Design Guide

COM-C

Communication Module

Hilscher Gesellschaft für Systemautomation mbH

www.hilscher.com

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1 Introduction

1.1 About this Document

All OEM piggyback Modules of Hilscher GmbH are called COM (**Co**mmunication **M**odules). These Modules provide a universal and easy to use fieldbus interface for integration on various host systems. Through the set of standard application interfaces and the same board dimensions in each COM family it is easy to switch between the different fieldbus systems, e.g. PROFIBUS DP, InterBus, CANopen, DeviceNet or Ethernet by changing the Module.

This manual describes only the hardware part of the Modules. The general application interface is common to all our COM Modules and CIF PC cards described in our Toolkit-Manual and the fieldbus related details are defined in our Protocol Interface Manuals.

A new generation of communication Modules exists named COMX Modules and offer beside field-bus communication also Real-Time Ethernet communication. The application interface is different (not compatible) compared to COM Modules. The COMX Modules are described in an own manual now. The following two tables give a comparison of both COM and COMX Modules.

Comparison COM and COMX Modules

Basic differences between COM-C and COMX-C

	COM-C	COMX-C
Processor	EC1	netX
Host Interface	8 Bit	8 / 16 Bit
Dual-Port Memory size	2 KByte or 8 KByte	16 KByte
USB Interface	No	Yes

Table 1: Basic differences between COM and COMX

Comparison of supported protocols for COM-C and COMX-C

	COM-C	COMX-C
AS-Interface Master	supported	in preparation
CANopen Master	supported	supported
CANopen Slave	supported	supported
CC-Link Slave	supported	supported
CompoNet Slave	-	in preparation
DeviceNet Master	supported	supported
DeviceNet Slave	supported	supported
InterBus Slave	supported	not supported by netX technology
PROFIBUS DP Master	supported	supported
PROFIBUS DP Slave	supported	supported
SERCOS II	supported	not supported by netX technology
EtherCAT Master	-	supported
EtherCAT Slave	-	supported
EtherNet/IP Scanner (Master)	-	supported
EtherNet/IP Adapter (Slave)	supported	supported
Open Modbus/TCP	supported	supported
POWERLINK Controlled Node	-	supported
PROFINET IO RT Controller	-	supported
PROFINET IO RT Device	-	supported
SERCOS III Master	-	supported
SERCOS III Slave	-	supported

Table 2: Comparison of supported protocols for COM and COMX

1.2 List of Revisions

Rev	Date	Name	Revision
7	2009-10-01	H. Hentsch	COMX-CA-DP, COMX-CN-DP, COMX-CA-CO, COMX-CN-CO, COMX-CA-CO, COMX-CN-CO, COMX-CA-CCS and COMX-CN-CCS added Chapter 1 restructured Table *Basic differences between COM and COMX* and *Comparison of supported protocols for COM and COMX* added. Figure *Block Diagram of the COMX-C Modules* and explaining text added Section *Mechanical Dimensions of COM-A Modules*: M0400272 (update), M0900141 (new) Section *Mechanical Dimensions of COM-B Modules*: M0400282 (update), M0900151 (new), M0400291 (kept) Section *Mechanical Dimensions of COM-C Modules*: M0200373 (update), M0200463 (kept), M0300632 (update), M0400353 (update), M0400363 (update), M0600172 (update), M0900161 (new) Section *Mounting of COM-C Modules*: M0500081 (new), M0100084 (update), M0600121 (new), M0900102 (new), M0200402 (kept) Section *Mounting of COM-C Modules* expanded (4 bolt types) Section : SYNC Signals added Section *Signal Overview and Pinning of the Fieldbus Connector X2 on COM-CN*: Added that Pin 21 is used for isolation Section *Timing Diagram of the COMX-C*: Both tables updated and notes expanded Section *LEDs* divided into LEDs for COM and LEDs for COMX Subsections in *LEDs for COMX Modules* updated respectively added Section *Technical Data*: New modules added
8	2009-10-27	H. Hentsch	Section *Diagnostic Interface USB*:: USB interface circuit modified Temperature range for COMX Modules. -20 … 65°C
9	2009-11-11	H. Hentsch	Section *Fieldbus Connector X2 for Real-Time Ethernet*: - LED names changed to COM0 and COM1 - *Figure 6* with example added Section *LEDs*: - *Figure 14: Example how to connect the LEDs COMX-CN Fieldbus* and - *Figure 15: Example how to connect the LEDs COMX-CN-RE* added Section *LEDs for COMX Modules* with references to signal COM0 and COM1 for all Real-Time Ethernet protocols

Table 3: List of Revisions (Part 1)

Continued on next page.

Rev	Date	Name	Revision
10	2010-07-13	H. Hentsch	*Table 2: Comparison of supported protocols for COM and COMX* updated: CANopen Slave, PROFIBUS DP Slave and DeviceNet Slave for COMX-C supported *Table 9: Available COMX-C Modules* updated with COMX-C for Fieldbus Slaves *Table 7: Usage of Bolt for COM Modules* updated *Designation of the COM-C* expanded Section *Fieldbus Connector X2 for CANopen-Master/-Slave*: COMX-CN-COS added Section *Fieldbus Connector X2 for DeviceNet-Master/-Slave*: COMX-CN-DNS added Section *Fieldbus Connector X2 for PROFIBUS-Master/-Slave*: COMX-CN-DPS added Section *Fieldbus Connector X2 for CANopen-Master/-Slave*: Note 2 added Section *Fieldbus Connector X2 for PROFIBUS-Master/-Slave*: Note 2 added Section *Diagnostic Interface USB*: Note removed, because firmware now supports USB *Table 74: Hardware Revision of COMX Modules with new USB Interface* updated *Table 75: Hardware Revision of COMX Modules with old USB Interface* updated German text replaced by English text in the following drawings: M0500081, M0500084, M0600121, M0900141, M0900151, M0400353 Section *SERCOS III Slave*, *CANopen Slave*, *DeviceNet Slave* and *PROFIBUS DP Slave* added with LED Description *Table 38: Technical Data – Operating Condition*: COMX-Cx-COS, COMX-Cx-DNS and COMX-Cx-DPS added
11	2011-03-20	H. Hentsch	Section *Mechanical Dimensions of COM-C Modules*: M0200373 updated to M0200374, M0200463 updated to M0200464. Tolerance of PCB thickness is 1.00 mm (-0,0 +0,2) Section *Type of Connector*: Headline ‘Cheaper version’ set to right position
12	2011-06-10	R. Göbel H. Hentsch	Separation of documents for COM and COMX. This manual contains the description for COM. COM-A and COM-B removed as they are to be discontinued. Section Mechanical Dimensions of COM-C Modules: Section updated, M0200374 updated, M0300632 updated Table 5: COM-CA-EIS and COM-CN-EIS added Section *Meaning of the Rotary* Switch added

Table 4: List of Revisions (Part 2)

1.3 Technical Features

Common Technical Features for COM-C

- Small footprint for the host connector with 50 mil grid
- Solid mechanical assembly and a massive connection to earth ground by metal blocks special design for the requirements of the Modules with fieldbus connector
- Two dowels for exact mounting of the Module on the host board
- Metal blocks can easily modified for special customer requirements
- Front panel can be mounted on the metal blocks that the modules have always the same front size and covers the fieldbus connector
- Easy to use dual-port memory interface, with additional serial and diagnostic interface
- Host interface is designed for 16 KByte address space of the dual-port memory with 8 bit bus width.
- 3.3 V power supply reduce power consumption
- Available in extended temperature specification

With the COM-C we have a much more compact form factor and additional technical features as the already established COM Modules.

- Extremely compact size 30 x 70 mm
- Available with angled and without fieldbus connector
- All fieldbus connectors are placed on one side, which is the edge side on the host board to reserves space
- 2.5 mm space below the Module available for SMD components on the host board

Now you can have only one type of base board (for each COM family) on stock and you can mount the requested fieldbus interface short before shipment to the customer. This gives much more flexibility and saves money even if you have same mechanical constraints (for each COM family) in comparison to our existing COM Modules. Therefore we have Modules with angled, straight and without fieldbus connectors:

- COM-CA COM-C Modules with angled fieldbus connector
- COM-CN COM-C Modules without fieldbus connector

Description of COM Modules

All COM-C have a powerful processor and a complete fieldbus interface including isolated drivers and the connector according to the standard. The slave modules have additional rotary switches to set up the station address.

All boards require only a single stabilized 3.3 Voltage. All other voltages are created by DC/DC converter on the COM-C Module.

The access to the COM-C Module is through the dual-port memory which can be easily integrated as a static memory device. It has a non multiplexed 8 bit data bus with several control lines to the host system. Between the COM-C Module and the host system it is possible to generate interrupts for data handling.

Generally the firmware and the configuration data are stored permanently in FLASH memory by loading the data through the dual port memory or the serial diagnostic line.

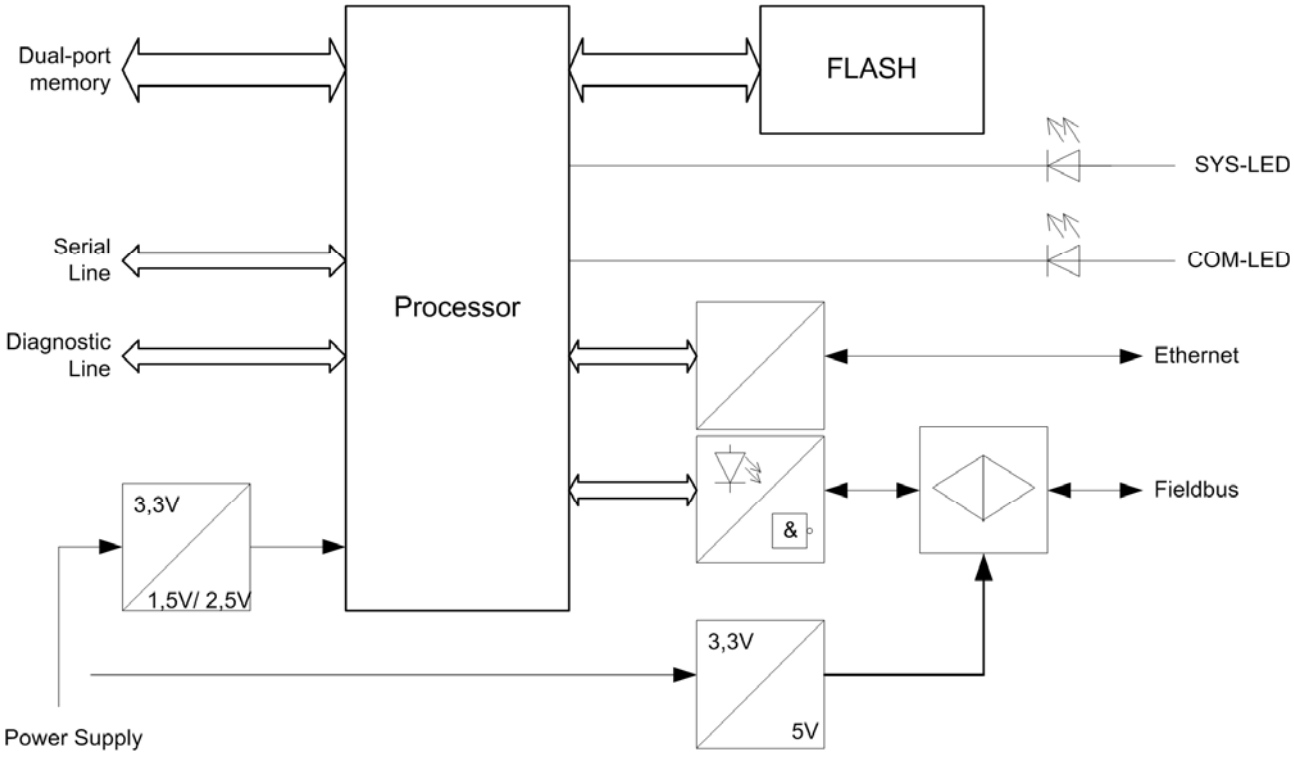

Figure 1: Block Diagram of the COM-C Modules

Note: The COM-CA-SCEB has only the special communication interface chip SERCON 816 on board. Programming of this chip must be done directly from the host application. The description of the communication interface chip SERCON 816 can be get from the 'SERCOS International'.

1.4 Legal Notes

1.4.1 Copyright

1.4.2 Important Notes

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- for military purposes or in weapon systems;
- for the design, construction, maintenance or operation of nuclear facilities;
- in air traffic control systems, air traffic or air traffic communication systems;
- in life support systems;
- in systems in which failures in the software could lead to personal injury or injuries leading to death.

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2 Type of COM-C Modules

The following table shows an overview about the availability of the different COM-C Modules.

Module	Fieldbus / Protocol	Type	Connector
COM-CA-ASM	AS-Interface	Master	angled
COM-CA-COS	CANopen	Slave	angled
COM-CA-COM	CANopen	Master	angled
COM-CA-CCS	CC-Link	Slave	angled
COM-CA-DNS	DeviceNet	Slave	angled
COM-CA-DNM	DeviceNet	Master	angled
COM-CA-EN	Ethernet		angled
COM-CA-EIS	EtherNet/IP	Slave	angled
COM-CA-IBS	INTERBUS	Slave	angled
COM-CA-DPS	PROFIBUS DP	Slave	angled
COM-CA-DPM	PROFIBUS DP	Master	angled
COM-CA-SCEB	SERCOS		angled
COM-CN-ASM	AS-Interface	Master	No
COM-CN-COS	CANopen	Slave	No
COM-CN-COM	CANopen	Master	No
COM-CN-CCS	CC-Link	Slave	No
COM-CN-DNS	DeviceNet	Slave	No
COM-CN-DNM	DeviceNet	Master	No
COM-CN-EN	Ethernet		No
COM-CN-EIS	EtherNet/IP	Slave	No
COM-CN-DPS	PROFIBUS DP	Slave	No
COM-CN-DPS\NR (NR = No Rotary switch)	PROFIBUS DP	Slave	No
COM-CN-DPM	PROFIBUS DP	Master	No

Table 5: Available COM-C Modules

2.1 Mechanical Dimensions

2.1.1 Common Mechanical Dimensions for COM-C Modules

After mounting the COM-CA Module parallel at a basis board the rotary switches, LEDs and the fieldbus connector are on the top side and are angled to the basis board. The edge of all front elements are in one layer which is 2.5 mm ahead of the edge of printed circuit board of the COM Module.

The COM-CN Module has to be used if the mechanical dimensions or order of the LEDs, switches and fieldbus connector doesn't fit. In that case you have to place these components directly on the motherboard and feed the signals to the connector X2 of the COM-CN Module.

Note Please take care on the isolation distance, because the optical isolation interface is on the Module!
Especially for 12 MBit PROFIBUS the distance should as be less as possible.
For Ethernet, the signal traces should run parallel and should have the same length.
Please refer at the fieldbus standards for further information!

2.1.2 Mechanical Dimensions of COM-C Modules

The COM-C Module has a board size of 30 x 70 mm. The maximum height of the components at the top side of the printed circuit board is 14.0 mm including the fieldbus connector. Keep the space of 14.0 mm above the top side free.

