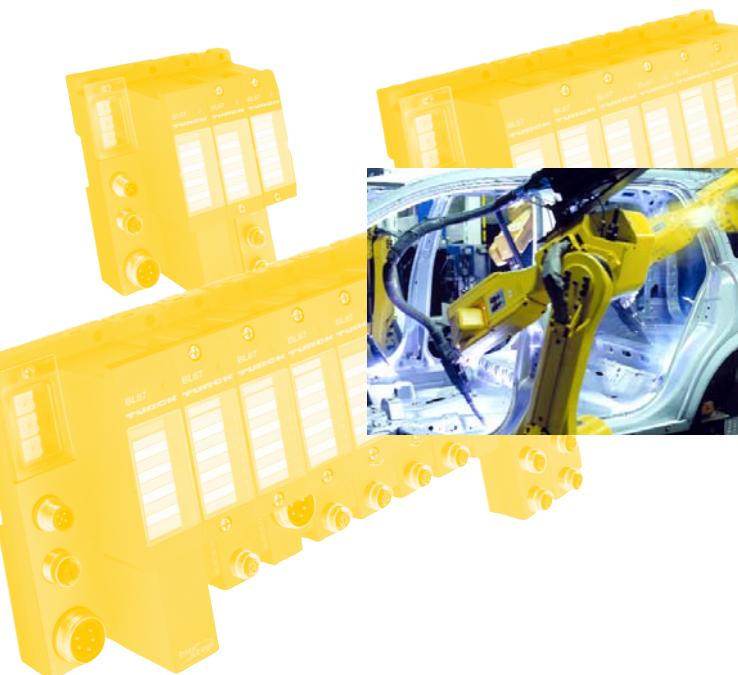


Industrial
Automation

BL67 -

**USER MANUAL
I/O-MODULES**



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4th edition 11/05

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Subject to alterations without notice.

Safety instructions!

Before starting the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit.
- Cover or enclose neighboring units that are live.
- Follow the engineering instructions of the device concerned.
- Only suitably qualified personnel in accordance with EN 50 110-1/-2 (VDE 0 105 Part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalization. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference do not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 volt supply. Only use power supply units complying with IEC 60 364-4-41 (VDE 0 100 Part 410) or HD 384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60 204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause restart.

- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.
- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks etc.).
- The electrical installation must be carried out in accordance with the relevant regulations (e. g. with regard to cable cross sections, fuses, PE).
- All work relating to transport, installation, commissioning and maintenance must only be carried out by qualified personnel. (IEC 60 364 and HD 384 and national work safety regulations).
- All shrouds and doors must be kept closed during operation.

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Documentation Concept

This manual contains all information about the bus-independent I/O-modules for the modular *busstop*® BL67-system.

The following chapters contain a short BL67 system description, exact descriptions of the functionality and the technical data for the I/O-modules as well as all general information concerning the whole system as for example mounting/dismounting, labeling etc.

Furthermore, this manual contains a short description of the project planning and diagnostics software for TURCK I/O-systems, the software I/O-ASSISTANT.

The bus-specific BL67-gateways, the connection to the different automation devices, the maximum system extension as well as all other bus specific information are described in separate manuals.

- BL67-gateway for PROFIBUS-DP
(TURCK-Documentation-No.: German D300570/ English D300527)
- BL67-gateway for DeviceNet
(TURCK-Documentation-No.: English D300528)

General Information**Attention**

Please read this section carefully. Safety aspects cannot be left to chance when dealing with electrical equipment.

Prescribed Use**Warning**

The devices described in this manual must be used only in applications prescribed in this manual or in the respective technical descriptions, and only with certified components and devices from third party manufacturers.

Appropriate transport, storage, deployment and mounting as well as careful operating and thorough maintenance guarantee the trouble-free and safe operation of these devices.

Notes Concerning Planning /Installation of this Product**Warning**

All respective safety measures and accident protection guidelines must be considered carefully and without exception.

Description of Symbols Used



Warning

This sign can be found next to all notes that indicate a source of hazards. This can refer to danger to personnel or damage to the system (hardware and software) and to the facility.

This sign means for the operator: work with extreme caution.



Attention

This sign can be found next to all notes that indicate a potential hazard.

This can refer to possible danger to personnel and damages to the system (hardware and software) and to the facility.



Note

This sign can be found next to all general notes that supply important information about one or more operating steps. These specific notes are intended to make operation easier and avoid unnecessary work due to incorrect operation.

List of Revisions

In comparison to the previous manual edition (01/05), the following changes/ revisions have been made:

*Table 1:
List of revisions*

Chapter	Subject/ Description	new	changed
2	general technical data: – isolation voltages		X
3 to 9	Base modules/ Pin assignment	X	
5 and 7	technical data: – isolation voltages		X
6	module description: – BL67-16DO-0.1A-P	X	
9	module description: – BL67-1CVI		X
13	Tables with nominal current consumption and power loss		X
	List of module ident codes	X	
	Ordering information		X

**Note**

The publication of this manual renders all previous editions invalid.

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The Basic Concept

BL67 is a modular IP67 I/O-system for use in industrial automation. It connects the sensors and actuators in the field to the higher-level controller.

BL67 offers modules for practically all applications:

- Digital input and output modules
- Analog input and output modules
- Technology modules (RS232 interface, ...)

A complete BL67 station counts as **one** station on the bus and therefore occupies **one** fieldbus address in any given fieldbus structure. A BL67 station consists of a gateway, power distribution modules and I/O modules.

The connection to the relevant fieldbus is made via the bus-specific gateway, which is responsible for the communication between the BL67 station and the other fieldbus stations.

The communication within the BL67 station between the gateway and the individual BL67 modules is regulated via an internal module bus.



Note

The gateway is the only fieldbus-dependent module on a BL67 station. All other BL67 modules are not dependent on the fieldbus used.

Flexibility

A BL67 station can contain modules in any combination, which means it is possible to adapt the system to practically all applications in automated industry.

Convenient Handling

All BL67 modules, with the exception of the gateway, consist of a base module and an electronic module.

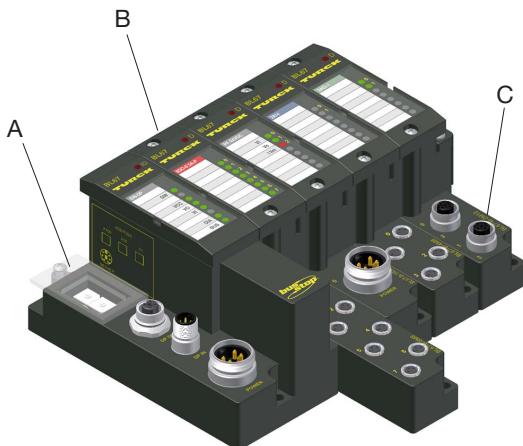
The gateway and the base modules are snapped onto a mounting rail or are directly mounted onto a mounting plate. The electronic modules are plugged onto the appropriate base modules.

After disconnection of the load, the electronic modules can be plugged or pulled when the station is being commissioned or for maintenance purposes, without having to disconnect the field wiring from the base modules.

BL67 Components

Figure 1:
BL67-Station
PROFIBUS-DP

- A** gateway
- B** electronics module
- C** base module



Gateways

The gateway connects the fieldbus to the I/O modules. It is responsible for handling the entire process data and generates diagnostic information for the higher-level master and the software tool I/O-ASSISTANT.

Figure 2:
Gateway



Electronic Modules

Electronic modules contain the I/O-functions of the BL67 modules (Power Feeding modules, digital and analog input/output modules and technology modules).

Electronic modules are plugged onto the base modules and are not directly connected to the wiring. They can be plugged or pulled when the station is being commissioned or for maintenance purposes, without having to disconnect the field wiring from the base modules.

Figure 3:
Electronic
module



Power Feeding Modules

Power Feeding modules distribute the required 24 V DC field voltage to the I/O modules. They are necessary for building groups of modules with different potentials within a BL67 station, or if the rated supply voltage for the outputs cannot be guaranteed. Power Feeding modules are potentially isolated from the gateway, the adjoining power supply module and the I/O modules to the left side.

Base Modules

The field wiring is connected to the base modules.

These are available in the following connection variations:

- 1 x M12, 2 x M12, 2 x M12-P, 4 x M12, 4 x M12-P
- 2 x M8, 4 x M8, 8 x M8
- 1 x M12-8
- 1 x 7/8" (for Power Feeding modules).

*Figure 4:
Base module*



End Plate

An end plate on the right-hand side physically completes the BL67 station. It protects the module bus contacts of the last base module in a station and guarantees the protection class IP67 when tightly screwed.

Figure 5:
End plate



2 General technical Data of BL67 modules

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Introduction

The following chapters (chapter 3 to chapter 9) contain all information about the BL67 power supply and I/O modules.

This chapter describes the general technical data valid for all BL67 modules.



Note

The parameter and diagnosis information of the individual modules correspond to those determined in the bus configuration files (GSD- or EDS- files) which are described in the bus specific manuals for the BL67 gateways with PROFIBUS-DP (Turck Documentation-No.: German D300570/ English D300527), with DeviceNet (Turck Documentation-No.: German D300571/ English D300528).

Please refer to these manuals for the fieldbus-specific description of the diagnostic and parameter data of the individual BL67 modules.



Note

The gateway's technical data and the gateway's diagnostic options are also described in the bus-specific manuals for the BL67 gateways with PROFIBUS-DP (Turck Documentation-No.: German D300570/ English D300527), with DeviceNet (Turck Documentation-No.: German D300571/ English D300528).

An overview of all electronic modules and the appropriate base modules can be found in the "Appendix".

Abbreviations**Module Abbreviations**

The module designations are explained in the following table:

*Table 2:
Module
abbreviations*

Abbr.	Designation	Example
AI	Analog input module	BL67-2 AI -I
AO	Analog output module	BL67-2 AO -V
B	Designation for the base modules.	B -2M12
DP	PROFIBUS-DP	BL67-GW- DP
I	Analog in- or output module for current signals (0/4 to 20 mA)	
P	Positive switching (sourcing)	BL67-8DO-0.5A- P
PF	Power Feeding Module	BL67- PF -24VDC
PT	Analog input module for connecting resistance thermometers with sensors PT100, PT200, PT500 and PT1000 in 2- or 3-wire measurement type	BL67-2AI- PT
RS232	Module with integrated RS232 interface	BL67-1 RS232
TC	Analog input module for connecting thermocouples	BL67-2AI- TC
V	Analog in- or output module for voltage signals (-10/0 to 10 V)	BL67-2AO- V

Technical Abbreviations

The following abbreviations are used in the technical data and wiring diagrams:

*Table 3:
Technical
abbreviations*

Abbr.	Designation
f_T	Transmission frequency
I_A	Output current
I_{Amax}	Maximum output current
I_{in}	Input current
I_K	Short circuit current
I_L	Nominal current consumption from power supply (field)
I_{MAX}	Maximum Input current (destruction limit)
I_{MB}	Nominal current consumption from the module bus (5 V DC)
I_{SENS}	Sensor supply fro V_I
PE	Protective earth
P_{MAX}	Maximum power loss of the modules
R_E	Input resistance
R_{LI}	Load resistance, inductive
R_{LK}	Load resistance, capacitive
R_{LL}	Lamp load
R_{LO}	Load resistance, ohmic
R_{ON}	Switch-on resistance
$t_{Ambient}$	Ambient temperature
T_K	Temperature coefficient
t_{Store}	Storage temperature

Table 3:
*Technical
abbreviations*

Abbr.	Designation
U_{Fe}	Isolation voltage (field/ functional earth)
U_{MAX}	Maximum input voltage (destruction limit)
U_{TMB}	Isolation voltage (module bus/ field)
V_i/U_B	Supply voltage for inputs/ operating voltage
V_o/U_L	Supply voltage for outputs/ load voltage
V_{sens}	Sensor supply

General technical Data of BL67 modules

Station Dimensions

Figure 6:

Top view

A Dimensions in
mm [inch]

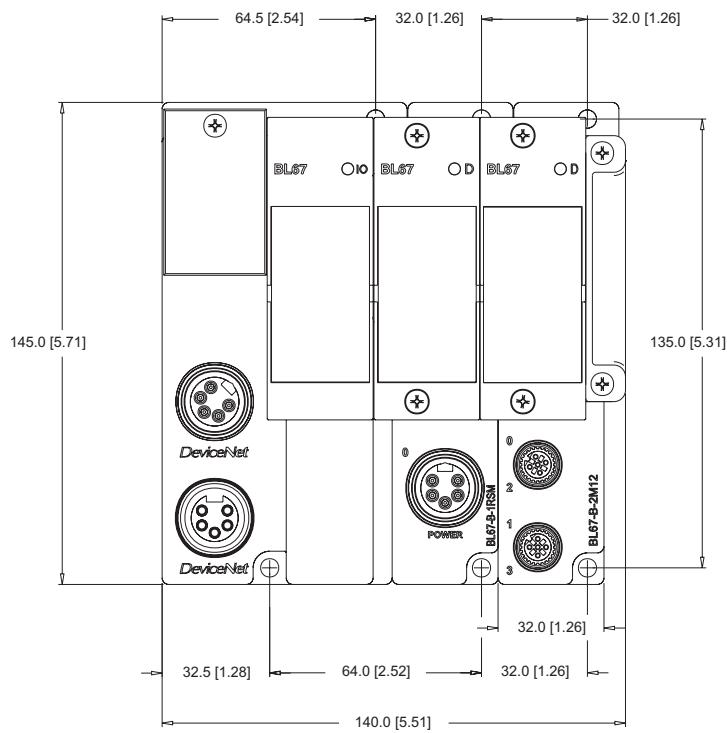


Figure 7:

Side view

A Dimensions in
mm [inch]

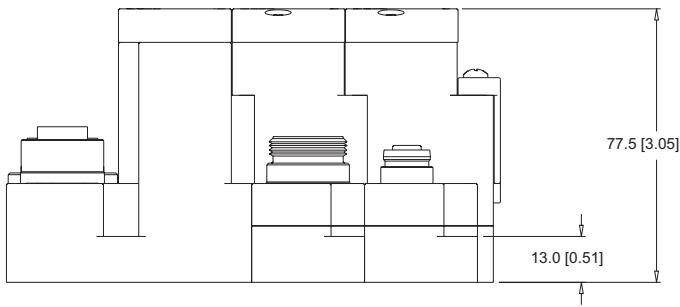
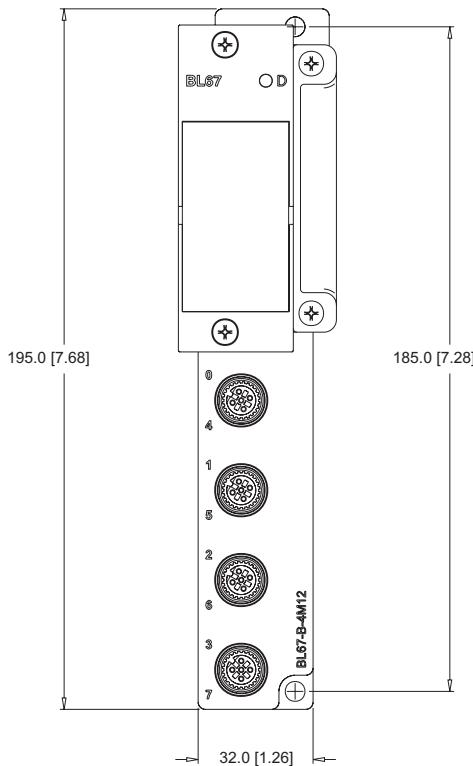


Figure 8:
BL67-module
(electronic - and
base module)

A Dimensions in
mm [inch]



General Technical Data



Note

The auxiliary power supply must comply with the stipulations of SELV (Safety Extra Low Voltage) according to IEC 364-4-41.

*Table 4:
General technical
data relating to a
station*

Supply voltage/ auxiliary voltage	
Nominal value (provision for other modules)	24 V DC
Permissible range	according to EN 61131-2 (18 to 30 V DC)
Residual ripple	according to EN 61131-2
Potential isolation	Yes, via optocoupler
Isolation voltage	
– field bus/(V_I/V_O)	– PROFIBUS-DP: 500 V _{eff} – DeviceNet: no – Ethernet: 500 V _{eff}
– V_I/V_O	no
– $(V_I/V_O\text{ }1)/(V_I/V_O\text{ }2)$, with PF module for potential isolation	500 V _{eff}
– field bus/ ($V_I/V_O\text{ }2$)	500 V _{eff}
Ambient conditions	
Ambient temperature	
– t_{Ambient}	0 to +55 °C / 32 to 131 °F
– t_{Store}	25 to +85 °C / 13 to 185 °F
Relative humidity	according to IEC 61131-2
Climatic tests	according to IEC 61131-2
Noxious gas	according to IEC 68068-42/43

Resistance to vibration	according to IEC 61131-2	
Protection class	according to IEC 60529 IP 67	
Shock resistant	according to IEC 61131-2	
Topple and fall/ free fall	according to IEC 61131-2	
Emitted interference		
High-frequency, radiated	according to EN 55011, Class A	
Immunity to interference		
Static electricity	according to IEC 61131-2	
Electromagnetic HF fields	according to IEC 61131-2	
Fast transients (Burst)	according to IEC 61131-2	
Conducted interferences induced by HF fields	according to IEC 61000-4-6 10 V Criteria A	
A I/O-line-length ≤ 30 m	High energy transients (Surge) A voltage supply	according to IEC 61000-4-5 0,5 kV CM, 12Ω/ 9 µF 0,5 kV DM, 2Ω/ 18 µF Criteria B
Reliability		
Operational life MTBF	min. 50000 h	
Electronic modules pull/ plug cycles	20	



Warning

This device can cause radio disturbances in residential areas and in small industrial areas (residential, business and trading). In this case, the operator can be required to take appropriate measures to suppress the disturbance at his own cost.

Approvals

*Table 5:
Approvals*

Approvals

CE

CSA (in preparation)

UL (in preparation)

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Power Feeding Modules

Overview

Power Feeding modules supply an galvanically isolated 24 V DC field voltage to the I/O modules.

By using Power Feeding modules, it is not necessary to distribute power separately to each BL67 I/O module.

Power Feeding modules distribute two separately switchable voltages to the modules, one for the inputs (V_i) and one for the outputs (V_o). These two voltages refer to the same ground potential (GND).

A sensor current limitation of 4 A for the input supply V_i is integrated in the modules to detect possible short circuits in the sensor supply.

The 24 V DC field supply is connected to the Power Feeding module by a 7/8“- connector.

LED status indicators

Error signals and diagnostic statuses are indicated via LEDs on the module. The corresponding diagnostic information is transmitted to the gateway via diagnostic bits.

Module Overview

- BL67-PF-24VDC

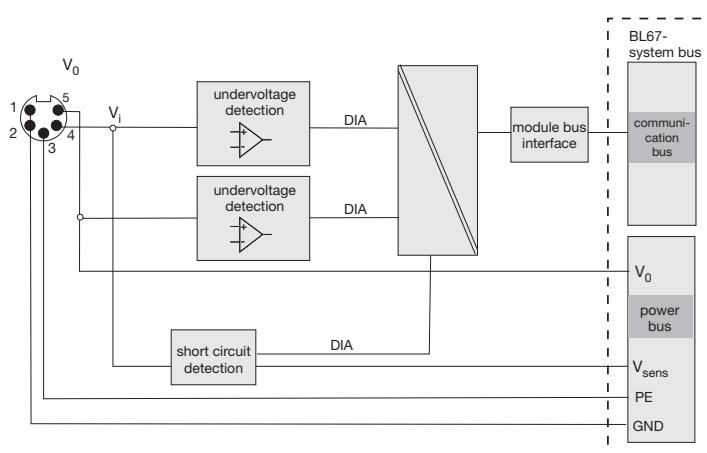
BL67-PF-24VDC, with Diagnostics

Figure 9:
BL67-PF-24VDC



3

Figure 10:
Block diagram



Power Feeding Modules

Technical Data

Table 6:
Technical data

	Designation	BL67-PF-24VDC
	Field supply	
	Output supply V_O / U_L	24 V DC
	– Permissible range	– 18 to 30 V DC
	Input supply V_I / U_B	24 V DC
	– Permissible range	– 18 to 30 V DC
	I_{MB} Nominal current from 5 V DC (module bus)	≤ 30 mA
	Max. output current from V_O	10 A
	Max. input current from V_I	4 A (limited by internal current limiter)
	Isolation voltage module bus/ supply voltage	Max. 1000 VDC

Diagnostic/ Status Messages**Diagnosis/ Status via LEDs**

*Table 7:
Diagnosis/ Status
via LEDs*

3

	LED	Display	Meaning	Remedy
	D	Red, flashing, 0.5 Hz	Diagnostics pending	-
	Red		Module bus communication failure	Check if more than two adjoining electronic modules have been pulled. This concerns modules located between this module and the gateway.
	Off		No error messages or diagnostics	-
V_O	Green		Power supply for outputs ok	-
	Off		Power supply for outputs faulty	Check the wiring to the power supply. Check the external power supply unit.
V_I	Green		Power supply for inputs ok	-
	Off		Power supply for inputs faulty	Check the wiring to the power supply. Check the external power supply unit.
I_{Im}	Red		short circuit in sensor supply (V_I)	Check the sensor supply.
	Off		sensor supply (V_I) ok	-

Power Feeding Modules

Diagnosis via Software

This module has the following diagnostic data:

*Table 8:
Diagnostic Data*

Diagnosis	Meaning
Current Overflow I_I	Current consumption too high ($> 4 \text{ A}$).
Low voltage V_O	$V_O < 18 \text{ VDC}$
Low voltage V_I	$V_I < 18 \text{ VDC}$

Module Parameters

none

Base modules/ Pin assignment

- BL67-B-1RSM (7/8")/ BL67-B-1RSM-4

Figure 11:
BL67-B-1RSM/
BL67-B-1RSM-4

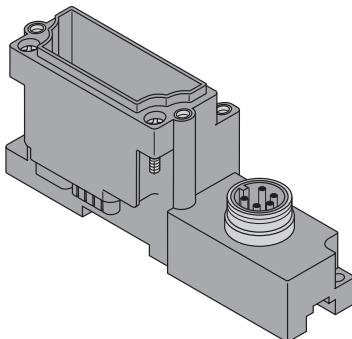


Figure 12:
Pin assignment
BL67-PF-24VDC 3
with *BL67-B-1RSM* 4
 2
 1
 5
 1 = GND
 2 = GND
 3 = PE
 4 = V_i
 5 = V_o

Figure 13:
Pin assignment
BL67-PF-24VDC 3
with
BL67-B-1RSM-4 4
 2
 1
 2
 3
 4
 1 = V_o , V_i
 2 = n.c.
 3 = n.c.
 4 = GND

Power Feeding Modules

4 Digital Input Modules

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Digital Input Modules

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Overview

Digital input modules (DI) detect electrical high- and low-level values through the base module connections and transmit the corresponding digital value to the gateway.

The modules provide optically isolated inputs according to IEC 61131 Type 1.

The sensor supply (V_{sens}) is tapped from the internal voltage supply bus.

This voltage is supplied by the gateway or a Power Feeding module. Both contain a short circuit detection for the sensor supply voltage.

In the modules without diagnostic function a sensor short circuit is thus detected in the gateway or in the Power Feeding module.

The modules with diagnostic function (BL67-xDI-**PD**) provide a short circuit protection.

The modules provide reverse polarity protection.

LED status indicators

- modules without channel- or connector-diagnosis:
The channel status is indicated via the channel LED. Error signals from the I/O level are indicated by each module via the "D" LED.
- modules with channel- or connector-diagnosis:
The modules BL67-xDI-**PD** provide whether a channel- or a connector diagnosis function. Diagnosis information are indicated via the channel LED or via the "D" LED.

Module Overview

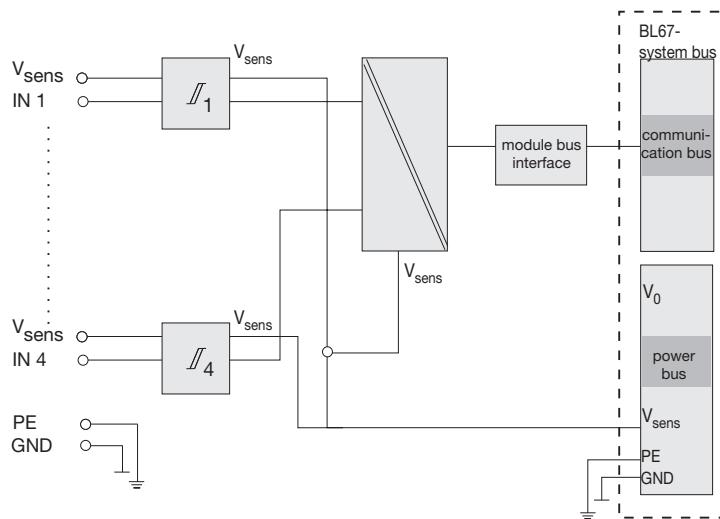
Table 9:
Module overview

Module	Number of channels	positive switching, sinking
BL67-4DI-P	4	✓
BL67-8DI-P	8	✓
BL67-4DI-N	4	-
BL67-8DI-N	8	-
BL67-4DI-PD	4	✓
BL67-8DI-PD	8	✓

BL67-4DI-P

Figure 14:

BL67-4DI-P

Figure 15:
Block diagram

Digital Input Modules

Technical Data

Table 10:
Technical data

Designation	BL67-4DI-P
Number of channels	4
Input voltage, nominal value at 24 V DC	
Low level	< 4.5 V
High level	7 V < U_{in} < 9 V
Nominal current from 5 V DC (module bus) I_{MB}	≤ 30 mA
Nominal current from supply terminal I_L	≤ 40 mA
Power loss of the module	< 250 mW
Input current I_{in}	
Low level	< 1.5 mA
High level	2.1 mA < I_{in} < 3.7 mA
Isolation voltage	
U_{TMB} (module bus/ field)	max. 1000 V DC

Diagnostic/ Status Messages**Diagnosis/ Status via LEDs**

*Table 11:
Diagnosis/ Status
via LEDs*

		LED	Display	Meaning	Remedy
	D	Red		Module bus communication failure	Check if more than two ad-joining electronic modules have been pulled. This concerns modules located between this module and the gateway.
		Off		No error messages	-
0 to 3		Green		Status of channel x = „1“	-
		Off		Status of channel x = „0“	-

Module Parameters

None

Digital Input Modules

Base modules/ Pin assignment

■ BL67-B-4M8

Figure 16:
BL67-B-4M8

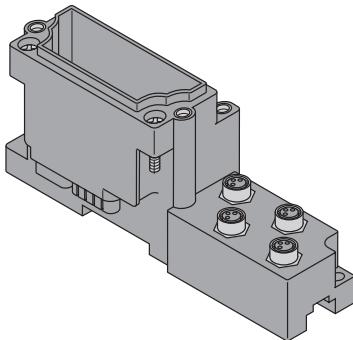


Figure 17:
Pin assignment
BL67-4DI-P with
BL67-B-4M8

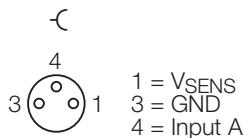
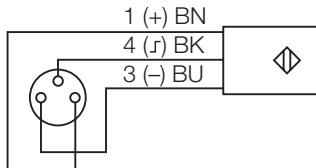
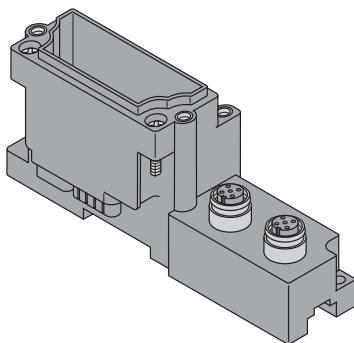


Figure 18:
Wiring diagram
BL67-4DI-P with
BL67-B-4M8



■ BL67-B-2M12/ BL67-B-2M12-P (paired)

Figure 19:
BL67-B-2M12/
BL67-B-2M12-P



4

Figure 20:
Pin assignment
BL67-4DI-P with
BL67-B-2M12/
BL67-B-2M12-P

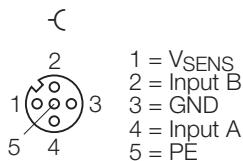
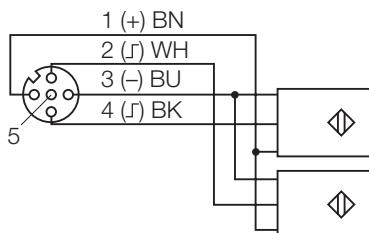
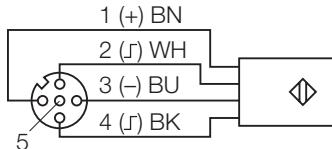


Figure 21:
Wiring diagrams
BL67-4DI-P with
BL67-B-2M12/
BL67-B-2M12-P



Digital Input Modules

■ BL67-B-4M12

Figure 22:
BL67-B-4M12

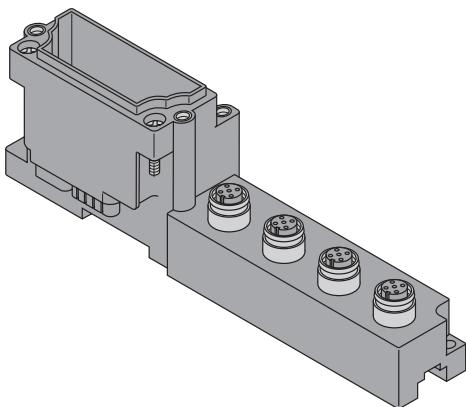


Figure 23:
Pin assignment
BL67-4DI-P with
BL67-B-4M12

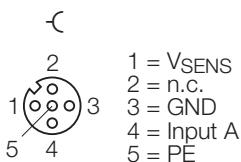
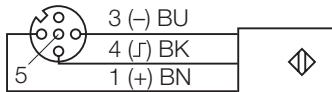
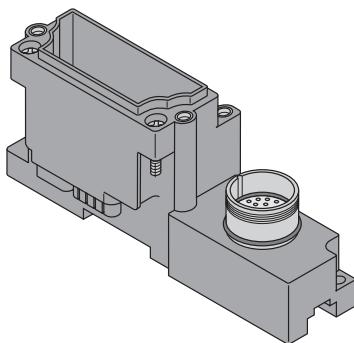


Figure 24:
Wiring diagram
BL67-4DI-P with
BL67-B-4M12



■ BL67-1M23

Figure 25:
BL67-B-1M23



4

Figure 26:
Pin assignment
BL67-4DI-P with
BL67-B-1M23



1	= Signal 0	7	= n.c.
2	= Signal 1	8	= n.c.
3	= Signal 2	9	= V _{SENS}
4	= Signal 3	10	= V _{SENS}
5	= n.c.	11	= V _{SENS}
6	= n.c.	12	= GND

Signal assignment

Tabelle 12:
Signal assignment
 $x.y \rightarrow$
 $x = \text{Connector}$
 $y = \text{Pin-No.}$

IN	0	1	2	3
BL67-B-4M8	0.4	1.4	2.4	3.4
BL67-B-2M12	0.4	1.4	0.2	1.2
BL67-B-2M12-P	0.4	0.2	1.4	1.2
BL67-B-4M12	0.4	1.4	2.4	3.4
BL67-B-1M23	0.1	0.2	0.3	0.4

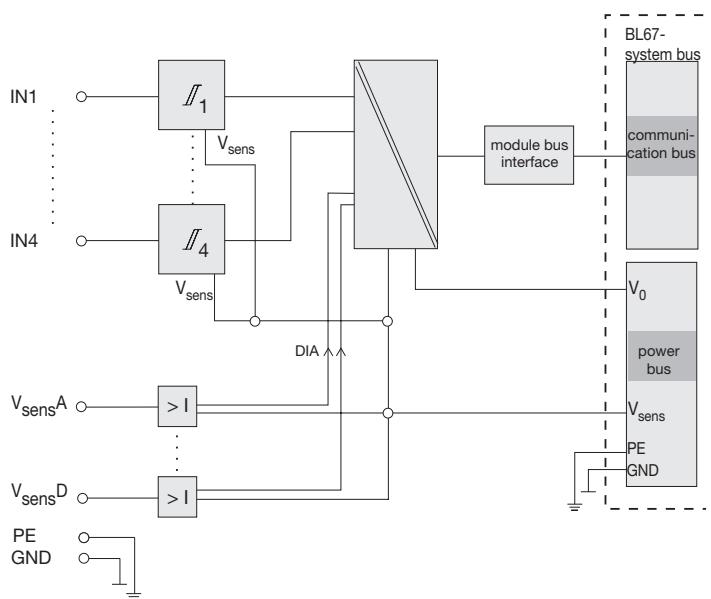
Digital Input Modules

BL67-4DI-PD

Figure 27:
BL67-4DI-PD



Figure 28:
Block diagram



Technical data

Table 13:
Technical data

Designation	BL67-4DI-PD
Number of channels	4
Input voltage, nominal value at 24 V DC	
Low level	< 4,5 V
High level	> 7 V (max. 30 V)
Nominal current from 5 V DC (module bus) I_{MB}	≤ 30 mA
Nominal current from supply terminal I_L	≤ 100 mA (all inputs low)
Power loss of the module	< 1,5 W
Input current I_{in}	
Low level	< 1,5 mA
High level	> 3,7 mA
Isolation voltage	
U_{TMB} (module bus/ field)	max. 2500 V DC
U_{FE}	max. 1000 V DC

Diagnostic/ Status Messages**Diagnosis/ Status via LEDs**

Table 14:
Diagnosis via
LEDs

	LED	Display	Meaning	Remedy
	D	Red	Module bus communication failure	Check if more than two ad-joining electronic modules have been pulled. This concerns modules located between this module and the gateway.
		Red	Error in field supply (LED V_i at Power Feeding module is „off“)	Check the power supply for the inputs (V_{sens}).
		Red, flashing, 0.5 Hz	Diagnosis pending	-
		Off	No error messages	-
0 to 3	Green		Status of channel x = „1“	Green
		Off	Status of channel x = „0“	Off
	Red flashing, 2 Hz	LED 0 to 3: Overload sensor supply x		- Check the sensor supply.
	Red	LED 0 and 1: open-circuit monitoring		- Check the wires for open-circuits.

Diagnosis via Software

This module has the following diagnostic data available per channel:

*Table 15:
Diagnosis*

Diagnosis	
Overcurrent/ short circuit sensor x	Overcurrent at sensor supply (> 100 mA).
Open circuit Kx	Groupwise open-circuit monitoring: Group A (channel 0 and 2) Group B (channel 2 and 3).

Module Parameters

*Table 16:
Module
parameters*

		Parameter name	Value	Meaning
A default setting	Input filter x	deactivate	A	Input filter: 0,25 ms.
		activate		Input filter: 2,5 ms
	Digital input x	normal	A	Input signal not inverted
		inverted		Input signal inverted, Conversion of the effective signal direction for sensors
	Operation mode group x	normal	A	
		open-circuit monitoring		open-circuit monitoring: Group A (channel 0 and 2) Group B (channel 2 and 3).

Digital Input Modules

Base modules/ Pin assignment

■ BL67-B-4M8

Figure 29:
BL67-B-4M8

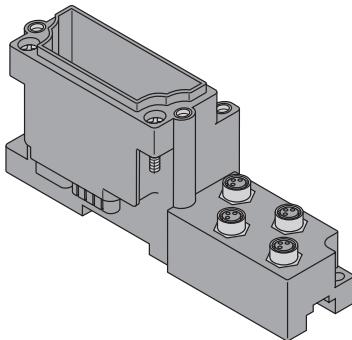


Figure 30:
Pin assignment
BL67-4DI-PD with
BL67-B-4M8

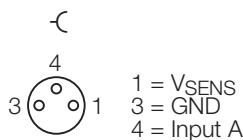
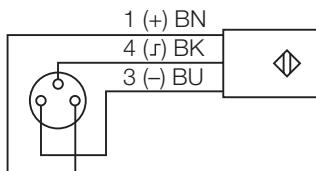
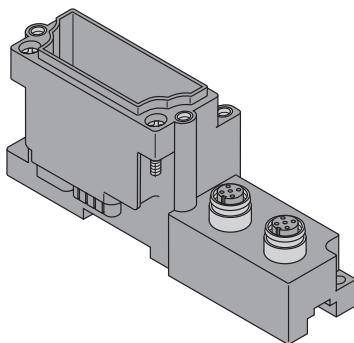


Figure 31:
Wiring diagram
BL67-4DI-PD with
BL67-B-4M8



■ BL67-B-2M12/ BL67-B-2M12-P (paired)

Figure 32:
BL67-B-2M12/
BL67-B-2M12-P



4

Figure 33:
Pin assignment
BL67-4DI-PD with
BL67-B-2M12/
BL67-B-2M12-P

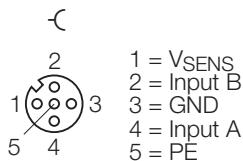
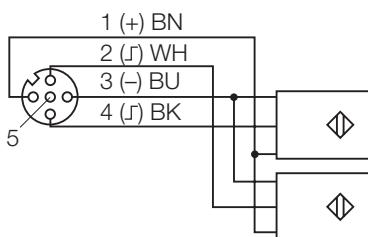
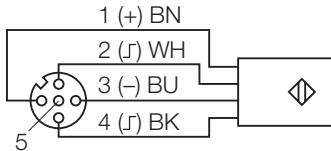


Figure 34:
Wiring diagrams
BL67-4DI-PD with
BL67-B-2M12/
BL67-B-2M12-P



Digital Input Modules

■ BL67-B-4M12

Figure 35:
BL67-B-4M12

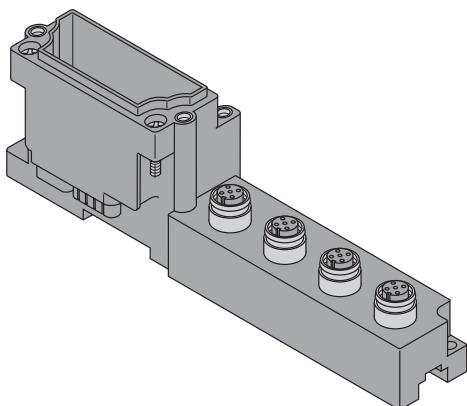


Figure 36:
Pin assignment
BL67-4DI-PD with
BL67-B-4M12

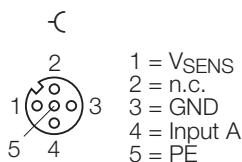
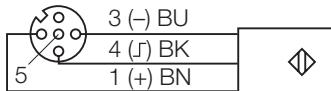


Figure 37:
Wiring diagram
BL67-4DI-PD with
BL67-B-4M12



Signal assignment

Tabelle 17:
Signal assignment
BL67-4DI-PD

A no open circuit
detection possible

x,y →
x = Connector
y = Pin-No.

