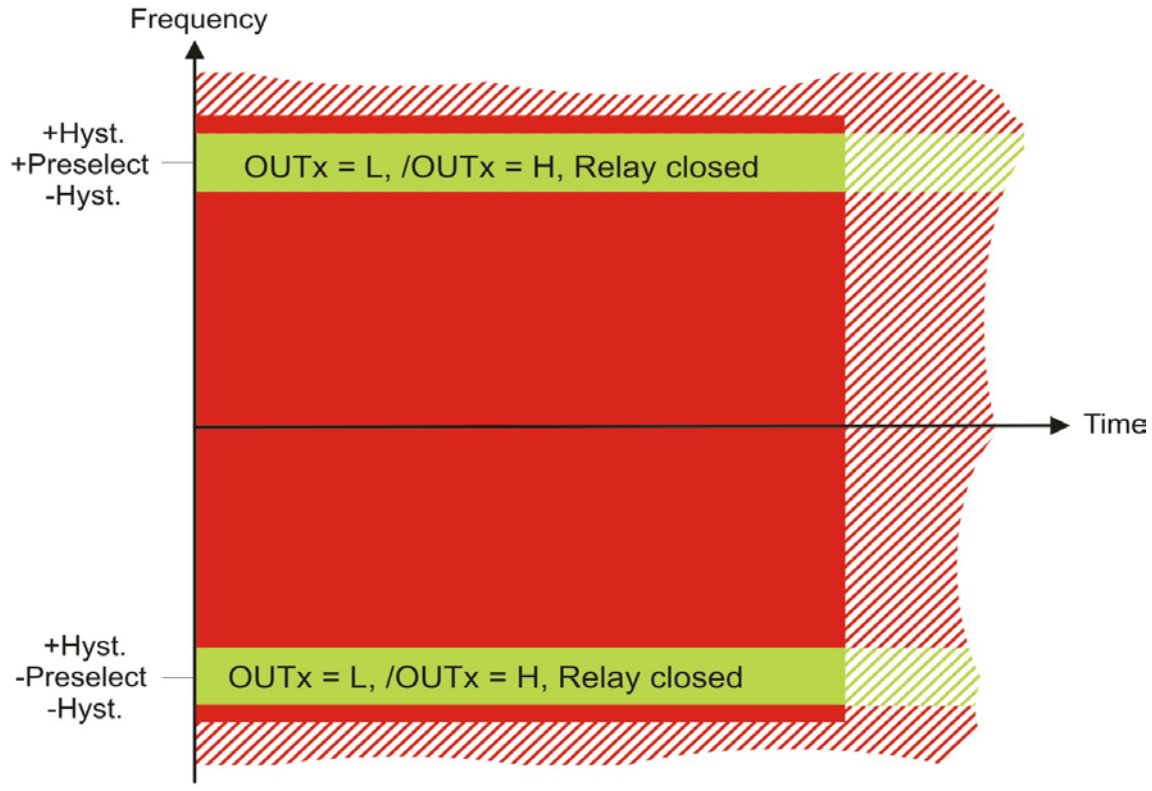
Relevant input functions	Remark
Clear lock function (function: 1-6)	when lock function is active only
Toggle switching points (function: 13)	When commutation is active only

Example:
With Preselect = 1000.0 Hz and Hysteresis = 10 %, frequencies |f| < 1000 Hz are detected as underspeed. The underspeed output will be cleared with frequencies |f| > 1100 Hz.

11.3. Frequency Band (Switch Mode = 2)

With parameter setting “Switch Mode” = 2, the frequency is monitored within a frequency band. The function is always active and independent of the direction of rotation. The switching points of the band are located at Preselect +/- Hysteresis.

Relevant Parameters	Remark
Switch Mode XXXX	= 2
Pulse Time XXXX	statically = 0 or pulse duration in x seconds
Hysteresis XXXX	+/- range (center)
Startup Mode	type of start-up delay
Startup Output	output assignment for start-up delai
Lock Output	lock function
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
Preselect XXX. L/H	center
IN function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions



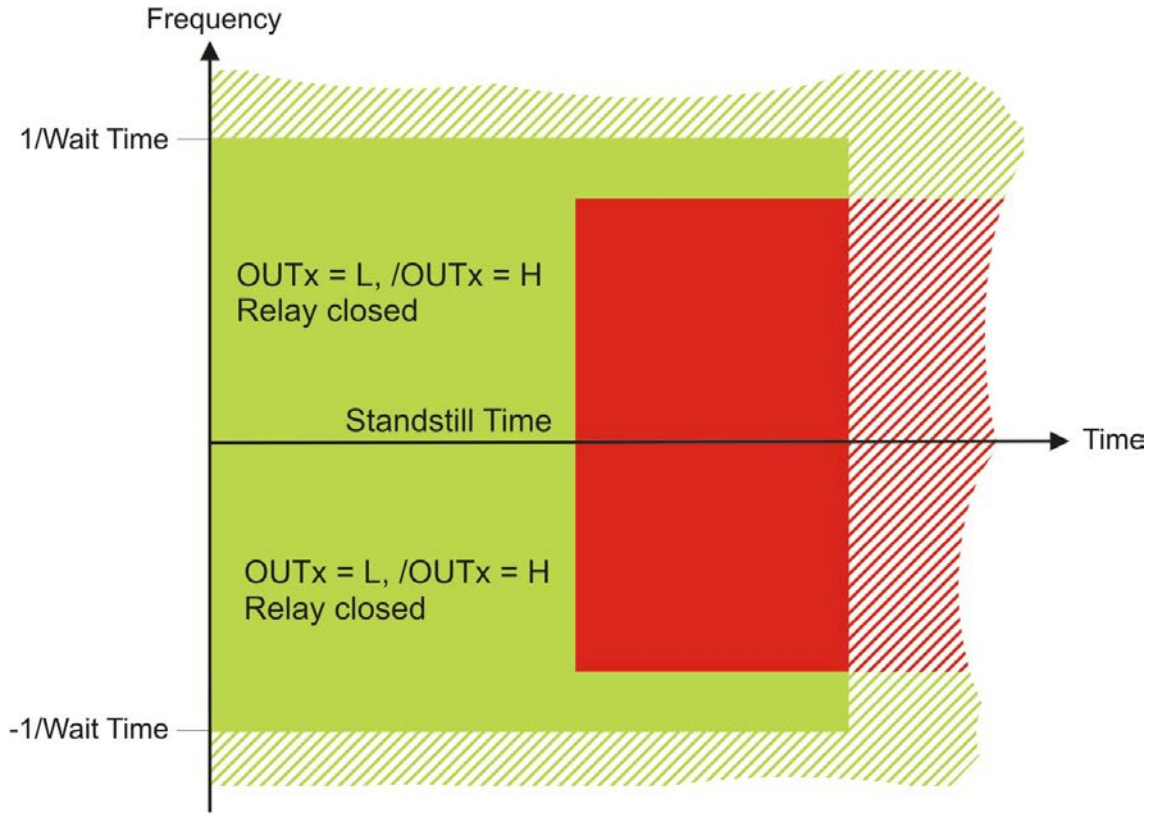
Relevant input functions	Remark
Clear lock function (function: 1-6)	when lock function is active only
Toggle switching points (function: 13)	when commutation is active only

Example:
With Preselect = 1000.0 Hz and Hysteresis = 10 %, frequencies |f| < 900 Hz are detected as underspeed and frequencies |f| > 1100 Hz as overspeed.

11.4. Standstill (Switch Mode = 3)

With parameter setting “Switch Mode” = 3, the frequency is monitored for standstill. The function is always active. The output is set after detection of frequency 0 Hz and expiration of the standstill time. When a frequency different from zero is detected, the output will be reset. Parameter “Wait Time” determines the threshold under which a frequency is taken as zero.

Relevant Parameters	Remark
Switch Mode XXXX	= 3
Pulse Time XXXX	statically = 0 or pulse duration in x seconds
Standstill Time	standstill time in x seconds
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)



Relevant input functions	Remark
none	none

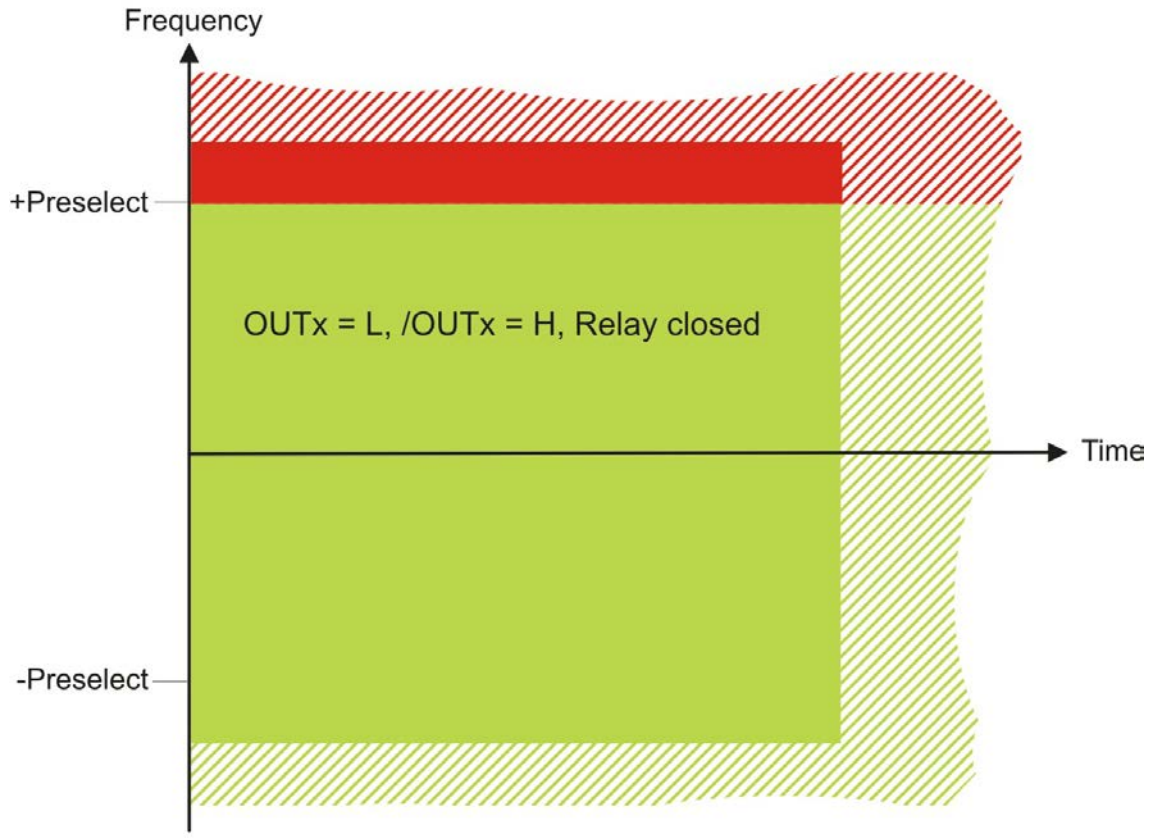
Example:

With a Wait Time setting of 0.01 seconds, all frequencies < 100 Hz will be taken as zero (f = 0).
The expiration of Standstill Time starts as soon both channels report 0 Hz. When this time has expired and both frequencies are still 0 Hz, the standstill output will be set. As soon one of the two frequencies becomes different from zero again, the standstill output will be reset.

11.5. Overspeed (Switch Mode = 4)

With parameter setting “Switch Mode” = 4, the frequency is monitored for overspeed.
The function is always active and considers the direction of rotation. The switching point for overspeed is always at Frequency = Preselect (no matter if with or without hysteresis).

Relevant Parameters	Remark
Switch Mode XXXX	= 4
Pulse Time XXXX	statically = 0 or pulse duration in x seconds
Hysteresis XXXX	hysteresis
Lock Output	lock function
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
Preselect XXX. L/H	switching point
IN function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions



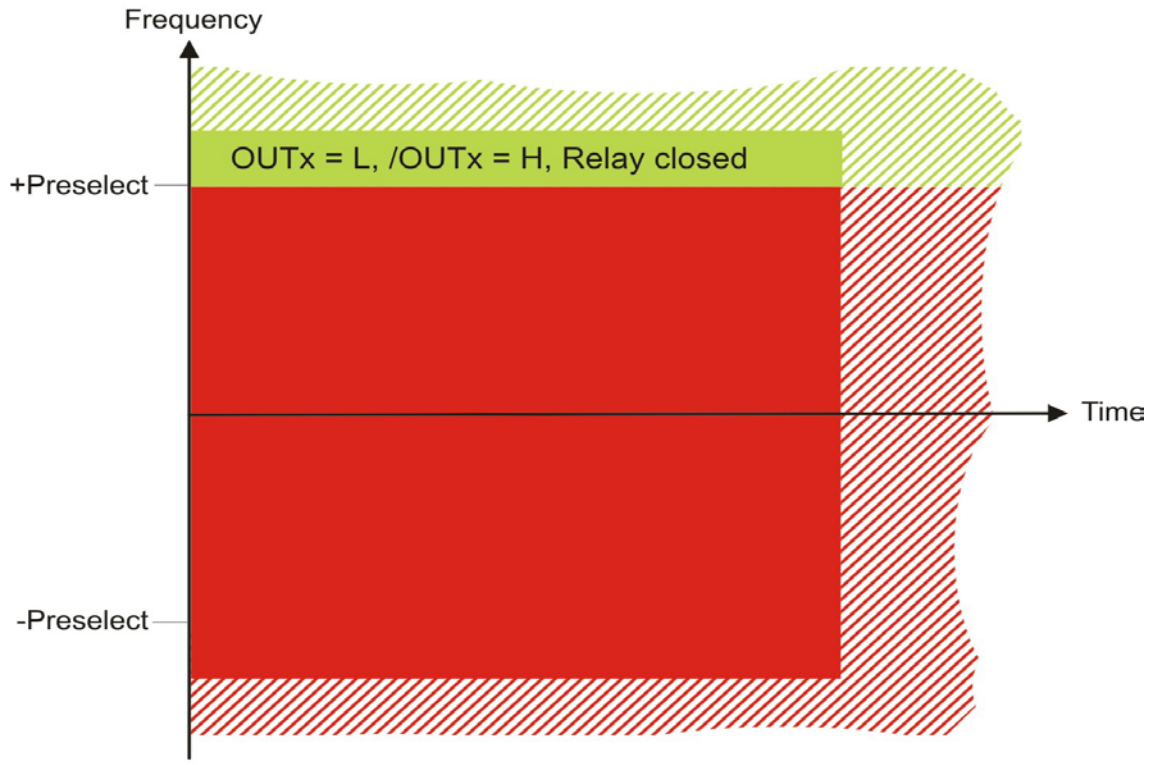
Relevant input functions	Remark
Clear lock function (function: 1-6)	when lock function is active only
Toggle switching points (function: 13)	when commutation is active only

Example:
With Preselect = 1000.0 Hz and Hysteresis = 10 %, Frequencies f ≥ 1000 Hz are declared as overspeed.
The overspeed output will be cleared with frequencies f < 900 Hz.

11.6. Underspeed (Switch Mode = 5)

With parameter setting “Switch Mode” = 5, the frequency is monitored for underspeed.
The function is always active and considers the direction of rotation. The switching point for underspeed is always at Frequency = Preselect (no matter if with or without hysteresis).

Relevant Parameters	Remark
Switch Mode XXXX	= 5
Pulse Time XXXX	statically = 0 or pulse duration in x seconds
Hysteresis XXXX	hysteresis
Startup Mode	type of start-up delay
Startup Output	output assignment for start-up delay
Lock Output	lock function
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
Preselect XXX. L/H	switching point
IN function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions



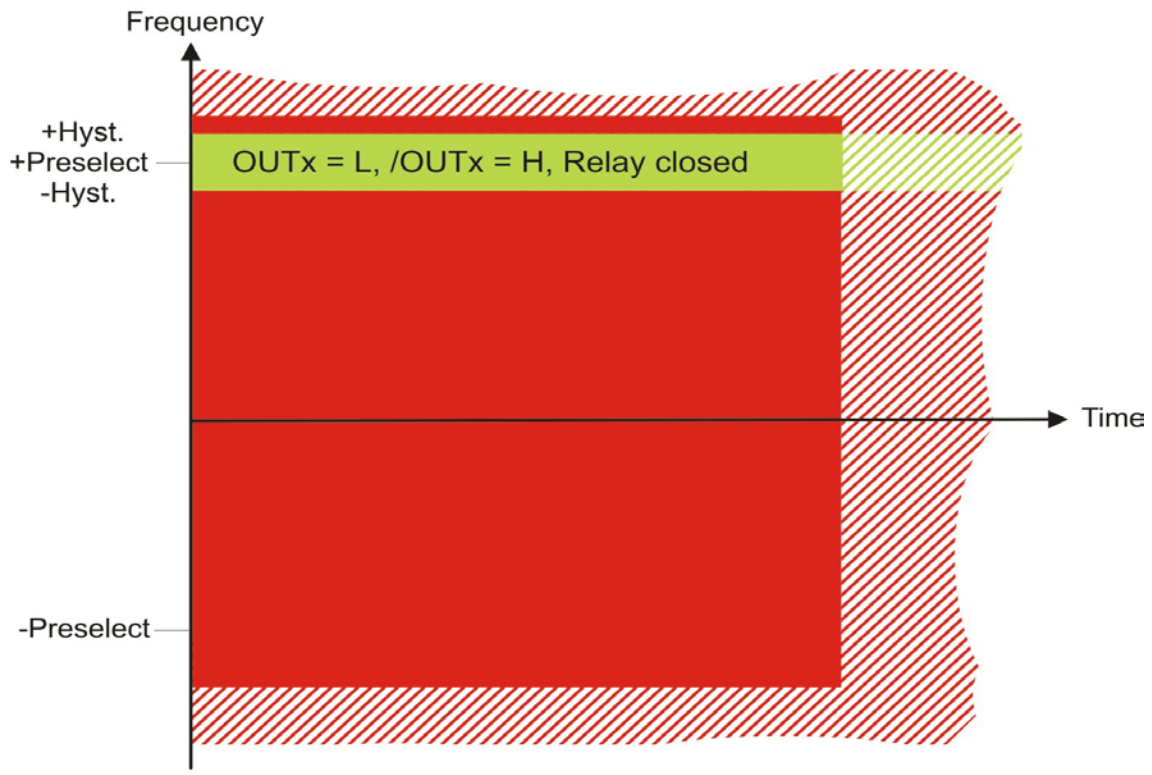
Relevant input functions	Remark
Clear lock function (function: 1-6)	when lock function is active only
Toggle switching points (function: 13)	when commutation is active only

Example:
With Preselect = 1000.0 Hz and Hysteresis = 10 %, frequencies f < 1000 Hz are declared as underspeed.
The underspeed output will be cleared with frequencies f > 1100 Hz.

