CAN - CAI812

8 Analog Inputs
12 Bit Resolution

Hardware Manual

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Changes in the Chapters

The changes in the user's manual listed below affect changes in the **hardware**, as well as changes in the **description** of the facts only.

Manual rev.	Chapter	Changes with respect to Rev. 5.0
5.1	-	First english issue.
	-	-

Further technical changes are subject to change without notice.

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1. Functional Characteristics

1.1 Overview

1.1.1 Description of the Module
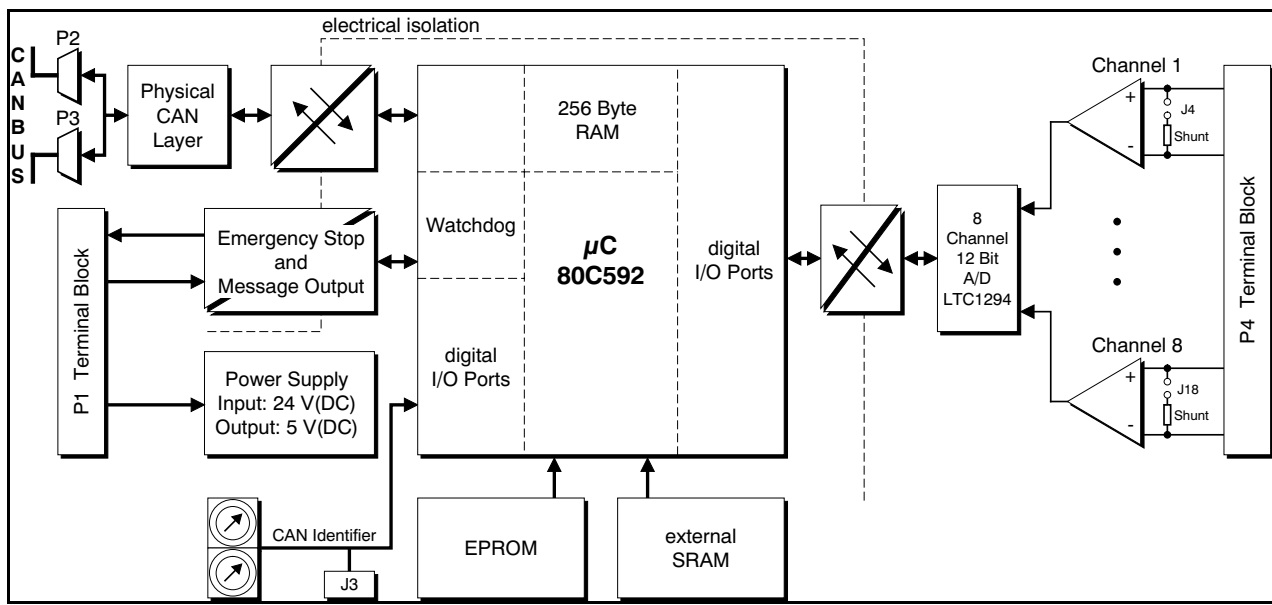
Fig. 1.1.1: Functional block diagram of the CAI812

The CAI812 module offers 8 differential analog inputs with a 12-bit resolution. The input-voltage area can be selected via jumpers separately for each channel between ±5 V and ±10 V. Furthermore the module can be configured via jumpers channel-by-channel for current measurement (±20 mA, ±40 mA). By means of the software it is possible to select whether the input signals are to be evaluated bipolarly or unipolarly.

The analog inputs are evaluated by means of the A/D converter LTC1294, which is galvanically isolated from the CAN assemblies.

The firmware offers the possibility to let the user select zero point and measuring area of the individual channels.

The physical CAN layer is galvanically isolated from the other local assemblies and is designed according to ISO 11898 for a bitrate of 1Mbit/s. Other physical layers are optionally realizable via mountable piggyback.

The bitrate can be altered via jumpers on the PCB or configured via the CAN. The CAN identifiers of the module can be set via two externally accessible rotary switches or they can also be configured via the CAN.
A dichromatic LED signalizes the total-system status of the module.

Additional monitoring functions increase the reliability:
After the watchdog time has elapsed, the watchdog timer, integrated into the µcontroller automatically triggers a RESET of the CAN module.
Via the potential-free EMY-OFF input and the relay-message output the module becomes part of an EMY-OFF chain.

1.1.2 Case View with LED and Connector Description

DIP switches:

setting of the module no. and the default value of the CAN identifier bis id1... id8

LED 1 (red/green):

board status:

LED lights green - no error
LED lights red - error on board
LED off - power supply failed

P2 and P3:

CAN connectors

P1:

connecting of 24V power supply, emergency stop input and message outputs

GND ES- ES+ +24V

HIGH

Status
LOW

P3

DSUB9/female

P2

DSUB9/male

P1
24V/ES/
message output

CAN BUS

Module-Id:

1 2 3 4 5 6 7 8

CAI812
8 analog inputs

inscription fields

17 P4 32

1 16

PE

P5

P5:

PE terminal
connected to metallic case

P4:

I/O connector

Overview

CAN-CAI812 Hardware Rev. 5.1

1.1.3 General Technical Data

Temperature area	permissible ambient temperature: 0...50 °C
Humidity	max. 90%, not condensing
Operating voltage	nominal voltage 24 V ±10 %, current input (typical, at 20 °C): 300 mA, electronic reverse-battery protection, safety fuse 400 mA/T
Connectors	P1 (MSTB/2.5) - supply voltage, EMY-OFF input, message output, P2 (DSUB9/male) - CAN connection P3 (DSUB9/female) - CAN connection P4 (screw/clip connector MSTB/2.5) - analog inputs P5 (KDS/4) - designed for earthing the case top
Case	Dimensions: 136 x 66 x 245 mm, installable on rails NS35/7.5 DIN EN 50022 (space between rails 150 mm)
Weight	ca. 700 g

Table 1.1.1: General data of the CAI812

1.1.4 CAN- and µController Assemblies

CAN interface	physical layer according to ISO 11898, add-on option for other physical interfaces
Transmission rate	selectable via jumpers or programmable from 10 kbit/s to 1 Mbit/s
CAN identifiers	can be set via coding switches and are programmable via the CAN, the module assigns 2 Tx identifiers
esd-module no.	Can be set via coding switches and programmed via CAN
µcontroller	8xC592, 16 MHz
EPROM	for storing the firmware, memory capacity 32 kbytes
EEPROM	for storing the CAN parameters
SRAM	memory capacity 32 kbytes
LED display	dichromatic LED for displaying the status of the µcontroller
Galvanical isolation of the CAN interface from µcontroller assemblies	according to German VDE regulation 0110b§8, isolation group C and installation into cubicle: 300 VDC / 250 VAC

Table 1.1.2: Technical data of the CAN- and µcontroller assemblies

1.1.5 EMY-OFF Input, Message Outputs

EMY-OFF input	
Nominal voltage	24 V, reverse-battery protected
Activation	EMY OFF is triggered, if the input is dead, activation triggers local RESET
Galvanical isolation	input isolated from µcontroller assemblies via optocoupler

Message outputs	
Number	1 break contact, 1 make contact
Activation	total-system status OK -> message outputs activated (breaker open, maker closed)
Switching voltage (DC)	1 mV...100 V DC
Load capacity (DC)	switching current area: 1 µA... 1 A make current: max. 5 A steady current: max. 2 A interrupting current: max. 1 A

Table 1.1.3: Technical data of the EMY-OFF input and the message outputs

1.1.6 A/D-Converter Assemblies

Number	8 inputs	
Resolution, accuracy	resolution of the converter: linearity and accuracy of the converter: measuring-value display on the CAN: range of values on the CAN: tolerance of measuring value:	12 bit $\leq \pm 1$ LSB straight binary, normalized to 16 bit $7FFF...$0000...$8000 $\pm$ $0004
Common mode	voltage area ± 5 V: voltage area ± 10 V:	common mode ± 8 V common mode ± 3 V
Measuring area	selectable via jumpers: furthermore selectable via software: bipolar or unipolar measuring area (with 12-bit resolution each)	-5 V...+5 V, (-20 mA...+20 mA) -10 V...+10 V
Input resistance	voltage input: ≥ 1 MΩ current input: 250 Ω/1‰	
Supply voltage of the analog assemblies	locally generated from the +24 V supply from the CAN module via DC/DC converters	
Potential separation from μcontroller assemblies	Galvanical isolation (according to German VDE regulation 0110b §8, isolation group C and installation into cubicle): 300 V(DC) / 250 V(AC)	

Table 1.1.4: Technical data of the analog inputs

1.1.7 Software Support

The complete EPROM-resident CAN-communication firmware required to operate the module is contained in the delivery.
(see software manual of the module.)

1.2 Order Information

Type	Properties	Order no.
CAN-CAI812	CAN module with 8 analog inputs, 12-bit resolution	C.2702.02
CAN-CAI812-MD (*)	user's manual in German	C.2702.20
CAN-CAI812-ME (*)	user's manual in English	C.2702.21

(*) The manual is included in the price, if ordered together with the module.

