User's guide

IFS-10

Safety controller for incremental encoders

lika

Smart encoders & actuators

General contents

Subject Index

1

A

C

D

E

F

G

H

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 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 **sin/cos 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: SLS, SSM, SS1, SS2, SOS, SDI.
IFS-10 connects at input two incremental encoders or a single redundant encoder (for instance the magnetic SGSD) with either sin/cos 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 sin/cos splitter output, 1 RS422 splitter output, 1 force guided redundant relay output (NO), 4 HTL inverse redundant control outputs and 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 and 2 RS422 inputs, analogue output and signal splitter
- IFS-10A: safety monitor with 2 sine cosine and 2 RS422 inputs and analogue output
- IFS-10S: safety monitor with SIL3 sine cosine input, analogue output and signal splitter
- IFS-10SA: safety monitor with SIL3 sine cosine input and analogue output
- 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
- 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)
- Easy Parametrization via USB interface and Operator Surface OS6.0 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;
- in compliance with the 2004/108/EC norm on electromagnetic compatibility, 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;
- 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

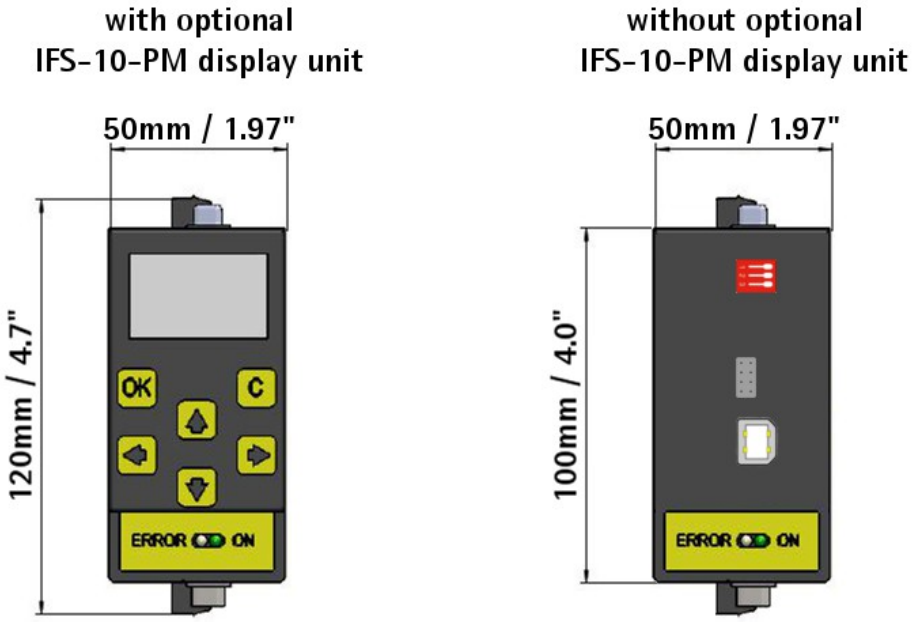


Figure 1 - Frontal view

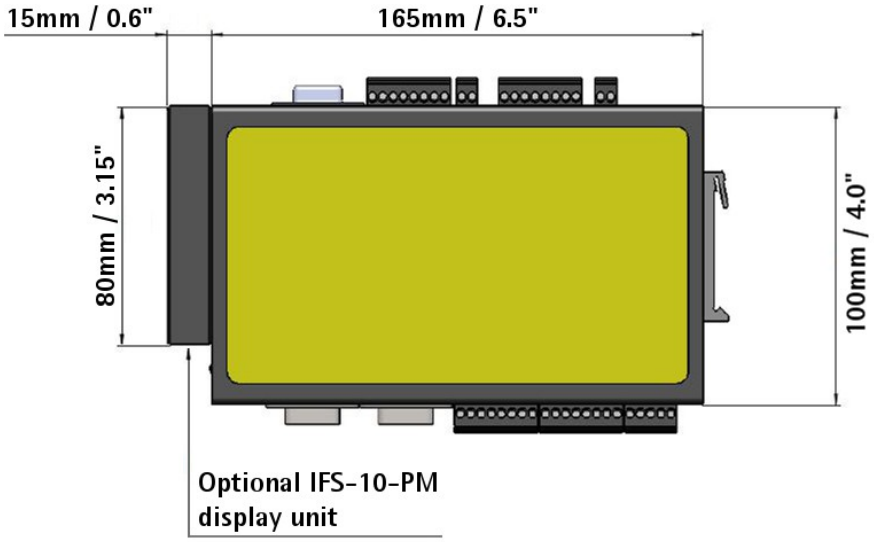


Figure 2 - Lateral view

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 all direct contact between the device and hot or aggressive gases and liquids.
Before installation or maintenance, the unit must be disconnected from all voltage sources. Furthermore it must be ensured that no danger can arise in the event of contact with the disconnected voltage sources.
Devices which are supplied by 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) with built-in DIN rail clips that require no additional brackets or supports.

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 Block diagrams and connections

