



BKSYS Fire damper mini-controller

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SAFETY-RELATED NOTES

The connection to the electric mains must be performed by a qualified electrician. The transformers used for power supply must meet the requirements according to DIN EN 61558 / VDE 570 part 2-6. A corresponding fuse protection must be available on the mains side.

The commissioning engineer is a sufficiently qualified person. He/she performs commissioning and corresponding tests and instructs the operator or maintenance technician.

The operator is a trained person familiar with the functions.

The maintenance technician is a qualified professional. He/she maintains the electric and mechanical components of the control unit and performs troubleshooting.

Maintenance work may only be performed by qualified personnel in order to avoid injuries, material damage and damage to the environment. Before performing any work on electric systems, make sure that they are de-energised.

In case of power failure, the connected motorised dampers go to the CLOSED position. If it causes a hazardous situation, then it has to be prevented using suitable measures.

The disposal (electric scrap) can harm the environment. Therefore, disposal of the electronic equipment must always be performed properly.

AREAS OF APPLICATION

The BKSYS fire damper mini-controller by SCHAKO controls and regulates up to 16 motorised fire dampers (24V AC/DC) or up to 32 fire dampers with a limit switch. The basic module BKSYS-GM1 can be easily extended by up to three expansion modules BKSYS-EM1 using a safe Plug and Play plug-in connection. The power supply and data exchange of the expansion modules is performed via the basic module.

The potential-free inputs can be used to connect the external contacts such as smoke detector, ventilation or central fire alarm system. The potential-free outputs can be used to forward fault messages, for example Fire damper closed or Smoke detector triggering.

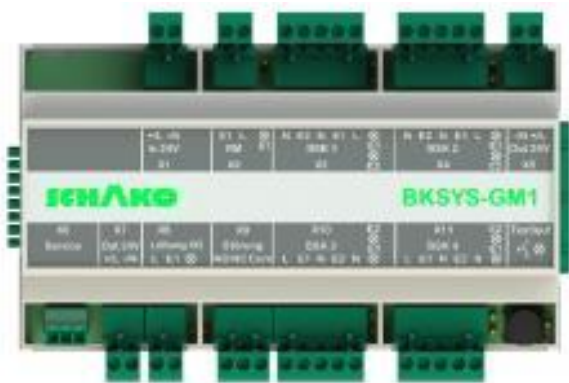
The connected spring return actuators of the fire dampers are supplied with voltage via the basic and expansion modules. Delayed opening of the connected spring-return actuators optimised according to start-up current reduces the required peak load.

The Duo LEDs on the basic and expansion modules are used to indicate the position of the fire dampers.

The assignment of the functional parameters of the BKSYS system is performed via the PC program in plain text. The PC program is included in the scope of delivery of the BKSYS USB adapter and can be run on the PC with a current version of MS operational system.

SYSTEM COMPONENTS

BASIC MODULE BKSYS-GM1



The power supply of all connected expansion modules and spring return actuators is performed via the basic module BKSYS-GM1.

Furthermore, the basic module BKSYS-GM1 controls and regulates the potential-free inputs and outputs, integrates the smoke detectors and forwards the data via the ring buffer and RS232/USB interface to the user.

All functions in the basic module BKSYS-GM1 have been designed for maximum simplicity and maximum safety at the same time. The optional PC software can be used to easily extend the existing fire damper group even subsequently.

- microprocessor-controlled system
- for up to 4 fire dampers with spring return actuators (24V AC/DC)
- or up to 4 fire dampers with two limit switches
- or up to 8 fire dampers with one limit switch
- can be extended with up to 3 expansion modules BKSYS-EM1
- with potential-free smoke detector input
- with potential-free ventilation input
- with potential-free fault output (changeover contact)
- with two voltage outputs 24 V AC/DC
- with ring buffer (up to 5,000 data) for logging
- with 8 Duo LEDs for indication of damper position
- with test switch for functional test
- with runtime monitoring for spring return actuators
- power supply via transformer 230 V AC / 24 V AC
- prepared for DIN rail mounting

EXPANSION MODULE BKSYS-EM1



Up to three expansion modules are connected to the basic module wirelessly via a stable connector strip (plug and play connection) and communicate always reliably via a fault-free transfer protocol.

The expansion module BKSYS-EM1 and spring return actuators connected there are monitored and commanded via the upstream basic module.

- for up to 4 fire dampers with spring return actuators (24V AC/DC)
- or up to 4 fire dampers with two limit switches
- or up to 8 fire dampers with one limit switch
- with potential-free smoke detector input
- with potential-free fault output (changeover contact)
- with a voltage output 24V AC/DC
- with 8 Duo LEDs for indication of damper position
- with test switch for functional test
- with runtime monitoring for spring return actuators
- power supply via the basic module BKSYS-GM1
- prepared for DIN rail mounting

TRANSFORMER BKSYS-063 - 160

The BKSYS transformer represents the supply voltage for the basic and expansion modules. The transformer likewise supplies power to the directly connected spring return actuators. If exclusively fire dampers with limit switch are connected, a system will require a 63 VA transformer. If fire dampers with 24V AC/DC spring return actuators are connected, it is mandatory to use the 160 VA transformer. The transformer data always applies to each system up to a maximum size of up to 3 expansion modules.

Attention! For fire dampers from size 1000x650 mm (WxH), actuators of higher power consumption will be installed, a 160 VA transformer being capable of supplying power to a maximum of 12 actuators.

