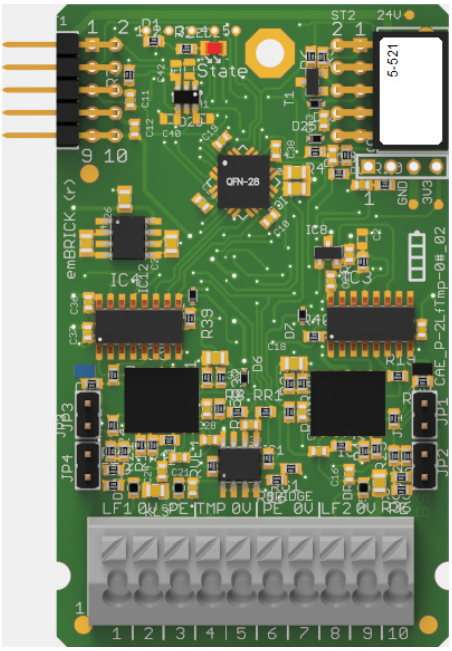
# CAE_P_2LfTmp_02

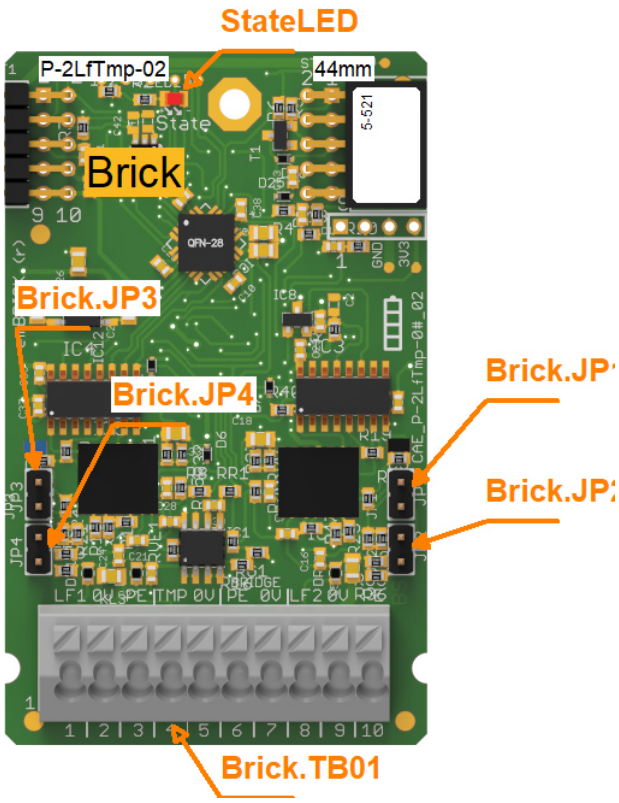



## 1.1 Description

ID: 5-521
Order No.: CAE_P-2LfTmp-02
Terminal: push-in (for ≤ 1.5mm²)
Size: 4 eU (44mm x 72mm)
BBFCP: 1-1-1
Weight: 60g

This module contains all IOs for two typical conductivity measurements with a range of 1 ... 4000µS/cm (configurable). It supports the common cell constants of k = 0.01... 1.0 (configurable). An integrated temperature input (for PT1000) supplies the necessary temperature compensation.

## 1.2 Connectors and Indication-/Operation-Elements




### 1.2.1 Terminal block (TB)

The following Illustration the technical details for Terminal blocks are listed. The location of a specific block is documented with the ID (left coloumn) in the preavious Illustrations.

| ID | Model | Model / Series | Grid | Num. of term. | connection | elec. usage |
|---|---|---|---|---|---|---|
| Brick.TB01 | Cage Terminal | WAGO250 | 2.5mm | 10 | up to 0.5mm² or 0,8mm | 50V/1A |

### 1.2.2 Terminal assignment

Here the assignment of individual terminals and there affilation to terminal blocks (Te block), terminal numbers (Te no.) and short description (T.desc.) aswell as there electrical function and usage are explained.
The associated mechanical and electrical properties are stated with the specific terminal block in the previous chapter. The position of a terminal is dedicated through the "Te block" and the actual terminal number (Te no.) or the therminal description (T.descr.) in the previous Illustration respectivly.
In the coloumn "usage" the technical-/ device-functional use is listed.