IN	0	1	2	3
BL67-B-4M8 A	0.4	1.4	2.4	3.4
BL67-B-2M12	0.4	1.4	0.2	1.2
	Sensorsignal 1 + 2			Drahtbruch 1 + 2
BL67-B-2M12-P A	0.4	0.2	1.4	1.2
BL67-B-4M12 A	0.4	1.4	2.4	3.4

Sensor Supply

Table 18:
Sensor supply

V _{sens}	A	B	C	D
BL67-B-2M12	Con 0	Con 1	-	-
BL67-B-2M12-P	Con 0	Con 1	-	-
BL67-B-4M12	Con 0	Con 1	Con 2	Con 3
BL67-B-4M8	Con 0	Con 1	Con 2	Con 3

Digital Input Modules

BL67-8DI-P

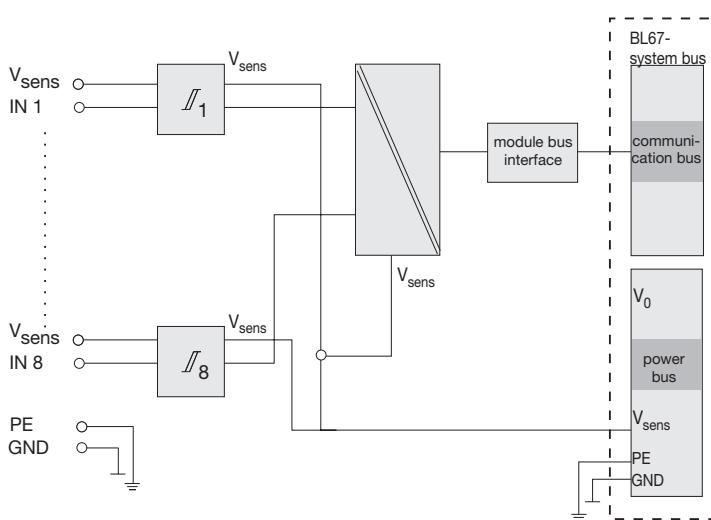
Figure 38:

BL67-8DI-P



Figure 39:

Block diagram



Technical Data*Table 19:
Technical data*

Designation	BL67-8DI-P
Number of channels	8
Input voltage, nominal value at 24 V DC	
Low level	< 4.5 V
High level	7 V < U _{in} < 9 V
Nominal current from 5 V DC (module bus) I _{MB}	< 30 mA
Nominal current from supply terminal I _L	≤ 40 mA
Power loss of the module	< 250 mW
Input current I _{in}	
Low level	< 1.5 mA
High level	2.1 mA < I _{in} < 3.7 mA
Isolation voltage	
U _{TMB} (module bus/ field)	max. 1000 V DC

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

Table 20:
Diagnosis/ Status
via LEDs

	LED	Display	Meaning	Remedy
	D	Red	Module bus communication failure	Check if more than two adjoining electronic modules have been pulled. This concerns modules located between this module and the gateway.
		Off	No error messages	-
0 to 7		Green	Status of channel x = „1“	-
		Off	Status of channel x = „0“	-

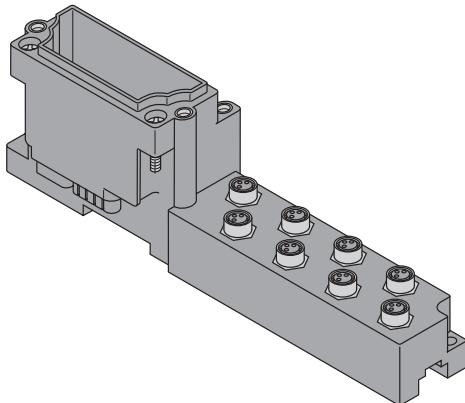
Module Parameters

None

Base modules/ Pin assignment

- BL67-B-8M8

Figure 40:
BL67-B-8M8



4

Figure 41:
Pin assignment
BL67-8DI-P with
BL67-B-8M8

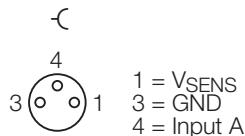
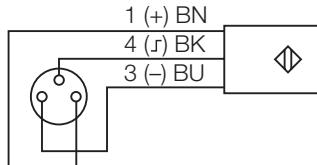


Figure 42:
Wiring diagram
BL67-8DI-P with
BL67-B-8M8



Digital Input Modules

- BL67-B-4M12/ BL67-B-4M12-P (paired)

Figure 43:
BL67-B-4M12/
BL67-B-4M12-P

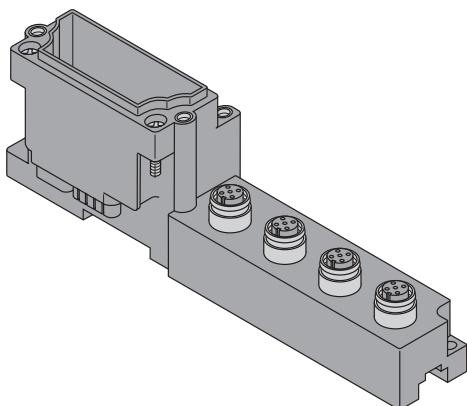


Figure 44:
Pin assignment
BL67-8DI-P with
BL67-B-4M12/
BL67-B-4M12-P

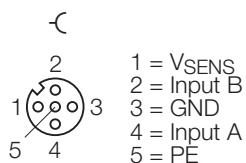
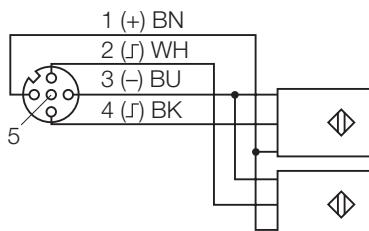
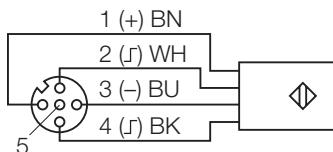
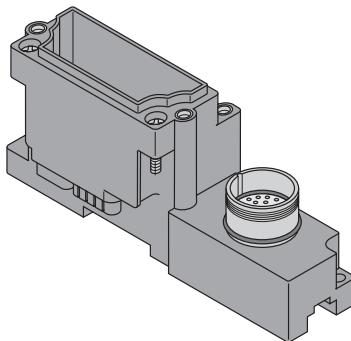


Figure 45:
Wiring diagrams
BL67-8DI-P with
BL67-B-4M12/
BL67-B-4M12-P



■ BL67-1M23

Figure 46:
BL67-B-1M23



4

Figure 47:
Pin assignment
BL67-8DI-P with
BL67-B-1M23



1 = Signal 0	7 = Signal 6
2 = Signal 1	8 = Signal 7
3 = Signal 2	9 = VSENS
4 = Signal 3	10 = VSENS
5 = Signal 4	11 = VSENS
6 = Signal 5	12 = GND

Signal assignment

Tabelle 21:
Signal assignment
BL67-8DI-P

x.y →
x = Connector
y = Pin-No.

IN	0	1	2	3	4	5	6	7
BL67-B-8M8	0.4	1.4	2.4	3.4	4.4	5.4	6.4	7.4
BL67-B-4M12	0.4	1.4	2.4	3.4	0.2	1.2	2.2	3.2
BL67-B-4M12-P	0.4	0.2	1.4	1.2	2.4	2.2	3.4	3.2
BL67-B-1M23	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8

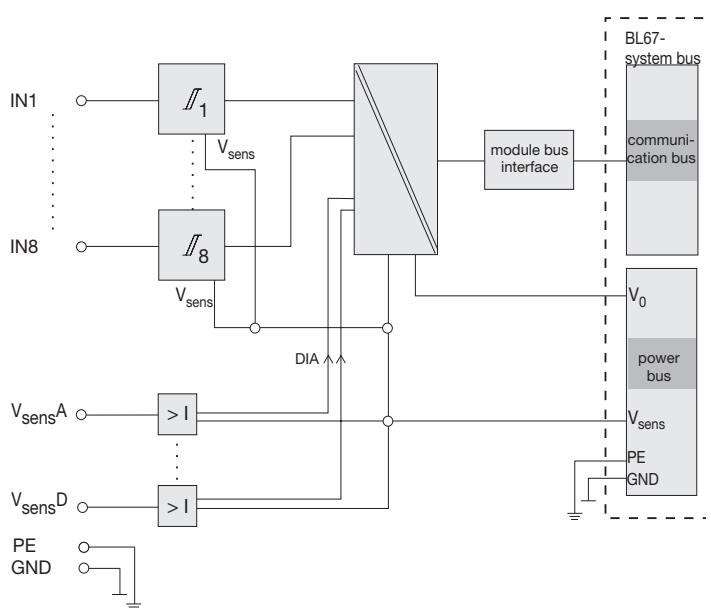
Digital Input Modules

BL67-8DI-PD

Figure 48:
BL67-8DI-PD



Figure 49:
Block diagram



Technical data*Table 22:
Technical data*

Designation	BL67-8DI-PD
Number of channels	8
Input voltage, nominal value at 24 V DC	
Low level	< 4,5 V
High level	> 7 V (max. 30 V)
Nominal current from 5 V DC (module bus) I_{MB}	≤ 30 mA
Nominal current from supply terminal I_L	≤ 100 mA (all inputs low)
Power loss of the module	< 1,5 W
Input current I_{in}	
Low level	< 1,5 mA
High level	> 3,7 mA
Isolation voltage	
U_{TMB} (module bus/ field)	max. 2500 V DC
U_{FE}	max. 1000 V DC

Diagnostic/ Status Messages**Diagnosis/ Status via LEDs**

Table 23:
Diagnosis via
LEDs

	LED	Display	Meaning	Remedy
	D	Red	Module bus communication failure	Check if more than two ad-joining electronic modules have been pulled. This concerns modules located between this module and the gateway.
		Red	Error in field supply (LED V_i at Power Feeding module is „off“)	Check the power supply for the inputs (V_{sens}).
		Red, flashing, 0.5 Hz	Diagnosis pending	-
		Off	No error messages	-
0 to 7	Green		Status of channel x = „1“	Green
		Off	Status of channel x = „0“	Off
	Red flashing, 2 Hz		LED 0 to 3: Overload sensor supply x	- Check the sensor supply.
	Red		LED 0 and 1: open-circuit monitoring	- Check the wires for open-circuit.

Diagnosis via Software

This module has the following diagnostic data available per channel:

*Table 24:
Diagnosis*

Diagnosis	
Overcurrent/ short circuit sensor x	Overcurrent at sensor supply (> 100 mA).
Open circuit Kx	Groupwise open-circuit monitoring: Group A (channel 0 and 4) Group B (channel 1 and 5) Group C (channel 3 and 6) Group D (channel 4 and 7).

4

Module Parameters

*Table 25:
Module
parameters*

A default setting

	Parameter name	Value	Meaning
A default setting	Input filter x	deactivate A	Input filter: 0,25 ms.
		activate	Input filter: 2,5 ms
	Digital input x	normal A	Input signal not inverted
		inverted	Input signal inverted, Conversion of the effective signal direction for sensors
	Operation mode group x	normal	
		open-circuit monitoring	open-circuit monitoring: Group A (channel 0 and 4) Group B (channel 1 and 5) Group C (channel 3 and 6) Group D (channel 4 and 7).

Digital Input Modules

Base modules/ Pin assignment

■ BL67-B-8M8

Figure 50:
BL67-B-8M8

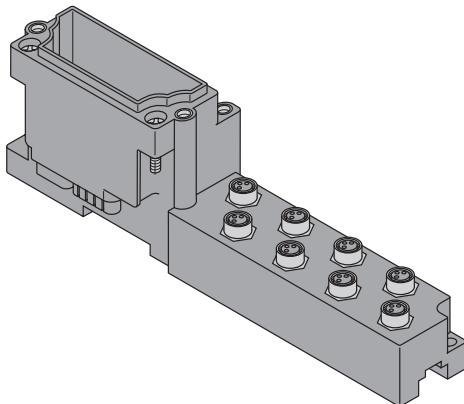


Figure 51:
Pin assignment
BL67-8DI-PD with
BL67-B-8M8

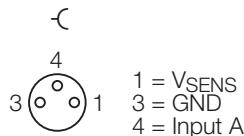
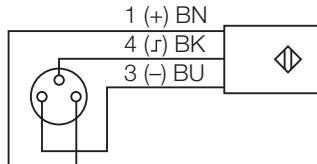
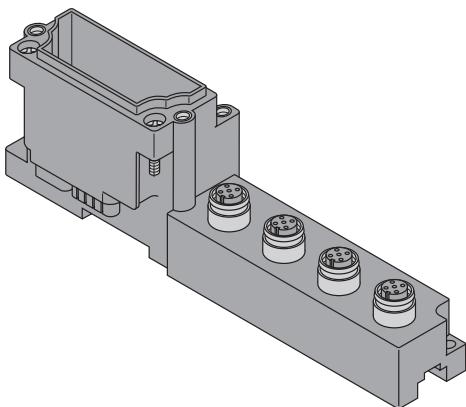


Figure 52:
Wiring diagram
BL67-8DI-PD with
BL67-B-8M8



■ BL67-B-4M12/ BL67-B-4M12-P (paired)

Figure 53:
BL67-B-4M12/
BL67-B-4M12-P



4

Figure 54:
Pin assignment
BL67-8DI-PD with
BL67-B-4M12/
BL67-B-4M12-P

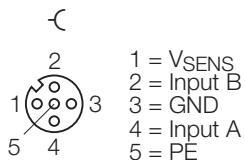
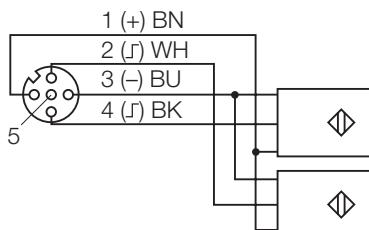
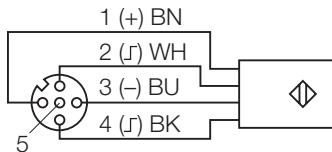


Figure 55:
Wiring diagrams
BL67-8DI-PD with
BL67-B-4M12/
BL67-B-4M12-P



Digital Input Modules

Signal assignment

Tabelle 26:
Signal assignment
BL67-8DI-PD

A no open circuit
detection possible

x,y →

x = Connector

y = Pin-No.

IN	0	1	2	3	4	5	6	7
BL67-B-8M8 A	0.4	1.4	2.4	3.4	4.4	5.4	6.4	7.4
BL67-B-4M12	0.4	1.4	2.4	3.4	0.2	1.2	2.2	3.2
Sensorsignal 1 bis 4						Drahtbruch 1 bis 4		
BL67-B-4M12-P A	0.4	0.2	1.4	1.2	2.4	2.2	3.4	3.2

Sensor Supply

Table 27:
Sensor supply

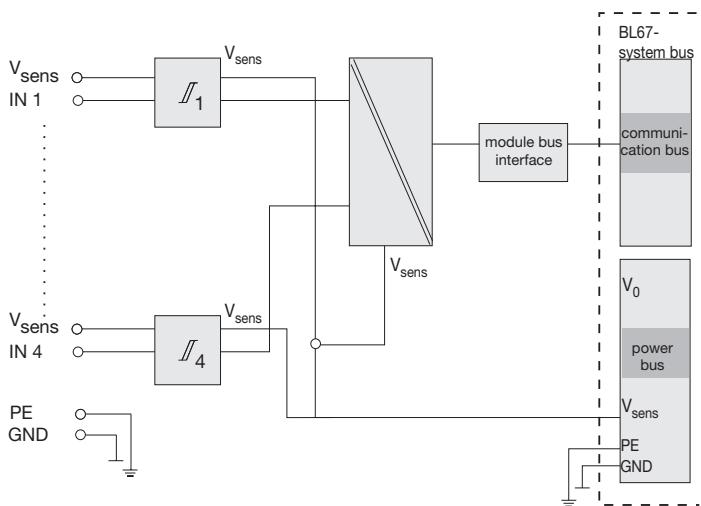
V _{sens}	A	B	C	D
BL67-B-4M12	Con 0	Con 1	Con 2	Con 3
BL67-B-4M12-P	Con 0	Con 1	Con 2	Con 3
BL67-B-8M8	Con 0/1	Con 2/3	Con 4/5	Con 6/7

BL67-4DI-N

Figure 56:
BL67-4DI-N



Figure 57:
Block diagram



Technical Data*Table 28:
Technical Data*

Designation	BL67-4DI-N
Number of channels	4
Input voltage, nominal value at 24 V DC	
Low level	> 7 V (max. 30 V)
High level	< 5 V
Nominal current from 5 V DC (module bus) I_{MB}	$\leq 30 \text{ mA}$
Nominal current from supply terminal I_L	$\leq 1 \text{ mA}$ (all inputs low)
Power loss of the module	< 1.3 W
Input current I_{in}	
Low level	< 2,5 mA
High level	> 3 mA
Isolation voltage	
U_{TMB} (module bus/ field)	max. 2500 V DC
U_{FE}	max. 1000 V DC

Diagnostic/ Status Messages**Diagnosis/ Status via LEDs**

*Table 29:
Diagnosis/ Status
via LEDs*

	LED	Display	Meaning	Remedy
	D	Red	Module bus communication failure	Check if more than two ad-joining electronic modules have been pulled. This concerns modules located between this module and the gateway.
		Off	No error messages	-
0 to 3	Green		Status of channel x = „1“	-
		Off	Status of channel x = „0“	-

Modul Parameters

None

Digital Input Modules

Base modules/ Pin assignment

■ BL67-B-4M8

Figure 58:
BL67-B-4M8

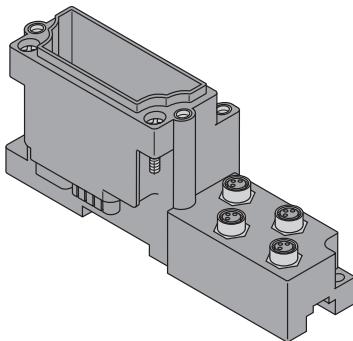


Figure 59:
Pin assignment
BL67-4DI-N with
BL67-B-4M8

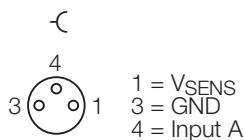
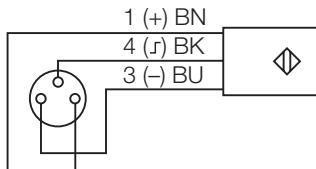
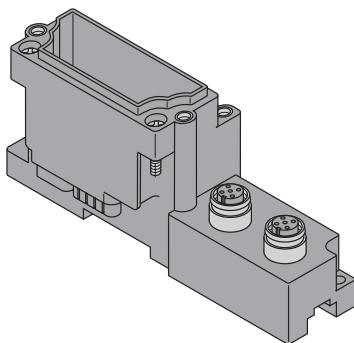


Figure 60:
Wiring diagram
BL67-4DI-N with
BL67-B-4M8



■ BL67-B-2M12/ BL67-B-2M12-P (paired)

Figure 61:
BL67-B-2M12/
BL67-B-2M12-P



4

Figure 62:
Pin assignment
BL67-4DI-N with
BL67-B-2M12/
BL67-B-2M12-P

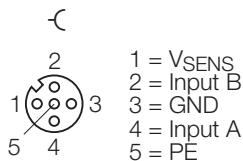
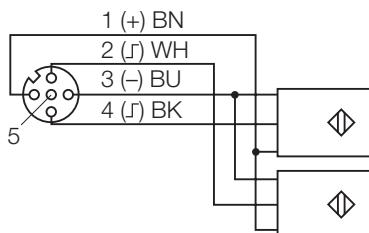
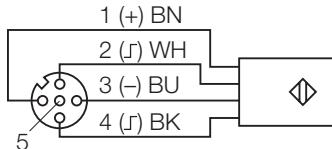


Figure 63:
Wiring diagrams
BL67-4DI-N with
BL67-B-2M12/
BL67-B-2M12-P



Digital Input Modules

■ BL67-B-4M12

Figure 64:
BL67-B-4M12

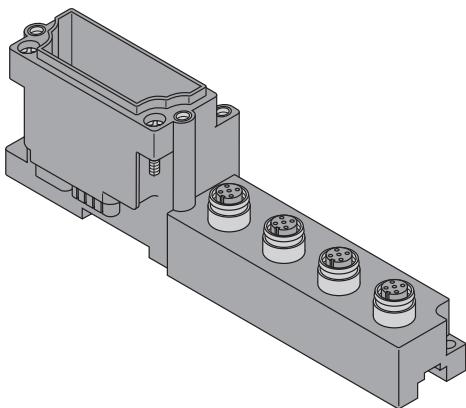


Figure 65:
Pin assignment
BL67-4DI-N with
BL67-B-4M12

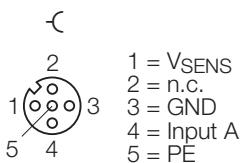
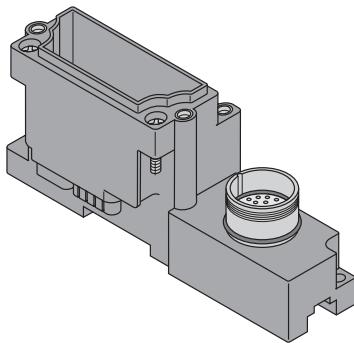


Figure 66:
Wiring diagram
BL67-4DI-N with
BL67-B-4M12



■ BL67-1M23

Figure 67:
BL67-B-1M23



4

Figure 68:
Pin assignment
BL67-4DI-N with
BL67-B-1M23



1 = Signal 0	7 = n.c.
2 = Signal 1	8 = n.c.
3 = Signal 2	9 = V _{SENS}
4 = Signal 3	10 = V _{SENS}
5 = n.c.	11 = V _{SENS}
6 = n.c.	12 = GND

Signal assignment

Tabelle 30:
Signal assignment
BL67-4DI
 $x.y \rightarrow$
 $x = \text{Connector}$
 $y = \text{Pin-No.}$

IN	0	1	2	3
BL67-B-4M8	0.4	1.4	2.4	3.4
BL67-B-2M12	0.4	1.4	0.2	1.2
BL67-B-2M12-P	0.4	0.2	1.4	1.2
BL67-B-4M12	0.4	1.4	2.4	3.4
BL67-B-1M23	0.1	0.2	0.3	0.4

Digital Input Modules

BL67-8DI-N

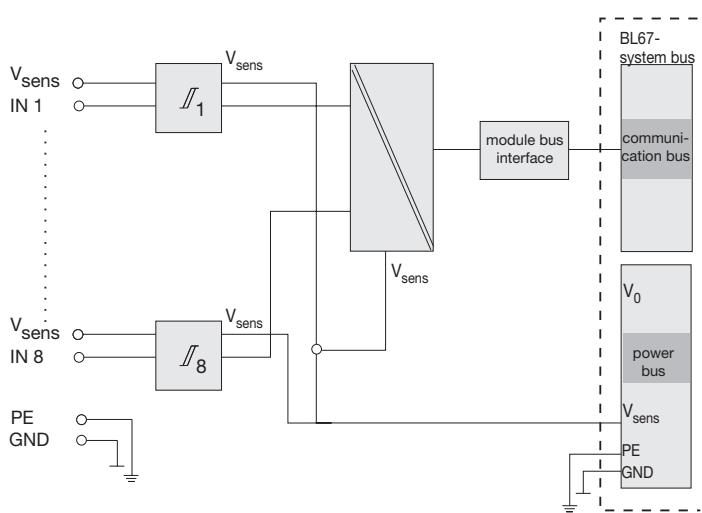
Figure 69:

BL67-8DI-N



Figure 70:

Block diagram



Technical Data*Table 31:
Technical Data*

Designation	BL67-8DI-N
Number of channels	8
Input voltage, nominal value at 24 V DC	
Low level	> 7 V (max. 30 V)
High level	< 5 V
Nominal current from 5 V DC (module bus) I_{MB}	≤ 30 mA
Nominal current from supply terminal I_L	≤ 1 mA (all inputs low)
Power loss of the module	< 1,3 W
Input current I_{in}	
Low level	< 1,2 mA
High level	> 1,5 mA
Isolation voltage	
U_{TMB} (module bus/ field)	max. 2500 V DC
U_{FE}	max. 1000 V DC

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

Table 32:
Diagnosis/ Status
via LEDs

	LED	Display	Meaning	Remedy
	D	Red	Module bus communication failure	Check if more than two ad-joining electronic modules have been pulled. This concerns modules located between this module and the gateway.
		Off	No error messages	-
0 to 7		Green	Status of channel x = „1“	-
		Off	Status of channel x = „0“	-

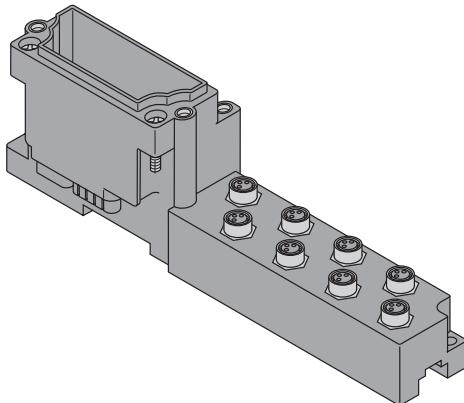
Module Parameters

None

Base modules/ Pin assignment

- BL67-B-8M8

Figure 71:
BL67-B-8M8



4

Figure 72:
Pin assignment
BL67-8DI-N with
BL67-B-8M8

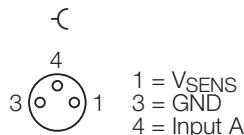
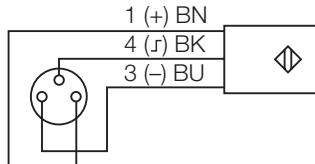


Figure 73:
Wiring diagram
BL67-8DI-N with
BL67-B-8M8



Digital Input Modules

- BL67-B-4M12/ BL67-B-4M12-P (paired)

Figure 74:
BL67-B-4M12/
BL67-B-4M12-P

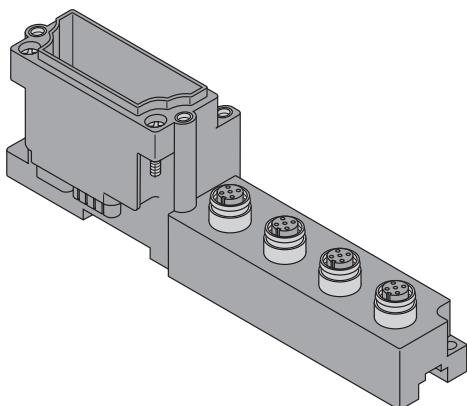


Figure 75:
Pin assignment
BL67-8DI-N with
BL67-B-4M12/
BL67-B-4M12-P

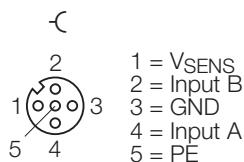
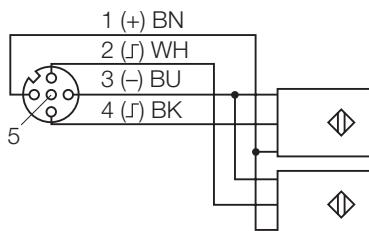
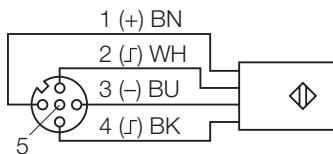
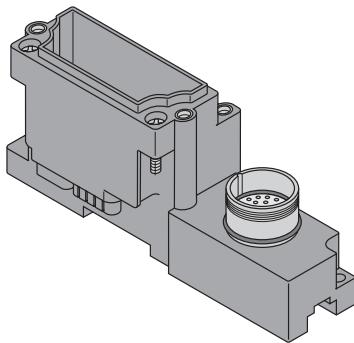


Figure 76:
Wiring diagrams
BL67-8DI-N with
BL67-B-4M12/
BL67-B-4M12-P



■ BL67-1M23

Figure 77:
BL67-B-1M23



4

Figure 78:
Pin assignment
BL67-8DI-N with
BL67-B-1M23



1 = Signal 0	7 = Signal 6
2 = Signal 1	8 = Signal 7
3 = Signal 2	9 = VSENS
4 = Signal 3	10 = VSENS
5 = Signal 4	11 = VSENS
6 = Signal 5	12 = GND

Signal assignment

Tabelle 33:
Signal assignment
BL67-8DI-N

x.y →
x = Connector
y = Pin-No.

IN	0	1	2	3	4	5	6	7
BL67-B-8M8	0.4	1.4	2.4	3.4	4.4	5.4	6.4	7.4
BL67-B-4M12	0.4	1.4	2.4	3.4	0.2	1.2	2.2	3.2
BL67-B-4M12-P	0.4	0.2	1.4	1.2	2.4	2.2	3.4	3.2
BL67-B-1M23	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8

Digital Input Modules

5 Analog Input Modules

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– 16 bit value representation	49
– 12 bit value representation (left-justified)	50

Overview

Analog input modules (AI) detect standard electrical signals, digitize them and transmit the corresponding measurement values to the gateway via the internal module bus.

The sensor supply (VI) is tapped from the internal voltage supply bus.

This voltage is supplied by the gateway or a Power Feeding module. Both contain a short circuit detection for the sensor supply voltage.

A sensor short circuit is thus also detected in the gateway or in the Power Feeding module.

The module bus electronic of the analog input modules are galvanically isolated from the field level via an optocoupler and provide reverse polarity protection.

Supported signal ranges

- BL67-2AI-I:
 - 0 to 20 mA
 - 4 to 20 mA
- BL67-2AI-V:
 - 0 to 10 V DC
 - 10 to 10 V DC

Connectable sensors

- BL67-2AI-PT
 - platinum sensors (PT100, PT200, PT500, PT1000)
 - nickel sensor (Ni100, Ni1000)
- BL67-2AI-TC
 - thermo elements (of types B, E, J, K, N, R, S, T)

LED status indicators

Error signals from the I/O level are indicated by each module via the "D" LED. The corresponding diagnostic information is transmitted to the gateway via diagnostic bits.

Analog Input Modules

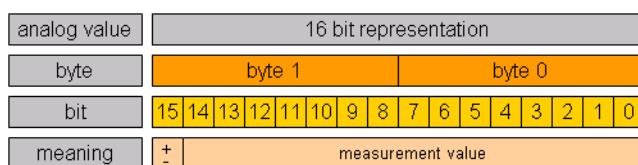
Analog value representation

The analog values can either be represented with 16 bit or 12 bit. The two's-complement representation allows the representation of positive as well as negative values.

16 bit representation:

The 16 bit representation is realized as a two's-complement. 2 bytes of process data are completely occupied.:

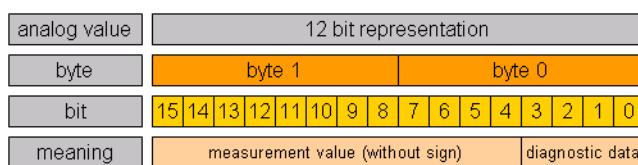
Figure 79:
16 bit
representation



12 bit representation:

In the voltage measurement/ output and in the temperature measurement, the value is represented as a two's-complement. In the current measurement/ output and in the resistance measurement, the value is represented as a dual number. The 12 bit value is **left-justified** and occupies bit 15 to 4 of the process data.

Figure 80:
12 bit
representation



The diagnosis information is integrated in the process input data and occupies 4 bit (right-justified).

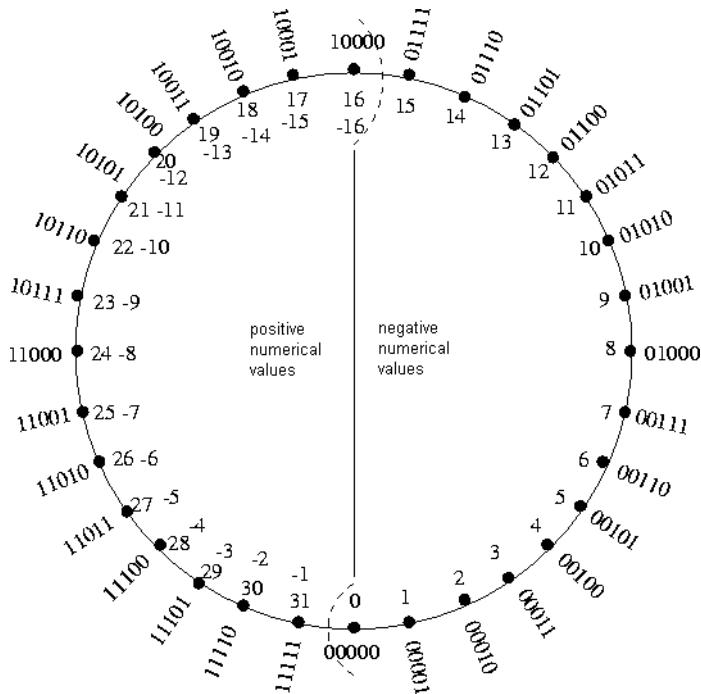


Note

A detailed description of the measurement value representation for the analog input modules in 16 or 12 bit can be found in the "appendix" of this manual, page 13-9.

The figure shows a 5-digit binary code in the outer circuit. The inner circuit shows the respective dual number, if the binary code is interpreted as binary number (positive numerical values) and as two's complement.

Figure 81:
Binary code as
binary number
and two's com-
plement



Analog Input Modules

Module Overview

Table 34:
Module overview

Module	Number of channels
BL67-2AI-I	2
BL67-2AI-V	2
BL67-2AI-PT	2
BL67-2AI-TC	2
BL67-4AI-V/I	4

BL67-2AI-I, 0/4...20mA

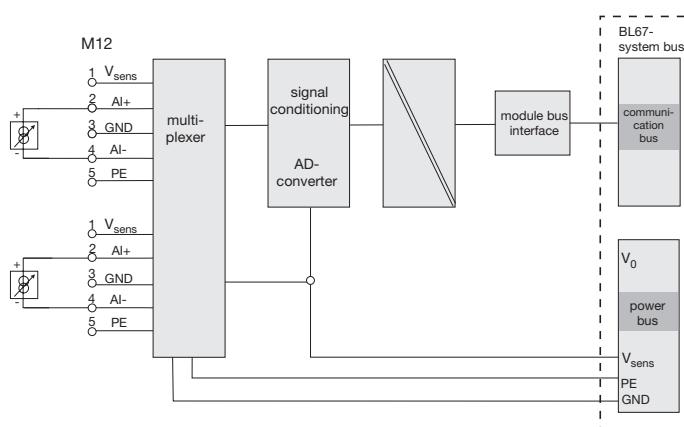
Figure 82:

BL67-2AI-I



5

Table 35:
Block diagram



Analog Input Modules

Technical Data

Table 36:
Technical data

Designation	BL67-2AI-I
Number of channels	2
Nominal voltage from supply terminal	24 V DC
voltage range	18 to 30 VDC
Nominal current from 5 V DC (module bus) I_{MB}	≤ 35 mA
Nominal current from supply terminal I_L	≤ 12 mA
Power loss of the module, typical P_{MAX}	< 1 W
Input current	0/4 to 20 mA
Max. input current	50 mA
Isolation voltage	
U_{TMB} (module bus/ field)	min. 500 V _{eff}
U_{Fe} (field/ functional earth)	min. 50 V _{AC}
channel/channel	no
channel/field supply	no
channel/system supply	500 V _{eff}
Input resistance (burden)	< 125 Ω
Cutoff frequency (-3 dB)	≥ 50 Hz
Basic error at 23 °C/ 73.4 °F	0.2 %
Repeat accuracy	0.05 %
Temperature coefficient	≤ 300 ppm/°C

Resolution of the A/D converter	16 Bit
Measuring principle	Delta Sigma
Measurement value representation	16 Bit Signed Integer / 12 Bit Full Range left-justified
I_{SENS} (sensor supply from Vi)	≤ 250 mA; short-circuit protection in gateway or Power Feeding module

Analog Input Modules

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

Table 37:
Diagnosis via LED

LED	Display	Meaning	Remedy
D	Red, flashing, 0.5 Hz	Diagnostics pending	-
Red	Module bus communication failure	Check if more than two ad-joining elec- tronic modules have been pulled. This concerns modules located between this module and the gateway.	
Off	No error messages or diagnostics	-	

Diagnosis via Software

This module has the following diagnostic data available per channel:

Table 38:
Diagnosis

Diagnosis	
<i>Measurement value range error</i>	Indicates an over- or under- current of 1 % of the set current range; „Undercurrent“ is only detected when the current range is set from 4 to 20 mA.
<i>Open circuit</i> ($I < 3 \text{ mA}$)	Indicates an open circuit in the signal line for the oper- ating mode 4 to 20 mA

**Note**

If the measurement value representation is parameterized as „12bit (left-justified)“ the diagnostic data will be transferred with the process data bits 0 to 3 of the respective channel.

Module Parameters (per Channel)

5

<i>Table 39: Module parameters</i>	Parameter name	Value
A default settings	Value representation	integer (15bit + sign) A 12bit (left-justified)
	Current mode	0...20mA A 4...20mA
	Channel	activate A deactivate
	Diagnostic	release A) block

Analog Input Modules

Base modules/ Pin assignment

■ BL67-B-2M12

Figure 83:
BL67-B-2M12

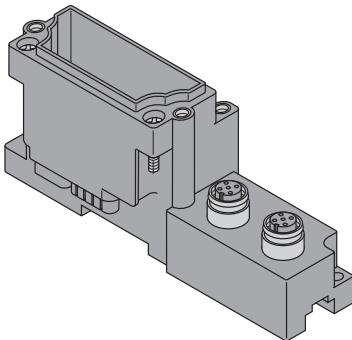
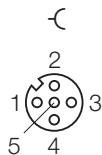


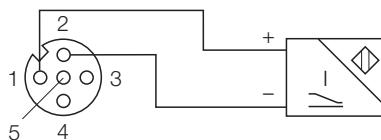
Figure 84:
Pin assignment
BL67-2AI-I



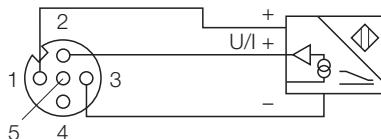
1 = V_{SENS}
2 = AI +
3 = GND
4 = AI -
5 = PE

Figure 85:
Wiring diagrams
BL67-2AI-I

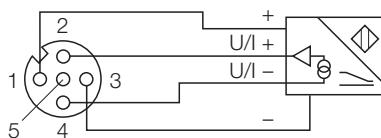
2-wire sensor with power supply via base module:



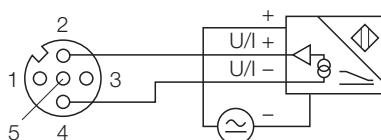
3-wire sensor with power supply via base module:



4-wire sensor with power supply via base module:



4-wire sensor with external power supply:



Measurement value representation

16 bit value representation:

- Current values from 0 to 20 mA

The value range

0 mA to 20 mA

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

- Current values from 4 to 20 mA

The value range

4 mA to 20 mA

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

12 bit value representation (left-justified)

- Current values from 0 to 20 mA

The value range

0 mA to 20 mA

is displayed as follows:

000(0)_{hex} to FFF(0)_{hex} (decimal: 0 to 4095)

- Current values from 4 to 20 mA

The value range

4 mA to 20 mA

is displayed as follows:

000(0)_{hex} to FFF(0)_{hex} (decimal: 0 to 4095)



Note

A detailed description of the measurement value representation for the analog input modules in 16 or 12 bit can be found in the "appendix" of this manual, page13-9.

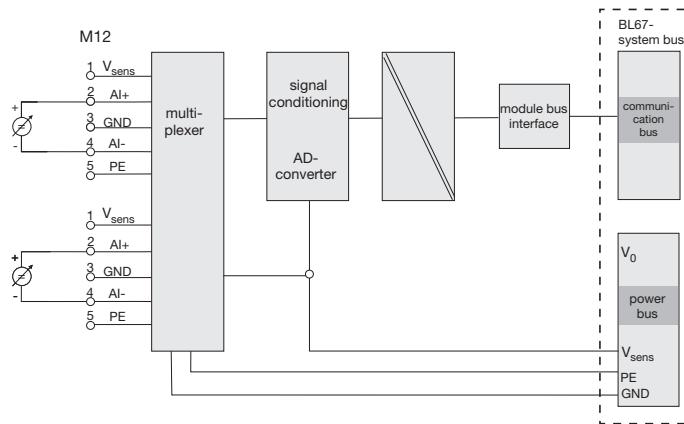
BL67-2AI-V, -10/0...+10 V DC

Figure 86:
BL67-2AI-V



5

Figure 87:
Block diagram



Analog Input Modules

Technical Data

Table 40:
Technical data

Designation	BL67-2AI-V
Number of channels	2
Nominal voltage from supply terminal	24 V DC
voltage range	18 to 30 VDC
Nominal current from 5 V DC (module bus) I_{MB}	≤ 35 mA
Nominal current from supply terminal I_L	≤ 12 mA
Power loss of the module, typical P_{MAX}	< 1 W
Input voltage	-10/0 to 10 VDC
Max. input voltage	35 V continuous
Isolation voltage	
U_{TMB} (module bus/ field)	min. 500 V _{eff}
U_{Fe} (field/ functional earth)	min. 50 V _{AC}
channel/channel	no
channel/field supply	no
channel/system supply	500 V _{eff}
Input resistance (burden)	≥ 98.5 k Ω
Cutoff frequency (-3 dB)	≥ 50 Hz
Basic error at 23 °C/ 73.4 °F	0.2 %
Repeat accuracy	0.05 %
Temperature coefficient	≤ 150 ppm/°C

Resolution of the A/D converter	16 Bit
Measuring principle	Delta Sigma
Measurement value representation	16 Bit Signed Integer / 12 Bit Full Range left-justified
I_{SENS} (sensor supply from V_i)	≤ 250 mA; short circuit protection in gateway or Power Feeding module

Analog Input Modules

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

Table 41:
Diagnosis via LED

LED	Display	Meaning	Remedy
D	Red, flashing, 0.5 Hz	Diagnostics pending	-
Red		Module bus communication failure	Check if more than two ad-joining elec- tronic modules have been pulled. This concerns modules located between this module and the gateway.
Off		No error messages or diagnostics	-

Diagnosis via Software

This module has the following diagnostic data available per channel:

Table 42:
Diagnosis

Diagnosis
Measurement value range error
Overvoltage: – U_{\max} ($U > 10.1$ V)
Undervoltage: – U_{\min} ($U < -10.1$ V) at -10 to +10 V DC – U_{\min} ($U < -0.1$ V) at 0 to +10 V DC

**Note**

If the measurement value representation is parameterized as „12bit (left-justified)“ the diagnostic data will be transferred with the process data bits 0 to 3 of the respective channel.

