E-T-A
ENGINEERING TECHNOLOGY

Instruction manual

ControlPlex® SIGMO

Contents

2 General information

2.1 Safety instructions

This manual points out possible danger for your personal safety and gives instruction how to avoid property damage. The following safety symbols are used to draw the reader's attention to the safety instructions included in this manual.

Danger!
Danger to life and limb unless the following safety precautions are taken.

Warning
Danger to machinery, materials or the environment unless the following safety precautions are taken.

Note
Information is provided to allow a better understanding.

2.2 Qualified personnel

This user manual must exclusively be used by qualified personnel, who are able - based on their training and experience - to realise arising problems when handling the product and to avoid related hazards. These persons have to ensure that the use of the product described here meets the safety requirements as well as the requirements of the presently valid directives, standards and laws.

2.3 Use

The product is part of a continuous enhancement process. Therefore there might be deviations between the product in hand and this documentation. These deviations will be remedied by a regular review and resulting corrections in future editions. The right to make changes without notice is reserved. Error and omissions excepted.

2.4 Delivery state

The product is supplied with a defined hardware and software configuration. Any changes in excess of the documented options are not permitted and lead to liability exclusion.

3 General description

The signalling module (SIGMO) is the connecting link for a communication with up to 8 circuit breakers REF16-S114 as well as with a superordinate control unit.

The data exchange with the control units is effected synchronously via two digital PLC outputs (DataInSigmo X51/Kl.1 and Clock X51/Kl.2) as well as via a digital PLC input (DataOutSigmo X51/Kl.3).

The terminal (X51/Kl.4) is intended for GND connection between the PLC and the signalling module.

This connection is not compulsory. In the event of a greater distance between the PLC and the signalling module it is recommended to minimise noise emissions on the data lines.

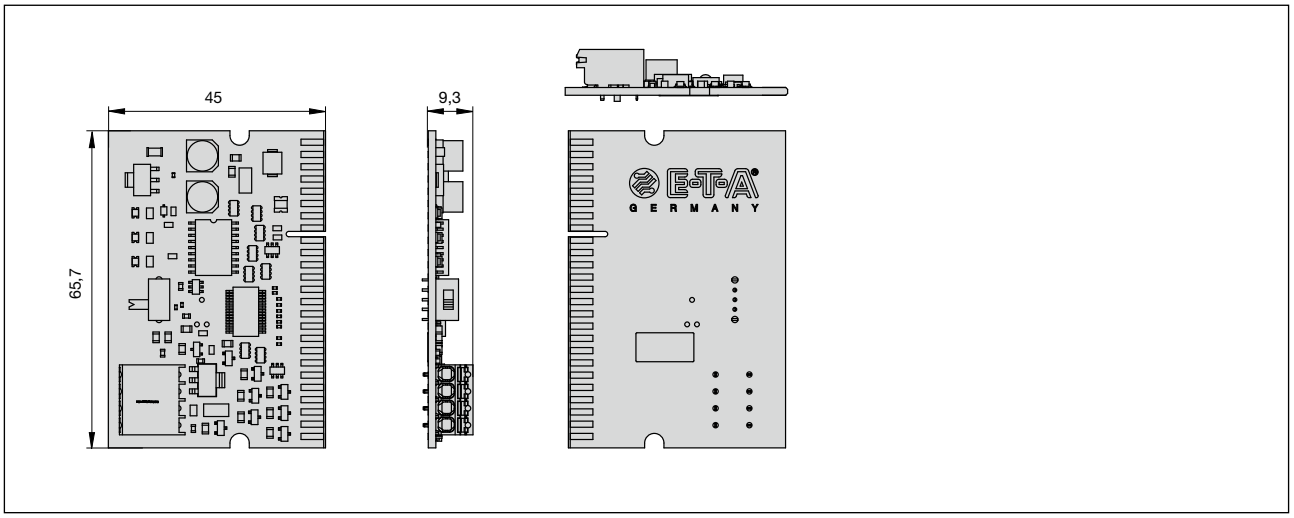

fig. 1: SIGMO-24-001 signalling module

The circuit breakers for equipment protection can be switched on or off via the signalling module. In addition the conditions of the circuit breaker status outputs are transmitted.

4 Start-up behaviour

Immediately after applying the supply voltage, the supply voltage is in the SYSTEMINIT operating mode, i.e. the module is initialised and routine self-tests are carried out (RAM test etc.).

If the test routines were successful, all 8 circuit breakers will be switched on sequentially after 100 ms each. Afterwards the signalling module will change into the operating mode WAIT_FOR_DATA. All CBEs will remain ON until the first data sequence was received faultlessly.

When a data sequence was received faultlessly, the signalling module will change into the operating mode NORMAL_MODE and data transmission will be monitored with regard to communication errors.