| Te block | Te no. | T. descr. | Function | Usage |
|---|---|---|---|---|
| Brick.TB01 | 1 | LF | Input Conductivity Sensor (Cond.) | Cond.1 |
| Brick.TB01 | 2 | 0V | Ground | Cond.1 |
| Brick.TB01 | 3 | PE | Shield | Cond.1 |

| | | | | |
|---|---|---|---|---|
| Brick.TB01 | 4 | Tmp | Input Temperature Sensor | Temperature |
| Brick.TB01 | 5 | 0V | Ground Sensor | Temperature |
| Brick.TB01 | 6 | PE | Shield | - |
| Brick.TB01 | 7 | 0V | Ground | - |
| Brick.TB01 | 8 | LF | Input Conductivity Sensor (Cond.) | Cond.2 |
| Brick.TB01 | 9 | 0V | Ground | Cond.2 |
| Brick.TB01 | 10 | PE | Shield | Cond.2 |

### 1.2.3 Jumper overview (JP)

The individuell jumpers, their combination to logical jumper groups and their usage are stated below. The location of individual jumpers is determined through the jumper ID (left coloumn) in the previous Illustrations.

| ID | Jumper Block | Usage |
|---|---|---|
| Brick.JP01 | Brick.JP-Cond.2 | Cond. Range Selection |
| Brick.JP02 | Brick.JP-Cond.2 | Cond. Range Selection |
| Brick.JP03 | Brick.JP-Cond.1 | Cond. Range Selection |
| Brick.JP04 | Brick.JP-Cond.1 | Cond. Range Selection |

### 1.2.4 Jumpergroups and configuration

Hereafter possible jumper groups settings are described. They refer to jumper-ID of the previous listings. A "o" symbolises a disconnected jumper, a "x" symbolises a connected jumper.

| Jumper Block | Selections | Effect |
|---|---|---|
| Brick.JP-Cond.1 | A: JP3=o JP4=o<br>B: JP3=x JP4=o<br>C: JP3=o JP4=x | Selection of the possible measuring range:<br>Depending on which measuring range you want to measure, the jumper must be plugged in accordingly.<br>This depends firstly on the K value of the probe used and secondly on the set measurement gain.<br><br>Example:<br><br>Probe with a K-value of 1.0<br>Conductivity to be measured max. Approx. 1000µS / cm<br><br>From the list below, option B would be suitable.<br>Jumper 1 must be plugged in and the Meas.-Ampl./Gain set to 10% in the Conductivity Sensor menu so that a measurement range up to 1000 µS/cm can be measured with a K = 1.0 probe.<br><br>A: 250µS/cm (K=1.0 with Meas.-Ampl./Gain = 10%), ADC-Value: approx. 395<br>25µS/cm (K=0.1 with Meas.-Ampl./Gain = 10%), ADC-Value: approx. 395<br>25µS/cm (K=1.0 with Meas.-Ampl./Gain = 100%), ADC-Value: approx. 395<br><br>B: 1000µS/cm (K=1.0 with Meas.-Ampl./Gain = 10%), ADC-Value: approx. 410<br>100µS/cm (K=0.1 with Meas.-Ampl./Gain = 10%), ADC-Value: approx. 410<br>100µS/cm (K=1.0 with Meas.-Ampl./Gain = 100%), ADC-Value: approx. 410<br><br>C: 4300µS/cm (K=1.0 with Meas.-Ampl./Gain = 10%), ADC-Value: approx. 410 |