Table 1.2.1: Order information

CAN-CAI812 Hardware Rev. 5.1
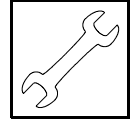
2. General Installation Notes

2.1 Installation and Fastening of the Module

The esd-CAN modules are flat assemblies which are designed for the installation into cubicles. They can be installed on two rails (NS 35/7.5 DIN EN 50022, space 150 mm) next to each other. It is important to consider the free spaces above and below the case, as these are needed for the installation of connectors and cables and for latching the module case on the rails. The dimensions and the required installation space of the CAN module can be taken from the following figure.
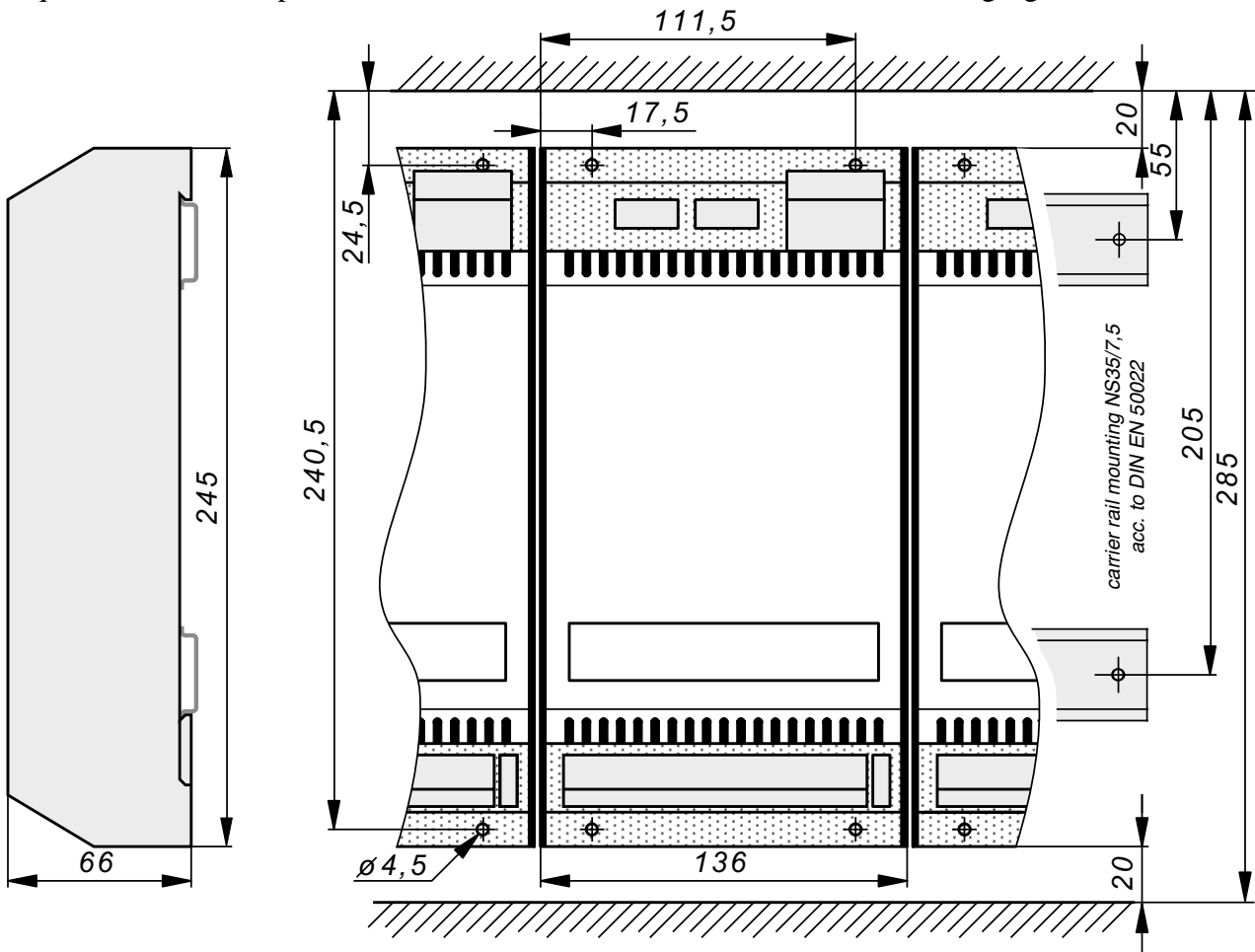
(All dimensions in [mm].)

Fig.2.1.1: Dimensions and required installation space of the module case
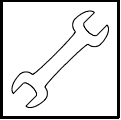
If possible, the modules are to be installed with the CAN connectors on top, since possible LED displays in the case can then be read much more comfortable.

2.2 Installation of Connectors and Cables
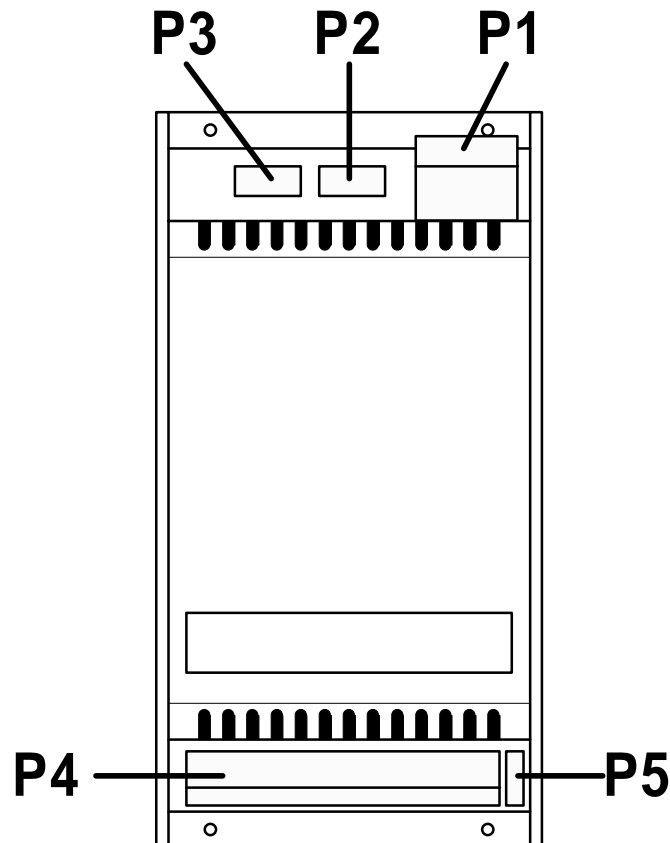
Fig. 2.2.1:
Position of externally reachable connectors of the CAN module

2.2.1 Supply Voltage, EMY OFF, Message Input and Earth Terminal (P1, P5)

The module is supplied with voltage via connector P1. The nominal value of the supply voltage is 24 VDC.
The EMY-OFF input and the message output of the module are also at P1. The message output can be connected optionally.

The EMY-OFF inputs must be supplied with voltage, otherwise the module cannot operate. If the inputs are open, the module is in 'RESET' status.
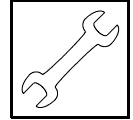
If the EMY-OFF inputs should not be used, it is advisable to make bridges to the terminals of the module-voltage supply, which is next to the inputs, in order to enable these.

Fig. 2.2.2: Connection of the supply voltage and the EMY-OFF input signal (example: EMY-OFF function not in use)
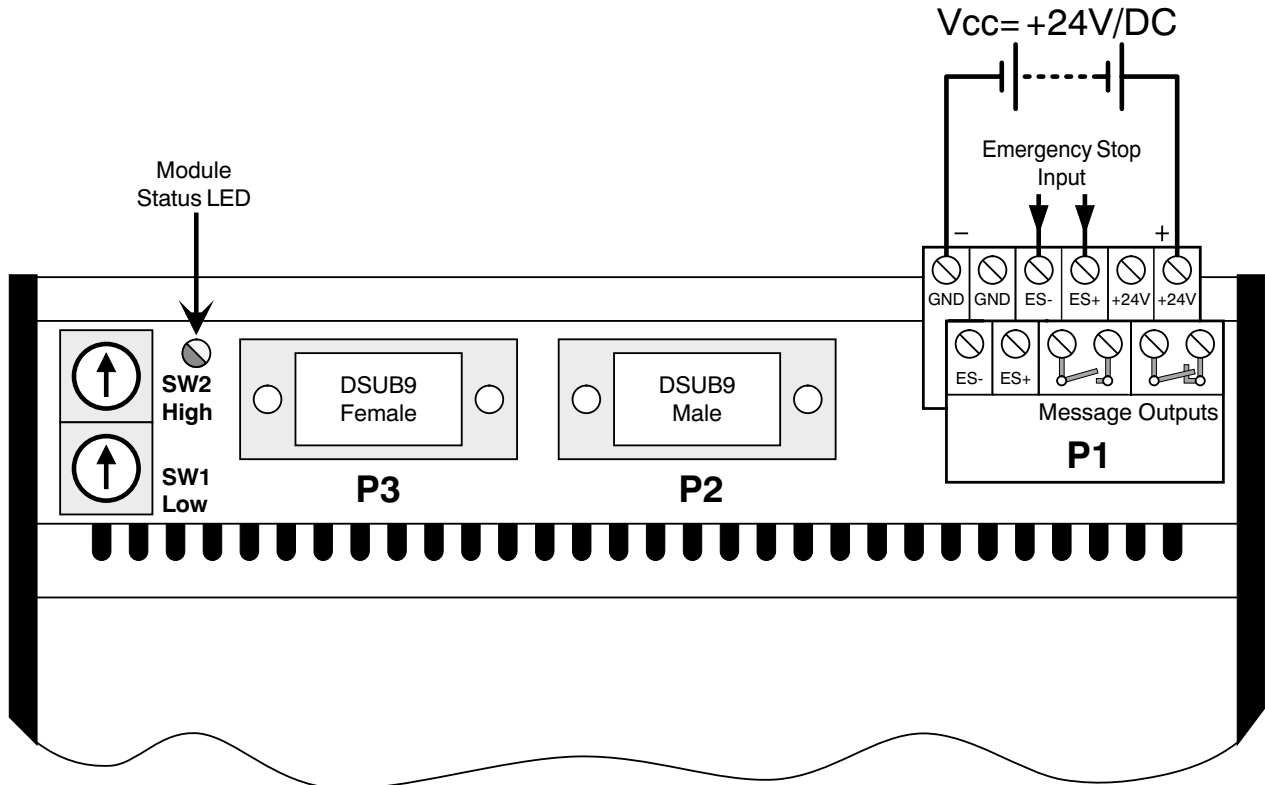
Via the EMY-OFF inputs the module can be integrated into an EMY-OFF chain (see fig. 2.2.3).

Wires with a cross section of up to 2.5 mm can be connected to connector P1 (type: MDSTBW/2.5) via a strippable screwed connector (type: MSTB/2.5).

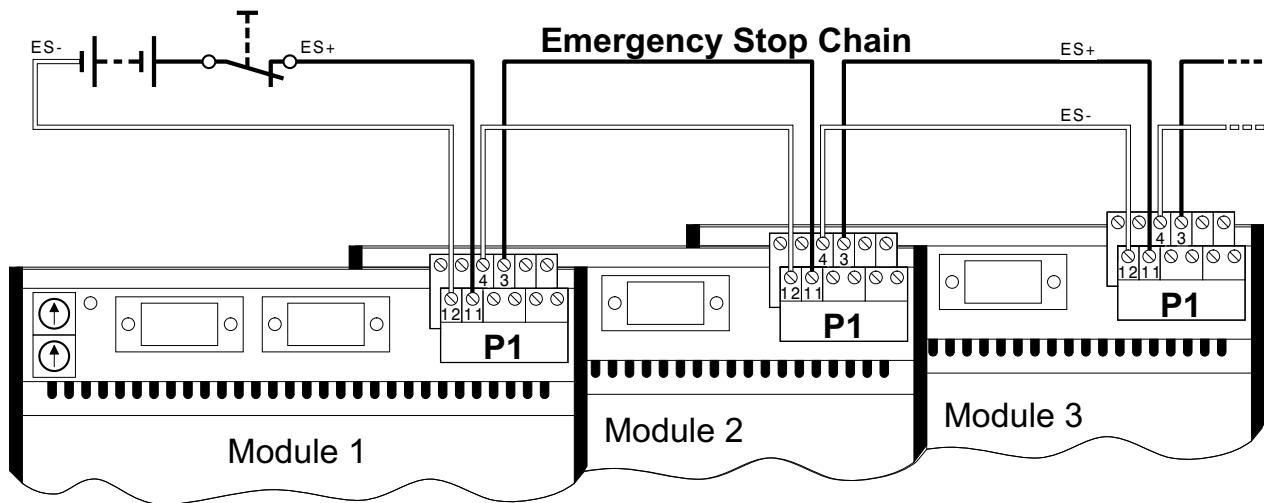Detailed descriptions about connector P1 can be taken from the appendix.