11.7. Frequency Band (Switch Mode = 6)

With parameter setting “Switch Mode” = 6, the frequency is monitored within a frequency band. The function is always active. The switching positions inside the frequency band are at Preselect +/- Hysteresis.

Relevant Parameters	Remark
Switch Mode XXXX	= 6
Pulse Time XXXX	statically = 0 or pulse duration in x seconds
Hysteresis XXXX	+/- range (center)
Startup Mode	type of start-up delay
Startup Output	output assignment for start-up delay
Lock Output	lock function
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
Preselect XXX. L/H	center
IN function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions



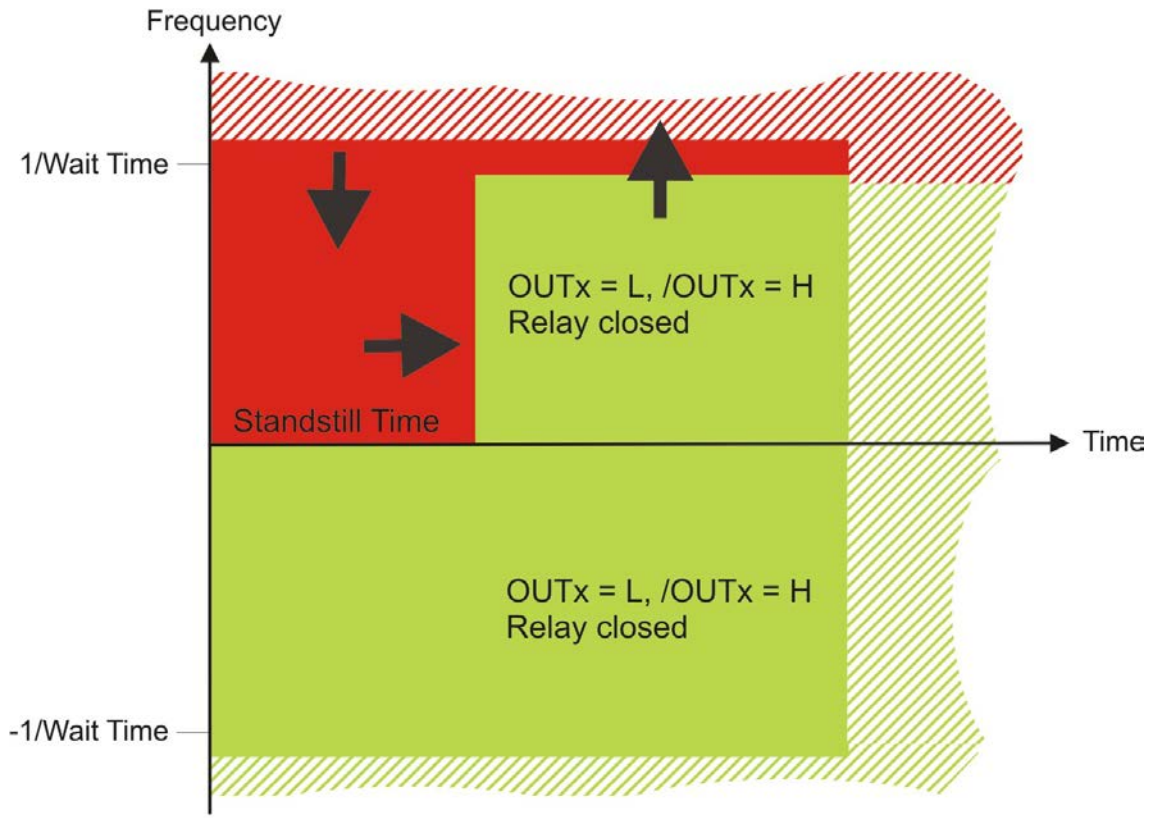
Relevant input functions	Remark
Clear lock function (function: 1-6)	when lock function is active only
Toggle switching points (function: 13)	when commutation is active only

Example:
With Preselect = 1000.0 Hz and Hysteresis = 10 %, frequencies f < 900 Hz are declared as underspeed and frequencies f > 1100 Hz as overspeed.

11.8. Frequency > 0 Hz (Switch Mode = 7)

With parameter setting “Switch Mode” = 7, the direction of the frequency is monitored. The function is always active. With positive frequencies (f > 0 Hz), the output is set to ON. The output will reset with negative frequencies (f < 0 Hz) or with standstill (f = 0 Hz) after expiration of the Standstill Time.

Relevant Parameters	Remark
Switch Mode XXXX	= 7
Pulse Time XXXX	statically = 0 or pulse duration in x seconds
Standstill Time	standstill time in seconds
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)



Relevant input functions	Remark
none	none

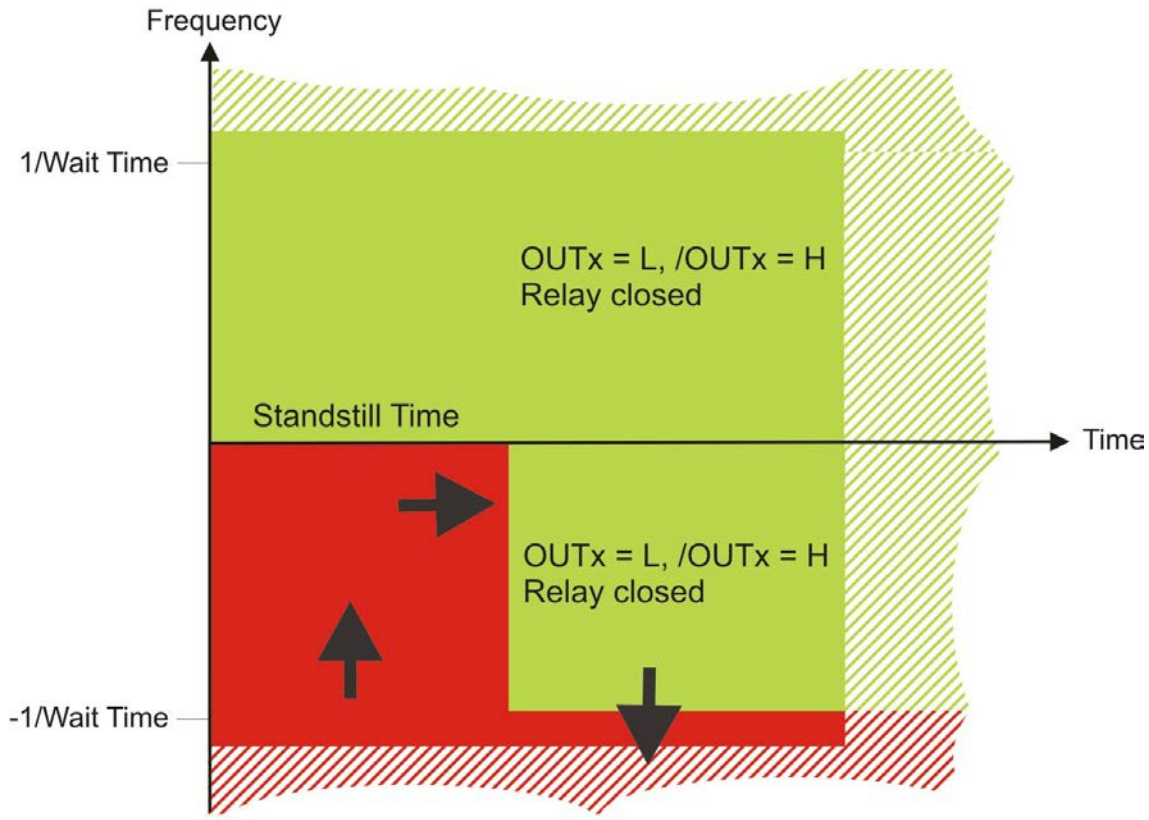
Example:

The transition from a negative to a positive frequency will cause an immediate change of the output state. Only in case of a transition from a positive frequency to zero, the output will not change before Standstill Time has elapsed.

11.9. Frequency < 0 Hz (Switch Mode = 8)

With parameter setting “Switch Mode” = 8, the direction of the frequency is monitored. The function is always active. With negative frequencies (f < 0 Hz), the output is set to ON. The output will reset with positive frequencies (f > 0 Hz) or with standstill (f = 0 Hz) after expiration of the Standstill Time.

Relevant Parameters	Remark
Switch Mode XXXX	= 8
Pulse Time XXXX	statically = 0 or pulse duration in x seconds
Standstill Time	standstill time in seconds
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)



Relevant input functions	Remark
none	none

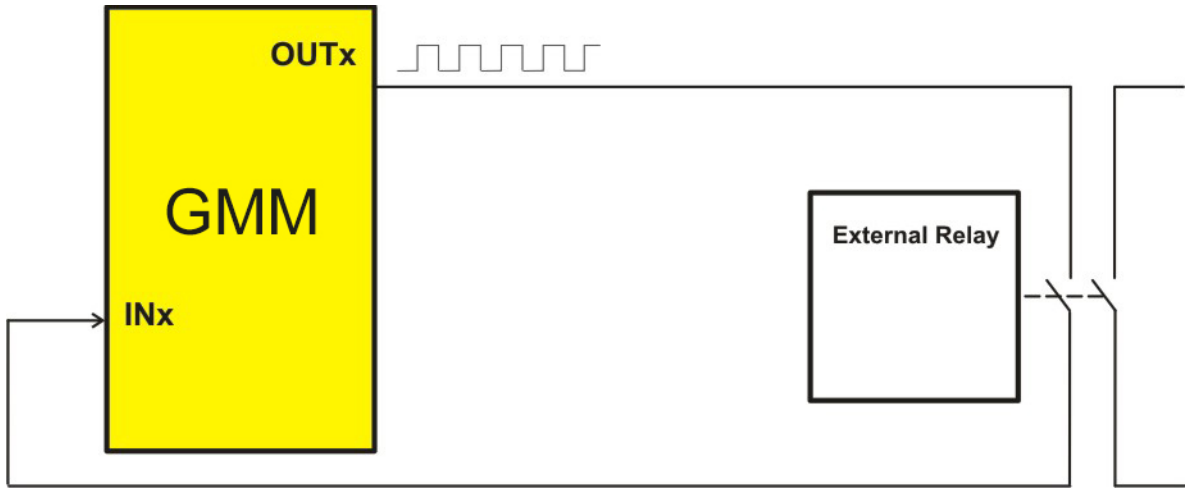
Example:

The transition from a positive to a negative frequency will cause an immediate change of the output state. Only in case of a transition from a negative frequency to zero, the output will not change before Standstill Time has elapsed.

11.10. Clock Generation for Pulsed Readback (Switch Mode = 9)

With parameter setting “Switch Mode” = 9, the output supplies a clock or an inverted clock with a specific frequency. The Output Mode of the output in use must be set to zero. Clock outputs provide different output frequencies. This function is used to monitor the readback contacts of an external relay (see EDM function).

Relevant Parameters	Remark
Switch Mode XXXX	= 9
Output Mode	= 0 for this output (inverse configuration)

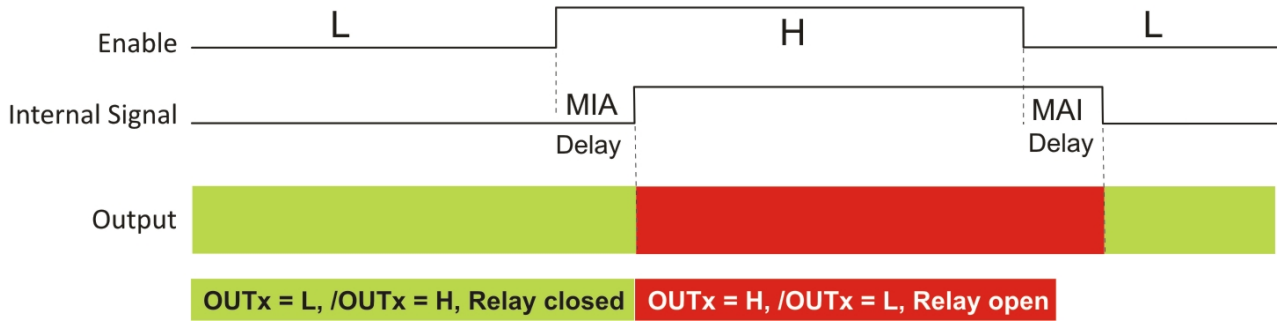


11.11. STO/SBC/SS1 by Input (Switch Mode = 10)

With parameter setting “Switch Mode” = 10, an STO, SBC or SS1 function is assigned to the output. The function requires an enable input signal which is assigned by the Matrix parameter. Parameter “Lock Output” can be used to activate a lock function, which can be acknowledged by a further input. Acknowledgement is only possible with deactivated enable signal. There is no frequency or ramp monitoring.

Relevant Parameters	Remark
Switch Mode XXXX	= 10
Matrix XXXX	use only inputs, but no feedback outputs
MIA-Delay XXXX	= 0
MAI-Delay XXXX	= 0
Lock Output	for lock function use only range 0-31
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
IN Function	Input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions

STO/SBC Function: Without Selfhold Function and with static high Enable Input



Relevant input functions	Remark
Enable (Function: 21)	activates the function
Clear lock function (function: 1-6)	when lock function is active only

Important: A safety function will not be achieved before the GMM230S monitor has been combined with a corresponding actuator unit.

11.12. STO/SBC Produced by Situation (Switch Mode = 10)

If an STO should e.g. be triggered by overspeed, a second feedback output, configured as overspeed can be used as enable input (parameter "Matrix XXXX"). One of the two functions requires a lock function.

Relevant Parameters	Remark
Switch Mode XXXX	= 10
Matrix XXXX	**feedback output**
MIA-Delay XXXX	= 0 (can also be set according to need)
MAI-Delay XXXX	= 0 (can also be set according to need)
Lock Output	for lock function use only range 0-31
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
IN Function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions

Relevant input functions	Remark
Enable (Function: 21)	activates the function
Clear lock function (function: 1-6)	when lock function is active only

11.13. SS1 Produced by Input (Switch Mode = 10)

An SS1 function can be achieved when the STO function is provided with a MIA Delay. After this safe delay time an STO will be triggered. In this case a lock function must be activated. In case the Enable signal should be reset during the delay period, the output will not trigger. There is no frequency or ramp monitoring.

