ENGLISH

Anybus® CompactCom™ M40

HARDWARE DESIGN GUIDE

HMSI-216-126
Version 3.3
Publication date 2025-08-19

Important User Information

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1. Preface

1.1. About this Document

This document is intended to provide a good understanding of the mechanical and electrical properties of the Anybus CompactCom platform. It does not cover any of the network specific features offered by the Anybus CompactCom 40 products; this information is available in the appropriate Network Guide.

The reader of this document is expected to be familiar with hardware design and communication systems in general. For additional information, documentation, support etc., please visit the support website at www.hms-networks.com/technical-support.

1.2. Related Documents

Document	Author	Document ID
Anybus CompactCom 40 Software Design Guide	HMS	HMSI-216-125
Anybus CompactCom Host Application Implementation Guide	HMS	HMSI-27-334
Anybus CompactCom Network Guides (separate document for each supported fieldbus or network system)	HMS	
Low-Cost, Low-Power Level Shifting in Mixed-Voltage (5V, 3.3V) Systems (SCBA002A)	Texas Instruments	
LT1767 Data Sheet	Linear Technology	
EN 61000	IEC	

1.3. Document history

Version	Date	Description
1.40	2015-09-22	Last FM version.
2.0	2016–02-24	Moved from FM to XML Misc. updates
2.1	2016-08-23	Misc. updates and corrections
2.2	2017-01-23	Transparent Ethernet M12 connectors
2.3	2017-06-16	Major update to Backward Compatibility section BACnet/IP and CC-Link IE Field added
2.4	2018-03-09	Updated Mechanical Specification Added section on EMC Updated section on usage of DIP1 and DIP 2 in stand alone mode Minor corrections
2.5	2018-05-03	Minor corrections
2.6	2018–08–07	Minor correction
2.7	2018-10-23	Minor corrections, primarily to tolerances Added screw terminal drawings.
2.8	2019-03-01	CANopen info added Minor updates Rebranded
2.9	2019-06-25	UL information updated Host connector information updated
3.0	2024-10-28	Migrated document from DOX to Paligo Minor updates
3.1	2024-12-17	Updated EMC information
3.2	2025-07-10	Added a new section on 'IP Rating'
3.3	2025-08-19	Added information about the timing value details for the new firmware.

1.4. Document Conventions

Lists

Numbered lists indicate tasks that should be carried out in sequence:

1. First do this
2. Then do this

Bulleted lists are used for:

- Tasks that can be carried out in any order
- Itemized information

User Interaction Elements

User interaction elements (buttons etc.) are indicated with bold text.

Program Code and Scripts

```
Program code and script examples
```

Cross-References and Links

Cross-reference within this document: Document Conventions (page 3)

External link (URL): www.hms-networks.com

Safety Symbols

DANGER
Instructions that must be followed to avoid an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
Instructions that must be followed to avoid a potential hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION
Instruction that must be followed to avoid a potential hazardous situation that, if not avoided, could result in minor or moderate injury.

IMPORTANT
Instruction that must be followed to avoid a risk of reduced functionality and/or damage to the equipment, or to avoid a network security risk.

Information Symbols

NOTE
Additional information which may facilitate installation and/or operation.

TIP
Helpful advice and suggestions.

1.5. Document Specific Conventions

- The terms “Anybus” or “module” refers to the Anybus CompactCom module.
- The terms “host” or “host application” refer to the device that hosts the Anybus CompactCom hardware or software.
- Hexadecimal values are written in the format NNNNh or 0xNNNN, where NNNN is the hexadecimal value.
- A byte always consists of 8 bits.
- All dimensions in this document have a tolerance of ±0.20mm unless otherwise stated.
- Outputs are TTL compliant unless otherwise stated.
- Signals which are “pulled to GND” are connected to GND via a resistor.
- Signals which are “pulled to 3V3” are connected to 3V3 via a resistor.
- Signals which are “tied to GND” are directly connect GND,
- Signals which are “tied to 3V3” are directly connected to 3V3.
- Inverted signals are represented either with an initial "n" or using an overline.

1.6. Trademarks

- Anybus® is a registered trademark of HMS Industrial Networks.
- EtherNet/IP is a trademark of ODVA, Inc.
- DeviceNet is a trademark of ODVA, Inc.
- EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

All other trademarks are the property of their respective holders.

2. Introduction

2.1. General Description

All Anybus CompactCom module implementations share the same footprint and electrical interface, allowing the host application to support all major networking systems using the same hardware platform. In the same way all Anybus CompactCom B40-1 share footprint and electrical interface. This document describes the hardware details of the Anybus CompactCom M40 modules, both with and without housing. Please consult the Anybus CompactCom B40–1 Design Guide for specific information about the Anybus CompactCom B40–1 brick solution.

> **IMPORTANT**
> This a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.
>
> This product contains ESD (Electrostatic Discharge) sensitive parts that may be damaged if ESD control procedures are not followed. Static control precautions are required when handling the product. Failure to observe this may cause damage to the product.

2.2. Features

- Hardware support for triple buffered process data, which increases performance
- Supports synchronization for selected industrial networks
- Black channel interface, offering a transparent channel for safety communication for selected networks
- Low latency
- Integrated protocol stack handling (where applicable)
- Galvanically isolated network interface (where applicable)
- On-board network status indications according to each network standard (where applicable)
- On-board network connectors according to each network standard
- Compact size (52 x 50 mm, 2”″ x 1.97″”)
- Firmware upgradable (FLASH technology)
- 3.3 V design
- 8-bit and 16-bit parallel modes
- SPI mode
- Shift register mode
- Precompliance tested for network conformance (where applicable).

> **IMPORTANT**
> All Anybus CompactCom versions will be precertified for network conformance. While this is done to ensure that the final product *can* be certified, it does not mean that the final product does not require certification. Contact HMS for further information.

- Precompliance tested for CE & UL.
- Version with M12 connector available for several networks.

2.3. M12 Connector

A number of the Anybus CompactCom M40 modules are available with M12 connectors instead of the usual network connector.

The M12 connector gives the opportunity to raise the IP rating of a product up to IP67. However, the standard Anybus CompactCom housing does not qualify for IP ratings above IP20. If a higher rating is needed, careful design of housings and/or module fronts is necessary. It is then recommended to use the Anybus CompactCom M40 without housing, and design a new housing/front that fulfills the requirements for IP67.

3. Host Interface

This chapter describes the low level properties of the Anybus CompactCom interface.

3.1. Overview

The Anybus CompactCom has five different host communication interfaces, corresponding to different operating modes. The figure below illustrates the basic properties of these interfaces as well as various I/O and control signals, and how they relate to the host application.

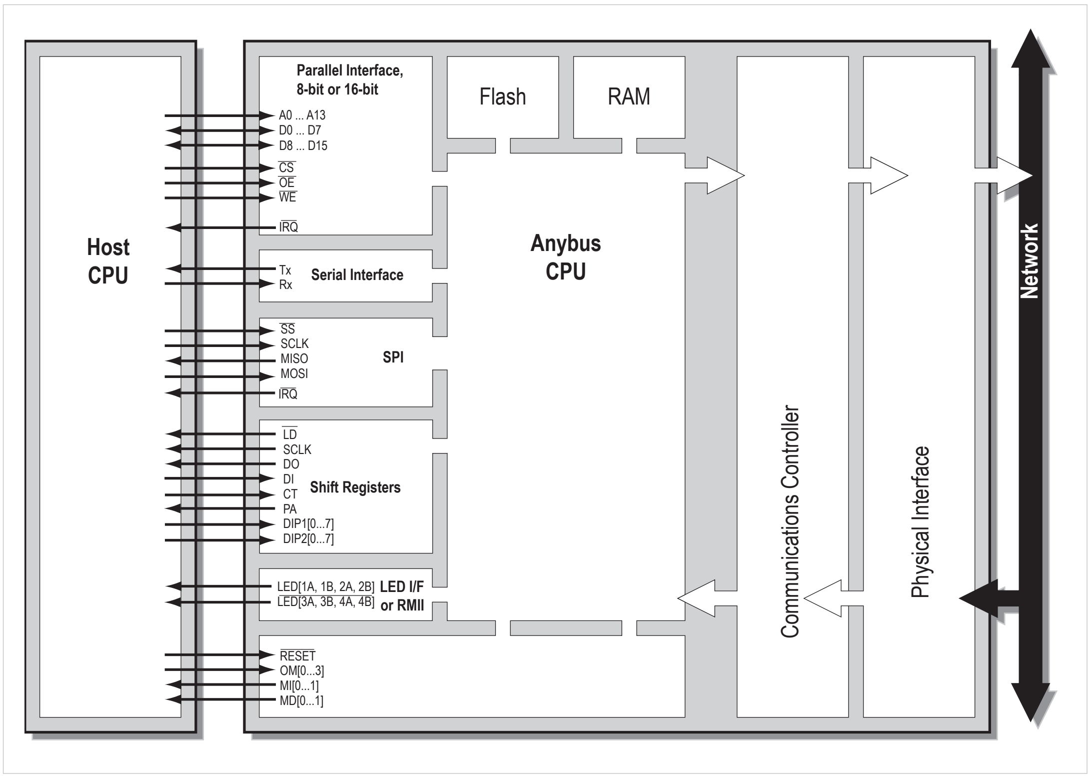


Figure 1.

Please note that only one communication interface at a time is available. Which one is decided at startup.

3.1.1. Parallel Interface, 8-bit or 16-bit

From an external point of view, the parallel interface is a common 8-bit or 16-bit parallel slave port interface, which can easily be incorporated into any microprocessor based system that has an external address/data bus. Generally, implementing this type of interface is comparable to implementing an 8-bit or 16-bit wide SRAM. Additionally, the parallel interface features an interrupt request line, allowing the host application to service the module only when actually needed.

3.1.2. SPI

The Serial Peripheral Interface (SPI) is a synchronous serial link. It operates in full duplex mode and devices communicate in master/slave mode where the Anybus CompactCom modules always act as slaves. The interface can provide much higher performance than the serial interface, but not as high as the parallel interface.

3.1.3. Stand-Alone Shift Register Interface

In this mode the Anybus CompactCom M40 operates stand-alone, with no host processor. Process data is communicated to the shift registers on the host.

3.1.4. Serial Interface (UART)

The serial interface is provided for backward compatibility with the Anybus CompactCom 30. The interface is event based, and it is not recommended to use it with an Anybus CompactCom M40 module as it can not take advantage of the greater performance of the 40-series. For more information about the serial interface, see the Anybus CompactCom M30 Hardware Design Guide.

3.1.5. LED Interface

Network status LED output signals are available in all operating modes except 16-bit parallel mode. The status of the network LEDs is always available in the LED status register for all modes, see Anybus CompactCom 40 Software Design Guide for more information.

3.1.6. Reduced Media-Independent Interface (RMII)

This interface is used for Transparent Ethernet, where Industrial Ethernet communication is handled by the Anybus CompactCom and other Ethernet communication is routed to the host application. 16–bit parallel mode and the LED Interface signals are not available when Transparent Ethernet is enabled.

See RMII — Reduced Media-Independent Interface (page 17) for more information.

3.2. Connector

The Anybus CompactCom uses a 50–pin CompactFlash™ style connector. The pinning is seen from the host application side of the Anybus CompactCom module.

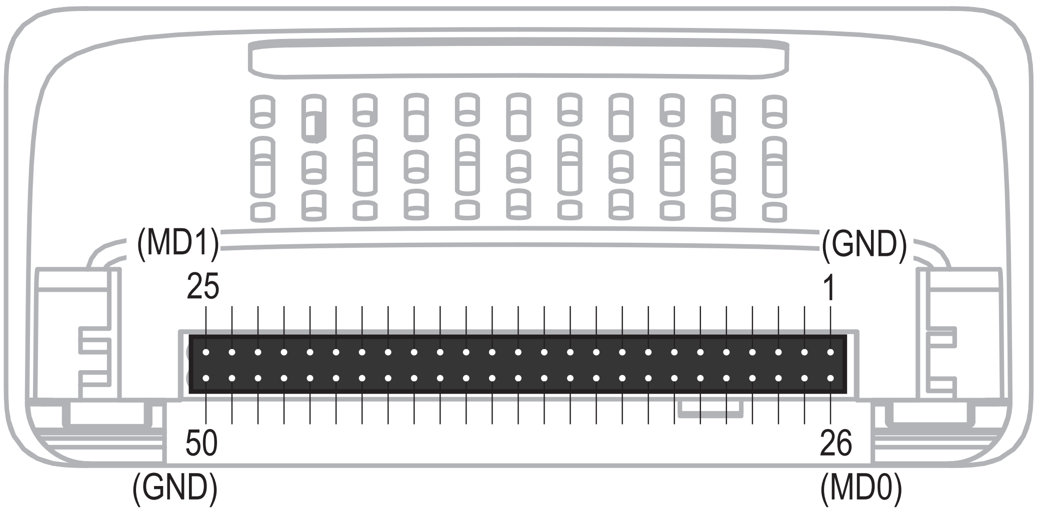


Figure 2.

See Application Connector Pin Overview (page 10) for information on how each pin is used in the different modes.

IMPORTANT

The host interface is not pin compatible with the CompactFlash™ standard. Also, prior to exchanging a module, power should be turned off or the MD (module detection) signals should be used to shut down communication and power when the module is removed. Failure to observe this may cause damage to the host product and/or the Anybus CompactCom module.

The pin types of the host interface connector are defined in the table below. The pin type may be different depending on which mode is used.

Pin type	Definition
I	Input
O	Output
I/O	Input/Output (bidirectional)
OD	Open Drain
Power	Pin connected directly to module power supply, GND or 3V3

3.2.1. Application Connector Pin Overview

Depending on operating mode, the pins have different names and different functionality. Presented below is an overview of all pins except GND and 3V3.

NOTE
The ASI (Anybus Safety Interface) signals are used by a safety module to connect to the safety module interface of an Anybus CompactCom M40 series module.

Pin	Signal Name					Type	Notes
	Serial Mode	SPI Mode	8-bit Mode	16-bit Mode	Shift Register Mode		
49	DIP1_0	DIP1_0	A0	$\overline{\text{WEH}}$	DIP1_0	I	-
24	DIP1_1	DIP1_1	A1	A1	DIP1_1	I	-
48	DIP1_2	DIP1_2	A2	A2	DIP1_2	I	-
23	DIP1_3	DIP1_3	A3	A3	DIP1_3	I	-
47	DIP1_4	DIP1_4	A4	A4	DIP1_4	I	-
22	DIP1_5	DIP1_5	A5	A5	DIP1_5	I	-
46	DIP1_6	DIP1_6	A6	A6	DIP1_6	I	-
21	DIP1_7	DIP1_7	A7	A7	DIP1_7	I	-
45		$\overline{\text{SS}}$	A8	A8	$\overline{\text{LD}}$	I	-
20		SCLK	A9	A9	SCLK	O, I	-
44		MISO	A10	A10	DO	O, I	-
19		MOSI	A11	A11	DI	I	-
43	ASI RX		A12	A12		I	-
18	ASI TX		A13	A13		O, I	-
14	DIP2_0	DIP2_0	D0	D0	DIP2_0	I, I/O	-
39	DIP2_1	DIP2_1	D1	D1	DIP2_1	I, I/O	-
15	DIP2_2	DIP2_2	D2	D2	DIP2_2	I, I/O	-
40	DIP2_3	DIP2_3	D3	D3	DIP2_3	I, I/O	-
16	DIP2_4	DIP2_4	D4	D4	DIP2_4	I, I/O	-
41	DIP2_5	DIP2_5	D5	D5	DIP2_5	I, I/O	-
17	DIP2_6	DIP2_6	D6	D6	DIP2_6	I, I/O	-
42	DIP2_7	DIP2_7	D7	D7	DIP2_7	I, I/O	-
4	LED1B	LED1B	LED1B	D8	LED1B	O, I/O	In modules supporting RMII, these pins are used for the RMII interface, see RMII — Reduced Media-Independent Interface (page 17).
29	LED1A	LED1A	LED1A	D9	LED1A	O, I/O	
5	LED2B	LED2B	LED2B	D10	LED2B	O, I/O	
30	LED2A	LED2A	LED2A	D11	LED2A	O, I/O	
6	$\overline{\text{LED3B}}$	$\overline{\text{LED3B}}$	$\overline{\text{LED3B}}$	D12	$\overline{\text{LED3B}}$	OD, I/O	
31	$\overline{\text{LED3A}}$	$\overline{\text{LED3A}}$	$\overline{\text{LED3A}}$	D13	$\overline{\text{LED3A}}$	OD, I/O	
7	$\overline{\text{LED4B}}$	$\overline{\text{LED4B}}$	$\overline{\text{LED4B}}$	D14	$\overline{\text{LED4B}}$	O, I/O	
32	$\overline{\text{LED4A}}$	$\overline{\text{LED4A}}$	$\overline{\text{LED4A}}$	D15	$\overline{\text{LED4A}}$	O, I/O	
34			$\overline{\text{WE}}$	$\overline{\text{WEL}}$	CT	I	-
33			$\overline{\text{OE}}$	$\overline{\text{OE}}$		I	-
10			$\overline{\text{CS}}$	$\overline{\text{CS}}$		I	-
9		$\overline{\text{IRQ}}$	$\overline{\text{IRQ}}$	$\overline{\text{IRQ}}$	PA	O	-
28	RX	ASI RX	ASI RX	ASI RX	ASI RX	I	Connect to 3V3 if not used.
3	TX / OM3	ASI TX / OM3	ASI TX / OM3	ASI TX / OM3	ASI TX / OM3	O	Strapping input with internal weak pull-up during powerup. To configure OM3, use an external pull-up/pull-down of 1.0 to 2.2 kΩ). The pin changes to output after powerup.
36	OM0	OM0	OM0	OM0	OM0	I	-
11	OM1	OM1	OM1	OM1	OM1	I	-
35	OM2	OM2	OM2	OM2	OM2	I	-
27	MI0/SYNC	MI0/SYNC	MI0/SYNC	MI0/SYNC	MI0/SYNC	O	Low at powerup and before reset release.
2	MI1	MI1	MI1	MI1	MI1	O	Connected to 3V3
26	MD0	MD0	MD0	MD0	MD0	O	Connected to GND
25	MD1	MD1	MD1	MD1	MD1	O	Connected to GND
8	$\overline{\text{RESET}}$	$\overline{\text{RESET}}$	$\overline{\text{RESET}}$	$\overline{\text{RESET}}$	$\overline{\text{RESET}}$	I	-

3.2.2. Power Supply Pins

Signal Name	Pin Type	Pin	Description
GND	Power	50 37 12 1	Power and signal ground reference.
3V3	Power	38 13	3.3 V power supply.

3.2.3. LED Interface / D8–D15 (Data Bus)

Signal Name	Pin Type	Pin	Description, LED Interface	Description, Data Bus
LED1A / D9	O / I/O	29	LED 1 Indication A • Green	D9 in 16-bit data bus mode
LED1B / D8	O / I/O	4	LED 1 Indication B • Red	D8 in 16-bit data bus modeData Bus
LED2A / D11	O / I/O	30	LED 2 Indication A • Green	D11 in 16-bit data bus mode
LED2B / D10	O / I/O	5	LED 2 Indication B • Red	D10 in 16-bit data bus mode
$\overline{LED3A}$ / D13	OD / I/O	31	LED 3 Indication A • Green • Mainly used for link/activity on network port 1 on the Ethernet modules. Pin is open-drain to maintain backward compatibility with existing applications, where this pin may be tied to GND. Also for compatibility with passive modules where this pin is a driver enable input	D13 in 16-bit data bus mode
$\overline{LED3B}$ / D12	OD / I/O	6	LED 3 Indication B • Yellow or red, depending on network • Mainly used for link/activity on network port 1 on the Ethernet modules (yellow). Pin is open-drain to maintain backward compatibility with existing applications, where this pin may be tied to GND. Also for compatibility with passive modules where this pin is as driver enable input	D12 in 16-bit data bus mode
$\overline{LED4A}$ / D15	O / I/O	32	LED 4 Indication A • Green • Mainly used for link/activity on network port 2 on the Ethernet modules.	D15 in 16-bit data bus mode
$\overline{LED4B}$ / D14	O / I/O	7	LED 4 Indication B • Yellow or red, depending on network • Mainly used for link/activity on network port 2 on the Ethernet modules (yellow).	D14 in 16-bit data bus mode

Corresponding LED Placement on Module Fronts

The LED interface signals are shown on the module front as indicated in the pictures below. See the different Anybus CompactCom 40 Network Guides (app. “Technical Specification”) for details.

Anybus CompactCom M40 Ethernet modules have four LEDs on the front:

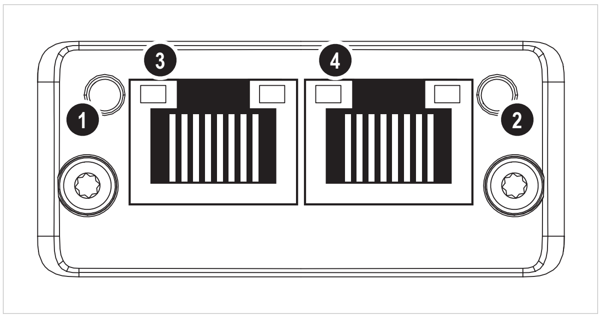


Figure 3.

LED no (in figure)	Corresponding signal name in LED interface
1	LED1A/LED1B
2	LED2A/LED2B
3	$\overline{\text{LED3A}}$/$\overline{\text{LED3B}}$
4	$\overline{\text{LED4A}}$/$\overline{\text{LED4B}}$

Anybus CompactCom M40 modules not supporting Ethernet have two LEDs on the front. The picture shows the module front of the Anybus CompactCom M40 DeviceNet, but other modules, e.g. PROFIBUS, have LEDs in the corresponding positions.

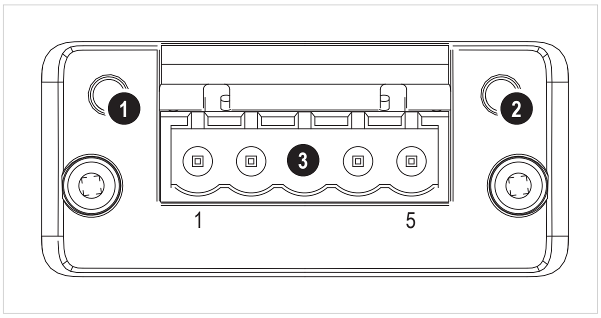


Figure 4.

LED no (in figure)	Corresponding signal name in LED interface
1	LED1A/LED1B
2	LED2A/LED2B

3.2.4. Settings / Sync

Signal Name	Pin Type	Pin	Description
OM0 OM1 OM2 OM3 (ASI TX) (TX)	I I I I (Used as OM3 during power up)	36 11 35 3	**Operating Mode** Used to select interface and baud rate, see below.
MI0 / SYNC MI1	O O	27 2	**Module Identification** MI0 and MI1 can be used by the host application to determine what type of Anybus CompactCom that is connected. **SYNC** On networks that support synchronous communication, a periodic synchronization pulse is provided on the SYNC output. The SYNC pulse is also available as a maskable interrupt using the IRQ signal.
MD0 MD1	O O	26 25	**Module Detection** These signals can be used by the host application to determine that an Anybus CompactCom is inserted into the slot, see Module Detection (page 16). The signals are connected directly to GND on the Anybus CompactCom.
ASI RX ASI TX	I O	28 3	**Black Channel Communication** These signals can be connected to a safety module, e.g. to IXXAT Safe T100 to provide a safe channel for black channel communication. If not used, pin 28 should be connected to 3V3.
RX TX	I O	28 3	**Serial Communications Signals**

Operating Modes

These inputs select the interface that should be used to exchange data (SPI, stand-alone shift register, parallel or serial) and, if the serial interface option is used, the operating baud rate. The state of these signals is sampled once during startup, i.e. any changes require a reset in order to have effect.

OM3	OM2	OM1	OM0	Operating Mode
LOW	LOW	LOW	LOW	Reserved
LOW	LOW	LOW	HIGH	SPI
LOW	LOW	HIGH	LOW	Stand-alone shift register
LOW	LOW	HIGH	HIGH	Reserved
LOW	HIGH	LOW	LOW	Reserved
LOW	HIGH	LOW	HIGH	Reserved
LOW	HIGH	HIGH	LOW	Reserved
LOW	HIGH	HIGH	HIGH	16-bit parallel
HIGH	LOW	LOW	LOW	8-bit parallel
HIGH	LOW	LOW	HIGH	Serial 19.2 kbps
HIGH	LOW	HIGH	LOW	Serial 57.6 kbps
HIGH	LOW	HIGH	HIGH	Serial 115.2 kbps
HIGH	HIGH	LOW	LOW	Serial 625 kbps
HIGH	HIGH	LOW	HIGH	Reserved
HIGH	HIGH	HIGH	LOW	Reserved
HIGH	HIGH	HIGH	HIGH	Service Mode

LOW = V_{IL}

HIGH = V_{IH}

NOTE
These signals must be stable prior to releasing the RESET signal. Failure to observe this may result in faulty behavior.

NOTE
In an application, where it has to be possible to change an Anybus CompactCom M30 module for an Anybus CompactCom M40 module, there should be an external pull-up on the OM3 pin to ensure correct and stable behavior. The reason is that during startup the OM3 will indicate an M30 mode if it is high. The signal will change to an output signal after startup, and will then be used either for the serial interface towards the host application or for black channel communication using an external safety module.

Module Detection

These signals are internally connected to GND, and can be used by the host application to detect whether a module is present or not.

State		Indication
MD0	MD1	
HIGH	HIGH	Module not present
LOW	HIGH	
HIGH	LOW	
LOW	LOW	Module present

LOW = V_{OL}

HIGH = V_{OH}

NOTE
If unused, leave these signals unconnected.

Module Identification

These signals indicate which type of module that is connected. It is recommended to check the state of these signals before accessing the module.

MI1	MI0	Module Type
LOW	LOW	Active Anybus CompactCom 30
LOW	HIGH	Passive Anybus CompactCom
HIGH	LOW	Active Anybus CompactCom 40
HIGH	HIGH	Customer specific

LOW = V_{OL}

HIGH = V_{OH}

NOTE
On modules supporting “SYNC”, MI0 is used as a SYNC signal during operation. MI0 should only be sampled by the application during the time period from power up to the end of SETUP state.

3.2.5. RMII — Reduced Media-Independent Interface

In RMII enabled modules, the pins described in the table below are used for the RMII communication. They are set to tristate during startup, making it impossible to indicate e.g. exception during setup. When setup is complete, they are set to inputs/outputs according to the selected mode. See Anybus CompactCom 40 Software Design Guide for more information on mode selection.

IMPORTANT

The 16–bit parallel mode can not be used when RMII is enabled.

LED status will not be available when RMII is enabled.

Pin	Signal Name	Pin Type	Notes
4	RXD0	O	-
29	RXD1	O	-
5	RXDV	O	-
30		I	Not used (connect to external pull-down)
6	TXD0	I	-
31	TXD1	I	-
7	TXEN	I	-
32	CLK	I	-

Table 1. RMII Timing Details

Symbol	Parameter	Min.	Max.	Unit
tSU	TXD0, TXD1, TXEN data setup to CLK rising edge	4	-	ns
tHOLD	TXD0, TXD1, TXEN data hold from CLK rising edge	2	-	ns
tOD	RXD0, RXD1, RXDV output delay from CLK rising edge	2	12	ns

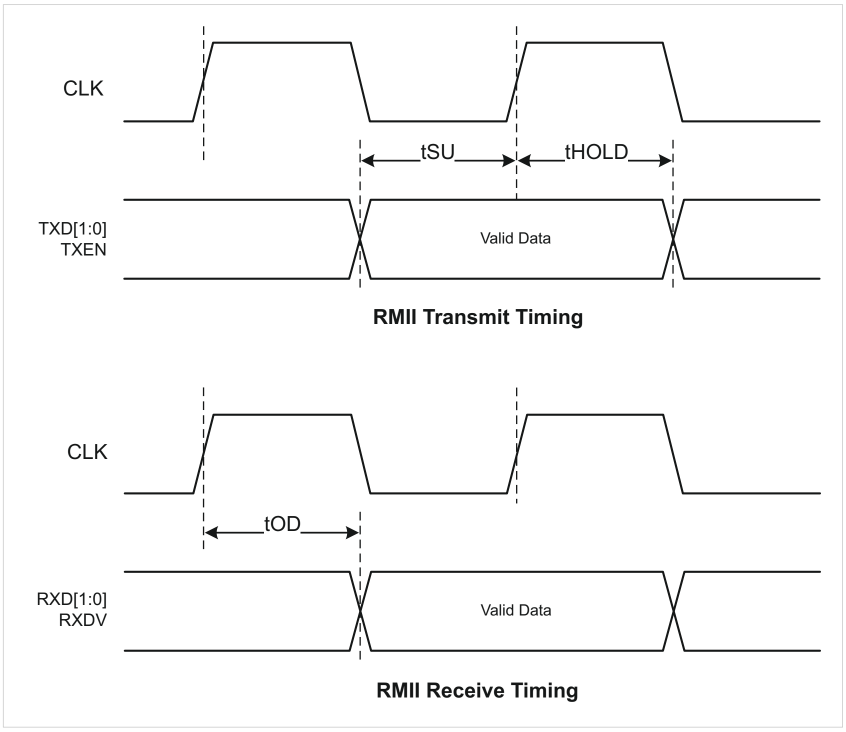


Figure 5.

3.2.6. IRQ (Interrupt Request)

Signal Name	Pin Type	Pin	Description
$\overline{\text{IRQ}}$	O	9	**Interrupt Request** Active low interrupt signal.

The interrupt request signal is active low. It is asserted by the Anybus CompactCom after a power up or a hardware reset event.

The use of this signal is optional but highly recommended. Even if the host application lacks interrupt capabilities, it is recommended to connect this signal to an input port to simplify software design.

This signal must be pulled to 3V3 on the host application side to prevent spurious interrupts during startup.

3.2.7. RESET (Reset Input)

Signal Name	Pin Type	Pin	Description
Reset	I	8	**Reset** Used to reset the module.

The reset input is active low. It must be connected to a host application controllable output pin in order to handle the power up sequence, voltage deviations and to be able to support network reset requests.

The module does not feature any internal reset regulation. To establish a reliable interface, the host application is solely responsible for resetting the module when the supply voltage is outside the specified range.

There is no Schmitt trigger circuitry on this input, which means that the module requires a fast rise time of the reset signal, preferably equal to the slew rate of typical logical circuits. A simple RC circuit is for example not sufficient to guarantee stable operation, as the slew rate from logic 0 to logic 1 is too slow.

IMPORTANT
The rise time of the reset signal should be as fast as possible, and must not exceed 30 ns. The signal is not under any circumstances allowed to be left floating. Use a pull-down to prevent this.

The following requirements must be met by the reset regulator connected to the reset input signal.

Power Up

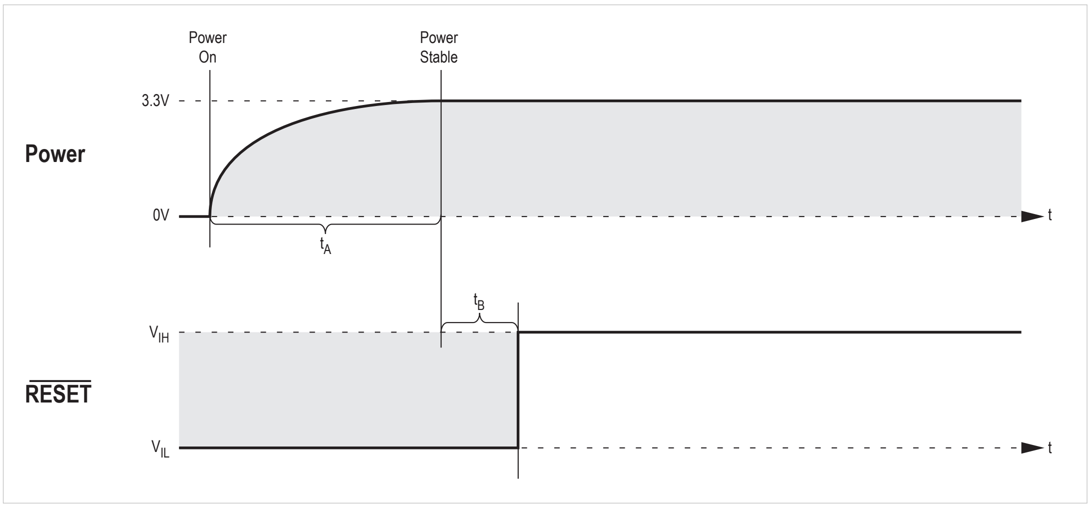


Figure 6.

Power up time limits are given in the table below:

Symbol	Min.	Max.	Definition
t_A	-	-	Time until the power supply is stable after power-on; the duration depends on the power supply design of the host application and is thus beyond the scope of this document.
t_B	1ms	-	Safety margin.

Restart

The reset pulse duration must be at least 10 µs in order for the NP40 to properly recognize a reset.

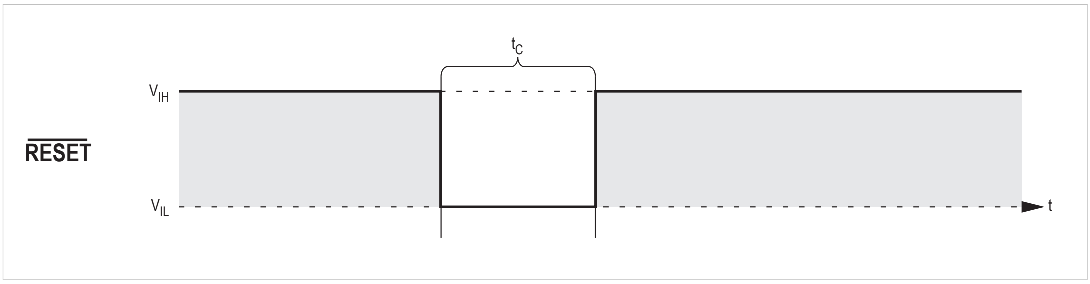


Figure 7.

Symbol	Min.	Max.	Definition
t_C	10 µs	-	Reset pulse width.

3.3. Parallel Interface Operation

3.3.1. General Description

The parallel interface is based on an internal memory architecture, that allows the Anybus CompactCom module to be interfaced directly as a memory mapped peripheral. The M40 modules can be configured for 8-bit or 16-bit parallel operation. The access time is 30 ns.

Polled operation is possible, but at the cost of an overhead. For increased efficiency, an optional interrupt request signal (IRQ) can relieve the host application from polling for new information, thus increasing the performance. For more information, see IRQ (Interrupt Request) (page 18).

The parallel interface must be enabled using OM[0... 3].

3.3.2. Pin Usage in 8-bit Parallel Mode

The parallel 8-bit interface uses the following signals:

Pin	Signal Name	Pin Type	Description/Comments
49	A0	I	A[0...13]: Mandatory address input signals.
24	A1		
48	A2		
23	A3		
47	A4		
22	A5		
46	A6		
21	A7		
45	A8		
20	A9		
44	A10		
19	A11		
43	A12		
18	A13		
14	D0	I/O	Standard bidirectional data bus.
39	D1		
15	D2		
40	D3		
16	D4		
41	D5		
17	D6		
42	D7		
4	LED1B	O	8-bit mode: LED functionality, see LED Interface (page 8). When not used, LED1A, LED1B, LED2A, LED2B, LED4A and LED4B can be left unconnected. LED3A and LED3B are open-drain outputs and should, if not used, be pulled to 3V3 or GND, or tied to GND, depending on the requirements of the application.
29	LED1A	O	
5	LED2B	O	
30	LED2A	O	
6	$\overline{\text{LED3B}}$	OD	
31	$\overline{\text{LED3A}}$	OD	
7	$\overline{\text{LED4B}}$	O	
32	$\overline{\text{LED4A}}$	O	
34	$\overline{\text{WE}}$	I	Active low write signal or combined read/write signal.
33	$\overline{\text{OE}}$	I	Bus output enable; enables output on the data bus when low.
10	$\overline{\text{CS}}$	I	Bus chip select enable; enables parallel access to the module when low.
9	$\overline{\text{IRQ}}$	O	Active low Interrupt Request signal. Asserted by the Anybus CompactCom. The use of this signal is optional but highly recommended. Even if the host application lacks interrupt capabilities, it is recommended to connect this signal to an input port to simplify software design. This signal must be pulled to 3V3 on the host application side to prevent spurious interrupts during startup.
36	OM0	I	Operating mode. Connect all three to GND for 8-bit parallel operating mode. For more information see Operating Modes (page 15).
11	OM1		
35	OM2		
3	OM3 / ASI TX	O, I	Black channel output. See Black Channel/Safety Module (page 46). During startup the pin (with OM[0..2]) is used to define the operating mode of the module. Connect to external pull-up for 8-bit parallel operating mode, see Application Connector Pin Overview (page 10).
28	ASI RX	I	Black channel input. Connect to 3V3 if not used. See Black Channel/Safety Module (page 46).
27	MI0/SYNC	O	See Module Identification (page 16).
2	MI1		

Pin	Signal Name	Pin Type	Description/Comments
26 25	MD0 MD1	O	See Module Detection (page 16).
8	$\overline{\text{RESET}}$	I	See RESET (Reset Input) (page 19).