4.1.1. IFS-10 block diagram

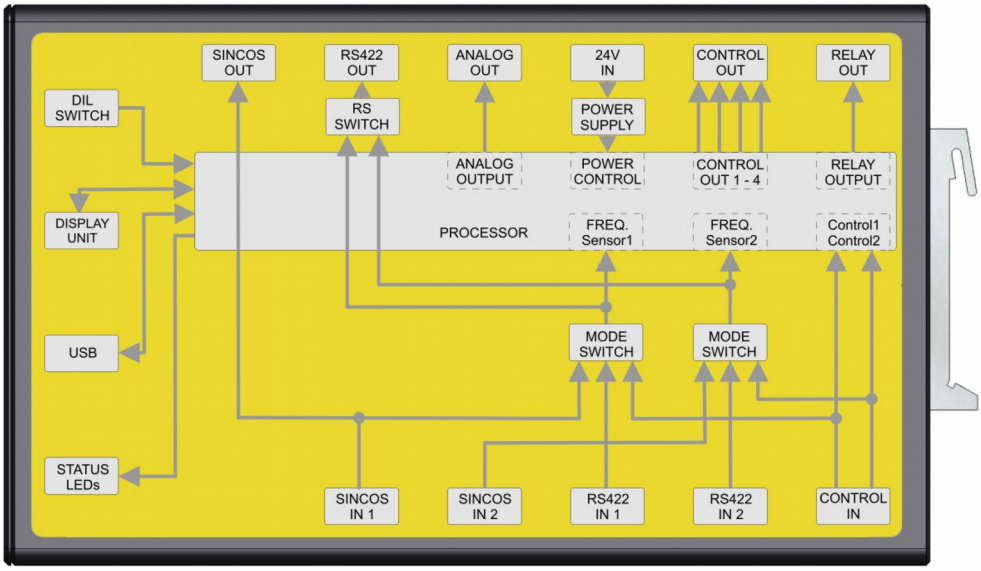


Figure 3 - IFS-10 block diagram

4.1.2 IFS-10 connections

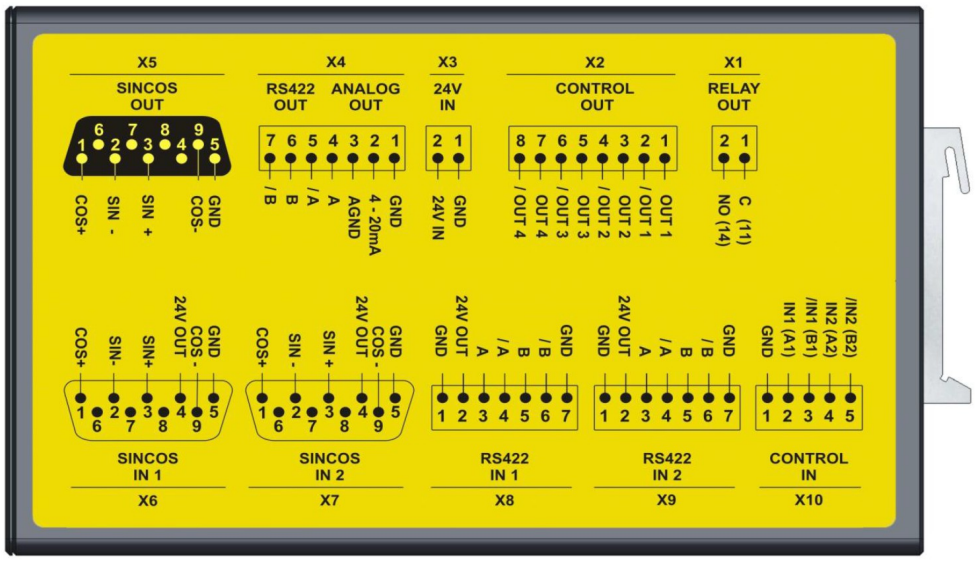


Figure 4 - IFS-10 connections

4.1.3 IFS-10A block diagram

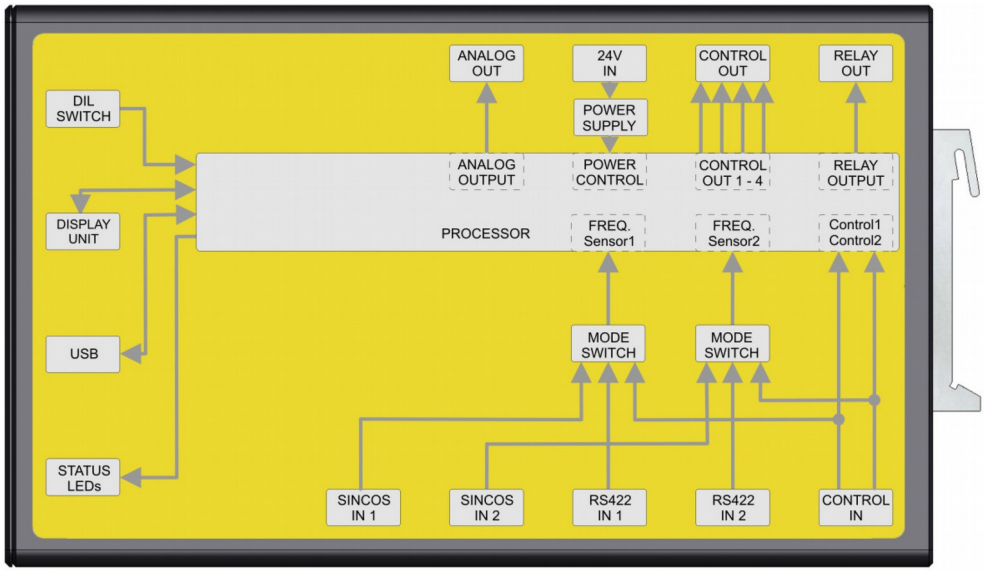


Figure 5 - IFS-10A block diagram

4.1.4 IFS-10A connections

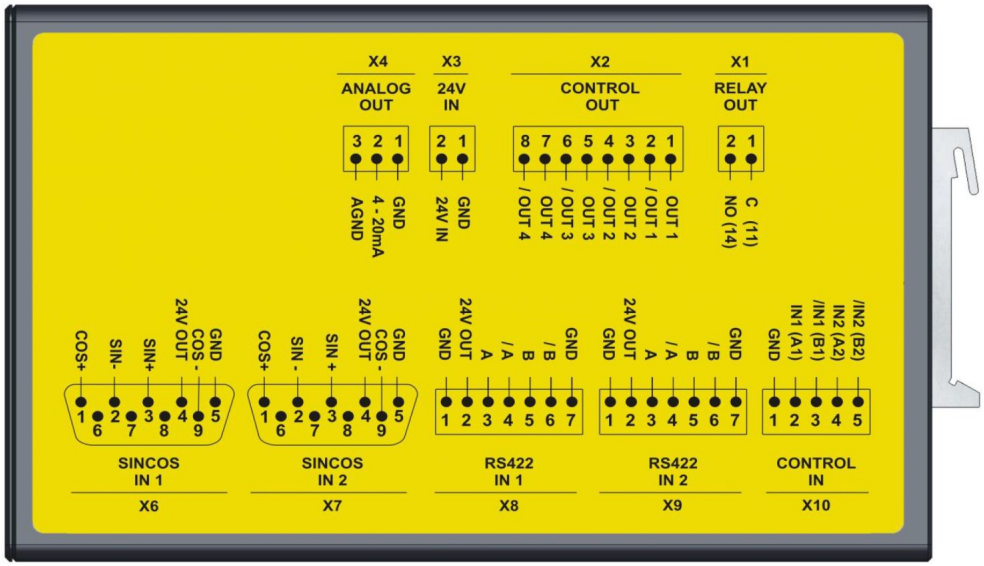


Figure 6 - IFS-10A connections

4.1.5 IFS-10S block diagram

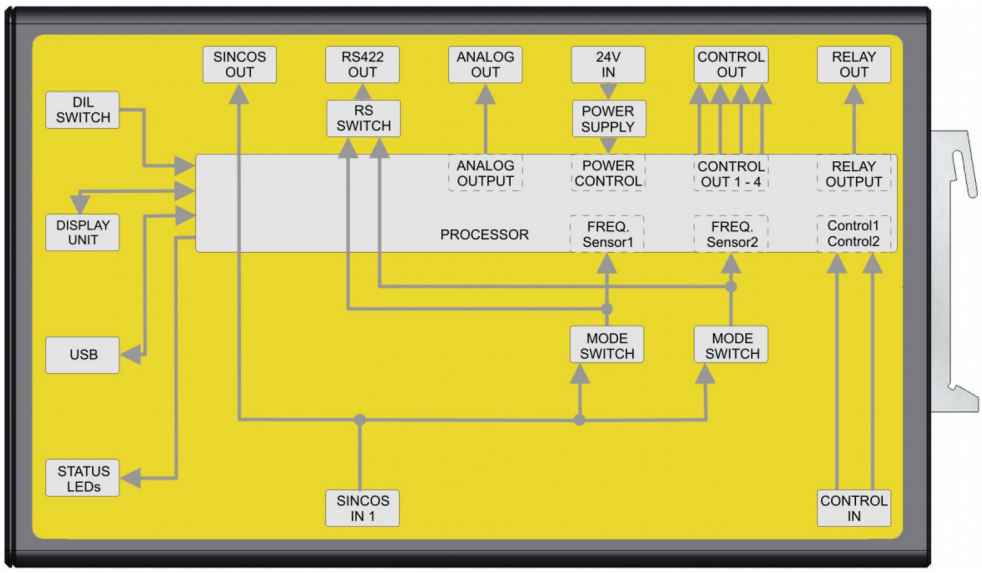


Figure 7 - IFS-10S block diagram

4.1.6 IFS-10S connections

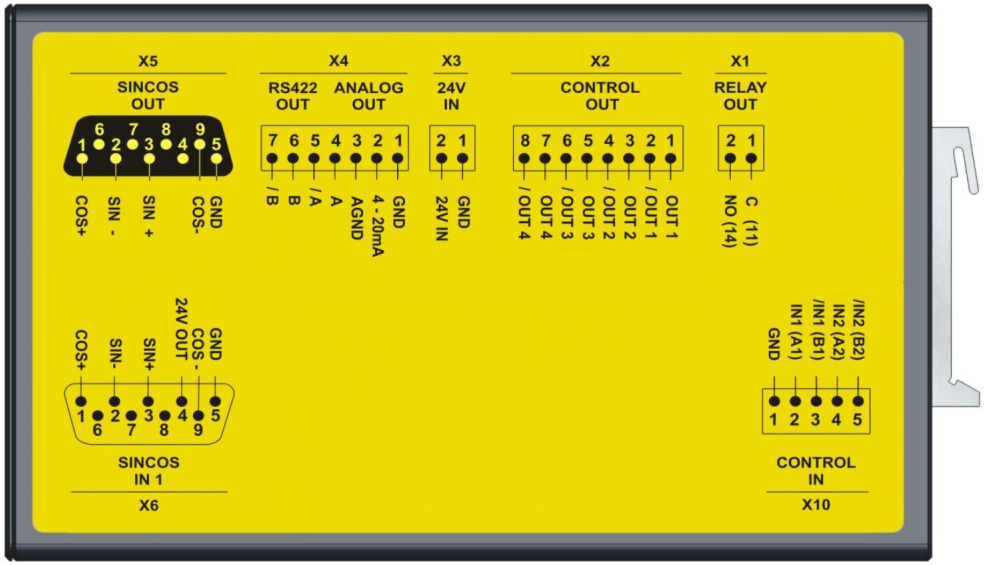


Figure 8 - IFS-10S connections

4.1.7 IFS-10SA block diagram

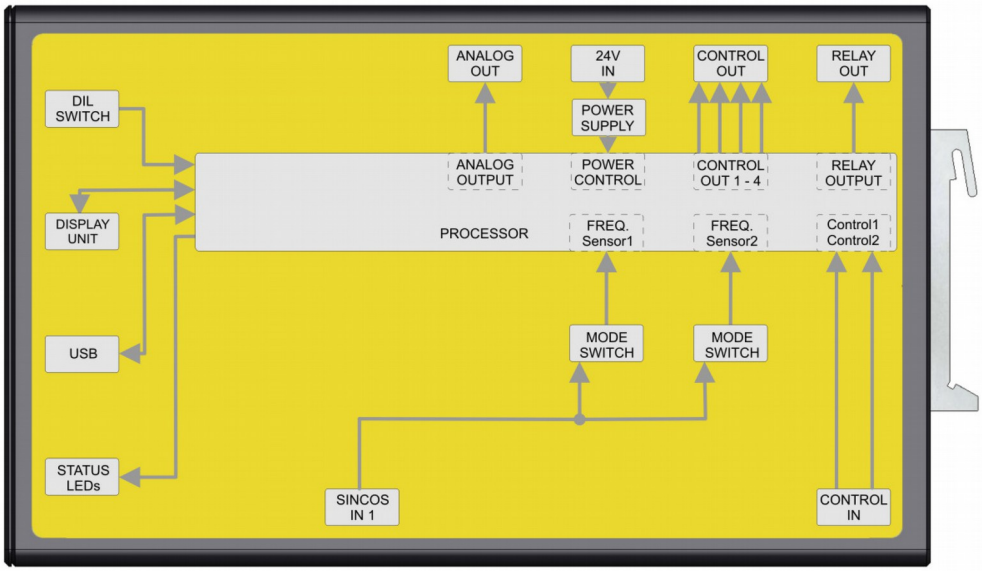


Figure 9 - IFS-10SA block diagram

4.1.8 IFS-10SA connections

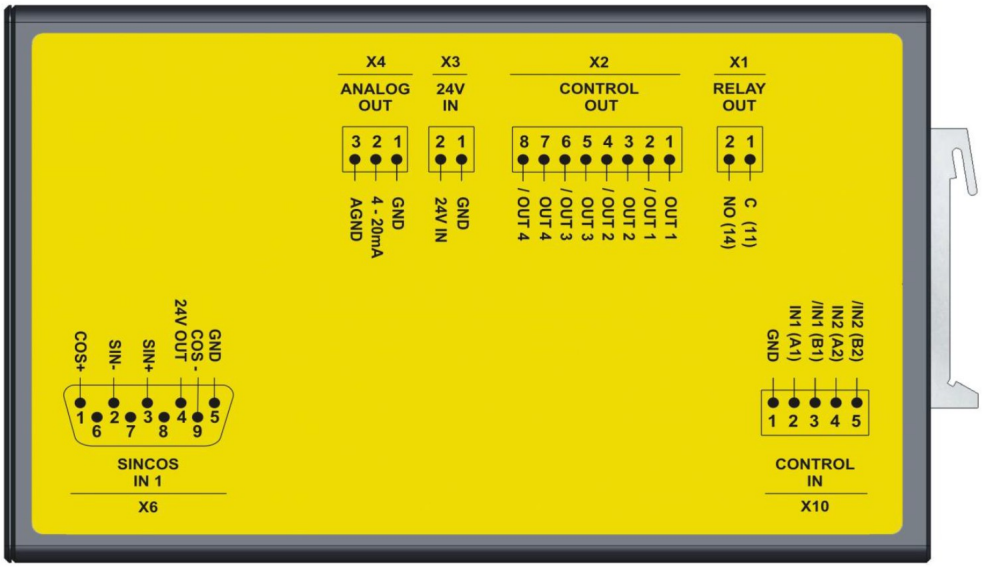


Figure 10 - IFS-10SA connections

4.2 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 please refer to the specific section.

Available connections	Complete description, see the section ...
X1 | RELAY OUT	"4.11 RELAY OUT, relay output ([X1] terminal block)", page 46
X2 | CONTROL OUT	"4.10 CONTROL OUT, HTL control outputs ([X2] terminal block)", page 44
X3 | 24V IN	"4.3 Power supply", page 28
X4 | ANALOG OUT	"4.9 ANALOG OUT, 4 - 20 mA analogue output ([X4] terminal block)", page 43
X4 | RS-422 OUT	"4.8 RS-422 OUT, RS-422 splitter output ([X4] terminal block)", page 42
X5 | SINCOS OUT	"4.7 SINCOS OUT, sine cosine splitter output ([X5] connector)", page 41
X6 | SINCOS IN 1	"4.4 SINCOS IN 1-2, sine cosine inputs ([X6] and [X7] connectors)", page 34
X7 | SINCOS IN 2	"4.4 SINCOS IN 1-2, sine cosine inputs ([X6] and [X7] connectors)", page 34
X8 | RS-422 IN 1	"4.5 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)", page 36
X9 | RS-422 IN 2	"4.5 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)", page 36
X10 | CONTROL IN	"4.6 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)", page 37
X11 | 8-PIN CONNECTOR	"4.13 Interface for connecting the IFS-10-PM display unit ([X11] connector)", page 50
X12 | USB PORT	"4.14 Interface for the OS6.x software tool ([USB] port)", page 51
S1 | DIP SWITCH	"4.12 DIL switch ([S1] DIP switch)", page 48
ERROR – ON LEDs	"4.15 Diagnostic LEDs", page 52

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.

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.

4.3 Power supply

4.3.1 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 further 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.

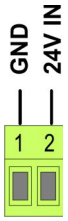


Figure 11 - [X3] pluggable 2-pin screw terminal block

WARNING

The 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.

4.3.2 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 "4.3.2.1 Direct encoder supply" section on page 31) or by means of an external power supply via a relay (see the "4.3.2.2 External encoder supply" section on page 32).

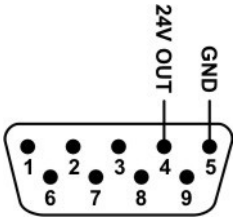


Figure 12 - Encoder supply: [X6] - [X7] sine cosine inputs

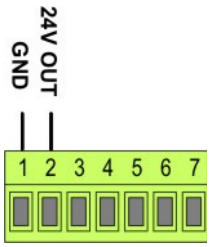


Figure 13 - Encoder supply: [X8] - [X9] RS-422 inputs
HTL (Push-Pull) encoders or sensors must be connected also to the encoder supply of the RS-422 inputs

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 can be exceeded due to different encoders. In this case, the encoder power supply will not be enabled and an error will appear (see the "8 - Error detection" section on page 129).

In case of such problems or if another voltage level is required, the encoder can be supplied by means of an external voltage source via a relay. The relay activation must be performed by the encoder supply of the safety unit (see the "4.3.2.2 External encoder supply" section on page 32).

WARNING

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

WARNING

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

4.3.2.1 Direct encoder supply

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

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]

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

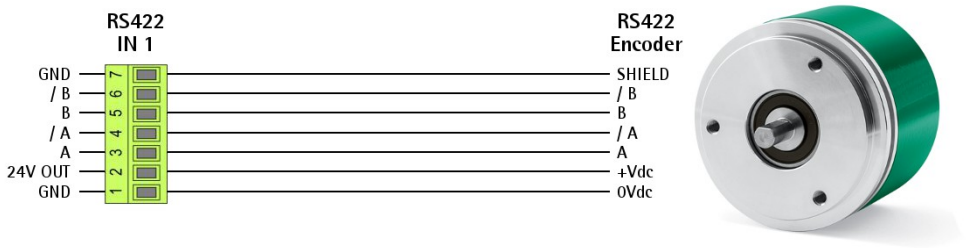


Figure 14 - Direct encoder supply Example

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

4.3.2.2 External encoder supply

An external (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 encoder supply will only be available after initialization and self-test of the unit.
In case of an indirect encoder supply, two independent supply voltages and relays must be used.

EXAMPLE 1

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

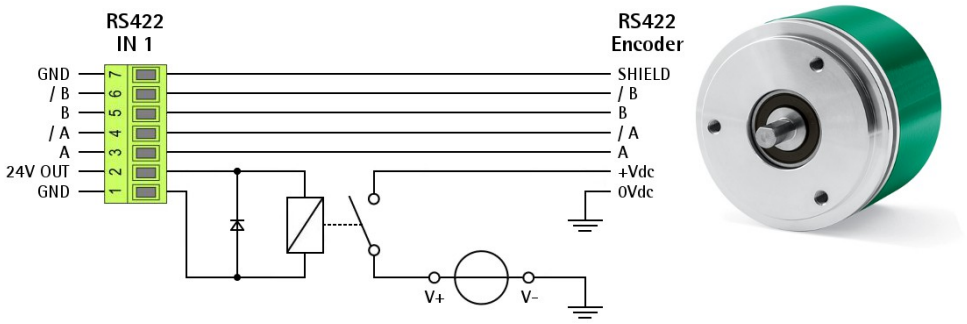


Figure 15 - External encoder supply Example 1

WARNING
An external (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 voltages and relays must be used.

EXAMPLE 2

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

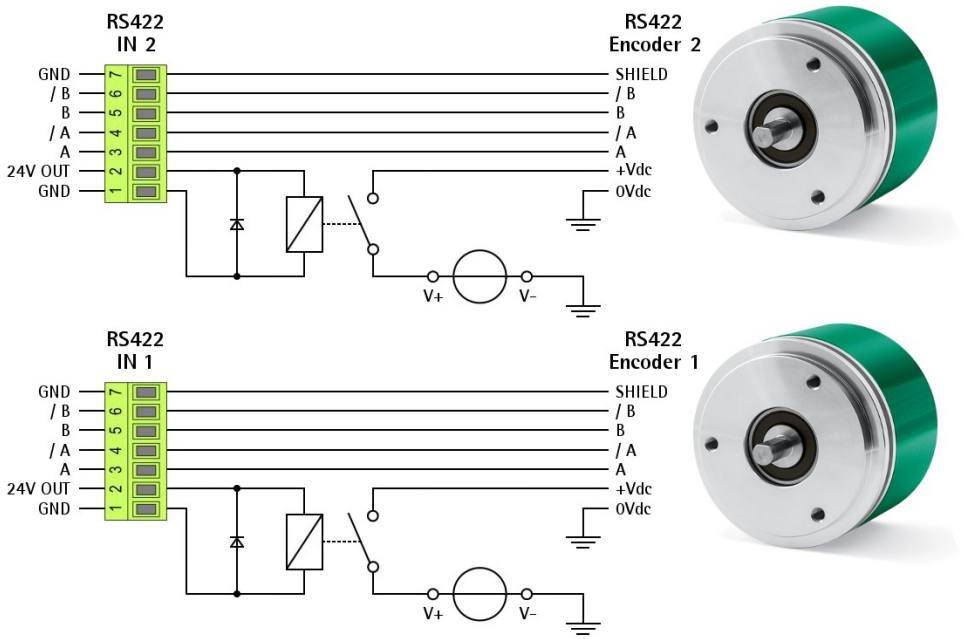


Figure 16 - External encoder supply Example 2

WARNING

An external (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 voltages and relays must be used.

4.4 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]*, SUB-D (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.

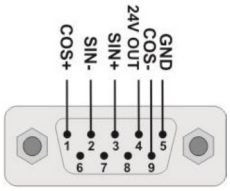


Figure 17 - Male SUB-D 9-pin connectors: [X6] - [X7] sine cosine inputs

The unit is suitable to connect sine cosine encoders and sensors with differential sine cosine input signals having 1 Vpp and 2.5 V DC offset.
For IFS-10 and IFS-10A models the operational mode (see the **000 Operational mode** parameter, refer to the "7.2.2 Main menu" section on page 86) must be set to **0**,**1**, **2** or **6**. The sine cosine encoder must be connected through the [X6] and/or [X7] 9-pin SUB-D connectors (either connector or both).
For IFS-10S and IFS-10SA models the operational mode (see the **000 Operational mode** parameter, refer to the "7.2.2 Main menu" section on page 86) must be set to **0**. The sine cosine encoder must be connected through the [X6] 9-pin SUB-D 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 signal line 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 "4.3.2 Encoder supply" section on page 29).

WARNING
An evaluation of any existing reference signals (0 and /0) is not applicable and therefore no connection pins are available.

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.

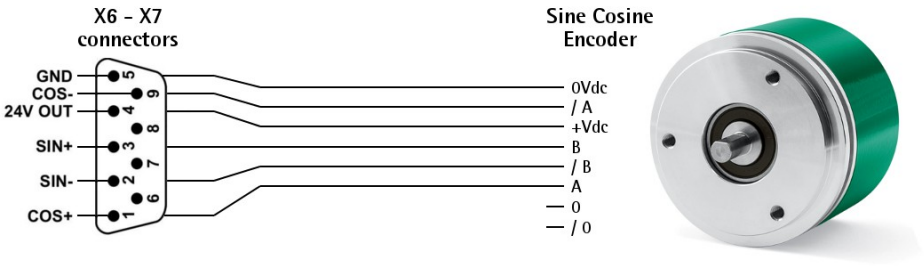


Figure 18 - [X6] and [X7] male SUB-D connectors

4.5 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 "7.2.2 Main menu" section on page 86), 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 "4.3.2 Encoder supply" section on page 29).

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.

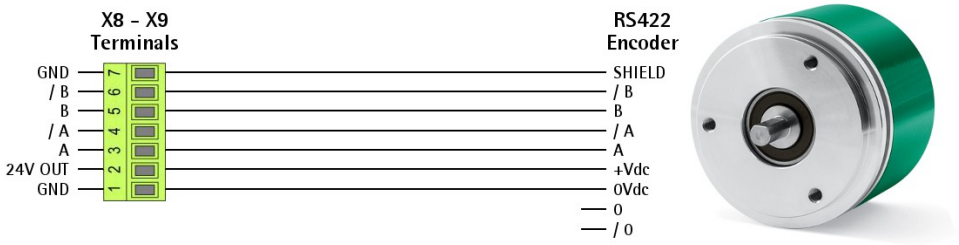


Figure 19 - [X8] and [X9] pluggable 7-pin screw terminal

4.6 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 "7.2.2 Main menu" section on page 86), the Control inputs can be configured as frequency or command inputs:

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

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

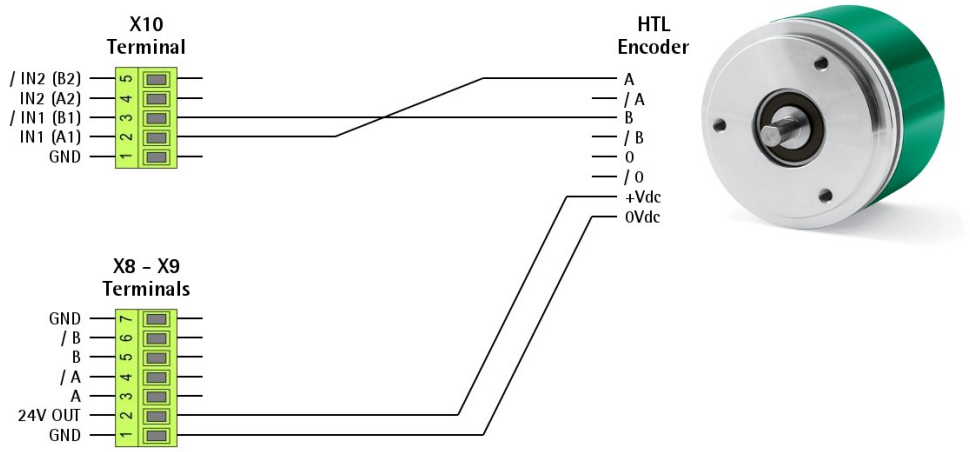


Figure 20 - [X10] screw terminal block for AB signal HTL encoders

WARNING

HTL encoders must be supplied by the encoder supply of the RS-422 inputs (X8-X9 terminal blocks, refer to the "4.3.2 Encoder supply" section on page 29). Please make sure to comply with the allowed frequencies.

