Smart encoders & actuators

# User's guide

# IFS-10 Safety Controller


- Safety monitor for Sine/Cosine and incremental encoders
- Up to SIL3 / PLe functional safety
- Monitoring of underspeed, overspeed, standstill, & rotation
- Inputs for 2 Sine/Cosine encoders or 2 RS-422/HTL encoders
- Relay, analogue, splitter, & control outputs (safety related)

Suitable for the following models:

- IFS-10
- IFS-10A
- IFS-10S
- IFS-10SA

General Contents

lika

# General contents

# Subject Index

**1**



**A**



**C**



**D**

# Typographic and iconographic conventions

In this guide, to make it easier to understand and read the text the following typographic and iconographic conventions are used:

- parameters and objects both of the device and the interface are coloured in **GREEN**;
- alarms are coloured in **RED**;
- states are coloured in **FUCSIA**.

When scrolling through the text some icons can be found on the side of the page: they are expressly designed to highlight the parts of the text which are of great interest and significance for the user. Sometimes they are used to warn against dangers or potential sources of danger arising from the use of the device. You are advised to follow strictly the instructions given in this guide in order to guarantee the safety of the user and ensure the performance of the device. In this guide the following symbols are used:

| | |
|---|---|
|  | This icon, followed by the word **WARNING**, is meant to highlight the parts of the text where information of great significance for the user can be found: user must pay the greatest attention to them! Instructions must be followed strictly in order to guarantee the safety of the user and a correct use of the device. Failure to heed a warning or comply with instructions could lead to personal injury and/or damage to the unit or other equipment. |
|  | This icon, followed by the word **NOTE**, is meant to highlight the parts of the text where important notes needful for a correct and reliable use of the device can be found. User must pay attention to them! Failure to comply with instructions could cause the equipment to be set wrongly: hence a faulty and improper working of the device could be the consequence. |
|  | This icon is meant to highlight the parts of the text where suggestions useful for making it easier to set the device and optimize performance and reliability can be found. Sometimes this symbol is followed by the word **EXAMPLE** when instructions for setting parameters are accompanied by examples to clarify the explanation. |

# Preliminary information

This guide is designed to describe the technical characteristics, installation and use of the **IFS-10 safety monitor for incremental encoders**.

IFS-10 safety controller is designed for integration of incremental encoders (and even "non-safe" encoders) into systems that require up the SIL3 Safety Integrity Level and the PLe Performance Level. Thus it is ideal to retrofit existing industrial plants.
**IFS-10 is SIL3/PLe certified** and allows to create a redundant safety subsystem by means of **Sine/Cosine 1Vpp, HTL/Push-Pull and TTL/RS422 incremental encoders**, but also proximity sensors, limit switches and command devices. It **monitors and controls speed (overspeed and underspeed), standstill and direction of rotation** in single axis applications and implements the following safety functions in compliance with the EN 61800-5-2 standard: SS1, SS2, SOS, SLS, SDI, SSM, SLI, SBC, STO, SMS.
IFS-10 connects at input two incremental encoders or a single redundant encoder (for instance the magnetic SGSD) with either Sine/Cosine or Push-Pull or RS422 interface, but also switches and sensors; they can be freely paired to achieve redundancy. The motion controller provides the following safety outputs, programmable according to needs:

- 1 Sine/Cosine splitter output
- 1 RS-422 splitter output
- 1 force guided redundant relay output (NO)
- 4 HTL inverse redundant control outputs
- 1 4-20mA analogue output

The set up of all functions and the parametrization of the input and output features is achieved by using either the PC software tool via USB supplied for free or the optional keyboard: the additional module is fitted with an OLED display and is even removable and allows for user-friendly configuration and comprehensive diagnostic information (for more information refer to the specific "User's guide").

**Available models:**

- IFS-10: safety monitor with 2 Sine/Cosine, 2 RS-422, and 2 HTL/PNP inputs + all outputs + signal splitter
- IFS-10A: safety monitor with 2 Sine/Cosine, 2 RS-422, and 2 HTL/PNP inputs + all outputs (no signal splitter)
- IFS-10S: safety monitor with 1 SIL3/PLe Sine/Cosine input + all control inputs + all outputs + signal splitter
- IFS-10SA: safety monitor with 1 SIL3/PLe Sine/Cosine input + all control inputs + all outputs (no signal splitter)
- IFS-10-PM: removable programming display with touchscreen

**Main features:**

- SIL3 certification in compliance with EN 61508 and 62061; PLe certification in compliance with EN ISO 13849-1 Cat. 3
- Safety functions in compliance with EN 61800-5-2 standard: SS1, SS2, SOS, SLS, SDI, SSM, SLI, SBC, STO, SMS
- Two differential inputs each for Sine/Cosine and incremental encoders
- Two inverse redundant HTL / PNP inputs for encoders, proximity switches, or control commands
- Forced guided redundant output relay (NO) and four inverse redundant HTL control outputs
- Safety related analogue output (4 to 20 mA)
- Easy and safe integration into existing sensor wirings, enabled by the integrated signal splitter
- Mounting on standard DIN rails (35 mm C-profile, according to EN 60715)
- Easy Parametrization via USB interface and Operator Surface or pluggable display- and programming-unit (optional)

# 1 - Safety summary

## Safety

- Always adhere to the professional safety and accident prevention regulations applicable to your country during device installation and operation;
- installation and maintenance operations have to be carried out by qualified personnel only, with power supply disconnected and stationary mechanical parts;
- device must be used only for the purpose appropriate to its design: use for purposes other than those for which it has been designed could result in serious personal and/or the environment damage;
- high current, voltage and moving mechanical parts can cause serious or fatal injury;
- warning ! Do not use in explosive or flammable areas;
- failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment;
- Lika Electronic assumes no liability for the customer's failure to comply with these requirements.

## Electrical safety

- Turn off the power supply before connecting the device;
- connect according to the explanation in the "4 - Electrical connections" section on page 28;
- in compliance with the 2014/30/EU norm on electromagnetic compatibility, the following precautions must be taken:

- before handling and installing, discharge electrical charge from your body and tools which may come in touch with the device;
- power supply must be stabilized without noise, install EMC filters on device power supply if needed;
- always use shielded cables (twisted pair cables whenever possible);
- avoid cables runs longer than necessary;
- avoid running the signal cable near high voltage power cables;
- mount the device as far as possible from any capacitive or inductive noise source, shield the device from noise source if needed;
- to guarantee a correct working of the device, avoid using strong magnets on or near by the unit;
- minimize noise by connecting the shield and/or the frame to ground. Make sure that ground is not affected by noise. The connection point to ground can be situated both on the device side and on user's side. The best solution to minimize the interference must be carried out by the user. Provide the ground connection as close as possible to the unit.

## Mechanical safety

- Install the device following strictly the information in the "3 – Mounting instructions" section on page 24;
- mechanical installation has to be carried out with power supply disconnected and stationary mechanical parts;
- do not disassemble the unit;
- do not tool the unit;
- delicate electronic equipment: handle with care;
- do not subject the device to knocks or shocks;
- respect the environmental characteristics declared by manufacturer.

# 2 - Identification

The device can be identified through the **order code** and the **serial number** printed on the label applied to its enclosure. Information is listed in the delivery document too. Please always quote the order code and the serial number when reaching Lika Electronic for purchasing spare parts or needing assistance. For any information on the technical characteristics of the product refer to the technical catalogue.

**Warning**: devices having order code ending with "/Sxxx" may have mechanical and electrical characteristics different from standard and be supplied with additional documentation for special connections (Technical info).

# 3 – Mounting instructions

**WARNING**

Installation and maintenance operations have to be carried out by qualified personnel only, with power supply disconnected and mechanical parts compulsorily in stop.

## 3.1 Overall dimensions

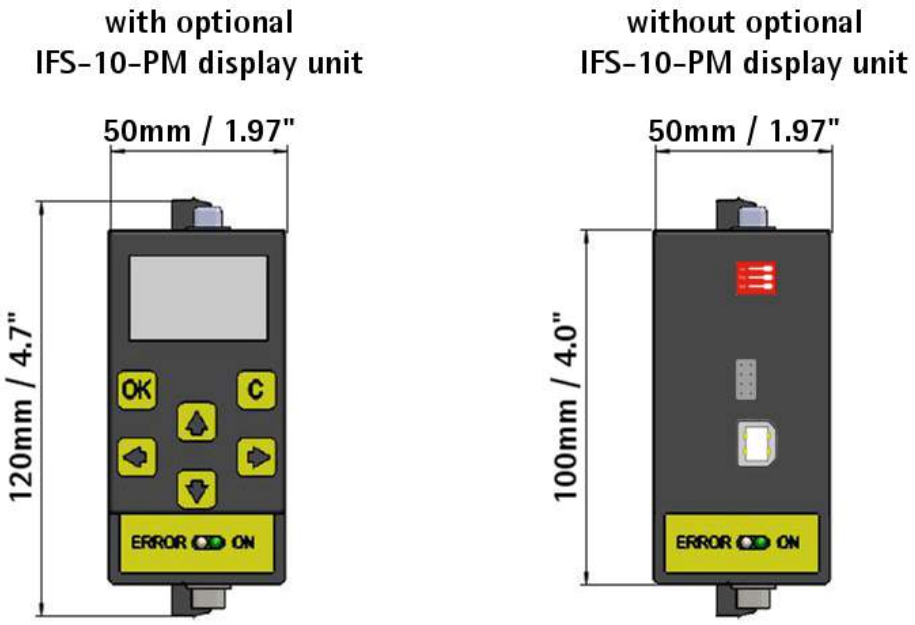



Figure 1 - Frontal view

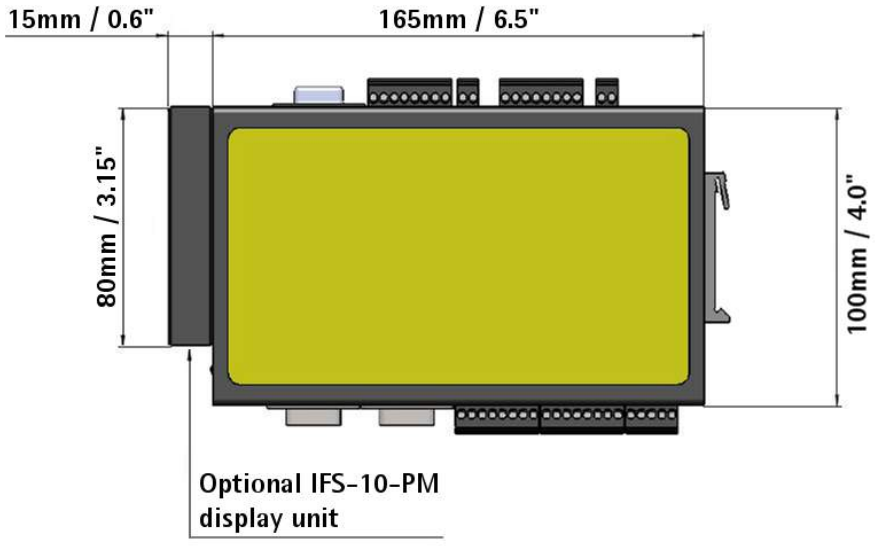



Figure 2 - Lateral view

### 3.2 Installation

The device is allowed to be installed and operated only within the permissible temperature range (-20 ÷ +55°C / -4 ÷ +131°F). Please ensure an adequate ventilation and avoid any 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. Furthermore it must be ensured that no danger can arise in the event of contact with the disconnected voltage sources.
Devices which are supplied with AC voltages must be connected only by means of switches or circuit breakers with low voltage circuit. The switch or circuit breaker must be installed 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 or increased insulation.
All selected wires and insulations must comply with the provided voltage and temperature ranges. Furthermore 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 product datasheet.

Before starting the unit for the first time it must be ensured that all connections and wires are firmly plugged in and secured to the screw terminal blocks. All terminal blocks (including unused terminal blocks) must be fastened by turning the relevant screws clockwise up to the end position.

Overvoltages 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 you must comply with the general standards stated for the industrial automation industry and the specific shielding instructions provided by the manufacturer.

### 3.3 Mounting the safety monitor

**WARNING**
Mount the unit with power supply disconnected.

IFS-10 safety monitor must be installed and protected inside the electric panel. It provides DIN rail mounting and can quickly snap onto a DIN rail (35 mm size C section profile, according to EN 60715) with built-in DIN rail clips that require no additional brackets or supports.

Before installation, please always observe the following remarks.

- The unit must be in perfect conditions, mechanically and technically.
- The unit must be snapped onto a 35 mm DIN rail (according to EN 60715), by using the clip at the rear.
- It must be ensured that the permissible environmental conditions of the specification are met accordingly.
- To choose and connect the power supply unit, please refer to the "4.6 Power supply" section on page 36.
- To choose and connect the encoders, please refer to the "4.6 Power supply" section on page 36; to the "4.7 SINCOS IN 1-2, Sine Cosine inputs ([X6] and [X7] connectors)" section on page 41; to the "4.8 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)" section on page 43; and to the "4.9 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 44.
- When control inputs, digital inputs, or external relays are used, please note that the whole configuration will be evaluated in the final Safety Integrity Level (SIL).
- The analogue output, the digital outputs as well as the splitter output can be safe only if the subsequent unit is able to detect and evaluate the error states of the monitor.
- The relay contacts at [X1] terminal must be integrated into the safety circuit.

## WARNING

- In order to prevent simultaneous damages to the cables by external influences, the encoder lines and the sensor lines must be kept physically separated from each other.
- Installation, commissioning, and maintenance must be performed by qualified personnel only.
- In order to prevent manipulations, the machine as well as the equipment must be protected from any unauthorized access.
- The machine must be securely mounted and ready to operate.
- The safety function of the unit cannot be guaranteed before the commissioning and parametrization procedure have been fully carried out.
- Before commissioning and parametrization, the situation of risk of the system must be analysed and all precautions must be taken accordingly. These are fundamental measures in order to protect persons and machinery.

### 3.4 Cleaning, maintenance, and service notes

To clean the unit please just use a slightly damp (not wet!), soft cloth. For the rear side no cleaning is necessary. For an unscheduled, individual cleaning of the rear side the maintenance technicians or installation operators are self-responsible.

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

In case of continuous operation the IFS-10 unit must be switched off and on once a year at least.

# 4 - Electrical connections

## WARNING

Power supply must be turned off before performing any electrical connection!

### 4.1 EMC Guidelines

These devices are designed to provide high protection against electromagnetic interference. Nevertheless you must minimize the influence of electromagnetic noise to the device and all connected cables.
Therefore the following measures are mandatory for a successful installation and operation:

- use shielded cables for all signal as well as control input and output lines;
- cables for digital controls (digital I/O, relay outputs) must not exceed a length of 30 m / 98.425 ft and are allowed for in-building operation only;
- use shield connection clamps to properly connect the cable shields to earth;
- the wiring of the common ground lines must be star-shaped and common ground must be connected to earth at one single point only;
- the device should be mounted in a metal enclosure providing enough distance from sources of electromagnetic noise;
- run signal and control cables apart from power lines and other cables emitting electromagnetic noise.

### 4.2 Commissioning

## WARNING

- In order to prevent simultaneous damages to the cables by external influences, the encoder lines and the sensor lines must be kept physically separated from each other.
- Installation, commissioning, and maintenance must be performed by qualified personnel only.
- In order to prevent manipulations, the machine as well as the equipment must be protected from any unauthorized access.
- The machine must be securely mounted and ready to operate.
- The safety function of the unit cannot be guaranteed before the commissioning and parametrization procedure have been fully carried out.
- Before commissioning and parametrization, the situation of risk of the system must be analysed and all precautions must be taken accordingly.

These are fundamental measures in order to protect persons and machinery.

### 4.3 Preliminary operations for setup and testing

When you need to put the IFS-10 monitor into operation or to change some settings and parameters, please observe the following measures:

- Connect the unit to a power supply source, refer to the "4.6 Power supply" section on page 36.
- Set the DIL switch sliders 1 and 2 to ON and the DIL switch slider 3 to OFF in order to set the Programming and Testing mode, refer to the "4.15 DIL switch ([S1] DIL switch)" section on page 55.
- Properly install the OS operating software on the PC and start the program, refer to the additional "MAN OS10.0 Installer E.pdf" manual.
- Connect the unit to the OS operator surface via the USB port, refer to the "4.17 Interface for the OS software tool ([USB] port)" section on page 58.
- As an alternative you can use the optional IFS-10-PM display unit, refer to the "4.16 Interface for connecting the IFS-10-PM display unit ([X11] connector)" section on page 57.

The parametrization and testing can be performed by means of the OS software. Parameters can be changed "on-the-fly" and their behaviour can be tested immediately after changing. The programming and test mode provides the complete functionality of the Normal and Safety mode. So all tests performed in the Programming and Test mode are also valid in the Safety mode.
The parameters **022 Set Frequency 1**, **029 Set Frequency 2**, **091 Action Output**, and **092 Action Polarity** as well as the related commands SET FREQUENCY and FREEZE FREQUENCY of the **100 IN1 Function**, **102 /IN1 Function**, **104 IN2 Function**, and **107 /IN2 Config** parameters are an exception. They are intended for the Test mode only. During the test the use of the DIL switch is not necessary to activate the parameter changes, see on page 55.
For an efficient and fast parametrization, the use of the OS software is preferable to the IFS-10-PM display.

## 4.4 Block diagrams and connections

### 4.4.1. IFS-10 block diagram

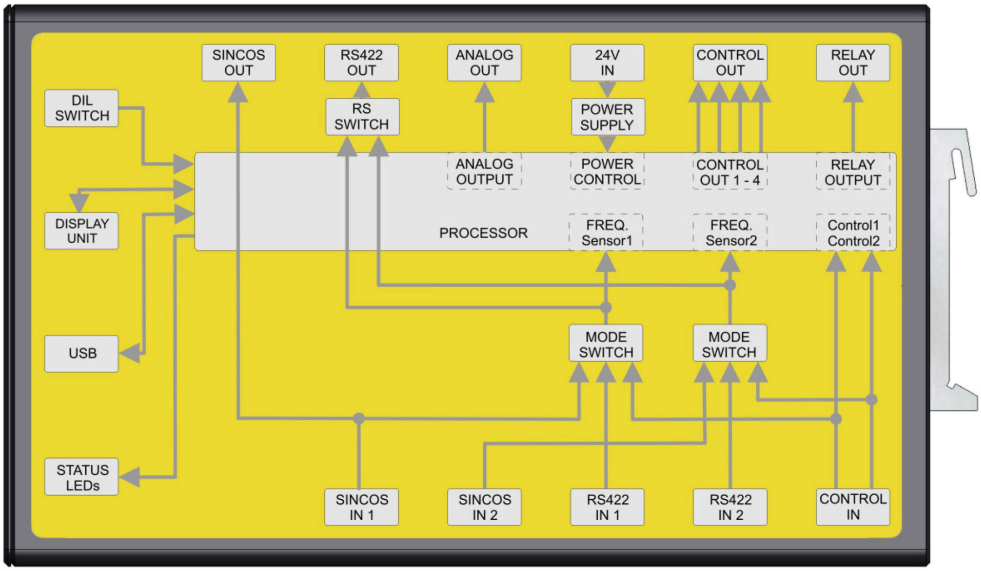



Figure 3 - IFS-10 block diagram

### 4.4.2 IFS-10 connections

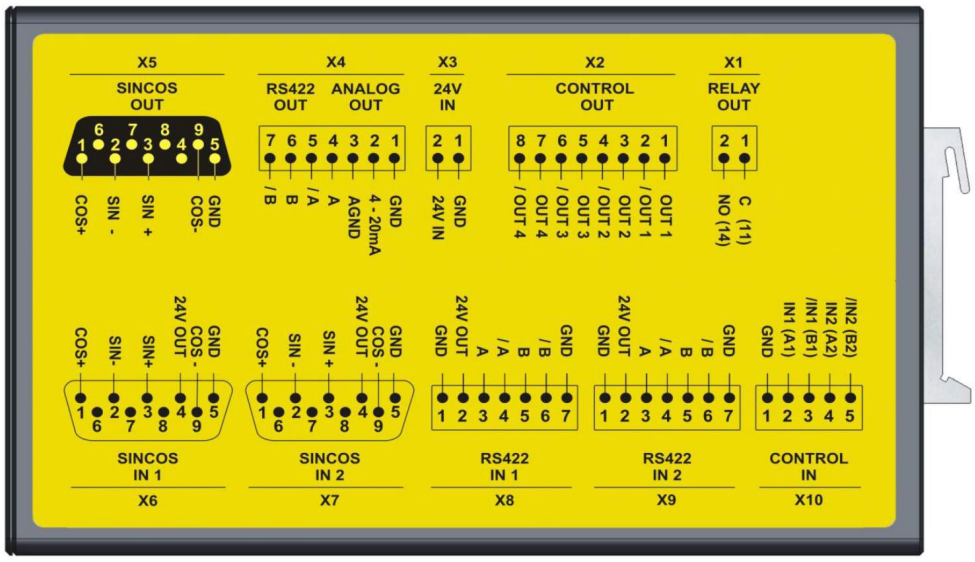



Figure 4 - IFS-10 connections

### 4.4.3 IFS-10A block diagram

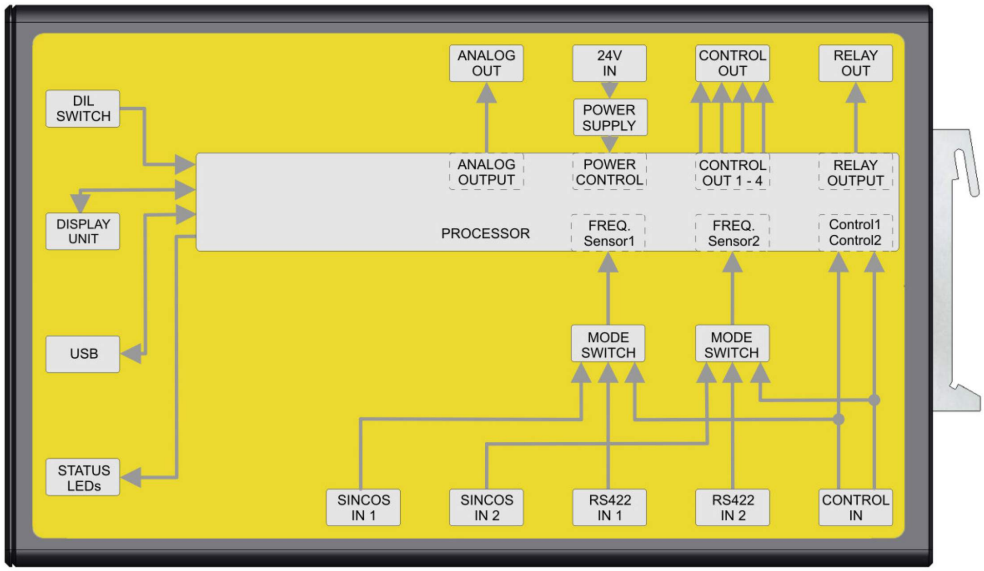



Figure 5 - IFS-10A block diagram

### 4.4.4 IFS-10A connections

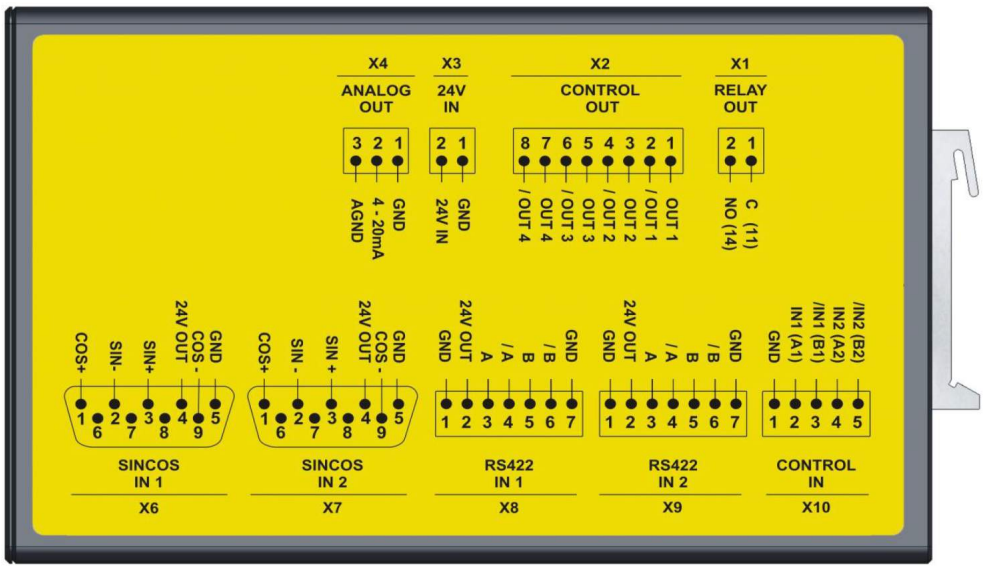



Figure 6 - IFS-10A connections

### 4.4.5 IFS-10S block diagram

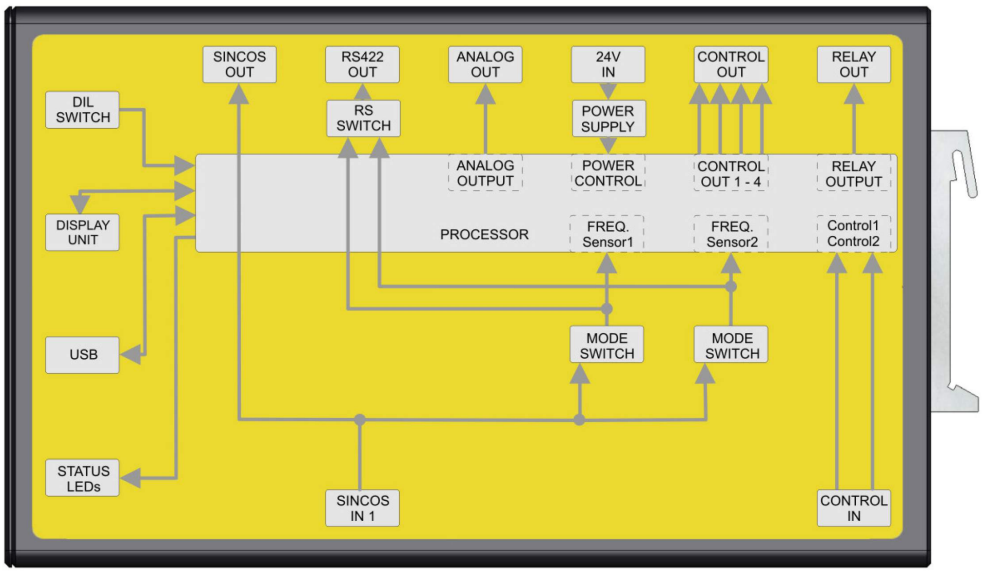



Figure 7 - IFS-10S block diagram

### 4.4.6 IFS-10S connections

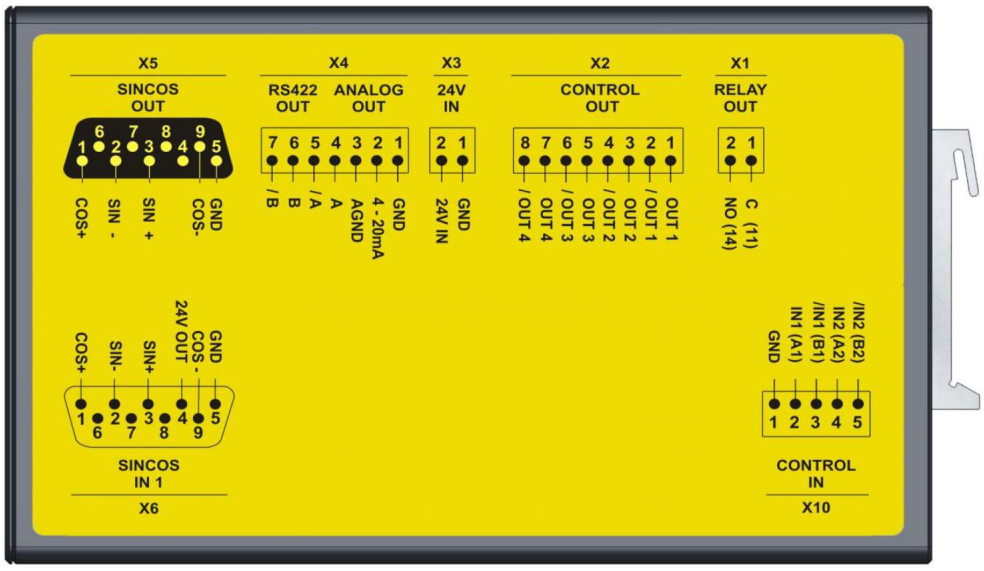



Figure 8 - IFS-10S connections

### 4.4.7 IFS-10SA block diagram

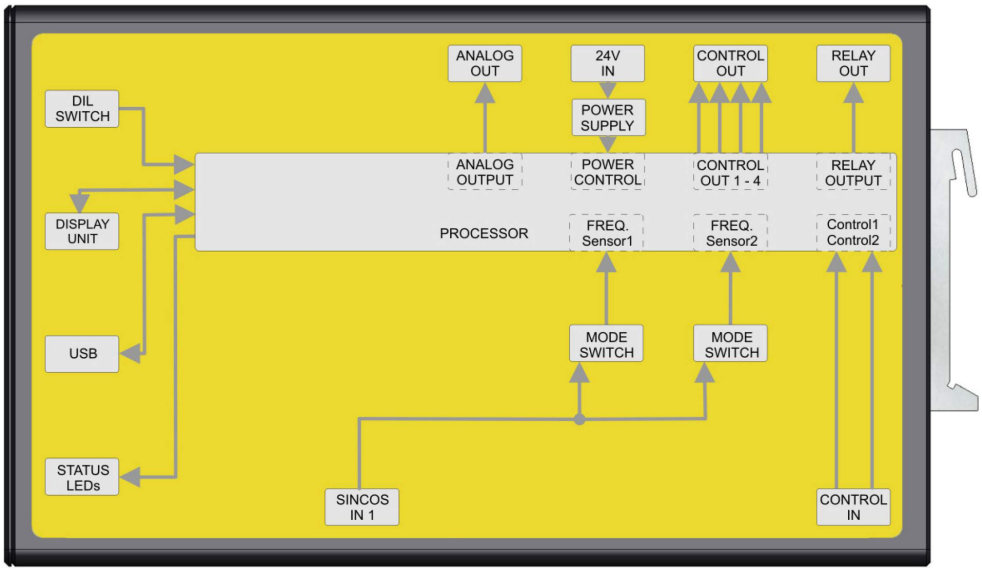



Figure 9 - IFS-10SA block diagram

### 4.4.8 IFS-10SA connections

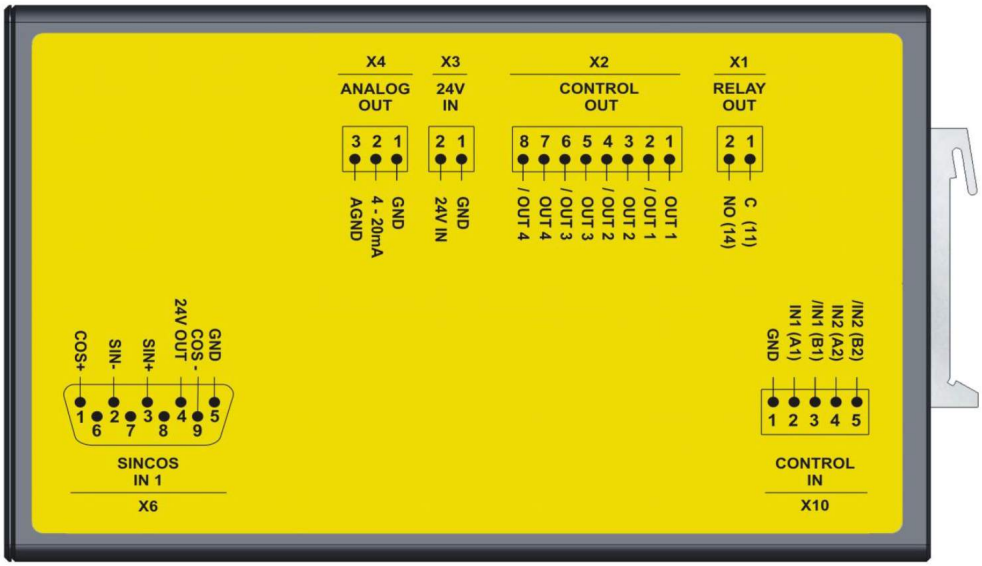



Figure 10 - IFS-10SA connections

### 4.5 Description of the connections

The following table describes the available electrical features and connections and their general function. For detailed technical information please refer to the product datasheet. For a complete description refer to the specific section.

| Available connections | Complete description, see the section ... |
|---|---|
| X1 \| RELAY OUT | Relay output, "4.14 RELAY OUT, relay output ([X1] terminal block)", page 53 |
| X2 \| CONTROL OUT | Control outputs, "4.13 CONTROL OUT, HTL control outputs ([X2] terminal block)", page 51 |
| X3 \| 24V IN | Power supply, "4.6 Power supply", page 36 |
| X4 \| ANALOG OUT | 4-20 mA analog output, "4.12 ANALOG OUT, 4 - 20 mA analogue output ([X4] terminal block)", page 49 |
| X4 \| RS-422 OUT | RS-422 splitter output, "4.11 RS-422 OUT, RS-422 splitter output ([X4] terminal block)", page 48 |
| X5 \| SINCOS OUT | Sine/Cosine splitter output, "4.10 SINCOS OUT, Sine Cosine splitter output ([X5] connector)", page 47 |
| X6 \| SINCOS IN 1 | Sine/Cosine encoder inputs, "4.7 SINCOS IN 1-2, Sine Cosine inputs ([X6] and [X7] connectors)", page 41 |
| X7 \| SINCOS IN 2 | Sine/Cosine encoder inputs, "4.7 SINCOS IN 1-2, Sine Cosine inputs ([X6] and [X7] connectors)", page 41 |
| X8 \| RS-422 IN 1 | RS-422 encoder inputs, "4.8 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)", page 43 |
| X9 \| RS-422 IN 2 | RS-422 encoder inputs, "4.8 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)", page 43 |
| X10 \| CONTROL IN | HTL encoder inputs / Control inputs, "4.9 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)", page 44 |
| X11 \| 8-PIN CONNECTOR | IFS-10-PM display, "4.16 Interface for connecting the IFS-10-PM display unit ([X11] connector)", page 57 |
| X12 \| USB PORT | USB port for OS Operator software, "4.17 Interface for the OS software tool ([USB] port)", page 58 |
| S1 \| DIL SWITCH | DIL switch, "4.15 DIL switch ([S1] DIL switch)", page 55 |
| ERROR – ON LEDs | LEDs for status indication, "4.18 Diagnostic LEDs / Status information", page 59 |

**WARNING**

All outputs are safety outputs yet the connections to the outputs are safe only if the downstream device detects the fault status of each output and when the outputs are configured properly.

**WARNING**

The wires of unused signals must be cut at different lengths and insulated singularly.

**WARNING**

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

## 4.6 Power supply

### 4.6.1 24V IN, Unit Power supply ([X3] terminal block)

**Power supply technical specifications**

| | |
|---|---|
| Input voltage: | 18 ... 30 Vdc with 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 block, 2-pin, 1.5 mm² / AWG14 |

If the unit is connected to a DC power supply which supplies several devices or systems, it must be ensured that no voltages ≥ 60 V can occur at the terminal blocks X3:1 and X3:2.
If this cannot be ensured, the unit must be supplied by a separate DC power source that cannot be connected to other devices or systems.

The main requirements for both kinds of power supply source are:

- Nominal voltage range: between 18Vdc and 30Vdc
- Ripple: < 10% @ 24V
- External fuse (2.5 A, medium time lag): required

A separate power pack must meet the following requirements:

- the switch-on current of the unit is maximum 2.5 A
- the consumption of the unit is approx. 23 W (at permissible load and without short circuit).

The 18 ... 30Vdc power supply must be connected to the pluggable **2-pin screw terminal block [X3]**.
The power supply input is protected by an internal reverse polarity protection.

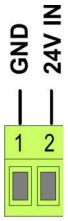



**Figure 11 - [X3] pluggable 2-pin screw terminal block**

**WARNING**
The DC power supply input must be protected by means of an external fuse as specified above in this section. The IFS-10 unit has no internal galvanic insulation, thus all GNDs are interconnected. Please avoid any GND loops to the power supply input [X3]. Also with a SIL3 certified power supply ($U_{FAIL}$ < 60 V) an external fuse must be used.

### 4.6.2 Encoder supply

**Encoder supply technical specifications**

| | |
|---|---|
| Output voltage: | approx. 2 Vdc lower than the input voltage |
| Output current: | max. 200 mA per encoder |
| Protection: | short circuit proof |

The unit offers an auxiliary voltage output to separately supply the connected encoder or sensor.
The power can be supplied to the encoders directly via the safety unit (see the "4.6.2.1 Direct encoder supply" section on page 38) or indirectly by means of an external power supply via a relay (see the "4.6.2.2 External encoder supply" section on page 39).

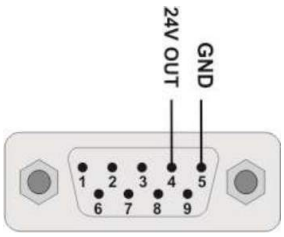



**Figure 12 - Encoder supply: [X6] - [X7] Sine Cosine inputs**

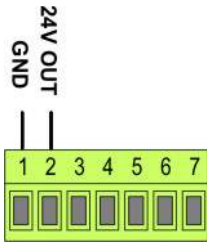



**Figure 13 - Encoder supply: [X8] - [X9] RS-422 inputs**
**HTL (Push-Pull) encoders or sensors must be connected also to the encoder supply terminals of the RS-422 inputs**

The maximum load of the encoder supply is 200 mA each channel (Sensor1 and Sensor2). The unit provides an auxiliary encoder supply for each sensor channel (HTL encoders will be supplied by the encoder supply of the RS-422 inputs). The level of the supply voltage is approximately 2V lower than the 18Vdc ... 30Vdc power supply at terminal [X3].

| Supply | Sine Cosine inputs | RS-422 inputs | HTL inputs |
|---|---|---|---|
| **Sensor1** | [X6:4] [X6:5] | [X8:1] [X8:2] | [X8:1] [X8:2] |
| **Sensor2** | [X7:4] [X7:5] | [X9:1] [X9:2] | [X9:1] [X9:2] |

When you switch on the encoder power supply, the maximum input current of the safety unit could be exceeded depending on the connected and used

encoders. In this case, the encoder power supply will not be enabled and an error will appear (see the "7 - Error detection" section on page 97).
In case of such problems or if a different voltage level is required, the encoder can be supplied by means of an external voltage source via a remote relay. The activation of the relay must be performed by the internal encoder supply of the safety unit (see the "4.6.2.2 External encoder supply" section on page 39).

**WARNING**
In case of a direct encoder supply it is mandatory to operate the encoders via the auxiliary voltage from the unit.

**WARNING**
An indirect encoder supply must be compulsorily provided via a relay which is triggered by the auxiliary voltage of the unit.

#### 4.6.2.1 Direct encoder supply

In case of a direct encoder supply, the encoder must be connected as shown in the Figure below:

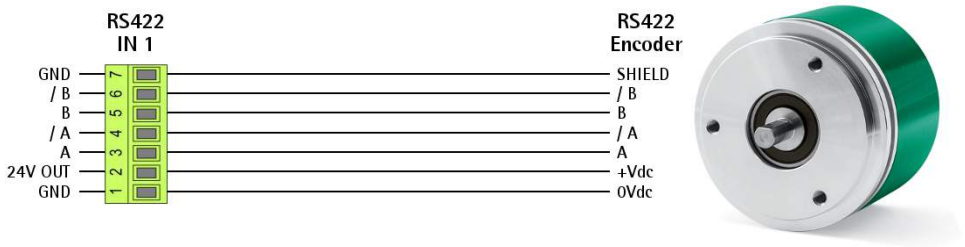



**Figure 14 - Example of direct encoder supply**

#### 4.6.2.2 External encoder supply

An indirect encoder supply must be compulsorily provided via a relay which is triggered by the auxiliary voltage of the unit. Separate relays must be used for each encoder.
This is necessary because the no encoder signal must be provided to the safety monitor before the unit has carried out successfully the initialization and auto-test.

**EXAMPLE 1**

In the EXAMPLE 1 one encoder is supplied via one relay.

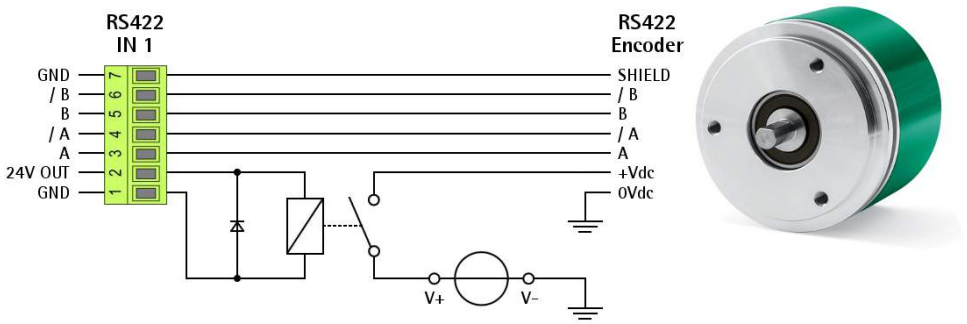



**Figure 15 - Example 1 of indirect encoder supply**

**EXAMPLE 2**

In the EXAMPLE 2 two encoders are supplied via 2 relays.

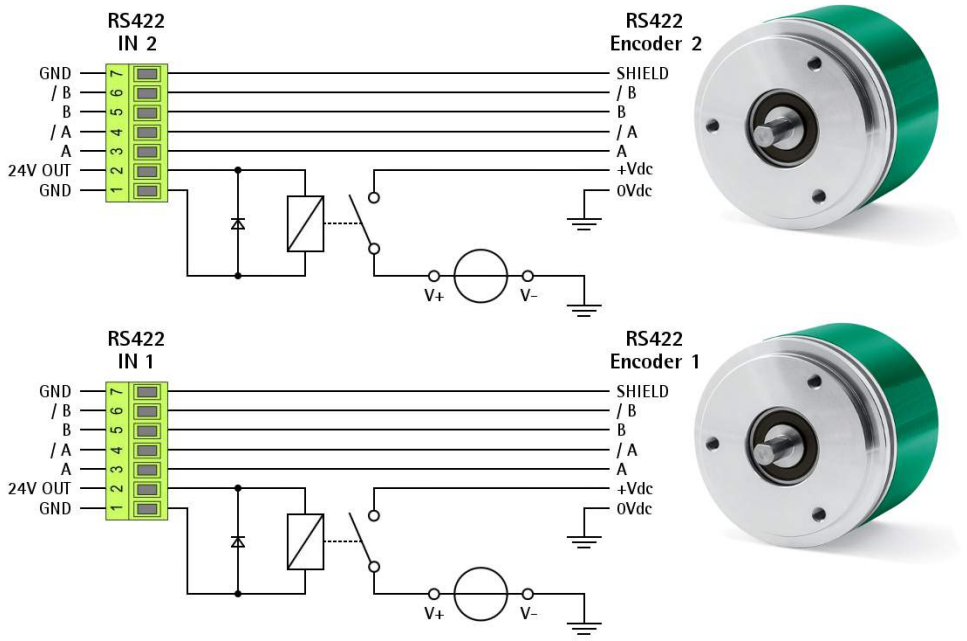



**Figure 16 - Example 2 of indirect encoder supply**

**WARNING**

An indirect encoder supply must be compulsorily provided via a relay which is triggered by the auxiliary voltage of the unit. Separate relays must be used for each encoder.

**WARNING**

In case of an indirect encoder supply, two independent supply sources and two separate relays must be used.

## 4.7 SINCOS IN 1-2, Sine Cosine inputs ([X6] and [X7] connectors)

**Sine cosine inputs technical specifications**

| | |
|---|---|
| Number of inputs: | 1 / 2* |
| Amplitude: | 0.8 ... 1.2 Vpp |
| DC offset: | 2.4 ... 2.6 Vdc |
| Frequency: | max. 500 kHz (with Lissajous figure monitoring max. 100 kHz) |
| Connections: | [X6] and [X7]*, DSub (male), 9-pin connectors |

* Only available in the IFS-10 and IFS-10A models

**WARNING**
IFS-10S / IFS-10SA models are are not fitted with the SINCOS 2 IN input.

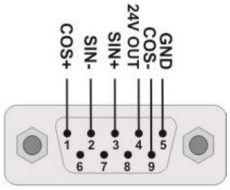



**Figure 17 - Male DSub 9-pin connectors: [X6] - [X7] Sine Cosine inputs**

The unit is suitable to connect Sine Cosine encoders and sensors providing differential Sine Cosine input signals having 1 Vpp level and 2.5 Vdc offset.

