Automotive
Energy & Power Analysis
Field Service
Environmental
Research & Development

DEWE-Modules

Technical Reference Manual

ISO9001

... the precision signal conditioning company

worldwide

DEWETRON

www.dewetron.com

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Notice

Safety symbols in the manual

Indicates hazardous voltages.

WARNING	*Calls attention to a procedure, practice, or condition that could cause bodily injury or death.*

CAUTION	*Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.*

WARNINGS

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. DEWETRON Elektronische Messgeraete Ges.m.b.H. assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as option and will not be shipped as standard parts.

Safety instructions for DEWETRON amplifiers

- The DEWETRON data acquisition systems and amplifiers may only be installed by experts.
- Read your manual carefully before operating.
- Observe local laws when using the amplifiers.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals or supplied power cable.
- DO NOT operate the product in an explosive atmosphere or in the presence of flammable gases or fumes.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to a DEWETRON sales and service office for service and repair to ensure that safety features are maintained.
- Keep away from live circuits: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers or shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.
- No modifications are allowed at the amplifiers.
- DO NOT service or adjust alone. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.
- DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to a DEWETRON sales and service office for service and repair to ensure that safety features are maintained.
- DO NOT touch internal wiring!
- DO NOT use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- Safety of the operator and the unit depend on following these rules.

Support

For any support please contact your local distributor first or DEWETRON directly.

For Asia and Europe, please contact:

DEWETRON Ges.m.b.H.
Parkring 4
A-8074 Graz-Grambach
AUSTRIA
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Fax: +43 316 307090
Email: support@dewetron.com
Web: http://www.dewetron.com

The telephone hotline is available Monday to Friday between 08:00 and 17:00 CET (GMT -1:00)

For the Americas, please contact:

DEWETRON, Inc.
PO Box 1460
Charlestown, RI 02813
U.S.A.
Tel.: +1 401 364 9464
Toll-free: +1 877 431 5166
Fax: +1 401 364 8565
Email: support@dewamerica.com
Web: http://www.dewamerica.com

The telephone hotline is available Monday to Friday between 08:00 and 17:00 GST (GMT +5:00)

Calibration information

All DEWETRON modules are calibrated at 25 °C and meet their specifications when leaving the factory. The time interval for recalibration depends on environmental conditions. Typically, the calibration should be checked once a year.

Calibration certificates are available from DEWETRON as an option. DEWETRON offers two types:

- ISO traceable DEWETRON certificate
- Calibration certificate according to ÖKD (equivalent to DKD)

This manual contains no calibration information. For self calibration, there is a separate calibration kit for the DAQ series modules available. The CAL-KIT contains the required cables, software and instructions.

Adjustment information are only mentioned if they are required for operation (e.g. DAQP-TRQ).

General module specifications

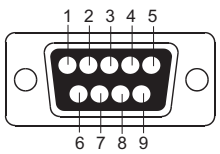
Module dimensions:	20 x 65 x 105 mm (W x H x D without front cover and connectors)	(0.79 x 2.56 x 4.13 in.)
Frontcover:	20 x 87 x 2 mm (W x H x D without connector)	(0.79 x 3.43 x 0.08 in.)
Environmental:		
Temp. range storage:	-30 °C to +85 °C	(-30 °F to 185 °F)
Temp. range operating:	-5 °C to +60 °C	(-4 °F to 140 °F)
Relative humidity (MIL202):	0 to 95 % at 60 °C, non-condensing	
RFI susceptibility:	±0.5 % span error at 400 MHz, 5 W, 3 m	

All modules are produced according ISO9001 and ISO14001.

Module connectors

Frontpanel connector:	Accessable to the user. The connector type and pin assignment varies from module to module. Detailed pin assignment of each module is shown in the appropriate module description.
Rear connector:	9-pin male SUB-D, interface to the DEWE-System, not accessable to the user.