Module Parameters (per Channel)

5

<i>Table 43: Module parameters</i>	Parameter name	Value
	Value representation	integer (15bit + sign) A 12bit (left-justified)
A default settings	Voltage mode	-10...+10V 0...10V A
	Channel	activate A deactivate
	Diagnostic	release A block

Analog Input Modules

Base modules/ Pin assignment

■ BL67-B-2M12

Figure 88:
BL67-B-2M12

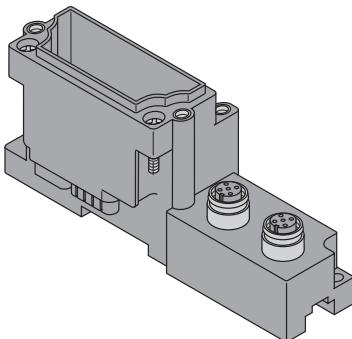


Figure 89:
Pin assignment
BL67-2AI-V

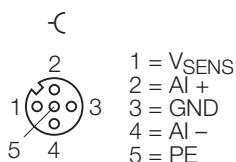
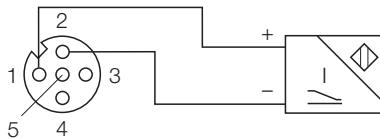
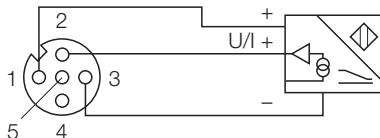


Figure 90:
Wiring diagrams
BL67-2AI-V

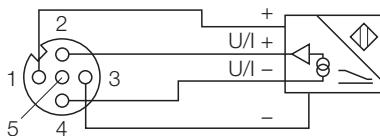
2-wire sensor with power supply via base module:



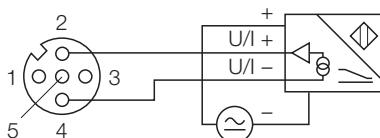
3-wire sensor with power supply via base module:



4-wire sensor with power supply via base module:



4-wire sensor with external power supply:



Measurement value representation

16 bit representation:

- Voltage values from 0 to 10 V DC

The value range

0 V DC to 10 V DC

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

- Voltage values from -10 to 10 V DC

The value range

-10 V to -3,052 10⁻⁴ V

is displayed as follows:

8000_{hex} to FFFF_{hex} (decimal:-32768 to -1)

The value range

0 V to 10 V

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

12 bit representation (left-justified)

- Voltage values from 0 to 10 V DC

The value range

0 V to 10 V

is displayed as follows:

000(0)_{hex} to FFF(0)_{hex} (decimal: 0 to 4095)

- Voltage values from -10 to 10 V DC

The value range

0 V to 10 V

is displayed as follows:

000(0)_{hex} to 7FF(0)_{hex} (decimal: 0 to 2047)



Note

A detailed description of the measurement value representation for the analog input modules in 16 or 12 bit can be found in the "appendix" of this manual, page13-9.

BL67-2AI-PT, PT-/NI-Sensors

Figure 91:
BL67-2AI-PT



5

Figure 92:
Block diagram

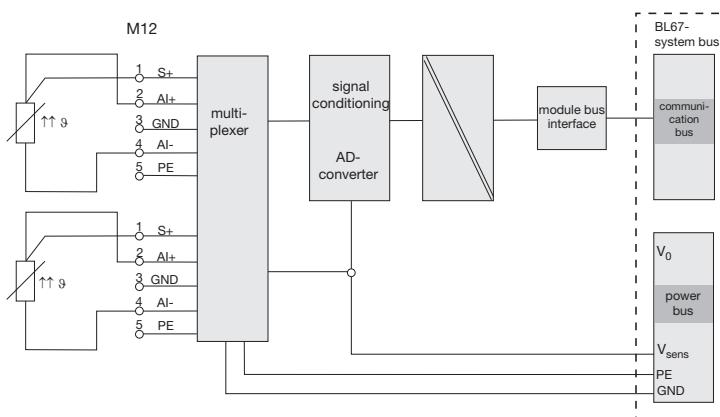
**Technical Data**

Table 44:
Technical data

Designation	BL67-2AI-PT
Number of channels	2
Nominal voltage from supply terminal	24 V DC
voltage range	18 to 30 VDC
Nominal current from 5 V DC (module bus) I_{MB}	≤ 45 mA

Analog Input Modules

Nominal current from supply terminal I_L	< 30 mA
Power loss of the module, typical P_{MAX}	< 1 W
Measurement current	< 1 mA
Max. input voltage U_{MAX} (Destruction limit)	> 30 VDC
Isolation voltage	
U_{TMB} (module bus/ field)	min. 500 V _{eff}
U_{Fe} (field/ functional earth)	min. 50 V _{AC}
channel/channel	no
channel/field supply	no
channel/system supply	500 V _{eff}
Measurement value representation	16 Bit signed integer / 12 Bit full range left-justified
Offset error	$\leq 0.1 \%$
Linearity	$< 0.1 \%$
Basic error at 23 °C / 73.4 °F	$< 0.2 \%$
Repeat accuracy	0.05 %
Temperature coefficient	$\leq 300 \text{ ppm}/^\circ\text{C}$ from end value
t_{CYCL} (Cycle time)	$\leq 130 \text{ ms}$ per channel
Connectable sensors	
Platinum sensors	PT100, PT200, PT500, PT1000
Nickel sensors	Ni100, Ni1000

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

Table 45:
Diagnosis via LED

LED	Display	Meaning	Remedy
D	Red, flashing, 0.5 Hz	Diagnostics pending	-
Red		Module bus communication failure	Check if more than two ad-joining elec- tronic modules have been pulled. This concerns modules located between this module and the gateway.
Off		No error messages or diagnostics	-

Diagnosis via Software

This module has the following diagnostic data available per channel:

Table 46:
Diagnosis

Diagnosis	Meaning
<i>Overflow/ Underflow</i>	Threshold: 1 % of positive measurement range end value. Underflow diagnostic only in the temperature measurement range.
<i>Open circuit</i>	
<i>Short-circuit</i>	Threshold: 5 Ω (loop resistance)
	Only with temperature measurements.



Note

3-wire measurements with PT100 sensors cannot differentiate between a short-circuit and an open circuit at temperatures below -177 °C. In this case, the diagnostic "Short-circuit" is generated.

Module Parameters (per Channel)

*Table 47:
Module
parameters*

**A default
settings**

5

Parameter name	Value
Mains suppression	50 Hz A
	60 Hz
Value representation	Integer (15Bit + sign) A
	12 Bit (left-justified)
Diagnostic	release A
	block
Channel	activate A
	deactivate
Element	PT100, -200...850°C A
	PT100, -200...150°C
	NI100, -60...250°C
	NI100, -60...150°C
	PT200, -200...850°C
	PT200, -200...150°C
	PT500, -200...850°C
	PT500, -200...150°C
	PT1000, -200...850°C
	PT1000, -200...150°C
	NI1000, -60...250°C
	NI1000, -60...150°C
	Resistance, 0...100Ω
	Resistance, 0...2000Ω
	Resistance, 0...4000Ω
	Resistance, 0...10000Ω
Measurement mode	2-wire A
	3-wire

Analog Input Modules

Base modules/ Pin assignment

■ BL67-B-2M12

Abbildung 93:
BL67-B-2M12

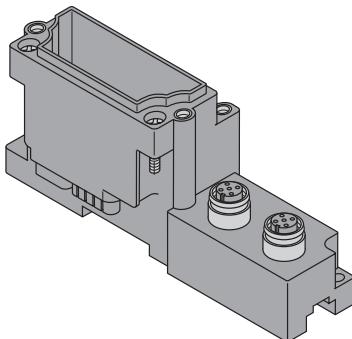


Table 48:
Pinbelegung
BL67-2AI-PT

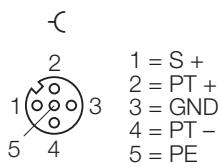
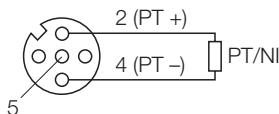
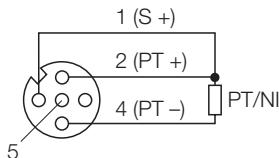


Table 49:
Anschlussbilder
BL67-2AI-PT



3-wire-connection technology:



Measurement value representation

16 bit representation

- For the parameterization
 "PT100, -200...850°C"
 "NI100, -60...250°C"
 "PT200, -200...850°C"
 "PT500, -200...850°C"
 "PT1000, -200...850°C"
 "NI1000, -60...250°C"

The value range

-200 °C to -0,1°C

is displayed as follows:

F830_{hex} to FFFF_{hex} (decimal: -2000 to -1)

The value range

0 °C to 850°C

is displayed as follows:

0000_{hex} to 2134_{hex} (decimal: 0 to 8500)

- For the parameterization
 "PT100, -200...150°C"
 "NI100, -60...150°C"
 "PT200, -200...150°C"
 "PT500, -200...150°C"
 "PT1000, -200...150°C"
 "NI1000, -60...150°C"

The value range

-200 °C to -0,01°C

is displayed as follows:

B1E0_{hex} to FFFF_{hex} (decimal: -20000 to -1)

The value range

0 °C to 150°C

is displayed as follows:

0000_{hex} to 3A98_{hex} (decimal: 0 to 15000)

- For representation of resistance values only positive numbers (hexadecimal/binary) are used. The positive values can easily be converted into decimal ones.

The value range

0 to 100 Ω; 0 to 200 Ω; 0 to 200 Ω; 0 to 1000 Ω

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

12 bit representation (left-justified)

- For the parameterization:
"PT100, -200...850°C"
"NI100, -60...250°C"
"PT200, -200...850°C"
"PT500, -200...850°C"
"PT1000, -200...850°C"
"NI1000, -60...250°C"

The value range

-200 °C to -0,5°C

is displayed as follows:

E70(0)_{hex} to FF(0)F_{hex} (decimal: -400 to -1)

The value range

0 °C to 850°C

is displayed as follows:

00(0)0_{hex} to 6A4(0)_{hex} (decimal: 0 to 1700)

- For the parameterization:
"PT100, -200...150°C"
"NI100, -60...150°C"
"PT200, -200...150°C"
"PT500, -200...150°C"
"PT1000, -200...150°C"
"NI1000, -60...150°C"

The value range

-200 °C to -0,1°C

is displayed as follows:

830(0)_{hex} to FFF(0)_{hex} (decimal: -2000 to -1)

The value range

0 °C to 150°C

is displayed as follows:

000(0)_{hex} to 5DC(0)_{hex} (decimal: 0 to 1500)

The value range

0 Ω to 100 Ω;

0 Ω to 200 Ω;

0 Ω to 400 Ω;

0 Ω to 1000 Ω;

is displayed as follows:

000(0)_{hex} to FFF(0)_{hex} (decimal: 0 to 4095)



Note

A detailed description of the measurement value representation for the analog input modules in 16 or 12 bit can be found in the "appendix" of this manual, page13-9.

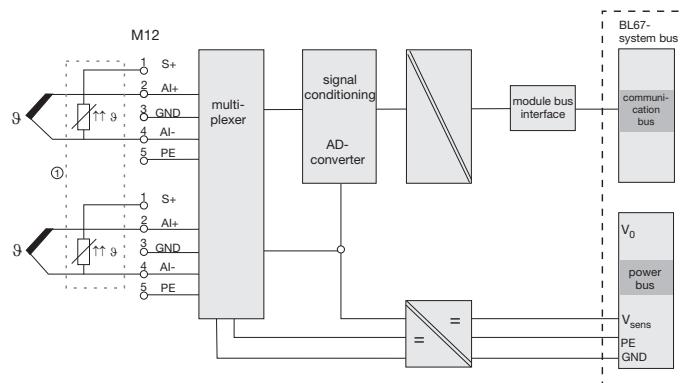
Analog Input Modules

BL67-2AI-TC, Thermocouple

Figure 94:
BL67-2AI-TC



Figure 95:
Block diagram



① cold junction compensation resistance (Pt1000) in male connector

Technical Data

Table 50:
Technical Data

Designation	BL67-2AI-TC
Number of channels	2
Nominal voltage from supply terminal	24 V DC
voltage range	18 to 30 VDC
Nominal current from 5 V DC (module bus) I_{MB}	≤ 35 mA
Nominal current from supply terminal I_L	< 30 mA
Power loss of the module, typical P_{MAX}	< 1 W
Input voltage	≥ 10 VDC (continuous)
Isolation voltage	
U_{TMB} (module bus/ field)	min. 500 V _{eff}
U_{Fe} (field/ functional earth)	min. 50 V _{AC}
channel/channel	no
channel/field supply	500 V _{eff}
channel/system supply	500 V _{eff}
Sensors	according to DIN IEC 584 Class 1, 2, 3

Temperature ranges

Type B	100 to 1820.0 °C
Type E	-270 to 1000.0 °C
Type J	-210 to 1200.0 °C
Type K	-270 to 1370.0 °C
Type N	-270 to 1300.0 °C
Type R	-50 to 1760.0 °C
Type S	-50 to 1540.0 °C
Type T	-270 to 400.0 °C

Voltage measurements (resolution)

± 50 mV	< 2 µV
± 100 mV	< 4 µV
± 500 mV	< 20 µV
± 1 V	< 50 µV

Measurement value representation	16 Bit signed integer / 12 Bit full range left-justified
----------------------------------	--

Basic error at 23 °C / 73.4 °F	Please refer to Table 51 below
--------------------------------	--------------------------------

Crosstalk suppression	≥ 80 dB
-----------------------	---------

Repeat accuracy	Please refer to Table 52 below
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Temperature coefficient T_K	≤ 300 ppm/°C from end value
-------------------------------	-----------------------------

Cycle time	Voltage measurement: – 70 ms/ channel Temperature measurement: – 130 ms/ channel
------------	---

Table 51:
Basic errors

Thermocouple	Temperature range/ °C	Basic error at 23°C / % of positive end value
Type K	-200...1370	0.2
Type J	-210...1200	0.2
Type B	300...1820	0.2
Type N	-150...1300	0.2
Type E	-180...1000	0.2
Type R	-50...1760	0.2
Type S	-50...1540	0.2
Type T	-200...0 0...400	0.6 0.2
Voltage measurement	all measurement ranges	0.2

Table 52:
Repeat
accuracies

Thermocouple	Repeat accuracy/ % of positive end value	Error due to cold junction compensa- tion/ % of positive end value
Type K	0.05	0.15
Type J	0.05	0.17
Type B	0.05	0.11
Type N	0.05	0.16
Type E	0.05	0.20
Type R	0.05	0.12
Type S	0.05	0.13
Type T	0.1 0.075	– 0.50
Voltage measurement	0.05	–



Note

Wider deviations of the cold junction compensation are to be expected by negative measurement temperatures!

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

Table 53:
Diagnosis via LED

LED	Display	Meaning	Remedy
D	Red, flashing, 0.5 Hz	Diagnostics pending	-
Red		Module bus communication failure	Check if more than two ad-joining elec- tronic modules have been pulled. This concerns modules located between this module and the gateway.
Off		No error messages or diagnostics	-

Diagnosis via Software

This module has the following diagnostic data available per channel:

Table 54:
Diagnosis

Diagnosis	
<i>Measurement value range error</i>	Threshold: 1 % of positive measurement range end value – Overflow – Underflow
<i>Open circuit</i> Threshold: negative transformer end value	Only with temperature measurements.
<i>No PT1000 sensor</i> (cold junction compensation)	A cold junction temperature of 23°C is automatically presumed.

Analog Input Modules

Module Parameters (per Channel)

<i>Table 55: Module parameters</i>	Parameter name	Value
A default settings	Mains suppression	50 Hz A
		60 Hz
	Value representation	Integer (15Bit + sign) A
		12Bit (left-justified)
	Diagnostic	release A
		block
	Channel	activate A
		deactivate
Element		type K, -270...1370°C A
		type B, +100...1820°C
		type E, -270...1000°C
		type J, -210...1200°C
		type N, -270...1300°C
		type R, -50...1760°C
		type S, -50...1540°C
		type T, -270...400°C
		+/-50mV
		+/-100mV
		+/-500mV
		+/-1000mV

Base modules/ Pin assignment

■ BL67-B-2M12

Figure 96:
BL67-B-2M12

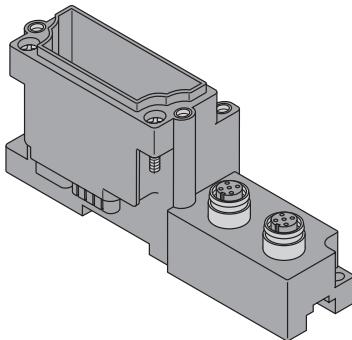
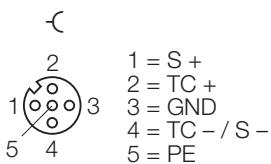
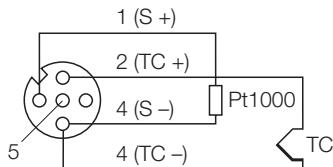
**5**

Table 56:
Pin assignment
BL67-2AI-TC



S = PT1000-sensor for cold junction compensation
TC = thermo element

Table 57:
Wiring diagram
BL67-2AI-TC



Measurement value representation

16 bit representation:

- For the parameterization
 - "Typ K, -270...1370°C"
 - "Typ B, +100...1820°C"
 - "Typ E, -270...1000°C"
 - "Typ J, -210...1200°C"
 - "Typ N, -270...1300°C"
 - "Typ R, -50...1760°C"
 - "Typ S, -50...1540°C"
 - "Typ T, -270...400°C"

The value range

-270 °C to -0,1°C

is displayed as follows:

F574_{hex} to FFFF_{hex} (decimal: -2700 to -1)

The value range

0 °C to 1820°C

is displayed as follows:

0000_{hex} to 4718_{hex} (decimal: 0 to 18200)

The value range

-50 mV to -0,002 mV;

-100 mV to -0,003 mV;

-500 mV to -0,015 mV;

-1000 mV to -0,031 mV

is displayed as follows:

8000_{hex} to FFFF_{hex} (decimal: -32768 to -1)

The value range

0 mV to 50 mV;

0 mV to 100 mV;

0 mV to 500 mV;

0 mV to 1000 mV;

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

12 bit representation (left-justified)

- For the parameterization
 "Typ K, -270...1370'C"
 "Typ B, +100...1820'C"
 "Typ E, -270...1000'C"
 "Typ J, -210...1200'C"
 "Typ N, -270...1300'C"
 "Typ R, -50...1760'C"
 "Typ S, -50...1540'C"
 "Typ T, -270...400'C"

The value range

-270 °C to 1820°C

is displayed as follows:

EF2(0)_{hex} to 71C(0)_{hex} (decimal: -270 to 1820)

The value range

-50 mV to -0,024mV;
-100 mV to -0,049mV;
-500 mV to -0,244mV;
-1000 mV to -0,489mV;

is displayed as follows:

800(0)_{hex} to FFF(0)_{hex} (decimal: -2048 to -1)

The value range

0 mV to 50 mV;
0 mV to 100 mV;
0 mV to 500 mV;
0 mV to 1000 mV;

is displayed as follows:

0008(0)_{hex} to 7FF(0)_{hex} (decimal: 0 to 2047)



Note

A detailed description of the measurement value representation for the analog input modules in 16 or 12 bit can be found in the "appendix" of this manual, page13-9.

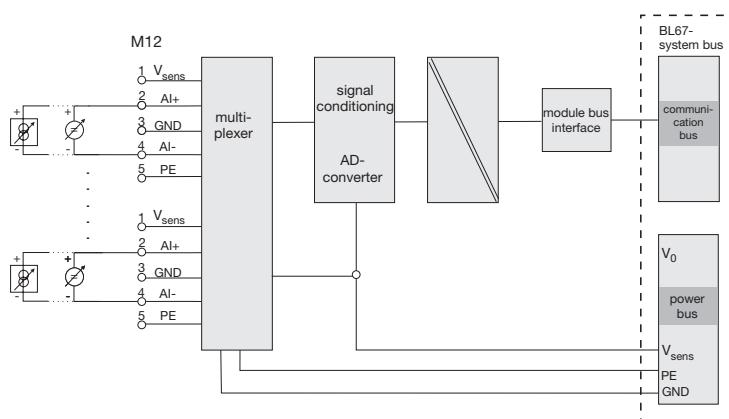
Analog Input Modules

BL67-4AI-V/I, voltage/ current

Figure 97:
BL67-4AI-V/I



Figure 98:
Block diagram



Technical Data

Table 58:
Technical Data

Designation	BL67-4AI-V/I
Number of channels	4
Nominal voltage from supply terminal	24 V DC
voltage range	18 to 30 VDC
Nominal current from 5 V DC (module bus) I_{MB}	≤ 35 mA
Nominal current from supply terminal I_L	< 12 mA
Power loss of the module, typical P_{MAX}	< 1 W
Input signal (current mode)	
Input resistance (burden)	< 125 Ω
Input current (range which can be evaluated by the A/D-converter)	0 to 20 mA 4 to 20 mA
Input current (maximum - an „measurement value range error“ is shown if the current is $\leq 20,2$ mA)	50 mA
Cutoff frequency (-3 dB)	20 Hz
Input signal (voltage mode)	
Input resistance (burden)	> 98,5 k Ω
Input voltage (range which can be evaluated by the A/D-converter)	-10 to 10 V DC 0 to 10 V DC

Analog Input Modules

Input voltage (maximum - an „measurement value range error“ is shown if the deviation from the evaluable measurement range is 1%)	35 V DC
Cutoff frequency (-3 dB)	20 Hz
Isolation voltage	
U_{TMB} (module bus/ field)	min. 500 V _{eff}
U_{Fe} (field/ functional earth)	min. 50 V _{AC}
channel/channel	no
channel/field supply	no
channel/system supply	500 V _{eff}
Accuracy of input signal	
Basic error at 23 °C	< 0,3 %
Temperature coefficient	≤ 300 ppm/°C from end value
Representation of the converted input signal	
Resolution of A/D converter	16 Bit
Measuring principle	Delta Sigma
Measurement value representation	<ul style="list-style-type: none">- 16 Bit: two's complement or- 12 Bit left justified:<ul style="list-style-type: none">two's complement (even negative values possible)Dual number without coding (only positive values possible)

Diagnostic/ Status Messages

Table 59:
LED indicators

LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics pending	-
	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	-
0 to 4	Green	Channel x active	-
	Green, flashing 0.5 Hz	Underflow in measuring range	
	Green, flashing 4 Hz	Overflow in measuring range	
	Off	Channel x inactive	

This module has the following diagnostic data:

■ “Measurement value range error“

Indicates an over- or undervoltage of 1 % of the set voltage range; whereby, undervoltages can only be recognized with those modules that have a set voltage range of 4 to 20 V.

Overvoltage: I_{max} ($I > 20.2 \text{ mA}$);

Undervoltage: I_{min} ($I < 3.8 \text{ mA}$)

Indicates an over- or undervoltage of 1% of the set current range.

Overcurrent: U_{max} ($U > 10.1 \text{ V}$);

Undervoltage: U_{min} ($U < -10.1 \text{ V}$) at -10 to +10 V

U_{min} ($U < -0.1 \text{ V}$) at 0 to 10 V

■ “Open circuit“

Indicates an open circuit in the signal line for the operating mode: 4 to 20 mA ($I < 3 \text{ mA}$)



Note

If the measurement value representation is „12 Bit left justified“, the diagnostic data are transferred in the process data (bit 0 to 3) of respective channel.

Module parameters (per channel)

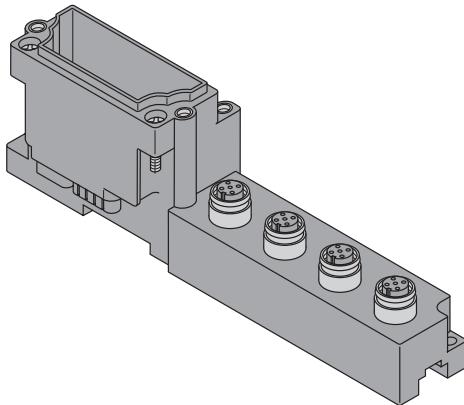
Table 60:
Module
parameters
A Standard
parameter value

Parameter name	Value
Operation mode	voltage A
	current
Value representation	Integer (15bit + sign) A
	12bit (left-justified)
Channel	activate A
	deactivate
Range	0..10V/0..20mA A
	-10..+10V/4..20mA
Diagnostic	release A
	block

Base Modules/ Pin assignment

■ BL67-B-4M12

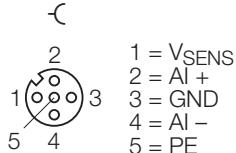
Figure 99:
BL67-B-4M12



5

Table 61:

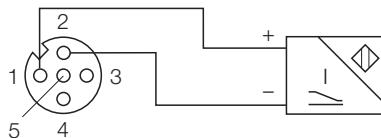
Pin assignment
BL67-4AI-V/I with
BL67-B-4M12



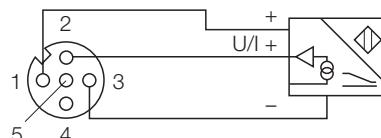
Analog Input Modules

Figure 100:
Wiring diagrams
BL67-2AI-V

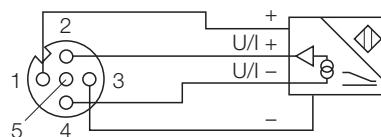
2-wire sensor with power supply via base module:



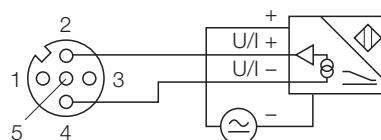
3-wire sensor with power supply via base module:



4-wire sensor with power supply via base module:



4-wire sensor with external power supply:



Measurement value representation**16 bit value representation**

- Current values from 0 to 20 mA

The value range

0 mA to 20 mA

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

5

- Current values from 4 to 20 mA

The value range

4 mA to 20 mA

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

- Voltage values from 0 to 10 V DC

The value range

0 V DC to 10 V DC

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

- Voltage values from -10 to 10 V DC

The value range

-10 V to -3,052 10⁻⁴ V

is displayed as follows:

8000_{hex} to FFFF_{hex} (decimal:-32768 to -1)

The value range

0 V to 10 V

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

12 bit value representation (left-justified)

- Current values from 0 to 20 mA

The value range

0 mA to 20 mA

is displayed as follows:

000(0)_{hex} to FFF(0)_{hex} (decimal: 0 to 4095)

- Current values from 4 to 20 mA

The value range

4 mA to 20 mA

is displayed as follows:

000(0)_{hex} to FFF(0)_{hex} (decimal: 0 to 4095)

- Voltage values from 0 to 10 V DC

The value range

0 V to 10 V

is displayed as follows:

000(0)_{hex} to FFF(0)_{hex} (decimal: 0 to 4095)

- Voltage values from -10 to 10 V DC

The value range

0 V to 10 V

is displayed as follows:

000(0)_{hex} to 7FF(0)_{hex} (decimal: 0 to 2047)



Note

A detailed description of the measurement value representation for the analog input modules in 16 or 12 bit can be found in the “appendix“ of this manual, page13-3.

6 Digital Output Modules

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Overview

Digital output modules (DO) receive output values from the gateway via the internal module bus. The modules convert these values and transwith the corresponding high or low level signals for each channel to the field level via the base modules.

The outputs are rated according to EN 61131-2 Type 2.

The output supply (V_O) is tapped from the internal voltage supply bus.

This voltage is supplied by the gateway or a Power Feeding module. Both contain a short circuit detection for the output supply voltage.

An output short circuit is thus also detected in the gateway or in the Power Feeding module.

The module bus electronic of the digital output modules are galvanically isolated from the field level via an optocoupler.

6



Warnung

After a short circuit or an overload, the output modules switch on automatically, as soon as the error has been eliminated.

LED status indicators

Channel statuses are indicated by LEDs. Error signals from the I/O level are indicated by each module via the "D" LED. The corresponding diagnostic information is transwirthted to the gateway via diagnostic bits.



Attention

An external suppressor should be planned for inductive loads.

Digital Output Modules

Module Overview

Table 62:
Module overview

Module	No. of channels	Output current, nominal
BL67-4DO-0.5A-P	4	0,5 A
BL67-4DO-2A-P	4	2 A
BL67-8DO-0.5A-P	8	0,5 A
BL67-16DO-0.1A-P	16	0,1 A
BL67-4DO-2A-N	4	2 A
BL67-8DO-0.5A-N	8	0,5 A

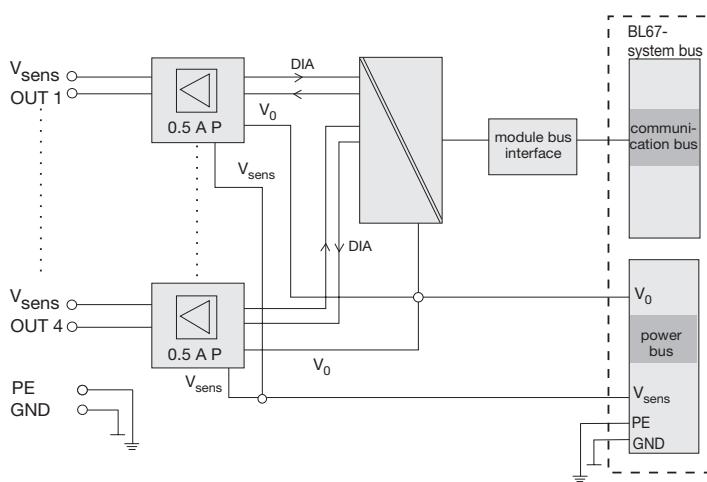
Module	Galvanically isolated	Positive switching (sinking)
BL67-4DO-0.5A-P	✓	✓
BL67-4DO-2A-P	✓	✓
BL67-8DO-0.5A-P	✓	✓
BL67-16DO-0.1A-P	✓	✓
BL67-4DO-2A-N	✓	-
BL67-8DO-0.5A-N	✓	-

BL67-4DO-0.5A-P

Figure 101:
BL67-4DO-0.5A



Figure 102:
Block diagram



Technical DataTable 63:
Technical Data

Designation	BL67-4DO-0.5A-P
Number of channels	4
Nominal voltage from supply terminal	24 V DC
Load voltage V_o	24 VDC
Voltage range	18 to 30 VDC
Nominal current from 5 V DC (module bus) I_{MB}	≤ 30 mA
Nominal current from supply terminal (field) I_L	< 100 mA (when load current = 0)
Power loss of the module, typical	< 1.5 W
Output voltage, High level (loaded)	min. L+ (-1 V)
Output current I_A	
High level I_A (nominal)	0.5 A
High level I_{AMAX}	0.6 A (according to IEC 6 1131-2)
Synchronization factor	100 %
Switching-off characteristic K_A	
$I_{OUT} > 1.5$ A	< 4 ms
1.0 A < I_{OUT} < 1.5 A	< 10 s
0.6 A < I_{OUT} > 1.0 A	min. 10 s/ max. 60 s
Delay at signal change and resistive load	
From low to high level	3 ms
From high to low level	3 ms
Load impedance range	48 Ω to 1 k Ω

Switch-on resistance R_{on} max. 190 mΩ

Resistive, inductive and lamp loads can be connected.

Load impedance,
resistive R_{LO} 48 Ω

Lamp load R_{LL} 3 W

Switching frequency

Resistive load 200 Hz

Inductive load 2 Hz

Lamp load 20 Hz

Isolation voltage

U_{TMB} (module bus/ field) max. 2500 V DC

U_{FE} (field/ functional earth) max. 1000 V DC

Short-circuit proof Yes, according to
EN 61 131-2



Note

The parallel switching of outputs is possible with the synchronous switching of the channels. In this case, the maximum output current can be increased up to 2 A, depending on the number of the parallel switched outputs.

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

Table 64:
Diagnosis/ Status
via LEDs

	LED	Display	Meaning	Remedy
D	Red, flashing, 0.5 Hz		Diagnostics pending	-
	Red		Module bus communication failure	Check if more than two ad-joining elec- tronic modules have been pulled. This concerns modules located between this module and the gateway.
	Off		No error messages or diagnostics	-
0 to 3	Green		Status of channel x = „1“	-
	Red		Short circuit/ Overload Channel x	Eliminate the cause for the short circuit or the overload → After cooling the module switches on automati- cally.
	Off		Status of channel x = „0“	-

Diagnosis via Software

Table 65:

Diagnosis

Diagnosis

Overload or short-circuit	The channel is switched off automatically. For the switching-off characteristics of the outputs see Table 63: „Technical Data“.
---------------------------	--

Module Parameters

None

Digital Output Modules

Base modules/ Pin assignment

■ BL67-B-4M8

Figure 103:
BL67-B-4M8

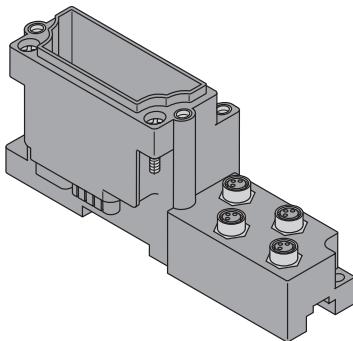


Figure 104:
Pin assignment
BL67-4DO-0.5A-P
with BL67-B-4M8

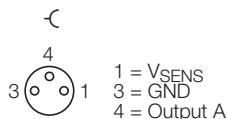
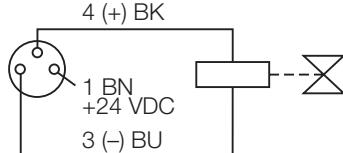
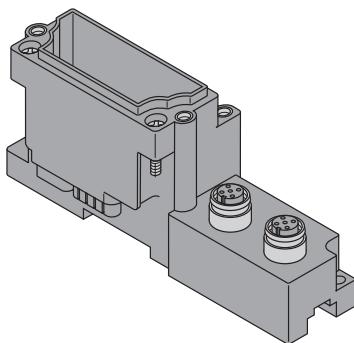


Figure 105:
Wiring diagram
BL67-4DO-0.5A-P
with BL67-B-4M8



■ BL67-B-2M12/ BL6 7-B-2M12-P (paired)

Figure 106:
BL67-B-2M12/
BL67-B-2M12-P



6

Figure 107:
Pin assignment
BL67-4DO-0.5A-P
with BL67-B-2M12/
BL67-B-2M12-P

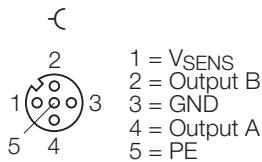
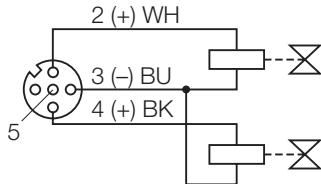


Figure 108:
Wiring diagram
BL67-4DO-0.5A-P
with BL67-B-2M12/
BL67-B-2M12-P



Digital Output Modules

■ BL67-B-4M12

Figure 109:

BL67-B-4M12

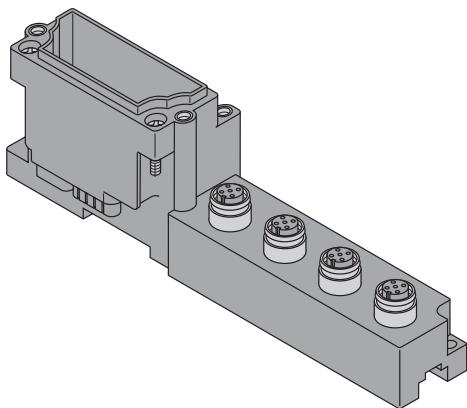


Figure 110:

Pin assignment

BL67-4DO-0.5A-P
with BL67-B-4M12

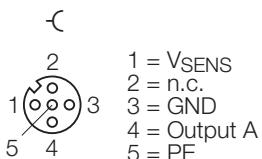
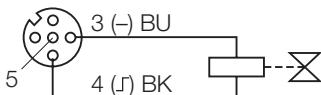


Figure 111:

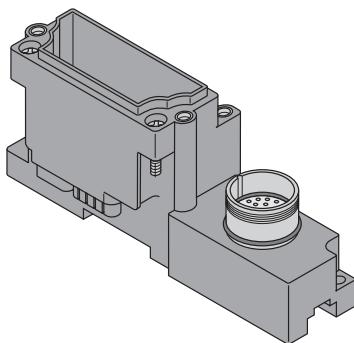
Wiring diagram

BL67-4DO-0.5A-P
with BL67-B-4M12



■ BL67-B-1M23

Figure 112:
BL67-B-1M23



6

Figure 113:
Pin assignment
BL67-4DO-0.5A-P
with BL67-B-1M23



1 = Signal 0	7 = n.c.
2 = Signal 1	8 = n.c.
3 = Signal 2	9 = V _{SENS}
4 = Signal 3	10 = V _{SENS}
5 = n.c.	11 = V _{SENS}
6 = n.c.	12 = GND

Signal assignment

Table 66:
Signal assignment
BL67-4DO

x.y →
x = Connector
y = Pin-No.

OUT	0	1	2	3
BL67-B-2M12	0.4	1.4	0.2	1.2
BL67-B-2M12-P	0.4	0.2	1.4	1.2
BL67-B-4M12	0.4	1.4	2.4	3.4
BL67-B-4M8	0.4	1.4	2.4	3.4

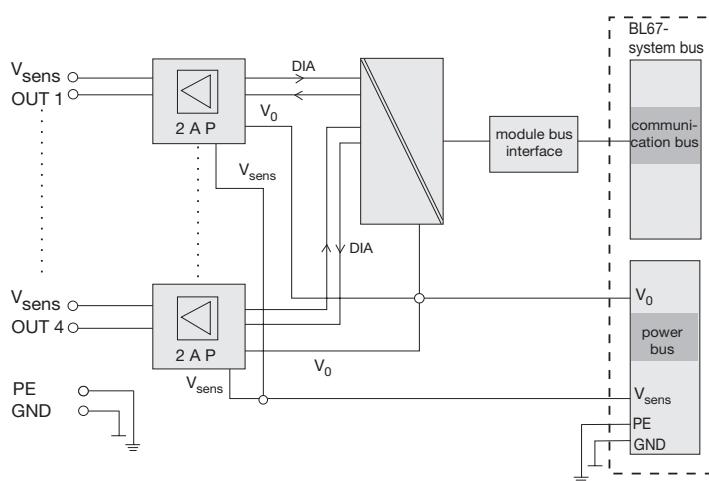
Digital Output Modules

BL67- 4DO-2A-P

Figure 114:
BL67-4DO-2A-P



Figure 115:
Block diagram



Technical Data

Table 67:
Technical Data

Designation	BL67-4DO-2A-P
Number of channels	4
Nominal voltage from supply terminal	24 V DC
Load voltage V_o	24 V DC
Voltage range	18 to 30 V DC
Nominal current from 5 V DC (module bus) I_{MB}	$\leq 30 \text{ mA}$
Nominal current from supply terminal (field) I_L	< 100 mA (when load current = 0)
Power loss of the module, typical	< 1.5 W
Output voltage, High level (loaded)	min. L+ (-1 V)
Output current I_A	
High level I_A (nominal)	2 A
High level I_{AMAX}	max. 2.4 A (according to IEC 61131-2)
Synchronization factor	100 %
Switching-off characteristic K_A	
$I_{OUT} > 6 \text{ A}$	< 4 ms
$4 \text{ A} < I_{OUT} < 6 \text{ A}$	< 10 s
$2.4 \text{ A} < I_{OUT} < 4 \text{ A}$	min. 10s/ max. 60 s
Delay at signal change and resistive load	
From low to high level	3 ms
From high to low level	3 ms

Load impedance range	12 Ω to 1 kΩ
Switch-on resistance R_{ON}	max. 50 mΩ
Resistive, inductive and lamp loads can be connected.	
Load impedance, resistive R_{LO}	12 Ω
Lamp load R_{LL}	10 W
Switching frequency	
Resistive load	200 Hz
Inductive load	2 Hz
Lamp load	20 Hz
Isolation voltage	
U_{TMB} (module bus/ field)	max. 2500 V DC
U_{FE} (field/ functional earth)	max. 1000 V DC
Short-circuit proof	Yes, according to EN 61 131-2



Note

The parallel switching of outputs is possible with the synchronous switching of the channels. In this case, the maximum output current can be increased up to 8 A, depending on the number of the parallel switched outputs.

