CiA® 303

Recommendation

Part 1: Cabling and connector pin assignment

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HISTORY

Date	Changes
1999-10-10	*Publication of Version 1.0* as draft recommendation
2004-09-01	*Publication of Version 1.2* as draft recommendation
2004-12-30	*Publication of Version 1.3* as draft recommendation
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2012-04-27	*Publication of Version 1.8* as public recommendation - minor editorial changes - textual content in several clauses is reworded NOTE: This document has been converted into "docx format". The conversion caused minor layout differences to the predecessor document in "doc format". The technical content word-by-word is the very same.

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CONTENTS

1 Scope

This document recommends cabling and pin assignment of bus connectors for CANopen-based systems. Additionally it provides recommendations for the naming conventions for the bus lines, ground lines and shield connections.

2 References

2.1 Normative references

/ISO11898-2/	ISO 11898-2, Road vehicles - Controller area network (CAN) - Part 2: High-speed medium access unit
/DIN41652/	DIN 41652, Steckverbinder für die Einschubtechnik
/IEC60130-9/	IEC 60130-9:1989, Connectors for frequencies below 3 MHz – Part 9: Circular connectors for radio and associated sound equipment
/IEC60947-5-2/	IEC 60947-5-2:1997, Low-voltage switchgear and control gear – Part 5-2: Control circuit devices and switching elements – Proximity switch
/ANSI/B.93.55M/	ANSI/B.93.55M:1981, (R1988) Hydraulic fluid power solenoid piloted industrial valves – Interface dimensions for electrical connectors
/CiA103/	CiA 103, CANopen intrinsically safe capable physical layer specification
/CiA301/	CiA 301, CANopen application layer and communication profile
/CiA413-1/	CiA 413, CANopen device profile for truck gateways – Part 1: General definitions
/CiA420-1/	CiA 420, CANopen profiles for extruder downstream devices – Part 1: General definitions
/CiA425-1/	CiA 425, CANopen application profile for medical diagnostic add-on modules – Part 1: General definitions
/CiA434-1/	CiA 434, CANopen profiles for laboratory automation systems – Part 1: General definitions
/CiA447-1/	CiA 447, CANopen application profile for special-purpose car add-on devices – Part 1: General definitions

2.2 Informative references

/AN96116/	AN 96116, Application note PCA82C250/251 CAN Transceiver, NXP (formerly: Philips Semiconductors)

3 Abbreviations and definitions

3.1 Abbreviations

AC	Alternating current
CAN	Controller area network
DC	Direct current
EMI	Electromagnetic interference
GND	Ground
Jr.	Junior
SJW	Resynchronization jump width
SHLD	Shield

3.2 Definitions

Bus cable
The bus cable is terminated at both ends by termination resistors.

Stub cable
The stub cable is an un-terminated cable, and should be as short as possible.

Socket connector
The socket connector may be powered.

Plug connector
The plug connector should be not powered; this is the reason why most devices are equipped with plug connectors.

T-connector
The T-connector provides a point of attachment onto the bus cable. Devices may be connected to the network either directly to the T-connector or with a stub cable. T-connectors also provide easy removal of a device without disrupting network operation.

4 Naming convention

If connectors are used that are not mentioned in this document, the pins shall be named (either in the accompanying manual or directly on the device) using the terminology shown in Table 1.

Table 1 – Terminology for connectors

Signal description	Notation
CAN_L bus line (dominant low)	CAN_L or CAN_{low} or CAN-
CAN_H bus line (dominant high)	CAN_H or CAN_{high} or CAN+
CAN ground	CAN_GND or CAN_{GND} or Ground or GND
Optional CAN shield	CAN_SHLD or CAN_{SHIELD} or Shield or SHLD
Optional CAN external positive supply	CAN_V+ or CAN_{V+} or V+ or UC or U_{CAN}
Optional ground	OPT_GND or GND_{opt} or V- or 0 V

5 AC and DC parameters

5.1 Bus cable and termination resistors

The cables, connectors and termination resistors used in CANopen networks shall meet the requirements defined in /ISO11898-2/. In addition, here are given some guidelines for selecting cables and connectors. Table 2 shows some standard values for DC parameters for CANopen networks with less than 64 nodes.

Table 2 – Standard values for DC parameters for CANopen networks

Bus length [m]	Bus cable[1]		Termination resistance [Ω]	Bit-rate [kbit/s]
	Length-related resistance [mΩ/m]	Cross-section [mm^2]		
0 to 40	70	0,25 to 0,34	124	1000 at 40 m
40 to 300	<60	0,34 to 0,6	150 to 300	≤500 at 100 m
300 to 600	<40	0,5 to 0,6	150 to 300	>100 at 500 m
600 to 1000	<26	0,75 to 0,8	150 to 300	>50 at 1 km

[1] Recommended cable AC parameters: 120-Ω impedance and 5-ns/m specific line delay.

NOTE For drop cables a wire cross-section of 0,25 to 0,34 mm^2 may be an appropriate choice in many cases.

Besides the cable impedance, the actual impedance of the connectors shall be considered, if calculating the voltage drop. The transmission resistance of one connector should be in the range of 2,5 to 10 mΩ.

With the assumed values for

minimum dominant value	$V_{diff.out.min}$	= 1,5 V
minimum differential resistance	$R_{diff.min}$	= 20 kΩ
requested differential input voltage	$V_{th.max}$	= 1,0 V
minimum termination resistance	$R_{T.min}$	= 118 Ω

Table 3 defines the maximum wiring length is given for different bus cables and different number of connected bus nodes.