CONNECTION SOCKET BKSYS-ADM



- for the connection of the spring return actuator 24V AC/DC
- with connection for the plugs (power supply and limit switch) of the spring return actuator 24V AC/DC
- spring-type terminals for the cable connection
- green LED for indication of the power supply

INTERFACE ADAPTER BKSYS-USB

The scope of delivery of the BKSYS USB adapter includes the PC program which can be run on PC with a current version of MS operational system. The assignment of the functional parameters of the BKSYS system is performed in the PC program in plain text:

- with language selection
- indication of the damper position
- indication of potential-free inputs and outputs
- indication of the test run (with runtime specification and runtime monitoring)
- indication of the event log in the form of a list
- export of the event log in the CSV format
- triggering of test runs (individually)
- with system time setting using the connected PC

MODBUS INTERFACE BKSYS-MOD



- For exchange with other systems inside the building, a Modbus interface for BKSYS is available. The interface is plugged into the basic module and configured as shown in the appendix part of the Modbus interface.
- for connection to a BKSYS-GM1
 - Duo LED for status display of communication with an external Modbus user
 - prepared for DIN rail mounting
 - coding switch for Modbus address

Construction subject to change
 No return possible

CONFIGURATION

PARAMETERISATION

- The following configuration parameters can be set using the PC converter BKSYS-USB and the associated PC program.
- Date/Time is taken from the system time of the PC (no automatic switching from daylight saving time to standard time)
 - potential-free fault input (smoke detector)

A smoke detector connected to the basic module can either activate all spring return actuators connected to the basic module and expansion modules (globally) or only spring return actuators connected to the basic module (locally). In case of local activation one smoke detector each can be connected to the basic modules and expansion modules, these smoke detectors activating the spring return actuators connected to the corresponding module.

The potential-free fault input for the smoke detector can be configured as NC or NO contact. If no smoke detector is connected, the contact is disabled. Delay of the smoke detector input. The message of the fault input can have a time delay of between 0 and 600 seconds.

Potential-free fault input (ventilation)

The potential-free fault input for the ventilation can be configured as NC or NO contact. If the fault contact is not connected, the contact is disabled.

Delay time of the collective alarm in the test run

The set delay time in the test run delays forwarding of the collective alarm message by the set time (e.g. 30 min) in order to provide time for the inspection by the tester.

Power of the power supply

The system-internal power selection (63 and 160 VA) must be adapted to the connected transformer.

Configuration of the terminals

The terminals for the spring return actuators or limit switches of the fire dampers must be assigned depending on the corresponding connection.

RING BUFFER LOG

- The following functions are logged in the ring buffer:
- end position indication of the fire dampers
 - runtime and runtime error of the spring return actuators
 - status change of the smoke detectors
 - status change of the fan input

Date and time are saved for each logging. The memory includes max. 5,000 data. All entries can be exported by means of the PC BKSYS USB adapter via the USB-RS232 interface and displayed on the PC in form of a list. This list can then be exported in the CSV format.

FUNCTIONAL TEST

The test run serves for functional check of the connected spring return actuators.

One button each on the BKSYS basic and expansion modules is used to start the functional test. The spring return actuators assigned to the corresponding basic or expansion module close the fire dampers. After reaching the Closed position, the spring return actuators open the fire dampers again. During this functional test, the LEDs assigned to the spring return actuators are flashing.

The same functional test can also be performed for the individual spring return actuators using the PC software.

The fire dampers with limit switches are not considered for this test. They must be checked manually.

DUO LEDs FOR POSITION INDICATION

The DUO LEDs for position indication in the BKSYS-GM1 (output terminals X3, X4, X10, X11 (number 2)) or BKSYS-EM1 (output terminals X2, X3, X6, X7 (number 2)) are lit depending on the selected configuration and damper position.

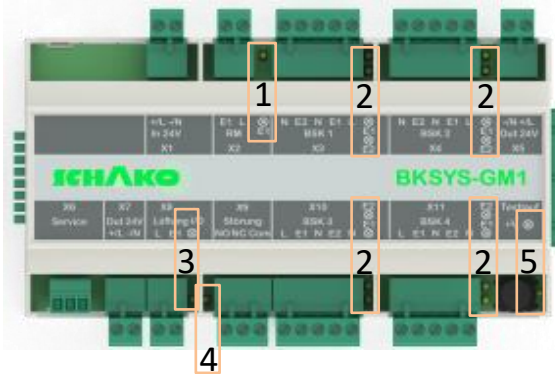


Figure: BKSYS basic module BKSYS-GM1

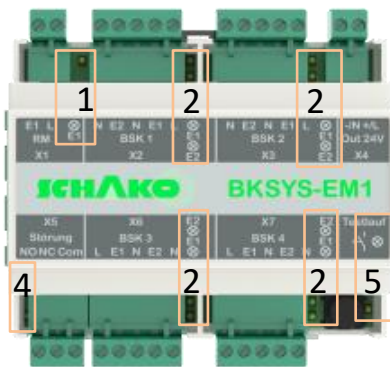


Figure: BKSYS basic module BKSYS-EM1

Configuration

Motorised fire damper

The red LED indicates the damper position CLOSED and the green LED - the damper position OPEN. If the fire damper moves after leaving the end position CLOSED to the end position OPEN, the LED is flashing green. When moving from the

end position OPEN to the end position CLOSED, the LED is flashing red.

Manual fire damper with limit switch CLOSED and OPEN

The red LED indicates the damper position CLOSED and the green LED - the damper position OPEN. The intermediate positions are not indicated.

Manual fire damper with limit switch CLOSED

The red LED indicates the damper position CLOSED. The OPEN position or intermediate positions are not displayed.

Manual fire damper with limit switch OPEN

The green LED indicates the damper position OPEN. The CLOSED position or intermediate positions are not displayed.

LED FOR FAULT INDICATION / FUNCTION DISPLAY

LED for fault indication RM (smoke detector (number 1))

Terminal X2 at BKSYS-GM1 and X1 at BKSYS-EM1

--- Standard operation: LED is off

--- Fault message: LED is lit red

LED for fault indication VENTILATION (number 3)

Terminal X8 at BKSYS-GM1:

- Not used LED is lit in yellow

- Normal (contact open) not lit

- Inverted mode (contact open): lit in yellow

LED for fault indication FAULT (number 4)

Terminal X9 at BKSYS-GM1 and X5 at BKSYS-EM1

--- Not used: LED is off

--- Normal or inverted mode: LED is lit red

LED for TEST function key (number 5)

--- LED flashes once yellow: Fault of the damper at connection BSK1

--- LED flashes twice yellow: Fault of the damper at connection BSK2

--- LED flashes 3 times in yellow: Fault of the damper at connection BSK3

--- LED flashes 4 times in yellow: Fault of the damper at connection BSK4

If the LED is flashing alternately repeatedly, then there is a fault at the dampers, according to the description above.