Diagnostic/ Status Messages**Diagnosis/ Status via LEDs**

*Table 68:
Diagnosis/ Status
via LEDs*

	LED	Display	Meaning	Remedy
	D	Red, flashing, 0.5 Hz	Diagnostics pending	-
	Red		Module bus communication failure	Check if more than two ad-joining electronic modules have been pulled. This concerns modules located between this module and the gateway.
	Off		No error messages or diagnostics	-
0 to 3	Green		Status of channel x = „1“	-
	Red		Short circuit/ Overload Channel x	Eliminate the cause for the short circuit or the overload → After cooling the module switches on automatic- ally.
	Off		Status of channel x = „0“	-

Diagnosis via Software

Table 69:

Diagnosis

Diagnosis

Overload or short-circuit	The channel is switched off automatically. For the switching-off characteristics of the outputs see Table 63: „Technical Data“.
---------------------------	--

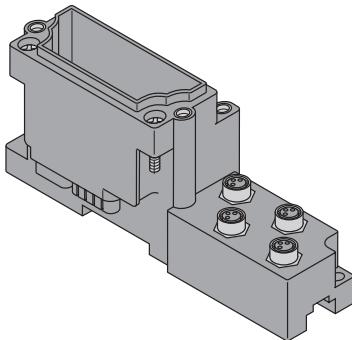
Module Parameters

None

Base modules/ Pin assignment

- BL67-B-4M8

Figure 116:
BL67-B-4M8



6

Figure 117:
Pin assignment
BL67-4DO-2A-P
with BL67-B-4M8

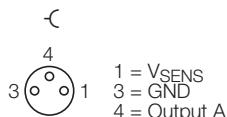
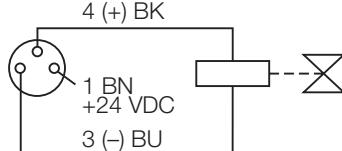


Figure 118:
Wiring diagram
BL67-4DO-2A-P
with BL67-B-4M8



Digital Output Modules

- BL67-B-2M12/ BL6 7-B-2M12-P (paired)

Figure 119:
BL67-B-2M12/
BL67-B-2M12-P

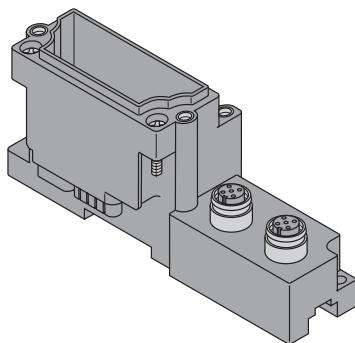


Figure 120:
Pin assignment
BL67-4DO-2A-P
with BL67-B-2M12/
BL67-B-2M12-P

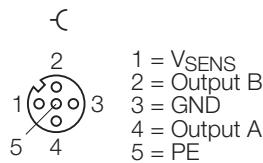
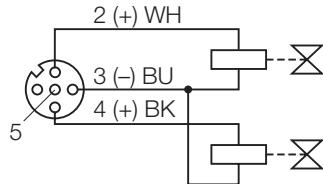
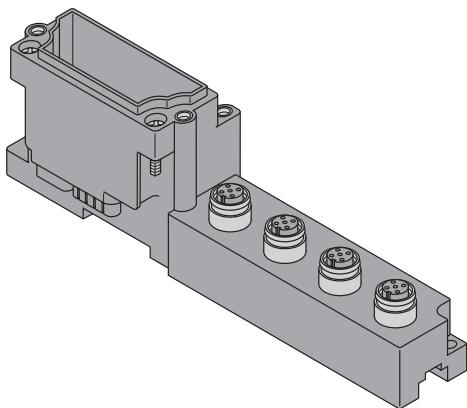


Figure 121:
Wiring diagram
BL67-4DO-2A-P
with BL67-B-2M12/
BL67-B-2M12-P



■ BL67-B-4M12

Figure 122:
BL67-B-4M12



6

Figure 123:
Pin assignment
BL67-4DO-2A-P
with BL67-B-4M12

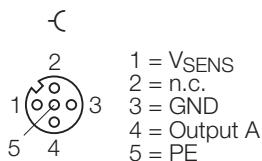
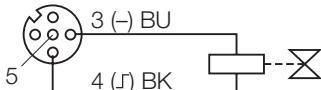


Figure 124:
Wiring diagram
BL67-4DO-2A-P
with BL67-B-4M12



Digital Output Modules

■ BL67-B-1M23

Figure 125:
BL67-B-1M23

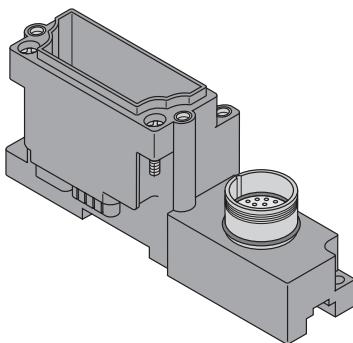


Figure 126:
Pin assignment
BL67-4DO-2A-P
with BL67-B-1M23



1	= Signal 0	7	= n.c.
2	= Signal 1	8	= n.c.
3	= Signal 2	9	= V _{SENS}
4	= Signal 3	10	= V _{SENS}
5	= n.c.	11	= V _{SENS}
6	= n.c.	12	= GND

Signal assignment

Table 70:
Signal assignment
BL67-4DO

x.y →
x = Connector
y = Pin-No.

OUT	0	1	2	3
BL67-B-4M8	0.4	1.4	2.4	3.4
BL67-B-2M12	0.4	1.4	0.2	1.2
BL67-B-2M12-P	0.4	0.2	1.4	1.2
BL67-B-4M12	0.4	1.4	2.4	3.4

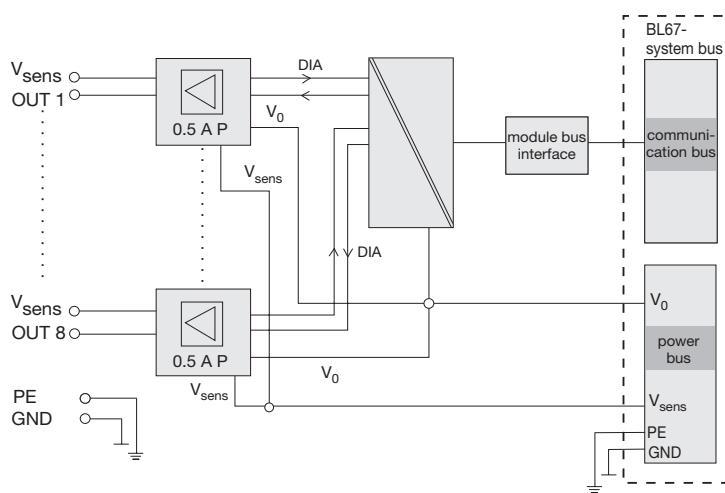
BL67-8DO-0.5A-P

Figure 127:
BL67-8DO-0.5A



6

Figure 128:
Block diagram



Technical DataTable 71:
Technical data

Designation	BL67-8DO-0.5A-P
Number of channels	8
Nominal voltage from supply terminal	24 V DC
Load voltage V_o	24 V DC
Voltage range	18 to 30 V DC
Nominal current from 5 V DC (module bus) I_{MB}	$\square \leq 30 \text{ mA}$
Nominal current from supply terminal I_L	< 100 mA (when load current = 0)
Power loss of the module, typical	< 1.5 W
Output voltage, High level (loaded)	min. L+ (-1 V)
Output current I_A	
High level I_A (nominal)	0.5 A
High level I_{AMAX}	0.6 A (according to IEC 61131-2)
Synchronization factor	100 %
Switching-off characteristic K_A	
$I_{OUT} > 1.5 \text{ A}$	< 4 ms
$1.0 \text{ A} < I_{OUT} < 1.5 \text{ A}$	10 s
$0.6 \text{ A} < I_{OUT} > 1.0 \text{ A}$	min. 10 s / max. 60 s
Delay at signal change and resistive load	
From low to high level	3 ms
From high to low level	3 ms
Load impedance range	48 Ω to 1 k Ω

Switch-on resistance R_{ON}	max. 190 mΩ
-------------------------------	-------------

Resistive, inductive and lamp loads can be connected.

Load impedance, resistive R_{LO}	48 Ω
---------------------------------------	------

Lamp load R_{LL}	3 W
--------------------	-----

Switching frequency

Resistive load	200 Hz
----------------	--------

Inductive load	2 Hz
----------------	------

Lamp load	20 Hz
-----------	-------

Isolation voltage

U_{TMB} (module bus/ field)	max. 2500 V DC
-------------------------------	----------------

U_{FE} (field/ functional earth)	max. 1000 V DC
------------------------------------	----------------

Short-circuit proof	Yes, according to EN 61 131-2
---------------------	----------------------------------



Note

The parallel switching of outputs is possible with the synchronous switching of the channels. In this case, the maximum output current can be increased up to 4 A, depending on the number of the parallel switched outputs.

Digital Output Modules

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

<i>Table 72: Diagnosis/ Status via LEDs</i>	LED	Display	Meaning	Remedy
D	Red, flashing, 0.5 Hz		Diagnostics pending	-
	Red		Module bus communication failure	Check if more than two ad-joining elec- tronic modules have been pulled. This concerns modules located between this module and the gateway.
	Off		No error messages or diagnostics	-
0 to 7	Green		Status of channel x = „1“	-
	Red		Short circuit/ Overload Channel x	Eliminate the cause for the short circuit or the overload → After cooling the module switches on automati- cally.
	Off		Status of channel x = „0“	-

Diagnosis via Software

<i>Table 73: Diagnosis</i>	Diagnosis
	Overload or short-circuit The channel is switched off automati- cally. For the for switching-off characteris- tics of the outputs see Table 63:„Technical Data”.

Module Parameters

None

Digital Output Modules

Base modules/ Pin assignment

■ BL67-B-8M8

Figure 129:
BL67-B-8M8

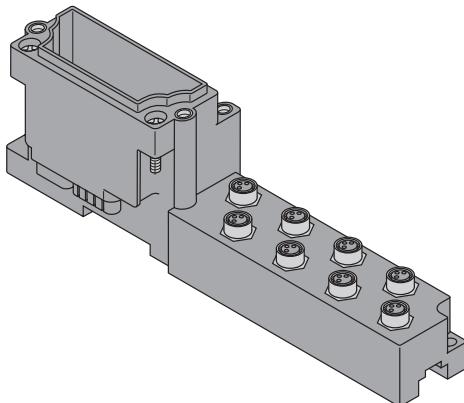


Figure 130:
Pin assignment
BL67-8DO-0.5A-P
with BL67-B-8M8

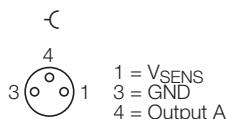
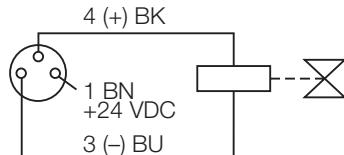
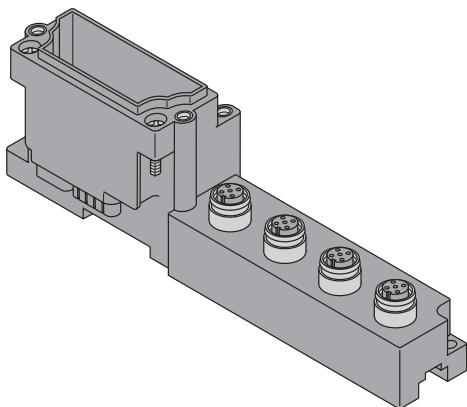


Figure 131:
Wiring diagram
BL67-8DO-0.5A-P
with BL67-B-8M8



■ BL67-B-4M12/ BL67-B-4M12-P

Figure 132:
BL67-B-4M12/
BL67-B-4M12-P



6

Figure 133:
Pin assignment
BL67-8DO-0.5A-P
with BL67-B-4M12

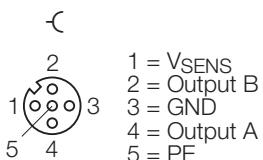
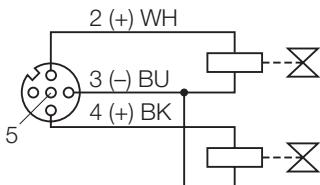


Figure 134:
Wiring diagram
BL67-8DO-0.5A-P
with BL67-B-4M12



Digital Output Modules

■ BL67-B-1M23

Figure 135:
BL67-B-1M23

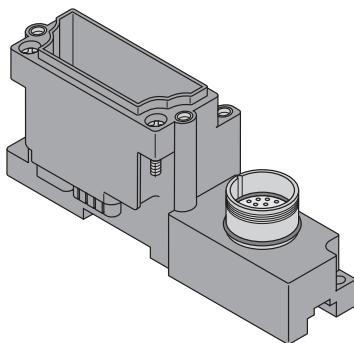


Figure 136:
Pin assignment
BL67-8DO-0.5A-P
with BL67-B-1M23



1 = Signal 0	7 = Signal 6
2 = Signal 1	8 = Signal 7
3 = Signal 2	9 = V _{SENS}
4 = Signal 3	10 = V _{SENS}
5 = Signal 4	11 = V _{SENS}
6 = Signal 5	12 = GND

Signal assignment

Table 74:
Signal assignment
BL67-8DO

x.y →
x = Connector
y = Pin-No.

OUT	0	1	2	3	4	5	6	7
BL67-B-8M8	0.4	1.4	2.4	3.4	4.4	5.4	6.4	7.4
BL67-B-4M12	0.4	1.4	2.4	3.4	0.2	1.2	2.2	3.2
BL67-B-4M12-P	0.4	0.2	1.4	1.2	2.4	2.2	3.4	3.2

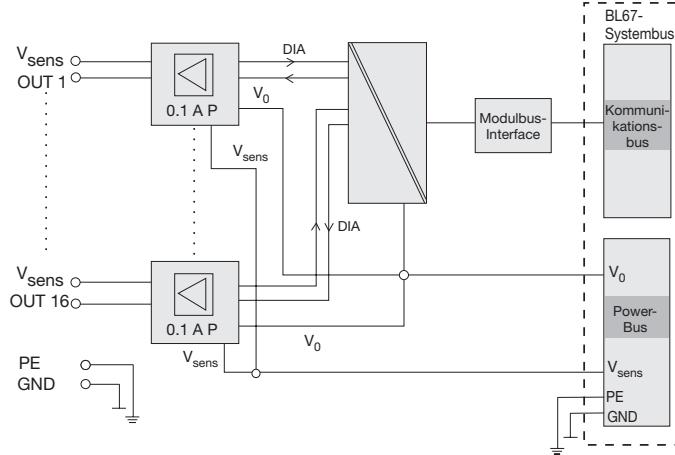
BL67-16DO-0.1A-P

Figure 137:
BL67-16DO-0.1A-P



6

Figure 138:
block diagram



Technical DataTable 75:
Technical data

Designation	BL67-16DO-0.1A-P
Number of channels	168
Nominal voltage from supply terminal	24 V DC
Load voltage V_o	24 V DC
Voltage range	18 to 30 V DC
Nominal current from 5 V DC (module bus) I_{MB}	$\leq 30 \text{ mA}$
Nominal current from supply terminal I_L	< 100 mA (when load current = 0)
Power loss of the module, typical	< 1.5 W
Output voltage, High level (loaded)	min. L+ (-1 V)
Output current I_A	
High level I_A (nominal)	0.1 A
High level I_{AMAX}	0.12 A (according to IEC 61131-2)
Synchronization factor	100 %
Delay at signal change and resistive load	
From low to high level	3 ms
From high to low level	3 ms
Load impedance range	250 Ω to 10 k Ω
Switch-on resistance R_{ON}	max. 2 Ω
Resistive and inductive loads can be connected.	
Load impedance, resistive R_{LO}	250 Ω

Switching frequency

Resistive load 200 Hz

Inductive load 2 Hz

Isolation voltage

 U_{TMB} (module bus/ field) max. 2500 V DC U_{FE} (field/ functional earth) max. 1000 V DCShort-circuit proof Yes, according to
EN 61 131-2

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

Table 76:
Diagnosis/ Status
via LEDs

	LED	Display	Meaning	Remedy
	D	Red, flashing, 0.5 Hz	Diagnostics pending	-
		Red	Module bus communication failure	Check if more than two ad-joining elec- tronic modules have been pulled. This concerns modules located between this module and the gateway.
		Off	No error messages or diagnostics	-
0 to 7	Green		Status of channels x/y = „1“ (see below: „Attention“)	-
	Red		Diagnosis at channels x/y	Eliminate the cause for the short circuit or the overload (see Page 6-35 „Diag- nosis via Software“) → After cooling the module switches on automatically.



Attention

In this module, each channel LED shows the status of two outputs:

- LED 0 = status of channels 0/1
- ...
- LED 7 = status of channels 14/15.

The red LED, indicating a channel diagnosis, is dominant.

Diagnosis via Software

Table 77:
Diagnosis

Diagnosis	
Channel diagnosis	<p>Short-circuit or/and open circuit (depending on the parameterization, see Table 78):</p> <ul style="list-style-type: none"> – byte 0, bit 0 to 7 = channel 0 to 7 – byte 1, bit 0 to 7 = channel 8 to 15

6

Module Parameters

Table 78:
Module parameters

	Parameter name	Value	Description
A default-settings	Short-circuit current (can be set groupwise for channels 0 to 7 or 8 to 15)	0 to 12 A	current above which a short-circuit diagnosis is generated: „Value“ × 10 mA.
	Open circuit current (can be set groupwise for channels 0 to 7 or 8 to 15)	0 A to 12	current below which an open circuit diagnosis is generated: „Value“ × 10 mA
	short-circuit detection	deactivate	
		activate A	
	open circuit detection	deactivate A	
		activate	

Digital Output Modules

Base modules/ Pin assignment

■ BL67-B-1M23-19

Figure 139:
BL67-B-1M23-19

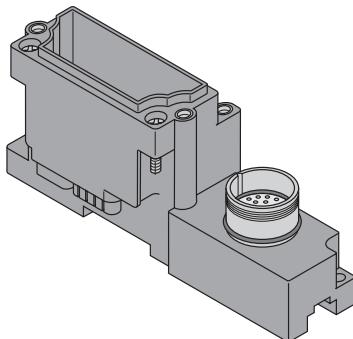
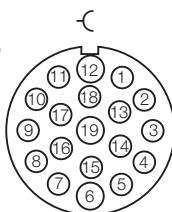


Figure 140:
Pin assignment
BL67-16DO-0.1A-P
with
BL67-B-1M23-19



1 = Output 14	11 = Output 12
2 = Output 10	12 = PE
3 = Output 6	13 = Output 11
4 = Output 3	14 = Output 7
5 = Output 2	15 = Output 0
6 = GND	16 = Output 4
7 = Output 1	17 = Output 8
8 = Output 5	18 = Output 15
9 = Output 9	19 = VSENS
10 = Output 13	

Signal assignment

Table 79:
Signal assignment
BL67-16DO-0.1A-P

x.y →
x = Connector
y = Pin-No.

OUT	0	1	2	3	4	5	6	7
	0.15	0.7	0.5	0.4	0.16	0.8	0.3	0.14
	8	9	10	11	12	13	14	15
	0.17	0.9	0.2	0.13	0.11	0.10	0.1	0.18

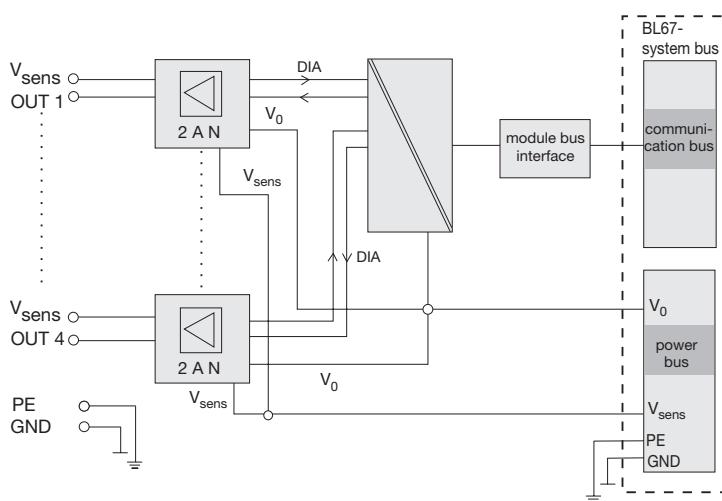
BL67-4DO-2A-N

Figure 141:
BL67-4DO-2A-N



6

Figure 142:
Block diagram



Technical DataTable 80:
Technical Data

Designation	BL67-4DO-2A-N
Number of channels	4
Nominal voltage from supply terminal	24 V DC
Load voltage V_o	24 V DC
Voltage range	18 to 30 V DC
Nominal current from 5 V DC (module bus) I_{MB}	≤ 30 mA
Nominal current from supply terminal (field) I_L	< 100 mA (when load current = 0)
Power loss of the module, typical	< 1.5 W
Output voltage, High level (loaded)	min. L+ (-1 V)
Output current I_A	
High level I_A (nominal)	2 A
High level I_{AMAX}	max. 3.6 A (according to IEC 61131-2)
Synchronization factor	100 %
Switching-off characteristic K_A	
$I_{OUT} > 6$ A	< 4 ms
4 A < I_{OUT} < 6 A	< 10 s
2.4 A < I_{OUT} < 4 A	min. 10 s/ max. 60 s
Delay at signal change and resistive load	
From low to high level	3 ms
From high to low level	3 ms

Load impedance range	12 Ω to 1 kΩ
Switch-on resistance R_{ON}	max. 400 mΩ
Resistive, inductive and lamp loads can be connected.	
Load impedance, resistive R_{LO}	12 Ω
Lamp load R_{LL}	6 W
Switching frequency	
Resistive load	200 Hz
Inductive load	2 Hz
Lamp load	20 Hz
Isolation voltage	
U_{TMB} (module bus/ field)	max. 2500 V DC
U_{FE} (field/ functional earth)	max. 1000 V DC
Short-circuit proof	Yes, according to EN 61 131-2

**Note**

The parallel switching of outputs is possible with the synchronous switching of the channels. In this case, the maximum output current can be increased up to 8 A, depending on the number of the parallel switched outputs.

Diagnostic/ Status Messages**Diagnosis/ Status via LEDs**

Table 81:
Diagnosis/ Status
via LEDs

	LED	Display	Meaning	Remedy
	D	Red, flashing, 0.5 Hz	Diagnostics pending	-
	Red		Module bus communication failure	Check if more than two ad-joining electronic modules have been pulled. This concerns modules located between this module and the gateway.
	Off		No error messages or diagnostics	-
0 to 3	Green		Status of channel x = „1“	-
	Red		Short circuit/ Overload Channel x	Eliminate the cause for the short circuit or the overload → After cooling the module switches on automatically.
	Off		Status of channel x = „0“	-

Diagnosis via Software

Table 82:

Diagnosis

Diagnosis

Overload or short-circuit	The channel is switched off automatically. For the switching-off characteristics of the outputs see Table 63: „Technical Data“.
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Module Parameters

None

Digital Output Modules

Base modules/ Pin assignment

■ BL67-B-4M8

Figure 143:
BL67-B-4M8

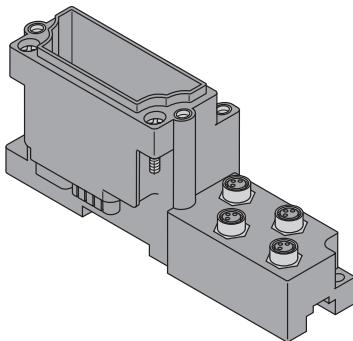


Figure 144:
Pin assignment
BL67-4DO-2A-N
with BL67-B-4M8

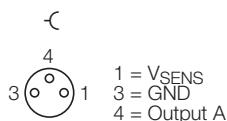
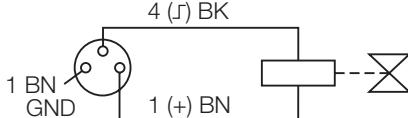
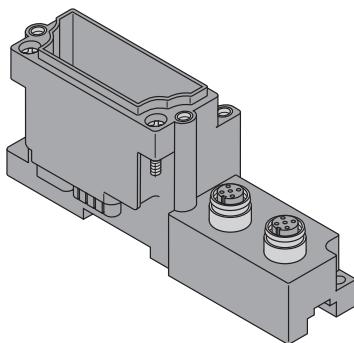


Figure 145:
Wiring diagram
BL67-4DO-2A-N
with BL67-B-4M8



■ BL67-B-2M12/ BL6 7-B-2M12-P (paired)

Figure 146:
BL67-B-2M12/
BL67-B-2M12-P



6

Figure 147:
Pin assignment
BL67-4DO-2A-N
with BL67-B-2M12/
BL67-B-2M12-P

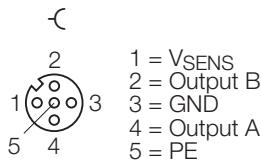
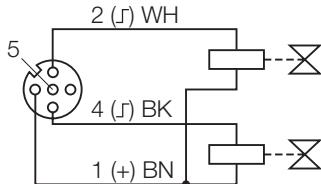


Figure 148:
Wiring diagram
BL67-4DO-2A-N
with BL67-B-2M12/
BL67-B-2M12-P



Digital Output Modules

■ BL67-B-4M12

Figure 149:
BL67-B-4M12

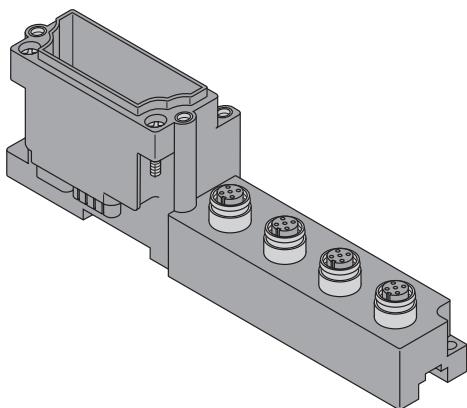


Figure 150:
Pin assignment
BL67-4DO-2A-N
with BL67-B-4M12

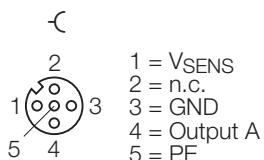
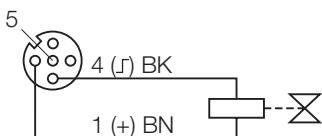
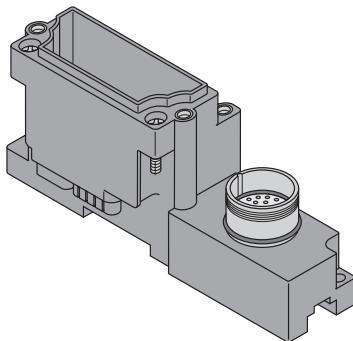


Figure 151:
Wiring diagram
BL67-4DO-2A-N
with BL67-B-4M12



■ BL67-B-1M23

Figure 152:
BL67-B-1M23



6

Figure 153:
Pin assignment
BL67-4DO-2A-N
with BL67-B-1M23



1 = Signal 0	7 = n.c.
2 = Signal 1	8 = n.c.
3 = Signal 2	9 = V _{SENS}
4 = Signal 3	10 = V _{SENS}
5 = n.c.	11 = V _{SENS}
6 = n.c.	12 = GND

Signal assignment

Table 83:
Signal assignment
BL67-4DO-2A-N

x.y →
x = Connector
y = Pin-No.

OUT	0	1	2	3
BL67-B-4M8	0.4	1.4	2.4	3.4
BL67-B-2M12	0.4	1.4	0.2	1.2
BL67-B-2M12-P	0.4	0.2	1.4	1.2
BL67-B-4M12	0.4	1.4	2.4	3.4
BL67-B-4M12-P	0.4	0.2	1.4	1.2

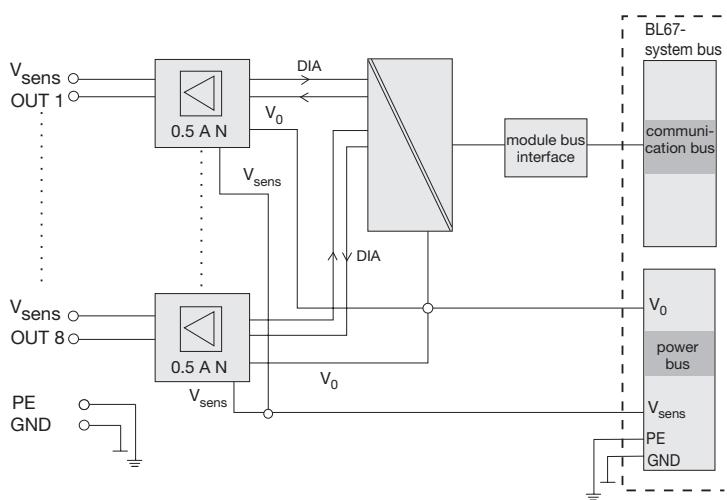
Digital Output Modules

BL67-8DO-0.5A-N

Figure 154:
BL67-8DO-0.5A-N



Figure 155:
Block diagram



Technical Data

Table 84:
Technical data

Designation	BL67-8DO-0.5A-N
Number of channels	8
Nominal voltage from supply terminal	24 V DC
Load voltage V_o	24 V DC
Voltage range	18 to 30 V DC
Nominal current from 5 V DC (module bus) I_{MB}	$\square \leq 30 \text{ mA}$
Nominal current from supply terminal I_L	< 100 mA (when load current = 0)
Power loss of the module, typical	< 1.5 W
Output voltage, High level (loaded)	min. L+ (-1 V)
Output current I_A	
High level I_A (nominal)	0.5 A
High level I_{AMAX}	0.6 A (according to IEC 61131-2)
Synchronization factor	100 %
Switching-off characteristic K_A	
$I_{OUT} > 1.5 \text{ A}$	< 4 ms
$1.0 \text{ A} < I_{OUT} < 1.5 \text{ A}$	10 s
$0.6 \text{ A} < I_{OUT} > 1.0 \text{ A}$	min. 10 s / max. 60 s
Delay at signal change and resistive load	
From low to high level	3 ms
From high to low level	3 ms
Load impedance range	48 Ω to 1 k Ω

Switch-on resistance R_{ON}	max. 800 mΩ
Resistive, inductive and lamp loads can be connected.	
Load impedance, resistive R_{LO}	48 Ω
Lamp load R_{LL}	3 W
Switching frequency	
Resistive load	200 Hz
Inductive load	2 Hz
Lamp load	20 Hz
Isolation voltage	
U_{TMB} (module bus/ field)	max. 2500 V DC
U_{FE} (field/ functional earth)	max. 1000 V DC
Short-circuit proof	Yes, according to EN 61 131-2



Note

The parallel switching of outputs is possible with the synchronous switching of the channels. In this case, the maximum output current can be increased up to 4 A, depending on the number of the parallel switched outputs.

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

<i>Table 85: Diagnosis/ Status via LEDs</i>	LED	Display	Meaning	Remedy
D	Red, flashing, 0.5 Hz		Diagnostics pending	-
	Red		Module bus communication failure	Check if more than two ad-joining elec- tronic modules have been pulled. This concerns modules located between this module and the gateway.
	Off		No error messages or diagnostics	-
0 to 7	Green		Status of channel x = „1“	-
	Red		Short circuit/ Overload Channel x	Eliminate the cause for the short circuit or the overload → After cooling the module switches on automati- cally.
	Off		Status of channel x = „0“	-

Diagnosis via Software

<i>Table 86: Diagnosis</i>	Diagnosis
	Overload or short-circuit The channel is switched off automati- cally. For the for switching-off characteris- tics of the outputs see Table 63.:.

Digital Output Modules

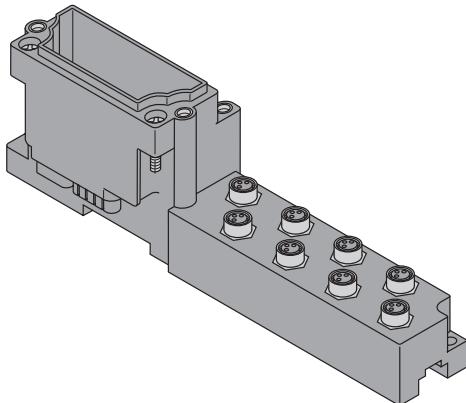
Module Parameters

None

Base modules/ Pin assignment

- BL67-B-8M8

Figure 156:
BL67-B-8M8



6

Figure 157:
Pin assignment
BL67-8DO-0.5A-N
with BL67-B-8M8

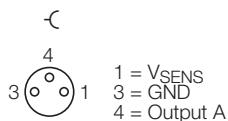
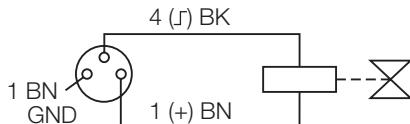


Figure 158:
Wiring diagram
BL67-8DO-0.5A-N
with BL67-B-8M8



Digital Output Modules

■ BL67-B-4M12/ BL67-B-4M12-P

Figure 159:
BL67-B-4M12/
BL67-B-4M12-P

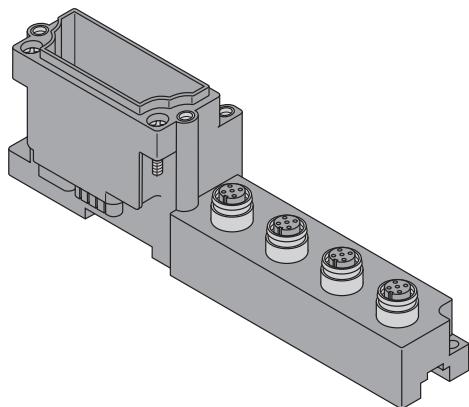


Figure 160:
Pin assignment
BL67-8DO-0.5A-N
with BL67-B-4M12

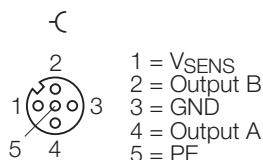
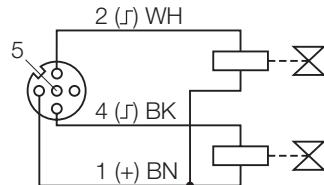
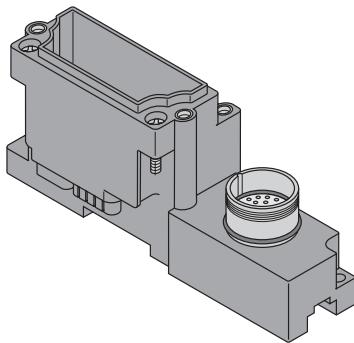


Figure 161:
Wiring diagram
BL67-8DO-0.5A-N
with BL67-B-4M12



■ BL67-B-1M23

Figure 162:
BL67-B-1M23



6

Figure 163:
Pin assignment

BL67-8DO-0.5A-N
with BL67-B-1M23



1 = Signal 0	7 = Signal 6
2 = Signal 1	8 = Signal 7
3 = Signal 2	9 = VSENS
4 = Signal 3	10 = VSENS
5 = Signal 4	11 = VSENS
6 = Signal 5	12 = GND

Signal assignment

Table 87:
Signal assignment
BL67-8DO-0.5A-N

x.y →
x = Connector
y = Pin-No.

OUT	0	1	2	3	4	5	6	7
BL67-B-4M12	0.4	1.4	2.4	3.4	0.2	1.2	2.2	3.2
BL67-B-4M12-P	0.4	0.2	1.4	1.2	2.4	2.2	3.4	3.2
BL67-B-8M8	0.4	1.4	2.4	3.4	4.4	5.4	6.4	7.4

Digital Output Modules

7 Analog Output Modules

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Overview

Analog output modules (AO) receive output values from the gateway via the internal module bus. The modules convert these values and transmit the corresponding signals for each channel to the field level via the base modules.

The output supply (V_O) is tapped from the internal voltage supply bus.

This voltage is supplied by the gateway or a Power Feeding module. Both contain a short circuit detection for the output supply voltage.

An output short circuit is thus also detected in the gateway or in the Power Feeding module.

The module bus electronic of the analog input modules are galvanically isolated from the module bus and provide reverse polarity protection.

The modules are short-circuit proof.

Supported signal ranges

- BL67-2AO-I:
0 to 20 mA,
4 to 20 mA
- BL67-2AO-V:
0 to 10 V DC
-10 to 10 V DC

LED status indicators

Error signals from the I/O level are indicated by each module via the "D" LED. The corresponding diagnostic information is transmitted to the gateway via diagnostic bits.

Resolution of analog value representations

In the bipolar mode the digitalized analog values are represented as a two's complement. The 16 bit or the 12 bit representation (left justified) can be chosen by setting the respective module parameter.



Note

A detailed description of the 16 bit/12 bit representation for the analog values can be found in the "appendix", page 13-30.

Module Overview

Table 88:
Module overview

Module	Number of channels	Short-circuit proof
BL67-2AO-I	2	✓
BL20-2AO-V	2	✓

Analog Output Modules

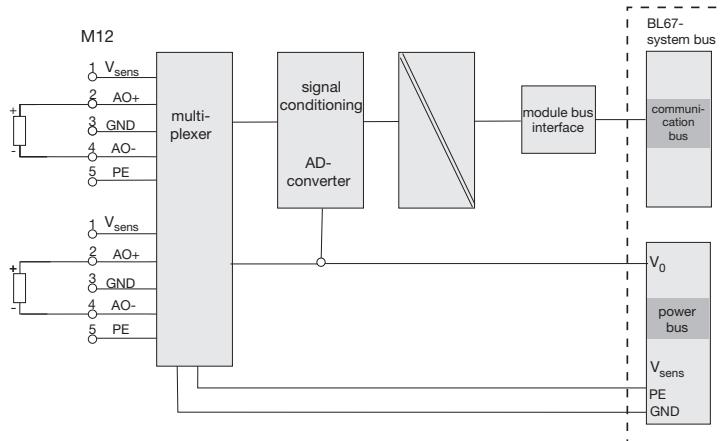
BL67-2AO-I, 0/4...20mA

Figure 164:

BL67-2AO-I



Figure 165:
Block diagram



Technical Data

Table 89:
Technical data

Designation	BL67-2AO-I
Number of channels	2
Nominal voltage from supply terminal	24 V DC
Load voltage U_L	24 VDC
voltage range	18 to 30 VDC
Nominal current from 5 V DC (module bus) I_{MB}	≤ 40 mA
Nominal current from supply terminal I_L	≤ 50 mA
Power loss of the module, typical P_{MAX}	< 1 W
Output current I_A	0/4 to 20 mA
Burden resistance	
Resistive load R_{LO}	< 450 Ω
Inductive load R_{Lk}	< 1 mH
Transmission frequency f_T	< 200 Hz
Basic error at 23 °C / 73.4 °F	0.2 %
Temperature coefficient	≤ 150 ppm/°C of end value
Settling time (maximum)	
Resistive load	0,1 ms
Inductive Load	0,5 ms

Isolation voltage

U_{TMB} (module bus/ field)	min. 500 V _{eff}
U_{Fe} (field/ functional earth)	min. 50 V _{AC}
channel/channel	no
channel/field supply	no
channel/system supply	500 V _{eff}
Measurement value representation	16 Bit Signed Integer / 12 Bit Full Range left-justified
I_{SENS} (output supply from V_O)	≤ 250 mA; short-circuit protection in gateway or Power Feeding module



Note

Negative values are automatically displayed as 0 mA or 4 mA, depending on the configured measurement range.

Diagnostic/ Status Messages**Diagnosis/ Status via LEDs**

Table 90:
*Diagnosis/ Status
via LEDs*

LED	Display	Meaning	Remedy
D	Red	Module bus communication failure	Check if more than two ad-joining electronic modules have been pulled. This concerns modules located between this module and the gateway.
Off		No error messages or diagnostics	–

Analog Output Modules

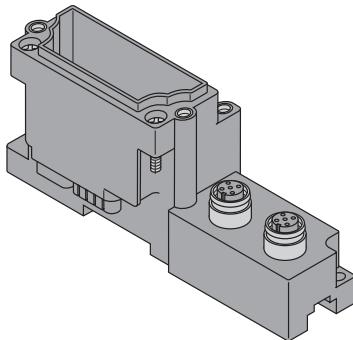
Module Parameters (per Channel)

<i>Table 91: Module parameters</i>	Parameter name	Value
A default- settings	Channel	activate A deactivate
	Value representation	integer (15bit + sign) A 12bit (left-justified)
	Current mode	0...20mA A 4...20mA
	Substitute value A	The substitute value will be transmitted if the respective parameters of the gateway have been set to „output substitute value“.

Base modules/ Pin assignment

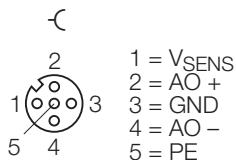
■ BL67-B-2M12

Figure 166:
BL67-B-2M12



7

Figure 167:
Pin assignment
BL67-2AO-I with
BL67-B2M12



Measurement value representation

16 bit representation:

- Current values from 0 to 20 mA

The value range

0 mA to 20 mA

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

- Current values from 4 to 20 mA

The value range

4 mA to 20 mA

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

12 bit representation (left-justified)

- Current values from 0 to 20 mA

The value range

0 mA to 20 mA

is displayed as follows:

000(0)_{hex} to FFF(0)_{hex} (decimal: 0 to 4095)

- Current values from 4 to 20 mA

The value range

4 mA to 20 mA

is displayed as follows:

000(0)_{hex} to FFF(0)_{hex} (decimal: 0 to 4095)



Note

A detailed description of the 16 bit/12 bit representation for the analog values can be found in the "appendix", page 13-30.