Table 3 – Maximum wiring length

Wire cross-section [mm²]	Maximum length [m] (1)			Maximum length [m] (2)		
	n = 32	n = 64	n = 100	n = 32	n = 64	n = 100
0,25	200	170	150	230	200	170
0,5	360	310	270	420	360	320
0,75	550	470	410	640	550	480

(1) safety margin of 0,2 (2) safety margin of 0,1

NOTE: If driving more than 64 nodes and/or more than 250 m bus length the accuracy of the V_{CC} supply voltage for the /ISO11898-2/ transceiver is recommended to be 5 % or better. You also have to consider the minimum supply voltage of at least 4,75 V when driving 50 Ω load, i.e. 64 bus nodes, and at least 4,9 V when driving 45 Ω load, i.e. 100 bus nodes.

5.2 Un-terminated stub cable

As a rule of thumb, the following relation may be considered for a single stub cable length L_u:

$L_u < t_{PROPSEG} / (50t_p)$

with the specific line delay per length unit t_p=5 ns/m and the time of the propagation segment

$t_{PROPSEG}$ = TSEG1 - SJW

But also the cumulative drop length L_{ui} should be considered, which is given by the following relation:

$\sum^{n}{}_{i=1} L_{ui} < (t_{PROPSEG}/10t_p)$

This effectively leads to a reduction of the maximum trunk cable length by the sum of the actual cumulative drop cable length at a given bit rate. If the above recommendations are met, then the probability of reflection problems is considered to be fairly low.

5.3 CAN ground and galvanic isolation

In complete galvanically isolated CANopen networks CAN ground signal is carried in the cable line. It is connected at only one point with the CAN ground potential. If one CAN device with not galvanically isolated interface is connected to the network, the connection with the CAN ground potential is given. Therefore only one device with not galvanically isolated interface may be connected to the network.

The user is responsible to guarantee that the common mode rejection of the transceivers has still reached the upper limit.

5.4 External power supply

The recommended output voltage at the optional power supply is +18 V_{DC} < V+ < +30 V_{DC} in order to enable the use of standard power supplies (24 V_{DC}).

6 General purpose connectors

6.1 D-SUB 9-pin connector

It is recommended to use a D-SUB 9-pin connector (/DIN41652/ or corresponding international standard) with the pinning provided in Table 4. The device shall provide a plug connector with the pinning provided in the Table 4, in case, the D-SUB 9-pin connector is supported. The pin 3 and pin 6 shall be interconnected within modules. All the pins (including the reserved ones) shall be connected inside of such modules, providing two bus connections, and inside of T-connectors. The intention is to prevent an interruption of any of the wires in the bus cable, assuming a future specification i.e. usage of the reserved pins. By using the pin V+ for supplying transceivers, in case of galvanic isolation, the necessity of extra local power isolation (e.g. DC/DC-converter) is avoided. The pin 8 shall be used, in case an error line is required. Figure 1 illustrates the D-SUB 9-pin connector.

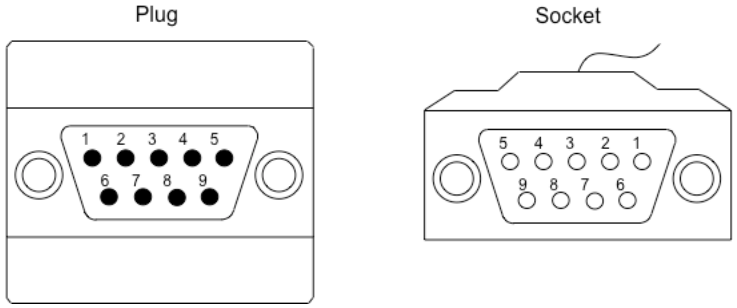

Figure 1 – D-SUB 9-pin connector

Table 4 – Pinning for D-SUB 9-pin connector

Pin	Signal	Description
1	-	Reserved
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	CAN ground
4	-	Reserved
5	(CAN_SHLD)	Optional CAN shield
6	(GND)	Optional ground
7	CAN_H	CAN_H bus line (dominant high)
8	-	Reserved
9	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4

6.2 Multi-pole connector

In case multi-pole connectors (5 x 2) are used (e.g. inside EMI protected housings), the pinning as provided in Table 5 is recommended, because it supports direct connection of the flat cables to D-SUB 9-pin connectors. Figure 2 illustrates the multi-pole connector.

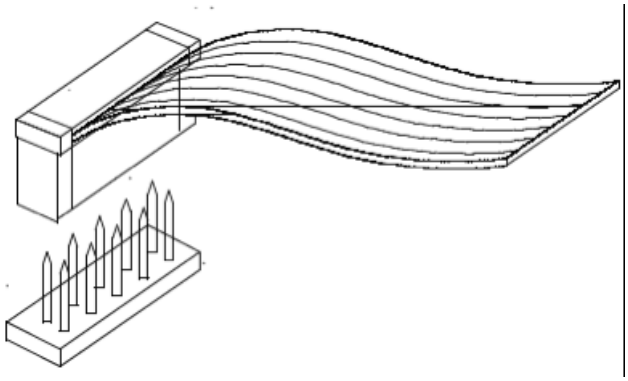

Figure 2 – Multi-pole connector

Table 5 – Pinning for multi-pole connector

Pin	Signal	Description
1	-	Reserved
2	(GND)	Optional ground
3	CAN_L	CAN_L bus line (dominant low)
4	CAN_H	CAN_H bus line (dominant high)
5	CAN_GND	CAN ground
6	-	Reserved
7	-	Reserved
8	(CAN_V+)	Optional CAN external positive supply NOTE For recommended range of external power supply see clause 5.4
9	-	Reserved
10	-	Reserved

6.3 RJ10 connector

The pinning for RJ10 connector is provided in Table 6. Figure 3 illustrates the RJ10 connector.