Installation

Fig. 2.2.3: Integration of the module into an EMY-OFF chain

The earth terminal P5 (type: KDS4) is connected to the plain connector P6 which is inside the case (see component diagram of the PCB). The earth cable of the case top is also connected to P6, therefore making it possible to connect the case top of the module to the protection earth (PE) via the screwed connector P5.

The bottom of the module, however, is not connected to P5 or P6! It is earthed by screwing the protective conductor to a mounting hole via a cable terminal and toothed disks.

Wires with a cross section of up to 4 mm² can be connected to the screwed connector P5.

2.2.2 CAN Connections P2, P3

The CAN is connected via connector P2 (male) or/and P3 (female). In their assignment both 9-pin DSUB connectors correspond to the recommendations of the CiA-Group (**C**AN **i**n **A**utomation, 11.1992). Detailed descriptions about these connectors can be taken from the appendix.

The CAN cable has to be terminated at both ends. For this two 9-pin DSUB connectors with terminal resistors are available.
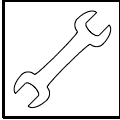
2.2.3 I/O Connector P4

Via P4 the analog inputs are connected. Three terminals have been designed for each of the 8 differential inputs: Ix+, Ix- and GND.

Wires with a cross section of up to 2.5 mm² can be connected to the screw terminal P4 (type: MSTB/2.5). The screwed connections are pluggable in groups.

Following display shows the top view of the screw terminal with the position of the individual connections.
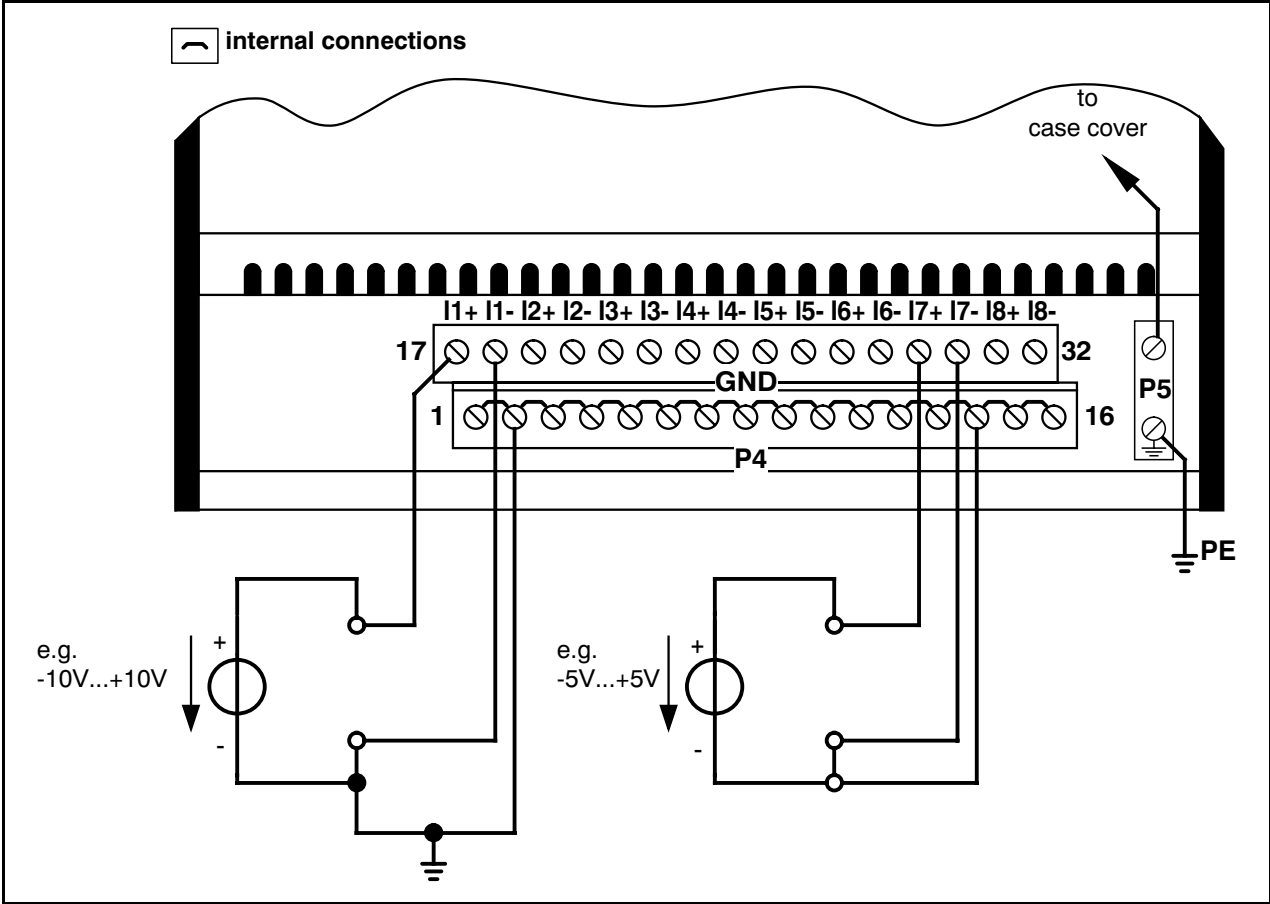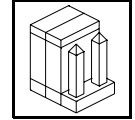

Fig. 2.2.4: Connection of the analog inputs to P4
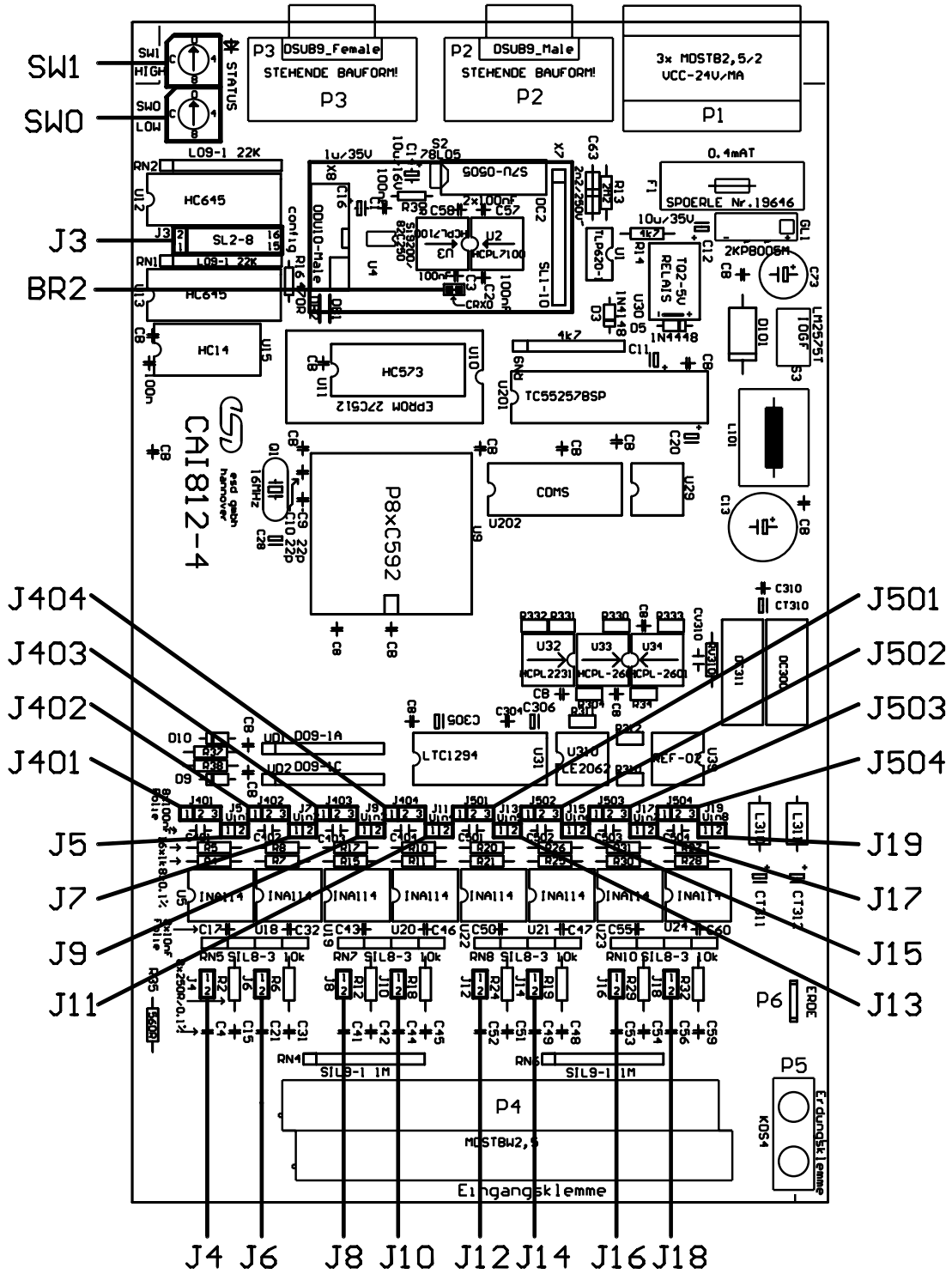
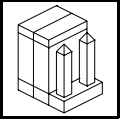# 3. Bridges and Coding Switches

Fig. 3.1.1: Position of the coding switches and the bridges on the component layer of the PCB