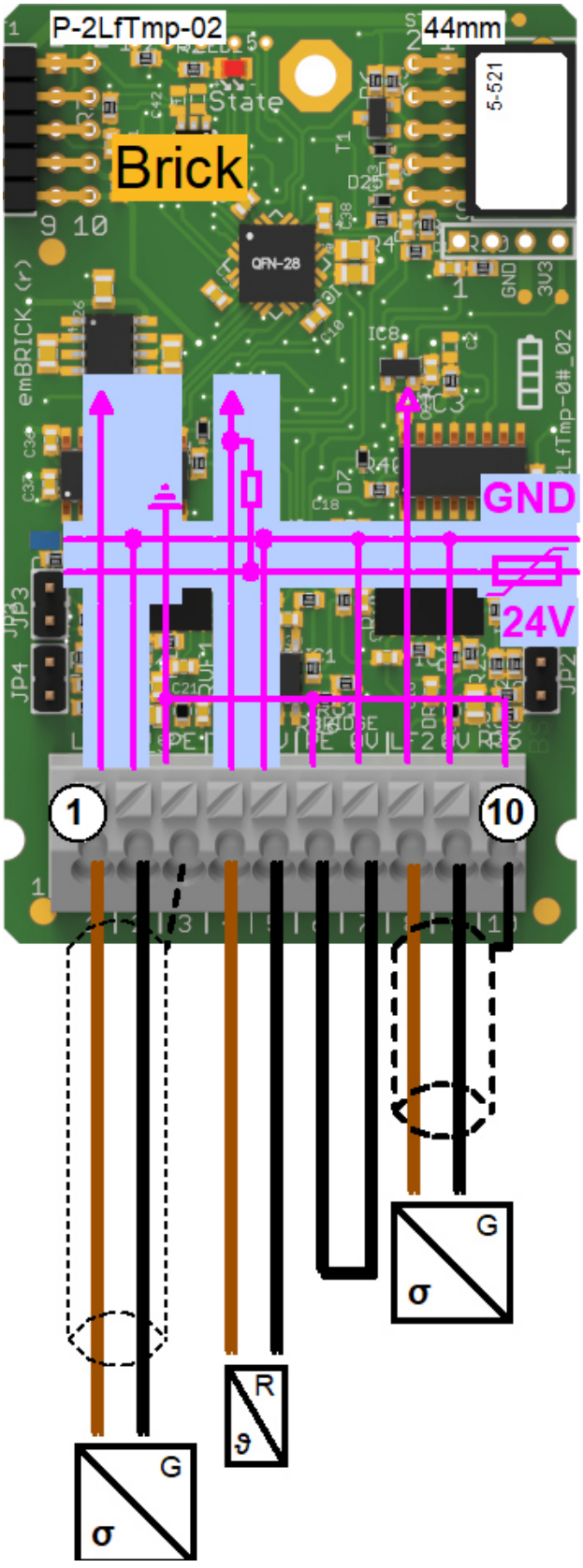
| | | |
|---|---|---|
| | | 430µS/cm (K=0.1 with Meas.-Ampl./Gain = 10%), ADC-Value: approx. 410<br><br>The jumper is usually plugged once into the basic configuration of the device.<br>If the jumper is changed after calibrations have been made, they must be redone. |
| Brick.JP-Cond.2 | A: JP1=o JP2=o<br>B: JP1=x JP2=o<br>C: JP1=o JP2=x | Selection of the possible measuring range:<br>Depending on which measuring range you want to measure, the jumper must be plugged in accordingly.<br>This depends firstly on the K value of the probe used and secondly on the set measurement gain.<br><br>Example:<br><br>Probe with a K-value of 1.0<br>Conductivity to be measured max. Approx. 1000µS / cm<br><br>From the list below, option B would be suitable.<br>Jumper 1 must be plugged in and the Meas.-Ampl./Gain set to 10% in the Conductivity Sensor menu so that a measurement range up to 1000 µS/cm can be measured with a K = 1.0 probe.<br><br>A: 250µS/cm (K=1.0 with Meas.-Ampl./Gain = 10%), ADC-Value: approx. 395<br>25µS/cm (K=0.1 with Meas.-Ampl./Gain = 10%), ADC-Value: approx. 395<br>25µS/cm (K=1.0 with Meas.-Ampl./Gain = 100%), ADC-Value: approx. 395<br><br>B: 1000µS/cm (K=1.0 with Meas.-Ampl./Gain = 10%), ADC-Value: approx. 410<br>100µS/cm (K=0.1 with Meas.-Ampl./Gain = 10%), ADC-Value: approx. 410<br>100µS/cm (K=1.0 with Meas.-Ampl./Gain = 100%), ADC-Value: approx. 410<br><br>C: 4300µS/cm (K=1.0 with Meas.-Ampl./Gain = 10%), ADC-Value: approx. 410<br>430µS/cm (K=0.1 with Meas.-Ampl./Gain = 10%), ADC-Value: approx. 410<br><br>The jumper is usually plugged once into the basic configuration of the device.<br>If the jumper is changed after calibrations have been made, they must be redone. |

### 1.2.5 LED Indications

| ID | Type | Specification | Type / Usage |
|---|---|---|---|
| Brick.StateLED | SMD-LED | yellow | communicationstate Brick |

## 1.3 Input-/Output Scheme

The following diagram shows the adaption of the control unit. To avoid overlapping, some wires are displayed interrupted and dashed.