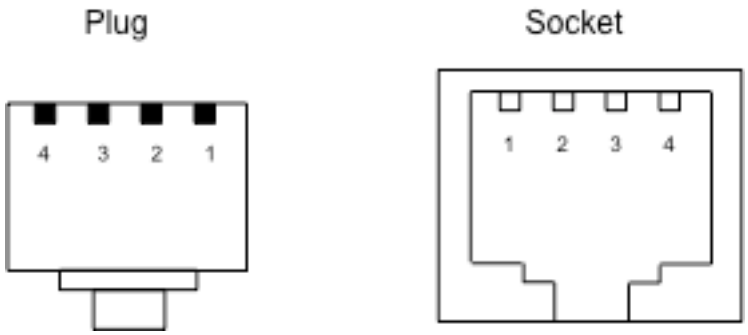

Figure 3 – RJ10 connector

Table 6 – Pinning for RJ10 connector

Pin	Signal	Description
1	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4
2	CAN_H	CAN_H bus line (dominant high)
3	CAN_L	CAN_L bus line (dominant low)
4	CAN_GND	Ground / 0 V / V-

6.4 RJ45 connector

The pinning for RJ45 connector is provided in Table 7. The device shall provide the socket connector, often used with 4 and 8 twisted pair cabling. By using this cables pin 3-6 and 1-2 are twisted pairs. Figure 4 illustrates the RJ45 connector.

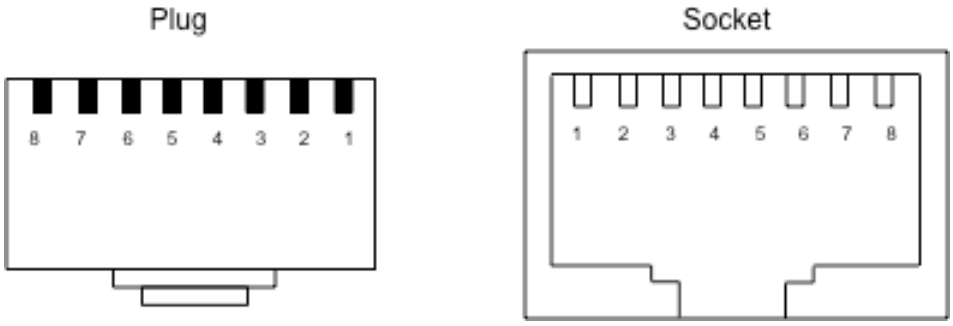

Figure 4 – RJ45 connector

Table 7 – Pinning for RJ45 connector

Pin	Signal	Description
1	CAN_H	CAN_H bus line (dominant high)
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	Ground / 0 V / V-
4	-	Reserved
5	-	Reserved
6	(CAN_SHLD)	Optional CAN Shield
7	(GND)	Optional ground
8	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4

6.5 Open style connector

The recommended pinning for open style connectors is provided in Table 8. The 4-pin open style connectors use either pins 1-4 (version A) or pins 2-5 (version B). The 3-pin open style connectors use pins 2-4. The device provides an open style plug connector. Figure 5 illustrates the open style connector.

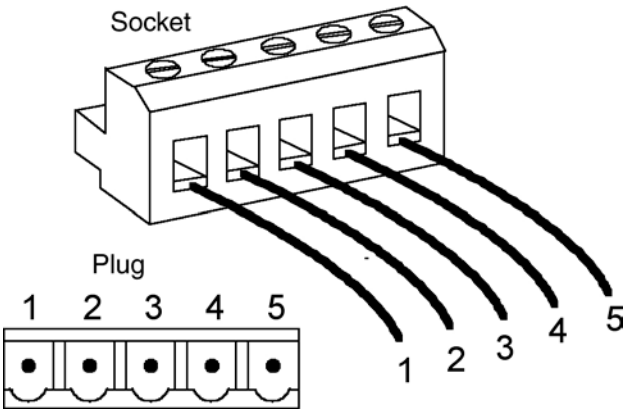

Figure 5 – Open style connector

Table 8 – Pinning for open style connector

Pin	Signal	Description
1	CAN_GND	Ground / 0 V / V-
2	CAN_L	CAN_L bus line (dominant low)
3	(CAN_SHLD)	Optional CAN shield
4	CAN_H	CAN_H bus line (dominant high)
5	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4

6.6 em069A-3 connector

The pinning for the "em069A-3“ connector is provided in Table 9. The connector is called "em069A-3“ and is manufactured by Embedor, Beijing (CN). Figure 6 illustrates an "em069A-3“connector.

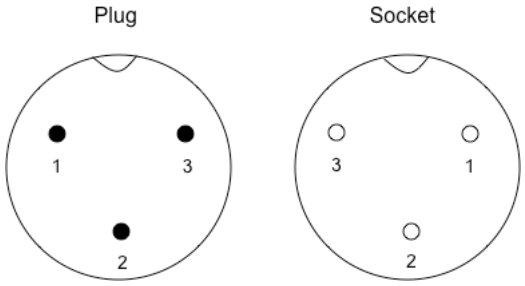

Figure 6 – "em069A-3“connector

Table 9 – Pinning for "em069A-3“ connector

Pin	Signal	Description
1	CAN_L	CAN_L bus line (dominant low)
2	CAN_GND	CAN ground
3	CAN_H	CAN_H bus line (dominant high)

7 Industrial connectors

7.1 5-pin “mini” style connector

The recommended pinning for the so-called 5-pin “mini” style connectors (see /ANSI/B.93.55M/) is provided in Table 10. The device shall provide the plug connector. The plug contacts shall meet 7/8-16 UN2A connection thread. The socket contacts shall meet 7/8-16 UN2B connection thread. Figure 7 illustrates the 5-pin “mini” style connector.