For IFS-10 and IFS-10A models the operational mode (see the **000 Operational mode** parameter, refer to the "14.2.2 Main menu" section on page 168) must be set to **0**, **1**, **2**, or **6**. The Sine Cosine encoder must be connected through the [X6] and/or [X7] 9-pin DSub connectors (either connector or both).
For IFS-10S and IFS-10SA models the operational mode (see the **000 Operational mode** parameter, refer to the "14.2.2 Main menu" section on page 168) must be set to **0**. The sine cosine encoder must be connected through the [X6] 9-pin DSub connector.

It is mandatory to always connect all existing signal lines (B = SIN+, /B = SIN-, A = COS+ and /A = COS-). The internal Sine Cosine encoder signal monitor checks the offset range of the signals as well as the Lissajous figure which results from the signals.
The Sine Cosine encoder must use the corresponding encoder supply at pin 4 and pin 5 of the connector (refer to the "4.6.2 Encoder supply" section on page 37).

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

**WARNING**
The wires of unused signals must be cut at different lengths and insulated singularly.

**NOTE**
Please note that all input lines are already terminated by internal 120 ohm load resistors.

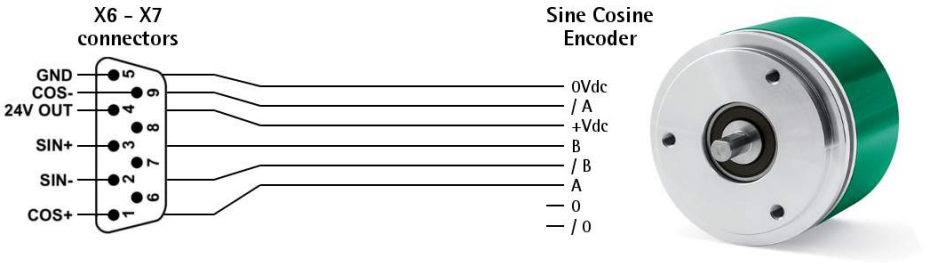



**Figure 18 - [X6] and [X7] male DSub connectors**

**NOTE**
We suggest activating rather than deactivating the Sine Cosine Error in order to avoid any subsequent errors. The **023 SIN Err Time 1** and **030 SIN Err Time 2** parameters (see on pages 177 and 180 respectively) can suppress the Sine Cosine error in 20 ms intervals. Sine Cosine signals affected by noise can produce Sine Cosine errors and frequency errors.

**IFS-10 and IFS-10A units only**
In the following cases you must switch off the detection of Sine Cosine errors in order to avoid continuous Sine Cosine error warnings:

- when the Sine Cosine encoders provide a DC offset different than specified;
- when the encoders provide 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, not for the transmission of the signals, i.e. the Sine Cosine output cannot be used.

## 4.8 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)

(IFS-10 and IFS-10A models only)

### RS-422 inputs technical specifications

| | |
|---|---|
| Number of inputs: | 2 |
| Format: | RS-422 standard (differential signal A, /A, B, /B) |
| Frequency: | max. 500 kHz |
| Connections: | [X8] and [X9], 7-pin, 1.5 mm² screw terminal / AWG14 |

If the operational mode is set to **7**, **8**, or **9** (see the **000 Operational mode** parameter, refer to the "14.2.2 Main menu" section on page 168), the unit will be enabled to accept signals from incremental encoders with complementary TTL or differential RS-422 levels through the [X8] and/or [X9] pluggable 7-pin screw terminals (either terminal or both).
The RS-422 input channels (A and /A or B and /B) are wired internally using a dynamic terminating circuit (220 pF / 120 ohm).
The RS-422 encoder must use the corresponding encoder supply at terminal block 1 and terminal block 2 of the respective terminal (refer to the "4.6.2 Encoder supply" section on page 37).

**WARNING**
It is mandatory to connect up all signal lines (A and /A, B and /B). An evaluation of any existing reference signals (0 and /0) is not applicable and therefore no connection terminal blocks are available.

**WARNING**
The wires of unused signals must be cut at different lengths and insulated singularly.

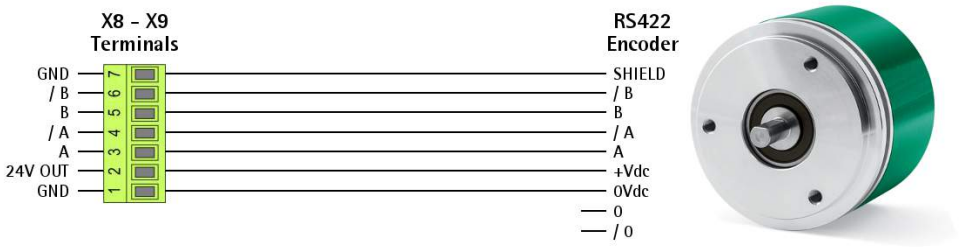



**Figure 19 - [X8] and [X9] pluggable 7-pin screw terminal**

## 4.9 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)

| | |
|---|---|
| Number of inputs: | 2 (each provides complementary signals) |
| Application: | HTL (Push-Pull) encoders, proximity switches or control commands |
| Signal level: | HTL / PNP (10 ... 30 V) |
| Load: | max. 15 mA |
| Frequency (HTL signals): | max. 250 kHz |
| Frequency (control inputs): | max. 1 kHz |
| Connections: | [X10], 5-pin, 1.5 mm² screw terminal / AWG14 |

The [X10] screw terminal has 2 - 4 inputs for signals with HTL level and PNP switching characteristic. Each input provides complementary signals.

Depending on the selected operational mode (see the **000 Operational mode** parameter, refer to the "14.2.2 Main menu" section on page 168), the Control inputs can be configured as frequency inputs or command inputs.

**Frequency input for HTL encoders (A / B / 90° phase shifted)**

| | | | | |
|---|---|---|---|---|
| **Sensor 1** | [X10 \| CONTROL IN] | Incremental HTL encoder | [X10:2]<br>[X10:3] | Channel A<br>Channel B |
| **Sensor 2** | [X10 \| CONTROL IN] | Incremental HTL encoder | [X10:4]<br>[X10:5] | Channel A<br>Channel B |

**WARNING**
HTL encoders must be supplied by the encoder supply of the RS-422 inputs (X8-X9 terminal blocks, refer to the "4.6.2 Encoder supply" section on page 37). Please make sure to comply with the allowed frequency ranges.

**WARNING**
The wires of unused signals must be cut at different lengths and insulated singularly.

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

| | | | | |
|---|---|---|---|---|
| **Sensor 1** | [X10 \| CONTROL IN] | Incremental HTL encoder | [X10:2]<br>[X10:3] | Channel A<br>not connected/direction sign. |
| **Sensor 2** | [X10 \| CONTROL IN] | Incremental HTL encoder | [X10:4]<br>[X10:5] | Channel A<br>not connected/direction sign. |

[X10:3] and [X10:5] inputs can be kept not connected (internal pull-down) or used for a static direction signal.

**WARNING**
HTL encoders must be supplied by the encoder supply of the RS-422 inputs (X8-X9 terminal blocks, refer to the "4.6.2 Encoder supply" section on page 37). Please make sure to comply with the allowed frequency ranges.

**WARNING**
The wires of unused signals must be cut at different lengths and insulated singularly.

### 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 |

The inverse signals must be always applied to the inverted inputs. Any other signal conditions are invalid and will be acknowledged by the unit as an error. For further information on the command inputs please refer to the "14.2.7 Control menu" section on page 204. The configuration of the inputs will affect the SIL level.

### Two homogeneous control inputs for HTL commands

| | | | | |
|---|---|---|---|---|
| **Signal pair 1** | [X10 \| CONTROL IN] | HTL/PNP control signal | [X10:2] [X10:3] | Control signal 1 Homogeneous control signal 1 |
| **Signal pair 2** | [X10 \| CONTROL IN] | HTL/PNP control signal | [X10:4] [X10:5] | Control signal 2 Homogeneous control signal 2 |

The inverted input must always receive the same signal as the non-inverted input. Any other signal conditions are invalid and will be acknowledged by the unit as an error. For further information on the command inputs please refer to the "14.2.7 Control menu" section on page 204. The configuration of the inputs will affect the SIL level.

### Four single control inputs for 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 |

For further information on the command inputs please refer to the "14.2.7 Control menu" section on page 204. The configuration of the inputs will affect the SIL level.

**One homogeneous / inverse control input and two single control inputs for HTL commands**

| | | | | |
|---|---|---|---|---|
| **Signal pair 1** | [X10 \| CONTROL IN] | HTL/PNP control signal | [X10:2]<br>[X10:3] | Control signal 1<br>Homogeneous / 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 |

The homogeneous or inverse signal must be always applied to the inverted input. Any other signal conditions are invalid and will be acknowledged by the unit as an error. For further information on the command inputs please refer to the "14.2.7 Control menu" section on page 204. The configuration of the inputs will affect the SIL level.

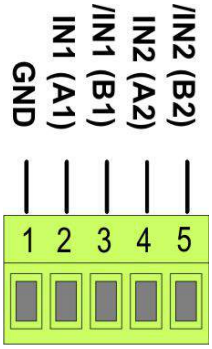



**Figure 20 - [X10] pluggable 5-pin screw terminal**

**NOTE**

- You are advised not to configure the device for the connection of two HTL encoders simultaneously, because no more inputs will be available for external commands then.
- With IFS-10S / IFS-10SA models, all four channels can be used as control inputs for external commands.
- When using a single-channel encoder, the associated second input is not suitable for other functions.
- It may happen that, on some housings, labels "IN1 ... IN4" can be found to describe the CONTROL IN signals of terminal X10. The meaning of the labels is as follows: IN1 = IN1, IN2 = /IN1, IN3 = IN2, IN4 = /IN2.

## 4.10 SINCOS OUT, Sine Cosine splitter output ([X5] connector)

(IFS-10 and IFS-10S models only)

### Sine Cosine splitter output technical specifications

| | |
|---|---|
| Splitter output: | SINCOS IN1 input (see on page 41) |
| Amplitude: | 0.8 ... 1.2 Vpp |
| DC offset: | 2.4 Vdc ... 2.6 Vdc |
| Frequency: | max. 500 kHz |
| Connection: | [X5], SUB-D (female), 9-pin connector |

IFS-10 and IFS-10S models are equipped with a safety-related Sine Cosine splitter output. Depending on the selected operating mode (**0**, **1**, **2**, or **6**; see the **000 Operational mode** parameter, refer to the "14.2.2 Main menu" section on page 168), the integrated splitter exports the signals at the SINCOS IN1 [X6] input to the [X5 | SINCOS OUT] 9-pin female DSub connector. Thus the signals from the encoder connected to the [X6 | SINCOS IN1] input can be processed by a further subsequent device.
The signal delay time between the Sine Cosine input and the Sine Cosine output is approximately 200 ns.
SIN+ / SIN- and COS+ / COS- channels must be terminated by 120 ohm load resistors at the subsequent device.
In the event of an error, the DC offset of the SINCOS output is shifted in order to signal the error condition to the subsequent device.

The connection to the Sine Cosine splitter output is safe only if the subsequent device integrates a Sine Cosine monitoring system which is able to detect offset errors.

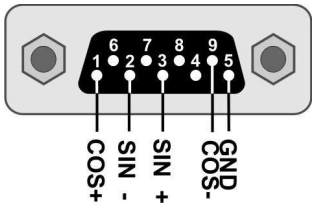



**Figure 21 - [X5] 9-pin female SUB-D connector**

**WARNING**

- SIN+ / SIN- and COS+ / COS- channels must be terminated by 120 ohm load resistors at the subsequent device.
- Sine Cosine input signals must consist of two Sine-shaped and two Cosine-shaped signal pairs.
- The DC offset value at the input is typically 2.5V and fully independent of the input offset.
- A Sine Cosine error at the input can produce an error also at the Sine Cosine output.

## 4.11 RS-422 OUT, RS-422 splitter output ([X4] terminal block)

(IFS-10 and IFS-10S models only)

### RS-422 splitter output technical specifications

| | |
|---|---|
| Splitter output: | SINCOS IN 1, SINCOS IN 2, RS422 IN 1, RS422 IN 2, HTL 1 or HTL 2 proximity switch |
| Format: | RS-422 (differential signals A, /A, B, /B) |
| Frequency: | max. 500 kHz |
| Signal delay: | Approx. 600 ns |
| Connections: | [X4], 7-pin 1.5 mm² screw terminal block / AWG14 |

IFS-10 and IFS-10S models are equipped with a safety-related RS-422 splitter output.
The device evaluates two frequency channels (Sensor1 and Sensor2) according to the selected operational mode (see the 000 Operational mode parameter, refer to the "14.2.2 Main menu" section on page 168). The splitter output allows to reproduce the inputs frequency of Sensor1 or Sensor2.
Independently from the input signal (Sine Cosine or HTL signal), the [X4] RS422 OUT output always provides incremental RS-422 square wave signals.
The signal delay time between the RS-422 input and the RS-422 output is approximately 600 ns.
In the event of an error, the incremental signals at the RS-422 output are cut off (Tri-State internally with 1 Kohm pull-down resistors).
The connections to the RS-422 splitter output are safe only if the subsequent device is able to detect the error state of the safety unit.
The Sine Cosine input signals are reproduced as 1:1 square wave output.

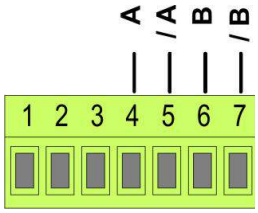



**Figure 22 - [X4] pluggable 7-pin screw terminal block**

[X4] screw terminal block is fitted with 7 connections:

| | | |
|---|---|---|
| [X4 \| ANALOG OUT] | analogue output | [X4:1-3] |
| [X4 \| RS422 OUT] | RS-422 output | [X4:4-7] |

**WARNING**
When using the converted Sine Cosine input as an RS-422 output, a Sine Cosine error at the input can produce an error also at the Sine Cosine output.

## 4.12 ANALOG OUT, 4 - 20 mA analogue output ([X4] terminal block)

### 4 – 20 mA analogue output technical specifications

| | |
|---|---|
| Current output: | 4 ... 20 mA (load max. 270 ohm) |
| Resolution: | 14 Bits |
| Accuracy: | ± 0.1 % |
| Connection: | [X4], 7-pin, 1.5 mm² screw terminal block / AWG14 |

One safety-related analogue output is available at the [X4] screw terminal block. The current output is freely scalable by setting the **118 Analog Start** and **119 Analog End** parameters (see the "14.2.10 Analogue menu" section on page 213). It delivers an output signal which is proportional to one of the two input frequencies (refer to the **003 F1-F2 Selection** parameter, see the "14.2.2 Main menu" section on page 168). If the analogue output is not used, you must bridge the pins 2 and 3 in the [X4] terminal block. An open analogue output will be acknowledged as an error (for instance a wire break).

During normal operation, the output will be in the proportional range from 4 to 20 mA.
In the event of errors, the analogue output is 0 mA.
The connection to the analogue output is safe only if the subsequent device is able to detect the error state of the safety unit.

In IFS-10 and IFS-10S models the [X4] screw terminal block is fitted with 7 connections:

| | | |
|---|---|---|
| [X4 \| ANALOG OUT] | analogue output | [X4:2-3] |
| [X4 \| RS422 OUT] | RS-422 output | [X4:4-7] |

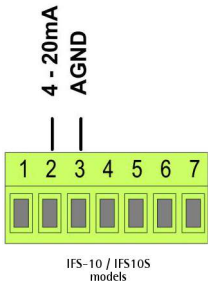



**Figure 23 - [X4] pluggable 7-pin screw terminal block**

In IFS-10A and IFS-10SA models the [X4] screw terminal block is fitted with only 3 connections:

| | | |
|---|---|---|
| [X4 \| ANALOG OUT] | analogue output | [X4:2-3] |
| [X4 \| RS422 OUT] | not available! | |

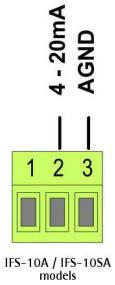



**Figure 24 - [X4] pluggable 3-pin screw terminal block**

**NOTE**

If an analogue output is not used, [X4:2] and [X4:3] must be linked. An open analogue output will be acknowledged as an error (for instance a wire break).

## 4.13 CONTROL OUT, HTL control outputs ([X2] terminal block)

**HTL control outputs technical specifications**

| | |
|---|---|
| Number of inputs | 2 (each provides complementary signals) |
| Output voltage: | HTL, approx. 2 Vdc lower than the input voltage |
| Output current: | max. 30 mA per output |
| Switching characteristic: | Push-Pull |
| Protection circuit: | short circuit proof |
| Connection: | [X2], 8-pin 1.5 mm² screw terminal / AWG14 |

Four inverse / homogeneous HTL control outputs are available at the [X2 | CONTROL OUT] screw terminal block. Each output provides the complementary signals (OUT1, /OUT1 ... OUT4, /OUT4).
The switching points and the switching conditions are adjustable by setting the dedicated parameters (see the "14.2.5 Preselect menu" section on page 181 and the "14.2.6 Switching menu" section on page 186).
When the output is at HIGH level, the level is about 2 V lower than the supply voltage which is connected to the [X3 | 24V IN] terminal block. The outputs are short circuit proof and push-pull type.
We recommend additional external suppression measures when switching inductive loads.

In the event of errors, all outputs are forced to LOW level (signals are not inverted anymore). The connections to the analogue output are safe only if the subsequent device is able to detect the error state of the safety unit.
The output configuration will affect the SIL level.

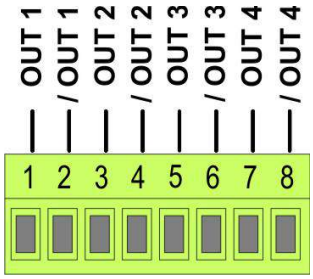
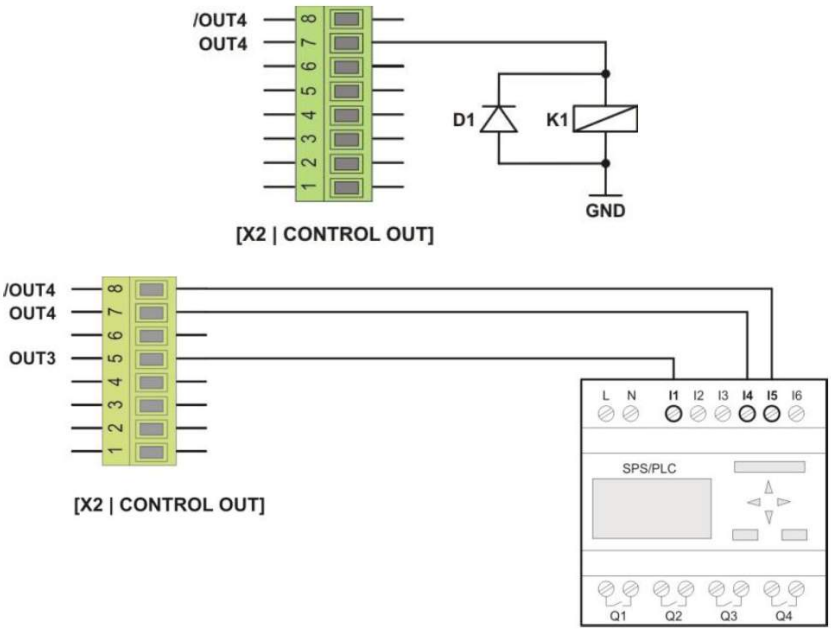



**Figure 25 - [X2] pluggable 8-pin screw terminal block**

**EXAMPLE**

Wiring example.



## 4.14 RELAY OUT, relay output ([X1] terminal block)

**Relay output technical specifications**

| | |
|---|---|
| Number of relays: | 2 relays connected in series with forced-guided contacts (NO) |
| Switching capability: | 5 ... 36 Vdc |
| Switching capacity: | 5 mA ... 5 A |
| Connection: | [X1], 2-pin 1.5 mm² screw terminal / AWG14 |

The safety-related relay output consists of two independent relays with force guided contacts. The normally open contacts (NO) of the two relays are internally connected in series. At the [X1 | RELAY OUT] 2-pin screw terminal block the series-relay contact can be tapped for integration into a safety circuit.

- The contacts are only closed during normal and disturbance-free operation. They open and switch to the safety state in the event of errors or when the programmed switching condition (see the "14.2.5 Preselect menu" section on page 181) is met.
- The contacts are open also in a de-energized state of the unit.
- The switching points and the switching conditions of the relay output are programmable by setting the dedicated parameters (see the "14.2.5 Preselect menu" section on page 181 and the "14.2.6 Switching menu" section on page 186).
- The force-guided relay opener is used to monitor the relay status by the unit itself.
- In the event of an error, the contact switches to the open and safety condition.

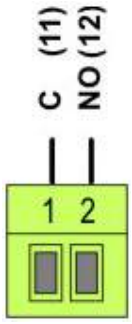



**Figure 26 - [X1] pluggable 2-pin screw terminal block**

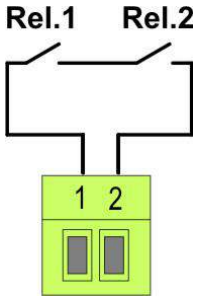



**Figure 27 - [X1] screw terminal block internal connection**

**WARNING**

- When the relay contact switches to the open condition, the operator is responsible to ensure a safety state to all relevant parts and components of the equipment.
- The subsequent unit must be able to evaluate the edges in order to determine also the dynamical conditions of the relay output.
- At frequencies close to the switching point, a bounce of the relay may occur caused by the change in the frequency measurement. To prevent this effect, hysteresis should be set (see the **066 Hysteresis REL1** parameter on page 192).
- If you detect that the switching point is exceeded even shortly, a lock function should be set to the output (see the **090 Lock Output** parameter on page 199).

### 4.15 DIL switch ([S1] DIL switch)

The 3-position DIL switch is located in the front of the unit. It is accessible only if the IFS-10-PM optional display unit is not connected.


**Figure 28 - [S1] 3-position DIL switch**

The following unit states can be selected by means of the DIL switch:

| DIL1 | DIL3 | Status | Yellow LED |
|---|---|---|---|
| **ON** | **ON** | "Normal Operation": parameter setting is disabled | OFF (it is solidly lit in error state) |
| **ON** | **OFF** | "Programming / Test Mode": it allows the parameters to be set (using the optional display unit or a PC) | Flashing (it is solidly lit in error state) |
| **OFF** | **ON** | "Factory Settings": at next power on, all parameters will be reset to default values | Flashing (it is solidly lit in error state) |
| **OFF** | **OFF** | "Factory Settings": at next power on, all parameters will be reset to default values | Flashing (it is solidly lit in error state) |

| DIL2 | Status | Operational readiness |
|---|---|---|
| **ON** | "Normal Operation": parameter setting is disabled | Ready for operation approx. 2 seconds after power on |
| **OFF** | "Self Test Message": at next power on, the unit will transmit a self test protocol via USB interface (please note that the | Ready for operation approx. 8 seconds after power on |

| | | |
|---|---|---|
| | booting process at start up is faster without "Self Test Message") | |

Set all DIL switch sliding levers to "ON" after start up and testing. Protect the DIL switch sliding levers after start up (for example cover them using some adhesive tape).

**WARNING**

The "Programming Mode" is only intended for start up and testing.
The "Normal operation" work mode is only allowed when the yellow status LED is permanently off (see the "4.18 Diagnostic LEDs / Status information" section on page 59).
The safety function of the unit cannot be guaranteed before the commissioning is completed.

## 4.16 Interface for connecting the IFS-10-PM display unit ([X11] connector)

IFS-10 safety unit can be equipped with an optional IFS-10-PM programming and display unit. The IFS-10-PM unit is able to perform a double task: it can be used either to programme the safety unit or to be a display of the safety unit.
The mounting of the IFS-10-PM programming and display unit is performed by simply plugging it into the 8-pin female connector located in the front of the safety device.
[X11] connector is accessible only if the optional display unit is not connected.
The interface is used to display the encoder signals (in user units) and for visual monitoring of the IFS-10 unit. Although the parameters can be set or changed by using the IFS-10-PM display unit, we recommend the OS software to be used for start up and commissioning purposes.


**Figure 29 - [X11] 8-pin female connector**

For complete information on installing, programming, and using the IFS-10-PM display unit, please refer to the specific "User's guide".

**NOTE**
The [X11] connector can be used only to connect the IFS-10-PM unit.

## 4.17 Interface for the OS software tool ([USB] port)

**USB interface technical specifications**

| | |
|---|---|
| Version: | USB 1.0 |
| Connection: | [X12], USB-B female port |
| Operating system: | DS2xx software from version 4c for Windows 7 / 8 / 10 (tested with 1511 build 10586.104); otherwise only for Windows 7 / 8 |


**Figure 30 - [USB] type B USB port**

A virtual COM port is accessible through the USB port located in the front of the safety unit. It is used for communication between the unit and a PC or a superordinate controller. For connection use a standard USB cable with a "type B" connector. [USB] port is accessible only if the optional display unit is not connected.
The procedure for installation of the USB drivers is described in the separate "MAN OSxx Installer E" manual.

The functions and parameters of the safety unit can be set via PC by means of the OS software tool. The OS software tool and the specific documentation can be downloaded from Lika web site. For complete information on using the OS software tool and programming the safety unit, please refer to the "6.2 Setting up the unit via PC" section on page 83.

### 4.18 Diagnostic LEDs / Status information

Two LEDs located in the front of the safety unit are meant to show visually the operating or fault status of unit. The yellow LED (on the left) is marked with [ERROR] while the green LED (on the right) is marked with [ON].


**Figure 31 - Diagnostic LEDs**

The following conditions are signalled by the **green** status LED:

| Green LED | Condition |
|---|---|
| **OFF** | Power OFF - no power supply voltage |
| **ON** | Power ON – the power supply voltage is provided properly |

The following conditions are signalled by the yellow status LED:

| Yellow LED | Condition |
|---|---|
| **OFF** | Normal operation, self-test completed successfully, no error messages |
| **ON** | Auto-test in progress |
| | Error state |

| | |
|---|---|
| **Flashing slowly** | "Factory Settings" unit state (see on page 55) |
| | "Programming Mode" / "Test mode" unit state (see on page 55) |

**WARNING**
The "Normal operation" work mode is only allowed when the yellow status LED is OFF.

# 5 - Operational modes

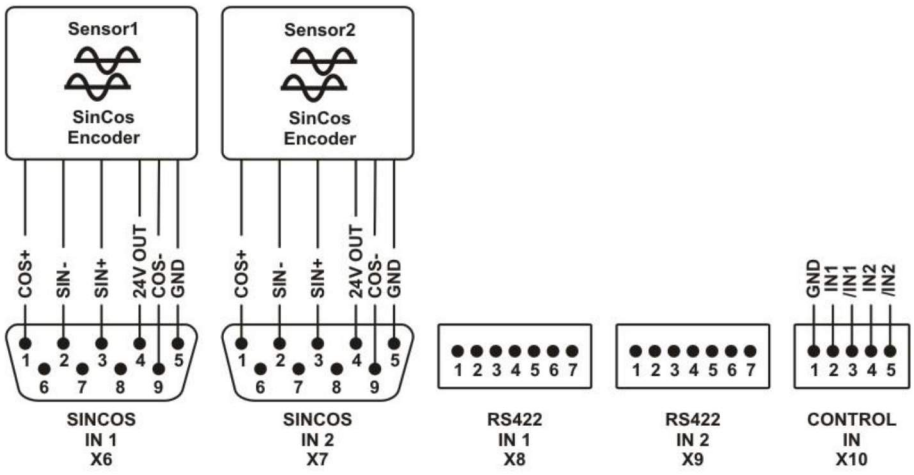
## 5.1 Application: 2 Sine Cosine encoders

**Unit = IFS-10 / IFS-10A models**
**000 Operational mode = 0**

| | | | |
|---|---|---|---|
| **Mode** | 0 | | |
| **Sensor 1** | [X6 \| SINCOS IN 1] | Sine Cosine encoder | (SIN+, SIN-, COS+, COS-) |
| **Sensor 2** | [X7 \| SINCOS IN 2] | Sine Cosine encoder | (SIN+, SIN-, COS+, COS-) |
| **Control Inputs** | [X10 \| CONTROL IN] | HTL/PNP control signal | 2 – 4 available |
| **Achievable Safety Level** | Speed ➔ SIL3 / PLe<br>Direction ➔ SIL3 / PLe<br>Standstill ➔ SIL3 / PLe | | |

**WARNING**
This operational mode is available only for IFS-10 / IFS-10A models.

This operational mode allows to evaluate a dual channel system equipped with two Sine Cosine encoders or sensors. They must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.7 SINCOS IN 1-2, Sine Cosine inputs ([X6] and [X7] connectors)" section on page 41.



**NOTE**

- With IFS-10 model safety monitor this operational mode can be used to duplicate the input frequency at the [X6 |SINCOS IN 1] terminal block to the [X5 | SINCOS OUT] splitter output.
- 2 - 4 inputs are available at [X10 | CONTROL IN] terminal block for control signals.
- The final Safety Integrity Level depends on the selected configuration and the external components that are connected to the unit.

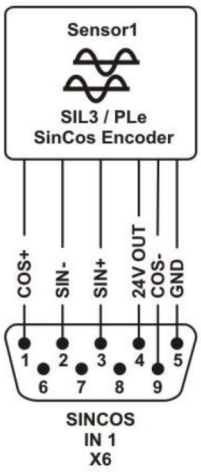
## 5.2 Application: 1 SIL3 Sine Cosine encoder

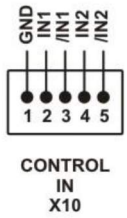
**Unit = IFS-10S / IFS-10SA models**
**000 Operational mode = 0**

| | | | |
|---|---|---|---|
| **Mode** | 0 | | |
| **Sensor 1** | [X6 \| SINCOS IN 1] | SIL3 Sine Cosine encoder | (SIN+, SIN-, COS+, COS-) |
| **Sensor 2** | Sensor 1 and Sensor 2 are internally bridged | | |
| **Control inputs** | [X10 \| CONTROL IN] | HTL/PNP control signal | 2 – 4 available |
| **Achievable Safety Level** | Speed ➔ SIL3 / PLe<br>Direction ➔ SIL3 / PLe<br>Standstill ➔ SIL3 / PLe | | |

**WARNING**
This operational mode is available only for IFS-10S / IFS-10SA models.

This operational mode is only used to connect a SIL3 or PLe certificated Sine Cosine encoder or sensor. It must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.7 SINCOS IN 1-2, Sine Cosine inputs ([X6] and [X7] connectors)" section on page 41.




**NOTE**

- With IFS-10S model safety monitor this operational mode can be used to duplicate the input frequency at [X6 |SINCOS IN 1] terminal block to the [X5 | SINCOS OUT] splitter output.

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

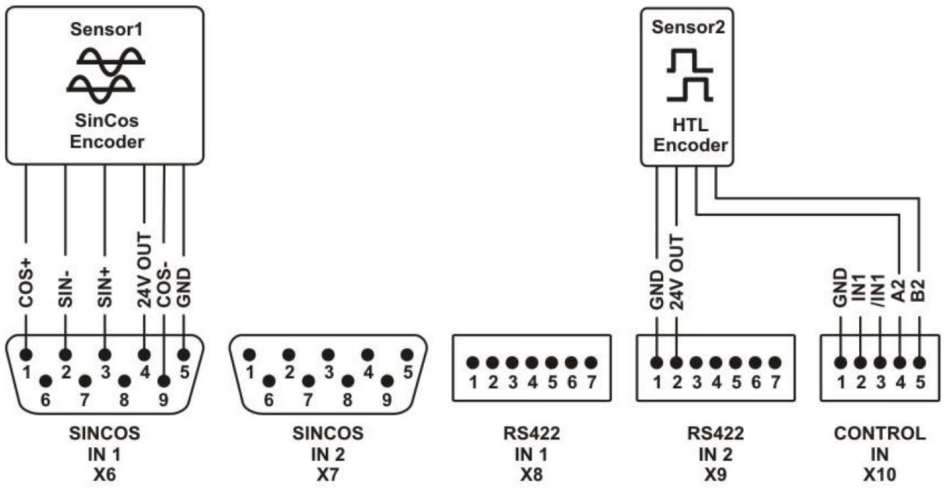
## 5.3 Application: 1 Sine Cosine encoder and 1 A/B 90° HTL encoder

**Unit = IFS-10 / IFS-10A models**
**000 Operational mode = 1**

| | | | |
|---|---|---|---|
| **Mode** | 1 | | |
| **Sensor 1** | [X6 \| SINCOS IN 1] | Sine Cosine 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 |
| **Achievable Safety Level** | Speed ➔ SIL3 / PLe<br>Direction ➔ SIL3 / PLe<br>Standstill ➔ SIL3 / PLe | | |

**WARNING**
This operational mode is available only for IFS-10 / IFS-10A models.

This operational mode allows to evaluate a dual channel system equipped with two different encoder types. Therefore a combination of a Sine Cosine encoder and a dual channel HTL/Push-Pull incremental encoder is used. The Sine Cosine encoder must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.7 SINCOS IN 1-2, Sine Cosine inputs ([X6] and [X7] connectors)" section on page 41. The incremental encoder must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.9 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 44.



**NOTE**

- In this operational mode the IFS-10 safety monitor can be used to duplicate the input frequency at the [X6 |SINCOS IN 1] terminal block to the [X5 | SINCOS OUT] splitter output.
- 1 - 2 inputs are available at [X10 | CONTROL IN] terminal block for control signals.
- The final Safety Integrity Level depends on the selected configuration and the external components that are connected to the unit.

## 5.4 Application: 1 Sine Cosine encoder and 1 single channel HTL encoder

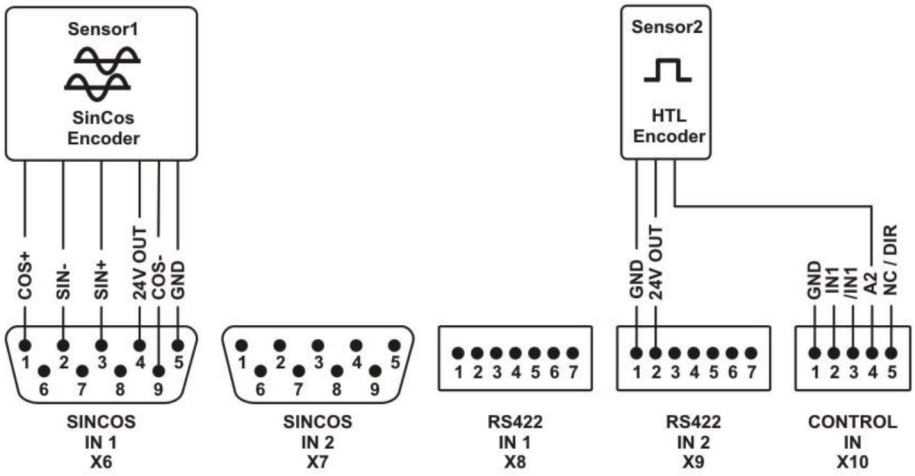
**Unit = IFS-10 / IFS-10A models**
**000 Operational mode = 2**

| | | | |
|---|---|---|---|
| **Mode** | 2 | | |
| **Sensor 1** | [X6 \| SINCOS IN 1] | Sine Cosine 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 |
| **Achievable Safety Level** | Speed ➔ SIL3 / PLe<br>Direction ➔ SIL3 / PLe *<br>Standstill ➔ SIL3 / PLe * | | |

* The safety level can be achieved only if it is physically (mechanically) ensured that the rotary or linear movement is performed towards one direction only (reversal movements are forbidden!). For example this can be carried out by using a self-locking gearbox.

**WARNING**
This operational mode is available only for IFS-10 / IFS-10A models.

This operational mode allows to evaluate a dual channel system equipped with two different encoder types. Therefore a combination of a Sine Cosine encoder and a single channel HTL/Push-Pull incremental encoder is used. The Sine Cosine encoder must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.7 SINCOS IN 1-2, Sine Cosine inputs ([X6] and [X7] connectors)" section on page 41. The incremental encoder must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.9 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 44.




**NOTE**

- In this operational mode the IFS-10 safety monitor can be used to duplicate the input frequency at the [X6 |SINCOS IN 1] terminal block to the [X5 | SINCOS OUT] splitter output.
- 1 - 2 inputs are available at [X10 | CONTROL IN] terminal block for control signals.
- The final Safety Integrity Level depends on the selected configuration and the external components that are connected to the unit.
- For unbalanced single channel signals, the **015 A-Edge 2/1** parameter must be set to 1 in order that a stable frequency can be detected.

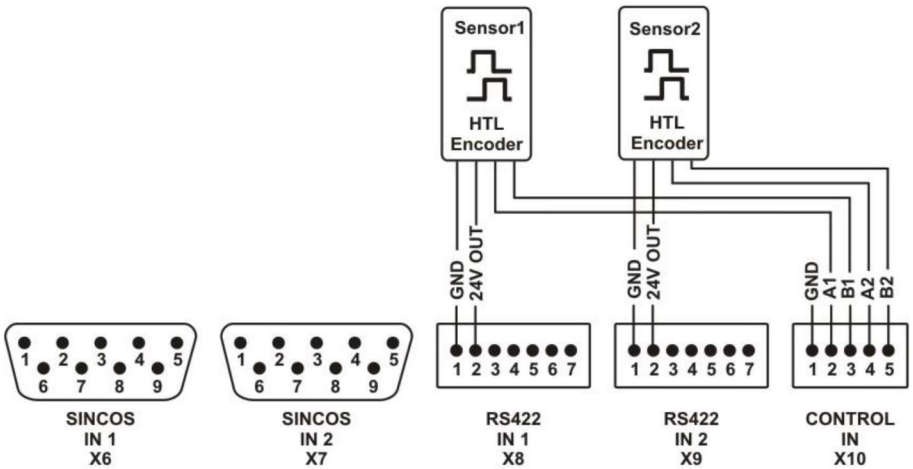
## 5.5 Application: 2 A/B 90° HTL encoders

**Unit = IFS-10 / IFS-10A models**
**000 Operational mode = 3**

| | | | |
|---|---|---|---|
| **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 signal | None available |
| **Achievable Safety Level** | Speed ➔ SIL3 / PLe<br>Direction ➔ SIL3 / PLe<br>Standstill ➔ SIL3 / PLe | | |

**WARNING**
This operational mode is available only for IFS-10 / IFS-10A models.

This operational mode allows to evaluate a dual channel system equipped with two dual channel HTL/Push-Pull incremental encoders. They must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.9 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 44.




**NOTE**

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

## 5.6 Application: 1 A/B 90° HTL encoder and 1 single channel HTL encoder

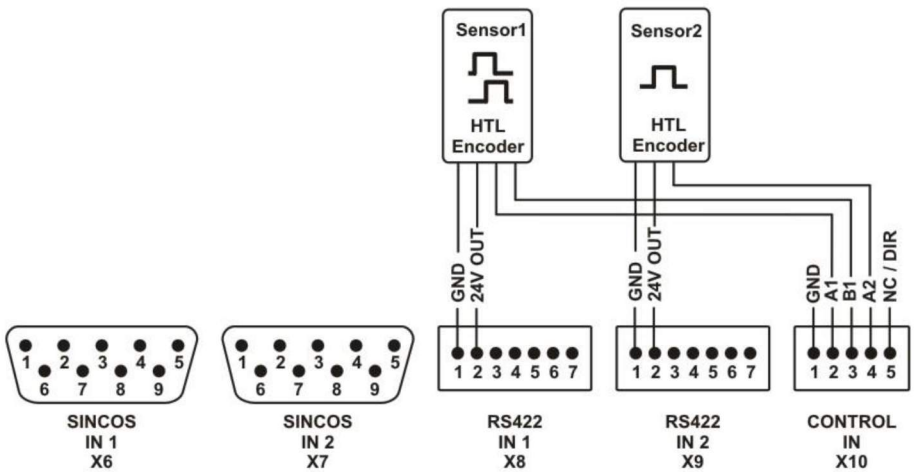
**Unit = IFS-10 / IFS-10A models**
**000 Operational mode = 4**

| | | | |
|---|---|---|---|
| **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 | None available |
| **Achievable Safety Level** | Speed ➔ SIL3 / PLe<br>Direction ➔ SIL3 / PLe *<br>Standstill ➔ SIL3 / PLe * | | |

* The safety level can be achieved only if it is physically (mechanically) ensured that the rotary or linear movement is performed towards one direction only (reversal movements are forbidden!). For example this can be carried out by using a self-locking gearbox.

**WARNING**
This operational mode is available only for IFS-10 / IFS-10A models.

This mode allows to evaluate a dual channel system equipped with two different encoder types. Therefore a combination of a dual channel HTL/Push-Pull incremental encoder and a single channel HTL/Push-Pull incremental encoder is used. They must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.9 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 44.



**NOTE**

- No inputs are available at [X10 | CONTROL IN] terminal block for control signals.
- The final Safety Integrity Level depends on the selected configuration and the external components that are connected to the unit.
- For unbalanced single channel signals, the **015 A-Edge 2/1** parameter must be set to 1 in order that a stable frequency can be detected.

## 5.7 Application: 2 single channel HTL encoders

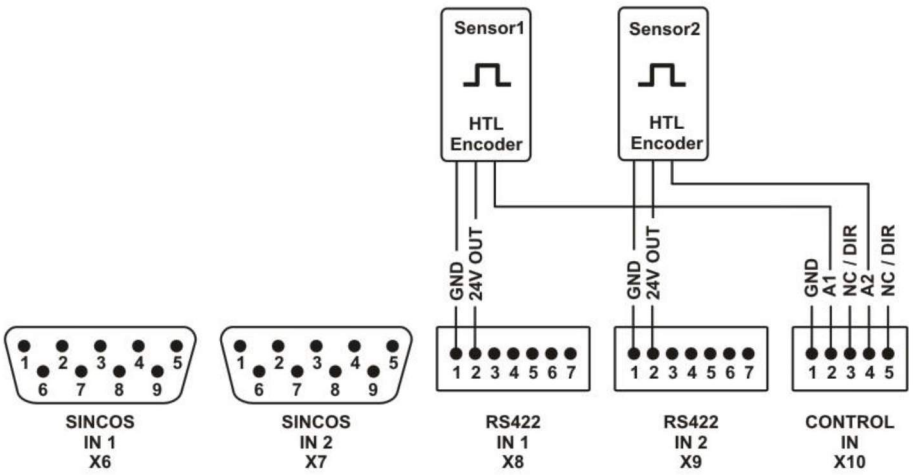
**Unit = IFS-10 / IFS-10A models**
**000 Operational mode = 5**

| | | | |
|---|---|---|---|
| **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 | None available |
| **Achievable Safety Level** | Speed ➔ SIL3 / PLe<br>Direction ➔ SIL3 / PLe *<br>Standstill ➔ SIL3 / PLe * | | |

* The safety level can be achieved only if it is physically (mechanically) ensured that the rotary or linear movement is performed towards one direction only (reversal movements are forbidden!). For example this can be carried out by using a self-locking gearbox.

**WARNING**
This operational mode is available only for IFS-10 / IFS-10A models.

This operational mode allows to evaluate a dual channel system equipped with two single channel HTL/Push-Pull incremental encoders. They must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.9 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 44.



**NOTE**

- No inputs are available at [X10 | CONTROL IN] terminal block for control signals.
- The final Safety Integrity Level depends on the selected configuration and the external components that are connected to the unit.
- For unbalanced single channel signals, the **015 A-Edge 2/1** parameter must be set to 1 in order that a stable frequency can be detected.