DAQx and PAD module rear view



9-pin male SUB-D connector

Interface pin assignment:

1 Module output (±5 V)
2 RS-485 (A)
3 RS-485 (B)
4 GND
5 +9 V power supply
6 +12 V power / sensor supply
7 Module input (from D/A converter of the A/D board)
8 reserved
9 -9 V power supply

General Module Information

RS-232/485 interface

DAQP modules can be configured via RS-485 interface, PAD modules require this interface for all data transfers.

For all DEWETRON systems, an internal RS-232/485 converter is available (standard with DEWE-2010, DEWE-3020, DEWE-4010 and DEWE-5000 systems). This converter allows communication with DAQP and PAD modules.

To communicate with the modules, the RS-232 interface has to be set to the following parameters:

baud rate:	9600 bps
data bits:	8
parity:	no parity
stop bits:	1
handshake:	not required

DAQP module configuration

1. Push button selection

All ranges and filters can be selected directly by pressing the push buttons on the module. Approx. 15 sec. after changing range and / or filter, the range and filter information is stored in an EEPROM. This procedure increases the livetime of the EEPROM.

The current input range setting is shown all the time by LED. To change the range just press ***RANGE*** button a few times until the required range is displayed.

To see the current filter setting just press the ***FILTER*** button once. The corresponding LED is flashing for approx. 3 seconds. Within this time, the filter can be selected by pressing the ***FILTER*** button again. Approx. 3 seconds after the last key activity, the information will be stored, the LED stops flashing and shows the input range again.

CAUTION: Power loss during this time leaves the module in the former settings.

2. RS-232/485 programming

All ranges and filters can also be selected via RS-232/485 interface. All new DEWE-2010, DEWE-3020, DEWE-4010 and DEWE-5000 systems are prepared as a standard to work with DAQP modules.

The easiest way to change the configuration is to use the DEWEConfig software, which comes as a standard with the DEWETRON data acquisition system.

Detailed information about DAQP modules programming for customer applications is available in the *DEWE-Modules Programmers Reference Manual*.

CAUTION: All range and filter changes which are done via RS-232/485 interface are not stored in the EEPROM of the DAQP modules! You have to store this information in a separat initialisation file to keep settings information for next system start!

PAD module communication

All PAD modules are only working through the RS-232/485 interface. All new DEWE-2010, DEWE-3020 and DEWE-4010 systems are prepared as a standard to work with PAD modules. The easiest way to change the configuration is to use the DEWEConfig software, which comes as a standard with the DEWETRON data acquisition system.

Detailed information about PAD modules programming for customer applications is available in the *DEWE-Modules Programmers Reference Manual*.

Strain gage amplifier

- Input sensitivity: ±0.1, ±0.2, ±0.5, 1, 2 and 5 mV/V
- Ranges and filter: Button or software selection
- Excitation voltage: 5 VDC standard
- Bridge resistance: 120 Ohm to 10 kOhm
- Bridge offset: Adjustable at front panel
- Signal connection: 9-pin SUB-D connector