BL67-2AO-V, -10/0...+10V DC

Figure 168:

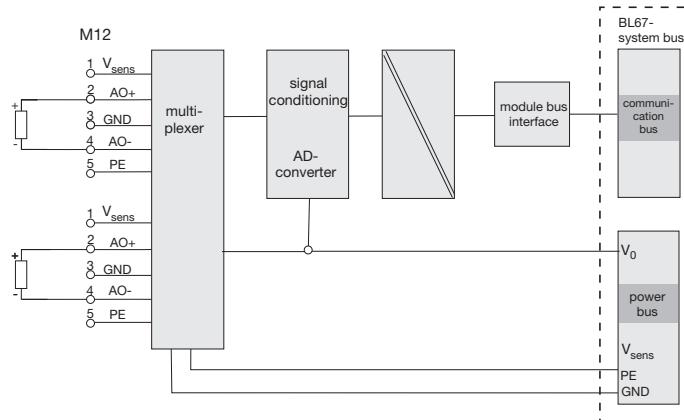
BL67-2AO-V



7

Figure 169:

Block diagram



Analog Output Modules

Technical Data

Table 92:
Technical data

Designation	BL67-2AO-V
Number of channels	2
Nominal voltage from supply terminal	24 V DC
Load voltage U_L	24 V DC
voltage range	18 to 30 V DC
Nominal current from 5 V DC (module bus) I_{MB}	≤ 60 mA
Nominal current from supply terminal I_L	≤ 50 mA
Power loss of the module, typical P_{MAX}	< 1 W
Output voltage U_A	-10/0 to 10 V DC
Burden resistance	
Resistive load R_{LO}	> 1 kΩ
Capacitive load R_{LK}	> 1 µF
Short-circuit current I_K	≤ 40 mA
Transmission frequency f_T	< 100 Hz
Offset error	≤ 0.1 %
Basic error at 23 °C / 73.4 °F	0.2 %
Repeat accuracy	0.05 %
Output ripple	0.02 %
Temperature coefficient	≤ 300 ppm/°C of end value

Settling time (maximum)

Resistive load	0.1 ms
----------------	--------

Inductive load	0.5 ms
----------------	--------

Isolation voltage

U_{TMB} (module bus/ field)	min. 500 V _{eff}
----------------------------------	---------------------------

U_{Fe} (field/ functional earth)	min. 50 V _{AC}
---------------------------------------	-------------------------

channel/channel	no
-----------------	----

channel/field supply	no
----------------------	----

channel/system supply	500 V _{eff}
-----------------------	----------------------

Measurement value representation	16 Bit Signed Integer / 12 Bit Full Range left-justified
----------------------------------	--

I_{SENS} (output supply from V_O)	≤ 250 mA; short-circuit protection in gateway or Power Feeding module
---	--

**Note**

Negative values are automatically displayed as 0 V, in a configured measurement range of 0 to 10 V.

Analog Output Modules

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

Table 93:
*Diagnosis/ Status
via LEDs*

LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two ad-joining electronic modules have been pulled. This concerns modules located between this module and the gateway.
Off		No error messages or diagnostics	–

Module Parameters (per Channel)

<i>Table 94: Module parameters</i>	Parameter name	Value
A default- settings	Channel	activate A deactivate
	Value representation	integer (15bit + sign) A 12bit (left-justified)
	Voltage mode	0 ... +10 V A -10 ... +10 V
	Substitute value A	The substitute value will be transmitted if the respective parameters of the gateway have been set to „output substitute value“.

Analog Output Modules

Base modules/ Pin assignment

■ BL67-B-2M12

Figure 170:
BL67-B-2M12

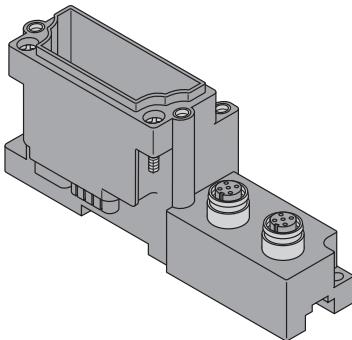
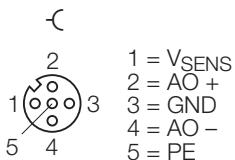


Figure 171:
Pin assignment
BL67-2AO-I with
BL67-B2M12



Measurement Value Representation

16 bit representation

- Voltage values from 0 to 10 V DC

The value range

0 V to 10 V

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

- Voltage values from -10 to 10 V DC

The value range

-10 V to -3,052 10⁻⁴ V

is displayed as follows:

8000_{hex} to FFFF_{hex} (decimal:-32768 to -1)

7

12 bit representation (left-justified)

- Voltage values from 0 to 10 V DC

The value range

0 V to 10 V

is displayed as follows:

000(0)_{hex} to FFF(0)_{hex} (decimal: 0 to 4095)

- Voltage values from -10 to 10 V DC

The value range

0 V to 10 V

is displayed as follows:

000(0)_{hex} to 7FF(0)_{hex} (decimal: 0 to 2047)

The value range

-10 V to -0,0049 V

is displayed as follows:

800(0)_{hex} to FFF(0)_{hex} (decimal: -2048 to -1)



Note

A detailed description of the 16 bit/12 bit representation for the analog values can be found in the "appendix", page 13-30.

Analog Output Modules

8 Digital Combi Modules

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Overview

The modules provide optically isolated in- and outputs according to IEC 61131 Type 1.

The inputs detect electrical high- and low-level values through the base module connections and transmit the corresponding digital value to the gateway and the outputs receive output values from the gateway via the internal module bus. The modules convert these values and transmit the corresponding high or low level signals for each channel to the field level via the base modules.

The sensor supply (V_{sens}) and the output supply (V_O) are tapped from the internal voltage supply bus. They are short circuit proof (100 mA) and supplied by the module.

Short circuit detection is realized in the module.



Warning

In case of a short circuit or an overload, the digital combi modules may switch on automatically after the removal of the short circuit or the overload.



Warning

Switching-off the outputs should not be a normal application!

Do not use the module for safety-related applications.

A failure of the output voltage may cause an output supply through the inputs.

LED status indicators

Error signals from the I/O-level are indicated as channel diagnostics via the channel-LEDs or as group diagnostics by each module via the "D" LED. The corresponding diagnostic information is transmitted to the gateway via diagnostic bits.



Attention

An external suppressor should be planned for inductive loads.

Module overview

Table 95:
Module overview

Module	No. of channels	Positive switching (sinking)
BL67-4DI4DO-PD	4	✓
BL67-8XSG-PD	8	✓

Digital Combi Modules

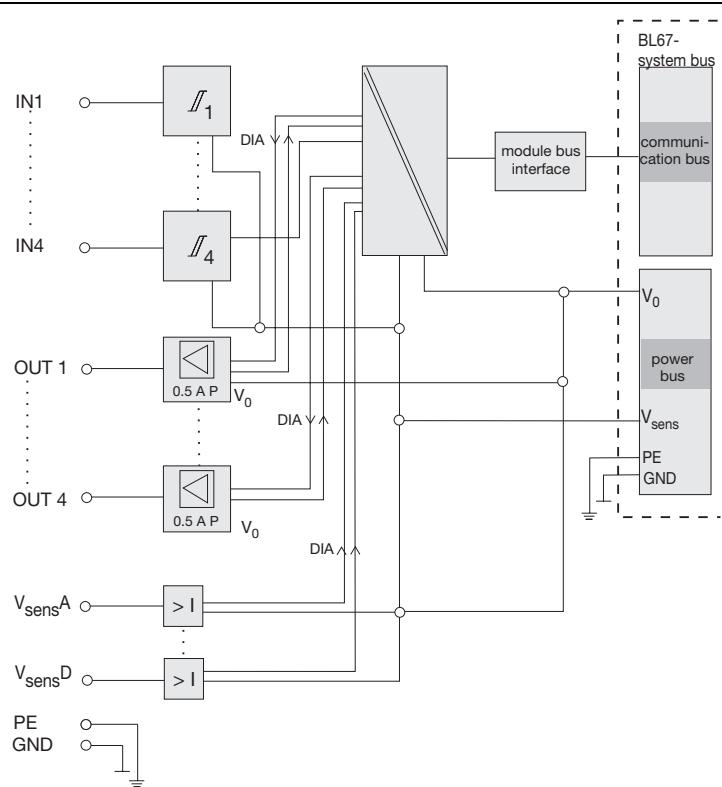
BL67-4DI4DO-PD

The module provides one in- and one output at each M12-connector.

Figure 172:
BL67-4DI/4DO-PD



Figure 173:
Block diagram



Technical data

Table 96:
Technical data

Designation	BL67-4DI4DO-PD
Nominal voltage from supply terminal	24 VDC
Nominal current from 5 VDC (module bus) I_{MB}	≤ 30 mA
Nominal current from supply terminal (field) I_L	≤ 100 mA (when load current = 0)
Power loss of the module, typical	< 1,5 W
Inputs	4
Input voltage at nominal value	24 VDC
– low level	< 4,5 V
– high level	> 7 V (max. 30 V)
Input current I_{in}	
– low level	< 1,5 mA
– high level	$2,1 \text{ mA} < I_{in} < 3,7 \text{ mA}$
Outputs	4
Load voltage V_O	24 VDC
– voltage range	18 to 30 VDC
Output voltage, high level (loaded)	min. L+ (-1 V)
Output current I_A	
– high level I_A (nominal value)	0,5 A
– high level I_{AMAX}	0,6 A (according to IEC 61 131-2)
Synchronization factor	100%

Switching-off characteristic K_A

– $I_{OUT} > 1.5 \text{ A}$	< 4 ms
– $1.0 \text{ A} < I_{OUT} < 1.5 \text{ A}$	< 10 s
– $0.6 \text{ A} < I_{OUT} < 1.0 \text{ A}$	min. 10 s / max. 60 s

Output delay at signal change and ohmic load

– low- to high level	3 ms
– high- to low level	3 ms

Load impedance range 48Ω to $1 \text{ k}\Omega$ Switch-on resistance R_{ON} max. $800 \text{ m}\Omega$

Resistive, inductive and lamp loads can be connected.

Load impedance, resistive R_{LO}	48Ω
---------------------------------------	-------------

Lamp load R_{LL}	3 W
--------------------	-----

Switching frequency

– Resistive load	200 Hz
– Inductive load	2 Hz
– Lamp load	20 Hz

Isolation voltage

 U_{TMB} (module bus/ field) max. 2500 V DC U_{FE} (field/ functional earth) max. 1000 V DCShort-circuit proof Yes, according to
EN 61 131-2

**Note**

The parallel switching of outputs is possible with the synchronous switching of the channels. In this case, the maximum output current can be increased up to 2A, depending on the number of the parallel switched outputs.

Diagnostic/ Status Messages**Diagnosis via LEDs**Table 97:
*Diagnosis via
LEDs*

	LED	Display	Meaning	Remedy
	D	Red, flashing, 0.5 Hz	Diagnostics pending	-
	Red		Module bus communication failure	Check if more than two ad-joining elec- tronic modules have been pulled. This concerns modules located between this module and the gateway.
	Red		Error in field supply (LEDs V_i and V_O at Power Feeding module are „off“)	Check the power supply for the inputs (V_{sens}) and the outputs (V_O).
	Off		No error messages or diagnostics	-
0 to 7	Green		– LEDs 0 to 3: Status of the input – LEDs 4 to 7: Status of the output	-
	Red, flashing, 2 Hz		LED 0 to 3: Short circuit in sensor supply	Eliminate the cause for the short circuit or the overload.
	Red		LED 4 to 7: Short circuit at output x	Eliminate the cause for the short circuit or the overload.
	Off		Status of in- or output at channels x = 0	-

Diagnosis via Software

Table 98:
Diagnosis

Diagnosis	
Overcurrent/ short circuit sensor x	Short circuit or overcurrent at sensor supply A, B, C or D (see Table 101:).
Overcurrent/ short circuit K x	Short circuit or overload at output x. The channel is switched-off automatically. For the switching-off characteristics of the outputs see Table 96:.

Module parameters

8

The parameters can be set for each channel.

Table 99:
Module parameters

A default setting

Parameter name	Value	Meaning
digital input x	0	normal A
	1	inverted
input filter x	0	deactivate A
	1	activate
output on overcurrent x	0	automatic recovery A
	1	controlled recovery: The output is manually switched-off and on again.

Digital Combi Modules

Base modules/ Pin assignment

■ BL67-B-8M8

Figure 174:
BL67-B-8M8

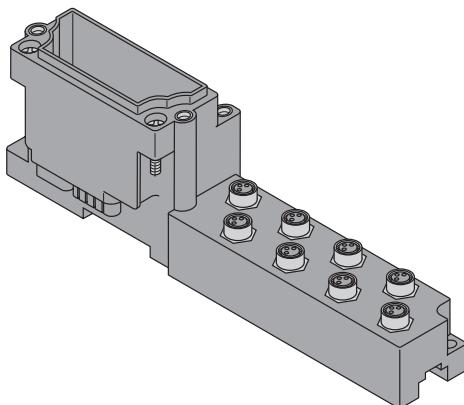


Figure 175:
Pin assignment
BL67-4DI4DO-PD
with BL67-B-8M8

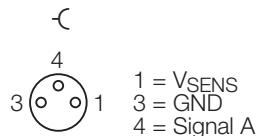
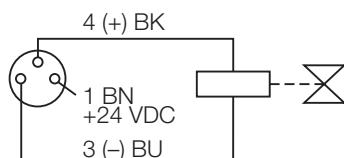
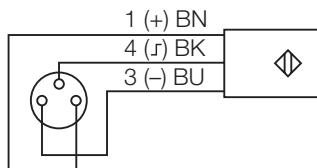
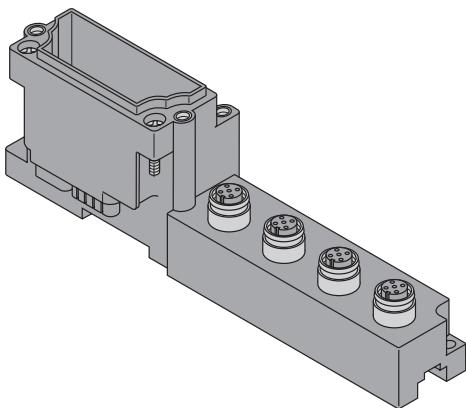


Figure 176:
Wiring diagram
BL67-4DI4DO-PD
with BL67-B-8M8



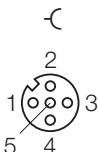
- BL67-B-4M12/ BL67-B-4M12-P (paired)

Figure 177:
BL67-B-4M12/
BL67-B-4M12-P



8

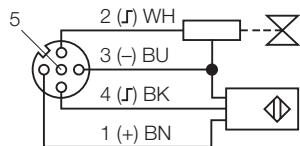
Figure 178:
Pin assignment
BL67-4DI4DO-PD
with
BL67-B-4M12/
BL67-B-4M12-P



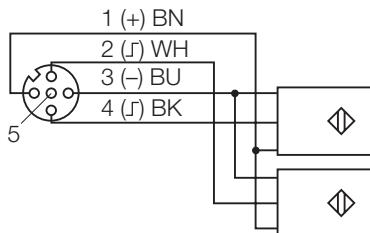
1 = V_{SENS}
2 = Signal B
3 = GND
4 = Signal A
5 = PE

Digital Combi Modules

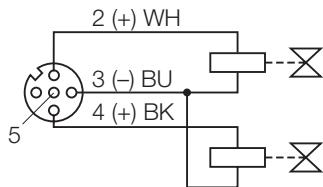
Figure 179:
Wiring diagrams
BL67-4DI4DO-PD
with
BL67-B-4M12/
BL67-B-4M12-P



Inputs (Connector 0 und 1):



Outputs (Connector 2 und 3):



Signal assignment

Table 100:
Signal assignment
BL67-4DI4DO-PD
 $x.y \rightarrow$
 $x = \text{Connector}$
 $y = \text{Pin-No.}$

IN/OUT	0	1	2	3	4	5	6	7
BL67-B-8M8	0.4	1.4	2.4	3.4	4.4	5.4	6.4	7.4
BL67-B-4M12	0.4	1.4	2.4	3.4	0.2	1.2	2.2	3.2
BL67-B-4M12-P	0.4	0.2	1.4	1.2	2.4	2.2	3.4	3.2

Sensor Supply

Table 101:
Sensor supply

V_{sens}	A	B	C	D
BL67-B-4M12	Con 0	Con 1	Con 2	Con 3
BL67-B-4M12-P	Con 0	Con 1	Con 2	Con 3
BL67-B-8M8	Con 0/1	Con 2/3	Con 4/5	Con 6/7

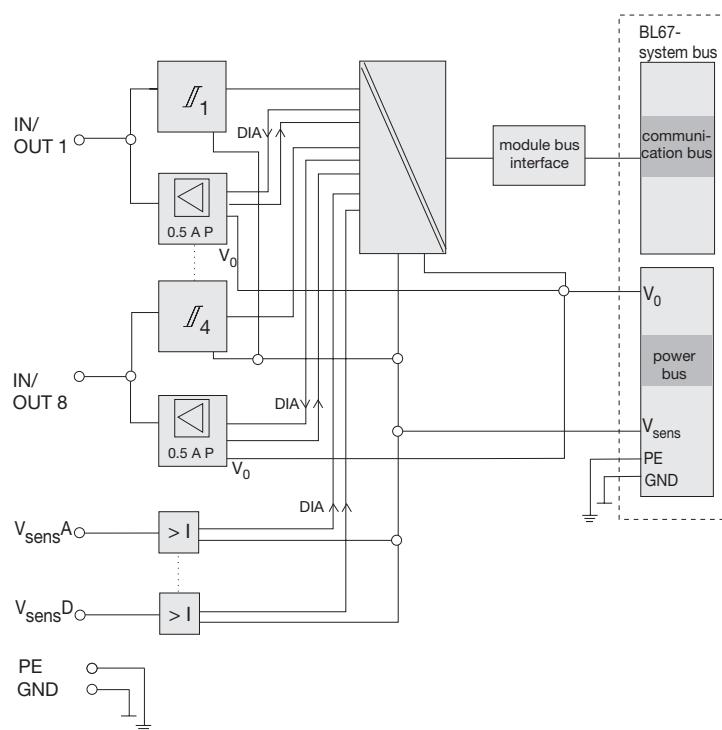
BL67-8XSG-PD

The module provides 8 channels which can be configured according to application-specific needs. A maximum of 8 2-/3-wire-pnp-sensors or 8 DC-actuators can be connected to the module.

Figure 180:
BL67-8XSG-PD



Figure 181:
Block diagram



Technical Data

Table 102:
Technical data

Designation	BL67-8XSG-PD
Nominal voltage from supply terminal	24 VDC
Nominal current from 5 VDC (module bus) I_{MB}	≤ 30 mA
Nominal current from supply terminal (field) I_L	≤ 100 mA (at load current = 0)
Power loss of the module, typical	< 1,5 W
Inputs	8
Input voltage at nominal value	24 VDC
– low level	< 4,5 V
– high level	> 7 V (max. 30 V)
Input current I_{in}	
– low level	< 1,5 mA
– high level	$2,1 \text{ mA} < I_{in} < 3,7 \text{ mA}$
Outputs	8
Load voltage V_O	24 VDC
– voltage range	18 to 30 VDC
Output voltage, high level (loaded)	min. L+ (-1 V)
Output current I_A	
– high level I_A (nominal value)	0,5 A
– high level I_{AMAX}	0,6 A (according to IEC 6 1131-2)
Synchronization factor	100%

Switching-off characteristic K_A	
– $I_{OUT} > 1.5 \text{ A}$	< 4 ms
– $1.0 \text{ A} < I_{OUT} < 1.5 \text{ A}$	< 10 s
– $0.6 \text{ A} < I_{OUT} < 1.0 \text{ A}$	min. 10 s / max. 60 s
Output delay at signal change and ohmic load	
– low- to high level	3 ms
– high- to low level	3 ms
Load impedance range	48 Ω to 1 k Ω
Switch-on resistance R_{ON}	max. 190 m Ω
Resistive, inductive and lamp loads can be connected.	
Load impedance, resistive R_{LO}	48 Ω
Lamp load R_{LL}	3 W
Switching frequency	
– Resistive load	200 Hz
– Inductive load	2 Hz
– Lamp load	20 Hz
Isolation voltage	
U_{TMB} (module bus/ field)	max. 2500 V DC
U_{FE} (field/ functional earth)	max. 1000 V DC
Short-circuit proof	Yes, according to EN 61 131-2

**Note**

The parallel switching of outputs is possible with the synchronous switching of the channels. In this case, the maximum output current can be increased up to 2A, depending on the number of the parallel switched outputs.

Diagnostic/ Status Messages**Diagnosis via LEDs**

Table 103:
Diagnosis via
LEDs

	LED	Display	Meaning	Remedy
	D	Red, flashing, 0.5 Hz	Diagnostics pending	-
	Red		Module bus communication failure	Check if more than two ad-joining elec- tronic modules have been pulled. This concerns modules located between this module and the gateway.
	Red		Error in field supply (LEDs V_I and V_O at Power Feeding module are „off“)	Check the power supply for the inputs (V_{sens}) and the outputs (V_O).
	Off		No error messages or diagnostics	-
0 to 7	Green		– Status of the input or the output at channel $x = 1$	-
	Red, flashing, 2 Hz	LED 0 to 3:	Short circuit in sensor supply	Eliminate the cause for the short circuit or the overload.
	Red	LED 4 to 7:	Short circuit at output x	Eliminate the cause for the short circuit or the overload.
	Off		Status of in- or output at channels $x = 0$	-

Diagnosis via Software

Table 104:
Diagnosis

Diagnosis	
Overcurrent/ short circuit sensor x	Short circuit or overcurrent at sensor supply A, B, C or D (see Table 107:).
Overcurrent/ short circuit K x	Short circuit or overload at output x. The channel is switched-off automatically. For the switching-off characteristics of the outputs see Table 102:.

Module parameters

8

The parameters can be set for each channel.

Table 105:
Module parameters

A default setting

Parameter name	Value	Meaning
digital input x	0	normal A
	1	inverted
input filter x	0	deactivate A
	1	activate
output x	0	deactivate A
	1	activate
output on overcurrent x	0	automatic recovery A
	1	controlled recovery: The output is manually switched-off and on again.

Digital Combi Modules

Base modules/ Pin assignment

■ BL67-B-8M8

Figure 182:
BL67-B-8M8

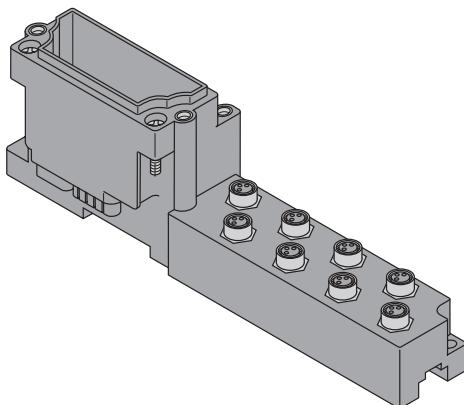


Figure 183:
Pin assignment
BL67-8XSG-PD
with BL67-B-8M8

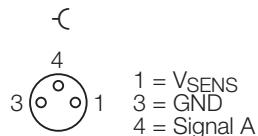
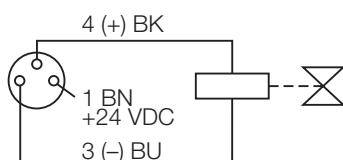
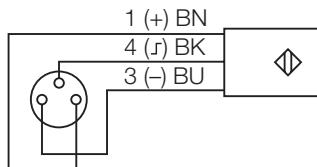
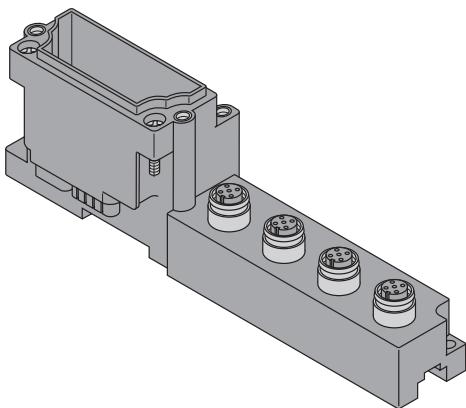


Figure 184:
Wiring diagram
BL67-8XSG-PD
with BL67-B-8M8



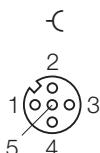
- BL67-B-4M12/ BL67-B-4M12-P (paired)

Figure 185:
BL67-B-4M12/
BL67-B-4M12-P



8

Figure 186:
Pin assignment
BL67-8XSG-PD
with
BL67-B-4M12/
BL67-B-4M12-P



1 = V_{SENS}
2 = Signal B
3 = GND
4 = Signal A
5 = PE

Digital Combi Modules

Figure 187:

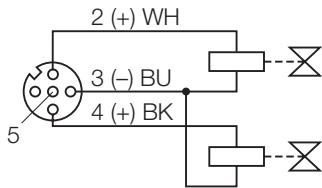
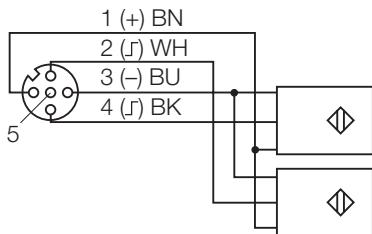
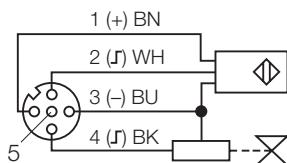
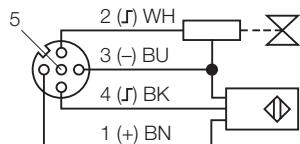
Wiring diagrams

BL67-8XSG-PD

with

BL67-B-4M12/

BL67-B-4M12-P



Signal assignment

Table 106:
Signal assignment
BL67-8XSG-PD
 $x.y \rightarrow$
 $x = \text{Connector}$
 $y = \text{Pin-No.}$

IN/OUT	0	1	2	3	4	5	6	7
BL67-B-4M12	0.4	1.4	2.4	3.4	0.2	1.2	2.2	3.2
BL67-B-4M12-P	0.4	0.2	1.4	1.2	2.4	2.2	3.4	3.2
BL67-B-8M8	0.4	1.4	2.4	3.4	4.4	5.4	6.4	7.4

Sensor Supply

Table 107:
Sensor supply

V _{sens}	A	B	C	D
BL67-B-4M12	Con 0	Con 1	Con 2	Con 3
BL67-B-4M12-P	Con 0	Con 1	Con 2	Con 3
BL67-B-8M8	Con 0/1	Con 2/3	Con 4/5	Con 6/7

Digital Combi Modules

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BL67-1RS232

The module BL67-1RS232 transmits serial data through the BL67 system via a RS232 interface and enables the connection of different devices (printer/ scanner/ bar code reader), which as well provide a serial RS232 interface.

Data Transfer Method

The serial data transfer is flexible. An operational data transfer method can be set by the module's parameters.

The data transfer can be parameterized as follows:

- Data rate: 300 Bit/s to 115200 Bit/s.
- Data bits: 7 or 8 data bits in one data frame
- Parity: none, odd or even
- Stop bits: 1 or 2 Bit.



Note

The data flow control can be realized via a hardware handshake (RTS/CTS) or a software handshake (XON/XOFF).

Data Exchange

For the data exchange with a field device, the module provides a 64-byte transmit-buffer and a 128-byte receive-buffer. This is a hardware-restriction. The data telegrams which have to be sent or received can be larger.

The data transfer from the PLC into the transmit-buffer of the module or from the receive-buffer of the module to the PLC is realized via a 8-byte transmission channel in the process input or process output data.

To ensure the error-free data transmission, 2 byte of each data package are used to display status-, control- and diagnosis information. The amount of user data is therefore reduced to 6 byte within a data package.

Process Input data (PDin)

The incoming data are stored in the receive-buffer of the BL67-1RS232 module, segmented and transferred to the PLC via the module bus and the gateway.

The transmission is realized in a 8-byte format, structured as follows:

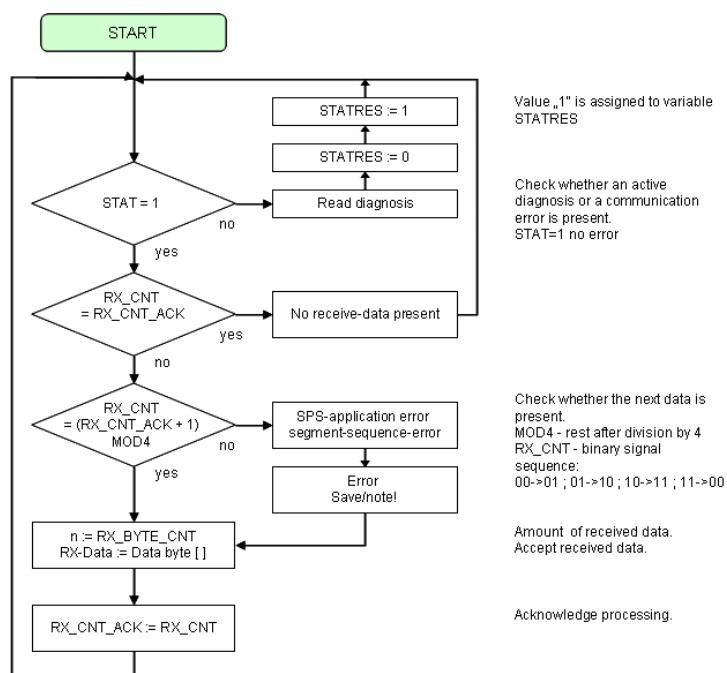
- 6 byte user data
- 1 byte diagnostic data
- 1 status byte, used to guarantee error free data-transmission.

Meaning of the data bits

<i>Table 108: Meaning of the data bits (process input)</i>	Designation	Value	Meaning
	BufOvfl; FrameErr; HndShErr; HwFailure; PrmErr	0 - 255	Diagnostic information (correspond to the diagnostic information in the diagnosis telegram). These diagnostics are always displayed and independent to the setting of the parameter „Diagnostics“.
	STAT	0-1	1: The communication with the data terminal equipment (DTE) is error free 0: The communication with the data terminal equipment (DTE) is disturbed. A diagnosis message is generated if the parameter „Diagnostics“ is set to „0/ release“. The diagnostic data show the cause of the communication disturbance. The user has to set back this bit in the process output data by using STATRES.
	TX_CNT_ACK	0-3	The value TX_CNT_ACK is a copy of the value TX_CNT. TX_CNT has been transmitted together with the last data segment of the process output data. TX_CNT_ACK is an acknowledge for the successful transmission of the data segment with TX_CNT.
	RX_CNT	0-3	This value is transferred together with every data segment. The RX_CNT values are sequential: 00->01->10->11->00... (decimal: 0->1->2->3->...) Errors in this sequence show the loss of data segments.
	RX_BYTE_CNT	0-7	Number of the valid bytes in this data segment.

Schematic Diagram of the Receive Sequence

Figure 188:
Schematic
diagram of the
receive sequence



PLC Output Data

The data received from the PLC are loaded into the transmit- buffer of the BL67-1RS232 module.

The fieldbus specific transmission for PROFIBUS-DP is realized in a 8-byte format which is structured as follows:

- 6 byte user data
- 1 byte containing signals to flush the transmit- and receive buffer.
- 1 control byte, used to guarantee error free data-transmission.

Meaning of the data bits

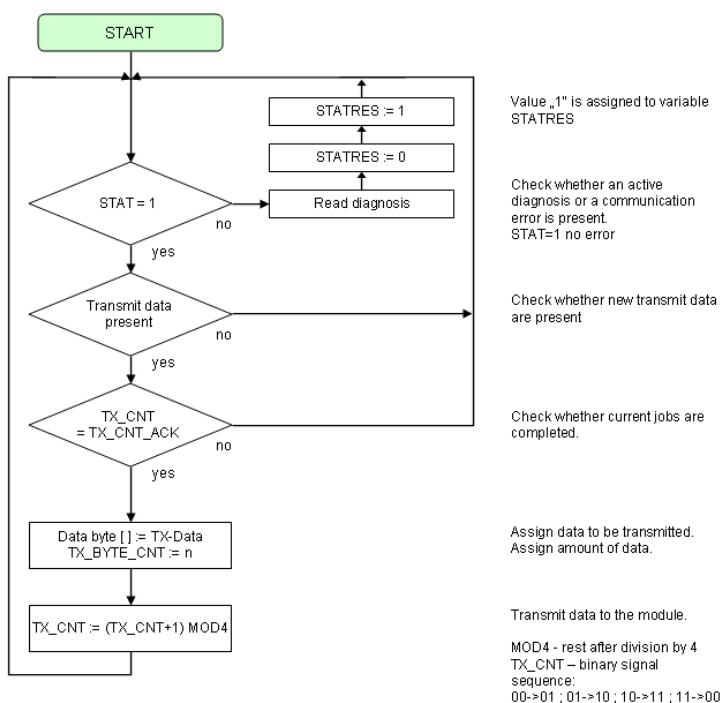
*Table 109:
Meaning of the
data bits
(process output)*

Designation	Value	Meaning
RXBUF FLUSH	0 - 1	<p>This bit is used to flush the receive-buffer.</p> <p>If STATRES = 1: The command RXBUF FLUSH = 1 is ignored.</p> <p>If STATRES = 0: RXBUF FLUSH = 1 causes the flushing of the receive-buffer.</p>
TXBUF FLUSH	0-1	<p>This bit is used to flush the transmit-buffer.</p> <p>If STATRES = 1: The command TXBUF FLUSH = 1 is ignored.</p> <p>If STATRES = 0: TXBUF FLUSH = 1 causes the flushing of the tranceive-buffer.</p>
STATRES	0-1	<p>This bit is set to reset the STAT bit in the process input data.</p> <p>With the change from 1 to 0 the STAT bit is reset (from 0 to 1).</p> <p>If this bit is 0, all changes in TX_BYT_CNT, TX_CNT and RX_CNT_ACK are ignored.</p> <p>Flushing the transmit-/ receive-buffer with RXBUF FLUSH/ TXBUF FLUSH is possible.</p> <p>If this bit is 1 or with the change from 0 to 1, the flushing of the transmit-/ receive-buffer with RXBUF FLUSH/ TXBUF FLUSH is not possible.</p>

RX_CNT_ACK	0-3	The value RX_CNT_ACK is a copy of the value RX_CNT. TX_CNT has been transmitted together with the last data segment of the process input data. TX_CNT_ACK is an acknowledge for the successful transmission of the data segment with RX_CNT.
TX_CNT	0-3	This value is transferred together with every data segment. The TX_CNT values are sequential: 00->01->10->11->00... (decimal: 0->1->2->3->0...) Errors in this sequence show the loss of data segments.
TX_BYTE_CNT	0 - 7	Number of the valid user data in this data segment. In PROFIBUS-DP, the data segments contain a maximum number of 6 bytes of user data.

Schematic Diagram of the Transmit Sequence

Figure 189:
Schematic
diagram of the
transmit sequence

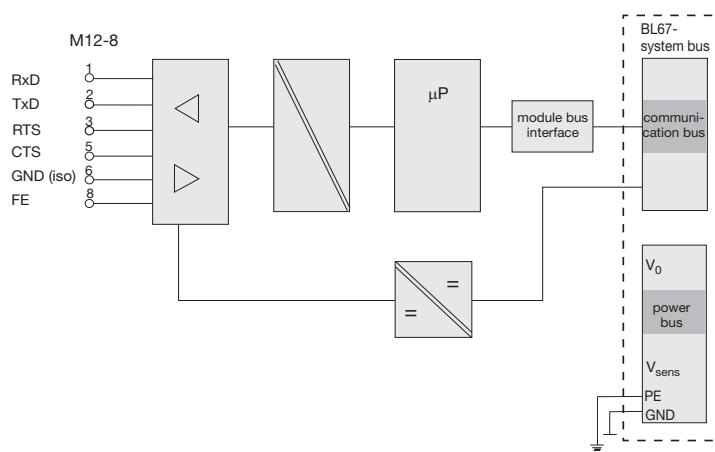


Technical Data

Figure 190:
BL67-1RS232



Figure 191:
Block diagram



*Table 110:
Technical Data*

	Designation	BL67-1RS232
	Number of Channels	1
	Voltage supply	via module bus
	Voltage from module bus U_{MB}	5 VDC
	voltage range	4.75 to 5.25 VDC
	Field supply	24 DC
	voltage range	18 to 30 VDC
	Nominal current from supply terminal I_L	≤ 50 mA
	Nominal current from module bus I_{MB}	≤ 140 mA
	Memory	128 Byte receive 64 Byte transmit
In/- Outputs		
	transmission level active (U_{RS1})	-15 to -3 VDC
	transmission level inactive (U_{RS0})	3 to 15 VDC
	transmission channels	2 (1/1) TxD and RxD, full-duplex
	transmission rate	300 to 115200 Baud (defined by parameters) Data, Parity, Stop (default: 9600 Baud, 7 Bit, impair, 2 stop-bits)
	RS232 cable length	max. 15 m

Technology-Modules

Flow Control	Software-Handshake (Xon/ Xoff) Hardware-Handshake (RTS/ CTS)
Diagnostic data can be written into the process image (depending on the parameterization)	
Isolation voltage	
U_{TMB} (module bus /RS232)	max. 1000 VDC
U_{Field} (Field voltage/ RS232)	max. 1000 VDC

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

Table 111:
Diagnosis/ Status
via LEDs

	LED	Display	Meaning	Remedy
	D	Red	Module bus communication failure	Check if more than two ad-joining electronic modules have been pulled. This concerns modules located between this module and the gateway.
		Off	No error messages or diagnostics	-
	TxD	Green	Data actually sent	-
		Off	No data sent actually	-
	RxD	Green	Data actually received	-
		Off	No data actually received	-
	RTS	Green	The RS232 module stopped the data transfer from the communication partner.	-
		Off	The RS232 module enabled the data transfer from the communication partner.	-
	CTS	Green	The communication partner stopped the data transfer from the RS232 module.	-
		Off	The communication partner enabled the data transfer from the RS232 module.	-

Diagnosis via Software

The module has the following diagnostic data available.

*Table 112:
Diagnosis*

Diagnostic message	
Buffer Overflow	Overflow of the receive-buffer (RX-buffer).
Frame error	The module has to be parameterized for adaptation to the data structure of the data terminal equipment (DTE). A frame error occurs in case of inconsequential parameterization (number of data bits, stop bits, method of parity,...).
Data flow control error	The DTE connected to the module does not react to XOFF or RTS handshake. The internal receive-buffer may overflow (buffer-overflow = 1).
Hardware failure	The module has to be replaced (e.g. error in EEPROM or UART)
Parameterization error	The parameter settings can not be supported.

Module Parameters

Table 113:
Module
parameters

A default-
settings

Parameter name	Value																								
Diagnostic	<table border="1"> <tr> <td>release</td> <td>Diagnosis activated/ diagnosis deactivated: This item only concerns the field bus specific diagnostic messages not the diagnosis mapped into the process input data of the module</td> </tr> <tr> <td>block A</td> <td></td> </tr> </table>	release	Diagnosis activated/ diagnosis deactivated: This item only concerns the field bus specific diagnostic messages not the diagnosis mapped into the process input data of the module	block A																					
release	Diagnosis activated/ diagnosis deactivated: This item only concerns the field bus specific diagnostic messages not the diagnosis mapped into the process input data of the module																								
block A																									
Disable ReducedCtrl	<p>Constant setting: The diagnosis messages are set in Byte 6 of the process input data (independent of "diagnostic").</p> <p>Byte 6 of the process output data contains two bits which may set to flush the transmit- or the receive-buffer.</p> <p>Byte 7 contains the status- or the control-byte. Bytes 0 to 5 contain the user data.</p>																								
Data rate	<table border="1"> <tr> <td>300 Bit/s</td> <td></td> </tr> <tr> <td>600 Bit/s</td> <td></td> </tr> <tr> <td>1200 Bit/s</td> <td></td> </tr> <tr> <td>2400 Bit/s</td> <td></td> </tr> <tr> <td>4800 Bit/s</td> <td></td> </tr> <tr> <td>9600 Bit/s A</td> <td></td> </tr> <tr> <td>14400 Bit/s</td> <td></td> </tr> <tr> <td>19200 Bit/s</td> <td></td> </tr> <tr> <td>28800 Bit/s</td> <td></td> </tr> <tr> <td>38400 Bit/s</td> <td></td> </tr> <tr> <td>57600 Bit/s</td> <td></td> </tr> <tr> <td>115200 Bit/s</td> <td></td> </tr> </table>	300 Bit/s		600 Bit/s		1200 Bit/s		2400 Bit/s		4800 Bit/s		9600 Bit/s A		14400 Bit/s		19200 Bit/s		28800 Bit/s		38400 Bit/s		57600 Bit/s		115200 Bit/s	
300 Bit/s																									
600 Bit/s																									
1200 Bit/s																									
2400 Bit/s																									
4800 Bit/s																									
9600 Bit/s A																									
14400 Bit/s																									
19200 Bit/s																									
28800 Bit/s																									
38400 Bit/s																									
57600 Bit/s																									
115200 Bit/s																									
none A	The data flow control has been deactivated.																								

