CiA® 303

Recommendation

Part 1: Cabling and connector pin assignment

Version: 1.9.0
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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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2017-09-18	*Publication of Version 1.9.0* as public recommendation - adding Micro-Fit 3.0™ connector - minor editorial changes

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CONTENTS

1 Scope

This document provides device and network design recommendations for CANopen physical layer. Additionally, it provides the guidelines for selecting cables and connectors for use in CANopen systems.

2 References

2.1 Normative references

/ISO11898-2/ ISO 11898-2:2003, Road vehicles - Controller area network (CAN) - Part 2: High-speed medium access unit

/DIN41652/ DIN 41652-1:1990-06, Steckverbinder für die Einschubtechnik, trapezförmig, runde Kontakte ø 1 mm; Gemeinsame Einbaumerkmale und Maße; Bauformenübersicht (NOTE)

/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 version 1.0.1, CANopen intrinsically safe capable physical layer specification

/CiA301/ CiA 301 version 4.2, CANopen application layer and communication profile

/CiA413-1/ CiA 413 version 3.0.0, CANopen device profile for truck gateways – Part 1: General definitions

/CiA420-1/ CiA 420 version 3.2.0, CANopen profiles for extruder downstream devices – Part 1: General definitions

/CiA425-1/ CiA 425 version 2.1.0, CANopen application profile for medical diagnostic add-on modules – Part 1: General definitions

/CiA434-1/ CiA 434 version 2.0.0, CANopen profiles for laboratory automation systems – Part 1: General definitions

/CiA447-1/ CiA 447 version 2.1.0, CANopen application profile for special-purpose car add-on devices – Part 1: General definitions

NOTE Title in English: Rack and panel connectors, trapezoidal, round contacts ø 1 mm; common mounting features and dimensions; survey of types

2.2 Informative references

/AN96116/ AN96116, 1996, Application note PCA82C250/251 CAN Transceiver, Philips Electronics N.V.

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

3.2.1 bus cable
CAN cable, terminated at both ends by termination resistors

3.2.2 drop cable
short branch off a CAN cable not terminated by a termination resistor and connected to the device

3.2.3 hybrid connector
electric connector for CAN cable with both male-ended pins and female-ended pin receptacles

3.2.4 socket connector
female-ended electric connector for a bus cable or a drop cable

3.2.5 stub cable
short branch off a CAN cable not terminated by a termination resistor

3.2.6 plug connector
male-ended electric connector for the device or a drop cable connected to the bus cable

3.2.7 T-connector
T-shape electric connector for CAN cable with three connection points with either plug, socket or hybrid connector

3.2.8 trunk cable
bus cable

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 (NOTE)	CAN_V+ or CAN_{V+} or V+ or UC or U_{CAN}
Optional ground	OPT_GND, GND_{opt}, 0 V, V-
NOTE It is dedicated for supply of transceiver and opto-couplers, if galvanic isolation of the bus node applies. For recommended range of external power supply see clause 5.4.	

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/. It is recommended to keep the stub cable as short as possible. The socket connector may be powered. The plug connector shall not be powered; !!this is the reason why most devices are equipped with plug connectors. 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.

Table 2 shows some recommended values for CANopen networks with less than 64 nodes (source: Table 4, and Table 5 in /AN96116/).

Table 2 – Recommended values for CANopen networks

Bus length [m]	Bus cable[1]		Termination resistance [Ω]	Bit-rate [kbit/s]
	Length-related resistance [mΩ/m]	Cross-section [mm²]		
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 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 mm² 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 (source: /AN96116/) 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 (source: Table 6 in /AN96116/).

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 Stub cable

As a rule of thumb, the following relation may be considered for a single stub cable length L_u (source: /AN96116/):

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

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 recommended pinout provided in Table 4. The device shall provide a plug connector. Pins 3 and 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.

