SIEMENS

# ACP 1703  Ax 1703

# CM-0829

EIA-232/EIA-422; EIA-485 Converter

Converter which provides interfaces to connect devices with different interface characteristics (no galvanical isolation).

The following interfaces are supported:

- EIA-232 ⇔ EIA-422 4-wire
- EIA-232 ⇔ EIA-422 clock master/clock slave
- EIA-232 ⇔ EIA-485 2-wire/4-wire

The module is supplied with 5V via state line of EIA-232 interface.



MC0-045-2.02

# Application

Converter which provides interfaces to connect devices with different interface characteristics. The TM1703 Terminal module is mounted on TS35 DIN rail.

- Following interfaces are supported:
  —EIA-232 ⇔ EIA-485 4-wire
  —EIA-232 ⇔ EIA-485 2-wire
  —EIA-232 ⇔ EIA-422 4-wire

The interface converter CM-0829 does not provide galvanical insulation between EIA-232 interface and the EIA-422/EIA-485 interface.

- Connection technique:
  —RJ45-plug 8-pin for EIA-232 interface
  —5-pole spring type terminal for EIA-485 interface
  —DSUB 15-pole (male) for EIA-422 Interface

- HEX switch for selection of desired mode (parameter setting)

- Power supply:
  In order to supply the interface converter a 5V voltage is necessary.This supply voltage is provided by state line of RJ-45 plug. The contacts on the side of the TM-module are not used to supply the interface converter.

# Functions

### Transmission mode

The interface converter provides the following transmission modes:

- EIA-232 ⇔ EIA-422 4-wire (full duplex/half duplex)
- EIA-232 ⇔ EIA-485 4-wire (full duplex)
- EIA-232 ⇔ EIA-485 2-wire (half duplex)

The correspondent serial interface protocol defines transmission mode full duplex / half duplex.

### EIA-232 interface with RJ45-plug 8-pole (plug X1)

The EIA-232 interface signals are always active in transmitting and receiving direction. Parallel operation of multiple interface converters at the EIA-232 interface is not allowed. An 8-pole RJ45 plug is available to wire the EIA-232 interface signals.

Available Signals for EIA-232 interface:

| **X1**<br>**Pin#** | **Signal name**<br>**EIA-232 Interface** | | **Function** | **Direction** |
|---|---|---|---|---|
| 1 | SERIN3 | CTS<br>TXC | DTE Clear to Send<br>DTE receive clock for isochronal operating mode: clock slave | EIA-232 ← EIA-422/EIA-485 |
| 2 | SEROUT2 | RTS | DTE Request to Send | EIA-232 → EIA-422/EIA-485 |
| 3 | +5V | +5V | Supply Voltage | |
| 4 | SEROUT1 | TXT | DTE Transmit Data | EIA-232 → EIA-422/EIA-485 |
| 5 | SERIN1 | RXD | DTE Receive Data | EIA-232 ← EIA-422/EIA-485 |
| 6 | GND | GND | DTE Reference Potential | transmit and receive |
| 7 | SERIN2 | DCD | DTE Data Carrier Detect | EIA-232 ← EIA-422/EIA-485 |
| 8 | SEROUT3 | DTR<br>TXC | DTE Data Terminal Ready<br>DTE transmit clock for isochronal operating mode: clock master | EIA-232 → EIA-422/EIA-485 |

Signal naming of the EIA-232 Interface is not according to EIA-232 standard, this is because the signals have different usage, depending on the adjusted operating mode.

**EIA-422 interface with DSUB 15-pole plug connector (Male), plug X2**

The desired operating mode for EIA-422 interface has to be selected at the HEX switch of the interface converter (see also "Settings"). The EIA-422 Interface is available in the form of a DSUB 15-pole plug connector (male).