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] [X10:3]	Channel A not connected/direction sign.
Sensor 2	[X10 | CONTROL IN]	Incremental HTL encoder	[X10:4] [X10:5]	Channel A 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.

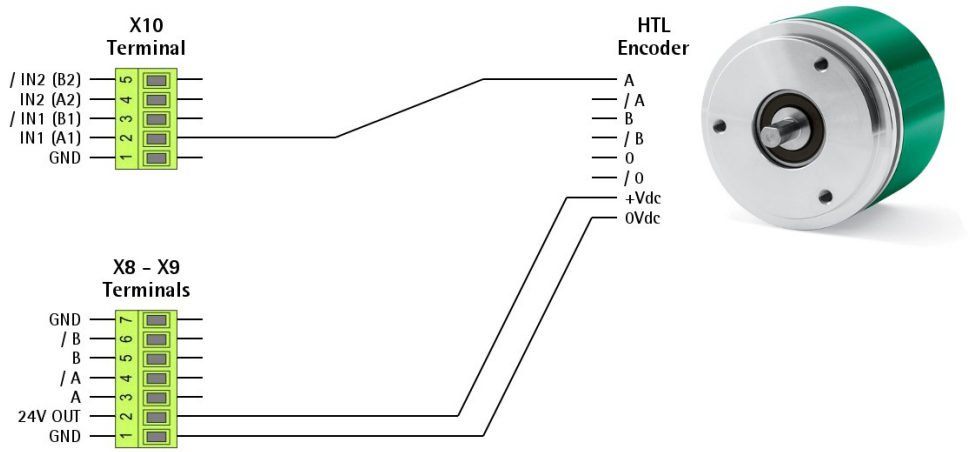


Figure 21 - [X10] screw terminal block for A signal HTL encoders

WARNING
HTL encoders must be supplied by the encoder supply of the RS-422 inputs (X8-X9 terminal blocks, refer to the "4.3.2 Encoder supply" section on page 29). Please make sure to comply with the allowed frequencies.

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

Two inverse control inputs for HTL commands

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

Basically the inverse signal must be always applied to the inverted input. Any homogeneous 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 "7.2.7 Control menu" section on page 116. The configuration of the inputs will affect the SIL level.

Two homogeneous control inputs for HTL commands

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

Basically the homogeneous or same signal must be always applied to the inverted input. Any inverse 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 "7.2.7 Control menu" section on page 116. The configuration of the inputs will affect the SIL level.

Four single control inputs for HTL commands

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

For further information on the command inputs please refer to the "7.2.7 Control menu" section on page 116. The configuration of the inputs will affect the SIL level.

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

Input 1	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:2] [X10:3]	Control signal 1 Homogeneous / inverse control signal 1
Input 2	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:4]	Control signal 2
Input 3	[X10 | CONTROL IN]	HTL/PNP control signal	[X10:5]	Control signal 3

Basically the homogeneous or inverse signal must be always applied to the inverted input. Any remaining 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 "7.2.7 Control menu" section on page 116. The configuration of the inputs will affect the SIL level.

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 commands then.
- With IFS-10S / IFS-10SA models, all four channels can be used as control inputs for external commands.
- When using uni-directional channel encoder, the associated second input is not suitable for other functions (e.g. direction signal).
- Transitional on some housing prints "IN1 ... IN4" can be found as designation for the CONTROL IN signals of terminal X10. The meanings of the terms are: IN1 = IN1, /IN1 = IN2, IN2 = IN3, /IN2 = IN4.

4.7 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 34)
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 "7.2.2 Main menu" section on page 86), the integrated splitter exports the signals at the SINCOS IN1 [X6] input to the [X5 | SINCOS OUT] 9-pin female SUB-D 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 and is able to detect the offset error.

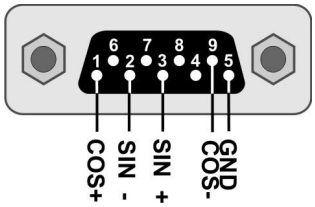


Figure 22 - [X5] 9-pin female SUB-D connector

WARNING
SIN+ / SIN- and COS+ / COS- channels must be terminated by 120 ohm load resistors at the subsequent device.

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

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

RS422 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
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 "7.2.2 Main menu" section on page 86). The splitter output allows to reproduce the inputs frequency of Sensor1 or Sensor2.
Independently from the input signal (sine cosine or HTL signal), the output signal provided to [X4] RS422 OUT output is always an incremental RS-422 square wave signal.
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 connection to the RS-422 splitter output is 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.

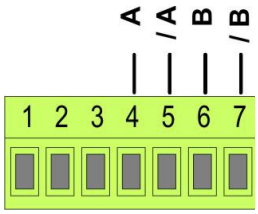


Figure 23 - [X4] pluggable 7-pin screw terminal block

[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]

4.9 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 (see the "7.2.10 Analogue menu" section on page 125). 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 "7.2.2 Main menu" section on page 86). 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 cable 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.

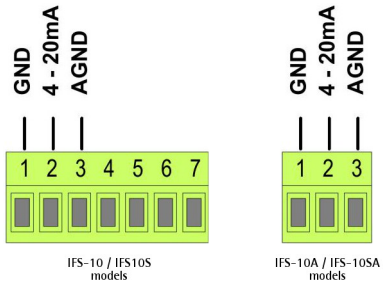


Figure 24 - [X4] pluggable 7-pin / 3-pin screw terminal block

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

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

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

[X4 | ANALOG OUT]	analogue output	[X4:1-3]
[X4 | RS422 OUT]	not available!	

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 cable break).

4.10 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 conditions and behaviour are adjustable by setting some parameters (see the "7.2.5 Preselect menu" section on page 97 and the "7.2.6 Switching menu" section on page 101).
When the output is at HIGH level, it is about 2 V below the supply voltage which is connected to the [X3 | 24V IN] terminal block. The outputs are short circuit proof and push-pull outputs.
We recommend additional external suppression measures when switching inductive loads.

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

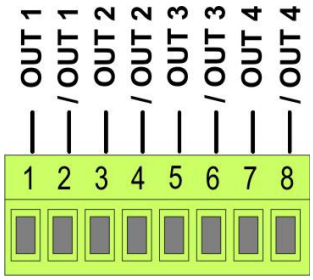
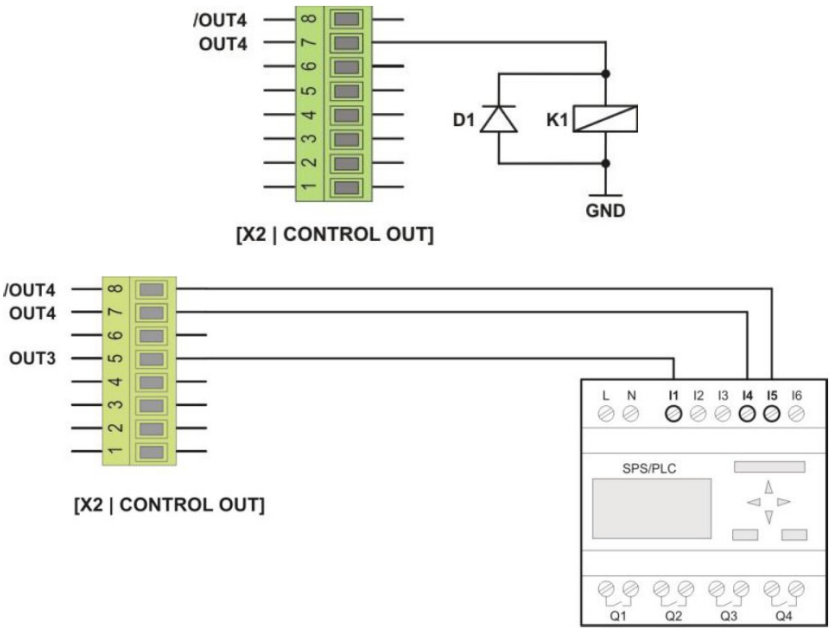


Figure 25 - [X2] pluggable 8-pin screw terminal block

EXAMPLE
Wiring example.



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

Relay output technical specifications

Number of relays:	two 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 "7.2.5 Preselect menu" section on page 97) is met. The contacts are open also in a de-energized state of the unit.
The switching conditions and behaviour of the relay output are freely programmable by setting some parameters (see the "7.2.5 Preselect menu" section on page 97 and the "7.2.6 Switching menu" section on page 101). Furthermore the force-guided relay opener is integrated into all monitoring functions.

In the event of an error, the contact switches to the open and safety condition.

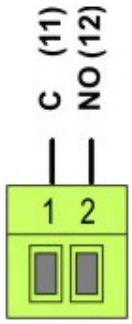


Figure 26 - [X1] pluggable 2-pin screw terminal block

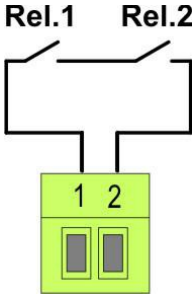


Figure 27 - [X1] screw terminal block internal connection

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 which cause the variance of the frequency measurement. To prevent this effect, hysteresis should be set (see the **057 Hysteresis REL1** parameter on page 106).

If short oversteps of the switching point are detected, a lock output should be set (see the **076 Lock Output** parameter on page 112).

4.12 DIL switch ([S1] DIP switch)

The 3-position DIP 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 DIP switch

The following unit states can be selected by means of the DIP 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 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 booting process at start up is	Ready for operation approx. 8 seconds after power on

	faster without "Self Test Message")	

Set all DIP switch sliding levers to "ON" after start up. Protect the DIP 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 "4.15 Diagnostic LEDs" section on page 52).
The safety function of the unit cannot be guaranteed before the commissioning is completed.

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

IFS-10 safety unit can 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. Neodymium magnets ensure a safe mechanical connection. Please note that a mechanical polarity protection ensures that the IFS-10-PM display unit cannot be plugged incorrectly.
[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 unit, we recommend the OS6.0 software to be used for start up / commissioning purposes.

Figure 29 - [X11] 8-pin female connector

For complete information on installing, programming and using the 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.

4.14 Interface for the OS6.x software tool ([USB] port)

USB interface technical specifications

Version:	USB 1.0
Connection:	[X12], USB-B female port

Figure 30 - [USB] type B USB port

A virtual COM port (serial 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 "OS6.0_Installation_01B EN" manual.

The functions and parameters of the safety unit can be set via PC by means of the OS6.x software tool. The OS6.x software tool and the specific documentation can be downloaded from Lika web site. For complete information on using OS6.x software tool and programming the safety unit, please refer to the "6.2 Setting up the unit via PC" section on page 75.

4.15 Diagnostic LEDs

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 ok

The following conditions are signalled by the yellow status LED:

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

Flashing slowly	"Factory Settings" unit state (see on page 48)
	"Programming Mode" unit state (see on page 48)

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

5 - Operational modes

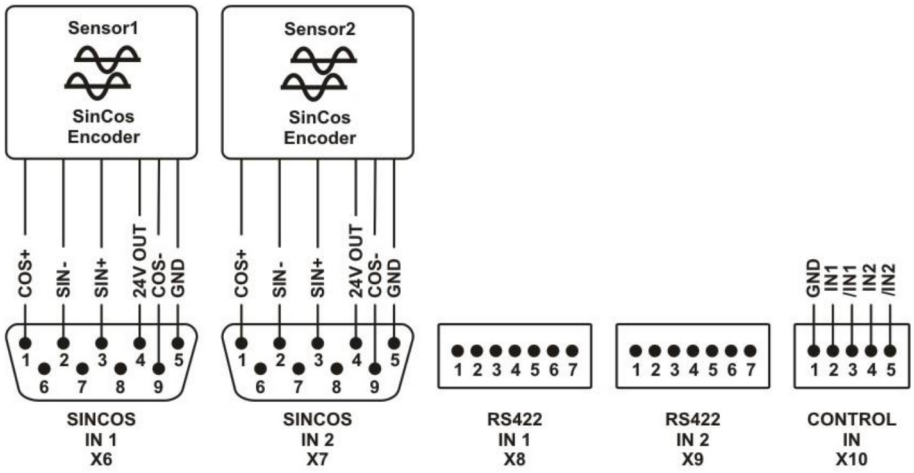
5.1 Operational Mode = 0 (IFS-10 / IFS-10A models)

Application: two sine cosine encoders

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 Direction → SIL3 / PLe 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 "4.3.2 Encoder supply" section on page 29 and the "4.4 SINCOS IN 1-2, sine cosine inputs ([X6] and [X7] connectors)" section on page 34.



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 through the [X5 | SINCOS OUT] splitter output.
- 2 - 4 inputs are available at [X10 | CONTROL IN] terminal block for control signals.
- The final SIL level depends on the selected configuration and the external components that are connected to the unit.

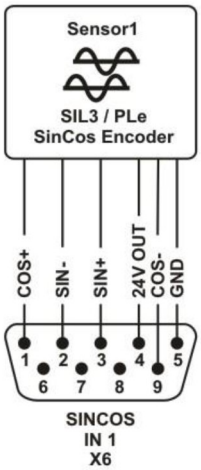
5.2 Operational Mode = 0 (IFS-10S / IFS-10SA models)

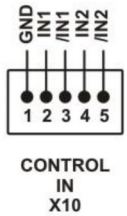
Application: one SIL3 sine cosine encoder

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 Direction → SIL3 / PLe 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 "4.3.2 Encoder supply" section on page 29 and the "4.4 SINCOS IN 1-2, sine cosine inputs ([X6] and [X7] connectors)" section on page 34.





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 through the [X5 | SINCOS OUT] splitter output.

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

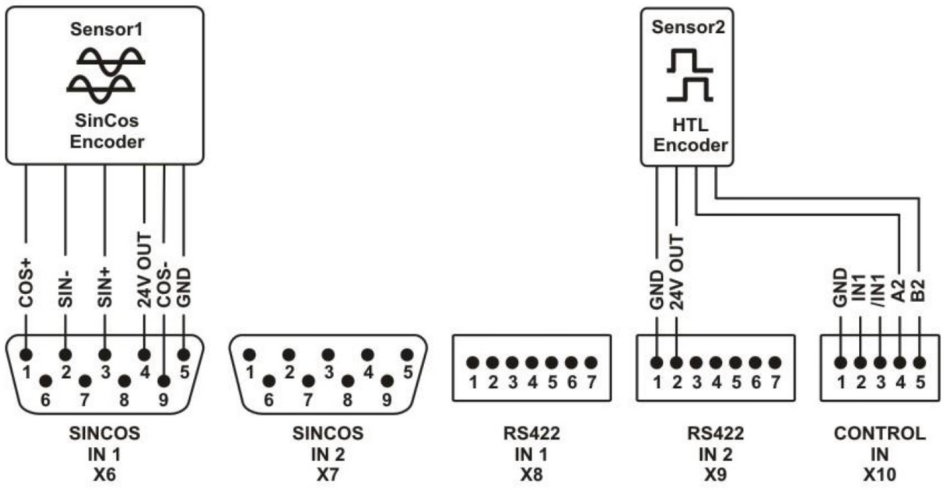
5.3 Operational Mode = 1 (IFS-10 / IFS-10A models)

Application: one sine cosine encoder and one A/B 90° HTL encoder

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 Direction → SIL3 / PLe 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 "4.3.2 Encoder supply" section on page 29 and the "4.4 SINCOS IN 1-2, sine cosine inputs ([X6] and [X7] connectors)" section on page 34. The incremental encoder must be connected according to information in the "4.3.2 Encoder supply" section on page 29 and the "4.6 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 37.



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 through the [X5 | SINCOS OUT] splitter output.
- 1 - 2 inputs are available at [X10 | CONTROL IN] terminal block for control signals.
- The final SIL level depends on the selected configuration and the external components that are connected to the unit.