Relevant Parameters	Remark
Switch Mode XXXX	= 10
Matrix XXXX	use only inputs, but no feedback outputs
MIA-Delay XXXX	**delay time**
MAI-Delay XXXX	= 0 (can also be set according to need)
Lock Output	for lock function use only range 0-31
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
IN Function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions

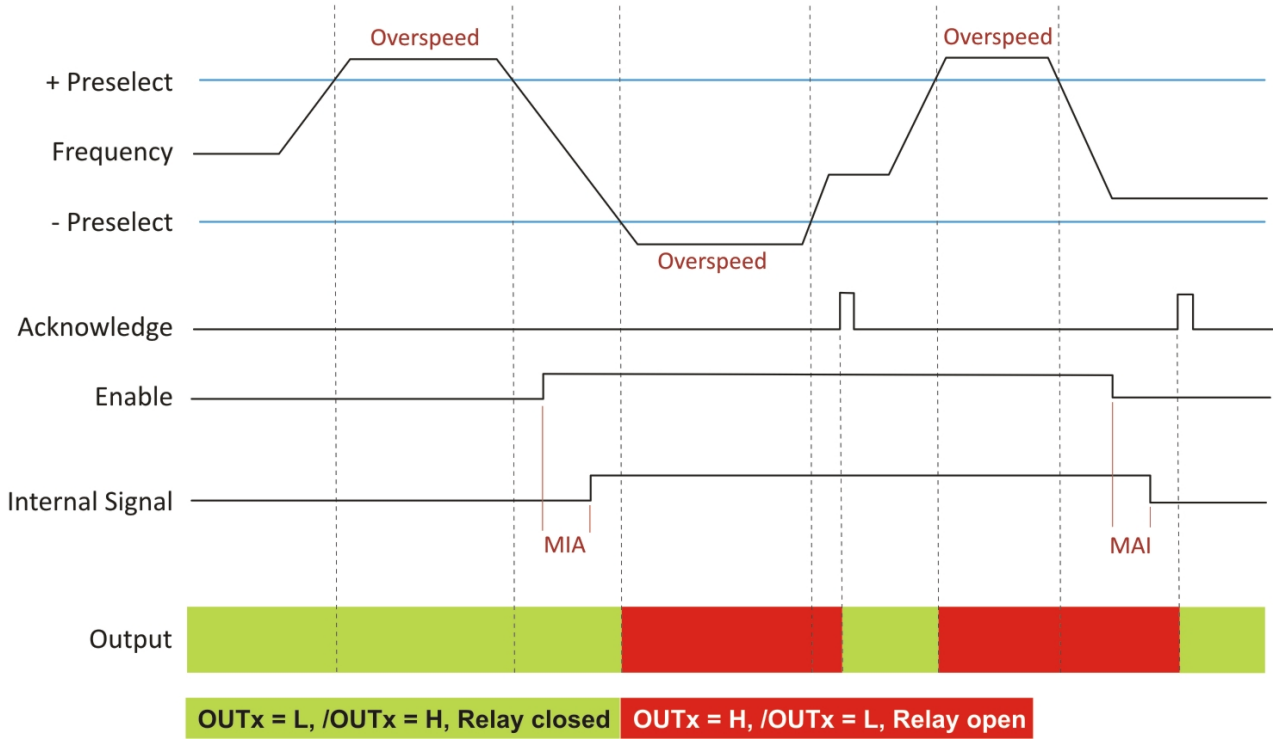
Relevant input functions	Remark
Enable (Function: 21)	activates the function
Clear lock function (function: 1-6)	when lock function is active only

11.14. SLS Produced by Input (Switch Mode = 11)

With parameter setting “Switch Mode” = 11, an SLS function is assigned to the output. The function is triggered, independent of the direction of rotation, at overspeed. The function requires an enable input signal which must be assigned by parameter Matrix.
A lock function is already implemented and does not need to be set separately. The lock function can be acknowledged by a further input. Acknowledgement is only possible with frequencies below overspeed, or with the enable signal deactivated. No ramp monitoring is available.

Relevant Parameters	Remark
Switch Mode XXXX	= 11
Matrix XXXX	use only inputs, but no feedback outputs
MIA-Delay XXXX	= 0 (can also be set according to need)
MAI-Delay XXXX	= 0 (can also be set according to need)
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
Preselect XXX. L/H	switching point
IN Function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions

SLS Function: with static high Enable Input



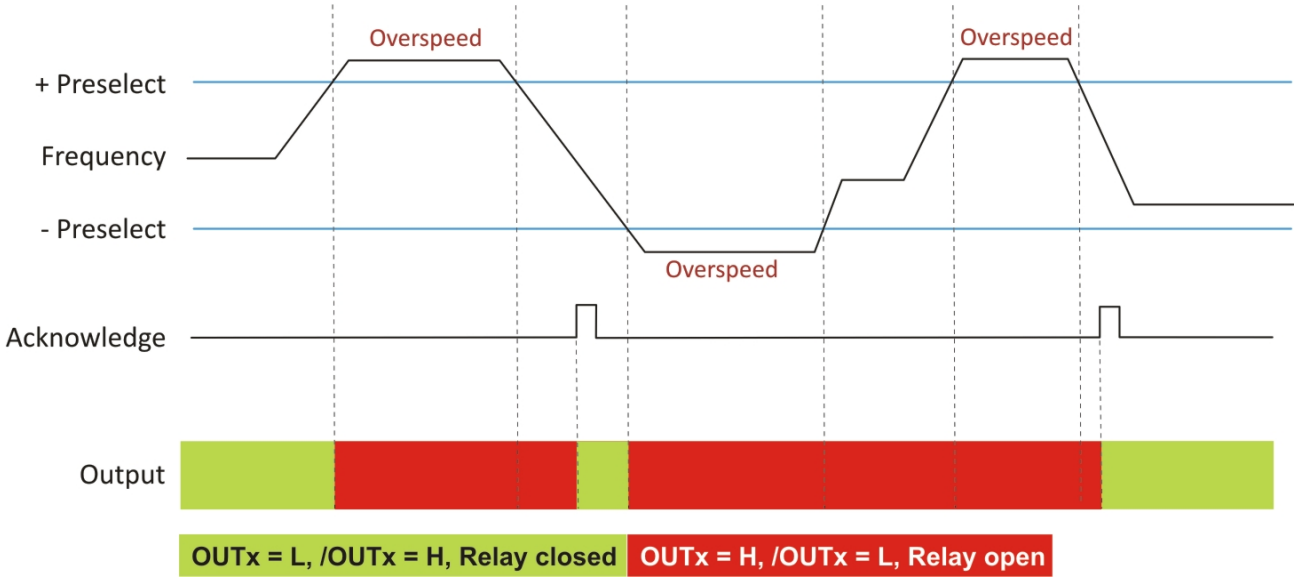
Relevant input functions	Remark
Enable (Function: 21)	activates the function
Clear lock function (function: 1-6)	activates the function

11.15. SMS (Switch Mode = 12)

With parameter setting “Switch Mode” = 12, an SMS function is assigned to the output. The function is triggered, independent of the direction of rotation, at overspeed.
A lock function is already implemented and does not need to be set separately. The lock function can be acknowledged by a further input. Acknowledgement is only possible with frequencies below overspeed. No ramp monitoring is available.

Relevant Parameters	Remark
Switch Mode XXXX	= 12
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
Preselect XXX. L/H	switching point
IN Function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions

SMS Function: No Enable Signal



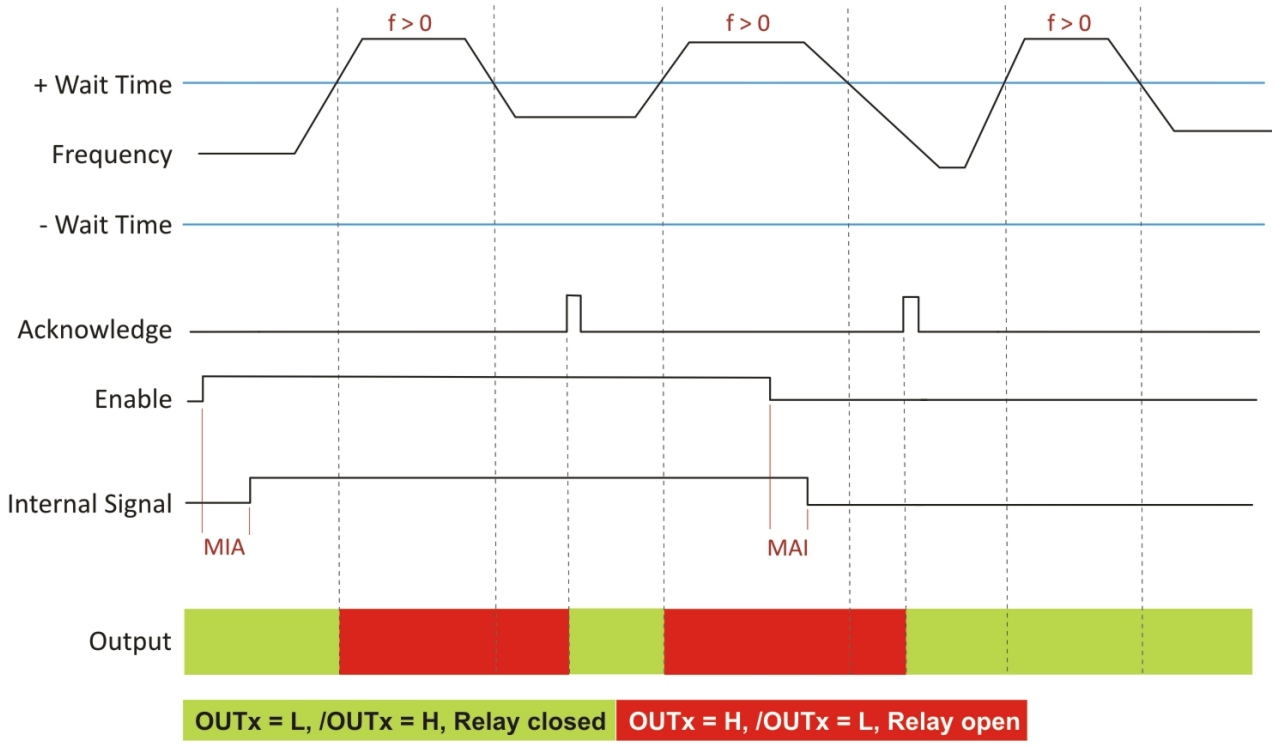
Relevant input functions	Remark
Clear lock function (function: 1-6)	activates the function

11.16. SDI Produced by Input (f > 0 Hz), (Switch Mode = 13)

With parameter setting “Switch Mode” = 13, an SDI function is assigned to the output. The function is triggered with positive frequency. A lock function is already implemented and does not need to be set separately. The lock function can be acknowledged by a further input. An Acknowledgement is only possible with frequencies lower than or equal to 0 Hz (f ≤ 0 Hz) or with the Enable signal deactivated. The SDI function refers to evaluation of frequency, but not of the position.

Relevant Parameters	Remark
Switch Mode XXXX	= 13
Wait Time	reset time
Matrix XXXX	use only inputs, but no feedback outputs
MIA-Delay XXXX	= 0 (can also be set according to need)
MAI-Delay XXXX	= 0 (can also be set according to need)
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
IN Function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions

SDI Function: with static high Enable Input



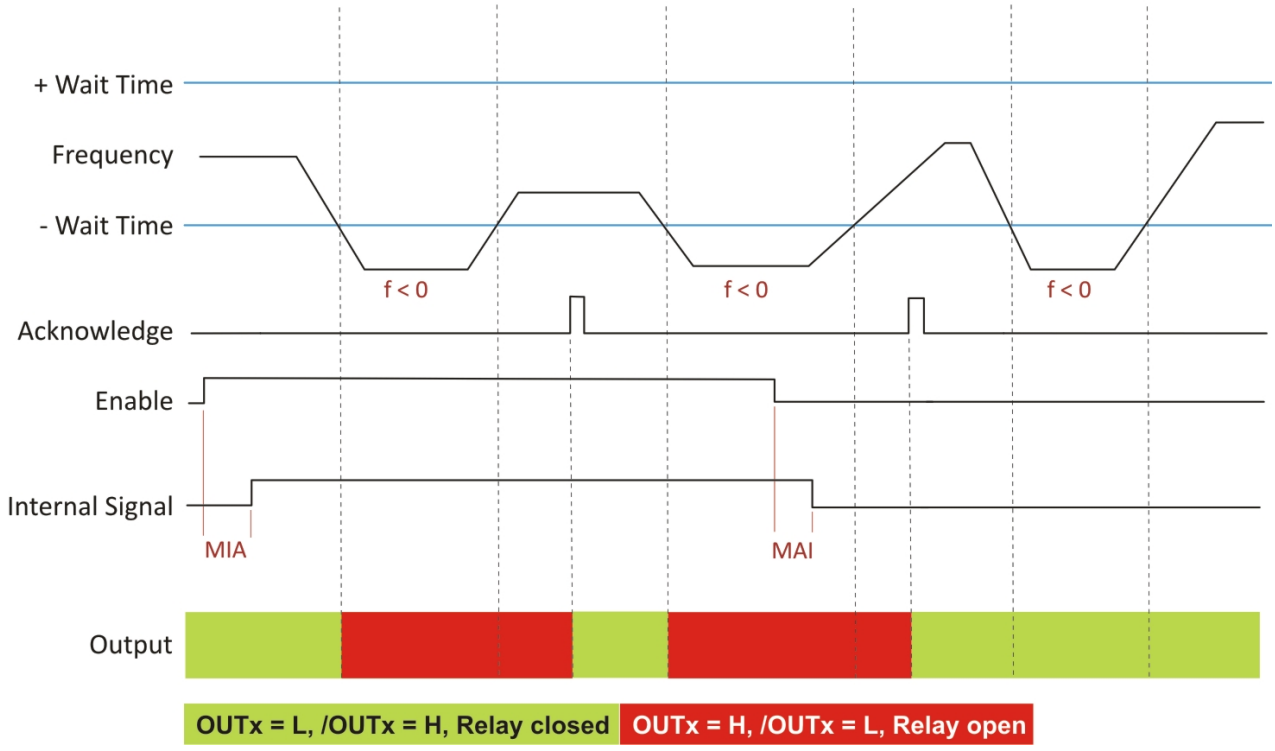
Relevant input functions	Remark
Enable (Function: 21)	activates the function
Clear lock function (function: 1-6)	activates the function

11.17. SDI Produced by Input (f < 0 Hz) (Switch Mode = 14)

With parameter setting “Switch Mode” = 14, an SDI function is assigned to the output. The function is triggered with negative frequency. A lock function is already implemented and does not need to be set separately. The lock function can be acknowledged by a further input. An Acknowledgement is only possible with frequencies higher than or equal to 0 Hz (f ≥ 0 Hz), or with the Enable signal deactivated. The SDI function refers to evaluation of frequency, but not of the position.

Relevant Parameters	Remark
Switch Mode XXXX	= 14
Wait Time	reset time
Matrix XXXX	use only inputs, but no feedback outputs
MIA-Delay XXXX	= 0 (can also be set according to need)
MAI-Delay XXXX	= 0 (can also be set according to need)
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
IN Function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions

SDI Function: with static high Enable Input



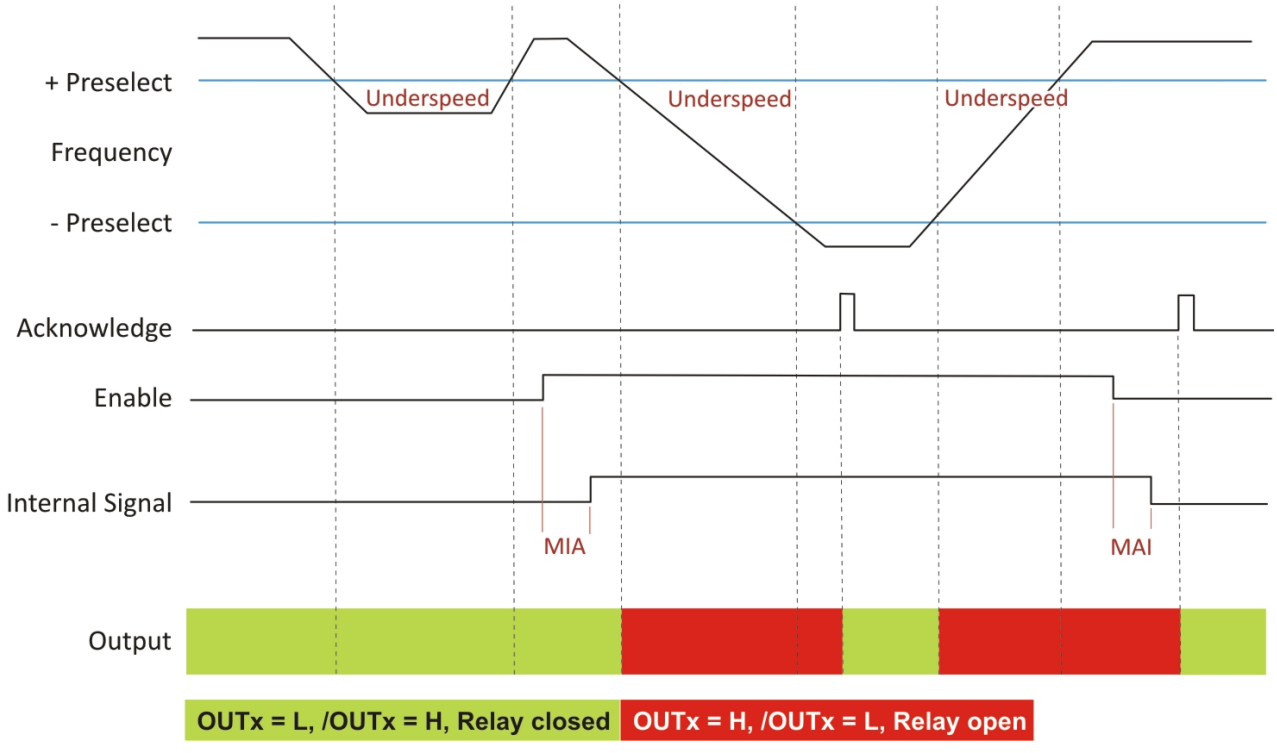
Relevant input functions	Remark
Enable (Function: 21)	activates the function
unlock lock function (function: 1-6)	activates the function

11.18. SSM via Input (Switch Mode = 15)

With parameter setting “Switch Mode” = 15, an SSM function is assigned to the output. The function is triggered by underspeed, independent of the direction of rotation. The function requires an enable input signal which must be assigned by parameter Matrix.
A lock function can be set separately, which can be acknowledged by a further input.
Acknowledgement is only possible with frequencies higher than underspeed, or with the enable signal deactivated.