FUNCTION: COLLECTIVE FAULT MESSAGE

The collective fault message is triggered:

--- if a connected fire damper closes

--- if the end position is not reached in the test run

--- if the runtime is exceeded in motorised fire dampers

--- in case of fault at the smoke detector input (if enabled)

--- in case of fault at the fan input (if enabled)

TECHNICAL DATA

PERFORMANCE DATA

Rated voltage:	24 V AC/DC +- 15%
Current consumption:	max. 3600 mA
Power consumption per module:	5 VA
Ambient temperature:	0°..... +55°C
Storage temperature:	(-) 20° to (+) 60°C
Humidity:	max. 80% relative, non-condensing

Switching capacity

24 V AC / 30 V DC-2A - at the fault outputs X9 (BKSYS-GM1) and X5 (BKSYS-EM)

Voltage

24 V AC/DC-125 mA-3 VA at the voltage outputs X5 and X7 (BKSYS-GM1) or X4 (BKSYS-EM1)

Contact load

24V AC/DC <15mA
 at the input X8 of the ventilation systems (BKSYS-GM1)

Terminals up to 2.5 mm²
 Protection class III Safety extra low voltage
 EMC according to directives on Electromagnetic Compatibility

DIMENSIONS

Basic module BKSYS-GM1: 160 x 106 x 90 mm (LxWxH)
 Expansion module BKSYS-EM1: 110 x 106 x 90 mm (LxWxH)
 Modbus module BKSYS-MOD: 90 x 106 x 90 mm (LxWxH)

CONNECTION OF THE FIELD MODULES

Fire dampers and smoke detectors

The wiring of the fire dampers and smoke detectors is performed using conventional star topology wiring while considering the following cable cross-sections:

Motorised fire dampers:	4 x 0.75 mm ²
Fire damper with two limit switches:	4 x 0.75 mm ²
Fire damper with one limit switch:	2 x 0.75 mm ²

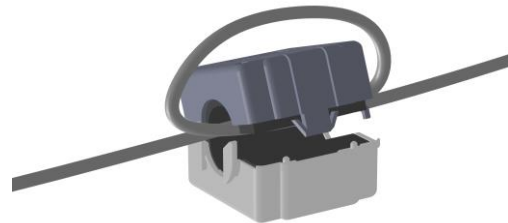
When selecting the cable cross-section, the voltage drops must be considered.

ASSEMBLY

The basic module BKSYS-GM1 and expansion modules BKSYS-EM1 are mounted on the existing DIN rails and connected to each other using Plug and Play plug-in connection. The power supply for the expansion modules BKSYS-EM1 is performed via the basic module BKSYS-GM1.

After mounting the modules BKSYS-GM1 and BKSYS-EM1, power is applied to the basic module BKSYS-GM1. This can be implemented by means of transformers BKSYS-063 /-160, or by means of a suitable on-site power supply 24V AC/DC. The connecting cable of the BKSYS-GM1 must be inserted into the delivered ferrite core as shown in the following figure.

The fault inputs and outputs, spring return actuators and limit



switches must be connected according to the connection diagrams.

After completing all connection operations, power supply is enabled.

COMMISSIONING

01. The basic module BKSYS-GM1 is connected on the voltage side.
02. To set the configuration parameters, a PC is connected to the basic module BKSYS-GM1 at the service plug X6 using the PC BKSYS USB adapter. The BKSYS software is used to set the configuration parameters.
03. The connection interface is displayed in the BKSYS software, this interface is activated with a mouse-click, then the CONNECT button must be pressed.
04. Click the "Settings" button, enter the activation code in the white field in the bottom right corner and click the "Enable" button. The configuration parameters can be specified now.
05. Click the SET SYSTEM TIME button and confirm by pressing OK. The time of the PC is transferred to the basic module BKSYS-GM1.
06. For the general device setting, click the SETTINGS button.
07. In the ALARM LOGIC checkbox, select the setting:
 - Collective - only basic module (globally)
 With this setting, a smoke detector is connected to the terminal X2 of the basic module BKSYS-GM1. If the smoke detector triggers an alarm, the basic module BKSYS-GM1 transfers the switching command to the connected expansion modules BKSYS-EM1. This closes all motorised fire dampers connected to the basic module BKSYS-GM1 and to the expansion modules BKSYS-EM1.
 - Individually - per module (locally)
 With this setting, one smoke detector each must be connected to the basic module BKSYS-GM1 and to all expansion modules BKSYS-EM1.

sion modules BKSYS-EM1 (terminal X2 to BKSYS-GM1 and terminal X1 to BKSYS-EM1).

If a smoke detector triggers an alarm, then this command is limited only to the connected module. Thus, only the motorised fire dampers connected to the corresponding module will be closed.

08. Select the setting in the ALARM DELAY checkbox: The set time indicates how long the fault output is disabled for maintenance purposes. Once the time has elapsed, the set value is reset to 0 minutes.
09. Select the setting in the VENTILATION INPUT checkbox: If the ventilation input is not connected, NOT USED is selected (as-delivered state); if NORMAL is selected, then the ventilation input is enabled as an NC contact and for INVERTED as an NO contact.
10. Select the setting in the POWER SUPPLY checkbox: Select the corresponding power consumption depending on all connected modules and spring return actuators.
11. Select the setting in the RM SUPPRESSION checkbox: The set numerical value specifies the time in seconds during which the fault message is suppressed. If the fault message is still active once the set time has elapsed, the fault message is triggered. A value between 0 and 600 seconds can be set.
12. Settings Basic module and Expansion module:
Terminals 1 to 4
 - not used
 - motorised fire damper
 - manual fire damper with limit switch CLOSED + OPEN
 - manual fire damper with limit switch CLOSED
 - manual fire damper with limit switch OPEN
13. Click the SAVE button and confirm by pressing OK.
14. Click the RESTART DEVICE button
15. Click the STATUS button to display the selected BKSYS modules in dark-grey. Not-selected BKSYS modules are shown in light-grey.
16. Click the corresponding TERMINAL BLOCK 1 - 4 in order to request information on the connected fire dampers. For motorised fire dampers, it is possible to start a test run. The opening and closing times are displayed.
17. Click the LOG button to display the functional and alarm messages which can be saved on the PC in the Excel format using the EXPORT CSV FILE button.
18. Press the QUIT button to close the program.

