Signalling Module

For Calio

Supplementary Operating Manual

KSB

Legal information/Copyright

Supplementary Operating Manual Signalling Module

Original operating manual

Contents

1 General

This supplementary operating manual accompanies the installation/operating manual. All information contained in the installation/operating manual must be observed.

Table 1: Relevant operating manuals

Type series	Reference number of the operating/installation manual
Calio	1157.82

Manufacturer's product literature For accessories and/or integrated machinery components observe the relevant manufacturer's product literature.

2 Storage

If the ambient conditions for storage are met, the accessories will give reliable service even after a prolonged period of storage. If stored properly, the product will be protected for a maximum of 12 months.

Table 2: Ambient conditions for storage

Ambient condition	Value
Relative humidity	85 % max. (non-condensing)
Ambient temperature	-10 °C to +70 °C

1. Store the device in dry conditions, if possible in its original packaging.

2. Store the device in a dry room in which the atmospheric humidity is maintained at a constant level (as far as this is possible).

3. Prevent excessive fluctuations in atmospheric humidity.

3 Description

3.1 Compatibility

The signalling module is already preconfigured at the factory and cannot be changed in its operative function.

3.2 General description

The module communicates with a connected pump via Modbus and is connected to the Modbus terminal pair of the pump for this purpose (see the operating manual for the pump).
Do not change the factory-configured Modbus settings for the pump.

The signalling module offers:

- ▪ 2 volt-free relay contacts (changeover contacts)
- ▪ 1 Modbus RTU interface

The relay contacts switch if the "in operation" status or the "alarm" status are signalled by the pump's Modbus register.

The respective relay of the signalling module switches in the following cases:

1. If, with power supplied (230 V AC), an external signal causes the pump to start or stop by way of the RUN terminal pair.
2. If the pump displays error message E01-E04 or E06, E08 and the pump is stopped.

	NOTE
	The E05 message does not cause the pump to be stopped (warning). A failure in Modbus communication between the pump and the signalling module will not be signalled by the alarm relay.

	NOTE
	Depending on the length of the (Modbus) cable between the pump and the signalling module, the "in operation" message or general fault message may take up to 10 seconds to be displayed.

3.3 Selecting the operating mode

3.3.1 "In operation"/alarm message

This function cannot be changed.

Actuation of the relays is indicated by the "Alarm" and "Run" LEDs on the circuit board (see circled-in area in Figure).
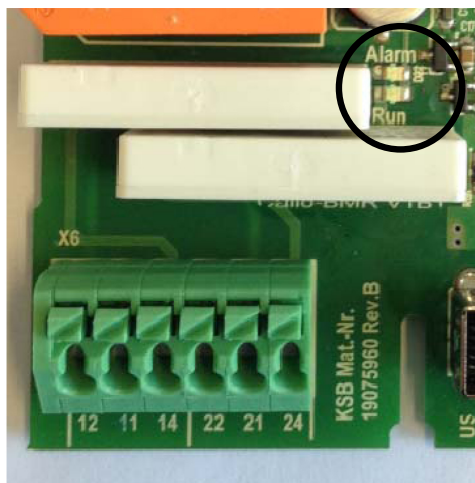

Fig. 1: Relay actuation

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NOTE
The alarm relay is not actuated if the pump is in good operative condition.

3.4 Connection to Modbus

The module offers a Modbus (RTU) interface that is used directly for integration in a Modbus network. The Modbus interface is equipped with an RS485 interface with the Modbus (RTU) protocol in accordance with specification V1.1b.

Table 3: Modbus

Parameter	Description/value
Terminal cross-section	1.5 mm² max.
Interface	RS485 (TIA-485A) optically isolated
Bus connection	Shielded bus cable, twisted in pairs, 1x 2x 0.5 mm²
Cable length	1000 m maximum, stub lines impermissible, for cable lengths > 30 m suitable measures must be taken to prevent overvoltages.
Wave impedance	120 Ohm (cable type B to TIA 485-A)
Data rates [baud]	2,400/4,800/9,600/19,200 (factory setting)
Protocol	Modbus RTU standard
Data format	8 data bits, EVEN parity, 1 stop bit
Modbus address	ID #17 (factory setting)

Also see the "Connection to bus systems with Modbus" section in the pump's operating manual.