5.4 Operational Mode = 2 (IFS-10 / IFS-10A models)

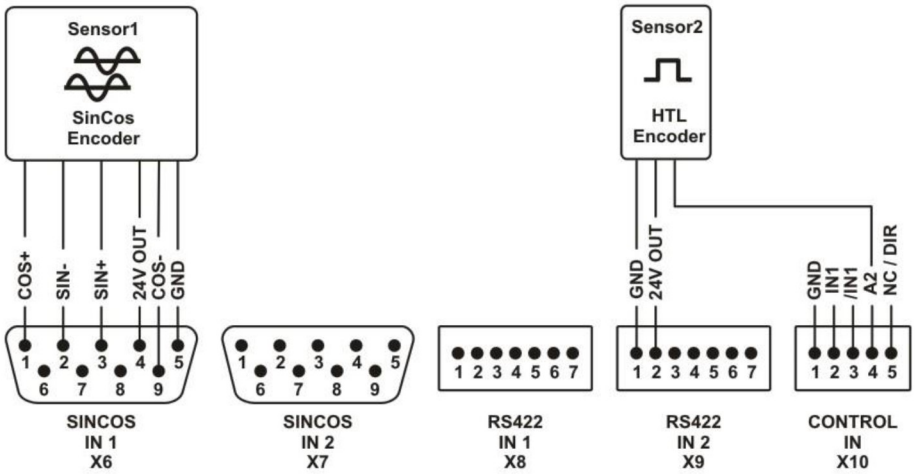
Application: one sine cosine encoder and one single channel HTL encoder

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 Direction → SIL3 / PLe * Standstill → SIL3 / PLe *		

* The safety level can be achieved only if it is physically ensured that the rotary or linear movement is performed towards one direction only. 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 "4.3.2 Encoder supply" section on page 29 and the "4.4 SINCOS IN 1-2, sine cosine inputs ([X6] and [X7] connectors)" section on page 34. The incremental encoder must be connected according to information in the "4.3.2 Encoder supply" section on page 29 and the "4.6 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 37.



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 through the [X5 | SINCOS OUT] splitter output.
- 1 - 2 inputs are available at [X10 | CONTROL IN] terminal block for control signals.
- The final SIL level depends on the selected configuration and the external components that are connected to the unit.

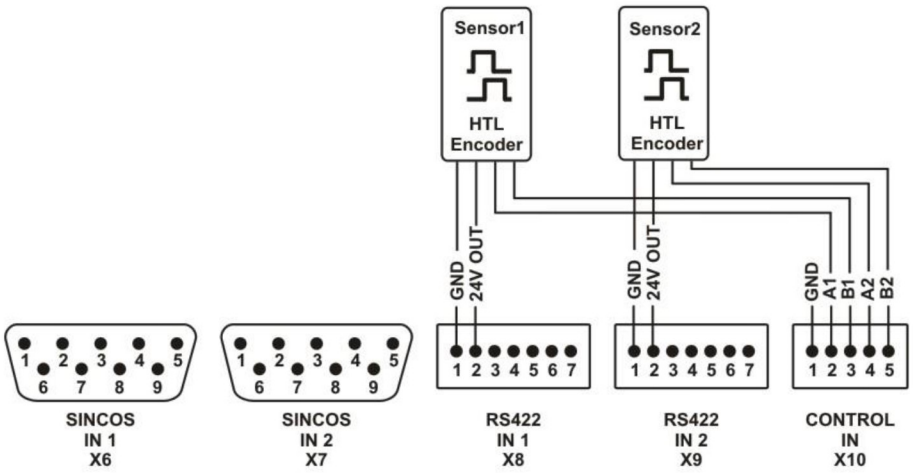
5.5 Operational Mode = 3 (IFS-10 / IFS-10A models)

Application: two A/B 90° HTL encoders

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 Direction → SIL3 / PLe 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 "4.3.2 Encoder supply" section on page 29 and the "4.6 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 37.



NOTE

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

5.6 Operational Mode = 4 (IFS-10 / IFS-10A models)

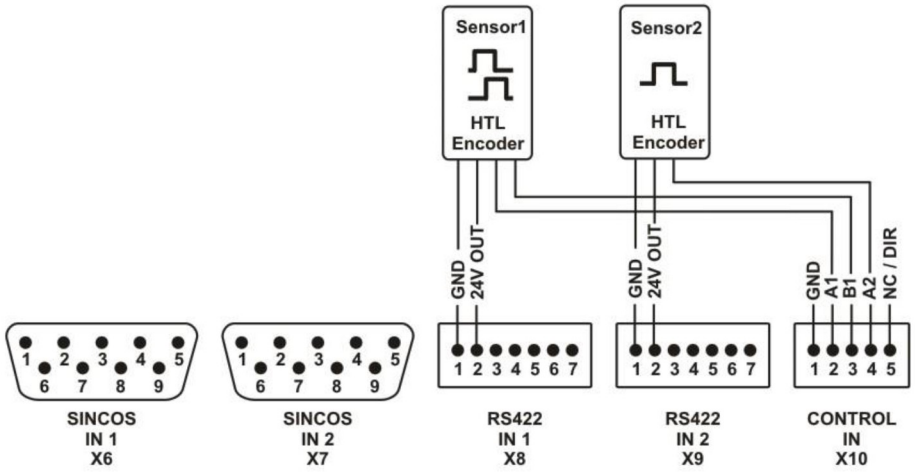
Application: one A/B 90° HTL encoder and one single channel HTL encoder

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 Direction → SIL3 / PLe * Standstill → SIL3 / PLe *		

* The safety level can be achieved only if it is physically ensured that the rotary or linear movement is performed towards one direction only. 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 "4.3.2 Encoder supply" section on page 29 and the "4.6 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 37.



NOTE

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

5.7 Operational Mode = 5 (IFS-10 / IFS-10A models)

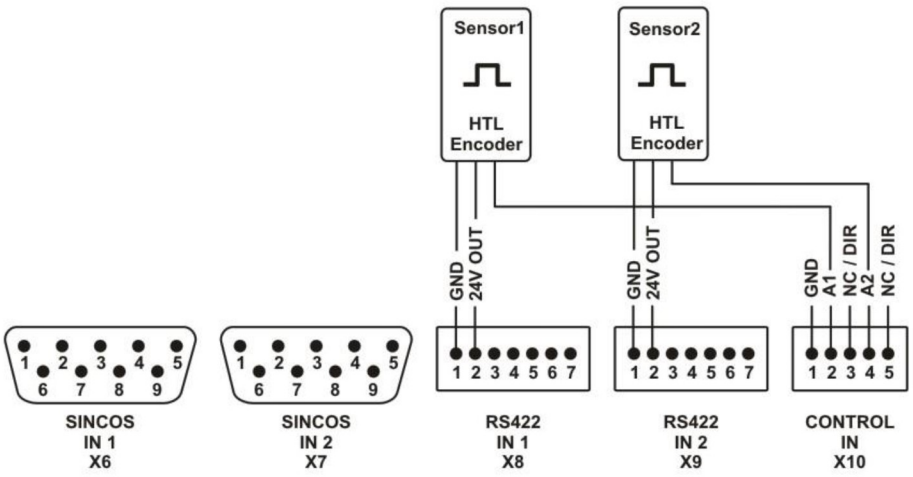
Application: two single channel HTL encoders

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 Direction → SIL3 / PLe * Standstill → SIL3 / PLe *		

* The safety level can be achieved only if it is physically ensured that the rotary or linear movement is performed towards one direction only. 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 "4.3.2 Encoder supply" section on page 29 and the "4.6 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 37.



NOTE

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

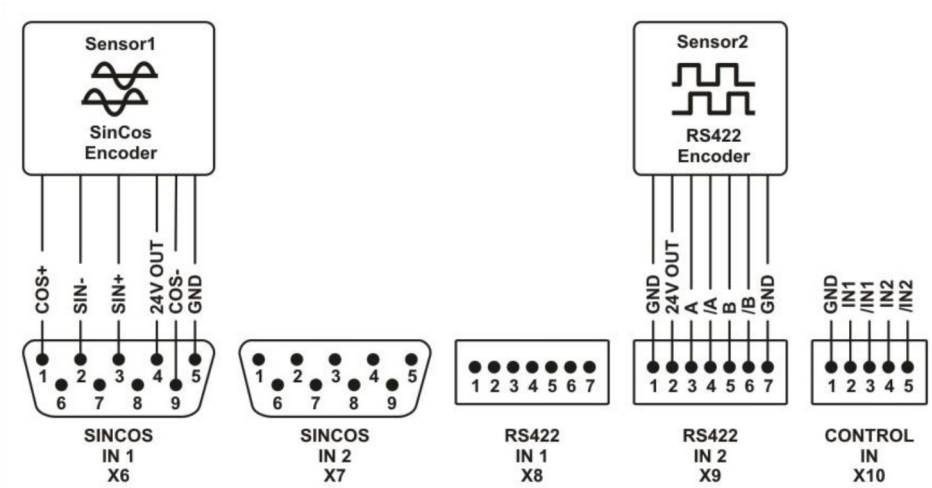
5.8 Operational Mode = 6 (IFS-10 / IFS-10A models)

Application: one sine cosine encoder and one RS-422 encoder

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 Direction → SIL3 / PLe 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 RS-422/TTL/Line Driver encoder is used. The sine cosine encoder must be connected according to information in the "4.3.2 Encoder supply" section on page 29 and the "4.4 SINCOS IN 1-2, sine cosine inputs ([X6] and [X7] connectors)" section on page 34. The incremental encoder must be connected according to information in the "4.3.2 Encoder supply" section on page 29 and the "4.5 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)" section on page 36.



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 through the [X5 | SINCOS OUT] splitter output.
- 2 - 4 inputs are available at [X10 | CONTROL IN] terminal block for control signals.
- The final SIL level depends on the selected configuration and the external components that are connected to the unit.

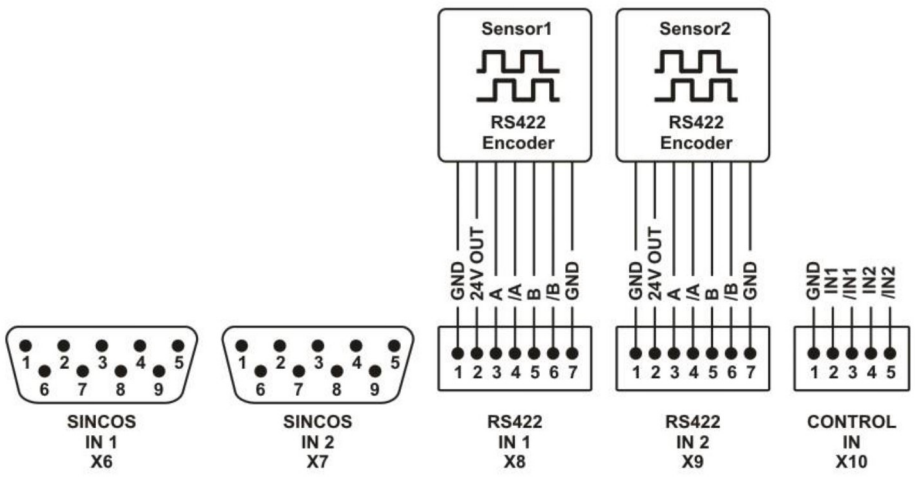
5.9 Operational Mode = 7 (IFS-10 / IFS-10A models)

Application: two RS-422 encoders

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 Direction → SIL3 / PLe 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 "4.3.2 Encoder supply" section on page 29 and the "4.5 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)" section on page 36.



NOTE

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

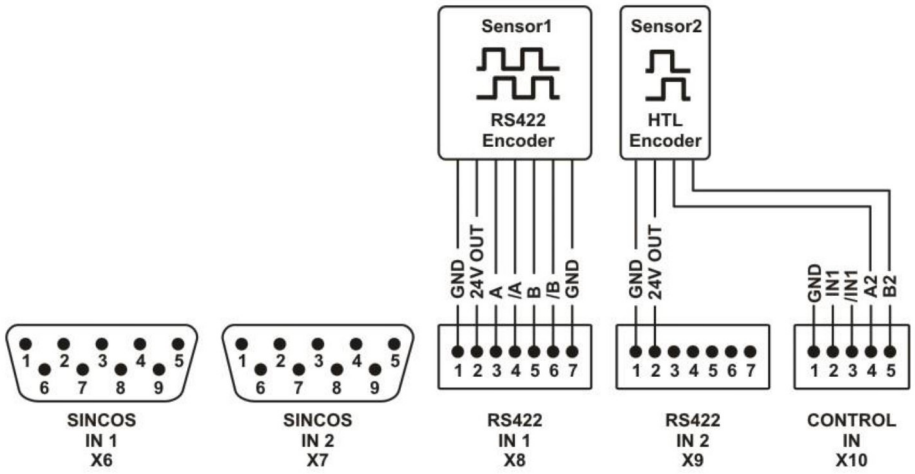
5.10 Operational Mode = 8 (IFS-10 / IFS-10A models)

Application: one RS-422 encoder and one A/B 90° HTL encoder

Mode	8		
Sensor 1	[X8 | RS422 IN 1]	Incremental RS422/TTL encoder	(A, /A, B, /B)
Sensor 2	[X9 | RS422 IN 2]	Incremental HTL encoder	(A, B, 90°)
Control Inputs	[X10 | CONTROL IN]	HTL/PNP control signal	1 – 2 available
Achievable Safety Level	Speed → SIL3 / PLe Direction → SIL3 / PLe 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 a 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 "4.3.2 Encoder supply" section on page 29 and the "4.5 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)" section on page 36. The HTL/Push-Pull encoder must be connected according to information in the "4.3.2 Encoder supply" section on page 29 and the "4.6 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 37.



NOTE

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

5.11 Operational Mode = 9 (IFS-10 / IFS-10A models)

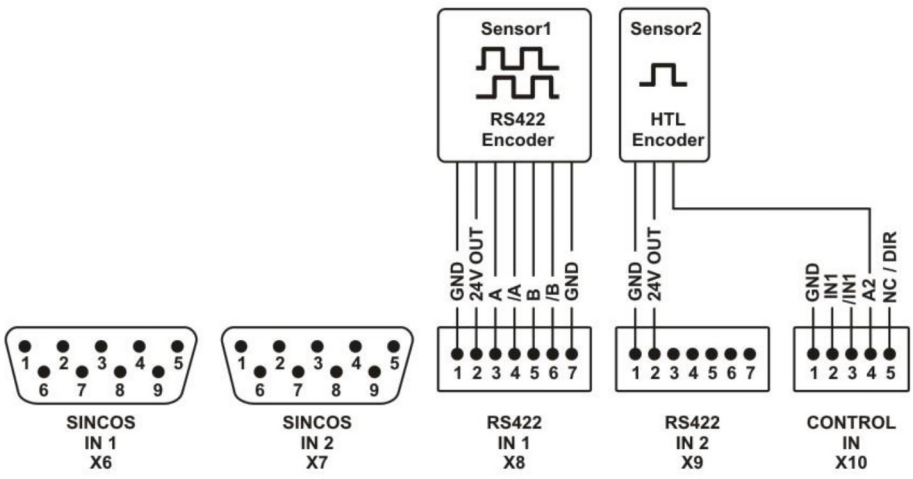
Application: one RS-422 encoder and one single channel HTL encoder

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 Direction → SIL3 / PLe * Standstill → SIL3 / PLe *		

* The safety level can be achieved only if it is physically ensured that the rotary or linear movement is performed towards one direction only. 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 a 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 "4.3.2 Encoder supply" section on page 29 and the "4.5 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)" section on page 36. The HTL/Push-Pull encoder must be connected according to information in the "4.3.2 Encoder supply" section on page 29 and the "4.6 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" section on page 37.



NOTE

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

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 19);
- all wirings must be executed in accordance with the general provisions for wiring (see on page 22);
- before connecting the unit to the power supply, please read carefully the information in the "4.3 Power supply" and "4.3.1 24V IN, Unit Power supply ([X3] terminal block)" sections on page 28;
- before connecting the encoder(s) to the power supply and the available inputs, please read carefully the information in the "4.3 Power supply", "4.3.2 Encoder supply", "4.4 SINCOS IN 1-2, sine cosine inputs ([X6] and [X7] connectors)", "4.5 RS-422 IN 1-2, RS-422 inputs ([X8] and [X9] terminal blocks)" and "4.6 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)" sections, on pages 28 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 separate 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 28;
- set the DIP switch sliding lever 1 and 2 to the ON position and the sliding lever 3 to the OFF position (unit state: "Programming Mode"); see on page 48;
- properly install the OS6.0 software tool in a PC and start the program;
- connect the unit either to the PC with OS6.0 software tool installed via USB or to the optional IFS-10-PM programming and display unit.

Set all DIP switch sliding levers to "ON" after start up. Protect the DIP 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"4.15 Diagnostic LEDs" section on page 52).