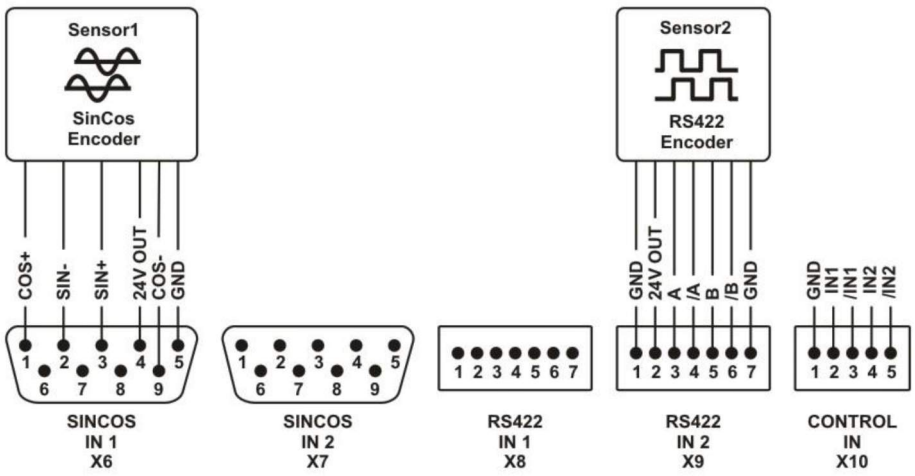
## 5.8 Application: 1 Sine Cosine encoder and 1 RS-422 encoder

**Unit = IFS-10 / IFS-10A models**
**000 Operational mode = 6**

| | | | |
|---|---|---|---|
| **Mode** | 6 | | |
| **Sensor 1** | [X6 \| SINCOS IN 1] | Sine Cosine encoder | (SIN+, SIN-, COS+, COS-) |
| **Sensor 2** | [X9 \| RS422 IN 2] | Incremental RS422/TTL encoder | (A, /A, B, /B) |
| **Control Inputs** | [X10 \| CONTROL IN] | HTL/PNP control signal | 2 – 4 available |
| **Achievable Safety Level** | Speed ➔ SIL3 / PLe<br>Direction ➔ SIL3 / PLe<br>Standstill ➔ SIL3 / PLe | | |

**WARNING**
This operational mode is available only for IFS-10 / IFS-10A models.

This operational mode allows to evaluate a dual channel system equipped with two different encoder types. Therefore a combination of a Sine Cosine encoder and an RS-422/TTL/Line Driver encoder is used. The Sine Cosine encoder must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.7 SINCOS IN 1-2, Sine Cosine inputs ([X6] and [X7] connectors)" section on page 41. The incremental encoder must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.8 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)" section on page 43.



**NOTE**

- In this operational mode the IFS-10 safety monitor can be used to duplicate the input frequency at the [X6 |SINCOS IN 1] terminal block to the [X5 | SINCOS OUT] splitter output.
- 2 - 4 inputs are available at [X10 | CONTROL IN] terminal block for control signals.
- The final Safety Integrity Level depends on the selected configuration and the external components that are connected to the unit.

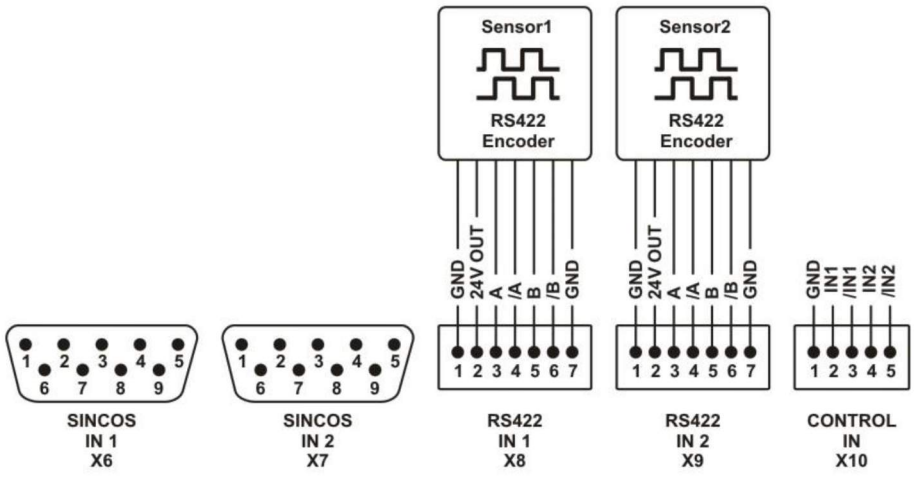
## 5.9 Application: 2 RS-422 encoders

**Unit = IFS-10 / IFS-10A models**
**000 Operational mode = 7**

| | | | |
|---|---|---|---|
| **Mode** | 7 | | |
| **Sensor 1** | [X8 \| RS422 IN 1] | Incremental RS422/TTL encoder | (A, /A, B, /B) |
| **Sensor 2** | [X9 \| RS422 IN 2] | Incremental RS422/TTL encoder | (A, /A, B, /B) |
| **Control Inputs** | [X10 \| CONTROL IN] | HTL/PNP control signal | 2 – 4 available |
| **Achievable Safety Level** | Speed ➔ SIL3 / PLe<br>Direction ➔ SIL3 / PLe<br>Standstill ➔ SIL3 / PLe | | |

**WARNING**
This operational mode is available only for IFS-10 / IFS-10A models.

This operational mode allows to evaluate a dual channel system equipped with two RS-422/TTL/Line Driver incremental encoders. They must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.8 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)" section on page 43.



**NOTE**

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

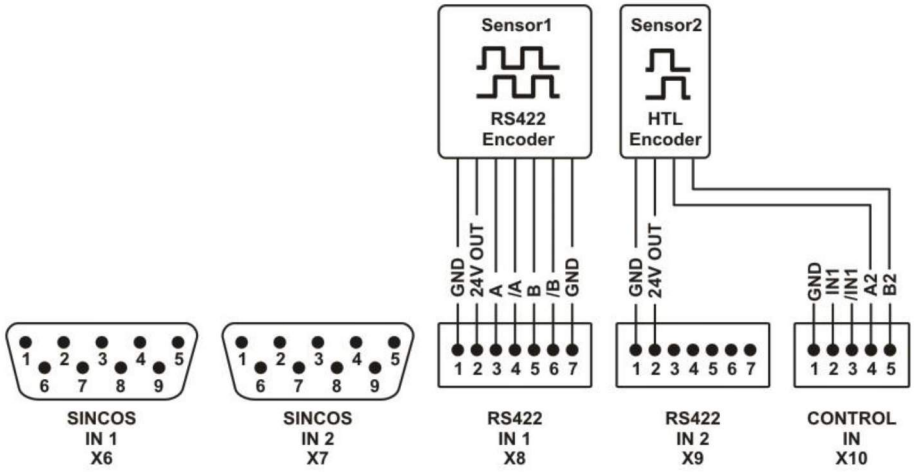
## 5.10 Application: 1 RS-422 encoder and 1 A/B 90° HTL encoder

Unit = IFS-10 / IFS-10A models
**000 Operational mode** = 8

| | | | |
|---|---|---|---|
| **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 |
| **Achievable Safety Level** | Speed ➔ SIL3 / PLe<br>Direction ➔ SIL3 / PLe<br>Standstill ➔ SIL3 / PLe | | |

**WARNING**
This operational mode is available only for IFS-10 / IFS-10A models.

This operational mode allows to evaluate a dual channel system equipped with two different incremental encoder or sensor types. Therefore a combination of an RS-422/TTL/Line Driver incremental encoder and a dual channel HTL/Push-Pull incremental encoder is used. The RS-422/TTL/Line Driver encoder must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.8 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)" section on page 43. The HTL/Push-Pull encoder must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.9 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 44.



**NOTE**

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

## 5.11 Application: 1 RS-422 encoder and 1 single channel HTL encoder

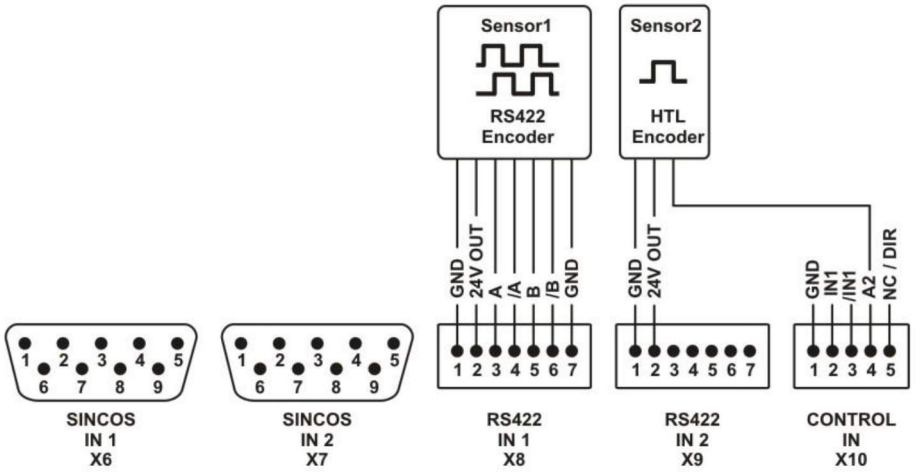
**Unit = IFS-10 / IFS-10A models**
**000 Operational mode = 9**

| | | | |
|---|---|---|---|
| **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 |
| **Achievable Safety Level** | Speed ➔ SIL3 / PLe<br>Direction ➔ SIL3 / PLe *<br>Standstill ➔ SIL3 / PLe *<br>With single channel encoders, jitter around an edge can be misinterpreted as a frequency. | | |

* The safety level can be achieved only if it is physically (mechanically) ensured that the rotary or linear movement is performed towards one direction only (reversal movements are forbidden!). For example this can be carried out by using a self-locking gearbox.

**WARNING**
This operational mode is available only for IFS-10 / IFS-10A models.

This operational mode allows to evaluate a dual channel system equipped with two different incremental encoder or sensor types. Therefore a combination of an RS-422/TTL/Line Driver incremental encoder and a single channel HTL/Push-Pull incremental encoder is used. The RS-422/TTL/Line Driver encoder must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.8 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)" section on page 43. The HTL/Push-Pull encoder must be connected according to information in the "4.6.2 Encoder supply" section on page 37 and the "4.9 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 44.




**NOTE**

- 1 - 2 inputs are available at [X10 | CONTROL IN] terminal block for control signals.
- The final Safety Integrity Level depends on the selected configuration and the external components that are connected to the unit.
- For unbalanced single channel signals, the **015 A-Edge 2/1** parameter must be set to 1 in order that a stable frequency can be detected.

# 6 – Starting up the unit

## 6.1 Preparation before first start-up

### 6.1.1 Before first start-up

- The unit must be in a perfect technical condition, properly installed, and wired;
- it must be ensured that the specification on the permissible environmental conditions are met;
- the unit must be snapped onto a 35 mm DIN rail (according to EN 60715) by using the clip at the rear (see on page 24);
- all wirings must be executed in accordance with the general provisions for wiring (see on page 28);
- before connecting the unit to the power supply, please read carefully the information in the "4.6 Power supply" and "4.6.1 24V IN, Unit Power supply ([X3] terminal block)" sections on page 36;
- before connecting the encoder(s) to the power supply and the available inputs, please read carefully the information in the "4.6 Power supply", "4.6.2 Encoder supply", "4.7 SINCOS IN 1-2, Sine Cosine inputs ([X6] and [X7] connectors)", "4.8 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)" and "4.9 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" sections, on pages 36 ff;
- if control inputs, digital inputs, or external relays are used, please note that the configuration will affect the final SIL level;
- the analogue output, the digital outputs as well as the splitter output are safe only if the subsequent electronics is able to detect and evaluate the error state;
- the relay contacts at terminal [X1] must be integrated into the safety circuit.

**WARNING**

- In order to prevent simultaneous damages to the cables due to external influences, the encoder and sensor lines must be kept physically separated from each other.
- Installation, commissioning, and maintenance can be performed only by qualified personnel.
- The machine / equipment must be protected from unauthorized persons, because undefined states of the machine / plant can occur during the first start up procedure.
- The machine must be securely mounted and ready to operate.
- The safety function of the unit cannot be guaranteed before the commissioning and parametrization procedure is completed.
- Before commissioning and parametrization, the risk condition of the system must be analysed and precautions must be taken. Measures are fundamental in protecting persons and plant parts.

### 6.1.2 Before changing the parameters

The following section describes the various options for setting and configuring the unit.
In order to make the unit operational or change the settings and parameters, the following procedure must be carried out:

- connect the unit to a 18 ... 30 Vdc power supply source; see on page 36;
- set the DIL switch sliding levers 1 and 2 to the ON position and the sliding lever 3 to the OFF position (unit state: "Programming Mode"); see on page 55;
- properly install the OS software tool in a PC and start the program;
- connect the unit either to the PC with OS software tool installed via USB or to the optional IFS-10-PM programming and display unit.

Set all DIL switch sliding levers to "ON" after start up. Protect the DIL switch sliding levers after start up (for example cover them using some adhesive tape).

**WARNING**
The "Programming Mode" is only intended for start up.
The "Normal operation" work mode is only allowed when the yellow status LED is permanently off (see the"4.18 Diagnostic LEDs / Status information" section on page 59).

## 6.2 Setting up the unit via PC

The functions and parameters of the safety unit can be set via PC by means of the OS software tool. The OS software tool and the specific documentation can be downloaded from Lika web site. For complete information on using the OS software tool and programming the safety unit, please refer to the "4.17 Interface for the OS software tool ([USB] port)" section on page 58.

For connection use a standard USB cable with a "type B" connector. [USB] port is accessible only if the optional display unit is not connected. For complete information on the USB port please refer to the "4.17 Interface for the OS software tool ([USB] port)" section on page 58.

The functions of the OS software tool are described in the specific OS user's guide "MAN OSxx.x Safety E.pdf".

## 6.3 Setting up the unit via optional IFS-10-PM programming module

The optional IFS-10-PM display and programming module is designed to perform a double task: it can be used either to programme a safety unit or to be a display of the safety unit. Thus it can be used instead of a PC. It is primarily used for visualization and diagnostic purposes without a PC. Additionally it can

be used for parametrization. We recommend the OS software tool to be used preferably for commissioning and parametrization procedure.
It can be easily connected to the safety unit by plugging it into the 8-pin female connector [X11] serial interface.
For complete information on the serial interface please refer to the "4.16 Interface for connecting the IFS-10-PM display unit ([X11] connector)" section on page 57.


The functions of the IFS-10-PM programming and display unit are described in the specific IFS-10-PM user's guide "MAN IFS-10-PM EN.pdf".

### 6.4 Checklist for parameter settings

In order to ensure the proper functionality appropriate values must be set next to each parameter. This section will describe the most important parameters that must be always set and checked.

#### 6.4.1 Operational Mode settings

The setting of the 000 Operational mode parameter depends on the encoder type and the available connections. The encoder wiring and the resulting mode setting are described in the "5 - Operational modes" section on page 61.

| No. | Parameter | Remark |
|---|---|---|
| 000 | Operational mode | With IFS-10 / IFS-10A models = see the "5 - Operational modes" section on page 61.<br>With IFS-10S / IFS-10SA models = 0 |

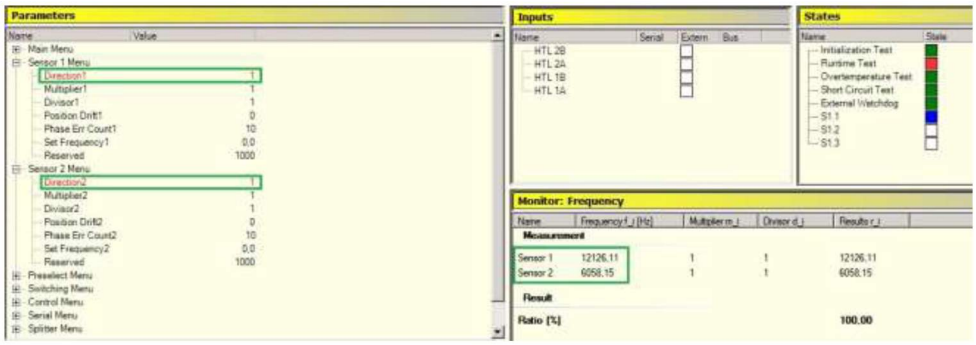
**NOTE**
With IFS-10S / IFS-10SA models the parameter value must be compulsorily set to default = 0.

### 6.4.2 Direction settings

In order to define the directions, the machine must move or turn according to its work direction. The IFS-10: Frequency button must be selected by using the tool bar in the operator software.
The frequencies of sensor 1 and 2 are indicated in the "Monitor" window of the software tool. If the frequency values are negative, the direction must be changed by setting the respective **017 Direction 1** or **024 Direction 2** parameters (to either 0 or 1) in the corresponding sensor menu.

| No. | Parameter | Remark |
|---|---|---|
| 017 | Direction 1 | With IFS-10 / IFS-10A models = X, positive frequency<br>With IFS-10S / IFS-10SA models = 0 or 1 |
| 024 | Direction 2 | With IFS-10 / IFS-10A models = X, positive frequency<br>With IFS-10S / IFS-10SA models = 0 or 1 |

**NOTE**
With IFS-10S / IFS-10SA models both parameter values must compulsorily have the same value (**017 Direction 1** = **024 Direction 2**).

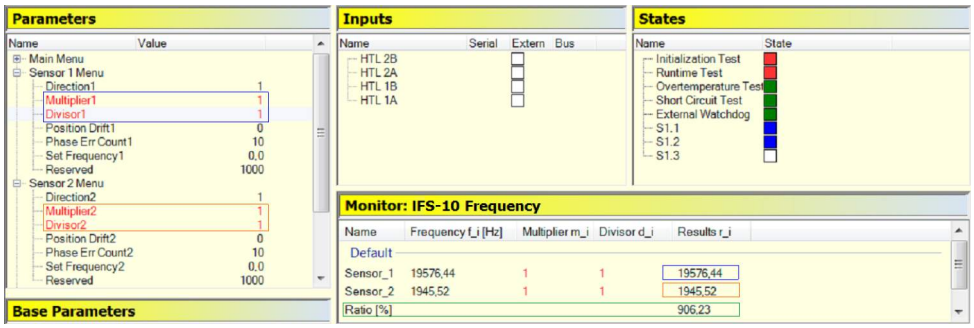


### 6.4.3 Frequency Ratio settings

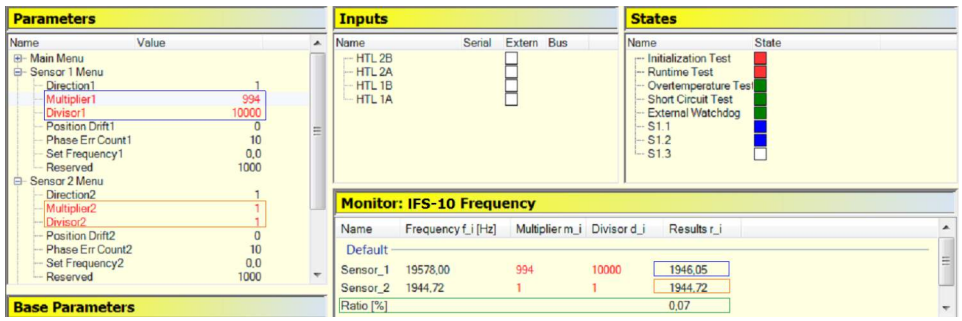
When you use two sensors having different number of pulses or in case of a mechanical speed reduction between both encoders, then the higher frequency must be adjusted to the lower frequency. For this calculation the scaling factors must be used (see the "14.2.3 Sensor 1 menu" section on page 175). We suggest setting accurately calculated values instead of experimental result values.

| No. | Parameter | Remark |
|---|---|---|
| 018 | Multiplier 1 | With IFS-10 / IFS-10A models Ratio = 0<br>With IFS-10S / IFS-10SA models Ratio = 1 |
| 019 | Divisor 1 | With IFS-10 / IFS-10A models Ratio = 0<br>With IFS-10S / IFS-10SA models Ratio = 1 |
| 025 | Multiplier 2 | With IFS-10 / IFS-10A models Ratio = 0<br>With IFS-10S / IFS-10SA models Ratio = 1 |
| 026 | Divisor 2 | With IFS-10 / IFS-10A models Ratio = 0<br>With IFS-10S / IFS-10SA models Ratio = 1 |

**NOTE**
With IFS-10S / IFS-10SA models the parameter values must be compulsorily set to default = 1.




**EXAMPLE**
In the example in the Figure above the frequency 2 is smaller than the frequency 1 by the factor "0.0994" (=1945.52/19576.44).
To adjust the frequencies, you must set the 018 Multiplier 1 parameter to "994" and the 019 Divisor 1 parameter to "10,000".



By scaling the frequency 1 both internally calculated frequencies are approximately equal and the calculated ratio is close to "0".

### 6.4.4 Clearing the errors

If the 000 Operational mode parameter is set properly, the machine will move in the work direction with positive frequency of Sensor 1 and Sensor 2. Due to the frequency ratio settings (see the previous section), both frequencies are adjusted according to the low frequency and are about the same.
By using the 009 Error Simulation parameter, the **Initialization Test** and **Runtime Test** items in the **States** pane can be set to green (green = no error; red = error). To do this, please follow the sequence described hereafter:

- set the 009 Error Simulation parameter to "2" and then press the Transmit Change button;
- set the 009 Error Simulation parameter to "1" again and then press the Transmit Change button.

Now all items in the **States** pane (except the DIL switch states S1.1, S1.2, and S1.3) are highlighted in green.

If a runtime error is triggered again, the IFS-10: Error button (see the tool bar) can be used to find details about the error occurred.
For more information on the **Initialization Test** and the **Runtime Test** please refer to the "7 - Error detection" section on page 97.

| Error | Description |
|---|---|
| GPI Error | If a GPI Error appears again after deleting without changing the input signal, check the setting of the 108 Input Mode parameter and the signal status (High/Low) at the input.<br>If a GPI Error appears when changing the input signal, check the setting of the 110 GPI Err Time parameter. |
| SIN/COS Channel X error | If a SIN/COS Channel X error appears again after deleting when the system is in standstill, check the wiring.<br>If a SIN/COS Channel X error sporadically appears when the system is in normal operation mode, eliminate the disturbance source first. By using the 011 SIN error and 023 SIN Err Time 1 / 030 SIN Err Time 2 parameters, a SIN/COS Channel X error can be tolerated for a certain time. |
| Frequency Error | If a Frequency Error appears while the system is running at normal rotation speed, check the rotation direction and the ratio of the two |

| | |
|---|---|
| | encoders (see the "6.4.2 Direction settings" and "6.4.3 Frequency Ratio settings" sections in the previous pages).<br>If the **Frequency Error** still appears, the rotation speeds are too different for a temporary or longer period of time.<br>In case of temporary deviations, change the settings in the **001 Sampling Time** and **014 Filter** parameters in order to smooth the frequency; or set the **008 Div. Filter** parameter to a higher value.<br>In case of continual deviations, the permissible deviation can be increased by setting the **005 Div. %-Value** parameter.<br>In case of deviations in the low-frequency range, adjust the **004 Div. Switch %-f** and **006 Div. f-Value** parameters. |
| **Position Error** | If a **Position Error** appears while the system is running at normal rotation speed, check the rotation direction and the ratio of the encoders (see the "6.4.2 Direction settings" and "6.4.3 Frequency Ratio settings" sections in the previous pages).<br>If the **Position Error** still appears, the encoder positions diverge.<br>In this case, check the maximum permissible deviation of the encoder positions and adjust the **013 Div. Inc-Value** parameter.<br>Do not use the **Position comparison** options, when the encoders slip or no comparison is possible, refer to the **012 Div. Mode** parameter. |

### 6.4.5 Sampling Time settings

All items in the **States** pane (except the DIL switch states S1.1, S1.2, and S1.3) are highlighted in green. Press the 

button in the tool bar. Now the working range of the unit must be set: it includes the frequency range from the lowest switching point to the highest switching point.

1. Check which one of the sensor frequencies shows the highest instability and fluctuation.
2. Scroll through the frequency range and find the point that fluctuates most (usually, it is around the lowest switching point, i.e. underspeed or frequency band).
3. The frequency can be adjusted by setting the **001 Sampling Time** and **014 Filter** parameters: higher values result in a smoother

running, but also increase the response time and the fault detection time.

4. A combination of both **001 Sampling Time** and **014 Filter** parameter values help to achieve the best result and allow to smooth the complete frequency range of the input frequencies. The frequencies that are out of the **001 Sampling Time** range, with regards to the lower frequency range, are smoothed by the **014 Filter** parameter.
5. Only exceptionally you should set the **001 Sampling Time** parameter to smooth the frequencies below the lower switching point setting (underspeed and frequency band).
6. The **001 Sampling Time** and **014 Filter** parameter values may also affect the signal variation on the analogue output.
7. The settings can be checked by means of the IFS-10 Frequency monitor.

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

### 6.4.6 Wait Time settings

The **002 Wait Time** parameter sets the frequency below which all frequencies are acknowledged as "zero".

For example: if **002 Wait Time** parameter is set to 1.0 second, all frequencies lower than 1 Hz will be set to zero. In this context it is necessary to specify whether the application requires a standstill or a drift monitoring or not.

1. When the application does not require any standstill or direction or drift control, you are free to set the **089 Standstill Time** parameter with regards to the expected minimum frequency and the required response time only.
2. When the application uses the standstill control, please check also possible jitter during standstill, set the **002 Wait Time** parameter accordingly.
3. When the application uses the forward / reverse direction control, please check also possible jitter while the system holds in closed loop position control.

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

### 6.4.7 F1-F2 Selection setting

When the actual frequency of the sensor 1 is higher than the actual frequency of the sensor 2, please set the **003 F1-F2 Selection** parameter to 0, otherwise set it to 1. In general the higher frequency should be the more stable one and therefore be used to set the switching points.

| No. | Parameter | Remark |
|---|---|---|
| 003 | F1-F2 Selection | When F1 > F2, 003 F1-F2 Selection = 0 (F1 is selected)<br>When F2 > F1, 003 F1-F2 Selection = 1 (F2 is selected) |

### 6.4.8 Divergence parameters setting

The **012 Div. Mode** parameter is used to set the type of comparison: **Frequency comparison** or **Position comparison**. The setting of this parameter affects only the detection of the errors. The IFS-10S / IFS-10SA models use one encoder only, this should benefit the control of the positions.
If the frequency ratio cannot be set precisely, do not use the **Position comparison** because of cumulative position increments. If the encoders slip, the **Frequency comparison** has to be preferred.

#### Frequency comparison

The following parameters allows to set the maximum permissible frequency deviation between sensor 1 and sensor 2, based on the percentage values of **007 Div. Calculation**.
**004 Div. Switch %-f** parameter sets the frequency threshold below which deviations are taken as absolute values, and above which deviations are taken as percentage. When the absolute difference of the frequencies exceeds the setting of **006 Div. f-Value** below the threshold setting, a frequency error will be triggered. When the percentage difference exceeds the setting of **005 Div. %-Value** above the threshold setting, also a frequency error will be triggered.
**008 Div. Filter** parameter 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 start-up phase.
2. The threshold setting must be below the lower switching point 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 start-up conditions that should trigger a frequency error signal.
4. When no standstill nor drift nor direction control is needed, the frequency threshold can be useful also as trigger threshold for error activation, by increasing the setting of **006 Div. f-Value** correspondingly (see point 3).

5. When the application uses the standstill control, please check possible jitter during closed-loop standstill and adjust the **006 Div. f-Value** setting correspondingly.
6. When the application uses the forward / reverse direction control, please check also possible jitter during standstill, adjust the **006 Div. f-Value** setting correspondingly.

**Position comparison**

This parameter option sets the maximum permissible position deviations between sensor 1 and sensor 2. **013 Div. Inc-Value** parameter sets the position threshold. If the deviation exceeds this threshold, a frequency error will be triggered. This position threshold is implemented independently of the direction of rotation. If the **013 Div. Inc-Value** parameter is set to zero, no error message will be triggered.

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

**WARNING**

Divergence parameters are relevant even to the IFS-10S / IFS-10SA models since also with one SIL3 encoder only frequency or position are split into two channels when asynchronism during changes of frequency may cause frequency divergence. When you use the IFS-10S / IFS-10SA models, the **Position comparison** has to be preferred.

### 6.4.9 Power-up delay setting

After initialization, the **010 Power-up Delay** parameter sets a delay time before the unit activates 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 delay 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, the delay time setting allows the adjustment to the IFS-10 / IFS-10A unit.

| No. | Parameter | Remark |
|---|---|---|
| 010 | Power-up Delay | Delay time |

### 6.4.10 Sine Cosine output settings

There are no settings available for the Sine Cosine output. The Sine Cosine input signals at terminal [X6] are transmitted to the Sine Cosine output at terminal [X5] at any time.

**NOTE**

The Sine Cosine output is not available in the IFS-10A and IFS-10SA models.

### 6.4.11 RS-422 output settings

The output delivers the signals from Sensor 1 or Sensor 2 depending on the 117 RS Selector setting. The converted signal from a Sine Cosine encoder or a HTL encoder (according to the 000 Operational mode parameter setting) will be available.

| No. | Parameter | Remark |
|---|---|---|
| 117 | RS Selector | Sensor 1 to output = 0; Sensor 2 to output = 1 |

**NOTE**

The RS-422 output is not available in the IFS-10A and IFS-10SA models.

### 6.4.12 Analogue output settings

In case of an unused analogue output, the output terminals must be bridged.
118 Analog Start and 119 Analog End parameters are related to the frequency that is selected in the 003 F1-F2 Selection parameter.
The 120 Analog Gain parameter should be changed only in exceptional cases (in order to limit the upper current value).
The 121 Analog Offset parameter is used for fine adjustment.

1. The fluctuation of the analogue output signal can be reduced by setting the 001 Sampling Time and 014 Filter parameters accordingly.

2. If very small span is present (between 118 Analog Start and 119 Analog End), the analogue output signal can be detected in steps due to the low frequency resolution.
3. 118 Analog Start and 119 Analog End operate under the control of the 003 F1-F2 Selection parameter.

| No. | Parameter | Remark |
|---|---|---|
| 118 | Analog Start | Input frequency to produce an output at 4 mA |
| 119 | Analog End | Input frequency to produce an output at 20 mA |
| 120 | Analog Gain | 100: fixed setting, to be changed only in exceptional cases |
| 121 | Analog Offset | 0: fine adjustment |

### 6.4.13 Digital output settings

The configuration of the outputs affects the SIL level.

1. The switching points are affected by the 003 F1-F2 Selection parameter setting.
2. Output flattering caused by unstable frequencies must be eliminated by setting corresponding hysteresis parameters.
3. No hysteresis setting is required with self-sustaining outputs.

| No. | Parameter | Remark |
|---|---|---|
| Refer to the "14.2.5 Preselect menu" section on page 181 | | Setting of the switching points |
| Refer to the "14.2.6 Switching menu" section on page 186 | | Configuration of the outputs |

### 6.4.14 Relay output settings

The relay contacts must be integrated into the safety circuit.

1. The switching points are affected by the **003 F1-F2 Selection** parameter setting.
2. Output flattering caused by unstable frequencies must be eliminated by setting corresponding hysteresis parameters.
3. No hysteresis setting is required with self-sustaining outputs.
4. It is mandatory to assign the most important and significant safety function to the relay output.

| No. Parameter | Remark |
|---|---|
| Refer to the "14.2.5 Preselect menu" section on page 181 | Setting of the switching points |
| Refer to the "14.2.6 Switching menu" section on page 186 | Configuration of the outputs |

### 6.4.15 Digital input settings

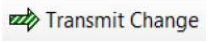
The configuration of the inputs affects the SIL level.

1. With 2-pole inputs please check possible difference between the transition times. The **110 GPI Err Time** parameter 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 the safety requirements.

| No. Parameter | Remark |
|---|---|
| Refer to the "14.2.7 Control menu" section on page 204 | Configuration of the inputs |

### 6.4.16 Producing an error

After having set all relevant parameters an error can be produced for testing purpose. The procedure allows to force the IFS-10 outputs into the error state and check the function and behaviour of the following units.

- Set the **009 Error Simulation** parameter to 0 and then press the 

button.
- The error state is set now.

- Set the **009 Error Simulation** parameter to 2 and then press the Transmit Change button.
- Set the **009 Error Simulation** parameter to 1 again and then press the Transmit Change button.
- The error state is released again.

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

- The analogue 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 Sine Cosine output is displaced.
- All channels of the RS-422 output are in LOW state.

It is important to check for the proper detection of these error indications in the target units that are connected to the monitor.

## 6.5 Completing the commissioning

After programming and before starting the unit all application-specific parameters should be checked for correctness and plausibility. The safety-related relay output opens when an error occurs or when the programmed switching condition occurs (see the "14.2.5 Preselect menu" section on page 181). Furthermore the contact will be open if the unit is in the de-energized state.

It is imperative to finally test and evaluate the safety behaviour of the monitor and of all the subsequent devices carefully!

**WARNING**
The following points must be checked carefully:

- check the correctness and plausibility of the encoder signals;
- check the direction of rotation and the proper scaling of the encoder frequencies;
- check the plausibility of the frequencies;
- check the correct setting of all necessary parameters;
- check the plausibility of the parameter settings;
- check the frequency and the error behaviour of the Sine Cosine output signals;
- check the frequency and the error behaviour of the RS-422 output signals;
- check the analogue output signal under operation and error conditions;
- check the scaling of the analogue output with respect to the frequency range;

- check whether a faulty behaviour of the digital outputs and relay output occurs;
- check whether the switching points operate properly;
- check the response times and the related parameter settings;
- check the operation and behaviour of the inputs.

**WARNING**
The user of the equipment is responsible for ensuring that all relevant parts of the system are in a safe state when the relay contact of the safety monitor is open.

After commissioning (parametrization and testing mode), you must exit the "Operational Mode" unit state by setting the sliding lever 3 of the DIL switch back to the ON position. For a normal operation all three sliding levers of the DIL switch must be always set to ON. For further information please refer to the "4.15 DIL switch ([S1] DIL switch)" section on page 55.

**WARNING**

- The "Programming Mode" (setting of the DIL switch sliding levers) is only intended for start up.
- Set all DIL switch sliding levers to "ON" after start up.
- After the start up procedure is carried out, protect the DIL switch sliding levers against intentional / unintentional use (for example cover them using some adhesive tape).
- The "Normal operation" work mode is only allowed when the yellow status LED is permanently off (see on page 59).

# 7 - Error detection

In order to ensure the maximum operational safety and reliability, the units are equipped with several and detailed monitoring functions. The monitoring allows an immediate detection and communication of possible failures and malfunctions.

**In the event of faults or errors:**

- the relay contact switches to its open (safety) condition (interruption of the safety circuit);
- the analogue output sets to 0 mA (value is out of the range) and no more current range (4 ... 20 mA) is output;
- all digital outputs are set to LOW level (no more inversion between OUT X and /OUT X is available, pay attention in case of homogeneous configuration);
- no more incremental signals are available at the RS-422 output (Tri-State with pull-down cut off);
- the DC offset of the Sine Cosine output will be shifted and an error will be signalled to the subsequent device.

The following types of error recognition are distinguished:

- initialization Test Error: they are processed automatically when switching the unit on;
- Runtime Test Error: they are processed automatically and continuously in the background while the unit is running.

Both error types are fully described in the following sections.

## 7.1 Error representation

Error conditions are shown in the following manners:

| Error Representation | Reference |
|---|---|
| Front LEDs | The yellow LED is solidly lit.<br>See the "4.18 Diagnostic LEDs / Status information" section on page 59 (LEDs / Status Indication). |
| Display unit IFS-10-PM | The bottom line displays the error when the IFS-10-PM display unit is not in "Programming mode". |

| | |
|---|---|
| | See the IFS-10-PM "User's guide". |
| OS operator surface | Initialization Test = red (State field)<br>Runtime Test = red (State field)<br>See the "User's guide" of the OS software tool. |

### 7.2 Initialization Test

These monitor functions / tests are processed automatically when switching the unit on.

| Error Code IFS-10-PM unit | Error OS software tool | Description |
|---|---|---|
| H' 0000 0001 | ADC Error | Internal error. |
| H' 0000 0002 | I2C Error | Internal error. |
| H' 0000 0004 | OTH Error | Check the IFS-10-PM power supply or the encoder power supply.<br>Otherwise internal error. |
| H' 0000 0008 | SCI Error | Internal error. |
| H' 0000 0010 | DIO Error | Check the digital outputs for short circuit or other errors.<br>Otherwise internal error. |
| H' 0000 0020 | GPI Error | Check the connections of the digital inputs and the input configuration.<br>Otherwise internal error. |
| H' 0000 0040 | CAP Error | Internal error. |
| H' 0000 0080 | SPI Error | Check the connections of the analogue output.<br>Otherwise internal error. |
| H' 0000 0100 | QEP Error | Check the separation or disconnection of the encoder supply at self-test.<br>Otherwise internal error. |
| H' 0000 0200 | SCO Error | Check the connections of the Sine Cosine output.<br>Otherwise internal error. |
| H' 0000 0400 | CPU Error | Internal error. |
| H' 0000 0800 | RAM Error | Internal error. |
| H' 0000 1000 | WDO Error | Internal error. |
| H' 0000 2000 | EDM Error | Error in the EDM test, check the |

| | | |
|---|---|---|
| | | external relay. |
| H' 0000 4000 | FLA Error | Internal error. |

**NOTE**
In the event of any of the above mentioned errors, please switch the unit off and then on. If the error appears again, please contact the manufacturer.

## 7.3 Runtime Test

### 7.3.1 Error codes from software version 5 on

These internal monitoring procedures / tests are processed automatically and continuously in the background while the unit is running. The error codes are available from software version 5 on.

| Error Code IFS-10-PM unit | Error message via PC (OS software tool) | Description |
|---|---|---|
| H' 0000 0001 | SIN/COS Channel 1 Error | Error of the [X6] SINCOS IN 1 input (Offset / Phase). |
| H' 0000 0002 | SIN/COS Channel 2 Error | Error of the [X7] SINCOS IN 2 input (Offset / Phase). |
| H' 0000 0004 | Encoder Supply Error | Error of the encoder supply 1 / 2 at terminal [X6-X9, X11]. Short circuit or faulty circuit. |
| H' 0000 0008 | Position Error | Position error detected. 012 Div. Mode parameter = 1 or 2. |
| H' 0000 0010 | - | - |
| H' 0000 0020 | - | - |
| H' 0000 0040 | - | - |
| H' 0000 0080 | Overlap Error | Faulty sensor overlap. |
| H' 0000 0100 | Temperature Error | Temperature error. The temperature is over the high range. |
| H' 0000 0200 | Readback Digital Output Error | Short circuit or faulty circuit in the [X2 \| CONTROL OUT] digital outputs. |
| H' 0000 0400 | Analog Error | Analogue output error, open analogue output. |
| H' 0000 0800 | Readback Relay Output | Relay control error, contact |

| | | |
|---|---|---|
| | Error | 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 of Encoder 1. |
| H' 0002 0000 | Phase Channel 2 Error | Illegal signal change of Encoder 2. |
| H' 0004 0000 | Frequency Error | Frequency error: F1 ≠ F2. 012 Div. Mode parameter = 0 or 2. |
| H' 0008 0000 | Drift Error 1 | Drift error of Encoder 1. |
| H' 0010 0000 | Drift Error 2 | Drift error of Encoder 2. |
| H' 0020 0000 | ESM Error | Internal error. |
| H' 0040 0000 | External RB Error | Fault in the setting or resetting of the external relay. |
| H' 0080 0000 | Wrong Parameter Error Simulation | The 009 Error Simulation parameter ≠ 1 while the DIL switches are set to "Normal Operation". |
| H' 0100 0000 | Register Error | Internal error. |
| H' 0200 0000 | RTI/QUP Cycle Error | |
| H' 0400 0000 | External Clock Error | |
| H' 0800 0000 | Wrong Parameter Setting | The frequency is too high with regards to the 001 Sampling Time parameter 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 the previous "7.2 Initialization Test" section on page 98. |

**NOTE**
In the event of any of the above mentioned errors, please switch the unit off and then on. If the error appears again, please contact the manufacturer.

### 7.3.2 Error codes up to software version 4

These monitors / tests are processed automatically and continuously in the background while the unit is running. The error codes are available up to software version 4.

| Error Code IFS-10-PM unit | Error OS software tool | Description |
|---|---|---|
| H' 0000 0001 | SIN/COS Channel 1 Error | SINCOS IN 1 signals at [X6] incorrect (Offset / Phase) or internal error. |
| H' 0000 0002 | SIN/COS Channel 2 Error | SINCOS IN 2 signals at [X7] incorrect (Offset / Phase) or internal error. |
| H' 0000 0004 | External Supply Channel 1 Error | Encoder Supply 1: short circuit or faulty circuit at [X6] or [X8] or internal error. |
| H' 0000 0008 | External Supply Channel 2 Error | Encoder Supply 2: short circuit or faulty circuit at [X7] or [X9] or internal error. |
| H' 0000 0010 | External Supply BG Error | IFS-10-PM Power Supply: short circuit or faulty circuit at [11] or internal error. |
| H' 0000 0020 | External Supply BG Status Error | IFS-10-PM Power Supply: short circuit or faulty circuit at [11] or internal error. |
| H' 0000 0040 | External Supply GV Status Error | Encoder Supply: short circuit or faulty circuit or internal error. |
| H' 0000 0080 | External Supply Short Circuit Error | Encoder Supply: short circuit or faulty circuit or internal error. |
| H' 0000 0100 | Temperature Error | Temperature too high or internal error. |
| H' 0000 0200 | Readback Digital Output Error | Digital outputs [X2]: short circuit or faulty circuit or internal error. |
| H' 0000 0400 | Sequence Analog Output Error | Open analogue 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 analogue output (mA), overheating or internal error. |

| | | |
|---|---|---|
| H' 0000 2000 | GPI Error | Illegal transition state at the inputs. |
| H' 0000 4000 | Sequence DAC Output Error | Open analogue output (mA), overheating or internal error. |
| H' 0000 8000 | DAC Output Error | Open analogue 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 | Fault in the setting or resetting of the external relay or internal error. |
| H' 0080 0000 | Wrong Parameter Error Simulation | The 009 Error Simulation parameter ≠ 1 while the DIL switches are set to "Normal Operation". |
| H' 0100 0000 | Register Error | Internal error. |
| H' 0200 0000 | RTI/QUP Cycle Error | |
| H' 0400 0000 | External Clock Error | |
| H' 0800 0000 | Wrong Parameter Setting | The frequency is too high with regards to the 001 Sampling Time parameter 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 the previous "7.2 Initialization Test" section on page 98. |

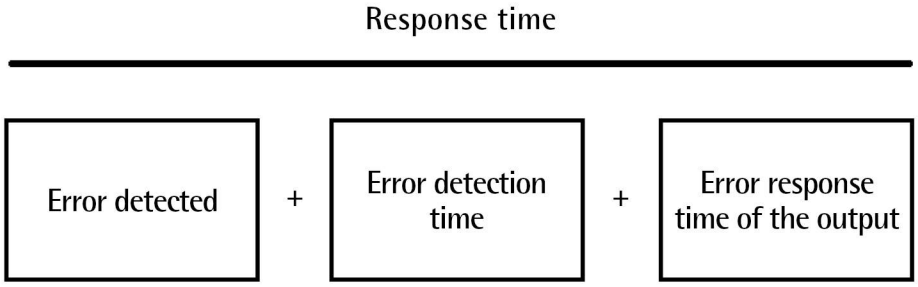
**NOTE**
In the event of any of the above mentioned errors, please switch the unit off and then on. If the error appears again, please contact the manufacturer.

## 7.4 Error Clearing

Error states can be generally cleared by switching the power off and then on again (after removing the error source). During commissioning only, the errors can be cleared also as described in the "6.4.4 Clearing the errors" section on page 87.

## 7.5 Error Detection Time

Basically it is not possible to specify an accurate error detection time because time depends on many factors and error reasons. For example there is a great difference in time between the detection of a Sine Cosine error and an analogue error. To simplify matters, we can assume that errors are acknowledged after a time of 85 ms plus the tripping time. As an exception of this, the detection of the frequency errors may require longer times since these times are related to the input frequency and the parameter settings.
Typical response times for different outputs and for frequency errors can be found in the "9 – Response time values" section on page 142.




**The error detection time depends on the following factors (amongst other reasons):**

- the type of error;
- the parameter settings;
- the external events and actions;
- the internal events and actions;
- the reaction time of the output.