TERMINAL ASSIGNMENT BASIC MODULE BKSYS-GM1

- X1 - voltage input 24 V AC/DC
- X2 - RM (potential-free fault input) for
Smoke detectors
- X3 - BSK1 input/output
- X4 - BSK2 input/output
- X5 - voltage output 24V AC/DC
- X6 - service plug (PC connection via
USB-RS232 cable)
- X7 - voltage output 24V AC/DC
- X8 - VENTILATION (potential-free fault input -
ventilation)
- X9 - FAULT (potential-free fault output - changeover con-
tact)

Construction subject to change
No return possible

- X10 - BSK3 input/output
- X11 - BSK4 input/output

TERMINAL ASSIGNMENT OF EXPANSION MODULE

BKSYS-EM1

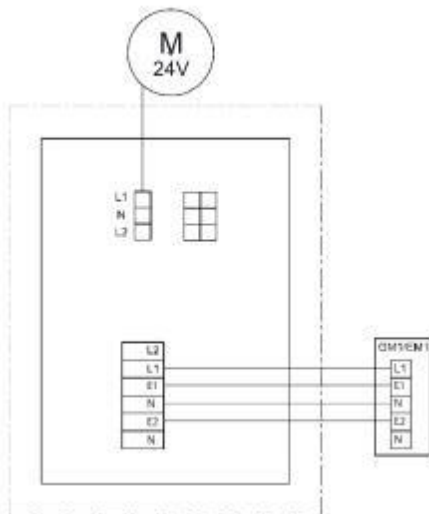
- X1 - RM (potential-free fault input for
smoke detector)
- X2 - BSK1 input/output
- X3 - BSK2 input/output
- X4 - voltage output 24V AC/DC
- X5 - FAULT (potential-free fault output - changeover con-
tact)
- X6 - BSK3 input/output
- X7 - BSK4 input/output

CONNECTION DIAGRAMS

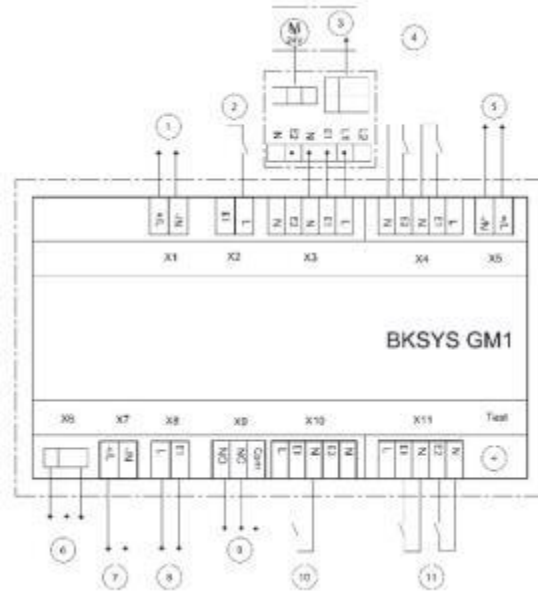
PIN ASSIGNMENT

POSITION	CONNECTION
1	24 V AC/DC feed
2	Smoke detector (RM) input
3	Connection socket BKSYS-ADM for spring return actuators
4	Mechanical fire damper with 2 limit switches (zero-current CLOSED)
5	Voltage output 24 V AC/DC
6	PC interface USB-RS232
7	Voltage output 24 V AC/DC
8	Fan input
9	Fault output (changeover contact)
10	One mechanical fire damper with one limit switch
11	Two mechanical fire dampers with one limit switch

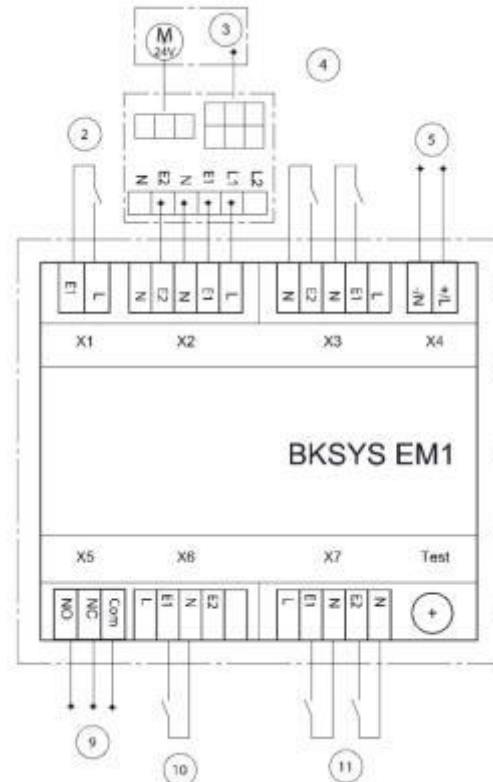
MOTOR CONNECTION SOCKET BKSYS-ADM



CONNECTION OF BASIC MODULE BKSYS-GM1



CONNECTION OF EXPANSION MODULE BKSYS-EM1



ORDER CODE

ORDER DETAILS

Type	Description
BKSYS-GM1	Basic module
BKSYS-EM1	Expansion module
BKSYS-USB	Interface adapter from USB to RS232 (serial)
BKSYS-ADM	Connection socket for motorised actuators
BKSYS-MOD	Modbus interface
BKSYS-063	Transformer 230 V AC / 24 V AC - 63 VA
BKSYS-160	Transformer 230 V AC / 24 V AC - 160 VA
BKSYS-WS1	Switch cabinet 800x600x300mm for 1 system maximum (1xGM1 +3xEM1)
BKSYS-WS2	Switch cabinet 800x600x300mm for 2 systems maximum (2xGM1 +6xEM1)

SPECIFICATION TEXT

Fire damper mini-controller BKSYS

Product SCHAKO KG

Fire damper mini-controller BKSYS for control and display of fire damper actuators and limit switches consisting of:

basic module BKSYS-GM1

microprocessor-controlled

with real-time clock, gold cap and ring buffer for control and display of up to:

- four motorised fire dampers with 24 V AC/DC spring return actuators or
- four mechanical fire dampers with two limit switches each OPEN/CLOSE or
- eight mechanical fire dampers with one limit switch each OPEN or CLOSED

The configuration can be selected freely. Visualisation of the statuses by means of green/red Duo LEDs.

