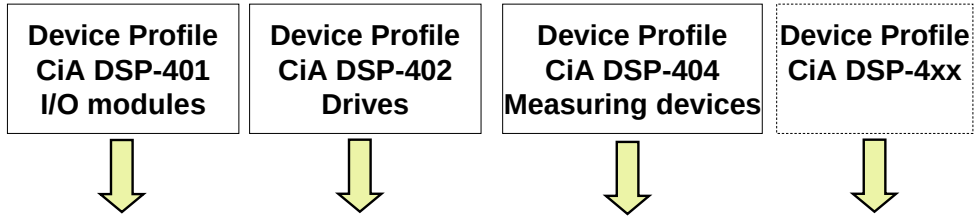
CANopen

Section 2: Physical layer

Part 1: Network characteristics

Part 2: Recommended connections

CANopen physical layer



7	APPLICATION	CiA DS-301 = Communication profile CAL= CAN Application Layer
6	PRESENTATION	EMPTY
5	SESSION	EMPTY
4	TRANSPORT	EMPTY
3	NETWORK	EMPTY
2	LINK = LLC + MAC	CAN 2.0 A and B + ISO 11898
1	PHYSICAL	CAN 2.0 A and B + ISO 11898 ISO 11898 + DS-102 + DRP-301-1

Description of the network

Twisted differential pair:	1 pair if CAN-H/CAN-L 2 pairs if CAN-H/CAN-L + p. supply
Characteristic line impedance:	120 ohms nominal
Line terminators:	120 ohms at each end
Wire resistance:	70 milli-ohms/metre nominal
Propogation time:	5 ns/metre nominal
Topology:	Bus type with the shortest possible tap links

Data rate - bus length - cable cross-section for 32 slaves maximum

Data rate	Bus length	Cable x-section
1 Mbps	25 m	0.25 mm^2 AWG 23
800 Kbps	50 m	0.34 mm^2 AWG 22
500 Kbps	100 m	0.34 mm^2 AWG 22
250 Kbps	250 m	0.34 mm^2 AWG 22
125 Kbps	500 m	0.5 mm^2 AWG 20
50 Kbps	1000 m	0.75 mm^2 AWG 18
20 Kbps	1000 m	0.75 mm^2 AWG 18
10 Kbps	1000 m	0.75 mm^2 AWG 18

Data rate - bus length - cable cross-section for 100 slaves maximum

Data rate	Bus length	Cable x-section
1 Mbps	25 m	0.34 mm^2 AWG 22
800 Kbps	50 m	0.6 mm^2 AWG 20
500 Kbps	100 m	0.6 mm^2 AWG 20
250 Kbps	250 m	0.6 mm^2 AWG 20
125 Kbps	500 m	0.75 mm^2 AWG 18
50 Kbps	1000 m	1 mm^2 AWG 17
20 Kbps	1000 m	1 mm^2 AWG 17
10 Kbps	1000 m	1 mm^2 AWG 17

Recommended connections

In its recommendation DR-303-1, the CiA provides a list of suitable connectors classified into 3 categories.

General use

9-pin SUB D connector DIN 41652, multi-pole connector (ribbon cable to 9-pin SUB-D), RJ10 and RJ45

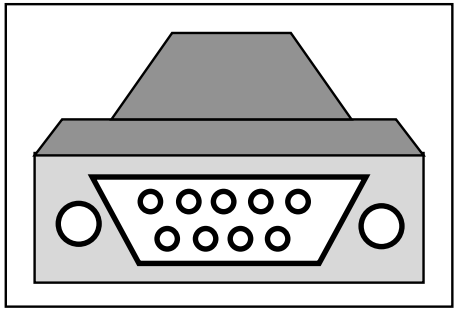
Industrial use

5-pin Mini Style, 5-pin Micro Style, Open Style

Special use

7-pin round connector, 8-pin round connector, 9-pin round connector, 12-pin round connector, Hand Brid Harting.

9-pin SUB D connector DIN 41652

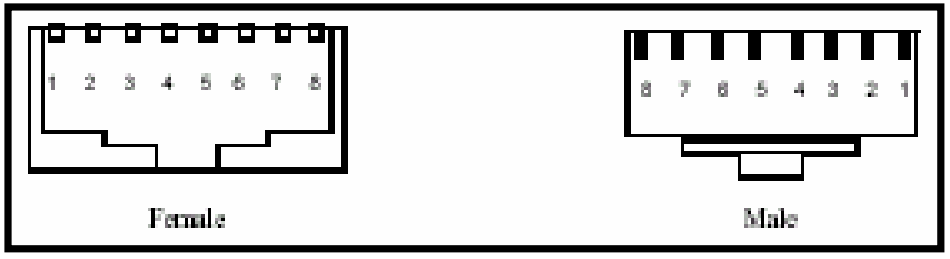


Male product end

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

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

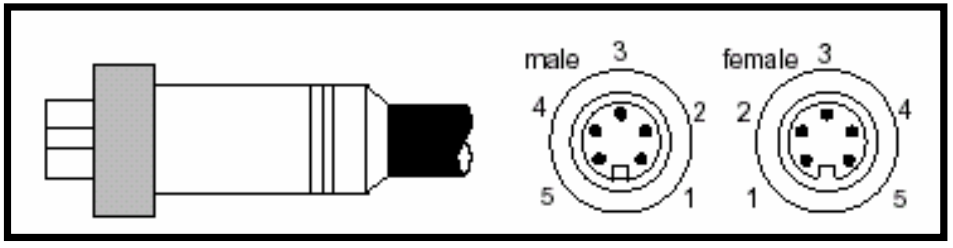
5: Reserved

6: (CAN_SHLD) = Optional CAN Shield

7: CAN_GND = Ground/0 V/V-

8 (CAN_V+) = Optional CAN external positive supply

5-pin Mini Style connector: ANSI/B93.55M-1981



Male product end

Pin Signal Description:

1: (CAN_SHLD) = Optional CAN Shield

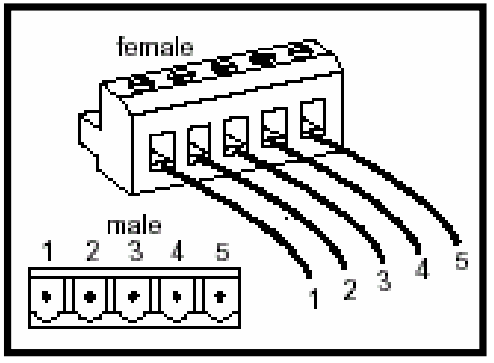
2: (CAN_V+) = Optional CAN external positive supply

3: CAN_GND = Ground/0V/V-

4: CAN_H = CAN_H bus line (dominant high)

5: CAN_L = CAN_L bus line (dominant low)

Open Style connector



Male product end

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

Recommended suppliers

Cables

- U.I.LAPP GmbH

Schultze-Delitsch-Str. 25
D-70565 Stuttgart Germany

http://www.lappcable.com

Connectors

- ERNI Elektroapparate GmbH

Seestrasse 9 D-73099 Adelberg Germany

- ERNI Connectique S.a.r.l, France

27 bis, avenue des Sources/CP 638 F-69258 LYON Cedex 09,

http://connect.erni.com/