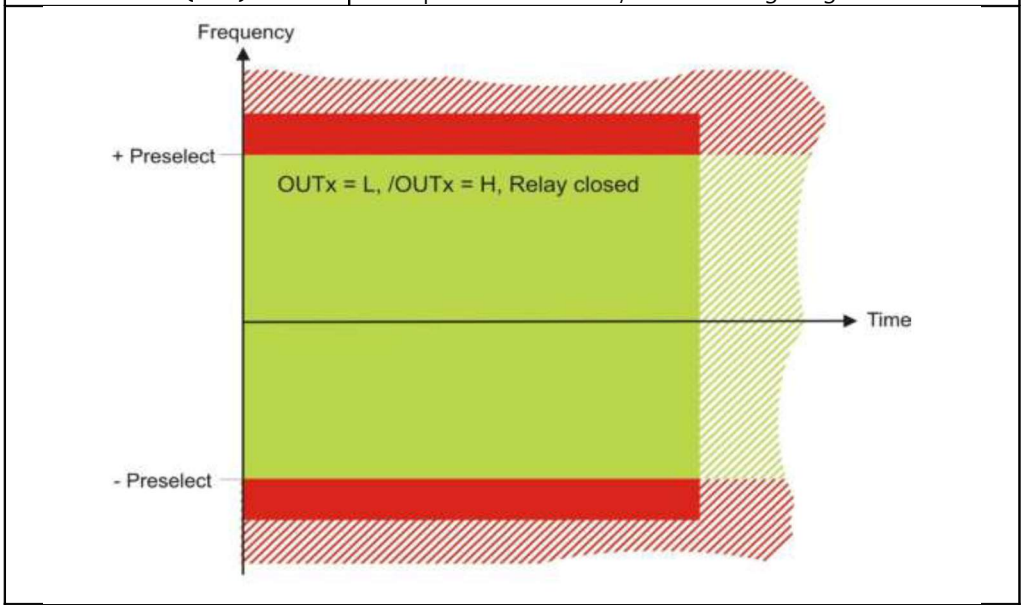
# 8 – Monitoring functions

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

### 8.1 Overspeed (Switch Mode = 0)

When the Switch Mode xxx parameter is set to 0, the frequency is monitored for overspeed. The function is always active, independently of the direction of rotation. The switching point for overspeed is always at Frequency = Preselection (no matter whether with or without hysteresis).
For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 0 |
| Pulse Time xxx (SM) | 0 = static; or >0 = pulse duration in seconds |
| Hysteresis xxx (SM) | Hysteresis |
| Lock Output (SM) | Lock function |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| Delay xxx (SM) | Shutter delay |
| Preselect xxx.H/L (PM) | Switching point |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |



| Relevant input functions | Remark |
|---|---|
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |
| Toggle switching points (Function: 13) | Only if the commutation function is activated |

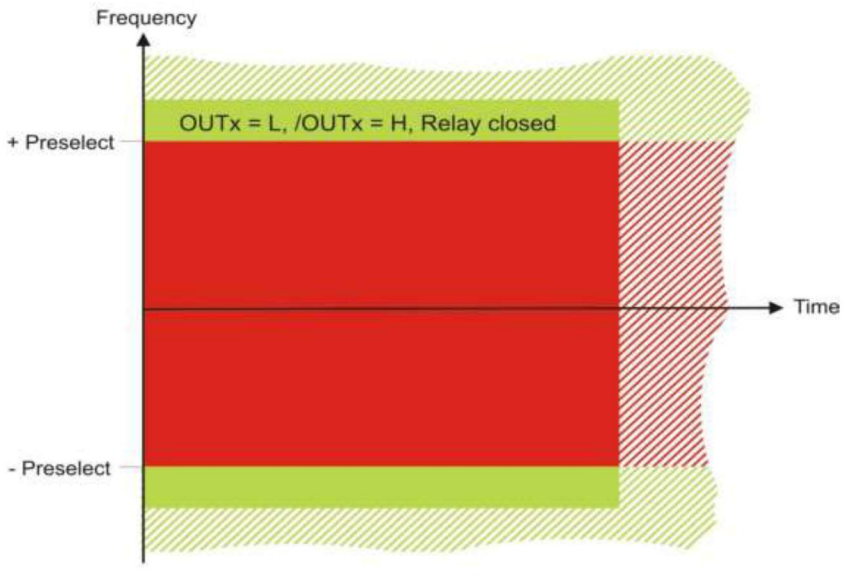
**EXAMPLE**

When the **Preselect xxx.H/L** parameter = 1000.0 Hz and the **Hysteresis xxx** parameter = 10 %, frequencies |f| >= 1000 Hz are detected as an overspeed. The overspeed output will be cleared when the frequencies |f| < 900 Hz.

### 8.2 Underspeed (Switch Mode = 1)

When the **Switch Mode xxx** parameter is set to 1, the frequency is monitored for underspeed. The function is always active, independently of the direction of rotation. The switching point for underspeed is always at Frequency = Preselection (no matter whether with or without hysteresis).
For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 1 |
| Pulse Time xxx (SM) | 0 = static; or >0 = pulse duration in seconds |
| Hysteresis xxx (SM) | Hysteresis |
| Start-up Mode (SM) | Type of start-up delay |
| Start-up Output (SM) | Assignment of the outputs for the start-up delay |
| Lock Output (SM) | Lock function |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| Delay xxx (SM) | Shutter delay |
| Preselect xxx.H/L (PM) | Switching point |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |




| Relevant input functions | Remark |
|---|---|
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |
| Toggle switching points (Function: 13) | Only if the commutation function is activated |

**EXAMPLE**

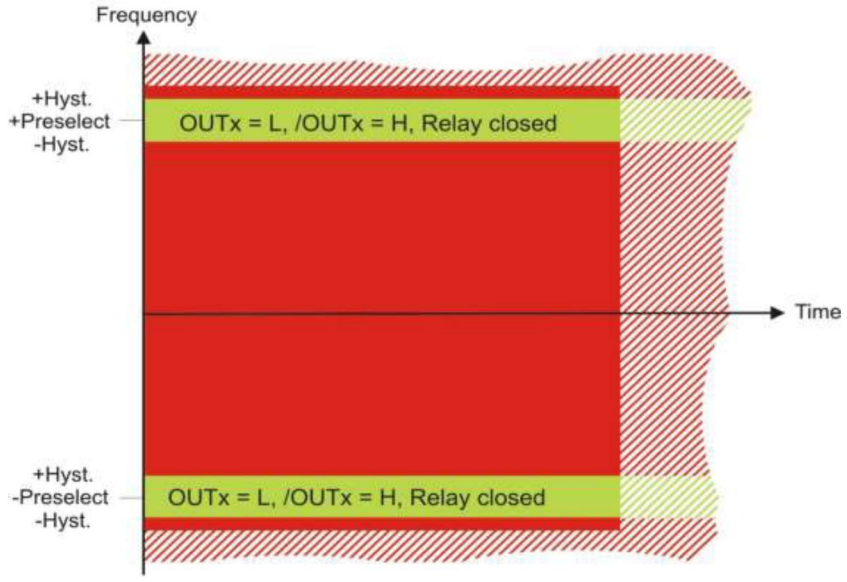
When the **Preselect xxx.H/L** parameter = 1000.0 Hz and the **Hysteresis xxx** parameter = 10 %, frequencies |f| < 1000 Hz are detected as an underspeed. The underspeed output will be cleared when the frequencies |f| > 1100 Hz.

### 8.3 Frequency band (Switch Mode = 2)

When the **Switch Mode xxx** parameter is set to 2, the frequency is monitored within a frequency band. The function is always active, independently of the direction of rotation. The switching points within the frequency band are located at **Preselect xxx.H/L** +/- **Hysteresis xxx**.

For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 2 |
| Pulse Time xxx (SM) | 0 = static; or >0 = pulse duration in seconds |
| Hysteresis xxx (SM) | +/- range (centre) |
| Start-up Mode (SM) | Type of start-up delay |
| Start-up Output (SM) | Assignment of the outputs for the start-up delay |
| Lock Output (SM) | Lock function |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| Delay xxx (SM) | Shutter delay |
| Preselect xxx.H/L (PM) | Centre |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |




| Relevant input functions | Remark |
|---|---|
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |
| Toggle switching points (Function: 13) | Only if the commutation function is activated |

**EXAMPLE**

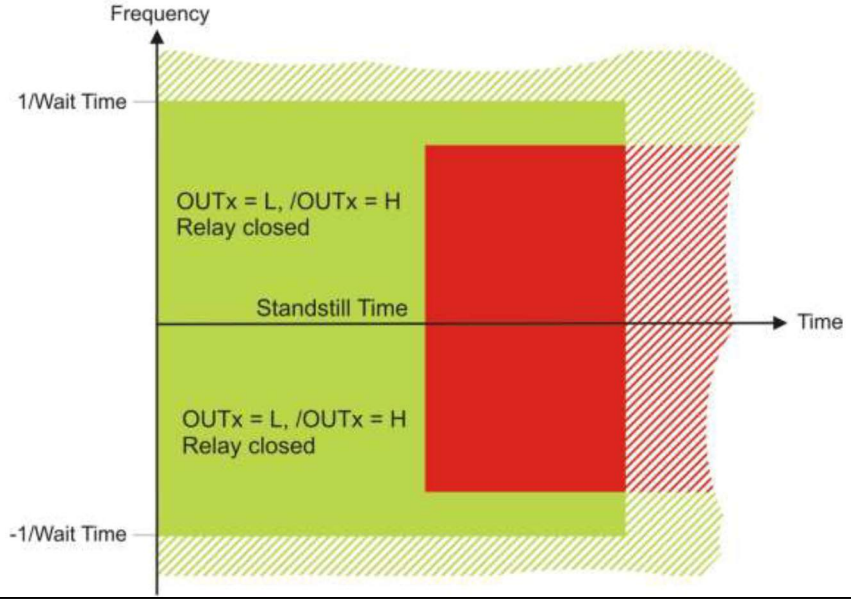
When the **Preselect xxx.H/L** parameter = 1000.0 Hz and the **Hysteresis xxx** parameter = 10 %, frequencies |f| < 900 Hz are detected as an underspeed; frequencies |f| > 1100 Hz are detected as an overspeed.

### 8.4 Standstill (Switch Mode = 3)

When the **Switch Mode xxx** parameter is set to 3, the frequency is monitored for standstill. The function is always active. The output is set after the detection of the frequency 0 Hz and the expiration of the standstill time. When a frequency different from 0 is detected, the output is reset. The **002 Wait Time** parameter (see on page 169) sets the threshold under which a frequency is acknowledged as zero.

For complete information on the parameters listed below please refer to the "14.2.2 Main menu" section on page 168 (MM); and to the "14.2.6 Switching menu" section on page 186 (SM).

| Parameters | Remark |
|---|---|
| **Switch Mode xxx (SM)** | 2 |
| **Pulse Time xxx (SM)** | 0 = static; or >0 = pulse duration in seconds |
| **Standstill Time (SM)** | Standstill time in seconds |
| **Output Mode (SM)** | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| **Wait Time (MM)** | Threshold for frequency to be acknowledged as zero |




| Relevant input functions | Remark |
|---|---|
| None | None |

**EXAMPLE**

When the **002 Wait Time** parameter = 0.01 seconds, all frequencies < 100 will be acknowledged as zero (f = 0).

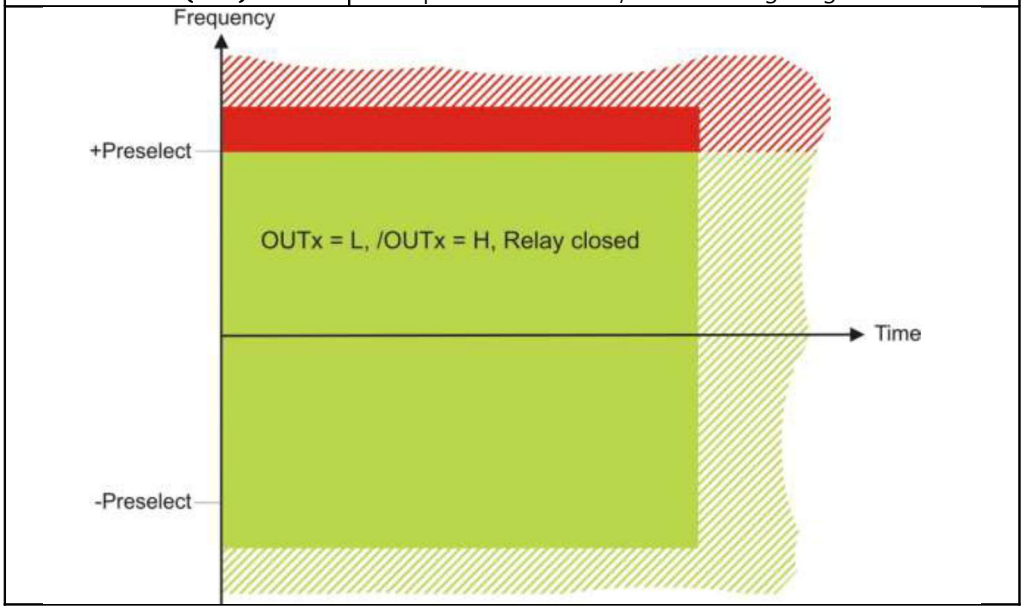
The expiration of the **089 Standstill Time** starts as soon as both channels detect 0 Hz. When the set time has expired and both frequencies are still 0 Hz, the standstill output will be set. As soon as one of the two frequencies becomes different from zero again, the standstill output is reset.

### 8.5 Overspeed (Switch Mode = 4)

When the **Switch Mode xxx** parameter is set to 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 = Preselection (no matter whether with or without hysteresis).

For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| **Switch Mode xxx (SM)** | 4 |
| **Pulse Time xxx (SM)** | 0 = static; or >0 = pulse duration in seconds |
| **Hysteresis xxx (SM)** | Hysteresis |
| **Lock Output (SM)** | Lock function |
| **Output Mode (SM)** | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| **Delay xxx (SM)** | Shutter delay |
| **Preselect xxx.H/L (PM)** | Switching point |
| **xINx Function (CM)** | Input function |
| **xINx Config (CM)** | Switching behaviour (dynamic or static) |
| **Input Mode (CM)** | Input configuration (it affects the SIL) |
| **GPI Err Time (CM)** | Max. permissible delay time during illegal conditions |




| Relevant input functions | Remark |
|---|---|
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |
| Toggle switching points (Function: 13) | Only if the commutation function is activated |

**EXAMPLE**

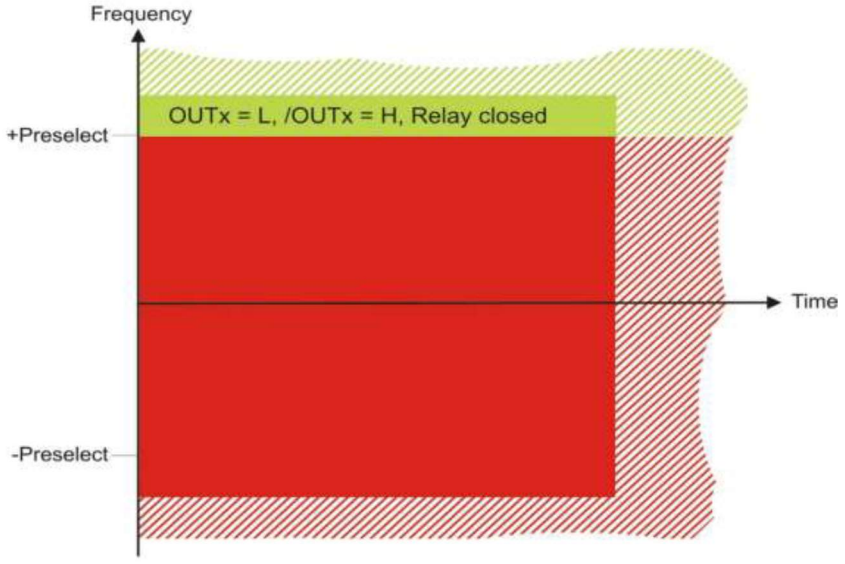
When the **Preselect xxx.H/L** parameter = 1000.0 Hz and the **Hysteresis xxx** parameter = 10 %, frequencies f >= 1000 Hz are detected as an overspeed. The overspeed output will be cleared when the frequencies f < 900 Hz.

### 8.6 Underspeed (Switch Mode = 5)

When the **Switch Mode xxx** parameter is set to 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 = Preselection (no matter whether with or without hysteresis).

For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 5 |
| Pulse Time xxx (SM) | 0 = static; or >0 = pulse duration in seconds |
| Hysteresis xxx (SM) | Hysteresis |
| Start-up Mode (SM) | Type of start-up delay |
| Start-up Output (SM) | Assignment of the outputs for the start-up delay |
| Lock Output (SM) | Lock function |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| Delay xxx (SM) | Shutter delay |
| Preselect xxx.H/L (PM) | Switching point |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |




| Relevant input functions | Remark |
|---|---|
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |
| Toggle switching points (Function: 13) | Only if the commutation function is activated |

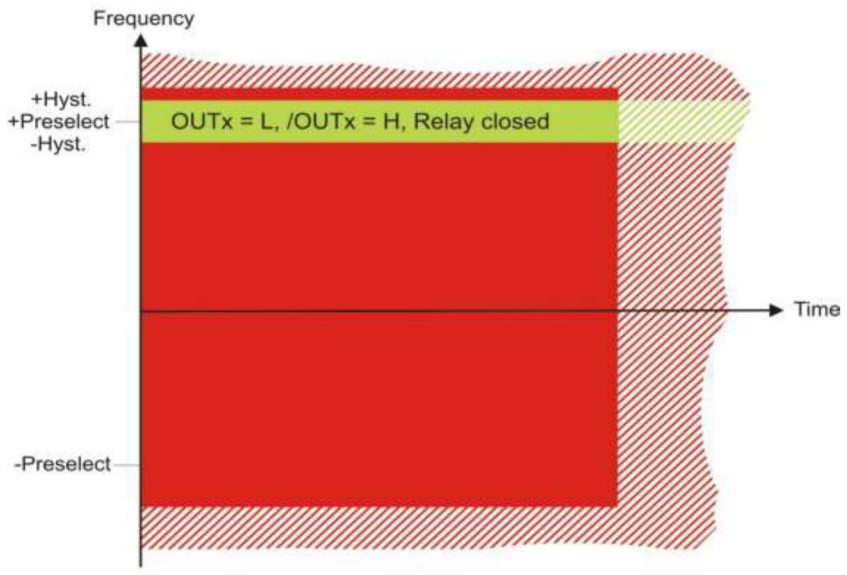
**EXAMPLE**

When the **Preselect xxx.H/L** parameter = 1000.0 Hz and the **Hysteresis xxx** parameter = 10 %, frequencies f < 1000 Hz are detected as an underspeed. The underspeed output will be cleared when the frequencies f > 1100 Hz.

### 8.7 Frequency band (Switch Mode = 6)

When the **Switch Mode xxx** parameter is set to 6, the frequency is monitored within a frequency band. The function is always active. The switching points within the frequency band are located at **Preselect xxx.H/L** +/- **Hysteresis xxx**. For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| **Switch Mode xxx** (SM) | 6 |
| **Pulse Time xxx** (SM) | 0 = static; or >0 = pulse duration in seconds |
| **Hysteresis xxx** (SM) | +/- range (centre) |
| **Start-up Mode** (SM) | Type of start-up delay |
| **Start-up Output** (SM) | Assignment of the outputs for the start-up delay |
| **Lock Output** (SM) | Lock function |
| **Output Mode** (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| **Delay xxx** (SM) | Shutter delay |
| **Preselect xxx.H/L** (PM) | Centre |
| **xINx Function** (CM) | Input function |
| **xINx Config** (CM) | Switching behaviour (dynamic or static) |
| **Input Mode** (CM) | Input configuration (it affects the SIL) |
| **GPI Err Time** (CM) | Max. permissible delay time during illegal conditions |




| Relevant input functions | Remark |
|---|---|
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |
| Toggle switching points (Function: 13) | Only if the commutation function is activated |

**EXAMPLE**

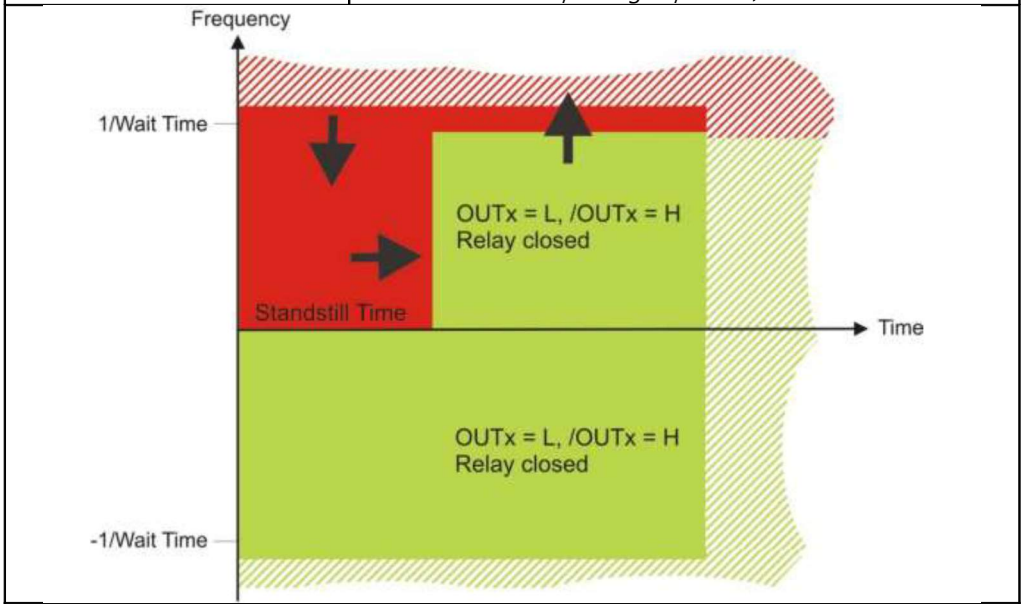
When the **Preselect xxx.H/L** parameter = 1000.0 Hz and the **Hysteresis xxx** parameter = 10 %, frequencies f < 900 Hz are detected as an underspeed; frequencies f > 1100 Hz are detected as an overspeed.

### 8.8 Frequency > 0 Hz (Switch Mode = 7)

When the **Switch Mode xxx** parameter is set to 7, the direction of the frequency is monitored. The function is always active. If the frequencies are positive (f > 0 Hz), then the output is set to ON. The output is reset when the frequencies are negative (f < 0 Hz) or a standstill is detected (f = 0 Hz) after the expiration of the **089 Standstill Time**.

For complete information on the parameters listed below please refer to the "14.2.6 Switching menu" section on page 186 (SM).

| Parameters | Remark |
|---|---|
| **Switch Mode xxx (SM)** | 7 |
| **Pulse Time xxx (SM)** | 0 = static; or >0 = pulse duration in seconds |
| **Standstill Time (SM)** | Standstill time in seconds |
| **Output Mode (SM)** | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |




| Relevant input functions | Remark |
|---|---|
| None | None |

**EXAMPLE**

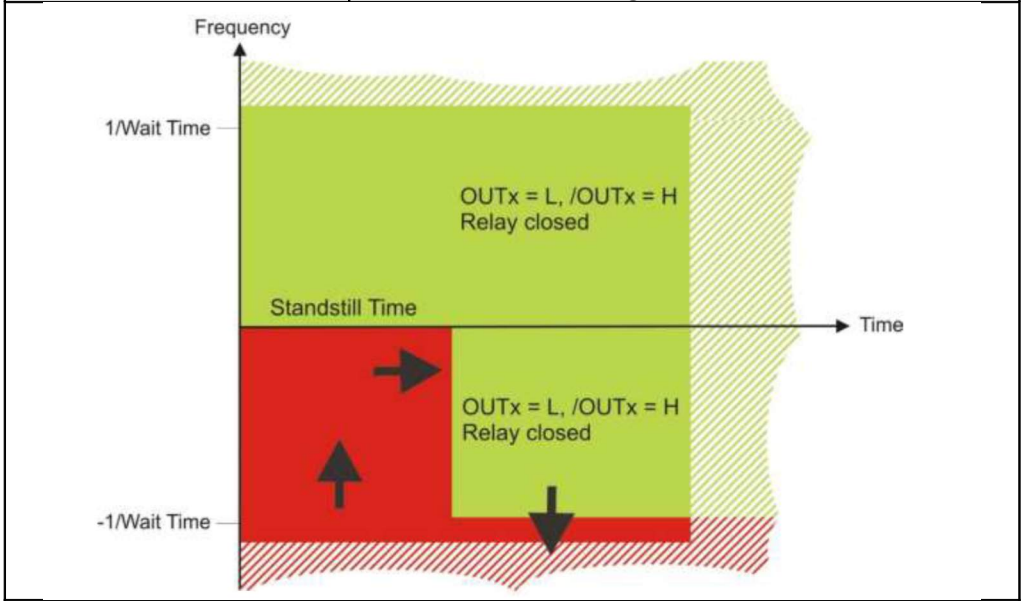
The transition from a negative to a positive frequency will cause an immediate change of the output state. Only in case of a transition from a positive to the 0 frequency, the output will not change its state until the **089 Standstill Time** has elapsed.

### 8.9 Frequency < 0 Hz (Switch Mode = 8)

When the **Switch Mode xxx** parameter is set to 8, the direction of the frequency is monitored. The function is always active. If the frequencies are negative (f < 0 Hz), then the output is set to ON. The output is reset when the frequencies are positive (f > 0 Hz) or a standstill is detected (f = 0 Hz) after the expiration of the **089 Standstill Time**.

For complete information on the parameters listed below please refer to the "14.2.6 Switching menu" section on page 186 (SM).

| Parameters | Remark |
|---|---|
| **Switch Mode xxx (SM)** | 8 |
| **Pulse Time xxx (SM)** | 0 = static; or >0 = pulse duration in seconds |
| **Standstill Time (SM)** | Standstill time in seconds |
| **Output Mode (SM)** | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |




| Relevant input functions | Remark |
|---|---|
| None | None |

**EXAMPLE**

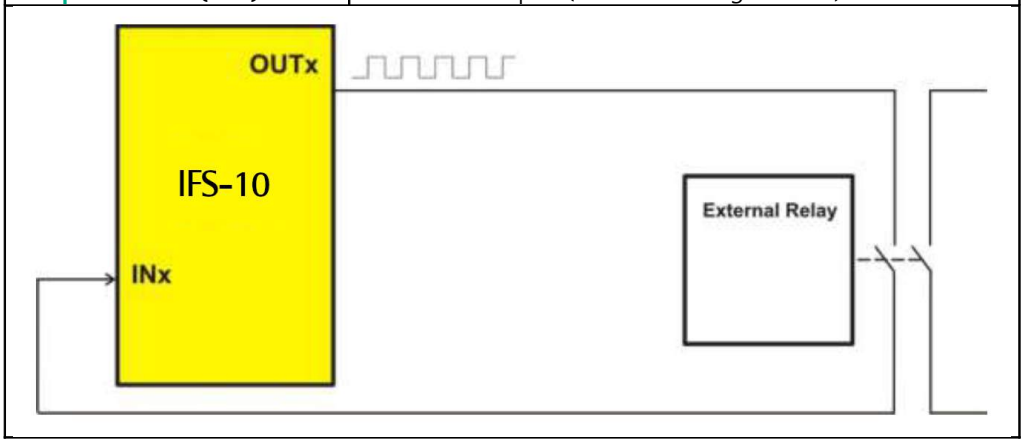
The transition from a positive to a negative frequency will cause an immediate change of the output state. Only in case of a transition from a negative to the 0 frequency, the output will not change its state until the **089 Standstill Time** has elapsed.

### 8.10 Clock generation for pulsed readback (Switch Mode = 9)

When the **Switch Mode xxx** parameter is set to 9, the output supplies a clock or an inverted clock with a specific frequency. The **094 Output Mode** of the output in use must be set to 0. The clock outputs provide different output frequencies. This function is used to monitor the readback contacts of an external relay, for more information please refer to the "12 – EDM Function" section on page 153.

For complete information on the parameters listed below please refer to the "14.2.6 Switching menu" section on page 186 (SM).

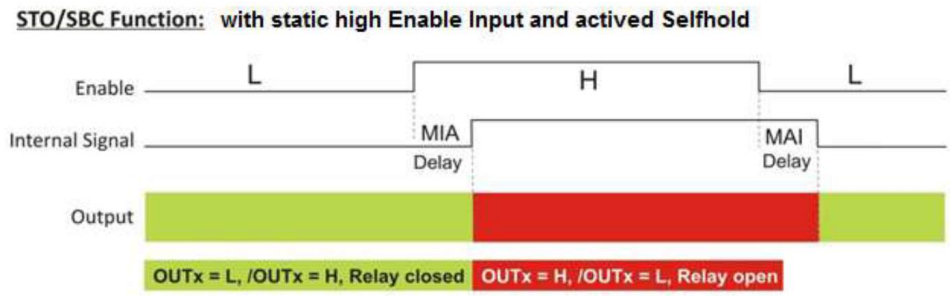
| Parameters | Remark |
|---|---|
| **Switch Mode xxx (SM)** | 9 |
| **Output Mode (SM)** | 0 for this output (inverse configuration) |



### 8.11 STO/SBC/SS1 produced by input (Switch Mode = 10)

When the Switch Mode xxx parameter is set to 10, an STO, SBC, or SS1 function is assigned to the output. The function requires an enable input signal which is assigned by Matrix xxx parameter. The 090 Lock Output parameter can be used to activate a lock function, which can be acknowledged by a further input. The acknowledgement is possible only if the enable signal is deactivated. There is no frequency or ramp monitoring.
For complete information on the parameters listed below please refer to the "14.2.6 Switching menu" section on page 186 (SM) and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 10 |
| Matrix xxx (SM) | Use only inputs, but no feedback outputs |
| MIA-Delay xxx (SM) | 0 |
| MAI-Delay xxx (SM) | 0 |
| Lock Output (SM) | For lock function use only settings 0 to 31 |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |




| Relevant input functions | Remark |
|---|---|
| Enable (Function: 21) | It activates the function |
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |

**WARNING**
A safety function will not be achieved before the IFS-10 monitor has been matched with a corresponding actuator unit.

### 8.12 STO/SBC produced by situation (Switch Mode = 10)

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

For complete information on the parameters listed below please refer to the "14.2.6 Switching menu" section on page 186 (SM) and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 10 |
| Matrix xxx (SM) | **Feedback output** |
| MIA-Delay xxx (SM) | 0 (it can also be set according to need) |
| MAI-Delay xxx (SM) | 0 (it can also be set according to need) |
| Lock Output (SM) | For lock function use only settings 0 to 31 |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |

| Relevant input functions | Remark |
|---|---|
| Enable (Function: 21) | It activates the function |
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |

### 8.13 SS1 produced by input (Switch Mode = 10)

An SS1 function can be achieved when the STO function is provided after a MIA-Delay xxx. After this safety delay time an STO will be triggered. In this case a lock function must be activated. Should the enable signal be reset during the delay period, the output is not triggered. There is no frequency or ramp monitoring.

For complete information on the parameters listed below please refer to the "14.2.6 Switching menu" section on page 186 (SM) and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 10 |
| Matrix xxx (SM) | Use only inputs, but no feedback outputs |
| MIA-Delay xxx (SM) | **Delay time** |
| MAI-Delay xxx (SM) | 0 (it can also be set according to need) |
| Lock Output (SM) | For lock function use only settings 0 to 31 |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |

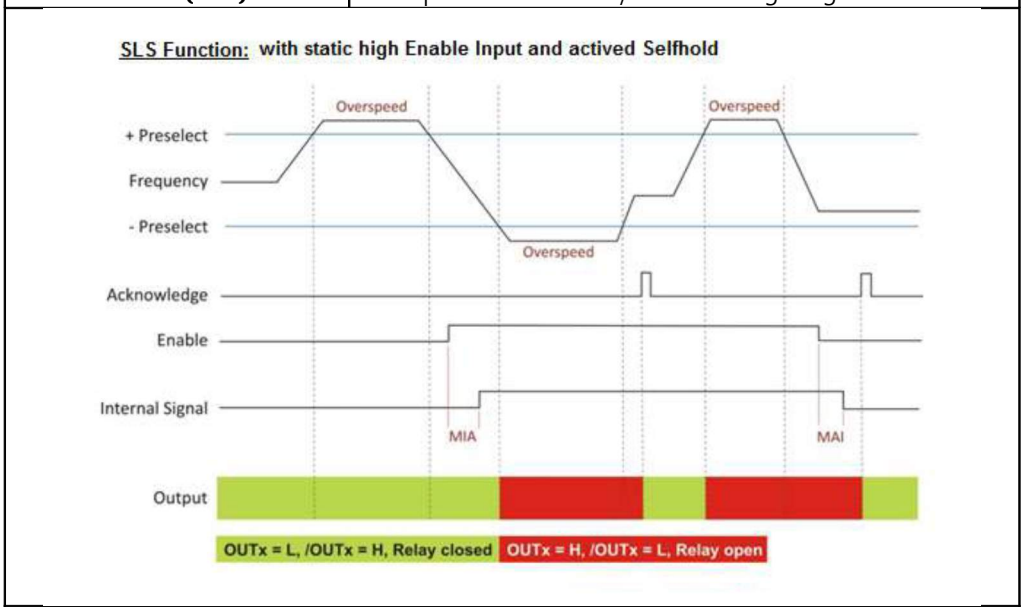
| Relevant input functions | Remark |
|---|---|
| Enable (Function: 21) | It activates the function |
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |

### 8.14 SLS produced by input (Switch Mode = 11)

When the **Switch Mode xxx** parameter is set to 11, an SLS function is assigned to the output. The function is triggered when the overspeed is detected, independently of the direction of rotation. The function requires an enable input signal which is assigned by **Matrix xxx** parameter. The **090 Lock Output** parameter can be used to activate a selfhold function, which can be acknowledged by a further input. The acknowledgement is possible only if the frequencies are below the overspeed limit or the enable signal is deactivated. There is no ramp monitoring.

For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 11 |
| Matrix xxx (SM) | Use only inputs, but no feedback outputs |
| MIA-Delay xxx (SM) | 0 (it can also be set according to need) |
| MAI-Delay xxx (SM) | 0 (it can also be set according to need) |
| Lock Output (SM) | Selfhold function, use only settings 0 to 31 |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| Delay xxx (SM) | Shutter delay |
| Preselect xxx.H/L (PM) | Switching point |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |



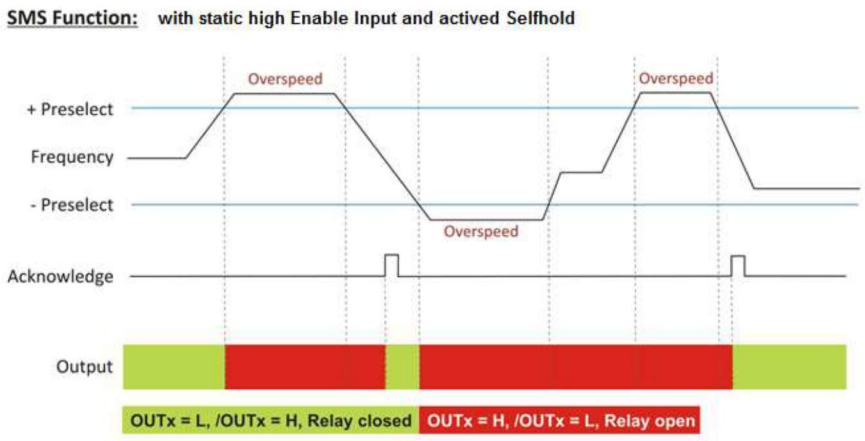
| Relevant input functions | Remark |
|---|---|
| Enable (Function: 21) | It activates the function |
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |

### 8.15 SMS (Switch Mode = 12)

When the **Switch Mode xxx** parameter is set to 12, an SMS function is assigned to the output. The function is triggered when the overspeed is detected, independently of the direction of rotation. The **090 Lock Output** parameter can be used to activate a selfhold function, which can be acknowledged by a further input. The acknowledgement is possible only if the frequencies are below the overspeed limit. There is no ramp monitoring.

For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 12 |
| Lock Output (SM) | Selfhold function, use only settings 0 to 31 |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| Delay xxx (SM) | Shutter delay |
| Preselect xxx.H/L (PM) | Switching point |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |



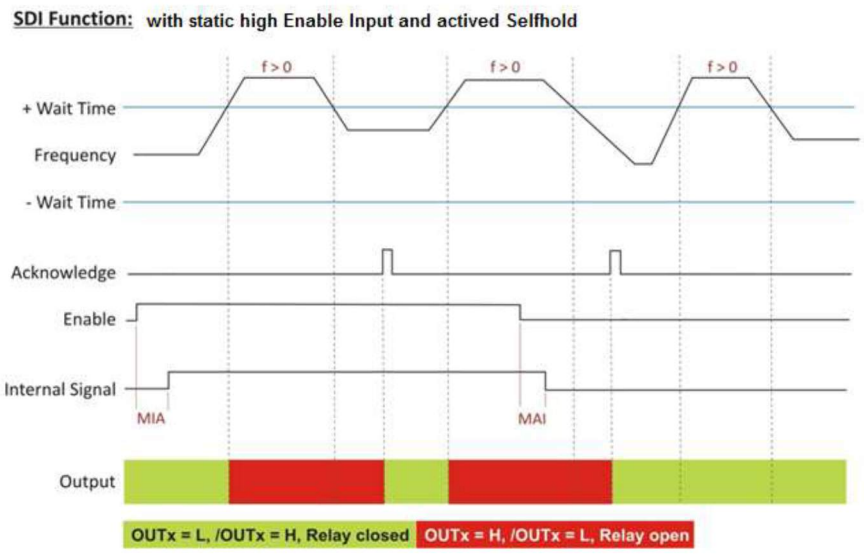

| Relevant input functions | Remark |
|---|---|
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |

### 8.16 SDI produced by input (f > 0 Hz) (Switch Mode = 13)

When the Switch Mode xxx parameter is set to 13, an SDI function is assigned to the output. The function is triggered when the frequency is positive. The 090 Lock Output parameter can be used to activate a selfhold function, which can be acknowledged by a further input. The acknowledgement is possible only if the frequencies are less than or equal to 0 Hz (f =< 0 Hz) or the enable signal is deactivated. The SDI function refers to the evaluation of the frequency, not to the evaluation of the position.

For complete information on the parameters listed below please refer to the "14.2.2 Main menu" section on page 168 (MM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 13 |
| Wait Time (MM) | Reset time |
| Matrix xxx (SM) | Use only inputs, but no feedback outputs |
| MIA-Delay xxx (SM) | 0 (it can also be set according to need) |
| MAI-Delay xxx (SM) | 0 (it can also be set according to need) |
| Lock Output (SM) | Selfhold function, use only settings 0 to 31 |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |



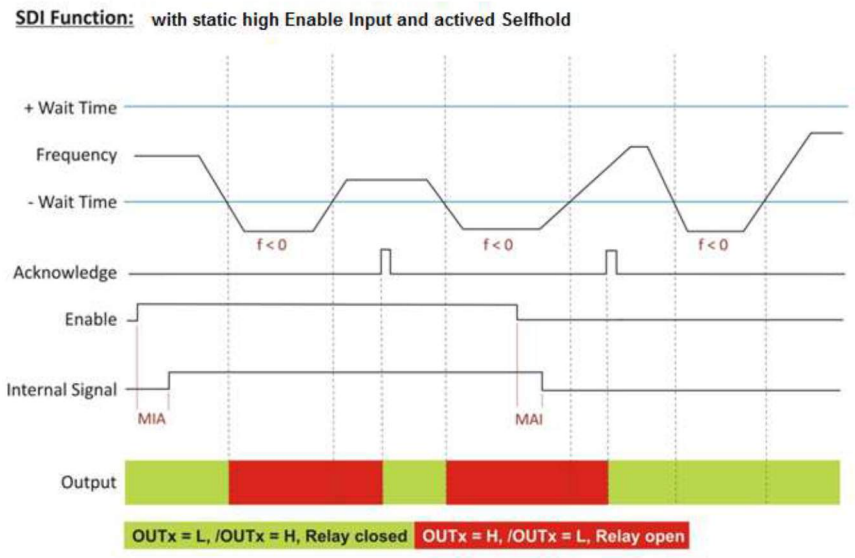

| Relevant input functions | Remark |
|---|---|
| Enable (Function: 21) | It activates the function |
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |

### 8.17 SDI produced by input (f < 0 Hz) (Switch Mode = 14)

When the Switch Mode xxx parameter is set to 14, an SDI function is assigned to the output. The function is triggered when the frequency is negative. The 090 Lock Output parameter can be used to activate a selfhold function, which can be acknowledged by a further input. The acknowledgement is possible only if the frequencies are higher than or equal to 0 Hz (f >= 0 Hz) or the enable signal is deactivated. The SDI function refers to the evaluation of the frequency, not to the evaluation of the position.

For complete information on the parameters listed below please refer to the "14.2.2 Main menu" section on page 168 (MM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 14 |
| Wait Time (MM) | Reset time |
| Matrix xxx (SM) | Use only inputs, but no feedback outputs |
| MIA-Delay xxx (SM) | 0 (it can also be set according to need) |
| MAI-Delay xxx (SM) | 0 (it can also be set according to need) |
| Lock Output (SM) | Selfhold function, use only settings 0 to 31 |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |

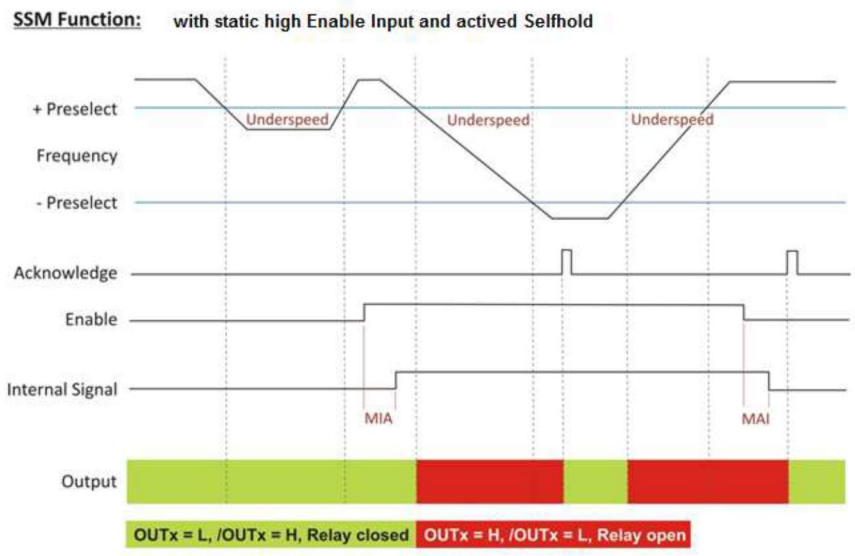



| Relevant input functions | Remark |
|---|---|
| Enable (Function: 21) | It activates the function |
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |

### 8.18 SSM produced by input (Switch Mode = 15)

When the Switch Mode xxx parameter is set to 15, an SSM function is assigned to the output. The function is triggered when the underspeed is detected, independently of the direction of rotation. The function requires an enable input signal which is assigned by Matrix xxx parameter. A lock function can be set separately, which can be acknowledged by a further input. The acknowledgement is possible only if the frequencies are higher than the underspeed or the enable signal is deactivated.
For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 15 |
| Matrix xxx (SM) | Use only inputs, but no feedback outputs |
| MIA-Delay xxx (SM) | 0 (it can also be set according to need) |
| MAI-Delay xxx (SM) | 0 (it can also be set according to need) |
| Lock Output (SM) | For lock function use only settings 0 to 31 |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| Delay xxx (SM) | Shutter delay |
| Preselect xxx.H/L (PM) | Switching point |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |

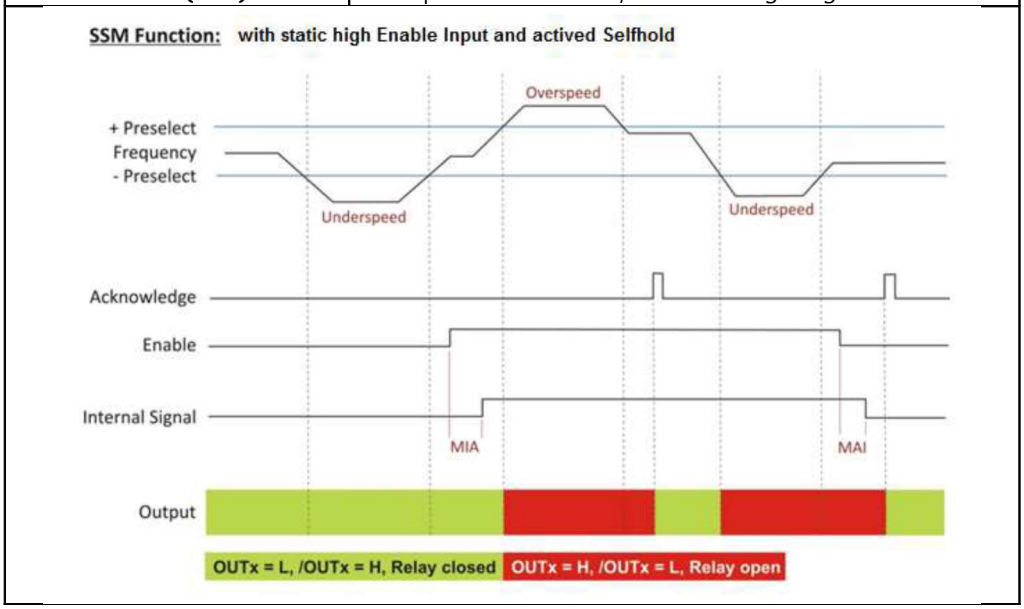


| Relevant input functions | Remark |
|---|---|
| Enable (Function: 21) | It activates the function |
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |

### 8.19 SSM produced by input (Switch Mode = 16)

When the Switch Mode xxx parameter is set to 16, an SSM function is assigned to the output. The function is triggered when the frequency leaves the frequency band, independently of the direction of rotation. The function requires an enable input signal which is assigned by Matrix xxx parameter. A lock function can be set separately, which can be acknowledged by a further input. The acknowledgement is possible only if the frequencies are within the frequency band or the enable signal is deactivated.
For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 16 |
| Hysteresis xxx (SM) | +/- range (centre) |
| Matrix xxx (SM) | Use only inputs, but no feedback outputs |
| MIA-Delay xxx (SM) | 0 (it can also be set according to need) |
| MAI-Delay xxx (SM) | 0 (it can also be set according to need) |
| Lock Output (SM) | For lock function use only settings 0 to 31 |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| Delay xxx (SM) | Shutter delay |
| Preselect xxx.H/L (PM) | Centre |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |



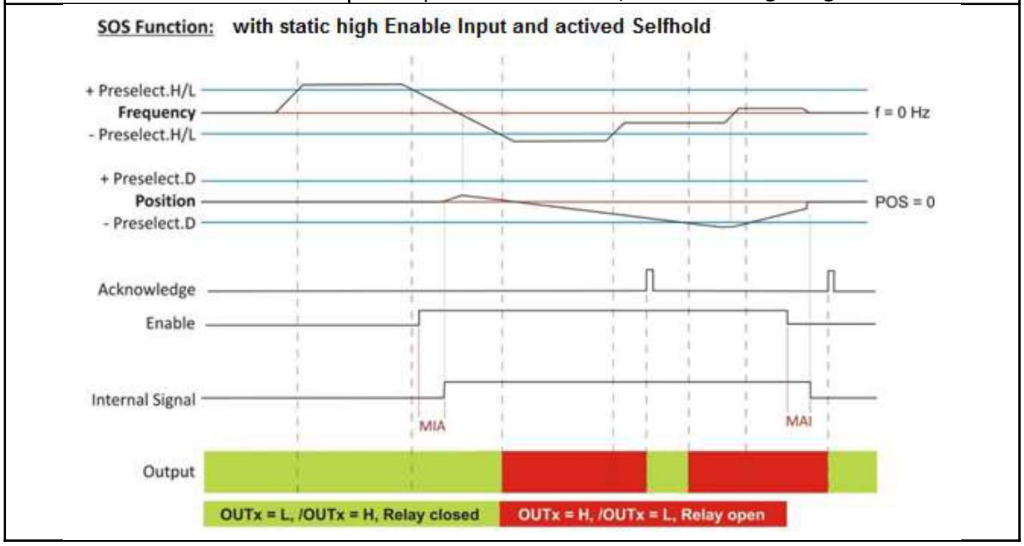
| Relevant input functions | Remark |
|---|---|
| Enable (Function: 21) | It activates the function |
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |

### 8.20 SOS/SLI/SS2 produced by input (Switch Mode = 17)

When the **Switch Mode xxx** parameter is set to 17, an SOS/SLI/SS2 function is assigned to the output. The function is triggered when the overspeed is detected or when a position error occurs, independently of the direction of rotation. The function requires an enable input signal which is assigned by **Matrix xxx** parameter. The selfhold function can be switched on. A lock function can be acknowledged by a further input. The acknowledgement is possible only if the frequencies are less than the overspeed or the enable signal is deactivated. By switching the enable signal from inactive to active, the current position is taken for error evaluation. SLI and SOS only differ in the level of the switching points. While SLI corresponds to a monitored jog operation, SOS provides standstill monitoring. A position error can be acknowledged only by deactivating the enable signal. Any SOS function with **MIA-Delay xxx** value different from zero will change to an SS2 function.