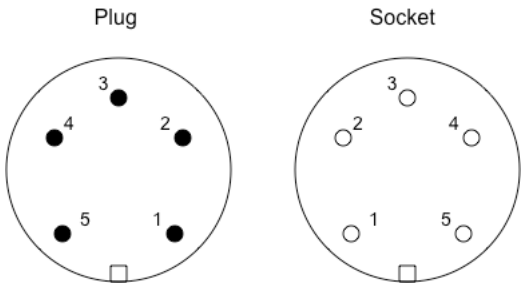

Figure 7 – 5-pin “mini” style connector

Table 10 – Pinning for 5-pin “mini” style connector

Pin	Signal	Description
1	(CAN_SHLD)	Optional CAN shield
2	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4
3	CAN_GND	Ground / 0V / V-
4	CAN_H	CAN_H bus line (dominant high)
5	CAN_L	CAN_L bus line (dominant low)

7.2 5-pin “micro” style connector

The recommended pinning for a 5-pin “micro” style connector (M12) is provided in Table 11. The device shall provide the plug connector /see IEC 60947-5-2/. The plug connector shall mate with Lumberg RST5-56/xm. The socket connector shall mate with Lumberg RKT5-56/xm or the equivalent. Figure 8 illustrates the 5-pin “micro” style connector.

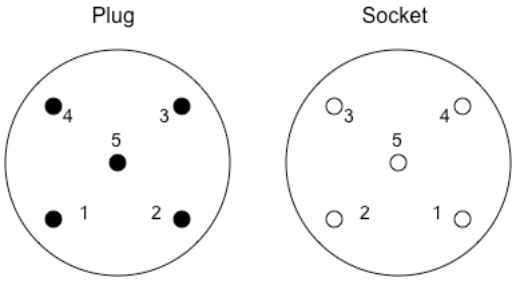

Figure 8 – 5-pin “micro” style connector

Table 11 – Pinning for 5-pin “micro” style connector

Pin	Signal	Description
1	(CAN_SHLD)	Optional CAN shield
2	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4
3	CAN_GND	Ground / 0V / V-
4	CAN_H	CAN_H bus line (dominant high)
5	CAN_L	CAN_L bus line (dominant low)

7.3 5-pin “pico” style connector

The definition and pinning profile of the 5-pin “pico” style connector is provided in /CiA103/.

7.4 Han-Quintax®

The definition and pinning profile is provided in /CiA420-1/.

8 Special purpose connectors

8.1 Round connectors

8.1.1 7-pin round connector

The pinning for 7-pin round connector is provided in Table 12. The device shall provide the socket connector. This type is known as “DIN” connector, e.g. manufacturer Binder Series 680. Figure 9 illustrates the 7-pin round connector.

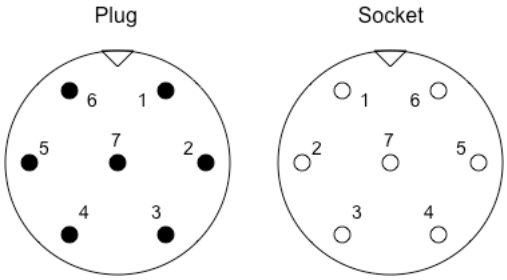

Figure 9 – 7-pin round connector

Table 12 – Pinning for 7-pin round connector

Pin	Signal	Description
1	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4
2	CAN_GND	Ground / 0 V / V-
3	CAN_H	CAN_H bus line (dominant high)
4	CAN_L	CAN_L bus line (dominant low)
5	DIL-1	DIP switch 1 connected with CAN_V+
6	DIL-2	DIP switch 2 connected with CAN_V+
7	DIL-3	DIP switch 3 connected with CAN_V+

8.1.2 8-pin round connector

The pinning for 8-pin round connector is provided in Table 13. The device shall provide the socket connector. This connector type corresponds to /IEC60130-9/, e.g. manufacturer Binder Series 723 or equivalent. Figure 10 illustrates the 8-pin round connector.

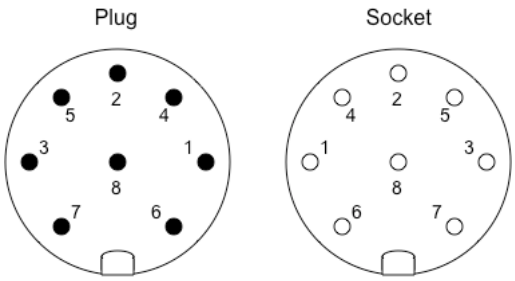

Figure 10 – 8-pin round connector

Table 13 – Pinning for 8-pin round connector

Pin	Signal	Description
1	CAN_V+	CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4
2	GND	0 V
3	CAN_H	CAN_H bus line (dominant high)
4	CAN_L	CAN_L bus line (dominant low)
5	CAN_GND	Ground
6	-	Reserved
7	-	Reserved
8	-	Reserved

8.1.3 9-pin round connector

The pinning for 9-pin round connector is provided in Table 14. The socket connector type is RC-09S1N and the plug connector type is RC-09P1N manufactured by Coninvers or similar manufacturers. Figure 11 illustrates the 9-pin round connector.

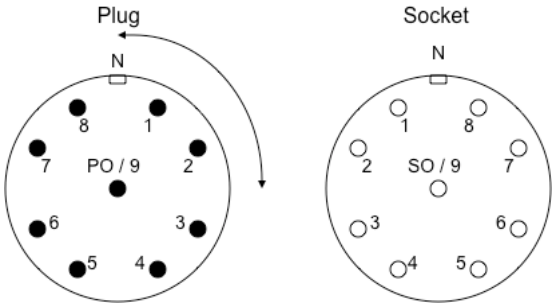

Figure 11 – 9-pin round connector

Table 14 – Pinning for 9-pin round connector

Pin	Signal	Description
1	CAN_H	CAN_H bus line (dominant high)
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	Ground / 0 V / V
4	-	Reserved
5	-	Reserved
6	-	Reserved
7	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4
8	(GND)	Optional ground
9	-	Reserved

8.1.4 10-pin round connector

The definition and pinning profile for this connector type is provided in /CiA425-1/.