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 OS6.x software tool. The OS6.x software tool and the specific documentation can be downloaded from Lika web site. For complete information on using the OS6.x software tool and programming the safety unit, please refer to the "4.14 Interface for the OS6.x software tool ([USB] port)" section on page 51.

A serial interface simulation 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. For complete information on the USB port please refer to the "4.14 Interface for the OS6.x software tool ([USB] port)" section on page 51.

The functions of the OS6.0 software tool are described in the specific OS6.x "User's guide".

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 OS6.0 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 "4.13 Interface for connecting the IFS-10-PM display unit ([X11] connector)" section on page 50.

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

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 54.

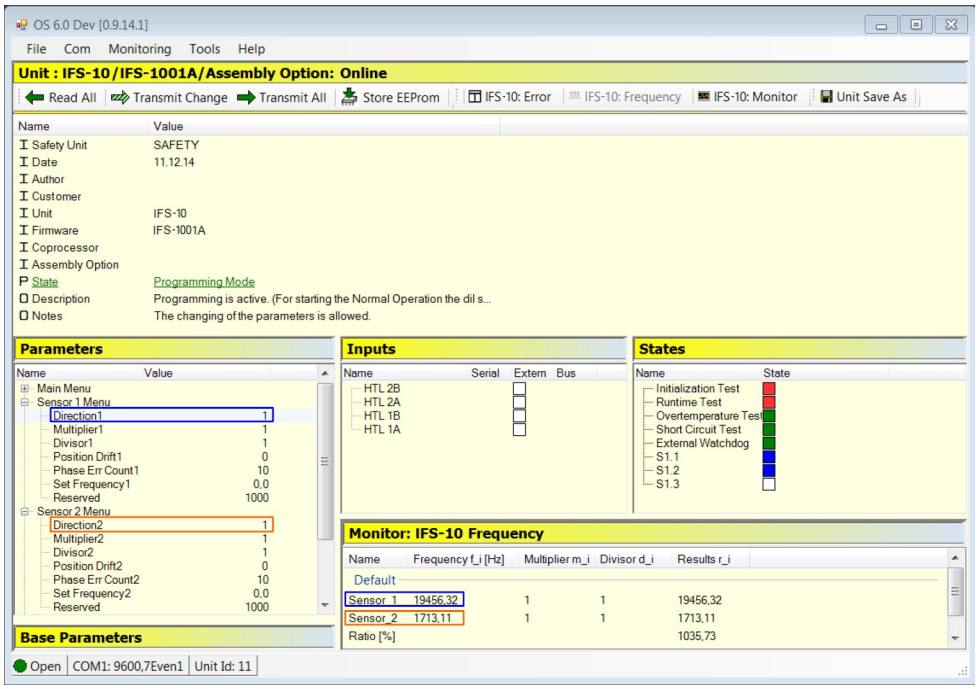
No.	Parameter	Remark
000	Operational mode	With IFS-10 / IFS-10A models = see the "5 - Operational modes" section on page 54. With IFS-10S / IFS-10SA models = 0

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 **013 Direction 1** or **020 Direction 2** parameters (to either 0 or 1) in the corresponding sensor menu.

No.	Parameter	Remark
013	Direction 1	With IFS-10 / IFS-10A models = X, positive frequency With IFS-10S / IFS-10SA models = 0 / 1
020	Direction 2	With IFS-10 / IFS-10A models = X, positive frequency With IFS-10S / IFS-10SA models = 0 / 1

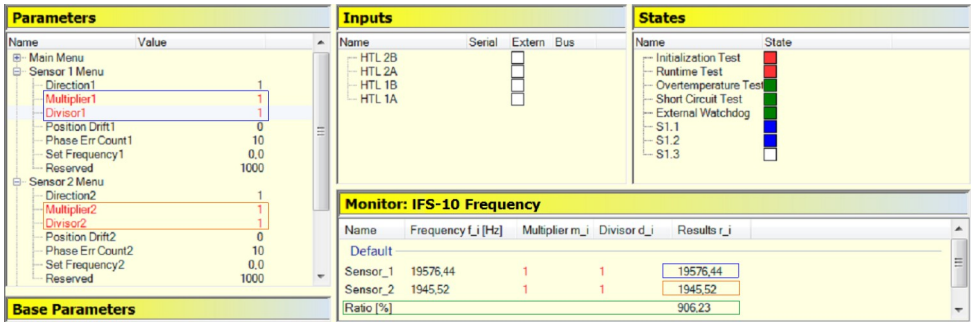


NOTE
With IFS-10S / IFS-10SA models both parameter values must compulsorily have the same value (**013 Direction 1** = **020 Direction 2**).

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 "7.2.3 Sensor 1 menu" section on page 91).

No.	Parameter	Remark
014	Multiplier 1	With IFS-10 / IFS-10A models Ratio = 0 With IFS-10S / IFS-10SA models Ratio = 1
015	Divisor 1	With IFS-10 / IFS-10A models Ratio = 0 With IFS-10S / IFS-10SA models Ratio = 1
021	Multiplier 2	With IFS-10 / IFS-10A models Ratio = 0 With IFS-10S / IFS-10SA models Ratio = 1
022	Divisor 2	With IFS-10 / IFS-10A models Ratio = 0 With IFS-10S / IFS-10SA models Ratio = 1



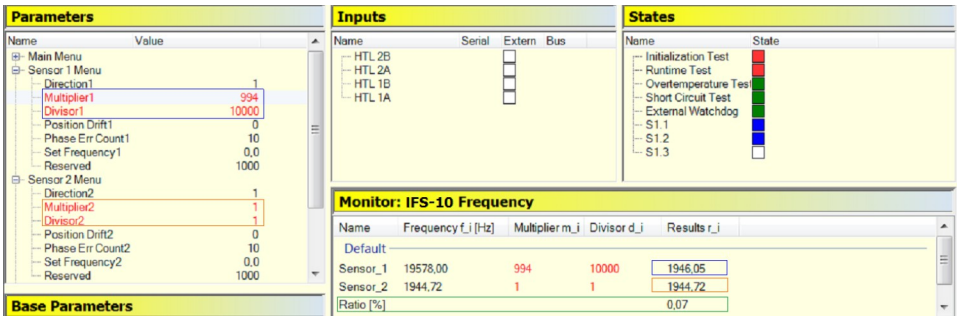
NOTE

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 frequency 1 by the factor "0.0994" (=1945.52/19576.44).

To adjust the frequencies, you must set the 014 Multiplier 1 parameter to "994" and the 015 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.x) 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 "8 - Error detection" section on page 129.

6.4.5 Sampling Time settings

All items in the **States** pane (except the DIL switch states S1.x) are highlighted in green. Press the IFS-10: Frequency button in the tool bar. Now the working range must be set: it includes the frequency range from the highest to the lowest switching point.

1. Find the sensor frequency that fluctuates most;
2. scroll through the frequency range and find the point that fluctuates most (usually, it is around the lowest switching point);
3. the frequency can be adjusted by using the 001 Sampling Time parameter: higher values result in a smooth running, but increase the response and fault times.

No.	Parameter	Remark
001	Sampling Time	Frequency fluctuations control

6.4.6 Wait Time settings

The 002 Wait Time parameter sets the frequency at which the frequency is 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.

No.	Parameter	Remark
002	Wait Time	Zero balancing window adjustment

6.4.7 Sine cosine output settings

The sine cosine output cannot be configured. The sine cosine input signals at terminal [X6] are transmitted to sine cosine output at terminal [X5].

NOTE
The sine cosine output is not available in IFS-10A and IFS-10SA models.

6.4.8 RS-422 output settings

The output delivers the signals from Sensor 1 or Sensor 2 depending on the 098 RS Selector setting. The converted signal from a sine cosine encoder or a HTL encoder (according to the 000 Operational mode parameter) will be available.

No.	Parameter	Remark
098	RS Selector	Sensor 1 = 0; Sensor 2 = 1

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

6.4.9 Analogue output settings

In case of an unused analogue output, the output signals must be linked. 102 Analog Start and 103 Analog End parameters are related to the frequency that is selected in the 003 F1-F2 Selection parameter. The 104 Analog Gain parameter should be changed only in exceptional cases (in order to limit the upper current value). The 105 Analog Offset parameter is used for fine adjustment.

No.	Parameter	Remark
102	Analog Start	Frequency at 4 mA
103	Analog End	Frequency at 20 mA
104	Analog Gain	100: to be changed only in exceptional cases
105	Analog Offset	0: fine adjustment

6.4.10 Digital output settings

The configuration of the outputs affects the SIL level.

No.	Parameter	Remark
027 ... 041	Preselect OUT1.H Preselect REL1.D	Switching points setting
043 ... 080	Switch Mode OUT1 Output Mode	Outputs configuration

6.4.11 Relay output settings

The relay contacts must be integrated into the safety circuit.

No.	Parameter	Remark
027 ... 041	Preselect OUT1.H Preselect REL1.D	Switching points setting
043 ... 080	Switch Mode OUT1 Output Mode	Outputs configuration

6.4.12 Digital input settings

The configuration of the outputs affects the SIL level.

No.	Parameter	Remark
081 ... 090	IN1 Function Read back delay	Inputs configuration

6.5 Completing the commissioning

After programming and before starting the unit all application-dependent parameters should be checked for plausibility again. The correct behaviour of the digital outputs and relays can be tested by means of the **077 Action Output** parameter, see the "7.2.6 Switching menu" section on page 101.

The safety-related relay output opens in case of failures or if a programmed switching condition (see the "7.2.5 Preselect menu" section on page 97) occurs. Furthermore the contact will be open if the unit is in the de-energized state.

It is imperative to finally test and evaluate the function of the relay in the subsequent device!

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 is open.

After commissioning, you must exit the "Operational Mode" unit state by setting the sliding lever 3 of the DIP switch back to the ON position. For a normal operation all three sliding levers of the DIP switch must be always set to ON. For further information please refer to the "4.12 DIL switch ([S1] DIP switch)" section on page 48.

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 on page 52).
- Set all DIP switch sliding levers to "ON" after start up.
- Protect the DIP switch sliding levers after start up (for example cover them using some adhesive tape).

7 - Menus and parameters

7.1 Menu / Parameters overview

This section provides an overview of the menus and their assignments to the different unit functions. The menu names are printed bold and associated parameters are listed right under the menu names.

No.	Menu / Parameter
7.2.2 Main menu, page 86	
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	Reserved
012	Reserved
7.2.3 Sensor 1 menu, page 91	
013	Direction 1
014	Multiplier 1
015	Divisor 1
016	Position Drift 1
017	Phase Err Count 1
018	Set Frequency 1
019	Reserved
7.2.4 Sensor 2 menu, page 94	
020	Direction 2
021	Multiplier 2
022	Divisor 2
023	Position Drift 2
024	Phase Err Count 2
025	Set Frequency 2
026	Reserved

No.	Menu / Parameter
7.2.5 Preselect menu, page 97	
027	Preselect OUT1.H
028	Preselect OUT1.L
029	Preselect OUT1.D
030	Preselect OUT2.H
031	Preselect OUT2.L
032	Preselect OUT2.D
033	Preselect OUT3.H
034	Preselect OUT3.L
035	Preselect OUT3.D
036	Preselect OUT4.H
037	Preselect OUT4.L
038	Preselect OUT4.D
039	Preselect REL1.H
040	Preselect REL1.L
041	Preselect REL1.D
042	Reserved

No.	Menu / Parameter
7.2.6 Switching menu, page 101	
043	Switch Mode OUT1
044	Switch Mode OUT2
045	Switch Mode OUT3
046	Switch Mode OUT4
047	Switch Mode REL1
048	Pulse Time OUT1
049	Pulse Time OUT2
050	Pulse Time OUT3
051	Pulse Time OUT4
052	Pulse Time REL1
053	Hysteresis OUT1
054	Hysteresis OUT2
055	Hysteresis OUT3
056	Hysteresis OUT4
057	Hysteresis REL1
058	Matrix OUT1
059	Matrix OUT2
060	Matrix OUT3
061	Matrix OUT4
062	Matrix REL1
063	MIA delay OUT1
064	MIA delay OUT2
065	MIA delay OUT3
066	MIA delay OUT4
067	MIA delay REL1
068	MAI delay OUT1
069	MAI delay OUT2
070	MAI delay OUT3
071	MAI delay OUT4
072	MAI delay REL1
073	Start-up Mode
074	Start-up Output
075	Standstill Time
076	Lock Output
077	Action Output
078	Action Polarity
079	Read Back OUT
080	Output Mode

No.	Menu / Parameter
7.2.7 Control menu, page 116	
081	IN1 Function
082	IN1 Config
083	/IN1 Function
084	/IN1 Config
085	IN2 Function
086	IN2 Config
087	/IN2 Function
088	/IN2 Config
089	Input Mode
090	Read back delay
091	Reserved
7.2.8 Serial menu, page 122	
092	Serial Unit No.
093	Serial Baud Rate
094	Serial Format
095	Serial Page
096	Serial Init
097	Reserved
7.2.9 Splitter menu, page 124	
098	RS Selector
099	Reserved
100	Reserved
101	Reserved
7.2.10 Analogue menu, page 125	
102	Analog Start
103	Analog End
104	Analog Gain
105	Analog Offset
106	Reserved
7.2.11 OPU menu, page 127	
107	X Factor 1
108	/ Factor 1
109	+/- Value 1
110	Units 1
111	Decimal Point 1
112	X Factor 2
113	/ Factor 2
114	+/- Value 2
115	Units 2
116	Decimal Point 2
117	Reserved ... 119 Reserved

7.2 Parameters description

7.2.1 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:

000 Operational mode	Only 000 Operational mode = "0" can be set
003 F1-F2 Selection	Both settings have the same effect
013 Direction 1	013 Direction 1 and 020 Direction 2 must be set to the same value
014 Multiplier 1	It must be set to "1"
015 Divisor 1	It must be set to "1"
016 Position Drift 1	016 Position Drift 1 and 023 Position Drift 2 must be set to the same value
017 Phase Err Count 1	017 Phase Err Count 1 and 024 Phase Err Count 2 must be set to the same value
020 Direction 2	013 Direction 1 and 020 Direction 2 must be set to the same value
021 Multiplier 2	It must be set to "1"
022 Divisor 2	It must be set to "1"
023 Position Drift 2	016 Position Drift 1 and 023 Position Drift 2 must be set to the same value
024 Phase Err Count 2	017 Phase Err Count 1 and 024 Phase Err Count 2 must be set to the same value
081 IN1 Function ... 088 /IN2 Config	To clear drift errors, the **Clear Drift 1** and **Clear Drift 2** settings must be used
098 RS Selector	Both settings have the same effect

7.2.2 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 Operational Mode = 0 (IFS-10 / IFS-10A models)" section on page 54 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.

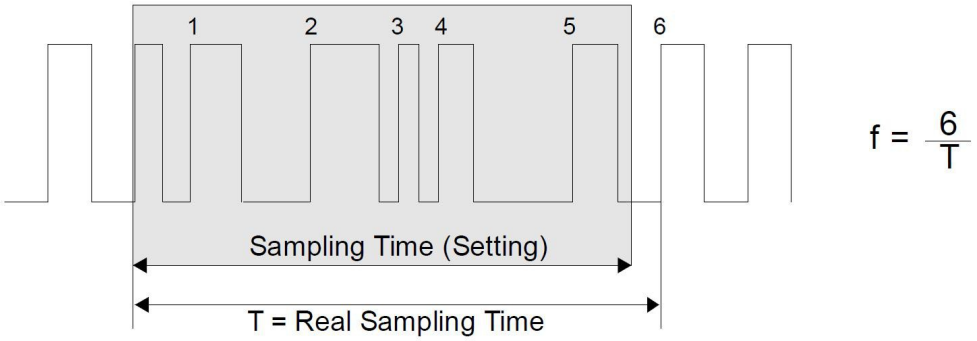
Mode	Sensor 1	Sensor 2	[X10: 2 & 3]	[X10: 4 & 5]
0	SIL3/PLe sine cosine encoder [X6 | SINCOS IN 1]	Sensor 1 and Sensor 2 are internally bridged	Available for control signals	Available for control signals

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

001 Sampling Time

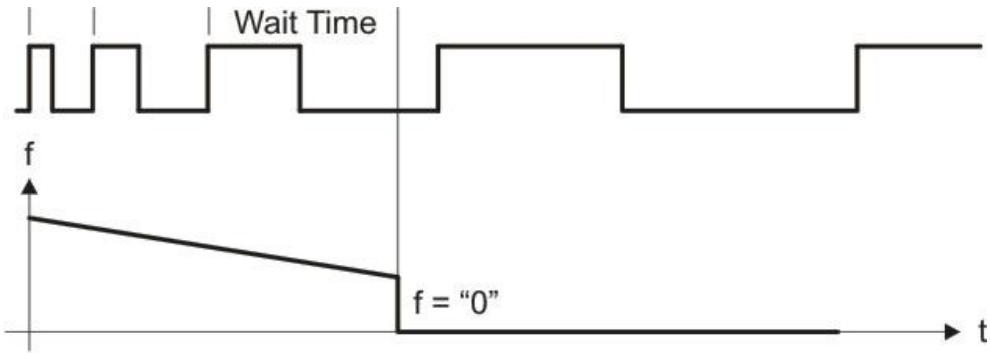
The configured value corresponds to the minimum measurement time. This parameter is used as a filter in case of irregular frequencies. It directly affects the response time of the unit. The setting is valid for both input channels. The value is expressed in seconds.