For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| **Switch Mode xxx** (SM) | 17 |
| **Matrix xxx** (SM) | Use only inputs, but no feedback outputs |
| **MIA-Delay xxx** (SM) | 0 (it can also be set according to need, **SS2**) |
| **MAI-Delay xxx** (SM) | 0 (it can also be set according to need) |
| **Lock Output** (SM) | For lock function use only settings 0 to 31 |
| **Output Mode** (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| **Delay xxx** (SM) | Shutter delay |
| **Preselect xxx.D** (PM) | Switching point for position |
| **Preselect xxx.H/L** (PM) | Switching point for overspeed |
| **xINx Function** (CM) | Input function |
| **xINx Config** (CM) | Switching behaviour (dynamic or static) |
| **Input Mode** (CM) | Input configuration (it affects the SIL) |
| **GPI Err Time** (CM) | Max. permissible delay time during illegal conditions |



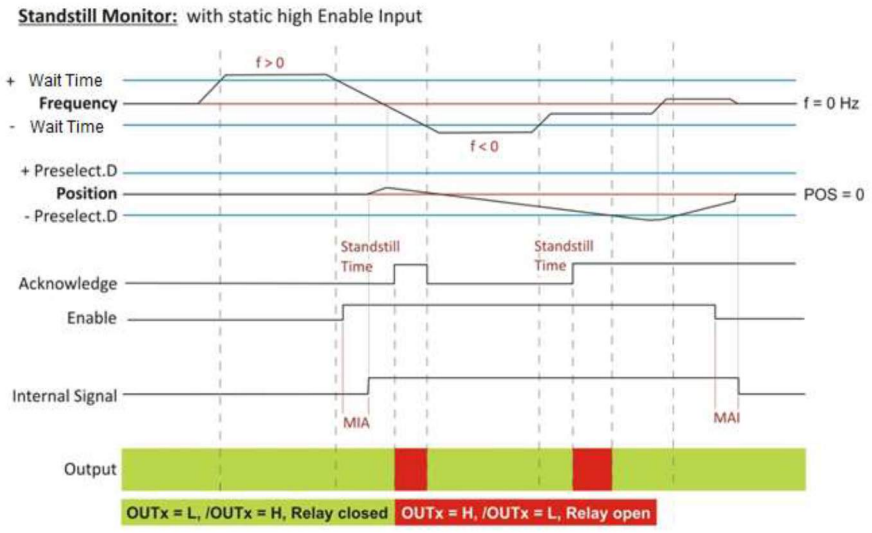
| Relevant input functions | Remark |
|---|---|
| Enable (Function: 21) | It activates the function |
| Selfhold function (Function: 1-6) | Only if the selfhold function is activated |

### 8.21 Standstill produced by input (Switch Mode = 18)

When the **Switch Mode xxx** parameter is set to 18, a standstill function is assigned to the output. The function is triggered when the standstill is detected. The function requires an enable input signal which is assigned by **Matrix xxx** parameter. No lock function is implemented. By switching the enable signal from inactive to active, the current position is taken for error evaluation. The output is set as soon as the **089 Standstill Time** has elapsed. When a position error occurs or the frequency is different from zero, the output is reset. Position errors can be cleared only by deactivating the enable signal.

For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 18 |
| Wait Time (SM) | Reset time |
| Matrix xxx (SM) | Use only inputs, but no feedback outputs |
| MIA-Delay xxx (SM) | 0 (it can also be set according to need) |
| MAI-Delay xxx (SM) | 0 (it can also be set according to need) |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| Delay xxx (SM) | Shutter delay |
| Preselect xxx.D (PM) | Switching point for position |
| Standstill Time (SM) | Time in seconds |
| xINx Function (CM) | Input function |
| xINx Config (CM) | Switching behaviour (dynamic or static) |
| Input Mode (CM) | Input configuration (it affects the SIL) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |



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

### 8.22 Reserved (Switch Mode = 19)

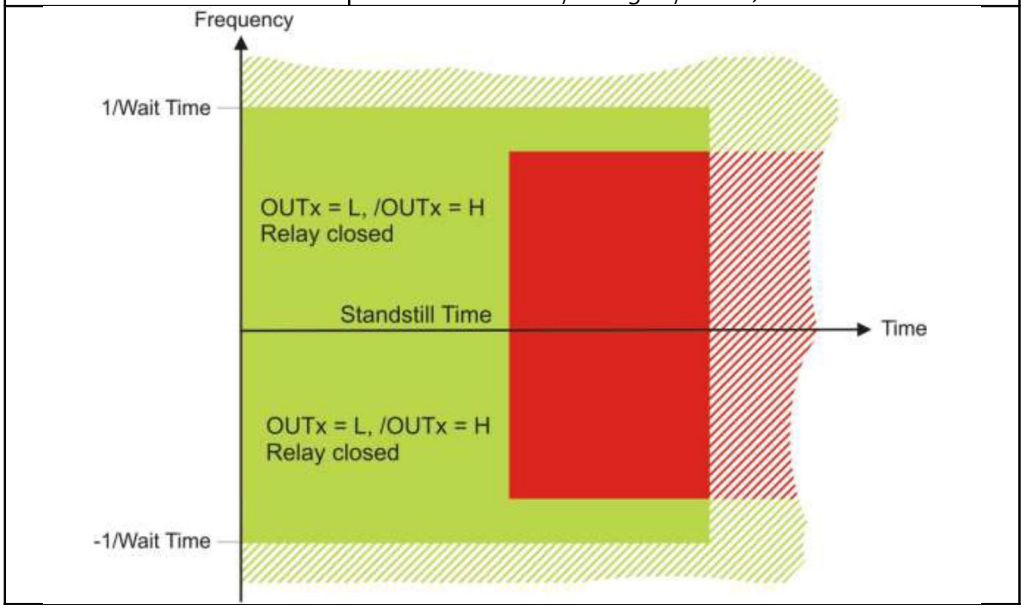
The **Switch Mode xxx** = 19 is reserved for factory tests.

### 8.23 No Standstill (Switch Mode = 20)

When the **Switch Mode xxx** parameter is set to 20, the unit operates contrary to when the **Switch Mode xxx** parameter is set to 3. The function is always active as in the **Switch Mode xxx** = 3, but the output can be set up for static operation only. With this function, the unit controls the relay output contrary to when the **Switch Mode xxx** parameter is set to 3, the relay is closed at standstill and opens when the frequencies are different from zero. The **089 Standstill Time** parameter sets a delay before the standstill condition is acknowledged.

For complete information on the parameters listed below please refer to the "14.2.6 Switching menu" section on page 186 (SM).

| Parameters | Remark |
|---|---|
| **Switch Mode xxx (SM)** | 20 |
| **Pulse Time xxx (SM)** | 0 = static only |
| **Standstill Time (SM)** | Standstill time in seconds |
| **Output Mode (SM)** | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |



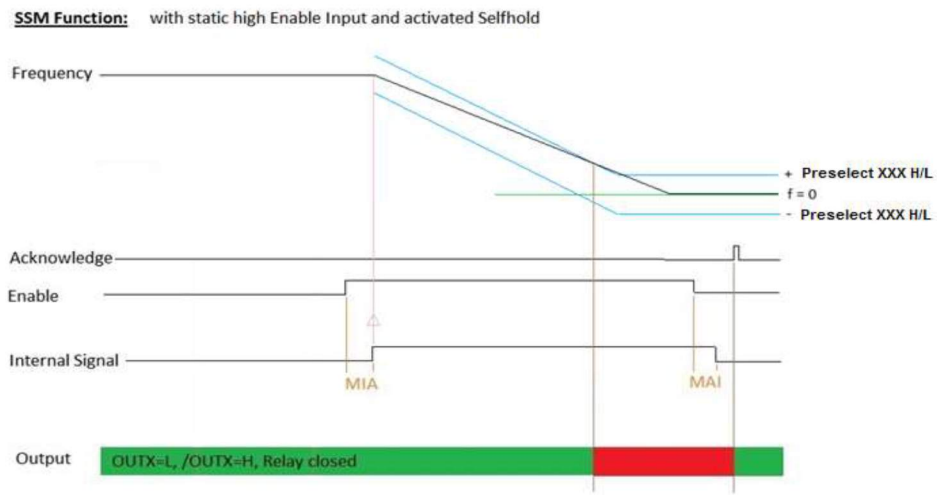

| Relevant input functions | Remark |
|---|---|
| None | None |

### 8.24 Ramp monitoring (Switch Mode = 21)

When the Switch Mode xxx parameter is set to 21, a ramp monitoring function is assigned to the output. The ramp monitoring function requires that the braking behaviour follows a linear function in terms of frequency and time. During the transition from inactive to active enable edge, the current frequency is cached in the device and the expected frequency can be determined by the pre-programmed ramp Preselect xxx.F parameter. If the current frequency deviates so that it goes out of the calculated window / range Preselect xxx.H/L, the output is set. The function requires an enable input signal which is assigned by Matrix xxx parameter. A lock function can be activated, it can be acknowledged by a further input. The acknowledgement is possible only if the enable signal is deactivated.

For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 21 |
| Matrix xxx (SM) | Use only inputs, but no feedback outputs |
| MIA-Delay xxx (SM) | 0 (it can also be set according to need) |
| MAI-Delay xxx (SM) | 0 (it can also be set according to need) |
| Lock Output (SM) | Selfhold function, use only settings 0 to 31 |
| Output Mode (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| Delay xxx (SM) | Shutter delay |
| Preselect xxx.H/L (PM) | +/- range from the cached centre point |
| Preselect xxx.F (PM) | Entering the brake ramp |
| xINx Function (CM) | Configuration of the control inputs (it affects the SIL) |
| xINx Config (CM) | Function of the control inputs |
| Input Mode (CM) | Switching behaviour (single channel, two channel, inverse, homogeneous, dynamic, or static) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |



| Relevant input functions | Remark |
|---|---|
| Enable e.g. **100 IN1 Function** parameter = 21 | It activates the function |
| Clear lock function, e.g. **104 IN2 Function** parameter = 1 ... 6 | Only when the lock function is active |

The window / range is determined by the **Preselect xxx.H/L** parameter setting, it is expressed in 0.00 Hz values. An input of 100.00 Hz generates a window of +/-100.00 Hz by the calculated frequency. The **Preselect xxx.F** parameter sets the braking ramp.
If the lock function has been activated, the **Delay xxx** parameter must also be activated. It must be set to the smallest value of 2 ms at least.

**EXAMPLE**
If a braking ramp is triggered from 0.01 Hz/ms at 1353 Hz, the time to 0 Hz is reached: 1353 Hz / (0.01 Hz/ms) = 135.3 s = 2 minutes and 15.3 seconds.
To determine the ramp, the drive should be braked at e.g. 1 kHz and the time duration should be measured. The parameter value follows by calculation.

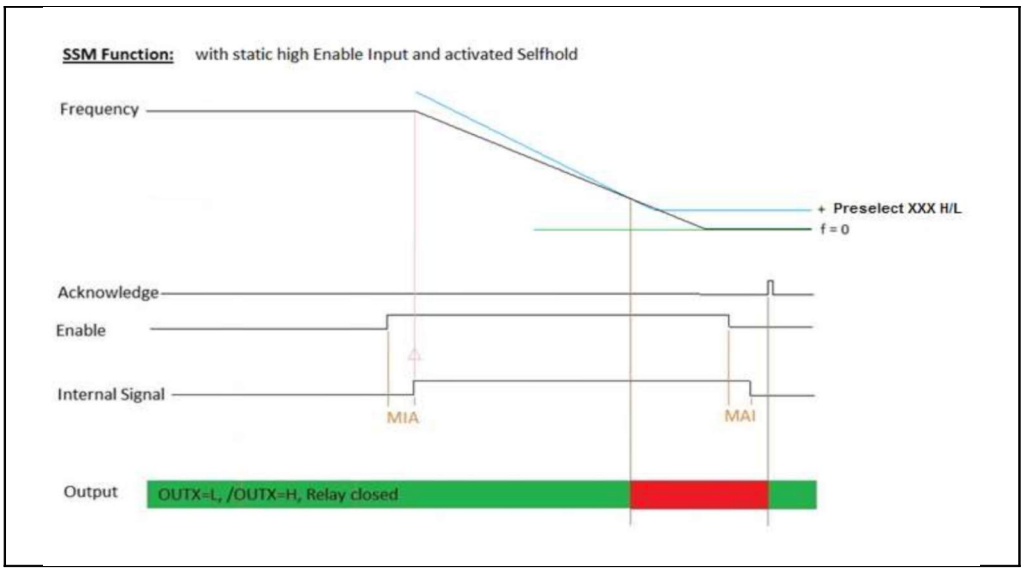
### 8.25 Ramp monitoring (Switch Mode = 22)

When the **Switch Mode xxx** parameter is set to 22, a ramp monitoring function is assigned to the output. The ramp monitoring function requires that the braking behaviour follows a linear function in terms of frequency and time. During the transition from inactive to active enable edge, the current frequency is cached in the device and the expected frequency can be determined by the pre-programmed ramp **Preselect xxx.F** parameter. Unlike the **Switch Mode xxx** = 22, only one monitoring of the ramp is performed.

If the current frequency is greater than the maximum value in the calculated window / range **Preselect xxx.H/L**, the output is set. On the contrary, if the current frequency is less than the minimum value in the calculated window / range **Preselect xxx.H/L**, the output is not set. The function requires an enable input signal which is assigned by **Matrix xxx** parameter. A lock function can be activated, it can be acknowledged by a further input. The acknowledgement is possible only if the enable signal is deactivated.

For complete information on the parameters listed below please refer to the "14.2.5 Preselect menu" section on page 181 (PM); to the "14.2.6 Switching menu" section on page 186 (SM); and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| **Switch Mode xxx** (SM) | 22 |
| **Matrix xxx** (SM) | Use only inputs, but no feedback outputs |
| **MIA-Delay xxx** (SM) | 0 (it can also be set according to need) |
| **MAI-Delay xxx** (SM) | 0 (it can also be set according to need) |
| **Lock Output** (SM) | For lock function use only settings 0 to 31 |
| **Output Mode** (SM) | Homogeneous or inverse output configuration (it affects the Safety Integrity Level) |
| **Delay xxx** (SM) | Shutter release delay |
| **Preselect xxx.H/L** (PM) | +/- range from the cached centre point |
| **Preselect xxx.F** (PM) | Entering the brake ramp |
| **xINx Function** (CM) | Configuration of the control inputs (it affects the SIL) |
| **xINx Config** (CM) | Function of the control inputs |
| **Input Mode** (CM) | Switching behaviour (single channel, two channel, inverse, homogeneous, dynamic, or static) |
| **GPI Err Time** (CM) | Max. permissible delay time during illegal conditions |




| Relevant input functions | Remark |
|---|---|
| Enable e.g. **100 IN1 Function** parameter = 21 | It activates the function |
| Selfhold function, e.g. **104 IN2 Function** parameter = 1 ... 6 | Only when the selfhold function is active |

The window / range is determined by the **Preselect xxx.H/L** parameter setting, it is expressed in 0.00 Hz values. An input of 100.00 Hz generates a range of +100.00 Hz by the calculated frequency. The **Preselect xxx.F** parameter sets the braking ramp.
If the lock function has been activated, the **Delay xxx** parameter must also be activated. It must be set to the smallest value of 2 ms at least.

**EXAMPLE**
If a braking ramp is triggered from 0.01 Hz/ms at 1353 Hz, the time to 0 Hz is reached: 1353 Hz / (0.01 Hz/ms) = 135.3 s = 2 minutes and 15.3 seconds.
To determine the ramp, the drive should be braked at e.g. 1 kHz and the time duration should be measured. The parameter value follows by calculation.

# 9 – Response time values

## 9.1 Response time of the relay output

**The hardware delay of the relay is 50 ms max.**

| **With normal monitoring of overspeed, underspeed, or frequency band** (with frequency band please choose the lower frequency, since this produces a longer delay) | |
|---|---|
| 2 x **001** Sampling Time + 25 ms | For frequencies > 1 / **001** Sampling Time |
| e.g. f = 10 kHz, **001** Sampling Time = 1 ms | 10 kHz > 1 kHz → delay = 27 ms |
| 2 x 1 / frequency + 25 ms | For frequencies < 1 / **001** Sampling Time |
| e.g. f = 100 Hz, **001** Sampling Time = 1 ms | 100 Hz < 1 kHz → delay = 45 ms |

| **With normal monitoring of standstill** | |
|---|---|
| 2 x **002** Wait Time + **089** Standstill Time + 25 ms | For frequency = 0 |
| e.g. **089** Standstill Time = 0 ms, **002** Wait Time = 100 ms | Delay = 225 ms |

NOTE

The response time values indicated above are based on a step function.
For the calculation of these times, the **014** Filter parameter is not considered. If the **014** Filter parameter is activated, **001** Sampling Time value or 1 / frequency must be multiplied by the factor x5 (5 = a final value which is about 100% is reached; 3 = a final value which is about 95% is reached).
If a system error (critical internal error) occurs, the response time will be:
85 ms + 25 ms = 110 ms (valid for version 3B or higher)

## 9.2 Response time of the analogue output

**The hardware delay of the analogue output is 1 ms.**

| **With normal monitoring of overspeed, underspeed, or frequency band** (with frequency band please choose the lower frequency, since this produces a longer delay) | |
|---|---|
| 2 x **001** Sampling Time + 1 ms | For frequencies > 1 / **001** Sampling Time |
| e.g. f = 10 kHz, **001** Sampling Time = 1 ms | 10 kHz > 1 kHz → delay = 3 ms |
| 2 x 1 / frequency + 1 ms | For frequencies < 1 / **001** Sampling Time |
| e.g. f = 100 Hz, **001** Sampling Time = 1 ms | 100 Hz < 1 kHz → delay = 21 ms |

| **With normal monitoring of standstill** | |
|---|---|
| 2 x **002** Wait Time + **089** Standstill Time + 1 ms | For frequency = 0 |
| e.g. **089** Standstill Time = 0 ms, **002** Wait Time = 100 ms | Delay = 201 ms |

NOTE

The response time values indicated above are based on a step function.
For the calculation of these times, the **014** Filter parameter is not considered. If the **014** Filter parameter is activated, **001** Sampling Time value or 1 / frequency must be multiplied by the factor x5 (5 = a final value which is about 100% is reached; 3 = a final value which is about 95% is reached).
If a system error (critical internal error) occurs, the response time will be:
85 ms + 1 ms = 86 ms (valid for version 3B or higher)

## 9.3 Response time of the digital outputs

**The hardware delay of the digital outputs is 1 ms.**

| **With normal monitoring of overspeed, underspeed, or frequency band** (with frequency band please choose the lower frequency, since this produces a longer delay) | |
|---|---|
| 2 x **001** Sampling Time + 1 ms | For frequencies > 1 / **001** Sampling Time |
| e.g. f = 10 kHz, **001** Sampling Time = 1 ms | 10 kHz > 1 kHz → delay = 3 ms |
| 2 x 1 / frequency + 1 ms | For frequencies < 1 / **001** Sampling Time |
| e.g. f = 100 Hz, **001** Sampling Time = 1 ms | 100 Hz < 1 kHz → delay = 21 ms |

| **With normal monitoring of standstill** | |
|---|---|
| 2 x **002** Wait Time + **089** Standstill Time + 1 ms | For frequency = 0 |
| e.g. **089** Standstill Time = 0 ms, **002** Wait Time = 100 ms | Delay = 201 ms |

**NOTE**

The response time values indicated above are based on a step function.
For the calculation of these times, the **014** Filter parameter is not considered. If the **014** Filter parameter is activated, **001** Sampling Time value or 1 / frequency must be multiplied by the factor x5 (5 = a final value which is about 100% is reached; 3 = a final value which is about 95% is reached).
If a system error (critical internal error) occurs, the response time will be:
85 ms + 1 ms = 86 ms (valid for version 3B or higher)

## 9.4 Response time of the splitter output

**The hardware delay of the splitter output is 1 ms.**

**NOTE**
The response time values are based on a step function.
If a system error (critical internal error) occurs, the response time will be:
85 ms + 1 ms = 86 ms (valid for version 3B or higher)

## 9.5 Response time of the frequency error evaluation

**Response time in case of a sudden frequency drop:**
time calculations in the next tables assume the following settings:
001 Sampling Time = 10 ms
002 Wait Time = 100 ms

Information for versions 3B or higher:

- use the 001 Sampling Time for the calculation when f > 1 / 001 Sampling Time
- use reciprocal frequency 1 / f when f < 1 / 001 Sampling Time

**NOTE**
In addition to the delay time values indicated in the following tables, please add the hardware delay of the corresponding output, i.e.: relay = 25 ms; analogue output = 1 ms; digital output = 1 ms. The 014 Filter parameter is excluded.

* The calculated values for response time assume that the 001 Sampling Time would be greater than the reciprocal frequency 1 / f.

| 008 Div. Filter = 10 | | | |
|---|---|---|---|
| 005 Div. %-Value = 10 | 11 x 001 Sampling Time or 1/f + 1 x 002 Wait Time | → delay = 210 ms * | |
| 005 Div. %-Value = 20 | 21 x 001 Sampling Time or 1/f + 1 x 002 Wait Time | → delay = 310 ms * | |
| 005 Div. %-Value = 30 | 31 x 001 Sampling Time or 1/f + 1 x 002 Wait Time | → delay = 410 ms * | |
| 005 Div. %-Value = 40 | 41 x 001 Sampling Time or 1/f + 1 x 002 Wait Time | → delay = 510 ms * | |

| 008 Div. Filter = 5 | | | |
|---|---|---|---|
| 005 Div. %-Value = 10 | 5 x 001 Sampling Time or 1/f + 1 x 002 Wait Time | → delay = 150 ms * | |
| 005 Div. %-Value = 20 | 10 x 001 Sampling Time or 1/f + 1 x 002 Wait Time | → delay = 200 ms * | |
| 005 Div. %-Value = 30 | 15 x 001 Sampling Time or 1/f + 1 x 002 Wait Time | → delay = 250 ms * | |
| 005 Div. %-Value = 40 | 21 x 001 Sampling Time or 1/f + 1 x 002 Wait Time | → delay = 310 ms * | |

| 008 Div. Filter = 3 | | | |
|---|---|---|---|
| 005 Div. %-Value = 10 | 1 x 001 Sampling Time or 1/f + 1 x 002 Wait Time | → delay = 110 ms * | |
| 005 Div. %-Value = 20 | 2 x 001 Sampling Time or 1/f + 1 x 002 Wait Time | → delay = 120 ms * | |
| 005 Div. %-Value = 30 | 3 x 001 Sampling Time or 1/f + 1 x 002 Wait Time | → delay = 130 ms * | |
| 005 Div. %-Value = 40 | 5 x 001 Sampling Time or 1/f + 1 x 002 Wait Time | → delay = 150 ms * | |

| Filtering effect with a frequency drop of 10% | |
|---|---|
| 008 Div. Filter = 3, 005 Div. %-Value = 10 | Tripping after 9 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 5, 005 Div. %-Value = 10 | Tripping after 10 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 10, 005 Div. %-Value = 10 | Tripping after 10 x 001 Sampling Time or 1/f |

| Filtering effect with a frequency drop of 20% | |
|---|---|
| 008 Div. Filter = 3, 005 Div. %-Value = 20 | Tripping after 13 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 3, 005 Div. %-Value = 10 | Tripping after 4 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 5, 005 Div. %-Value = 20 | Tripping after 20 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 5, 005 Div. %-Value = 10 | Tripping after 10 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 10, 005 Div. %-Value = 20 | Tripping after 20 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 10, 005 Div. %-Value = 10 | Tripping after 10 x 001 Sampling Time or 1/f |

| Filtering effect with a frequency drop of 30% | |
|---|---|
| 008 Div. Filter = 3, 005 Div. %-Value = 30 | Tripping after 16 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 3, 005 Div. %-Value = 20 | Tripping after 7 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 3, 005 Div. %-Value = 10 | Tripping after 3 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 5, 005 Div. %-Value = 30 | Tripping after 30 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 5, 005 Div. %-Value = 20 | Tripping after 20 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 5, 005 Div. %-Value = 10 | Tripping after 10 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 10, 005 Div. %-Value = 30 | Tripping after 30 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 10, 005 Div. %-Value = 20 | Tripping after 20 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 10, 005 Div. %-Value = 10 | Tripping after 10 x 001 Sampling Time or 1/f |

| Filtering effect with a frequency drop of 40% | |
|---|---|
| 008 Div. Filter = 3, 005 Div. %-Value = 40 | Tripping after 18 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 3, 005 Div. %-Value = 30 | Tripping after 9 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 3, 005 Div. %-Value = 20 | Tripping after 5 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 3, 005 Div. %-Value = 10 | Tripping after 2 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 5, 005 Div. %-Value = 40 | Tripping after 36 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 5, 005 Div. %-Value = 30 | Tripping after 26 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 5, 005 Div. %-Value = 20 | Tripping after 16 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 5, 005 Div. %-Value = 10 | Tripping after 6 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 10, 005 Div. %-Value = 40 | Tripping after 40 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 10, 005 Div. %-Value = 30 | Tripping after 30 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 10, 005 Div. %-Value = 20 | Tripping after 20 x 001 Sampling Time or 1/f |
| 008 Div. Filter = 10, 005 Div. %-Value = 10 | Tripping after 10 x 001 Sampling Time or 1/f |

# 10 – Connection of the inputs

There are several possibilities to connect the inputs. The IFS-10 safety monitors offer HTL inputs with SIL3 capability, provided that their configuration is set to two pole inverse operation. The SIL Safety Integrity Level that finally results also depends on the remote circuit and on the configuration.
For complete information on the parameters listed below please refer to the "14.2.6 Switching menu" section on page 186 (SM) and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Switch Mode xxx (SM) | 9, when an output is used for clock generation with clocked input |
| Output Mode (SM) | Clock output must be set to inverse |
| xINx Config (CM) | Input characteristics (bipolar, unipolar, clocked) |
| Input Mode (CM) | Input configuration (individual input, signal pair, mixed) |
| GPI Err Time (CM) | Max. permissible delay time during illegal conditions |

NOTE

- **Unipolar unclocked inputs can reach SIL 1 only**
  see the "10.1 Connection of unipolar unclocked inputs" section on page 149

- **Unipolar clocked inputs can reach SIL 1 or SIL 2**
  see the "10.2 Connection of unipolar clocked inputs" section on page 150

- **Bipolar unclocked inputs can reach SIL 2 or SIL 3**
  see the "10.3 Connection of bipolar unclocked inputs" section on page 151

If you use clocked inputs, you should use OUT1, OUT2, and OUT3 first, and OUT4 lastly to generate the clocks. The clock outputs have different characteristics in terms of frequency and OUT1 is able to output the highest frequency.

Both output tracks can be used due to the 180° phase displacement (please check the information on the 094 Output Mode parameter on page 202).

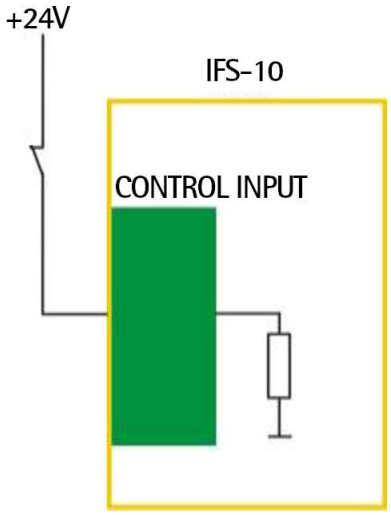
### 10.1 Connection of unipolar unclocked inputs

Unipolar unclocked inputs are connected as shown below. As an alternative a change-over contact can be used, toogling between GND and +24V. Unipolar unclocked inputs provide Safety Integrity Level SIL = 1.

The **xINx Config** parameter (see the "14.2.7 Control menu" section on page 204) must be set to a value ranging between 8 and 11.

The **108 Input Mode** parameter (see the "14.2.7 Control menu" section on page 204) must be set to 1 or 2.

No errors can be detected, so there is no influence on the response time.



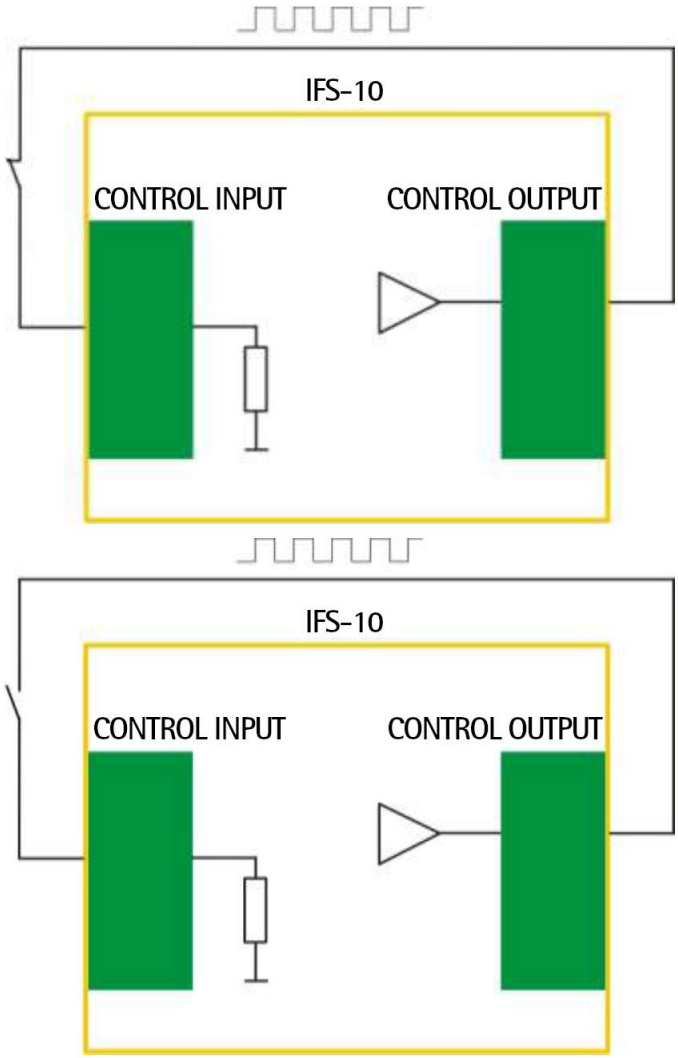
### 10.2 Connection of unipolar clocked inputs

Unipolar clocked inputs are connected as shown below. This type of input reaches a Safety Integrity Level SIL = 1 or SIL = 2.

The **xINx Config** parameter (see the "14.2.7 Control menu" section on page 204) must be set to a value ranging between 20 and 35.

The **108 Input Mode** parameter (see the "14.2.7 Control menu" section on page 204) 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 so that no safety risk can result (line interruption or switching failure cannot be detected). In case of error, a **Readback Digital Output Error** will result and the response time will be approx. 20 ms.




**NOTE**

Impacts on the final Safety Integrity Level (SIL) are:

- separate areas for cable leads of switch cables;
- force-guided and redundant series contacts;
- protected switch terminals to avoid short circuits and shunt faults;
- MTTFd specification of the switch.

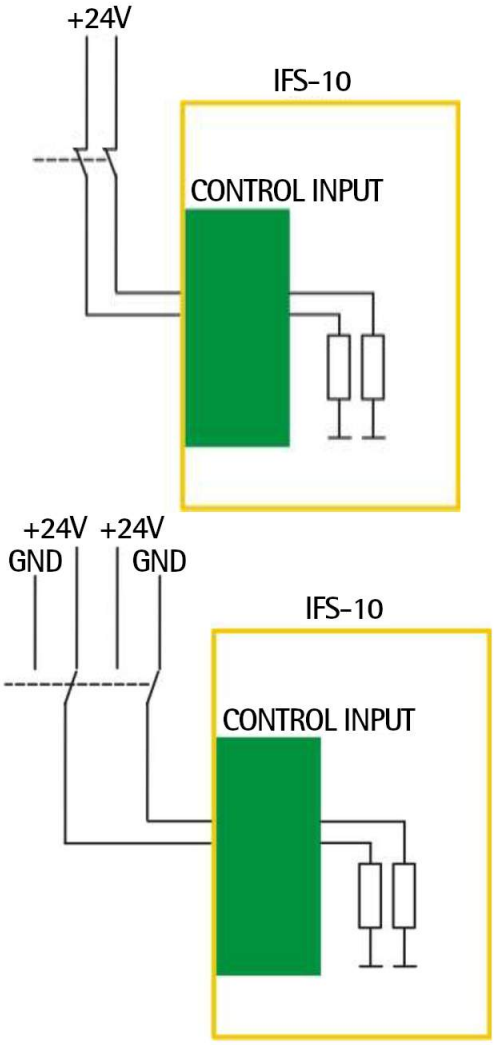
### 10.3 Connection of bipolar unclocked inputs

Bipolar unclocked inputs can be connected as shown below. This type of input reaches a Safety Integrity Level SIL = 2 or SIL = 3 (homogeneous = 2 or 3; inverse = 3).

The **xINx Config** parameter (see the "14.2.7 Control menu" section on page 204) must be set to a value ranging between 0 and 7.

The **108 Input Mode** parameter (see the "14.2.7 Control menu" section on page 204) must be set to 1 or 2.

In case of error, a **GPI Error** will result and the response time will be approx. 20 ms. The **110 GPI Err Time** sets the max. delay time during illegal conditions (1 equals approx. 1 ms).




**NOTE**

Impacts on the final Safety Integrity Level (SIL) are:

- separate areas for cable leads of switch cables;
- force-guided and redundant series contacts;
- protected switch terminals to avoid short circuits and shunt faults;
- MTTFd specification of the switch.

# 11 – Connection of the outputs

There are several possibilities to connect the inputs. The IFS-10 safety monitors offer HTL outputs with SIL3 capability, provided that their configuration is set to two pole inverse operation. The SIL Safety Integrity Level that finally results also depends on the remote circuit and on the configuration.
For complete information on the parameters listed below please refer to the "14.2.6 Switching menu" section on page 186 (SM) and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| Output Mode (SM) | Homogeneous or inverse output configuration |

NOTE

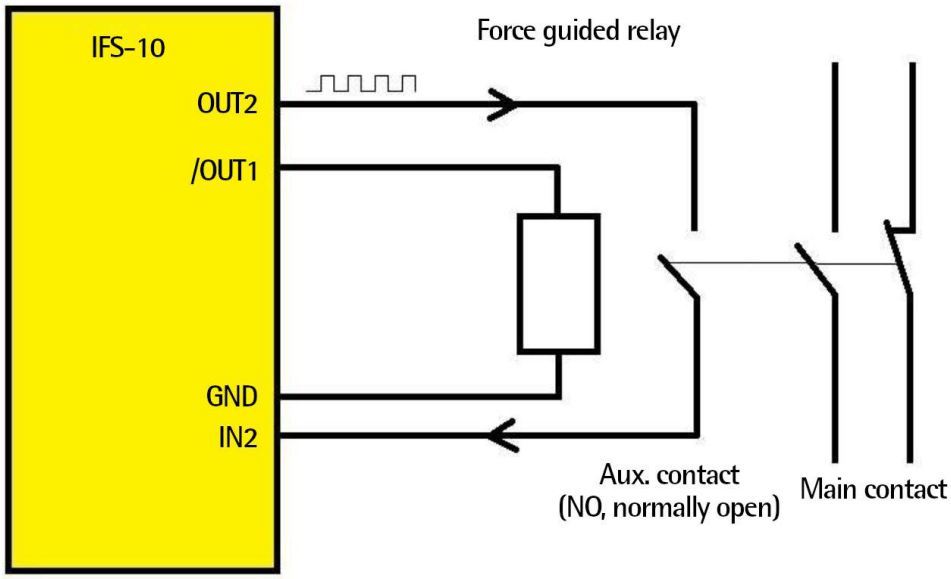
- **Unipolar outputs can reach** **SIL 1 only**
- **Bipolar homogeneous outputs can reach** **SIL 1 or SIL 2**
- **Bipolar inverse outputs can reach** **SIL 2 or SIL 3**

# 12 – EDM Function

The EDM function (External Device Monitoring) provides special monitoring of the faulty operation of remote relay or contactors by means of a separate feedback circuit. A clocked output signal is used for feedback, which is routed to an input by a force-guided relay contact. This means that the IFS-10 monitor has to provide one output to drive the relay coil and a second another output to generate the clock signal; and further an input for reading back the clock signal.
The **xINx Function** parameter sets the output that has to be used for controlling the relay. Possible settings are from 17 to 20 and 22. The **xINx Config** parameter sets the output that has to be used for clock generation. Possible settings are from 12 to 19.
The SIL Safety Integrity Level that finally results also depends on the remote circuit and on the configuration. In case of error, an **External RB Error** signal will be provided.
For complete information on the parameters listed below please refer to the "14.2.6 Switching menu" section on page 186 (SM) and to the "14.2.7 Control menu" section on page 204 (CM).

| Parameters | Remark |
|---|---|
| **Switch Mode xxx (SM)** | Output to control the relay coil (setting = inverse) |
| **Switch Mode xxx (SM)** | Clock output (setting = inverse) |
| **Read Back OUT (SM)** | Possible inversion of the relay control |
| **xINx Function (CM)** | Specification of the relay feedback |
| **xINx Config (CM)** | Specification of the clock feedback |
| **Input Mode (CM)** | Configuration of the readback input (single input for readback) |
| **Read Back Delay (CM)** | Delay time to ensure that the relay has quite certainly energized (common parameter valid for all relays in use) |

### 12.1 EDM: 1 relay, 1 output, 1 input (NO)




IN2 = IN3 (previous assignment)

| Parameters | Remark |
|---|---|
| Switch Mode OUT1 (SM) | 0 = OUT1 to detect the overspeed |
| Switch Mode OUT2 (SM) | 9 = OUT2 to generate the clock signal |
| Read Back OUT (SM) | **1 = Inversion (connection to /OUT1 via NO contact)** |
| Output Mode (SM) | 0 = Inverse configuration |
| IN2 Function (CM) | 17 = Function output OUT1 (overspeed) |
| IN2 Config (CM) | 14 = Clock output OUT2 (connection to [X10:4]) |
| Input Mode (CM) | 2 = Configuration of the readback input (single input for readback) |
| Read Back Delay (CM) | 0.050 = 50 ms delay time to compensate for contact bouncing |

**NOTE**

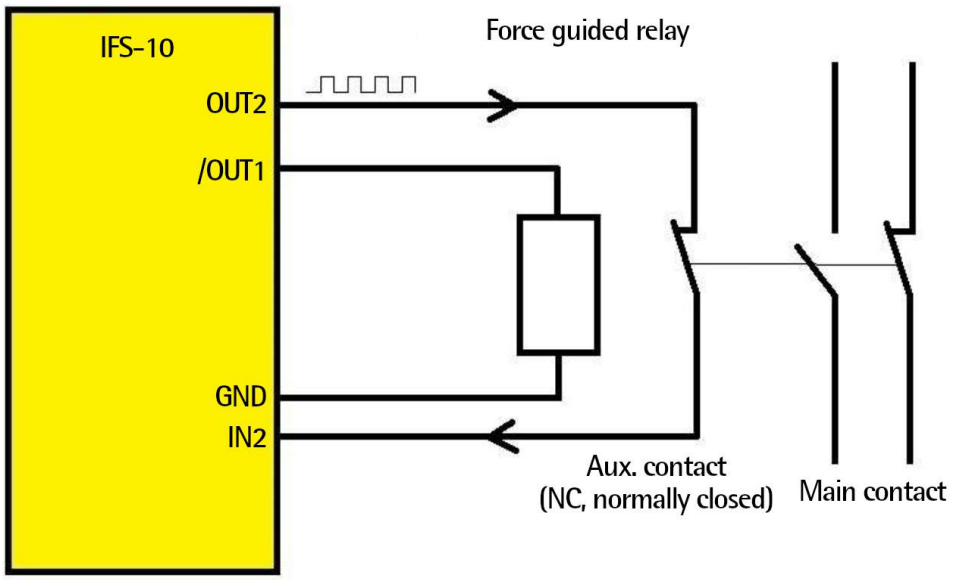
About operation

With normal operation speed, the inverted output /OUT1 is in HIGH state and the relay is energized. Therefore the force-guided auxiliary contact is closed and the clock signal is transmitted to the input. With overspeed condition, the output /OUT1 will switch to the LOW state and the remote relay will drop.

Errors in the clock circuit can be detected only while the relay is energized. Under error condition, the IFS-10 safety monitor will set all digital outputs to LOW state, i.e. the remote relay will be de-energized, and this condition will signal the overspeed. In case of errors occurring under normal operating speed, the unit will assume an error state that signals the overspeed again (Safety Integrity Level = 1).