With two potential-free fault inputs (ventilation, smoke detector, central fire alarm system, etc.) and a potential-free fault output (changeover contact). With test switch for functional test incl. runtime monitoring and logging (ring buffer).

Operating voltage 24V AC/DC

Fastening: DIN rail mounting

Dimensions 160 x 90 x 106 mm (WxHxD)

Can be parameterised via USB interface.

The basic module BKSYS-GM1 can be extended with up to three expansion modules BKSYS-EM1 using Plug and Play plug-in connection.

Product: SCHAKO type **BKSYS-GM1**

expansion module BKSYS-EM1

microprocessor-controlled

For control and display of up to

- four motorised fire dampers with 24 V AC/DC spring return actuators or
- four mechanical fire dampers with two limit switches each OPEN/CLOSE or
- eight mechanical fire dampers with one limit switch each OPEN or CLOSED

The configuration can be selected freely. Visualisation of the statuses by means of green/red Duo LEDs.

With a potential-free fault input (smoke detector, central fire alarm system etc.) and a potential-free fault output (changeover contact). With test switch for functional test. Runtime monitoring and logging (ring buffer) is performed via the basic module as well as the power supply and system control.

Operating voltage 24V AC/DC

Fastening: DIN rail mounting

Dimensions 110 x 90 x 106 mm (WxHxD)

Product: SCHAKO type **BKSYS-EM1**

ACCESSORIES

Connection socket BKSYS-ADM

for the plug-in connection of spring return actuator 24V AC/DC. With spring-type terminals for the connection of connecting cables to the BKSYS modules. With LED (green) for indication of power supply at BKSYS-ADM.
Product: SCHAKO type **BKSYS-ADM**

USB-RS232 ADAPTER BKSYS-USB

for connection of a PC to the basic module incl. operation and protocol software as well as the connecting cable (2 m).
Product: SCHAKO type **BKSYS-USB**

ModBus interface for BKSYS-GM1

Network interface for data transmission from BKSYS to other systems.

- Serial interface to EIA-485 standard, galvanically isolated
- RTU transmission protocol
- Power supply from and communication connection to basic module via plug-in connector
- Signalling of received data packets by green flashing of a two-colour LED
- Signalling of faulty data packets by red flashing of a two-colour LED
- Connection of the Modbus cable to a lead-through terminal for interruption-free bus connection even with a pulled plug-in terminal
- Setting of a baud rate from 1200 baud to 57,600 baud via rotary coding switch
- Setting of the Modbus module address via rotary coding switch
- Setting of the communication parameters via DIP switches
- Supported Modbus function codes: Read Input Register
- Supported Modbus error codes: Illegal Function Code, Illegal Address

Dimensions 90 x 90 x 106 mm (WxHxD)
Product: SCHAKO type **BKSYS-MOD**

Switch cabinet BKSYS-WS1

according to degree of protection IP 66
Housing: Stable sheet steel construction consisting of 1.25 mm or 1.5 mm sheet steel, canted and welded from a single piece, with circumferential protective channel at the door opening, rear wall with countersunk bores for wall mounting support. Housing bottom with sheet steel flange plates. All modules are completely preassembled and prewired on terminal blocks.
Maximum size: 1x GM1 + 3xEM1
Dimensions (W x H x D): 800 x 600 x 300 mm
Product: SCHAKO type **BKSYS-WS1**

Switch cabinet BKSYS-WS2

according to degree of protection IP 66
Housing: Stable sheet steel construction consisting of 1.25 mm or 1.5 mm sheet steel, canted and welded from a single piece, with circumferential protective channel at the door opening, rear wall with countersunk bores for wall mounting support. Housing bottom with sheet steel flange plates. All modules are completely preassembled and prewired on terminal blocks.
Maximum size: 2x GM1 + 6xEM1
Dimensions (W x H x D): 800 x 600 x 300 mm
Product: SCHAKO type **BKSYS-WS2**

Transformers BKSYS- BKSYS-063 / BKSYS-160

Transformer 230 V AC / 24 V AC for power supply of the connected modules and spring return actuators.
63 VA: BKSYS-063
160 VA: BKSYS-160
Product: SCHAKO type **BKSYS-063 / BKSYS-160**

APPENDIX PART 1 MODBUS INTERFACE

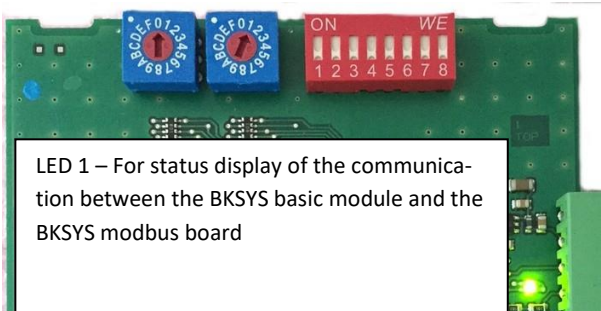
MODBUS CONFIGURATION

The Modbus configuration must be set **before** initialisation and cannot be changed during operation.

CONNECTIONS AND CONFIGURATIONS

	Switch for setting the unique address (hexadecimal)
	Switches 3 + 4: Parity setting Switches 5 – 8: Baud rate setting Switches are in the off position by default
	Modbus connection X1 Terminal 1 D+ Terminal 2 D- Terminal 3 GND Terminal 4 nc Terminal 5 nc Terminal 6 nc
	Modbus status LED
	Terminating resistor of Modbus default setting of the switches "on"

COMMUNICATION BETWEEN MOTHERBOARD AND MODBUS BOARD



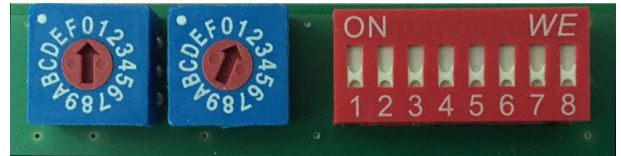
Following initialisation, the BKSYS basic module immediately starts sending data to the Modbus board via the network interface. The Modbus board responds by cyclic flashing in green, which, however, does not take place synchronously with the heartbeat LED basic module, but depends on the transmitted system time of the basic module. If the Modbus receives a faulty message, the red LED at the network interface will light up.