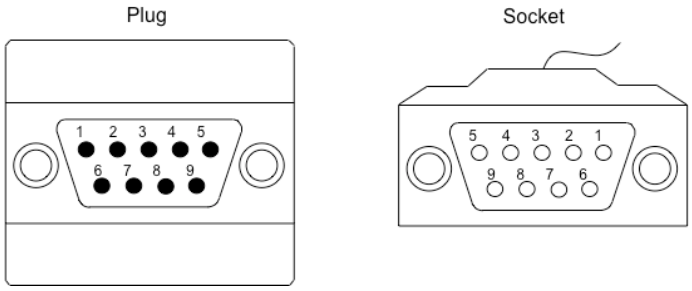


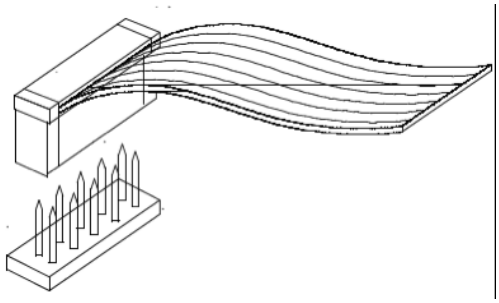
Figure 1 – D-SUB 9-pin connector

Table 4 – Pinout 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

6.2 Multi-pole connector

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



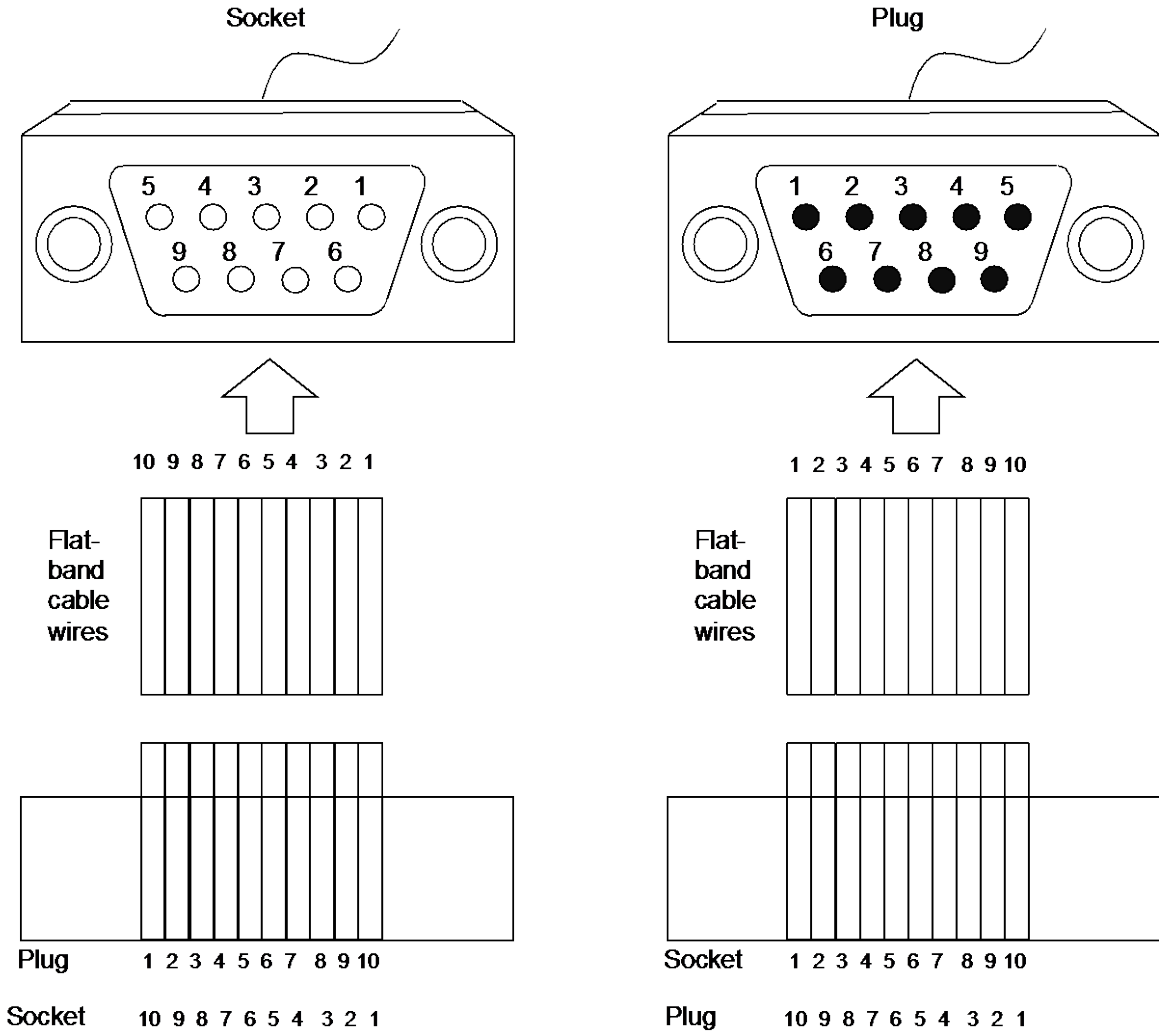


Figure 2 – Multi-pole cable (flat band) with D-SUB 9-pin and multi-pole connectors