Jumper Assignment

BR1
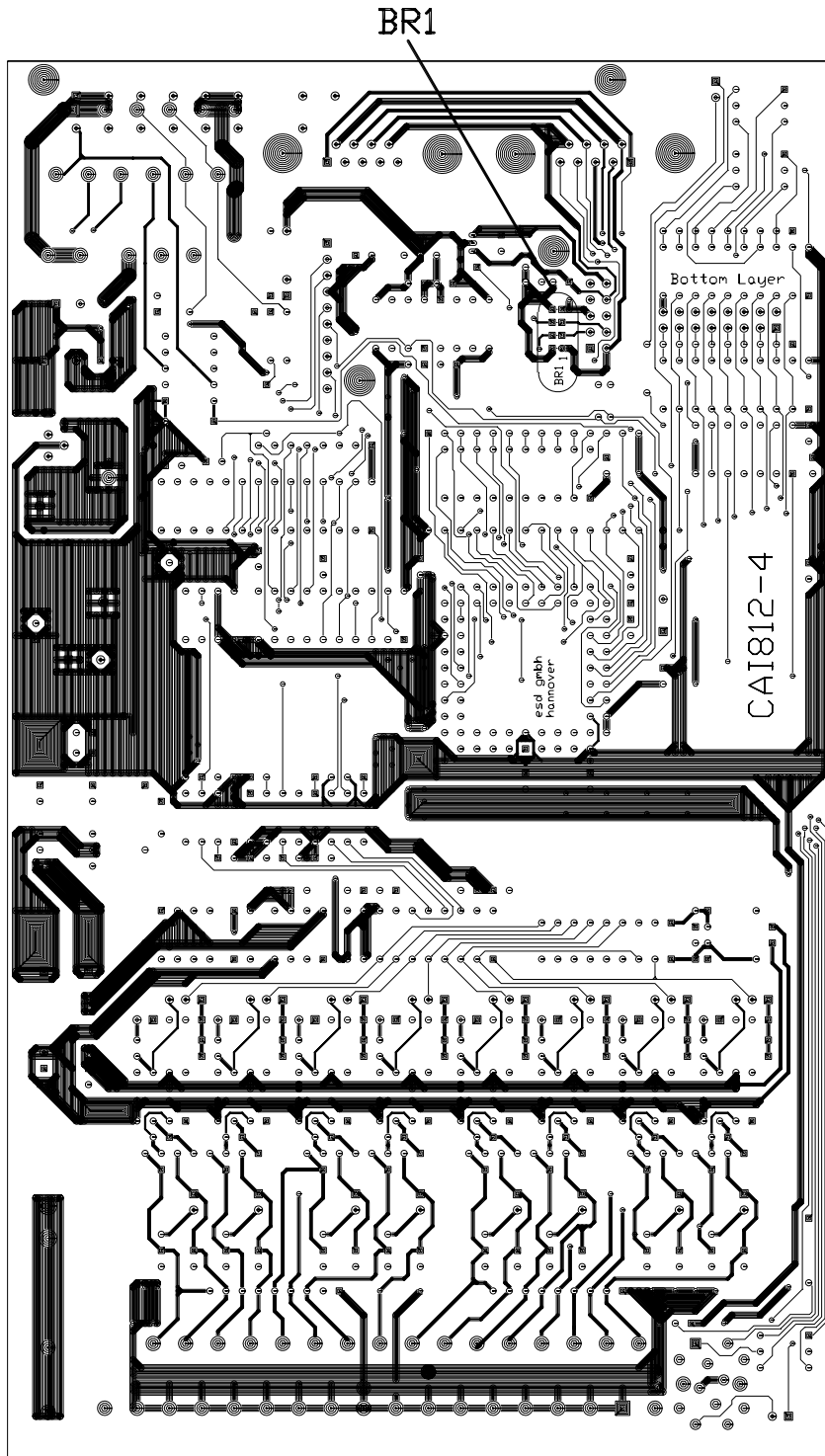
Fig. 3.1.2: Position of the solder bridges on the bottom layer
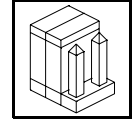
3.1 Default Setting of Bridges and Coding Switches

The respective default setting (see following table) as factory-set is registered.

The arrangement of bridges and coding switches on the component layer can be taken from figure 3.1.1. In the following the bridges are shown as seen by the user when the PCB is viewed with the CAN connectors to the left.

The arrangement of bridges on the bottom layer can be taken from figure 3.1.2. In the following the soldering bridges are shown as seen by the user when the PCB is viewed with the CAN connectors to the right.

Bridge/ coding switch	Function	Setting
BR1, BR2	piggyback connection for other physical layers	standard according to ISO 11898
J3	configuration	bit rate 125 kbit/s
J4, J6, ...J16, J18	current measurement channels 1 to 8	open, i.e. all inputs are configured to measure voltage
J5, J7, ...J17, J19	setting the measuring area channels 1 to 8	jumpered, i.e the measuring area is set to ±10 V for all channels
J401, J402,... ...J503, J504	bridging the potential dividers of the input circuits	potential dividers and filters are not bridged
coding switches SW0 - LOW SW1 - HIGH	CAN-identifier bits id4-id11	user-dependent

Table 3.1.1: Default setting of bridges and coding switches
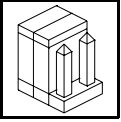
Jumper Assignment

3.2 Bridges and Coding Switches of CAN Assemblies

3.2.1 Use of other 'Physical Layers' (BR1, BR2)

If other physical interfaces are to be used, the module can be equipped with an ADD-ON.

If the module already has the CAN driver 82C250 or Si9200 and another interface should be used, the CAN connectors have to be separated from the driver. This is achieved by removing thin conductor lines between the pads of soldering bridge BR1. If required, the connections can be established again by soldering the pads.
The soldering bridge is on the bottom layer of the PCB near to the CAN connectors.

Furthermore the Rx output of optocoupler U3 has to be separated from the interface, since the coupler sets its outputs also with open input. This is avoided by separating the thin conductor line between the pads of soldering bridge BR2. If required, this connection, too, can be established again by soldering the pads of the bridge. BR2 can be found on the component layer of the PCB next to optocoupler U3 of the CAN interface.
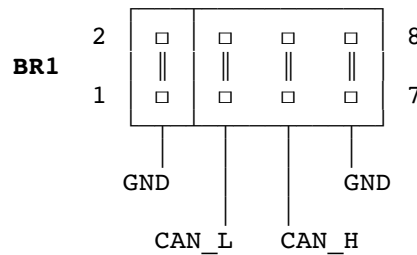
(View of bottom layer/CAN connectors to the right)
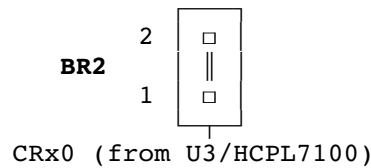
(View of component layer/CAN connectors to the left)

Standard setting: All bridges are connected.
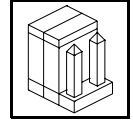
3.2.2 Configuration field (J3)

Jumper	Bit	Function
16 ○ ○ 15	D7	mode
○ ○	D6	
○══○	D5	bitrate
○══○	D4	
○ ○	D3	
○ ○	D2	CAN-identifier bit id11
○ ○	D1	CAN-identifier bit id10
2 ○ ○ 1	D0	CAN-identifier bit id9

J3

jumper set --▸ bit = '1'!

Function of bits:

Mode (D7):   Only for esd-internal use:
jumper open   ...   normal mode
jumper set   ...   test mode
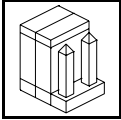
Jumper Assignment

Bitrate (D6-D3): Transmission speed

A jumper here sets the according bit to the value '1'!
The specified typical line lengths base on experimental values from practice. The minimum reachable line lengths result from the 'worst case' delay of the components used.

The default setting of the module as factory-set is shown in **bold** print.

Jumper bits				8xC592 register		Bitrate [kbit/s]	typical values of the reachable line length l_{max} [m]	minimum reachable line length l_{min} [m]
D6	D5	D4	D3	BTR0 [HEX]	BTR1 [HEX]			
0	0	0	0	00	14	1000	37	20
0	0	0	1	00	18	666.6	80	65
0	0	1	0	00	1C	500	130	110
0	0	1	1	01	18	333.3	180	160
0	1	0	0	01	1C	250	270	250
0	1	0	1	02	1C	166	420	400
0	**1**	**1**	**0**	**03**	**1C**	**125**	**570**	**550**
0	1	1	1	04	1C	100	710	700
1	0	0	0	45	2F	66.6	1000	980
1	0	0	1	09	1C	50	1400	1400
1	0	1	0	4B	2F	33.3	2000	2000
1	0	1	1	18	1C	20	3600	3600
1	1	0	0	5F	2F	12.5	5400	5400
1	1	0	1	31	1C	10	7300	7300
1	1	1	0	00	16	800	59	42

The specifications in the table base on the limit values of the bit timing of the CAN protocol, the delay times of the local CAN interface and the delay times of the cable. This is assumed with about 5.5 ns/m. Further influences, as caused for instance by missing terminal resistors, the specific resistance, the cable geometry or external disturbances, have not been considered for the transmission!

Table 3.2.1: Setting the transmission speed via J3

CAN-Identifier Bits id9 to id11:

> D0 = id9
> D1 = id10
> D2 = id11

jumpered --▸ bit = '1'
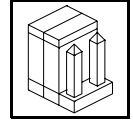
3.2.3 CAN-Identifier Bits id11...id4 (SW0, SW1)

Via the coding switches 'HIGH'(SW1) and 'LOW'(SW0) the default values of the CAN-identifier bits id1 to id8 are set.
Furthermore the value set at the coding switches corresponds to the esd-module no. (see software manual of the module).

Setting: $00...$FF

Switch	HIGH (SW1)				LOW (SW0)			
Bit	7	6	5	4	3	2	1	0
Function	id8	id7	id6	id5	id4	id3	id2	id1 *)

*)   The setting of identifier bit id1 is not evaluated on the CAI812. Id1 either selects channels 1-4 or 5-8.

Table 3.2.2: Assignment of CAN-identifier bits id1 to id8 to the coding switches
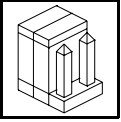
3.2.4 Bridges and Coding Switches of the Analog Inputs

3.2.4.1 Selection of Channels for Current Measurement (J4...J18)

Each input channel of the CAI812 has a jumper which enables a shunt of 250Ω/0.1% between the two inputs Ix+ and Ix- (x=1,2,...8). In order to configure the respective channel for measuring the current, the jumper has to be set. Standardly this jumper is open.

The (electric) position of the jumper and the shunt in the input circuit can be taken from the circuit diagram in chapter 'Analog Inputs'.