LED status Modbus communication (see circled-in area in the "X4 switch" figure)

- LED flashes with 1 Hz: Bus scanning
- LED continuously on: Cyclical polling
- LED on, and for approx. 0.1 seconds, off: Communication with building management system OK
- LED off: Communications error with pump

If the module is operated as the end device in the field bus system or if a point-to-point connection with a field bus gateway is made, the terminating resistors must be set on the PCB in order to ensure correct operation. This can be achieved easily via the switch for the X4 terminal strip. (⇨ Section 4.1, Page 11)

Fig. 2: X4 switch

Function

The signalling module is a Modbus slave and therefore only responds when prompted accordingly by a Modbus master (external hardware and software). The signalling module can neither be set nor operated as a Modbus master. The send and receive commands comply with the requirements of the standard protocol Modbus RTU.
Neither the bus cable nor the hardware and software of a Modbus master are included in the pumps' scope of supply.

Connection

Connect the bus cable (shielded, 2-core, 0.5 mm²) to terminal pair D+, D-, GND of the three-piece Modbus terminal.
Terminal G is connected to ground. The shield of the bus cable can be connected to this terminal, for example. The terminals are suitable for cable cross-sections of up to 1.0 mm².
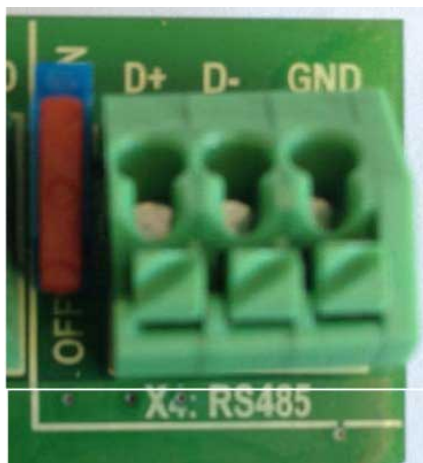

Fig. 3: X4 terminal pair

1	D+ (signal conductor)
2	D- (signal conductor)
3	GND (Ground)

All Modbus data points can be read at all times (monitoring) without having to enable the **Modbus** function at the signalling module. All data points are listed below.
Before the pump can receive and respond to any Modbus input, the **Modbus** function has to be enabled at the pump (see settings).

Data points

Data points of type R are read-only; data points of type R/W are read & write enabled.

Table 4: Overview of Modbus operating parameters

Parameter description	Register	Length [byte]	Type/format	Unit	Access
Error vector, bit code	07 D0	00 02	INT16	Bit 0 = error code E01 Bit 1 = error code E02 Bit 2 = error code E03 Bit 3 = error code E04 Bit 4 = error code E05 Bit 5 = error code E06 (error codes see "Key to the error vectors" table)	R
Calculated head	07 D2	00 02	INT16	Head in m x 10	R
Calculated flow rate	07 D4	00 02	INT16	Flow rate in m³/h x 10	R
Current speed	07 D8	00 02	UINT16	Speed in rpm	R

Parameter description	Register	Length [byte]	Type/format	Unit	Access
Pump status	07 D9	00 02	UINT16	0 = Pump stop 1 = Pump in operation	R
Operating hours pump	07 DA	00 02	INT16	Operating hours	R
Power pump	07 DC	00 02	INT16	Watt	R
Current pump load	07 DE	00 02	UINT16	Value between 0 - 100 %	R
Operating mode selection	08 34	00 01	ENUM	1 = Constant-pressure Control 4 = Proportional-pressure Control (factory setting) 8 = Eco Mode 16 = Fixed Speed Operation	R/W
Setpoint input	08 35	00 02	UINT16	0 - 9999 equals 0 - 100 % of the setpoint	R/W
Pumps start/stop	08 36	00 01	ENUM	0x05 = pump stop 0xA0 = pump start (cannot overwrite the external RUN contact)	R/W
Modbus baud rate	0B B8	00 01	ENUM	0 = 19,200 (factory setting) 3 = 9,600	R/W
Modbus address	0B B9	00 02	UINT16	0 - 240, default address 17	R/W

Function	Function code
Read	Function code 03 (0x03 read holding registers)
Write	Function code 16 (0x10 write multiple registers)

All registers (07 D0 … 07 DE) can be read out via function code 0x03 (read holding registers) as one unit.

> **NOTE**
>
> A minimum poll time of 2 seconds should be set for reading and writing.