8.1.5 Mini-snap 10-pin round connector

The definition and pinning profile for this connector type is provided in /CiA425-1/.

8.1.6 12-pin round flange connector

The pinning for 12-pin round flange connector is provided in Table 15. The socket connector type is RC12S1N121 and the plug connector type is RC-12P1N121, manufactured by Coninvers or similar manufacturers. Figure 12 shows the 12-pin round flange connector.

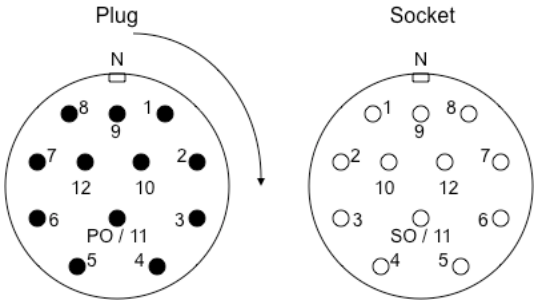

Figure 12 – 12-pin round flange connector

Table 15 – Pinning for 12-pin round flange connector

Pin	Signal	Description
1	-	Reserved
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	Ground / 0 V / V-
4	-	Reserved
5	-	Reserved
6	-	Reserved
7	CAN_H	CAN_H bus line (dominant high)
8	-	Not used
9	-	Reserved
10	(GND)	Optional ground
11	-	Reserved
12	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4

8.1.7 9-pin flange round T-connector with ID-switch

The pinning for 9-pin flange round T-connector with ID-switch is provided in Table 16. This connector type is called “Zylin series R2.5” and is manufactured by LAPP Kabel/Contact Connectors. The setting of up to 16 node-IDs by hardware is changeable by means of CANopen services. This T-connector is designed for using a 4-wire bus cable. The diameter of this T-connector is about 25 mm. Figure 13 shows the 9-pin flange round T-connector with ID-switch.

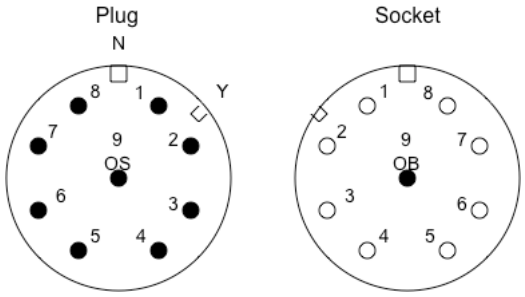

Figure 13 – 9-pin flange round T-connector with ID-switch

Table 16 – Pinning for 9-pin flange round T-connector with ID-switch

Pin	Signal	Description
1	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4
2	CAN_H	CAN_H bus line (dominant high)
3	DIL-1	DIP switch 1 connected with CAN_V+
4	DIL-2	DIP switch 2 connected with CAN_V+
5	DIL-3	DIP switch 3 connected with CAN_V+
6	DIL-4	DIP switch 4 connected with CAN_V+
7	CAN_L	CAN_L bus line (dominant low)
8	CAN_GND	Ground / 0 V / V-
9	-	Reserved

8.2 Han-Brid® CU

8.2.1 General

This clause describes pinning of the housing and cable side of the Han-Brid® CU connector, which is manufactured by Harting.

8.2.2 Housing-side

The pinning for the housing-side of “Han-Brid® CU” is provided in Table 17. Figure 14 illustrates the housing-side of “Han-Brid® CU”.

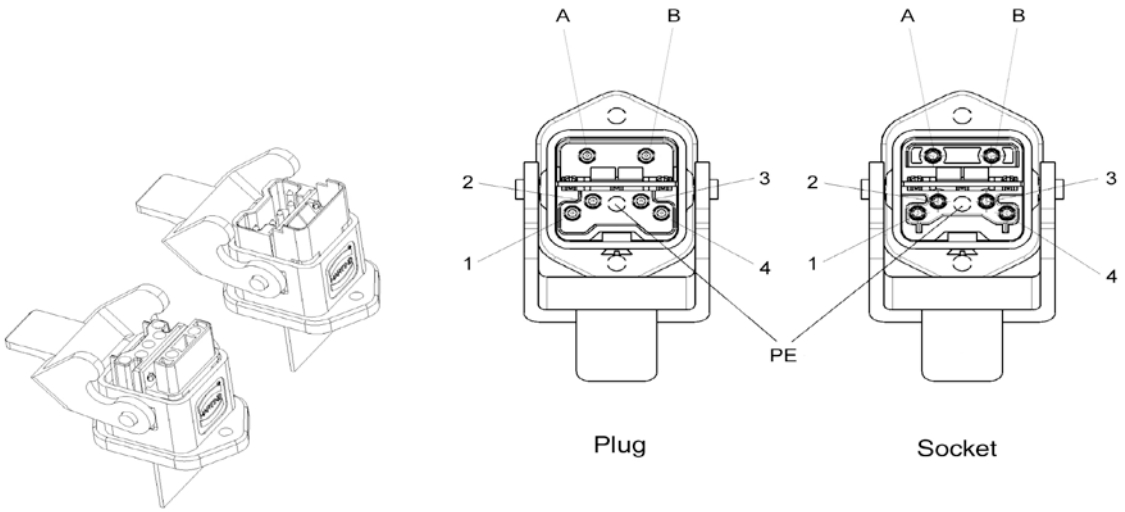

Figure 14 – Housing-side of “Han-Brid® CU”

Table 17 – Pinning for housing-side of “Han-Brid® CU”

Pin	Signal	Description
1	CAN_V+	Optional unswitched CAN external positive supply NOTE For recommended range of external power supply see clause 5.4
2	CAN_GND	Optional unswitched CAN ground
3	CAN_GND	Optional switched CAN ground
4	CAN_V+	Optional switched CAN external positive supply NOTE For recommended range of external power supply see clause 5.4
A	CAN_L	CAN_L bus line (dominant low)
B	CAN_H	CAN_H bus line (dominant high)
PE	PE	Optional PE

8.2.3 Cable-side

The pinning for the cable-side of “Han-Brid® CU” is provided in Table 18. Figure 15 illustrates the cable-side of “Han-Brid® CU”.