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

## 12.2 EDM: 1 relay, 1 output, 1 input (NC)




IN2 = IN3 (previous assignment)

| Parameters | Remark |
|---|---|
| Switch Mode OUT1 (SM) | 0 = OUT1 to detect the overspeed |
| Switch Mode OUT2 (SM) | 9 = OUT2 to generate the clock signal |
| Read Back OUT (SM) | **0 = No inversion (connection to /OUT1 via NC contact)** |
| Output Mode (SM) | 0 = Inverse configuration |
| IN2 Function (CM) | 17 = Function output OUT1 (overspeed) |
| IN2 Config (CM) | 14 = Clock output OUT2 (connection to [X10:4]) |
| Input Mode (CM) | 2 = Configuration of the readback input (single input for readback) |
| Read Back Delay (CM) | 0.050 = 50 ms delay time to compensate for contact bouncing |

**NOTE**

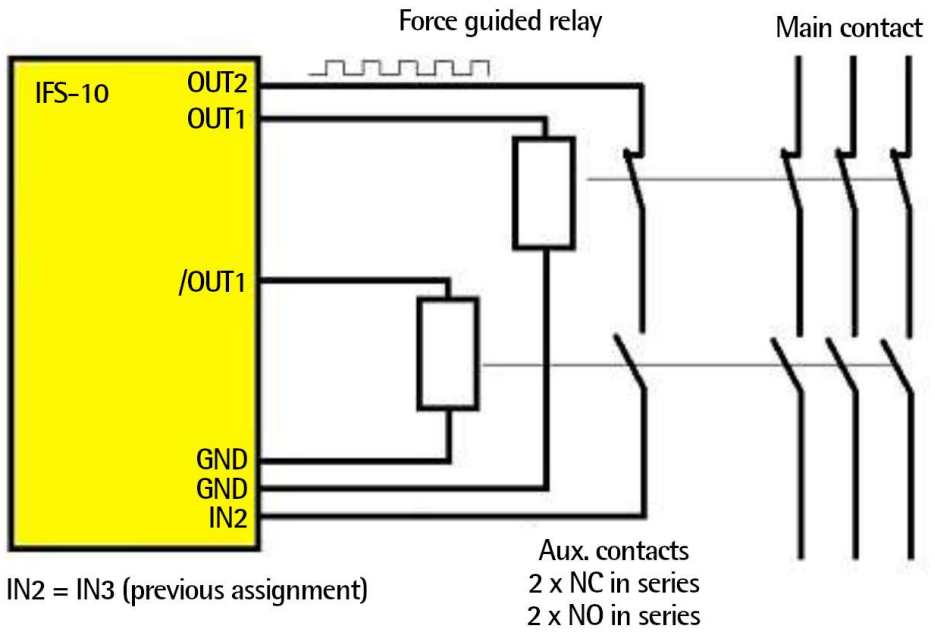
About operation

With normal operation speed, the inverted output /OUT1 is in HIGH state and the relay is energized. Therefore the force-guided auxiliary contact is open and the clock signal is disconnected from the input. With overspeed condition, the output /OUT1 will switch to the LOW state and the remote relay will drop.

Errors in the clock circuit can be detected only while the relay is de-energized. Under error condition, the IFS-10 safety monitor will set all digital outputs to LOW state, i.e. the remote relay will be de-energized, and this condition will signal the overspeed. In case of errors occurring under overspeed conditions, the unit will assume an error state that signals the overspeed again (Safety Integrity Level = 1).

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

### 12.3 EDM: 2 relays, 1 output, 1 input (NC, NO)




| Parameters | Remark |
|---|---|
| Switch Mode OUT1 (SM) | 0 = OUT1 to detect the overspeed |
| Switch Mode OUT2 (SM) | 9 = OUT2 to generate the clock signal |
| Read Back OUT (SM) | **1 = Inversion** |
| Output Mode (SM) | 0 = Inverse configuration |
| IN2 Function (CM) | 17 = Function output OUT1 (overspeed) |
| IN2 Config (CM) | 14 = Clock output OUT2 (connection to [X10:4]) |
| Input Mode (CM) | 2 = 4 single inputs for free use |
| Read Back Delay (CM) | 0.050 = 50 ms delay time to compensate for contact bouncing |

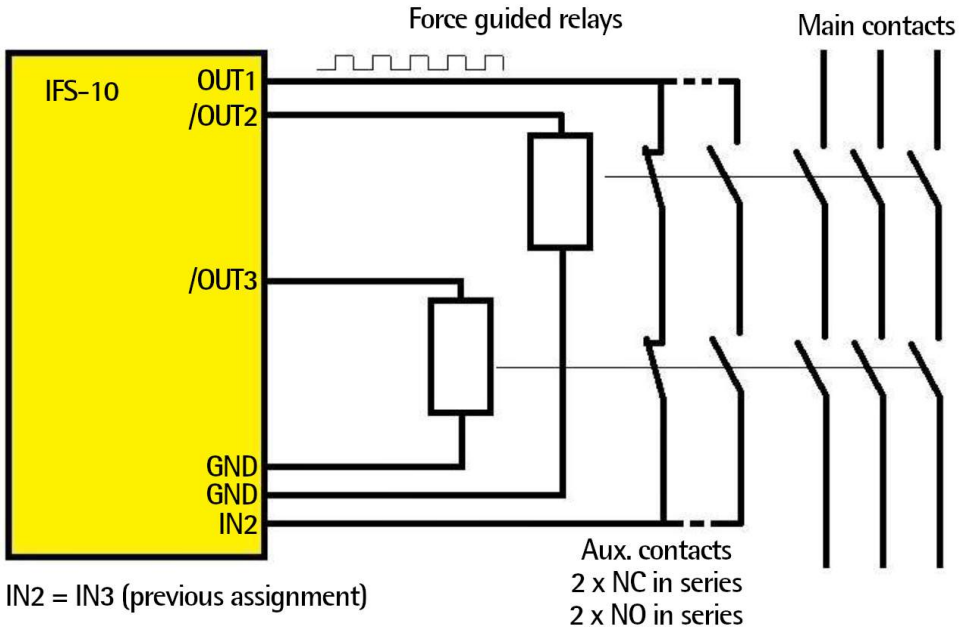
**NOTE**

About operation

With normal operation speed, output /OUT1 is in HIGH state and output OUT1 is in LOW state. With overspeed condition, 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 from each other.
Errors in the clock circuit can be detected only while the clock loop is closed. Under error condition, the IFS-10 safety monitor will set all digital outputs to LOW state, i.e. both relays will drop, and this condition will signal the overspeed. In case of errors in the clock loop occurring under overspeed conditions, the unit will assume an error state that signals the overspeed again (Safety Integrity Level = 2).
The main contacts can be used as opener or closer depending on the application.

## 12.4 EDM: 2 relays, 2 outputs, 1 input (NC, NO)




| Parameters | Remark |
|---|---|
| Switch Mode OUT1 (SM) | 9 = OUT1 to generate the clock signal |
| Switch Mode OUT2 (SM) | 0 = OUT2 to signal the overspeed |
| Switch Mode OUT3 (SM) | 0 = OUT3 to detect the overspeed |
| Read Back OUT (SM) | **0/6 = Inversion yes or no, depending on the type of auxiliary contact** |
| Output Mode (SM) | 0 = Inverse configuration |
| IN2 Function (CM) | 18/19 = Function output OUT2 or OUT3 (overspeed) |
| IN2 Config (CM) | 12 = Clock output OUT1 (connection to [X10:4]) |
| Input Mode (CM) | 2 = 4 single inputs for free use |
| Read Back Delay (CM) | 0.050 = 50 ms delay time to compensate for contact bouncing |

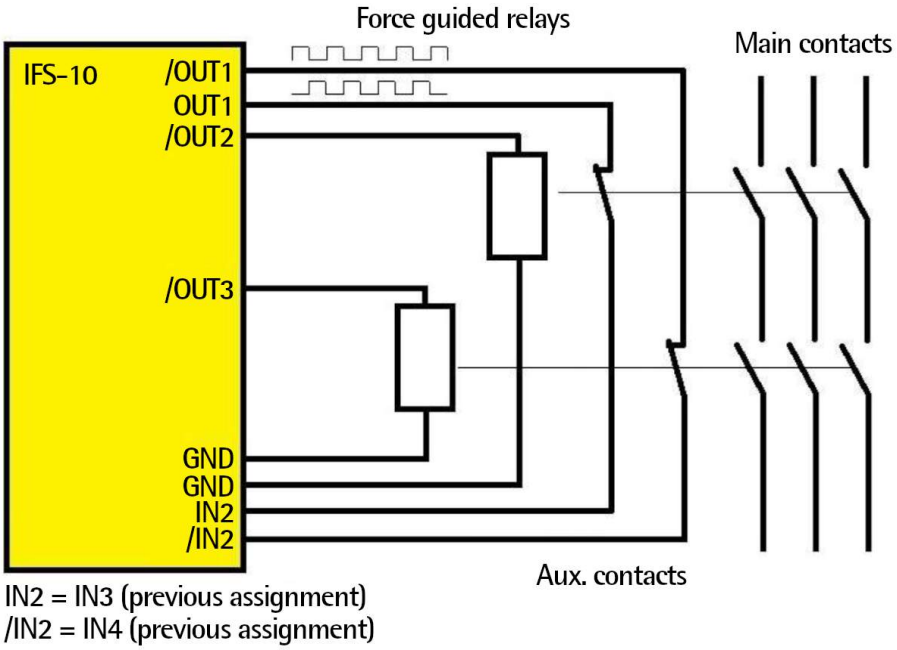
**NOTE**

About operation

This application uses two independent outputs /OUT2 and /OUT3 having the same configuration of the switching characteristics. The basic function is quite the same as in the application with one relay. The auxiliary contacts of both relays are connected in series to provide the clock signal to an input. The 104 IN2 Function parameter can be set to either 18 or 19 since the switching behaviour of both outputs must be the same. The GND lines of the two relays must be independent from each other (Safety Integrity Level = 2).

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

## 12.5 EDM: 2 relays, 2 outputs, 2 inputs (NC)




| Parameters | Remark |
|---|---|
| Switch Mode OUT1 (SM) | 9 = OUT1 to generate the clock signal |
| Switch Mode OUT2 (SM) | 0 = OUT2 to signal the overspeed |
| Switch Mode OUT3 (SM) | 0 = OUT3 to detect the overspeed |
| Read Back OUT (SM) | **0 = No inversion (connection via NC contact)** |
| Output Mode (SM) | 0 = Inverse configuration |
| IN2 Function (CM) | 18 = Function output OUT2 (overspeed) |
| IN2 Config (CM) | 12 = Clock output OUT1 (connection to [X10:4]) |
| /IN2 Function (CM) | 19 = Function output OUT3 (overspeed) |
| /IN2 Config (CM) | 13 = Clock output /OUT1 (connection to [X10:5]) |
| Input Mode (CM) | 2 = 4 single inputs for free use |
| Read Back Delay (CM) | 0.050 = 50 ms delay time to compensate for contact bouncing |

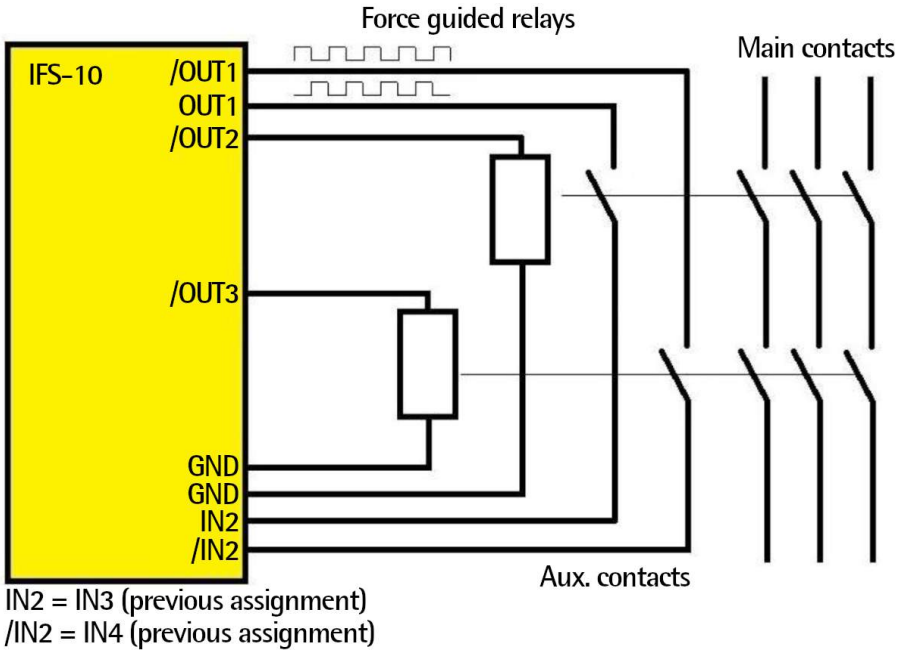
**NOTE**

About operation

This application uses two independent outputs /OUT2 and /OUT3 having the same configuration of the switching characteristics. The basic function is quite the same as in the application with one relay. The auxiliary contacts of both relays are connected individually to provide each the clock signal to a separate input. The GND lines of the two relays must be independent from each other (Safety Integrity Level = 3).

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

## 12.6 EDM: 2 relays, 2 outputs, 2 inputs (NO)




| Parameters | Remark |
|---|---|
| Switch Mode OUT1 (SM) | 9 = OUT1 to generate the clock signal |
| Switch Mode OUT2 (SM) | 0 = OUT2 to signal the overspeed |
| Switch Mode OUT3 (SM) | 0 = OUT3 to detect the overspeed |
| Read Back OUT (SM) | **6 = Inversion (connection via NO contact)** |
| Output Mode (SM) | 0 = Inverse configuration |
| IN2 Function (CM) | 18 = Function output OUT2 (overspeed) |
| IN2 Config (CM) | 12 = Clock output OUT1 (connection to [X10:4]) |
| /IN2 Function (CM) | 19 = Function output OUT3 (overspeed) |
| /IN2 Config (CM) | 13 = Clock output /OUT1 (connection to [X10:5]) |
| Input Mode (CM) | 2 = 4 single inputs for free use |
| Read Back Delay (CM) | 0.050 = 50 ms delay time to compensate for contact bouncing |

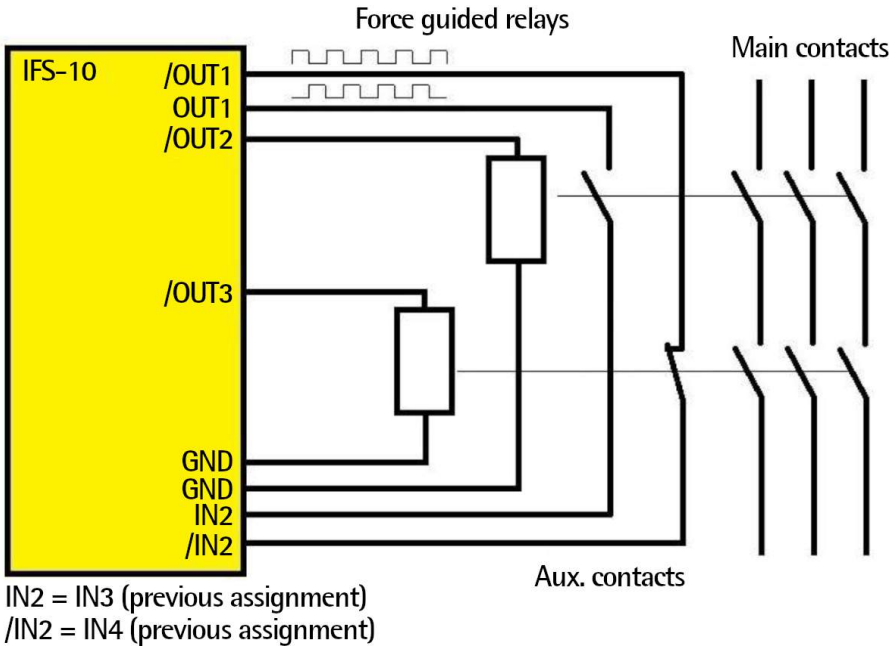
**NOTE**

About operation

This application uses two independent outputs /OUT2 and /OUT3 having the same configuration of the switching characteristics. The basic function is quite the same as in the application with one relay. The auxiliary contacts of both relays are connected individually to a separate input each. The GND lines of the two relays must be independent from each other (Safety Integrity Level = 3).

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

## 12.7 EDM: 2 relays, 2 outputs, 2 inputs (NO, NC)




| Parameters | Remark |
|---|---|
| Switch Mode OUT1 (SM) | 9 = OUT1 to generate the clock signal |
| Switch Mode OUT2 (SM) | 0 = OUT2 to signal the overspeed |
| Switch Mode OUT3 (SM) | 0 = OUT3 to detect the overspeed |
| Read Back OUT (SM) | **2 = Inversion (connection via NO, NC contact)** |
| Output Mode (SM) | 0 = Inverse configuration |
| IN2 Function (CM) | 18 = Function output OUT2 (overspeed) |
| IN2 Config (CM) | 12 = Clock output OUT1 (connection to [X10:4]) |
| /IN2 Function (CM) | 19 = Function output OUT3 (overspeed) |
| /IN2 Config (CM) | 13 = Clock output /OUT1 (connection to [X10:5]) |
| Input Mode (CM) | 2 = 4 single inputs for free use |
| Read Back Delay (CM) | 0.050 = 50 ms delay time to compensate for contact bouncing |

**NOTE**

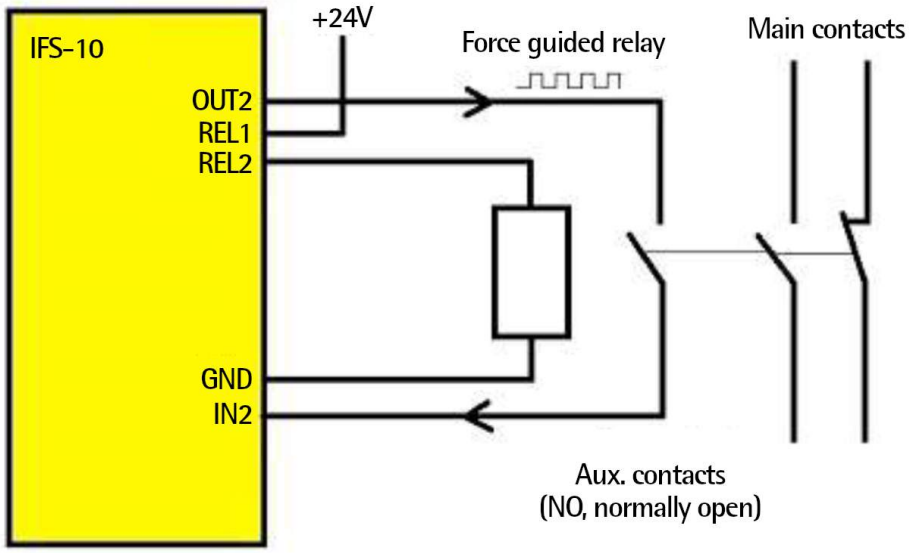
About operation

This application uses two independent outputs /OUT2 and /OUT3 having the same configuration of the switching characteristics. The basic function is quite the same as in the application with one relay. The auxiliary contacts of both relays are connected individually to a separate input each. The GND lines of the two relays must be independent from each other (Safety Integrity Level = 3).

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

## 12.8 EDM: Configuration of relay OUT X1

### 12.8.1 SIL1 configuration




IN2 = IN3 (previous assignment)

| Parameters | Remark |
|---|---|
| Switch Mode REL1 (SM) | 0 = REL1 to detect the overspeed |
| Switch Mode OUT2 (SM) | 9 = OUT2 to generate the clock signal |
| Read Back OUT (SM) | **16 = Inversion (connection to REL2 via NO contact)** |
| Output Mode (SM) | 0 = Inverse configuration |
| IN2 Function (CM) | 22 = Function relay REL1 (overspeed) |
| IN2 Config (CM) | 14 = Clock output OUT1 (connection to [X10:4]) |
| Input Mode (CM) | 2 = 4 single inputs for free use |
| Read Back Delay (CM) | 0.100 = 100 ms delay time to compensate for double contact bouncing |

**NOTE**

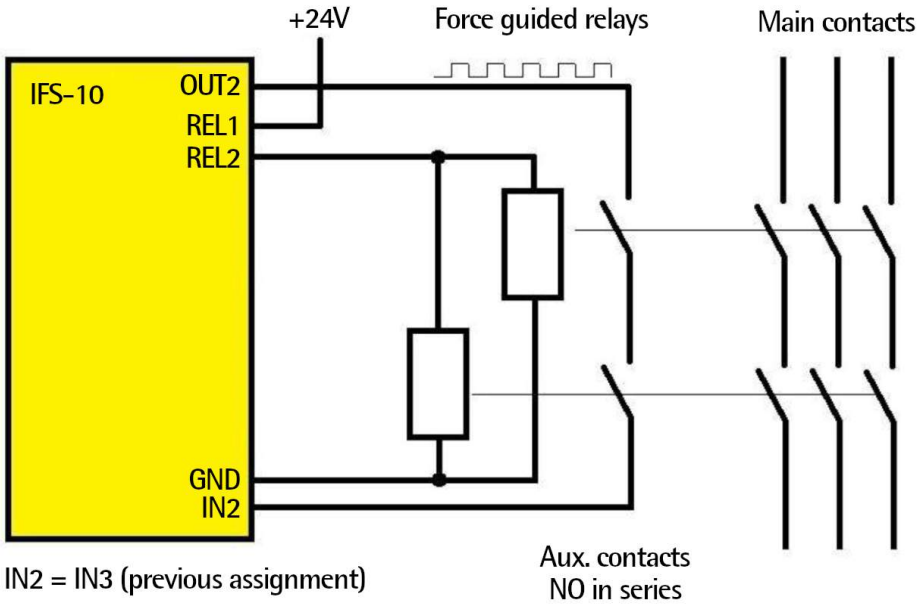
About operation

With normal operation speed, the relay output X1 is closed, so the external relay is energized. With overspeed condition, the relay output X1 is open and the remote relay will drop. The force guided relay auxiliary contact is closed when the relay output X1 is energized and the clock signal is transmitted to the input.

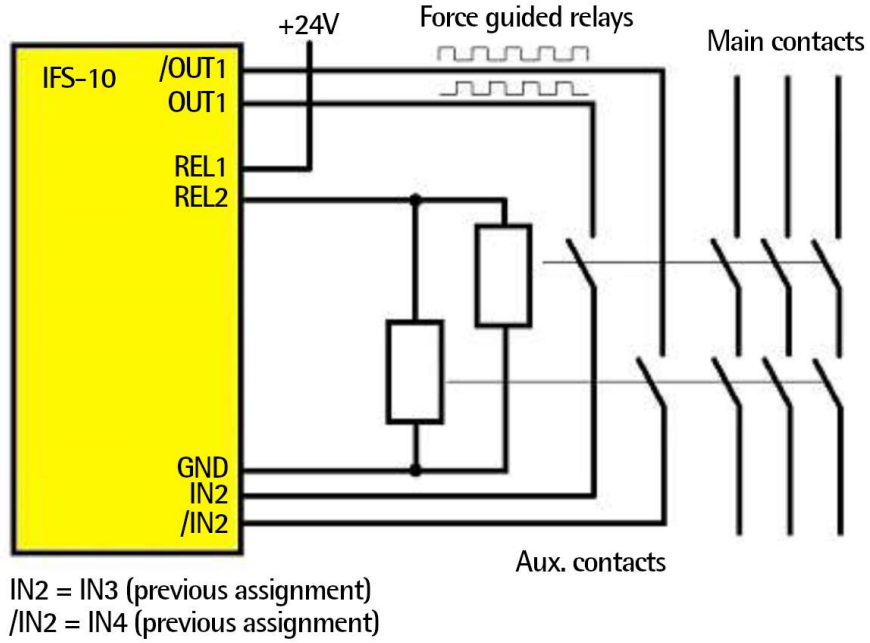
Under error condition, the IFS-10 safety monitor will open the relay output X1, while the remote relay will be de-energized and this condition will signal the overspeed. In case of errors occurring under normal operating speed, the unit will assume an error state that signals the overspeed again (Safety Integrity Level = 1).

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

### 12.8.2 SIL2 configuration

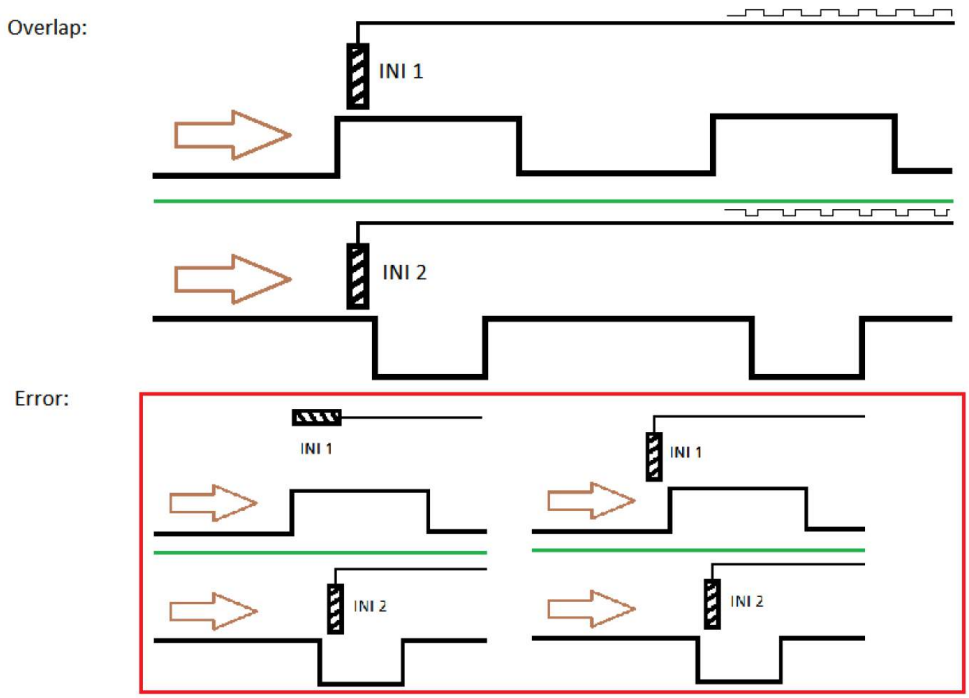



### 12.8.3 SIL3 configuration



# 13 - Overlap

Using the **016 Sensor Overlap** parameter, the Overlap monitoring can be activated. The Overlap function can be performed only if the **000 Operational mode** = 5 is activated, i.e. when both sensors work with HTL signals.
If the sensors are proximity switches, the recesses of both sensors must be installed in such a way that only three of the four possible output states occur during the run-off.
The picture below shows that there is never a condition where both proximity switches are uncovered. If a sensor fails, an error can be triggered in the uncovered phase of the other sensor, because both sensors display the uncovered state. Removing both sensors or a cable break can also cause an error.
The type of recess can cause an error while the proximity switches are simultaneously covered or simultaneously uncovered. By choosing the type of proximity switch (PNP opener or PNP closer), the polarity can be adjusted to the input of the IFS-10 (IFS-10 input open corresponds to LOW).



# 14 - Menus and parameters

## 14.1 Menu / Parameters overview

The parametrization of the device is carried out via USB interface with a PC and the OS operating software. The software can be freely downloaded from Lika's web site. This section provides an overview of the menus and their assignments to the different unit functions. The name of the menus are printed in bold characters and the related parameters are listed right under the name.

| No. | Menu / Parameter |
|---|---|
| **14.2.2 Main menu, page 168** | |
| 000 | Operational mode |
| 001 | Sampling Time |
| 002 | Wait Time |
| 003 | F1-F2 Selection |
| 004 | Div. Switch %-f |
| 005 | Div. %-Value |
| 006 | Div. f-Value |
| 007 | Div. Calculation |
| 008 | Div. Filter |
| 009 | Error Simulation |
| 010 | Power-up Delay |
| 011 | SIN error |
| 012 | Div. Mode |
| 013 | Div. Inc-Value |
| 014 | Filter |
| 015 | A-Edge 2/1 |
| 016 | Sensor Overlap |
| **14.2.3 Sensor 1 menu, page 175** | |
| 017 | Direction 1 |
| 018 | Multiplier 1 |
| 019 | Divisor 1 |
| 020 | Position Drift 1 |
| 021 | Phase Err Count 1 |
| 022 | Set Frequency 1 |
| 023 | SIN Err Time 1 |

| No. | Menu / Parameter |
|---|---|
| **14.2.4 Sensor 2 menu, page 178** | |
| 024 | Direction 2 |
| 025 | Multiplier 2 |
| 026 | Divisor 2 |
| 027 | Position Drift 2 |
| 028 | Phase Err Count 2 |
| 029 | Set Frequency 2 |
| 030 | SIN Err Time 2 |
| **14.2.5 Preselect menu, page 181** | |
| 031 | Preselect OUT1.H |
| 032 | Preselect OUT1.L |
| 033 | Preselect OUT1.D |
| 034 | Preselect OUT2.H |
| 035 | Preselect OUT2.L |
| 036 | Preselect OUT2.D |
| 037 | Preselect OUT3.H |
| 038 | Preselect OUT3.L |
| 039 | Preselect OUT3.D |
| 040 | Preselect OUT4.H |
| 041 | Preselect OUT4.L |
| 042 | Preselect OUT4.D |
| 043 | Preselect REL1.H |
| 044 | Preselect REL1.L |
| 045 | Preselect REL1.D |
| 046 | Preselect OUT1.F |
| 047 | Preselect OUT2.F |
| 048 | Preselect OUT3.F |
| 049 | Preselect OUT4.F |
| 050 | Preselect REL1.F |
| 051 | Reserved |

| No. | Menu / Parameter |
|---|---|
| 14.2.6 Switching menu, page 186 | |
| 052 | Switch Mode OUT1 |
| 053 | Switch Mode OUT2 |
| 054 | Switch Mode OUT3 |
| 055 | Switch Mode OUT4 |
| 056 | Switch Mode REL1 |
| 057 | Pulse Time OUT1 |
| 058 | Pulse Time OUT2 |
| 059 | Pulse Time OUT3 |
| 060 | Pulse Time OUT4 |
| 061 | Pulse Time REL1 |
| 062 | Hysteresis OUT1 |
| 063 | Hysteresis OUT2 |
| 064 | Hysteresis OUT3 |
| 065 | Hysteresis OUT4 |
| 066 | Hysteresis REL1 |
| 067 | Matrix OUT1 |
| 068 | Matrix OUT2 |
| 069 | Matrix OUT3 |
| 070 | Matrix OUT4 |
| 071 | Matrix REL1 |
| 072 | MIA-Delay OUT1 |
| 073 | MIA-Delay OUT2 |
| 074 | MIA-Delay OUT3 |
| 075 | MIA-Delay OUT4 |
| 076 | MIA-Delay REL1 |
| 077 | MAI-Delay OUT1 |
| 078 | MAI-Delay OUT2 |
| 079 | MAI-Delay OUT3 |
| 080 | MAI-Delay OUT4 |
| 081 | MAI-Delay REL1 |
| 082 | Delay OUT1 |
| 083 | Delay OUT2 |
| 084 | Delay OUT3 |
| 085 | Delay OUT4 |
| 086 | Delay REL1 |
| 087 | Start-up Mode |
| 088 | Start-up Output |
| 089 | Standstill Time |

| No. | Menu / Parameter |
|---|---|
| 090 | Lock Output |
| 091 | Action Output |
| 092 | Action Polarity |
| 093 | Read Back OUT |
| 094 | Output Mode |
| 095 | Reserved |
| 096 | Reserved |
| 097 | Reserved |
| 098 | Reserved |
| 099 | Reserved |
| 14.2.7 Control menu, page 204 | |
| 100 | IN1 Function |
| 101 | IN1 Config |
| 102 | /IN1 Function |
| 103 | /IN1 Config |
| 104 | IN2 Function |
| 105 | IN2 Config |
| 106 | /IN2 Function |
| 107 | /IN2 Config |
| 108 | Input Mode |
| 109 | Read Back Delay |
| 110 | GPI Err Time |
| 14.2.8 Serial menu, page 210 | |
| 111 | Serial Unit Nr. |
| 112 | Serial Baud Rate |
| 113 | Serial Format |
| 114 | Serial Page |
| 115 | Serial Init |
| 116 | Reserved |
| 14.2.9 Splitter menu, page 212 | |
| 117 | RS Selector |
| 14.2.10 Analogue menu, page 213 | |
| 118 | Analog Start |
| 119 | Analog End |
| 120 | Analog Gain |
| 121 | Analog Offset |
| 122 | Reserved |

| No. | Menu / Parameter |
|---|---|
| | 14.2.11 OPU menu, page 215 |
| 123 | X Factor 1 |
| 124 | / Factor 1 |
| 125 | +/- Value 1 |
| 126 | Units 1 |
| 127 | Decimal Point 1 |
| 128 | X Factor 2 |
| 129 | / Factor 2 |
| 130 | +/- Value 2 |
| 131 | Units 2 |
| 132 | Decimal Point 2 |
| 133 | Reserved |

## 14.2 Parameters description

### 14.2.1 Important notes for IFS-10S and IFS-10SA

When you install the IFS-10S or IFS-10SA model unit you must strictly comply with the following hints:

| Nr. | Parameter | Information |
|---|---|---|
| 000 | Operational mode | Only 000 Operational mode = "0" can be set |
| 003 | F1-F2 Selection | Both settings have the same effect |
| 017 | Direction 1 | 017 Direction 1 and 024 Direction 2 must be set to the same value |
| 018 | Multiplier 1 | It must be set to "1" |
| 019 | Divisor 1 | It must be set to "1" |
| 020 | Position Drift 1 | 020 Position Drift 1 and 027 Position Drift 2 must be set to the same value |
| 021 | Phase Err Count 1 | 021 Phase Err Count 1 and 028 Phase Err Count 2 must be set to the same value |
| 024 | Direction 2 | 017 Direction 1 and 024 Direction 2 must be set to the same value |
| 025 | Multiplier 2 | It must be set to "1" |
| 026 | Divisor 2 | It must be set to "1" |
| 027 | Position Drift 2 | 020 Position Drift 1 and 027 Position Drift 2 must be set to the same value |
| 028 | Phase Err Count 2 | 021 Phase Err Count 1 and 028 Phase Err Count 2 must be set to the same value |
| 100<br>...<br>107 | IN1 Function<br><br>/IN2 Config | To clear drift errors, the **Clear Drift 1** and **Clear Drift 2** settings must be used |
| 117 | RS Selector | Both settings have the same effect |

### 14.2.2 Main menu

#### 000 Operational mode

It defines the source and type of the input signals that are assigned to Sensor 1 and Sensor 2 and need to be monitored; depending on the setting, up to four control inputs are available for external commands.
Notes and examples for wiring the encoders, control inputs etc. can be found in the "5.1 Application: 2 Sine Cosine encoders" section on page 61 and following pages.
Please note that the available settings in this parameter are different for IFS-10/IFS-10A models and IFS-10S/IFS-10SA models.

**Operational mode with IFS-10 and IFS-10A models**

It defines the source and type of the input signals to be monitored. In order to ensure the safety function, two independent encoders or sensors are required.

| Mode | Sensor 1 | Sensor 2 | [X10: 2 & 3] | [X10: 4 & 5] |
|---|---|---|---|---|
| 0 | Sine Cosine encoder [X6 \| SINCOS IN 1] | Sine Cosine encoder [X7 \| SINCOS IN 2] | Available for control signals | Available for control signals |
| 1 | Sine Cosine encoder [X6 \| SINCOS IN 1] | HTL encoder (A,B,90°) [X10 \| CONTROL IN] | Available for control signals | **Not** available for control signals |
| 2 | Sine Cosine encoder [X6 \| SINCOS IN 1] | HTL encoder (A) [X10 \| CONTROL IN] | Available for control signals | **Not** available for control signals |
| 3 | HTL encoder (A,B,90°) [X10 \| CONTROL IN] | HTL encoder (A,B,90°) [X10 \| CONTROL IN] | **Not** available for control signals | **Not** available for control signals |
| 4 | HTL encoder (A,B,90°) [X10 \| CONTROL IN] | HTL encoder (A) [X10 \| CONTROL IN] | **Not** available for control signals | **Not** available for control signals |
| 5 | HTL encoder (A) [X10 \| CONTROL IN] | HTL encoder (A) [X10 \| CONTROL IN] | **Not** available for control signals | **Not** available for control signals |
| 6 | Sine Cosine encoder [X6 \| SINCOS IN 1] | RS-422 encoder [X9 \| RS422 IN 2] | Available for control signals | Available for control signals |
| 7 | RS-422 encoder [X8 \| RS422 IN 1] | RS-422 encoder [X9 \| RS422 IN 2] | Available for control signals | Available for control signals |
| 8 | RS-422 encoder [X8 \| RS422 IN 1] | HTL encoder (A,B,90°) [X10 \| CONTROL IN] | Available for control signals | **Not** available for control signals |
| 9 | RS-422 encoder [X8 \| RS422 IN 1] | HTL encoder (A) [X10 \| CONTROL IN] | Available for control signals | **Not** available for control signals |

Default = 0 (min. = 0, max. = 9)

**Operational mode with IFS-10S and IFS-10SA models**

It defines the source and type of the input signals to be monitored. In order to ensure the safety function, a SIL3/PLe certificated Sine Cosine encoder or sensor is required.

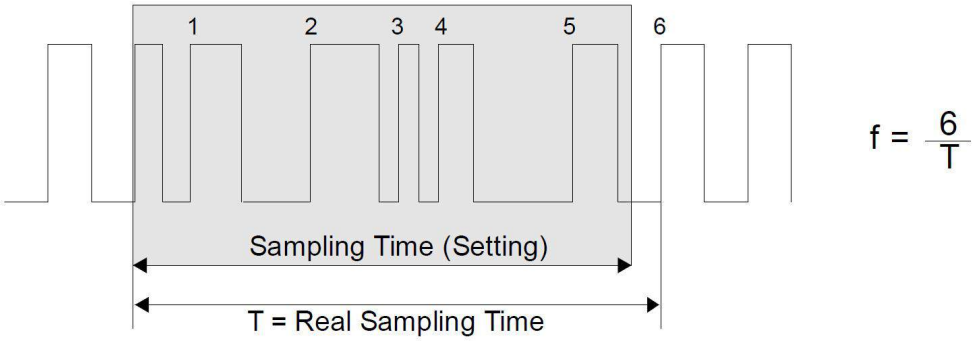
| Mode | Sensor 1 | Sensor 2 | [X10: 2 & 3] | [X10: 4 & 5] |
|---|---|---|---|---|
| **0** | SIL3/PLe Sine Cosine encoder [X6 \| SINCOS IN 1] | Sensor 1 and Sensor 2 are internally bridged | Available for control signals | Available for control signals |

Default = 0 (min. = 0, max. = 0)

## 001 Sampling Time

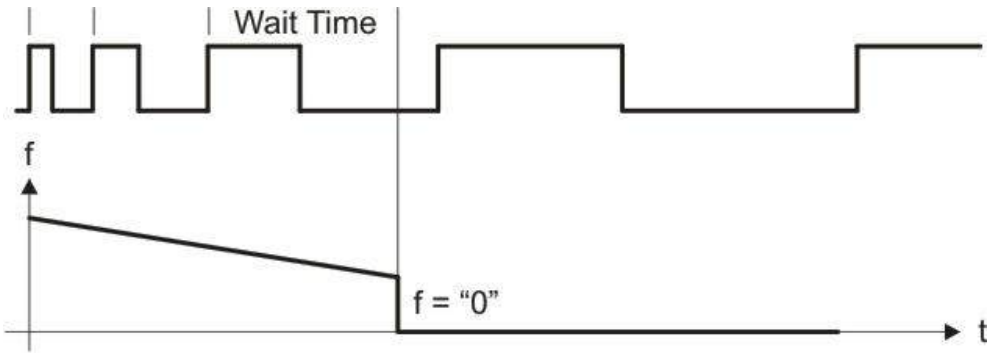
The configured value corresponds to the minimum measurement time. This parameter is used as a filter in case of irregular frequencies. It directly affects the response time of the unit. The setting is valid for both input channels. The value is expressed in seconds.

Default = 0.001 (min. = 0.001, max. = 9.999)




## 002 Wait Time

Zeroing. It sets the period of time of the lowest frequency or the waiting time between two rising edges which is detected as "Frequency = 0 Hz" by the unit.



All frequencies having a period longer than the **002 Wait Time** value will be acknowledged and further processed as "Frequency = 0 Hz". The setting is valid for both input channels. The value is expressed in seconds.

**0.010** Frequency = "0 Hz" with frequencies below 100 Hz
**...**
**9.999** Frequency = "0 Hz" with frequencies below 0.1 Hz

Default = 0.100 (min. = 0.010, max. = 9.999)

### 003 F1-F2 Selection

Basic frequency selection. This parameter allows to set which of the two input frequencies of Sensor 1 or Sensor 2 (see the **000 Operational mode** parameter) is monitored and processed as basic frequency.
The selection of the basic frequency affects the following outputs:

- analogue output;
- control outputs;
- relay outputs.

**0:** the frequency of Sensor 1 will be used as basic frequency
**1:** the frequency of Sensor 2 will be used as basic frequency

Default = 0 (min. = 0, max. = 1)

### 004 Div. Switch %-f

Divergence switching point %-Hz. The unit continuously compares the frequencies of the Sensor 1 and the Sensor 2 to the set maximum allowed divergence. Usually the comparison uses percentages. However in specific applications with low frequencies a comparison of percentages may be difficult, so a direct monitoring of the difference frequency in Hz can provide better results.
This parameter allows to define the point where the system switches from percentage to Hz and vice versa. When the set limit is reached, the comparison will not use percentages any more, but the absolute values expressed in Hz instead (see the **005 Div. %-Value** and **006 Div. f-Value** parameters). The value is expressed in Hz.
Default = 100.00 (min. = 0, max. = 999.99)

### 005 Div. %-Value

Maximum percentage % divergence. It sets the maximum allowed divergence expressed in percentage between the frequencies of the Sensor 1 and the Sensor 2. If the set value is exceeded, the unit switches to an error status (see the **004 Div. Switch %-f** parameter). The calculation is specified in the next **007 Div. Calculation** parameter. The value is expressed in percentage (%).
Default = 10 (min. = 0, max. = 100)

### 006 Div. f-Value

Maximum frequency Hz divergence. It sets the maximum allowed absolute divergence expressed in Hz between the frequencies of the Sensor 1 and the Sensor 2. If the set value is exceeded, the unit switches to an error status (see the **004 Div. Switch %-f** parameter). The value is expressed in hertz (Hz).
Default = 30.00 (min. = 0, max. = 99.99)

### 007 Div. Calculation

Divergence calculation mode. It sets the calculation used to determine the percentage divergence.

**0**: the frequency of the Sensor 1 is the reference value:
$\Delta(\%)$ = (Sensor 1 – Sensor 2) / Sensor 1 * 100%

**1**: the frequency of the Sensor 2 is the reference value:
$\Delta(\%)$ = (Sensor 2 – Sensor 1) / Sensor 2 * 100%

Default = 0 (min. = 0, max. = 1)

### 008 Div. Filter

This digital filter parameter evaluates the divergence between the Sensor 1 and the Sensor 2.

**0**: **The filter is not active.** The unit reacts to each frequency deviation immediately.

**5**: **Medium filter effect.** The unit tolerates temporary deviations and fluctuations, caused for instance by torsions or mechanical vibrations and reacts after a delay to deviations between the Sensor 1 and the Sensor 2 input frequencies.

**10**: **High filter effect.** The unit tolerates temporary deviations and fluctuations, caused for instance by torsions or mechanical vibrations and reacts after a very long delay to prolonged deviations between the Sensor 1 and the Sensor 2 input frequencies.

Default = 1 (min. = 0, max. = 20)

### 009 Error Simulation

This parameter is active only in the "Programming Mode" (see the "4.15 DIL switch ([S1] DIL switch)" section on page 55) and is used for test purposes during the commissioning procedure. It allows to simulate and so to prevent the following error conditions:

**0**: **Error state**: it causes the unit to fall into an alarm status. By using this parameter it is possible to check if the whole system reacts correctly when an alarm condition occurs.

**1**: **Normal state**. Before exiting the "Programming Mode", the parameter must be always set to "1".

**2**: **Error clearing**. All errors detected by the unit will be reset.

Directly changing the setting from 0 to 2 and vice versa should be avoided.
After the test, the parameter must be set to the default value = "1".

Default = 1 (min. = 0, max. = 2)

### 010 Power-up Delay

The delay time setting is recommended to allow all the connected encoders to switch on safely and have enough time to stabilize after the power supply of all connected encoders is turned on. As soon as the set delay has expired, the unit will begin to evaluate the encoder signals. This parameter can be used also to compensate for different switching-on times at power on. The value is expressed in seconds.
Default = 0.100 (min. = 0.001, max. = 9.999)

### 011 SIN error

Activation or deactivation of the Sine Cosine errors. This parameter allows to activate or deactivate the Sine Cosine errors. **023 SIN Err Time 1** (see on page 177) and **030 SIN Err Time 2** (see on page 180) parameters sets a permitted time limit for each sensor. If the **011 SIN error** parameter is set to "1", all Sine Cosine errors are suppressed. For more information on the errors available refer also to the "7 - Error detection" section on page 97.

**0**: Sine Cosine errors are evaluated

**1**: All Sine Cosine errors are suppressed

Default = 0 (min. = 0, max. = 1)

### 012 Div. Mode

Type of comparison. This parameter sets the type of comparison for the evaluation of the sensors. 0 = Frequency Comparison compares the frequencies of the two sensors. Parameters from **004 Div. Switch %-f** to **008 Div. Filter** are relevant to the comparison. 1 = Sensor Position Comparison compares the positions of the two sensors. The **013 Div. Inc-Value** parameter is relevant to the comparison.