Applications with limited number of address lines may connect A[0..10] of the Anybus CompactCom to their CPU, and pull signals A[11..13] high. This will allow communication with the Anybus CompactCom using the smaller message format of the Anybus CompactCom 30 series, with a reduced set of address lines, allowing access to only 256 byte process data, see the Anybus CompactCom 30 Software Design Guide for more information.

NOTE
There are no internal pull-up resistors on any of the signals above, except for OM3, which has an internal weak pull-up.

Function Table (CS, WE, OE, D[0...7])

$\overline{\text{CS}}$	WE	OE	D[0...7] State	Comment
HIGH	X	X	High impedance	Module not selected.
LOW	LOW	X	Data Input (Write)	Data on D[0...7] is written to location selected by address bus.
LOW	HIGH	LOW	Data Output (Read)	Data from location selected by address bus is available on D[0...7].
LOW	HIGH	HIGH	High impedance	Module is selected, but D[0...7] is in a high impedance state.

X = don’t care

LOW = V_{IL}

HIGH = V_{IH}

3.3.3. Pin Usage in 16–bit Parallel Mode

The parallel 16-bit interface uses the following signals:

Pin	Signal Name	Pin Type	Description/Comments
24	A1	I	A[1...13]: Mandatory address input signals. Selects source/target location.
48	A2		
23	A3		
47	A4		
22	A5		
46	A6		
21	A7		
45	A8		
20	A9		
44	A10		
19	A11		
43	A12		
18	A13		
14	D0	I/O	Standard bidirectional data bus.
39	D1		
15	D2		
40	D3		
16	D4		
41	D5		
17	D6		
42	D7		
4	D8		
29	D9		
5	D10		
30	D11		
6	D12		
31	D13		
7	D14		
32	D15		
49	$\overline{WEH}$	I	Write enable high byte.
34	$\overline{WEL}$	I	Write enable low byte.
33	$\overline{OE}$	I	Bus output enable; enables output on the data bus when low.
10	$\overline{CS}$	I	Bus chip select enable; enables parallel access to the module when low.
9	$\overline{IRQ}$	O	Active low Interrupt Request signal. Asserted by the Anybus CompactCom. The use of this signal is optional but highly recommended. Even if the host application lacks interrupt capabilities, it is recommended to connect this signal to an input port to simplify software design. This signal must be pulled to 3V3 on the host application side to prevent spurious interrupts during startup.
36	OM0	I	Operating mode. Connect all three to 3V3 for 16-bit parallel operating mode. For more information see Operating Modes (page 15).
11	OM1		
35	OM2		
27	MI0/SYNC	O	See Module Identification (page 16).
2	MI1		
3	OM3 / ASI TX	O, Strap	Black channel output. See Black Channel/Safety Module (page 46). During startup the pin (with OM[0..2]) is used to define the operating mode of the module. Connect to pull-down for 16-bit parallel operating mode, see Application Connector Pin Overview (page 10).
28	ASI RX	I	Black channel input. Connect to 3V3 if not used. See Black Channel/Safety Module (page 46).

Pin	Signal Name	Pin Type	Description/Comments
26 25	MD0 MD1	O	See Module Detection (page 16).
8	$\overline{\text{RESET}}$	I	See RESET (Reset Input) (page 19).

Applications with limited number of address lines may connect A[0..10] of the Anybus CompactCom to their CPU, and pull signals A[11..13] high. This will allow communication with the module using the smaller message format of the Anybus CompactCom 30 series, with a reduced set of address lines, allowing access to only 256 byte process data, see the Anybus CompactCom 30 Software Design Guide for more information.

The A0 signal is not needed in 16-bit parallel operating mode, as 16 bits are addressed instead of 8 bits. If there is need for writing one byte at the time signals $\overline{\text{WEH}}$ and $\overline{\text{WEL}}$ can be used to enable writing to the high or low byte respectively. If both are enabled both bytes are written.

Function Table (CS, WEL, WEH, OE, D[0...15])

$\overline{\text{CS}}$	$\overline{\text{WEL}}$	$\overline{\text{WEH}}$	$\overline{\text{OE}}$	D[0...15] State	Comment
HIGH	X	X	X	High impedance	Module not selected.
LOW	LOW	HIGH	X	Data Input (Write)	Data on D[0...7] is written to low byte of location selected by address bus.
LOW	HIGH	LOW	X	Data Input (Write)	Data on D[8...15] is written to high byte of location selected by address bus.
LOW	LOW	LOW	X	Data Input (Write)	Data on D[0 ...15] is written to location selected by address bus.
LOW	HIGH	HIGH	LOW	Data Output (Read)	Data from location selected by address bus is available on D[0...15].
LOW	HIGH	HIGH	HIGH	High impedance	Module is selected, but D[0...15] is in a high impedance state.

X = don’t care

LOW = V_{IL}

HIGH = V_{IH}

3.3.4. Memory Access Read Timing

The $\overline{\text{WE}}$ input signal must remain high during a read access. The timing diagram shows a burst read, but the timing applies for a single read as well. The Anybus CompactCom M40 has no setup or hold timing requirements on the address bus relative to $\overline{\text{CS}}$ during read operations. The only limitation on read setup and hold times is that the pingpong and powerup interrupt will be acknowledged if all address lines are high for 10-15 ns or more while $\overline{\text{CS}}$ is low.

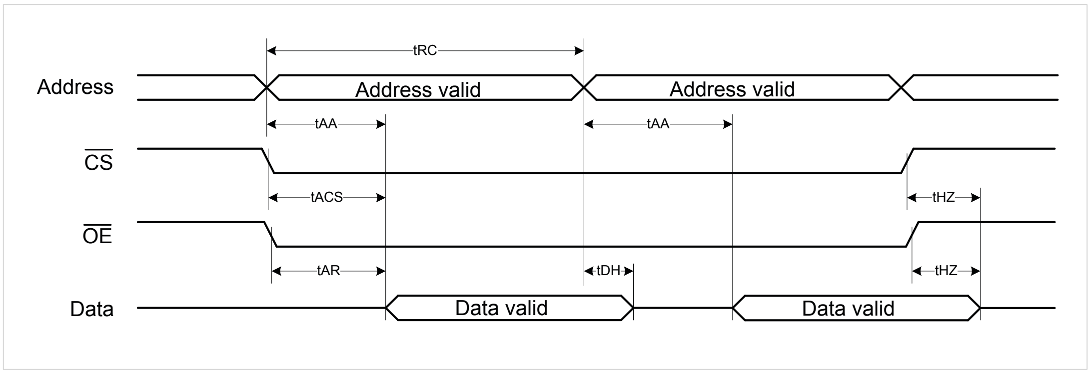


Figure 8.

Symbol	**Parameter**	**Min (ns)**	**Max (ns)**
tRC	Read cycle time	30	-
tAA	Address valid to Data valid	-	30
tACS	$\overline{CS}$ low to Data valid	-	30
tAR	$\overline{OE}$ low to Data valid	-	15
tHZ	$\overline{CS}$ or $\overline{OE}$ high to output reached tristate	-	15
tDH	Data hold time	0	-

3.3.5. Memory Access Write Timing

It doesn't matter if the $\overline{OE}$ signal is low or high as long as $\overline{WE}$ is active (low). In 16 bit mode, the timing requirements of $\overline{WE}$ applies to both $\overline{WEL}$ and $\overline{WEH}$. The timing diagrams show a burst write but the timing applies for a single write as well. The first diagram shows write enable controlled write timing and the second shows chip select controlled write timing.

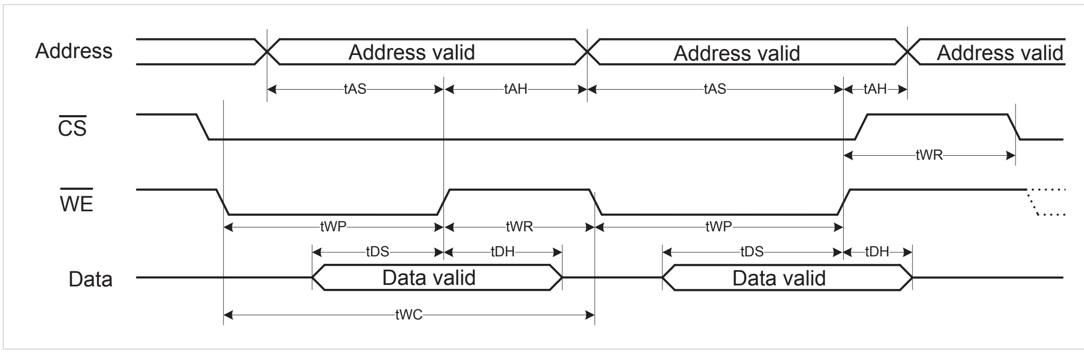


Figure 9.

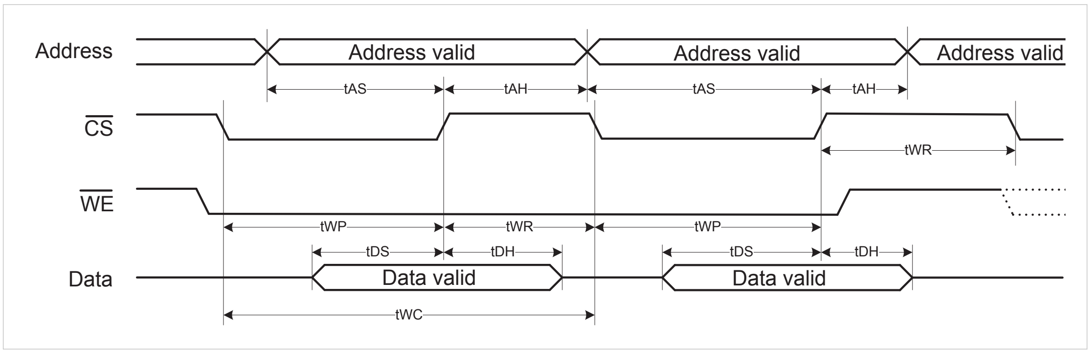


Figure 10.

Symbol	Parameter	Min (ns)	Max (ns)
tWC	Write cycle time	30	-
tAS	Address valid before End-of-Write	15	-
tAH	Address valid after End-of-Write	0	-
tWP	$\overline{CS}$ and $\overline{WE}$ low pulse width	15	-
tDS	Data valid before End-of-Write	15	-
tDH	Data valid after End-of-Write	0	-
tWR	Write recovery time	10	-

3.4. SPI Operation

3.4.1. General Description

The SPI (Serial Peripheral Interface) bus is a synchronous serial data link standard which operates in full duplex mode.

The SPI interface is activated using the OM[0...3] inputs. See Operating Modes (page 15).

3.4.2. Pin Usage in SPI Mode

Presented below is an overview of all pins except GND and 3V3.

Pin	Signal Name	Pin Type	Description/Comments
49	DIP1_0	I	DIP switch. Usage defined by application. Readable through attribute #14 (Switch status) in Anybus Object, instance #1. Connect to GND if not used.
24	DIP1_1	I	
48	DIP1_2	I	
23	DIP1_3	I	
47	DIP1_4	I	
22	DIP1_5	I	
46	DIP1_6	I	
21	DIP1_7	I	
45	$\overline{\text{SS}}$	I	Slave select. Active low.
20	SCLK	I	Serial Clock Input
44	MISO	O	Master input, slave output. Input to the master's shift register, and output from the slave's shift register.
19	MOSI	I	Master output, slave input. Output from the master's shift register, and input to the slave's shift register.
43	(not used)	I	Connect to 3V3.
18		O, I	
14	DIP2_0	I	DIP switch. Usage defined by application. Readable through attribute #14 (Switch status) in Anybus Object, instance #1. Connect to GND if not used.
39	DIP2_1	I	
15	DIP2_2	I	
40	DIP2_3	I	
16	DIP2_4	I	
41	DIP2_5	I	
17	DIP2_6	I	
42	DIP2_7	I	
4	LED1B	O	LED interface. Gives access to LED indications. For more information, see LED Interface / D8–D15 (Data Bus) (page 12). When not used, LED1A, LED1B, LED2A, LED2B, LED4A and LED4B can be left unconnected. LED3A and LED3B are open-drain outputs and should, if not used, be pulled to 3V3 or GND, or tied to GND, depending on the requirements of the application.
29	LED1A	O	
5	LED2B	O	
30	LED2A	O	
6	$\overline{\text{LED3B}}$	OD	
31	$\overline{\text{LED3A}}$	OD	
7	$\overline{\text{LED4B}}$	O	
32	$\overline{\text{LED4A}}$	O	
34	(not used)	I	Connect to 3V3.
33			
10			
9	$\overline{\text{IRQ}}$	O	Active low Interrupt Request signal. Asserted by the Anybus CompactCom. The use of this signal is optional but highly recommended. Even if the host application lacks interrupt capabilities, it is recommended to connect this signal to an input port to simplify software design. This signal must be pulled to 3V3 on the host application side to prevent spurious interrupts during startup.
36	OM0	I	Operating mode [OM2, OM1, OM0]: 0,0,1 for SPI operating mode. For more information see Operating Modes (page 15).
11	OM1		
35	OM2		
3	OM3 / ASI TX	O, Strap	Black channel output. See Black Channel/Safety Module (page 46). During startup the pin (with OM[0..2]) is used to define the operating mode of the module. Connect to external pull-down for SPI operating mode,see Application Connector Pin Overview (page 10).
28	ASI RX	I	Black channel input. Connect to 3V3 if not used. See Black Channel/Safety Module (page 46).
27	MI0/SYNC	O	See Module Identification (page 16).
2	MI1		

Pin	Signal Name	Pin Type	Description/Comments
26	MD0	O	See Module Detection (page 16).
25	MD1		
8	$\overline{\text{RESET}}$	I	See RESET (Reset Input) (page 19).

3.4.3. SPI Interface Signals

The SPI interface option uses three (optionally four) signals:

Signal	Description
SCLK	Serial Clock Input
MOSI	Master output, slave input. Output from the master's shift register, and input to the slave's shift register.
MISO	Master input, slave output. Input to the master's shift register, and output from the slave's shift register.
$\overline{SS}$	Slave Select (optional)

For increased efficiency, the interrupt request signal ($\overline{IRQ}$) is also available, allowing the host application to service the Anybus CompactCom only when necessary.

The Anybus CompactCom samples MOSI data on the rising edge of SCLK and propagates MISO data on the falling edge of SCLK, this is commonly known as SPI Mode 0.

Table 2. Summary of SPI Mode Support

SPI Mode	CPOL	CPHA	Supported by the Anybus CompactCom	Mode description
0	0	0	Only in 4-wire mode	Clock idles low; sample on first edge. Sample on rising edges.
1	0	1	No	Clock idles low; sample on second edge. Sample on falling edges.
2	1	0	No	Clock idles high; sample on first edge. Sample on falling edges.
3	1	1	Yes	Clock idles high; sample on second edge. Sample on rising edges.

4–Wire Mode

In 4-wire mode the $\overline{SS}$ signal is used to indicate the start and stop of an SPI transfer. In this mode the SCLK signal is allowed to be either idle high or idle low. This mode also allows multiple SPI slaves on the same SPI bus, since Anybus CompactCom MISO is tri-stated when $\overline{SS}$ is high.

A 4-wire diagram example:

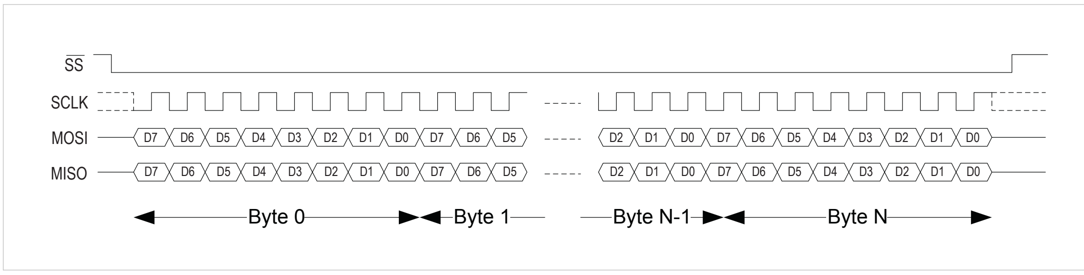


Figure 11.

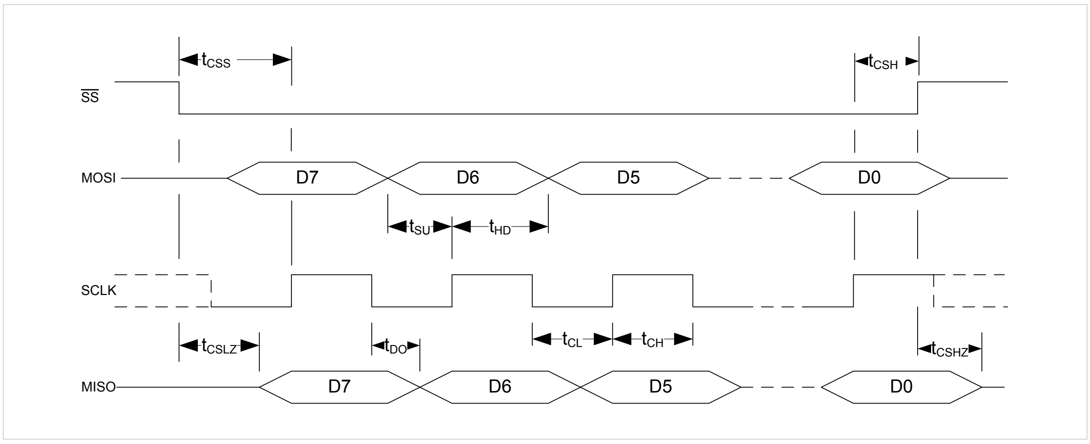


Figure 12.

Item	Description	New Firmware[1]		Classic Firmware	
		Min Value	Max Value	Min Value	Max Value
tSU	MOSI setup before SCK rising edge	3 ns	-	10 ns	-
tHD	MOSI hold after SCK rising edge	3 ns	-	10 ns	-
tDO	MISO change after SCK falling edge	0 ns	7 ns	0 ns	20 ns
tCL	SCK low period	7 ns	-	20 ns	-
tCH	SCK high period	7 ns	-	20 ns	-
tCL+tCH	SCLK period. Max. frequency supported is 50 MHz[2].	20 ns	-	50 ns	-
tCSS	$\overline{SS}$ setup before first SCLK rising edge.	8 ns	-	20 ns	-
tCSH	$\overline{SS}$ hold after last SCLK rising edge.	0 ns	-	20 ns	-
tCSLZ	MISO valid after falling edge of $\overline{SS}$.	-	10 ns	-	20 ns
tCSHZ	MISO high-Z after rising edge of $\overline{SS}$.	-	10 ns	-	20 ns

[1]These columns refer to firmware versions with an updated design of the SPI controller. See release notes for respective network module for information on which firmware version this is introduced in.

[2]Classic firmware for limited networks only support 20 MHz.

3–Wire Mode

In 3-wire mode the $\overline{SS}$ signal must be tied low permanently, and the SCLK signal must be idle high. Multiple SPI slaves on the same bus are not possible in this mode. The module detects start and stop of a transfer by monitoring SCLK activity.

There must be an idle period of at least 10 µs between two transfers in this mode, and the SCLK signal must never remain high for more than 5 µs during a transfer.

A 3-wire diagram example.

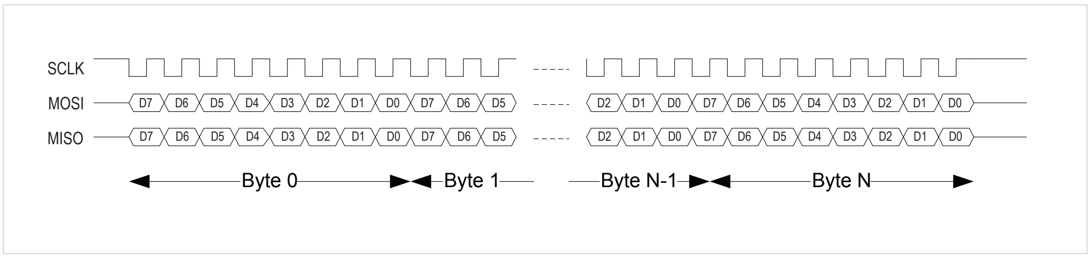


Figure 13.

SPI diagram and bit timing for 3-wire mode.

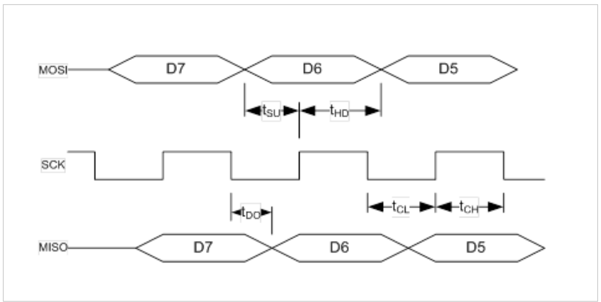


Figure 14.

Item	Description	New Firmware[1]		Classic Firmware	
		Min Value	Max Value	Min Value	Max Value
tSU	MOSI setup before SCK rising edge	3 ns	-	10 ns	-
tHD	MOSI hold after SCK rising edge	3 ns	-	10 ns	-
tDO	MISO change after SCK falling edge	0 ns	7 ns	0 ns	20 ns
tCL	SCK low period	7 ns	-	20 ns	-
tCH	SCK high period	7 ns	-	20 ns	-
tCL+tCH	SCK period Max. frequency supported is 50 MHz[2].	20 ns	-	50 ns	-

[1]These columns refer to firmware versions with an updated design of the SPI controller. See release notes for respective network module for information on which firmware version this is introduced in.

[2]Classic firmware for limited networks only support 20 MHz.

SPI Frame Format

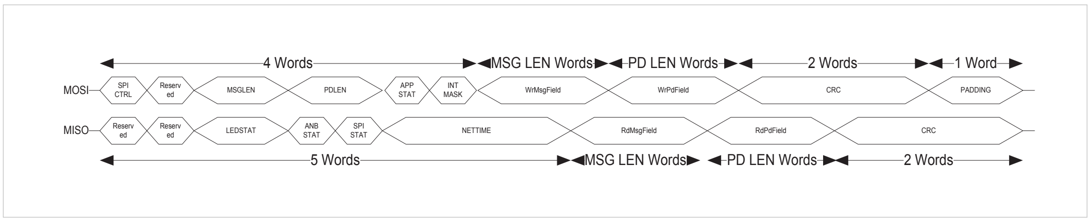


Figure 15.

Most bytes are transmitted with the most significant bit first, but the byte order is little endian. The least significant byte is transmitted first. The only exception is the CRC32 checksum field that is transmitted in big endian order.

3.5. Stand-Alone Shift Register

3.5.1. General Information

In this mode the Anybus CompactCom M40 operates stand-alone, with no host processor. Process data is communicated to shift registers on the host. The Anybus CompactCom M40 supports up to 32 registers in each direction, for a total of 256 bits of data.

NOTE
The PROFIBUS version of the Anybus CompactCom 40 supports up to 24 registers in each direction, for a total of 192 bits of data.

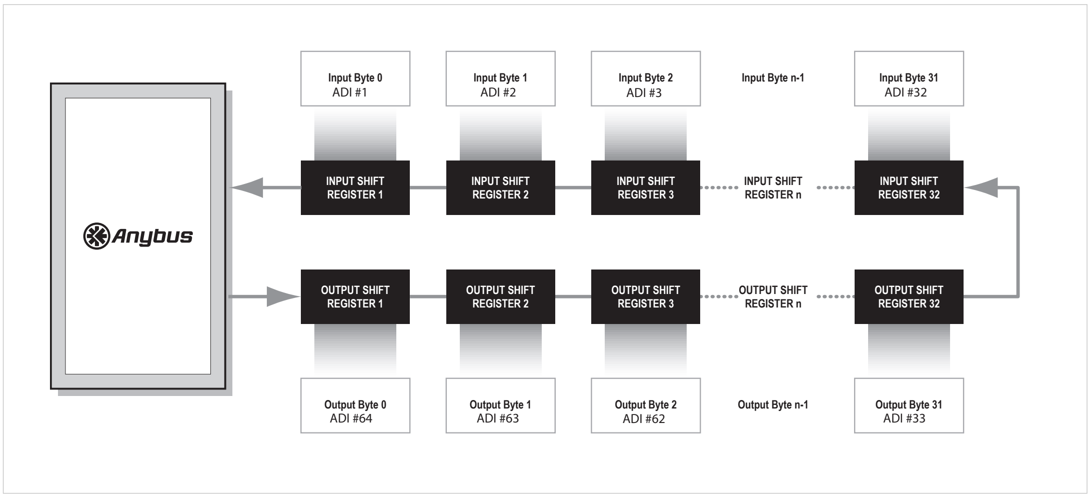


Figure 16.

Even though the Anybus CompactCom M40 operates stand-alone, it is still possible to set host application attributes, via the use of the virtual attributes list. Some attributes are mandatory to implement in order to pass conformance tests.

See the Virtual Attributes section in the Anybus CompactCom 40 Software Design Guide for more information.

The Anybus CompactCom M40 will automatically detect the number of connected input and output shift registers. Every shift register will be represented by one UINT8 ADI (Application Data Instance). The input ADIs will be named “Input 0”, “Input 1”, etc. The output ADIs will be named “Output 0”, “Output 1”, etc.

NOTE
The ADI access descriptor values cannot be changed:

Input ADIs: 09h (Get access + Write process data mapping possible).

Output ADIs: 11h (Get access + Read process data mapping possible).

Bits are clocked out/in MSB first, on the positive side of CLK. An active low load signal ($\overline{LD}$) loads all shift registers before and after a transfer.

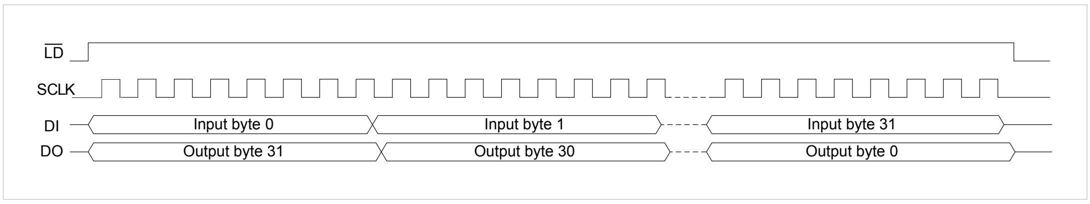


Figure 17.

A fifth signal, PA, is high when the module is in active state, and low when the module is not. This signal can be used by the application to clear/set the output shift registers to default values when the module is not in active state.

3.5.2. Pin Usage in Stand-Alone Shift Register Mode

Presented below is an overview of all pins except GND and V_{DD}.

Pin	Signal Name	Pin Type	Description/Comments
49	DIP1_0	I	DIP switch node address / IP address. See DIP1 and DIP2 Pins Usage (page 38).
24	DIP1_1	I	
48	DIP1_2	I	
23	DIP1_3	I	
47	DIP1_4	I	
22	DIP1_5	I	
46	DIP1_6	I	
21	DIP1_7	I	
45	$\overline{LD}$	O	Shift register load.
20	SCLK	O	Clock output.
44	DO	O	Serial data output from shift registers.
19	DI	I	Serial data input from shift registers.
43	(not used)	-	Leave unconnected
18	(not used)	-	Leave unconnected
14	DIP2_0	I	DIP switch baud rate / Device ID / station name. See DIP1 and DIP2 Pins Usage (page 38).
39	DIP2_1	I	
15	DIP2_2	I	
40	DIP2_3	I	
16	DIP2_4	I	
41	DIP2_5	I	
17	DIP2_6	I	
42	DIP2_7	I	
4	LED1B	O	LED interface. Gives access to LED indications. For more information, see LED Interface / D8–D15 (Data Bus) (page 12). When not used, LED1A, LED1B, LED2A, LED2B, LED4A and LED4B can be left unconnected. LED3A and LED3B are open-drain outputs and should, if not used, be pulled to 3V3 or GND, or tied to GND, depending on the requirements of the application.
29	LED1A	O	
5	LED2B	O	
30	LED2A	O	
6	$\overline{LED3B}$	OD	
31	$\overline{LED3A}$	OD	
7	$\overline{LED4B}$	O	
32	$\overline{LED4A}$	O	
34	CT	I	Center tap signal for shift register mode. The number of connected input and output shift registers will be detected using this signal.
9	PA	O	Process active signal for shift register mode. In a PROFINET shift register stand-alone application, the PA signal must be used to clear outputs, when the Anybus CompactCom M40 is not in state PROCESS ACTIVE. Otherwise it will not be possible to certify the final product. See the Anybus CompactCom 40 PROFINET IRT Network Guide for more information. The PA signal should be pulled low to make sure that noise/glitches does not affect the output shift registers while the Anybus CompactCom is in RESET, or not plugged in.
33	(not used)	-	Leave unconnected.
10	(not used)	-	Leave unconnected.
28	ASI RX	I	Black channel input. Connect to 3V3 if not used. See Black Channel/Safety Module (page 46).
3	ASI TX / OM3	O, Strap	Black channel output. See Black Channel/Safety Module (page 46). During startup the pin (with OM[0..2]) is used to define the operating mode of the module. Connect to external pull-down for shift register operating mode, see Application Connector Pin Overview (page 10).
36	OM0	I	Operating mode [OM2, OM1, OM0]: 0,1,0 for shift register operating mode. For more information see Operating Modes (page 15).
11	OM1		
35	OM2		

Pin	Signal Name	Pin Type	Description/Comments
27 2	MI0/SYNC MI1	O	See Module Identification (page 16).
26 25	MD0 MD1	O	See Module Detection (page 16).
8	$\overline{\text{RESET}}$	I	See RESET (Reset Input) (page 19).

DIP1 and DIP2 Pins Usage

The use of the DIP1 and DIP2 pins is network specific. If used, they will be read during SETUP state. Thereafter, DIP switch changes will be sampled and written to the Network Configuration Object every 0.5 seconds.

DIP1 is linked to the Network Configuration Object, instance 1 (node address) or instance 3 (IP address). DIP2 is linked to the Network Configuration Object, instance 2 (baud rate) or instance 1 (Device ID, EtherCAT), or, in the case of PROFINET, linked to the PROFINET IO Object , instance 1, attribute 24.

See Network Configuration Object (04h) in the Anybus CompactCom 40 Software Design Guide for more information.

Network	DIP1 (linked to Network Configuration Object)	DIP2	Notes
DeviceNet	0 - 63 (Instance 1: Node address)	Value: 0 - 3 (Network Configuration Object, Instance 2: Baud Rate)	DIP2: Network Configuration Object, Instance 2: Baud Rate (125 kbps, 250 kbps, 500 kbps, Auto)
EtherCAT	1 - 254 (Instance 3: IP address)	0 - 255 (Network Configuration Object, Instance 1: Device ID)	If DIP1 is set to 0, saved values from instances 3 - 6 are used. If DIP1 is set to 255, DHCP is used for all settings. The DIP switches set the last byte of the IP address. Virtual attributes are used to configure the remaining part the IP address, as well as the subnetmask (Network Configuration Object, instance 4) and the gateway (instance 5).
EtherNet/IP	1 - 254 (Instance 3: IP address)	Not used	
Modbus-TCP	1 - 254 (Instance 3: IP address)	Not used	
Common Ethernet	1 - 254 (Instance 3: IP address)	Not used	
Ethernet POWERLINK	NMT_CS_BASIC_ETHERNET: 1 - 254 (Instance 3: IP address) NMT_CS_EPL_MODE: 1 - 239 (Instance 1: Node address)	Not used	If no POWERLINK traffic is seen at startup the module will enter the NMT_CS_BASIC_ETHERNET state after 5 seconds. In this state DIP1 is used for the IP address. As soon as the module detects POWERLINK traffic it will enter the NMT_CS_EPL_MODE super state. In this state DIP1 is used as the POWERLINK node address. In the NMT_CS_EPL_MODE state the IP address of the module is fixed to 192.168.100.yyy where yyy is the node address. Note that IT functionality can be disabled in the POWERLINK host application object. If that is done DIP1 is never used for the IP address.
PROFIBUS	0 - 126 (Instance 1: Node address)	Not used	-
PROFINET	1 - 254 (Instance 3: IP address)	Value: 1 — 255 (PROFINET IO object, Instance 1, attribute 24)	If DIP1 is set to 0, saved values from instances 3 - 6 are used. If DIP1 is set to 255, DHCP is used for all settings. The DIP1 switches set the last byte of the IP address. Virtual attributes are used to configure the remaining part of the IP address, as well as the subnetmask (Network Configuration Object, instance 4) and the gateway (instance 5). If DIP2 is set to 0, the value saved in the non volatile memory will be used. The DIP2 switches set the last three digits of the station name. see the Anybus CompactCom 40 PROFINET IRT Network Guide.
CC-Link	1 - 64 (Instance 1: Node address)	Value: 0 - 4 (Network Configuration Object, Instance 2: Baud Rate)	DIP1: Depending on number of stations used. An invalid value will generate a NACK on Setup Complete. DIP2: Network Configuration Object, Instance 2: Baud Rate (156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps, 10 Mbps)
CC-Link IE Field	1 - 120 (Instance 1: Station Number)	1 - 239 (Instance 3: Network Number).	-
CANopen	0 - 127 (Instance 1: Node address)	Value: 0 - 9 (Network Configuration Object, Instance 2: Data Rate)	DIP2: Network Configuration Object, Instance 2: Data Rate
BACnet/IP	1 - 254 (Instance 3: IP address)	Not used	-

Unused DIP pins should be connected to ground (GND).

External pull-down resistors are needed if DIP switches are connected to the DIP1 and DIP2 pins, see DIP Switches Example (page 41).

3.5.3. Timing

The Anybus CompactCom M40 operates in 12.5 MHz in shift register mode.

Timing Diagram

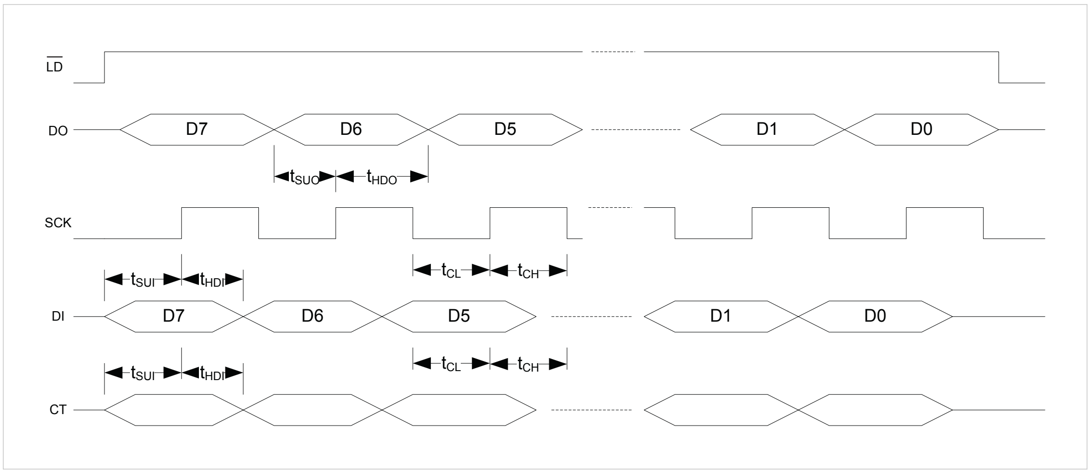


Figure 18.

Abbreviations from the diagram above, explained, and timing details:

Item	Description	Min Value
tSUO	DO setup before SCK rising edge	20 ns
tHDO	DO hold after SCK rising edge	20 ns
tSUI	DI/CT setup before SCK rising edge	10 ns
tHDI	DI/CT hold after SCK rising edge	0 ns
tCH	SCK high period	35 ns
tCL	SCK low period	35 ns
tCH + tCL	SCK period	78 ns

The idle time between two transfers, i.e. when the $\overline{LD}$ signal is low, is at least 1 µs.

The cycle time range is typically 160 µs to 200 µs. However it is highly module and network dependent, and may differ from the defined range.

3.5.4. Basic Shift Register Circuit

The schematic below illustrates a basic shift register circuit.