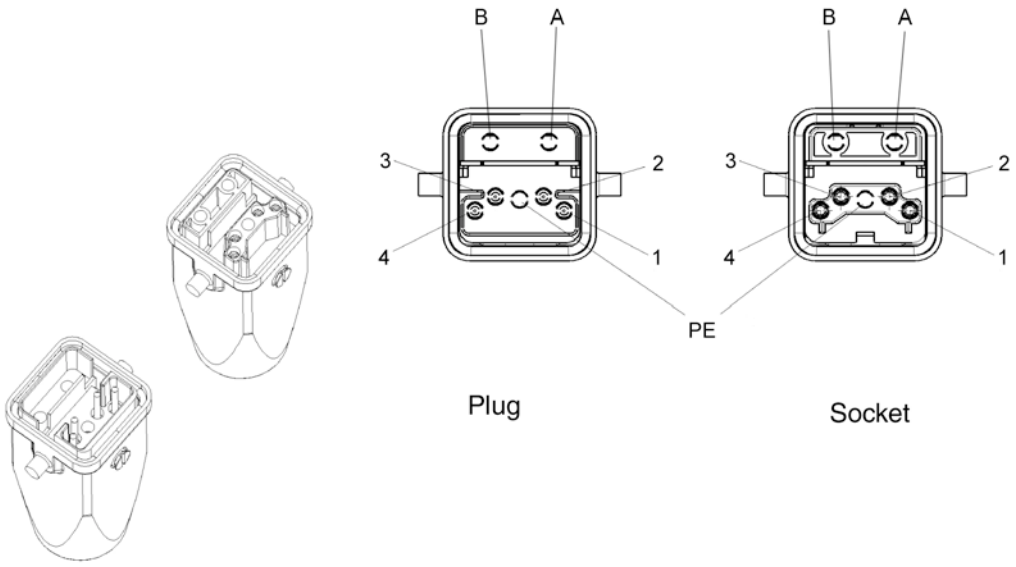

Figure 15 – Cable-side of “Han-Brid® CU”

Table 18 – Pinning for cable-side of “Han-Brid® CU”

Pin	Signal	Description
1	CAN_V+	Optional unswitched CAN external positive supply NOTE For recommended range of external power supply see clause 5.4
2	CAN_GND	Optional unswitched CAN ground
3	CAN_GND	Optional switched CAN ground
4	CAN_V+	Optional switched CAN external positive supply NOTE For recommended range of external power supply see clause 5.4
A	CAN_L	CAN_L bus line (dominant low)
B	CAN_H	CAN_H bus line (dominant high)
PE	PE	Optional PE

8.3 IEEE1394/Firewire connector with shielding

8.3.1 Chaining of the bus on the node

The recommended pinning for IEEE1394/Firewire connector with shielding with chaining of the bus on the node is provided in Table 19. The cable shall provide the socket connector and changes the terminals of the two twisted shielded pairs. The device shall provide two plug connectors with pairs switching according the IEEE1394 mechanical specification to allow usage of standard cables. A master node may provide only the plug corresponding to the beginning of segment (see Figure 16). Figure 16 to Figure 18 illustrate the chaining of the bus on the node for IEEE1394/Firewire connector with shielding.