Available Signals for EIA-485 interface:

| X2 | Signal name | | Function | Direction |
|---|---|---|---|---|
| Pin# | EIA-422 | ISO 4903 | | |
| 1 | PE | Shield | Protective Earth | |
| 2 | TX_A | Transmit T | Transmit Data | EIA-232 → EIA-422/EIA-485 |
| 3 | RT_A | Control C | Request to Send | EIA-232 → EIA-422/EIA-485 |
| 4 | RX_A | Receive R | Receive Data | EIA-232 ← EIA-422/EIA-485 |
| 5 | CD_A | Indication I | Data Carrier Detect | EIA-232 ← EIA-422/EIA-485 |
| 6 | RCTC_A | Signal Timing S | receive clock for isochronal mode – clock slave<br>transmit clock for isochronal mode - clock master | EIA-232 ← EIA-422/EIA-485<br>EIA-232 →EIA-422/EIA-485 |
| 7 | CT_A *) | | Clear to Send<br>receive clock for isochronal mode – clock slave | EIA-232 → EIA-422/EIA-485 |
| 8 | System grounding | Ground G | | |
| 9 | TX_B | Transmit T | Transmit Data | EIA-232 → EIA-422/EIA-485 |
| 10 | RT_B | Control C | Request to Send | EIA-232 → EIA-422/EIA-485 |
| 11 | RX_B | Receive R | Receive Data | EIA-232 ← EIA-422/EIA-485 |
| 12 | CD_B | Indication I | Data Carrier Detect | EIA-232 ← EIA-422/EIA-485 |
| 13 | RCTC_B | Signal Timing S | receive clock for isochronal mode – clock slave<br>transmit clock for isochronal mode - clock master | EIA-232 ← EIA-422/EIA-485<br>EIA-232 →EIA-422/EIA-485 |
| 14 | CT_B *) | | Clear to Send<br>receive clock for isochronal mode – clock slave | EIA-232 → EIA-422/EIA-485 |
| 15 | | | | |

*) not according to standard; acc.to standard ISO 4903 those pins are reserved. The CM-0829 provides a state line at those pins (according to the adjusted operation mode).

**Switch over clock master/clock slave**

If the interface converter is operated in EIA-232 ⇔ EIA-422 mode, it is adjustable to select 'clock master' or 'clock slave' in isochronal mode. This has to be selected at the HEX switch of the interface converter.

**EIA-422 interface clock master**

If 'clock master' mode is selected at the HEX switch, clock pulse is generated and output over the pins 6 and 13 (RCTC_A / RCTC_B) of the DSUB plug.

Available signals:

- Transmit data
- Transmit pulse clock
- Receive data
- State line incoming DCD
- State line incoming CTS
- State line outgoing RTS

**EIA-422 Interface clock slave**

If 'clock slave' mode is selected at the HEX switch, clock pulse is incoming over pins 6 and13 (RCTC_A / RCTC_B) of the DSUB plug..

Available signals:

- Transmit data
- Receive data
- Receive pulse clock
- State line incoming DCD
- State line outgoing RTS

**EIA-485 interface with spring type terminal 5-pole (plug X3)**

The desired operating mode for EIA-485 interface has to be selected at the HEX switch of the interface converter (see also "Settings").

To wire the EIA-485 interface signals, a 5-pole spring type terminal (RM=3,5mm) is available. For each signal point a double connection is possible. The signal cores have to be stripped. Incoming and outgoing conductor pair may be wired in different terminal points, both signal points are parallel connected on the terminal. To loosen the connection, the orange fastening has to be used. This connection technique enables to wire the EIA-485 interface properly – only one core per terminal point.

Available Signals for EIA-485 interface:

| Pin# | Signal name | | Function | Direction |
|---|---|---|---|---|
| 1 | TX_A<br>(/RX_A *)) | | Transmit Data<br>(Receive Data *)) | EIA-232 → EIA-422/EIA-485<br>(EIA-232 ← EIA-422/EIA-485*) |
| 2 | TX_B<br>(/RX_B *)) | | Transmit Data<br>(Receive Data *)) | EIA-232 → EIA-422/EIA-485<br>(EIA-232 ← EIA-422/EIA-485*) |
| 3 | RX_A | | Receive Data | EIA-232 ← EIA-422/EIA-485 |
| 4 | RX_B | | Receive Data | EIA-232 ← EIA-422/EIA-485 |
| 5 | GND | | Reference Potential | |

*) in 2-wire mode

**Switchover 2-wire mode / 4-wire mode**

If operating mode EIA-232 ⇔ EIA-485 is used, there is an additional option to select between 2-wire and 4-wire mode. This switchover has to be selected at the HEX switch.