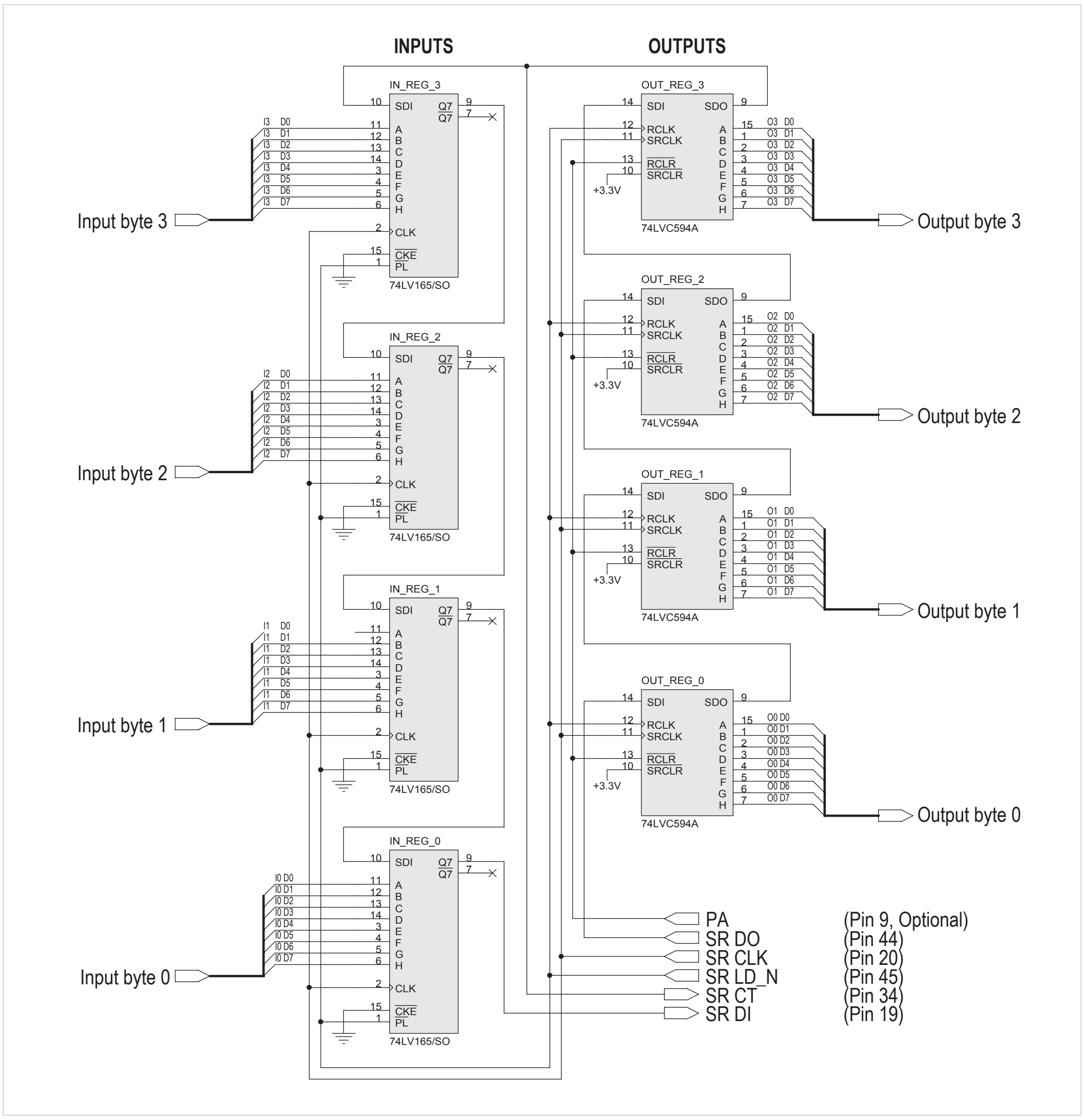


Figure 19.

3.5.5. Reset Circuit Example

The reset circuit example in the figure, is a common 3.3 V supervisor. The main usage is to obtain a defined reset release delay after the voltage is switched on. The power supply has to provide a stable voltage within the interval 3.15–3.45 V.

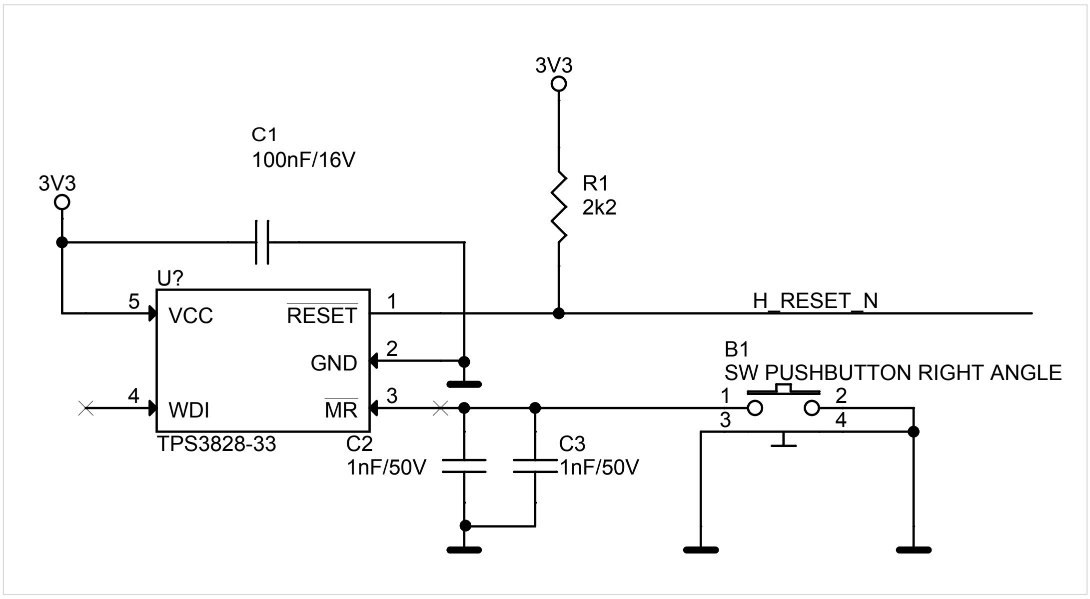


Figure 20.

3.5.6. DIP Switches Example

Pull-down resistors are necessary if DIP switches are connected to the DIP inputs.

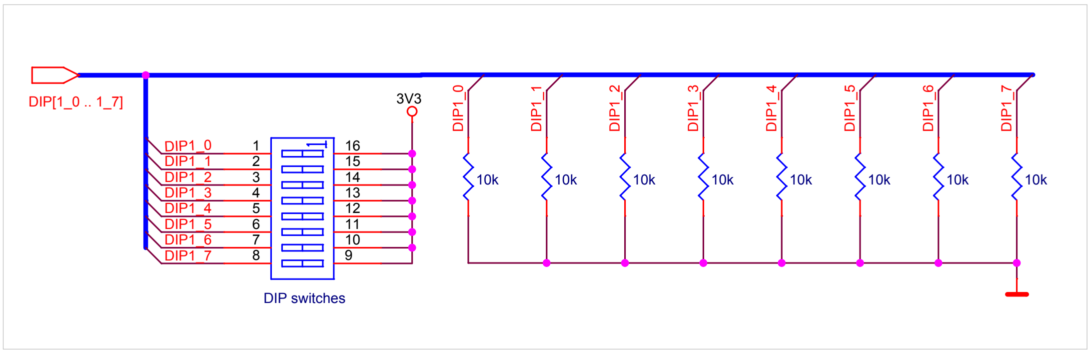


Figure 21.

3.6. UART Operation

3.6.1. General Description

The serial interface is a common asynchronous serial interface, which can easily be interfaced directly to a microcontroller or UART. It is provided for backward compatibility with the Anybus CompactCom 30 series.

The serial interface is activated using the OM[0...3] inputs, which also are used to select the operating baud rate, see Operating Modes (page 15).

Other communication settings are fixed to the following values:

Data bits: 8

Parity: None

Stop bits: 1

Communication settings are fixed to asynchronous, 8-N-1, with bit order LSB first and without hardware flow control signals.

NOTE
It is not possible to build a synchronous application in this mode.

3.6.2. Pin Usage in Serial Mode

Presented below is an overview of all pins except GND and 3V3.

Pin	Signal Name	Pin Type	Description/Comments	
49	DIP1_0	I	DIP switch. Usage defined by application. Readable through attribute #14 (Switch status) in Anybus Object, instance #1. Connect to GND if not used.	
24	DIP1_1	I		
48	DIP1_2	I		
23	DIP1_3	I		
47	DIP1_4	I		
22	DIP1_5	I		
46	DIP1_6	I		
21	DIP1_7	I		
45	(not used)	I	Connect to GND	
20		I		
44		O,I		
19	(not used)	I	Connect to 3V3.	
43	ASI RX	I	See Black Channel/Safety Module (page 46) If not used, connect to 3V3.	
18	ASI TX	O	See Black Channel/Safety Module (page 46) If not used, leave unconnected.	
14	DIP2_0	I	DIP switch. Usage defined by application. Readable through attribute #14 (Switch status) in Anybus Object, instance #1. Connect to GND if not used.	
39	DIP2_1	I		
15	DIP2_2	I		
40	DIP2_3	I		
16	DIP2_4	I		
41	DIP2_5	I		
17	DIP2_6	I		
42	DIP2_7	I		
4	LED1B	O	LED interface. Gives access to LED indications. For more information, see LED Interface / D8–D15 (Data Bus) (page 12). When not used, LED1A, LED1B, LED2A, LED2B, LED4A and LED4B can be left unconnected. LED3A and LED3B are open-drain outputs and should, if not used, be pulled to 3V3 or GND, or tied to GND, depending on the requirements of the application.	
29	LED1A	O		
5	LED2B	O		
30	LED2A	O		
6	$\overline{\text{LED3B}}$	OD		
31	$\overline{\text{LED3A}}$	OD		
7	$\overline{\text{LED4B}}$	O		
32	$\overline{\text{LED4A}}$	O		
34	(not used)	I	Connect to 3V3.	
33		I		
10		I		
9	(not used)	O	Leave unconnected	
28	RX	I	Receive Input • Direction: Host application -> Anybus CompactCom • Idle state = High Connect to 3V3 if not used.	
3	TX / OM3	O, I	Transmit Output • Direction: Anybus CompactCom -> Host application • Idle state = High This pin doubles as OM3 strapping input on Anybus CompactCom M40 modules. Connect a pull-up resistor on the application for this pin in serial mode.	
36	OM0	I	Operating mode [OM2, OM1, OM0]:	
11	OM1		001	Serial 19.2 kbps
35	OM2		010	Serial 57.6 kbps
			011	Serial 115.2 kbps

Pin	Signal Name	Pin Type	Description/Comments	
			100	Serial 625 kbps
			For more information see Operating Modes (page 15).	
27 2	MI0/SYNC MI1	O	See Module Identification (page 16).	
26 25	MD0 MD1	O	See Module Detection (page 16) .	
8	$\overline{\text{RESET}}$	I	See RESET (Reset Input) (page 19).	

NOTE
It is important to connect all signals correctly for proper functioning of the serial interface.

3.6.3. Baud Rate Accuracy

As with most asynchronous communication devices, the actual baud rate used on the Anybus CompactCom may differ slightly from the ideal baud rate.

The baud rate error of the module is less than ±1.5%. For proper operation, it is recommended that the baud rate accuracy in the host application lies within ±1.5% from the ideal value.

4. EMC

This section offers information, necessary when designing in an Anybus CompactCom, to ensure sufficient performance related to EMC. However, an engineering assessment is always needed to ensure the quality. HMS Industrial Networks does not leave any guarantees, but provides relevant information to the customers.

4.1. General

When working with a design in relation to EMC, it is recommended to always aim for good signal integrity, since this is highly related to the EMC. For power, this means solid planes for both power and GND together with good decoupling between the planes. As the quality of the power is of great importance, it is important to perform sufficient verifications during the design process to ensure this. This is also true for signals, where good signal integrity most likely results in good EMC performance. There should always exist good connection to a reference plane without any obstacles for the return current. Traces should also be kept short, with as few board and cable transitions as possible, since every transition will have a negative impact on the signal integrity.

Also, different protocols are more sensitive to interference than others. E.g. try to avoid using parallel and RMII interface in the design, if the recommendations in this section cannot be followed or if the risk of interference is high. To ensure stability, there has to be a sufficient separation on the host board between a parallel interface and an RMII interface.

EMC Guidelines

EMC Guidelines regarding the layout and implementation of the Anybus CompactCom M40 is presented in Footprint (page 89) for the module with housing, and in Without Housing (page 101) for the module without housing.

4.2. Header Footprint

Guidelines regarding the compact flash header footprint is presented in Without Housing (page 101). This layout is designed to ensure stable connection between the Anybus CompactCom board and the main board for both power, GND and signals (pin list can be found in Power Supply Pins (page 12)).

4.3. Bulk and Decoupling

Recommendations regarding bulk and decoupling capacitors is presented in Bypass Capacitance (page 55).

The capacitors have impact on the power quality at the Anybus CompactCom board, but are also of importance in relation to EMC immunity. These general recommendations should be evaluated for every design. The values may also need to be adjusted in relation to power consumption, power quality on the main board, and the layout of the main board.

4.4. Reset Signal

There are several aspects to consider when routing the reset signal for the Anybus CompactCom. Requirements for rise and fall time, but also the relation between the power up and the reset signal are described in RESET (Reset Input) (page 19). These requirements must be met in all designs to ensure stability. If the reset signal has a long trace or if there is any other aspect that has a negative impact on the signal integrity, an RC filter may be required. To minimize the risk of EMC problems, it is possible to add footprints for a RC-filter in advance and evaluate the need before it becomes a problem during any certification. When designing the filter, all timing aspects must be considered, so that the timing requirements in RESET (Reset Input) (page 19) are fulfilled.

5. Black Channel/Safety Module

The black channel is a transportation mechanism for safety related protocol extensions over a nonsafe communication media. The safety layer performs safety related transmission functions and checks on the communication to ensure that the integrity of the link meets the requirement for SIL 3, cat4/PL e. The black channel can be seen as a virtual link between the safety layers of the devices.

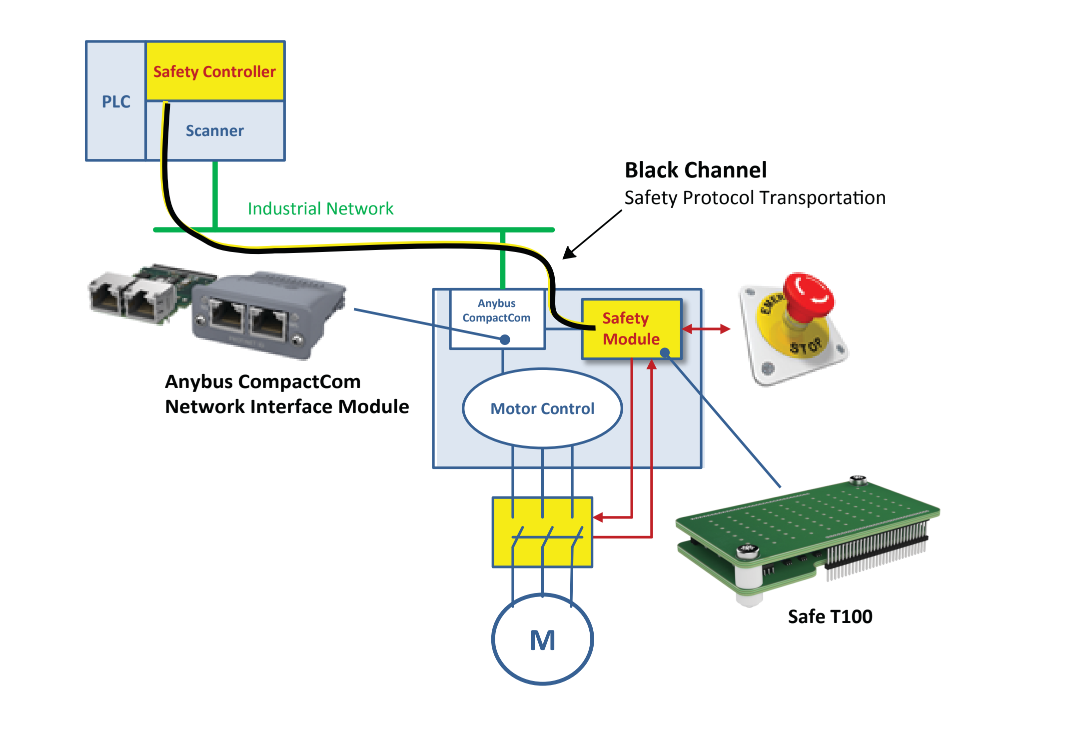


Figure 22.

The IXXAT Safe T100 is a precertified embedded safety option module which provides device manufacturers with an easy and cost efficient way to integrate conformant safe I/O signals into standard automation devices. It connects via its serial black channel interface to the Anybus CompactCom. The safety module provides digital safe I/O signals that can be controlled via the network and that can be directly connected to the safety functions of an automation device. Other standard safety modules can also be used to provide a safety communication interface for the Anybus CompactCom 40 series.

If it is planned to use serial download to the module, please take this in account when implementing the use of a safety module or Black Channel.

Appendix A. Implementation Examples

1. General

In this appendix HMS provides examples of possible implementations for the Anybus CompactCom M40 series. Some of the examples can also be used for the Anybus CompactCom 30 series, showing that the modules from the two product families in some contexts are interchangeable.

> **IMPORTANT**
> There are many different processors with different functionality available on the market today. The implementations in this appendix are to be regarded as examples that are designed for one single type of processor. Other hardware interfaces may require adjustments for timing, different functionality etc. It is important to fully understand the interface to take correct design decisions in order to obtain a stable and reliable design.

2. Design Considerations

It is recommended to ensure that each signal controlling the Anybus CompactCom M40 has a drive strength enough to fulfill level and timing constraints even if the signal is loaded with 20 pF in parallel with 2.2 kΩ to GND or 3V3.

3. Serial and 16–bit Parallel

The example in the figure below shows an implementation with serial communication and firmware update (via UART). An Anybus CompactCom 30, connected as shown, can thus be used in serial mode and is prepared for firmware update via the UART. Exchanging the M30 for the M40 will also give access to 16-bit parallel mode.

Firmware update for an M40 series module is preferably done using the File System Interface Object, see Anybus CompactCom 40 Software Design Guide.

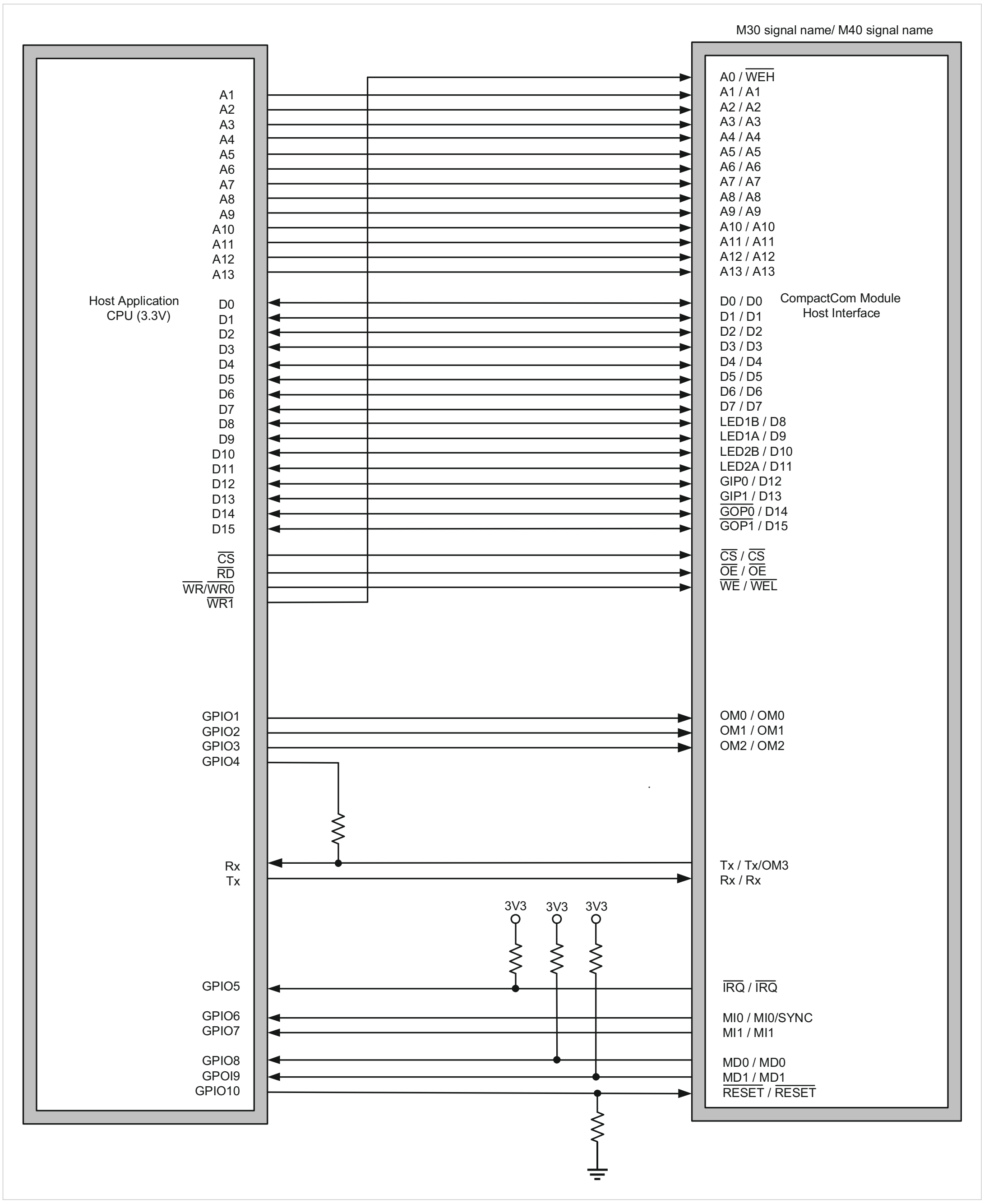


Figure A.1.

For information on how to handle unused pins, see Pin Usage in Serial Mode (page 43), or Pin Usage in 16–bit Parallel Mode (page 24).

IMPORTANT
To prevent damage to the host processor, as well as the Anybus CompactCom M30 LED outputs, the host processor must disable data inputs/outputs D8 - D15, i.e. these pins must be set to high impedance state, if MI indicates that some other module than an Anybus CompactCom M40 is inserted. If a CompactCom M30 is connected, and if the host processor cannot shut off this part of the data bus, the CompactCom M30 will have to be protected by external circuitry. See example on next page.

If the host application uses the data bus lines D8 - D15 for any other purpose, e.g. toward other circuitry, this implementation may cause damage to other components connected to the data bus.

NOTE
This implementation does not support Anybus CompactCom passive modules.

4. 8–bit/16–bit Parallel

This example shows a design for 8-bit and 16-bit parallel mode. Using M30 you have access to 8-bit parallel and serial modes. With M40 you can also use the 16-bit parallel mode.

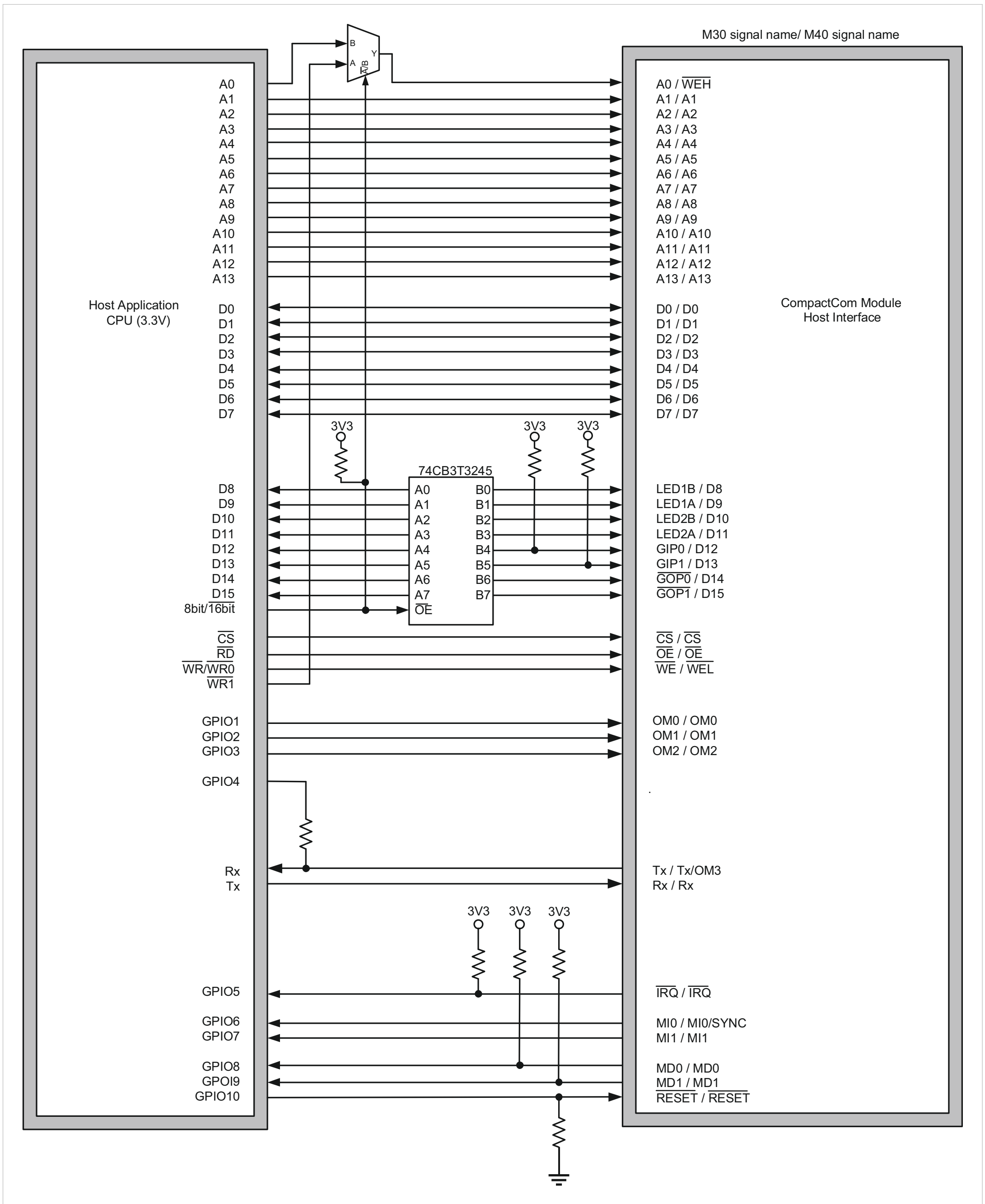


Figure A.2.

If LEDs are to be used in the host application, please refer to Network Status LED Outputs (LED[1A...4B]) (page 53), for guidelines on how to connect the LED outputs. In 16-bit parallel mode it is not possible to use these outputs for LEDs.

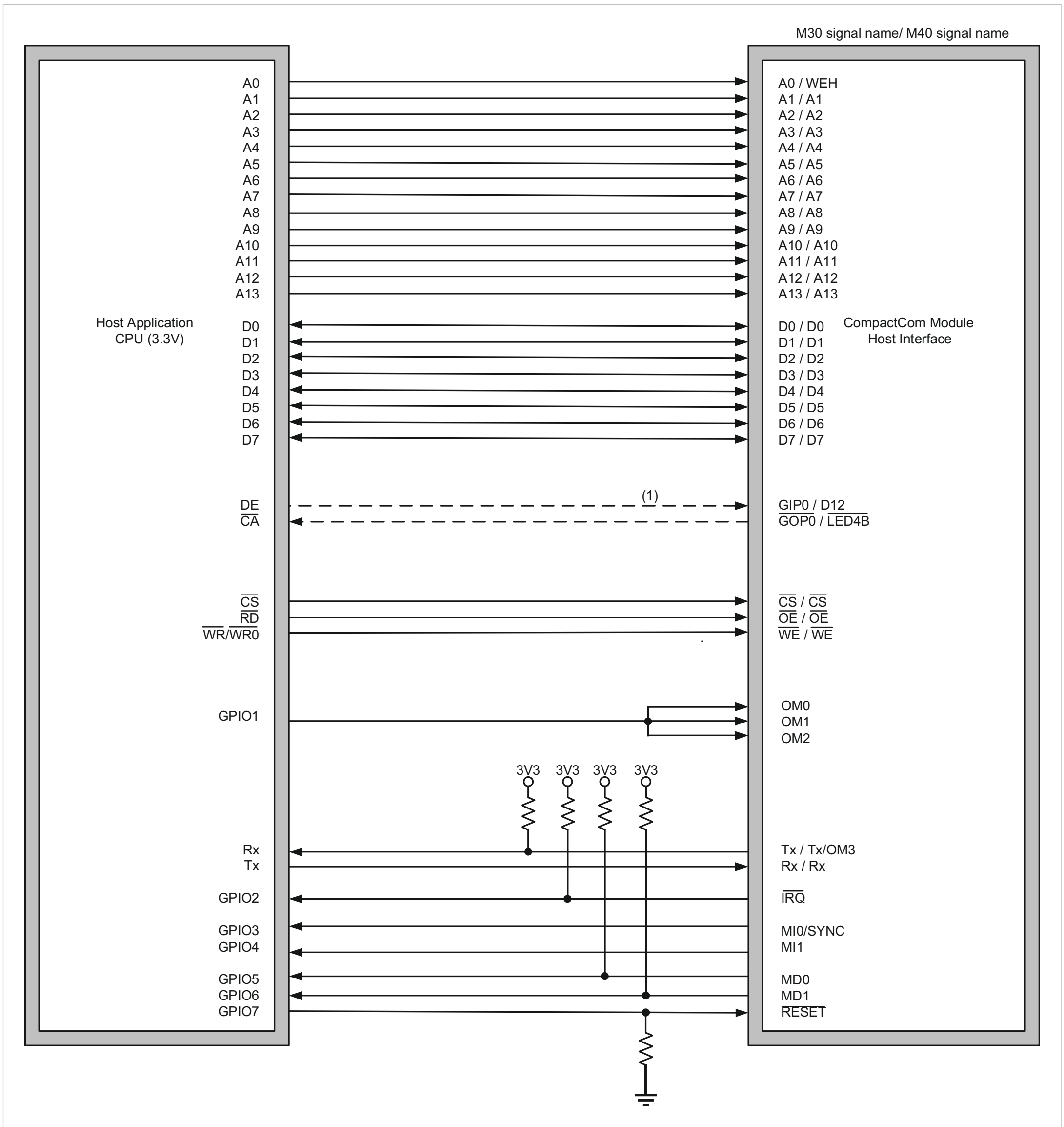
In this implementation, the LED outputs on the Anybus CompactCom M30 module are protected by external circuitry (74B3T3245, a SN74CB3T3245, 8-BIT FET BUS SWITCH is suggested). This circuit is fast, and only lets the signal from the driving circuit pass through.

For information on how to handle unused pins, see Pin Usage in 8-bit Parallel Mode (page 22), or Pin Usage in 16–bit Parallel Mode (page 24).

5. 8–bit Parallel

This design for 8-bit parallel mode, including firmware update (via UART), can be used for both M30 and M40.

Firmware update for a M40 series module is preferably done using the File System Interface Object, see Anybus CompactCom 40 Software Design Guide.



1: Connections necessary to support Anybus CompactCom passive modules.

Figure A.3.

If LEDs are to be used in the host application, please refer to Network Status LED Outputs (LED[1A...4B]) (page 53), for guidelines on how to connect the LED outputs.

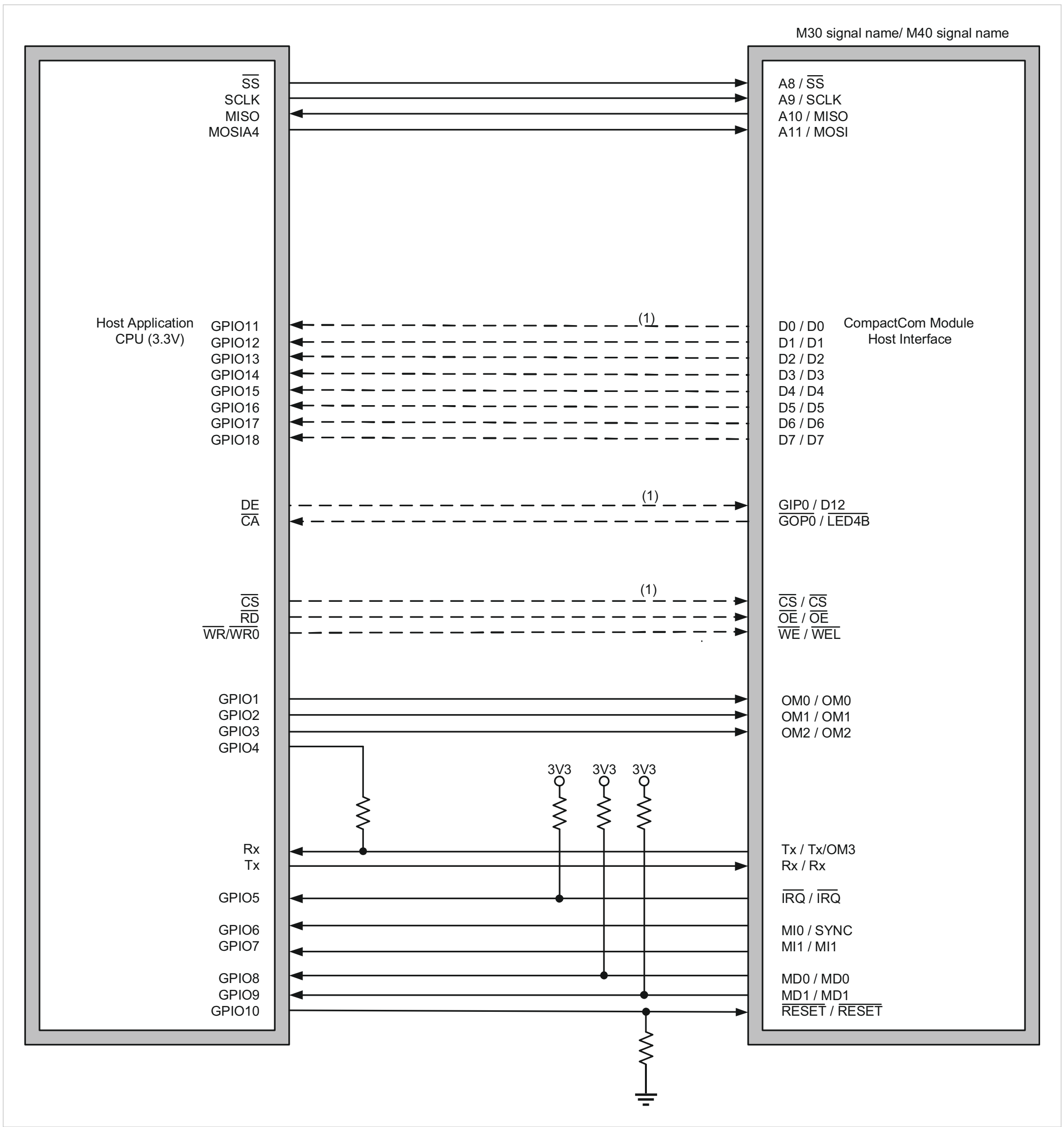
The pull-down resistors on LED3A and LED3B make it possible to support Anybus CompactCom passive modules.

For information on how to handle unused pins, see Pin Usage in 8-bit Parallel Mode (page 22).

6. SPI and Serial

When using M30, the serial interface will be available with this design, as well as firmware update (using a UART). If the M30 is exchanged for a M40 the SPI interface will also be available.

Firmware update for a M40 series module is preferably done using the File System Interface Object, see Anybus CompactCom 40 Software Design Guide.



1: Connections necessary to support Anybus CompactCom passive modules.

Figure A.4.

If LEDs are to be used in the host application, please refer to Network Status LED Outputs (LED[1A...4B]) (page 53), for guidelines on how to connect the LED outputs.

In serial mode, The pull-down resistors on LED3A and LED3B make it possible to support Anybus CompactCom passive modules.

For information on how to handle unused pins, see Pin Usage in SPI Mode (page 28), or Pin Usage in Serial Mode (page 43).

7. Network Status LED Outputs (LED[1A...4B])

The LED[1A....4B] outputs can be used to relay the network status LEDs to elsewhere on the host application. This is possible in all modes except 16-bit parallel mode, where these pins are used for data (D8...D15).

Note that it is the responsibility of the host application to ensure that each LED output is connected to a LED of the correct color (on active modules, it is possible to retrieve this information from the LED status register or from the Anybus Object (01h); consult the Anybus CompactCom 40 Software Design Guide for more information). For more information, see LED Interface / D8–D15 (Data Bus) (page 12).