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



002 Wait Time

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 with a period longer than the 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 = 1.000 (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 basic frequency selection 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 affect.** 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 sustained 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 "4.12 DIL switch ([S1] DIP switch)" section on page 48) 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.

Changing the setting from 0 to 2 and vice versa should be avoided.
After the test, the parameter must be set to 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 is turned on. As soon as the set delay has expired, the unit will begin to evaluate the signals. The value is expressed in seconds.
Default = 0.100 (min. = 0.001, max. = 1.000)

011 Reserved

Reserved.

012 Reserved

Reserved.

7.2.3 Sensor 1 menu

013 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 "7.2.1 Important notes for IFS-10S and IFS-10SA" section on page 85: **013 Direction 1** must be the same as **020 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 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)

014 Multiplier 1

For IFS-10S and IFS-10SA models please read the information in the "7.2.1 Important notes for IFS-10S and IFS-10SA" section on page 85: **014 Multiplier 1** must be "=1"; **021 Multiplier 2** must be "=1".

Proportional pulse scaling factor of the Sensor 1. It allows to modulate 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 78. See the **004 Div. Switch %-f** parameter and the following.
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 78).

015 Divisor 1

For IFS-10S and IFS-10SA models please read the information in the "7.2.1 Important notes for IFS-10S and IFS-10SA" section on page 85: **015 Divisor 1** must be "=1"; **022 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 78. See the **004 Div. Switch %-f** parameter and the following.
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 78).

016 Position Drift 1

For IFS-10S and IFS-10SA models please read the information in the "7.2.1 Important notes for IFS-10S and IFS-10SA" section on page 85: **016 Position Drift 1** must be the same as **023 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 time period of the input frequency exceeds the value set next to the **002 Wait Time** parameter, the sensor is assigned to "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 adjusted 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)

017 Phase Err Count 1

For IFS-10S and IFS-10SA models please read the information in the "7.2.1 Important notes for IFS-10S and IFS-10SA" section on page 85: **017 Phase Err Count 1** must be the same as **024 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 directly when you switch on the encoder power supply or change the counting direction parameter (see **013 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)

018 Set Frequency 1

Simulation of a fixed encoder frequency. 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 "7.2.7 Control menu" section on page 116).
The setting will be effective if:

- the unit state (DIL switch) is set to "Programming mode";
- the **081 IN1 Function** parameter is set to "7".

The value is expressed in hertz (Hz).
Default = 0 (min. = -500,000.0, max. = 500,000.0)

019 Reserved

Reserved

7.2.4 Sensor 2 menu

020 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 "7.2.1 Important notes for IFS-10S and IFS-10SA" section on page 85: **013 Direction 1** must be the same as **020 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 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)

021 Multiplier 2

For IFS-10S and IFS-10SA models please read the information in the "7.2.1 Important notes for IFS-10S and IFS-10SA" section on page 85: **014 Multiplier 1** must be "=1"; **021 Multiplier 2** must be "=1".

Proportional pulse scaling factor of the Sensor 2. It allows to modulate 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 78. See the **004 Div. Switch %-f** parameter and the following.
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 78).

022 Divisor 2

For IFS-10S and IFS-10SA models please read the information in the "7.2.1 Important notes for IFS-10S and IFS-10SA" section on page 85: **015 Divisor 1** must be "=1"; **022 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 78. See the **004 Div. Switch %-f** parameter and the following.
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 78).

023 Position Drift 2

For IFS-10S and IFS-10SA models please read the information in the "7.2.1 Important notes for IFS-10S and IFS-10SA" section on page 85: **016 Position Drift 1** must be the same as **023 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 time period of the input frequency exceeds the value set next to the **002 Wait Time** parameter, the sensor is assigned to "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 adjusted 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 alarm 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)

024 Phase Err Count 2

For IFS-10S and IFS-10SA models please read the information in the "7.2.1 Important notes for IFS-10S and IFS-10SA" section on page 85: **017 Phase Err Count 1** must be the same as **024 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 directly when you switch on the encoder power supply or change the counting direction parameter (see **020 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)

025 Set Frequency 2

Simulation of a fixed encoder frequency. 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 "7.2.7 Control menu" section on page 116).
The setting will be effective if:

- the unit state (DIL switch) is set to "Programming mode";
- the **081 IN1 Function** parameter is set to "8".

The value is expressed in hertz (Hz).
Default = 0 (min. = -500,000.0, max. = 500,000.0)

026 Reserved

Reserved

7.2.5 Preselect menu

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

- [X1 | RELAY OUT] relay output (refer to the "4.11 RELAY OUT, relay output ([X1] terminal block)" section on page 46);
- four [X2 | CONTROL OUT] control outputs (refer to the "4.10 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 44).

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.

There are two separate switching points 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 (**081 IN1 Function** parameter = 13, see the "7.2.7 Control menu" section on page 116).

The changeover between "High" and "Low" switching points can be performed 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 in the set "Operational Mode" (**000 Operational mode** parameter, see the "5.1 Operational Mode = 0 (IFS-10 / IFS-10A models)" section on page 54).
".H" Index stands for "High" and requires to define the higher limit value.
".L" Index stands for "Low" and requires to define the lower limit value.

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 "7.2.7 Control menu" section on page 116.
- 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 **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.

027 Preselect OUT1.H

Upper switching point of the OUT1 output [X2:1 - 2] terminal block (refer to the "4.10 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 44). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 20,000.0 (min. = -500,000.0, max. = 500,000.0)

028 Preselect OUT1.L

Lower switching point of the OUT1 output [X2:1 - 2] terminal block (refer to the "4.10 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 44). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 10,000 (min. = -500,000.0, max. = 500,000.0)

029 Preselect OUT1.D

Maximum drift if the **043 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).
Default = 0 (min. = -500,000.0, max. = 500,000.0)

030 Preselect OUT2.H

Upper switching point of the OUT2 output [X2:3 - 4] terminal block (refer to the "4.10 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 44). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 40,000 (min. = -500,000.0, max. = 500,000.0)

031 Preselect OUT2.L

Lower switching point of the OUT2 output [X2:3 - 4] terminal block (refer to the "4.10 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 44). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 30,000 (min. = -500,000.0, max. = 500,000.0)

032 Preselect OUT2.D

Maximum drift if the **044 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).
Default = 0 (min. = -500,000.0, max. = 500,000.0)

033 Preselect OUT3.H

Upper switching point of the OUT3 output [X2:5 - 6] terminal block (refer to the "4.10 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 44). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 60,000 (min. = -500,000.0, max. = 500,000.0)

034 Preselect OUT3.L

Lower switching point of the OUT3 output [X2:5 - 6] terminal block (refer to the "4.10 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 44). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 50,000 (min. = -500,000.0, max. = 500,000.0)

035 Preselect OUT3.D

Maximum drift if the **045 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).
Default = 0 (min. = -500,000.0, max. = 500,000.0)

036 Preselect OUT4.H

Upper switching point of the OUT4 output [X2:7 - 8] terminal block (refer to the "4.10 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 44). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 80,000 (min. = -500,000.0, max. = 500,000.0)

037 Preselect OUT4.L

Lower switching point of the OUT4 output [X2:7 - 8] terminal block (refer to the "4.10 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 44). The limit values relate to the selected basic frequency (see the **003 F1-F2 Selection** parameter). The value is expressed in hertz (Hz).
Default = 70,000 (min. = -500,000.0, max. = 500,000.0)

038 Preselect OUT4.D

Maximum drift if the **046 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).
Default = 0 (min. = -500,000.0, max. = 500,000.0)

039 Preselect REL1.H

Upper switching point of the relay output [X1:1 - 2] terminal block (refer to the "4.11 RELAY OUT, relay output ([X1] terminal block)" section on page 46). 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 (min. = -500,000.0, max. = 500,000.0)

040 Preselect REL1.L

Lower switching point of the relay output [X1:1 - 2] terminal block (refer to the "4.11 RELAY OUT, relay output ([X1] terminal block)" section on page 46). 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)

041 Preselect REL1.D

Maximum drift if the **047 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).
Default = 0 (min. = -500,000.0, max. = 500,000.0)

042 Reserved

Reserved

7.2.6 Switching menu

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

- [X1 | RELAY OUT] relay output (refer to the "4.11 RELAY OUT, relay output ([X1] terminal block)" section on page 46);
- four [X2 | CONTROL OUT] control outputs (refer to the "4.10 CONTROL OUT, HTL control outputs ([X2] terminal block)" section on page 44).

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 **027 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 **027 Preselect OUT1.H** parameter and the following)

Additional features that can be assigned to the output:

{S}	= self-locking function (see the **076 Lock Output** parameter)
{H}	= switching hysteresis (see the **053 Hysteresis OUT1** parameter and the following)
{A}	= start up delay (see the **074 Start-up Output** parameter)

For more information on the preselection please refer to the "7.2.5 Preselect menu" section on page 97.

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** to "7" or "8", the specified standstill time (see the **075 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 **048 Pulse Time OUT1** parameter on page 104 and following.
- When you set the **Switch Mode** to "2", "6" or "16", the **Hysteresis** parameters are used to determine the frequency band.

043 Switch Mode OUT1

Switching condition of OUT1.

0: |**f**| ≥ |**Preselection**| {S, H}
The outputs switches in case of overspeed

1: |**f**| ≤ |**Preselection**| {S, H, A}
The outputs switches in case of underspeed

2: |**f**| = |**Preselection**| {S, A}
The output switches if the frequency is out of the set band (Preselection +/- Hysteresis)

3: **Standstill** (see the **075 Standstill Time** parameter)
The output switches in case of standstill

4: **f ≥ Preselection** {S, H}
The output switches in case of overspeed
It can be used only with positive preselection values!

5: **f ≤ Preselection** {S, H, A}
The output switches in case of underspeed
It can be used only with positive preselection values!

6: **f = Preselection** {S, A}
The output switches if the frequency is out of the set band (Preselection +/- Hysteresis)
It can be used only with positive preselection values!

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 **075 Standstill Time** parameter).

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 **075 Standstill Time** parameter).

9: **Clock generation for pulsed readback**
EDM and pulse monitored inputs.

10: **STO/SBC** {S}
Enable + external self-locking, without ramp monitoring.

11: **SLS** |**f**| ≥ |**Preselection**|
Overspeed + enable + self-locking, without ramp monitoring.

12: **SMS |f| ≥ |Preselection|**
Overspeed without enable + self-locking.

13: **SDI1 f > 0**
Enable + self-locking, frequency monitoring, no position monitoring.

14: **SDI2 f < 0**
Enable + self-locking, frequency monitoring, no position monitoring.

15: **SSM1 |f| ≤ |Preselection|** {S}
Underspeed + enable + external self-locking.

16: **SSM2 |f| within |Preselection +/- Hysteresis|** {S}
Underspeed + overspeed + enable + external self-locking.

17: **SOS/SLI |f| > |Preselection| or Position Error**
Overspeed + position + enable + self-locking.

18: **Standstill (at Standstill and no Position Error)**
Standstill + position + enable + self-locking.

Default = 0 (min. = 0, max. = 18)

044 Switch Mode OUT2

Switching condition of OUT2. For any information refer to the **043 Switch Mode OUT1** parameter.
Default = 0 (min. = 0, max. = 18)

045 Switch Mode OUT3

Switching condition of OUT3. For any information refer to the **043 Switch Mode OUT1** parameter.
Default = 0 (min. = 0, max. = 18)

046 Switch Mode OUT4

Switching condition of OUT4. For any information refer to the **043 Switch Mode OUT1** parameter.
Default = 0 (min. = 0, max. = 18)

047 Switch Mode REL1

Switching condition of the relay output. For any information refer to the **043 Switch Mode OUT1** parameter.
Default = 0 (min. = 0, max. = 18)

048 Pulse Time OUT1

Wipe signal period of 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** to "7" or "8", the specified standstill time (see the **075 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 **043 Switch Mode OUT1** parameter on page 102.
- If a wipe signal is set, no self-locking function (see the **076 Lock Output** parameter) can be assigned to the respective output.

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

049 Pulse Time OUT2

Wipe signal period of OUT2. For any information refer to the **048 Pulse Time OUT1** parameter.
Default = 0 (min. = 0, max. = 9.999)

050 Pulse Time OUT3

Wipe signal period of OUT3. For any information refer to the **048 Pulse Time OUT1** parameter.
Default = 0 (min. = 0, max. = 9.999)

051 Pulse Time OUT4

Wipe signal period of OUT4. For any information refer to the **048 Pulse Time OUT1** parameter.
Default = 0 (min. = 0, max. = 9.999)

052 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** to "7" or "8", the specified standstill time (see the **075 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 **043 Switch Mode OUT1** parameter on page 102.

- If a wipe signal is set, no self-locking function (see the **076 Lock Output** parameter) can be assigned to the respective output.

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

053 Hysteresis OUT1

Percentage hysteresis of the set OUT1 switching point. For more information refer to the **027 Preselect OUT1.H** and **028 Preselect OUT1.L** parameters in the "7.2.5 Preselect menu" section on page 97. 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 **043 Switch Mode OUT1** parameter is set to **0**, **6** or **16**.

Default = 0 (min. = 0, max. = 100.0)

054 Hysteresis OUT2

Percentage hysteresis of the set OUT2 switching point. For more information refer to the **030 Preselect OUT2.H** and **031 Preselect OUT2.L** parameters in the "7.2.5 Preselect menu" section on page 97. 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 **044 Switch Mode OUT2** parameter is set to **0**, **6** or **16**.

Default = 0 (min. = 0, max. = 100.0)

055 Hysteresis OUT3

Percentage hysteresis of the set OUT3 switching point. For more information refer to the **033 Preselect OUT3.H** and **034 Preselect OUT3.L** parameters in the "7.2.5 Preselect menu" section on page 97. 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 **045 Switch Mode OUT3** parameter is set to **0**, **6** or **16**.

Default = 0 (min. = 0, max. = 100.0)

056 Hysteresis OUT4

Percentage hysteresis of the set OUT4 switching point. For more information refer to the **036 Preselect OUT4.H** and **037 Preselect OUT4.L** parameters in the "7.2.5 Preselect menu" section on page 97. Value is expressed in percentage (%).
Default = 0 (min. = 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 **046 Switch Mode OUT4** parameter is set to **0**, **6** or **16**.

057 Hysteresis REL1

Percentage hysteresis of the set relay switching point. For more information refer to the **039 Preselect REL1.H** and **040 Preselect REL1.L** parameters in the "7.2.5 Preselect menu" section on page 97. 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 **047 Switch Mode REL1** parameter is set to **0**, **6** or **16**.

Default = 0 (min. = 0, max. = 100.0)

058 Matrix OUT1

Enable matrix for OUT1 output. It defines the enable signal (see the **10** to **18** settings of the **043 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)

059 Matrix OUT2

Enable matrix for OUT2 output. For any information please refer to the **058 Matrix OUT1** parameter on page 106.

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)

060 Matrix OUT3

Enable matrix for OUT3 output. For any information please refer to the **058 Matrix OUT1** parameter on page 106.