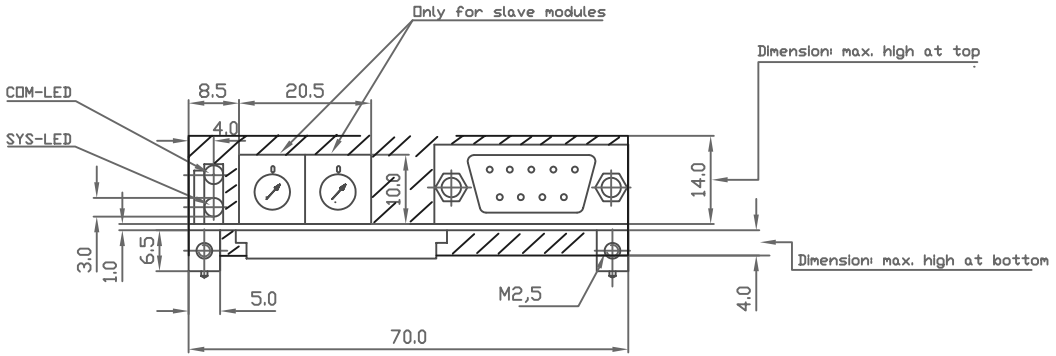
At the bottom side the maximum height is 4.0 mm, therefore you have 2.5 mm space for components on the host board below the Module. The power dissipation in that area should be less than 330 maw!

For further Module development please reserve additional 10 mm space behind the Module. There are a few larger fieldbus interfaces which do not fit on the small board space. In that case a second printed circuit board will be mounted on top of the Module and the 10 mm space is necessary for the connection with flex stripe between these boards.

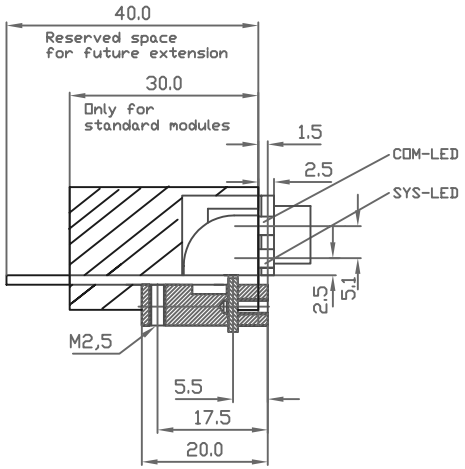
The general dimensions of the COM-C Modules are shown on the following drawings:

- M0200374 General Mechanical dimension of COM-CA-XXX
- M0200464 Mechanical dimension of COM-CN-XXX
- M0300632 Mechanical dimension of light pipe of COM-CA-XXX
- M0400353 Mechanical dimension of Front Plate and Connector of COM-CA-XXX (part 1)
- M0400363 Mechanical dimension of Front Plate and Connector of COM-CA-XXX (part 2)

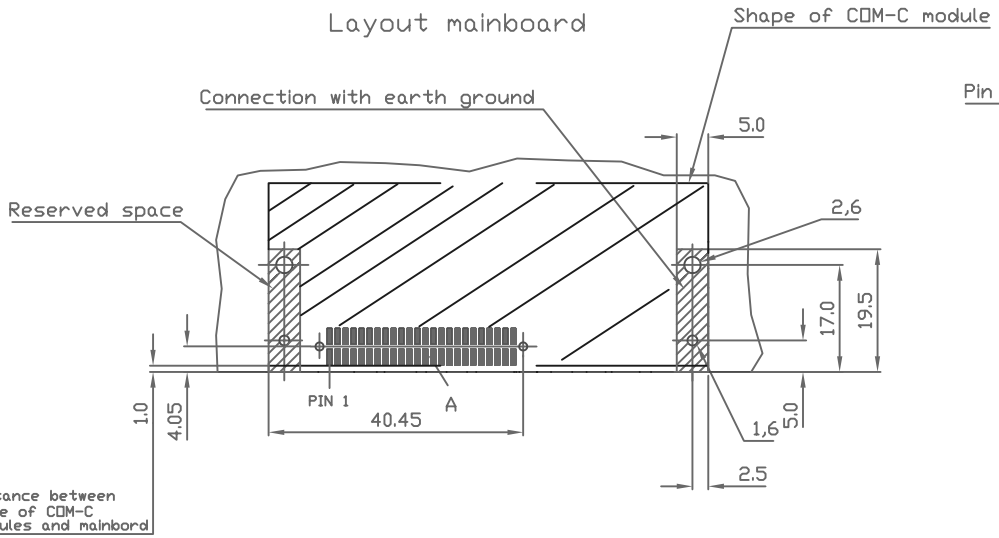
Front View



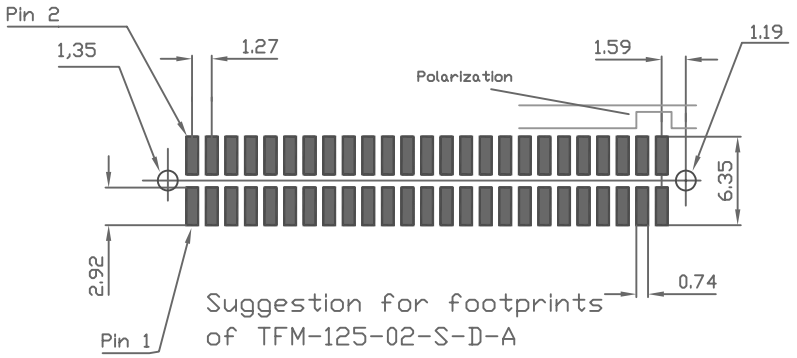
Side View



Layout mainboard



Detail A
Layout mainboard



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2	Grundla. pos. gez.	15.11.02	K.H.	Gepr.					M0200374	Blatt 1
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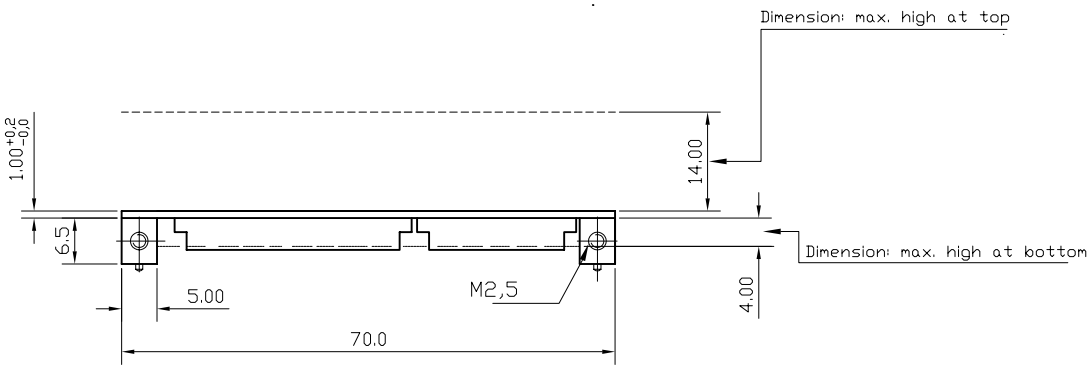
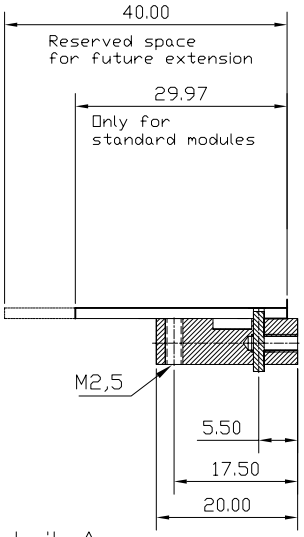
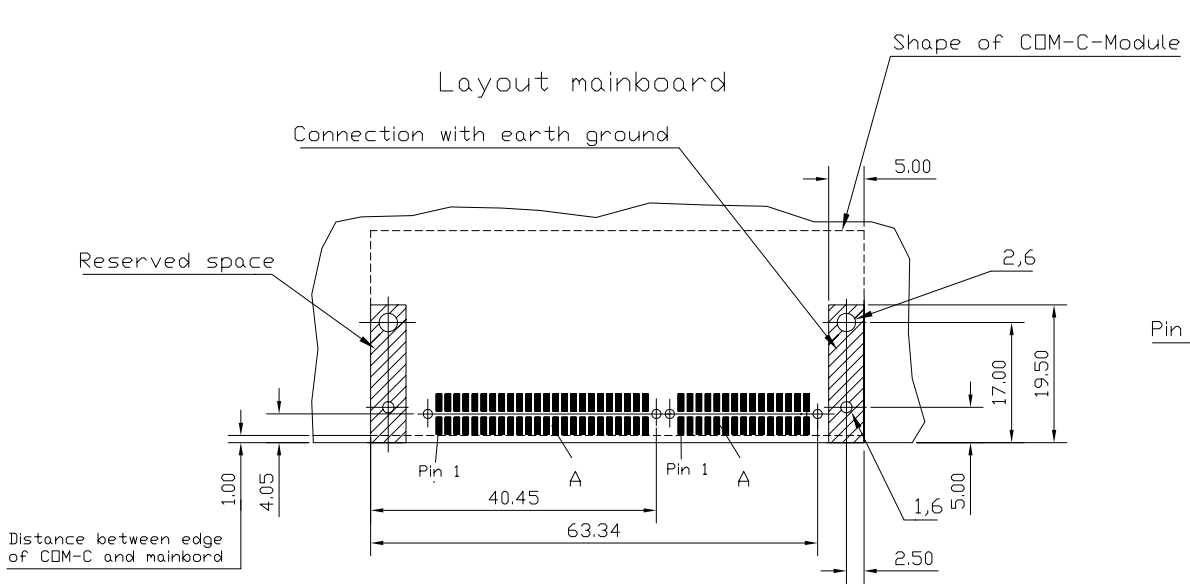
Front View



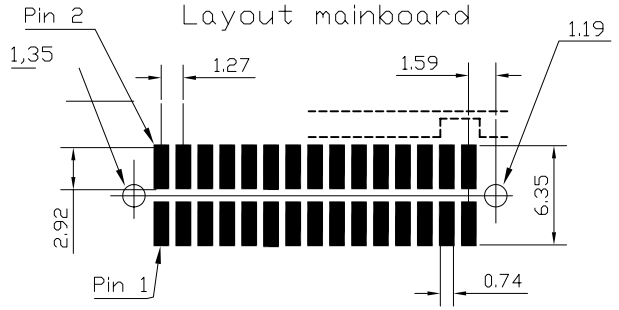
Side View

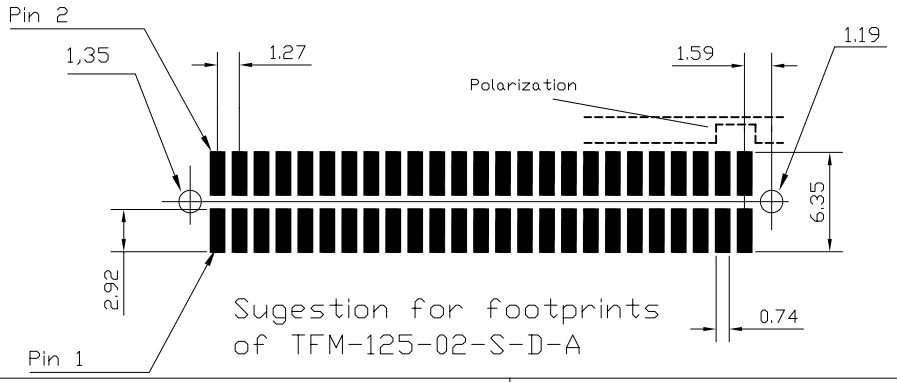


Layout mainboard



Detail A
Layout mainboard





Rev.	Change	Date	Name
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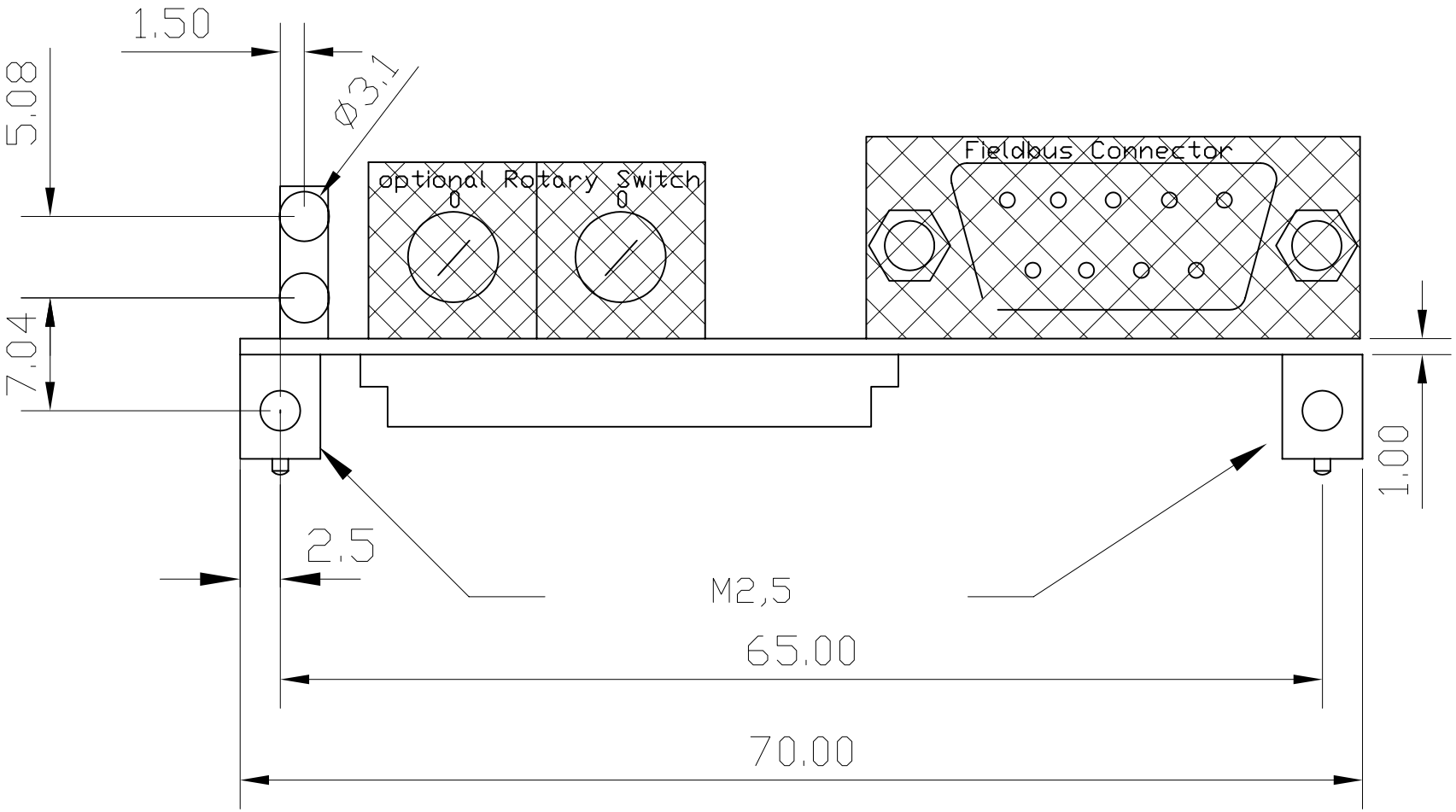
		Edited	N. Racky
		Checked	F. Wertich