Module specifications

	DAQN-BRIDGE	DAQP-BRIDGE
Input ranges:	±0.1, ±0.2, ±0.5, ±1, ±2, ±5 mV/V	±0.1, ±0.2, ±0.5, ±1, ±2, ±5 mV/V
Range selection:	Push button	Push button or software
DC accuracy:	Better than ±0.05 %	Better than ±0.05 %
Input bias current:	Typical 40 nA @ 70 °C, max. 240 nA Typical 30 nA @ 25 °C, max. 180 nA	Typical 40 nA @ 70 °C, max. 240 nA Typical 30 nA @ 25 °C, max. 180 nA
Input resistance:	> 100 MOhm	> 100 MOhm
Offset range:	0.2 mV/V or 2 mV/V (jumper selected)	0.2 mV/V or 2 mV/V (jumper selected)
Excitation voltage:	5 V_{DC} (2.5, 5, 10 or 15 VDC jumper selectable)	5 V_{DC} (2.5, 5, 10 or 15 VDC jumper selectable)
Bridge types: ½ and ¼ bridge:	Full bridge With bridge completion	Full bridge With bridge completion
Bridge resistance: @ 2.5 and 5 V excitation: @ 10 and 15 V excitation:	 120 Ohm to 10 kOhm ≥ 350 Ohm to 10 kOhm	 120 Ohm to 10 kOhm ≥ 350 Ohm to 10 kOhm
Bandwidth (-3dB):	5 kHz (±1.5 dB @ f_0)	20 kHz (±1.5 dB @ f_0)
Filters (lowpass):	10 Hz, 100 Hz, 1 kHz (±1.5 dB @ f_0)	10 Hz, 100 Hz, 1 kHz, 5 kHz (±1.5 dB @ f_0)
Filter selection:	Push button	Push button or software
Filter characteristics:	Bessel (factory default) Butterworth (jumper selectable) 40 dB / decade (12 dB / octave)	Bessel (factory default) Butterworth (jumper selectable) 40 dB / decade (12 dB / octave)
Typical CMR:	84 dB @ 0 Hz 96 dB @ 50 Hz 70 dB @ 400 Hz	84 dB @ 0 Hz 96 dB @ 50 Hz 70 dB @ 400 Hz
Overvoltage protection:	±10 V_{DC}	±10 V_{DC}
Output voltage:	±5 V	±5 V
Output resistance:	< 10 Ohm	< 10 Ohm
Output current:	Max. 5 mA	Max. 5 mA
Output protection:	Continuous short to ground	Continuous short to ground
RS-485 interface:	No	Yes
Power supply voltage:	±9 V_{DC} (±10 %)	±9 V_{DC} (±10 %)
Power consumption:	0.7 W to 1.45 W (depending on sensor)	0.7 W to 1.45 W (depending on sensor)

LED state

The DAQx-BRIDGE series module has a set of 6 LEDs showing the current input range (constant active) and filter range (flashing) setting.

Input range and filter selection

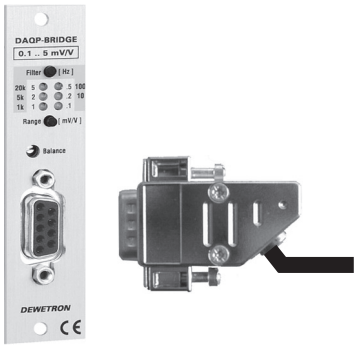
The DAQx-BRIDGE series module has two push buttons.

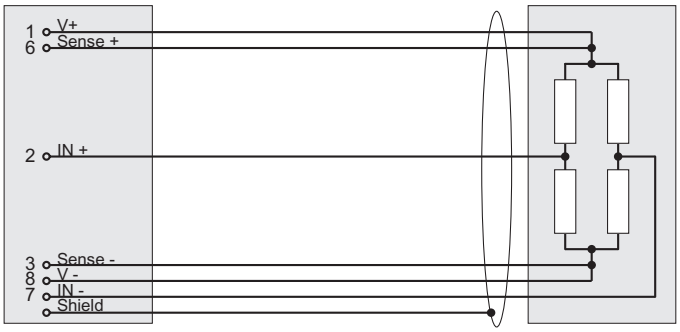
- Range button: Push the ***RANGE*** button several times until the LED displays the desired input range.
- Filter button: Push the ***FILTER*** button once - the LEDs will flash for approx. 3 seconds and display the current filter setting.

  Push the ***FILTER*** button within the three seconds several times until the flashing LED displays the desired filter range.