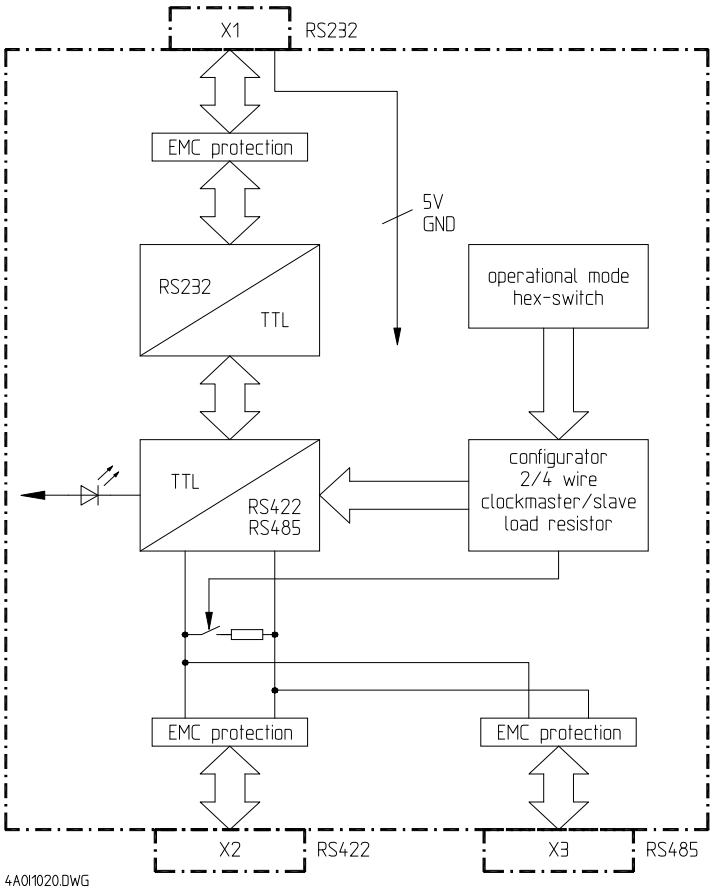
**EIA-485 interface in 4-wire mode**

For data transmission one conductor pair in transmit direction (TX_A/TX_B) and one additional conductor pair in receive direction (RX_A/RX_B) are required. In 4-wire mode the terminating resistor at the interface converters at the end of the line has to be parameterized, the interface converters along the line must not have terminating resistors parameterized (see also "Settings").

**EIA-485 interface in 2-wire mode**

In 2-wire mode only one conductor pair is needed for data transmission in transmit and receive direction (TX_A/TX_B). In 2-wire mode the terminating resistor at the interface converters at the end of the line has to be parameterized, the interface converters along the line must not have terminating resistors parameterized (see also "Settings").In 2-wire mode, transmit data as well as receive data are controlled over state line RTS. During transmission the receive channel is locked by the state line. If transmission is completed, the transmitter is switched to high-impedance by the state line, and the receiver becomes active. Therefore a listening mode is not possible.

# Block Diagram (module)



## Technical Specification

| Interfaces | |
|---|---|
| **General** | Signals are not galvanically insulated |
| **EIA-232 Interface** | • Signal level according to V.28<br>• Interface signals<br>TXD, RXD<br>RTS, DCD<br>DTR resp. TXC; CTS resp. RXC<br>• no parallel connection possible<br>• EMC-protection by transzorbdiodes<br>• Cable shield connected to system ground<br>• Line length: max. 115.2kbps ≤ 3m<br><br>**Electrical properties**<br>EIA-232 transmitter:<br>• Output signal level:<br>≥ +5 V at resistive load 3 kΩ<br>≤ -5 V at resistive load 3 kΩ<br>• Short-circuit current<br>(typ. +/- 17 mA) min. +/- 9 mA;<br>EIA-232 receiver:<br>• Input signal level, LOW Thresholds (Vout TTL = High)<br>≤ 0.8V<br>• Input signal level, HIGH Thresholds (Vout TTL = Low)<br>≥ 2.4V<br>• Hysteresis (typ. 400 mV) max. 1 V<br>• Input impedance<br>> 3 kΩ < 7 kΩ<br><br>**Terminating resistor**<br>Terminating resistor for EIA-232 Interface is integrated. Receive site signals have an input resistor within the range of 3 kΩ to 7 kΩ |