Relevant Parameters	Remark
Switch Mode XXXX	= 15
Matrix XXXX	use only inputs, but no feedback outputs
MIA-Delay XXXX	= 0 (can also be set according to need)
MAI-Delay XXXX	= 0 (can also be set according to need)
Lock Output	for lock function use only range 0-31
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
Preselect XXX. L/H	switching point
IN Function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions

SSM Function: with static high Enable Input



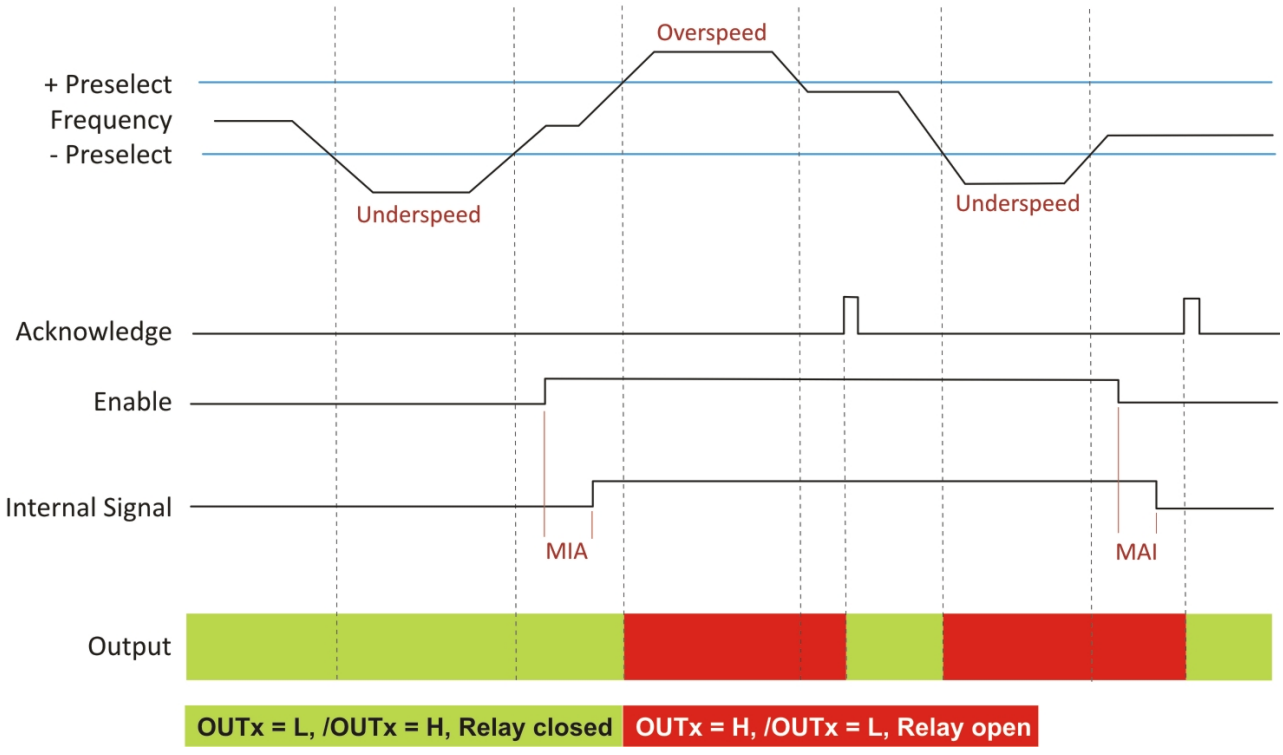
Relevant input functions	Remark
Enable (Function: 21)	activates the function
Clear lock function (function: 1-6)	when lock function is active only

11.19. SSM via Input (Switch Mode = 16)

With parameter setting “Switch Mode” = 16, an SSM function is assigned to the output. The function is triggered when the frequency leaves the frequency band, independent of the direction of rotation. The function requires an enable input signal which must be assigned by parameter Matrix. A lock function can be set separately, which can be acknowledged by a further input. Acknowledgement is only possible with frequencies inside the frequency band, or with the enable signal deactivated.

Relevant Parameters	Remark
Switch Mode XXXX	= 16
Hysteresis XXXX	+/- range (center)
Matrix XXXX	use only inputs, but no feedback outputs
MIA-Delay XXXX	= 0 (can also be set according to need)
MAI-Delay XXXX	= 0 (can also be set according to need)
Lock Output	for lock function use only range 0-31
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
Preselect XXX. L/H	center
IN Function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions

SSM Function: with static high Enable Input

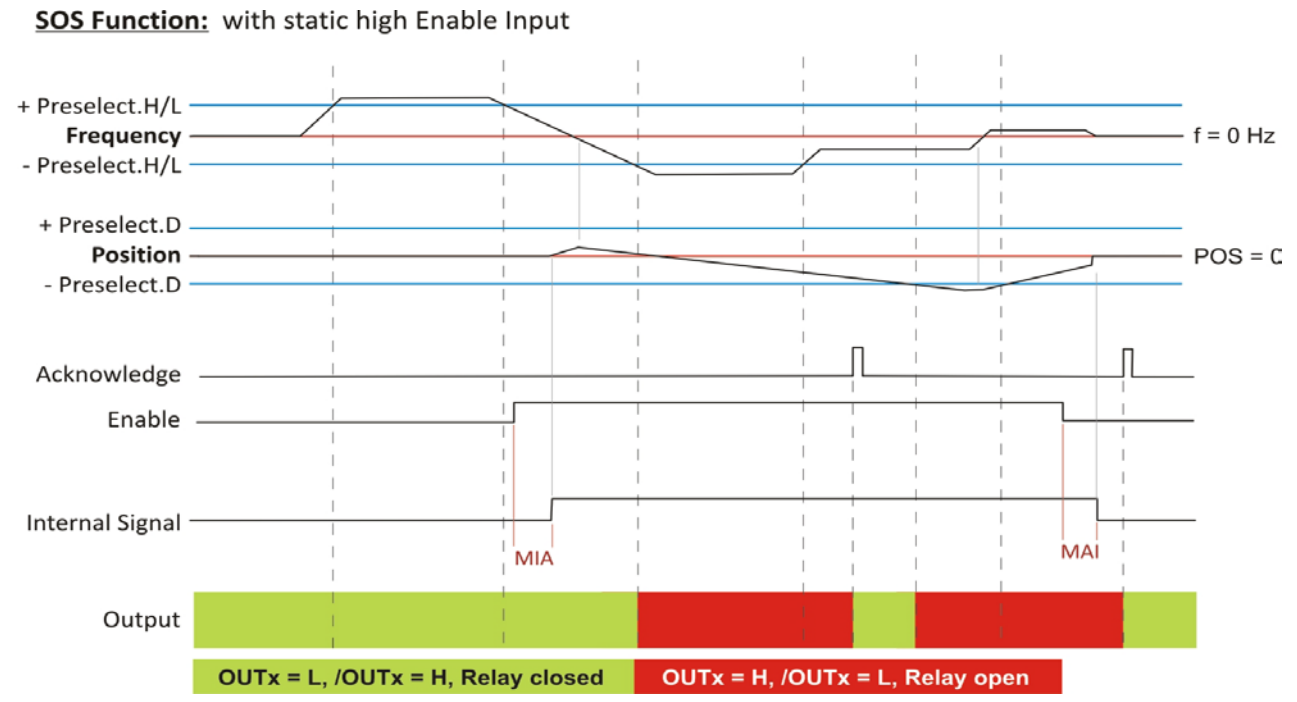


Relevant input functions	Remark
Enable (Function: 21)	activates the function
Clear lock function (function: 1-6)	when lock function is active only

11.20. SOS/SLI/SS2 via Input (Switch Mode = 17)

With parameter setting “Switch Mode” = 17, an SOS/SLI/SS2 function is assigned to the output. This function will be triggered by overspeed or by position error, with no regard of the direction of rotation. An enable input signal is required, which can be assigned by the Matrix parameter. A lock function is already implemented and does not need to be set separately. The lock function can be acknowledged by a further input. Acknowledgement is only possible with frequencies lower than overspeed, or with the enable signal deactivated. By switching the enable signal from inactive to active, the current position is adopted for error evaluation. SLI and SOS are different with regard to the level of the switching points only. While SLI corresponds to a monitored Jog operation, SOS provides standstill monitoring. A position error can be acknowledged only by disabling the Enable signal. Any SOS function with MIA Delay unequal to zero will turn to an SS2 function.

Relevant Parameters	Remark
Switch Mode XXXX	= 17
Matrix XXXX	use only inputs, but no feedback outputs
MIA-Delay XXXX	= 0 (can also be set according to need, **SS2**)
MAI-Delay XXXX	= 0 (can also be set according to need)
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
Preselect XXX. D	switching point for position
Preselect XXX. L/H	switching point for overspeed
IN Function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions

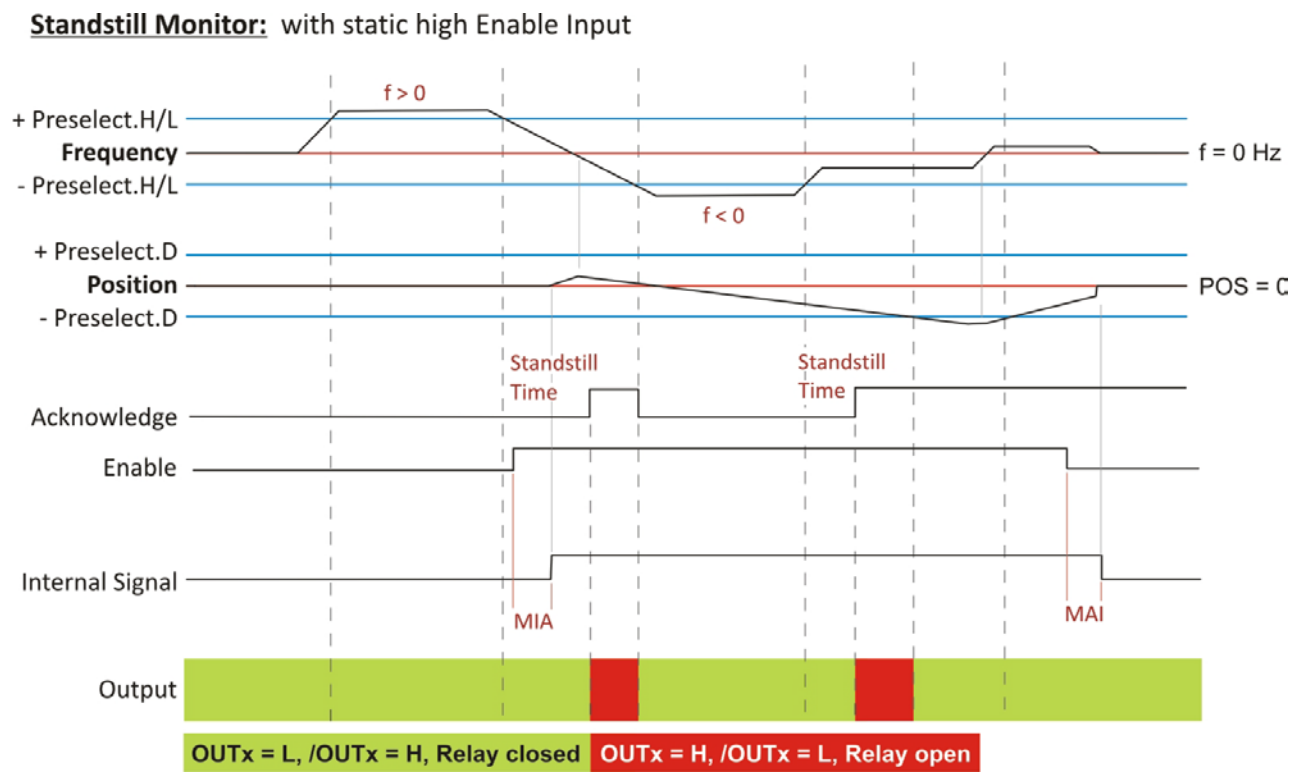


Relevant input functions	Remark
Enable (Function: 21)	activates the function
Clear lock function (function: 1-6)	activates the function

11.21. Standstill via Input (Switch Mode = 18)

With parameter setting “Switch Mode” = 18, a standstill function is assigned to the output. The function is triggered at standstill. The function requires an enable input signal which can be assigned by parameter Matrix. There is no lock function implemented. By switching the enable signal from inactive to active, the current position will be adopted for error evaluation. The output is set after Standstill Time has elapsed. In case of a position error, or with a frequency unequal to zero, the output will reset. Position errors can be cleared only by deactivation of the Enable signal.

Relevant Parameters	Remark
Switch Mode XXXX	= 18
Wait Time	reset time
Matrix XXXX	use only inputs, but no feedback outputs
MIA-Delay XXXX	= 0 (can also be set according to need)
MAI-Delay XXXX	= 0 (can also be set according to need)
Output Mode	homogenous or inverse (affects the Safety Integrity Level SIL)
Preselect XXX. D	switching point for position
Standstill Time	time (sec.)
IN Function	input function
IN Config	switching behavior (dynamically, statically)
Input Mode	input configuration (affects the Safety Integrity Level SIL)
GPI Err Time	Max. permissible delay time during illegal conditions



Relevant input functions	Remark
Enable (Function: 21)	activates the function

11.22. Reserved (Switch Mode = 19)

This Switch Mode is reseved for factory tests.

11.23 No Standstill (Switch Mode = 20)

If the parameter „Switch Mode“ is set to 20, the functionality corresponds to the inverted Switch Mode = 3. The function is always active as in the Switch Mode = 3, but the output can only be set up statically.
With this function, the relay output is invertedly controlled to the Switch Mode=3, the relay is closed at standstill and opened for frequencies different to zero. The Standstill Time defines a delay before standstill is detected.

Relevant Parameters	Remark
Switch Mode XXXX	= 20
Pulse Time XXXX	Only statically = 0
Standstill Time	Standstill time in x seconds
Output Mode	homogenous or inverse output configuration (affects the Safety Integrity Level SIL)
Relevant Input function	**Remark**
no	no

12. Response times

12.1. Response Time of the Relay Output

Hardware delay of the relay itself: 50 ms (max.)

With normal monitoring of overspeed, underspeed or frequency band: (with frequency band please choose the lower frequency, since this produces more delay)	
2 x Sampling Time + 25 ms	for frequencies > 1 / Sampling Time
e.g. f = 10 kHz, Sampling Time = 1 ms	10 kHz > 1 kHz -> delay = 27 ms
2 x 1/frequency + 25 ms	for frequencies < 1 / Sampling Time
e.g.. f = 100 Hz, Sampling Time = 1 ms	100 Hz < 1 kHz -> delay = 45 ms

With normal monitoring of standstill:	
2 x Wait Time + Standstill Time + 25 ms	for frequency = 0
e. g. Standstill Time = 0 ms, Wait Time = 100 ms	delay = 225 ms



These response times are based on a step function.
For this times, the parameter "Filter" is not regarded. If Filter is activated, Sampling Time or 1/frequency has to be multiplied by the factor x 5. (5 = a final value about 100% is reached, 3= a final value about 95% is reached).
With a system error (critical internal error) the response time will be 85 ms + 25 ms =110 ms (valid for versions 3B or higher)

12.2. Response Time of the Analog Output

Hardware delay of the analog output itself: 1 ms

With normal monitoring of overspeed, underspeed or frequency band: (with frequency band please choose the lower frequency, since this produces more delay)	
2 x Sampling Time + 1 ms e.g. f = 10 kHz, Sampling Time = 1 ms	for frequencies > 1 / Sampling Time 10 kHz > 1 kHz -> delay = 3 ms
2 x 1/frequency + 1 ms e.g. f = 100 Hz, Sampling Time = 1 ms	for frequencies < 1 / Sampling Time 100Hz < 1 kHz -> delay = 21 ms

With normal monitoring of standstill:	
2 x Wait Time + Standstill Time + 1 ms e.g. Standstill Time = 0, Wait Time = 100 m s	for frequency = 0 delay = 201 ms



These response times are based on a step function.
For this times, the parameter "Filter" is not regarded. If Filter is activated, Sampling Time or 1/frequency has to be multiplied by the factor x 5. (5 = a final value about 100% is reached, 3= a final value about 95% is reached).
With a system error (critical internal error) the response time will be 85 ms + 1 ms =86 ms (valid for versions 3B or higher)

12.3. Response Time of the Digital Outputs

Hardware delay of the digital output itself: 1 ms

With normal monitoring of overspeed, underspeed or frequency band: (with frequency band please choose the lower frequency, since this produces more delay)	
2 x Sampling Time + 1 ms	for frequencies > 1 / Sampling Time
e.g. f = 10 kHz, Sampling Time = 1 ms	10 kHz > 1 kHz -> delay = 3 ms
2 x 1/frequency + 1 ms	for frequencies < 1 / Sampling Time
e.g. f = 100 Hz, Sampling Time = 1 ms	100Hz < 1 kHz -> delay = 21 ms

With normal monitoring of standstill:	
2 x Wait Time + Standstill Time + 1 ms	for frequency = 0
e.g. Standstill Time = 0, Wait Time = 100 ms	delay = 201 ms



These response times are based on a step function.
For this times, the parameter "Filter" is not regarded. If Filter is abled, Sampling Time or 1/frequency has to multiplied by the factor x 5. (5 = a final value about 100% is reached, 3= a final value about 95% is reached).
With a system error (critical internal error) the response time will be 85 ms + 1 ms =86 ms (valid for versions 3B or higher)

12.4. Response Time of the Splitter Output:

Hardware delay of the splitter output itself: 1 ms



These response times are based on a step function.
With a system error (critical internal error) the response time will be 85 ms + 1 ms = 86 ms (valid for versions 3B or higher)

12.5. Response Time of the Frequency Error Evaluation

Response time with a sudden frequency drop:

Time calculations in the subsequent tables assume the following settings:
Sampling Time = 10 ms, Wait Time = 100 ms

Valid for versions 3B or higher:

- Use Sampling Time for the calculation when f > 1/Sampling Time
- Use reciprocal frequency 1/f when f < 1/Sampling Time



In addition to the delay times shown in the tables below, please add also the hardware delay time of the corresponding output (relay = 25 ms, analog output = 1 ms, digital output = 1 ms). The parameter Filter is excluded.