Table 5 – Pinout for multi-pole connector and compatibility to D-SUB 9-pin connector

Pin		Signal	Description
Multi-pole connector	D-SUB 9-pin connector		
1	1	-	Reserved
2	6	(GND)	Optional ground
3	2	CAN_L	CAN_L bus line (dominant low)
4	7	CAN_H	CAN_H bus line (dominant high)
5	3	CAN_GND	CAN ground
6	8	-	Reserved
7	4	-	Reserved
8	9	(CAN_V+)	Optional CAN external positive supply
9	5	-	Reserved
10	-	-	Not used

6.3 RJ10 connector

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

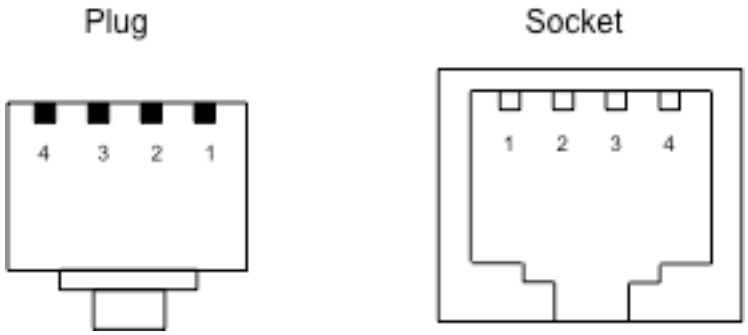


Figure 3 – RJ10 connector

Table 6 – Pinout for RJ10 connector

Pin	Signal	Description
1	(CAN_V+)	Optional CAN external positive supply
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 recommended pinout for RJ45 connector is provided in Table 7. The device shall provide the socket connector, often used with 4 and 8 twisted pair cabling. The pin 3-6 and 1-2 are twisted pairs. Figure 4 illustrates the RJ45 connector.

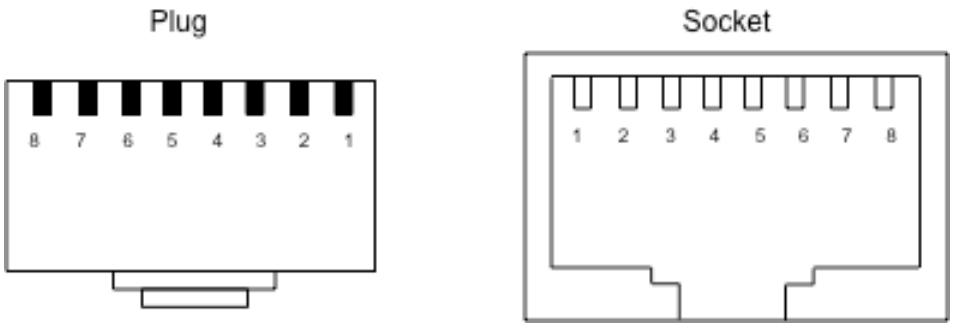


Figure 4 – RJ45 connector

Table 7 – Pinout 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

6.5 Open style connector

The recommended pinout 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.

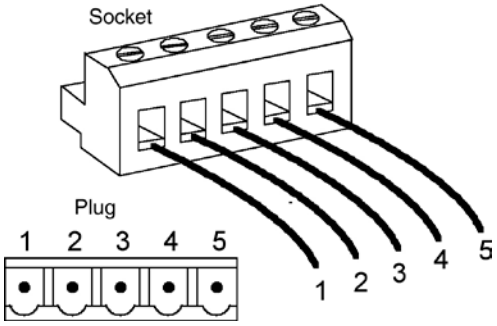


Figure 5 – Open style connector

Table 8 – Pinout 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

6.6 em069A-3 connector

The recommended pinout 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 a "em069A-3“connector.