Construction subject to change
 No return possible

A transmitted message always contains all status information of exactly one module and the current system time.

SETTING THE MODBUS ADDRESS

Each Modbus slave requires a unique address in the allowed address space of 1 - 247 (decimal). The address 0 is reserved for broadcast and therefore not valid as slave address. The Modbus address of the device is set via the two hexadecimal rotary switches on the board. They allow the addresses 1 - F7 (hexadecimal) to be set.



In this example, the Modbus address 1 has been set, and all other DIP switches are in their default setting! Setting reserved or assigned addresses will lead to an initialisation error during initialisation and to permanent flashing of the red Modbus LED.

Address		
0	1-247	248-255
Reserved; broadcast address	Allowed address space	reserved

SETTING THE MODBUS PARITY

The BKSYS Modbus board works in RTU mode, the standard mode of Modbus. The standard byte format in RTU mode is the following:

- 1 Start bit
- 8 data bits (lowest ranking first)
- 1 parity bit (default: even)
- 1 stop bit

The default setting is even parity. However, it is also possible to set an odd parity or no parity at all (2 stop bits). The parity is set via the two DIP switches 3 and 4:

Parity	DIP 3	DIP 4
Even	0	0
Odd	0	1
None	1	0

SETTING THE MODBUS BAUD RATE

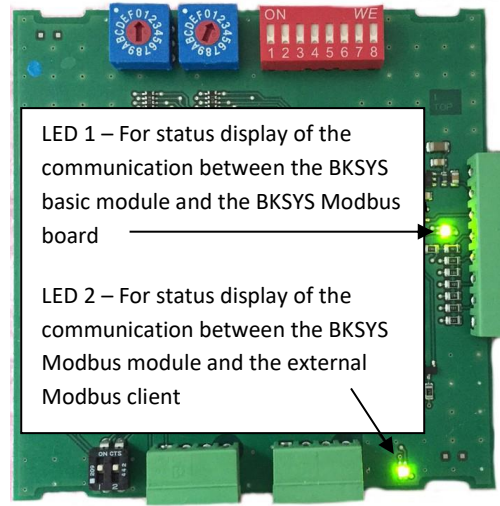
The RTU Modbus has a default speed of 19,200 baud. The Modbus baud rate is set using DIP switches 5-8.

Baud rate	DIP 5	DIP 6	DIP 7	DIP 8
19,200 default	0	0	0	0
1200	0	0	0	1
2400	0	0	1	0
4800	0	0	1	1
9600	0	1	0	0
19,200	0	1	0	1
38,400	0	1	1	0
57,600	0	1	1	1

MODBUS STATUS LEDS

In terms of the software, the Modbus slave is configured as a finite state machine. This means that the slave can adopt different states. Depending on the state, certain events ensure that a different state is adopted. The Modbus board has two LEDs that display the current state.

State	Red LED	Green LED
Faulty initialisation	On	Off
Wait	Off	Off
Send	Off	On
Receive	Off	On
Faulty packet	On	Off



MODBUS REQUESTS

A complete Modbus request has a minimum of 4 and a maximum of 256 bytes. The bytes are transmitted individually. How exactly this transmission occurs can be found under the Modbus parity setting and depends on the selected transmission mode. The transmission mode of the BKSYS Modbus board is the RTU mode.

A complete Modbus request consists of the following units:

Field 1	Field 2	Field 3	Field 4
Slave address	Function code	Data	CRC
1 byte	1 byte	0 to 252 bytes	2 bytes

ACTUAL VALUES TABLE OF THE SLAVE UNITS

The assignment of the corresponding addresses to the values can be seen from the following table. A parameter table is not required.

Register	Protocol address	Parameter name	Range of va-	Data type	Authorisation
30001	0	Device type	128...143		R
30002	1	System time year	2000...2999	Year	R
30003	2	System time month	1...12	Month	R
30004	3	System time day	1...31	Day	R
30005	4	System time weekday	1...7	Weekday	R
30006	5	System time hours	0...23	Hours	R
30007	6	System time minutes	0...59	Minutes	R
30008	7	System time seconds	0...59	Seconds	R
30009 - 30010	8 - 9	SW version BKSYS-GM		String	R
⋮	⋮	⋮	⋮	⋮	⋮
30100	100	ModuleBase Ventilation	0...1	Bool	R
30101	101	ModuleBase AlarmState	0...1	Bool	R
30102	102	ModuleBase SmokeAlertSta-	0...1	Bool	R
30103	103	Connector 1 ConnectorType	0...4	Enumeration ConnectorType	R
30104	104	Connector 1 alarmState	0...1	Bool	R
30105	105	Connector 1 hasDamperA	0...1	Bool	R
30106	106	Connector 1 damperAState	0...4	Enumeration DamperState	R
30107	107	Connector 1 hasDamperB	0...1	Bool	R
30108	108	Connector 1 damperBState	0...4	Enumeration DamperState	R
30109	109	Connector 1 TestState	0...2	Enumeration Teststate	R
30110	110	Connector 1 LastOpe-	0...65535	Seconds	R
30111	111	Connector 1 LastClosing Ti-	0...65535	Seconds	R
30112	112	Connector 2 ConnectorType	0...4	Enumeration ConnectorType	R
30113	113	Connector 2 alarmState	0...1	Bool	R
30114	114	Connector 2 hasdamperA	0...1	Bool	R
30115	115	Connector 2 damperAState	0...4	Enumeration DamperState	R
30116	116	Connector 2 hasdamperB	0...1	Bool	R
30117	117	Connector 2 damperBState	0...4	Enumeration DamperState	R
30118	118	Connector 2 TestState	0...2	Enumeration Teststate	R
30119	119	Connector 2 LastOpe-	0...65535	Seconds	R
30120	120	Connector 2 LastClosing Ti-	0...65535	Seconds	R
30121	121	Connector 3 ConnectorType	0...4	Enumeration ConnectorType	R
30122	122	Connector 3 alarmState	0...1	Bool	R