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)

061 Matrix OUT4

Enable matrix for OUT4 output. For any information please refer to the **058 Matrix OUT1** parameter on page 106.

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)

062 Matrix REL1

Enable matrix for REL1 output. For any information please refer to the **058 Matrix OUT1** parameter on page 106.

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)

063 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 (min. = 0, max. = 99.999)

064 MIA delay OUT2

Delay of OUT2 output for transition from inactive to active. For any information please refer to the **063 MIA delay OUT1** parameter on page 109.
Default = 0 (min. = 0, max. = 99.999)

065 MIA delay OUT3

Delay of OUT3 output for transition from inactive to active. For any information please refer to the **063 MIA delay OUT1** parameter on page 109.
Default = 0 (min. = 0, max. = 99.999)

066 MIA delay OUT4

Delay of OUT4 output for transition from inactive to active. For any information please refer to the **063 MIA delay OUT1** parameter on page 109.
Default = 0 (min. = 0, max. = 99.999)

067 MIA delay REL1

Delay of REL1 output for transition from inactive to active. For any information please refer to the **063 MIA delay OUT1** parameter on page 109.
Default = 0 (min. = 0, max. = 99.999)

068 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 (min. = 0, max. = 99.999)

069 MAI delay OUT2

Delay of OUT2 output for transition from active to inactive. For any information please refer to the **068 MAI delay OUT1** parameter on page 109.
Default = 0 (min. = 0, max. = 99.999)

070 MAI delay OUT3

Delay of OUT3 output for transition from active to inactive. For any information please refer to the **068 MAI delay OUT1** parameter on page 109.
Default = 0 (min. = 0, max. = 99.999)

071 MAI delay OUT4

Delay of OUT4 output for transition from active to inactive. For any information please refer to the **068 MAI delay OUT1** parameter on page 109.
Default = 0 (min. = 0, max. = 99.999)

072 MAI delay REL1

Delay of REL1 output for transition from active to inactive. For any information please refer to the **068 MAI delay OUT1** parameter on page 109.
Default = 0 (min. = 0, max. = 99.999)

073 Start-up Mode

Start-up delay time window. Delay time window before activating the monitoring function. It is only useful if the **Switch Mode** parameter is set to "**1**", "**2**", "**5**" or "**6**" (see the **043 Switch Mode OUT1** parameter and the following).
To use the start-up delay, it must be assigned to an output in the **074 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 "7.2.5 Preselect menu" section on page 97)

The set delay time window is valid for all outputs.

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

074 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:

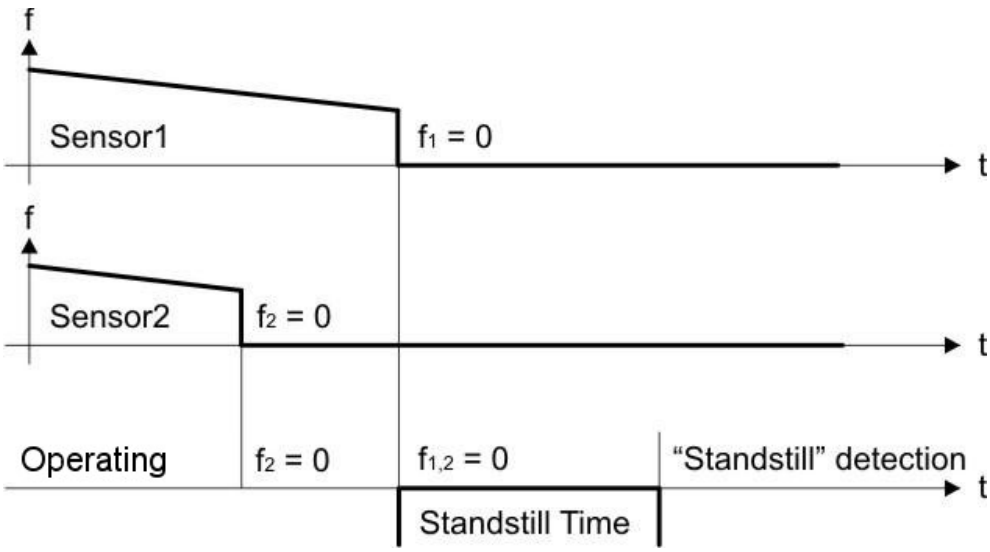
Output	RELAY	OUT4	OUT3	OUT2	OUT1
Bit	5	4	3	2	1
Binary	10000	01000	00100	00010	00001
Value	**16**	**8**	**4**	**2**	**1**

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)

075 Standstill Time

Delay time for the acknowledgement of a standstill condition. As soon as both input frequencies are detected as "0", 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" ($f_{1,2}$ = 0 Hz). From that moment the standstill time delay starts, when it expires the standstill condition is acknowledged.
Default = 0 (min. = 0, max. = 9.999)

076 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 "7.2.7 Control menu" section on page 116 - or additionally by an automatic reset when the standstill condition is detected (bit 6 = 1).
Default = 0 (min. = 0, max. = 63)

EXAMPLE 1
If you set "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 "7.2.7 Control menu" section on page 116).

EXAMPLE 2
If you set "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 **048 Pulse Time OUT1** parameter and the following), no self-locking function can be assigned to the respective output.

077 Action Output

Output selection for overwriting.
The function to set fixed output conditions for OUT1 to OUT4 and REL1 **is only effective in the "Programming Mode"** (see the "4.12 DIL switch ([S1] DIP switch)" section on page 48). It is used for test purposes and allows to force each output to a defined switching condition. This **077 Action Output** parameter selects the outputs to be tested. The next **078 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
If you set "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 **078** **Action Polarity** parameter
OUT3	1	Status, see the **078** **Action Polarity** parameter
OUT2	1	Status, see the **078** **Action Polarity** parameter
OUT1	0	No overwriting

WARNING
After the test, the parameter must be set back to the default value (=0).

078 Action Polarity

Setting the output conditions.
This function **is only effective in the "Programming Mode"** (see the "4.12 DIL switch ([S1] DIP switch)" section on page 48) and requires a selection of the corresponding outputs (see the **077** **Action Output** parameter on page 112).

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 "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.

079 Read Back OUT

Output for the EDM function. It defines the readback output for the EDM function with respect to inverted and non-inverted signals.

Bit 0	= 0 = 1	EDM function of OUT1 EDM function of /OUT1
Bit 1	= 0 = 1	EDM function of OUT2 EDM function of /OUT2
Bit 2	= 0 = 1	EDM function of OUT3 EDM function of /OUT3
Bit 3	= 0 = 1	EDM function of OUT4 EDM function of /OUT4

Default = 0 (min. = 0, max. = 15)

080 Output Mode

Output configuration. It defines the configuration of the outputs.

Bit 0	= 0 = 1	OUT1 and /OUT1 are inverse OUT1 and /OUT1 are homogeneous
Bit 1	= 0	OUT2 and /OUT2 are inverse

	= 1	OUT2 and /OUT2 are homogeneous
Bit 2	= 0 = 1	OUT3 and /OUT3 are inverse OUT3 and /OUT3 are homogeneous
Bit 3	= 0 = 1	OUT4 and /OUT4 are inverse 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.

7.2.7 Control menu

This section describes the features and configuration options of the control inputs (refer to the "4.6 CONTROL IN, HTL encoder inputs / control inputs ([X10] terminal)"section on page 37). Depending on the selected operating mode (see the "7.2.2 Main menu" section on page 86), up to four HTL/PNP control inputs are available at [X10 | CONTROL IN] terminal.

Three different input configurations can be set in the **089 Input Mode** parameter (see on page 121).

7.2.7.1 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.

Input 1	[X10:2] **LOW**	[X10:3] **LOW**	Error if inverse	Configuration by setting the **081 IN1 Function** and **082 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	
Inputs 2	[X10:4] **LOW**	[X10:5] **LOW**	Error if inverse	Configuration by setting the **085 IN2 Function** and **086 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	

7.2.7.2 One 2-pole inputs (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.

Input 1	[X10:2] **LOW**	[X10:3] **LOW**	Error if inverse	Configuration by setting the **081 IN1 Function** and **082 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	
Inputs 2	[X10:4] **LOW**		Configuration by setting the **085 IN2 Function** and **086 IN2 Config** parameters	
	[X10:4] **HIGH**			
	[X10:5] **LOW**		Configuration by setting the **087 /IN2 Function** and **088 /IN2 Config** parameters	
	[X10:5] **HIGH**			

7.2.7.3 Four 1-pole inputs (IN1 + /IN1 + IN2 + /IN2)

The 1-pole inputs only require a single channel. Thus four independent inputs are available.

Input 1	[X10:2] **LOW**	Configuration by setting the **081 IN1 Function** and **082 IN1 Config** parameters
	[X10:2] **HIGH**	
	[X10:3] **LOW**	Configuration by setting the **083 /IN1 Function** and **084 /IN1 Config** parameters
	[X10:3] **HIGH**	
Inputs 2	[X10:4] **LOW**	Configuration by setting the **085 IN2 Function** and **086 IN2 Config** parameters
	[X10:4] **HIGH**	
	[X10:5] **LOW**	Configuration by setting the **087 /IN2 Function** and **088 /IN2 Config** parameters
	[X10:5] **HIGH**	

081 IN1 Function

It sets a function to the [X10 : 2] input.
The switching behaviour must be set in the **082 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 **018 Set Frequency 1** parameter) Frequency simulation of Sensor 1 (see the **000 Operational mode** parameter)	[stat] [PRG]
8	Sets Frequency 2 (see the **025 Set Frequency 2** parameter) Frequency simulation of Sensor 2 (see the **000 Operational mode** parameter)	[stat] [PRG]
9	Sets Frequencies 1 and 2 (see the **018 Set Frequency 1** and **025 Set Frequency 2** parameters) Frequency simulation of Sensor 1 and Sensor 2	[stat] [PRG]

10	Freezes Frequency 1 Freezes the current encoder frequency of Sensor 1	[stat] [PRG]
11	Freezes Frequency 2 Freezes the current encoder frequency of Sensor 2	[stat] [PRG]
12	Freezes Frequencies 1 and 2 Freezes the encoder frequency of Sensor 1 and Sensor 2	[stat] [PRG]
13	Preselection change (see the "7.2.5 Preselect menu" section on page 97). Switch-over from the upper to the lower switching point and vice versa. It affects all outputs.	[stat]
14	Clears Drift 1 (see the **016 Position Drift 1** parameter). It clears the counter of position drift 1.	[dyn]
15	Clears Drift 2 (see the **023 Position Drift 2** parameter). It clears the counter of position drift 2.	[dyn]
16	Clears Drifts 1 and 2 (see the **016 Position Drift 1** and **023 Position Drift 2** parameters). It clears both counters (position drifts 1 and 2).	[dyn]
17	EDM function of OUT1 or /OUT1	
18	EDM function of OUT2 or /OUT2	
19	EDM function of OUT3 or /OUT3	
20	EDM function of OUT4 or /OUT4	
21	Enables input for the output function of the **Switch Mode** parameter when set to 10 ... 18 (see the **043 Switch Mode OUT1** parameter and the following).	[stat]

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 "4.12 DIL switch ([S1] DIP switch)" section on page 48)

Default = 0 (min. = 0, max. = 21)

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.

082 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 **081 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)

083 /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 **081 IN1 Function** parameter.
Default = 0 (min. = 0, max. = 21)

084 /IN1 Config

Switching behaviour of the [X10 : 3] input. For more information on the switching behaviours please refer to the **082 IN1 Config** parameter.
Default = 0 (min. = 0, max. = 35)

085 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 **081 IN1 Function** parameter.
Default = 0 (min. = 0, max. = 21)

086 IN2 Config

Switching behaviour of the [X10 : 4] input. For more information on the switching behaviours please refer to the **082 IN1 Config** parameter.
Default = 0 (min. = 0, max. = 35)

087 /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 **081 IN1 Function** parameter.
Default = 0 (min. = 0, max. = 21)

088 /IN2 Config

Switching behaviour of the [X10 : 5] input. For more information on the switching behaviours please refer to the **082 IN1 Config** parameter.
Default = 0 (min. = 0, max. = 35)

089 Input Mode

Input configuration.
It defines 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)

090 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.
Default = 0 (min. = 0000, max. = 1.000)

091 Reserved

Reserved

7.2.8 Serial menu

092 Serial Unit No.

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)

093 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)

094 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
* With "no parity" option a safe data transmission cannot be guaranteed. For a safer data transmission the parity bit must be set to "even" or "odd".

095 Serial Page
This parameter is only used for diagnosis purposes by the manufacturer.
Default = 0 (min. = 0, max. = 14)

096 Serial Init
This parameter allows to set the baud rate (see the **093 Serial Baud Rate** parameter) for the transmission of the initialization values to either the OS6.0 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.

097 Reserved
Reserved

7.2.9 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.

098 RS Selector

For IFS-10S model please read the information in the "7.2.1 Important notes for IFS-10S and IFS-10SA" section on page 85.

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 "7.2.2 Main menu" section on page 86).

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 "4.8 RS-422 OUT, RS-422 splitter output ([X4] terminal block)" section on page 42).
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 "4.8 RS-422 OUT, RS-422 splitter output ([X4] terminal block)" section on page 42).
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.

099 Reserved

Reserved

100 Reserved

Reserved

101 Reserved

Reserved

7.2.10 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.

102 Analog Start

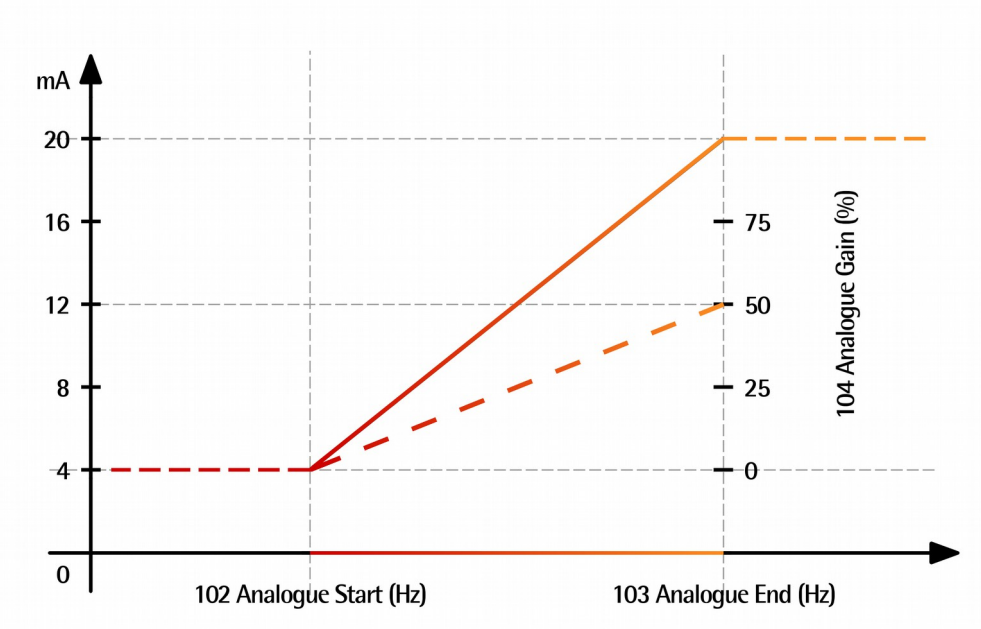
Starting value of the conversion range expressed in Hz.
This parameter allows to set the starting frequency that has to be paired with the 4 mA low limit of the analogue output range. The value is expressed in hertz (Hz).
Default = 0 (min. = -500000.0, max. = 500000.0)

103 Analog End

Final value of the conversion range expressed in Hz.
This parameter allows to set the 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 = 10000.0 (min. = -500000.0, max. = 500000.0)

104 Analog Gain

Gain of the D/A converter expressed in percentage (%).
If you set "100" % the frequency ramp between **102 Analog Start** and **103 Analog End** parameters equals the whole ramp from 4 mA to 20 mA (the whole range is 16 mA), see the solid line ramp in the Figure below.
Otherwise, if you set, for example, "50" %, the 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 **103 Analog End** parameter, see the dotted line ramp in the Figure below.
Default = 100 (min. = 1, max. = 100)



105 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)

106 Reserved

Reserved

7.2.11 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".