***) Calculated values for response times assume that "Sampling Time" would be greater than the reciprocal frequency 1/f.**

Div. Filter = 10	
With „Div. %-Value" = 10:	11 x (Sampling Time or (1/f)) + 1x Wait Time -> delay = 210 ms*)
With „Div. %-Value" = 20:	21 x (Sampling Time or (1/f)) + 1x Wait Time -> delay = 310 ms*)
With „Div. %-Value" = 30:	31 x (Sampling Time or (1/f)) + 1x Wait Time -> delay = 410 ms*)
With „Div. %-Value" = 40:	41 x (Sampling Time or (1/f)) + 1x Wait Time -> delay = 510 ms*)

Div. Filter = 5	
With „Div. %-Value" = 10:	5 x (Sampling Time or (1/f)) + 1x Wait Time -> delay = 150 ms*)
With „Div. %-Value" = 20:	10 x (Sampling Time or (1/f)) + 1x Wait Time -> delay = 200 ms*)
With „Div. %-Value" = 30:	15 x (Sampling Time or (1/f)) + 1x Wait Time -> delay = 250 ms*)
With „Div. %-Value" = 40:	21 x (Sampling Time or (1/f)) + 1x Wait Time -> delay = 310 ms*)

Div. Filter = 3	
With „Div. %-Value" = 10:	1 x (Sampling Time or (1/f)) + 1x Wait Time -> delay 110 ms*)
With „Div. %-Value" = 20:	2 x (Sampling Time or (1/f)) + 1x Wait Time -> delay 120 ms*)
With „Div. %-Value" = 30:	3 x (Sampling Time or (1/f)) + 1x Wait Time -> delay 130 ms*)
With „Div. %-Value" = 40:	5 x (Sampling Time or (1/f)) + 1x Wait Time -> delay 150 ms*)

Filtering effect with a frequency drop of 10 %	
Div. Filter = 3 and Div. %-Value = 10:	tripping after 9 x (Sampling Time or 1/f)
Div. Filter = 5 and Div. %-Value = 10:	tripping after 10 x (Sampling Time or 1/f)
Div. Filter = 10 and Div. %-Value = 10:	tripping after 10 x (Sampling Time or 1/f)

Filtering effect with a frequency drop of 20 %	
Div. Filter = 3 and Div. %-Value = 20:	tripping after 13 x (Sampling Time or 1/f)
Div. Filter = 3 and Div. %-Value = 10:	tripping after 4 x (Sampling Time or 1/f)
Div. Filter = 5 and Div. %-Value = 20:	tripping after 20 x (Sampling Time or 1/f)
Div. Filter = 5 and Div. %-Value = 10:	tripping after 10 x (Sampling Time or 1/f)
Div. Filter = 10 and Div. %-Value = 20:	tripping after 20 x (Sampling Time or 1/f)
Div. Filter = 10 and Div. %-Value = 10:	tripping after 10 x (Sampling Time or 1/f)

Filtering effect with a frequency drop of 30 %	
Div. Filter = 3 and Div. %-Value = 30:	tripping after 16 x (Sampling Time or 1/f)
Div. Filter = 3 and Div. %-Value = 20:	tripping after 7 x (Sampling Time or 1/f)
Div. Filter = 3 and Div. %-Value = 10:	tripping after 3 x (Sampling Time or 1/f)
Div. Filter = 5 and Div. %-Value = 30:	tripping after 30 x (Sampling Time or 1/f)
Div. Filter = 5 and Div. %-Value = 20:	tripping after 20 x (Sampling Time or 1/f)
Div. Filter = 5 and Div. %-Value = 10:	tripping after 10 x (Sampling Time or 1/f)
Div. Filter = 10 and Div. %-Value = 30:	tripping after 30 x (Sampling Time or 1/f)
Div. Filter = 10 and Div. %-Value = 20:	tripping after 20 x (Sampling Time or 1/f)
Div. Filter = 10 and Div. %-Value = 10:	tripping after 10 x (Sampling Time or 1/f)

Filtering effect at a frequency drop of 40 %	
Div. Filter = 3 and Div. %-Value = 40:	tripping after 18 x (Sampling Time or 1/f)
Div. Filter = 3 and Div. %-Value = 30:	tripping after 9 x (Sampling Time or 1/f)
Div. Filter = 3 and Div. %-Value = 20:	tripping after 5 x (Sampling Time or 1/f)
Div. Filter = 3 and Div. %-Value = 10:	tripping after 2 x (Sampling Time or 1/f)
Div. Filter = 5 and Div. %-Value = 40:	tripping after 36 x (Sampling Time or 1/f)
Div. Filter = 5 and Div. %-Value = 30:	tripping after 26 x (Sampling Time or 1/f)
Div. Filter = 5 and Div. %-Value = 20:	tripping after 16 x (Sampling Time or 1/f)
Div. Filter = 5 and Div. %-Value = 10:	tripping after 6 x (Sampling Time or 1/f)
Div. Filter = 10 and Div. %-Value = 40:	tripping after 40 x (Sampling Time or 1/f)
Div. Filter = 10 and Div. %-Value = 30:	tripping after 30 x (Sampling Time or 1/f)
Div. Filter = 10 and Div. %-Value = 20:	tripping after 20 x (Sampling Time or 1/f)
Div. Filter = 10 and Div. %-Value = 10:	tripping after 10 x (Sampling Time or 1/f)

13. Connection of the Inputs

There are different ways to connect the inputs. The GMM2xxS monitors offer HTL inputs with SIL3 capability, provided that their configuration is set to two-pole-inverse operation. The finally resulting Safety Integration Level (SIL) however also depends on the remote circuit and on the configuration.

Relevant Parameters	Remark
xINx Config	Input characteristics (bipolar, unipolar, clocked)
Input Mode	Configuration of inputs (individual input, signal pair, mixed)
Switch Mode XXXX	=9, when an output is used for clock generation with clocked input
Output Mode	Clock output must be set to “inverse”
GPI Err Time	Max. permissible delay time during illegal conditions

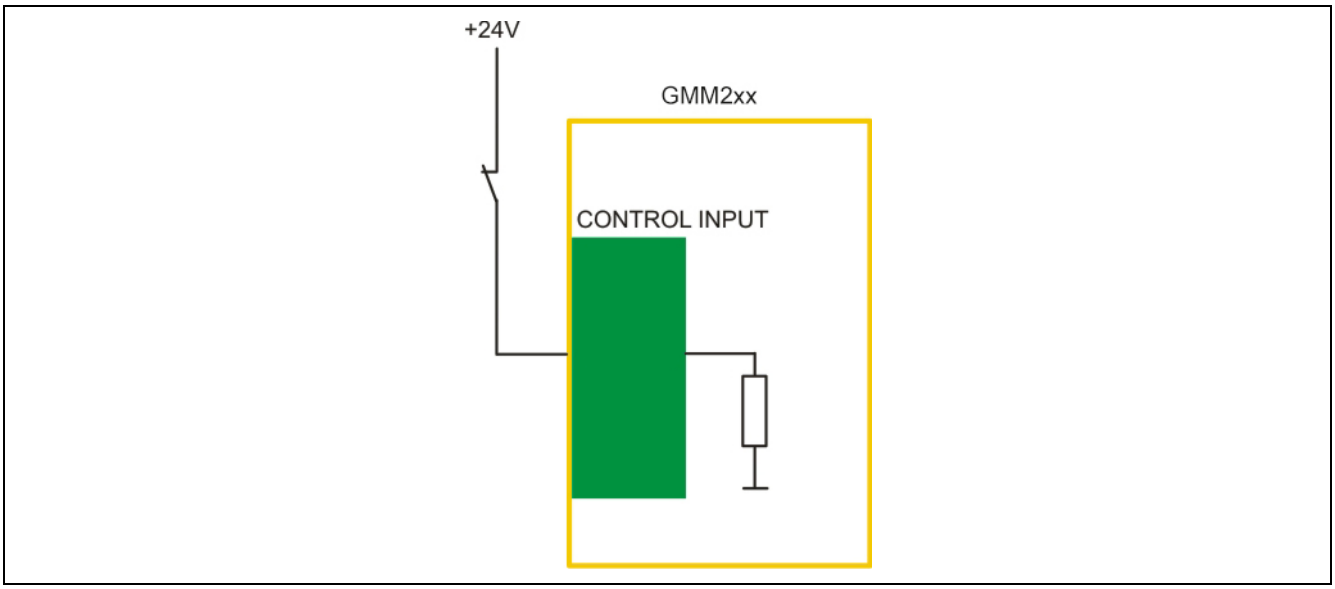
- **Unipolar, un-clocked inputs provide SIL = 1 only**
- **Unipolar, clocked inputs can reach SIL = 1 - 2**
- **Bipolar, un-clocked inputs can reach SIL = 2 - 3**

Where you utilize clocked inputs, for the clock generation you should use OUT1, OUT2 and OUT3 first, and lastly OUT4. The clock outputs are different regarding the output frequency, and OUT1 is able to emit the highest frequency.

Both output tracks can be used due to the 180° phase displacement (please observe parameter „Output Mode“)

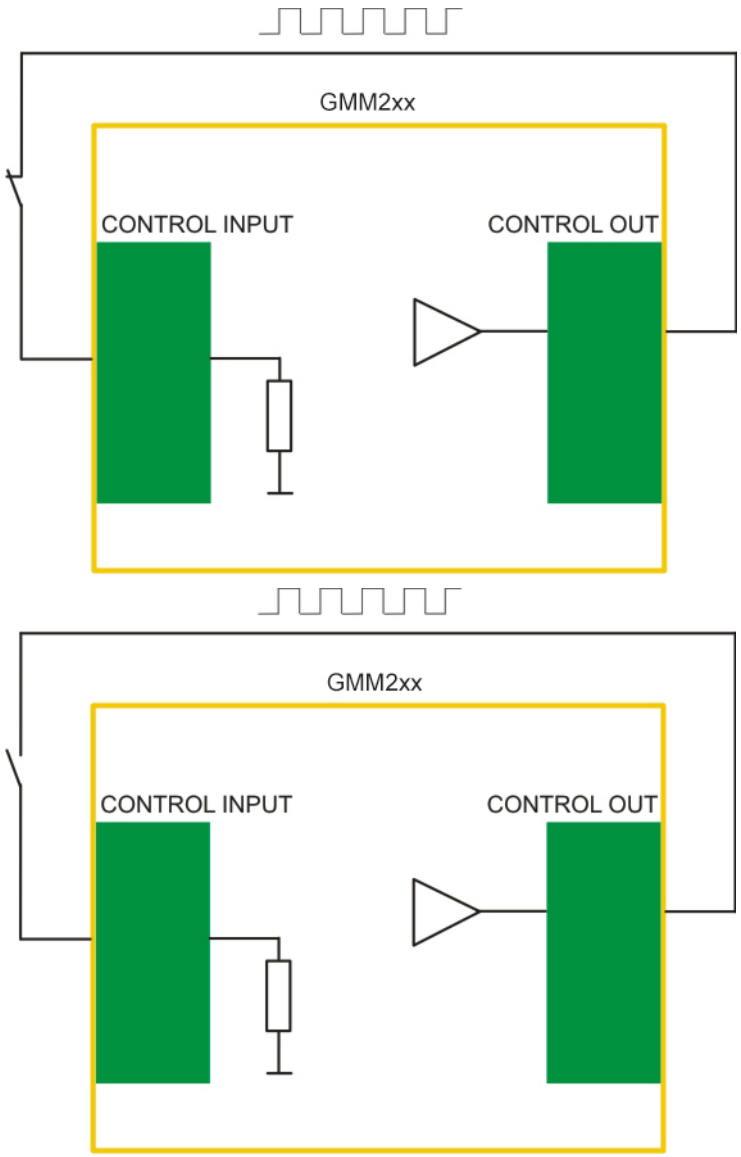
13.1. Connection of Unipolar, Un-Clocked Inputs

Unipolar, un-clocked inputs are connected as shown below. Alternatively a change-over contact can be used, toggling between GND and +24 V. Unipolar, un-clocked inputs provide Safety Integrity Level (SIL) = 1. Parameter “xINx Config” must be set to a value between 8 and 11. Parameter “Input Mode” must be set to 1 or 2. No errors can be detected, therefore no response time applies.



13.2. Connection of Unipolar, Clocked Inputs

Unipolar, clocked inputs are connected as shown below. This type of input reaches a Safety Integrity Level (SIL) = 1 - 2. Parameter “xINx Config” must be set to a value between 20 and 35. Parameter “Input Mode” must be set to 1 or 2. For clock generation, one of the outputs must be available. In case of incorrect or missing clock signal, the tripping function (static high/low) must be chosen in a way that no safety risk can come up (line interruption and switching failure cannot be detected). In case of error, a Runtime Readback Digital Output Error will result and the response time will be approx. 20 ms.

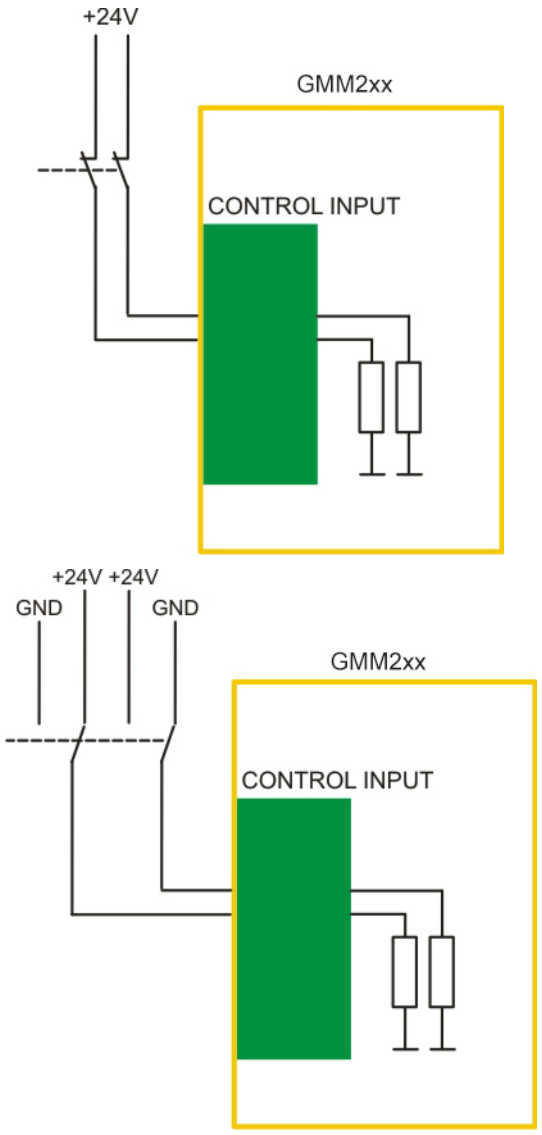


Impacts to the final Safety Integrity Level (SIL):

- **Separate areas for cable leads of switch cables**
- **Forcibly guided and redundant series contacts**
- **Protected switch terminals to avoid short circuits and shunt faults**
- **MTTFd specification if the switch**

13.3. Connection of Bipolar, Un-Clocked Inputs

Bipolar, un-clocked inputs can be connected as shown below. This type of input reaches a Safety Integrity Level (SIL) = 2 - 3. (homogenous = 2 - 3, inverse = 3). Parameter “xINx Config” must be set to a value between 0 and 7. Parameter “Input Mode” must be set to 0 or 1. In case of error, a Runtime GPI Error will result and the response time will be approx. 20ms. Parameter GPI Err Time defines the max. permissible delay time during illegal conditons (1 equals approx. 1 ms).



Impacts to the final Safety Integrity Level (SIL):

- **Separate areas for cable leads of switch cables**
- **Forcibly guided and redundant series contacts**
- **Protected switch terminals to avoid short circuits and shunt faults**
- **MTTFd specification if the switch**

14. Connection of the Outputs

There are different ways to connect the outputs. The GMM2xxS monitors offers HTL outputs with SIL3 capability, provided that their configuration is set to two-pole-inverse operation. The finally resulting Safety Integration Level (SIL) also depends on the remote circuit and on the configuration.