Hilscher GmbH
65795 Hattersheim Rheinstr. 15

COM-CN-XXX
allgemeine Abmessungen

M0200464

mechanic
with two-lane lightpipe



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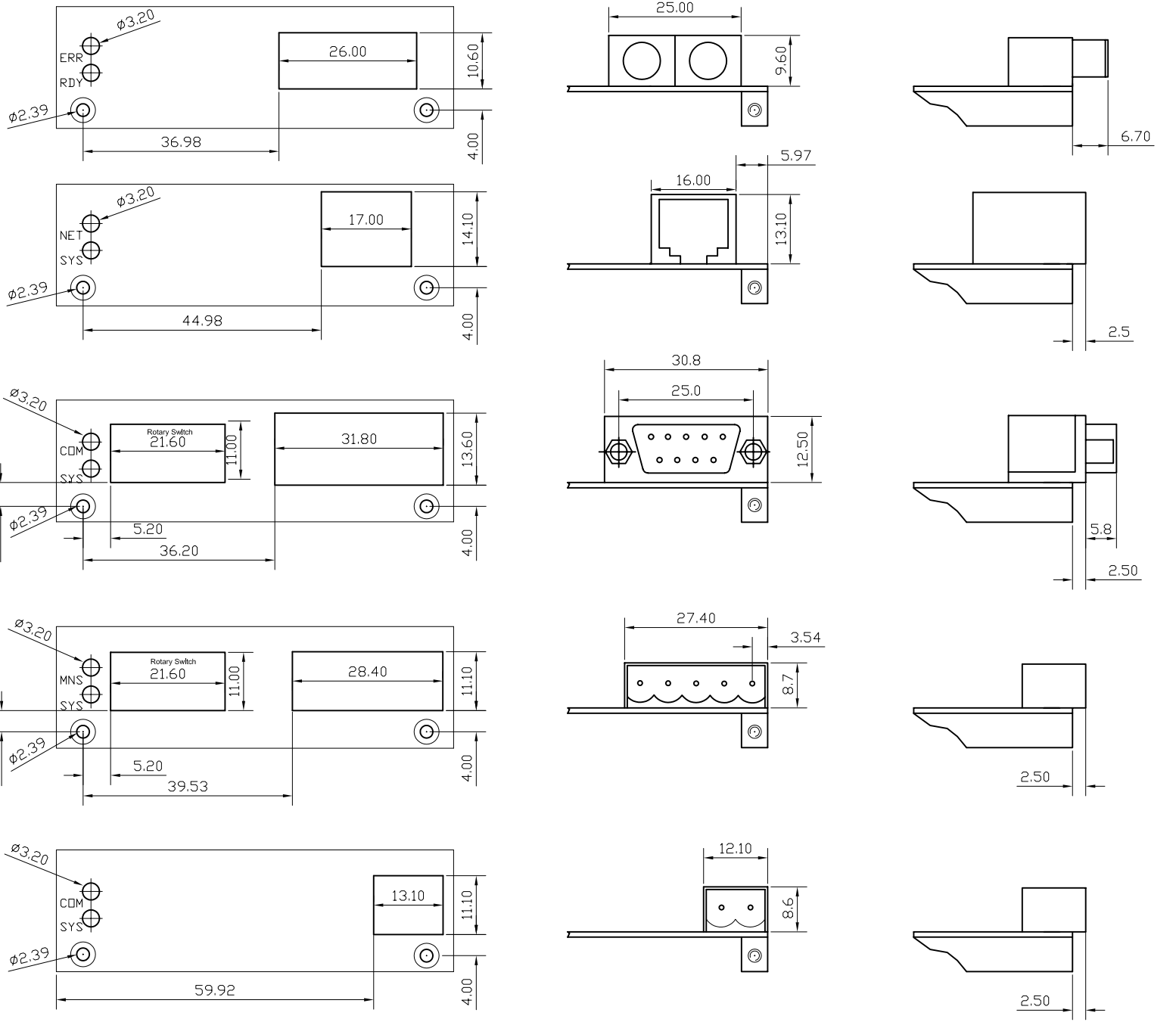

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			Edited	M. Zinke		
			Checked			

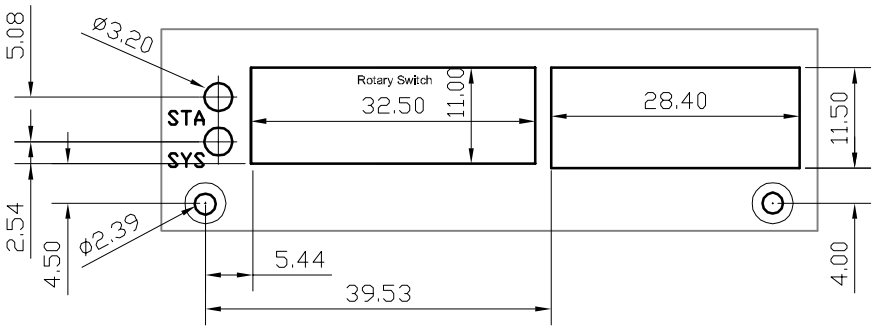
Hilscher GmbH
65795 Hattersheim Rheinstr. 15
created by

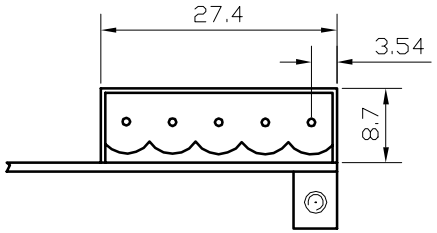
Blenden COM-CA-
1.Teil

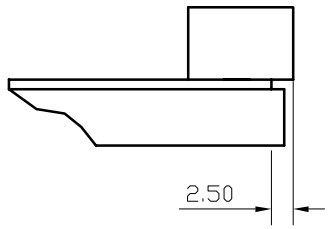
Fertigungsplan

M0400353

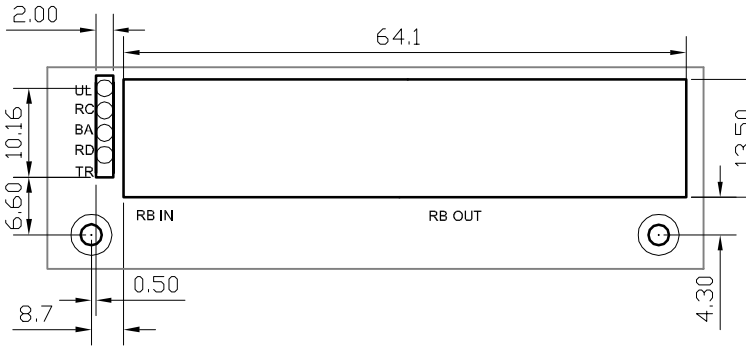
Page 1
1 p.

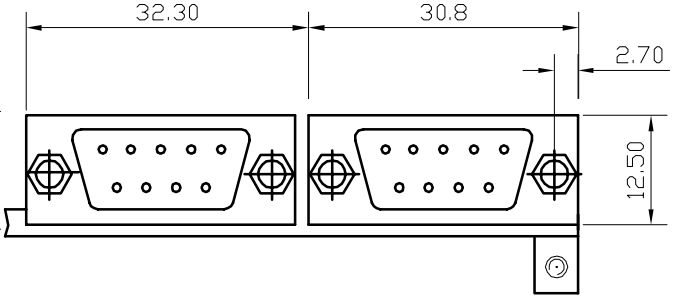


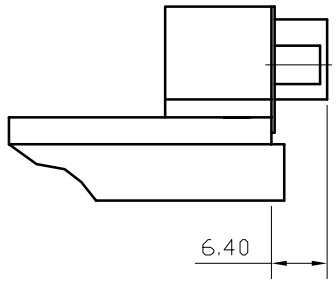




COM-CA-CCS







COM-CA-IBS

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Rev.	Change	Date	Name	Norm		Origin	created for	created by			1 p.

2.2 Type of Connector

The connector X1 for the host interface is a 50 pins SMT female type with a grid of 1.27 mm. The COM-CN Modules have an additional fieldbus connector X2 with 30 pins of the same family.

The connector of the motherboard is the corresponding male type and can be ordered as follows:

In Germany

FJH die Steckverbinder GmbH
Hinter dem Turm 7
D-55286 Wörrstadt

Germany
Tel. +49 (0) 67 32 / 93 27 -0
Fax +49 (0) 67 32 / 93 27 -27

Web: www.fjh.de

Email: info@fjh.de

50 pin. Box header 127 KA - 050 SB
30 pin. Box header 127 KA - 030 SB

World Wide

SAMTEC
www.samtec.com

		Cheaper version
50 pin. Connector	TFM - 125 - 02 - S - D – A	TFC - 125 - 02 - F - D – A
30 pin. Connector	TFM - 115 - 02 - S - D – A	TFC - 115 - 02 - F - D – A

Note: Datasheet of SAMTEC TFM connector see next page!
Please notice that the polarization of X1 and X2 is opposite to Pin 1!

The fieldbus connector on the Module is defined by the fieldbus standard as followed:

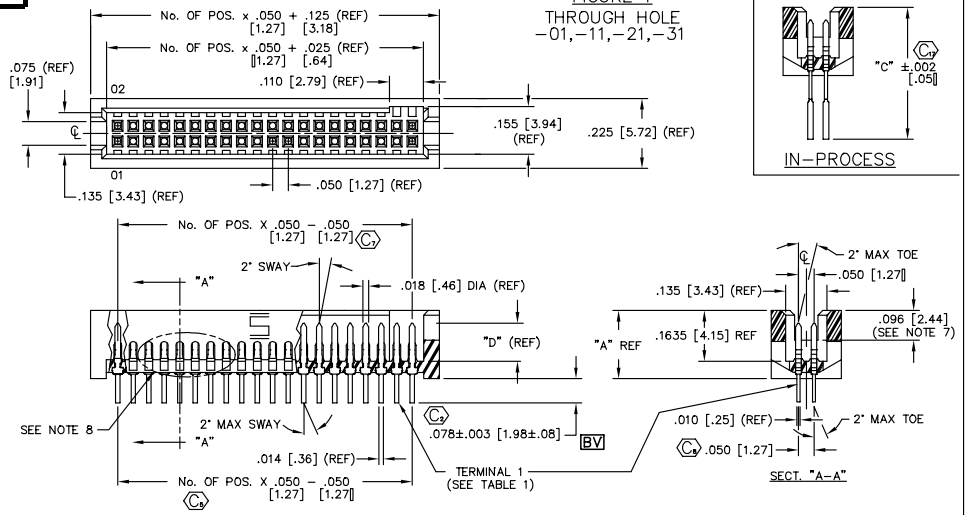
Fieldbus	Connector	Vendor
AS-Interface	2 pin, COMBICON, male Grid 5.08 mm	ie. PHOENIX Contact MSTBA2,5/2-5,08-G
CANopen	9 pin, DSub, male	div. Vendor
DeviceNet	5 pin, COMBICON, male Grid 5.08 mm	ie. PHOENIX Contact MSTBA2,5/5-5,08G-AU
Ethernet	8 pin, RJ45, female	div. Vendor
PROFIBUS	9 pin, DSub, female	div. Vendor
InterBus	9 pin, DSub, male, female	div. Vendor
CC-Link	5 pin, COMBICON, male Grid 5.08 mm	ie. PHOENIX Contact MSTBA2,5/5-G-AU

Table 6: Connector Types

Please use the same type of connector at the motherboard if you have chosen the COM-CN Module.

REV. BV

FIGURE 1
THROUGH HOLE
−01,−11,−21,−31



UNLESS OTHERWISE NOTED				TITLE:	DWG NO:
DIMENSIONS ARE IN INCHES	TOLERANCES ARE:			.050 x .050 TERMINAL STRIP	TFM−1XX−XX−X−X−XX
ONE PLACE DECIMALS ±.1 [2.54]	THREE PLACE DECIMALS	+.002 [.05] −.005 [.13]	ANGLES		SHEET 1 OF 3
TWO PLACE DECIMALS ±.01 [.25]	FOUR PLACE DECIMALS ±.0020 [.05]		± 2°		

TFM−1XX−XX−X−X−XX

NO. OF POSITIONS
LEAD STLYES −01 & −02
(−5 THRU −50
ALL POSITIONS AVAILABLE)
ALL OTHER LEAD STYLES
(−5 THRU −50
MULTIPLES OF 5 ONLY)

LEAD STYLE

THROUGH HOLE	SURFACE MOUNT
−01: (SEE FIG. 1)	−02: (SEE FIG. 2)
−11: (SEE FIG. 1)	−12: (SEE FIG. 2)
−21: (SEE FIG. 1)	−22: (SEE FIG. 2)
−31: (SEE FIG. 1)	−32: (SEE FIG. 2)

(SEE TABLE 1)

PLATING SPECIFICATION
−S: SELECTIVE (SPECIFY −S IN PLATING SUFFIX)
−L: LIGHT SELECTIVE (SPECIFY −L IN PLATING SUFFIX)
−F: FLASHED GOLD (SPECIFY −F IN PLATING SUFFIX)
−P: GOLD FLASHED PALLADIUM NICKEL (SPECIFY −P IN PLATING SUFFIX)
−H: HEAVY GOLD (SPECIFY −H IN PLATING SUFFIX)

OPTIONS
−A: ALIGNMENT PIN (USE TFM−XX−D−XX−A, SEE TABLE 1) (SEE PAGE 2) (NOT AVAILABLE FOR −RA)
−LC: LOCKING CLIP (USE LC−05−T) (NOT AVAILABLE WITH −RA OPTION) (SEE PAGE 2)
−P: PICK AND PLACE PAD (USE PPP−04) (AVAILABLE IN ALL POSITIONS) (NOT AVAILABLE WITH −RA OPTION, SEE PAGE 2)
−RA: RIGHT ANGLE (AVAILABLE ONLY IN LEAD STYLE: −01, SEE PAGE 2)
−TR: TAPE AND REEL (SEE FIG 4)
−SA: STAKED ALIGNMENT PIN (SEE PAGE 2) (NOT AVAILABLE FOR −RA)
−K: POLYAMIDE FILM (SEE FIG. 3)

BODY SPECIFICATION
−D: DOUBLE ROW

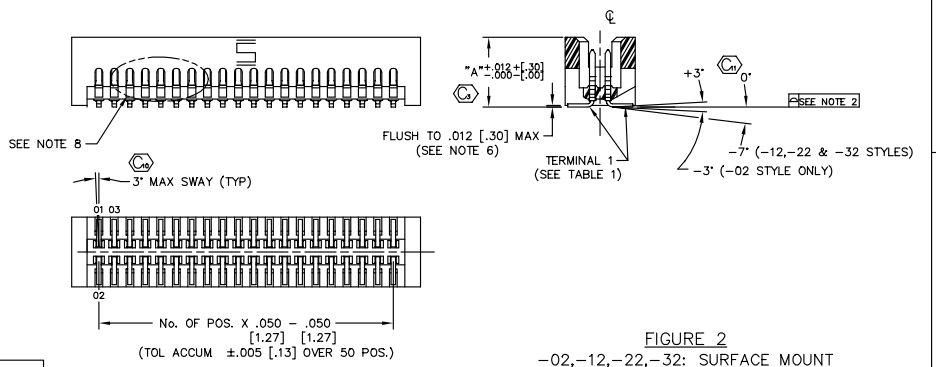


FIGURE 2
−02,−12,−22,−32: SURFACE MOUNT
DIFFERENT AS SHOWN, OTHERWISE SAME AS FIG. 1

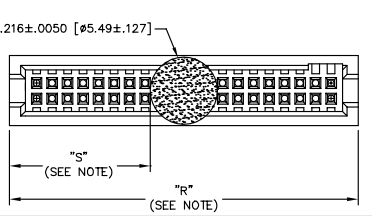
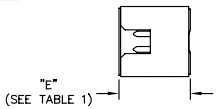


FIG. 3
−K POLYAMIDE FILM PAD



NOTE: "R" = OVERALL LENGTH (REF)
"S" = {("R" − .216 [5.49]) / 2} ±.020 [.51]

NOTES:
1. MINIMUM PUSHOUT FORCE TO BE 12 OUNCES.
2. COPLANARITY: .004 [.10]=POS 02 THRU 26
3. MANUFACTURING IN PROCESS DIMENSION DESIGNED TO ACHIEVE FINISHED ASSEMBLY.
4. Ⓒ REPRESENTS CRITICAL DIMENSION.
5. [ ] DIMENSIONS ARE IN MILLIMETERS.
6. MEASURED FROM BEND.
7. DIMENSION CHANGED PER REVISION AD. CONTACT ENGINEERING FOR INFORMATION.
8. SIDES OF PLASTIC BODIES ON ALL LEADSTYLES EXCEPT THE −01 & −02 WILL BE SOLID AND NOT RIBBED
9. MEASURE FROM TIPS OF PIN.
10. USE T−1R16−01−X−2 WHEN ASSEMBLED ON M16. OTHERWISE, USE T−1R16−01−X−2.NEW
11. .003 MAXIMUM TERMINAL BURR
12. .005 MAXIMUM HEIGHT VARIATION BETWEEN ANY TWO PINS.