The assignment of channels to jumpers is shown in the table below:

Channel of the CAI812	Jumper for current measurement
1	J4
2	J6
3	J8
4	J10
5	J12
6	J14
7	J16
8	J18

Table 3.2.3: Current-measurement assignment of channels to jumpers
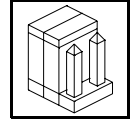
3.2.4.2 Selection of the Measuring Area (J5...J19)

For each channel of the CAI812 the voltage (current) area to be evaluated can be selected via a jumper.

If the jumper is open, input voltages in the area of ±5 V can be measured. If the jumper is set, the voltage-measuring area is ±10 V. Standardly all jumpers are set.

The measuring area can only be selected via the jumpers J5...J19, if the jumpers J401...J504 (see following chapter) are set accordingly!

Jumper J5...J19	open	set **default setting**
Measuring area voltage measurement*)	-5 V...+5 V	-10 V...+10 V
Measuring area current measurement*)	-20 mA...+20 mA	-40 mA...+40 mA

*) Jumpers J4..J18 are set according to current or voltage measurement.

Table 3.2.4: Setting the measuring area via jumper J5...J19

Channel of the CAI812	Jumper for measuring-area setting
1	J5
2	J7
3	J9
4	J11
5	J13
6	J15
7	J17
8	J19

Table 3.2.5: Measuring-area assignment of channels to jumpers

3.2.4.3 Bridging the Potential Divider and the Second Input Filters (J401...J504)

For each channel a jumper is available by means of which the potential divider, which is switched-on via jumpers J5, J7, ... and J19, can be bridged. Furthermore the following low pass of the instrument amplifier INA114 is bridged. The function of the jumper can also be taken from the figure in the chapter 'Input Circuit'.
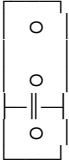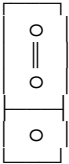
Jumper positions J401...J504	Function
3 ○ 2 ○ 1 ○	potential divider is active (input voltage can be selected between ±5 V and ±10 V), filter circuit is active **default setting**
3 ○ 2 ○ 1 ○	potential divider and filter are not active, input-voltage area is always ±5 V, jumper position of J5, J7,...J19 is unimportant

Table 3.2.6 Function of jumpers J401...J504

Channel of the CAI812	Jumper for bridging the potential divider
1	J401
2	J402
3	J403
4	J404
5	J501
6	J502
7	J503
8	J504

Table 3.2.7: Bridging the input-potential divider - assignment of channels to jumpers
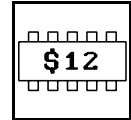
4. CAN Identifiers

In operation with the default parameters the CAN-Tx identifiers on the module consist of the following:

id11	id10	id9	id8	id7	id6	id5	id4	id3	id2	id1
setting via jumper J3			setting via coding switch HIGH (SW1)				setting via coding switch LOW (SW0)			

id11-id9...   are set by means of jumper J3 (1-2, 3-4, 5-6)

id8-id2...   are set via the coding switches SW0 and SW1 of the module

id1...   via id1 the channel group of the CAI812 is selected:

Channel	id1	Tx identifier
1 to 4	0	TxId1
5 to 8	1	TxId2

A detailed description of the assignment of the jumper and the coding switches can be taken from the chapter 'Configuration Jumpers'.

The local software of the module offers the possibility to program the Tx identifiers freely. Further information on this can be taken from the software manual of the esd-CAN protocol.
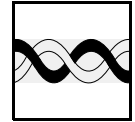
5. Description of the Assemblies

5.1 CAN Interface

5.1.1 Bitrate

The transmission speed can be varied from 10 kbit/s to 1,0 Mbit/s. The bitrate is selected via J3.

The local software of the module offers the possibility to reprogram the bitrate. This programmed bitrate then substitutes the bitrate set via J3. Further information on this can be taken from the software manual of the esd-CAN protocol.

A detailed description of the possible bit rates can be taken from the description of jumper J3.

5.1.2 Transmit and Receive Circuit of the CAN Interface (Physical Layer)

The physical interface of the esd CAN corresponds to the norm ISO 11898. The interface is connected to the busline via 9-pin DSUB connectors from which one is male and one is female.
Other physical layers can optionally be realized by mountable piggyback.

The Si9200or the 82C250, for instance, are used as CAN transceivers on the module.

The voltage supply of the CAN is galvanically isolated from the fed 24V supply and the CAN controller 8xC592.
The signals are galvanically isolated from the CAN by means of optocouplers.
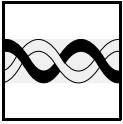
CAN Interface
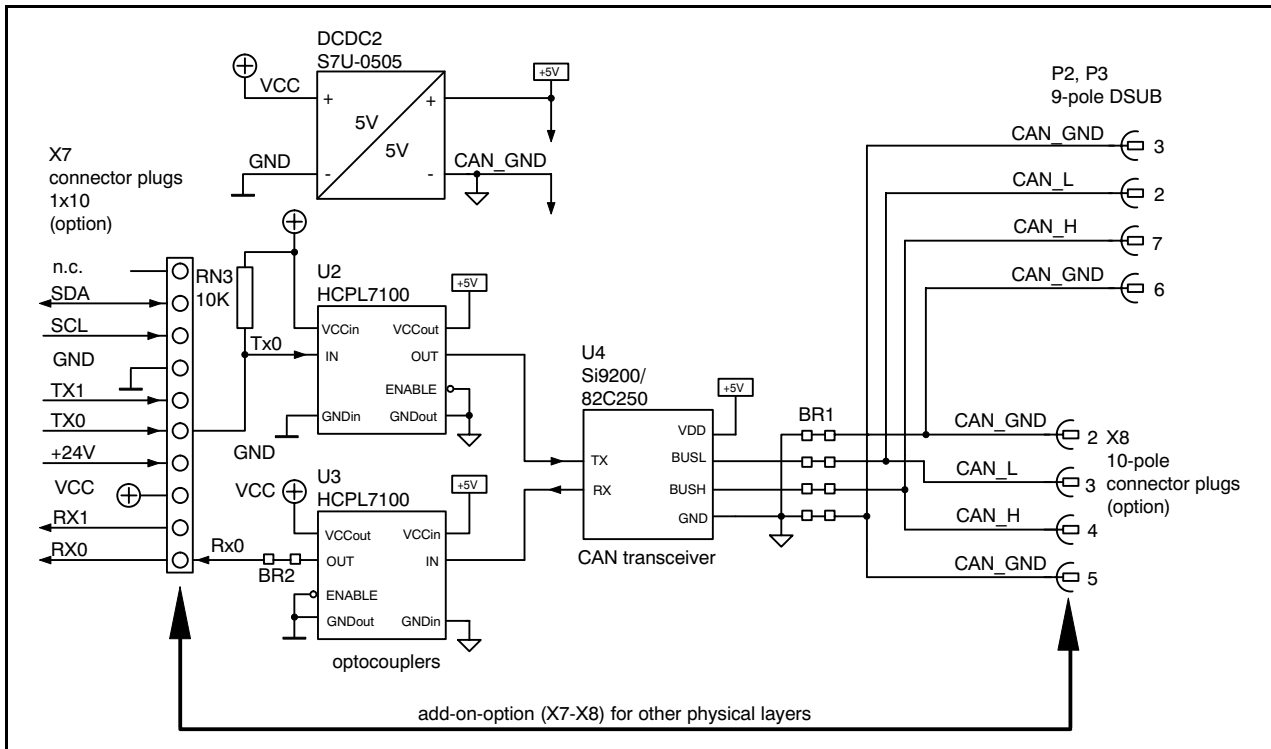
+24 V, VCC, GND...   local supply voltages (galvanically isolated from the CAN interface)
TX0, RX0...   signals of CAN controller 8xC592 (U9), which are led onto the CAN (via available interface)
TX1, RX1...   signals of CAN controller 8xC592 for future applications (add-on)
SDA, SCL...   local serial bus (I²C), generated by the 8xC592 ports P1.1 (SDA) and P1.3 (SCL)

Fig. 5.1.1:   Functional circuit diagram of the CAN interface in use with the interface components Si9200 or 82C250

The description of the connector assignment can be taken from the appendix.
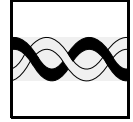
5.1.3 Use of other Physical Layers (Add-On Option)

The CAN module offers the possibility to run the CAN with other physical layers. For this matter a PCB with the desired circuit can be mounted on an add-on plug-in.

If the module is equipped with the CAN drivers 82C250 or Si9200, the CAN connectors have to be separated from the driver. This is achieved by removing thin conductor lines between the pads of bridge BR1.

Furthermore the Rx output of the optocoupler U3 of the standard interface has to be separated, since the coupler also sets its output with open input. This can be avoided by separating the conductor line between the pads of bridge BR2.

The add-ons are electrically connected via the optionally equipped wrap plugs X7 and X8. The pin assignment and description of these connectors can be taken from the chapter 'Connector Assignments', which can be found in the appendix.
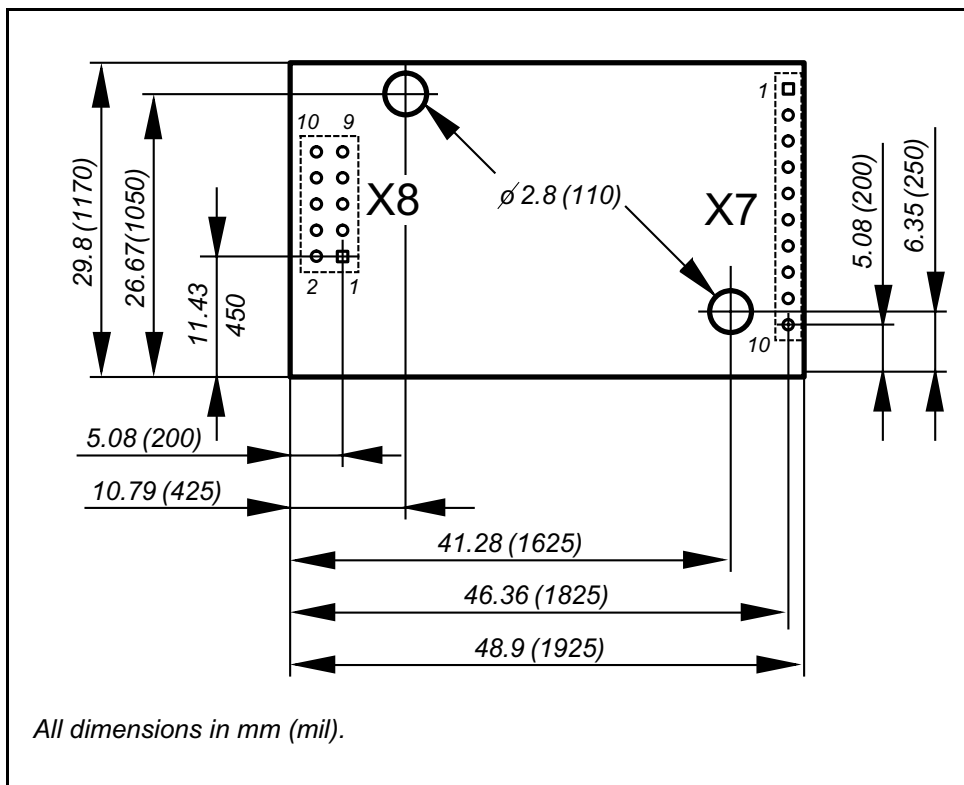
Fig. 5.1.2: Installation dimensions of the add-on (top view)
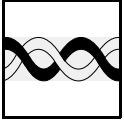
Figure 5.1.2 shows the maximum permissible dimensions of the add-on. The free spaces above and below the add-on have to be considered when mounting the add-on. Since the dimensions of these free spaces depend on the size of the chosen PCB connectors, the user is responsible for keeping to the installation height.