A default-settings	Data flow control	XON/XOFF	Software-Handshake (XON/XOFF) activated.
		RTS/CTS	Hardware-Handshake (RTS/CTS) activated.
Data bits	7 A		The number of data bits is 7.
	8		The number of data bits is 8.
Parity	none	-	
	odd A		The number of the bits set (data bits and parity bit) is odd.
stop bits	even		The number of the bits set (data bits and parity bit) is even.
	1		Number of stop bits is 1.
XON character	2 A		Number of stop bits is 2.
	0 – 255		XON-character (17 A) This character is used to start the data transfer of the data terminal device (DTE) when the software-handshake is activated
XOFF character	0 – 255		XOFF-sign (19 A) This character is used to stop the data transfer of the data terminal device (DTE) when the software-handshake is activated

Base modules/ Pin assignment

- BL67-B-1M12/ BL67-B-1M12-8

Figure 192:
BL67-B-1M12-8/
BL67-B-1M12

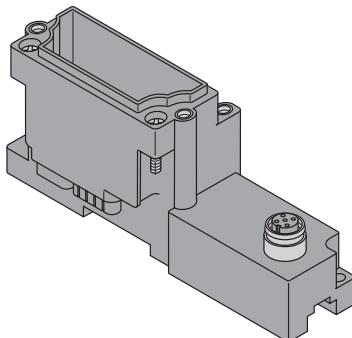


Figure 193:
Pin assignment
BL67-1RS232 with
BL67-B-1M12

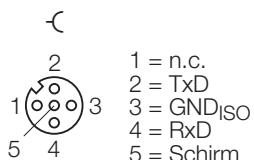
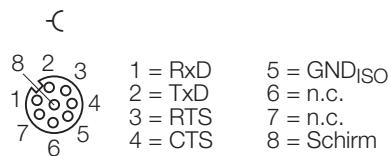


Figure 194:
Pin assignment
BL67-1RS232 with
BL67-B-1M12-8



■ BL67-B-1M23

Figure 195:
BL67-B-1M23

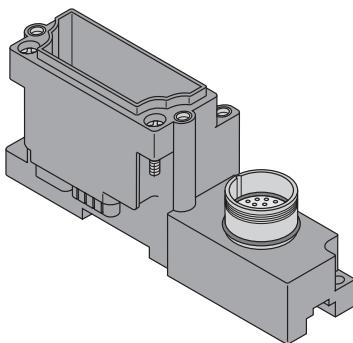


Figure 196:
Pin assignment
BL67-1RS232 with
BL67-B-1M23



1 = RxD	7 = n.c.
2 = TxD	8 = Schirm
3 = RTS	9 = n.c.
4 = CTS	10 = n.c.
5 = GND (iso)	11 = n.c.
6 = n.c.	12 = n.c.

Signal assignment

Tabelle 114:
Signalassignment
BL67-1RS232

x.y →
x = Connector
y = Pin-No.

Signal	RxD	TxD	RTS	CTS	GND	SHLD*
BL67-B-1M12-80.1	0.2	0.3	0.4	0.5 **	0.8	
BL67-B-1M12	0.4	0.2	-	-	0.3 **	0.5
BL67-1M123	0.1	0.2	0.3	0.4	0.5**	0.8

* SHIELD is connected to PE

** GND_{ISO} is isolated to field supply V_{sens}

BL67-1RS485/422

The module BL67-1RS485/422 allows the transfer of serial data streams via the RS485/422 interface and therefore enables various devices to be connected, such as printers, scanners or bar code readers that use the RS485/422 interface for communication. The interface transfers the data received from the device to the PLC or transfers data to be sent from the PLC to the device.

Transmission procedure

The BL67-1RS485/422 module allows the flexible transfer of serial data. The RS422 connection mode supports two wire simplex or four wire full-duplex transmission. The RS485 connection supports two wire half-duplex transmission.

The parameters of the module can be configured by the user to set up a functional transmission procedure as required.

The following transfer parameters can be configured:

- Bit transmission rate: 300 bit/s to 115200 bit/s.
- Data bits: 7 or 8 user data bits in a data frame.
- Parity: none, even or odd.
- Stop bits: 1 or 2 bits.

The data flow control can be implemented in RS422 operation with a software handshake (XON/XOFF) routine.

Data exchange

The module provides a 64 byte transmit buffer and a 128 byte receive buffer for data exchange with the field device. This is a hardware-restriction. The data telegrams which have to be sent or received can be larger.

The data transfer from the PLC into the transmit-buffer of the module or from the receive-buffer of the module to the PLC is realized via a 8-byte transmission channel in the process input or process output data.

To ensure the error-free data transmission, 2 byte of each data package are used to display status-, control- and diagnosis information. The amount of user data is therefore reduced to 6 byte within a data package.

Process Input data (PDin)

The incoming data are stored in the receive-buffer of the BL67-1RS485/422 module, segmented and transferred to the PLC via the module bus and the gateway.

The transmission is realized in a 8-byte format, structured as follows:

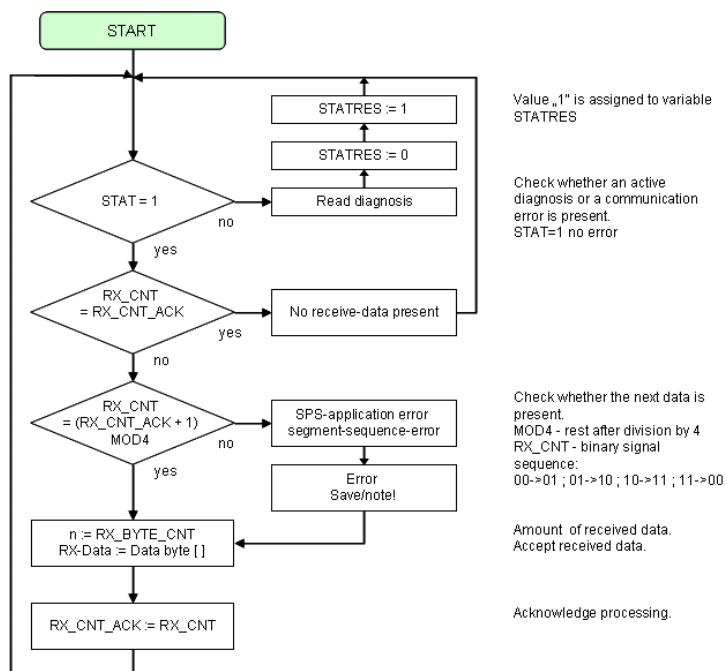
- 6 byte user data
- 1 byte diagnostic data
- 1 status byte, used to guarantee error free data-transmission.

Meaning of the data bits

Designation	Value	Meaning
BufOvfl; FrameErr; HndShErr; HwFailure; PrmErr	0 - 255	Diagnostic information (correspond to the diagnostic information in the diagnosis telegram). These diagnostics are always displayed and independent to the setting of the parameter „Diagnostics“.
STAT	0-1	1: The communication with the data terminal equipment (DTE) is error free 0: The communication with the data terminal equipment (DTE) is disturbed. A diagnosis message is generated if the parameter „Diagnostics“ is set to „0/ release“. The diagnostic data show the cause of the communication disturbance. The user has to set back this bit in the process output data by using STATRES.
TX_CNT_ACK	0-3	The value TX_CNT_ACK is a copy of the value TX_CNT. TX_CNT has been transmitted together with the last data segment of the process output data. TX_CNT_ACK is an acknowledge for the successful transmission of the data segment with TX_CNT.
RX_CNT	0-3	This value is transferred together with every data segment. The RX_CNT values are sequential: 00->01->10->11->00... (decimal: 0->1->2->3->...) Errors in this sequence show the loss of data segments.
RX_BYTE_CNT	0-7	Number of the valid bytes in this data segment.

Schematic Diagram of the Receive Sequence

Figure 197:
Schematic
diagram of the
receive sequence



PLC Output Data

The data received from the PLC are loaded into the transmit- buffer of the BL67-1RS485/422 module.

The fieldbus specific transmission for PROFIBUS-DP is realized in a 8-byte format which is structured as follows:

- 6 byte user data
- 1 byte containing signals to flush the transmit- and receive buffer.
- 1 control byte, used to guarantee error free data-transmission.

Meaning of the data bits

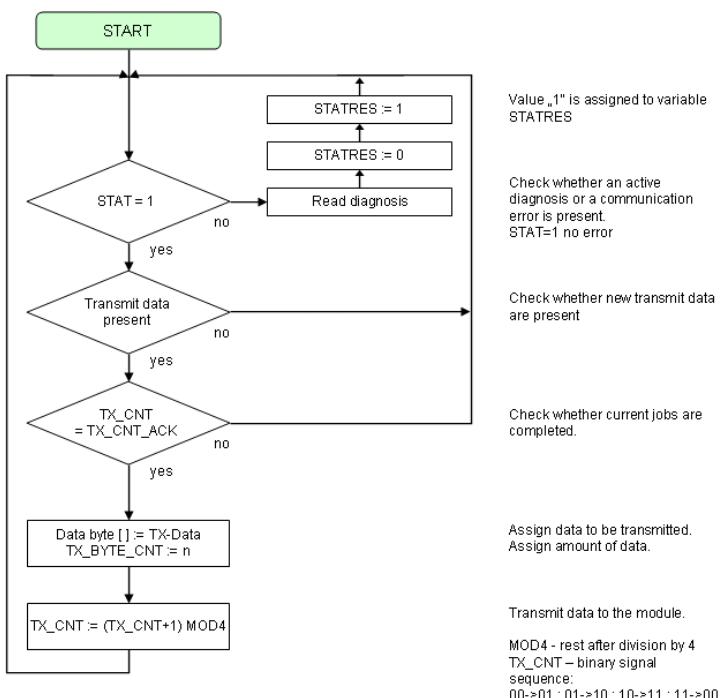
*Table 116:
Meaning of the
data bits
(process output)*

Designation	Value	Meaning
RXBUF FLUSH	0 - 1	<p>This bit is used to flush the receive-buffer.</p> <p>If STATRES = 1: The command RXBUF FLUSH = 1 is ignored.</p> <p>If STATRES = 0: RXBUF FLUSH = 1 causes the flushing of the receive-buffer.</p>
TXBUF FLUSH	0-1	<p>This bit is used to flush the transmit-buffer.</p> <p>If STATRES = 1: The command TXBUF FLUSH = 1 is ignored.</p> <p>If STATRES = 0: TXBUF FLUSH = 1 causes the flushing of the tranceive-buffer.</p>
STATRES	0-1	<p>This bit is set to reset the STAT bit in the process input data.</p> <p>With the change from 1 to 0 the STAT bit is reset (from 0 to 1).</p> <p>If this bit is 0, all changes in TX_BYT_CNT, TX_CNT and RX_CNT_ACK are ignored.</p> <p>Flushing the transmit-/ receive-buffer with RXBUF FLUSH/ TXBUF FLUSH is possible.</p> <p>If this bit is 1 or with the change from 0 to 1, the flushing of the transmit-/ receive-buffer with RXBUF FLUSH/ TXBUF FLUSH is not possible.</p>

RX_CNT_ACK	0-3	The value RX_CNT_ACK is a copy of the value RX_CNT. TX_CNT has been transmitted together with the last data segment of the process input data. TX_CNT_ACK is an acknowledge for the successful transmission of the data segment with RX_CNT.
TX_CNT	0-3	This value is transferred together with every data segment. The TX_CNT values are sequential: 00->01->10->11->00... (decimal: 0->1->2->3->0...) Errors in this sequence show the loss of data segments.
TX_BYTE_CNT	0 - 7	Number of the valid user data in this data segment. In PROFIBUS-DP, the data segments contain a maximum number of 6 bytes of user data.

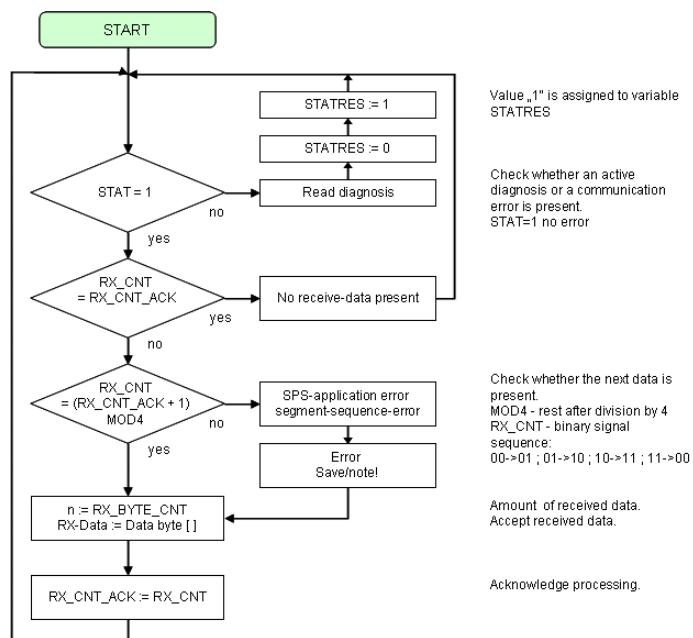
Schematic Diagram of the Transmit Sequence

Figure 198:
Schematic
diagram of the
transmit sequence



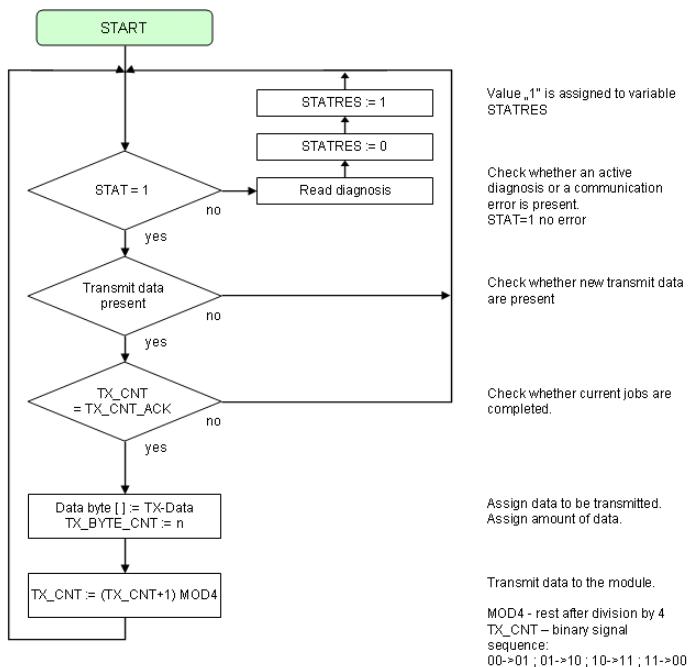
Schematic diagram of the receive sequence

Figure 199:
Schematic
diagram of the
receive sequence



Schematic diagram of the transmit sequence

Figure 200:
Schematic
diagram of the
transmit sequence

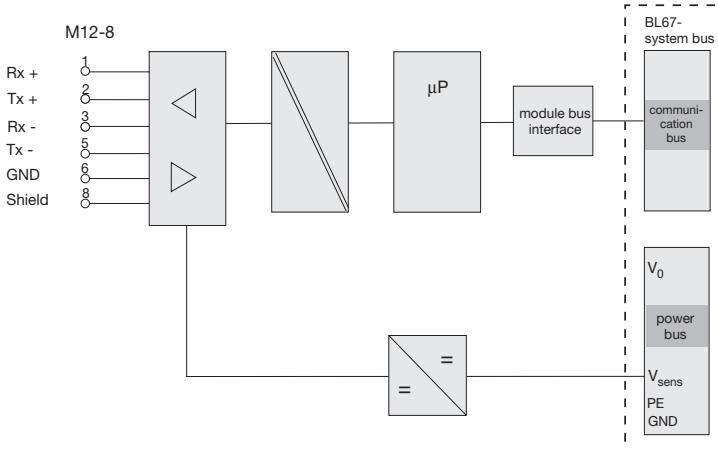


Technical Data

Figure 201:
BL67-1RS485/422



Figure 202:
Block diagram
BL67-1RS485/422



<i>Tabelle 117:</i> <i>Technical data</i> BL67-1RS485/422	Designation	BL67-1RS485/422
	Number of RS485/422-interfaces	1
	Nominal voltage via supply terminal	18 VDC
	Nominal current from supply terminal (field) I_L	25 mA
	Voltage from module bus	4,75 to 5,25 VDC
	Nominal current consumption from 5 VDC (module bus) I_{MB}	60 mA
	transmission channels	RxD, TxD
	Data buffer	
	Receive buffer	128 byte
	Transmit buffer	64 byte
	RS422 connection type	Two wire simplex or four wire full-duplex
	RS485 connection type	Two wire half-duplex
	Bit transmission rate	max. 115200 Bit/s (parameterizable)
	U_{RS1} (active)	> 500 mV
	U_{RS0} (inactive)	0 to 200 mV
	U_{GLRS} (common mode)	-7 to 12 mV
	RS485/422 cable length	max. 30 m
	Cable impedance	120 Ω
	Bus terminating resistors	120 Ω (external)

isolation voltage	
U_{TMB} (module bus/ field voltage/ RS485)	max. 1000 VDC
U_{Field} (field voltage/ RS485)	0 V

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

Table 118:
*Diagnosis/ Status
via LEDs*

	LED	Display	Meaning	Remedy
	D	Red	Module bus communication failure	Check if more than two ad-joining electronic modules have been pulled. This concerns modules located between this module and the gateway.
		Red flashing, 0,5 Hz	Diagnosis pending	-
		Off	No error messages or diagnostics	-
	TxD	Green	Data actually sent	-
		Off	No data sent actually	-
	RxD	Green	Data actually received	-
		Off	No data actually received	-

Diagnosis via Software

The module has the following diagnostic data available.

*Table 119:
Diagnosis*

Diagnostic message	
Buffer Overflow	Overflow of the receive-buffer (RX-buffer).
Frame error	The module has to be parameterized for adaptation to the data structure of the data terminal equipment (DTE). A frame error occurs in case of inconsequential parameterization (number of data bits, stop bits, method of parity,...).
Data flow control error	The DTE connected to the module does not react to XOFF or RTS handshake. The internal receive-buffer may overflow (buffer-overflow = 1).
Hardware failure	The module has to be replaced (e.g. error in EEPROM or UART)
Parameterization error	The parameter settings can not be supported.

Module Parameters

Table 120:
Module
parameters

A default-
settings

Parameter name	Value
Diagnostic	release block A
Disable ReducedCtrl	Constant setting: The diagnosis messages are set in Byte 6 of the process input data (independent of "diagnostic"). Byte 6 of the process output data contains two bits which may set to flush the transmit- or the receive-buffer. Byte 7 contains the status- or the control-byte. Bytes 0 to 5 contain the user data.
Data rate	300 Bit/s 600 Bit/s 1200 Bit/s 2400 Bit/s 4800 Bit/s 9600 Bit/s A 14400 Bit/s 19200 Bit/s 28800 Bit/s 38400 Bit/s 57600 Bit/s 115200 Bit/s
Data bits	7 A 8

Parity	none	-
	odd A	The number of the bits set (data bits and parity bit) is odd.
	even	The number of the bits set (data bits and parity bit) is even.
Stop bits	1	Number of stop bits is 1.
	2 A	Number of stop bits is 2.

Base modules/ Pin assignment

■ BL67-B-1M12/ BL67-B-1M12-8

Figure 203:
BL67-B-1M12-8/
BL67-B-1M12

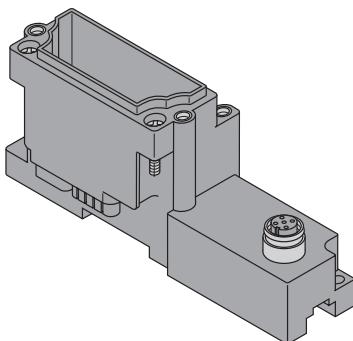


Figure 204:
Pin assignment
BL67-1RS485/422
with BL67-B-1M12

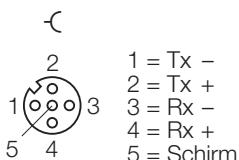
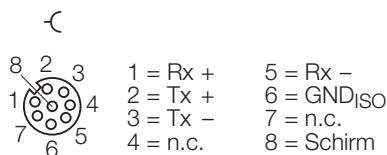


Figure 205:
Pin assignment
BL67-1RS485/422
with
BL67-B-1M12-8



■ BL67-B-1M23

Figure 206:
BL67-B-1M23

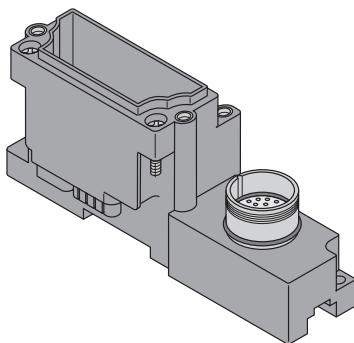


Figure 207:
Pin assignment
BL67-1RS485/422
with BL67-B-1M23



1 = Rx +	7 = n.c.
2 = Tx +	8 = Schirm
3 = Tx -	9 = n.c.
4 = n.c.	10 = n.c.
5 = Rx +	11 = Tx -
6 = GND (iso)	12 = n.c.

BL67-1SSI

The BL67-1SSI module is used for connecting SSI encoders with a maximum word length of 32 bits and a maximum bit transmission rate of 1Mbit/s. It provides a 24 VDC (500 mA) power supply.

In order to read SSI encoder data, the module outputs a clock signal with which the encoder value can be read via the signal input. The clock signal and the signal input are based on the RS422 protocol.

Transmission procedure

The BL67-1SSI module enables the SSI data to be transferred according to the requirements of the application. The parameters of the module can be configured by the user to set up a functional transmission procedure as required.

- Gray code or binary code data transmission is possible.
- Bit transmission rates from 62.5 Kbit/s to 1 Mbit/s are possible.

The SSI encoder value can be represented in a data frame with between 1 to 32 bits. Bits can be deactivated at both the LSB and MSB side of the frame. At the MSB side this is done by a masking operation, which causes invalid bits to be set to 0. At the LSB side, the invalid bits are removed by shifting the entire data frame to the right. The missing bits on the MSB side are filled with zeros.

Data exchange

The process output data is transmitted from the PLC to the BL67-1SSI module, whilst the process input data is transferred from the module to the PLC.

The process output data is used for writing the registers and requesting data from them. It is possible to stop the communication with the SSI encoder and activate or deactivate comparison operations.

The process input data is used for reading the contents of the registers inside the modules. In this case, the SSI encoder value is part of the register. The writing of these registers can be controlled. The results of different comparison operations can be supplied, and the communication status with the SSI encoder can also be displayed. Status messages that were generated by the connected SSI encoder can be passed to the PLC as process input data.

The diagnostics messages are also embedded in the process input data.

The parameter and diagnostics interface allows acyclic data to be transferred in addition to this cyclic data. The parameters for the data transmission on the SSI module, such as bit transmission rate, telegram length etc. are set via the parameter interface. The diagnostics interface supplies the higherlevel system with error messages, such as parameter errors.

Internal registers - read and write operations

The SSI module is provided with a universal register interface that enables access to up to 64 registers. These are accessed via the process data.

For write access, it must be ensured beforehand that the register write interface is in the default status and that a write access operation is therefore not currently active. This is ensured if REG_WR = 0 in the process output data, and is confirmed in the process input data with REG_WR_AKN = 0. Write access is then possible. The following values must be transferred with the process output data for this:

- REG_WR_ADR = Register address,
- REG_WR_DATA = Value to be written (32 bit)
- REG_WR = 1 (write command)

The SSI module acknowledges the processing of the write command via the process input data by signalling REG_WR_AKN = 1. REG_WR_ACCEPT = 1 in the process input data confirms whether the write operation to the register was successfully completed. If the register could not be written (no access authorisation, out of value range, ...), this is indicated by REG_WR_ACCEPT = 0. The write operation must then be terminated by REG_WR = 0 in order to resume the default state.

The address specified at REG_RD_ADR of the process output data is used for read access. The read register content is entered in REG_RD_DATA (bytes 4-7) if the address at REG_RD_ADR was accepted in the process input data and if REG_RD_ABORT = 0 confirms that the register was read error-free. REG_RD_ABORT = 1 indicates that the register could not be read. REG_RD_ADR in the process input data then contains the address that could not be accessed successfully. The user data is then set to ZERO.

Register access and meaning

Table 121:
*Register access
and meaning*

Designation	Description	Default (HEX)
REG_SSI_POS	Actual binary SSI encoder value	
REG_MAGIC_NO 1	Magic number (0xaaa55cc33)	
REG_HW_VER 2	Hardware version	
REG_SW_VER 3	Software version	
REG_SF 4	Special Function register	
REG 5	Reserve	
...		
REG_WR_ADR 14	ointer register OUT	
PREG_RD_ADR 15	Pointer register IN	
REG_DIAG1 16	Diagnostics data	
REG 17	Reserve	
...		
REG_PARA1 20	Parameter data	0 x 19 01 00 00
REG 21	Reserve	
...		
REG_GRAY_POS 32	32 Actual Gray-coded SSI encoder value.	
REG_SSI_FRAME 33	33 Complete frame read from SSI encoder.	
REG_CMP1 34	Comparison value 1	0 x 00 00 00 00
REG_CMP2 35	Comparison value 2	0 x 00 00 00 00

REG	36	Reserve	
...			
REG_LOWER_LIMIT	484	Lower limit	0 x 00 00 00 00
REG_UPPER_LIMIT	49	Upper limit	0 x FF FF FF FF
REG_OFFSET	50	Offset value	0 x 00 00 00 00
REG_SSI_MASK	51	Selection of the SSI encoder diagnostics transferred to the diagnostics interfaces	0 x 00 00 00 00
52 to Reserve			
	63		

9

Designation	Process output interface	Storage in module	Proces input interface	Param. interface	Diag. interface
REG_SSI_POS	0		RD		
REG_MAGIC_NO	1		RD		
REG_HW_VER	2		RD		
REG_SW_VER	3		RD		
REG_SF	4	WR	Non-retentive	RD	
REG	5				
...					
REG_WR_ADR	14		RD		
REG_RD_ADR	15		RD		
REG_DIAG1	16		RD		RD

Technology-Modules

Designation		Proc. output interf.	Storage in module	Proc. input interf.	Param. interf.	Diag. interf.
REG	17					
	...					
REG_PARA1	20	WR	Retentive	RD	WR	
REG	21					
	...					
REG_GRAY_POS	32			RD		
REG_SSI_FRAME	33			RD		
REG_CMP1	34	WR	Non-retentive	RD		
REG_CMP2	35	WR	Non-retentive	RD		
	...					
REG_LOWER_LIMIT	48	WR	Retentive	RD		
REG_UPPER_LIMIT	49	WR	Retentive	RD		
REG_OFFSET	50	WR	Retentive	RD		
REG_SSI_MASK	51	WR	Retentive	RD		
REG	52					
	...					
REG	63					

Comparison value 1, Comparison value 2

The recorded encoder position can be compared with two loadable values. The character "x" below stands for "1" or "2". The register contents are loaded into the register REG_CMPx using in a write operation. The comparison functions are activated by setting bit EN_CMPx = 1 in the process output data. The results of the continuous comparison operations are displayed in the process input data via STS_CMPx, REL_CMPx and FLAG_CMPx. Bit REL_CMPx indicates as the actual status message the relation of the actual value (register content of REG_SSI_POS) to the comparison value (register content of REG_CMPx). Bit STS_CMPx is non-retentive and indicates whether the current actual value (REG_SSI_POS) and the comparison value (REG_CMPx) match. FLAG_CMPx is also used as a marker to indicate that the status (REG_SSI_POS = REG_CMPx) is present or lost. This bit must be reset by the application via the process output data using CLR_CMPx = 1. If the comparator is inactive (EN_CMPx = 0), the signals from STS_CMPx, REL_CMPx and FLAG_CMPx are always zero.

Table 122:
Comparator
enable

A

*The value Z0 of this flag is 1 as soon as the comparison values match. The value stays 1 until it is reset.

Comparator EN_CMPx = 0	
Process input data	Proces output data
	REL_CMPx = 0 STS_CMPx = 0 FLAG_CMPx = 0
Comparator EN_CMPx = 1	
Process input data	Proces output data
(REG_SSI_POS) < (REG_CMPx)	REL_CMPx = 1 Reset the Flag FLAG_CMPx STS_CMPx = 0 with CLR_CMPx = 1 FLAG_CMPx = Z0A
(REG_SSI_POS) > (REG_CMPx)	REL_CMPx = 1 Reset the Flag FLAG_CMPx STS_CMPx = 0 with CLR_CMPx = 1 FLAG_CMPx = Z0A
(REG_SSI_POS) = (REG_CMPx)	REL_CMPx = 1 STS_CMPx = 1 FLAG_CMPx = 1 Rücksetzen von FLAG_CMPx nicht möglich, solange Gleichheit besteht

Lower limit, upper limit

The recorded encoder position can be compared with up to two loadable limit values. The upper limit value must be entered in the REG_UPPER_LIMIT register and the lower limit value in REG_LOWER_LIMIT. Writing these registers with values that are different to the default values will activate the monitoring of the limits, and bits STS_OFLW and STS_UFLW will be enabled in the process input data. The diagnostics function will indicate the presence of values above or below the default values.

“Encoder value overflow” and “Encoder value underflow” signals will also indicate this via the acyclic diagnostics interface.

The limit values are set by default to the maximum and minimum value.

*Table 123:
Overflow of the
encoder values*

Register access	Process input data	Diagnostics
REG_UPPER_LIMIT at default-value FFFFFFFFFFh	→ STS_OFLW = 0	Value: 0
Register content of REG_UPPER_LIMIT less than FFFFFFFFh	(REG_SSI_POS) ≤ (REG_UPPER_LIMIT) → STS_OFLW = 0 (REG_SSI_POS) > (REG_UPPER_LIMIT) → STS_OFLW = 1	Value: 0 Value: 1 Text: Encoder value overflow

Table 124:
Underflow of the
encoder values

Register access	Process input data	Diagnostics
REG_LOWER_LIMIT at default-value 00000000h	$\rightarrow \text{STS_UFLW} = 0$	Value: 0
Register content of REG_LOWER_LIMIT greater than 0	$(\text{REG_SSI_POS}) \geq (\text{REG_LOWER_LIMIT})$ $\rightarrow \text{STS_UFLW} = 0$	Value: 0
	$(\text{REG_SSI_POS}) < (\text{REG_LOWER_LIMIT})$ $\rightarrow \text{STS_UFLW} = 1$	Value: 1 Text: Encoder value underflow

Offset function / load value

This function is activated by writing the REG_OFFSET register with a value $<> 0$. The content of the register is then subtracted from the SSI encoder value and stored in REG_SSI_POS. All limit values, such as lower limit, upper limit, comparison value 1, comparison value 2 then refer to the newly calculated value (REG_SSI_POS).

The calculation is thus:

$$(\text{REG_SSI_POS}) = \text{SSI encoder} - (\text{REG_OFFSET})$$

This function can be deactivated by writing the REG_OFFSET with zero.

Status messages of the SSI encoder

Some SSI encoders not only transfer the position value in the data frame that they transfer to the module but also supply additional status messages. It is useful to include these status messages in the application in order to analyse the measured value.

Writing the REG_SSI_MASK register allows up to four individual bits to be taken from the data frame of the SSI encoder and transferred to the SSI_STSx bits of the process input data. It is also possible to output the “SSI encoder group diagnostics message” with an acyclic diagnostics operation when a status message is initiated.

Table 125:
Masking with
REG_SSI_MASK

Process input data	REG_SSI_MASK							
	Byte	B7	B6	B5	B4	B3	B2	B1
SSI_STS0	0	EN_D0_RMS0	EN_D0_DS	X	SSI_FRAME_BIT_SEL0			
SSI_STS1	1	EN_D1_RMS1	EN_D1_DS	X	SSI_FRAME_BIT_SEL1			
SSI_STS2	2	EN_D2_RMS2	EN_D2_DS	X	SSI_FRAME_BIT_SEL2			
SSI_STS3	3	EN_D3_RMS3	EN_D3_DS	X	SSI_FRAME_BIT_SEL3			

Table 126:
Description of the
diagnosis
messages

A default

Designation	Value	Description
EN_Dx_RMSx	0 A	The transfer of the SSI status messages to the process input data is not activated
	1	The transfer of the SSI status messages to the process input data is activated
EN_Dx_DS	0 A	The evaluation of the SSI status messages for bit 0 of the diagnostics is not activated
	1	The evaluation of the SSI status messages for bit 0 of the diagnostics is activated.
SSI_FRAME_BIT_SEL	0-31	Definition of the selected bits in the frame of the SSI encoder to be evaluated or copied. Default:0

The following applies to bit 0 (SSI group diagnostics) of the diagnostics interface and SSI_DIAG of the process input data:

(SSI_STS0 & EN_D0_DS) || (SSI_STS1 & EN_D1_DS) || (SSI_STS2 & EN_D2_DS) || (SSI_STS3 & EN_D3_DS)

Resetting the register bank

If register REG_SF is written with the signature:

“LD20” = 6C643230hex,
all default values of the retentive registers (incl. parameter registers)
are reset.

If register REG_SF is written with the signature:

“LD48” = 6C643438hex
all default values of the retentive registers except the parameter
registers are reset.



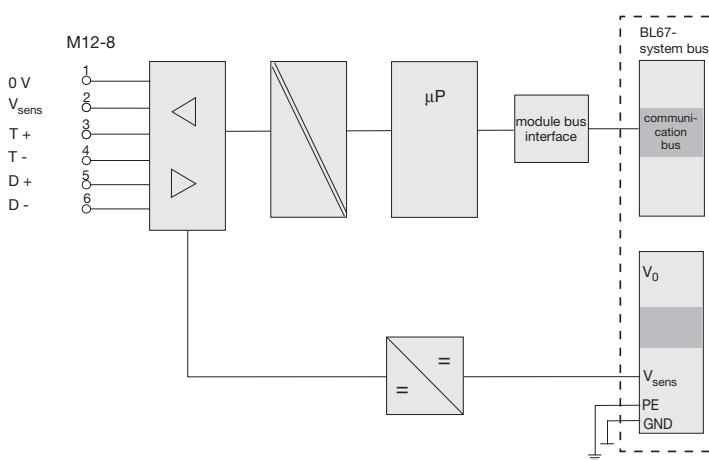
Hinweis

Overwritten values are lost.

Figure 208:
BL67-1SSI



Figure 209:
BL67-1SSI



The module is provided with two RS422 interfaces that form one SSI interface. One RS422 interface works as the clock generator for reading the data, which is then received on the other RS422 interface.

Technical Data

Table 127:
Technical data
BL67-1SSI

	Designation	BL67-1SSI
	Number of serial interfaces	1
	Encoder voltage	24 VDC (-15% / +20%)
	Encoder current	500 mA (not short-circuit proof)
	U_{RS1} (active)	> 500 mV
	U_{RS0} (inactive)	0 to 200 mV
	U_{GLRS} (common mode)	-7 to 12 mV
	Clock output type	RS422
	Signal input type	RS422
	RS422 cable length	max. 30 m
	Nominal voltage from supply terminal	24 VDC
	Nominal current from supply voltage (field) I_L	25 mA (without encoder current)
	Nominal current consumption at 5 VDC (module bus) I_{MB}	50 mA
	Power loss of the module	< 1 W
	U_{TMB} (module bus/ field voltage)	1000 VDC
	U_{FE} (field voltage/ functional earth)	1000 VDC
	U_{Field} (field voltage/ IOs)	0 V

Diagnostic/ Status Messages

Diagnosis via LEDs

*Tabelle 128:
Diagnosis via
LEDs*

	LED	Display	Meaning	Remedy
	D	Red	Module bus communication failure	Check if more than two adjoining electronic modules have been pulled. This concerns modules located between this module and the gateway.
		Red flashing, 0,5 Hz	Diagnosis pending	-
		Off	No error messages or diagnostics	-
	UP	Green	Direction of movement upwards	-
		Off	No upwards direction of movement	-
	DN	Green	Direction of movement downwards	-
		Off	No downwards direction of movement	-

Diagnosis via Software

The module has the following diagnostic data available.

*Table 129:
Diagnosis*

Diagnostic message	
SSI group diagnostics	Status messages of the SSI encoder present.
Open circuit	SSI encoder signal faulty (e.g. due to a cable break).
Sensor value overflow	SSI encoder value above upper limit. Overflow occurred.
sensor value underflow	SSI encoder value below lower limit. Underflow occurred.
Parameter error	Operation of the module is not possible with the present parameter set.

Module Parameters

Table 130:
Module
parameters

A default-
settings

Parameter name	Value	Description
sensor idle data cable test	Activate A	ZERO test of data cable.
	Deactivate	After the last valid bit, a ZERO test of the data cable is not carried out.
invalid bits (LSB)	"0" to "15"	<p>Number of invalid bits on the LSB side of the position value supplied by the SSI encoder.</p> <p>The meaningful word width of the position value transferred to the module bus master is as follows:</p> <p><code>SSI_FRAME_LEN - INVALID_BITS_MSB - INVALID_BITS_LSB</code>. The invalid bits on the LSB side are removed by shifting the position value to the right, starting with the LSB.</p> <p>(Default 0 Bit = 0x 0).</p> <p><code>INVALID_BITS_MSB + INVALID_BITS_LSB</code> must always be less than <code>SSI_FRAME_LEN</code>.</p>

A default-settings

Parameter name	Value	Description
invalid bits (MSB)	"0" to "7"	Number of invalid bits on the MSB side of the position value supplied by the SSI encoder. The meaningful word width of the position value transferred to the module bus master is as follows: SSI_FRAME_LEN - INVALID_BITS_MSB - INVALID_BITS_LSB. The invalid bits on the MSB side are zeroed by masking the position value. INVALID_BITS_MSB + INVALID_BITS_LSB must always be less than SSI_FRAME_LEN. Default: 0 = 0hex
Data rate	1000000 Bit/s 500000 Bit/s A 250000 Bit/s 125000 Bit/s 100000 Bit/s 83000 Bit/s 71000 Bit/s 62500 Bit/s	
Data frame bits	1 to 32	Number of bits of the SSI data frame. SSI_FRAME_LEN must always be greater than INVALID_BITS. Default: 25 = 19 hex
Data format	Binary coded GRAY coded	SSI encoder sends data in binary code SSI encoder sends data in Gray code

Number of data frame bits:

INVALID_BITS_MSB: Number of invalid bits (MSB)

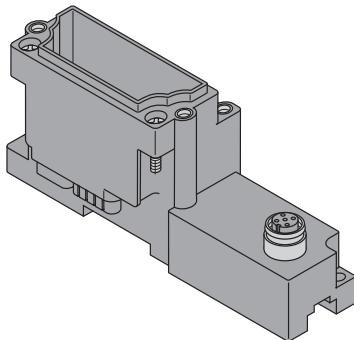
INVALID_BITS_LSB: Number of invalid bits (LSB)

INVALID_BITS: INVALID_BITS_MSB + INVALID_BITS_LSB

Base modules/ Pin assignment

- BL67-B-1M12-8

Figure 210:
BL67-B-1M12-8



9

Figure 211:
Pin assignment
BL67-1SSI with
BL67-B-1M12-8



Technology-Modules

■ BL67-B-1M23

Figure 212:
BL67-B-1M23

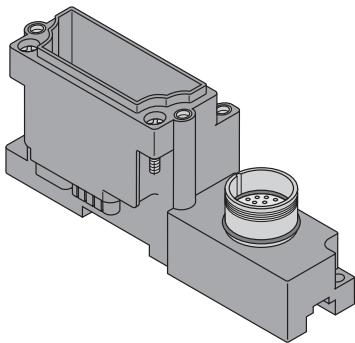


Figure 213:
Pin assignment
BL67-1SSI with
BL67-B-1M23

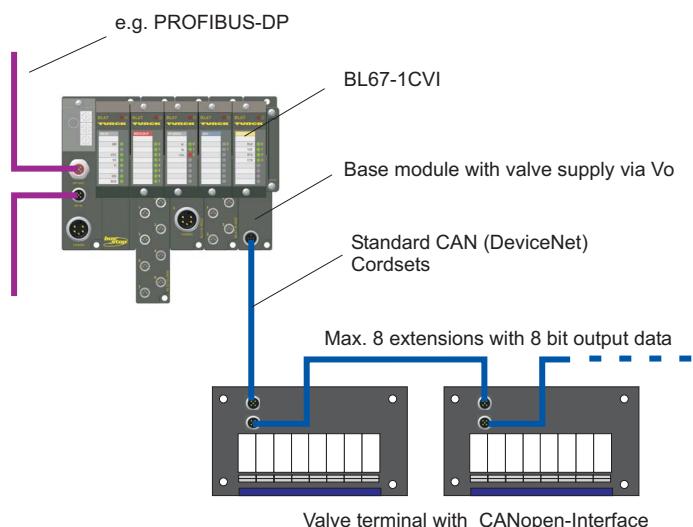


1 = GND	7 = n.c.
2 = V_{SENS}	8 = Schirm
3 = CLK +	9 = n.c.
4 = CLK -	10 = n.c.
5 = Data +	11 = n.c.
6 = Data -	12 = n.c.

BL67-1CVI

The module BL67-1CVI is an interface to the CAN-Bus. It serves to connect simple digital CANopen device (e.g. valve terminals of different manufacturers) to a BL67-System.