Table 5: Key to the error vectors

Error vector	Description	Bit
E01	Temperature limit exceeded	0
E02	Overcurrent	1
E03	Internal fault	2
E04	Rotor blocked	3
E05	Overload / adjusted speed	4
E06	Supply voltage too high/low	5
E08	Motor fault	7

> **NOTE**
>
> Error E05 is a warning. The pump will not stop but reduce its speed until no overload is detected any more.

Examples of Modbus communication

1. Monitoring the speed:
    To be able to read the current speed of the pump, the following request has to be sent by the master: Modbus Request 11 03 07 D8 00 01 07 D5

2. Setpoint input:
    The setpoint can be set to any value from 0 - 9999, with 9999 equalling 100 % of the setpoint.
    Example: Write setpoint 50 %
    Modus Request 11 10 08 35 00 01 02 13 88 EA A3

3. Input control mode:
    The operating mode of the pump can also be changed via Modbus (see table).
    Example: Write Fixed Speed Operation control mode
    Modbus Request 11 10 08 34 00 01 02 00 10 E7 E8

3.5 Technical data

| Characteristic	Value
Power supply	90 - 265 V, 47 - 63 Hz, 20 - 28 V DC
Enclosure	Cabinet-mounted (CM): IP 20 Wall-mounted (WM): IP 54
Switching capacity of individual signals	24 V DC/240 V AC - 5 A
Housing design	Installation housing
Weight	Cabinet-mounted (CM): 0.15 [kg] Wall-mounted (WM): 0.5 [kg]
Dimensions	Cabinet-mounted (CM): W x H x D: approx. 71 x 90 x 60 [mm] Wall-mounted (WM): W x H x D: approx. 170 x 135 x 107 [mm]