The wrap plugs X7 and X8 are mounted optionally. The size of the pins can vary depending on the design of the wrap plugs. The minimum size of the pins is 8 mm including the plastic socket. The pins of the wrap plugs have a square cross section of 0.635 mm².

Two mounting holes are available for installing the add-on with 2.5 mm screws.

5.2 EMY-OFF Input and Message Outputs

5.2.1 EMY-OFF Input

The EMY-OFF input of the module is connected to the RESET input of controller 8xC592 via optocoupler U1 (TLP620).
If the EMY-OFF input is dead at P1, the module is in 'RESET' status. This means that the connections EMY+ and EMY- have to be supplied with voltage on P1 for the operation of the module, even if the EMY-OFF option is not used. This can be achieved, e.g., by externally bridging pins 2 and 5 of the connector and the inputs.

The nominal voltage of the EMY-OFF input is 24 V(DC) (between EMY+ and EMY-) for the operation of the module.

The EMY-OFF input as well as the connections of the supply voltage cannot be polarized wrongly.
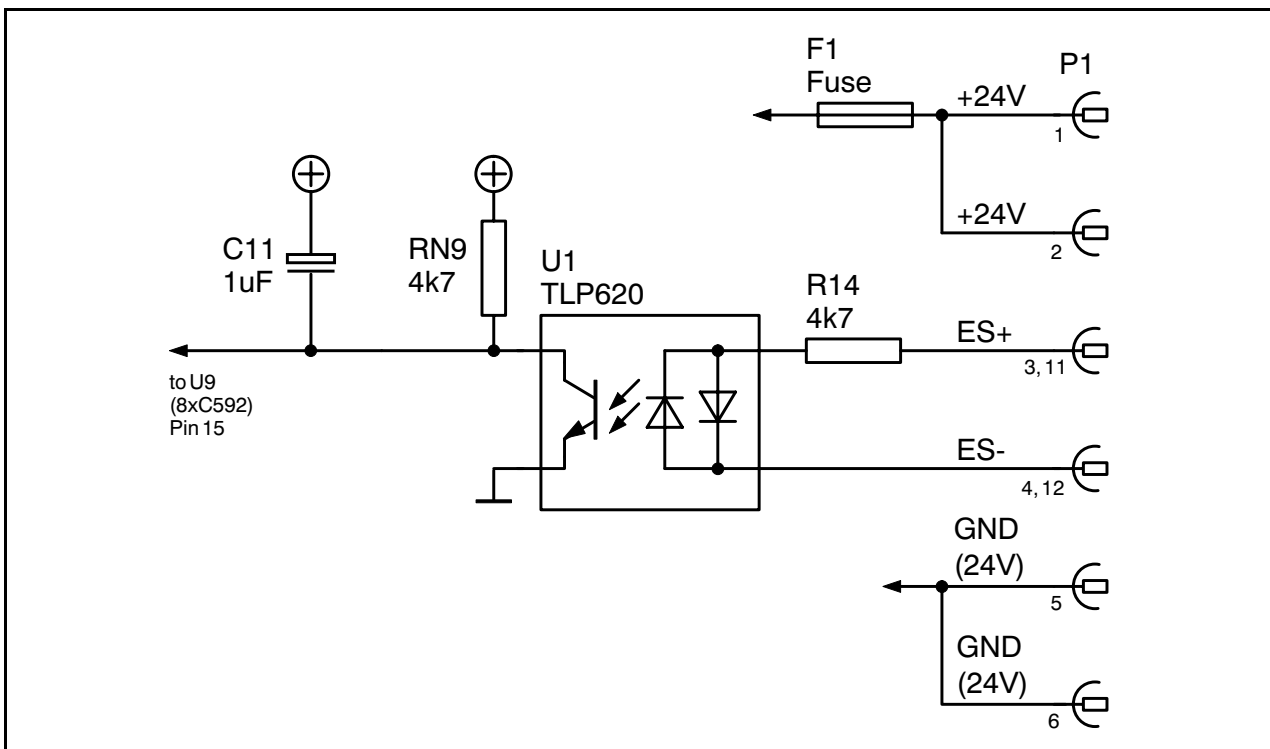
Fig. 5.2.1: Input circuit of the EMY-OFF input

In chapter 'General Installation Notes' detailed displays of the wiring of the EMY-OFF input can be found. The description of the assignment of connector P1 can be taken from the appendix.

STOP

5.2.2 Message Outputs

The module has two message outputs at P1, which are enabled by a relay. One output is connected to the maker and the second output is connected to breaker of the relay.

The relay is driven via a 74HC14 component from port P35T1 (pin 30) of the controller 8xC592.

Fig. 5.2.2: Circuit of the message outputs

The description of the assignment of connector P1 can be taken from the appendix.

5.3 Analog Inputs

5.3.1 Input Circuit

The input circuit of the CAI812 has been designed in a way that individually for each channels the desired voltage measuring area can be chosen via a jumper (J5...J19)(provided that J401...J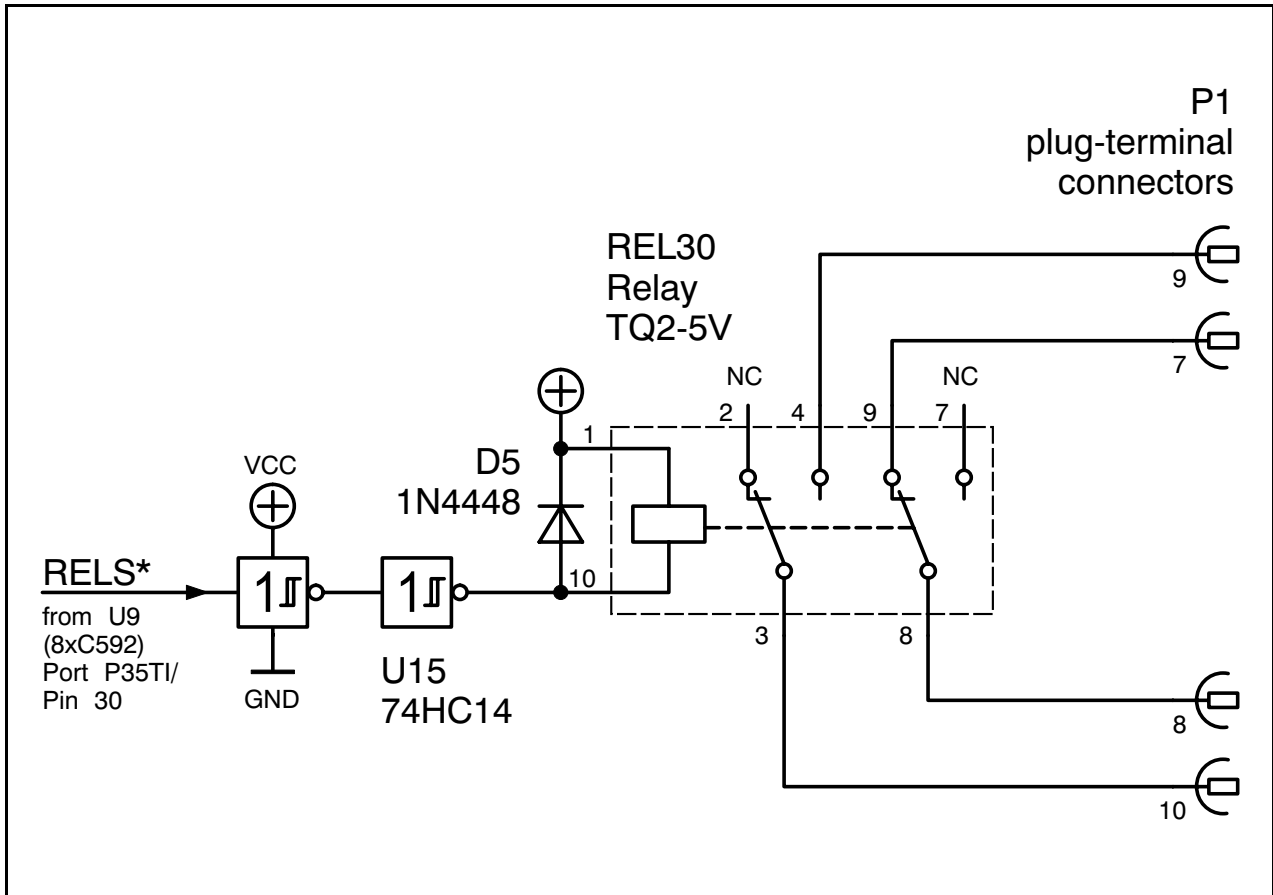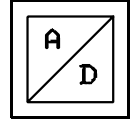504 are set accordingly). The input circuit has a shunt which can also be enabled via a jumper (J4...J18) and by which it is possible to measure current via the module.