30123	123	Connector 3 hasDamperA	0...1	Bool	R
30124	124	Connector 3 damperAState	0...4	Enumeration DamperState	R
30125	125	Connector 3 hasDamperB	0...1	Bool	R
30126	126	Connector 3 damperBState	0...4	Enumeration DamperState	R
30127	127	Connector 3 TestState	0...2	Enumeration Teststate	R
30128	128	Connector 3 LastOpe-	0...65535	Seconds	R
30129	129	Connector 3 LastClosing Ti-	0...65535	Seconds	R
30130	130	Connector 4 ConnectorType	0...4	Enumeration ConnectorType	R
30131	131	Connector 4 alarmState	0...1	Bool	R
30132	132	Connector 4 hasDamperA	0...1	Bool	R
30133	133	Connector 4 damperAState	0...4	Enumeration DamperState	R
30134	134	Connector 4 hasDamperB	0...1	Bool	R
30135	135	Connector 4 damperBState	0...4	Enumeration DamperState	R
30136	136	Connector 4 TestState	0...2	Enumeration Teststate	R
30137	137	Connector 4 LastOpe-	0...65535	Seconds	R
30138	138	Connector 4 LastClosing Ti-	0...65535	Seconds	R
:	:	:	:	:	:
30200	200	Module 1 installed	0...1	Bool	R
30201	201	Module 1 AlarmState	0...1	Bool	R
30202	202	Module 1 SmokeAlertState	0...1	Bool	R
30203	203	Connector 1 ConnectorType	0...4	Enumeration ConnectorType	R
30204	204	Connector 1 alarmState	0...1	Bool	R
30205	205	Connector 1 hasDamperA	0...1	Bool	R
30206	206	Connector 1 damperAState	0...4	Enumeration DamperState	R
30207	207	Connector 1 hasDamperB	0...1	Bool	R
30208	208	Connector 1 damperBState	0...4	Enumeration DamperState	R
30209	209	Connector 1 TestState	0...2	Enumeration Teststate	R
30210	210	Connector 1 LastOpe-	0...65535	Seconds	R
30211	211	Connector 1 LastClosing Ti-	0...65535	Seconds	R
30212	212	Connector 2 ConnectorType	0...4	Enumeration ConnectorType	R
30213	213	Connector 2 alarmState	0...1	Bool	R
30214	214	Connector 2 hasDamperA	0...1	Bool	R
30215	215	Connector 2 damperAState	0...4	Enumeration DamperState	R
30216	216	Connector 2 hasDamperB	0...1	Bool	R

30217	217	Connector 2 damperBState	0..4	Enumeration DamperState	R
30218	218	Connector 2 TestState	0..2	Enumeration Teststate	R
30219	219	Connector 2 LastOpe-	0..65535	Seconds	R
30220	220	Connector 2 LastClosing Ti-	0..65535	Seconds	R
30221	221	Connector 3 ConnectorType	0..4	Enumeration ConnectorType	R
30222	222	Connector 3 alarmState	0..1	Bool	R
30223	223	Connector 3 hasDamperA	0..1	Bool	R
30224	224	Connector 3 damperAState	0..4	Enumeration DamperState	R
30225	225	Connector 3 hasDamperB	0..1	Bool	R
30226	226	Connector 3 damperBState	0..4	Enumeration DamperState	R
30227	227	Connector 3 TestState	0..2	Enumeration Teststate	R
30228	228	Connector 3 LastOpe-	0..65535	Seconds	R
30229	229	Connector 3 LastClosing Ti-	0..65535	Seconds	R
30230	230	Connector 4 ConnectorType	0..4	Enumeration ConnectorType	R
30231	231	Connector 4 alarmState	0..1	Bool	R
30232	232	Connector 4 hasDamperA	0..1	Bool	R
30233	233	Connector 4 damperAState	0..4	Enumeration DamperState	R
30234	234	Connector 4 hasDamperB	0..1	Bool	R
30235	235	Connector 4 damperBState	0..4	Enumeration DamperState	R
30236	236	Connector 4 TestState	0..2	Enumeration Teststate	R
30237	237	Connector 4 LastOpe-	0..65535	Seconds	R
30238	238	Connector 4 LastClosing Ti-	0..65535	Seconds	R
:	:	:	:	:	:
30300	300	Module 2 installed	0..1	Bool	R
30301	301	Module 2 AlarmState	0..1	Bool	R
30302	302	Module 2 SmokeAlertState	0..1	Bool	R
30303	303	Connector 1 ConnectorType	0..4	Enumeration ConnectorType	R
30304	304	Connector 1 alarmState	0..1	Bool	R
30305	305	Connector 1 hasDamperA	0..1	Bool	R
30306	306	Connector 1 damperAState	0..4	Enumeration DamperState	R
30307	307	Connector 1 hasDamperB	0..1	Bool	R
30308	308	Connector 1 damperBState	0..4	Enumeration DamperState	R
30309	309	Connector 1 TestState	0..2	Enumeration Teststate	R
30310	310	Connector 1 LastOpe-	0..65535	Seconds	R
30311	311	Connector 1 LastClosing Ti-	0..65535	Seconds	R

