TURCK

Industrielle Automation

User manual

BLCDN-8M12L-4AI-VI-4AI-VI

Sense it! Connect it! Bus it! Solve it!

BLCDN-8M12L-4AI-VI-4AI-VI

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1 General safety notes

1.1 Before 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 equalisation.
- 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 Ensure a reliable electrical isolation of the low 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.

2 General information

This manual includes all information necessary for the prescribed product. It has been specially conceived for personnel with the necessary qualifications.

ATTENTION

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

2.1 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.

2.2 Prescribed Use

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

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.

2.3 Notes Concerning Planning /Installation of this Product

WARNING

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

3 Introduction

3.1 BL compact – High signal variety in a compact design

For the first time, BL compact provides a product family of IP67 fieldbus devices that can meet any requirement in the I/O level in terms of signal type and connectivity. Until now, compact fieldbus stations were applied to process only digital fieldbus signals. BL compact now allows a wide range of I/O tasks to be implemented outside of the control cabinet in a compact design with virtually any signal combination.

The basic concept

With the modular concept of the BL67 system by TURCK a fieldbus node can be installed outside the control cabinet using any signal combination. For this purpose, passive base and active electronic modules are connected to fieldbus gateways which fulfill application specific I/O tasks. Such a fieldbus node can take one gateway with up to 32 extension modules (max. 512 I/O points). For applications with low signal density and limited mounting space, BL compact is an efficient alternative because basically all BL67 I/O signals are also available in BL compact.

The modular principle

The BL compact devices provide three basic functions in a single housing: Fieldbus connection, I/O signal and connector. Depending on the housing style, one or two I/O modules can be housed. The smaller versions (e.g. M12S and M12MT) can link any BL67 electronic module each to PROFIBUS-DP or DeviceNet™. The bigger versions (e.g. M12LT) have space for two BL67 electronic modules, making the possibilities of signal combination nearly infinite.

NOTE

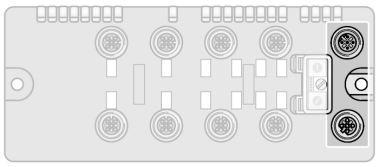
The I/O-system BL compact does not require mounting in an extra housing. It was specially designed for the harsh industrial environment and for direct mounting on the machine and in the process. The system is extremely robust and protected against dirt, dust and the most liquids through its high degree of protection. However, it is not suited for the following applications: high pressure jet cleaning, 100 % humidity, out-door installation or permanent operation in liquids.

4 Technical data

Type	BLCDN-8M12L-4AI-VI-4AI-VI
Ident-No.	6811043
Supply voltage	24 VDC
Admissible range	11...30 VDC
System power supply	via DeviceNet cable
Nominal voltage V_i	24 VDC
Nominal voltage V_o	24 VDC
Max. sensor supply I_{sens}	4 A
Max. load current I_o	4 A
Fieldbus transmission rate	125…500 kbps
Adjustment transmission rate	auto detection
Fieldbus addressing range	0...63 64…80 (Programmable MACID) 81…99 (Vendor Specific)
Fieldbus addressing	2 decimally coded rotary switches
Service interface	RS232 interface
Fieldbus connection technology	2 x M12, 5-pin
Fieldbus termination	external
Analog inputs	
Input type	0/4 … 20 mA or -10/0 … 10 VDC
Type of input diagnostics	channel diagnostics
Sensor supply	24 VDC
Input resistance	0.125 or 98.5 kΩ
Maximum limiting frequency analog	< 20 Hz
Basic fault limit at 23 °C	< 0.3 %
Repeatability	< 0.05 %
Temperature coefficient	< 300 ppm/°C of full scale
Resolution	16 bit
Measuring principle	Sigma Delta
Measured-value display	16 bit signed integer 12 bit full range left justified
Operating temperature	-40...+70 °C
Storage temperature	-40...+85 °C
Extended vibartion resistance	
- up to 20 g (at 10 to 150 Hz)	firm mounting on base plate or machine
Protection class	IP69K
housing material	Glass-filled nylon, nickel plated brass connectors

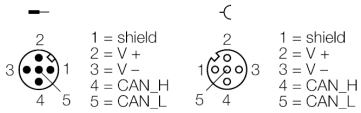
5 Fieldbus and I/O connections

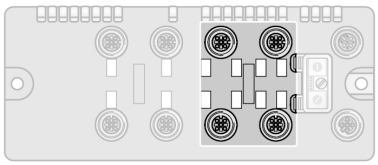
5.1 Pinning and wiring diagram



Fieldbus accessories
DeviceNet™ fieldbus cable (example):
RSC-RKC572-2M
Ident. no. 6603629