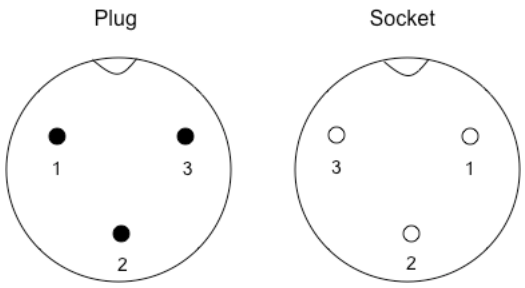


Figure 6 – "em069A-3“connector

Table 9 – Pinout 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 pinout for the 5-pin “mini” style connectors (see /ANSI/B.93.55M/) is provided in Table 10. The device shall provide the plug connector. The plug shall fit in housing with 7/8-16 UN2A thread. The socket shall fit in housing with 7/8-16 UN2B thread. Figure 7 illustrates the 5-pin “mini” style connector.

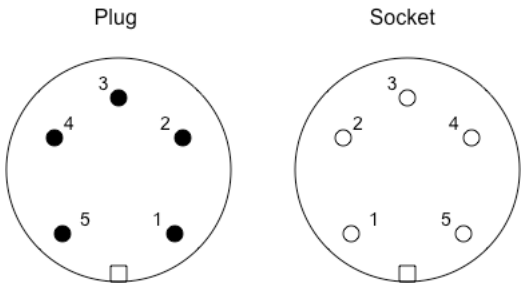


Figure 7 – 5-pin “mini” style connector

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

Pin	Signal	Description
1	(CAN_SHLD)	Optional CAN shield
2	(CAN_V+)	Optional CAN external positive supply
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 pinout 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.

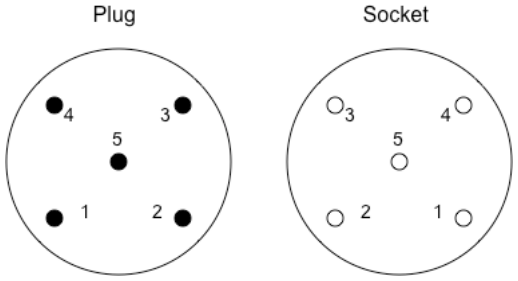


Figure 8 – 5-pin “micro” style connector

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

Pin	Signal	Description
1	(CAN_SHLD)	Optional CAN shield
2	(CAN_V+)	Optional CAN external positive supply
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 pinout profile of the 5-pin “pico” style connector is provided in /CiA103/.

7.4 Han-Quintax®

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

8 Special purpose connectors

8.1 Round connectors

8.1.1 7-pin round connector

The recommended pinout 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. Binder Series 680. Figure 9 illustrates the 7-pin round connector.

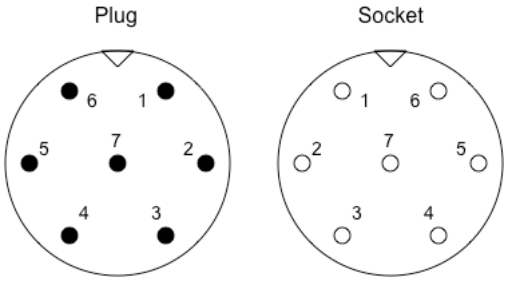


Figure 9 – 7-pin round connector

Table 12 – Pinout for 7-pin round connector

Pin	Signal	Description
1	(CAN_V+)	Optional CAN external positive supply
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+

The recommended pinout 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. Binder Series 723 or equivalent. Figure 10 illustrates the 8-pin round connector.

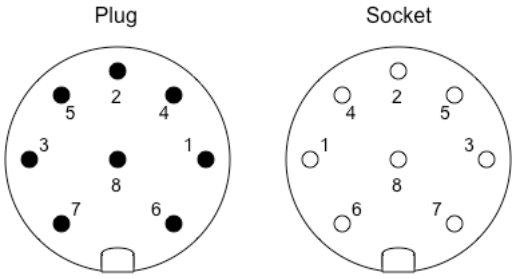


Figure 10 – 8-pin round connector

Table 13 – Pinout for 8-pin round connector

Pin	Signal	Description
1	CAN_V+	CAN external positive supply
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

8.1.2 9-pin round connector

The recommended pinout 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 other manufacturers. Figure 11 illustrates the 9-pin round connector.

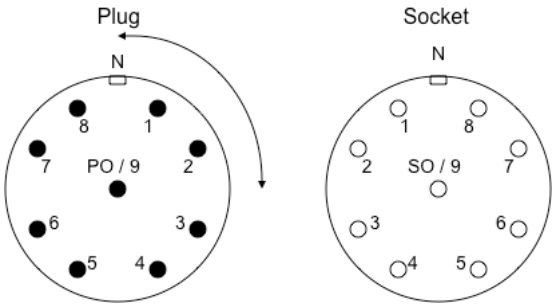


Figure 11 – 9-pin round connector

Table 14 – Pinout 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
8	(GND)	Optional ground
9	-	Reserved

8.1.3 10-pin round connector

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

8.1.4 Mini-snap 10-pin round connector

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

8.1.5 12-pin round flange connector

The recommended pinout 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 other manufacturers. Figure 12 illustrates the 12-pin round flange connector.