The outputs are unbuffered, and are not recommended for driving LEDs directly. Please consult the image below for guidelines on how to connect the LED outputs.

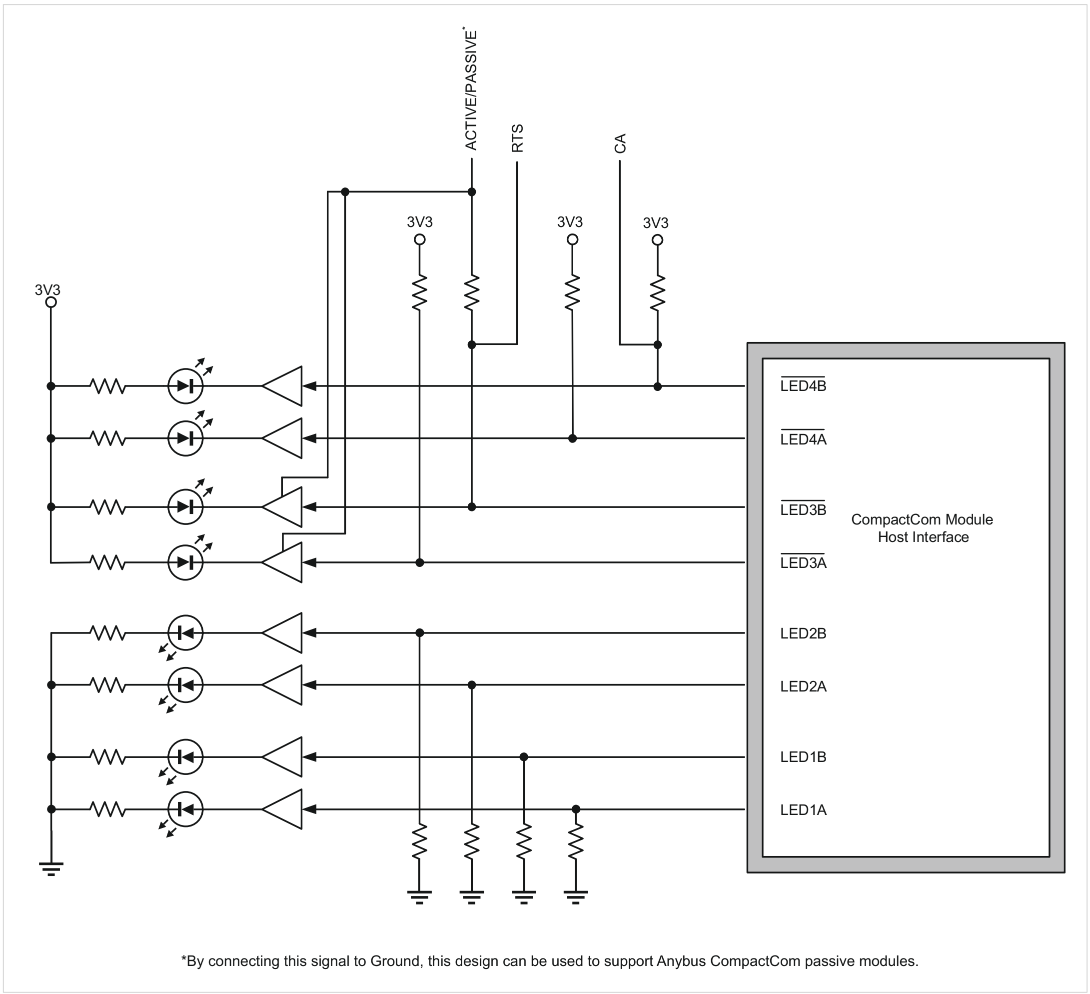


Figure A.5.

NOTE

These pins can not be used for LEDs in 16-bit parallel mode, as the pins in that case are used for data.

This solution can be used to support Anybus CompactCom passive modules. Please verify that the rest of the application is correctly designed for passive modules.

8. Power Supply Considerations

8.1. General

The Anybus CompactCom 40 platform in itself is designed to be extremely power efficient. The exact power requirements for a particular networking system will however vary a lot depending on to the components used in the actual bus circuitry.

While some systems usually require less than 250 mA of supply current, some high performance networks, or networks which require the use of legacy ASIC technology, will consume up to 500 mA, or in rare cases even as much as 1000 mA.

As an aid when designing the power supply electronics, the networks have been divided into classes based on their power consumption as follows.

- Class A
  This class includes systems which consume less than 250 mA of supply current.
- Class B
  This class includes systems which consume up to 500 mA of supply current.
- Class C
  This class includes systems which consume up to 1000 mA of supply current.

The following table lists the currently supported networking systems and their corresponding class.

Network	Class A	Class B	Class C
DeviceNet		X	
PROFIBUS	X		
EtherCAT		X	
PROFINET 2-Port		X	
PROFINET Fiber Optic 2-Port			X
EtherNet/IP 2-Port		X	
Ethernet POWERLINK		X	
Common Ethernet		X	
CC-Link		X	
Modbus-TCP 2-Port		X	
CC-Link IE Field			X
BACnet/IP		X	
CANopen	X		

A power supply designed to fulfill Class A requirements (250 mA), will be able to support all networks belonging to class A, but none of the networks in Class B and C.

A power supply designed to fulfill Class C requirements, will be able to support all networks.

8.2. Bypass Capacitance

The power supply inputs must have adequate bypass capacitance for high-frequency noise suppression. It is therefore recommended to add extra bulk capacitors near the power supply inputs:

Reference	Value (Ceramic)
C1	22 µF / 6.3 V
C2	100 nF / 16 V

An example is shown in the picture below.

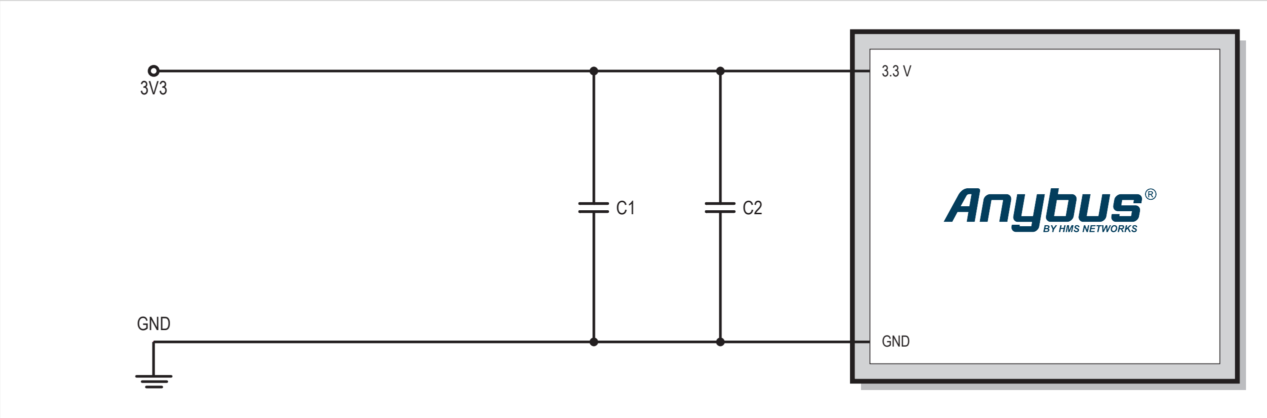


Figure A.6.

8.3. 3.3 V Regulation

The following example uses the LT1767 from Linear Technology to provide a stable 3.3 V power source for the module. Note that all capacitors in this example are of ceramic type.

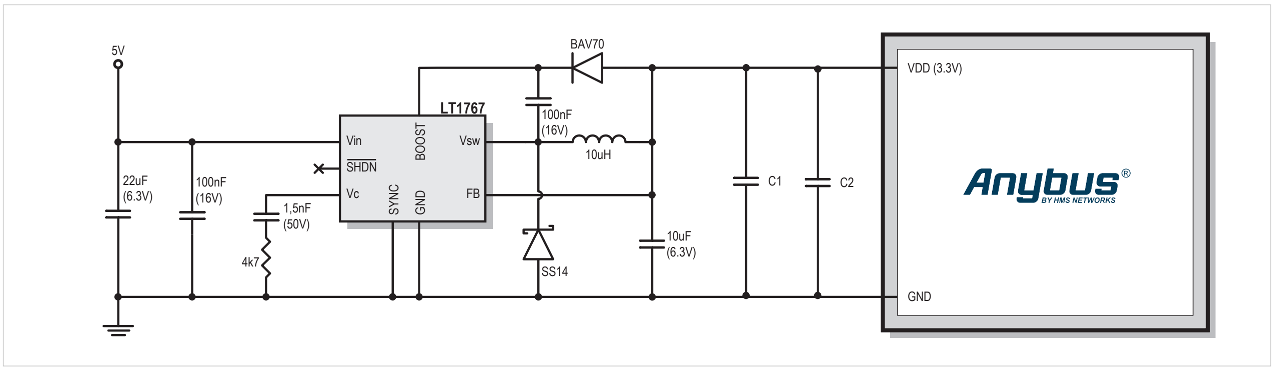


Figure A.7.

NOTE

For detailed information regarding this example, consult the data sheet for the LT1767 (Linear Technology).

Appendix B. Backward Compatibility

The Anybus CompactCom M40 series of industrial network modules have significantly better performance and include more functionality than the modules in the Anybus CompactCom 30 series. The 40 series is backward compatible with the 30 series in that an application developed for the 30 series should be possible to use with the 40 series, without any major changes. Also it is possible to mix 30 and 40 series modules in the same application.

This appendix presents the backwards compatibility issues that have to be considered, when designing with both series in one application, or when adapting a 30 series application for the 40 series.

1. Background

1.1. Anybus CompactCom 30-Series

The Anybus CompactCom 30-series concept was introduced in 2005 and is based on the NP30 processor from HMS Industrial Networks. The concept supports various fieldbuses and industrial Ethernet networks. The Anybus CompactCom 30-series fieldbus and industrial Ethernet solutions today offer a good level of performance and is used by many customers.

1.2. Upgrade to the 40-Series

During 2013, HMS Industrial Networks introduced the new Anybus CompactCom 40-series which presented a high performance solution with very low latency, extended APIs, and the ability to meet the future demands of industrial networking. In addition to the new APIs, the Anybus CompactCom 40-series supports the same APIs as the 30series, offering a possibility to enable present Anybus CompactCom 30 applications an easy upgrade to the latest technology.

1.3. Access to Real-time Ethernet, IIoT and Advanced Security Features

The Anybus CompactCom 40-series is based on the NP40 processor which is the foundation for the high performance and extended functions offered by the 40-series. Future technologies and demands of advanced network functions, IIoT solutions, and advanced security features will be incorporated in the Anybus CompactCom 40-series.

1.4. Recommendations from HMS Industrial Networks

For new designs the Anybus CompactCom 40-series is the recommended platform for communication, but the compatibility between the two series enables usage of both series in one product. This appendix describes the differences between the CompactCom 30-series and the CompactCom 40-series in order to add guidance on how to modify an existing product to support the latest 40-series modules in addition to existing 30-series support.

2. Initial Considerations

There are two options to consider when starting the work to modify a host application developed for Anybus CompactCom 30-series modules to also be compatible with the 40-series modules:

- Add support with as little work as possible i.e. reuse as much as possible of the current design.
  - This is the fastest and easiest solution but with the drawback that many of the new features available in the 40-series will not be enabled (e.g. enhanced and faster communication interfaces, larger memory areas, and faster communication protocols).
  - You have to check the hardware and software differences below to make sure the host application is compatible with the 40-series modules. Small modifications to your current design may be needed.

- Make a redesign and take advantage of all new features presented in the 40-series.
  - A new driver and host application example code are available at www.anybus.com/support to support the new communication protocol. This driver supports both 30-series and 40-series modules.
  - You have to check the hardware differences below and make sure the host application is compatible with the 40-series modules.

NOTE
This information only deals with differences between the 30-series and the 40-series.

Link to support page: www.anybus.com/support.

3. Hardware Compatibility

Anybus CompactCom is available in three hardware formats; Module, Chip, and Brick.

3.1. Module

The modules in the 30-series and the 40-series share physical characteristics, like dimensions, outline, connectors, LED indicators, mounting parts etc. They are also available as modules without housing.

Figure B.1. Anybus CompactCom M30/M40

3.2. Chip

The chip (C30/C40) versions of the Anybus CompactCom differ completely when it comes to physical dimensions.

IMPORTANT

There is no way to migrate a chip solution from the 30-series to the 40-series without a major hardware update.

3.3. Brick

The Anybus CompactCom B40-1 does not share dimensions with the Anybus CompactCom B30. The B40-1 is thus not suitable for migration. However HMS Industrial Networks has developed a separate brick version in the 40-series, that can be used for migration. This product, B40-2, shares dimensions etc. with the B30. Please contact HMS Industrial Networks for more information on the Anybus CompactCom B40-2.

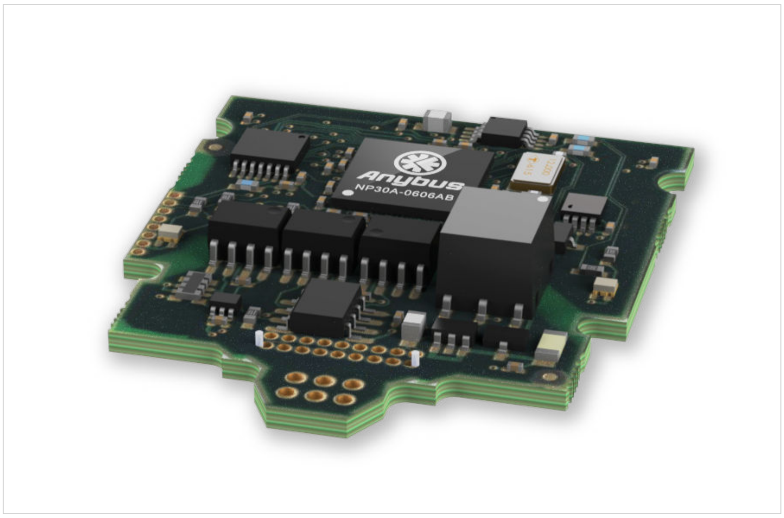


Figure B.2. Anybus CompactCom B30

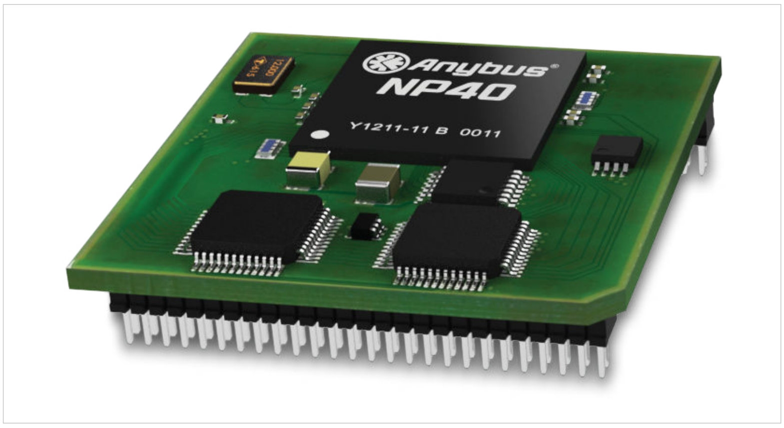


Figure B.3. Anybus CompactCom B40–1 (not for migration)

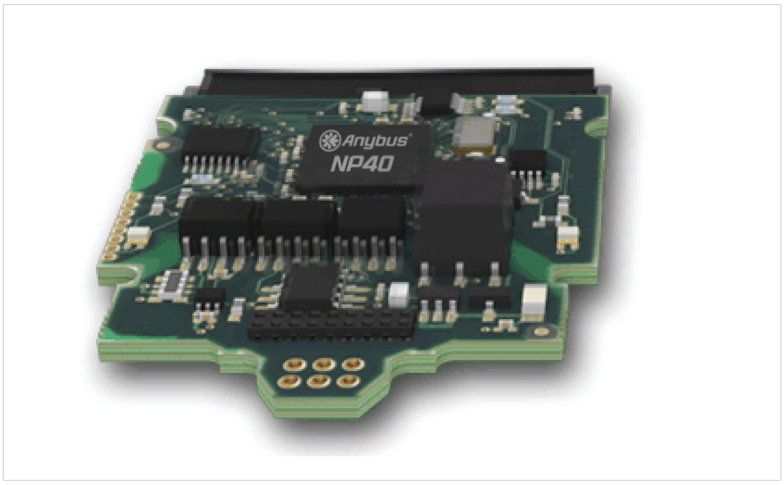


Figure B.4. Anybus CompactCom B40–2

3.4. Host Application Interface

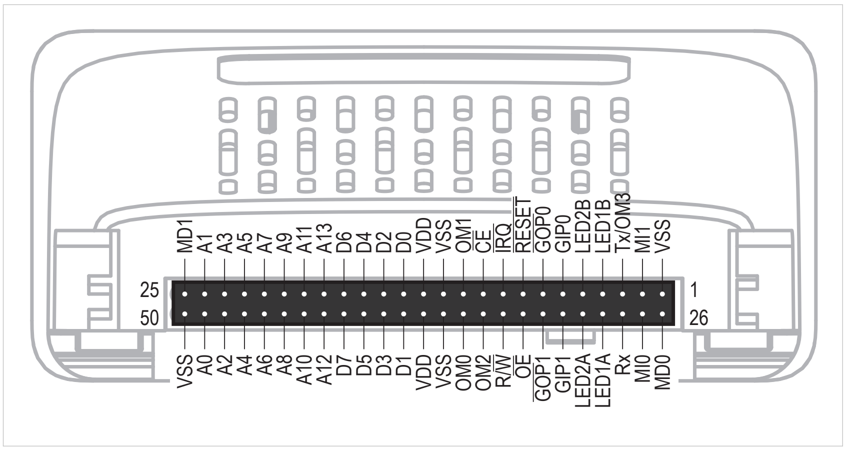


Figure B.5.

Some signals in the host application interface have modified functionality and/or functions which must be checked for compatibility. See the following sections.

Tx/OM3

In the 30-series, this pin is only used for Tx. It is tri-stated during power up, and driven by the Anybus CompactCom UART after initialization. In the 40-series this pin is used as a fourth operating mode setting pin (OM3). During startup after releasing the reset, this pin is read to determine the operating mode to use. The pin is then changed to a Tx output.

In the 40-series, this pin has a built-in weak pull-up. On a 30-series module or brick, if this pin is unconnected, pulled high, or connected to a high-Z digital input on the host processor, it will be compatible with the 40-series. An external pull-up is recommended, but not required.

IMPORTANT

If this pin is pulled low by the host during startup in a 30-series application, any 40-series module or brick, substituted in the application, will not enter the expected operating mode.

Related Information: Application Connector Pin Overview (page 10)

Module Identification (MI[0..1])

These pins are used by the host application (i.e. your product) to identify what type of Anybus CompactCom that is mounted. The identification differs between the 30-series and the 40-series.

NOTE

If backwards compatibility shall be supported and an interface other than serial or 8 bit parallel shall be used on the 40-series, this identification method must be used. The host application must then handle identification values for both 30- and 40-series.

MI1	MI0	Module Type
LOW	LOW	Active Anybus CompactCom 30
HIGH	LOW	Active Anybus CompactCom 40

MI[0..1] shall only be sampled by the application during the time period from power up to the end of SETUP state. The pins are low at power up and before reset release.

Related Information: Settings / Sync (page 14)

GIP[0..1]/LED3[A..B]
These pins are tri-stated inputs by default in the 30-series. In the 40-series, these pins are tri-stated until the state NW_INIT. After that they become open-drain, active low LED outputs (LED3A/LED3B). For more information, see the Anybus CompactCom 40 Software Design Guide.

No modification of the hardware is needed, if your current design has

- tied these pins to GND
- pulled up the pins
- pulled down the pins
- left the pins unconnected

> **IMPORTANT**
> If the application drive the pins high, a short circuit will occur.

If you connect the pins to LEDs, a pull-up is required.

In the 40-series, there is a possibility to set the GIP[0..1] and GOP[0..1] in high impedance state (tri-state) by using attribute #16 (GPIO configuration) in the Anybus object (01h). I.e. if it is not possible to change the host application hardware, this attribute can be configured for high impedance state of GIP and GOP before leaving NW_INIT state. For more information, see the Anybus CompactCom 40 Software Design Guide.

Related Information: LED Interface / D8–D15 (Data Bus) (page 12)

GOP[0..1]/LED4[A..B]
These pins are outputs (high state) by default in the 30-series. In the 40-series, these pins are tri-stated until the state NW_INIT, and after that they become push-pull, active low LED outputs (LED4A/LED4B).

This change should not affect your product.

Related Information: LED Interface / D8–D15 (Data Bus) (page 12)

Address Pins A[11..13]
The address pins A11, A12, and A13 are ignored by the 30-series. These pins must be high when accessing the 40-series module in backwards compatible 8-bit parallel mode. If you have left these pins unconnected or connected to GND, you need to make a hardware modification to tie them high.

Max Input Signal Level (V_{IH})
The max input signal level for the 30-series is specified as V_{IH}=V_{DD}+0,2 V, and for the 40-series as V_{IH}=3.45 V. Make sure that you do not exceed 3.45 V for a logic high level.

RMII Compatibility
If the RMII mode is being used on an Anybus CompactCom 40 module and it is desired to remain compatible with the 30 series, it is important to disable this connection when switching to an Anybus CompactCom 30 module due to pin conflicts. The RMII port of the host processor should be set to tristate by default, and only be enabled if an RMII capable Anybus CompactCom 40 is detected. In case the RMII connection cannot be disabled through an internal hardware control on the host processor, it will be necessary to design in external hardware (i.e. a FET bus switch) to prevent short circuits.

Related Information: Anybus CompactCom M40 Hardware Design Guide (HMSI-216-126), Section 3.2.5, “RMII — Reduced Media-Independent Interface”.

4. General Software

4.1. Extended Memory Areas

The memory areas have been extended in the 40-series, and it is now possible to access larger sizes of process data (up to 4096 bytes instead of former maximum 256 bytes) and message data (up to 1524 bytes instead of former maximum 255 bytes). The 30-series has reserved memory ranges that the application should not use. The 40-series implements new functionality in some of these memory areas.

NOTE

To use the extended memory areas you need to implement a new communication protocol which is not part of this document.

Memory areas not supported by the specific network cannot be used. Make sure you do not access these areas, e.g. for doing read/write memory tests.

Related Information: Anybus CompactCom 40 Software Design Guide (HMSI-216-125), Section "Memory Map"

4.2. Faster Ping-Pong Protocol

The ping-pong protocol (the protocol used in the 30-series) is faster in the 40-series. A 30-series module typically responds to a so called ping within 10-100 µs. The 40-series typically responds to a ping within 2 µs.

Interrupt-driven applications (parallel operating mode) may see increased CPU load due to the increased speed.

4.3. Requests from Anybus CompactCom to Host Application During Startup

All requests to software objects in the host application must be handled and responded to (even if the object does not exist). This applies for both the 30-series and the 40-series. The 40-series introduces additional objects for new functionality.

There may also be additional commands in existing objects added to the 40-series that must be responded to (even if it is not supported).

If your implementation already responds to all commands it cannot process, which is the expected behavior, you do not need to change anything.

4.4. Anybus Object (01h)

Attribute	30-series	40-series	Change/Action/Comment
#1, Module Type	0401h	0403h	Make sure the host application accepts the new module type value for the 40-series.
#15, Auxiliary Bit	Available	Removed	It is not possible to turn off the "Changed Data Indication" in the 40-series. Also see "Control Register CTRL_AUX-bit" and "Status Register STAT_AUX-bit" below.
#16, GPIO Configuration	Default: General input and output pins	Default: LED3 and LED4 outputs	See also .. • GIP[0..1]/LED3[A..B] (page 61) • GOP[0..1]/LED4[A..B] (page 61)

4.5. Control Register CTRL_AUX-bit

30-series	The CTRL_AUX bit in the control register indicates to the Anybus CompactCom if the process data in the current telegram has changed compared to the previous one.
40-series	The value of the CTRL_AUX bit is always ignored. Process data is always accepted.

All released Anybus CompactCom 30 example drivers from HMS Industrial Networks comply with this difference.

Related Information: Anybus CompactCom 40 Software Design Guide (HMSI-216-125), section "Control Register".

4.6. Status Register STAT_AUX-bit

30-series	The STAT_AUX bit in the status register indicates if the output process data in the current telegram has changed compared to the previous one. This functionality must be enabled in the Anybus object (01h), Attribute #15. By default, the STAT_AUX bit functionality is disabled.
40-series	The STAT_AUX bit indicates updated output process data (not necessarily changed data) from the network compared to the previous telegram. The functionality is always enabled.

All released Anybus CompactCom 30 example drivers from HMS Industrial Networks comply with this difference.

Related Information: Anybus CompactCom 40 Software Design Guide (HMSI-216-125), section “Status Register”.

4.7. Control Register CTRL_R-bit

30-series	The application may change this bit at any time.
40-series	For the 8-bit parallel operating mode, the bit is only allowed to transition from 1 to 0 when the STAT_M-bit is set in the status register. When using the serial operating modes, it is also allowed to transition from 1 to 0 in the telegram immediately after the finalizing empty fragment.

All released Anybus CompactCom 30 example drivers from HMS Industrial Networks comply with this difference.

Related Information: Anybus CompactCom 40 Software Design Guide (HMSI-216-125), section “Control Register”.

4.8. Modifications of Status Register, Process Data Read Area, and Message Data Read Area

In the 40-series, the Status Register, the Process Data Read Area, and the Message Data Read Area are write protected in hardware (parallel interface). If the software for some reason writes to any of those areas, a change is needed.

All released Anybus CompactCom 30 example drivers from HMS Industrial Networks comply with this difference.

5. Network Specific — BACnet/IP

5.1. Network Configuration Object (04h)

The instances in the Network Configuration Object have been rearranged for the Ethernet based modules for consistency. Network specific instances are moved to instance number 20 and onwards. This is done to increase the number of instances in the section that is not network specific.

If the host application is using any of the parameters below, the software must be updated to use the new instance numbers.

Parameter Name	30-series Instance #	40-series Instance #
Device Instance	3	20
UDP Port	4	21
Process Active Timeout	5	22
IP Address	6	3
Subnet Mask	7	4
Gateway Address	8	5
DHCP Enable	9	6
Comm 1 Settings	10	7
Comm 2 Settings	11	8
DNS1	12	9
DNS2	13	10
Host Name	14	11
Domain Name	15	12
SMTP Server	16	13
SMTP User	17	14
SMTP Password	18	15
Foreign Device Registration IP	19	23
Foreign Device Registration UDP Port	20	24
Foreign Device Registration Time to Live Value	21	25

5.2. Reduced Network Resources Due to Memory Constraints

The Anybus CompactCom 40 BACnet/IP will have reduced network resources compared to the Anybus CompactCom 30 due to memory constraints.

Network Resource	30-series	40-series
Maximum size of BACnet NPDU	1476	1024
Maximum number of active server requests	10	5
Number of supported COV server subscriptions	60	60
Maximum number of Network Configuration object recipients supported	60	18
Number of client requests	120	78
Number of supported Network Configuration events	256	64
Maximum size of APDU service payload with segmentation included	32 kB	5 kB
Number of BACnet objects (advanced mode)	6120	768
Number of BAPL DeviceAddressBindings supported 18	60	18

6. Network Specific — CC-Link

6.1. Network CC-Link Object (08h)

The specific CC-Link mapping commands: Map_ADI_Specified_Write_Area, Map_ADI_Specified_Read_Area have been removed. With these two previously used commands it was possible to freely specify the location of the mapped data in the CC-Link address map; this is not possible anymore.

The mapping is now handled with the commands: Map_ADI_Write_Area, Map_ADI_Read_Area or Map_ADI_Write_Ext_Area and Map_ADI_Read_Ext_Area. The location of the mapped data in the CC-Link address map can now only be managed by using these commands in conjunction with the chronological order the commands are sent.

See Anybus CompactCom 40 CC-Link Network Guide for the new Process Data mapping scheme details.

6.2. Network Object (03h)

Process Data

A new default Process Data mapping scheme has been implemented in the 40-series. Data type BOOL is now mapped to the Word-area. In the 40-series, use the new BITx data types instead to map the data to the Bit-area.

All bit data must be mapped before all other data types for the data to be mapped to the Bit-area. If mapping bit data after having mapped other "non-bit-data" the data will be mapped to the Word-area.

The change was made to get a more logical and faster mapping.

You need to make sure the process data is mapped according to the above in the host application.

6.3. Diagnostic Object (02h)

To use the Diagnostic Events in conjunction with the automatic System Area Handler (CC-Link Host Object (F7h), Attribute #5, System Area Handler) in the Anybus CompactCom 40 CC-Link, there is one modification required. The application is now required to use the Diagnostic Events with the severity representing Latching Events <u>or</u> handle the system area completely in the application. For details on Diagnostic Event with latching severity, see the Anybus CompactCom 40 Software Design Guide, Diagnostic Object.

If the Diagnostic Event created is not of the latching severity, the system area will not work according the CC-Link specification.

If the automatic System Area Handler functionality is used previously, add the use of Diagnostic Events with a latching event severity <u>or</u> let the host application handle the system area completely.

7. Network Specific — DeviceNet

7.1. DeviceNet Host Object (FCh)

Attribute	30-series	40-series	Change/Action/Comment
#2, Device Type	Default: 0000h	Default: 002Bh	If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series. If the attribute is not implemented, the default value is used.
#3, Product Code	Default: 0062h	Default: 003Fh	If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series. If the attribute is not implemented, the default value is used.
#6, Product Name	Default: “Anybus-CC DeviceNet”	Default: “CompactCom 40 DeviceNet(TM)”	If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series. If the attribute is not implemented, the default value is used.

7.2. EDS file (Electronic Datasheet file used by configuration tool)

Keywords

The following keywords must be updated when migrating.

Keyword	Comments
ProdType	Must match attribute #2 (Device Type) in the DeviceNet Host Object (FCh).
ProdCode	Must match attribute #3 (Product Code) in the DeviceNet Host Object (FCh).
ProdName	Must match attribute #6 (Product Name) in the DeviceNet Host Object (FCh).
MajRev	Must match the major revision of the product.

8. Network Specific — EtherCAT

8.1. Network Configuration Object (04h)

The instance number for the Device ID instance has changed from number 3 (30-series) to number 1 (40-series).

8.2. EtherCAT Object (F5h)

Attribute	30-series	40-series	Change/Action/Comment
#2, Product Code	Default: 0000 0034h	Default: 0000 0036h	If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series. If the attribute is not implemented, the default value is used.
#6, Manufacturer Device Name	Default: “Anybus-CC EtherCAT”	Default: “CompactCom 40 EtherCAT”	If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series. If the attribute is not implemented, the default value is used.

8.3. ESI-file (Configuration file used by engineering tool)

When migrating from the 30-series to the 40-series, a new, updated ESI-file is needed. To help you, there is an ESI-file Generator available from HMS Industrial Networks, see below.

ESI-file Generator

An ESI-file generator is available on the HMS Industrial Networks website. The generator will create an up to date ESI file fitted for the specific design. The ESI generator works for both the 30-series and the 40-series.

The generator can be downloaded from www.anybus.com/starterkit40.

Keywords

The ESI-file generator is up to date with the following differences between the 30-series and the 40-series.

The Product Code, Revision Number and Product Name must be updated to reflect the current module. Note: These values can be changed via the EtherCAT object (F5h) and the ESI-file values must match the EtherCAT object values.

```
<Type ProductCode="#x00000036" RevisionNo="#x00020001">
   CompactCom 40 EtherCAT</Type>
```

The EtherCAT state transition timeouts must be present in the ESI-file per the latest specification. Note: These timeout values can be change via the EtherCAT object (F5h) and the ESI-file values must match the EtherCAT object values.

```
<StateMachine>
      <Timeout>
            <PreopTimeout>1000</PreopTimeout>
            <SafeopOpTimeout>5000</SafeopOpTimeout>
            <BackToInitTimeout>1000</BackToInitTimeout>
            <BackToSafeopTimeout>200</BackToSafeopTimeout>
      <Timeout>
</StateMachine>
```

The sync manager start addresses have been changed in the 40-series, and the sync manager sizes are now configurable in the EtherCAT configuration tool.

```
<Sm MinSize="34" MaxSize="1486" DefaultSize="276" StartAddress="#x4000"
ControlByte="#x26" Enable="1">MBoxOut</Sm>
<Sm MinSize="34" MaxSize="1486" DefaultSize="276" StartAddress="#x4800"
ControlByte="#x22" Enable="1">MBoxIn</Sm>
<Sm StartAddress="#x2800" ControlByte="#x20" Enable="1">Inputs</Sm>
```

The 40-series supports File over EtherCAT (FoE) and this must be reflected in the ESI-file. If FoE is disabled in the EtherCAT host object, this keyword must be removed from the ESI-file.

```
<FoE/>
```

Since the 40-series is using the HMS slave controller, the EEPROM byte size and the SII configuration data must be changed according to the following settings.

```
<ByteSize>384</ByteSize>
<ConfigData>80360046F4010000000000000000</ConfigData>
```

The 40-series supports the boot strap state, and requires the following keyword.

```
<BootStrap>0040000400480004</BootStrap>
```

9. Network Specific — EtherNet/IP

9.1. Network Object (03h)

Attribute #1, Network Type

The 30-series module is available in two network type versions, either with “Beacon based DLR” (Highest performance) or with “Announce based DLR” which both are Ethernet redundancy protocols. The 40-series is only available with “Beacon based DLR”. The network type value differs between the versions.

Value	Network Type	Anybus CompactCom Product
0085h	EtherNet/IP, No DLR	30-series 1-port
009Ch	EtherNet/IP, Announce Based DLR	30-series 2-port
009Bh	EtherNet/IP, Beacon Based DLR	30-series and 40-series
00ABh	EtherNet/IP, Beacon Based DLR + IIoT	40–series

9.2. EtherNet/IP Host Object (F8h)

Attribute	Default	Anybus CompactCom Product	Comment
#2, Device Type	0000h	30-series, EtherNet/IP, No DLR	If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series. If the attribute is not implemented, the default value is used.
	0000h	30-series, EtherNet/IP, Announce Based DLR	
	002Bh	30-series, EtherNet/IP, Beacon Based DLR	
	002Bh	40-series, EtherNet/IP, Beacon Based DLR	
#3, Product Code	0063h	30-series, EtherNet/IP, No DLR	If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series. If the attribute is not implemented, the default value is used.
	002Eh	30-series, EtherNet/IP, Announce Based DLR	
	0036h	30-series, EtherNet/IP, Beacon Based DLR	
	0037h	40-series, EtherNet/IP, Beacon Based DLR	
#6, Product Name	Anybus-CC EtherNet/IP	30-series, EtherNet/IP, No DLR	If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series. If the attribute is not implemented, the default value is used.
	CompactCom EtherNet/IP(TM) 2P	30-series, EtherNet/IP, Announce Based DLR	
	Anybus-CC EIP (2-Port) BB DLR	30-series, EtherNet/IP, Beacon Based DLR	
	Anybus CompactCom 40 EtherNet/IP(TM)	40-series, EtherNet/IP, Beacon Based DLR	
Attribute #27, Producing Instance Map	See comment		Attribute removed in the 40-series (only available in the 30-series EtherNet/IP Beacon Based DLR). The CompactCom will never request this attribute. Replaced by the functionality in the Assembly Mapping Object (EBh). If this attribute is used, the Assembly Mapping object must be implemented instead.
Attribute #28, Consuming Instance Map	See comment		Attribute removed in the 40-series (only available in the 30-series EtherNet/IP Beacon Based DLR). The CompactCom will never request this attribute. Replaced by the functionality in the Assembly Mapping Object (EBh). If this attribute is used, the Assembly Mapping object must be implemented instead.

EtherNet/IP functionality

Max Message Connections	The maximum number of simultaneous Class 3 connections are 16 in the 30-series and 6 in the 40-series. No change is needed in the host application.
EtherNet/IP Encapsulation Sessions	The maximum number of simultaneous encapsulation sessions are 48 in the 30-series and 15 in the 40-series. No change is needed in the host application.

9.3. EDS file (Electronic Datasheet file used by configuration tool)

EDS file Generator Tool

An EDS-generator for automatic EDS-file generation up to date with the differences below. The EDS-generator only works with the 40-series, version 1.30 and later.

The generator can be downloaded from www.anybus.com/starterkit40.

Keywords

The following keywords differs between the 30-series and the 40-series. The EDS generator reflects this change.