Depending on the jumper positions, following measuring areas are possible:
 -5 V ...+5 V   (-20 mA ...+20 mA)
-10 V ...+10 V   (-40 mA ...+40 mA)

The possible jumper positions have already been described in the chapter 'Selection of the Measuring Area (J5...J19)'.
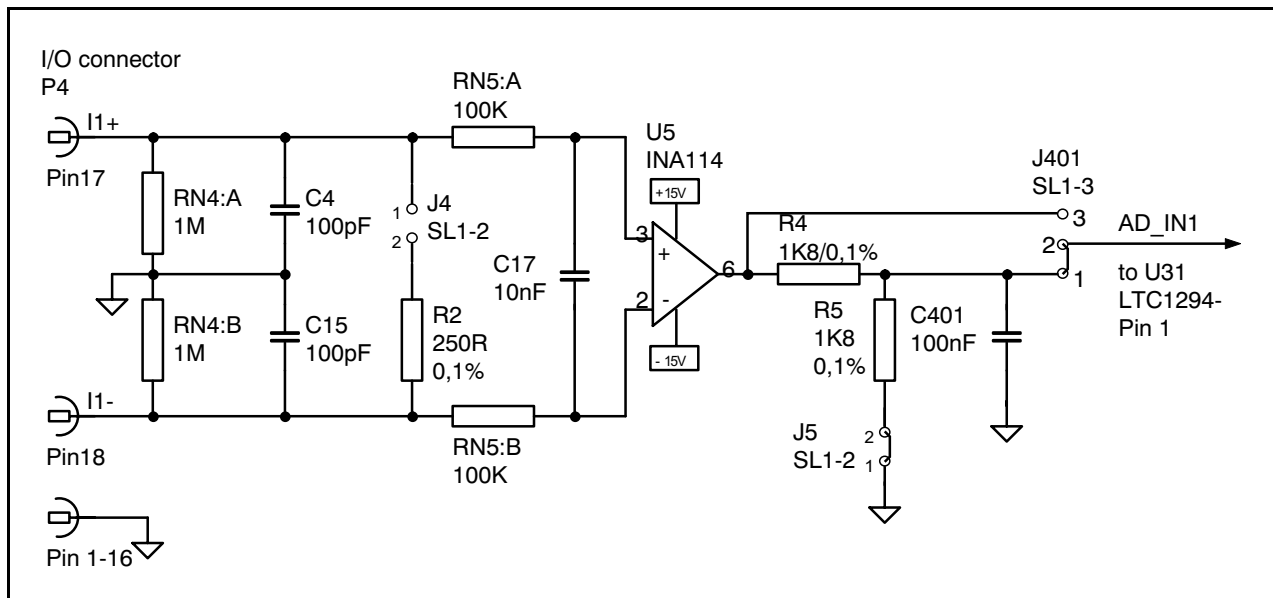
Fig. 5.3.1: Analog input circuit of the module (example: channel 1, ±10 V)

Via the local software it is furthermore possible to configure the A/D converter LTC1294 for unipolar measurements. This makes measurements with 12-bit resolution in the areas of 0...+5 V (0...20 mA) and 0...+10 V (0...40 mA) possible.

This configuration is described in the software manual of the module.
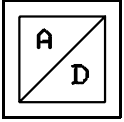
Analog Inputs

5.3.2 Balancing the Analog Inputs

The analog inputs can be balanced by the user by means of the firmware. This procedure is described in the manual 'CAN - CAI812 Manual of the Module-Specific Software'.

5.4 LED Displays

5.4.1 Status LED (LED 1)

The status LED is between the coding switches and the CAN connector P3. In off-voltage status the LED is white, when run, however, it can luminesce in red or green.

Following table shows the meaning of the different luminous states of the status LED.

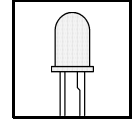| State of the status LED	Status of the CAN module
constantly green	module status is OK, module runs with the parameters stored in the EEPROM.
LED flashes: 250 ms green, 50 ms red	module status is OK, module runs with the default parameters, because EEPROM data is defective or deleted.
LED flashes: 40 ms green, 40 ms red	current CAN error
LED flashes: 50 ms green, 250 ms red	The module found a temporary CAN error which however is not active anymore.
constantly red	Voltage supply is OK, all other functions of the module are out of order -▸ µC 8xC592 is not working or an internal error has occurred. (In this case the user should contact the supplier who will then remove the error.)

Table 5.4.1: Display of the status LED

The position of the status LED on the module can also be taken from the figure in the chapter 'Case View with LED and Connector Description'.
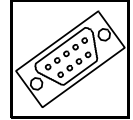
6. Appendix

6.1 Connector Assignments

6.1.1 Voltage Supply and 'EMY OFF' P1

```
                P1      row 1 (lower row)
internal     +24V  +24V  EMY+  EMY-  GND   GND
assignment

pin            1     2     3     4     5     6

external
connections
      +24V                               GND of the
supply       'EMY OFF'-   bridge        supply
  voltage    key switch    for          voltage
             (optional)  'EMY OFF'
```
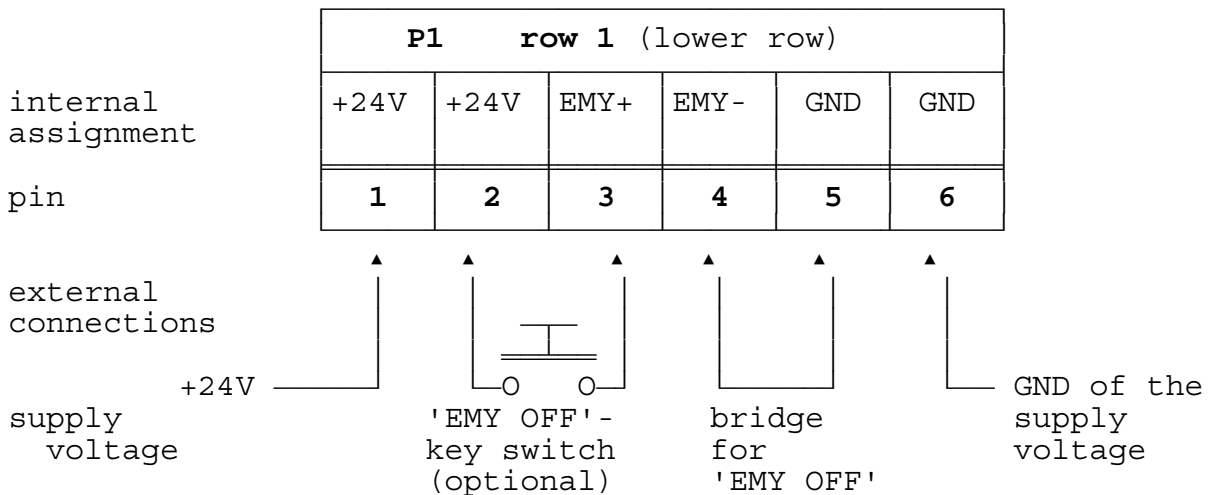
The 'EMY-OFF' input is inactive (no EMY OFF), if a voltage of 24 VDC is applied between the terminals 'EMY+' and EMY-'. For this either the supply voltage (see example above) or any other DC voltage can be used. The 'EMY-OFF' input is galvanically isolated from all other assemblies of the CAN module.

If the voltage between the EMY inputs is disconnected (e.g. by key switch (breaker), a local RESET is triggered on the module.

> The RESET is maintained until voltage is applied to the EMY-OFF inputs again. The EMY-OFF inputs are always evaluated. The EMY-Off function cannot be blocked, that means that a voltage must <u>always</u> apply to the EMY-OFF inputs when the module is to be taken into operation!
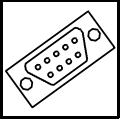
Connector Assignment

The EMY-OFF input can be accessed by two male contacts each. Contacts 3 and 11 and contacts 4 and 12 are internally bridged. The construction of an EMY-OFF chain is shown in detail in the chapter 'General Installation Notes'.

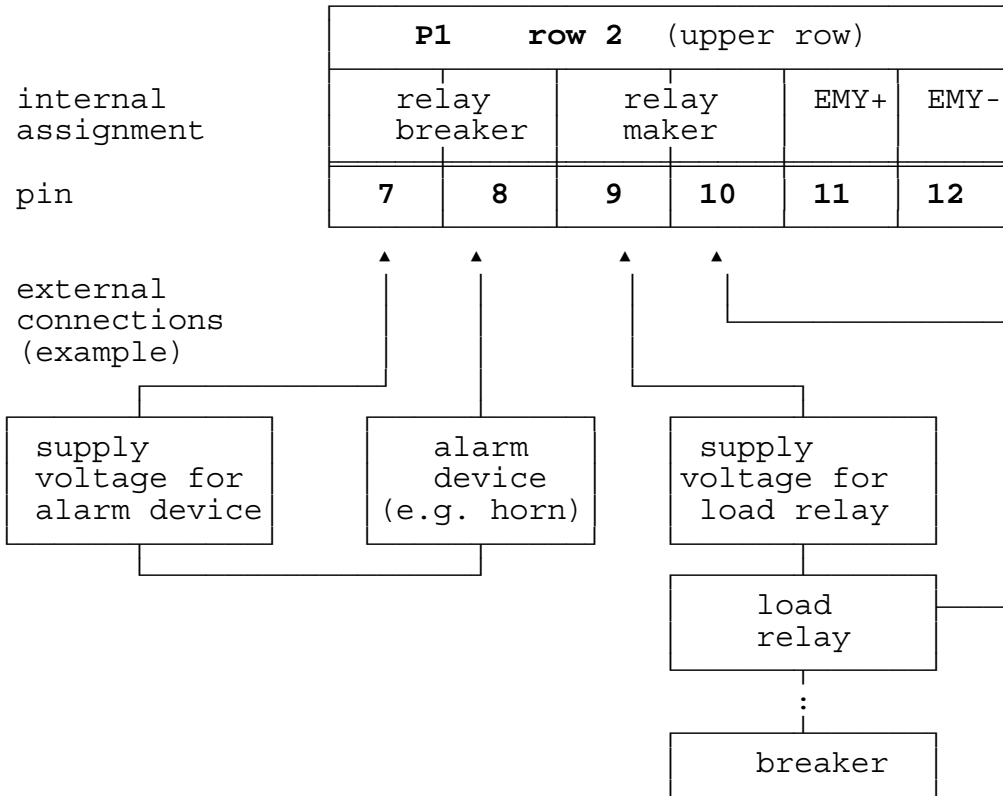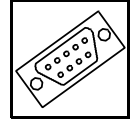| **P1**	**row 2**		(upper row)		
internal assignment	relay breaker		relay maker	EMY+	EMY-
pin	7	8	9	10	11	12

external connections (example)

```
+-----------+    +-----------+         +-----------+
| supply    |    | alarm     |         | supply    |
| voltage for|   | device    |         | voltage for|
| alarm device|  | (e.g. horn)|        | load relay |
+-----------+    +-----------+         +-----------+

                                       +-----------+
                                       | load      |
                                       | relay     |
                                       +-----------+
                                            :
                                       +-----------+
                                       | breaker   |
                                       +-----------+
```