Relevant Parameters	Remarks
Output Mode	Output configuration (homogenous / inverse)



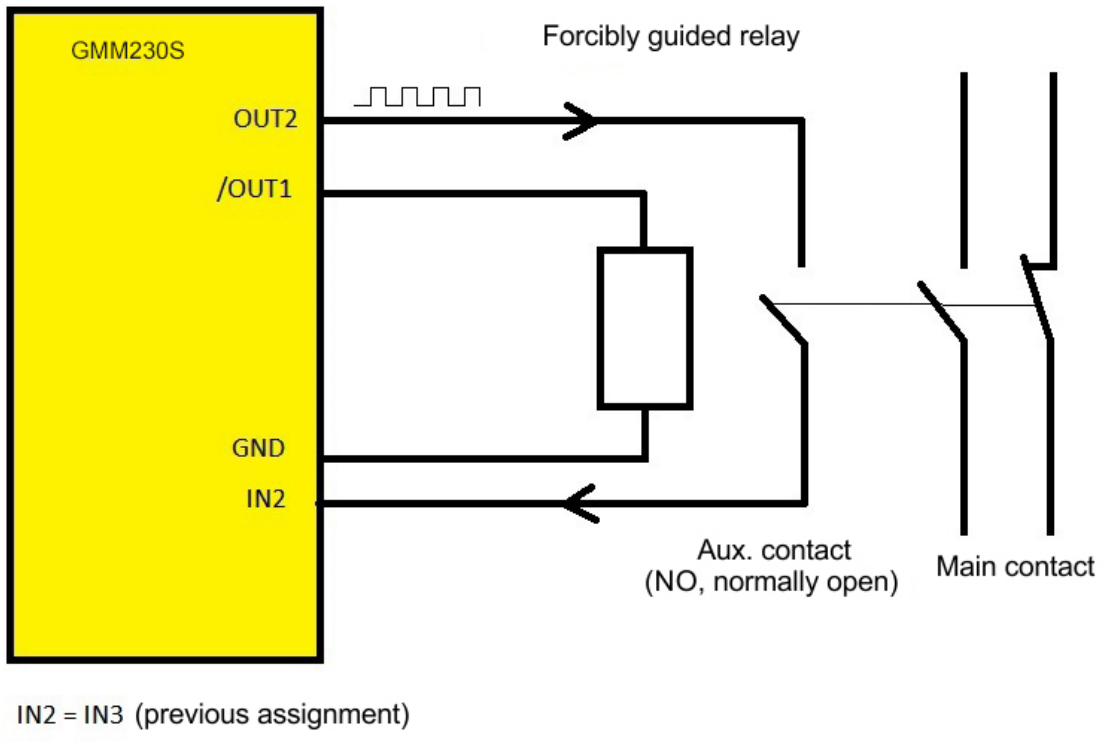
- **Unipolar outputs provide SIL = 1**
- **Bipolar homogenous outputs can reach SIL = 2 - 3**
- **Bipolar inverse outputs can reach SIL = 3**

15. EDM Function

The EDM function (External Device Monitoring) provides special surveillance of faulty operation of remote relay or contactors by means of a separate feedback circuit. For feedback a clocked output signal is used, which is lead back to an input by a positively driven relay contact. This means that the GMM2xxS monitor has to allocate one output to drive the relay coil, another output to generate the clock signal, and an input for reading back of the clock signal.
Parameter *IN* Function appoints the output to be used for control of the relay. Possible settings are from 17 – 20 and 22. Parameter *IN* Config appoints the output to be used for clock generation.
Possible settings are from 12 to 19.
The finally resulting Safety Integration Level (SIL) also depends on the remote circuit and on the configuration. In case of error, a Runtime External RB Error signal will be produced.

Relevant Parameters	Remarks
Read Back OUT	Possible inversion of the relay control
Output Mode	Output to control the relay coil (setting: „inverse“)
Output Mode	Clock output (setting: „inverse“)
IN Function	Specification of the relay feedback
IN Config	Specification of the clock feedback
Input Mode	Configuration of the read-back input (single input for read-back)
Read Back Delay	Delay time to ensure that the relay has quite certainly energized (common parameter valid for all relays in use)

15.1. EDM: 1 Relay, 1 Output, 1 Input (NO)



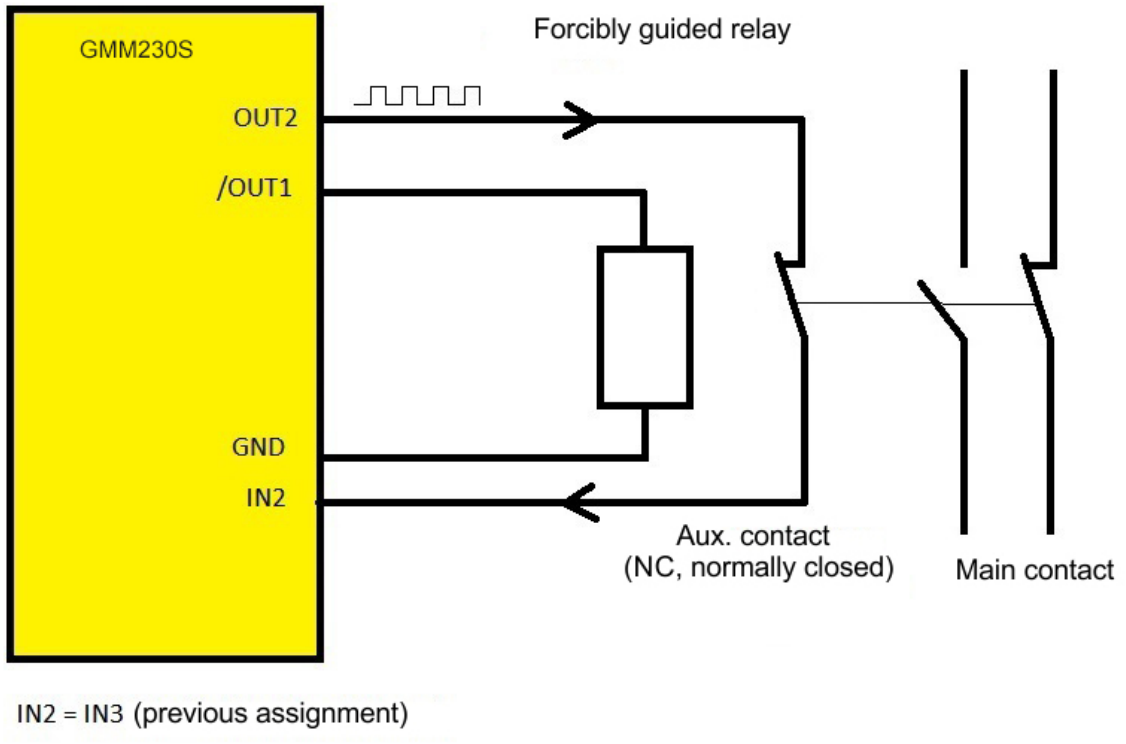
Parameter	Setting	Description
Switch Mode OUT1	0	OUT1 to detect overspeed
Switch Mode OUT2	9	OUT2 to generate clock signal
Read Back OUT	**1**	**Inversion (connection to /OUT1 via NO contact)**
IN2 Function	17	Adaption to OUT1 (overspeed)
IN2 Config	14	Adaption to clock output OUT2 **[X10/4]**
Input Mode	2	4 single inputs for free use
Read Back Delay	0,050	Delay 50 ms to obviate contact bouncing
Output Mode	0	Inverse configuration

Function:

With normal operation speed the inverted output /OUT1 is in HIGH state and the relay is energized. The forcibly guided aux. contact therefore is closed and the clock signal is conducted to the input. Upon overspeed output /OUT1 will descend to LOW and the remote relay will drop.

Errors in the clock circuit can only be detected while the relay is energized. Under error condition the GMM2xxS monitor will set all digital outputs to LOW, i.e. the remote relay will be de-energized, which will signal "overspeed". With errors occurring under normal operating speed, the unit will take an error state which signals "overspeed" again (Safety Integrity Level = 1).
The main contacts can be used as opener or closer depending on the application.

15.2. EDM: 1 Relay, 1 Output, 1 Input (NC)



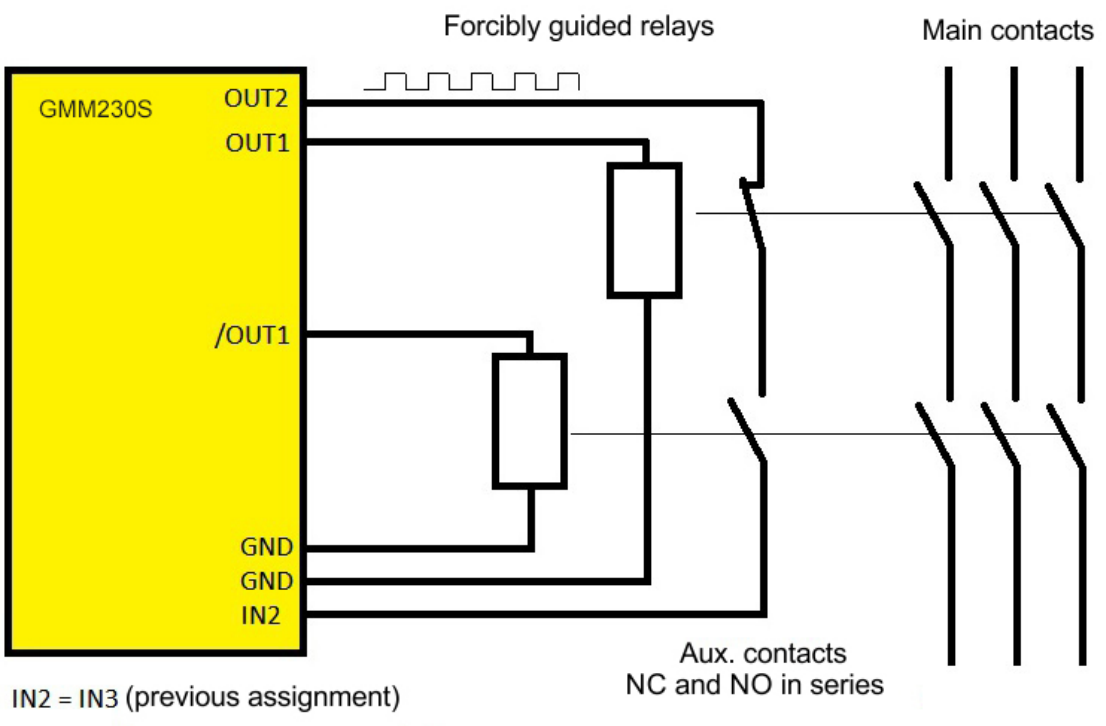
Parameter	Setting	Description
Switch Mode OUT1	0	OUT1 to detect overspeed
Switch Mode OUT2	9	OUT2 to generate clock signal
Read Back OUT	**0**	**No inversion (connection to /OUT1 via NC contact)**
IN2 Function	17	Adaption to OUT1 (overspeed)
IN2 Config	14	Adaption to clock output OUT2 **[X10/4]**
Input Mode	2	4 single inputs for free use
Read Back Delay	0,050	Delay 50 ms to obviate contact bouncing
Output Mode	0	Inverse configuration

Function:

With normal operation speed the inverted output /OUT1 is in HIGH state and the relay is energized. The forcibly guided aux. contact therefore is open and the clock signal is disconnected from to the input. Upon overspeed output /OUT1 will descend to LOW and the remote relay will drop.

Errors in the clock circuit can only be detected while the relay is de-energized. Under error condition the GMM2xxS monitor will set all digital outputs to LOW, i.e. the remote relay will be de-energized, which will signal "overspeed". With errors occurring under overspeed conditions, the unit will take an error state which signals "overspeed" again (Safety Integrity Level = 1). The main contacts can be used as opener or closer depending on the application.

15.3. EDM: 2 Relays, 1 Output, 1 Input (NC, NO)



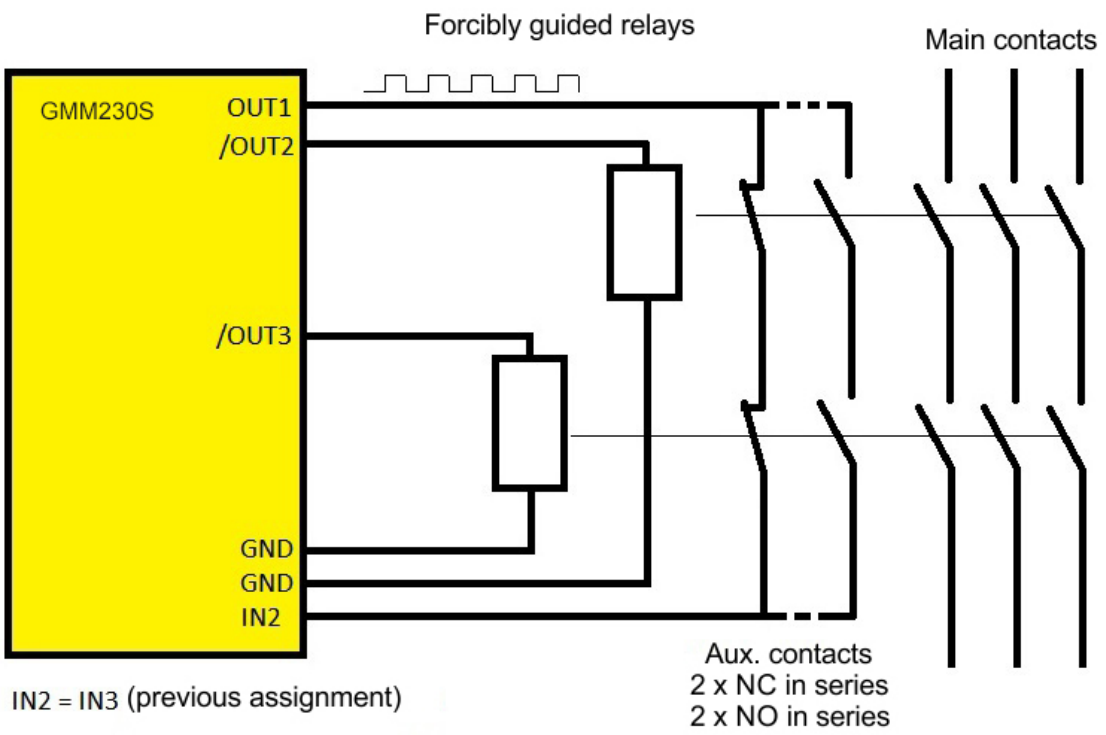
Parameter	Setting	Description
Switch Mode OUT1	0	OUT1 to detect overspeed
Switch Mode OUT2	9	OUT2 to generate clock signal
Read Back OUT	**1**	**Inversion**
IN2 Function	17	Adaption to OUT1 (overspeed)
IN2 Config	14	Adaption to clock output OUT2 **[X10/4]**
Input Mode	2	4 single inputs for free use
Read Back Delay	0,050	Delay 50 ms to obviate contact bouncing
Output Mode	0	Inverse configuration

Function:

With normal operation speed, output /OUT1 is in HIGH state and output OUT1 is in LOW state. With overspeed, output /OUT1 is in LOW state and output OUT1 is in HIGH state. Therefore, at any time one of the relays is energized while the other one is de-energized.

The clock loop is closed with normal speed and interrupted with overspeed.
The GND lines of the two relays must be independent one from each other.
Errors in the clock circuit can only be detected with the clock loop closed. In case of errors the GMM2xxS monitor will set all digital outputs to LOW, i.e. both relays will drop and overspeed will be indicated. In case of errors in the clock loop during overspeed, an error signal will be produced and overspeed will be indicated. (Safety Integrity Level = 2). The main contacts can be used as opener or closer depending on the application.