**EIA-422 Interface**

- Signal level according to V.11
- Interface signals::
  TX_A/TX_B, RX_A/RX_B
  RT_A/RT_B, CD_A/CD_B
  DT_A/DT_B resp.. TC_A/TC_B
  CT_A/CT_B resp. RC_A/RC_B
- Parallel connection possible, according to selected operation mode.
- EMC-protection by transzorbdiode
- Terminating resistor: 100Ω depending of selected operating mode
- Line lengths (in buildings)
  max. 1200 m max. 115.2 kbps

**Electrical properties**

EIA-422 transmitter:

- Output signal level:
  ≥ +2 V at 50 Ω resistive load
  ≤ -2 V at 50 Ω resistive load
- Short-circuit current
  max. +/- 250mA; typ. +/- 100mA

EIA-422 receiver:

- Differential voltage RX_A – RX_B
  ≤ + 0.2 V (TTL-Out = HIGH)
- Differential voltage RX_A – RX_B
  ≤ - 0.2 V (TTL-Out = LOW)
- Input hysteresis 70 mV
- Input impedance ≥ 12 kΩ

**Terminating resistor**

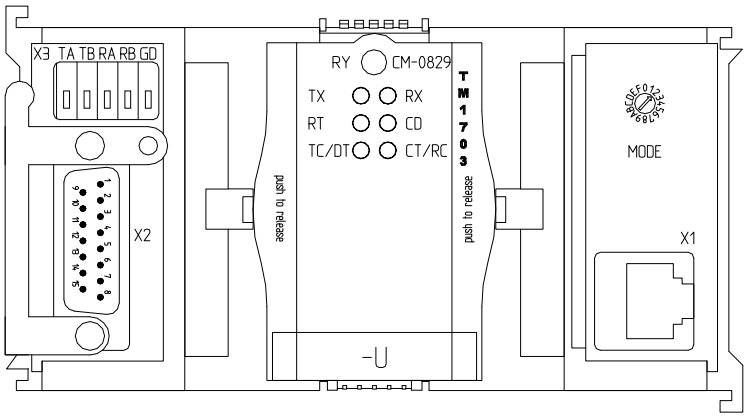
For balanced transmission each conductor pair must be terminated at the begin and the end of the line. Terminating resistor (100R) for EIA-422 is integrated, and can be activated or deactivated by selecting operating mode with the hex switch.

| | |
|---|---|
| **EIA-485 Interface** | • Signal level according to V.11<br>• Interface signals:<br>TX_A/TX_B<br>RX_A/RX_B<br>• Operating mode<br>2-wire/4-wire (parameter-settable)<br>• parallel connection is possible (depends on operating mode)<br>• EMC-protection by transzorbdiodes<br>• Terminating resistor<br>100 Ω (depends on operating mode)<br>• Line lengths (in buildings)<br>max. 1200 m max. 115.2 kbps<br>**Electrical properties**<br>EIA-485 transmitter:<br>• Output signal level:<br>≥ +2 V at 50 Ω resistive load<br>≤ -2 V at 50 Ω resistive load<br>• Short-circuit current<br>(typ. +/- 100 mA) max. +/- 250mA<br>EIA-485 receiver:<br>• Differential voltage RX_A – RX_B<br>≤ + 0.2 V (TTL-Out = HIGH)<br>• Differential voltage RX_A – RX_B<br>≤ - 0.2 V (TTL-Out = LOW)<br>• Input hysteresis: 70 mV<br>• Input impedance: ≥ 12 kΩ<br>**Terminating resistor**<br>For balanced transmission each conductor pair must be terminated at the begin and the end of the line. The HEX-switch activates or deactivates terminating resistor, depending on adjusted operating mode. For each signal pair, the terminating resistor must be activated at begin and end of the lines by adjusting the operation mode. Devices along the line have to be configured without terminating resistor. |
| **Signal propagation delay** | EIA-232 input to EIA-485 output ca. 0.9 µs |

| | |
|---|---|
| **Power supply** | |
| Operating voltage | 4,75..5,5V DC:<br>This supply voltage is provided by state line of RJ-45 plug.<br>Pin3: +5V<br>Pin6: GND |
| Power consumption<br>Power consumption EIA-485 Driver at 100 Ω terminating resistor | auxiliary: ≤ 150 mWatt<br>EIA-422 ≤ 400 mWatt<br>EIA-485 ≤ 200 mWatt |
| **Engineering and wiring** | |
| Connection facilities | • RJ45-plug 8-pole for EIA-232 interface<br>• Spring type terminal 5-pole for EIA-485 interface<br>• DSUB 15-pole connector plug (male) for EIA-422 Interface |
| Rotary switch | HEX-switch, 16 positions |
| Mechanical design | 127 x 63 x 72 mm (without DIN rail) |
| weight | ca. 200 g |