30312	312	Connector 2 ConnectorType	0...4	Enumeration ConnectorType	R
30313	313	Connector 2 alarmState	0...1	Bool	R
30314	314	Connector 2 hasdamperA	0...1	Bool	R
30315	315	Connector 2 damperAState	0...4	Enumeration DamperState	R
30316	316	Connector 2 hasdamperB	0...1	Bool	R
30317	317	Connector 2 damperBState	0...4	Enumeration DamperState	R
30318	318	Connector 2 TestState	0...2	Enumeration Teststate	R
30319	319	Connector 2 LastOpe-	0...65535	Seconds	R
30320	320	Connector 2 LastClosing Ti-	0...65535	Seconds	R
30321	321	Connector 3 ConnectorType	0...4	Enumeration ConnectorType	R
30322	322	Connector 3 alarmState	0...1	Bool	R
30323	323	Connector 3 hasDamperA	0...1	Bool	R
30324	324	Connector 3 damperAState	0...4	Enumeration DamperState	R
30325	325	Connector 3 hasDamperB	0...1	Bool	R
30326	326	Connector 3 damperBState	0...4	Enumeration DamperState	R
30327	327	Connector 3 TestState	0...2	Enumeration Teststate	R
30328	328	Connector 3 LastOpe-	0...65535	Seconds	R
30329	329	Connector 3 LastClosing Ti-	0...65535	Seconds	R
30330	330	Connector 4 ConnectorType	0...4	Enumeration ConnectorType	R
30331	331	Connector 4 alarmState	0...1	Bool	R
30332	332	Connector 4 hasDamperA	0...1	Bool	R
30333	333	Connector 4 damperAState	0...4	Enumeration DamperState	R
30334	334	Connector 4 hasDamperB	0...1	Bool	R
30335	335	Connector 4 damperBState	0...4	Enumeration DamperState	R
30336	336	Connector 4 TestState	0...2	Enumeration Teststate	R
30337	337	Connector 4 LastOpe-	0...65535	Seconds	R
30338	338	Connector 4 LastClosing Ti-	0...65535	Seconds	R
:	:	:	:	:	:
30400	400	Module 3 installed	0...1	Bool	R
30401	401	Module 3 AlarmState	0...1	Bool	R
30402	402	Module 3 SmokeAlertState	0...1	Bool	R
30403	403	Connector 1 ConnectorType	0...4	Enumeration ConnectorType	R
30404	404	Connector 1 alarmState	0...1	Bool	R
30405	405	Connector 1 hasDamperA	0...1	Bool	R

30406	406	Connector 1 damperAState	0..4	Enumeration DamperState	R
30407	407	Connector 1 hasDamperB	0..1	Bool	R
30408	408	Connector 1 damperBState	0..4	Enumeration DamperState	R
30409	409	Connector 1 TestState	0..2	Enumeration Teststate	R
30410	410	Connector 1 LastOpe-	0..65535	Seconds	R
30411	411	Connector 1 LastClosing Ti-	0..65535	Seconds	R
30412	412	Connector 2 ConnectorType	0..4	Enumeration ConnectorType	R
30413	413	Connector 2 alarmState	0..1	Bool	R
30414	414	Connector 2 hasDamperA	0..1	Bool	R
30415	415	Connector 2 damperAState	0..4	Enumeration DamperState	R
30416	416	Connector 2 hasDamperB	0..1	Bool	R
30417	417	Connector 2 damperBState	0..4	Enumeration DamperState	R
30418	418	Connector 2 TestState	0..2	Enumeration Teststate	R
30419	419	Connector 2 LastOpe-	0..65535	Seconds	R
30420	420	Connector 2 LastClosing Ti-	0..65535	Seconds	R
30421	421	Connector 3 ConnectorType	0..4	Enumeration ConnectorType	R
30422	422	Connector 3 alarmState	0..1	Bool	R
30423	423	Connector 3 hasDamperA	0..1	Bool	R
30424	424	Connector 3 damperAState	0..4	Enumeration DamperState	R
30425	425	Connector 3 hasDamperB	0..1	Bool	R
30426	426	Connector 3 damperBState	0..4	Enumeration DamperState	R
30427	427	Connector 3 TestState	0..2	Enumeration Teststate	R
30428	428	Connector 3 LastOpe-	0..65535	Seconds	R
30429	429	Connector 3 LastClosing Ti-	0..65535	Seconds	R
30430	430	Connector 4 ConnectorType	0..4	Enumeration ConnectorType	R
30431	431	Connector 4 alarmState	0..1	Bool	R
30432	432	Connector 4 hasDamperA	0..1	Bool	R
30433	433	Connector 4 damperAState	0..4	Enumeration DamperState	R
30434	434	Connector 4 hasDamperB	0..1	Bool	R
30435	435	Connector 4 damperBState	0..4	Enumeration DamperState	R
30436	436	Connector 4 TestState	0..2	Enumeration Teststate	R
30437	437	Connector 4 LastOpe-	0..65535	Seconds	R
30438	438	Connector 4 LastClosing Ti-	0..65535	Seconds	R
	65534-65535	SW version BKSYS-MOD		String	R

ENUMERATIONS USED

The states of the dampers, etc., have been coded in the Modbus registers. The enumerations used are listed below:

Enumeration Connector Type

value	Description
0	Connector unused
1	Motorised
2	OpenClose
3	Open
4	Close

Enumeration Damper State

Value	Description
0	Damper state not known
1	Damper open
2	Damper opens
3	Damper closed
4	Damper closes

Enumeration TestState

value	Description
0	No test active
1	Test in queue
2	Test active

SUPPORTED MODBUS FUNCTION CODES

Description	Name	Function code	Hex
Reads the value of a setpoint register. Currently without function, since no holding register has been created.	Read Holding Register	3	0x03
Reads the value of an actual value register.	Read Input Register	4	0x04
Sets a setpoint register to a certain value. Currently without function, since no holding register has been created.	Write Single Register	6	0x06
Sets several setpoint registers to a certain value. Currently without function, since no holding register has been created.	Write Multiple Registers	16	0x10

SUPPORTED MODBUS ERROR CODES

The Modbus slave responds with error messages if it is unable to process a request received successfully from the master. In this case, received successfully means that no parity, frame or checksum error has occurred. In other words: There are other reasons than a faulty transmission why the slave is unable to process the request.

An error message by the slave to the master has the following structure:

Field 1	Field 2	Field 3	Field 4
Slave address	Function code +	Error code	CRC

In field 2, the function code of the request is taken, and 80 hex are added to it. If the master receives such a response, the 80 hex will show to him that an error has occurred in the request for this function code. Which exact error has occurred, can be seen by the master referring to field 3.

Code	Name	Description
01	Illegal function code	The requested function code is not available.
02	Illegal address	The requested address is not accessible or does not exist.