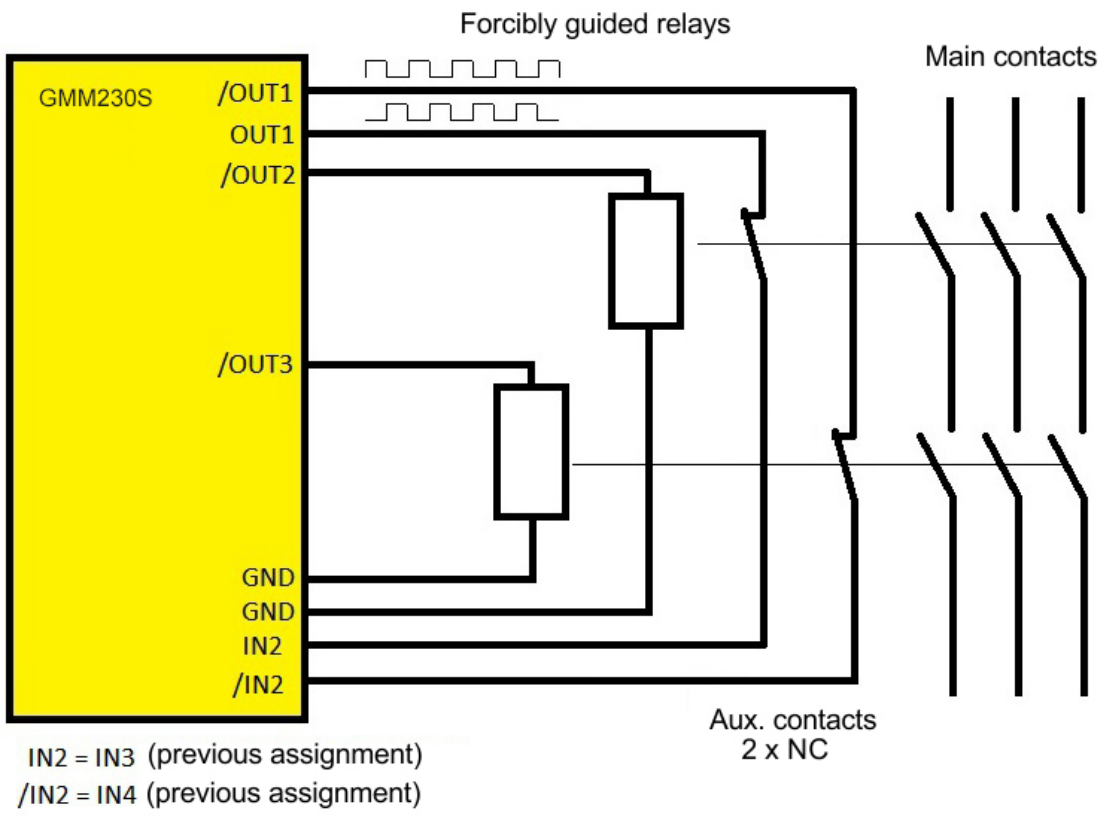
15.4. EDM: 2 Relays, 2 Outputs, 1 Input (NC, NO)



Parameter	Setting	Description
Switch Mode OUT1	9	OUT1 to generate clock signal
Switch Mode OUT2	0	OUT2 to signal overspeed
Switch Mode OUT3	0	OUT3 to detect overspeed
Read Back OUT	**0/6**	**Inversion yes or no, depending on type of aux. contact**
IN2 Function	18/19	Adaption to OUT2 or OUT3 (overspeed)
IN2 Config	12	Adaption to clock output OUT1 [**X10/4**]
Input Mode	2	4 single inputs for free use
Read Back Delay	0,050	Delay 50 ms to obviate contact bouncing
Output Mode	0	Inverse operation

Function:
This application uses two independent outputs /OUT2 and /OUT3 with fully identical configuration concerning their switching characteristics. The basic function is similar to the application with one relay. The auxiliary contacts of both relays are connected in series to conduct the clock signal to an input. Parameter *IN2 Function* can be set to 18 or 19, since the switching behavior of both outputs must be identical. The GND lines of the two relays must be independent one from each other (Safety Integrity Level = 2).
The main contacts can be used as opener or closer depending on the application.

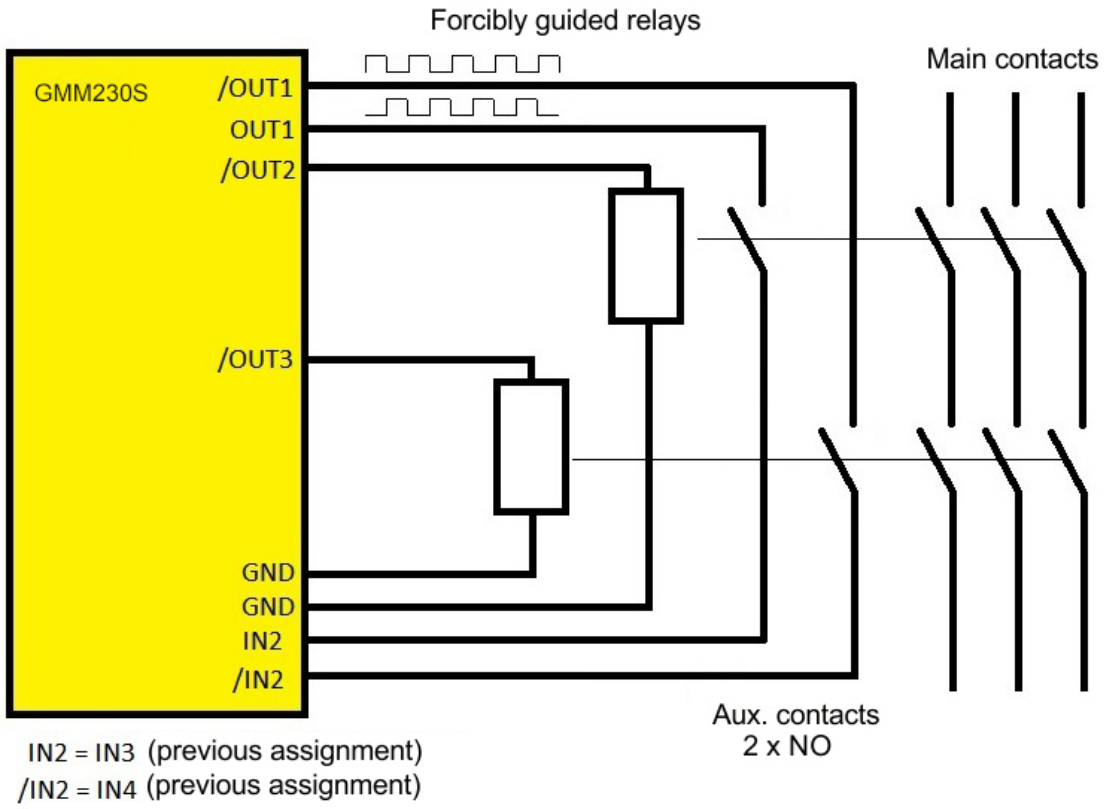
15.5. EDM: 2 Relays, 2 Outputs, 2 Inputs (NC)



Parameter	Setting	Description
Switch Mode OUT1	9	OUT1 to generate clock signal
Switch Mode OUT2	0	OUT2 to signal overspeed
Switch Mode OUT3	0	OUT3 to detect overspeed
Read Back OUT	**0**	**No inversion (connection via NC contact)**
IN2 Function	18	Adaption to OUT2 (overspeed)
IN2 Config	12	Adaption to clock output OUT1 **[X10/4]**
/IN2 Function	19	Adaption to OUT3 (overspeed)
/IN2 Config	13	Adaption to clock output /OUT1 **[X10/5]**
Input Mode	2	4 single inputs for free use
Read Back Delay	0,050	Delay 50 ms to obviate contact bouncing
Output Mode	0	Inverse operation

Function:
This application uses two independent outputs /OUT2 and /OUT3 with fully identical configuration concerning their switching characteristics. The basic function is similar to the application with one relay. The auxiliary contacts of both relays are individually connected to a separate input each. The GND lines of the two relays must be independent one from each other (Safety Integrity Level = 3).
The main contacts can be used as opener or closer depending on the application.

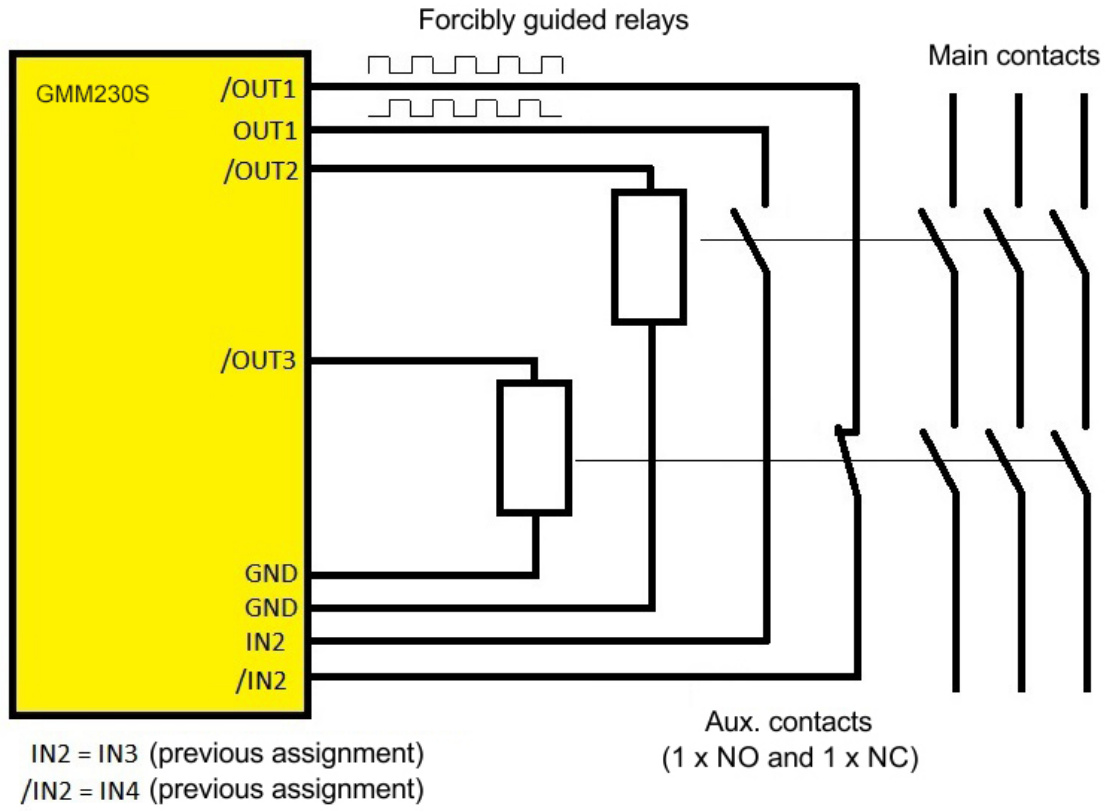
15.6. EDM: 2 Relays, 2 Outputs, 2 Inputs (NO)



Parameter	Setting	Description
Switch Mode OUT1	9	OUT1 to generate clock signal
Switch Mode OUT2	0	OUT2 to signal overspeed
Switch Mode OUT3	0	OUT3 to detect overspeed
Read Back OUT	**6**	**Inversion (connection via NO contact)**
IN2 Function	18	Adaption to OUT2 (overspeed)
IN2 Config	12	Adaption to clock output OUT1 **[X10/4]**
/IN2 Function	19	Adaption to OUT3 (overspeed)
/IN2 Config	13	Adaption to clock output /OUT1 **[X10/5]**
Input Mode	2	4 single inputs for free use
Read Back Delay	0,050	Delay 50 ms to obviate contact bouncing
Output Mode	0	Inverse operation

Function:
This application uses two independent outputs /OUT2 and /OUT3 with fully identical configuration concerning their switching characteristics. The basic function is similar to the application with one relay. The auxiliary contacts of both relays are individually connected to a separate input each. The GND lines of the two relays must be independent one from each other (Safety Integrity Level = 3).
The main contacts can be used as opener or closer depending on the application.

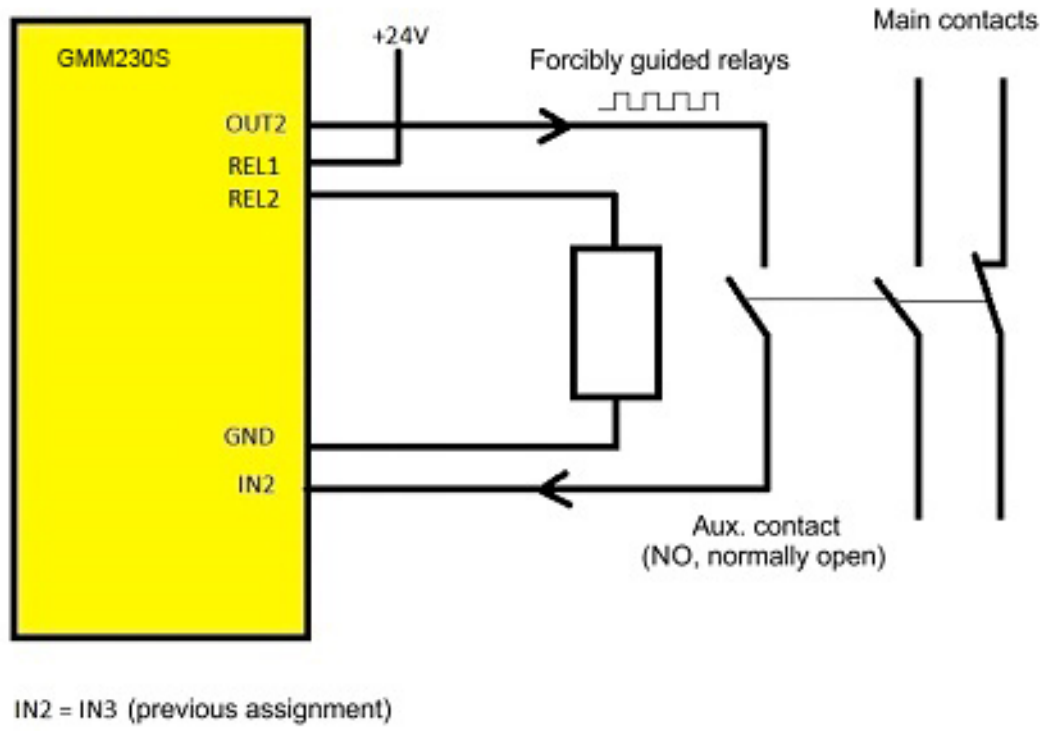
15.7. EDM: 2 Relays, 2 Outputs, 2 Inputs (NO, NC)



Parameter	Setting	Description
Switch Mode OUT1	9	OUT1 to generate clock signal
Switch Mode OUT2	0	OUT2 to signal overspeed
Switch Mode OUT3	0	OUT3 to detect overspeed
Read Back OUT	**2**	**Inversion (connection via NO, NC contact)**
IN2 Function	18	Adaption to OUT2 (overspeed)
IN2 Config	12	Adaption to clock output OUT1 **[X10/4]**
/IN2 Function	19	Adaption to OUT3 (overspeed)
/IN2 Config	13	Adaption to clock output /OUT1 **[X10/5]**
Input Mode	2	4 single inputs for free use
Read Back Delay	0,050	Delay 50 ms to obviate contact bouncing
Output Mode	0	Inverse operation

Function:
This application uses two independent outputs /OUT2 and /OUT3 with fully identical configuration concerning their switching characteristics. The basic function is similar to the application with one relay. The auxiliary contacts of both relays are individually connected to a separate input each. The GND lines of the two relays must be independent one from each other (Safety Integrity Level = 3).
The main contacts can be used as opener or closer depending on the application.

15.8. EDM: Configuration of Relay Out X1



Parameter	Setting	Description
Switch Mode REL1	0	REL1 to detect overspeed
Switch Mode OUT2	9	OUT2 to generate clock signal
Read Back OUT	**16**	**Inversion (connection to REL2 via NO contact)**
IN2 Function	22	Adaption to REL1 (overspeed)
IN2 Config	14	Adaption to clock output OUT2 **[X10/4]**
Input Mode	2	4 single inputs for free use
Read Back Delay	0,100	Delay 100 ms to obviate double contact bouncing
Output Mode	0	Inverse configuration

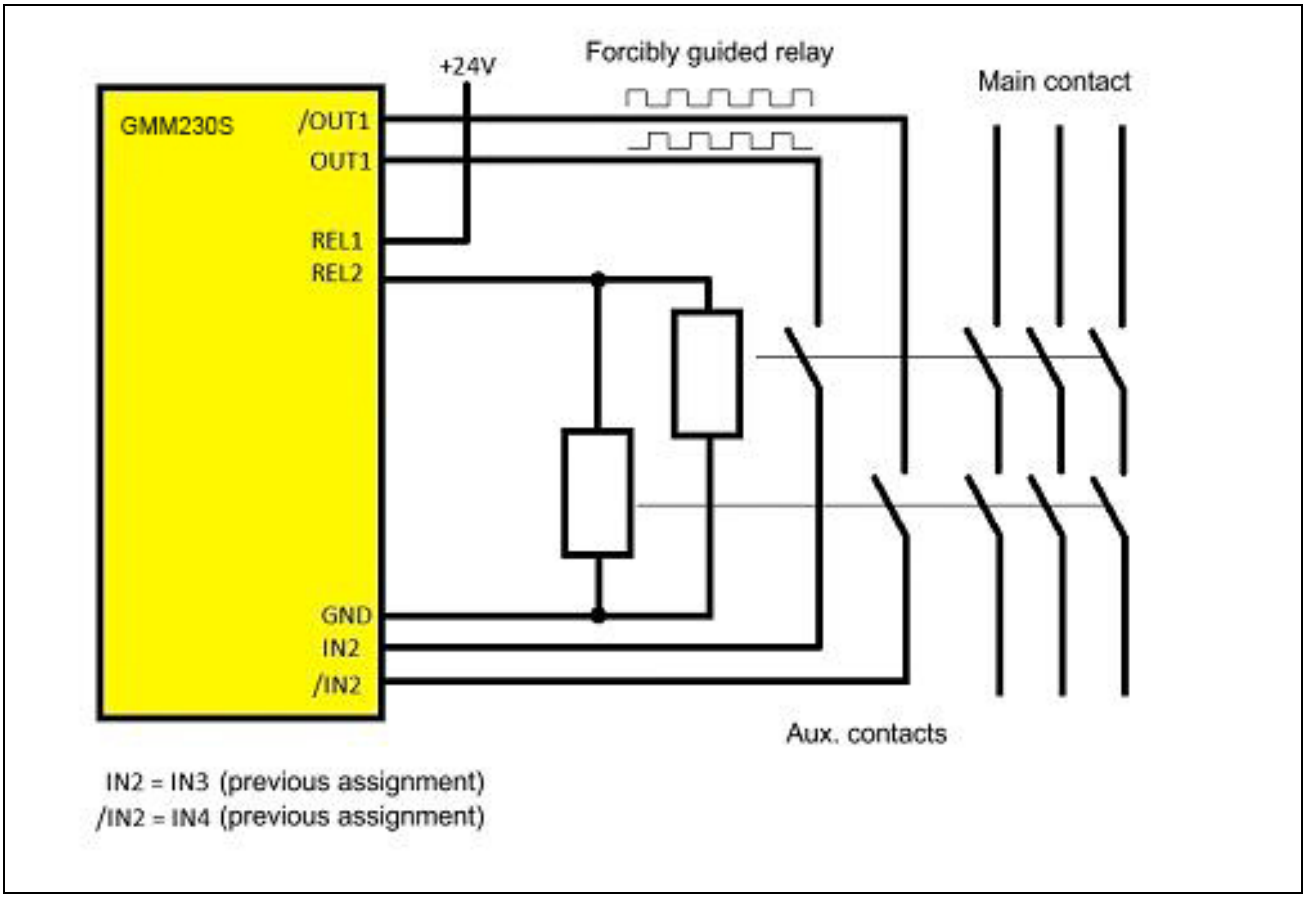
Function:

With normal operation speed the relay output X1 is closed, the external relay therefore is energized. Upon overspeed the relay output X1 is open and the remote relay will drop. The forcibly guided aux. contact is closed, when the relay output X1 is energized and the clock signal is conducted to the input.