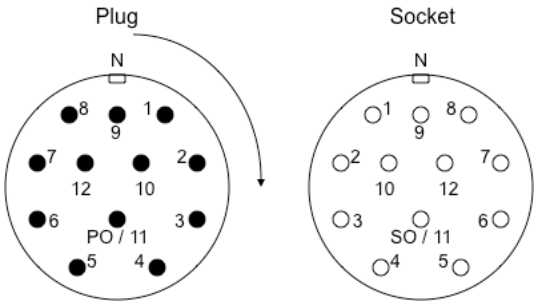


Figure 12 – 12-pin round flange connector

Table 15 – Pinout 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

8.1.6 9-pin flange round T-connector with ID-switch

The recommended pinout 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 illustrates the 9-pin flange round T-connector with ID-switch.

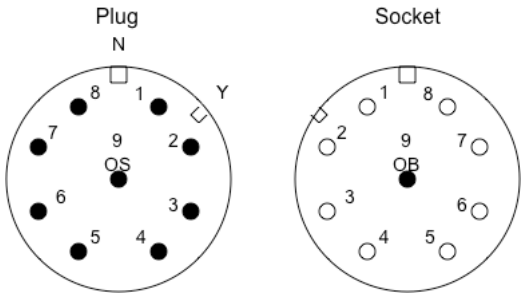


Figure 13 – 9-pin flange round T-connector with ID-switch

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

Pin	Signal	Description
1	(CAN_V+)	Optional CAN external positive supply
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 provides the recommended pinout of the housing and cable side of the Han-Brid® CU connector, which is manufactured by Harting.

8.2.2 Housing-side

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

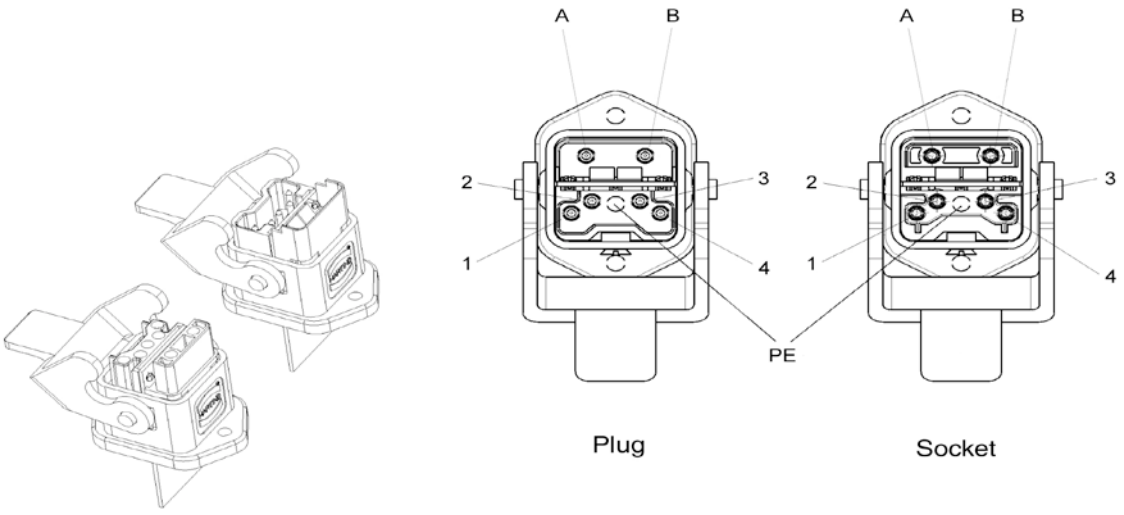


Figure 14 – Housing-side of “Han-Brid® CU”

Table 17 – Pinout for housing-side of "Han-Brid® CU"

Pin	Signal	Description
1	(CAN_V+)	Optional unswitched CAN external positive supply
2	(CAN_GND)	Optional unswitched CAN ground
3	(CAN_GND)	Optional switched CAN ground
4	(CAN_V+)	Optional switched CAN external positive supply
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 recommended pinout for the cable-side of "Han-Brid® CU" is provided in Table 18. Figure 15 illustrates the cable-side of "Han-Brid® CU".