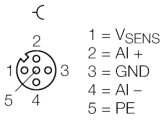
Fieldbus



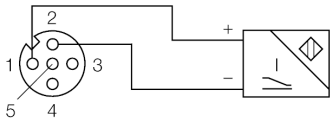


Slot 1: analog inputs

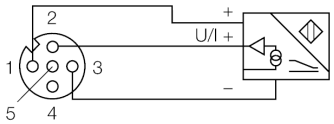
Pin configuration



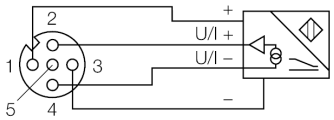
2-wire technology

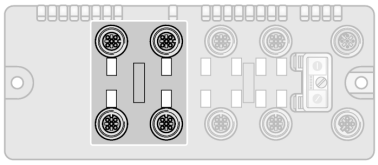


3-wire technology



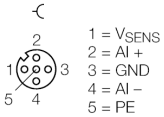
4-wire technology





Slot 2: analog inputs

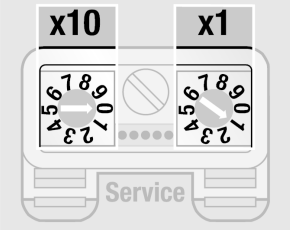
Pin configuration



6 Commissioning

6.1 Address setting

The DeviceNet™ address setting at the module is done via the two decimal rotary coding switches under the protective cover. DeviceNet™ allows a maximum of 64 (00 to 63) addresses (MAC IDs) to be assigned. Each address may be allocated only once in the entire bus structure.



All new settings become valid only after a module restart!

6.2 Setting the transmission rate

The module provides automatic transmission rate detection.
The bit rate can be changed via the standard ODVA DeviceNet Class™ (Class 0x03, Instance 0x01, Attribute 0xx02).

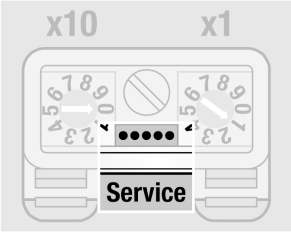
6.3 Field bus termination

If the module is used as the first or the last station in the bus communication, the fieldbus line has to be terminated using a terminating resistor.
The module offers no internal bus terminating resistor. The termination has to be done externally.

Terminating resistor (female), RKE57-TR2, Ident-no.: 6602629
Terminating resistor (male), RSE57-TR2, Ident-no.: 6602308

6.4 Service interface

In order to connect the service interface on the module with a PC and the I/O-ASSISTANT software (project planning and diagnostics software), a cable with a pin assignment, different from the PS2 standard pin assignment, has to be used.



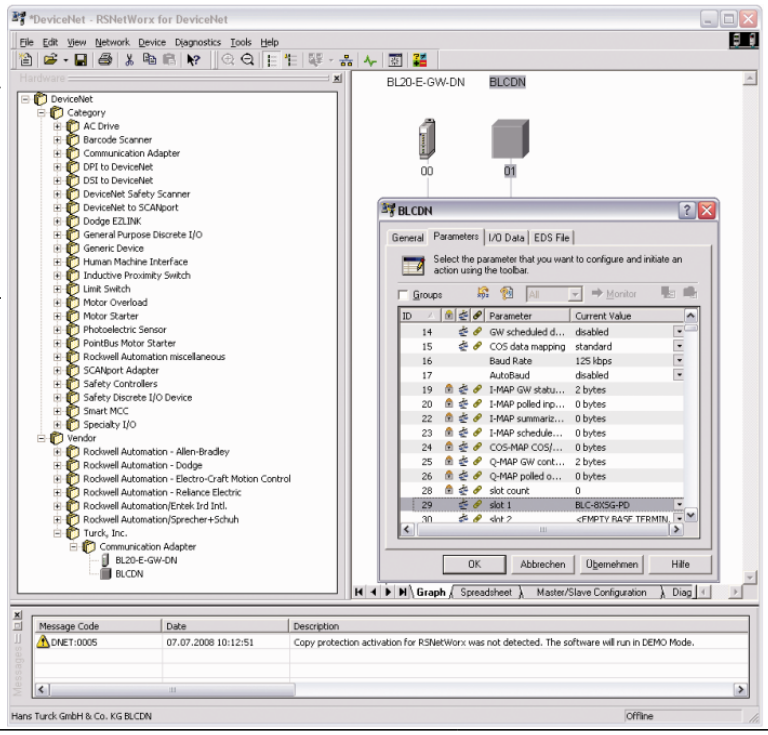
6 Commissioning

6.5 PLC configuration

The modules can be integrated into the DeviceNet™ structure by means of module specific BL compact EDS files.