107 X Factor 1

No function for IFS-10, IFS-10-PM internal parameter.
Default = 1 (min. = 1, max. = 999999)

108 / Factor 1

No function for IFS-10, IFS-10-PM internal parameter.
Default = 1 (min. = 1, max. = 999999)

109 +/- Value 1

No function for IFS-10, IFS-10-PM internal parameter.
Default = 0 (min. = -999999, max. = 999999)

110 Units 1

No function for IFS-10, IFS-10-PM internal parameter.
Default = 0 (min. = 0, max. = 12)

111 Decimal Point 1

No function for IFS-10, IFS-10-PM internal parameter.
Default = 0 (min. = 0, max. = 5)

112 X Factor 2

No function for IFS-10, IFS-10-PM internal parameter.
Default = 1 (min. = 1, max. = 999999)

113 / Factor 2

No function for IFS-10, IFS-10-PM internal parameter.
Default = 1 (min. = 1, max. = 999999)

114 +/- Value 2

No function for IFS-10, IFS-10-PM internal parameter.
Default = 0 (min. = -999999, max. = 999999)

115 Units 2

No function for IFS-10, IFS-10-PM internal parameter.
Default = 0 (min. = 0, max. = 12)

116 Decimal Point 2

No function for IFS-10, IFS-10-PM internal parameter.
Default = 0 (min. = 0, max. = 5)

117 Reserved

Reserved

118 Reserved

Reserved

119 Reserved

Reserved

8 - Error detection

In order to ensure the maximum operational safety and reliability, the units are equipped with several and careful 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 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 variants are fully described in the following sections.

8.1 Error representation

Error conditions are shown in the following manners:

Error Representation	Reference
Front LEDs	The yellow LED is solidly lit. See the "4.15 Diagnostic LEDs" section on page 52 (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".

Operator surface OS6.0	Initialization Test = red (State field) Runtime Test = red (State field) See the OS6.0 software tool "User's guide".

8.2 Initialization Test

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

Error Code IFS-10-PM unit	Error OS6.0 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. 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. Otherwise internal error.
H' 0000 0020	GPI Error	Check the connections of the digital inputs and the input configuration. Otherwise internal error.
H' 0000 0040	CAP Error	Internal error.
H' 0000 0080	SPI Error	Check the connections of the analogue output. Otherwise internal error.
H' 0000 0100	QEP Error	Check the separation or disconnection of the encoder supply at self-test. Otherwise internal error.
H' 0000 0200	SCO Error	Check the connections of the sine cosine output. Otherwise internal error.
H' 0000 0400	CPU Error	Internal error.
H' 0000 0800	RAM Error	Internal error.
H' 0000 1000	WDO Error	Internal error.

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

8.3 Runtime Test

These monitors / tests are processed automatically and continuously in the background while the unit is running.

Error Code IFS-10-PM unit	Error OS6.0 software tool	Description
H' 0000 0001	SIN/COS Channel 1 Error	Error of the SINCOS IN 1 input. Faulty sine cosine encoder, faulty wiring or internal error of the unit. Check the encoder and the wiring. If the error cannot be cleared, please contact the manufacturer.
H' 0000 0002	SIN/COS Channel 2 Error	See the H' 0000 0001 error code.
H' 0000 0004	External Supply Channel 1 Error	Error of the encoder supply. Disconnect the encoder supply, switch off the unit and then on again. If the error is OFF → external error, e.g. faulty wiring or short circuit. If the error is still ON → internal error, please contact the manufacturer.
H' 0000 0008	External Supply Channel 2 Error	See the H' 0000 0004 error code.
H' 0000 0010	External Supply BG Error	Error of the IFS-10-PM power supply. Remove the display, switch off the unit and then on again. If the error is OFF → external error, e.g. IFS-10-PM short circuit. If the error is still ON → internal error, please contact the manufacturer.
H' 0000 0020	External Supply BG Status Error	See the H' 0000 0010 error code.

H' 0000 0040	External Supply GV Status Error	See the H' 0000 0004 error code.
H' 0000 0080	External Supply Short Circuit Error	See the H' 0000 0004 error code. See the H' 0000 0010 error code.
H' 0000 0100	Temperature Error	Temperature error. Switch off the unit and cool it down, then switch it on again. If the error is OFF → external error, e.g. temperature out of range. If the error is still ON → internal error, please contact the manufacturer.
H' 0000 0200	Readback Digital Output Error	Control outputs error. Remove the [X2 | CONTROL OUT] connector, switch off the unit and then on again. If the error is OFF → external error, e.g. faulty wiring or short circuit. If the error is still ON → internal error, please contact the manufacturer.
H' 0000 0400	Sequence Analog Output Error	Analogue output error. Switch off the unit and remove the [X4 : 2] and [X4 : 3] wiring of the connector. Switch on the unit again. If the error is OFF → external error, e.g. faulty wiring or open circuit. If the error is still ON → internal error, please contact the manufacturer.
H' 0000 0800	Readback Relay Output Error	Relay output error. Please contact the manufacturer.
H' 0000 1000	Readback Analog Output Error	See the H' 0000 0400 error code.
H' 0000 2000	GPI Error	Control inputs error. Faulty wiring, illegal signal states (no complementary signals) or internal error.
H' 0000 4000	Sequence DAC Output Error	See the H' 0000 0400 error code.

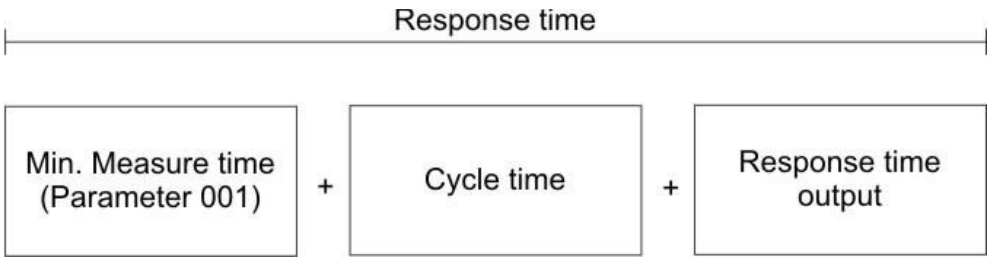
H' 0000 8000	DAC Output Error	See the H' 0000 0400 error code.
H' 0001 0000	Phase Channel 1 Error	Sensor 1 phase error. Check the 017 Phase Err Count 1 parameter. Switch off the unit and then on again.
H' 0002 0000	Phase Channel 2 Error	Sensor 2 phase error. Check the 024 Phase Err Count 2 parameter. Switch off the unit and then on again.
H' 0004 0000	Frequency Error	Divergence error. Check the parameters from 004 Div. Switch %-f to 021 Multiplier 2. Switch off the unit and then on again.
H' 0008 0000	Drift Error 1	Sensor 1 drift error. Check the 016 Position Drift 1 parameter. Switch off the unit and then on again.
H' 0010 0000	Drift Error 2	Sensor 2 drift error. Check the 023 Position Drift 2 parameter. Switch off the unit and then on again.
H' 0020 0000	ESM Error	Internal error. Switch off the unit and then on again. If the error is still ON, please contact the manufacturer.
H' 0040 0000	Wrong Parameter Error Simulation	Error in the Error Simulation procedure. Check the 009 Error Simulation parameter. Switch off the unit and then on again.
H' 0080 0000	Register Error	Internal error. Switch off the unit and then on again. If the error is still ON, please contact the manufacturer.
H' 0100 0000	RTI/QUP Cycle Error	
H' 0200 0000	External Clock Error	
H' 0400 0000	ADC Error	
H' 0800 0000	I2C Error	
H' 1000 0000	Initialization Test Error	

8.4 Error Clearing

Error states can generally be cleared by switching the power off and then on again (after removing the error source).

8.5 Error Detection Time

Basically it is not possible to specify an exact error detection time because the error detection depends on many factors.



Reaction time

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

- the input frequency;
- some parameters such as: 001 Sampling Time, 002 Wait Time, Divergence (004 Div. Switch %-f, 005 Div. %-Value, 006 Div. f-Value, 007 Div. Calculation, 008 Div. Filter), 010 Power-up Delay, 075 Standstill Time, ...;
- the reaction time of the output.

9 - Parameters list

No.	Parameter	Min. Value	Max. Value	Default	Characters	Decimal Places	Serial Code
See the "7.2.2 Main menu" section on page 86							
000	Operational mode	0	9	0	1	0	A0
001	Sampling Time	1	9999	1	4	3	A1
002	Wait Time	10	9999	1000	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	1000	100	4	3	B0
011	Reserved	0	10000	1000	5	0	B1
012	Reserved	0	10000	1000	5	0	B2
See the "7.2.3 Sensor 1 menu" section on page 91							
013	Direction 1	0	1	0	1	0	B3
014	Multiplier 1	1	10000	1	5	0	B4
015	Divisor 1	1	10000	1	5	0	B5
016	Position Drift 1	0	100000	0	6	0	B6
017	Phase Err Count 1	1	1000	10	4	0	B7
018	Set Frequency 1	-5000000	5000000	0	87	1	B8
019	Reserved	0	10000	1000	5	0	B9
See the "7.2.4 Sensor 2 menu" section on page 94							
020	Direction 2	0	1	0	1	0	C0
021	Multiplier 2	1	10000	1	5	0	C1
022	Divisor 2	1	10000	1	5	0	C2
023	Position Drift 2	0	100000	0	6	0	C3
024	Phase Err Count 2	1	1000	10	4	0	C4
025	Set Frequency 2	-5000000	5000000	0	87	1	C5
026	Reserved	0	10000	1000	5	0	C6
See the "7.2.5 Preselect menu" section on page 97							
027	Preselect OUT1.H	-5000000	5000000	100000	87	1	C7
028	Preselect OUT1.L	-5000000	5000000	200000	87	1	C8
029	Preselect OUT1.D	-5000000	5000000	0	07	1	M0
030	Preselect OUT2.H	-5000000	5000000	300000	87	1	C9
031	Preselect OUT2.L	-5000000	5000000	400000	87	1	D0
032	Preselect OUT2.D	-5000000	5000000	0	07	1	M1
033	Preselect OUT3.H	-5000000	5000000	500000	87	1	D1
034	Preselect OUT3.L	-5000000	5000000	600000	87	1	D2
035	Preselect OUT3.D	-5000000	5000000	0	07	1	M2

No.	Parameter	Min. Value	Max. Value	Default	Characters	Decimal Places	Serial Code
See the "7.2.5 Preselect menu" section on page 97 (continued from previous page)							
036	Preselect OUT4.H	-5000000	5000000	700000	87	1	D3
037	Preselect OUT4.L	-5000000	5000000	800000	87	1	D4
038	Preselect OUT4.D	-5000000	5000000	0	07	1	M3
039	Preselect REL1.H	-5000000	5000000	10000	87	1	D5
040	Preselect REL1.L	-5000000	5000000	20000	87	1	D6
041	Preselect REL1.D	-5000000	5000000	0	07	1	M4
042	Reserved	0	10000	1000	5	0	D8
See the "7.2.6 Switching menu" section on page 101							
043	Switch Mode OUT1	0	18	0	1	0	D9
044	Switch Mode OUT2	0	18	0	1	0	E0
045	Switch Mode OUT3	0	18	0	1	0	E1
046	Switch Mode OUT4	0	18	0	1	0	E2
047	Switch Mode REL1	0	18	0	1	0	E3
048	Pulse Time OUT1	0	9999	0	4	3	E4
049	Pulse Time OUT2	0	9999	0	4	3	E5
050	Pulse Time OUT3	0	9999	0	4	3	E6
051	Pulse Time OUT4	0	9999	0	4	3	E7
052	Pulse Time REL1	0	9999	0	4	3	E8
053	Hysteresis OUT1	0	1000	0	4	1	E9
054	Hysteresis OUT2	0	1000	0	4	1	F0
055	Hysteresis OUT3	0	1000	0	4	1	F1
056	Hysteresis OUT4	0	1000	0	4	1	F2
057	Hysteresis REL1	0	1000	0	4	1	F3
058	Matrix OUT1	0	511	0	3	0	K0
059	Matrix OUT2	0	511	0	3	0	K1
060	Matrix OUT3	0	511	0	3	0	K2
061	Matrix OUT4	0	511	0	3	0	K3
062	Matrix REL1	0	511	0	3	0	K4
063	MIA delay OUT1	0	99999	0	5	3	K5
064	MIA delay OUT2	0	99999	0	5	3	K6
065	MIA delay OUT3	0	99999	0	5	3	K7
066	MIA delay OUT4	0	99999	0	5	3	K8
067	MIA delay REL1	0	99999	0	5	3	K9
068	MAI delay OUT1	0	99999	0	5	3	L0
069	MAI delay OUT2	0	99999	0	5	3	L1
070	MAI delay OUT3	0	99999	0	5	3	L2
071	MAI delay OUT4	0	99999	0	5	3	L3
072	MAI delay REL1		99999	0	5	3	L4
073	Start-up Mode	0	9	0	1	0	F4
074	Start-up Output	0	31	0	2	0	F5
075	Standstill Time	0	9999	0	4	3	F6

No.	Parameter	Min. Value	Max. Value	Default	Characters	Decimal Places	Serial Code
See the "7.2.6 Switching menu" section on page 101 (continued from previous page)							
076	Lock Output	0	63	0	2	0	F7
077	Action Output	0	31	0	2	0	F8
078	Action Polarity	0	511	0	3	0	F9
079	Read Back OUT	0	15	0	2	0	60
080	Output Mode	0	15	0	2	0	61
See the "7.2.7 Control menu" section on page 116							
081	IN1 Function	0	21	0	2	0	G2
082	IN1 Config	0	35	0	2	0	G3
083	/IN1 Function	0	21	0	2	0	I0
084	/IN1 Config	0	35	0	2	0	I1
085	IN2 Function	0	21	0	2	0	G4
086	IN2 Config	0	35	0	2	0	G5
087	/IN2 Function	0	21	0	2	0	I2
088	/IN2 Config	0	35	0	2	0	I3
089	Input Mode	0	2	0	1	0	I4
090	Read back delay	0	1000	0	4	3	G6
091	Reserved	0	10000	1000	5	0	G7
See the "7.2.8 Serial menu" section on page 122							
092	Serial Unit No.	11	99	11	2	0	90
093	Serial Baud Rate	0	10	0	2	0	91
094	Serial Format	0	9	0	1	0	92
095	Serial Page	0	14	0	2	0	~0
096	Serial Init	0	1	0	1	0	9~
097	Reserved	0	10000	1000	5	0	H0
See the "7.2.9 Splitter menu" section on page 124							
098	RS Selector	0	1	0	1	0	H1
099	Reserved	0	10000	1000	5	0	H2
100	Reserved	0	10000	1000	5	0	H3
101	Reserved	0	10000	1000	5	0	H4
See the "7.2.10 Analogue menu" section on page 125							
102	Analog Start	-5000000	5000000	0	87	1	H5
103	Analog End	-5000000	5000000	100000	87	1	H6
104	Analog Gain	1	100	100	4	0	H7
105	Analog Offset	-25	25	0	83	0	H8
106	Reserved	0	10000	1000	5	0	H9

No.	Parameter	Min. Value	Max. Value	Default	Characters	Decimal Places	Serial Code
See the "7.2.11 OPU menu" section on page 127							
107	X Factor 1	1	999999	1	6	0	z0
108	/ Factor 1	1	999999	1	6	0	z1
109	+/- Value 1	-999999	999999	0	86	0	z2
110	Units 1	0	12	0	2	0	z3
111	Decimal Point 1	0	5	0	1	0	z4
112	X Factor 2	1	999999	1	6	0	z5
113	/ Factor 2	1	999999	1	6	0	z6
114	+/- Value 2	-999999	999999	0	86	0	z7
115	Units 2	0	12	0	2	0	z8
116	Decimal Point 2	0	5	0	1	0	z9
117	Reserved	0	10000	1000	5	0	J0
118	Reserved	0	10000	1000	5	0	J1
119	Reserved	0	10000	1000	5	0	0

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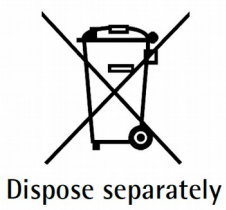
Document release	Release date	Description	HW	SW	File version
1.0	31.05.2016	First issue	-	-	-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