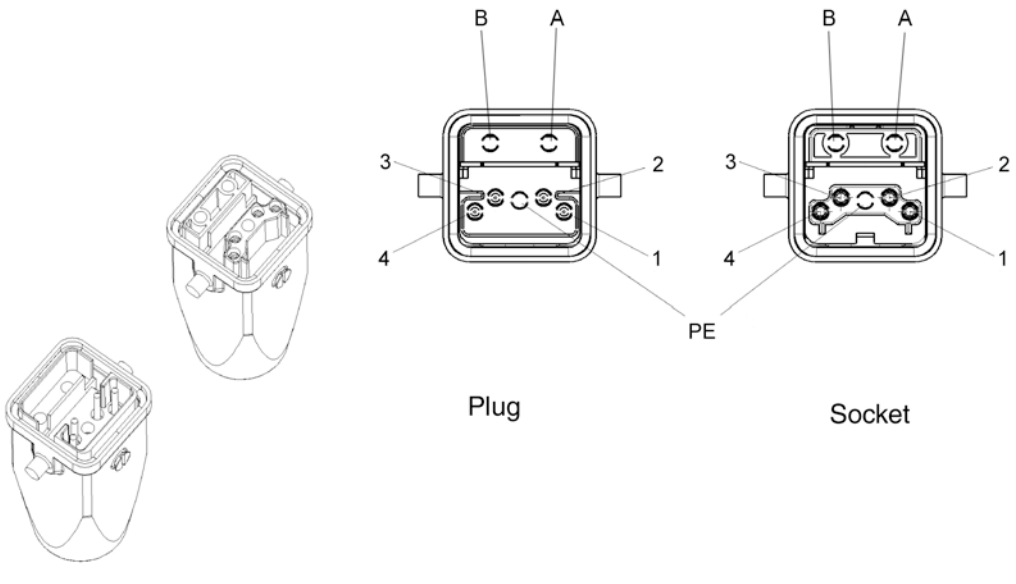


Figure 15 – Cable-side of "Han-Brid® CU"

Table 18 – Pinout for cable-side of "Han-Brid® CU"

Pin	Signal	Description
1	(CAN_V+)	Optional unswitched CAN external positive supply (NOTE)
2	(CAN_GND)	Optional unswitched CAN ground
3	(CAN_GND)	Optional switched CAN ground
4	(CAN_V+)	Optional switched CAN external positive supply (NOTE)
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 pinout 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.