Commissioning in a configuration tool

Registrate the EDS-files in the PLC configuration tool eg. in RSNetWorX from Rockwell Automation. The BL compact modules can now be found under “TURCK, Inc.> Communication Adapter“. Add the modules to your fieldbus line. The EDS-files can be downloaded from **www.turck.com.**



6.6 Vendor Specifc Classes (VSCs)

BL compact modules for DeviceNet™ are based on the communications adapter profile according to ODVA specifications Rel. V2.0 (ODVA: Open DeviceNet™ Vendor Association).

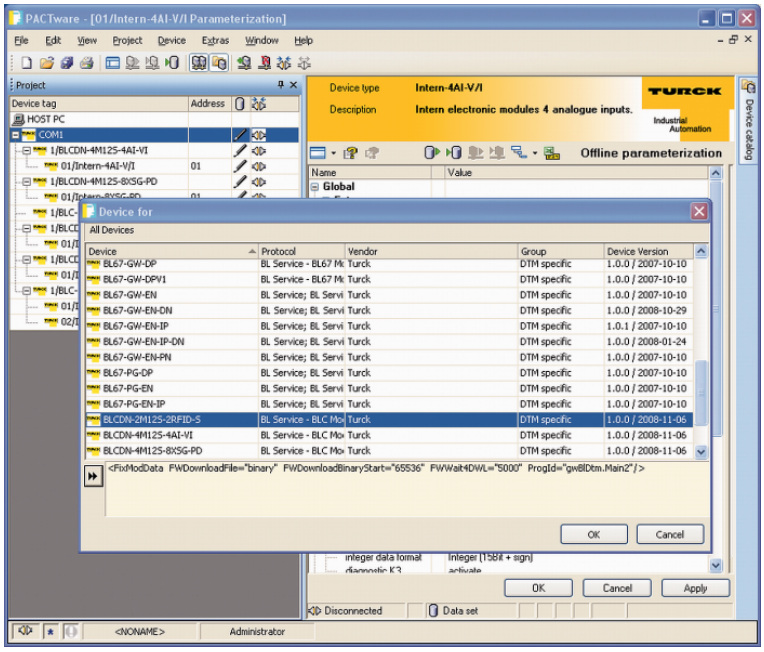
Besides the standard DeviceNet™ classes, this module supports the following Vendor Specific Classes (VSC):
100 (64h) Gateway Class
101 (65h) Terminal Slot Class
102 (66h) Process Data Class
+ VSCs for the respective I/O channels.

NOTE

For more detailed information about the PLC-configuration of TURCK DeviceNet™-products or the Vendor Specific Classes of the I/O-channels, please read for example the respective BL67 manual D300528.pdf which can be downloaded from www.turck.com.

7 The I/O-ASSISTANT

The configuration software I/O-ASSISTANT supports you in planning and implementation of an I/O system.
No matter if you are online or offline, the software simplifies the configuration and parameterizsation of the modules. The I/O-ASSISTANT is also extremely helpful in system set-up and testing.



7.1 FDT/DTM

The system configuration, parameterization and diagnostics are done via graphical interfaces based on FDT/DTM technology.
The DTMs can be integrated in any FDT frame application for configuration, commissioning and maintenance.
The I/O-ASSISTANT and the DTMs are available free of charge on www.turck.com.

Software functions

- Supporting software tool
- Configuration, parameterization and commissioning of BL Compact modules via DTM-technology
- Import of BL Compact DTM-files
- Offline planning and configuration of BL67, BL20 and BL compact I/O modules
- Reading and setting of process data
- Commissioning help for testing the wiring and sensors without PLC
- Automatic documentation of configured TURCK-systems