Figure 214:
Example for connecting valve terminals to
BL67-1CVI



Technical Data

Figure 215:

BL67-1CVI



Figure 216:

Block diagram
BL67-1CVI

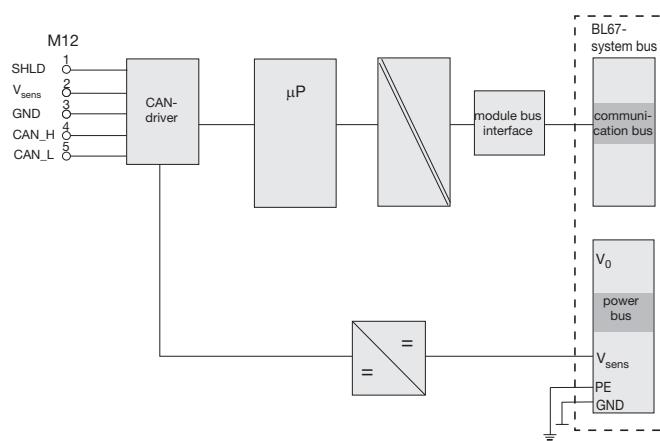


Table 131:
Technical data[^]

Designation	BL67-1CVI
Number of channels	1
Nominal voltage from supply terminal	24 V DC
Load voltage V_o	24 V DC
Voltage range	18 to 30 VDC
Nominal current consumption at 5 VDC (module bus) I_{MB}	$\leq 30 \text{ mA}$
Nominal current from supply voltage (field) I_L	< 100 mA (at load current = 0)
Power loss of the module, typical	< 1,5 W

CAN

U_{RS1} (active)	min. 500 mV
U_{RS1} (inactive)	max. 200 mV
U_{GLRS} (common mode)	-7 to 12 V

Power supply (valve electronic)

Output current	
High level I_A (nominal value)	0,5 A
High-level I_{AMAX}	0,6 A (acc. to IEC 6 1131-2)
Switch-on resistance R_{ON}	190 mΩ
Synchronisation factor	100%
Switch-off characteristic K_A	
$I_{OUT} > 1.5 \text{ A}$	< 4 ms
$1.0 \text{ A} < I_{OUT} \leq 1.5 \text{ A}$	< 10 s
$0,6 \text{ A} < I_{OUT} \leq 1.0 \text{ A}$	min. 10 s / max. 60 s

Power supply (valves)

Output current

High level I_A (nominal value)	1 A
High-level $I_{A\text{MAX}}$	1,2 A (acc. to IEC 6 1131-2)
Switch-on resistance R_{ON}	95 mΩ
Synchronisation factor	100%
Switch-off characteristic K_A	
$I_{OUT} > 3 \text{ A}$	< 4 ms
$2 \text{ A} < I_{OUT} \leq 3 \text{ A}$	< 10 s
$1,2 \text{ A} < I_{OUT} \leq 2 \text{ A}$	min. 10 s/ max. 60 s
Isolation voltage	
U_{TMB} (module bus/ field/ CAN)	max. 1000 V DC
U_{Feld} (field/ CAN)	0 V DC
U_{Feld} (Supply valve electronic/ CAN)	0 V DC
U_{Feld} (supply valves/ CAN)	0 V DC
Short-circuit proof	yes, acc. to EN 61 131-2

Process Data

The process data of the CVI-module mirror the data of the connected CANopen-nodes depending on their parameterization (see Table 137: „Configuration possibilities for the CANopen-nodes”).

The process data begin with the data of the node with the lowest address, followed by the data of all other modules in chronological order. This applies to both, in- and output data.



Note

The input data of not connected or disturbed CANopen-nodes are assumed as "0".

Diagnostic/ Status Messages

Diagnosis/ Status via LEDs

<i>Table 132: Diagnosis/ Status via LEDs</i>	LED	Display	Meaning	Remedy
	D	Red	Module bus communication failure	Check if more than two adjoining electronic modules have been pulled. This concerns modules located between this module and the gateway.
		Red, flashing, 0,5 Hz	Diagnosis pending	
		Off	No error messages or diagnostics	-
	BUS	Orange (+ Error = Red)	Not all configured CANopen-nodes are online and in Operational mode.	Please check the connected CANopen-nodes.
		Green	All configured CANopen-nodes are online and in Operational mode.	
	Error	Red	Communication between interface and other bus nodes disturbed: - CAN BusOff - Heartbeat- error - Guarding- error - Transmit-Timeout	Control the CAN-communication between the nodes
		Off	Communication between CVI and other bus nodes OK	

VE	Green	Valve electronic power supply is switched on.
	Red	Over load / short-circuit in valve electronic power supply
	Off	Valve electronic power supply is switched off.
VC	Green	Valve power supply is switched on.
	Red	Over load / short-circuit in valve power supply
	Off	Valve power supply is switched off.

Diagnosis via Software

The module has the following diagnostic data available.

Table 133:
Diagnosis data

Name	Description
DiagNode x	Diagnostic messages of the respective node (see Table 134: „Diagnosis data of the CANopen-nodes“)
DiagCVI	Global diagnostic messages of the CVI-module (see Table 135: „Global diagnosis of the CVI-module“)

Table 134:
*Diagnosis data of
the CANopen-
nodes*

Name	Description
Emergencies transmitted since module start	The emergency messages may already be eliminated. The diagnosis is deleted 10s after eliminating all communication and application errors of all nodes.
Node transmitted emergencies	Node sent emergency messages.
Communication error transmitted since module start/ Guard Time	The communication errors may already be eliminated. The diagnosis is deleted 10s after eliminating all communication and application errors of all nodes.
Communication error/Guard Time timeout	Communication error, for example Guard-Time elapsed

Table 135:
*Global diagnosis of
the CVI-module*

Name	Description
Emergencies transmitted since module start	The emergency messages may already be eliminated. The diagnosis is deleted 10s after eliminating all communication and application errors of all nodes.
Node address not within permissible range (1-8)	This error is only deleted after a module-restart.
Overcurrent VC	Overcurrent at the valve power supply.
Overcurrent VE	Overcurrent at the valve electronic power supply.

Module Parameters

Table 136:
Module
parameters

Parameter name	Description
Configuration Node x	Configuration of the connected node (see Table 137:)
Guarding time [n*0.1s]	Setting the Guard-Time in steps of 100 ms (value 0 to 255); default 3 = 300 ms
Life time factor	Factor which defines how often a node is allowed not to answer a request or to exceed the Guard-Time (values 0 to 255); default = 3
Configuration	Different configuration settings (see Table 137:)

*Table 137:
Configuration
possibilities for
the CANopen-
nodes*

Bit	Parameter name	Description
0	Node x 0 = inactive/ not connected A 1 = active	
1	Guarding 0 = inactive A 1 = active	
2 to 4	Input bits 000 = 0 bit A 001 = 4 bit 010 = 8 bit 011 = 12 bit 100 = 16 bit 101 = 24 bit 110 = 32 bit 111 = reserved	Length of the node's input data.
5 to 7	Output bits 000 = 0 bit A 001 = 4 bit 010 = 8 bit 011 = 12 bit 100 = 16 bit 101 = 24 bit 110 = 32 bit 111 = reserved	Length of the node's output data.

Bit	Parameter name	Description
0 to 2	Data rate 000 = 1000k 001 = reserved 010 = 500k 011 = 250k 100 = 125k A 101 = 50k 110 = 20k 111 = 10k	Baudrate for CANopen
3	Terminating resistor 0 = no terminating resistor A 1 = terminating resistor active	Activation of the bus terminating resistor
4 to 7	reserved	

Base modules/ Pin assignment

- BL67-B-1M12

Figure 217:
BL67-B-1M12

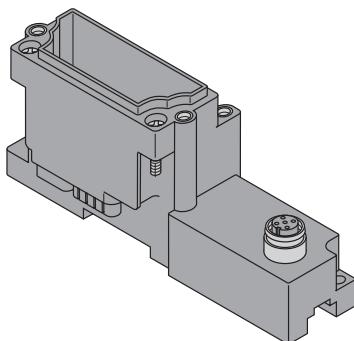
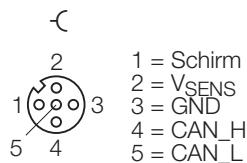


Figure 218:

Pin assignment

BL67-1CVI with

BL67-B-1M12



10 Mounting and Dismounting

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Building up a BL67 station	4
Mounting a Gateway	4
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Mechanical Mounting

General Mounting Rules

- BL67 is designed to be mounted on a mounting plate or on mounting rails directly at the machine.
- A vertical as well as a horizontal mounting of the stations is possible.
- The complete BL67 system is secured to the mounting rail by means of two end brackets. One at each end of the station.
- The gateway is the first electronic component on a BL67 station.
- The electronic modules are mounted subsequently in the order required.
- Potential isolation can be achieved by mounting a Power Feeding module (power distribution) before mounting the next module.
- Power Feeding modules can be mounted between the rest of the modules as required.
- An end plate is mounted at the end of each BL67station to protect the module bus contacts and to guarantee the protection class IP 67.

Building up a BL67 station**Note**

The BL67-station should be assembled completely before mounting it on a mounting plate or a mounting rail.

Mounting a Gateway

The gateway is the first module of a BL67-station.

The electronic modules are mounted on the right side of the gateway.

Mounting a Base Module

- 1 The module bus contacts of the first base module have to be inserted from above into the module bus contacts of the gateway.
- 2 Tighten the screws of the inserted base module.
- 3 All other base modules of the station are mounted identically. Their module bus contacts have to fit into the contacts of the respective left-hand base module.

10

**Attention**

To guarantee the protection class IP67, the screws at the base modules have to be firmly tightened.

Furthermore the seals at the left module bus contacts of the base modules must not be damaged or slipped due to wrong transport, storage or similar.

Mounting the Electronic Modules

Please observe:

- 1 The correct base module must have been previously mounted onto the mounting rail.
- 2 Electronic modules are fitted onto the previously mounted and wired base modules.



Note

Before plugging the electronic modules, it is advisable to blowclean the station with compressed air. This prevents dust and grains of dirt from contaminating the contacts, which can negatively influence the communication on the station.

Method:

- 1 Press the electronic module squarely onto the base module and tighten the two screws on the top of the electronic module.



Attention

To guarantee the protection class IP67, the screws at the base modules have to be firmly tightened.

Furthermore the seal at the lower side of the electronic module housing must not be damaged or slipped due to wrong transport, storage or similar.

Prevention of False Mounting

A mechanical coding element prevents an electronic module from being mounted onto the wrong base module – for example, following a defect in an electronic module. The coding element consists of two pieces and is supplied with every electronic module.

The complete coding element is mounted on the underside of each electronic module. When mounting the electronic module for the

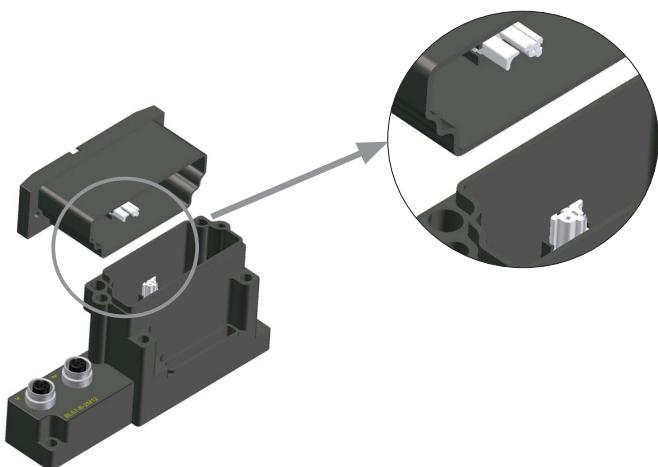
first time, the lower part of the coding element is automatically inserted into the recess provided in the base module.

**Note**

When plugging electronic modules for the first time, an initial resistance must be overcome. This is because the lower part of the coding element has to be pressed into the base module.

Should the electronic module be pulled, one half of the coding element remains in the base module, the other half remains in the electronic module. It is now possible to mount a new electronic module only when its coding matches that of the base module.

Figure 219:
Coding element



Mounting and Dismounting

When replacing an electronic module (plugging a new electronic module), remove and dispose of the lower part of the coding element (that part destined for the base module). The original lower part of the coding element, which remains in the base module, cannot be removed.



Note

When all modules are mounted, the supply to the module bus should be applied to check if the station communication functions correctly (no false mounting, no empty slots, etc.). The field voltage should be applied only when the correct functioning of the station has been established.

End Plate

The end plate is mounted onto the last base module of a station. It is fixed with two screws and serves to protect the module bus contacts and to guarantee the protection class IP67.

Method:

- 1** Insert the end plate into the last base module of the station so that the module bus contacts of the base module are covered by the end plate.
- 2** Tighten both screws of the end plate.



Attention

Without the end plate, the protection class IP67 can not be guaranteed.

Furthermore the seal at the end plate must not be damaged or slipped due to wrong transport, storage or similar.

Mounting of BL67 directly on the Mounting Plate

The BL67 stations can be mounted directly onto a pre-drilled galvanized mounting plate. The mounting plate has to be connected to protective earth (PE).

- Fasten the station on the mounting plate by screws through the holes in the base modules and in the gateway.

FE Connection

The station is connected to functional earth by the FE connection at the upper right drilling of the gateway.



Note

If the mounting plate is not connected to ground, the station has to be grounded via a separate ground terminal at the FE contact of the gateway.

10

Mounting the BL67-stations on a Mounting Rail

The mounting rails used for BL67 should be mounted onto a galvanized mounting plate with a minimum thickness of 2 mm / 0.08 inch.

This allows a reference potential for protective earth (PE) and functional earth (FE) to be created.

Please allow for a maximum distance of 150 mm / 5.91 inch between mounting holes, when mounting non pre-drilled mounting rails.

- 1 Insert a screwdriver into the opening provided in the locking mechanism at the top of the gateway and of the base modules and open the locking mechanism of all modules in the station.
- 2 Tilt the top of the station towards you, position the lower groove provided on the rear of the gateway and each base module onto the lower edge of the mounting rail.
- 3 Tilt the top of the base module away from you and towards the mounting rail and close the locking mechanism at the every module.
- 4 The station is mounted on the mounting rail.

Mounting and Dismounting

Mounting End Brackets

BL67 stations must be fixed securely onto the mounting rail using two end brackets.

Method:

- Clip the end bracket onto the mounting rail. If necessary, loosen the screw beforehand.
- Slide one end bracket up to the gateway and one up to the last module in the station and tighten the screws.

Dismounting a BL67-station**Note**

The complete station should be dismounted from the mounting plate or the mounting rail before disassembling it.

Dismounting from the Mounting Plate

The BL67 stations are dismounted from the mounting plate by loosening all screws at the station.

Dismounting from the Mounting Plate

Please observe the following basic rules when dismounting:

Dismounting of a single component:

- The gateway can only be dismounted from a station after all the base modules located on its right are dismounted.
- Individual base modules can only be removed from a station when all base modules located to its right have been dismounted.

**Warning**

Before dismounting a base module, the supply voltage to the relevant power distribution modules must be switched off. All wires must be disconnected.

Dismounting an entire BL67 station in chronological order.

- Switch off the power to the distribution modules.
- Pull the electronic modules.
- Disconnect wiring.
- Loosen/remove end brackets.
- Dismount base modules.
- Dismount gateway.

Dismounting Electronic Modules

Method:

- Loosen the screws at the front of the electronic modules and pull the electronic module away from the base module.

Dismounting the End Brackets

- Loosen the screws at the end brackets and pull them away from the mounting rail.

Dismounting Base Modules



Warning

The supply voltage to the relevant power distribution modules must be switched off before dismounting a base module.

Please observe:

- Base modules can only be dismounted from the right.
- If one base module in the middle of the station has to be changed, all other base modules on the right have to be dismounted from the mounting rail as well.

Method:

- Disconnect the wiring from the base module.
- Loosen the two screws at the front of the base modules.
- Insert a screwdriver into the opening provided in the locking mechanism at the top of the base module to be changed and of all base modules on its right.
- Pull the base modules away from the mounting rail.

Dismounting the Gateway



Warning

The supply voltage to the gateway must be disconnected before dismounting the gateway. The connection to the field bus must also be disconnected.

Please observe:

- All base modules on the mounting rail must be dismounted.

Method:

- Open the locking hook at the top of the gateway by inserting a screwdriver into the opening of the locking mechanism.
- Pull the gateway away from the mounting rail.

Plugging and Pulling Electronic Modules

10

BL67 enables the pulling and plugging of electronic modules without having to disconnect the field wiring. The BL67 station remains in operation if an electronic module is pulled. The voltage and current supplies as well as the protective earth connections are not interrupted.



Attention

If the electronic modules are plugged or pulled under load with the field and system supplies remaining connected, arc discharges may be caused.

Mounting and Dismounting

11 Module Labeling

General Notes	2
Colors	2
– Color Identification of BL67 Modules	2
Designations/ Ident.-No.	3
Channel Numbering	4
Labeling of the Rotary Coding Switches.....	4
Labels	5

Module Labeling

General Notes

All electrical and electronic components for BL67 stations are supplied with labels to guarantee clear identification. In addition, Turck offers marking and labeling materials which enable individual and application specific labeling of each component.

Fundamentally, the differences are as follows:

Colors

Each electronic module can be recognized immediately by the colored lid imprint (top and bottom).

Color Identification of BL67 Modules

Table 138:
Color identification of modules

Gateway (GW)		grey
Power Feeding modules 24 VDC (PF)		grey
Digital input modules (DI)		white
Analog input modules (AI)		blue
Digital output modules (DO)		red
Analog output modules (AO)		green
Technology modules (e.g. RS232)		yellow

Designations/ Ident.-No.

The designation is imprinted on the top of the electronic modules.

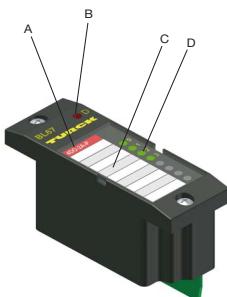
Each module is clearly identified by a Indent-number. The Indent-number as well as further module-specific details (pin assignment of the base modules, etc.) can be found on a label attached to the side of the respective module.

*Figure 220:
Module label*



*Figure 221:
Designation*

- A** module designation
- B** diagnosis-LED
- C** label for application specific use
- D** channel-LEDs



Module Labeling

Channel Numbering

All base module connectors are numbered.

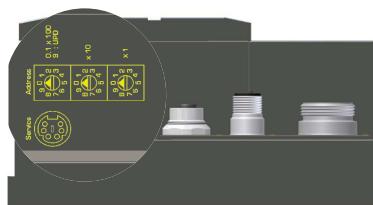
Figure 222:
Channel
numbering



Labeling of the Rotary Coding Switches

The labeling of the rotary coding switches for setting the field bus addresses can be found on the gateway side next to the protection cover.

Figure 223:
Gateway labeling



Labels

Each electronic module is supplied with a label to enable application-specific identification. Labels are available as accessories.

Module Labeling

12 I/O-ASSISTANT Software

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General

The interactive software tool I/O-ASSISTANT supports the entire planning and configuration process of an I/O system. I/O-ASSISTANT helps with planning stations, it configures and sets parameter values, online as well as offline. Furthermore, it is possible to commission the plant and carry out tests and diagnostics on the stations.

The software I/O-ASSISTANT can be operated in two modes:

- Offline (without active connection to the BL67 gateway)
- Online (with active connection to the BL67 gateway)

Offline Mode

The main features and functions in the Offline mode of the software I/O-ASSISTANT are the following:

- Project examples
- Creating, structuring and expanding projects on-screen
- Selecting and including necessary modules and accessories
- Realistic display of Turck I/O products
- Station plausibility testing
- Configuring and setting of parameters for individual stations in offline mode.
- Detailed project documentation
- Online Help
- Generating station specific EDS files

Online Mode

As well as the above, the software I/O-ASSISTANT offers the following additional features in the Online mode:

- Online configuration and parameter setting of individual stations
- Commissioning of stations
- Reading and setting process data
- Diagnostics and troubleshooting
- Downloading new firmware to a BL67 station
- Resetting a BL67 station

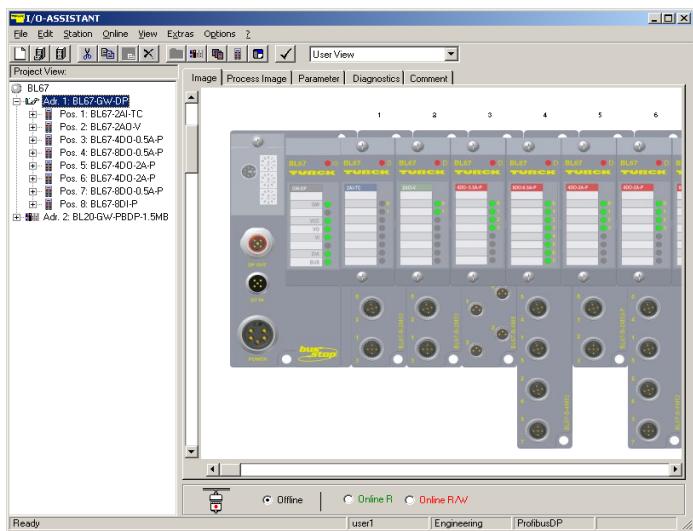


Note

A detailed description of all I/O-ASSISTANT functions and how to work with the program can be found in the Online Help.

I/O-ASSISTANT Software

Figure 224:
Project tree in the
I/O-ASSISTANT



The project tree is displayed on the left-hand side of the main screen. The individual stations are displayed with the gateway and the I/O modules in logical succession.

A realistic graphic display of the station is shown on the right-hand side of the screen (depending on the setting), as well as the corresponding process image, parameter and diagnostics data, and user-specific comments concerning the individual modules.

Installation

I/O-ASSISTANT runs on the operating systems Windows 98, Windows 2000, Windows NT and Windows XP. For online operations, the PC requires a serial COM port and a SUB-D/PS2 adapter cable, both of which are available from Turck.

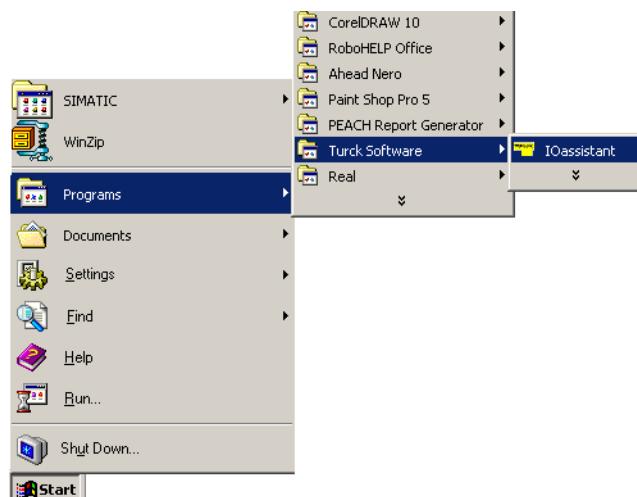
**Note**

To install the full version of the software, follow the instructions included on the CD.

Start the I/O-ASSISTANT via:

"Windows task bar < Start → Programs → Turck Software → I/O-ASSISTANT>"

*Figure 225:
Starting the
software*



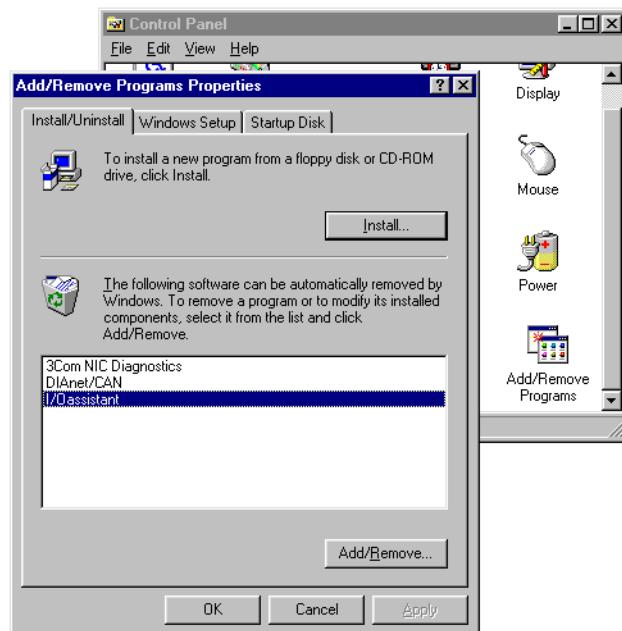
I/O-ASSISTANT Software

Uninstall

Uninstall the software as follows:

"Windows task bar < Start → Settings → Control Panel → Software
→ I/O-ASSISTANT → Install/ Uninstall"

Figure 226:
Uninstall



Offline Functions**Login**

I/O-ASSISTANT has three access levels:

- Engineering
- Service
- Diagnostics

Each of these access levels and its program functions can be assigned to different user profiles. In addition, each level can be protected by a password.

Figure 227:
Login dialog box



- Engineering

On this level, the project engineer has access to all software functions. Stations can be added or deleted.

- Service

On this level, it is not possible to make changes to a project. The stations are tested for plausibility. Station data can be read and transmitted, outputs can be set and parameters adjusted. Following the planning phase, commissioning tests can be carried out on this level.

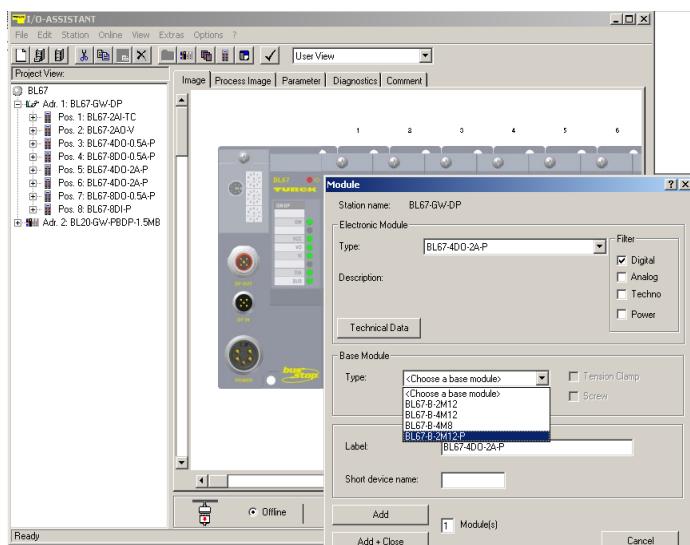
Diagnostics

This level is used for the diagnosis/monitoring of stations during operation. Station data can be transmitted, but not altered.

Engineering

During the engineering phase, a project planning engineer can plan a station, select the I/O modules and set the parameters.

Figure 228:
Planning a BL67
station

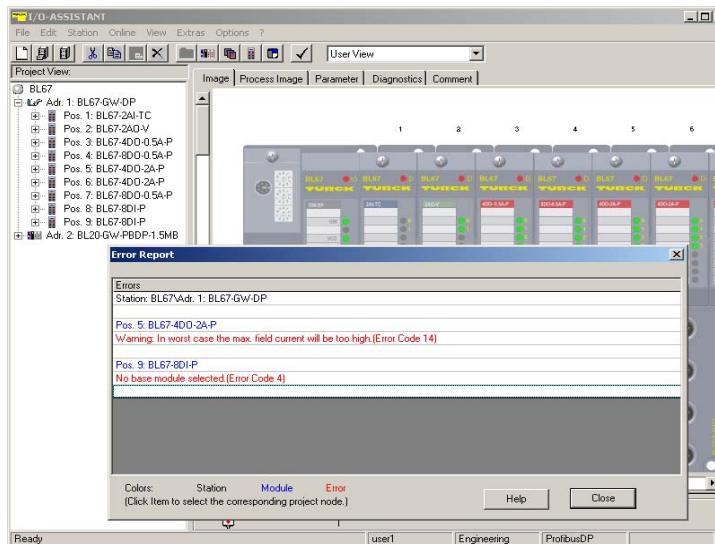


By using the I/O-ASSISTANT in the offline mode, the project planning engineer can plan new projects or make alterations to existing stations.

Plausibility Test

Using I/O-ASSISTANT, it is possible to verify if individual stations and the entire project are physically complete. Planning errors are displayed in an error report.

Figure 229:
Error report



12

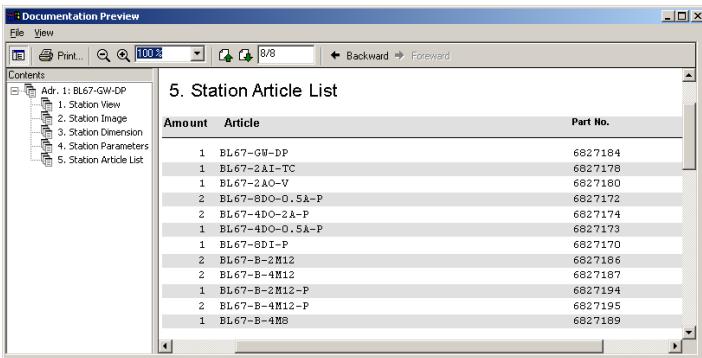
Station Documentation

Documentation can be drawn up for each planned station. The documentation includes a list of components, from which a fax form for ordering can be generated, a view of the station's process, an image of the station, station dimensions and a list of the station's parameters.

I/O-ASSISTANT Software

The list of components contains all products planned for in the project. It is possible to alter the number of components and add other Turck products to the list

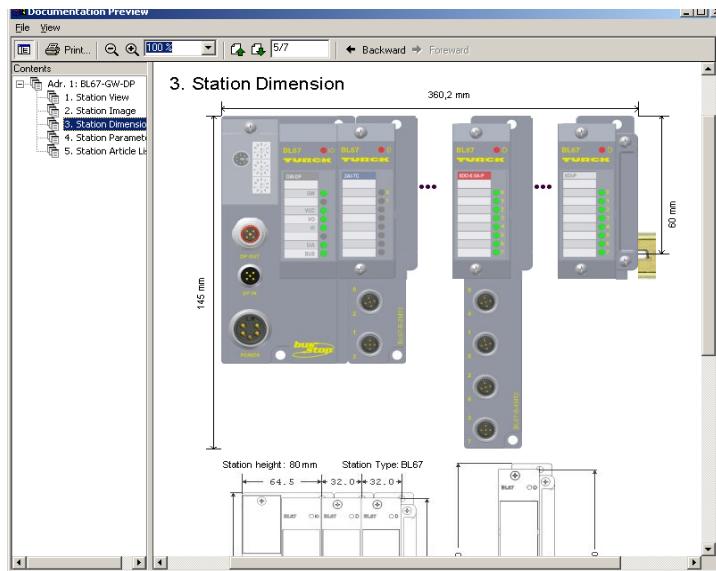
Figure 230:
BL67 article list



This screenshot shows the 'Documentation Preview' window of the I/O-ASSISTANT software. The left sidebar displays a table of contents with five items: 1. Station View, 2. Station Image, 3. Station Dimension, 4. Station Parameters, and 5. Station Article List. The main area is titled '5. Station Article List'. It contains a table with three columns: 'Amount', 'Article', and 'Part No.'. The table lists various BL67 components with their respective part numbers.

Amount	Article	Part No.
1	BL67-GW-DP	6827184
1	BL67-2AI-TC	6827186
1	BL67-2AO-V	6827180
2	BL67-SDO-O_5A-P	6827172
2	BL67-4DO-2AI-P	6827174
1	BL67-4DI-U_5A-P	6827173
1	BL67-8DI-P	6827170
2	BL67-B-2M12	6827186
2	BL67-B-4M12	6827187
1	BL67-B-2M12-P	6827194
2	BL67-B-4M12-P	6827195
1	BL67-B-4MS	6827189

Figure 231:
BL67 Station
dimensions



Online Functions

As well as planning projects offline using I/O-ASSISTANT, it is also possible to access existing stations online. To do so, connect the serial COM-port to the service interface on the station's gateway using a Sub-D/PS2 adapter cable.

The following features are available in online mode:

- Exporting of labels
- Testing wiring
- Displaying the process image
- Setting outputs
- Reading inputs
- Diagnostic functions
- Reading and writing parameters
- Comparing connected and planned stations

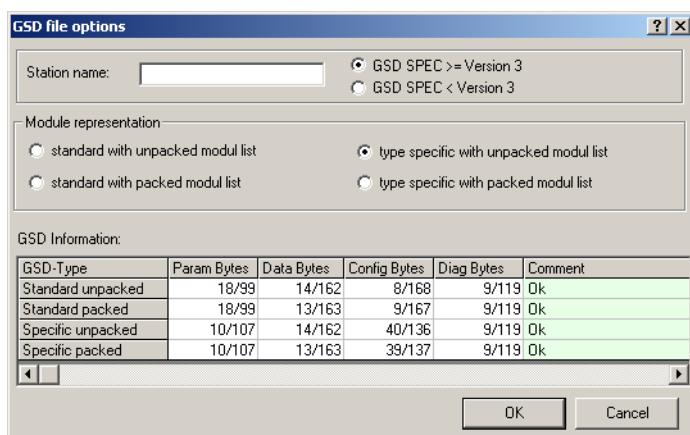
Generating station specific GSD- and EDS-files

For the configuration of fieldbus stations in the PLC software, universal GSD- or EDS-files are used.

The I/O-ASSISTANT offers the possibility to generate station specific files for each BL 67 station after complete configuration.

These files contain only the modules planned in the respective BL67 station including all modules parameters.

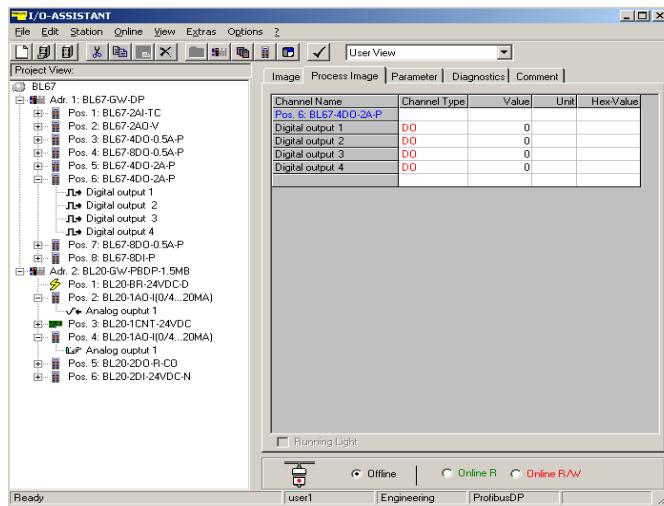
*Figure 232:
Generating a
GSD-file*



Reading a Process Image

When the application is operating, it is possible to visualize the current process image via the service interface, parallel to the fieldbus communication.

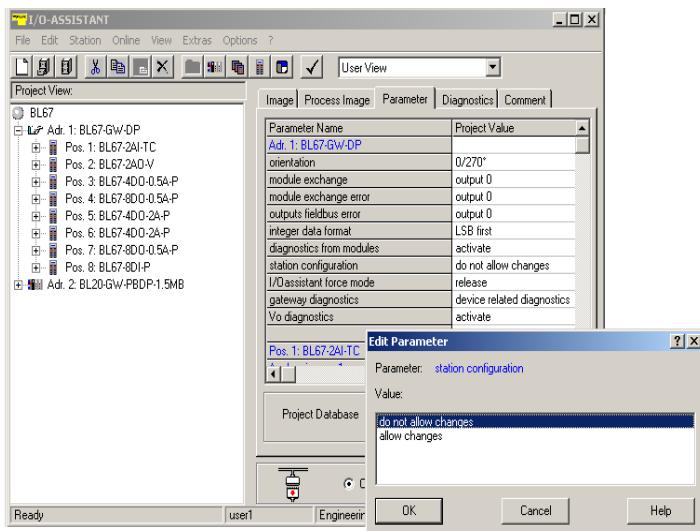
Figure 233:
Project tree with
process data



Reading and Writing Parameters

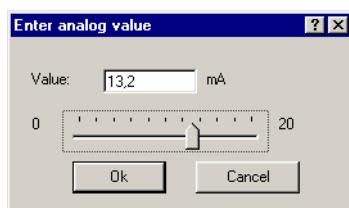
It is possible to read and write parameters in online mode.

Figure 234:
Setting
parameters



I/O-ASSISTANT can force outputs as well as read input data.

Figure 235:
Forcing analog
values



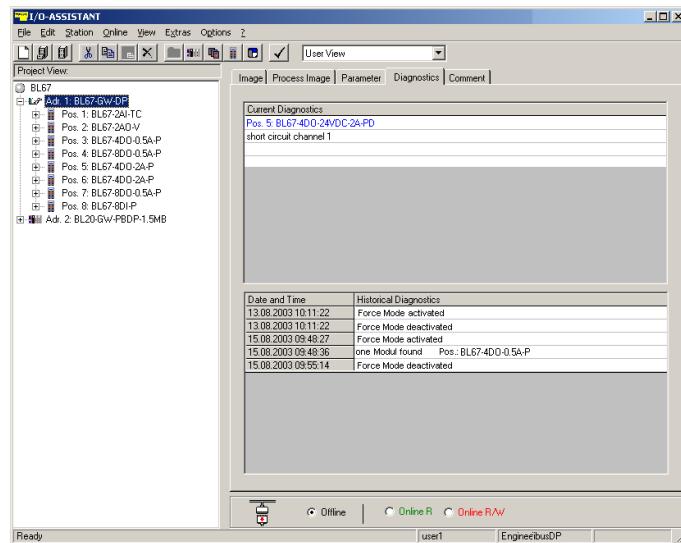
Diagnostics

The software I/O-ASSISTANT reads the diagnostic data of the stations during operation.

The I/O-ASSISTANT indicates the existence of diagnostic data from the gateway and the I/O modules by means of small symbols in the station's image.

The corresponding diagnostic data can be found in plain text in the "Diagnostics" tab. The station-specific diagnostics record is scanned-in from the gateway and displayed on-screen.

*Figure 236:
"Diagnostics" tab
with plain text di-
agnostics and a
history of the
diagnostics*



13 Appendix

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Nominal Current Consumption and Power Loss of the Modules



Note

The nominal current consumption of the modules from the 24 V DC system supply at the gateway or the Power Feeding module are different for each bus system.

Please read the relevant sections in the "Appendix" of the respective gateway manual.

- BL67 gateway for PROFIBUS-DP
(TURCK-Documentation-no.: German D300570/
English D300527)
- BL67 gateway for DeviceNet™
(TURCK-Documentation-no.: English D300528)

Nominal Current Consumption from the Module Bus (5 V DC)
 I_{MB}

Table 139:
Current consumption from the module bus

Module	Supply	Current consumption
Gateway	1500 mA	
Power supply modules		
BL67-PF-24VDC-D		≤ 30 mA
Digital input modules		
BL67-4DI-P		≤ 30 mA
BL67-8DI-P		≤ 30 mA
BL67-4DI-PD		≤ 30 mA
BL67-8DI-PD		≤ 30 mA
BL67-4DI-N		≤ 30 mA
BL67-8DI-N		≤ 30 mA
Analog input modules		
BL67-2AI-I		≤ 35 mA
BL67-1AI-V		≤ 35 mA
BL67-2AI-PT		≤ 45 mA
BL67-2AI-TC		≤ 35 mA
BL67-4AI-V/I		≤ 35 mA

Digital output modules

BL67-4DO-0.5A-P ≤ 30 mA

BL67-4DO-2A-P ≤ 30 mA

BL67-8DO-0.5A-P ≤ 30 mA

BL67-16DO-0.1A-P ≤ 30 mA

BL67-4DO-2A-N ≤ 30 mA

BL67-8DO-0.5A-N ≤ 30 mA

Analog output module

BL67-2AO-I ≤ 40 mA

BL67-2AO-V ≤ 60 mA

Digital combi modules

BL67-4DI/4DO-PD ≤ 30 mA

BL67-8XSG-PD ≤ 30 mA

Technology modules

BL67-1RS232 ≤ 140 mA

BL67-1RS485/422 ≤ 60 mA

BL67-1SSI ≤ 50 mA

BL67-1CVI ≤ 30 mA

**Nominal Current Consumption from Supply Terminal (Field)
 I_L**

Table 140:
Current consumption from supply terminal

A limited by internal short circuit protection (4 A)

B sum of current consumptions must not exceed 10 A

Module	Supply	Nennstromaufnahme aus Feldversorgung	
		aus V_{sens} A	aus V_o B
Gateway	-	-	-
Power supply modules			
BL67-PF-24VDC	11 A		
Digital input modules			
BL67-4DI-P		≤ 40 mA	
BL67-8DI-P		≤ 40 mA	
BL67-4DI-PD		≤ 100 mA	
BL67-8DI-PD		≤ 100 mA	
BL67-4DI-N		≤ 1 mA	
BL67-8DI-N		≤ 1 mA	
Analog input modules			
BL67-2AI-I		≤ 12 mA	
BL67-2AI-V		≤ 12 mA	
BL67-2AI-PT		≤ 45 mA	
BL67-2AI-TC		≤ 30 mA	
BL67-4AI-V/I		≤ 12 mA	

C at load
current = 0

Digital output modules

BL67-4DO-0.5A-P	< 100 mA C
BL67-4DO-2A-P	< 100 mA C
BL67-8DO-0.5A-P	< 100 mA C
BL67-16DO-0.1A-P	< 100 mA C
BL67-4DO-2A-N	< 100 mA C
BL67-8DO-0.5A-N	< 100 mA C

Analog output modules

BL67-2AO-I	\leq 50 mA
BL67-2AO-V	\leq 50 mA

Digital combi modules

BL67-4DI/4DO-PD	\leq 100 mA (from V_{sens} and V_o)
BL67-8XSG-PD	\leq 100 mA (from V_{sens} and V_o)

Technology modules

BL67-1RS232	\leq 50 mA
BL67-1RS485	\leq 25 mA
BL67-1SSI	\leq 25 mA
BL67-1CVI	< 100 mA C

Maximum Power Loss of the Modules

Tabelle 141:
Power loss

Module	max. power loss, typical (P _{max})
Gateway	-
Power supply modules	
BL67-PF-24VDC-D	-
Digital input modules	
BL67-4DI-P	< 250 mW
BL67-8DI-P	< 250 mW
BL67-4DI-PD	< 1,5 W
BL67-8DI-PD	< 1,5 W
BL67-4DI-N	< 1,3 W
BL67-8DI-N	< 1,3 W
Analog input modules	
BL67-2AI-I	< 1 W
BL67-2AI-V	< 1 W
BL67-2AI-PT	< 1 W
BL67-2AI-TC	< 1 W
BL67-4AI-V/I	< 1 W

Digital output modules

BL67-4DO-0.5A-P < 1,5 W

BL67-4DO-2A-P < 1,5 W

BL67-8DO-0.5A-P < 1,5 W

BL67-16DO-0.1A-P < 1,5 W

BL67-4DO-2A-N < 1,5 W

BL67-8DO-0.5A-N < 1,5 W

Analog output modules

BL67-2AO-I < 1 W

BL67-2AO-V < 1 W

Digital combi modules

BL67-4DI/4DO-PD < 1,5 W

BL67-8XSG-PD < 1,5 W

Technology modules

BL67-1RS232 <1 W

BL67-1RS485/422 <1 W

BL67-1SSI < 1 W

BL67-1CVI < 1,5 W

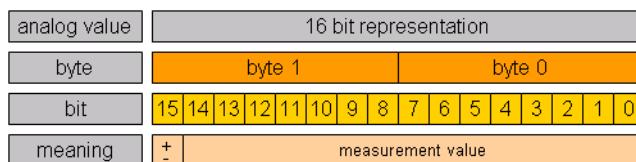
Analog Value Representation (Analog Input Modules)

The analog values can either be represented with 16 bit or 12 bit. The two's-complement representation allows the representation of positive as well as negative values.