Keyword	Comments
Capacity->MaxCIPConnections	Removed in 40-series – replaced by: MaxMsgConnections and MaxIOConnections (see below)
Capacity->MaxMsgConnections	New keyword in the 40-series, Value: 6
Capacity->MaxIOConnections	New keyword in the 40-series, Value: 4

10. Network Specific — Modbus-TCP

10.1. Modbus Registers

Rearrangements have been made in the Modbus register map, because process data sizes have been increased to 1536 bytes in each direction. An existing PLC configuration need to be changed to use the new addresses. **No difference on the application side.**

Contents	30-series Modbus Address	40-series Modbus Address
Holding Registers (4x)		
Read Process Data	0000h-00FFh	0000h-02FFh
Write Process Data	0100h-01FFh	0800h-0AFFh
Process Active Timeout	0203h	1003h
Enter/Exit Idle Mode	0204h	1004h
ADI Number 1	0210h-021Fh	1010h-101Fh
ADI Number 2	0220h-022Fh	1020h-102Fh
ADI Number 3839		FFF0h-FFFFh
Input Registers (3x)		
Write Process Data	0000h-00FFh	0000h-02FFh
Diagnostic Event Count	0100h	0800h
Diagnostic Event #1	0101h	0801h
Diagnostic Event #2	0102h	0802h
Diagnostic Event #3	0103h	0803h
Diagnostic Event #4	0104h	0804h
Diagnostic Event #5	0105h	0805h
Diagnostic Event #6	0106h	0806h
Coils (0x)		
Read Process Data	0000h-0FFFh	0000h-2FFFh
Discrete Inputs (1x)		
Write Process Data	0000h-0FFFh	0000h-2FFFh

10.2. BOOL arrays

Process data mapped BOOL arrays are not compressed to bit-fields on the network in the 40-series, but handled as a normal 8-bit datatype. To create bit-arrays in the 40-series, use the new datatypes BITx instead.

10.3. Network Configuration Object (04h)

The instances in the Network Configuration Object have been rearranged for the Ethernet based modules for consistency. Network specific instances are moved to instance number 20 and onwards. This is done to increase the number of instances in the section that is not network specific.

If the host application is using any of the parameters below, the software must be updated to use the new instance numbers.

Parameter Name	30-series Instance #	40-series Instance #
Modbus Connection Timeout	9	20
Process Active Timeout	10	21
DNS1	11	9
DNS2	12	10
Host Name	13	11
Domain Name	14	12
SMTP Server	15	13
SMTP User	16	14
SMTP Password	17	15
Word Order	18	22

10.4. Modbus Host Object (FAh)

Attribute	30-series	40-series	Change/Action/Comment
#2, Product Code	Default: “Anybus-CC Modbus-TCP (2-Port)”	Default: “Anybus CompactCom 40 Modbus TCP”	If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series. If the attribute is not implemented, the default value is used.
#11,Modbus read/ write registers command offset	-	-	In the 30-series, this register address offset is only applied when accessing holding registers with the command Read/Write Multiple registers (23). The 40-series applies this register offset to all holding register access, i.e. commands 3, 6, 16 and 23.

10.5. Ethernet Host Object (F9h)

Attribute	30-series	40-series	Change/Action/Comment
#4, Enable Modbus-TCP	Available	Removed	Attribute removed in the 40-series. The Anybus CompactCom will never request this attribute. Nothing needs to be changed in the host application.

10.6. Process data

In the 30-series modules, writing to the ADI register area would only result in a Set_Attribute command to the application (Application Data Object (FEh)) if the ADI was not mapped to read process data. For the 40-series, all register writes to the ADI area also results in a corresponding Set_Attribute command to the host application (Application Data Object (FEh)), <u>as well as updating of the process data</u>.

11. Network Specific — PROFIBUS

11.1. Additional Diagnostic Object (05h)

Object removed in the 40-series. To create diagnostics, use Diagnostic Object (02h).

Another option is to use the PROFIBUS DP-V0 Diagnostic Object (10h) where diagnostics can be sent transparently from the host application to the network.

If you use the Additional Diagnostic Object you need to update your software implementation.

11.2. Network PROFIBUS DP-V1 Object (0Bh)

Object removed in the 40-series, i.e. commands Map_ADI_Specified_Write_Area and Map_ADI_Specified_Read_Area are not supported.

11.3. PROFIBUS DP-V1 Object (FDh)

Attribute	30-series	40-series	Change/Action/Comment
#1, PNO Ident Number	1811h	1815h	If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series. If the attribute is not implemented, the default value is used.
#2, Parameterization Data	See Comment		In the first 10 bytes, only the Parameter Struct bit (bit 3) is copied to this attribute in the 40-series. All other bits are set to 0. In the 30-series all information in the first 10 bytes were copied.
#5, Size of Identifier Related Diagnostics	Available	Removed	Attribute removed in the 40-series. The Anybus CompactCom will never request this attribute. Nothing needs to be changed.
#6, Buffer Mode	Available	Removed	Attribute removed in the 40-series. The Anybus CompactCom will never request this attribute. No buffer modes needed in the 40-series since maximum sizes for all buffers are supported. Nothing needs to be changed.
#7, Alarm Settings	Available	Removed	Attribute removed in the 40-series. The Anybus CompactCom will never request this attribute. Only Diagnostic Alarms supported.
#16, I&M Version	Available	Removed	Attribute removed in the 40-series. The Anybus CompactCom will never request this attribute. The host application cannot influence the I&M version implemented by the Anybus CompactCom.
#17, I&M Supported	Available	Removed	Attribute removed in the 40-series. The Anybus CompactCom will never request this attribute. The host application cannot influence the I&M version supported by the Anybus CompactCom.
#19, Check Config Behavior	Available	Removed	Attribute removed in the 40-series. The Anybus CompactCom will never request this attribute. The 40-series depends on CheckCfgMode (often configurable in the PROFIBUS master) in default mode. Either the expected and actual configuration must match exactly or can differ as long as the expected input and output sizes are equal or larger than the actual sizes.

11.4. Network Configuration Object (04h)

The following attributes are removed in the 40–series. The Anybus CompactCom will never request these attributes. It is only possible to set these values via the network (I&M1-4) – end user configuration.

- Instance #3, Function Tag
- Instance #4, Location Tag
- Instance #5, Installation Date
- Instance #6, Description

11.5. GSD file (PROFIBUS configuration file used by engineering tool)

Implementation Type	If the keyword “Implementation Type” is present in the GSD-file (optional keyword), the value for the 30-series shall be “NP30” and the value for the 40-series shall be “NP40”.
Length Related Keywords	The following keywords are possible to set to maximum values if neeed in the 40-series. In the 30-series the maximum lengths were dependent of the buffer mode setting. • Max_Input_Len • Max_Output_Len • Max_Data_Len • Max_User_Prm_Data_Len • Max_Diag_Data_Len

12. Network Specific — PROFINET

Related Information:

Anybus CompactCom 40 PROFINET IRT Network Guide, HMSI-27-226

Network Interface Appendix, Anybus CompactCom 30, PROFINET IO 2-Port, HMSI-168-49

12.1. Network Object (03h)

<table>
<tr><th>Attribute</th><th>Default</th><th>Anybus CompactCom Product</th><th>Comment</th></tr>
<tr><td rowspan="6">#1, Network Type</td><td>0084h</td><td>30-series, PROFINET IO 1-Port</td><td rowspan="6">The 30-series module is a PROFINET RT module without IRT capabilities. The 40-series module has PROFINET IRT capabilities. The Network Type value differs between the different Anybus CompactCom PROFINET versions.</td></tr>
<tr><td>0096h</td><td>30-series, PROFINET IO 2-Port</td></tr>
<tr><td>0089h</td><td>40-series, PROFINET IRT</td></tr>
<tr><td>009Dh</td><td>40-series, PROFINET IRT Fiber Optic</td></tr>
<tr><td>00ADh</td><td>40-series, PROFINET IRT + IIoT</td></tr>
<tr><td>00AEh</td><td>40-series, PROFINET IRT Fiber Optic +IIoT</td></tr>
<tr><td rowspan="4">#2, Network Type String</td><td>“PROFINET IO”</td><td>30-series, PROFINET IO 1-Port</td><td rowspan="4">The 30-series module is a PROFINET RT module without IRT capabilities. The 40-series module has PROFINET IRT capabilities. The Network Type value differs between the different Anybus CompactCom PROFINET versions.</td></tr>
<tr><td>“PROFINET IO 2-Port”</td><td>30-series, PROFINET IO 2-Port</td></tr>
<tr><td>“PROFINET IRT”</td><td>40-series, PROFINET IRT and PROFINET IRT + IIoT</td></tr>
<tr><td>“PROFINET IRT Fiber Optic”</td><td>40-series, PROFINET IRT Fiber Optic 40-series, PROFINET IRT Fiber Optic +IIoT</td></tr>
</table>

12.2. PROFINET IO Object (F6h)

<table>
<tr><th>Attribute</th><th>Default</th><th>Anybus CompactCom Product</th><th>Comment</th></tr>
<tr><td rowspan="3">#1, Device ID</td><td>0007h</td><td>30-series, PROFINET IO 1-Port</td><td rowspan="3">The Device ID controls how your product identifies itself on the PROFINET network.
If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series.
If the attribute is not implemented, the default value differs between the different Anybus CompactCom PROFINET types.</td></tr>
<tr><td>0009h</td><td>30-series, PROFINET IO 2-Port</td></tr>
<tr><td>0010h</td><td>40-series, PROFINET IRT</td></tr>
<tr><td rowspan="3">#3, Station Type</td><td>“ABCC-PRT”</td><td>30-series, PROFINET IO 1-Port</td><td rowspan="3">The Station Type defines the name your product uses to identify itself on the PROFINET network.
If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series.
If the attribute is not implemented, the default value differs between the different Anybus CompactCom PROFINET types.</td></tr>
<tr><td>“ABCC-PRT (2-Port)”</td><td>30-series, PROFINET IO 2-Port</td></tr>
<tr><td>“CompactCom 40 PIR”</td><td>40-series, PROFINET IRT</td></tr>
<tr><td rowspan="3">#8, I&M Order ID</td><td>“ABCC-PRT”</td><td>30-series, PROFINET IO 1-Port</td><td rowspan="3">If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series.
If the attribute is not implemented, the default value differs between the different Anybus CompactCom PROFINET types.</td></tr>
<tr><td>“ABCC-PRT (2-Port)”</td><td>30-series, PROFINET IO 2-Port</td></tr>
<tr><td>“CompactCom 40 PIR”</td><td>40-series, PROFINET IRT</td></tr>
<tr><td rowspan="3">#19, System Description</td><td>“HMS Industrial Networks Anybus CompactCom”</td><td>30-series, PROFINET IO 1-Port</td><td rowspan="3">If the attribute is implemented in the host application, it overrides the default value and there is no difference between the 30-series and the 40-series.
If the attribute is not implemented, the default value differs between the different Anybus CompactCom PROFINET types.</td></tr>
<tr><td>“Anybus CompactCom PROFINET IO 2-Port”</td><td>30-series, PROFINET IO 2-Port</td></tr>
<tr><td>“HMS Industrial Networks Anybus-CompactCom 40”</td><td>40-series, PROFINET IRT</td></tr>
</table>

Attribute	30-series	40-series	Change/Action/Comment
#7, Record Data Mode	See Comment		I&M Record data transparent mode (bit 1) is replaced with the IM_Options command in the Network PROFINET IO object (0Eh). If this bit is 0 in the current implementation, no action is needed
#13, I&M Profile ID	Used for all APIs	Only used for “non-zero” APIs	In the 40-series, this attribute is only read for submodules belonging to a “non-zero” API (e.g. PROFIdrive profile). Constant values (F600h, Generic Device and 0004h, Communication Module) are used for submodules belonging to API 0. In the 30-series this parameter is used for all API:s.
#14, I&M Profile Specific Type	Used for all APIs	Only used for “non-zero” APIs	In the 40-series, this attribute is only read for submodules belonging to a “non-zero API” (e.g. PROFIdrive profile). Constant values (F600h, Generic Device and 0004h, Communication Module) are used for submodules belonging to API 0. In the 30-series this parameter is used for all API:s.
#15, I&M Version	Available	Removed	Attribute removed in the 40-series. The Anybus CompactCom will never request this attribute. The host application cannot influence the I&M implemented by the Anybus CompactCom.
16, I&M Supported	Available	Removed	Attribute removed in the 40-series. The Anybus CompactCom will never request this attribute. The host application cannot influence the I&M supported by the Anybus CompactCom.
#20, Interface description	Available	Removed	Attribute removed in the 40-series. The Anybus CompactCom will never request this attribute.
#21, Module ID Assignment Mode	Available	Removed	Attribute removed in the 40-series (Incremental Module Identification removed in the 40-series). The Anybus CompactCom will never request this attribute.
#22, System Contact	Available	Removed	Attribute removed in the 40-series. The Anybus CompactCom will never request this attribute. System Contact can now only be reached from the network via SNMP (sysContact). Also see SNMP MIB-II (page 80).
#23, PROFIenergy functionality	Available	Removed	Attribute removed in the 40-series. The Anybus CompactCom will never request this attribute. PROFIenergy is now enabled by the application having implemented the Energy Control Object (F0h).

Command	30-series	40-series	Change/Action/Comment
Ar_Info_Ind	Available	Removed	Command removed in the 40-series. The Anybus CompactCom will never use this command in a request. The command is replaced by the command Expected_Ident_Ind
Ar_Offline_Ind	Available	Removed	Command removed in the 40-series. The Anybus CompactCom will never use this command in a request. The 30-series module issues this command to indicate to the host application that the module enters an offline state. Use Ar_Abort_Ind instead.
Plug_Submodule_Failed	Available	Removed	Command removed in the 40-series. The Anybus CompactCom will never use this command in a request.
Get_IM_Record	Available	Removed	Command removed in the 40-series. The Anybus CompactCom will never use this command in a request. It will use the general Get_Record-command instead (filter on index AFF0h-AFFFh).
Set_IM_Record	Available	Removed	Command removed in the 40-series. The Anybus CompactCom will never use this command in a request. It will use the general Set_Record-command instead (filter on index AFF0h-AFFh).

12.3. PROFINET Additional Diagnostic Object (0Fh)

Object removed in the 40-series. All diagnostics are handled via the standard diagnostic object (02h), Event code FFh. Only Channel diagnostics can be created.

12.4. Diagnostic Object (02h)

The structure of network specific event information has changed in the create command. Instead of including diagnostic source information such as API, Slot, and Subslot in the data field, it is extracted from the extended diagnostic fields in the create command. API, Slot, and Subslot are determined with the help of Slot and ADI given by the extended diagnostic mode.

Process alarms cannot be created in the 40-series.

12.5. Network Configuration Object (04h)

The instances in the Network Configuration Object have been rearranged for the Ethernet based modules for consistency. Network specific instances are moved to instance number 20 and onwards. This is done to increase the number of instances in the section that is not network specific.

If the host application is using any of the parameters below, the software must be updated to use the new instance numbers.

Parameter Name	30-series Instance #	40-series Instance #
DNS1	8	9
DNS2	9	10
Host Name	10	11
Domain Name	11	12
SMTP Server	12	13
SMTP User	13	14
SMTP Password	14	15
Station Name	15	20
F-Address	20	21
Function Tag	16	Parameter removed
Location Tag	17	Parameter removed
Installation Date	18	Parameter removed
Description	19	Parameter removed

The following instances are removed in the 40-series. They are only possible to set via the network.

- Instance #16 in 30-series, Function Tag
- Instance #17 in 30-series, Location Tag
- Instance #18 in 30-series, Installation Date
- Instance #19 in 30-series, Description

12.6. Network PROFINET IO Object (0Eh)

Attribute	30-series	40-series	Change/Action/Comment
#3, Last OffLineInd ReasonCode	-	Removed	Attribute removed in the 40-series. Since the command Ar_Offline_Ind is removed, this attribute makes no sense. If the host application is accessing this attribute, it will receive an error response when using the 40-series.
#9, ProfinetIoStack Init ErrorCode	-	Removed	Attribute removed in the 40-series. If the host application is accessing this attribute, it will receive an error response when using the 40-series.

12.7. I&M4

I&M4 is removed in the 40-series. Writeable I&M records in GSD must be updated (see GSD section below).

12.8. LED Indications

Changes has been made regarding the specification of the LED indications. See tables below for differences.

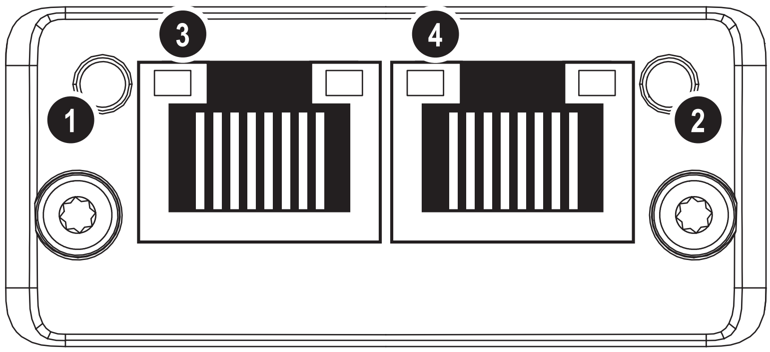


Figure B.6.

Network Status LED (LED1[A..B])

LED State	30-series	40-series	Comments
Off	Offline	Offline	- No power- No connection with IO controller
Green	Online (RUN)	Online (RUN)	Connection with IO controller established, IO controller in Run state
Green, 1 flash	-	Online (STOP)	Connection with IO controller established, IO controller in STOP state or IO data bad, IRT synchronization not finished
Green, 3 flashes	-	Identify	Flashing 3 times (1Hz) continuously to identify slave (DCP_Identify).
Green, cont. flash	Online (STOP)	-	Connection with IO controller established, IO controller in STOP state
Red	Fatal event	Fatal event	Major internal error (this indication is combined with a red module status LED)
Red, 1 flash	-	Station Name error	Station name not set
Red, 2 flashes	-	IP address error	IP address not set
Red, 3 flashes	-	Configuration error	Expected Identification differs from Real Identification.

Module Status LED (LED2[A..B])

LED State	30-series	40-series	Comments
Off	Not Initialized	Not Initialized	No power or Module in SETUP or NW_INIT state
Green	Normal Operation	Normal Operation	Module has shifted from the NW_INIT state
Green, 1 flash	Diagnostic Event	Diagnostic Event	Diagnostic event(s) present
Green, cont. flash	Identify	-	Flashing 1Hz continuously to identify slave (DCP_Identify).
Red	Exception error	Exception error	Module in state Exception
	Fatal Event	Fatal Event	Major internal error (this indication is combined with a red Network Status LED)
Red, 1 flash	Configuration error	-	
Red, 2 flashes	IP address error	-	
Red, 3 flashes	Station Name Error	-	
Red, 4 flashes	Internal error	-	
Alternating Red/Green	-	Firmware Update	Do NOT power off the module. Turning the module off during this phase could cause permanent damage.

12.9. SNMP MIB-II

sysContact, sysLocation and sysName are used to give the product identification in the end installation.

In the 40-module these variables are only set from the network using SNMP protocol by the end user.

Due to this, sysContact (PROFINET IO object (F6h), Attribute 22), sysLocation (Network Configuration Object (04h), Attribute 17) and sysName (Network Configuration Object (04h), Attribute 15) are no longer used.

Nothing needs to be updated in your implementation but attribute values will no longer be used.

12.10. ADI Based Configuration

When using the ADI based configuration, the structure of module identifiers and submodule identifiers are changed in the 40-series to be able to support the re-map functionality.

30-series (2-Port)
DAP V2.0: Module ID: 0x00000011, Submodule ID: 0x00000001

Modules:

Fixed module IDs for different data sizes and data directions

Output 1 byte - Module ID: 0x00000020, Submodule ID: 0x00000000

Output 1 word - Module ID: 0x00000030, Submodule ID: 0x00000000

Output 2 word - Module ID: 0x00000040, Submodule ID: 0x00000000

Output 4 word – Module ID: 0x00000050, Submodule ID: 0x00000000

Input 1 byte – Module ID: 0x00000002, Submodule ID: 0x00000000

Input 1 word – Module ID: 0x00000003, Submodule ID: 0x00000000

Input 2 word - Module ID: 0x00000004, Submodule ID: 0x00000000

Input 4 word – Module ID: 0x00000005, Submodule ID: 0x00000000

One submodule per module

40-series
DAP: Module ID: 0x80010000, Submodule ID: 0x00000001

Modules:

The Module IDs and Submodule IDs are built up according to the figure below.

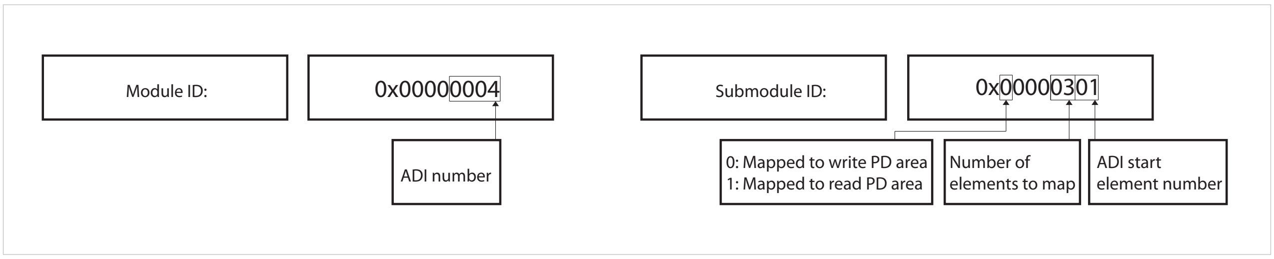


Figure B.7.

12.11. Configuration Mismatch

The 40-series are stricter regarding outputs and more tolerant regarding inputs compared to the 30-series. All outputs are locked if at least one output is missing. The network engineering tool may use anywhere between 0 and all actual input submodules without error indication.

ABCC40 provides a window for "seamless" adaptation of Real Identification (RI). In ADI based RI mode through remap, and in advanced mode by blocking in the connect request handling. It is not ok to adapt RI by rebooting.

For detailed information about how a configuration mismatch is handled in the 30-series, see Anybus CompactCom 30 PROFINET IO Network Appendix, HMSI-168-74, Section “Configuration Mismatch”.

For detailed information about how a configuration mismatch is handled in the 40-series, see Anybus CompactCom 40 PROFINET IRT Network Guide, HMSI-27-226, Section “Configuration Mismatch”.

12.12. Media Redundancy Protocol (MRP)

MRP is supported in the 40-series and cannot be disabled by the host application. You need to add new keywords in your GSD file, see GSD section below.

12.13. GSD File (PROFINET configuration file used by engineering tool)

GSD Generator Tool

When using the ADI-based configuration, it is possible to use a GSD Generator from HMS which will generate a basic GSD file (up to date with the above differences) with correct ADI modules.

> **NOTE**
> The GSD generator only works for the 40-series

The generator can be downloaded from www.anybus.com/starterkit40.

Modifications for Conformance Class B (if you want to disable support for IRT)

The example GSD file, supplied by HMS Industrial Networks, is prepared for testing an Anybus CompactCom 40 PROFINET IRT for conformance class C, which includes PROFINET isochronous communication mode (IRT). If the implementation does not need the isochronous features of the device, the GSD file can be modified to reflect this. The product can then be conformance tested for conformance class B instead. The list below describe the changes needed in the example GSD file to accomplish this.

> **IMPORTANT**
> If IRT support is removed from the GSD file, it is not possible to use the device in the middle of an IRT line. It has to be connected to the line using an IRT capable switch or placed at the end of the line.

1. The value of the ConformanceClass attribute in the `<CertificationInfo...>` element <u>in each DAP</u> must be changed from “C” to “B”:
   ```
   <CertificationInfo ConformanceClass="B" ApplicationClass=""
   NetloadClass="III"/>
   ```
2. The value of the SupportedRT_Classes attribute in the `<InterfaceSubmoduleItem...>` element <u>in each DAP</u> must be “RT_CLASS_1”. I.e. the “RT_CLASS_2” and “RT_CLASS_3” values must be removed.
   ```
   <InterfaceSubmoduleItem ID="Interface" SubslotNumber="32768"
   SubmoduleIdentNumber="0x00000002" SupportedRT_Classes="RT_CLASS_1"
   TextId="T_ID_INTERFACE "SupportedProtocols="SNMP;LLDP" DCP_
   HelloSupported="true" PTP_BoundarySupported="true"
   DCP_BoundarySupported="true"
   ```
3. The elements `<RT_Class3Properties ...>`, `<SynchronisationMode ...>`, and `<RT_Class3TimingProperties ...>` must be removed from <u>each DAP</u>.

Keywords

Keyword	Comments
GSDML-DeviceProfile version	2.31 for 30-series, 2.32 for 40-series
DeviceIdentity->DeviceID	Must be changed to reflect the Device ID you have configured in the PROFINET IO object (F6h), Attribute 1.
DeviceAccessPointItem->CheckDeviceID_Allowed	False for 30-series, true for 40-series
DeviceAccessPointItem->ImplementationType	NP30 for 30-series, NP40 for 40-series
DeviceAccessPointItem->WebServer	Optional keyword. Can be removed if not used.
DeviceAccessPointItem->LLDP_NoD_Supported	Manadatory, =true for 40-series
DeviceAccessPointItem->PowerOnToCommReady	Required if Fast Start-Up is supported
DeviceAccessPointItem->ResetToFactoryModes	2 in 30-series, 2 and 8 in 40-series (2 mandatory)
DeviceAccessPointItem->PNIO_Version	V2.2 in 30-series, V2.32 in 40-series
ModuleInfo->HardwareRelease Value	Optional. Removed in 40-series
ModuleInfo->SoftwareRelease Value	Optional. Removed in 40-series
CertificationInfo->ConformanceClass	B in 30-series, B or C in 40-series depending on IRT.
CertificationInfo->NetloadClass	Mandatory. III in 40-series
VirtualSubmoduleItem->API	Removed in 40-series. API=0 default.
VirtualSubmoduleItem->IOData IOPS_Length	Removed in 40-series. Default=1
VirtualSubmoduleItem->IOData IOCS_Length	Removed in 40-series. Default=1
VirtualSubmoduleItem->Writeable_IM_Records	1 2 3 4 in 30-series. 1 2 3 in 40-series.
VirtualSubmoduleItem->MayIssueProcessAlarm	Mandatory for 2.32. False in 40-series.
InterfaceSubmoduleItem->PTP_BoundarySupported	False in 30-series, true in 40-series
InterfaceSubmoduleItem->DCP_HelloSupported	True - Required if FSU is supported
InterfaceSubmoduleItem->DelayMeasurementSupported	Only for IRT (40-series)
InterfaceSubmoduleItem->RT_Class3Properties	Only for IRT (40-series)
InterfaceSubmoduleItem->SynchronisationMode	Only for IRT (40-series)
ApplicationRelations->StartupMode	Legacy in 30-series. Legacy and Advance in 40-series (mandatory).
MediaRedundancy SupportedRole="Client"	New MRP keyword in the 40-series. MRP not supported in 30-series.
SupportsRingportConfig="true"	New MRP keyword in the 40-series. MRP not supported in 30-series.
IsDefaultRingport="true"	New MRP keyword in the 40-series. MRP not supported in 30-series.
VirtualSubmoduleItem->Writeable_IM_Records="1 2 3"	I&M4 removed in the 40-series

Appendix C. Technical Specification

NOTE
The properties specified in this chapter apply to all Anybus CompactCom M40 modules unless otherwise stated. Any deviations from what is stated in this chapter is specified separately in each network appendix.

1. Environmental

Operating temperature:

Modules with plastic housing:	-40 to 70°C (-40 to 158°F)
Modules without plastic housing:	-40 to 85°C (-40 to 185°F)

(Tests performed according to SS-EN 60068-2-1:2007 and SS-EN 60068-2-2:2008)

Storage temperature

Active and passive modules: -40 to 85°C (-40 to 185°F)

(Tests performed according to SS-EN 60068-2-1:2007 and SS-EN 60068-2-2:2008)

Humidity

Active modules: 5 to 95% noncondensing

(Tests performed according to SS-EN 60068-2-30:2006 and SS-EN 60068-2-78:2001)

1.1. IP Rating

The IP and type rating, indoor or outdoor use is defined by the end product. The end product needs to be placed in an enclosure that is suitable to achieve the necessary rating.

IP67 can be reached if M12 network connectors are used and properly installed in the end product enclosure. For more information, see M12 Connector (page 5).

2. Shock and Vibration

- Shock test, operating IEC 68-2-27 half-sine 30g, 11 ms, 3 positive and 3 negative shocks in each of three mutually perpendicular directions.
- Sinusoidal vibration, operating IEC 68-2-6 10-500 Hz, 0.35 mm, 5g, 1oct/min., 10 double-sweep in each of three mutually perpendicular directions.

3. Electrical Characteristics

3.1. Operating Conditions

Symbol	Parameter	Pin Types	Conditions	Min.	Typ.	Max.	Unit
	Supply Voltage (DC)			3.15	3.30	3.45	V
3V3	Ripple (AC)			-	-	± 100	mV
GND	Ground reference		-	0.00	0.00	0.00	V
			Class A	-	-	250	mA
			Class B	-	-	500	mA
I_{IN}	Current consumption	PWR	Class C	-	-	1000	mA
V_{IH}	Input High Voltage	I, BI	-	2.0	-	3.45	V
V_{IL}	Input Low Voltage			-0.3	-	0.8	V
I_{OH}	Current, Output High	O, BI	-	-8.0	-	8.0	mA
I_{OL}	Current, Output Low						
V_{OH}	Output High Voltage		I_{OH} = -4mA	2.4	-	-	V
V_{OL}	Output Low Voltage		I_{OL} = 4mA	-	-	0.4	V

I= Input, CMOS (3.3V)

O= Output, CMOS (3.3V)

BI= Bidirectional, Tristate

PWR= Power supply inputs

3.2. Isolation (Host to Network)

Functional isolation of 250 V AC (1 minute)

3.3. Functional Earth & Shielding

All Anybus CompactCom modules features a cable shield filter designed according to each network standard. To be able to support this, the host application *must* have a conductive area connected to functional earth as described in Mechanical Specification (page 86) (FE Connection Pad).

HMS cannot guarantee proper EMC behavior unless this requirement is fulfilled.

4. Regulatory Compliance

4.1. EMC Compliance (CE)

Since the Anybus CompactCom is considered a component for embedded applications, it cannot be CE-marked as an end product. However, the Anybus CompactCom family is pre-compliance tested in a typical installation providing that all modules conforms to the EMC directive in that installation.

Once the end product has successfully passed the EMC test using any of the Anybus CompactCom modules, the precompliance test concept allows any other interface of the same type in the Anybus CompactCom family to be embedded in that product without further EMC tests.

To be compliant to the EMC directive 2004/108/EC, the precompliance testing has been conducted according to the following standards:

- Emission: EN61000-6-4
  EN55016-2-3 Radiated emission
  EN55032 Conducted emission
- Immunity: EN61000-6-2
  EN61000-4-2 Electrostatic discharge
  EN61000-4-3 Radiated immunity
  EN61000-4-4 Fast transients/burst
  EN61000-4-5 Surge immunity
  EN61000-4-6 Conducted immunity

Since all Anybus CompactCom modules have been evaluated according to the EMC directive through the above standards, this serves as a base for our customers when certifying Anybus CompactCom based products.

4.2. UL/c-UL Compliance

All members in the Anybus CompactCom M40 series are UL Recognized Components.

Appendix D. Mechanical Specification

3D models for the CompactCom 40 are available on the respective product web pages, see www.hms-networks.com/technical-support.

IMPORTANT
This a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

This product contains ESD (Electrostatic Discharge) sensitive parts that may be damaged if ESD control procedures are not followed. Static control precautions are required when handling the product. Failure to observe this may cause damage to the product.

1. Overview

NOTE
The dimensions below are given in millimeters and include a tolerance of ±0.20 mm.

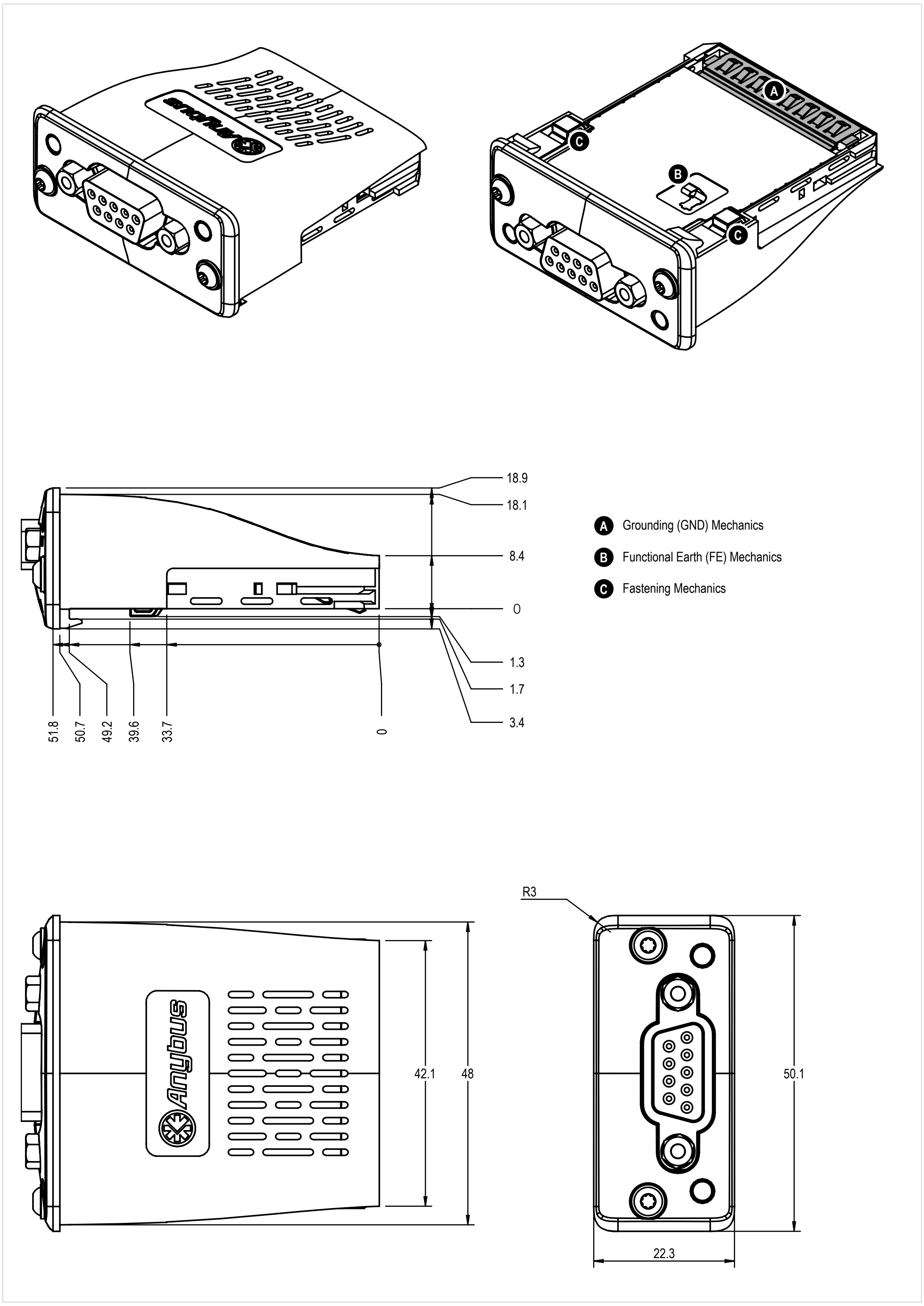


Figure D.1.

2. M12 Connector

The modules that are equipped with M12 connectors, either have two female connectors or one female and one male connector.

> **NOTE**
> The dimensions below are given in millimeters and include a tolerance of ±0.20 mm.