8 LED description

8.1 Stations LED Status

LED	Colour	Status	Description
IOs		OFF	No power
	RED	ON	Low power or station error
	RED	FLASHING (1 Hz)	I/O module configuration error
	RED	FLASHING (4 Hz)	No I/O module bus communication
	GREEN	ON	Station ok
	GREEN	FLASHING	Force mode active
MNS		OFF	No connection
	GREEN	ON	Connection established
	GREEN	FLASHING (1 Hz)	No connection established, device OK
	RED	ON	Duplicate MAC-ID
	RED	FLASHING	Connection time out
IO	GREEN	ON	I/O active
	GREEN	FLASHING (1 Hz)	One or more I/O idle
	RED	ON	One or more I/O error
	RED	FLASHING	One or more I/O faulted

8.2 I/O LED Status Slot 1

LED	Colour	Status	Description
D1 *		OFF	No diagnostics active
	RED	ON	Station error/ module bus communication failure
	RED	FLASHING (0.5Hz)	Any diagnostics active
AI channels		OFF	Not active
1_0...1_3	GREEN	ON	Active
	GREEN	FLASHING (0.5 Hz)	Underflow in measuring range
	GREEN	FLASHING (4 Hz)	Overflow in measuring range

* D1 LED also reports gateway diagnostics

8.3 I/O LED Status Slot 2

LED	Colour	Status	Description
D2 *		OFF	No diagnostics active
	RED	ON	Station error/ module bus communication failure
	RED	FLASHING (0.5Hz)	Any diagnostics active
AI channels		OFF	Not active
2_0...2_3	GREEN	ON	Active
	GREEN	FLASHING (0.5 Hz)	Underflow in measuring range
	GREEN	FLASHING (4 Hz)	Overflow in measuring range

* D2 LED also reports gateway diagnostics

9 Mapping and diagnostics

9.1 I/O and Diagnostic Data mapping

INPUT	BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	0	AI 0 LSB							
	1	AI 0 MSB							
	2	AI 1 LSB							
	3	AI 1 MSB							
	4	AI 2 LSB							
	5	AI 2 MSB							
	6	AI 3 LSB							
	7	AI 3 MSB							
Diag.	8	Module number reporting diagnostic data							
	9	Replace station	N/A	Diag. active	Reserved				
	10	Reserved							Range error CH 0
	11	Reserved							Range error CH 1
	12	Reserved							Range error CH 2
	13	Reserved							Range error CH 3
	14	Reserved							Range error CH 4
	15	Reserved							Range error CH 5
	16	Reserved							Range error CH 6
	17	Reserved							Range error CH 7

* The scheduled diagnostic information changes every 125 ms between slot 1 and 2, if both slots send active diagnostics.

9.2 4AI-VI - Diagnostic messages

Diagnostic message	Meaning
Range error CH x	The measurement range has been exceeded. The threshold is 1% of the positive measurement range end value. In current mode, an underflow diagnosis is only invalid for the value range 4...20 mA.

10 Parameters

10.1 DeviceNet™-Parameters

Gateway parameters (fieldbus communication)

The module provides the following parameters to configure the DeviceNet™-communication.
The parameters are described in module-specific EDS-files which allow text-based parameterization in EDS-interpreting configuration tools like RSNetworx from Rockwell Automation, for example.
For a parameterization via Class Instance Attribute (C - I - A), please find the necessary information in brackets (hexadecimal format).

Parameter	Description
MAC-ID (03 - 01 - 01)	0 to 63
Baud rate (03 - 01 - 02)	0 = 125 kbps * 1 = 250 kbps 2 = 500 kbps
AutoBaud (03 - 01 - 64)	0 = disable 1 = enable *
on I/O cntcn timeout (64 - 02 - 73)	Defines the output behavior in case of I/O connection timeout: 0 = switch outputs faulted * 1 = switch outputs off 2 = hold outputs
BUS OFF irtp (03 - 01 - 03)	0 = holf CAN chip in BUS OFF state * 1 = reset CAN chip

* default setting

10.2 4AI-VI - Parameters

Parameter	Description
4AI-VI ch#1 operation mode (76 - 01 - A5) to 4AI-VI ch#4 operation mode (76 - 01 - A8)	Parameter for setting the operation mode for the respective channel 0 = deactivate channel 1 = -10 V...+10 V * 2 = 0 V...+10 V 3 = 0 mA...20 mA 4 = 4 mA...20 mA
4AI-VI ch#1 data representation (76 - 01 - B5) to 4AI-VI ch#4 operation mode (76 - 01 - B8)	Parameter for setting the type of values representation for the respective channel: 0 = default 1 = 16 bit integer * 2 = 12 bit left justified + diagnostics
4AI-VI disable diagnostics (76 - 01 - C5)	0 = channel 1 * … 3 = channel 4

* default setting