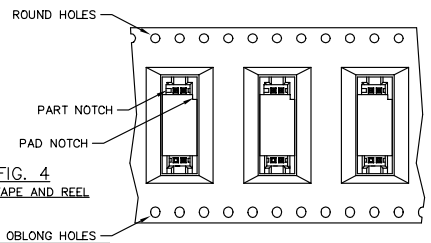


FIG. 4
−TR TAPE AND REEL

DO NOT SCALE FROM THIS PRINT

TABLE 1

LEAD STYLE	BODY	"A"	TERMINAL 1	"B"	TERMINAL 2	"C"	"D"	"E"
−01	TFM−XX−D−01−X	.2200 [5.588]	T−1R16−01−X−02.NEW	.015 [.38]	----------	.427±.002 [10.85±.05]	.133 [3.38]	.230 [5.84]
−02	TFM−XX−D−01−X	.2200 [5.588]	SEE NOTE 10	.015 [.38]	----------	.427±.002 [10.85±.05]	.133 [3.38]	.230 [5.84]
−11,−12	TFM−XX−D−02−X	.2900 [7.366]	T−1R20−03−X	.030 [.76]	----------	.644±.002 [16.36±.05]	.130 [3.30]	.300 [7.62]
−21,−22	TFM−XX−D−03−X	.3600 [9.144]	T−1R20−04−X	.100 [2.54]	----------	.644±.002 [16.36±.05]	.130 [3.30]	.370 [2.00]
−31,−32	TFM−XX−D−04−X	.4350 [11.049]	T−1R20−02−X	.175 [4.45]	----------	.644±.002 [16.36±.05]	.130 [3.30]	.445 [11.30]
−01−RA	TFM−XX−D−01−X	.2200 [5.588	T−1R16−02−X	.035 [.76]	T−1R16−03−X	----------	.133 [3.38]	.230 [5.84]

MATERIAL:
INSULATOR:
LIQUID CRYSTAL POLYMER
COLOR: BLACK

TERMINAL:
PHOSPHOR BRONZE

MISC\MKTG
TFM−MKT
samtec
520 PARK EAST BLVD. NEW ALBANY, INDIANA 47150
PHONE (812) 944−6733 P.O. BOX 1147
CODE 55322

MADE BY: KOLB 12−8−89	ENG. APPROVAL D.E.M	TFM−1XX−XX−X−X−XX
CHECKED BY: McCARTIN		SHEET 1 OF 3

2.3 Mounting of COM-C Modules

The COM-C Module has two metal blocks for mounting. This guaranties a robust mechanical construction and a solid connection to earth ground for the fieldbus connector. The metal blocks define also the distance between the Module and host board. They are connected together with M2.5 screws.

On the front side of the metal blocks there are a M2.5 thread to mount a front panel directly on the Module. This allows to have the same cutting in the device housing for all types of Modules.

- Use fine technology that means six-mil-wide (150 µm) tracks

Note	With this you have the possibility to get out between the pads. For the power tracks you can insert a via straight in the pad. To prevent a soldering problem please use a fine via (drill 0,2 mm).

- Place a via between board edge and connector pad

Note	There is 1 mm space between the connector and the board edge, where you can place a 'normal' via (drill 0,3 mm) to feed the signals to the bottom side.

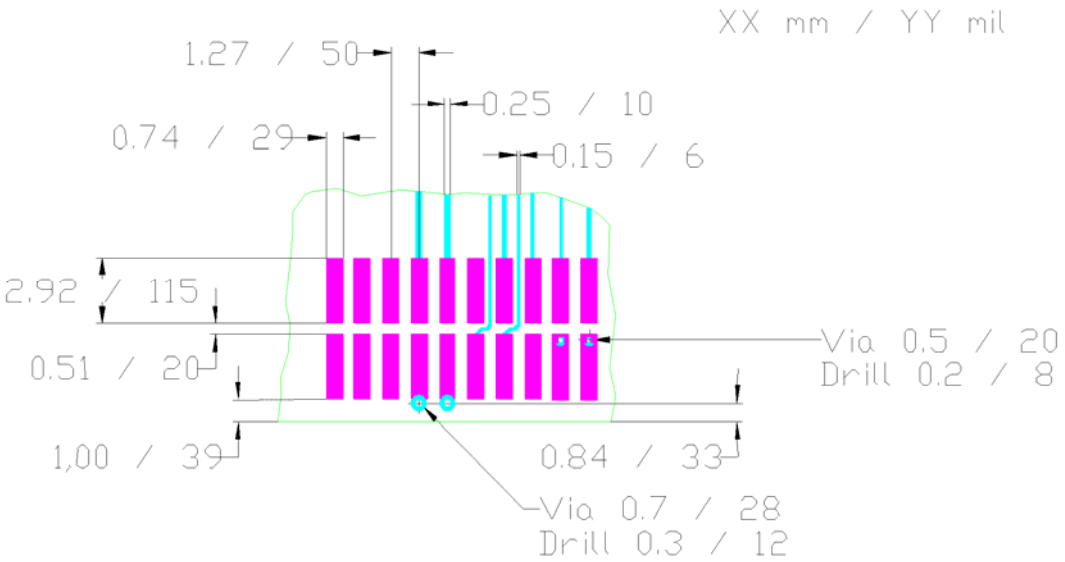


Figure 2: How to layout the Signals at the Connectors X1 and X2

Four types of metal bolts are used. The following table lists the usage for each COM Module.

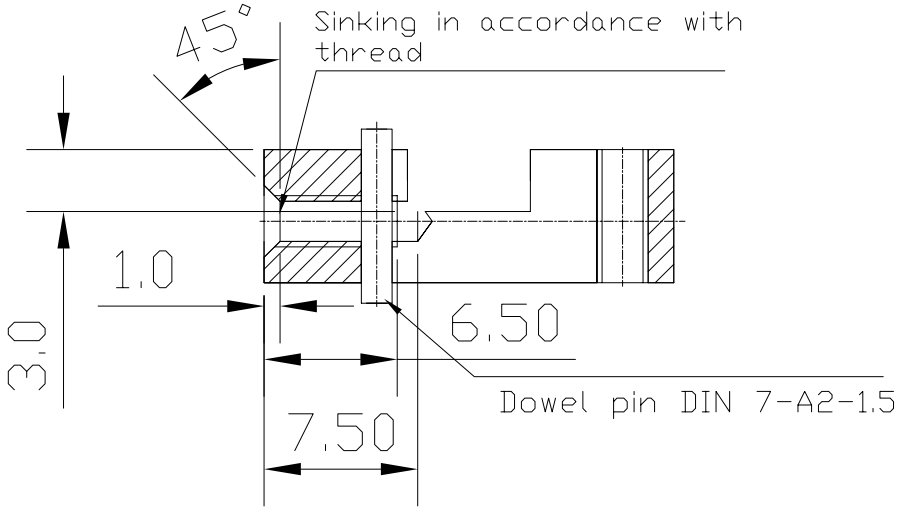
COM	Type	Left Side	Right Side
COM-CA	AS, CCS, CO, DN, DP, EN, IBS, SCEB	COM-CA-B20X5	COM-CA-B20X5
COM-CN	AS, CCS, CO, DN, DP, EN, IBS	COM-CA-B20X5	COM-CA-B20X5

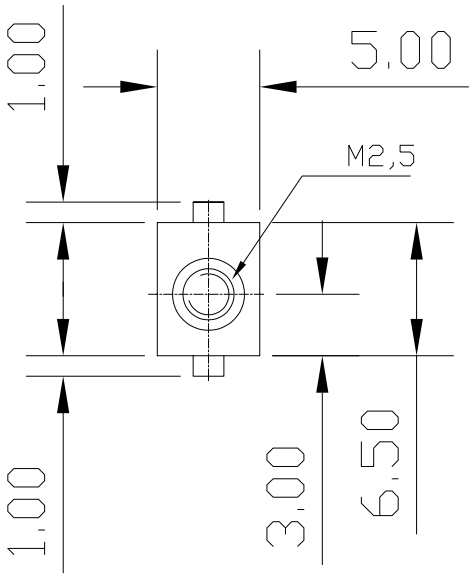
Table 7: Usage of Bolt for COM Modules

The drawings for the bolts are shown on the following drawings:

- M0100084 Mechanical dimension of Bolt COM-CA-B20X5
- M0600121 Mechanical dimension of Bolt COM-CA-B31,5X5
- M0900102 Mechanical dimension of Bolt COM-CA-B24X5

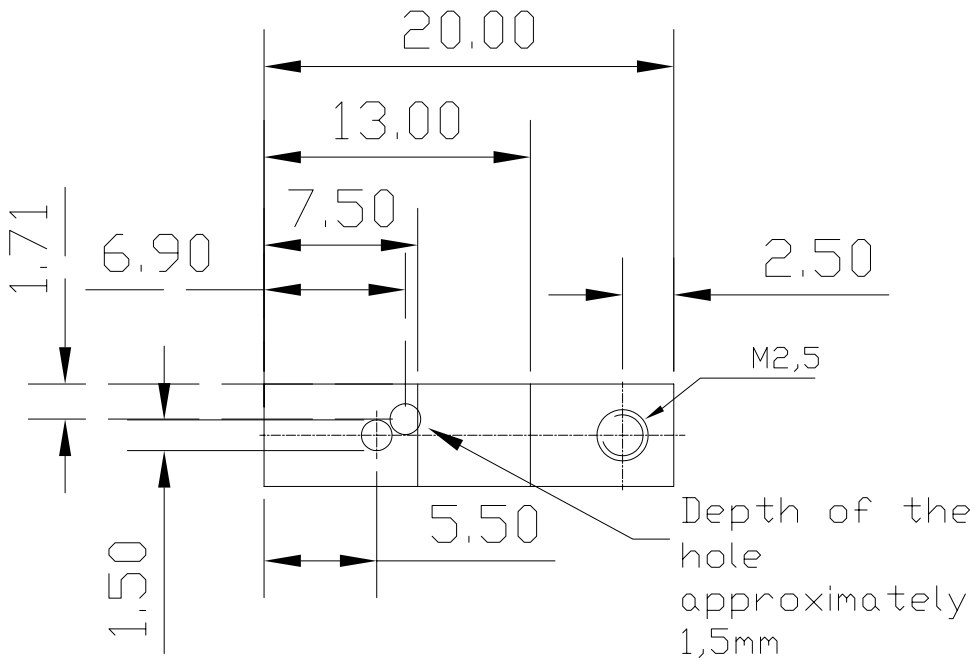
- M0200402 Mechanical dimension how to assemble COM-CA-XXX on the mother board





- Material brass or steel
- Surface plated
- Tolreances ±0.1 mm

Dimensions in mm



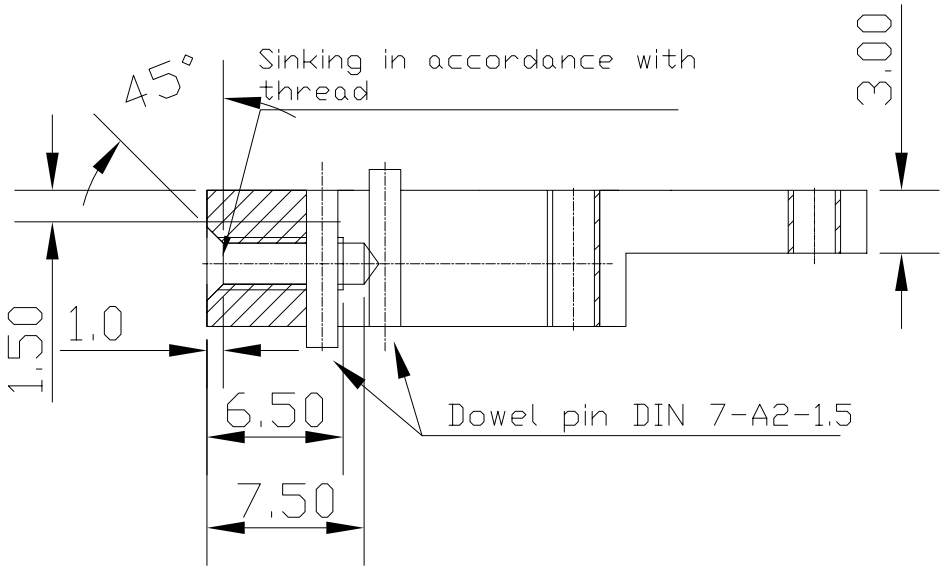
Rev.	Change	Date	Name		
	Text de=>eng	07/10	NR	Checked	F. Wertich 01.01.07
				Edited	N. Racky
				Date	13.12.07

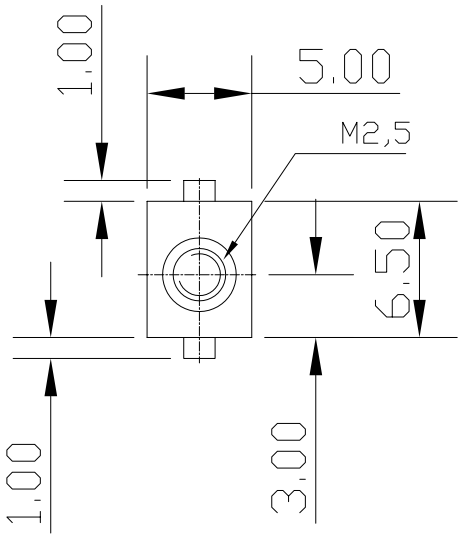
Hilscher GmbH
65795 Hattersheim Rheinstr. 15

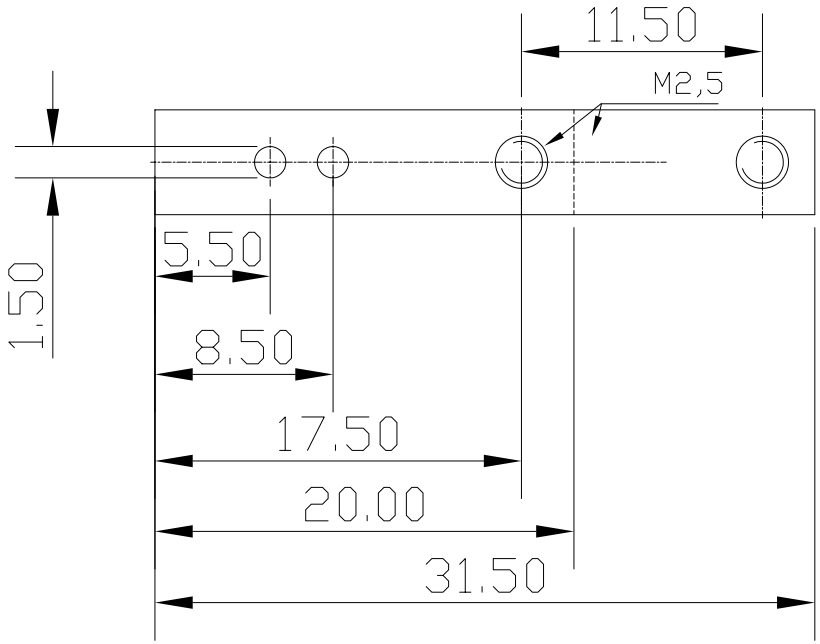
Modifikation
C□M-CA-B20X5

Bestückungsplan Fertigung
M0100084

Page 1 of 1 p.