## 1.4 Technical Data

### 1.4.1 Analog Inputs

The control unit has the following analogue inputs / measuring inputs:

| | |
|---|---|
| Identifier | Cond.1 |
| Type | Conductivity, conductive sensor |
| Range | 0 ... 5000µS/cm @ K=1.0 |
| Input/Load Resistor | - |
| Resolution | 0.2% |
| Accuracy | 2% |
| Linearity | 1% |
| Filter | Tau = 1s |
| Linearization | Temperature compensation 2.2%/K |
| Model / Series | for cell constant K=0.01 ... 10 |
| Remark | - |

| | |
|---|---|
| Identifier | Cond.2 |
| Type | Conductivity, conductive sensor |
| Range | 0 ... 5000µS/cm @ K=1.0 |
| Input/Load Resistor | - |
| Resolution | 0.2% |
| Accuracy | 2% |
| Linearity | 1% |
| Filter | Tau = 1s |
| Linearization | Temperature compensation 2.2%/K |
| Model / Series | for cell constant K=0.01 ... 10 |
| Remark | - |

| | |
|---|---|
| Identifier | Temperature |
| Type | Temperature input, PT1000, 0...50°C |
| Range | 0 ... 50°C |
| Input/Load Resistor | - |
| Resolution | 0.1% |
| Accuracy | 2% |
| Linearity | 1% |
| Filter | Tau = 1s |
| Linearization | - |
| Model / Series | PT1000 |
| Remark | - |

### 1.4.2 User Notes

• Blinking behavior StateLED:
Each Morse code is 3 seconds long!
not initialized = flashing continuously at approx. 5Hz
no communication = short-long-short

too little communication = short-short-short
disturbed communication = short-long-long
OK = continuous flashing at approx. 1Hz (0.6-1.5Hz)

### 1.4.3 Developer Notes

• Shield-Ground Bridge
The PE terminals 3+10 are intended to connect the shield of the sensor line. Then there are two options:
o Connect the sensor shield to the PE. Therefor use terminal 6 and connect it to the system PE.
o Connect the sensor shield to the internal GND. Therefor set the Bridge terminal 6 to 7.

## 1.5 Process Data Image

### 1.5.1 Outgoing Process Data (from bus master to this brick)

| Byte | Function | rCAssign |
|---|---|---|
| 00..01 | Measuring Voltage Cond.1<br>0...16000 Dig. ≡ 0...100% | ...+eB_W0,0,... |
| 02..03 | Measuring Voltage Cond.2<br>0...16000 Dig. ≡ 0...100% | ...+eB_W1,0,... |
| 04..05 | Cond. Measuring Mode<br>Bit 3-0 ...SS: Sample Start Value (Little Endian) 1, 2, … ,15 = 1%, 5%, 9 %, …, 57% (0=default 40 %)<br>Bit 7-4 ...SE: Sample End Value (Little Endian) 1, 2, … ,15 = 5%, 9%, 13 %, …, 61% (0=default 80 %)<br>Bit 10-8 ...MF: Measuring Frequency<br>000 = 1 kHz (default)<br>001 = 2 kHz<br>010 = 4 kHz<br>011 = 8 kHz<br>100 = 500 H<br>101 = 250 Hz<br>110 = unused<br>111 = unused | ...+eB_W2,0,... |