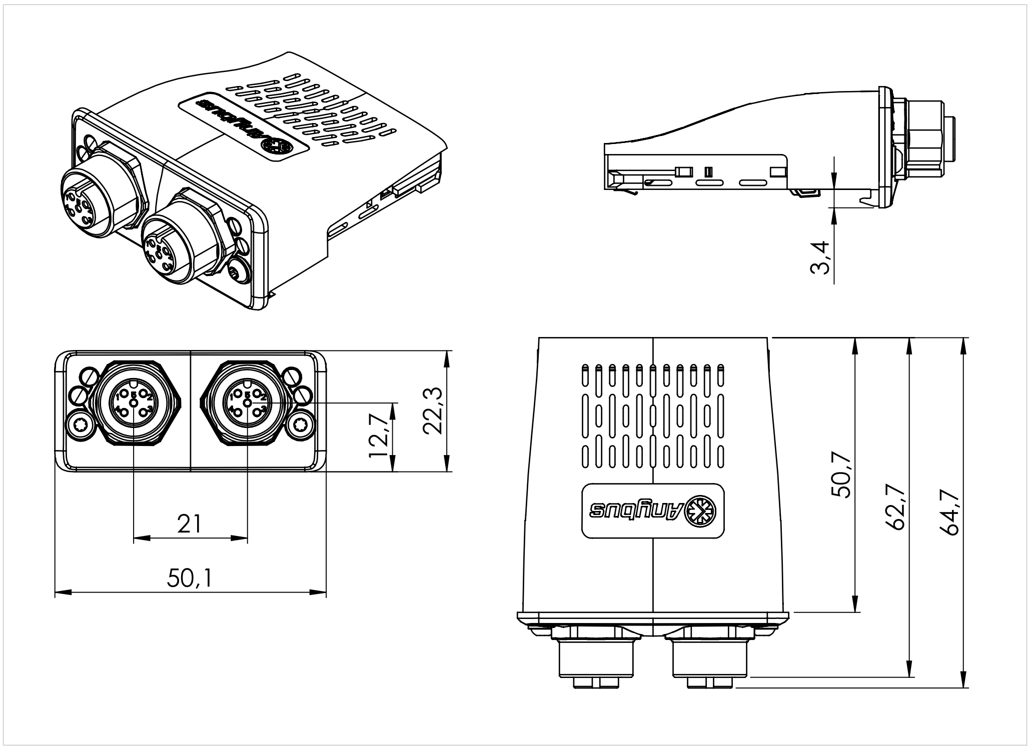


Figure D.2.

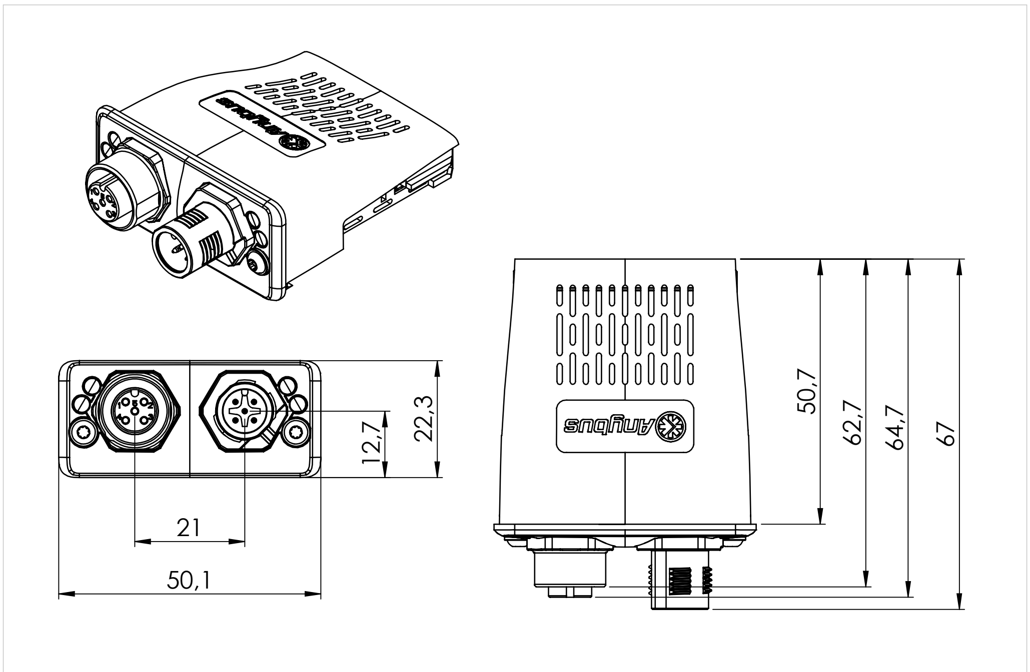


Figure D.3.

3. Footprint

NOTE
The dimensions below are given in millimeters and include a tolerance of ±0.10 mm.

For a footprint for the Anybus CompactCom host connector, see Anybus CompactCom Host Connector (page 94)

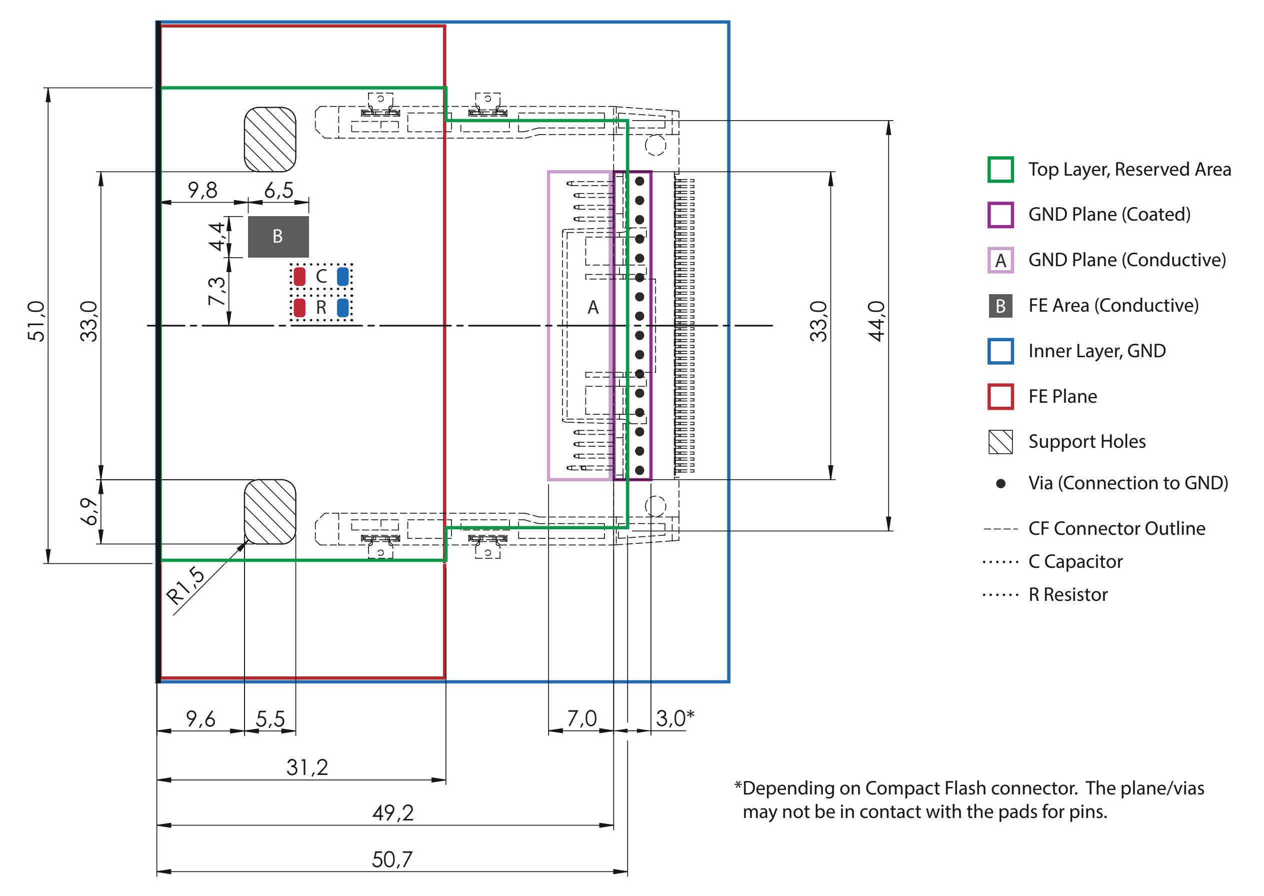


Figure D.4.

Area	Description
Top Layer, Reserved Area	To ensure isolation and mechanical compatibility, it is strongly advised that this area is kept completely free from components and signal lines. Under no circumstances may components, via holes, or signal lines, be placed on the PCB-layer facing the Anybus module. Failure to comply with this requirement may induce EMC/EMI problems, mechanical compatibility issues, or even short circuit.
FE Area (Conductive)	To achieve proper EMC behavior and to provide support for different cable shielding standards, this area must be tin plated (preferably using Hot Air Levelling technology) and have a stable, low impedance connection to functional earth.
GND Plane (Coated) GND Plane (Conductive)	The exact shape of this area depends on the properties of the CompactFlash connector. It is however important to follow these basic design rules: • The plane must be continuous and have a stable, low impedance connection to GND (preferably through at least 16 vias as illustrated in the figure) • The connection to GND should be placed beneath the CompactFlash connector as illustrated above (see figure) • The plane must follow the signal path through the connector • The conductive part must be tin plated, preferably using Hot Air Levelling technology
Inner Layer, GND FE Plane	FE and GND planes should ideally be regularly shaped and as large as possible. As a rule of thumb, the length/width relationship of the planes should not exceed 5/2.
Support Holes	These holes are used by the fastening mechanics to secure the module onto the host application.
Capacitor	The purpose of the capacitor between FE and GND is to keep the high-frequency voltage drop across the Ethernet transformers as low as possible while being exposed to, for example, ESD. The reason for overlapping the planes is to minimize inductance and reduce current density in such events. The value of the capacitor must be chosen in relation to the DCMR[1] and CMR[2] values of the transformer, this is especially important for immunity testing, such as ESD. In most cases 1nF is a reasonable starting point.
Resistor	A bleeding resistor of 1 M ohm should be installed parallel to the capacitor.

[1]DCMR is defined as the rejection ratio between the common-mode and the differential-mode voltage.

[2]Common mode rejection ratio.

4. Housing Preparations

> **NOTE**
> The dimensions below are given in millimeters and include a tolerance of ±0.20 mm.

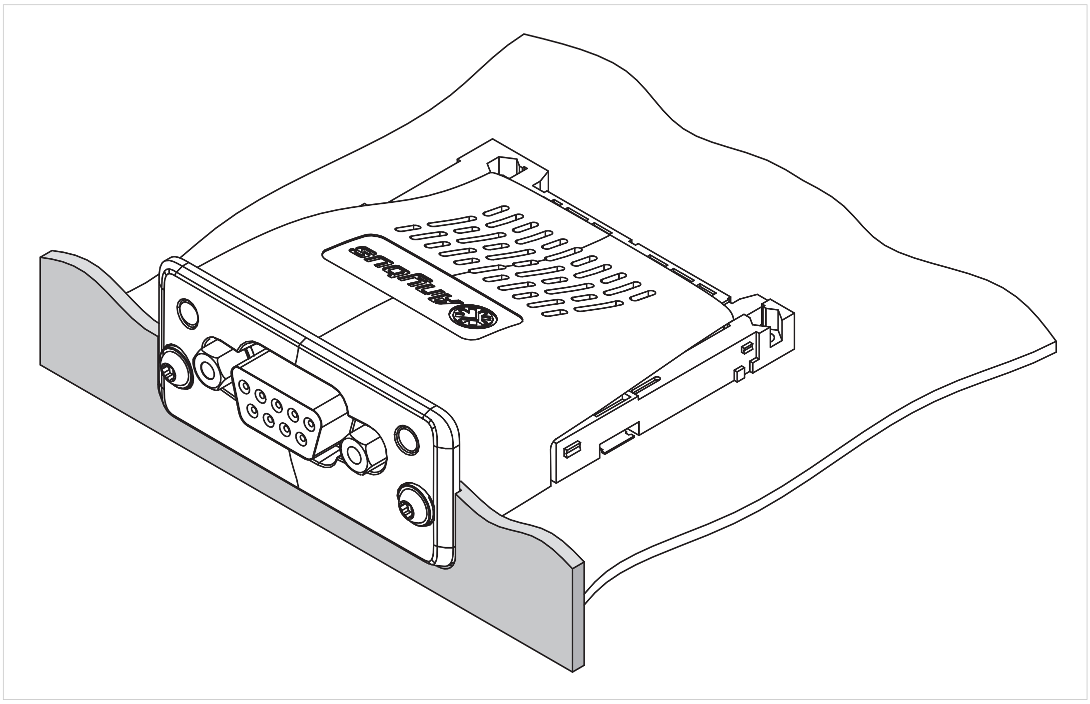


Figure D.5.

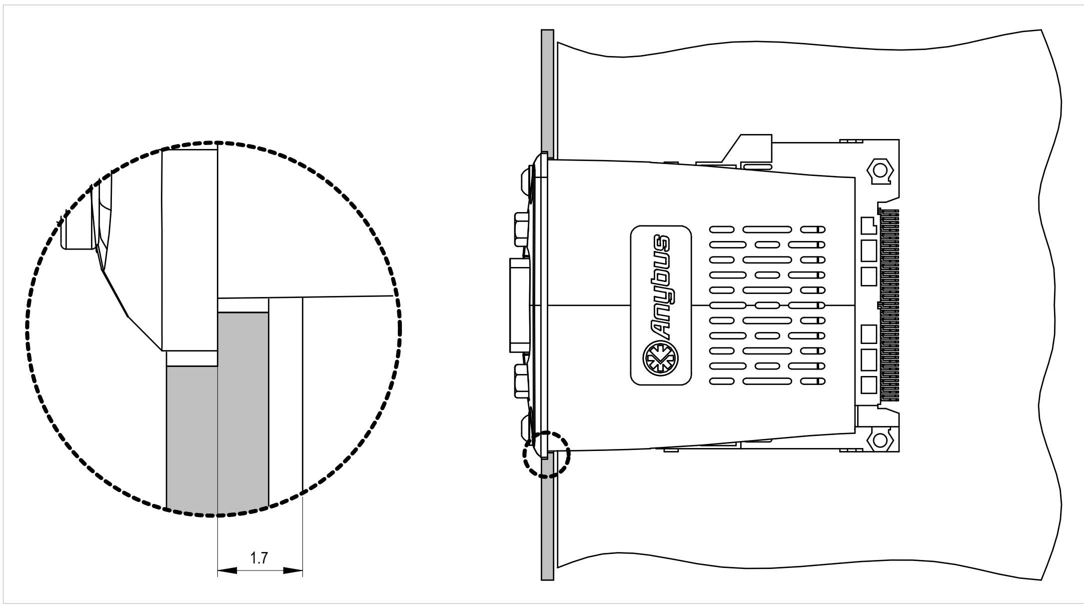


Figure D.6.

4.1. Front

NOTE
The dimensions below are given in millimeters and include a tolerance of ±0.10 mm.

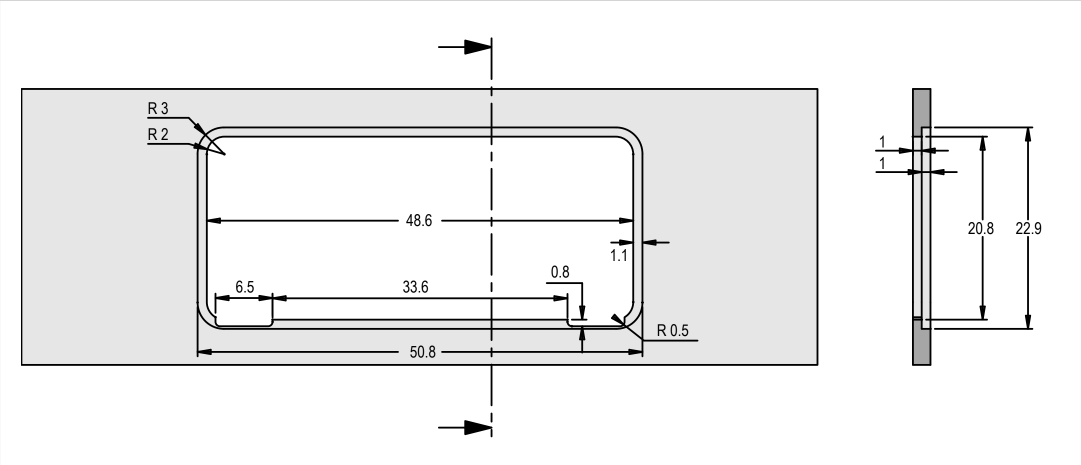


Figure D.7.

5. Slot Cover

HMS Industrial Networks can supply a “blind” slot-cover, which may be used to cover the Anybus CompactCom slot when not in use, allowing the Anybus CompactCom module to be supplied as an end-user option instead of being mounted during manufacturing.

NOTE
The dimensions below are given in millimeters and include a tolerance of ±0.10 mm.

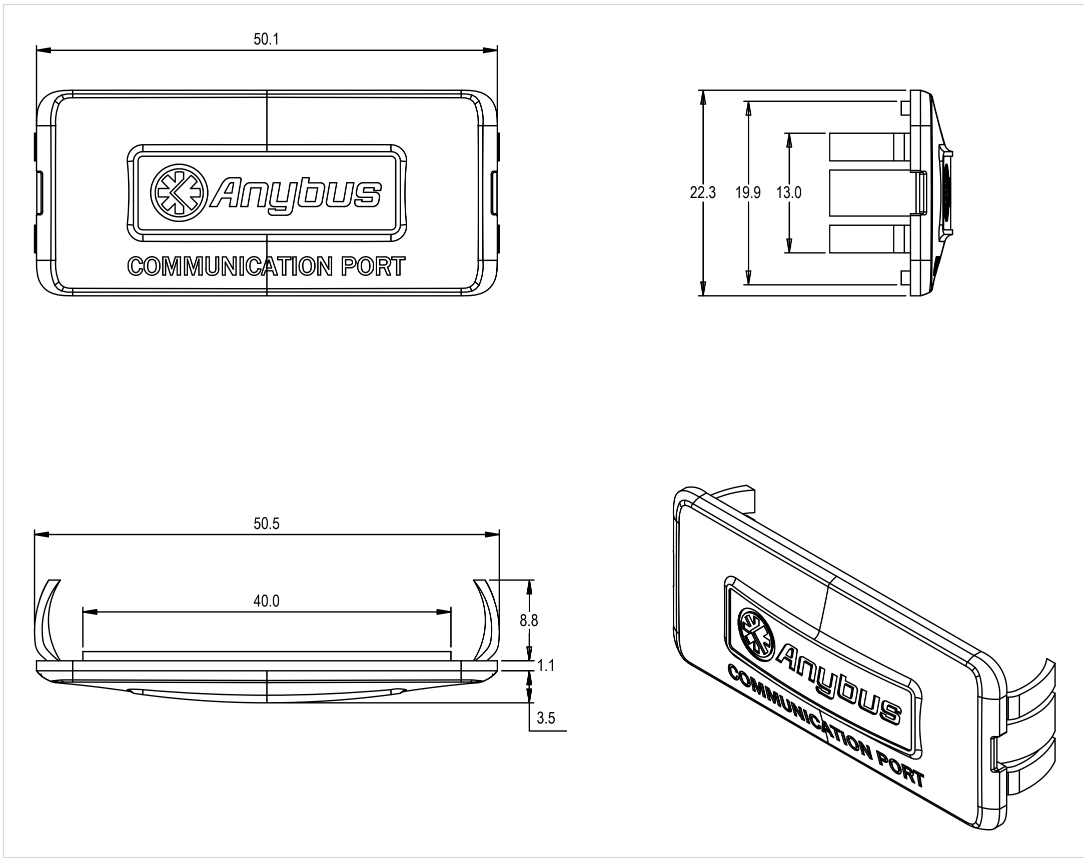


Figure D.8.

6. Anybus CompactCom Host Connector

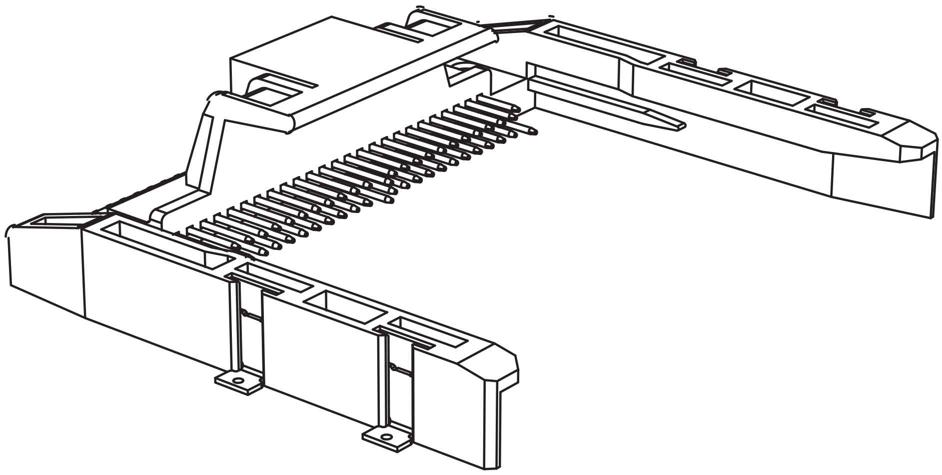


Figure D.9.

The Anybus CompactCom is designed to use a compact flash connector as application connector. HMS Industrial Networks offers a host connector, that is designed to simplify the mounting and to meet the demands for a secure and stable connection of the Anybus CompactCom modules. For the dimensions of the connector and the information needed for the PCB layout, please visit the support pages for Anybus CompactCom at www.anybus.com/support, where you will find the latest available information for the connector.

Please note that it is recommended to mill oval holes in the PCB, to enable usage of other connectors.

IMPORTANT
Always verify that the dimensions of another connector is compatible with this design.

Manufacturer	Part No.	Web
HMS Industrial Networks	SP1137	For more information visit the support pages for Anybus CompactCom at www.anybus.com/support

6.1. Host Connector Considerations

When using other connectors, the following needs to be considered:

To prevent incorrect insertion and to ensure that the grounding mechanics work as intended, use connectors with guiding rails of sufficient length (preferably longer than 19 mm), or provide an equivalent mechanical solution.

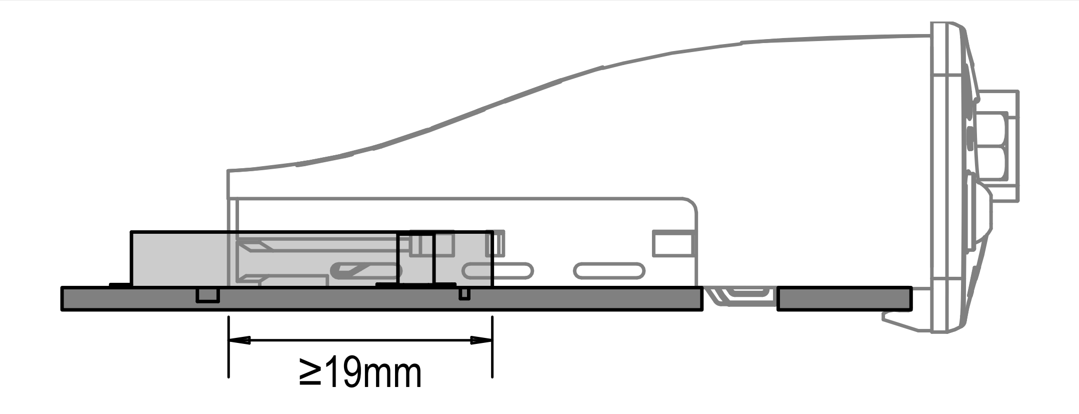


Figure D.10.

To ensure stable connection to GND, use a connector that fits the distances from the PCB to the pins of the host connector, that are recommended in the picture. Tolerance (+0.35 mm, -0.05 mm).

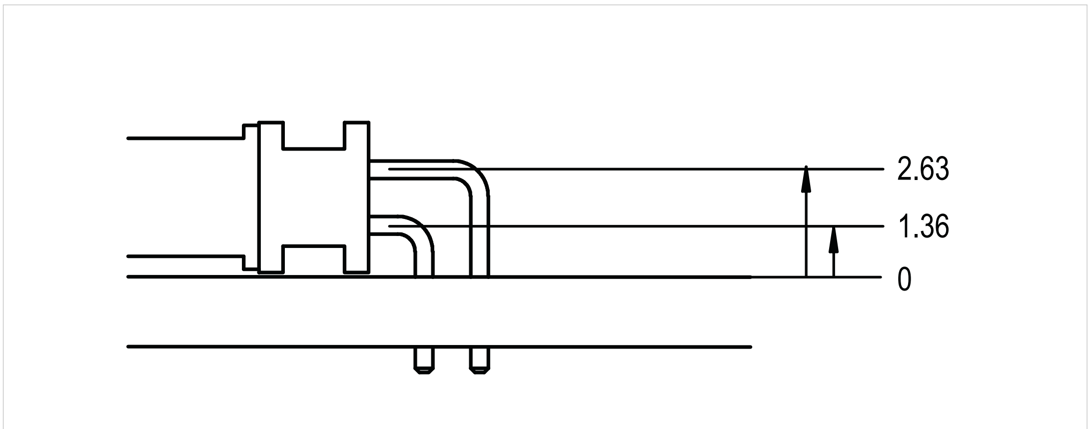


Figure D.11.

It is recommended to use connectors which can be screwed into the host application board, to minimize mechanical strain on solder joints, etc.

The following connectors have been verified for use with the Anybus CompactCom:

Manufacturer	Part No.	Web
Tyco	1734451-1	www.tycoelectronics.com
AllConnectors	101D-TAAB-R	www.allconnectors.de
Suyin	127531MB050XX04NA	www.suyin.com, www.suyin-europe.com, www.suyinusa.com
Harwin	M504-8815042 (obsolete) M504-8825042	www.harwin.com ***Note****: The dimensions of the holes for the fixing pins of this connector are 1.8 mm, i.e. slightly larger than the dimensions given in the figure above.*

6.2. Host Connector Pin Numbering

The surface mounted pins of the HMS compact flash connector are numbered from left to right (see figure below), corresponding to pin numbers 1, 26, 2, 27...... 25, 50 of the host interface connector.

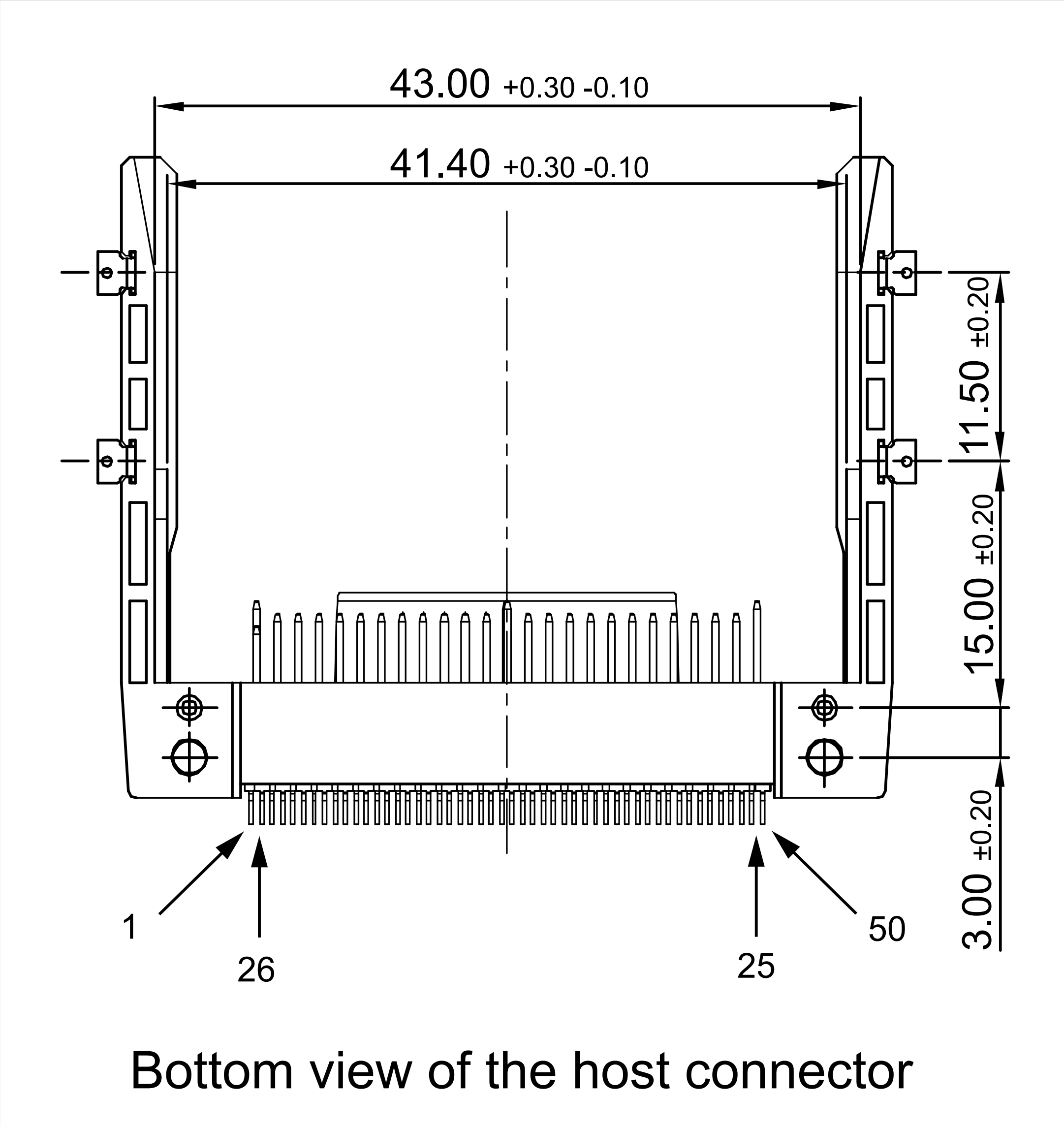


Figure D.12.

7. Fastening Mechanics

NOTE
To support the fastening mechanism, the host application PCB thickness must be 1.60 (±10%) mm.

Recommended screw tightening torque is 0.25 Nm.

IMPORTANT
When fastening the module into the end product, make sure that the Anybus module is properly aligned into the CompactFlash socket prior to applying any force. Rough handling and/or excessive force in combination with misalignment may cause mechanical damage to the Anybus CompactCom module and/or the end product.

7.1. Fastening

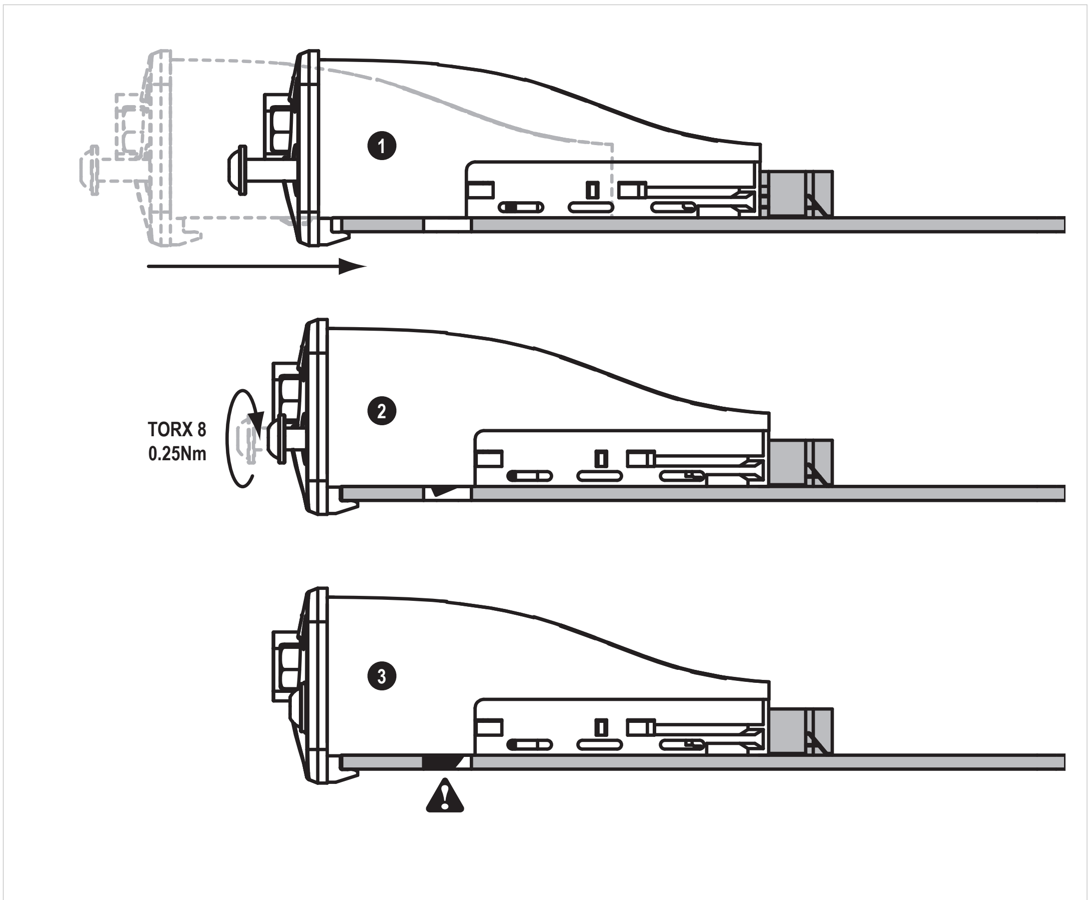


Figure D.13.

7.2. Removal

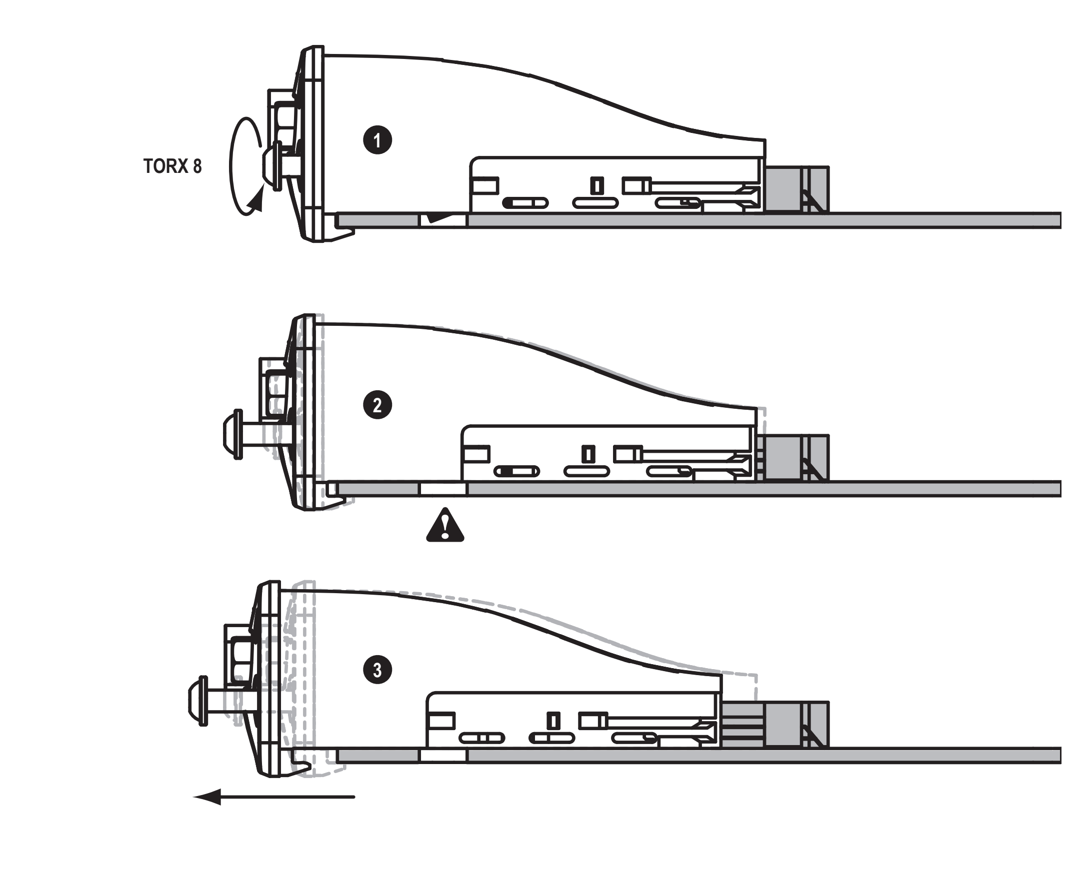


Figure D.14.

Appendix E. Anybus CompactCom 40 without Housing

IMPORTANT
This a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

This product contains ESD (Electrostatic Discharge) sensitive parts that may be damaged if ESD control procedures are not followed. Static control precautions are required when handling the product. Failure to observe this may cause damage to the product.

1. General Information

In some applications the standard Anybus CompactCom plug-in housing concept cannot be used. Instead an Anybus CompactCom 40 module without housing is mounted on the PCB, using a specially designed Anybus CompactCom Mounting Kit. This enables full Anybus CompactCom functionality for all applications without loss of network compatibility or environmental characteristics.