During initialisation the switching status of the switch S1 will be determined. This switch determines the behaviour of the circuit breakers in the event of data transmission error (parity bit, start bit and/or stop bit invalid, timeout error).

The switching status of the switch S1 will be imported only once after applying the supply voltage. Changing the switching status will therefore only take effect after removing and re-applying the supply voltage.

If a failure is detected during the self-test routines, the signalling module will change into the operating mode FEHLER_MODE. In this case the CBEs will remain off.

This operating mode can only be left by re-applying the supply voltage.

5 Definitions regarding communication

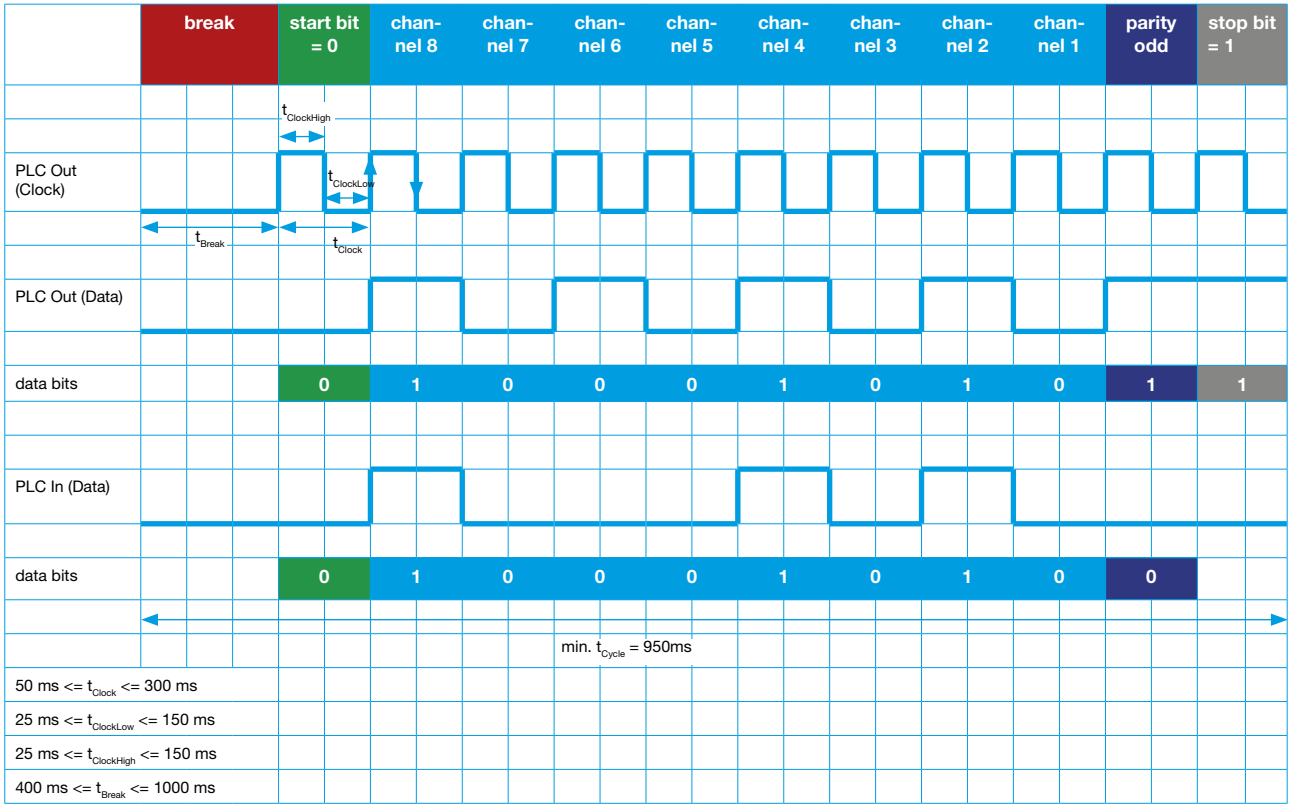

fig. 2: communication process

Communication between the superposed control unit and the signalling module (SIGMO) is realised with three cables and the corresponding signals. These include the clock cable (X51/KI.2), the PLC IN-cable (X51/KI.3) for importing the status outputs of the CBEs as well as the PLC OUT-cable (X51/KI.1) for controlling the CBEs.

The exact sequence of the communication can be seen in the picture above and is described in the following: Data transmission is always started with a “Break”.

For this both the clock line and the data out line of the PLC have to show LOW level for min. 400 ms and max. 1000 ms. As soon as this “Break” condition was recognised by the signalling module, it is ready for the following data sequence.

By means of the clock line the PLC defines the pulse with which the data are read by the signalling module or made available for the PLC. The clock signal has to show a LOW and a HIGH phase of 25 ms to 150 ms each.