4 Related Documents

4.1 Terminal wiring diagram
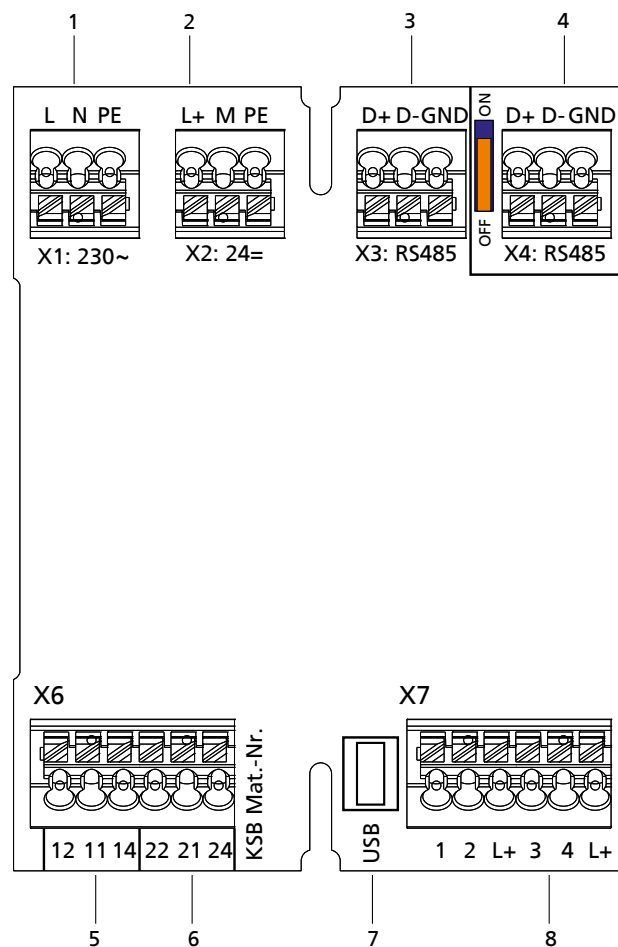
Fig. 4: Terminal wiring diagram

Table 6: Terminal wiring diagram

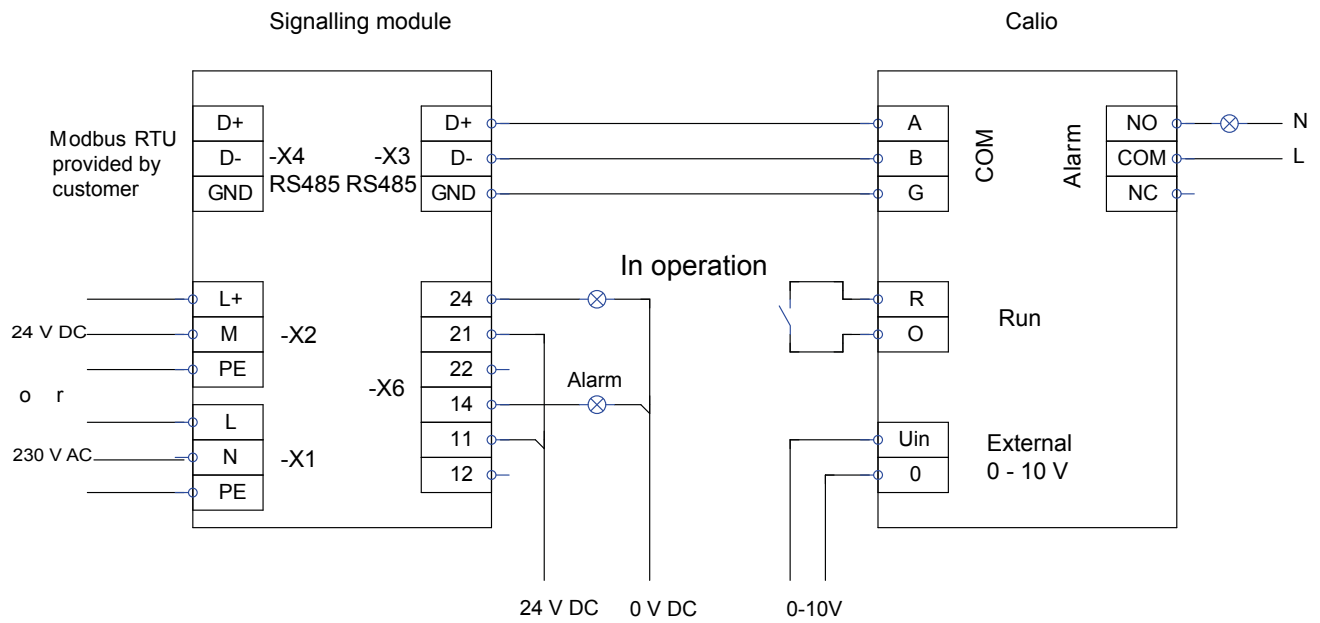| 1	X1	Power supply: 230 V AC	2	X2	Power supply: 24 V DC
3	X3	Modbus RTU connection to pump, not galvanically isolated from 24 V (1 KV), PELV	4	X4	Modbus RTU connection to building services; not galvanically isolated from 24 V (1 KV), PELV Switch for Modbus RTU scheduling
5	X6	Volt-free changeover contact, alarm, 24 V DC/240 V AC, 5 A	6	X6	Volt-free changeover contact, operation, 24 V DC/240 V AC, 5 A
7		Not used	8		Not used

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In operation

Modbus RTU provided by customer

D+	
D-	-X4
GND	RS485

D+	
D-	-X3
GND	RS485

A	
B	COM
G	

NO	N
COM	L
NC	Alarm

24 V DC

L+	
M	-X2
PE	

o r

L	
N	-X1
PE	

230 V AC

24	
21	
22	-X6
14	
11	
12	

Alarm

R	Run
O	

Uin	External
0	0 - 10 V

24 V DC   0 V DC   0-10V

Fig. 5: Connection to signalling module

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5 EU Declaration of Conformity

Manufacturer:

KSB SE & Co. KGaA
Johann-Klein-Straße 9

67227 Frankenthal (Germany)

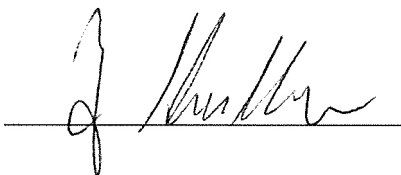The manufacturer herewith declares that **the product**:

Signalling module

Serial number range: 2018w01 to 2019w52

- is in conformity with the provisions of the following Directives as amended from time to time:
    – Electromagnetic Compatibility Directive 2014/30/EU
    – Low-voltage Directive 2014/35/EU

The EU Declaration of Conformity was issued in/on:

Frankenthal, 1 February 2018

Joachim Schullerer

Head of Product Development Pump Systems and Drives

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