16 bit representation:

The 16 bit representation is realized as a two's-complement. 2 byte of process data are completely occupied:

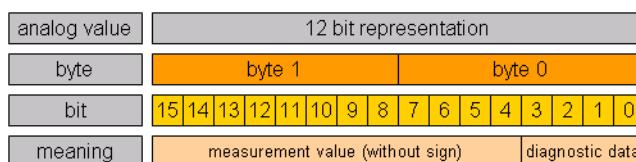
Figure 237:
16 bit
representation



12 bit representation:

In the voltage measurement/ output and in the temperature measurement, the value is represented as a two's-complement. In the current measurement/ output and in the resistance measurement, the value is represented as a dual number. The 12 bit value is left-justified and occupies bit 15 to 4 of the process data:

Figure 238:
12 bit
representation

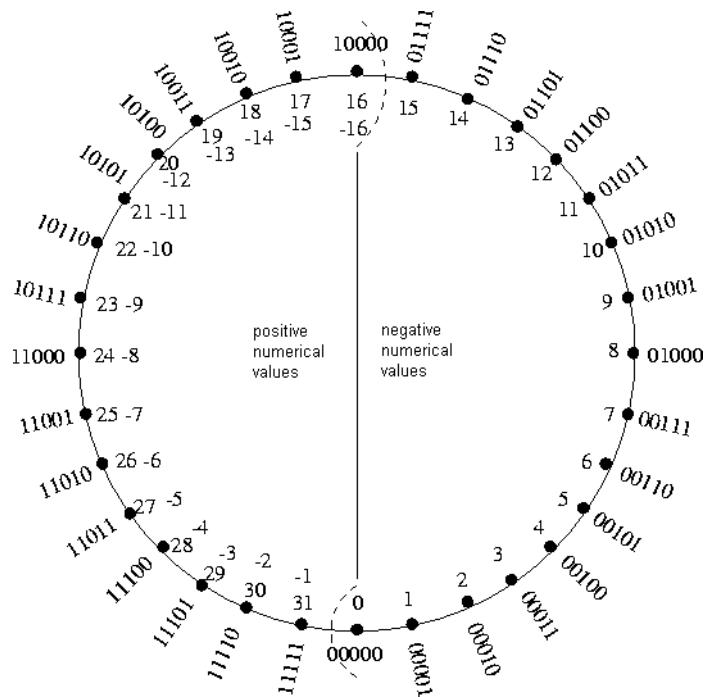


The diagnosis information is integrated in the process input data and occupies 4 bit (right-justified).

Appendix

The figure shows a 5-digit binary code in the outer circuit. The inner circuit shows the respective dual number, if the binary code is interpreted as binary number (positive numerical values) and as two's complement.

Figure 239:
Binary code as
binary number
and two's com-
plement



Equations for 16 bit representation

Current values from 0 to 20 mA

Before using the equation below, the hexadecimal or binary value has to be converted into a decimal value.

The value range

0 mA to 20 mA

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

The hexadecimal/binary value can easily be converted into a decimal value, because all numbers belong to the positive range of the two's complement (→ Seite 13-10).

The current value can now be calculated by means of the following equation:

$$\text{current value} = \frac{\text{decimal value}}{1638,35} \text{ mA} = 6,1 \cdot 10^{-4} \text{ mA} \cdot \text{decimal value}$$

Current values from 4 to 20 mA

Before using the equation below, the hexadecimal or binary value has to be converted into a decimal value.

The value range

4 mA to 20 mA

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

The hexadecimal/binary value can easily be converted into a decimal value, because all numbers belong to the positive range of the two's complement (→ page 13-4).

The current value can now be calculated by means of the following equation:

$$\text{current value} = 4,88 \cdot 10^{-4} \text{ mA} \times \text{decimal value} + 4 \text{ mA}$$

Temperature- and resistance values (BL67-2AI-PT)

Before using the equation below, the hexadecimal or binary value has to be converted into a decimal value.

The hexadecimal/binary values for the negative value range cannot easily be converted into decimal values, because the values are coded as two's complement (→ Seite 13-10).

All numerical values from 0000_{hex} to $7FFF_{\text{hex}}$ represent **positive** values when coded as two's complement. Values in this range can easily be converted into decimal values. This is also relevant for binary numbers in which the most significant bit (bit 16) is "0".

All numerical values from 8000_{hex} to $FFFF_{\text{hex}}$ represent **negative** values when coded as two's complement. This is also relevant for binary numbers in which the most significant bit (bit 16) is "1".

The conversion into a decimal number is shown in the following:

Example of the conversion of negative numerical values:

The following parameterization is used in the example:

"PT100, -200...150°C"

The temperature is thus calculated with the factor 0.01 (see below).

The example explains the general procedure to convert a hexadecimal or binary number coded as two's complement to a decimal number.

The hexadecimal value should be „**B344**“.

1 The binary value is:

$$\text{B344} \leftrightarrow 1011.0011.0100.0100$$

2 Invert the binary number:

$$1011.0011.0100.0100 \rightarrow 0100.1100.1011.1011$$

3 Add a "1" to the inverted binary number:

$$\begin{array}{r} 0100.1100.1011.1011 \\ 0000.0000.0000.0001 \\ \hline 0100.1100.1011.1100 \end{array}$$

4 Convert the binary number into a decimal number:

$$0100110010111100 \leftrightarrow \mathbf{19644}$$

5 The temperature value is calculated as follows:

$$\text{Temperature value} = 0,01^\circ\text{C} \times \text{decimal value} = 0,01^\circ\text{C} \times (-19644) = -196,44^\circ\text{C}$$

The temperature values can now be calculated according to the parameterization.

- For the parameterization
 - "PT100, -200...850°C"
 - "NI100, -60...250°C"
 - "PT200, -200...850°C"
 - "PT500, -200...850°C"
 - "PT1000, -200...850°C"
 - "NI1000, -60...250°C"

use the equation:

$$\text{temperature value} = \mathbf{0,1}^\circ\text{C} \times \text{decimal value}$$

The value range

-200 °C to -0,1°C

is displayed as follows:

F830_{hex} to FFFF_{hex} (decimal: -2000 to -1)

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The value range

0 °C to 850°C

is displayed as follows:

0000_{hex} to 2134_{hex} (decimal: 0 to 8500)

- For the parameterization
 - "PT100, -200...150°C"
 - "NI100, -60...150°C"
 - "PT200, -200...150°C"
 - "PT500, -200...150°C"
 - "PT1000, -200...150°C"
 - "NI1000, -60...150°C"

use the equation:

$$\text{temperature value} = \mathbf{0,01\ ^\circ C} \times \text{decimal value}$$

The value range

-200 °C to -0,01°C

is displayed as follows:

B1E0_{hex} to FFFF_{hex} (decimal: -20000 to -1)

The value range

0 °C to 150°C

is displayed as follows:

0000_{hex} to 3A98_{hex} (decimal: 0 to 15000)

For representation of resistance values only positive numbers (hexa-decimal/binary) are used. The positive values can easily be converted into decimal ones.

The value range

0 to 100 Ω; 0 to 200 Ω; 0 to 200 Ω; 0 to 1000 Ω

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

The resistance values can now be calculated according to the parameterization.

The following equations are valid:

- "resistance, 0...100 Ohm":

$$\text{resistance value} = 0,00305 \Omega \cdot \text{decimal value}$$

- "resistance, 0...200 Ohm":

$$\text{resistance value} = 0,00610 \Omega \cdot \text{decimal value}$$

- „resistance, 0...400 Ohm":

$$\text{resistance value} = 0,01221 \Omega \cdot \text{decimal value}$$

- „resistance, 0...1000 Ohm":

$$\text{resistance value} = 0,03052 \Omega \cdot \text{decimal value}$$

Temperature- and voltage values (BL67-2AI-TC)

Before using the equation below, the hexadecimal or binary value has to be converted into a decimal value.

The hexadecimal/binary values for the negative value range cannot easily be converted into decimal values, because the values are coded as two's complement (→ page 13-4).

All numerical values from 0000_{hex} to $7FFF_{\text{hex}}$ represent **positive** values when coded as two's complement. Values in this range can easily be converted into decimal values. This is also relevant for binary numbers in which the most significant bit (no. 16) is "0".

All values from 8000_{hex} to $FFFF_{\text{hex}}$ represent **negative** values when coded as two's complement. This is also relevant for binary numbers in which the most significant bit (no. 16) is "1".

Please see → „Example of the conversion of negative numerical values:”, Seite 13-12.

The temperature and voltage values can now be calculated according to the parameterization.

- For the parameterization
 - "Typ K, -270...1370°C"
 - "Typ B, +100...1820°C"
 - "Typ E, -270...1000°C"
 - "Typ J, -210...1200°C"
 - "Typ N, -270...1300°C"
 - "Typ R, -50...1760°C"
 - "Typ S, -50...1540°C"
 - "Typ T, -270...400°C"

use the equation.

$$\text{temperature value} = \mathbf{0,01 \ ^\circ C} \times \text{decimal value}$$

The value range

-270 °C to -0,1°C

is displayed as follows:

F574_{hex} to FFFF_{hex} (decimal: -2700 to -1)

The value range

0 °C to 1820°C

is displayed as follows:

0000_{hex} to 4718_{hex} (decimal: 0 to 18200)

The value range

-50 mV to -0,002 mV;

-100 mV to -0,003 mV;

-500 mV to -0,015 mV;

-1000 mV to -0,031 mV

is displayed as follows:

8000_{hex} to FFFF_{hex} (decimal: -32768 to -1)

The value range

0 mV to 50 mV;

0 mV to 100 mV;

0 mV to 500 mV;

0 mV to 1000 mV;

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

- For the parameterization " +/-50mV":

$$\text{voltage value} = 0,001526 \text{ mV} \times \text{decimal value}$$

- For the parameterization " +/-100mV":

$$\text{voltage value} = 0,003052 \text{ mV} \times \text{decimal value}$$

- For the parameterization " +/-500mV":

$$\text{voltage value} = 0,015259 \text{ mV} \times \text{decimal value}$$

- For the parameterization " +/-1000mV":

$$\text{voltage value} = 0,030519 \text{ mV} \times \text{decimal value}$$

Voltage values from 0 to 10 V DC

Before using the equation below, the hexadecimal or binary value has to be converted into a decimal value. The hexadecimal/binary value can easily be converted into a decimal value, because all numbers belong to the positive range of the two's complement (→ page 13-4).

The value range

0 V DC to 10 V DC

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

The voltage values can now be calculated by means of the following equation:

$$\text{voltage value} = 3,05185 \times 10^{-4} \text{ V} \times \text{decimal value}$$

Voltage values from -10 to 10 V DC

Before using the equation below, the hexadecimal or binary value has to be converted into a decimal value.

The hexadecimal/binary values for the negative value range cannot easily be converted into decimal values, because the values are coded as two's complement (→ page 13-4).

All numerical values from 0000_{hex} to 7FFF_{hex} represent **positive** values when coded as two's complement. Values in this range can easily be converted into **decimal** values. This is also relevant for binary numbers in which the most significant bit (no. 16) is "0".

All numerical values from 8000_{hex} to FFFF_{hex} represent **negative** values when coded as two's complement. This is also relevant for binary numbers in which the most significant bit (no. 16) is "1".

Please see → „Example of the conversion of negative numerical values.”, Seite 13-12.

The value range

-10 V to -3,052 10⁻⁴ V

is displayed as follows:

8000_{hex} to FFFF_{hex} (decimal:-32768 to -1)

The value range

0 V to 10 V

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

$$\text{voltage value} = 3,052 \cdot 10^{-4} \text{ V} \times \text{decimal value}$$

Equations for 12 bit representation



Attention

The 12 bit representation is „left-justified“. The value is transmitted with 16 bit. The last 4 digits of the binary number or respectively the last digit position of the hexadecimal value are used as diagnostic bits!



Note

Before using the following equations, the hexadecimal or binary value always has to be converted into a decimal value.

The value is contained in the 3 more significant digit positions of the hexadecimal number or in the 12 more significant bits of the binary number.



Note

In the 12 Bit representation only the 3 more significant digit positions of the hexadecimal number or the 12 more significant bits of the binary number are used for the calculation of the decimal value.

Current values from 0 to 20 mA

The value range

0 mA to 20 mA

is displayed as follows:

000_{hex} to FFF_{hex} (decimal: 0 to 4095)

The current values can now be calculated by means of the following equation:

$$\text{current value} = 4,88 \times 10^{-3} \text{mA} \times \text{decimal value}$$

Current values from 4 to 20 mA

The value range

4 mA to 20 mA

is displayed as follows:

000_{hex} to FFF_{hex} (decimal: 0 to 4095)

The current values can now be calculated by means of the following equation:

$$\text{current value} = 3,91 \times 10^{-3} \text{mA} \times \text{decimal value} + 4 \text{mA}$$

Temperature and resistance values (BL67-2AI-PT)

The hexadecimal/binary values for the negative value range cannot easily be converted into decimal values, because the values are coded as two's complement (→ page 13-4).

All numerical values from 000_{hex} to $7FF_{\text{hex}}$ represent **positive** values when coded as two's complement. Values in this range can easily be converted into **decimal** values. This is also relevant for binary numbers in which the most significant bit (no. 16) is "0".

All numerical values from 800_{hex} to FFF_{hex} represent **negative** values when coded as two's complement. This is also relevant for binary numbers in which the most significant bit (no. 16) is "1".

Please see → „Example of the conversion of negative numerical values:”, Seite 13-12.

The temperature values can now be calculated depending on the parameterization.

- For the parameterization:
"PT100, -200...850°C"
"NI100, -60...250°C"
"PT200, -200...850°C"
"PT500, -200...850°C"
"PT1000, -200...850°C"
"NI1000, -60...250°C"

use the following equation:

$$\text{temperatur e value} = 0,5^{\circ}\text{C} \times \text{decimal value}$$

The value range

-200 °C to -0,5°C

is displayed as follows:

E70_{hex} to FFF_{hex} (decimal: -400 to -1)

The value range

0 °C to 850°C

is displayed as follows:

000_{hex} to 6A4_{hex} (decimal: 0 to 1700)

- For the parameterization:
"PT100, -200...150°C"
"NI100, -60...150°C"
"PT200, -200...150°C"
"PT500, -200...150°C"
"PT1000, -200...150°C"
"NI1000, -60...150°C"

use the following equation:

$$\text{temperature value} = 0,1^\circ\text{C} \times \text{decimal value}$$

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The value range

-200 °C to -0,1°C

is displayed as follows:

830_{hex} to FFF_{hex} (decimal: -2000 to -1)

The value range

0 °C to 150°C

is displayed as follows:

000_{hex} to 5DC_{hex} (decimal: 0 to 1500)



Note

In the 12 Bit representation only the 3 more significant digit positions of the hexadecimal number or the 12 more significant bits of the binary number are used for the calculation of the decimal value.

The temperature values can now be calculated depending on the parameterization.

The value range

- 0 Ω to 100 Ω;**
- 0 Ω to 200 Ω;**
- 0 Ω to 400 Ω;**
- 0 Ω to 1000 Ω;**

is displayed as follows:

000_{hex} to FFF_{hex} (decimal: 0 to 4095)

The following equations are valid:

- "resistance, 0...100 Ohm":

$$\text{resistance value} = 0,02442 \Omega \cdot \text{decimal value}$$

- "resistance, 0...200 Ohm":

$$\text{resistance value} = 0,04884 \Omega \cdot \text{decimal value}$$

- "resistance, 0...200 Ohm":

$$\text{resistance value} = 0,09768 \Omega \cdot \text{decimal value}$$

- "resistance, 0...1000 Ohm":

$$\text{resistance value} = 0,24420 \Omega \cdot \text{decimal value}$$

Temperature- and voltage values (BL67-2AI-TC)

All numerical values from 000_{hex} to $7FF_{\text{hex}}$ represent **positive** values when coded as two's complement. Values in this range can easily be converted into **decimal** values. This is also relevant for binary numbers in which the most significant bit (no. 16) is "0".

All numerical values from 800_{hex} to FFF_{hex} represent **negative** values when coded as two's complement. This is also relevant for binary numbers in which the most significant bit (no. 16) is "1".

Please see → „Example of the conversion of negative numerical values:”, Seite 13-12.



Note

In the 12 Bit representation only the 3 more significant digit positions of the hexadecimal number or the 12 more significant bits of the binary number are used for the calculation of the decimal value.

The temperature values can now be calculated depending on the parameterization.

- For the parameterization
 - "Typ K, -270...1370°C"
 - "Typ B, +100...1820°C"
 - "Typ E, -270...1000°C"
 - "Typ J, -210...1200°C"
 - "Typ N, -270...1300°C"
 - "Typ R, -50...1760°C"
 - "Typ S, -50...1540°C"
 - "Typ T, -270...400°C"

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use the following equation:

$$\text{temperature value} = 1 \text{ °C} \times \text{decimal value}$$

The value range

-270 °C to 1820°C

is displayed as follows:

EF2_{hex} to 71C_{hex} (decimal: -270 to 1820)

- For the parameterization " +/-50mV" :

voltage value = 0,02443 mV × decimal value

- For the parameterization " +/-100mV":

voltage value = 0,04885 mV × decimal value

- For the parameterization " +/-500mV":

voltage value = 0,24426 mV × decimal value

- For the parameterization " +/-1000mV":

voltage value = 0,48852 mV × decimal value

The value range

-50 mV to -0,024mV;

-100 mV to -0,049mV;

-500 mV to -0,244mV;

-1000 mV to -0,489mV;

is displayed as follows:

800_{hex} to FFF_{hex} (decimal: -2048 to -1)

The value range

0 mV to 50 mV;

0 mV to 100 mV;

0 mV to 500 mV;

0 mV to 1000 mV;

is displayed as follows:

000_{hex} to 7FF_{hex} (decimal: 0 to 2047)

Voltage values from 0 to 10 V DC**Note**

In the 12 Bit representation only the 3 more significant digit positions of the hexadecimal number or the 12 more significant bits of the binary number are used for the calculation of the decimal value.

The voltage values can now be calculated by means of the following equation:

$$\text{voltage value} = 0,002442 \text{ V} \times \text{decimal value}$$

The value range

0 V to 10 V

is displayed as follows:

000_{hex} to FFF_{hex} (decimal: 0 to 4095)

Voltage values from -10 to 10 V DC

All numerical values from 000_{hex} to $7FF_{\text{hex}}$ represent **positive** values when coded as two's complement. Values in this range can easily be converted into **decimal** values. This is also relevant for binary numbers in which the most significant bit (no. 16) is "0".

All numerical values from 800_{hex} to FFF_{hex} represent **negative** values when coded as two's complement. This is also relevant for binary numbers in which the most significant bit (no. 16) is "1".



Note

In the 12 Bit representation only the 3 more significant digit positions of the hexadecimal number or the 12 more significant bits of the binary number are used for the calculation of the decimal value.

For **positive** voltage values (0 to 10 V DC) use:

$$\text{voltage value} = 0,004885 \text{ V} \times \text{decimal value}$$

The value range

0 V to 10 V

is displayed as follows:

000_{hex} to 7FF_{hex} (decimal: 0 to 2047)

For **negative** voltage values (-10 to 10 V DC) use:

$$\text{voltage value} = 0,004883 \text{ V} \times \text{decimal value}$$

The value range

-10 V to -0,0049 V

is displayed as follows:

800_{hex} to FFF_{hex} (decimal: -2048 to -1)

Analog Value Representation (Analog Output Modules)

In the bipolar mode the digitalized analog values are represented as a two's complement. The 16 bit or the 12 bit representation (left justified) can be chosen by setting the respective module parameter.

Equations for 16 bit representation

Current values from 0 to 20 mA

The decimal values can be converted into current values from 0 mA to 20 mA by means of the following equation:

$$\text{decimal value} = 1638,35 \frac{1}{\text{mA}} \times \text{current value}$$

The value range

0 mA to 20 mA

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

The decimal values can easily be converted into a hexadecimal value, because all possible values belong to the positive value range of the two's complement (→ Seite 13-10).

Current values from 4 to 20 mA

The decimal values can be converted into current values from 4 mA to 20 mA by means of the following equation:

$$\text{decimal value} = 2047,9375 \frac{1}{\text{mA}} \times \text{current value} - 8191,75$$

The value range

4 mA to 20 mA

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

The decimal values can easily be converted into a hexadecimal value, because all possible values belong to the positive value range of the two's complement (→ Seite 13-10).

Voltage values from 0 to 10 V DC

The decimal values can be converted into voltage values from 0 to 10 V DC by means of the following equation:

$$\text{decimal value} = 3276,7 \frac{1}{V} \times \text{voltage value}$$

The value range

0 V to 10 V

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

The decimal values can easily be converted into a hexadecimal value, because all possible values belong to the positive value range of the two's complement (→ Seite 13-10).

Voltage values from -10 to 10 V DC

The decimal values can be converted into voltage values from -10 to 10 V DC by means of the following equation:

For **positive** voltage values (0 to 10 V DC) use:

$$\text{decimal value} = 3276,7 \frac{1}{V} \times \text{voltage value}$$

13

The value range

0 V to 10 V

is displayed as follows:

0000_{hex} to 7FFF_{hex} (decimal: 0 to 32767)

Appendix

For **negative** voltage values (-10 to 0 V DC) use:

$$\text{decimal value} = 3276,8 \frac{1}{V} \times \text{voltage value}$$

The value range

-10 V to -3,052 10⁻⁴ V

is displayed as follows:

8000_{hex} to FFFF_{hex} (decimal:-32768 to -1)

Conversion of the decimal values into hexadecimal/binary values

The decimal value can easily be converted into hexadecimal or binary values. The two's complement (→ Seite 13-10) for the 16 bit values corresponds to the dual numbers in the positive range.

The conversion of negative decimal values into hexadecimal values is more complicated, because the values have to be coded as a two's complement.

The following example explains the method of conversion:

The 4-digit hexadecimal number for the voltage value **-6V** is searched:

$$\text{decimal value} = 3276,8 \frac{1}{V} \times (-6V) = -19660,8$$

Some calculators can be used to convert negative decimal values directly in a hexadecimal value coded as two's complement.

Without such a calculator, convert the value as follows:

- 1 Convert the amount of the negative decimal value to a binary number:

$$|-19660,8| = 19660,8 \Leftrightarrow 100.1100.1100.1100$$

- 2 Fill the 16 bit of the binary number with “0“:

$$100.1100.1100.1100 \Leftrightarrow 0100.1100.1100.1100$$

- 3 Invert the 16-digit binary number:

$$0100.1100.1100.1100 \Rightarrow 1011.0011.0011.0011$$

- 4 Add “1“ to this inverted number:

$$\begin{array}{r} 1011.0011.0011.0011 \\ \underline{0000.0000.0000.0001} \\ 1011.0011.0011.0100 \end{array}$$

Appendix

- 5** The number is now coded as a two's complement and can be converted into a hexadecimal number.

1011.0011.0011.0100 \Rightarrow B334

- 6** The result is:

-6 V \Rightarrow 19660,8 \Rightarrow B334

Equations for 12 bit representation



Attention

The 12 bit representation is „left-justified“. The value is transmitted with 16 bit. The last 4 digits of the binary number or the last digit position of the hexadecimal value are always “0“.

Current values from 0 to 20 mA

The decimal values can be converted into current values from 0 to 20 mA by means of the following equation:

$$\text{decimal value} = 204,75 \frac{1}{\text{mA}} \times \text{current value}$$

The value range

0 mA to 20 mA

is displayed as follows:

000_{hex} to FFF_{hex} (decimal: 0 to 4095)



Note

As the numbers are represented left-justified, a “0“ has to be added to the 3-digit hexadecimal value or the number has to move one digit to the left.

XXX_{hex} ⇒ XXX0_{hex}

The 12-digit binary number has to be filled with 4 digits of “0“ or has to move 4 digits to the left:

XXXX.XXXX.XXXX ⇒ XXXX.XXXX.XXXX.0000

Current values from 4 to 20 mA

The decimal values can be converted into current values from 4 to 20 mA by means of the following equation:

$$\text{decimal value} = 255,9375 \frac{1}{\text{mA}} \times \text{current value} - 1023,75$$

The value range

4 mA to 20 mA

is displayed as follows:

000_{hex} to FFF_{hex} (decimal: 0 to 4095)

Voltage values from 0 to 10 V DC

The decimal values can be converted into voltage values from 0 to 10 V DC by means of the following equation:

$$\text{decimal value} = 409,5 \frac{1}{V} \div \text{voltage value}$$

The value range

0 V to 10 V

is displayed as follows:

000_{hex} to FFF_{hex} (decimal: 0 to 4095)

Voltage values from -10 to 10 V DC

The decimal values can be converted into voltage values from -10 to 10 V DC by means of the following equation:

For **positive** voltage values (0 to 10 V DC) use:

$$\text{decimal value} = 204,7 \frac{1}{V} \times \text{voltage value}$$

The value range

0 V to 10 V

is displayed as follows:

000_{hex} to 7FF_{hex} (decimal: 0 to 2047)

For **negative** voltage values (-10 to 0 V DC) use:

$$\text{decimal value} = 204,8 \frac{1}{V} \times \text{voltage value}$$

The value range

-10 V to -0,0049 V

is displayed as follows:

800_{hex} to FFF_{hex} (decimal: -2048 to -1)

13

Positive decimal values can easily be converted into hexadecimal values. The two's complement (→ Seite 13-10) corresponds to the 12 bit values in the positive range of the binary numbers.



Note

As the numbers are represented left-justified, a “0“ has to be added to the 3-digit hexadecimal value or the number has to move one digit to the left (→ Seite 13-35).

Conversion of the negative decimal values into hexadecimal/ binary value

The conversion of negative decimal values into hexadecimal values is more complicated, because the values have to be coded as a two's complement.

The following example explains the method of conversion:

The 4-digit hexadecimal number for the voltage value **-6V** is searched:

$$\text{dezimaler Zahlenwert} = 204,8 \frac{1}{V} \times (-6V) = -1228,8$$

Some calculators can be used to convert negative decimal values directly in a hexadecimal value coded as two's complement.

Without such a calculator, convert the value as follows:

- 1 Convert the amount of the negative decimal value to a binary number:

$$[-1228,8] = 1228,8 \Leftrightarrow 100.1100.1100$$

Fill the 12 bit of the binary number with “0“:

$$100.1100.1100 \Rightarrow 0100.1100.1100$$

- 2 Invert the 12-digit binary number:

$$0100.1100.1100 \Rightarrow 1011.0011.0011$$

- 3 Add “1“ to this inverted number:

$$\begin{array}{r} 1011.0011.0011 \\ 0000.0000.0001 \\ \hline 1011.0011.0100 \end{array}$$

- 4 The number is now coded as a two's complement and can be converted into a hexadecimal number.

$$1011.0011.0100 \Rightarrow B34$$

- 5** As the number is represented as 16 bit left-justified, the hexa-decimal value has to be completed with a “0“ and the binary value with 4 “0“.

B34 \Rightarrow B340

(1011.0011.0100 \Rightarrow 1011.0011.0100.0000)

- 6** The result is:

- 6 V \Rightarrow -1228,8 \Rightarrow B340

Ident codes of the BL67-modules

Each module modul is identified by the gateway with the help of a module-specific ident code.

Table 142:
Module ident
codes

Module	Ident code
<i>Digital input modules</i>	
BL67-4D-P	0x410030xx
BL67-8DI-P	0x610040xx
BL67-4D-PD	0x015630xx
BL67-8DI-PD	0x015640xx
BL67-4DI-N	0x420030xx
BL67-8DI-N	0x620040xx
<i>Analog input modules</i>	
BL67-2AI-I	0x225570xx
BL67-2AI-V	0x235570xx
BL67-2AI-PT	0x215770xx
BL67-2AI-TC	0x215570xx
BL67-4AI-V/I	0x417790xx
<i>Digital output modules</i>	
BL67-4DO-0.5A-P	0x413003xx
BL67-4DO-2A-P	0x433003xx
BL67-8DO-0.5A-P	0x614004xx
BL67-16DO-0.1A-P	0x805505xx
BL67-4DO-2A-N	0x443003xx
BL67-8DO-0.5A-N	0x624004xx

Module	Ident code
<i>Analog output modules</i>	
BL67-2AO-I	0x220807xx
BL67-2AO-V	0x210807xx
<i>Digital combi modules</i>	
BL67-4DI4DO-PD	0x015633xx
BL67-8XSG	0x015744xx
<i>Technology modules</i>	
BL67-1RS232	0x014799xx
BL67-1RS485/422	0x024799xx
BL67-1SSI	0x044799xx
BL67-1CVI	0x018B99xx (0x242224xx) A
<i>Power supply modules</i>	
BL67-PF-24VDC	0x063000xx

A Default ID of the module → Only transmitted in case of non-connected field voltage during module start.

Ordering Information

Table 143:
Ordering
Information

Electronic modules	Base modules	BL67-B-4M8	BL67-B-8M8	BL67-B-1M12	BL67-B-2M12	BL67-B-2M12-P	BL67-B-4M12	BL67-B-4M12-P	BL67-B-1M23	BL67-B-1M23-19	BL67-B-1RSM
<i>Digital input modules</i>											
BL67-4D-P											
BL67-8DI-P	✓					✓	✓	✓		✓	
BL67-4D-PD	✓					✓	✓	✓			
BL67-8DI-PD			✓					✓	✓		
BL67-4DI-N	✓					✓	✓	✓		✓	
BL67-8DI-N		✓						✓	✓	✓	
<i>Analog input modules</i>											
BL67-2AI-I						✓					
BL67-2AI-V							✓				
BL67-2AI-PT							✓				
BL67-2AI-TC							✓				
BL67-4AI-V/I								✓			
<i>Digital output modules</i>											
BL67-4DO-0.5A-P	✓					✓	✓	✓		✓	
BL67-4DO-2A-P	✓					✓	✓	✓		✓	
BL67-8DO-0.5A-P		✓						✓	✓	✓	
BL67-16DO-0.1A-P										✓	

	Base modules	BL67-B-4M8	BL67-B-8M8	BL67-B-1M12	BL67-B-1 M12-8	BL67-B-2M12	BL67-B-2M12-P	BL67-B-4M12	BL67-B-4M12-P	BL67-B-1M23	BL67-B-1M23-19	BL67-B-1RSM
Electronic modules												
BL67-4DO-2A-N	✓				✓	✓	✓	✓	✓	✓		
BL67-8DO-0.5A-N		✓					✓	✓	✓			
<i>Analog output modules</i>												
BL67-2AO-I					✓							
BL67-2AO-V					✓							
<i>Digital combi modules</i>												
BL67-4DI4DO-PD		✓				✓	✓	✓	✓			
BL67-8XSG-PD		✓				✓	✓					
<i>Technology modules</i>												
BL67-1RS232			✓	✓					✓			
BL67-1RS485/422		✓	✓						✓			
BL67-1SSI			✓					✓		✓		
BL67-1CVI			✓					✓		✓		
<i>Power supply modules</i>												
BL67-PF-24VDC												✓

Appendix

14 Glossary

A

Acknowledge

Acknowledgment of a signal received.

Active metal component

Conductor or conducting component that is electrically live during operation.

Address

Identification number of, e.g. a memory position, a system or a module within a network.

Addressing

Allocation or setting of an address, e. g. for a module in a network.

Analog

Infinitely variable value, e. g. voltage. The value of an analog signal can take on any value, within certain limits.

Attribute

Attributes represent the data that a device makes available via the DeviceNet fieldbus (e. g. status of an object, serial number of the device, process data).

Automation device

A device connected to a technical process with inputs and outputs for control. Programmable logic controllers (PLC) are a special group of automation devices.

B

Baud

Baud is a measure for the transmission speed of data. 1 Baud corresponds to the transmission of one bit per second (Bit/s).

Baud rate

Unit of measurement for data transmission speeds in Bit/s.

Bidirectional

Working in both directions.

Glossary

Bit Strobe

A Bit Strobe I/O connection is a connection between a DeviceNet client and an undetermined number of servers, these being queried by commands sent by the client.

Bonding strap

Flexible conductor, normally braided, that joins inactive components, e. g. the door of a switch gear cabinet to the cabinet main body.

Bus

Bus system for data exchange, e. g. between CPU, memory and I/O levels. A bus can consist of several parallel cables for data transmission, addressing, control and power supply.

Bus cycle time

Time required for a master to serve all slaves or stations in a bus system, i. e. reading inputs and writing outputs.

Bus line

Smallest unit connected to a bus, consisting of a PLC, a coupling element for modules on the bus and a module.

Bus system

All units which communicate with one another via a bus.

Capacitive coupling

Electrical capacitive couplings occur between cables with different potentials. Typical sources of interference are, e. g. parallel-routed signal cables, contacts and electrostatic discharges.

Coding elements

Two-piece element for the unambiguous assignment of electronic and base modules.

Configuration

Systematic arrangement of the I/O modules of a station.

Control interface

The control interface is the interface from the BL67's internal module bus to the counter module. The commands and signals directed to the counter module are converted by the BL67 gateway from the respective type of communication applicable to the fieldbus in to the module-specific bits and bytes.

COS

Change of State Connections are event controlled connections. This means the DeviceNet devices generate messages as soon as a change of state takes place.

CPU

Central Processing Unit. Central unit for electronic data processing, the processing core of the PC.

Cyclic

Messages are triggered time-controlled in Cyclic I/O connections by means of a time generator.

D

Digital

A value (e. g. a voltage) which can adopt only certain statuses within a finite set, mostly defined as 0 and 1.

DIN

14

German acronym for German Industrial Standard.

E

EDS

Electronic Device Data Sheet which contains standardized DeviceNet station descriptions. They simplify the planning of the DeviceNet nodes.

EIA

Electronic Industries Association – association of electrical companies in the United States.

Electrical components

All objects that produce, convert, transmit, distribute or utilize electrical power (e. g. conductors, cable, machines, control devices).

Glossary

EMC

Electromagnetic compatibility – the ability of an electrical part to operate in a specific environment without fault and without exerting a negative influence on its environment.

EN

German acronym for European Standard.

ESD

Electrostatic Discharge.

F

Field power supply

Voltage supply for devices in the field as well as the signal voltage.

Fieldbus

Data network on sensor/actuator level. A fieldbus connects the equipment on the field level. Characteristics of a fieldbus are a high transmission security and real-time behavior.

Force Mode

Software mode which enables the user to set his plant to a required state by forcing certain variables on the input and output modules.

G

GND

Abbreviation of ground (potential „0“).

Ground

Expression used in electrical engineering to describe an area whose electrical potential is equal to zero at any given point. In neutral grounding devices, the potential is not necessarily zero, and one speaks of the ground reference.

Ground connection

One or more components that have a good and direct contact to earth.

Ground reference

Potential of ground in a neutral grounding device. Unlike earth whose potential is always zero, it may have a potential other than zero.

H

Hexadecimal

System of representing numbers in base 16 with the digits 0 ... 9, and further with the letters A, B, C, D, E and F.

Hysteresis

A sensor can get caught up at a certain point, and then “waver” at this position. This condition results in the counter content fluctuating around a given value. Should a reference value be within this fluctuating range, then the relevant output would be turned on and off in rhythm with the fluctuating signal.

I/O

Input/output.

Impedance

Total effective resistance that a component or circuit has for an alternating current at a specific frequency.

Inactive metal components

Conductive components that cannot be touched and are electrically isolated from active metal components by insulation, but can adopt voltage in the event of a fault.

Inductive coupling

Magnetic inductive couplings occur between two cables through which an electrical current is flowing. The magnetic effect caused by the electrical currents induces an interference voltage. Typical sources of interference are for example, transformers, motors, parallel-routed network and HF signal cables.

Intelligent modules

Intelligent modules are modules with an internal memory, able to transmit certain commands (e. g. substitute values and others).

L

Predefined value for the counter module with which the count process begins.

Lightning protection

All measures taken to protect a system from damage due to overvoltages caused by lightning strike.

Low impedance connection

Connection with a low AC impedance.

LSB

Least Significant Bit

M

Mass

Glossary

All interconnected inactive components that do not take on a dangerous touch potential in the case of a fault.

Master

Station in a bus system that controls the communication between the other stations.

Master/slave mode

Mode of operation in which a station acting as a master controls the communication between other stations in a bus system.

Module bus

The module bus is the internal bus in a BL67 station. The BL67 modules communicate with the gateway via the module bus which is independent of the fieldbus.

MSB

Most Significant Bit

Multi-master mode

Operating mode in which all stations in a system communicate with equal rights via the bus.

N

Namur

German acronym for an association concerned with standardizing measurement and control engineering. Namur initiators are special versions of the two-wire initiators. Namur initiators are characterized by their high immunity to interference and operating reliability, due to their special construction (low internal resistance, few components and compact design).

O

Overhead

System administration time required by the system for each transmission cycle.

P

PLC

Programmable Logic Controller.

Potential compensation

The alignment of electrical levels of electrical components and external conductive components by means of an electrical connection.

Potential free

Galvanic isolation of the reference potentials in I/O modules of the control and load circuits.

Potential linked

Electrical connection of the reference potentials in I/O modules of the control and load circuits.

Protective earth

Electrical conductor for protection against dangerous shock currents. Generally represented by PE (protective earth).

R

Radiation coupling

A radiation coupling appears when an electromagnetic wave hits a conductive structure. Voltages and currents are induced by the collision. Typical sources of interference are e. g. sparking gaps (spark plugs, commutators from electric motors) and transmitters (e. g., radio), that are operated near to conducting structures.

Reaction time

The time required in a bus system between a reading operation being sent and the receipt of an answer. It is the time required by an input module to change a signal at its input until the signal is sent to the bus system.

Reference potential

Potential from which all voltages of connected circuits are viewed and/or measured.

Repeater

Amplifier for signals transmitted via a bus.

14

Root-connecting

Creating a new potential group using a power distribution module. This allows sensors and loads to be supplied individually.

RS 485

Serial interface in accordance with EIA standards, for fast data transmission via multiple transmitters.

S

Serial

Type of information transmission, by which data is transmitted bit by bit via a cable.

Setting parameters

Setting parameters of individual stations on the bus and their modules in the configuration software of the master.

Shield

Glossary

Conductive screen of cables, enclosures and cabinets.

Shielding

Description of all measures and devices used to join installation components to the shield.

Short-circuit proof

Characteristic of electrical components. A short-circuit proof part withstands thermal and dynamic loads which can occur at its place of installation due to a short circuit.

Station

A functional unit or I/O components consisting of a number of elements.

T

Terminating resistance
Resistor on both ends of a bus cable used to prevent interfering signal reflections and which provides bus cable matching. Terminating resistors must always be the last component at the end of a bus segment.

To ground

Connection of a conductive component with the grounding connection via a grounding installation.

Topology

Geometrical structure of a network or the circuitry arrangement.

U

UART
Universal Asynchronous Receiver/Transmitter. UART is a logic circuit which is used to convert an asynchronous serial data sequence to a parallel bit sequence or vice versa.

Unidirectional

Working in one direction.

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Industrial
Automation

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