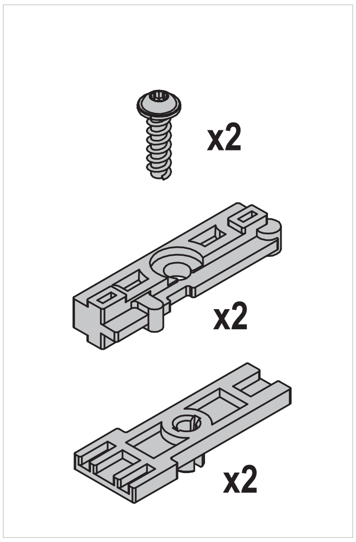


Figure E.1.

The kit is easy to assemble, and is based on a few plastic parts which when assembled secures the Anybus module firmly onto the host application.

To support this concept in the host application, the PCB must be designed according to the footprint specification in this document.

To guarantee proper EMC behavior, it is also important that the application supports the FE (functional earth) and grounding mechanisms found on all Anybus CompactCom modules.

Anybus CompactCom modules without housing exist in three different versions:

- with the usual fieldbus or industrial network connector
- with M12 connectors
- as brick, with a pin connector directly to the carrier board instead of a fieldbus or network connector mounted on the Anybus CompactCom, for more information see the Anybus CompactCom B40 Design Guide

If the module is equipped with M12 connectors, and front plate and housing are correctly designed, the resulting product can be rated up to class IP67.

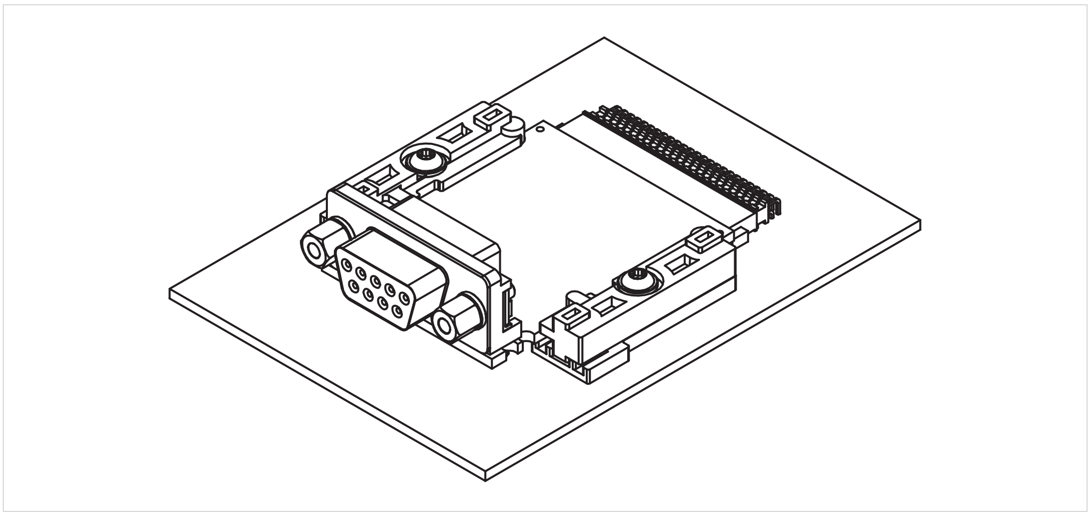


Figure E.2.

2. Ordering Information

Part No.	Name	Contents
019180	CompactCom Mounting Kit	100 x Bottom Part 100 x Top Part 100 x Screw

3. Footprint

3.1. Without Housing

Footprint for modules without housing.

NOTE
The dimensions below are given in millimeters and include a tolerance of ±0.10 mm.

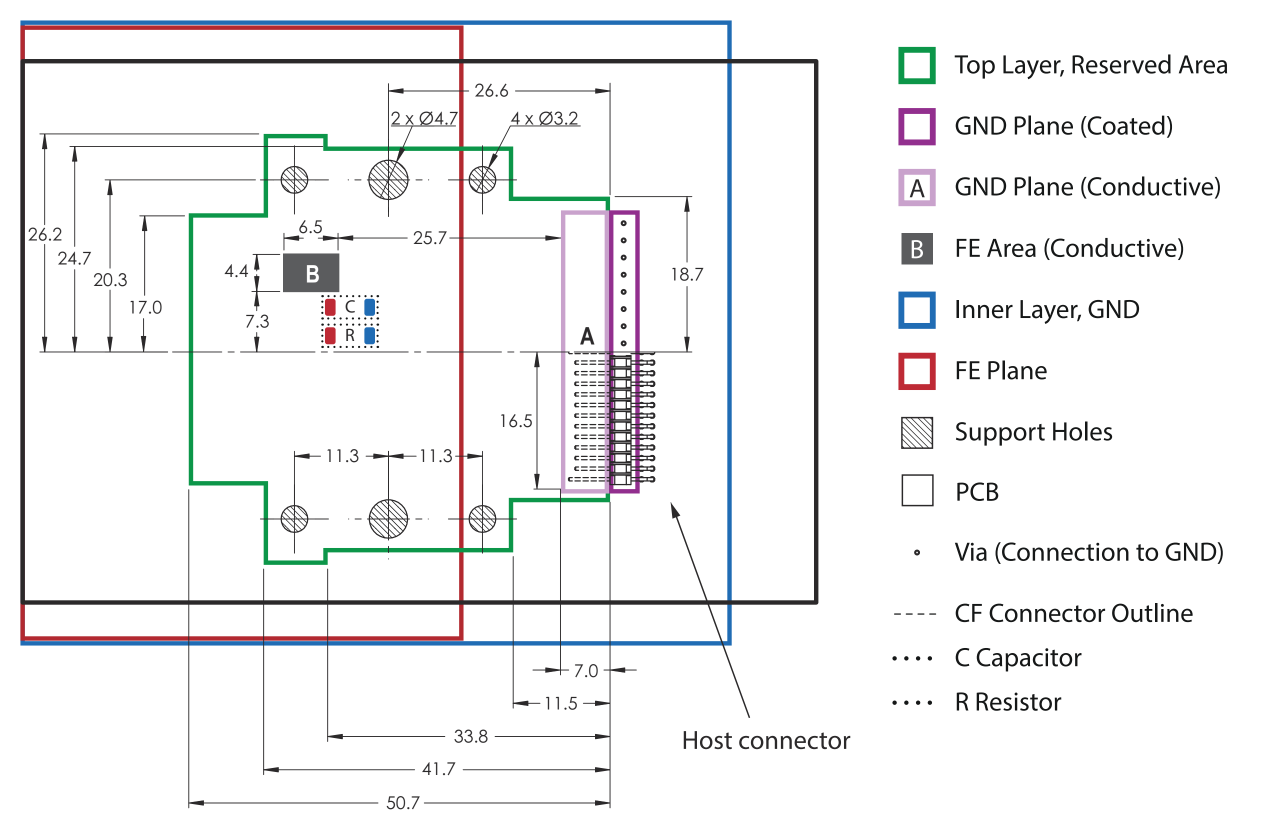


Figure E.3.

Area	Description
Top Layer, Reserved Area	To ensure isolation and mechanical compatibility, it is strongly advised that this area is kept completely free from components and signal lines. Under no circumstances may components, vias, or signal lines, be placed on the PCB-layer facing the Anybus CompactCom module. Failure to comply with this requirement may induce EMC/EMI problems, mechanical compatibility issues, or even short circuit.
FE Area (Conductive)	To achieve proper EMC behavior and to provide support for different cable shielding standards, this area must be tin plated (preferably using Hot Air Levelling technology) and have a stable, low impedance connection to functional earth.
GND Plane (Coated) GND Plane (Conductive)	The exact shape of this area depends on the properties of the CompactFlash connector. It is however important to follow these basic design rules: • The plane must be continuous and have a stable, low impedance connection to GND (preferably through at least 16 vias as illustrated in the figure) • The connection to GND should be placed beneath the CompactFlash connector as illustrated above (see figure) • The plane must follow the signal path through the connector • The conductive part must be tin plated, preferably using Hot Air Levelling technology
Inner Layer, GND FE Plane	FE and GND planes should ideally be regularly shaped and as large as possible. As a rule of thumb, the length/width relationship of the planes should not exceed 5/2.
Support Holes	These holes are used by the mounting kit mechanics to secure the module onto the host application.
PCB	The host application PCB should be 1.6 mm thick to be able to support the fastening mechanics.
Capacitor	The purpose of the capacitor between FE and GND is to keep the high-frequency voltage drop across the Ethernet transformers as low as possible while being exposed to, for example, ESD. The reason for overlapping the planes is to minimize inductance and reduce current density in such events. The value of the capacitor must be chosen in relation to the DCMR[1] and CMR[2] values of the transformer, this is especially important for immunity testing, such as ESD. In most cases 1nF is a reasonable starting point.
Resistor	A bleeding resistor of 1 M ohm should be installed parallel to the capacitor.

[1]DCMR is defined as the rejection ratio between the common-mode and the differential-mode voltage.

[2]Common mode rejection ratio.

4. Host Connectors

The following connectors have been found to be compatible with the mounting kit.

Manufacturer	Part No.	Comment	Web
Samtec	HPT-125-01-L-D-RA (recommended)	Through hole mounted	www.samtec.com
3M	N7E50-D516PG-30	Surface mounted	www.3m.com

5. Height Restrictions

NOTE
The dimensions below are given in millimeters and include a tolerance of ±0.20 mm.

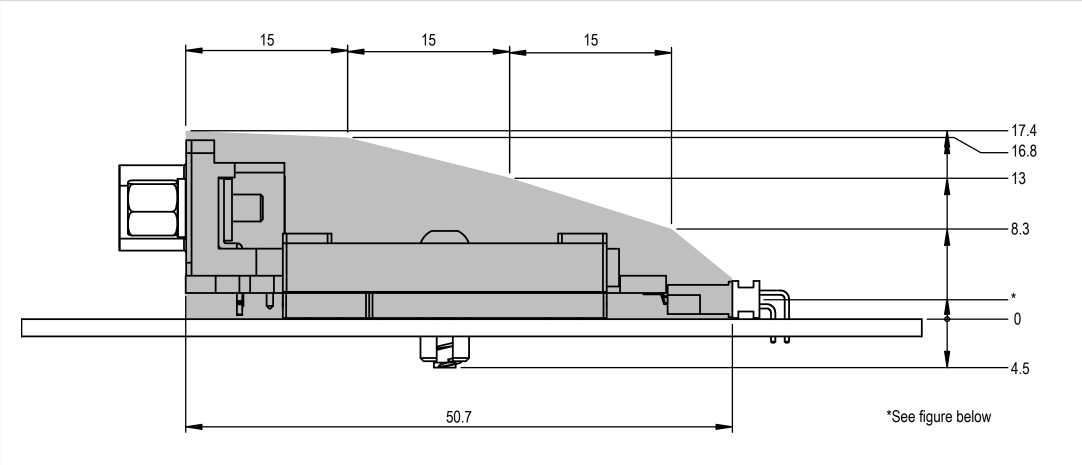


Figure E.4.

The gray area in the figure above specifies the maximum height occupied by onboard components of the Anybus module. To ensure an adequate distance, it is recommended to add an additional 2.5 mm on top of these dimensions.

To ensure stable connection to GND, use a connector that fits the distances from the PCB to the pins of the host connector, that are recommended in the picture. Tolerance (+0.35 mm, -0.05 mm).

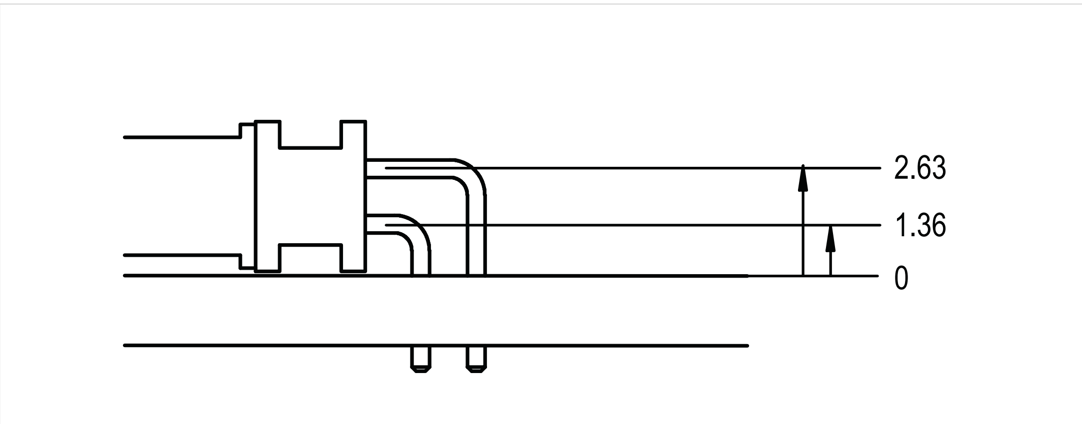


Figure E.5.

6. Assembly

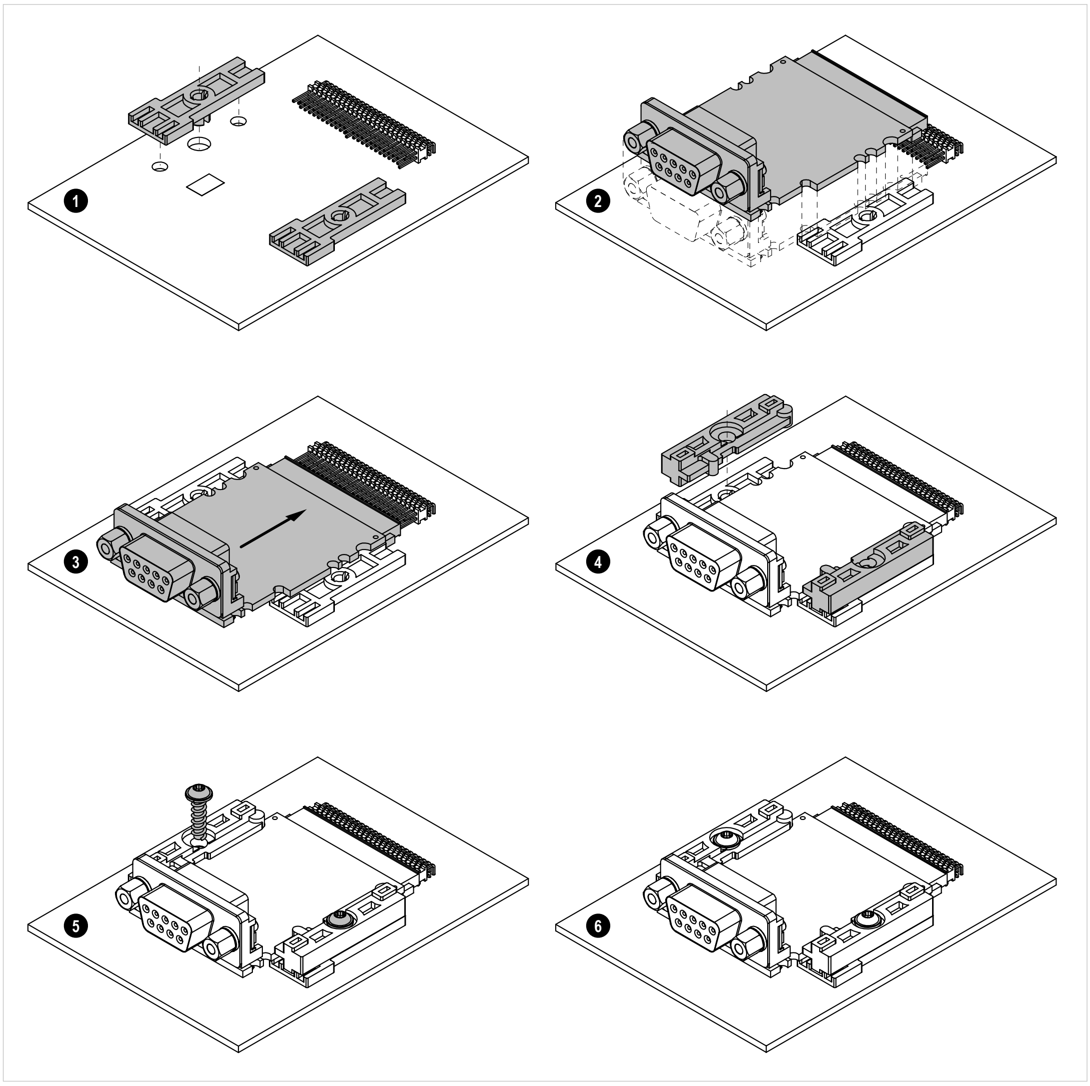


Figure E.6.

7. Dimensions

> **NOTE**
> The dimensions below are given in millimeters and include a tolerance of ±0.20 mm unless otherwise stated.

7.1. General

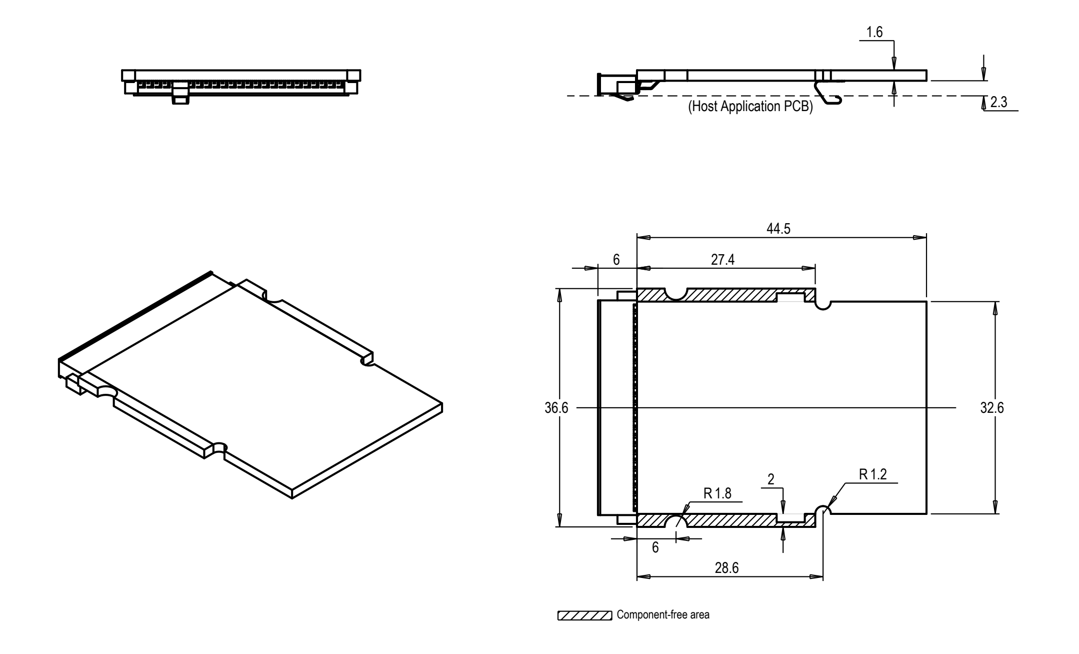


Figure E.7.

7.2. Standard LED Positions

Standard Anybus CompactCom:

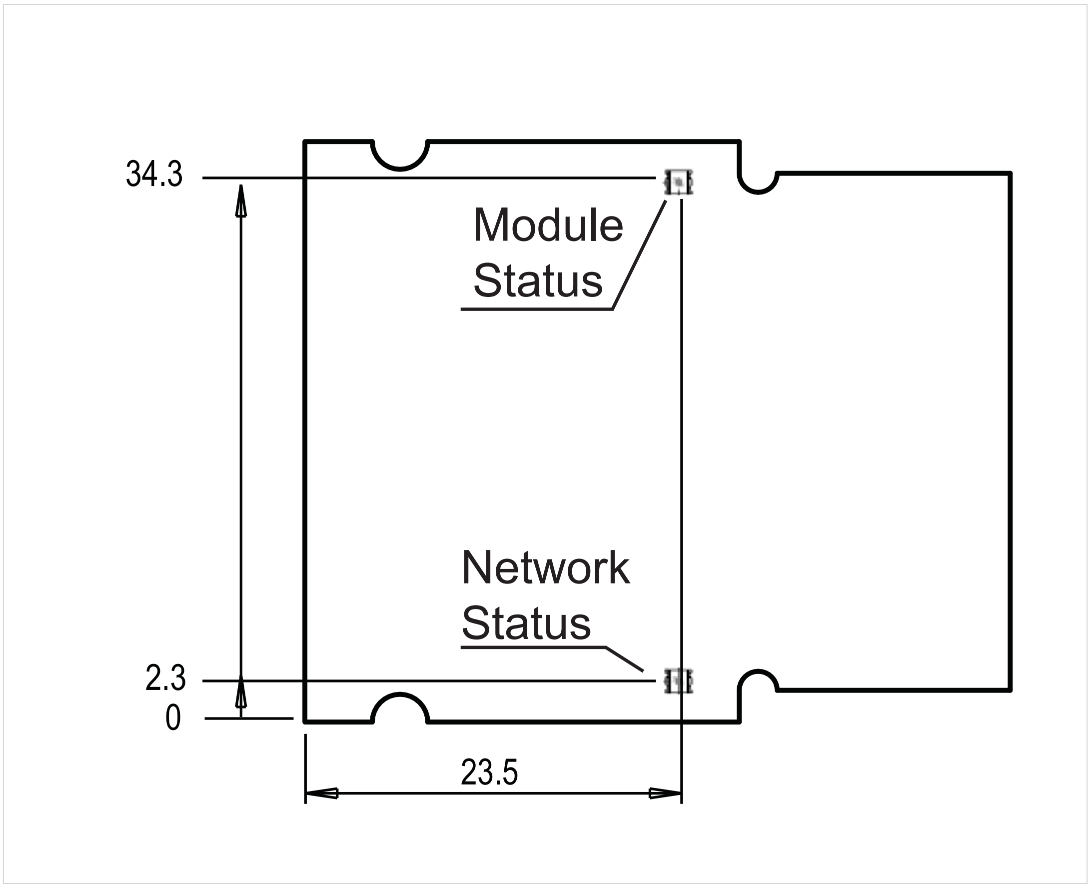


Figure E.8.

Standard Anybus CompactCom, Ethernet versions:

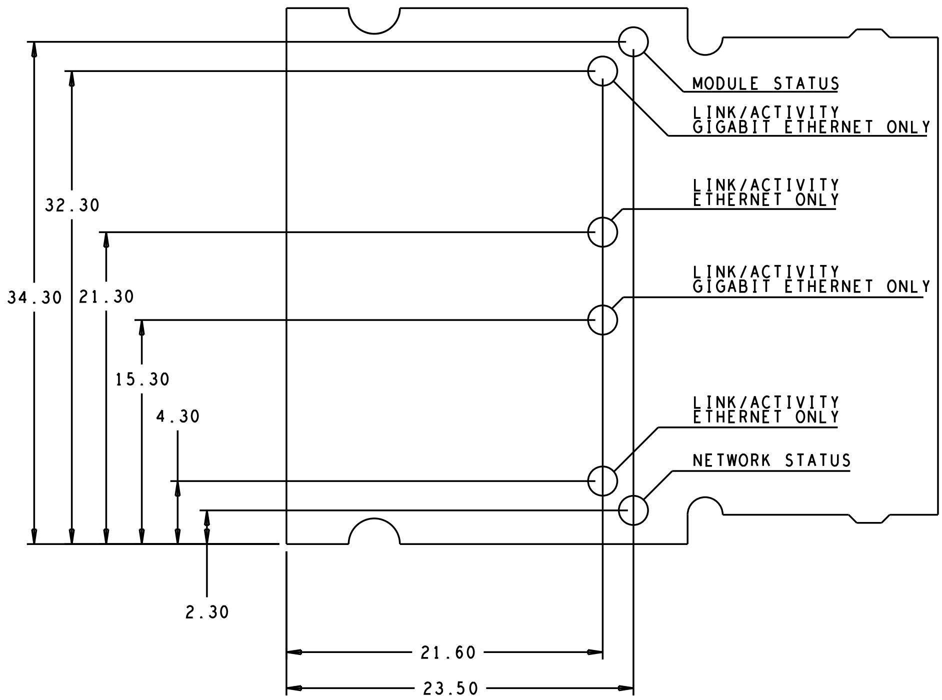


Figure E.9.

Anybus CompactCom for M12 connectors:

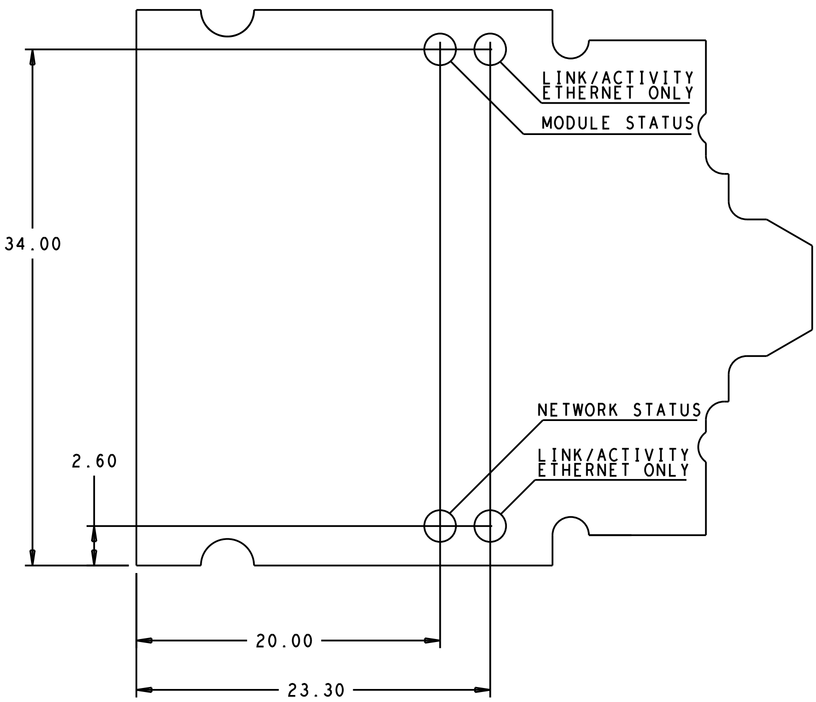


Figure E.10.

7.3. Mounting Kit Parts

Bottom Part

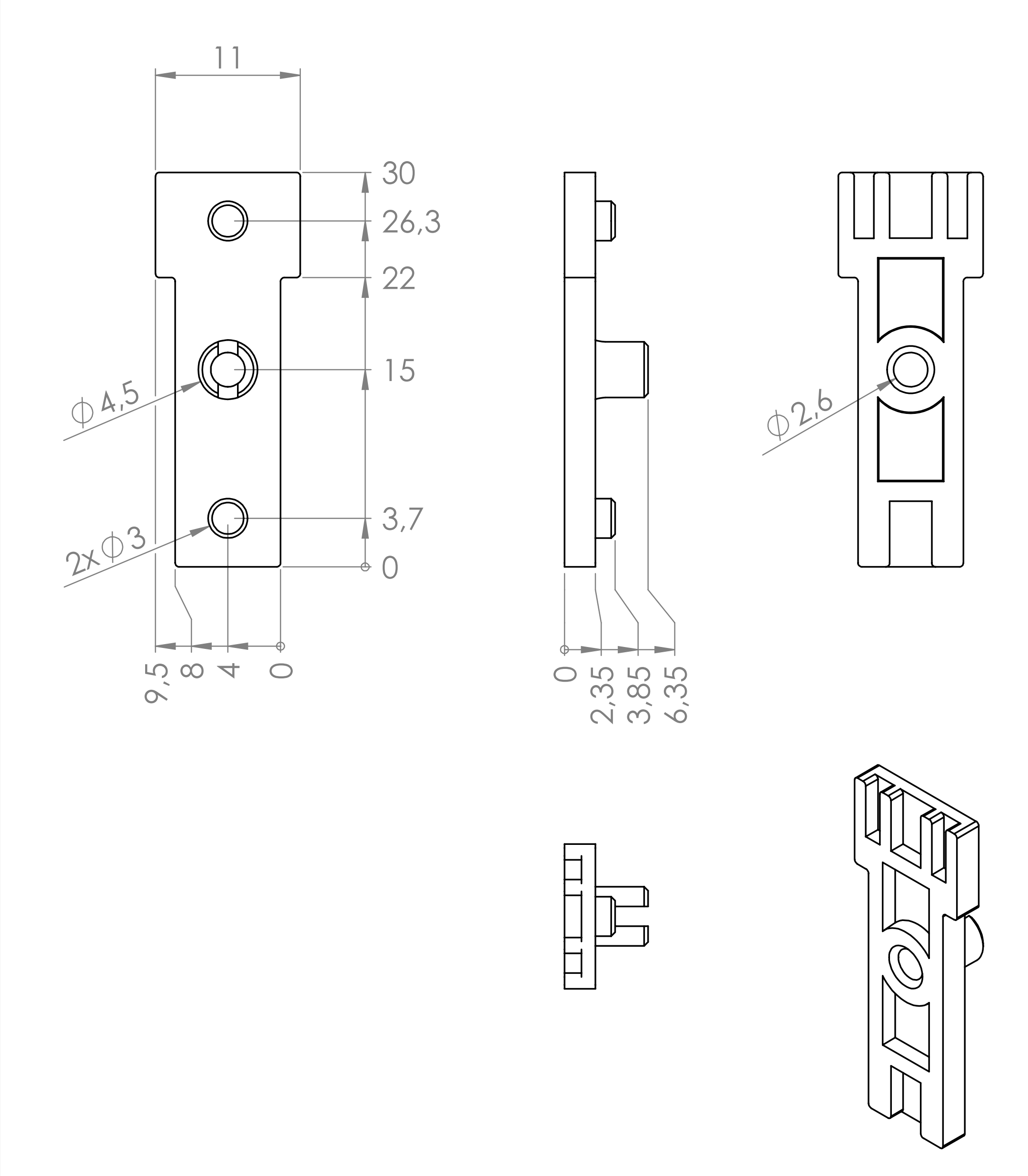


Figure E.11.

Top Part

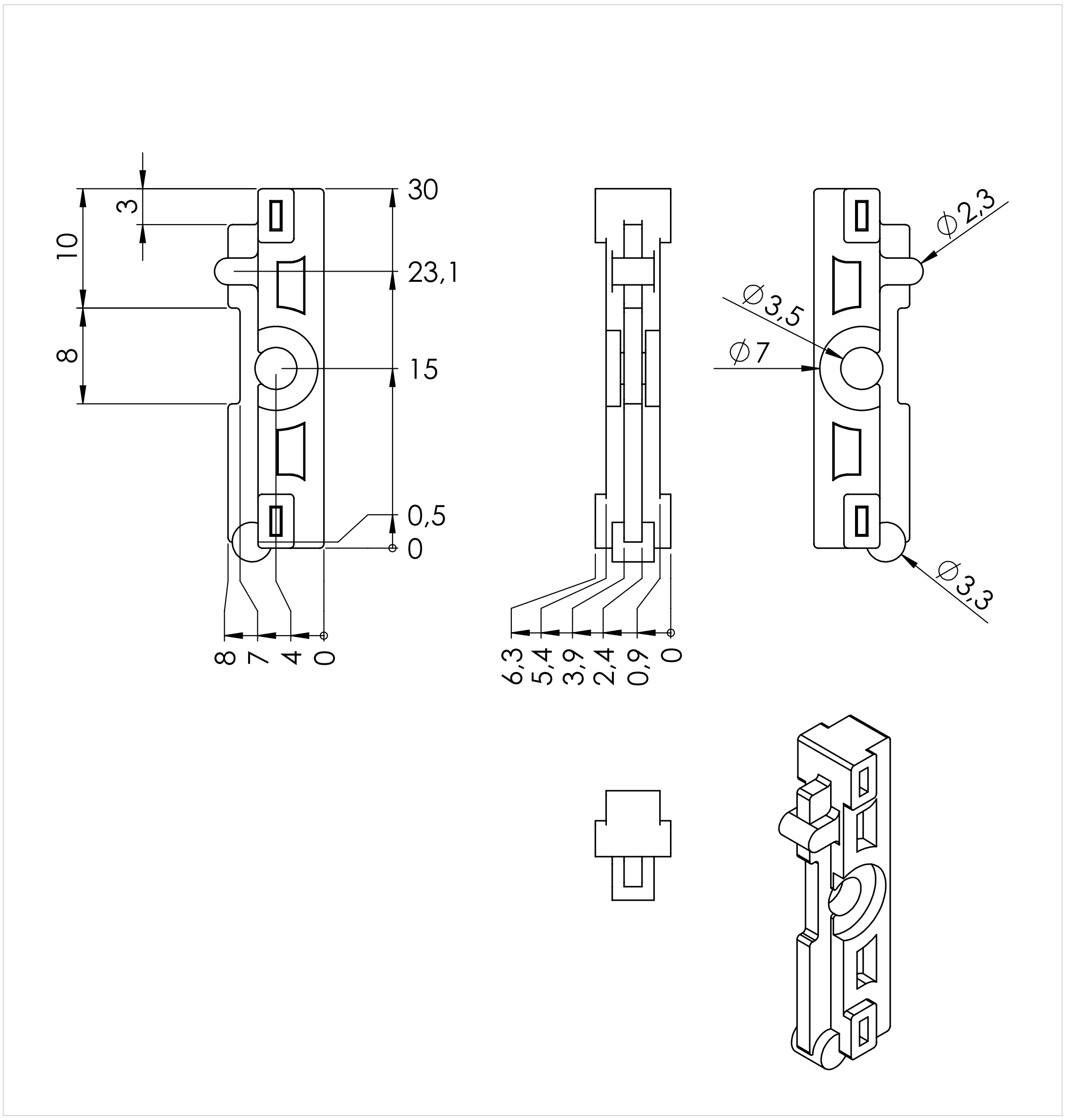


Figure E.12.

Fastening Screw

Recommended screw tightening torque is 0.3 Nm (tolerance ±10 %).

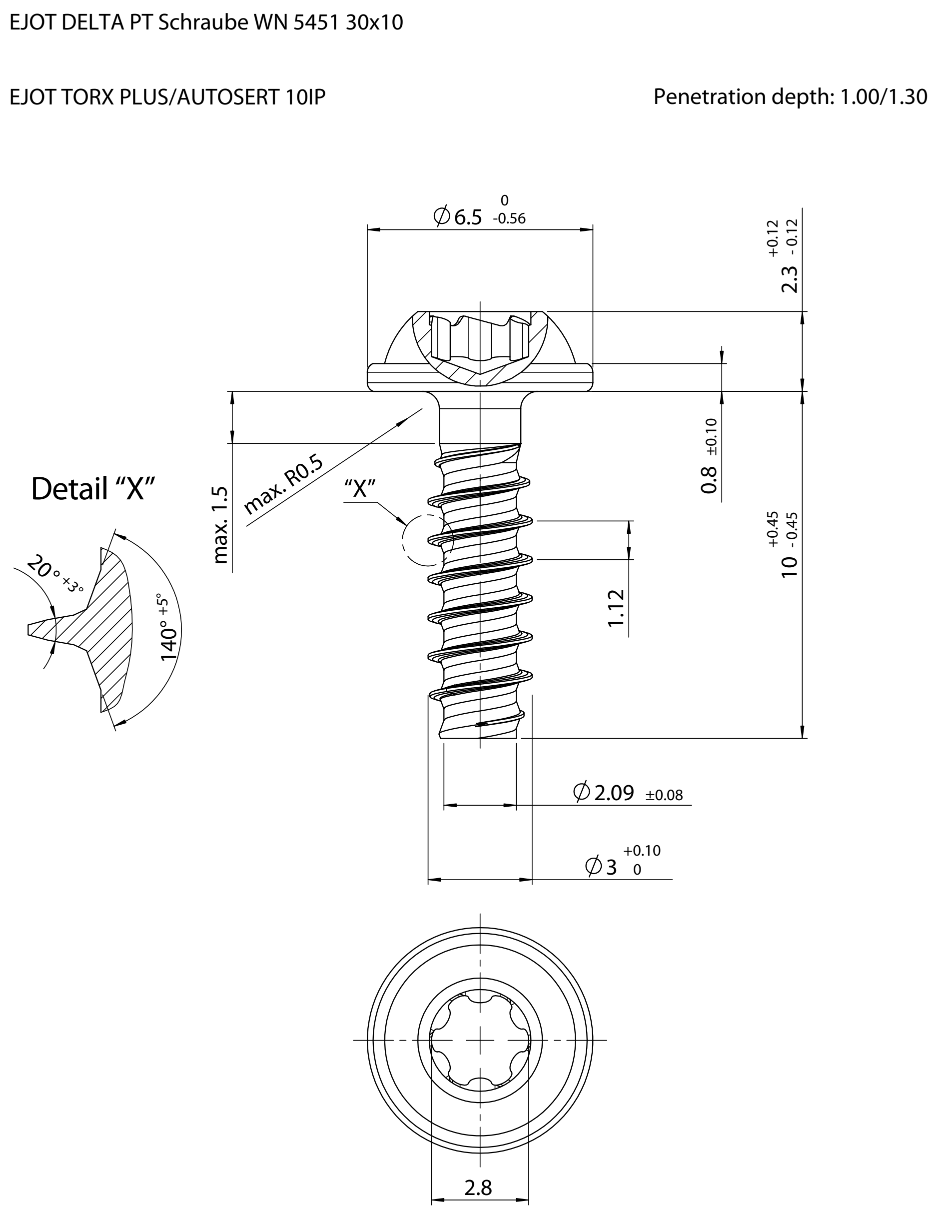


Figure E.13.