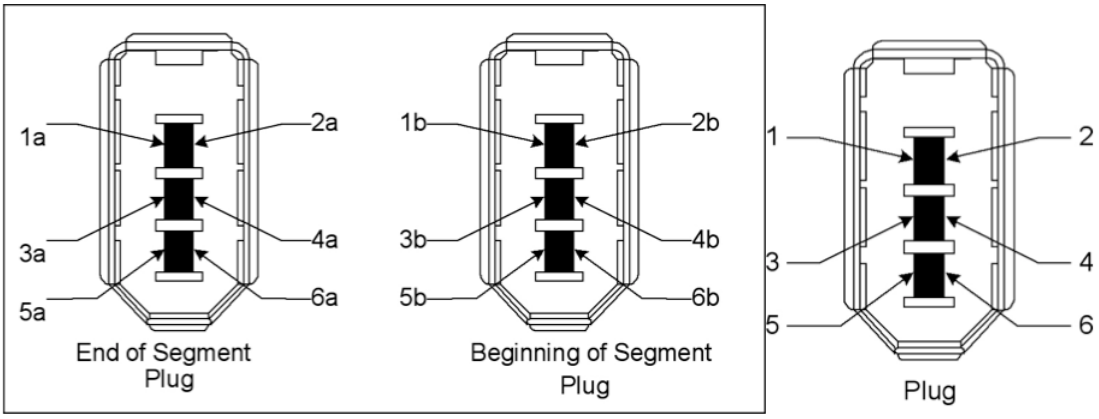


Figure 16 – IEEE1394/Firewire plug connector with shielding

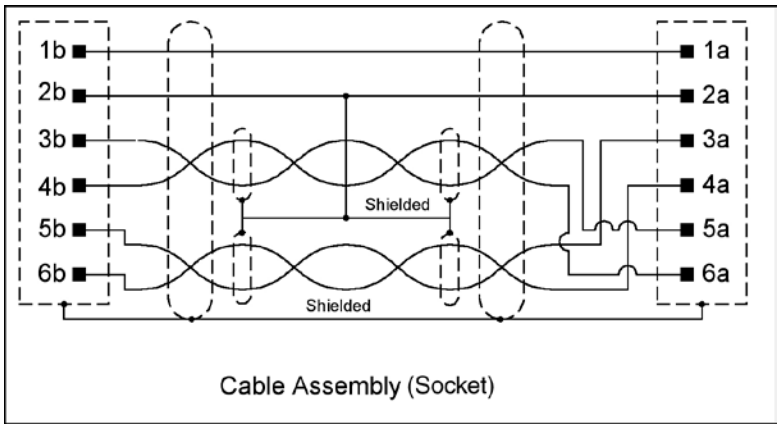
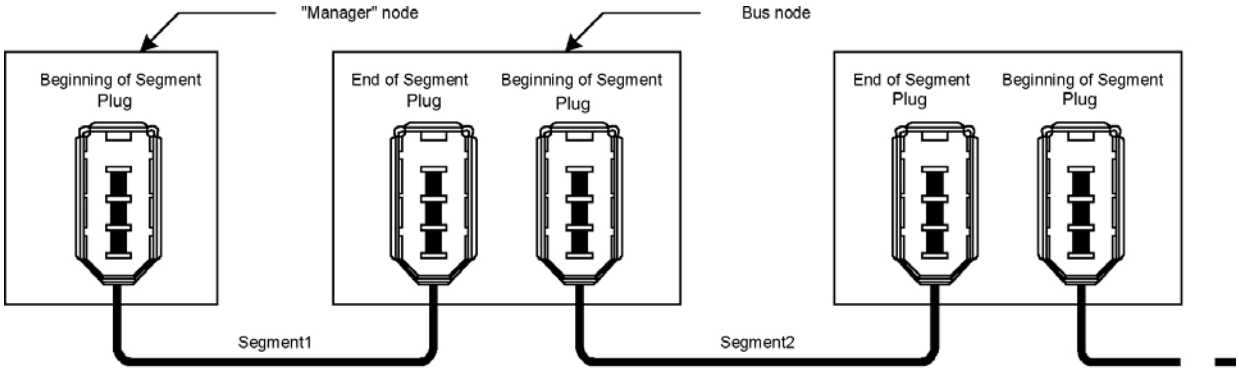


Figure 17 – Interconnection of the bus segments



Global overview

Figure 18 – Global overview

Table 19 – Pinout 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+)	Optional CAN external positive supply
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 pinout 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 the 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.

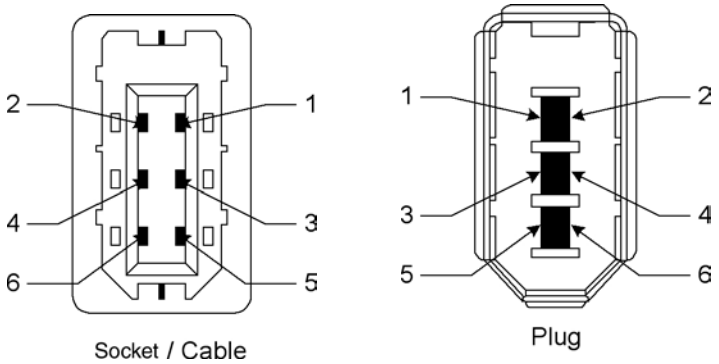


Figure 19 – IEEE1394/Firewire socket and plug connector with shielding without chaining of the bus on the node

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

Pin	Signal	Description
1	(CAN_V+)	Optional CAN external positive supply
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 pinout 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.

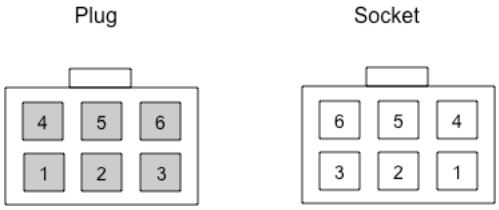


Figure 20 – Mini-Fit Jr.™ connector

Table 21 – Pin assignment 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

8.4.2 Micro-Fit 3.0™connector

The recommended pinout for the Micro-Fit 3.0™ connector, manufactured by Molex, is provided in Table 22. Figure 21 illustrates the Micro-Fit 3.0™ connector.