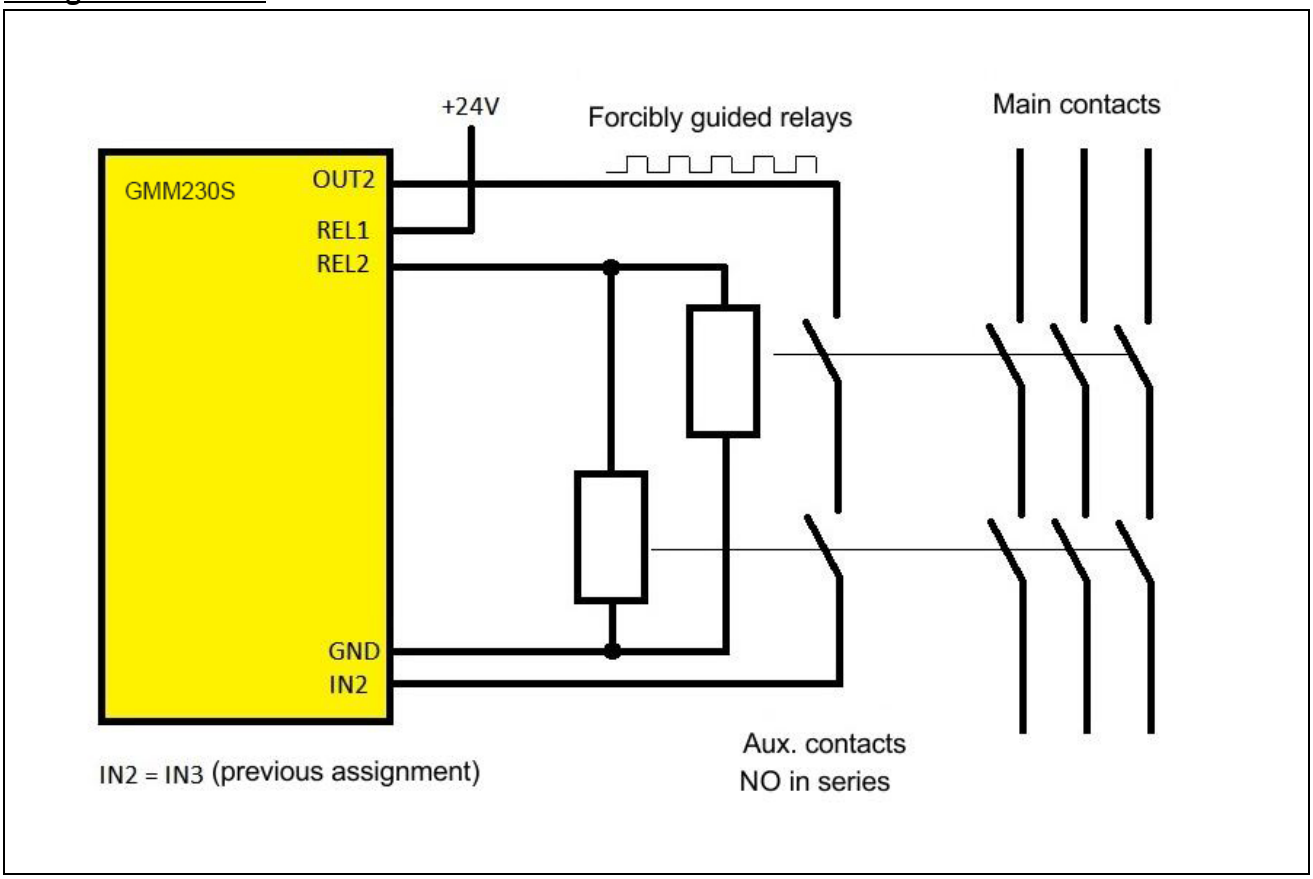
Under error condition the GMM2xxS monitor will open the relay output X1, the remote relay will be de-energized, which will signal "overspeed". With errors occurring under normal operating speed, the unit will take an error state which signals "overspeed" again (Safety Integrity Level = 1).

The main contacts can be used as opener or closer depending on the application.

Configuration of SIL3 :



Configuration of SIL2 :



16. Technical Specifications

Power supply:	Input voltage:	18 ... 30 VDC
	Protective circuit:	reverse polarity protection
	Ripple:	max. 10 % at 24 VDC
	Power consumption:	approx. 150 mA (unloaded)
	Protection:	external fuse (2.5 A, medium time lag) necessary
	Connections:	X3, screw terminal, 2-pin, 1.5 mm² / AWG 14
Encor supply:	Number:	2
	Output voltage:	approx. 2 VDC lower than input voltage
	Output current:	max. 200 mA per encoder
	Protection:	short circuit proof
SinCos inputs:	Number of inputs:	2
	Signal tracks:	SIN+, SIN-, COS+, COS-
	Amplitude:	0.8 ... 1.2 Vpp
	DC offset:	2.4 ... 2.6 VDC
	Frequency:	max. 500 kHz
	Connections:	(with Lissajous figure monitoring max. 100 kHz) X6 and X7, SUB-D (male), 9-pin
Incremental inputs:	Number of inputs:	2
	Format:	RS422 standard (differential signal A, /A, B, /B)
	Frequency:	max. 500 kHz
	Connections:	X8 and X9, screw terminal, 7-pin, 1.5 mm² / AWG14
Control-/ incremental inputs:	Number of inputs:	2 (complementary format)
	Application:	HTL encoder, proximity switch, control command
	Signal level:	HTL / PNP (10 ... 30 V)
	Load:	max. 15 mA
	Frequency (control):	max. 1 kHz
	Frequency incremental):	max. 250 kHz
	Connections:	X10, screw terminal, 5-pin, 1.5 mm² / AWG 14
SinCos output: (safety related)	Splitter output:	Source: input SinCos 1
	Signal tracks:	SIN+, SIN-, COS+, COS-
	Amplitude:	0.8 ... 1.2 Vpp
	DC offset:	2.4 ... 2.6 VDC
	Frequency:	max. 500 kHz
	Connection:	X5, SUB-D (female), 9-pin
Incremental output: (safety related)	Splitter output:	Source: input SinCos 1, SinCos 2, RS422 1, RS422 2 HTL1 or HTL2
	Format:	RS422 (differential signals A, /A, B, /B)
	Frequency:	max. 500 kHz
	Connections:	X4, screw terminal, 7-pin, 1.5 mm² / AWG 14
Analog output: (safety related)	Current output:	4 ... 20 mA (load max. 270 Ohm)
	Resolution:	14 bit
	Accuracy:	± 0.1 %
	Connection:	X4, screw terminal, 7-pin, 1.5 mm² / AWG 14
Control outputs: (safety related)	Number of outputs:	4 (complementary format)
	Output voltage:	HTL (approx. 2 VDC lower than input voltage)
	Output current:	max. 30 mA per output
	Switching characteristic:	Push-Pull
	Protective circuit:	short-circuit-proof
	Connection:	X2, screw terminal, 8-pin, 1.5 mm² / AWG 14
Relay output: (safety related)	Number of relays:	two relays in series with forced-guided contacts (NO)
	Switching capability:	5 ... 36 VDC
	Switching capacity:	5 mA ... 5 A
	Connection:	X1, screw terminal, 2-pin, 1.5 mm² / AWG 14

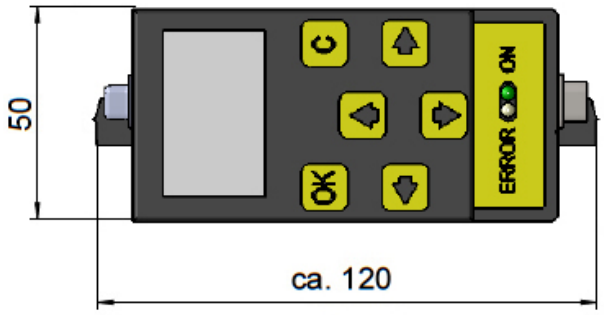
Continuation „Technical Specifications“:

USB interface:	Version:	USB 1.0
	Connection:	X12, USB-B (female)
	Operating System:	Software GMM2xxS from version 4c for WIN7 /8 / 10 (tested with (1511 build 10586.104), otherwise only for WIN7 / 8
Display:	Green LED:	„ON“
	Yellow LED:	„ERROR“
Switches:	DIL switch:	1 x 3-pin
	Marking:	S1
Conformity and standards:	MD2006/42EC	EN ISO 13849-1
		EN 61508
		EN 62061
	EMC 2004/108/EC:	EN 61000-6-2
		EN 61000-6-3
		EN 61000-6-4
		EN 61326-3-2
	Vibration resistance:	EN 60068-2-6 (sine, 7 g, 10 – 200 Hz, 20 cycles)
		EN 60068-2-27 (half sine, 30 g, 11 ms, 3 shocks)
	Shock resistance:	EN 60068-2-27 (half sine, 17 g, 6 ms, 4000 shocks)
	RoHs 2011/65/EU:	EN 50581
Safety characteristic data:	Classification:	SIL3/PLe (depends on encoders in use)
	Approved Safety function:	Certification No.: 44 207 14018601
	System structure:	dual-channel
	System architecture:	Cat. 3 / HFT = 1
	DC_{avg}:	97,95 %
	SFF:	98,77 %
	$MTTF_D$:	38,1 Jahre
	PFH:	$3{,}76 * 10^{-8}\ h^{-1}$
	λ_{SD}:	$1{,}93 * 10^{-6}\ h^{-1}$
	λ_{SU}:	$4{,}64 * 10^{-8}\ h^{-1}$
	λ_{DD}:	$2{,}94 * 10^{-6}\ h^{-1}$
	λ_{DU}:	$6{,}14 * 10^{-8}\ h^{-1}$
	Safety functions:	equivalent to EN 61800-5-2 for SS1, SS2, SOS, SLS, SDI, SSM, SLI, SBC, STO, SMS (depending on the used encoder input signals)
Housing:	Material:	Plastic
	Mounting:	to 35 mm top hat rail (according to EN 60715)
	Dimensions:	50 x 100 x 165 mm (B x H x T)
	Protection class:	IP20
	Weight:	approx. 390 g
Ambient temperature:	Operation:	-20 °C ... +55 °C (without condensation)
	Storage:	-25 °C ... +70 °C (without condensation)
Maintenance:	Interval:	Switch on/off for at least 1 times a year (at continuous operation)
Programming module GMI230S (optional):	Display:	OLED-Display
	Operation:	Touch screen

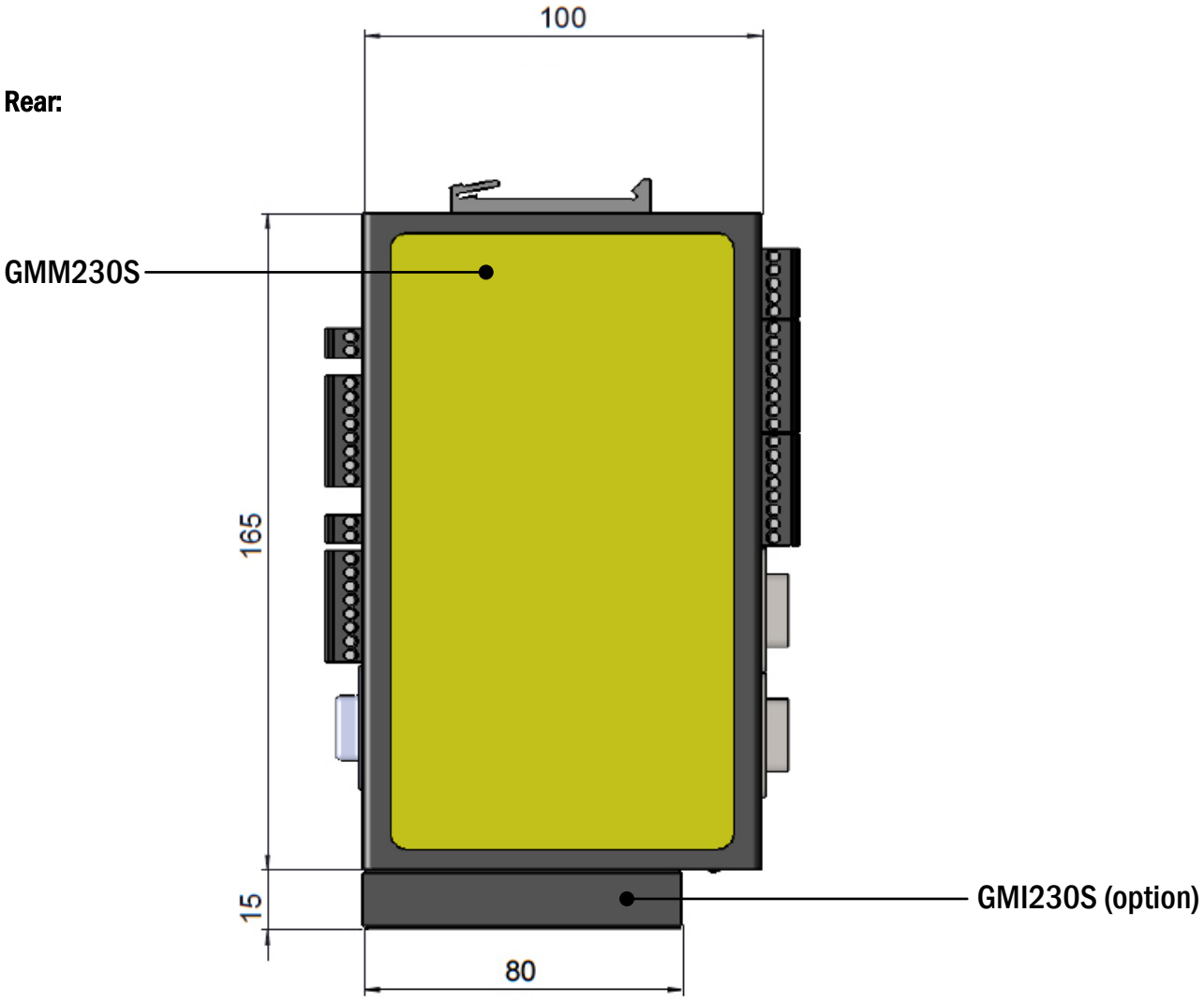
16.1. Dimensions

(incl. GMI230S on front)

Front:



Rear:



17. Certificate

TÜV NORD

ZERTIFIKAT
CERTIFICATE

Hiermit wird bescheinigt, dass die Firma / *This is to certify, that the company*

Baumer Hübner GmbH
Max-Dohrn-Straße 2+4
10589 Berlin
Deutschland

berechtigt ist, das unten genannte Produkt mit dem abgebildeten Zeichen zu kennzeichnen.
is authorized to provide the product described below with the mark as illustrated.

Geprüft nach *Tested in accordance with*	**EN ISO 13849 – Kat. 3, PL e** **EN 61508 - SIL 3** **EN 62061 - $SIL_{CL}3$**
Beschreibung des Produktes *(Details s. Anlage 1)* Description of product *(Details see Annex 1)*	**GMM2xxS Wächter Serie zur sicherheitsgerichteten Überwachung von Drehzahl, Stillstand und Drehrichtung.** *GMM2xxS monitor series for safety-related monitoring of speed, standstill and direction of rotation.*
Fertigungsstätte *Manufacturing plant*	**Siehe Anlage 1** *see Annex 1*

TÜV NORD
TÜV NORD CERT GmbH
Approved Safety Function
EN ISO 13849-1
EN 61508
EN 62061
PL 'e'
SIL 3
$SIL_{CL}3$

Registrier-Nr. / *Registered No.* 44 207 16114901
Prüfbericht Nr. / *Test Report No.* 3518 5434
Aktenzeichen / *File reference* 8000462979

Gültigkeit / Validity
von / *from* 2017-02-08
bis / *until* 2020-06-10

F. Hegenfeld

Zertifizierungsstelle der TÜV NORD CERT GmbH
Certification body of TÜV NORD CERT GmbH

Essen, 2017-02-08

TÜV NORD CERT GmbH Langemarckstraße 20 45141 Essen www.tuev-nord-cert.de machinery@tuev-nord.de

Bitte beachten Sie auch die umseitigen Hinweise
Please also pay attention to the information stated overleaf

DAkkS
Deutsche
Akkreditierungsstelle
D-ZE-12007-01-06