### 1.5.2 Incoming Process Data (from this brick to the bus master)

<table>
<tr><th>Byte</th><th>Function</th><th>rCAssign</th></tr>
<tr><td>00..01</td><td>
Analog Input 1 (Cond.1)<br>
Bit 9-0 ...AIV: Analog Input Value (Little Endian)<br>
11 1111 1111 = Analog Input Value: 1023<br>
...<br>
00 0000 0000 = Analog Input Value: 0<br>
The indicated measuring end ranges refers to the given jumper configuration, cell constant and measuring amplitude.<br><br>
<table>
<tr><th>jumper configuration.</th><th>measured conductance</th><th colspan="2">corresponds to a sensor value conductivity in medium</th><th>measured conductivity</th><th>with a measuring amplitude of ...</th></tr>
<tr><th></th><th>approx.</th><th>approx.</th><th>cell constant</th><th>approx.</th><th></th></tr>
<tr><td rowspan="2">jumper JP4</td><td rowspan="2">4300µS</td><td>4300 µS/cm</td><td>K = 1.0</td><td rowspan="2">410</td><td>10 %</td></tr>
<tr><td>430 µS/cm</td><td>K = 0.1</td><td>10 %</td></tr>
<tr><td rowspan="3">jumper JP3</td><td rowspan="3">1000µS</td><td>1000 µS/cm</td><td>K = 1.0</td><td rowspan="3">410</td><td>10 %</td></tr>
<tr><td>100 µS/cm</td><td>K = 0.1</td><td>10 %</td></tr>
<tr><td>100 µS/cm</td><td>K = 1.0</td><td>100 %</td></tr>
<tr><td rowspan="3">no jumper</td><td rowspan="3">250µS</td><td>250 µS/cm</td><td>K = 1.0</td><td rowspan="3">395</td><td>10 %</td></tr>
<tr><td>25 µS/cm</td><td>K = 0.1</td><td>10 %</td></tr>
<tr><td>25 µS/cm</td><td>K = 1.0</td><td>100 %</td></tr>
</table>
<br>
Note: The measured conductivity has an offset of 3 ... 8 digits. Therefore an initial zero point calibration (one time, independent of sensor) by software is recommended.<br><br>
Note: The delivery state of the jumpers are JP4 is set.<br><br>
The measuring range can be made proportionally more sensitive (less sensitive) by increasing (decreasing) the measuring amplitude. More sensitivity means the same measured value (or a higher value) at less (or the same) sensor conductivity in the medium.
</td><td>...+eB_W0,0,...</td></tr>
<tr><td>02..03</td><td>
Analog Input 2 (Cond.2)<br>
Bit 9-0 ...AIV: Analog Input Value (Little Endian)<br>
11 1111 1111 = Analog Input Value: 1023<br>
...<br>
00 0000 0000 = Analog Input Value: 0<br>
The indicated measuring end ranges refers to the given jumper configuration, cell constant and measuring amplitude.<br><br>
<table>
<tr><th>jumper configuration.</th><th>measured conductance</th><th colspan="2">corresponds to a sensor value conductivity in medium</th><th>measured conductivity</th><th>with a measuring amplitude of ...</th></tr>
<tr><th></th><th>approx.</th><th>approx.</th><th>cell constant</th><th>approx.</th><th></th></tr>
<tr><td rowspan="2">jumper JP2</td><td rowspan="2">4300µS</td><td>4300 µS/cm</td><td>K = 1.0</td><td rowspan="2">410</td><td>10 %</td></tr>
<tr><td>430 µS/cm</td><td>K = 0.1</td><td>10 %</td></tr>
<tr><td rowspan="3">jumper JP1</td><td rowspan="3">1000µS</td><td>1000 µS/cm</td><td>K = 1.0</td><td rowspan="3">410</td><td>10 %</td></tr>
<tr><td>100 µS/cm</td><td>K = 0.1</td><td>10 %</td></tr>
<tr><td>100 µS/cm</td><td>K = 1.0</td><td>100 %</td></tr>
<tr><td rowspan="3">no jumper</td><td rowspan="3">250µS</td><td>250 µS/cm</td><td>K = 1.0</td><td rowspan="3">395</td><td>10 %</td></tr>
<tr><td>25 µS/cm</td><td>K = 0.1</td><td>10 %</td></tr>
<tr><td>25 µS/cm</td><td>K = 1.0</td><td>100 %</td></tr>
</table>
<br>
Note: The measured conductivity has an offset of 3 ... 8 digits. Therefore an initial zero point calibration (one time, independent of sensor) by software is recommended.<br><br>
Note: The delivery state of the jumpers are JP2 is set.<br><br>
The measuring range can be made proportionally more sensitive (less sensitive) by increasing (decreasing) the measuring amplitude. More sensitivity means the same measured value (or a higher value) at less (or the same) sensor conductivity in the medium.
</td><td>...+eB_W1,0,...</td></tr>
<tr><td>04..05</td><td>
Analog Input 3 (Temp)<br>
PT1000:<br>
166...888 Dig. ≡ 0...100 °C<br>
≡ 1000 und 1385 Ohm
</td><td>...+eB_W2,0,...</td></tr>
</table>

## 1.6 History

On the following page you will find a list of changes that have been made to the product.

### 1.6.1 History

| Date | Entry scope (HW, SWappl, SWapi, Release) | Entry type (Enhancement, Improvement, Bugfix, Release) | Version | Status (development, implemented, tested) | Responsible | Reason for the modification | Items of the modification | Impact for (end-)customer | Comment | location in model/source |
|---|---|---|---|---|---|---|---|---|---|---|
| xxxx-xx-xx | | Release | 0.99 | tested | NSt | | | | | |

For questions please contact: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