**0**: **Frequency Comparison**. Differences in the frequencies of the two sensors result in a runtime error (see on page 99).

**1**: **Sensor Position Comparison**. Differences in the positions of the two sensors result in a runtime error (see on page 99).

**2**: **Frequency and Sensor Position Comparison**. Differences in both the frequencies and the positions of the two sensors result in a runtime error (see on page 99).

In case of strongly fluctuating frequencies caused by step motors or elastic connections between the encoders, 1 = Sensor Position Comparison option could offer more stable results.
The relationship between the encoders which are not adjusted by setting the **018 Multiplier 1** / **019 Divisor 1** and **025 Multiplier 2** / **026 Divisor 2** parameters could cause cumulative errors. In this case the 0 = Frequency Comparison option offers more stable results.

Default = 0 (min. = 0, max. = 2)

### 013 Div. Inc-Value

Absolute deviation in increments. This parameter sets the maximum acceptable deviation in increments when the **012 Div. Mode** parameter is set to 1 = Sensor Position Comparison.
If the value "1000" is set here, a position deviation higher than 1000 increments or lower than -1000 increments will result in a runtime error (see on page 99).
This parameter is only relevant to the **012 Div. Mode** parameter set to 1 = Sensor Position Comparison.

**WARNING**
If the parameter is set to "0", no error is acknowledged.

Default = 0 (min. = 0, max. = 9999999)

### 014 Filter

Filter for the input frequencies. If the value is set to "0", no smoothing and filtering of the input frequencies will be performed.
The higher is the set value, the stronger will result the smoothing of the input frequencies, the lower the dynamic when the frequency changes.
A combination of **001 Sampling Time** and **014 Filter** is the best solution to obtain smoothed input frequencies. The **001 Sampling Time** value affects more the high frequency range (period time shorter than the sampling time). The filtering affects the frequency value resulting after the sampling time or the frequencies with period time longer than the sampling time.

**Frequencies > 1 / 001 Sampling Time**
If **001 Sampling Time** = 1 ms and **014 Filter** = 10, a value of approx. 63% is reached after 10 ms, a value of approx. 95% is reached after 30 ms and the 100% value is reached after 50 ms.
If the sampling time is multiplied tenfold also the filtering is multiplied tenfold.
The same if the **014 Filter** parameter and the filtering time are multiplied tenfold.
The minimum filter time is approx. 100 µs, up to two sampling periods.

T (63%) = 001 Sampling Time x 014 Filter
T (95%) = 3 x 001 Sampling Time x 014 Filter
T (100%) = 5 x 001 Sampling Time x 014 Filter

**Frequencies < 1 /** 001 Sampling Time
In this case, you have to look at the period time = 1/f.
If 014 Filter = 10, a value of approx. 63% is reached after 10 periods, a value of approx. 95% is reached after 30 periods.
T (63%) = 1/f x 014 Filter
T (95%) = 3 x 1/f x 014 Filter
T (100%) = 5 x 1/f x 014 Filter

Default = 0 (min. = 0, max. = 999)

### 015 A-Edge 2/1

Edge evaluation with A single channel.
This parameter is active only if the 000 Operational mode parameter is set to "2", "4", "5", or "9". The parameter refers to the A single signal processing. By setting this parameter, every edge (015 A-Edge 2/1 = 0) or every second edge (015 A-Edge 2/1 = 1) can be evaluated. For signals with different pulse / pause times, the parameter must be set to "1" in order to detect a clear frequency.
A faster reaction time is achieved by setting 015 A-Edge 2/1 = 0.
Default = 0 (min. = 0, max. = 1)

### 016 Sensor Overlap

The overlap of the two sensors can be set in this parameter when the 000 Operational mode parameter is set to "5". For complete information on the Overlap monitoring please refer to the "13 - Overlap" section on page 163.

**0**: **Off**. The overlap monitoring is disabled. No error evaluation is performed.

**1**: **Error at LOW**. The overlap monitoring of both A signals of the encoder is active. An error is triggered when both sensors are set to LOW.

**2**: **Error at HIGH**. The overlap monitoring of both A signals of the encoder is active. An error is triggered when both sensors are set to HIGH.

Default = 0 (min. = 0, max. = 2)

### 14.2.3 Sensor 1 menu

#### 017 Direction 1

For any information on the standard counting direction of the connected encoder please refer to the specific "User's guide".

For IFS-10S and IFS-10SA models please read the information in the "14.2.1 Important notes for IFS-10S and IFS-10SA" section on page 167: **017 Direction 1** must be the same as **024 Direction 2**.

The standard counting direction is to be intended with encoder moving as indicated in the "User's guide". This parameter allows to reverse the counting direction of the Sensor 1 in order to adjust it according to the counting direction of the Sensor 2. In other words it allows the count up when the sensor moves in reverse of the standard direction.

**0**: no changes
**1**: the sign of the direction is reversed

Default = 0 (min. = 0, max. = 1)

#### 018 Multiplier 1

For IFS-10S and IFS-10SA models please read the information in the "14.2.1 Important notes for IFS-10S and IFS-10SA" section on page 167: **018 Multiplier 1** must be "=1"; **025 Multiplier 2** must be "=1".

Proportional pulse scaling factor of the Sensor 1. It allows to adjust the frequencies of the Sensor 1 and the Sensor 2. The scaling only affects the calculation of the divergence. For further information refer also to the "6.4.3 Frequency Ratio settings" section on page 86. See the **004 Div. Switch %-f** parameter and the followings.
Default = 1 (min. = 1, max. = 10,000)

**WARNING**
When using two encoders with different pulse rates or in case of a mechanical reduction between both encoders, the higher frequency must be converted down to the lower frequency by using the scaling factors (see the "6.4.3 Frequency Ratio settings" section on page 86).

#### 019 Divisor 1

For IFS-10S and IFS-10SA models please read the information in the "14.2.1 Important notes for IFS-10S and IFS-10SA" section on page 167: **019 Divisor 1** must be "=1"; **026 Divisor 2** must be "=1".

Reciprocal pulse scaling factor of the Sensor 1. It allows to adjust the frequencies of the Sensor 1 and the Sensor 2. The scaling only affects the

calculation of the divergence. For further information refer also to the "6.4.3 Frequency Ratio settings" section on page 86. See the **004 Div. Switch %-f** parameter and the followings.
Default = 1 (min. = 1, max. = 10,000)

**WARNING**
When using two encoders with different pulse rates or in case of a mechanical reduction between both encoders, the higher frequency must be converted down to the lower frequency by using the scaling factors (see the "6.4.3 Frequency Ratio settings" section on page 86).

## 020 Position Drift 1

For IFS-10S and IFS-10SA models please read the information in the "14.2.1 Important notes for IFS-10S and IFS-10SA" section on page 167: **020 Position Drift 1** must be the same as **027 Position Drift 2**.

Drift monitoring of the sensor 1 at standstill. This parameter allows to monitor the drift movements of the Sensor 1 at standstill. If the period time of the input frequency exceeds the value set next to the **002 Wait Time** parameter, the frequency of the sensor is acknowledged as "Frequency = 0 Hz", even if a slow drift movement is present.
In case of an illegal drift, this parameter allows to preset an error threshold (symmetrical position window +/- xxx pulses). An error status is triggered if the set value is exceeded.
The monitoring operation is only performed at standstill and begins at position 0, as soon as "Frequency = 0 Hz" is detected. The value is expressed in pulses.

**0**: Drift monitoring not active
**xxx**: An error message is invoked to appear when a position drift outside the "+/- xxx pulses" window is detected (single edge evaluation).

Default = 0 (min. = 0, max. = 100,000)

## 021 Phase Err Count 1

For IFS-10S and IFS-10SA models please read the information in the "14.2.1 Important notes for IFS-10S and IFS-10SA" section on page 167: **021 Phase Err Count 1** must be the same as **028 Phase Err Count 2**.

Faulty pulse counting limit. The unit is able to detect incorrect pulse sequences as well as faulty phase positions. Incorrect pulses may result from faulty wirings, EMC problems, wrong operation mode settings, but also when you switch on the encoder power supply or change the counting direction parameter (see **017 Direction 1**). The alarm condition is triggered off when the number of faulty pulses set here is exceeded. Normally the parameter should remain set to the default value = "10". Any different setting can be useful in special cases only. The value is expressed in pulses.

Default = 10 (min. = 1, max. = 1,000)

### 022 Set Frequency 1

Simulation of a fixed encoder frequency for Sensor 1. This parameter is active only in the "Programming Mode" and if the input is assigned to this function. It is used for test purposes during the commissioning procedure. It allows to replace the real encoder frequency with a fixed frequency for test purposes (refer also to the "14.2.7 Control menu" section on page 204).
The setting will be effective if the DIL switch is set to "Programming mode", see on page 55.
The value is expressed in hertz (Hz).
Default = 0.00 (min. = -500,000.00, max. = 500,000.00)

### 023 SIN Err Time 1

Time until Sine Cosine error appears. This parameter sets the time after which the Sine Cosine error appears. Every step represents an interval of 20 ms: 1 = 20 ms; 2 = 40 ms; etc. If the parameter is set to "1", every Sine Cosine error longer than 20 ms will result in a runtime error (see on page 99). If the parameter is set to "0", every Sine Cosine error will result in a runtime error (see on page 99). If the **011 SIN error** parameter is set to "1" (see on page 172), this parameter is disabled and no Sine Cosine error will appear.
Default = 0 (min. = 0, max. = 99)

### 14.2.4 Sensor 2 menu

#### 024 Direction 2

For any information on the standard counting direction of the connected encoder please refer to the specific "User's guide".

For IFS-10S and IFS-10SA models please read the information in the "14.2.1 Important notes for IFS-10S and IFS-10SA" section on page 167: **017 Direction 1** must be the same as **024 Direction 2**.

The standard counting direction is to be intended with encoder moving as indicated in the "User's guide". This parameter allows to reverse the counting direction of the Sensor 2 in order to adjust it according to the counting direction of the Sensor 1. In other words it allows the count up when the sensor moves in reverse of the standard direction.

**0**: no changes
**1**: the sign of the direction is reversed

Default = 0 (min. = 0, max. = 1)

#### 025 Multiplier 2

For IFS-10S and IFS-10SA models please read the information in the "14.2.1 Important notes for IFS-10S and IFS-10SA" section on page 167: **018 Multiplier 1** must be "=1"; **025 Multiplier 2** must be "=1".

Proportional pulse scaling factor of the Sensor 2. It allows to adjust the frequencies of the Sensor 1 and the Sensor 2. The scaling only affects the calculation of the divergence. For further information refer also to the "6.4.3 Frequency Ratio settings" section on page 86. See the **004 Div. Switch %-f** parameter and the followings.
Default = 1 (min. = 1, max. = 10,000)

**WARNING**
When using two encoders with different pulse rates or in case of a mechanical reduction between both encoders, the higher frequency must be converted down to the lower frequency by using the scaling factors (see the "6.4.3 Frequency Ratio settings" section on page 86).

#### 026 Divisor 2

For IFS-10S and IFS-10SA models please read the information in the "14.2.1 Important notes for IFS-10S and IFS-10SA" section on page 167: **019 Divisor 1** must be "=1"; **026 Divisor 2** must be "=1".

Reciprocal pulse scaling factor of the Sensor 2. It allows to adjust the frequencies of the Sensor 1 and the Sensor 2. The scaling only affects the

calculation of the divergence. For further information refer also to the "6.4.3 Frequency Ratio settings" section on page 86. See the **004 Div. Switch %-f** parameter and the followings.
Default = 1 (min. = 1, max. = 10,000)

**WARNING**
When using two encoders with different pulse rates or in case of a mechanical reduction between both encoders, the higher frequency must be converted down to the lower frequency by using the scaling factors (see the "6.4.3 Frequency Ratio settings" section on page 86).

## 027 Position Drift 2

For IFS-10S and IFS-10SA models please read the information in the "14.2.1 Important notes for IFS-10S and IFS-10SA" section on page 167: **020 Position Drift 1** must be the same as **027 Position Drift 2**.

Drift monitoring of the sensor 2 at standstill. This parameter allows to monitor the drift movements of the Sensor 2 at standstill. If the period time of the input frequency exceeds the value set next to the **002 Wait Time** parameter, the frequency of the sensor is acknowledged as "Frequency = 0 Hz", even if a slow drift movement is present.
In case of an illegal drift, this parameter allows to preset an error threshold (symmetrical position window +/- xxx pulses). An error status is triggered if the set value is exceeded.
The monitoring operation is only performed at standstill and begins at position 0, as soon as "Frequency = 0 Hz" is detected. The value is expressed in pulses.

**0**: Drift monitoring not active
**xxx**: An error message is invoked to appear when a position drift outside the "+/- xxx pulses" window is detected (single edge evaluation).

Default = 0 (min. = 0, max. = 100,000)

## 028 Phase Err Count 2

For IFS-10S and IFS-10SA models please read the information in the "14.2.1 Important notes for IFS-10S and IFS-10SA" section on page 167: **021 Phase Err Count 1** must be the same as **028 Phase Err Count 2**.

Faulty pulse counting limit. The unit is able to detect incorrect pulse sequences as well as faulty phase positions. Incorrect pulses may result from faulty wirings, EMC problems, wrong operation mode settings, but also when you switch on the encoder power supply or change the counting direction parameter (see **024 Direction 2**). The alarm condition is triggered off when the number of faulty pulses set here is exceeded. Normally the parameter should remain set to the default value = "10". Any different setting can be useful in special cases only. The value is expressed in pulses.

Default = 10 (min. = 1, max. = 1,000)

### 029 Set Frequency 2

Simulation of a fixed encoder frequency for Sensor 2. This parameter is active only in the "Programming Mode" and if the input is assigned to this function. It is used for test purposes during the commissioning procedure. It allows to replace the real encoder frequency with a fixed frequency for test purposes (refer also to the "14.2.7 Control menu" section on page 204).
The setting will be effective if the DIL switch is set to "Programming mode", see on page 55.
The value is expressed in hertz (Hz).
Default = 0.00 (min. = -500,000.00, max. = 500,000.00)

### 030 SIN Err Time 2

Time until Sine Cosine error appears. This parameter sets the time after which the Sine Cosine error appears. Every step represents an interval of 20 ms: 1 = 20 ms; 2 = 40 ms; etc. If the parameter is set to "1", every Sine Cosine error longer than 20 ms will result in a runtime error (see on page 99). If the parameter is set to "0", every Sine Cosine error will result in a runtime error (see on page 99). If the **011 SIN error** parameter is set to "1" (see on page 172), this parameter is disabled and no Sine Cosine error will appear.
Default = 0 (min. = 0, max. = 99)

### 14.2.5 Preselect menu

This menu allows to set the switching points of the following outputs:

- one [X1 | RELAY OUT] relay output (refer to the "4.14 RELAY OUT, relay output ([X1] terminal block)" section on page 53);
- four [X2 | CONTROL OUT] control outputs (refer to the "4.13 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 51).

All limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The pulse scaling does not affect the switching points.

Two separate switching points are available for each output, they allow for example to set the limit values for the "Set up mode" and the "Production mode". For this purpose the "**Preselection Change**" setting must be assigned to an unused control input (**xINx Function** parameters, see the "14.2.7 Control menu" section on page 204).

The switch-over between "High" and "Low" switching points can be performed only by an external command via control input available at [X10 | CONTROL IN] terminal block. The change will affect all outputs! A switch-over is possible only if the control input is available by setting the **000 Operational mode** parameter, see the "5.1 Application: 2 Sine Cosine encoders" section on page 61.

- ".H" index stands for "HIGH" and requires the higher limit value to be defined.
- ".L" index stands for "LOW" and requires the lower limit value to be defined.

**WARNING**

- The upper switching points (".H" index) are active only if no error can be detected and if the "**Preselection Change**" function is assigned to the control input according to the "14.2.7 Control menu" section on page 204.
- The operator has to enter the values of the switching points correctly. The "HIGH" value must be higher than the "LOW" value.
- The drift depends on the setting of the **003 F1-F2 Selection** parameter and thus refers to the selected encoder channel. Depending on the setting a drift error can set the output, but it does not cause an error state.

#### 031 Preselect OUT1.H

Upper switching point of the OUT1 output [X2:1 - 2] terminal block (refer to the "4.13 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 51). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 2,000.0 (min. = -500,000.00, max. = 500,000.00)

### 032 Preselect OUT1.L

Lower switching point of the OUT1 output [X2:1 - 2] terminal block (refer to the "4.13 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 51). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 1,000 (min. = -500,000.0, max. = 500,000.0)

### 033 Preselect OUT1.D

Maximum drift if the **052 Switch Mode OUT1** parameter is set to either "**17**" or "**18**". The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz). Drift values are indicated in increments of ¼.
Default = 0 (min. = -500,000.00, max. = 500,000.00)

### 034 Preselect OUT2.H

Upper switching point of the OUT2 output [X2:3 - 4] terminal block (refer to the "4.13 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 51). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 4,000 (min. = -500,000.00, max. = 500,000.00)

### 035 Preselect OUT2.L

Lower switching point of the OUT2 output [X2:3 - 4] terminal block (refer to the "4.13 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 51). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 3,000 (min. = -500,000.00, max. = 500,000.00)

### 036 Preselect OUT2.D

Maximum drift if the **053 Switch Mode OUT2** parameter is set to either "**17**" or "**18**". The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz). Drift values are indicated in increments of ¼.
Default = 0 (min. = -500,000.00, max. = 500,000.00)

### 037 Preselect OUT3.H

Upper switching point of the OUT3 output [X2:5 - 6] terminal block (refer to the "4.13 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 51). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 6,000 (min. = -500,000.00, max. = 500,000.00)

### 038 Preselect OUT3.L

Lower switching point of the OUT3 output [X2:5 - 6] terminal block (refer to the "4.13 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 51). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 5,000 (min. = -500,000.00, max. = 500,000.00)

### 039 Preselect OUT3.D

Maximum drift if the **054 Switch Mode OUT3** parameter is set to either "**17**" or "**18**". The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz). Drift values are indicated in increments of ¼.
Default = 0 (min. = -500,000.00, max. = 500,000.00)

### 040 Preselect OUT4.H

Upper switching point of the OUT4 output [X2:7 - 8] terminal block (refer to the "4.13 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 51). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 8,000 (min. = -500,000.00, max. = 500,000.00)

### 041 Preselect OUT4.L

Lower switching point of the OUT4 output [X2:7 - 8] terminal block (refer to the "4.13 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 51). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 7,000 (min. = -500,000.00, max. = 500,000.00)

### 042 Preselect OUT4.D

Maximum drift if the **055 Switch Mode OUT4** parameter is set to either "**17**" or "**18**". The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz). Drift values are indicated in increments of ¼.
Default = 0 (min. = -500,000.00, max. = 500,000.00)

### 043 Preselect REL1.H

Upper switching point of the relay output [X1:1 - 2] terminal block (refer to the "4.14 RELAY OUT, relay output ([X1] terminal block)" section on page 53). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 200.00 (min. = -500,000.00, max. = 500,000.00)

### 044 Preselect REL1.L

Lower switching point of the relay output [X1:1 - 2] terminal block (refer to the "4.14 RELAY OUT, relay output ([X1] terminal block)" section on page 53). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 100.00 (min. = -500,000.00, max. = 500,000.00)

### 045 Preselect REL1.D

Maximum drift if the **056 Switch Mode REL1** parameter is set to either "**17**" or "**18**". The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz). Drift values are indicated in increments of ¼.
Default = 0 (min. = -500,000.00, max. = 500,000.00)

### 046 Preselect OUT1.F

This parameter allows to set the frequency deviation per unit of time when the **052 Switch Mode OUT1** parameter is set to either "**21**" or "**22**".

Duration = frequency [Hz] / setting [Hz / ms]

**EXAMPLE**
1000 Hz / 0.1 [Hz / ms] = 10,000 ms = 10 s

| Frequency | Setting | Duration |
|---|---|---|
| 10 Hz | 00.0010 | 10 s |
| 100 Hz | 00.0100 | 10 s |
| 1 kHz | 00.1000 | 10 s |
| 10 kHz | 01.0000 | 10 s |
| 100 kHz | 10.0000 | 10 s |

| Frequency | Setting | Duration |
|---|---|---|
| 1 kHz | 1.0000 | 1 s |
| 1 kHz | 0.1000 | 10 s |
| 1 kHz | 0.0100 | 100 s |

Default = 1000.0000 (min. = 1, max. = 5000.0000)

### 047 Preselect OUT2.F

This parameter allows to set the frequency deviation per unit of time when the **053 Switch Mode OUT2** parameter is set to either "**21**" or "**22**". For complete information please refer to the **046 Preselect OUT1.F** parameter.
Default = 1000.0000 (min. = 1, max. = 5000.0000)

### 048 Preselect OUT3.F

This parameter allows to set the frequency deviation per unit of time when the 054 Switch Mode OUT3 parameter is set to either "**21**" or "**22**". For complete information please refer to the 046 Preselect OUT1.F parameter.
Default = 1000.0000 (min. = 1, max. = 5000.0000)

### 049 Preselect OUT4.F

This parameter allows to set the frequency deviation per unit of time when the 055 Switch Mode OUT4 parameter is set to either "**21**" or "**22**". For complete information please refer to the 046 Preselect OUT1.F parameter.
Default = 1000.0000 (min. = 1, max. = 5000.0000)

### 050 Preselect REL1.F

This parameter allows to set the frequency deviation per unit of time when the 056 Switch Mode REL1 parameter is set to either "**21**" or "**22**". For complete information please refer to the 046 Preselect OUT1.F parameter.
Default = 1000.0000 (min. = 1, max. = 5000.0000)

### 051 Reserved

Reserved.

### 14.2.6 Switching menu

This menu allows to set the switching conditions of the following outputs:

- one [X1 | RELAY OUT] relay output (refer to the "4.14 RELAY OUT, relay output ([X1] terminal block)" section on page 53);
- four [X2 | CONTROL OUT] control outputs (refer to the "4.13 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 51).

The following texts and abbreviations are used hereafter:

| | |
|---|---|
| **\|f\|** | = absolute value of the basic frequency (see the **003 F1-F2 Selection** parameter) |
| **\|Preselection\|** | = absolute value of the switching point (see the **031 Preselect OUT1.H** parameter and the following) |
| **f** | = direction dependent, direction signed basic frequency (see the **003 F1-F2 Selection** parameter) |
| **Preselection** | = direction dependent, direction signed switching point (see the **031 Preselect OUT1.H** parameter and the following) |

Additional features that can be assigned to the output:

| | |
|---|---|
| **{S}** | = self-locking function (see the **090 Lock Output** parameter) |
| **{H}** | = switching hysteresis (see the **062 Hysteresis OUT1** parameter and the following) |
| **{A}** | = start up delay (see the **088 Start-up Output** parameter) |

For more information on the preselection please refer to the "14.2.5 Preselect menu" section on page 181.

**WARNING**

- With an active self-locking function no hysteresis setting is necessary because no bouncing is possible.
- With an inactive self-locking function the hysteresis setting is always useful.
- When you set the **Switch Mode xxx** to "7" or "8", the specified standstill time (see the **089 Standstill Time** parameter) must be higher than the set wipe period, in order to prevent a breakdown of the wipe signal before the wipe period has elapsed. Refer to the **057 Pulse Time OUT1** parameter on page 190 and following.
- When you set the **Switch Mode xxx** to "2", "6", or "16", the **Hysteresis xxx** parameters are used to determine the frequency band.

## 052 Switch Mode OUT1

Switching condition of output OUT1.

**0**: **|f| ≥ |Preselection|** {S, H}
The outputs switches in case of overspeed
See the "8.1 Overspeed (Switch Mode = 0)" section on page 104

**1**: **|f| ≤ |Preselection|** {S, H, A}
The outputs switches in case of underspeed
See the "8.2 Underspeed (Switch Mode = 1)" section on page 106

**2**: **|f| = |Preselection|** {S, A}
The output switches if the frequency is out of the set band (Preselection +/- Hysteresis)
See the "8.3 Frequency band (Switch Mode = 2)" section on page 108

**3**: **Standstill** (see the **089 Standstill Time** parameter)
The output switches in case of a standstill
See the "8.4 Standstill (Switch Mode = 3)" section on page 110

**4**: **f ≥ Preselection** {S, H}
The output switches in case of overspeed
See the "8.5 Overspeed (Switch Mode = 4)" section on page 111

**5**: **f ≤ Preselection** {S, H, A}
The output switches in case of underspeed
See the "8.6 Underspeed (Switch Mode = 5)" section on page 113

**6**: **f = Preselection** {S, A}
The output switches if the frequency is out of the set band (Preselection +/- Hysteresis)
See the "8.7 Frequency band (Switch Mode = 6)" section on page 115

**7**: **f > 0**
The output switches if a positive frequency is detected (for instance in case of a clockwise direction). The direction information will be zero set as soon as the standstill position is reached (see the **089 Standstill Time** parameter).
See the "8.8 Frequency > 0 Hz (Switch Mode = 7)" section on page 117

**8**: **f < 0**
The output switches if a negative frequency is detected (for instance in case of a counter-clockwise direction). The direction information will be zero set as soon as the standstill position is reached (see the **089 Standstill Time** parameter).
See the "8.9 Frequency < 0 Hz (Switch Mode = 8)" section on page 118

**9**: **Clock generation for pulsed readback**
EDM and pulse monitored inputs.
See the "8.10 Clock generation for pulsed readback (Switch Mode = 9)" section on page 119

**10**: **STO/SBC/SS1** {S}
Enable + external self-locking, without ramp monitoring.
See the "8.11 STO/SBC/SS1 produced by input (Switch Mode = 10)" section on page 120
See the "8.12 STO/SBC produced by situation (Switch Mode = 10)" section on page 121
See the "8.13 SS1 produced by input (Switch Mode = 10)" section on page 122

**11**: **SLS |f| ≥ |Preselection|** {S}
Overspeed + enable + external self-locking, without ramp monitoring.
See the "8.14 SLS produced by input (Switch Mode = 11)" section on page 123

**12**: **SMS |f| ≥ |Preselection|** {S}
Overspeed without enable + external self-locking.
See the "8.15 SMS (Switch Mode = 12)" section on page 125

**13**: **SDI1 f > 0** {S}
Enable + external self-locking, frequency monitoring, no position monitoring.
See the "8.16 SDI produced by input (f > 0 Hz) (Switch Mode = 13)" section on page 126

**14**: **SDI2 f < 0** {S}
Enable + external self-locking, frequency monitoring, no position monitoring.
See the "8.17 SDI produced by input (f < 0 Hz) (Switch Mode = 14)" section on page 127

**15**: **SSM1 |f| ≤ |Preselection|** {S}
Underspeed + enable + external self-locking.
See the "8.18 SSM produced by input (Switch Mode = 15)" section on page 128

**16**: **SSM2 |f| within |Preselection +/- Hysteresis|** {S}
Underspeed + overspeed + enable + external self-locking.
See the "8.19 SSM produced by input (Switch Mode = 16)" section on page 130

**17**: **SOS/SLI/SS2 |f| > |Preselection| or Position Error** {S}
Overspeed + position + enable + self-locking.
See the "8.20 SOS/SLI/SS2 produced by input (Switch Mode = 17)" section on page 132

**18**: **Standstill (at Standstill and no Position Error)**
Standstill + position + enable + self-locking.
See the "8.21 Standstill produced by input (Switch Mode = 18)" section on page 134

**19**: **Reserved**

**20**: **No standstill**
This mode operates as Mode 3, yet statically only and the output is inverted. The inverted relay control is important in this mode. The output switches if f is not equal to zero (no standstill).
See the "8.23 No Standstill (Switch Mode = 20)" section on page 137

**21**: **Ramp monitoring 1** {S}
Underspeed + overspeed + enable + external self-locking.
The condition is that the braking behaviour is linear. The **Preselect xxxx.H/L** parameter sets the slope. The **Preselect xxxx.D** parameter sets the +/- deviation expressed in hertz (Hz).
See the "8.24 Ramp monitoring (Switch Mode = 21)" section on page 138

**22**: **Ramp monitoring 2** {S}
Underspeed + overspeed + enable + external self-locking.
The condition is that the braking behaviour is linear. The **Preselect xxxx.H/L** parameter sets the slope. The **Preselect xxxx.D** parameter sets the +/- deviation expressed in hertz (Hz).
See the "8.25 Ramp monitoring (Switch Mode = 22)" section on page 140

Default = 0 (min. = 0, max. = 22)

### 053 Switch Mode OUT2

Switching condition of output OUT2. For any information refer to the **052 Switch Mode OUT1** parameter.
Default = 0 (min. = 0, max. = 22)

### 054 Switch Mode OUT3

Switching condition of output OUT3. For any information refer to the **052 Switch Mode OUT1** parameter.
Default = 0 (min. = 0, max. = 22)

### 055 Switch Mode OUT4

Switching condition of output OUT4. For any information refer to the **052 Switch Mode OUT1** parameter.
Default = 0 (min. = 0, max. = 22)

### 056 Switch Mode REL1

Switching condition of the relay output. For any information refer to the **052 Switch Mode OUT1** parameter.
Default = 0 (min. = 0, max. = 22)

### 057 Pulse Time OUT1

Wipe signal period of output OUT1.
**0**: static wipe signal
≠**0**: wipe signal period expressed in seconds.
The minimum wipe period of the control output is 1 msec (0.001 seconds).

**WARNING**

- When you set the **Switch Mode xxx** to "7" or "8", the specified standstill time (see the **089 Standstill Time** parameter) must be higher than the set wipe period, in order to prevent a breakdown of the wipe signal before the wipe period has elapsed. Refer to the **052 Switch Mode OUT1** parameter on page 187.
- If a wipe signal is set, no self-locking function (see the **090 Lock Output** parameter) can be assigned to the respective output.

Default = 0.000 (min. = 0.000, max. = 9.999)

### 058 Pulse Time OUT2

Wipe signal period of output OUT2. For any information refer to the **057 Pulse Time OUT1** parameter.
Default = 0.000 (min. = 0.000, max. = 9.999)

### 059 Pulse Time OUT3

Wipe signal period of output OUT3. For any information refer to the **057 Pulse Time OUT1** parameter.
Default = 0.000 (min. = 0.000, max. = 9.999)

### 060 Pulse Time OUT4

Wipe signal period of output OUT4. For any information refer to the **057 Pulse Time OUT1** parameter.
Default = 0.000 (min. = 0.000, max. = 9.999)

### 061 Pulse Time REL1

Wipe signal period of the relay.
**0**: static wipe signal
≠**0**: wipe signal period expressed in seconds.
The minimum wipe period of the relay output is 25 msec (0.025 seconds).

**WARNING**

- When you set the **Switch Mode xxx** to "7" or "8", the specified standstill time (see the **089 Standstill Time** parameter) must be higher than the set wipe period, in order to prevent a breakdown of the wipe signal before the wipe period has elapsed. Refer to the **052 Switch Mode OUT1** parameter on page 187.
- If a wipe signal is set, no self-locking function (see the **090 Lock Output** parameter) can be assigned to the respective output.

Default = 0.000 (min. = 0.000, max. = 9.999)

### 062 Hysteresis OUT1

Percentage hysteresis of the set OUT1 switching point. For more information refer to the **031 Preselect OUT1.H** and **032 Preselect OUT1.L** parameters in the "14.2.5 Preselect menu" section on page 181. Value is expressed in percentage (%).

**WARNING**

- Due to the variance of the frequency measurement an output bouncing around the limit value can occur. This behaviour can be prevented by setting a hysteresis. A reasonable hysteresis value is approximately 1%.
- The setting of a hysteresis is possible only when the **052 Switch Mode OUT1** parameter is set to **0**, **6**, or **16**.

Default = 0.0 (min. = 0.0, max. = 100.0)

### 063 Hysteresis OUT2

Percentage hysteresis of the set OUT2 switching point. For more information refer to the **034 Preselect OUT2.H** and **035 Preselect OUT2.L** parameters in the "14.2.5 Preselect menu" section on page 181. Value is expressed in percentage (%).

**WARNING**

- Due to the variance of the frequency measurement an output bouncing around the limit value can occur. This behaviour can be prevented by setting a hysteresis. A reasonable hysteresis value is approximately 1%.
- The setting of a hysteresis is possible only when the **053 Switch Mode OUT2** parameter is set to **0**, **6**, or **16**.

Default = 0.0 (min. = 0.0, max. = 100.0)

### 064 Hysteresis OUT3

Percentage hysteresis of the set OUT3 switching point. For more information refer to the 037 Preselect OUT3.H and 038 Preselect OUT3.L parameters in the "14.2.5 Preselect menu" section on page 181. Value is expressed in percentage (%).

**WARNING**

- Due to the variance of the frequency measurement an output bouncing around the limit value can occur. This behaviour can be prevented by setting a hysteresis. A reasonable hysteresis value is approximately 1%.
- The setting of a hysteresis is possible only when the 054 Switch Mode OUT3 parameter is set to **0**, **6**, or **16**.

Default = 0.0 (min. = 0.0, max. = 100.0)

### 065 Hysteresis OUT4

Percentage hysteresis of the set OUT4 switching point. For more information refer to the 040 Preselect OUT4.H and 041 Preselect OUT4.L parameters in the "14.2.5 Preselect menu" section on page 181. Value is expressed in percentage (%).
Default = 0.0 (min. = 0.0, max. = 100.0)

**WARNING**

- Due to the variance of the frequency measurement an output bouncing around the limit value can occur. This behaviour can be prevented by setting a hysteresis. A reasonable hysteresis value is approximately 1%.
- The setting of a hysteresis is possible only when the 055 Switch Mode OUT4 parameter is set to **0**, **6**, or **16**.

### 066 Hysteresis REL1

Percentage hysteresis of the set relay switching point. For more information refer to the 043 Preselect REL1.H and 044 Preselect REL1.L parameters in the "14.2.5 Preselect menu" section on page 181. Value is expressed in percentage (%).

**WARNING**

- Due to the variance of the frequency measurement an output bouncing around the limit value can occur. This behaviour can be prevented by setting a hysteresis. A reasonable hysteresis value is approximately 1%.
- The setting of a hysteresis is possible only when the 056 Switch Mode REL1 parameter is set to **0**, **6**, or **16**.

Default = 0.0 (min. = 0.0, max. = 100.0)

### 067 Matrix OUT1

Enable matrix for OUT1 output. It defines the enable signal (see the **10** to **18** settings of the **052 Switch Mode OUT1** parameter) of OUT1 output by input selection at terminal X10 as well as the remaining feedback outputs (see the table below). An input as well as a feedback output can be used as enable signal (OR operation in case of several signals).

| | |
|---|---|
| **Bit 0** | Input 1 [X10: 2] |
| **Bit 1** | Input 2 [X10: 3] |
| **Bit 2** | Input 3 [X10: 4] |
| **Bit 3** | Input 4 [X10: 5] |
| **Bit 4** | Output OUT1, not available here |
| **Bit 5** | Output OUT2 |
| **Bit 6** | Output OUT3 |
| **Bit 7** | Output OUT4 |
| **Bit 8** | Output REL1 |

Default = 0 (min. = 0, max. = 511)

### 068 Matrix OUT2

Enable matrix for OUT2 output. For any information please refer to the **067 Matrix OUT1** parameter on page 193.

| | |
|---|---|
| **Bit 0** | Input 1 [X10: 2] |
| **Bit 1** | Input 2 [X10: 3] |
| **Bit 2** | Input 3 [X10: 4] |
| **Bit 3** | Input 4 [X10: 5] |
| **Bit 4** | Output OUT1 |
| **Bit 5** | Output OUT2, not available here |
| **Bit 6** | Output OUT3 |
| **Bit 7** | Output OUT4 |
| **Bit 8** | Output REL1 |

Default = 0 (min. = 0, max. = 511)

## 069 Matrix OUT3

Enable matrix for OUT3 output. For any information please refer to the **067 Matrix OUT1** parameter on page 193.

| | |
|---|---|
| **Bit 0** | Input 1 [X10: 2] |
| **Bit 1** | Input 2 [X10: 3] |
| **Bit 2** | Input 3 [X10: 4] |
| **Bit 3** | Input 4 [X10: 5] |
| **Bit 4** | Output OUT1 |
| **Bit 5** | Output OUT2 |
| **Bit 6** | Output OUT3, not available here |
| **Bit 7** | Output OUT4 |
| **Bit 8** | Output REL1 |

Default = 0 (min. = 0, max. = 511)

## 070 Matrix OUT4

Enable matrix for OUT4 output. For any information please refer to the **067 Matrix OUT1** parameter on page 193.

| | |
|---|---|
| **Bit 0** | Input 1 [X10: 2] |
| **Bit 1** | Input 2 [X10: 3] |
| **Bit 2** | Input 3 [X10: 4] |
| **Bit 3** | Input 4 [X10: 5] |
| **Bit 4** | Output OUT1 |
| **Bit 5** | Output OUT2 |
| **Bit 6** | Output OUT3 |
| **Bit 7** | Output OUT4, not available here |
| **Bit 8** | Output REL1 |

Default = 0 (min. = 0, max. = 511)

### 071 Matrix REL1

Enable matrix for REL1 output. For any information please refer to the **067 Matrix OUT1** parameter on page 193.

| | |
|---|---|
| **Bit 0** | Input 1 [X10: 2] |
| **Bit 1** | Input 2 [X10: 3] |
| **Bit 2** | Input 3 [X10: 4] |
| **Bit 3** | Input 4 [X10: 5] |
| **Bit 4** | Output OUT1 |
| **Bit 5** | Output OUT2 |
| **Bit 6** | Output OUT3 |
| **Bit 7** | Output OUT4 |
| **Bit 8** | Output REL1, not available here |

Default = 0 (min. = 0, max. = 511)

### 072 MIA-Delay OUT1

Delay of OUT1 output for transition from inactive to active. It sets the matrix delay from inactive to active for OUT1 output. This setting allows to delay the enable function, if the enable input or the feedback output changes from inactive to active. The value is expressed in seconds.
Default = 0.000 (min. = 0, max. = 99.999)

### 073 MIA-Delay OUT2

Delay of OUT2 output for transition from inactive to active. For any information please refer to the **072 MIA-Delay OUT1** parameter on page 195.
Default = 0.000 (min. = 0, max. = 99.999)

### 074 MIA-Delay OUT3

Delay of OUT3 output for transition from inactive to active. For any information please refer to the **072 MIA-Delay OUT1** parameter on page 195.
Default = 0.000 (min. = 0, max. = 99.999)

### 075 MIA-Delay OUT4

Delay of OUT4 output for transition from inactive to active. For any information please refer to the **072 MIA-Delay OUT1** parameter on page 195.
Default = 0.000 (min. = 0, max. = 99.999)

### 076 MIA-Delay REL1

Delay of REL1 output for transition from inactive to active. For any information please refer to the **072 MIA-Delay OUT1** parameter on page 195.
Default = 0.000 (min. = 0, max. = 99.999)

### 077 MAI-Delay OUT1

Delay of OUT1 output for transition from active to inactive. It sets the matrix delay from active to inactive for OUT1 output. This setting allows to delay the enable function, if the enable input or the feedback output changes from active to inactive. The value is expressed in seconds.
Default = 0.000 (min. = 0, max. = 99.999)

### 078 MAI-Delay OUT2

Delay of OUT2 output for transition from active to inactive. For any information please refer to the **077 MAI-Delay OUT1** parameter on page 196.
Default = 0.000 (min. = 0, max. = 99.999)

### 079 MAI-Delay OUT3

Delay of OUT3 output for transition from active to inactive. For any information please refer to the **077 MAI-Delay OUT1** parameter on page 196.
Default = 0.000 (min. = 0, max. = 99.999)

### 080 MAI-Delay OUT4

Delay of OUT4 output for transition from active to inactive. For any information please refer to the **077 MAI-Delay OUT1** parameter on page 196.
Default = 0.000 (min. = 0, max. = 99.999)

### 081 MAI-Delay REL1

Delay of REL1 output for transition from active to inactive. For any information please refer to the **077 MAI-Delay OUT1** parameter on page 196.
Default = 0.000 (min. = 0, max. = 99.999)

### 082 Delay OUT1

Delay of the tripping for OUT1 output. It sets the trip delay for the OUT1 output expressed in seconds. The value set here delays the tripping of OUT1 output. If the output has been reset before the delay time has expired, no change of state occurs in the OUT1. The return occurs without delay. Oscillating releases and their recall ensure that the delay time restarts.
If a wiping time is activated, a new wiping impulse can be issued only after recall and after the delay time has expired.
This setting does not apply to **052 Switch Mode OUT1** = 3, 9, 10, and 20.
The value is expressed in seconds.
Default = 0.000 (min. = 0, max. = 9.999)

### 083 Delay OUT2

Delay of the tripping for OUT2 output. For any information please refer to the **082 Delay OUT1** parameter on page 196.
Default = 0.000 (min. = 0, max. = 9.999)

### 084 Delay OUT3

Delay of the tripping for OUT3 output. For any information please refer to the **082 Delay OUT1** parameter on page 196.
Default = 0.000 (min. = 0, max. = 9.999)

### 085 Delay OUT4

Delay of the tripping for OUT4 output. For any information please refer to the **082 Delay OUT1** parameter on page 196.
Default = 0.000 (min. = 0, max. = 9.999)

### 086 Delay REL1

Delay of the tripping for REL1 output. For any information please refer to the **082 Delay OUT1** parameter on page 196.
Default = 0.000 (min. = 0, max. = 9.999)

### 087 Start-up Mode

Start-up delay time window. Delay time window before activating the monitoring function. It is only useful if the **Switch Mode xxx** parameter is set to "**1**", "**2**", "**5**", or "**6**" (see the **052 Switch Mode OUT1** parameter and the followings).
To use the start-up delay, it must be assigned to an output in the **088 Start-up Output** parameter.

The start-up delay will be applied:

- at next power up;
- as soon as a frequency is detected again after a standstill condition.

Available settings:

**0**: no start-up delay
**1**: start-up delay = 1 second
**2**: start-up delay = 2 seconds
**3**: start-up delay = 4 seconds
**4**: start-up delay = 8 seconds
**5**: start-up delay = 16 seconds
**6**: start-up delay = 32 seconds
**7**: start-up delay = 64 seconds
**8**: start-up delay = 128 seconds
**9**: automatically, until the value is exceeded for the first time (see the "14.2.5 Preselect menu" section on page 181)

The set delay time window is valid for all outputs.

Default = 0 (min. = 0, max. = 9)

## 088 Start-up Output

Assignment of a start-up delay to an output.
By using a 5 bit binary code the start-up delay function can be assigned to the outputs according to the settings in the following table:

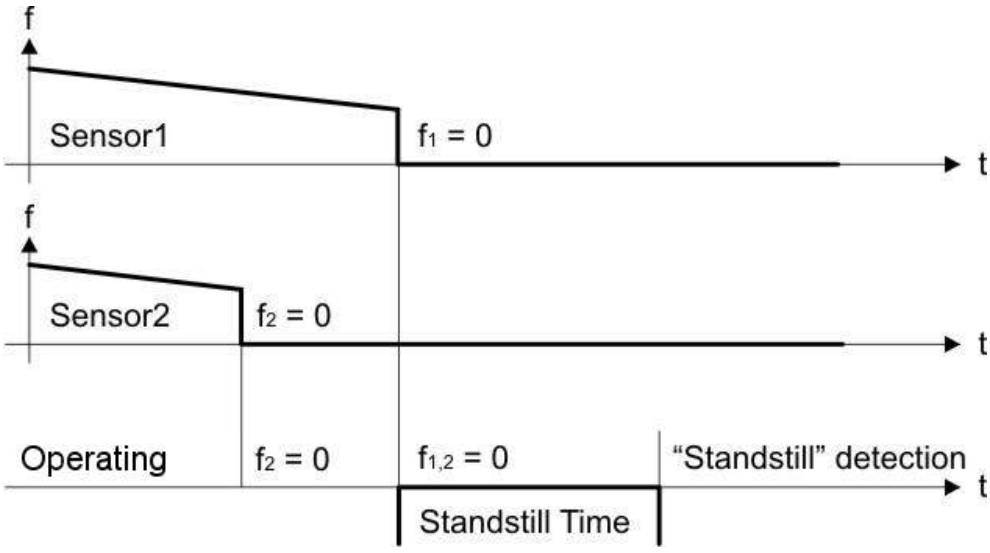
| Output | RELAY | OUT4 | OUT3 | OUT2 | OUT1 |
|---|---|---|---|---|---|
| Bit | 5 | 4 | 3 | 2 | 1 |
| Binary | 10000 | 01000 | 00100 | 00010 | 00001 |
| Value | **16** | **8** | **4** | **2** | **1** |

**EXAMPLE**
If you set "17" (binary 10001) this means that a start-up delay will be enabled for both the OUT1 output (1, binary 00001) and the relay output (16, binary 10000).