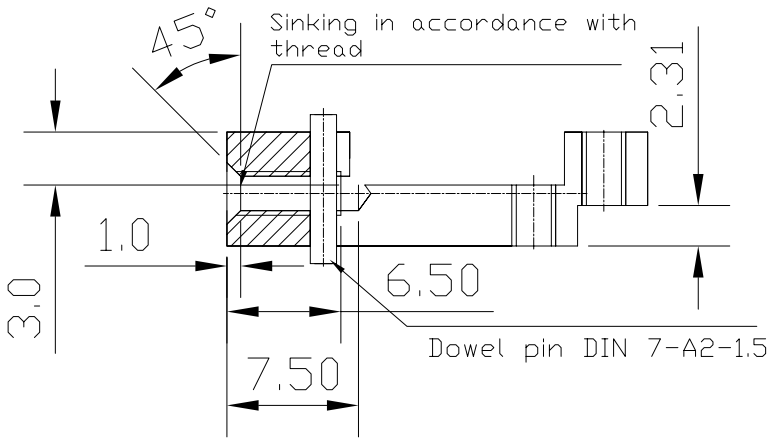


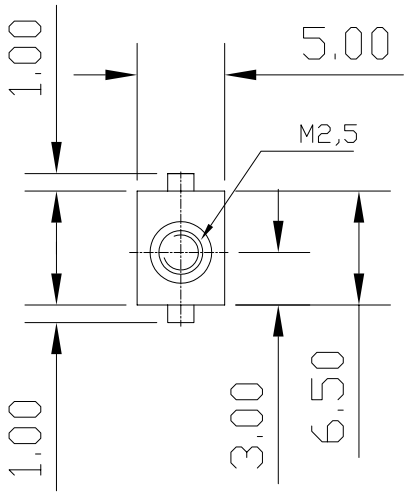


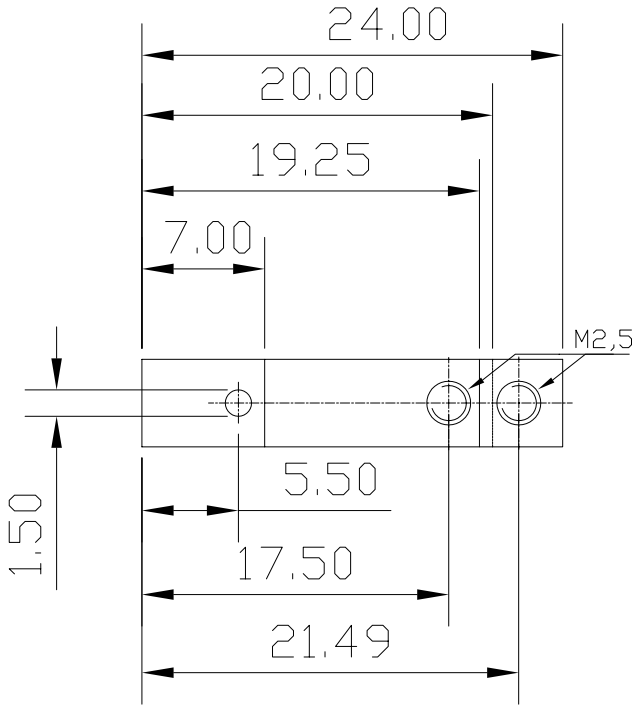
- Material brass or steel
- Surface plated
- Tolerances ±0.1 mm

Dimensions in mm

				Date	09.05.06		Hilscher GmbH	Bolzen	Fertigungsplan	=	
				Edited	N. Racky					+	
	Text de=>eng	07/10	NR	Checked			65795 Hattersheim Rheinstr. 15	COM-CA-B31,5X5	M0600121		Page 1
Rev.	Change	Date	Name	Norm		Origin	created for	created by			1 p.







- Material brass or steel
- Surface plated
- Tolerances ±0.1 mm

Dimensions in mm

Rev.	Change	Date	Name
	Text de=>eng	07/10	NR

Date	18.06.2009
Edited	M. Zinke
Checked	F. Wertich
	18.06.2009

Hilscher GmbH
65795 Hattersheim Rheinstr. 15

CIM-CA-B24X5

Bestückungsplan Fertigung

M0900102

2.4 Designation of the COM-C

Each COM-C Module has a matrix code label. A matrix label contains 3 items:

1. Part number
2. Hardware Revision
3. Serial number

The figure shows part number 1521.416, hardware revision 3 and serial number 00200.

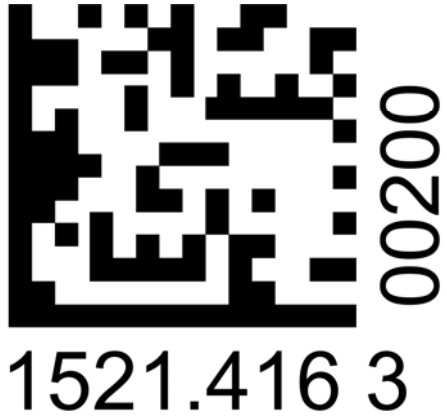


Figure 3: Example Matrix Code label of COM-C Modules

The label is normally glued on top of the main processor.

2.5 Meaning of the Rotary Switch

The following figure shows the meaning of the rotary switch for COM-CA-DPS, COM-CA-COS and COM-CA-DNS. The rotary switches are to set the bus address.

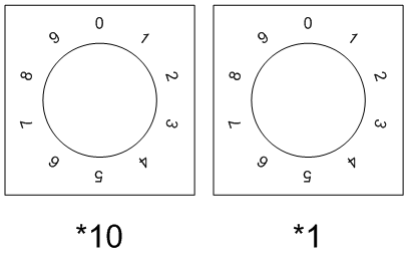


Figure 4: Meaning of the Rotary Switch

The following figure shows the meaning of the rotary switch for COM-CA-CCS and COM-CN-CCS. The left and the middle rotary switch are to set the bus address.

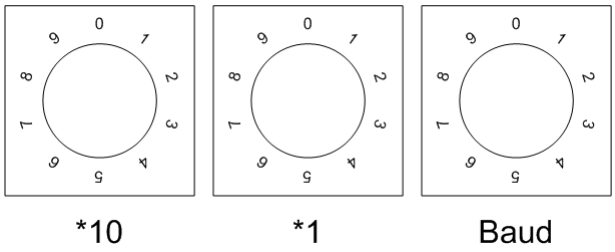


Figure 5: Meaning of the Rotary Switch of COM-Cx-CCS

3 Host Interface

Attention! All COM modules have an operation voltage of 3.3 V which reduces the power consumption. Therefore the voltage levels of the signals have to be not higher than 3.3 V otherwise the module will be damaged.

The next sections show an overview of the signal pinning of the system connector.

3.1 COM Pinning of the System Bus Connector X1

Pin	Signal	Symbol	Type
1	Word Interface, active low	WIF#	GND if D8 - D15 is available (16 bit), left unconnected if not (8 bit)
2	Bus high enable (future use), active low	BHE#	LVTTL Input
3	Data line 15 (future use)	D15	LVTTL Input / Output
4	Data line 14 (future use)	D14	LVTTL Input / Output
5	Data line 13 (future use)	D13	LVTTL Input / Output
6	Data line 12 (future use)	D12	LVTTL Input / Output
7	Data line 11 (future use)	D11	LVTTL Input / Output
8	Data line 10 (future use)	D10	LVTTL Input / Output
9	Data line 9 (future use)	D9	LVTTL Input / Output
10	Data line 8 (future use)	D8	LVTTL Input / Output
11	Ground	GND	
12	Power Supply	+3.3 V	
13	Transmit Data, Serial line	TXD1	LVTTL Output
14	Receive Data, Serial line	RXD1	LVTTL Input
15	Request to Send, Serial line	RTS1	LVTTL Output
16	Clear to Send, Serial line	CTS1	LVTTL Input
17	reserved for future - don't connect	-	
18	reserved for future - don't connect	-	
19	Receive Data, Diagnostic line	RX0	LVTTL Input
20	Transmit Data, Diagnostic line	TX0	LVTTL Output
21	Reset, active low	RES#	LVTTL Input; 10 k pull up
22	Busy, active low	BUSY#	LVTTL Output
23	Interrupt, active low	INT#	LVTTL Output
24	Read, active low	RD#	LVTTL Input
25	Write, active low	WR#	LVTTL Input
26	Chip select, active low	CS#	LVTTL Input
27	Address line 13	A13	LVTTL Input
28	Address line 12	A12	LVTTL Input
29	Address line 11	A11	LVTTL Input
30	Address line 10	A10	LVTTL Input
31	Address line 9	A9	LVTTL Input
32	Address line 8	A8	LVTTL Input
33	Address line 7	A7	LVTTL Input
34	Address line 6	A6	LVTTL Input
35	Address line 5	A5	LVTTL Input
36	Address line 4	A4	LVTTL Input
37	Address line 3	A3	LVTTL Input
38	Address line 2	A2	LVTTL Input
39	Address line 1	A1	LVTTL Input
40	Address line 0	A0	LVTTL Input

Table 8: COM Pinning of the System Bus Connector X1 (Part 1)

Continued on next page.

Pin	Signal	Symbol	Type
41	Data line 7	D7	LVTTL Input / Output
42	Data line 6	D6	LVTTL Input / Output
43	Data line 5	D5	LVTTL Input / Output
44	Data line 4	D4	LVTTL Input / Output
45	Data line 3	D3	LVTTL Input / Output
46	Data line 2	D2	LVTTL Input / Output
47	Data line 1	D1	LVTTL Input / Output
48	Data line 0	D0	LVTTL Input / Output
49	Ground	GND	
50	Power Supply	+3.3 V	

Table 9: COM Pinning of the System Bus Connector X1 (Part 2)

3.2 COM-CA-SCEB Pinning of the System Bus Connector X1

Pin	Signal	Symbol	Type
1	Word Interface, active low	WIF#	GND if D8 - D15 is available (16 bit), left unconnected if not (8 bit)
2	Bus high enable, active low	BHE#	LVTTL Input
3	Data line 15	D15	LVTTL Input / Output
4	Data line 14	D14	LVTTL Input / Output
5	Data line 13	D13	LVTTL Input / Output
6	Data line 12	D12	LVTTL Input / Output
7	Data line 11	D11	LVTTL Input / Output
8	Data line 10	D10	LVTTL Input / Output
9	Data line 9	D9	LVTTL Input / Output
10	Data line 8	D8	LVTTL Input / Output
11	Ground	GND	
12	Power Supply	+3.3 V	
13	reserved for future - don't connect	-	
14	reserved for future - don't connect	-	
15	reserved for future - don't connect	-	
16	reserved for future - don't connect	-	
17	Interrupt, active low	INT1#	LVTTL Output
18	reserved for future - don't connect	-	
19	reserved for future - don't connect	-	
20	reserved for future - don't connect	-	
21	Reset, active low	RES#	LVTTL Input; 10 k … 30 k pull up
22	Busy, active low	BUSY#	LVTTL Output
23	Interrupt, active low	INT0#	LVTTL Output
24	Read, active low	RD#	LVTTL Input
25	Write, active low	WR#	LVTTL Input
26	Chip select, active low	CS#	LVTTL Input
27	Address line 13 (reserved for future use)	A13	LVTTL Input
28	Address line 12	A12	LVTTL Input
29	Address line 11	A11	LVTTL Input
30	Address line 10	A10	LVTTL Input
31	Address line 9	A9	LVTTL Input
32	Address line 8	A8	LVTTL Input
33	Address line 7	A7	LVTTL Input
34	Address line 6	A6	LVTTL Input
35	Address line 5	A5	LVTTL Input
36	Address line 4	A4	LVTTL Input
37	Address line 3	A3	LVTTL Input
38	Address line 2	A2	LVTTL Input
39	Address line 1	A1	LVTTL Input
40	Address line 0	A0	LVTTL Input

Table 10: COM-CA-SCEB Pinning of the System Bus Connector X1 (Part 1)

Continued on next page.

Pin	Signal	Symbol	Type
41	Data line 7	D7	LVTTL Input / Output
42	Data line 6	D6	LVTTL Input / Output
43	Data line 5	D5	LVTTL Input / Output
44	Data line 4	D4	LVTTL Input / Output
45	Data line 3	D3	LVTTL Input / Output
46	Data line 2	D2	LVTTL Input / Output
47	Data line 1	D1	LVTTL Input / Output
48	Data line 0	D0	LVTTL Input / Output
49	Ground	GND	
50	Power Supply	+3.3 V	

Table 11: COM-CA-SCEB Pinning of the System Bus Connector X1 (Part 2)

3.3 Signal Overview and Pinning of the Fieldbus Connector X2 on COM-CN

3.3.1 Fieldbus Connector X2 for AS-Interface-Master

Fieldbus connector X2 for COM-CN-ASM

Pin	Signal	Symbol	Type	Pin at Fieldbus Connector COMBICON 2pin
1				
2				
3				
4				
5				
6				
7				
8				
9				
10	*AS-i, Receive Data*	*ASI_RX*	*LVTTL Input*	*Note 1*
11	*AS-i, Power Fail*	*ASI_PF*	*LVTTL Output*	*Note 1*
12	*AS-i, Transmit Data*	*ASI_TX*	*LVTTL Output*	*Note 1*
13	COM-LED, STA, Cathode yellow LED	STA#	4 mA Output	
14	SYS-LED, RUN, Cathode green LED	RUN#	4 mA Output	
15	COM-LED, ERR, Cathode red LED	ERR#	4 mA Output	
16	SYS-LED, RDY, Cathode yellow LED	RDY#	4 mA Output	
17	Ground	GND		
18	Power Supply	+3.3 V		
19	Peripheral IO	PIO	LVTTL Input / Output	
20	Don't use - needed for isolation			
21	Don't use - needed for isolation			
22				
23				
24				
25				
26				
27				
28				
29	AS-i + Bus line	AS-i+	+24 V with AS-i	1
30	AS-i - Bus line	AS-i-	0 V with AS-i	2

Table 12: Fieldbus Connector X2 for AS-Interface-Master

Note	Information
1	LVTTL Signals could be only used without the hardware interface on the COM. Ask for special customer version.