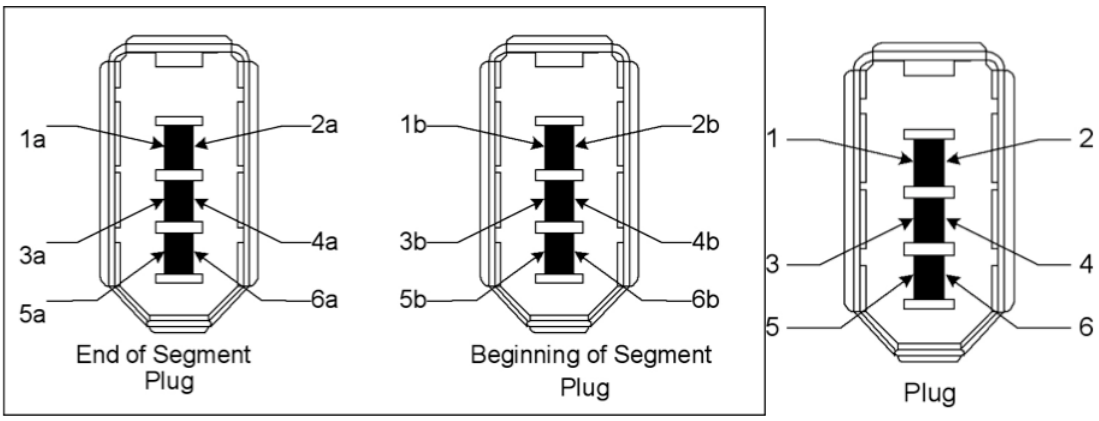

Figure 16 – IEEE1394/Firewire plug connector with shielding

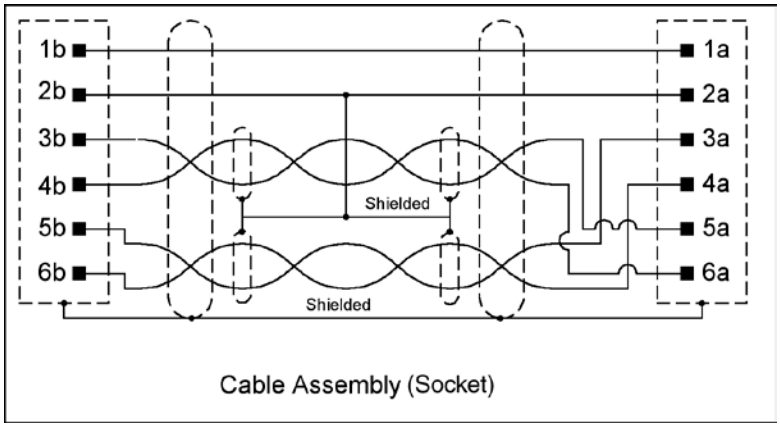

Figure 17 – Interconnection of the bus segments

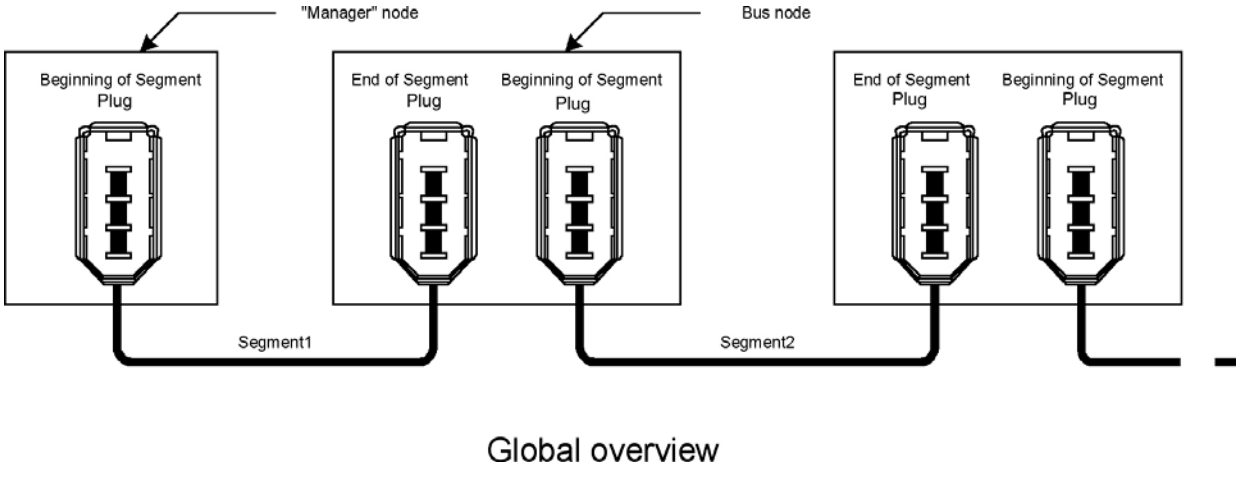

Figure 18 – Global overview

Table 19 – Pinning for IEEE1394/Firewire connector with shielding with chaining of the bus on the node

End of segment Pin	Beginning of segment Pin	Signal	Description
1a	1b	(CAN_V+)	CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4
2a	2b	CAN_GND	0 V
3a	5b	CAN_H	CAN_H bus line (dominant high)
4a	6b	CAN_L	CAN_L bus line (dominant low)
5a	3b	-	Reserved
6a	4b	-	Reserved
Shield	Shield	(CAN_SHLD)	Optional CAN shield

8.3.2 No chaining of the bus on the node

The recommended pinning for IEEE1394/Firewire connector with shielding without chaining of the bus on the node is provided in Table 20. The device shall provide the plug connector. The cable shall provide the socket connector. Therefore it is possible to connect a device with one plug at end of a segment (see Figure 19) provided by a device with two plugs according clause 8.3.1. Figure 19 illustrates the IEEE1394/Firewire socket and plug connector with shielding without chaining of the bus on the node.

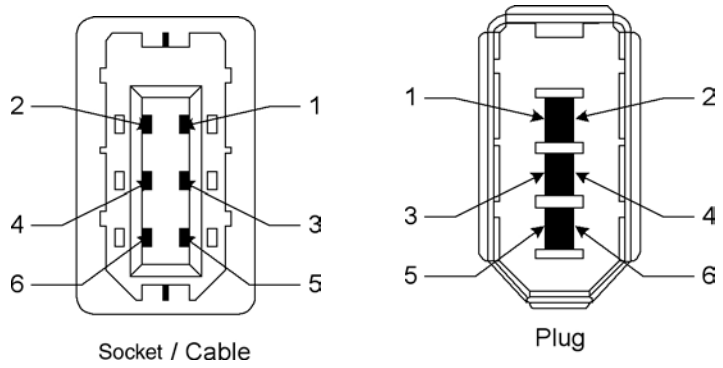

Figure 19 – IEEE1394/Firewire socket and plug connector with shielding without chaining of the bus on the node

Table 20 – Pinning for IEEE1394/Firewire connector with shielding without chaining of the bus on the node

Pin	Signal	Description
1	(CAN_V+)	CAN external positive supply (dedicated for supply of transceiver and optocoupler, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4
2	CAN_GND	0 V
3	CAN_H	CAN_H bus line (dominant high)
4	CAN_L	CAN_L bus line (dominant low)
5	-	Reserved
6	-	Reserved
Shield	(CAN_SHLD)	Optional CAN shield

8.4 Lift connectors

8.4.1 Mini-Fit Jr.™ connector

The pinning for the Mini-Fit Jr.™ connector is provided in Table 21. The Mini-Fit Jr.™ connector is manufactured by Molex. Figure 20 illustrates the "Mini-Fit Jr.“ connector.