D-sub

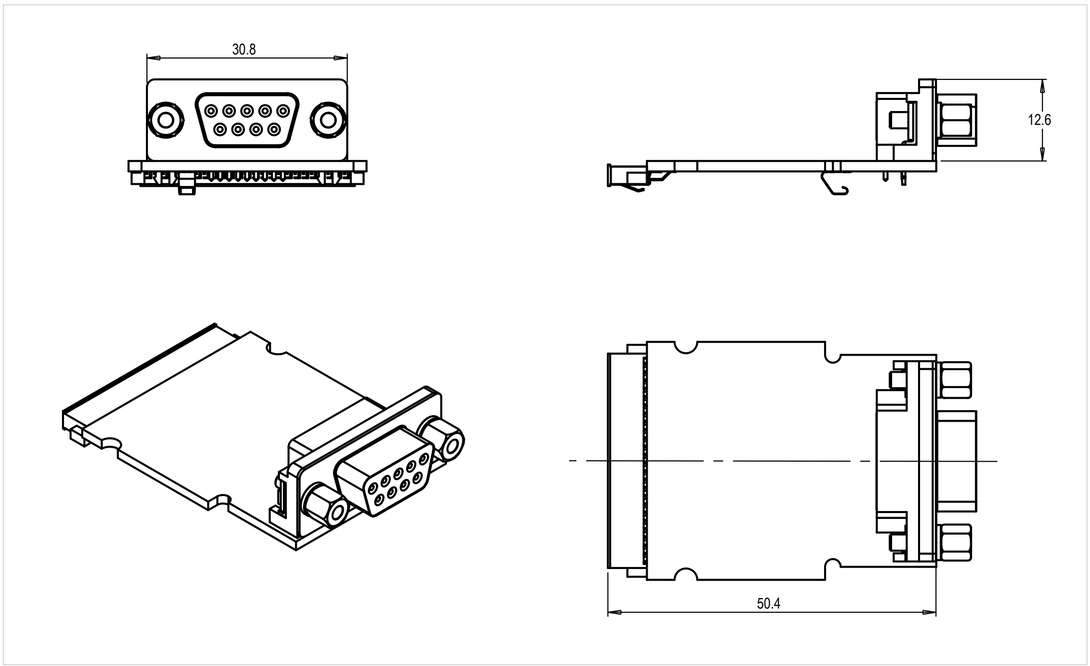


Figure E.14.

RJ45, 2–port

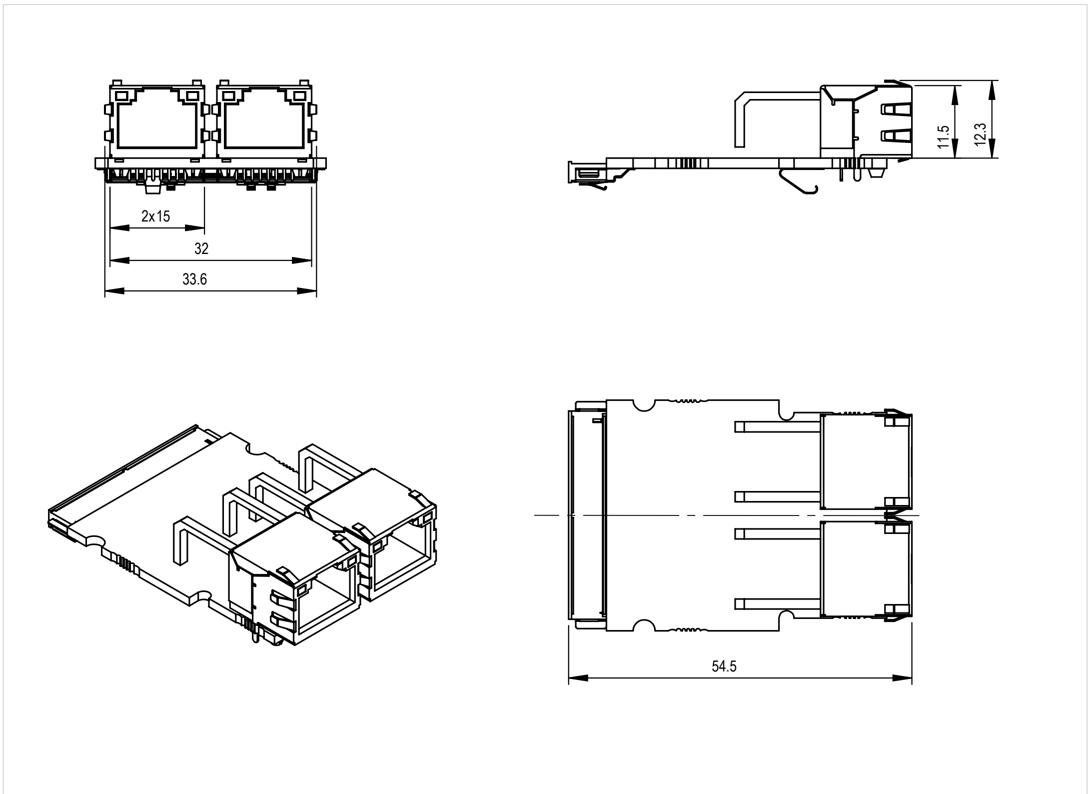


Figure E.15.

Fiber Optics, 2–port

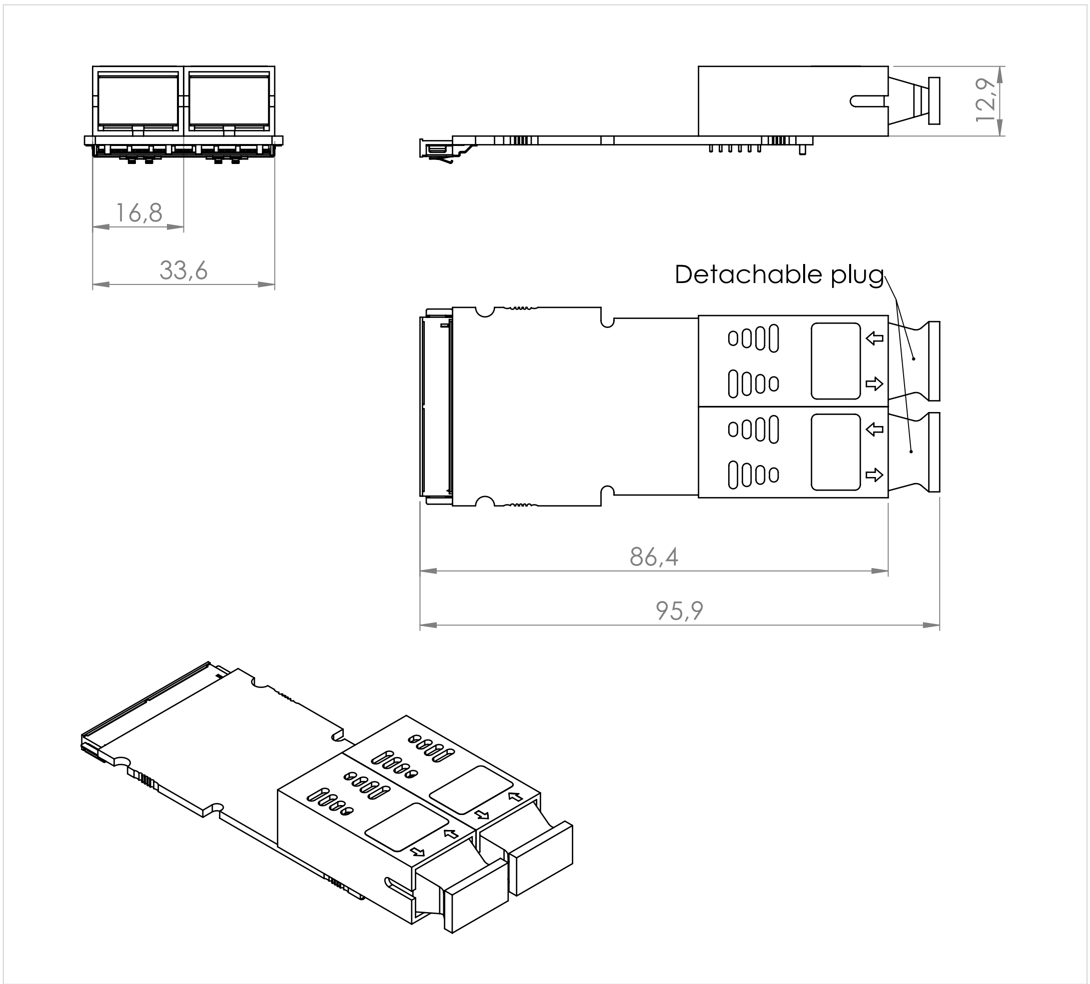


Figure E.16.

Pluggable Screw Terminal (5.08 mm)

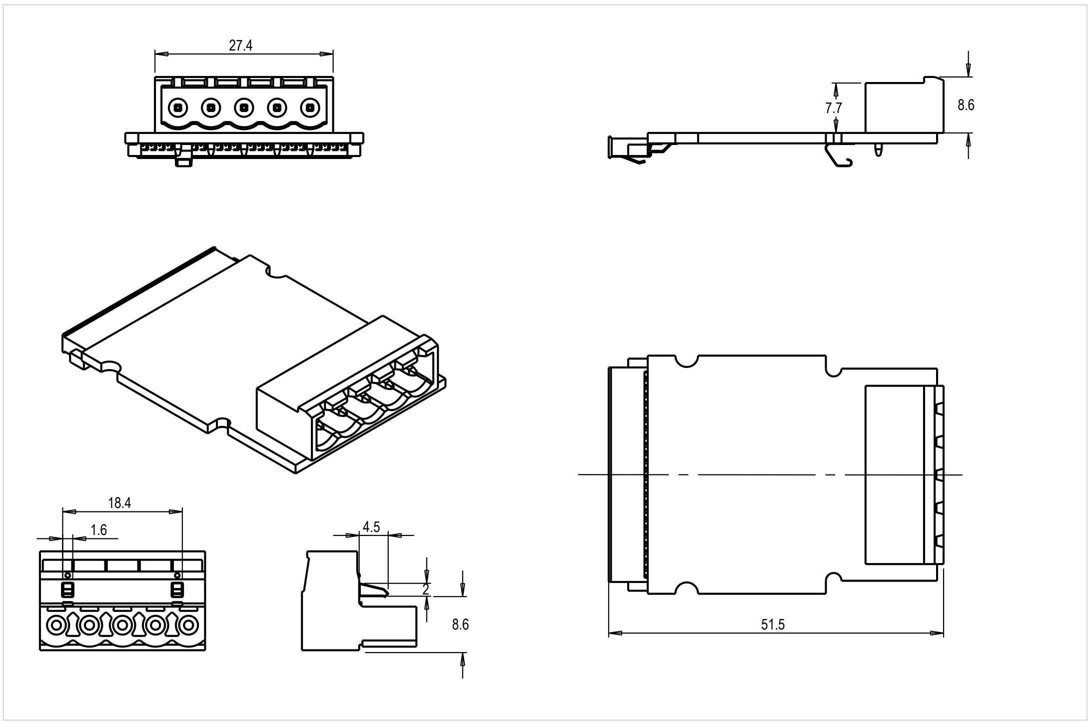


Figure E.17.

8. M12 Connectors

NOTE
The dimensions below are given in millimeters and include a tolerance of ±0.20 mm unless otherwise stated.

8.1. Dimensions

Female - Female

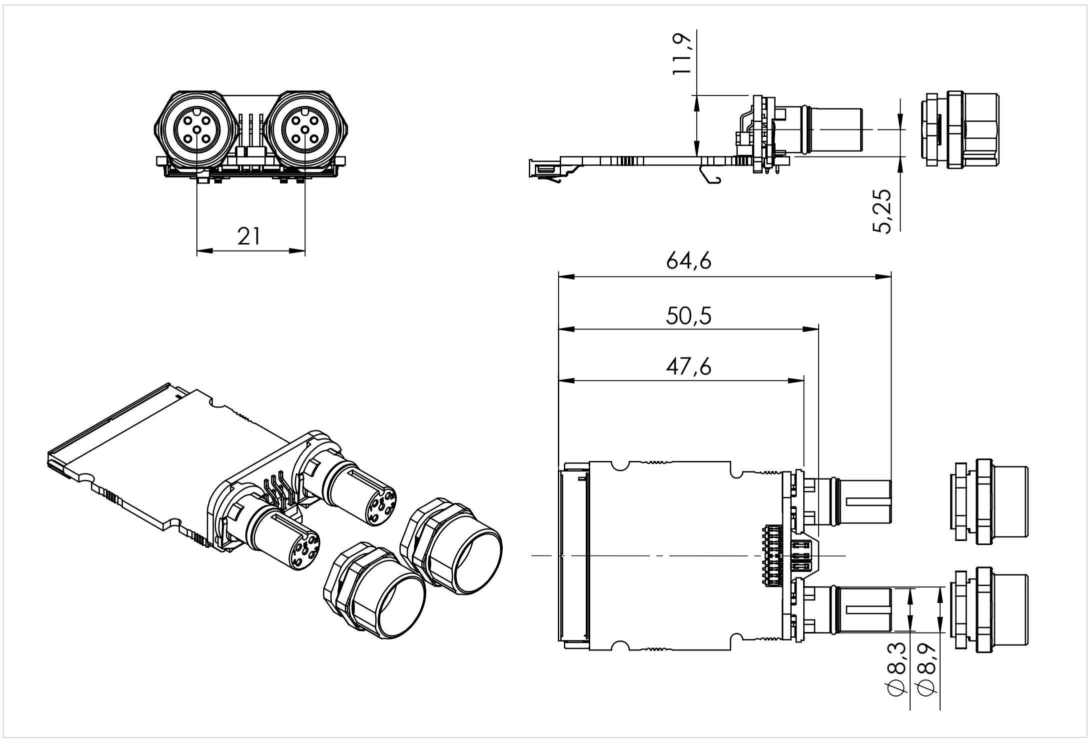


Figure E.18.

Female - Male

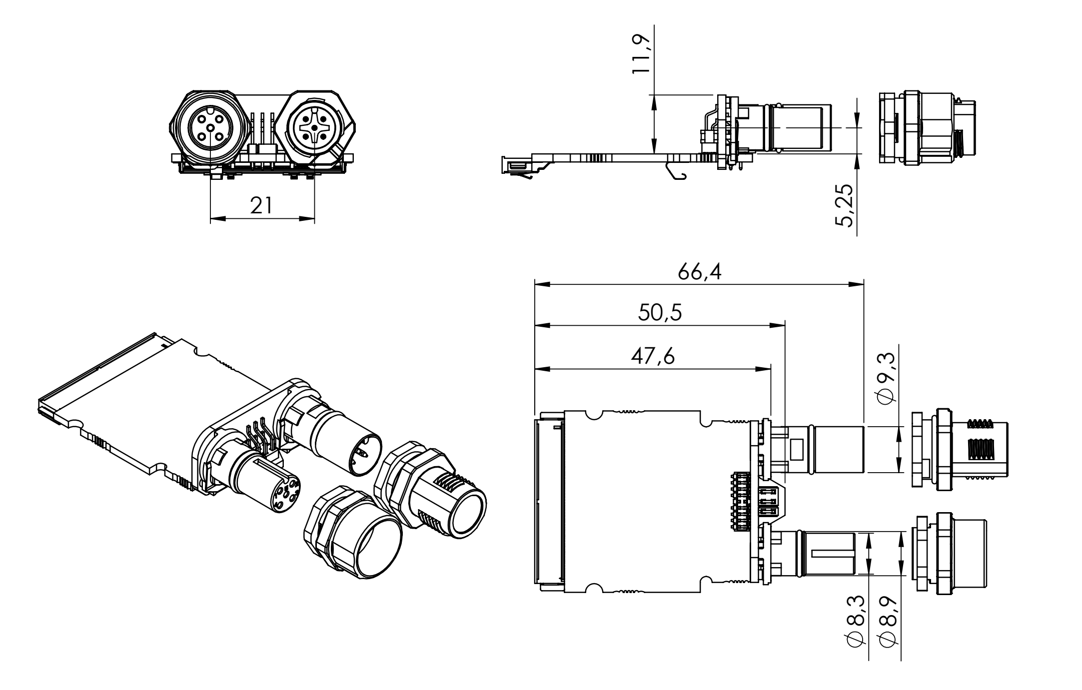


Figure E.19.

8.2. IP Rating

To ensure that the final design will fulfill the requirements for IP67 rating, the M12 connectors have to be firmly and tightly attached on both sides of the front plate. The dimensions for the front plate are given in millimeters below.

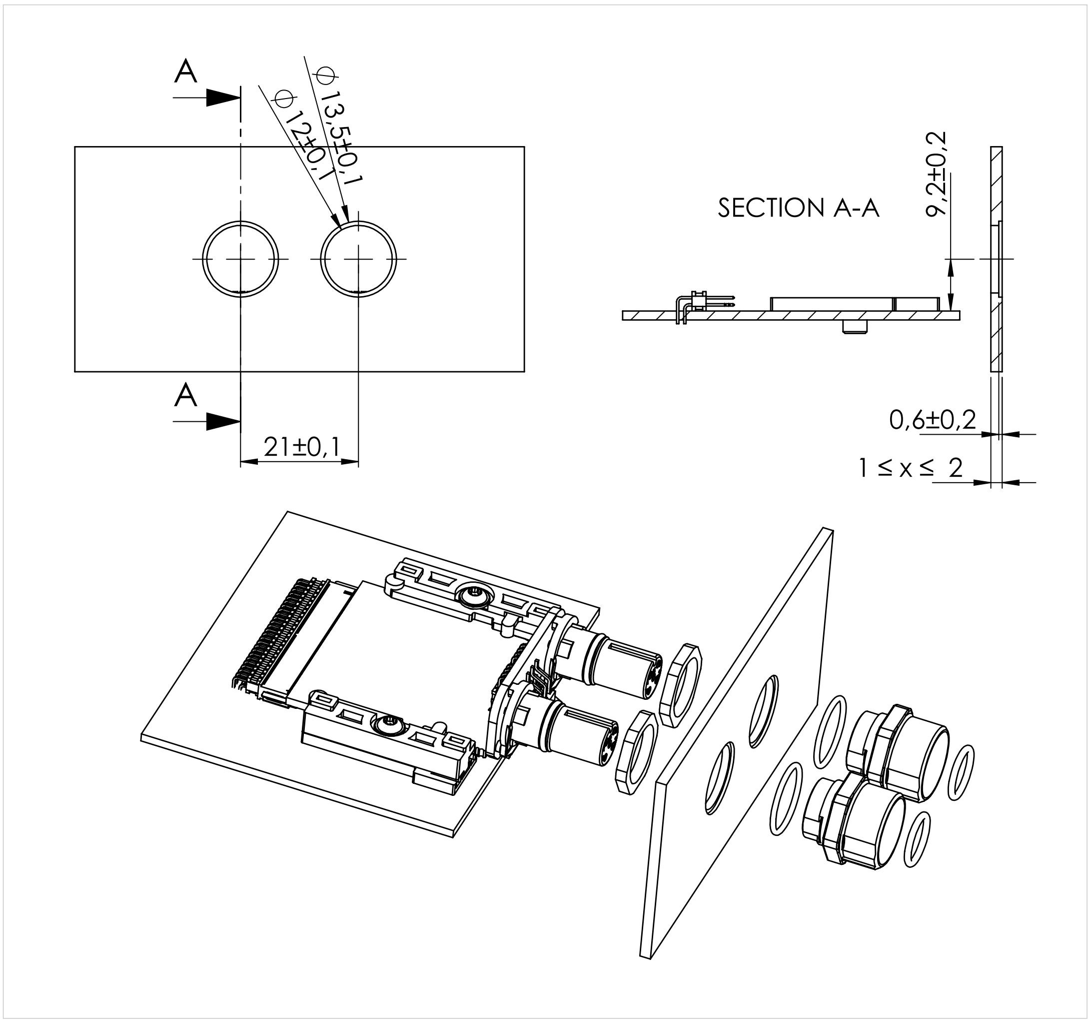


Figure E.20.

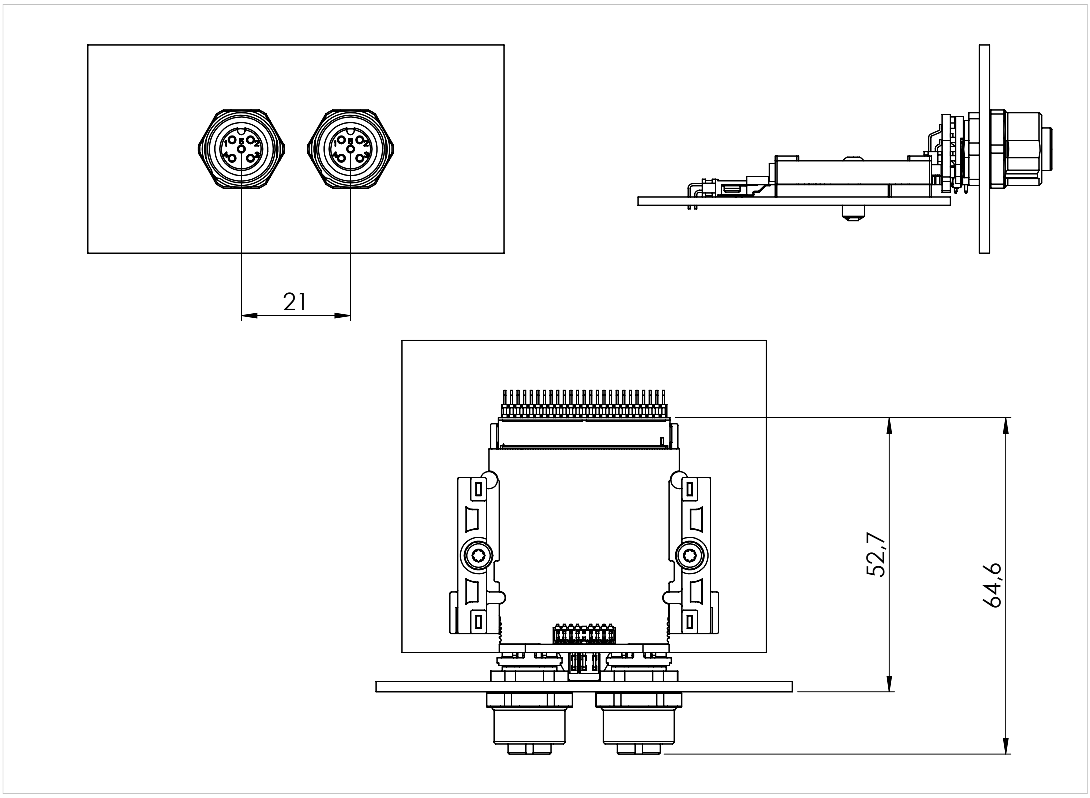


Figure E.21.

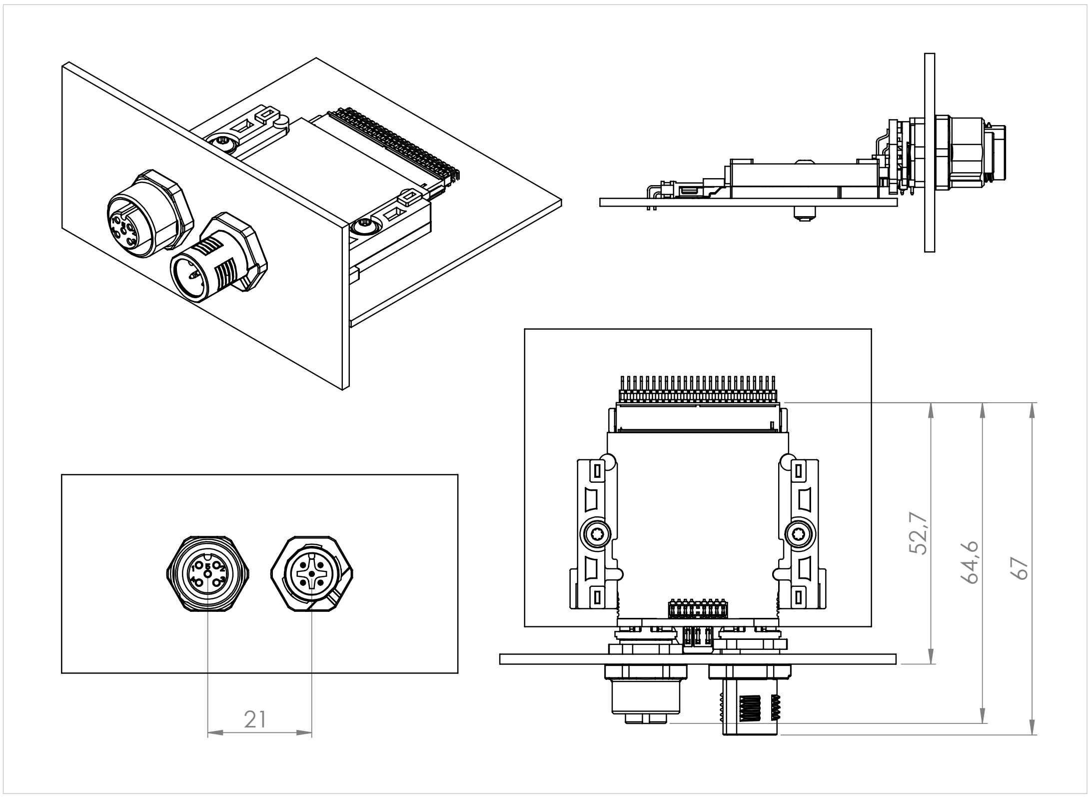
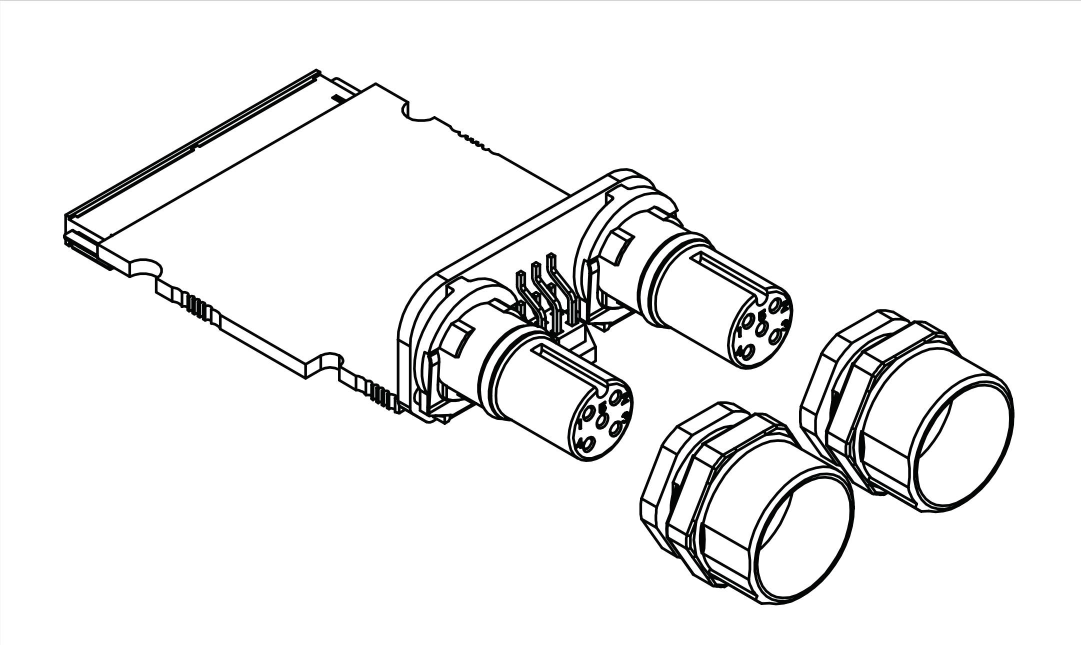


Figure E.22.

8.3. M12 Connector Assembly

The M12 connector parts are not joined on the Anybus CompactCom module at delivery. The connector has to be tightly mounted on both sides of the front plate if the design is to be rated at class IP67. The design, preparation and manufacturing of the front plate is not offered by HMS Industrial Networks, but has to be performed by the customer. For dimensions see M12 Connectors (page 114).



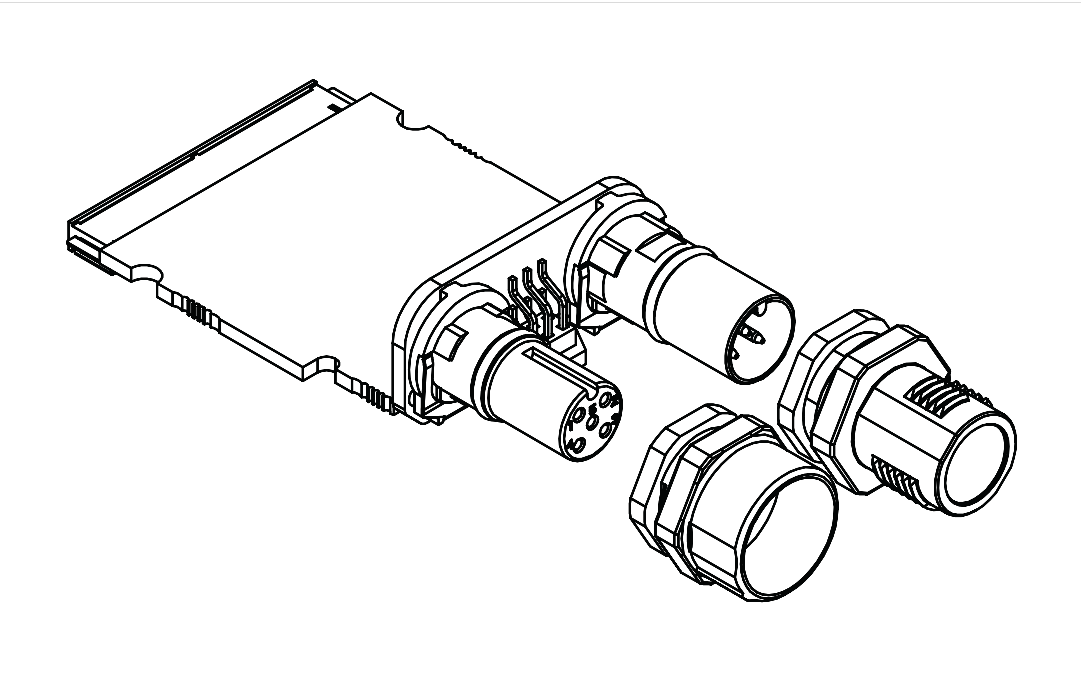


Figure E.23.

There are three guides on both the inner and outer parts of the connectors for mechanical keying, ensuring correct rotation of the outer parts.

NOTE
Please make sure that the connectors are pushed all the way into these guides at assembly.

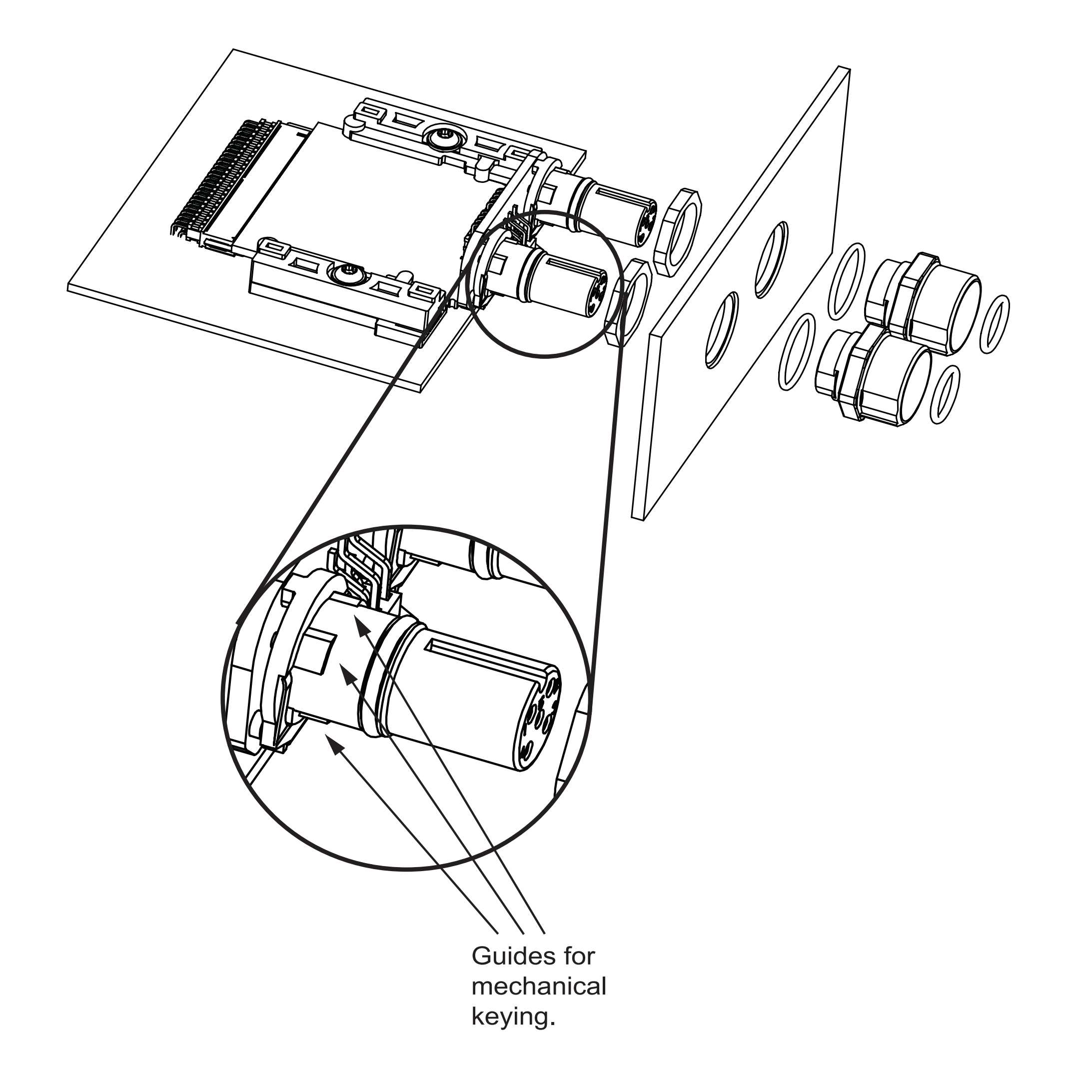


Figure E.24.

There are also markings on the casings of the connectors to make it easier to mount the connectors at the correct mounting angle.

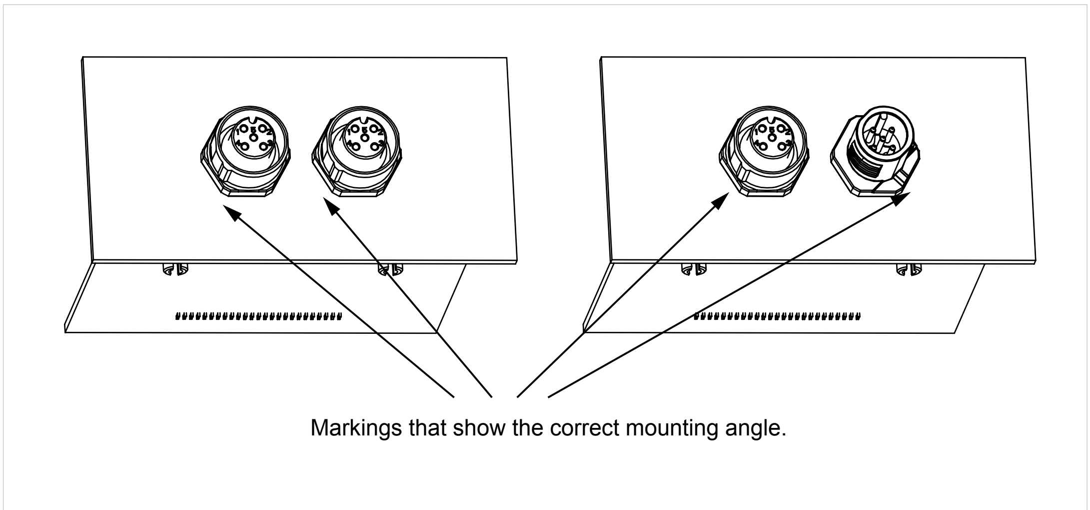


Figure E.25.