Default = 0 (min. = 0, max. = 31)

## 089 Standstill Time

Delay time for the acknowledgement of a standstill condition. As soon as both input frequencies are detected as "0 Hz", the standstill condition is acknowledged at the expiration of the set delay. The value is expressed in seconds.




Prior condition is that both input frequencies are detected as "0 Hz" ($f_{1,2} = 0$ Hz). From that moment the standstill time delay starts, when it expires the standstill condition is acknowledged.

Default = 0.000 (min. = 0, max. = 9.999)

### 090 Lock Output

Assignment of a lock function to an output.
The assignment of a self-locking function to an output can be set by using a 6 bit binary code according to the settings in the following table:

| Output | (*) | RELAY | OUT4 | OUT3 | OUT2 | OUT1 |
|---|---|---|---|---|---|---|
| Bit | 6 | 5 | 4 | 3 | 2 | 1 |
| Binary | 100000 | 010000 | 001000 | 000100 | 000010 | 000001 |
| Value | **32** | **16** | **8** | **4** | **2** | **1** |

Bits 1 to 5 are used to assign the lock function to the respective outputs.
(*) The highest valued bit 6 allows to set whether a locked output can be released only by an external input signal (bit 6 = 0) - see the **IN Function** in the "14.2.7 Control menu" section on page 204 - or as an alternative by an automatic reset when the standstill condition is detected (bit 6 = 1).
Default = 0 (min. = 0, max. = 63)

**EXAMPLE 1**
You set the **090 Lock Output** parameter = "17" (binary 010001). This means that a lock is assigned to both OUT1 output (1, binary 000001) and to the relay output (16, binary 010000); furthermore they can be released exclusively by an external input signal (bit 6 = 0, see the "14.2.7 Control menu" section on page 204).

**EXAMPLE 2**
You set the **090 Lock Output** parameter = "49" (binary 110001). This means that a lock is assigned to both OUT1 output (1, binary 000001) and to the relay output (16, binary 010000); furthermore the lock functions are deleted when the standstill condition is detected (bit 6 = 1).

**WARNING**
If you set a wipe signal (see the **057 Pulse Time OUT1** parameter and the followings), no self-locking function can be assigned to the respective output.

### 091 Action Output

Output selection for overwriting.
The function is used to set fixed output conditions for OUT1 to OUT4 as well as for REL1, **it is only effective in the "Programming Mode"** (see the "4.15 DIL switch ([S1] DIL switch)" section on page 55). It is used for test purposes and allows to force each output to a defined switching condition. This **091**

**Action Output** parameter selects the outputs to be tested. The next **092 Action Polarity** parameter is used to assign the desired switching conditions to the selected outputs.

The outputs can be selected by using a 5 bit binary code according to the settings in the following table:

| Output | RELAY | OUT4 | OUT3 | OUT2 | OUT1 |
|---|---|---|---|---|---|
| Bit | 5 | 4 | 3 | 2 | 1 |
| Binary | 10000 | 01000 | 00100 | 00010 | 00001 |
| Value | **16** | **8** | **4** | **2** | **1** |

Default = 0 (min. = 0, max. = 31)

**EXAMPLE**

You set the **091 Action Output** parameter = "14" (binary 01110). This means that the OUT2 (2, binary 00010), OUT3 (4, binary 00100), and OUT4 (8, binary 01000) outputs are selected for overwriting.

| | | |
|---|---|---|
| REL | 0 | No overwriting |
| OUT4 | 1 | Status, see the **092 Action Polarity** parameter |
| OUT3 | 1 | Status, see the **092 Action Polarity** parameter |
| OUT2 | 1 | Status, see the **092 Action Polarity** parameter |
| OUT1 | 0 | No overwriting |

**WARNING**

After the test, the parameter must be set back to the default value (= 0).

## 092 Action Polarity

Setting of the output conditions.
This function **is only effective in the "Programming Mode"** (see the "4.15 DIL switch ([S1] DIL switch)" section on page 55) and requires a selection of the corresponding outputs (see the **091 Action Output** parameter on page 199).

The output conditions can be assigned by a 9 bit binary code according to the settings in the following table:

| OUT | REL | 4 | /4 | 3 | /3 | 2 | /2 | 1 | /1 |
|---|---|---|---|---|---|---|---|---|---|
| Bit | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Binary | 1 0000 0000 | 0 1000 0000 | 0 0100 0000 | 0 0010 0000 | 0 0001 0000 | 0 0000 1000 | 0 0000 0100 | 0 0000 0010 | 0 0000 0001 |
| Value | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |

Default = 0 (min. = 0, max. = 511)

**EXAMPLE**
If you set the **092 Action Polarity** parameter = "275" (binary 1 0001 0011), you will obtain the following output conditions (from left to right):

| | | | |
|---|---|---|---|
| REL | 1 | 1 0000 0000 | Contact closed |
| OUT4 | 0 | 0 0000 0000 | Low |
| /OUT4 | 0 | 0 0000 0000 | Low |
| OUT3 | 0 | 0 0000 0000 | Low |
| /OUT3 | 1 | 0 0001 0000 | High |
| OUT2 | 0 | 0 0000 0000 | Low |
| /OUT2 | 0 | 0 0000 0000 | Low |
| OUT1 | 1 | 0 0000 0010 | High |
| /OUT1 | 1 | 0 0000 0001 | High |

**WARNING**
After the test, the parameter must be set back to the default value (= 0).

## 093 Read Back OUT

Output for the EDM function. It sets the readback output for the EDM function with respect to the inverted and non-inverted signals. For complete information on the EDM function, please refer to the "12 – EDM Function" section on page 153. Refer also to the 109 Read Back Delay parameter on page 209.

| | | |
|---|---|---|
| **Bit 0** | = 0<br>= 1 | EDM function of OUT1<br>EDM function of /OUT1 |
| **Bit 1** | = 0<br>= 1 | EDM function of OUT2<br>EDM function of /OUT2 |
| **Bit 2** | = 0<br>= 1 | EDM function of OUT3<br>EDM function of /OUT3 |
| **Bit 3** | = 0<br>= 1 | EDM function of OUT4<br>EDM function of /OUT4 |
| **Bit 4** | = 0<br>= 1 | EDM function of REL1<br>EDM function of REL1 (inverted) |

Default = 0 (min. = 0, max. = 31)

## 094 Output Mode

Output configuration. It defines the configuration of the outputs.

| | | |
|---|---|---|
| **Bit 0** | = 0<br>= 1 | OUT1 and /OUT1 are inverse<br>OUT1 and /OUT1 are homogeneous |
| **Bit 1** | = 0<br>= 1 | OUT2 and /OUT2 are inverse<br>OUT2 and /OUT2 are homogeneous |
| **Bit 2** | = 0<br>= 1 | OUT3 and /OUT3 are inverse<br>OUT3 and /OUT3 are homogeneous |
| **Bit 3** | = 0<br>= 1 | OUT4 and /OUT4 are inverse<br>OUT4 and /OUT4 are homogeneous |

Default = 0 (min. = 0, max. = 15)

**WARNING**

- With homogeneous outputs, all inputs will be pulled down to GND in case of power or hardware failure. Thereby an error state cannot be clearly transmitted to another device by these outputs.
- Using homogeneous outputs will reduce the SIL level.

### 095 Reserved

Reserved.

### 096 Reserved

Reserved.

### 097 Reserved

Reserved.

### 098 Reserved

Reserved.

### 099 Reserved

Reserved.

### 14.2.7 Control menu

This section describes the features and configuration options of the control inputs (refer to the "4.9 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)"section on page 44). Depending on the selected operating mode (see the **000 Operational mode** parameter and the "14.2.2 Main menu" section on page 168), two to four HTL/PNP control inputs are available at [X10 | CONTROL IN] terminal.

Three different input configurations can be set in the **108 Input Mode** parameter (see on page 209).

#### 14.2.7.1 Two 2-pole inputs (IN1, /IN1 + IN2, /IN2)

The control inputs are either homogeneous or inverse. In this case each input requires a dual signal.

| | | | | |
|---|---|---|---|---|
| **Signal pair 1** | [X10:2] **LOW** | [X10:3] **LOW** | Error if inverse | Configuration by setting **100 IN1 Function** and **101 IN1 Config** parameters |
| | [X10:2] **LOW** | [X10:3] **HIGH** | Error if homogeneous | |
| | [X10:2] **HIGH** | [X10:3] **LOW** | Error if homogeneous | |
| | [X10:2] **HIGH** | [X10:3] **HIGH** | Error if inverse | |
| **Signal pair 2** | [X10:4] **LOW** | [X10:5] **LOW** | Error if inverse | Configuration by setting **104 IN2 Function** and **105 IN2 Config** parameters |
| | [X10:4] **LOW** | [X10:5] **HIGH** | Error if homogeneous | |
| | [X10:4] **HIGH** | [X10:5] **LOW** | Error if homogeneous | |
| | [X10:4] **HIGH** | [X10:5] **HIGH** | Error if inverse | |

#### 14.2.7.2 One 2-pole input (IN1, /IN1) and two 1-pole inputs (IN2 + /IN2)

The 2-pole input is either homogeneous or inverse. The 2-pole control input requires a dual signal, while the 1-pole inputs only require a single channel. Thus three independent inputs are available.

| | | | | |
|---|---|---|---|---|
| **Signal pair 1** | [X10:2] **LOW** | [X10:3] **LOW** | Error if inverse | Configuration by setting **100 IN1 Function** and **101 IN1 Config** parameters |
| | [X10:2] **LOW** | [X10:3] **HIGH** | Error if homogeneous | |
| | [X10:2] **HIGH** | [X10:3] **LOW** | Error if homogeneous | |
| | [X10:2] **HIGH** | [X10:3] **HIGH** | Error if inverse | |
| **Signal 2** | [X10:4] **LOW** | | Configuration by setting **104 IN2 Function** and **105 IN2 Config** parameters | |
| | [X10:4] **HIGH** | | | |
| **Signal 3** | [X10:5] **LOW** | | Configuration by setting **106 /IN2 Function** and **107 /IN2 Config** parameters | |
| | [X10:5] **HIGH** | | | |

#### 14.2.7.3 Four 1-pole inputs (IN1 + /IN1 + IN2 + /IN2)

The 1-pole inputs only require a single channel. Thus four independent inputs are available.

| | | |
|---|---|---|
| **Signal 1** | [X10:2] **LOW** | Configuration by setting **100 IN1 Function** and **101 IN1 Config** parameters |
| | [X10:2] **HIGH** | |
| **Signal 2** | [X10:3] **LOW** | Configuration by setting **102 /IN1 Function** and **103 /IN1 Config** parameters |
| | [X10:3] **HIGH** | |
| **Signal 3** | [X10:4] **LOW** | Configuration by setting **104 IN2 Function** and **105 IN2 Config** parameters |
| | [X10:4] **HIGH** | |
| **Signal 4** | [X10:5] **LOW** | Configuration by setting **106 /IN2 Function** and **107 /IN2 Config** parameters |
| | [X10:5] **HIGH** | |

### 100 IN1 Function

It sets a function to the [X10 : 2] input.
The switching behaviour must be set in the **101 IN1 Config** parameter.

Available settings:

| | | |
|---|---|---|
| **0** | No function assigned | [dyn] |
| **1** | Releases lock of OUT1 output | [dyn] |
| **2** | Releases lock of OUT2 output | [dyn] |
| **3** | Releases lock of OUT3 output | [dyn] |
| **4** | Releases lock of OUT4 output | [dyn] |
| **5** | Releases lock of RELAY output | [dyn] |
| **6** | Releases all output locks together | [dyn] |
| **7** | Sets Frequency 1 (see the **022 Set Frequency 1** parameter)<br>Frequency simulation of Sensor 1, for information on the "Programming Mode" see the "4.15 DIL switch ([S1] DIL switch)" section on page 55. | [stat]<br>[PRG] |
| **8** | Sets Frequency 2 (see the **029 Set Frequency 2** parameter)<br>Frequency simulation of Sensor 2, for information on the "Programming Mode" see the "4.15 DIL switch ([S1] DIL switch)" section on page 55. | [stat]<br>[PRG] |
| **9** | Sets Frequencies 1 and 2 (see the **022 Set Frequency 1** and **029 Set Frequency 2** parameters) | [stat] |

| | | |
|---|---|---|
| | Frequency simulation of Sensor 1 and Sensor 2, for information on the "Programming Mode" see the "4.15 DIL switch ([S1] DIL switch)" section on page 55. | [PRG] |
| **10** | Freezes Frequency 1<br>Freezes the current encoder frequency of Sensor 1, for information on the "Programming Mode" see the "4.15 DIL switch ([S1] DIL switch)" section on page 55. | [stat]<br>[PRG] |
| **11** | Freezes Frequency 2<br>Freezes the current encoder frequency of Sensor 2, for information on the "Programming Mode" see the "4.15 DIL switch ([S1] DIL switch)" section on page 55. | [stat]<br>[PRG] |
| **12** | Freezes Frequencies 1 and 2<br>Freezes the encoder frequency of Sensor 1 and Sensor 2, for information on the "Programming Mode" see the "4.15 DIL switch ([S1] DIL switch)" section on page 55. | [stat]<br>[PRG] |
| **13** | Preselection change (see the "14.2.5 Preselect menu" section on page 181). Switch-over from the upper to the lower switching point and vice versa. It affects all outputs. | [stat] |
| **14** | Clears Drift 1 (see the **020 Position Drift 1** parameter).<br>It clears the counter of position drift 1. | [dyn] |
| **15** | Clears Drift 2 (see the **027 Position Drift 2** parameter).<br>It clears the counter of position drift 2. | [dyn] |
| **16** | Clears Drifts 1 and 2 (see the **020 Position Drift 1** and **027 Position Drift 2** parameters).<br>It clears both counters (position drifts 1 and 2). | [dyn] |
| **17** | EDM function of OUT1 or /OUT1, see the "12 – EDM Function" section on page 153. | |
| **18** | EDM function of OUT2 or /OUT2, see the "12 – EDM Function" section on page 153. | |
| **19** | EDM function of OUT3 or /OUT3, see the "12 – EDM Function" section on page 153. | |
| **20** | EDM function of OUT4 or /OUT4, see the "12 – EDM Function" section on page 153. | |
| **21** | Enables input for the output function of the **Switch Mode xxx** parameter when set to 10 ... 18 (see the **052 Switch Mode OUT1** parameter and the followings). | [stat] |
| **22** | EDM function for REL1, see the "12 – EDM Function" section on page 153. | |

**NOTE**

[dyn] = dynamic function when a rising edge is detected at the input
[stat] = static permanent function
[PRG] = function only active in the "Programming Mode" (see the "4.15 DIL switch ([S1] DIL switch)" section on page 55)

Default = 0 (min. = 0, max. = 22)

**WARNING**

If the "**Set Frequency**" commands (options 7, 8 and 9) and the "**Freeze Frequency**" commands (options 10, 11 and 12) are activated simultaneously by the external control inputs, the "**Set Frequency**" function has priority.

### 101 IN1 Config

Switching behaviour of the [X10 : 2] input.
This parameter defines the switching behaviour of the input. The function assignment must be specified in the **100 IN1 Function** parameter.

| | |
|---|---|
| **0** | Inverse dual channel input (static, LOW) |
| **1** | Inverse dual channel input (static, HIGH) |
| **2** | Inverse dual channel input (dynamic, LOW) |
| **3** | Inverse dual channel input (dynamic, HIGH) |
| **4** | Homogeneous dual channel input (static, LOW) |
| **5** | Homogeneous dual channel input (static, HIGH) |
| **6** | Homogeneous dual channel input (dynamic, LOW) |
| **7** | Homogeneous dual channel input (dynamic, HIGH) |
| **8** | Single channel input (static, LOW) |
| **9** | Single channel input (static, HIGH) |
| **10** | Single channel input (dynamic, LOW) |
| **11** | Single channel input (dynamic, HIGH) |
| **12** | Single channel input EDM clock of OUT1 |
| **13** | Single channel input EDM clock of /OUT1 |
| **14** | Single channel input EDM clock of OUT2 |
| **15** | Single channel input EDM clock of /OUT2 |
| **16** | Single channel input EDM clock of OUT3 |
| **17** | Single channel input EDM clock of /OUT3 |
| **18** | Single channel input EDM clock of OUT4 |
| **19** | Single channel input EDM clock of /OUT4 |
| **20** | Pulsed single channel input of OUT1 (static, HIGH) |
| **21** | Pulsed single channel input of /OUT1 (static, HIGH) |
| **22** | Pulsed single channel input of OUT2 (static, HIGH) |
| **23** | Pulsed single channel input of /OUT2 (static, HIGH) |

| | |
|---|---|
| **24** | Pulsed single channel input of OUT3 (static, HIGH) |
| **25** | Pulsed single channel input of /OUT3 (static, HIGH) |
| **26** | Pulsed single channel input of OUT4 (static, HIGH) |
| **27** | Pulsed single channel input of /OUT4 (static, HIGH) |
| **28** | Pulsed single channel input of OUT1 (static, LOW) |
| **29** | Pulsed single channel input of /OUT1 (static, LOW) |
| **30** | Pulsed single channel input of OUT2 (static, LOW) |
| **31** | Pulsed single channel input of /OUT2 (static, LOW) |
| **32** | Pulsed single channel input of OUT3 (static, LOW) |
| **33** | Pulsed single channel input of /OUT3 (static, LOW) |
| **34** | Pulsed single channel input of OUT4 (static, LOW) |
| **35** | Pulsed single channel input of /OUT4 (static, LOW) |

Default = 0 (min. = 0, max. = 35)

### 102 /IN1 Function

It sets a function to the [X10 : 3] input. For more information and the list of the available functions please refer to the **100 IN1 Function** parameter.
Default = 0 (min. = 0, max. = 22)

### 103 /IN1 Config

Switching behaviour of the [X10 : 3] input. For more information on the switching behaviours please refer to the **101 IN1 Config** parameter.
Default = 0 (min. = 0, max. = 35)

### 104 IN2 Function

It sets a function to the [X10 : 4] input. For more information and the list of the available functions please refer to the **100 IN1 Function** parameter.
Default = 0 (min. = 0, max. = 22)

### 105 IN2 Config

Switching behaviour of the [X10 : 4] input. For more information on the switching behaviours please refer to the **101 IN1 Config** parameter.
Default = 0 (min. = 0, max. = 35)

### 106 /IN2 Function

It sets a function to the [X10 : 5] input. For more information and the list of the available functions please refer to the **100 IN1 Function** parameter.
Default = 0 (min. = 0, max. = 22)

### 107 /IN2 Config

Switching behaviour of the [X10 : 5] input. For more information on the switching behaviours please refer to the **101 IN1 Config** parameter.
Default = 0 (min. = 0, max. = 35)

### 108 Input Mode

Input configuration.
It sets the input types according to the following table:

| | |
|---|---|
| **0** | Two dual channel input pairs |
| **1** | One dual channel input pair and two single inputs |
| **2** | Four single ended inputs |

Default = 0 (min. = 0, max. = 2)

### 109 Read Back Delay

Delay before the readback is active again.
Bounce time delay for an external relay of the EDM function. The value is expressed in seconds.
For complete information on the EDM function, please refer to the "12 – EDM Function" section on page 153. Refer also to the **093 Read Back OUT** parameter on page 202.
Default = 0.000 (min. = 0.000, max. = 1.000)

### 110 GPI Err Time

After the time set next to this item, illegal conditions of the GPI input results in an error. Value "1" corresponds to an error time of approx. 1 ms. So the default value of "10" corresponds to an error time of approx. 10 ms. See also the "7 - Error detection" section on page 97.
Default = 10 (min. = 1, max. = 999)

### 14.2.8 Serial menu

#### 111 Serial Unit Nr.

It allows to set a serial unit number.
It is possible to set a unit number between 11 and 99, the default setting is 11.
Unit numbers must not contain any "0" because such numbers are used for group- or bulk-addressing.
Default = 11 (min. = 11, max. = 99)

#### 112 Serial Baud Rate

It allows to set the serial transmission speed (baud rate).
Available options are:

| | | |
|---|---|---|
| **0** | **9 600 Baud** | **(default)** |
| **1** | 4 800 Baud | |
| **2** | 2 400 Baud | |
| **3** | 1 200 Baud | |
| **4** | 600 Baud | |
| **5** | 19 200 Baud | |
| **6** | 38 400 Baud | |
| **7** | 56 000 Baud | |
| **8** | 57 200 Baud | |
| **9** | 76 800 Baud | |
| **10** | 115 200 Baud | |

Default = 0 (min. = 0, max. = 10)

#### 113 Serial Format

It allows to set the format of the serial data.
Available options are (default values in bold):

| | Data bits | Parity | Stop bits |
|---|---|---|---|
| **0:** | **7** | **even** | **1** |
| **1:** | 7 | even | 2 |
| **2:** | 7 | odd | 1 |
| **3:** | 7 | odd | 2 |
| **4:** | 7 | no parity * | 1 |
| **5:** | 7 | no parity * | 2 |
| **6:** | 8 | even | 1 |
| **7:** | 8 | odd | 1 |
| **8:** | 8 | no parity * | 1 |
| **9:** | 8 | no parity * | 2 |

Default = 0 (min. = 0, max. = 9)

**WARNING**

* When the "no parity" option is set, a safe data transmission cannot be guaranteed. For a safer data transmission the parity bit must be set to "even" or "odd".

### 114 Serial Page

This parameter is only used for diagnosis purposes by the manufacturer.
Default = 0 (min. = 0, max. = 16)

### 115 Serial Init

This parameter allows to set the baud rate (see the 112 Serial Baud Rate parameter) for the transmission of the initialization values to either the OS software tool or the IFS-10-PM programming and display unit.

**0**: The initialization values will be transmitted at 9600 baud. After initialization the unit will operate according to the user settings again.

**1**: The initialization values will be transmitted according to the user defined baud rate. After initialization the unit will go on operating according to the user settings again.

Default = 0 (min. = 0, max. = 1)

**NOTE**

If you set transmission values higher than 9600 baud, the duration of the initialization procedure will be shortened.

### 116 Reserved

Reserved.

### 14.2.9 Splitter menu

Duplication (looping) of the sensor signals for further subsequent units.
IFS-10 and IFS-10S units only are equipped with the splitter function.
Refer also to the "4.11 RS-422 OUT, RS-422 splitter output ([X4] terminal block)" section on page 48.

#### 117 RS Selector

For IFS-10S model please read the information in the "14.2.1 Important notes for IFS-10S and IFS-10SA" section on page 167.

It allows to set the source of the RS-422 output. In other words it set which input frequency (Sensor 1 or Sensor 2) is output through the [X4 | RS422 OUT].
The type of input to be assigned to a channel can be set in the operating mode (see the **000 Operational mode** parameter, refer to the "14.2.2 Main menu" section on page 168).

**0**: Source = Sensor 1
A copy of the Sensor 1 input signal (as set next to the **000 Operational mode** parameter) is available at the [X4 | RS422 OUT] output (see the "4.11 RS-422 OUT, RS-422 splitter output ([X4] terminal block)" section on page 48).
Incremental RS-422 square wave pulses are always generated independently from the input signal.
If a Sine Cosine encoder is paired with the Sensor 1 input, the Sine Cosine signal will be converted into a square wave signal at output with 1 pulse / period (without interpolation).

**1**: Source = Sensor 2
A copy of the Sensor 2 input signal (as set next to the **000 Operational mode** parameter) is available at the [X4 | RS422 OUT] output (see the "4.11 RS-422 OUT, RS-422 splitter output ([X4] terminal block)" section on page 48).
Incremental RS-422 square wave pulses are always generated independently from the input signal.
If a Sine Cosine encoder is paired with the Sensor 2 input, the Sine Cosine signal will be converted into a square wave signal at output with 1 pulse / period (without interpolation).

Default = 0 (min. = 0, max. = 1)

**NOTE**
Incremental RS-422 square wave pulses are always generated independently from the input signal.

### 14.2.10 Analogue menu

This menu is used to configure the analogue output.
The **003 F1-F2 Selection** parameter allows to set which frequency (Sensor 1 or Sensor 2) is used to generate the analogue output signal.
Refer also to the "4.12 ANALOG OUT, 4 - 20 mA analogue output ([X4] terminal block)" section on page 49.

#### 118 Analog Start

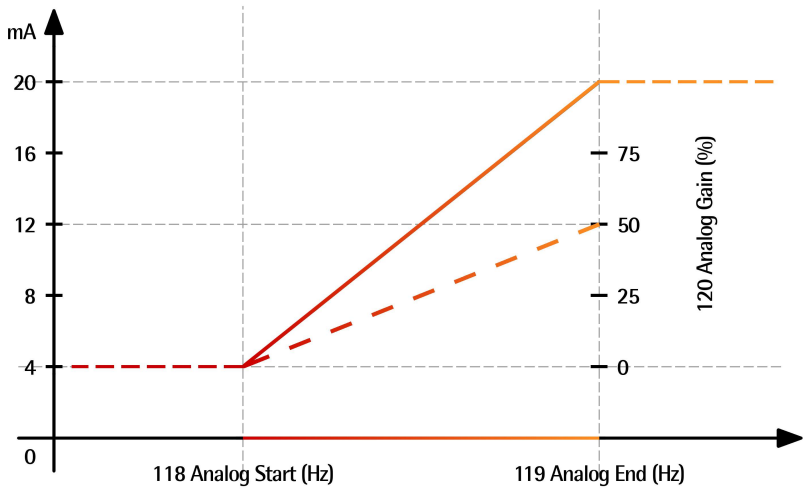
Starting value of the conversion range expressed in Hz.
This parameter allows to set the lower (starting) frequency that has to be paired with the 4 mA low limit of the analogue output range. The value is expressed in hertz (Hz).
Default = 0 (min. = -500 000.0, max. = 500 000.00)

#### 119 Analog End

Final value of the conversion range expressed in Hz.
This parameter allows to set the higher (last) frequency that has to be paired with the 20 mA high limit of the analogue output range. The value is expressed in hertz (Hz).
Default = 1000.00 (min. = -500 000.0, max. = 500 000.00)

#### 120 Analog Gain

Gain of the D/A converter expressed in percentage (%).
If you set "100" % the frequency ramp between **118 Analog Start** and **119 Analog End** parameters equals the whole ramp from 4 mA to 20 mA (the full range is 20 – 4 = 16 mA), see the solid line ramp in the Figure below.
Otherwise, if you set, for example, "50" %, the 16 mA full range is halved down to 8 mA and the analogue output can only reach a value of 4 + 8 = 12 mA at the higher limit set next to the **119 Analog End** parameter, see the dotted line ramp in the Figure below.
Default = 100 (min. = 1, max. = 1000)



### 121 Analog Offset

Fine adjustment of the zero point expressed in µA. This parameter allows an accurate adjustment of the analogue offset within a fine range. The value is expressed in µA.
Default = 0 (min. = -25, max. = +25)

### 122 Reserved

Reserved.

### 14.2.11 OPU menu

OPU is the Operation Unit menu when an IFS-10-PM is connected.

**NOTE**

Complete information on the parameters listed below can be found in the specific IFS-10-PM "User's guide".

#### 123 X Factor 1

No function for IFS-10, internal parameter of IFS-10-PM unit.
Default = 1 (min. = 1, max. = 999999)

#### 124 / Factor 1

No function for IFS-10, internal parameter of IFS-10-PM unit.
Default = 1 (min. = 1, max. = 999999)

#### 125 +/- Value 1

No function for IFS-10, internal parameter of IFS-10-PM unit.
Default = 0 (min. = -999999, max. = 999999)

#### 126 Units 1

No function for IFS-10, internal parameter of IFS-10-PM unit.
Default = 0 (min. = 0, max. = 12)

#### 127 Decimal Point 1

No function for IFS-10, internal parameter of IFS-10-PM unit.
Default = 0 (min. = 0, max. = 5)

#### 128 X Factor 2

No function for IFS-10, internal parameter of IFS-10-PM unit.
Default = 1 (min. = 1, max. = 999999)

#### 129 / Factor 2

No function for IFS-10, internal parameter of IFS-10-PM unit.
Default = 1 (min. = 1, max. = 999999)

#### 130 +/- Value 2

No function for IFS-10, internal parameter of IFS-10-PM unit.
Default = 0 (min. = -999999, max. = 999999)

### 131 Units 2

No function for IFS-10, internal parameter of IFS-10-PM unit.
Default = 0 (min. = 0, max. = 12)

### 132 Decimal Point 2

No function for IFS-10, internal parameter of IFS-10-PM unit.
Default = 0 (min. = 0, max. = 5)

### 133 Reserved

Reserved.

# 15 - Parameters list

| No. | Parameter | Min. Value | Max. Value | Default | Characters | Decimal Places | Serial Code |
|---|---|---|---|---|---|---|---|
| See the "14.2.2 Main menu" section on page 168 | | | | | | | |
| 000 | Operational mode | 0 | 9 | 0 | 1 | 0 | A0 |
| 001 | Sampling Time | 1 | 9999 | 1 | 4 | 3 | A1 |
| 002 | Wait Time | 10 | 9999 | 100 | 4 | 3 | A2 |
| 003 | F1-F2 Selection | 0 | 1 | 0 | 1 | 0 | A3 |
| 004 | Div. Switch %-f | 0 | 99999 | 10000 | 5 | 2 | A4 |
| 005 | Div. %-Value | 1 | 100 | 10 | 3 | 0 | A5 |
| 006 | Div. f-Value | 0 | 9999 | 3000 | 4 | 2 | A6 |
| 007 | Div. Calculation | 0 | 1 | 0 | 1 | 0 | A7 |
| 008 | Div. Filter | 0 | 20 | 1 | 2 | 0 | A8 |
| 009 | Error Simulation | 0 | 2 | 1 | 1 | 0 | A9 |
| 010 | Power-up Delay | 1 | 9999 | 100 | 4 | 3 | B0 |
| 011 | SIN error | 0 | 1 | 0 | 1 | 0 | B1 |
| 012 | Div. Mode | 0 | 2 | 0 | 1 | 0 | B2 |
| 013 | Div. Inc-Value | 0 | 9999999 | 0 | 7 | 0 | J2 |
| 014 | Filter | 0 | 999 | 0 | 3 | 0 | J3 |
| 015 | A-Edge 2/1 | 0 | 1 | 0 | 1 | 0 | J4 |
| 016 | Sensor Overlap | 0 | 2 | 0 | 1 | 0 | J5 |

| No. | Parameter | Min. Value | Max. Value | Default | Characters | Decimal Places | Serial Code |
|---|---|---|---|---|---|---|---|
| See the "14.2.3 Sensor 1 menu" section on page 175 | | | | | | | |
| 017 | Direction 1 | 0 | 1 | 0 | 1 | 0 | B3 |
| 018 | Multiplier 1 | 1 | 10000 | 1 | 5 | 0 | B4 |
| 019 | Divisor 1 | 1 | 10000 | 1 | 5 | 0 | B5 |
| 020 | Position Drift 1 | 0 | 100000 | 0 | 6 | 0 | B6 |
| 021 | Phase Err Count 1 | 1 | 1000 | 10 | 4 | 0 | B7 |
| 022 | Set Frequency 1 | -50000000 | 50000000 | 0 | 88 | 2 | B8 |
| 023 | SIN Err Time 1 | 0 | 99 | 0 | 2 | 0 | B9 |

| No. | Parameter | Min. Value | Max. Value | Default | Characters | Decimal Places | Serial Code |
|---|---|---|---|---|---|---|---|
| See the "14.2.4 Sensor 2 menu" section on page 178 | | | | | | | |
| 024 | Direction 2 | 0 | 1 | 0 | 1 | 0 | C0 |
| 025 | Multiplier 2 | 1 | 10000 | 1 | 5 | 0 | C1 |
| 026 | Divisor 2 | 1 | 10000 | 1 | 5 | 0 | C2 |
| 027 | Position Drift 2 | 0 | 100000 | 0 | 6 | 0 | C3 |
| 028 | Phase Err Count 2 | 1 | 1000 | 10 | 4 | 0 | C4 |
| 029 | Set Frequency 2 | -50000000 | 50000000 | 0 | 88 | 2 | C5 |
| 030 | SIN Err Time 2 | 0 | 99 | 0 | 2 | 0 | C6 |

| No. | Parameter | Min. Value | Max. Value | Default | Characters | Decimal Places | Serial Code |
|---|---|---|---|---|---|---|---|
| See the "14.2.5 Preselect menu" section on page 181 | | | | | | | |
| 031 | Preselect OUT1.H | -50000000 | 50000000 | 200000 | 88 | 2 | C7 |
| 032 | Preselect OUT1.L | -50000000 | 50000000 | 100000 | 88 | 2 | C8 |
| 033 | Preselect OUT1.D | -50000000 | 50000000 | 0 | 7 | 0 | M0 |
| 034 | Preselect OUT2.H | -50000000 | 50000000 | 400000 | 88 | 2 | C9 |
| 035 | Preselect OUT2.L | -50000000 | 50000000 | 300000 | 88 | 2 | D0 |
| 036 | Preselect OUT2.D | -50000000 | 50000000 | 0 | 7 | 0 | M1 |
| 037 | Preselect OUT3.H | -50000000 | 50000000 | 600000 | 88 | 2 | D1 |
| 038 | Preselect OUT3.L | -50000000 | 50000000 | 500000 | 88 | 2 | D2 |
| 039 | Preselect OUT3.D | -50000000 | 50000000 | 0 | 7 | 0 | M2 |
| 040 | Preselect OUT4.H | -50000000 | 50000000 | 800000 | 88 | 2 | D3 |
| 041 | Preselect OUT4.L | -50000000 | 50000000 | 700000 | 88 | 2 | D4 |
| 042 | Preselect OUT4.D | -50000000 | 50000000 | 0 | 7 | 0 | M3 |
| 043 | Preselect REL1.H | -50000000 | 50000000 | 20000 | 88 | 2 | D5 |
| 044 | Preselect REL1.L | -50000000 | 50000000 | 10000 | 88 | 2 | D6 |
| 045 | Preselect REL1.D | -50000000 | 50000000 | 0 | 7 | 0 | M4 |
| 046 | Preselect OUT1.F | 1 | 50000000 | 10000000 | 8 | 4 | N0 |
| 047 | Preselect OUT2.F | 1 | 50000000 | 10000000 | 8 | 4 | N1 |
| 048 | Preselect OUT3.F | 1 | 50000000 | 10000000 | 8 | 4 | N2 |
| 049 | Preselect OUT4.F | 1 | 50000000 | 10000000 | 8 | 4 | N3 |
| 050 | Preselect REL1.F | 1 | 50000000 | 10000000 | 8 | 4 | N4 |
| 051 | Reserved | 0 | 10000 | 1000 | 5 | 0 | D8 |

| No. | Parameter | Min. Value | Max. Value | Default | Characters | Decimal Places | Serial Code |
|---|---|---|---|---|---|---|---|
| See the "14.2.6 Switching menu" section on page 186 | | | | | | | |
| 052 | Switch Mode OUT1 | 0 | 22 | 0 | 1 | 0 | D9 |
| 053 | Switch Mode OUT2 | 0 | 22 | 0 | 1 | 0 | E0 |
| 054 | Switch Mode OUT3 | 0 | 22 | 0 | 1 | 0 | E1 |
| 055 | Switch Mode OUT4 | 0 | 22 | 0 | 1 | 0 | E2 |
| 056 | Switch Mode REL1 | 0 | 22 | 0 | 1 | 0 | E3 |
| 057 | Pulse Time OUT1 | 0 | 9999 | 0 | 4 | 3 | E4 |
| 058 | Pulse Time OUT2 | 0 | 9999 | 0 | 4 | 3 | E5 |
| 059 | Pulse Time OUT3 | 0 | 9999 | 0 | 4 | 3 | E6 |
| 060 | Pulse Time OUT4 | 0 | 9999 | 0 | 4 | 3 | E7 |
| 061 | Pulse Time REL1 | 0 | 9999 | 0 | 4 | 3 | E8 |
| 062 | Hysteresis OUT1 | 0 | 1000 | 0 | 4 | 1 | E9 |
| 063 | Hysteresis OUT2 | 0 | 1000 | 0 | 4 | 1 | F0 |
| 064 | Hysteresis OUT3 | 0 | 1000 | 0 | 4 | 1 | F1 |
| 065 | Hysteresis OUT4 | 0 | 1000 | 0 | 4 | 1 | F2 |
| 066 | Hysteresis REL1 | 0 | 1000 | 0 | 4 | 1 | F3 |
| 067 | Matrix OUT1 | 0 | 511 | 0 | 3 | 0 | K0 |
| 068 | Matrix OUT2 | 0 | 511 | 0 | 3 | 0 | K1 |
| 069 | Matrix OUT3 | 0 | 511 | 0 | 3 | 0 | K2 |
| 070 | Matrix OUT4 | 0 | 511 | 0 | 3 | 0 | K3 |
| 071 | Matrix REL1 | 0 | 511 | 0 | 3 | 0 | K4 |
| 072 | MIA-Delay OUT1 | 0 | 99999 | 0 | 5 | 0 | K5 |
| 073 | MIA-Delay OUT2 | 0 | 99999 | 0 | 5 | 0 | K6 |
| 074 | MIA-Delay OUT3 | 0 | 99999 | 0 | 5 | 0 | K7 |
| 075 | MIA-Delay OUT4 | 0 | 99999 | 0 | 5 | 0 | K8 |
| 076 | MIA-Delay REL1 | 0 | 99999 | 0 | 5 | 0 | K9 |
| 077 | MAI-Delay OUT1 | 0 | 99999 | 0 | 5 | 0 | L0 |
| 078 | MAI-Delay OUT2 | 0 | 99999 | 0 | 5 | 0 | L1 |
| 079 | MAI-Delay OUT3 | 0 | 99999 | 0 | 5 | 0 | L2 |
| 080 | MAI-Delay OUT4 | 0 | 99999 | 0 | 5 | 0 | L3 |
| 081 | MAI-Delay REL1 | 0 | 99999 | 0 | 5 | 0 | L4 |
| 082 | Delay OUT1 | 0 | 9999 | 0 | 4 | 3 | N5 |
| 083 | Delay OUT2 | 0 | 9999 | 0 | 4 | 3 | N6 |
| 084 | Delay OUT3 | 0 | 9999 | 0 | 4 | 3 | N7 |
| 085 | Delay OUT4 | 0 | 9999 | 0 | 4 | 3 | N8 |
| 086 | Delay REL1 | 0 | 9999 | 0 | 4 | 3 | N9 |
| 087 | Start-up Mode | 0 | 9 | 0 | 1 | 0 | F4 |
| 088 | Start-up Output | 0 | 31 | 0 | 2 | 0 | F5 |
| 089 | Standstill Time | 0 | 9999 | 0 | 4 | 3 | F6 |

(to be continued in the next page)

| No. | Parameter | Min. Value | Max. Value | Default | Characters | Decimal Places | Serial Code |
|---|---|---|---|---|---|---|---|
| See the "14.2.6 Switching menu" section on page 186 (continued from the previous page) | | | | | | | |
| 090 | Lock Output | 0 | 63 | 0 | 2 | 0 | F7 |
| 091 | Action Output | 0 | 31 | 0 | 2 | 0 | F8 |
| 092 | Action Polarity | 0 | 511 | 0 | 3 | 0 | F9 |
| 093 | Read Back OUT | 0 | 31 | 0 | 2 | 0 | G0 |
| 094 | Output Mode | 0 | 15 | 0 | 2 | 0 | G1 |
| 095 | Reserved | 0 | 10000 | 1000 | 5 | 0 | H2 |
| 096 | Reserved | 0 | 10000 | 1000 | 5 | 0 | H3 |
| 097 | Reserved | 0 | 10000 | 1000 | 5 | 0 | H4 |
| 098 | Reserved | 0 | 10000 | 1000 | 5 | 0 | J0 |
| 099 | Reserved | 0 | 10000 | 1000 | 5 | 0 | J1 |

| No. | Parameter | Min. Value | Max. Value | Default | Characters | Decimal Places | Serial Code |
|---|---|---|---|---|---|---|---|
| See the "14.2.7 Control menu" section on page 204 | | | | | | | |
| 100 | IN1 Function | 0 | 22 | 0 | 2 | 0 | G2 |
| 101 | IN1 Config | 0 | 35 | 0 | 2 | 0 | G3 |
| 102 | /IN1 Function | 0 | 22 | 0 | 2 | 0 | I0 |
| 103 | /IN1 Config | 0 | 35 | 0 | 2 | 0 | I1 |
| 104 | IN2 Function | 0 | 22 | 0 | 2 | 0 | G4 |
| 105 | IN2 Config | 0 | 35 | 0 | 2 | 0 | G5 |
| 106 | /IN2 Function | 0 | 22 | 0 | 2 | 0 | I2 |
| 107 | /IN2 Config | 0 | 35 | 0 | 2 | 0 | I3 |
| 108 | Input Mode | 0 | 2 | 0 | 1 | 0 | I4 |
| 109 | Read Back Delay | 0 | 1000 | 0 | 4 | 3 | G6 |
| 110 | GPI Err Time | 1 | 999 | 10 | 3 | 0 | G7 |

| No. | Parameter | Min. Value | Max. Value | Default | Characters | Decimal Places | Serial Code |
|---|---|---|---|---|---|---|---|
| See the "14.2.8 Serial menu" section on page 210 | | | | | | | |
| 111 | Serial Unit Nr. | 11 | 99 | 11 | 2 | 0 | 90 |
| 112 | Serial Baud Rate | 0 | 10 | 0 | 2 | 0 | 91 |
| 113 | Serial Format | 0 | 9 | 0 | 1 | 0 | 92 |
| 114 | Serial Page | 0 | 16 | 0 | 2 | 0 | ~0 |
| 115 | Serial Init | 0 | 1 | 0 | 1 | 0 | 9~ |
| 116 | Reserved | 0 | 10000 | 1000 | 5 | 0 | H0 |

| No. | Parameter | Min. Value | Max. Value | Default | Characters | Decimal Places | Serial Code |
|---|---|---|---|---|---|---|---|
| See the "14.2.9 Splitter menu" section on page 212 | | | | | | | |
| 117 | RS Selector | 0 | 1 | 0 | 1 | 0 | H1 |

| No. | Parameter | Min. Value | Max. Value | Default | Characters | Decimal Places | Serial Code |
|---|---|---|---|---|---|---|---|
| See the "14.2.10 Analogue menu" section on page 213 | | | | | | | |
| 118 | Analog Start | -50000000 | 50000000 | 0 | 88 | 1 | H5 |
| 119 | Analog End | -50000000 | 50000000 | 1000000 | 88 | 1 | H6 |
| 120 | Analog Gain | 1 | 1000 | 100 | 4 | 0 | H7 |
| 121 | Analog Offset | -25 | 25 | 0 | 83 | 0 | H8 |
| 122 | Reserved | 0 | 10000 | 1000 | 5 | 0 | H9 |

| No. | Parameter | Min. Value | Max. Value | Default | Characters | Decimal Places | Serial Code |
|---|---|---|---|---|---|---|---|
| See the "14.2.11 OPU menu" section on page 215 | | | | | | | |
| 123 | X Factor 1 | 1 | 999999 | 1 | 6 | 0 | z0 |
| 124 | / Factor 1 | 1 | 999999 | 1 | 6 | 0 | z1 |
| 125 | +/- Value 1 | -999999 | 999999 | 0 | 86 | 0 | z2 |
| 126 | Units 1 | 0 | 12 | 0 | 2 | 0 | z3 |
| 127 | Decimal Point 1 | 0 | 5 | 0 | 1 | 0 | z4 |
| 128 | X Factor 2 | 1 | 999999 | 1 | 6 | 0 | z5 |
| 129 | / Factor 2 | 1 | 999999 | 1 | 6 | 0 | z6 |
| 130 | +/- Value 2 | -999999 | 999999 | 0 | 86 | 0 | z7 |
| 131 | Units 2 | 0 | 12 | 0 | 2 | 0 | z8 |
| 132 | Decimal Point 2 | 0 | 5 | 0 | 1 | 0 | z9 |
| 133 | Reserved | 0 | 10000 | 1000 | 5 | 0 | 00 |

This page intentionally left blank

This page intentionally left blank

| Document release | Release date | Description | HW | SW | File version |
|---|---|---|---|---|---|
| 1.0 | 31.05.2016 | First issue | - | - | 01a, 03a, 03b, 04a, 04b |
| 1.1 | 04.05.2022 | Monitoring functions added, inputs and outputs wiring updated, new parameters and functions added | - | - | 04c, 04d, 04e, 04f, 05a, 06c, 07a, 07b |


Dispose separately

**Lika Electronic**
Via S. Lorenzo, 25 • 36010 Carrè (VI) • Italy

Tel. +39 0445 806600
Fax +39 0445 806699

info@lika.biz • www.lika.biz