The LOW and HIGH phases can have a different length. The PLC makes the data bits available with the rising flank of the clock signal. The signalling module imports the data shortly after the falling flank of the clock signal. The data bits transmitted by the PLC begin with a start bit which is always 0. Then the databits for the 8 CBEs follow, beginning with slot 8.

5.1 Assignment of the data bits

Data bit	action
0	Switch off CBE
1	Switch on CBE

fig. 3: data bit assignment

After the data bits, a test bit is transmitted in the shape of a parity bit (”parity odd”).

By means of the 8 received data bits the signalling module calculates the parity for the CBEs and compares the calculated parity with received parity bit. If the calculated parity conforms with the received parity, the data will be adopted and the CBEs will be activated corresponding to the data bits.

If the calculated parity does not conform with the received parity bit, the data will not be adopted. In this case the signalling module will change into the operating mode KOMMUNIKATIONSFEHLER.

Thus the PLC can use the parity bit also as an enable bit.

The end of the data sequence is a stop bit which always has HIGH level.

The data bits transmitted by the signalling module for the PLC will be made available by the signalling module with the rising flank of the clock signal.

These data bits will also begin with a start bit which is always 0.

Subsequent to the start bit the signalling module transmits the status indications of the CBEs.

After the 8 status signals the signalling module also transmits a parity bit (”parity odd”), calculated from the 8 status signals. This test bit can be evaluated by the PLC so as to recognise a possible transmission failure of the status signals.

By means of this parity bit missing supply voltage of the signalling module can also be detected.

If there is no supply voltage, the PLC reads a permanent LOW level. However, if only all CBEs are switched off, the parity bit will be set to HIGH.

The PLC should imort these data shortly after the falling flank of the clock signal.

5.2 Comments regarding communication

The data bits sent by the PLC will only be transmitted as updated on occasion of the next data sequence by the signalling module as status signals. By means of these status signals, the PLC can recognise if a CBE has manually been switched off or if it has tripped or if there was a transmission failure.

If status signals of the CBEs should not be enquired, it is sufficient to transmit the data sequence only once from the PLC to the signalling module. In this case the switch S1 has to be in condition “FREEZE”, because if there are no further data sequences this will be identified as transmission failure and all CBEs are switched off in the position “OFF”.

However, if all status signals of the CBEs are to be permanently monitored, the data sequences with the required activations of the CBEs have to be transmitted permanently from the PLC to the signalling module.

6 Calculation of the parity

Odd parity is used. The number of ones within the 8 data bits is determined. If the number of data bits set to 1 is even, the parity bit will be set. If the number of data bits set to 1 is odd, the parity bit will be deleted. Therefore odd means the number of set data bits including the parity bit.

In the following examples we want to establish an odd parity:

8 data bits (channel 8 - channel 1)	parity bit	comments
01001110	1	The data bits of the channels hold 4 ones. The parity bit is set so as to produce an odd number (5 ones).
11001110	0	The parity with 5 ones is already odd, the parity bit is not set.
01000000	1	The number of set data bits including the parity bit here is 2, although the number should be odd. An error has occurred! Either the parity bit was miscalculated or there was a transmission failure.

fig. 4: calculation of the parity

7 Communication errors

The signalling module gets into this operating mode when the parity bit, start bit or stop bit are invalid, or if there was a timing infringement (timeout error).

Further behaviour of the module in this case depends on the switching status of the switch S1 (see chapter start-up behaviour).

7.1 Switch positions S1

Switching status “OFF”:

A transmission error will affect the condition of the CBEs.

LOW level will be applied at the control input of the CBEs. This causes the CBEs to go into OFF condition.

Switching status “FREEZE”:

A transmission error will not affect the condition of the CBEs.

The control input of the CBEs will remain unchanged.

With the next faultlessly received data sequence the module will change back to operating mode NORMAL_MODE.

8 Visual status indication and data output

operating state	LED Pwr	LED Com	LED Err	Data Out	Load outputs
SYSTEMINIT	green	yellow	red	LOW	OFF ➔ ON
WAIT_FOR_DATA	green	blinking yellow*	red	LOW	ON
FEHLER_MODE	green	yellow OFF	red	LOW	OFF
NORMAL_MODE	green	blinking yellow*	red OFF*	DATA	INDIVIDUAIL
KOMMUNIKATIONS-FEHLER	green	blinking yellow*	red	LOW	OFF or INDIVIDUAL (depending on S1)

* The LED (Com)munication changes its condition with the rising flank of the clock signal.

fig. 5: Visual status indication and data output

9 Appendix

9.1 List of pictures

9.2 Technical data

For the technical data of SIGMO-24-001 signalling module please see relevant data sheet.

9.3 Subject index

Notes

http://www.e-t-a.de/QR1017

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