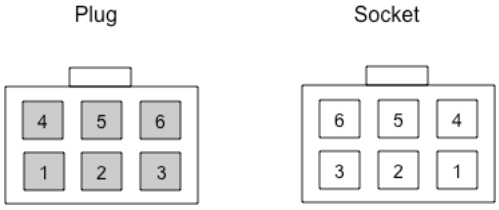


Figure 21 – Micro-Fit 3.0™ connector

Table 22 – Pin assignment for Micro-Fit 3.0™ 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	CAN_GND	CAN ground
5	(V-)	Optional ground
6	(CAN_V+)	Optional CAN external positive supply

8.5 Automotive connectors

8.5.1 7-pin socket connector

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

8.5.2 9-pin socket connector

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

8.5.3 18-pin VDA interface connector

The definition and pinout 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 pinout 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 pinout 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 pinout 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 recommended pinout for D-SUB 15-pin connector is provided in Table 23. Figure 22 illustrates the D-SUB 15-pin connector.

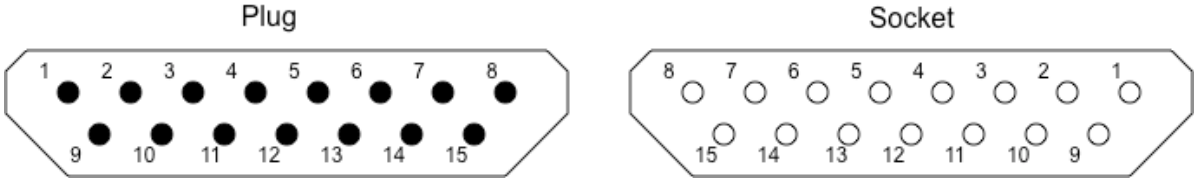


Figure 22 – D-SUB 15-pin connector

Table 23 - Pinout 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 NOTE*
7	NODENO_1	*See NOTE*
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 NOTE*
14	NODENO_2	*See NOTE*
15	NODENO_0	*See NOTE*

NOTE NODENO_x is a Node number, where x is a number. It is used for adjustment of the node ID ext. CAN

8.8.2 8-pin Ampseal connector

The recommended pinout for the 8-pin Ampseal connector is provided in Table 24. 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 23 illustrates the 8-pin Ampseal connector (header assembly).

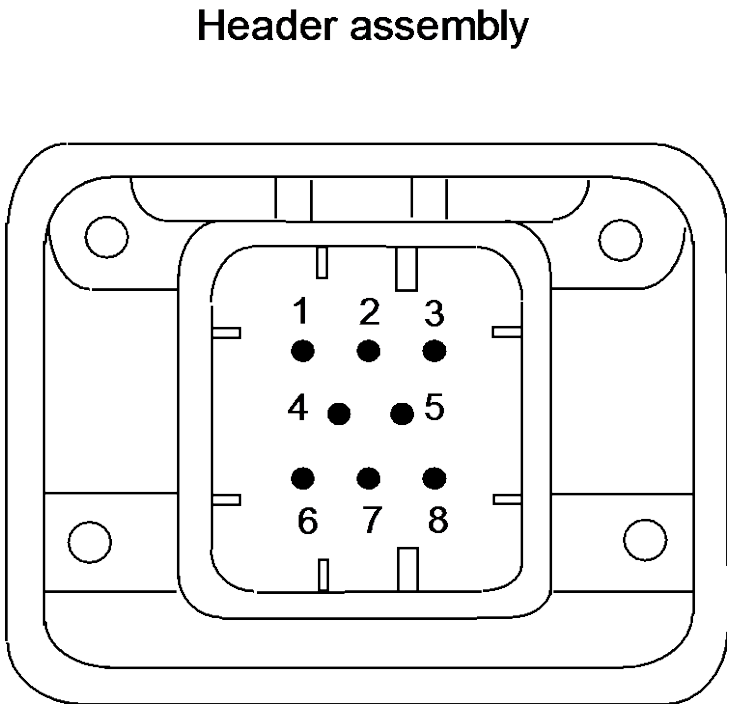


Figure 23 – 8-pin Ampseal connector

Table 24 – Pinout 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
4	CAN1_GND	CAN1 ground
5	CAN2_GND	CAN2 ground
6	CAN2_V+	Optional CAN2 external positive supply
7	CAN2_L	CAN2_L bus line (dominant low)
8	CAN2_H	CAN2_H bus line (dominant high)