Table 13: Notes for Fieldbus Connector X2 for AS-Interface-Master

3.3.2 Fieldbus Connector X2 for CANopen-Master/-Slave

Fieldbus connector X2 for COM-CN-COM / COM-CN-COS

Pin	Signal	Symbol	Type	Pin at Fieldbus Connector DSub 9, male
1				
2				
3				
4				
5				
6				
7	*CAN, Receive Data*	*CAN_RX1*	*LVTTL Input*	*Note 1*
8				
9	*CAN, Transmit Data*	*CAN_TX1*	*LVTTL Output*	*Note 1*
10				
11				
12				
13	COM-LED, STA, Cathode yellow LED	STA#	4 mA Output	*Note 2*
14	SYS-LED, RUN, Cathode green LED	RUN#	4 mA Output	
15	COM-LED, ERR, Cathode red LED	ERR#	4 mA Output	
16	SYS-LED, RDY, Cathode yellow LED	RDY#	4 mA Output	
17	Ground	GND		
18	Power Supply	+3.3 V		
19	Peripheral IO	PIO	LVTTL Input / Output	
20	Don't use - needed for isolation			
21	Don't use - needed for isolation			
22				
23	CAN_H Bus line	CAN_H	ISO 11898	7
24				
25				
26	CAN Ground	CAN_GND		3
27				
28				
29	CAN_L Bus line	CAN_L	ISO 11898	2
30				

Table 14: Fieldbus Connector X2 for CANopen-Master/-Slave

Note	Information
1	LVTTL Signals could be only used without the hardware interface on the COM. Ask for special customer version.
2	Yellow LED for COM-CN-COM / COM-CN-COS

Table 15: Notes for Fieldbus Connector X2 for CANopen-Master/-Slave

3.3.3 Fieldbus Connector X2 for DeviceNet-Master/-Slave

Fieldbus connector X2 for COM-CN-DNM / COM-CN-DNS

Pin	Signal	Symbol	Type	Pin at Fieldbus connector COMBICON 5pin
1				
2				
3				
4				
5				
6				
7	*CAN, Receive Data*	*CAN_RX1*	*LVTTL Input*	*Note 1*
8				
9	*CAN, Transmit Data*	*CAN_TX1*	*LVTTL Output*	*Note 1*
10				
11	*CAN, Power Fail*	*CAN_PF1*	*LVTTL Input*	*Note 1*
12				
13	MNS-LED, active low, Cathode green LED	MNS_CG#	4 mA Output	
14	RUN-LED, RUN, Cathode green LED	RUN#	4 mA Output	
15	MNS-LED, active low, Cathode red LED	MNS_CR#	4 mA Output	
16	SYS-LED, RDY, Cathode yellow LED	RDY#	4 mA Output	
17	Ground	GND		
18	Power Supply	+3.3 V		
19	Peripheral IO	PIO	LVTTL Input / Output	
20	Don't use - needed for isolation			
21	Don't use - needed for isolation			
22				
23				
24				
25				
26	Reference potential DeviceNet	V-		1
27	CAN Low-Signal	CAN_L		2
28	Shield	Drain		3
29	CAN High-Signal	CAN_H		4
30	+24V Power Supply DeviceNet	V+		5

Table 16: Fieldbus Connector X2 for DeviceNet-Master/-Slave

Note	Information
1	LVTTL Signals could be only used without the hardware interface on the COM. Ask for special customer version.

Table 17: Notes for Fieldbus Connector X2 for DeviceNet-Master/-Slave

3.3.4 Fieldbus Connector X2 for PROFIBUS-Master/-Slave

Fieldbus connector X2 for COM-CN-DPM / COM-CN-DPS

Pin	Signal	Symbol	Type	Pin at Fieldbus connector DSub-9, female
1	*PROFIBUS, Receive Data*	*PB_RX*	*LVTTL Input*	*Note 1*
2				
3	*PROFIBUS, Transmit Data*	*PB_TX*	*LVTTL Output*	*Note 1*
4				
5	*PROFIBUS, Enable Bus Driver*	*PB_ENB*	*LVTTL Output*	*Note 1*
6				
7				
8				
9				
10				
11				
12				
13	COM-LED, STA, Cathode yellow LED	STA#	4 mA Output	*Note 2*
14	SYS-LED, RUN, Cathode green LED	RUN#	4 mA Output	
15	COM-LED, ERR, Cathode red LED	ERR#	4 mA Output	
16	SYS-LED, RDY, Cathode yellow LED	RDY#	4 mA Output	
17	Ground	GND		
18	Power Supply	+3.3 V		
19	Peripheral IO	PIO	LVTTL Input / Output	
20	Don't use - needed for isolation			
21	Don't use - needed for isolation			
22	Reference potential	DGND		5
23	Control	CNTR-P	LVTTL	4
24				
25	Receive / Send Data-N	RXD/TXD-N	RS 485	8
26	Receive / Send Data-P	RXD/TXD-P	RS 485	3
27				
28				
29	Positive power supply	VP	+ 5V	6
30				

Table 18: Fieldbus Connector X2 for PROFIBUS-Master/-Slave

Note	Information
1	LVTTL Signals could be only used without the hardware interface on the COM. Ask for special customer version.
2	Yellow LED for COM-CN-DPM / COM-CN-DPS

Table 19: Notes for Fieldbus Connector X2 for PROFIBUS-Master/-Slave

3.3.5 Fieldbus Connector X2 for Ethernet

Fieldbus connector X2 for COM-CN-EN

Pin	Signal	Symbol	Type	Pin at Fieldbus connector RJ45
1				
2	Ethernet, Receive Data N	EN_IN	MAC Input neg.	*Note 1*
3				
4	Ethernet, Receive Data P	EN_IP	MAC Input pos.	*Note 1*
5				
6	Ethernet , Transmit Data N	EN_ON	MAC Output neg.	*Note 1*
7				
8	Ethernet, Transmit Data P	EN_OP	MAC Output pos.	*Note 1*
9				
10				
11				
12				
13	LINK-LED, active low	LNK#	4 mA Output	
14	SYS-LED, RUN, Cathode green LED	RUN#	4 mA Output	
15	ERR-LED, active low	ERR#	4 mA Output	
16	SYS-LED, RDY, Cathode yellow LED	RDY#	4 mA Output	
17	Ground	GND		
18	Power Supply	+3.3 V		
19	Peripheral IO	PIO	LVTTL Input / Output	
20	Don't use - needed for isolation			
21	Don't use - needed for isolation			
22				
23	Transmit Data +	TX+		1
24	Transmit Data -	TX-		2
25	Receive Data +	RX+		3
26				
27				
28	Receive Data -	RX-		6
29				
30				

Table 20: Fieldbus Connector X2 for Ethernet

Note	Information
1	Ethernet Signals could be only used without the hardware interface on the COM. Ask for special customer version.

Table 21: Notes for Fieldbus Connector X2 for Ethernet

3.3.6 Fieldbus Connector X2 for CC-Link-Slave

Fieldbus connector X2 for COM-CN-CCS

Pin	Signal	Symbol	Type	Pin at Fieldbus Connector COMBICON 5pin
1				
2	*Receive Driver Enable*	*RDENL#*	*8 mA Output*	*Note 1*
3				
4	*CC-Link, Transmission period signal*	*SDGATEON*	*12 mA Output*	*Note 1*
5				
6	*CC-Link, Transmission Data*	*SD*	*4 mA Output*	*Note 1*
7				
8	*CC-Link, Received Data (channel 1)*	*RD1*	*TTL Input*	*Note 1*
9				
10				
11				
12				
13	COM-LED, STA, Cathode yellow LED	STA#	4 mA Output	
14	SYS-LED, RUN, Cathode green LED	RUN#	4 mA Output	
15	COM-LED, ERR, Cathode red LED	ERR#	4 mA Output	
16	SYS-LED, RDY, Cathode yellow LED	RDY#	4 mA Output	
17	Ground	GND		
18	Power Supply	+3.3V		
19				
20	Don't use - needed for isolation			
21	Don't use - needed for isolation			
22				
23				
24				
25				
26	CC-Link, Data A	DA		1
27	CC-Link, Data B	DB		2
28	CC-Link, Data Ground	DG		3
29	CC-Link, Function Ground	FG		5
30	CC-Link, Shield	SLD		4

Table 22: Fieldbus Connector X2 for CC-Link-Slave

Note	Information
1	Signals could be only used without the hardware interface on the COM. Ask for a special customer version.

Table 23: Notes for Fieldbus Connector X2 for CC-Link-Slave

3.4 Signals of the Host Interface

3.4.1 Power Supply of the COM-C Modules

Only a single 3.3 V operation voltage is needed for the COM-C Module. The voltage must be regulated and can have a tolerance of ±5% (3.1 - 3.5 Volt) and must be connected twice to the system bus connector X1. To avoid EMI problems we suggested using bypass capacitors in the power supply path. All other special voltages required on the COM-C Module are generated by on board DC/DC converter.

A watchdog circuit on all COM-C Modules supervises the voltage and the microprocessor. If the voltage falls below the voltage reset level of typically 2.93 V (2.85 - 3.00 V) the COM-C are hold in reset state. If the voltage increases over the reset voltage level the COM-C Module begin with the power up sequence. To avoid problems with the power supply we recommended using a voltage of 3.3 V. So the operation will be in the safe range of voltage operation area and short voltage drops, spikes and noise will not produce any reset conditions.

3.4.2 RESET Signal

It is possible to reset the COM-C Module by the extra reset signal RES#. For operation of the COM-C Modules it is important to switch the signal RES# to high level. Then the COM-C Modules begins with the program execution and initialization. This power up time is different for each COM-C Module. Normally, the time is about less than two seconds. The COM-C Module is in reset state when the signal RES# has a static low level. To reset the COM-C Module the RES# signal must be low for more than 10 µs.

Note	During Reset all signals of the Dual-port memory are configured as inputs! The output level could be floating. If the host system needs a stable level a pull-up or pull-down resistor is required on the host board.

3.4.3 The Dual-port Memory Bus of COM

The communication for all input and output data and control commands between the COM-C Module and the host system are exchanged over the dual port memory with the same memory address map. The highest 1 KByte is reserved for the communication mailboxes and some control and parameter values. The rest of the Dual-port memory is divided into two data areas, an input and output process data. Please refer at the special documents of the data model and communication methods.

From host system side, the Dual-port memory looks like static RAM. The COM-C Modules have always an 8 KByte Dual-port memory even if the firmware doesn't need so much memory. Only a few signals are used to control the access to the Dual-port memory.

The maximum driving capability for the data lines is 4 mA.

To avoid data loss through simultaneous access at the same memory cell, it is necessary to use the BUSY# signal.

3.4.4 Address Bus and Data Bus

These signal lines contain the address bus lines A0 till A13 and data bus lines D0 up to D15 of the Dual-port memory. The address and data lines are non-multiplexed. Generally the COM devices use only an 8 Bit data bus (signals D0-D7) but the signals D8-D15, BHE# and WIF# are not connected.

The COM-CA-SCEB devices support additional data bus lines to drive a 16 Bit data interface. If your host interface can support 16 Bit you should connect the WIF# signal to ground. If not please let this uncommitted that 16 Bit modules will work in a compatible 8 Bit mode.

In case of a 16 Bit system you have to generate the BHE# and A0 signal according the following table.

BHE#	A0	Function
0	0	word access
0	1	access high byte
1	0	access low byte
1	1	no access

Table 24: Function Table of the 16 Bit Decode Logic

3.4.5 Dual-Port Memory Control Lines

The user has to integrate the Dual-port memory by mapping the memory space of the Dual-port memory into the address range of the host system.

The access to the Dual-port memory is handled over the control lines write WR#, read RD# and Chip select CS# and could be like standard static RAM. All signals are low active.

3.4.6 Interrupt Line to the Host System

The signal INT# can be used to generate an interrupt at the host system when the COM-C Module writes into the special handshake cells of the Dual-port memory. These cells are used for synchronization of the COM-C Module and the host system and have some handshake bits. For detailed information see the special documentation for the Dual-port memory software protocol. The interrupt will be only cleared if the host reads a handshake cells.

3.4.7 Busy Line to the Host System

The signal BUSY# is used to insert wait states into an current access from host system to a COM-C module. When the signal is active the host must hold on the current transfer.

3.4.8 Interfacing to the Dual-Port Memory of COM-C

If you connect the host system to the Dual-port memory you have to know some details of the functional working of the used microcontroller EC1. Generally it works like a standard SRAM. To ensure the proper operation of the Ethernet and the PROFIBUS when the host systems generates very low speed accesses you have to consider the BUSY# signal.

To solve this problem, the external accesses to the EC1 Dual-port memory are internally synchronized to the EC1 memory cycle. This technique actually removes the possibility of the EC1 and the external interface accessing the Dual-port memory at the same time. The internal memory bus arbitration logic insures that this cannot happen. The external interface may have to wait for several EC1 memory cycles, but this is a short 80-145 ns compared to the 500 ns of the PC/ISA cycle. When the PC/ISA interface starts its access to the Dual-port memory, the request is synchronized, and the memory cycle to the Dual-port memory is completed during a normal EC1 memory cycle of 20.8 ns. The only additional requirement is that the write data has to be valid when the WR# strobe for the external memory access becomes active. Fortunately, this is the normal case.

Note	It is not possible to switch the address line with active CE# and WR# or RD# lines (no burst access). The internal synchronization cycle is started only when CE# and WR' or RD# is going low.

The EC1 does have a busy signal to synchronize the external accesses to the Dual port memory. The BUSY# signal is a normally low signal that goes high once the Dual-port memory access has completed. It will remain high until the external cycle completes. If the external memory cycle is longer than 145 ns, then the BUSY# signal can just be ignored.

For further details please refer the following timing diagrams.

3.4.9 Timing Diagram of COM-C

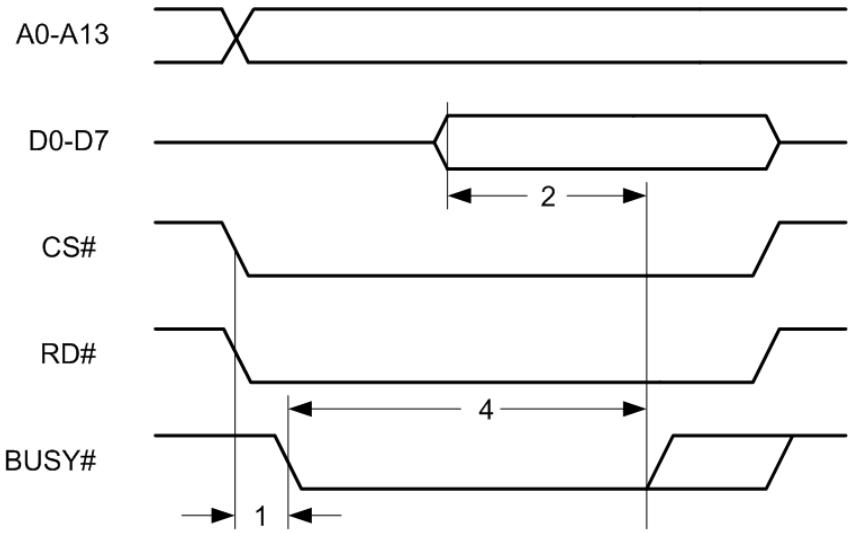


Figure 6: COM Timing Diagram of a Read Cycle at the Dual-Port Memory

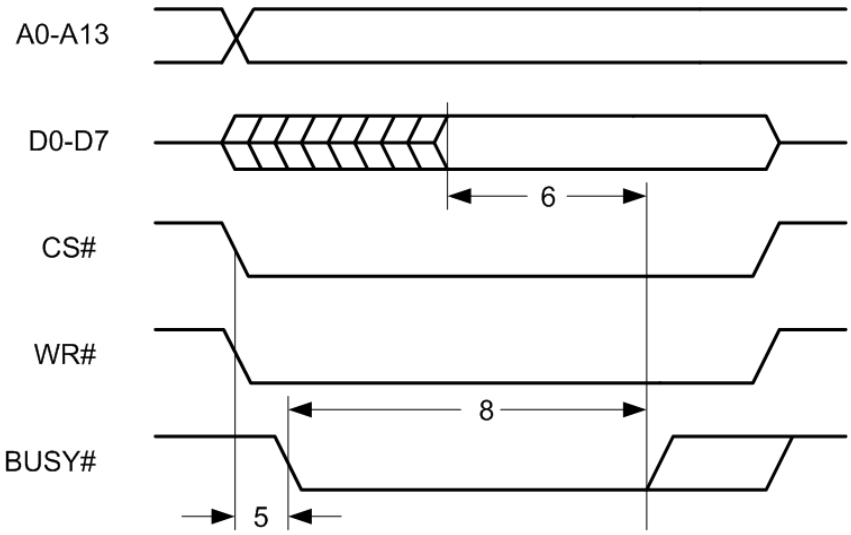


Figure 7: COM Timing Diagram of a Write Cycle at the Dual-Port Memory

Continued on next page.