6.1.2 I/O Connectors P4 (MSTB/2.5 40-pin)

Pin	Signal	Pin	Signal
1	GNDA	17	I1+
2	GNDA	18	I1-
3	.	19	I2+
4	.	20	I2-
5	.	21	I3+
6	.	22	I3-
7	.	23	I4+
8	.	24	I4-
9	.	25	I5+
10	.	26	I5-
11	.	27	I6+
12	.	28	I6-
13	.	29	I7+
14	.	30	I7-
15	.	31	I8+
16	GNDA	32	I8-

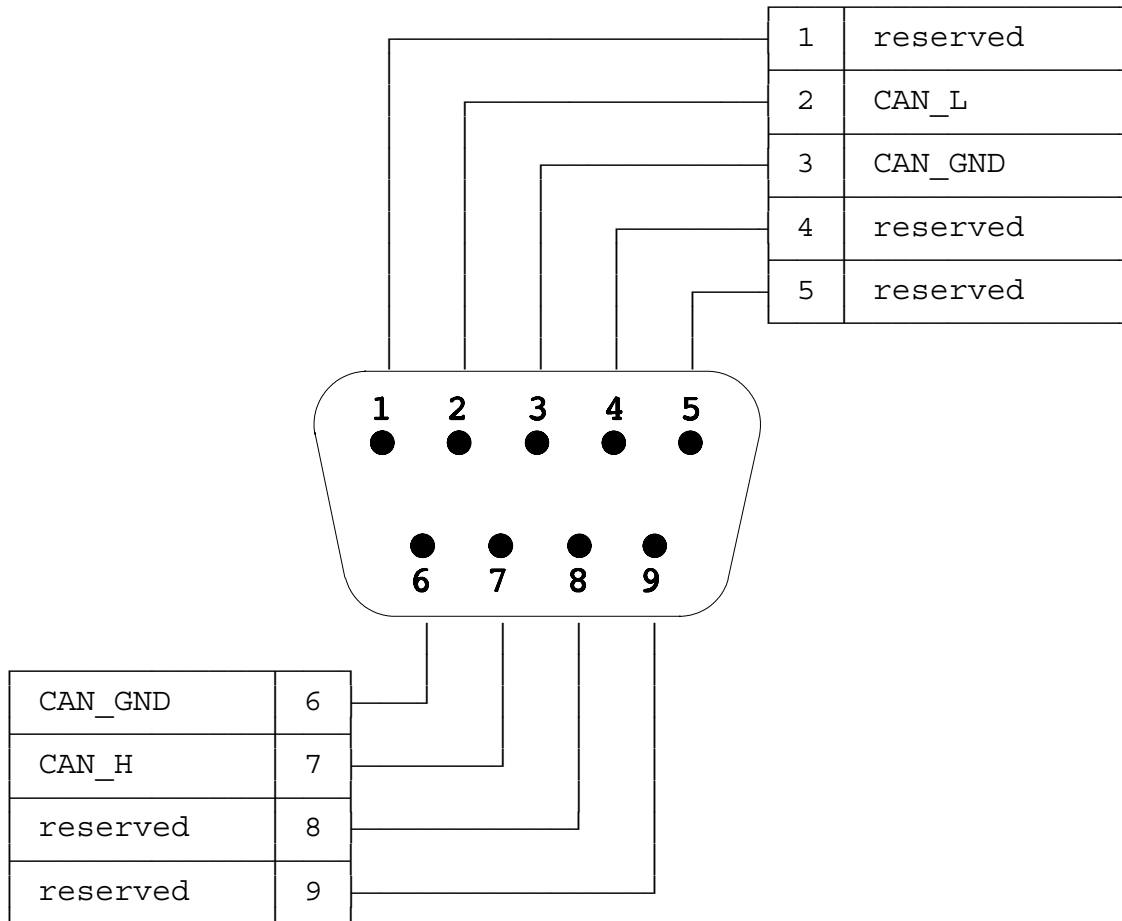Ix+, Ix-...   differential analog inputs (x=1, 2, ...8)

GNDA...   reference potential

Note: The permissible input-voltage area of a channel depends on the position of the according jumper (see section 'Selection of the Measuring Area') and the software parameterization (unipolar/bipolar)!
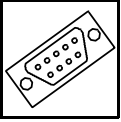
Connector Assignment

6.1.3 CAN Connector P2 (9-pin DSUB male)

1	reserved
2	CAN_L
3	CAN_GND
4	reserved
5	reserved

1	2	3	4	5
●	●	●	●	●

	6	7	8	9
	●	●	●	●

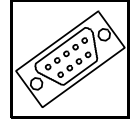| CAN_GND	6
CAN_H	7
reserved	8
reserved	9

Signal description:
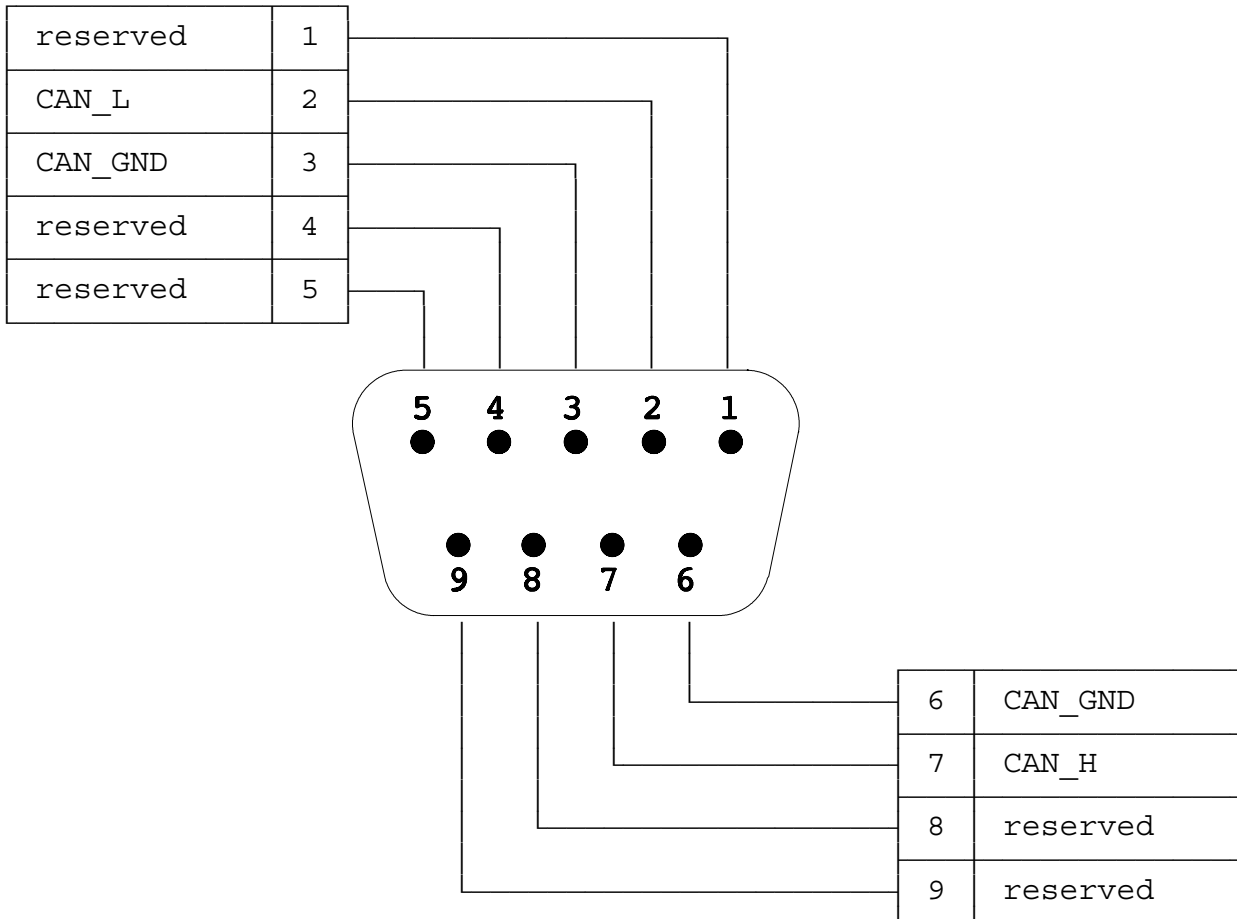
CAN_L, CAN_H...   CAN-signal lines

CAN_GND ...   reference potential of the local CAN-physical layer

reserved ...   reserved for future applications

6.1.4 CAN Connector P3 (9-pin DSUB female)

reserved	1
CAN_L	2
CAN_GND	3
reserved	4
reserved	5

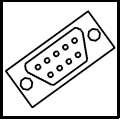| 6	CAN_GND
7	CAN_H
8	reserved
9	reserved

Signal description:

CAN_L, CAN_H...   CAN-signal lines

CAN_GND ...   reference potential of the local physical layer

reserved ...   reserved for future applications

 Connector Assignment
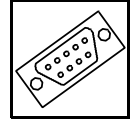
6.1.5 Add-On Male Connector X8 (optional)

The connector X8 is optionally mounted. It is next to the DSUB connector inside the case. X8 has been designed for the use of optional add-ons (other physical layers).

Signal	Pin		Signal
reserved	1	2	CAN_GND
CAN_L	3	4	CAN_H
CAN_GND	5	6	reserved
reserved	7	8	reserved
reserved	9	10	+5 V

10-pin wrap plug

Signal description:

CAN_L, CAN_H...   CAN-signal lines

CAN_GND ...   reference potential of the local CAN-physical layer

+5 V ...   local voltage supply of the CAN interface

reserved ...   reserved for future applications

6.1.6 Add-On Male Connector X7 (optional)

In connection with connector X8, the optional connector X8 can be used for an add-on for the use of other physical layers.

Pin	Signal
1	-
2	SDA
3	SCL
4	GND
5	TX1
6	TX0
7	+24V
8	VCC
9	RX1
10	RX0

wrap plug 1 x 10

Signal description:

+24V, VCC, GND...   local supply voltages
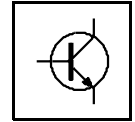(galvanically isolated from the CAN interface)

TX0, RX0...   signals of the CAN controller 8xC592 (U9) which are led onto the CAN (via available interface)
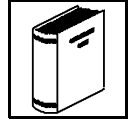
TX1, RX1...   signals of the CAN controller 8xC592 for future applications (add-on)

SDA, SCL...   local serial bus (I^2C), generated by the 8xC592 ports P1.1 (SDA) and P1.3 (SCL)

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6.2 Circuit Diagrams

6.3 Data Sheets

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