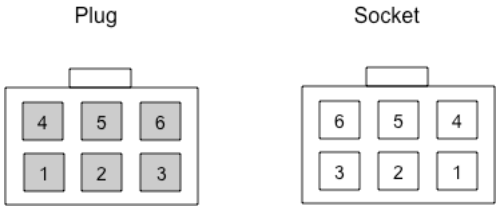

Figure 20 – Mini-Fit Jr.™ connector

Table 21 – Pinning for Mini-Fit Jr.™ connector

Pin	Signal	Description
1	CAN_SHLD	Optional CAN shield
2	CAN_H	CAN_H bus line (dominant high)
3	CAN_L	CAN_L bus line (dominant low)
4	-	Reserved
5	CAN_GND	CAN ground
6	CAN_V+	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4

8.5 Automotive/Vehicle connectors

8.5.1 7-pin socket connector

The definition and pinning profile of the 7-pin socket connector are provided in /CiA413-1/.

8.5.2 9-pin socket connector

The definition and pinning profile of the 9-pin socket connector are provided in /CiA413-1/.

8.5.3 18-pin VDA interface connector

The definition and pinning profile of the 18-pin VDA interface connector (e.g. micro quadlok system 0.64 from Tyco Electronics) are provided in /CiA447-1/.

8.5.4 2-pin power connector

The definition and pinning profile of the 2-pin power connector (e.g. AMP926474-1 from Tyco Electronics) are provided in /CiA447-1/.

8.6 Laboratory automation connectors

8.6.1 Header 10-pin plug connector

The definition and pinning profile of the header 10-pin plug connector are provided in /CiA434-1/.

8.7 Connectors for medical applications

8.7.1 D-SUB 15-pin connector

The definition and pinning profile of the D-SUB 15-pin connector are provided in /CiA425-1/.

8.8 Connectors for redundant communication

8.8.1 D-SUB 15-pin connector

The pinning for D-SUB 15-pin connector is given in Table 22. Figure 21 illustrates the D-SUB 15-pin connector.

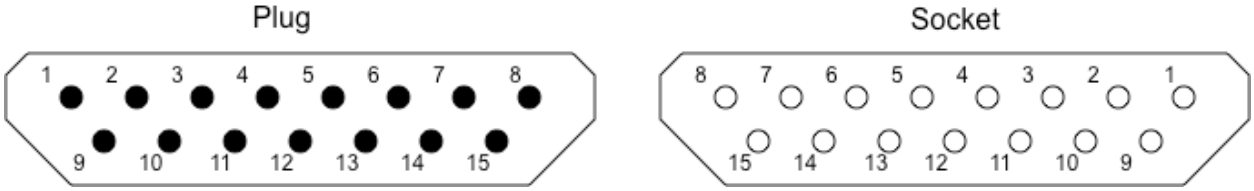

Figure 21 – D-SUB 15-pin connector

Table 22 - Pinning for D-SUB 15-pin connector

Pin	Signal	Description
1	CAN1_L	CAN1 low
2	CAN1_GND	CAN1 ground
3	CAN2_L	CAN2 low
4	CAN2_GND	CAN2 ground
5	Parity	Adjustment “odd parity”
6	NODENO_3	*See NODENO_x*
7	NODENO_1	*See NODENO_x*
8	GND	Logic ground
9	CAN1_H	CAN1 high
10	CAN1_HR	Termination resistor
11	CAN2_H	CAN2 high
12	CAN2_HR	Termination resistor
13	NODENO_4	*See NODENO_x*
14	NODENO_2	*See NODENO_x*
15	NODENO_0	*See NODENO_x*

NODENO_x: Adjustment of the node ID ext. CAN

8.8.2 8-pin Ampseal connector

The pinning for the 8-pin Ampseal connector is illustrated in Table 23. The Ampseal connector is manufactured by Tyco Electronics. The CAN1 line (pin 1 to 4) shall be used if only one CAN line is used. If two CAN lines are used, then the CAN1 line shall be considered as the default line and the CAN2 line (pin 5 to 8) as the redundant line. Figure 22 illustrates the 8-pin Ampseal connector (header assembly).

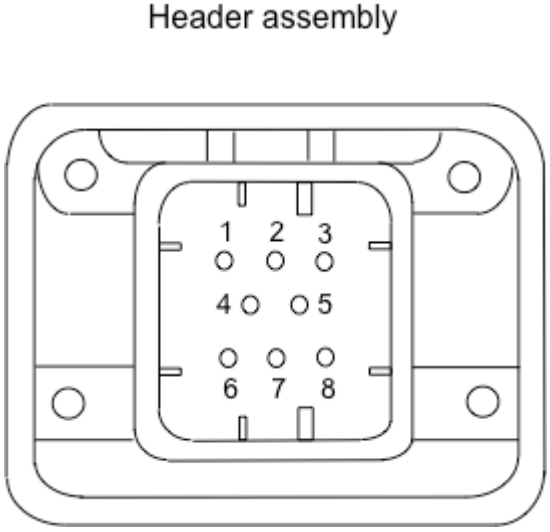

Figure 22 – 8-pin Ampseal connector

Table 23 – Pinning for 8-pin Ampseal connector

Pin	Signal	Description
1	CAN1_L	CAN1_L bus line (dominant low)
2	CAN1_H	CAN1_H bus line (dominant high)
3	CAN1_V+	Optional CAN1 external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4
4	CAN1_GND	CAN1 ground
5	CAN2_GND	CAN2 ground
6	CAN2_V+	Optional CAN2 external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies) NOTE For recommended range of external power supply see clause 5.4
7	CAN2_L	CAN2_L bus line (dominant low)
8	CAN2_H	CAN2_H bus line (dominant high)