No.	Description	Min.	Max.	Units
1	CS#, RD# low to BUSY# low	6		ns
2	Read Data available to BUSY# high	12		ns
4	BUSY# low width	0	3 - 7	CLK Cycle
5	CS#, WR# low to BUSY# low	6		ns
6	Write Data setup time to BUSY high	26		ns
8	BUSY# low width	0	3 - 7	CLK Cycle
	CLK Cycle is 20.8 ns with 48 MHz CLK			
	Notes			
	Both CS# and RD# resp. CS# and WR# must be low to start a Dual-port memory cycle			
	If the CS# signal is going low or held low the BUSY# signal goes also low			
	Then after some clock cycle the BUSY# signal is released and going to high level			
	It's not possible to change the address lines with holding low the RD# or WR# signal low			
	The high level between two read and/or write cycles the RD# and WR# signals must be longer held at high level than two CLK Cycle (41.6 ns)			

Table 25: Symbols for COM Timing Diagram of a Read respectively Write Cycle at the Dual-Port Memory

3.4.10 Interfacing to the Dual-Port Memory for COM-CA-SCEB

The connection of the COM-CA-SCEB can be done like for the other COM-C. The timing is a little bit different because of the used SERCON 816 protocol interface chip. Please ask for details of timing and wiring if necessary.

3.4.11 Timing Diagram of COM-CA-SCEB

Ask for the special timing diagram of the COM-CA-SCEB Module if necessary.

3.5 Integration a COM-C Module into a Host System

The following picture shows an example for a connection of a COM- C Module directly to a microprocessor. The signal lines of the COM-C Module are directly connected to the microprocessor AM80C188ER which runs with 3.3 V. For other microprocessor families please check the bus timing and the control signals if additional glue logic is needed.

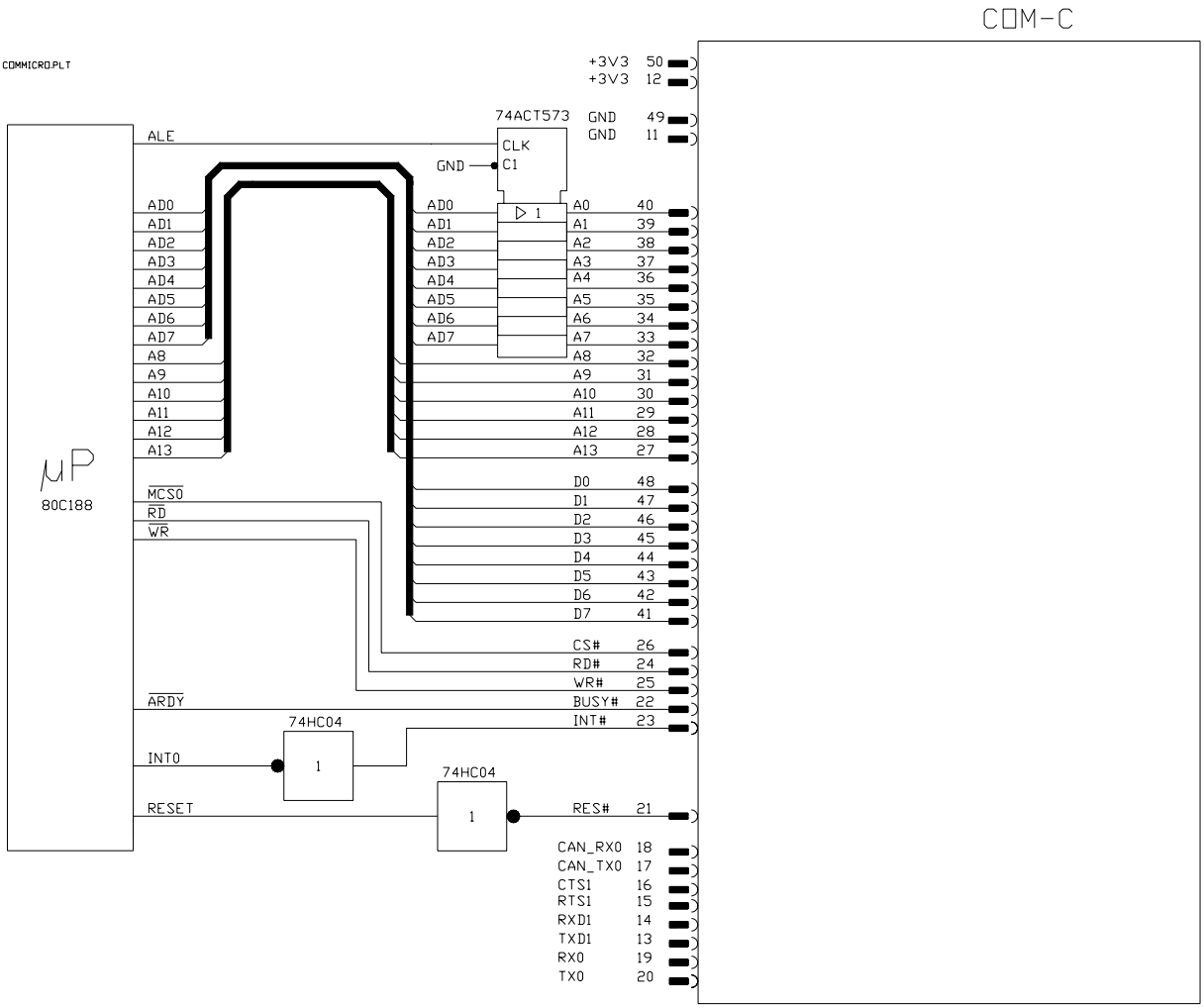


Figure 8: Connection Diagram of a COM-C Module with AM80C188ER Microprocessor

4 LEDs

To get a fast overview about the status of the Module and the Communication two duo color LEDs are placed on the Module respectively can be connected.

SYS defines the general status of the Module, means self test passed, firmware and configuration loaded. On the Module we are using the colors yellow for hardware and basic function oriented information like self test passed, firmware loaded. Green is used for application oriented functions like valid configuration loaded for that LED.

2nd Status LED shows communication errors or status and communication activities. If there is no definition in the fieldbus standard we use red for error and yellow for status. If there is a definition we use these for the functions and colors of that LED. For the Modules described in that revision of the manual it is only for DeviceNet the case.

The outputs can drive max. 4 mA. If this is too less an external driver should be placed before the LEDs.

The following schematic shows how to connect the LEDs.

In some cases the brightness of the LEDs of the duo color LEDs are so different that it makes sense to use different resistors to make it equal. This is shown as an example for the LED COM.

The following figure shows the example how to connect the LED for COM-CN-ASM, COM-CN-COM, COM-CN-COS, COM-CN-DNM, COM-CN-DNS, COM-CN-DPM, COM-CN-DPS and COM-CN-CCS.

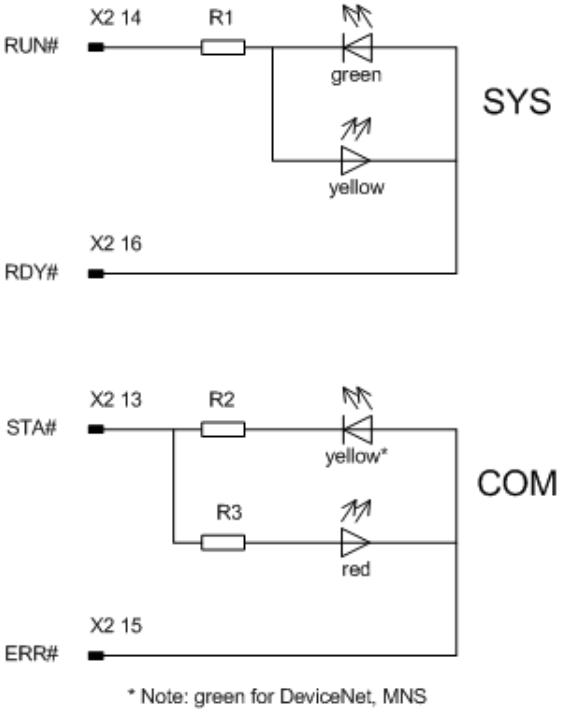


Figure 9: Example how to connect the LEDs COM-CN

This design is possible for all current COM modules except COM-CN-RE.

4.1 LEDs for COM Modules

4.1.1 Ethernet

The LEDs for Ethernet depends on the used firmware.

LED	Color	State	Meaning
SYS	yellow	Flashing cyclic at 1Hz	Device is in boot loader mode and is waiting for firmware download
	yellow	Flashing cyclic at 5Hz	Firmware download is in progress
	yellow	Flashing irregular (*)	Hardware or heavy runtime error detected
	green	On	Communication is running, the device has established at least one connection
	green	Flashing cyclic at 5Hz	No error in the configuration found, communication is stopped or ready for communication but no connection established.
	green	Flashing irregular (*)	Power Up: Configuration missing or faulty, device needs commissioning.
	-	Off	Device has no power supply or hardware defect
NET	green	On	depends on used firmware
		Flashing	depends on used firmware
	red	On	depends on used firmware
		Flashing	depends on used firmware
	red/green	Flashing	depends on used firmware
	-	Off	depends on used firmware

Table 26: LED Ethernet (COM)

(*) 3 times fast at 5 Hz, 8 times between 0,5 Hz und 1 Hz

4.1.2 EtherNet/IP Adapter (Slave)

LED	Color	State	Meaning
SYS	yellow	Flashing cyclic at 1Hz	Device is in boot loader mode and is waiting for firmware download
	yellow	Flashing cyclic at 5Hz	Firmware download is in progress
	yellow	Flashing irregular (*)	Hardware or heavy runtime error detected
	green	On	Slave in cyclic data exchange with the Master
	green	Flashing cyclic at 5Hz	Slave has no cyclic data exchange with the Master
	green	Flashing irregular (*)	Power Up: Configuration missing or faulty, device needs commissioning, Runtime: Host Watchdog timeout
	-	Off	Device has no power supply or hardware defect
COM	yellow	On	A connection to the Ethernet exists
	yellow	Flashing	The device sends/receives Ethernet frames
	red	On	not used
	-	Off	The device has no connection to the Ethernet

Table 27: LED EtherNet/IP Adapter (COM)

(*) 3 times fast at 5 Hz, 8 times between 0.5 Hz and 1 Hz

4.1.3 AS-Interface Master

LED	Color	State	Meaning
SYS	yellow	Flashing cyclic at 1Hz	Device is in boot loader mode and is waiting for firmware download
	yellow	Flashing cyclic at 5Hz	Firmware download is in progress
	yellow	Flashing irregular (*)	Hardware or heavy runtime error detected
	green	On	Communication is running, the device has established at least one configured fieldbus connection
	green	Flashing cyclic at 5Hz	No error in the configuration found, communication is stopped or ready for communication but no connection to any Slave.
	green	Flashing irregular (*)	Power Up: Configuration missing or faulty, device needs commissioning, Runtime: Host Watchdog timeout
	-	Off	Device has no power supply or hardware defect
CH1	green	On	No configuration error, data exchange active
		Flashing	Configuration error, data exchange active
	red	On	Heavy system error or hardware failure
		Flashing	AS-Interface power fail
	red/green	Flashing	Project mode active
	-	Off	No configuration found for the AS Interface channel

Table 28: LED AS-Interface Master (COM)

(*) 3 times fast at 5 Hz, 8 times between 0,5 Hz und 1 Hz

4.1.4 CANopen Master

LED	Color	State	Meaning
SYS	yellow	Flashing cyclic at 1Hz	Device is in boot loader mode and is waiting for firmware download
	yellow	Flashing cyclic at 5Hz	Firmware download is in progress
	yellow	Flashing irregular (*)	Hardware or heavy runtime error detected
	green	On	Communication is running, the device has established at least one configured fieldbus connection
	green	Flashing cyclic at 5Hz	No error in the configuration found, communication is stopped or ready for communication but no connection to any CANopen Node
	green	Flashing irregular (*)	Power Up: Configuration missing or faulty, device needs commissioning, Runtime: Host Watchdog timeout
	-	Off	Device has no power supply or hardware defected
COM	yellow	On	Device sends a telegram
	red	On	Device has detected a communication problem to at least one CANopen Node
	-	Off	Device is ready to receive or is receiving telegrams

Table 29: LED CANopen Master (COM)

(*) 3 times fast at 5 Hz, 8 times between 0,5 Hz und 1 Hz

4.1.5 CANopen Slave

LED	Color	State	Meaning
SYS	yellow	Flashing cyclic at 1Hz	Device is in boot loader mode and is waiting for firmware download
	yellow	Flashing cyclic at 5Hz	Firmware download is in progress
	yellow	Flashing irregular (*)	Hardware or heavy runtime error detected
	green	On	Node is in state Operational
	green	Flashing cyclic at 5Hz	Node is in state preoperational (respectively prepared)
	green	Flashing irregular (*)	Power Up: Configuration missing or faulty, device needs commissioning, Runtime: Host Watchdog timeout
	-	Off	Device has no power supply or hardware defected
COM	yellow	On	Device sends a telegram
	red	On	Node has left the state Operational
	-	Off	Device is ready to receive or is receiving telegrams

Table 30: LED CANopen Slave (COM)

(*) 3 times fast at 5 Hz, 8 times between 0,5 Hz und 1 Hz

4.1.6 CC Link Slave

LED	Color	State	Meaning
SYS	yellow	Flashing cyclic at 1Hz	Device is in boot loader mode and is waiting for firmware download
	yellow	Flashing cyclic at 5Hz	Firmware download is in progress
	yellow	Flashing irregular (*)	Hardware or heavy runtime error detected
	green	On	Slave in cyclic data exchange with CC-Link Master
	green	Flashing cyclic at 5Hz	No error in the configuration found, communication is stopped or ready for communication but the device has no cyclic data exchange with the CC-Link Master
	green	Flashing irregular (*)	Power Up: Configuration missing or faulty, device needs commissioning, Runtime: Host Watchdog timeout
	-	Off	Device has no power supply or hardware defect
STA	yellow	On	Connection to CC-Link Master established
	red	On	CRC error detected or station address not valid (valid is 1 … 64) or baud rate not valid (valid is 0 ... 4)
		Flashing cyclic at 2.5Hz	Station address or baud rate setting was changed since the last network controller reset.
	-	Off	No connection to CC-Link Master

Table 31: LED CC-Link Slave (COM)

(*) 3 times fast at 5 Hz, 8 times between 0,5 Hz und 1 Hz

4.1.7 DeviceNet Master

LED	Color	State	Meaning
SYS	yellow	Flashing cyclic at 1Hz	Device is in boot loader mode and is waiting for firmware download
	yellow	Flashing cyclic at 5Hz	Firmware download is in progress
	yellow	Flashing irregular (*)	Hardware or heavy runtime error detected
	green	On	Communication is running, the device has established at least one configured fieldbus connection
	green	Flashing cyclic at 5Hz	No error in the configuration found, communication is stopped or ready for communication but no connection to any Slave.
	green	Flashing irregular (*)	Power Up: Configuration missing or faulty, device needs commissioning, Runtime: Host Watchdog timeout
	-	Off	Device has no power supply or hardware defect
MNS	green	On	Device is online and has at least one connection in established state
		Flashing	Device is online and has no connection in established state
	red	On	Critical link failure; Device has detected a network error (duplicate MAC-ID or bus off)
		Flashing	Connection timeout
	red/green	Flashing	Communication faulted state
	-	Off	Not powered, not online.