# Engineering

## Front View (CM-0829)




4A0I0020.DWG

RY . . . . . board ready to operate (ready)
TX . . . . . on, if a positive Rs-232 level exists on the Rs-232 socket X1-4/6, independently of the adjusted mode of operation.
RT . . . . . on, if a positive Rs-232 level exists on the Rs-232 socket X1-2/6, independently of the adjusted mode of operation.
TC/DT. . . . . on, if a positive Rs-232 level exists on the Rs-232 socket X1-8/6, independently of the adjusted mode of operation.
RX . . . . . on, if a positive level exists on the RxD+/RxD- signal, independently of the adjusted mode of operation.
CD . . . . . on, if a positive level (IA/IB) exists on the Rs-422 socket X2-5/12, independently of the adjusted mode of operation.
CT/RC . . . . . on, if a positive level exists on the CTS+/CTS- signal, independently of the adjusted mode of operation.

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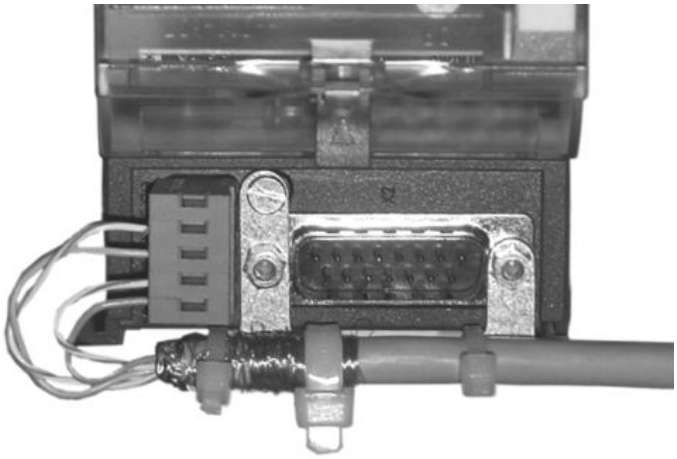
| LED | Active Signal | |
|---|---|---|
| (TX, RT, DT/TC,RX, CD, CT/RC) | EIA-232 interface | EIA-422/EIA-485 interface |
| on | ≥ + 3.0 V | A-B ≥ +0.3 V |
| off | ≤ -3.0 V | A-B ≤ -0.3 V |

## Grounding and cable relief

Metal holder for grounding and cable relief of the EIA-485 interface



# Settings

To adjust the wanted operation mode, Interface converter CM-0819 is equipped with an HEX-switch (rotary switch). Out of 16 possible positions, ten positions can be used to adjust the operation mode.

| Position<br>Mode switch | Mode |
|---|---|
| 0 | EIA-485 2-wiret with bus terminator (100 R) |
| 1 | EIA-485 2-wire without bus terminator |
| 2 | EIA-485 4-wire with bus terminator (100 R) |
| 3 | EIA-485 4-wire without bus terminator |
| 4 | X.24/X.27 signal element timing TRANSMIT with bus terminator (100R) (clock generator) |
| 5 | X.24/X.27 signal element timing TRANSMIT without bus terminator (clock generator) |
| 6 | X.24/X.27 signal element timing RECEIVE with bus terminator (100R) (clock receiver) |
| 7 | X.24/X.27 signal element timing RECEIVE without bus terminator (clock receiver) |
| 8 | not used |
| 9 | not used |
| A | not used |
| B | not used |
| C | RS-422 signal element timing TRANSMIT with bus terminator (100R) (clock generator) |
| D | not used |
| E | RS-422 signal element timing RECEIVE with bus terminator (100R) (clock receiver) |
| F | not used |