Table 32: LED DeviceNet Master (COM)

(*) 3 times fast at 5 Hz, 8 times between 0,5 Hz und 1 Hz

4.1.8 DeviceNet Slave

LED	Color	State	Meaning
SYS	yellow	Flashing cyclic at 1Hz	Device is in boot loader mode and is waiting for firmware download
	yellow	Flashing cyclic at 5Hz	Firmware download is in progress
	yellow	Flashing irregular (*)	Hardware or heavy runtime error detected
	green	On	Communication is running, the device has established one connection
	green	Flashing cyclic at 5Hz	No error in the configuration found, ready for communication but no established connection
	green	Flashing irregular (*)	Power Up: Configuration missing or faulty, device needs commissioning, Runtime: Host Watchdog timeout
	-	Off	Device has no power supply or hardware defect
MNS	green	On	Device is operational, online and connection is established
		Flashing	Device is operational, online and connection is not established
	red	On	Critical fault
		Flashing	Minor fault
	red/green	Flashing	Communication faulted
	-	Off	Not powered, not online

Table 33: LED DeviceNet Slave (COM)

(*) 3 times fast at 5 Hz, 8 times between 0,5 Hz und 1 Hz

4.1.9 InterBus Slave

LED	Color	State	Meaning
UL	green	On	Protocol chip is supplied with power.
		Off	Reset. Protocol chip is not supplied with power.
RC	green	On	Communication to the IBS Master is possible.
		Off	Communication to the IBS Master is not possible.
BA	green	On	Master active, user data is exchanged
		Flashing irregular	Communication is not possible, system operation is being monitored.
		Off	No user data is exchanged.
RD	yellow	On	The outgoing interface is disabled.
		Off	The outgoing interface is not disabled.
TR	green	On	PCP communication, send or receive
		Off	No PCP data is exchanged.

Table 34: LED InterBus Slave (COM)

4.1.10 PROFIBUS DP Master

LED	Color	State	Meaning
SYS	yellow	Flashing cyclic at 1Hz	Device is in boot loader mode and is waiting for firmware download
	yellow	Flashing cyclic at 5Hz	Firmware download is in progress
	yellow	Flashing irregular (*)	Hardware or heavy runtime error detected
	green	On	Communication is running, the device has established at least one configured fieldbus connection
	green	Flashing cyclic at 5Hz	No error in the configuration found, communication is stopped or ready for communication but no connection to any slave
	green	Flashing irregular (*)	Power Up: Configuration missing or faulty, device needs commissioning, Runtime: Host Watchdog timeout
	-	Off	Device has no power supply or hardware defect
COM	yellow	On	Devise is holding the PROFIBUS Token and is able to transmit telegrams
	yellow	Flashing irregular (**)	Devise is sharing the PROFIBUS Token with other Master devices in the PROFIBUS network
	red	On	Device has found a communication problem to at least one PROFIBUS DP Slave or has detected a short circuit
	-	Off	Device is not configured or has not received the Token permission on the PROFIBUS network

Table 35: LED PROFIBUS DP Master (COM)

(*) 3 times fast at 5 Hz, 8 times between 0,5 Hz und 1 Hz

(**) between 0,5 Hz and 1 Hz

4.1.11 PROFIBUS DP Slave

LED	Color	State	Meaning
SYS	yellow	Flashing cyclic at 1Hz	Device is in boot loader mode and is waiting for firmware download
	yellow	Flashing cyclic at 5Hz	Firmware download is in progress
	yellow	Flashing irregular (*)	Hardware or heavy runtime error detected
	green	On	Slave in cyclic data exchange with DP Master
	green	Flashing cyclic at 5Hz	Slave has no cyclic data exchange with DP Master
	green	Flashing irregular (*)	Power Up: Configuration missing or faulty, device needs commissioning, Runtime: Host Watchdog timeout
	-	Off	Device has no power supply or hardware defect
COM	yellow	On	Slave has received parameter data / configuration data from DP Master and has reached the state data exchange
	red	On	Application program (communication mode: bus synchronous / device controlled) not longer synchronous to bus cycle
	-	Off	Slave has not reached the state data exchange

Table 36: LED PROFIBUS DP Slave (COM)

(*) 3 times fast at 5 Hz, 8 times between 0,5 Hz und 1 Hz

4.1.12 SERCOS (optical)

LED	Color	State	Meaning
RDY	yellow	On	Device is powered and not in reset state
		Off	Device is not powered or in reset state
ERR	red	On or Flashing	Communication errors detected
		Off	No communication errors

Table 37: LED SERCOS (COM)

5 Device Address

The COM-CA Slave Modules have the rotary switch to set up the device address on board. If the Module COM-CN is used for slave the address can be set by software over the dual-port memory.

Note: This feature is not available at the CC-Link Module COM-Cx-CCS, because the CC-Link Communication Controller allows only a direct connection of the address switches.

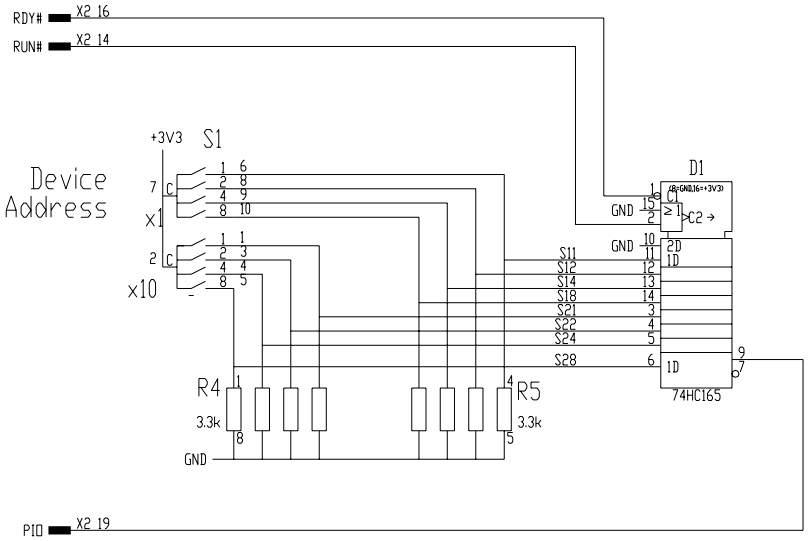


Figure 10: Schematic to read in the device address for COM-CN Slave Modules

6 Diagnostic Interface

6.1 Diagnostic Interface RS232C

The signals TX0 and RX0 are transmit and receive signals to use with an RS232C interface for diagnostic purpose.

Over this diagnostic line you can download a new firmware, configuration files or make only diagnostic during running communication.

The following schematic shows an example for the RS232C interface necessary on the host board. The module has not integrated drivers.

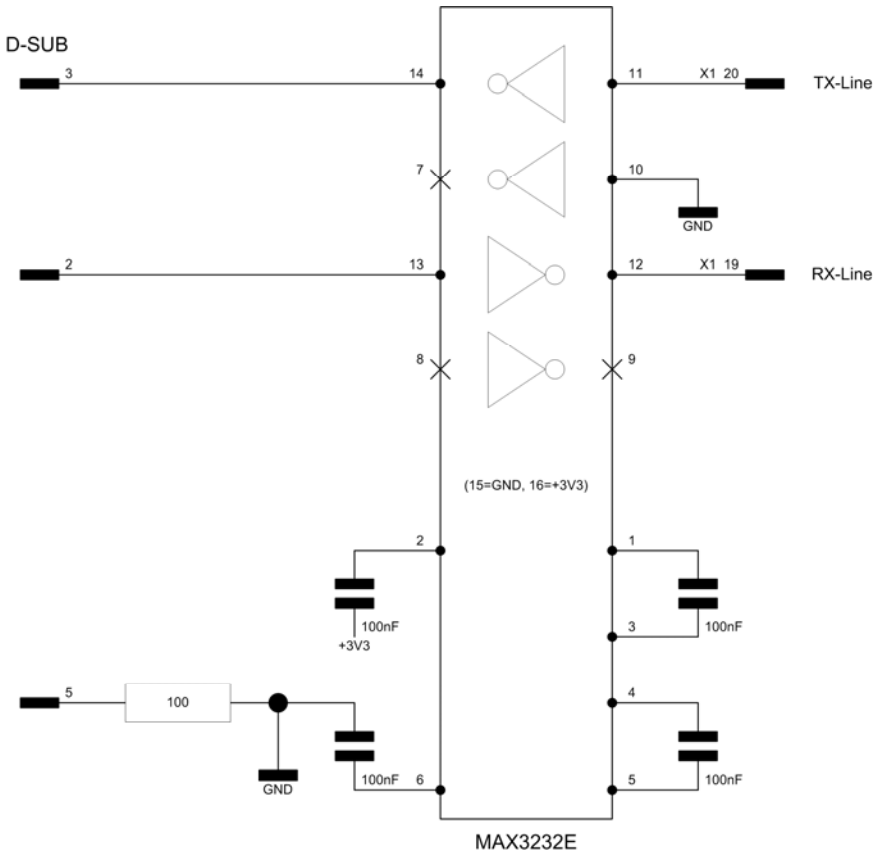


Figure 11: RS232C Interface Circuit for the Diagnostic Interface

7 Technical Data

Operating Condition			Minimum	Maximum
Operating temperature [° C] COM-C	Standard Extended (Note 1)		0° C -20° C	+60° C +70° C
Storage temperature [° C]	Standard Extended		-25° C -40° C	+70° C +85° C
Operating voltage [V]		U1 U2 U3	+3.1 V 11.0 V 29.5 V	+3.5 V 25.0 V 31.6 V
			Typical	**Maximum**
Operating current [mA]	COM-Cx-ASM	U1 U3	280 mA 50 mA	400 mA 70 mA
	COM-Cx-COS COM-Cx-COM	U1	240 mA	400 mA
	COM-Cx-DNS COM-Cx-DNM	U1 U2	170 mA 20 mA	300 mA 55 mA
	COM-Cx-EN	U1	310 mA	400 mA
	COM-Cx-DPM	U1	340 mA	400 mA
	COM-Cx-DPS	U1	300 mA	400 mA
	COM-Cx-IBS	U1	450 mA	1150 mA
	COM-Cx-CCS	U1	400 mA	500 mA
	COM-CN-SCEB	U1	550 mA	700 mA

Table 38: Technical Data – Operating Conditions

Note 1: Modules for extended temperature for the module COM-C have the extension ‘-E’ in the module name. Currently the modules types COM-Cx-DPM-E and COM-Cx-COM-E are available for extended temperature range. For other types please contact us.

EMC			Generic Standard	Basic Standard
Immunity			EN 61000-6-2 (1999) Industrial Environment	EN 61000-4-2 EN 61000-4-3 EN 61000-4-4 EN 61000-4-5 EN 61000-4-6 Details are listed in chapter Product tests
Emission			EN 61000-6-4	EN55011

Table 39: Technical Data - EMC

Mechanical Dimensions			Minimum	Maximum
Dimensions [mm] COM-C			30 x 70 x 21.5 mm	40 x 70 x 21.5 mm for further extension
Weight			35 gr.	40 gr.

Table 40: Technical Data – Mechanical Dimensions

7.1 Product Tests

Immunity				
Generic Standard	Basic Standard	Test	Test level	Error Class
EN 61000-6-2 (1999) Industrial Environment Replacement of EN 50082-2 EN61131-2(1994)+A11, A12 Programmable Controllers	EN 61000-4-2	Electrostatic Discharge		
		Air discharge	± 8kV	A
		Contact discharge	± 4kV	A
	EN 61000-4-3	Radiated Immunity	10V/m 80-1000 MHz	A
	EN 61000-4-4	Burst		
		Power supply lines (+24V only)	± 2kV fr = 5 kHz	A
		Communication lines	± 1kV fr = 5 kHz	A
	EN 51000-4-5	Surge		
		Power supply lines (+24V only) Common mode (+24V / GND to PE)	1 kV 12 Ohm / 9 µF	B
		Power Supply lines (+24V only) Differential mode (+24V to GND)	0.5 kV 2 Ohm / 18 µF	B
		Communication lines (shielded)	1 kV 2 Ohm / 18 µF	B
	EN 61000-4-6	Conducted Immunity		
		Power supply lines (+24V only)	10V 0,15-80 MHz	A
		Communication lines	10V 0,15-80 MHz	A

Table 41: Product Tests - Immunity

Emission				
Generic Standard	Basic Standard	Test	Test level	Error Class
EN 61000-6-4 Industrial Environment Replacement of EN50081-2	EN55011	Conducted emission	0,15-30 MHz	A
	EN55011	Radiated emission	30-1000 MHz 40/50 db (µV/m) at 10 m	A

Table 42: Product Test - Emission

Environmental Conditions				
	Standard	Test	Test level	Error Class
	IEC 60068-2-1 Ad	Cold immunity Min. operating temperature standard extended	 +0°C / 16h -20°C / 16h	A
	IEC 60068-2-2 Bd	Dry heat immunity Max. operating temperature standard extended	 +60°C / 16h +70°C / 16h	A
	IEC 60068-2-3 Ca	Humidity immunity Operating humidity standard extended	 +60°C / 24h / 85% +70°C / 24h / 85% non condensing	A
	IEC 60068-2-1 Ab	Cold withstand Min. storage temperature standard extended	 -25°C / 24h -40°C / 24h	A
	IEC 60068-2-2 Bb	Dry heat withstand Max. storage temperature standard extended	 +70°C / 24h +85°C / 24h	A
	IEC 60068-2-30 Db	Humidity withstand Storage humidity	+60°C / 24h / 95% non condensing	A

Table 43: Product Tests – Environment Conditions

Mechanical Tests				
	IEC 60068-2-6 Fc	Vibration	10-150 Hz $\pm$ 0.075 mm / 10 m/s^2	
	IEC 60068-2-27 Ea	Shock	150 m/s^2 / 11ms	

Table 44: Product Tests – Mechanical Tests

Safety				
	Standard	Test		
			Max. Voltage	Pollution degree
	EN 60947	Rated insulation voltage	500 V	1
	UL94V0	PCB-Material, Connectors		

Table 45: Product Tests – Safety

8 Appendix

8.1 List of Tables

8.2 List of Figures

8.2.1 Contacts

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