Full bridge signal connection

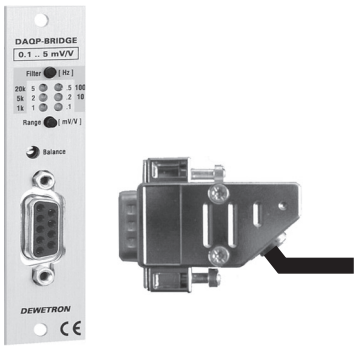
6-wire sensor connection

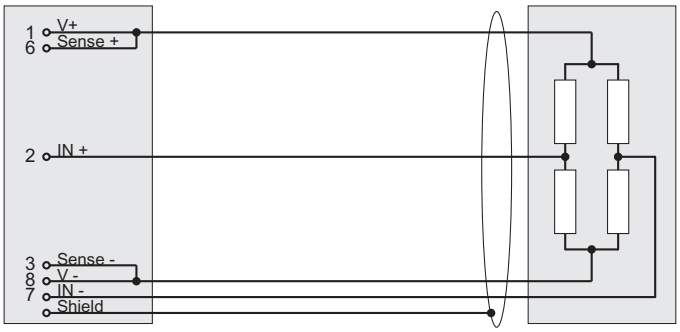




Sense leads (Pin 3 and 6) have to be connected!

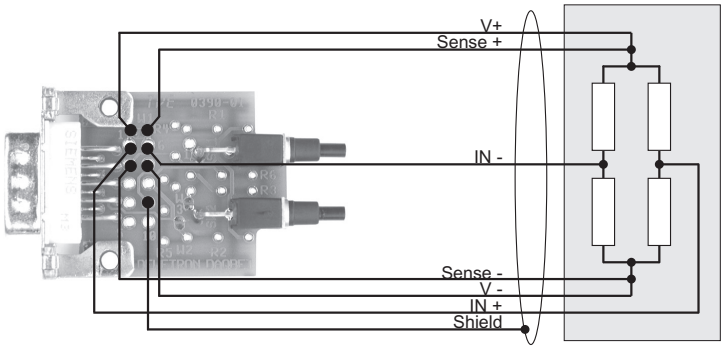
4-wire sensor connection





Sense leads (Pin 3 and 6) have to be connected!

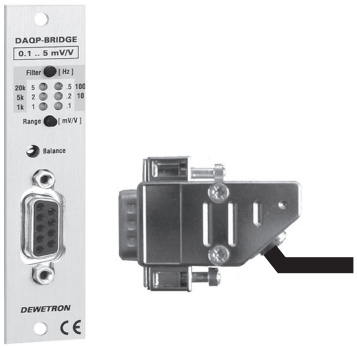
Full bridge connection with BRIDGE-COMPL-4 connector

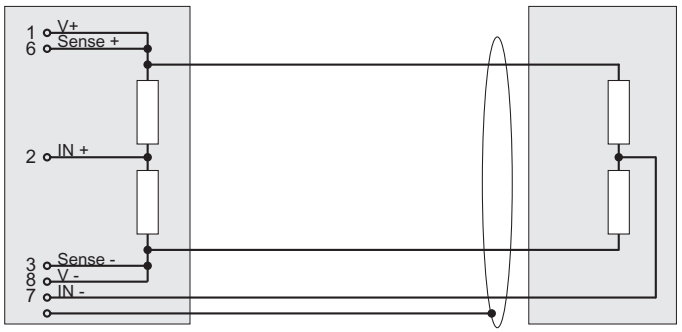


BRIDGE-COMPL-4 is available as an option and not included with standard shipment!

Half bridge signal connection

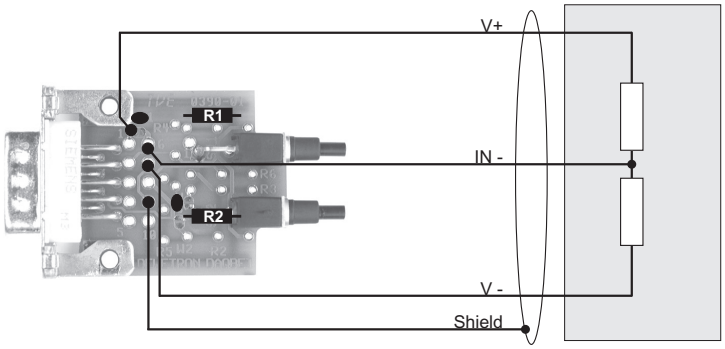
3-wire sensor connection





Sense leads (Pin 3 and 6) have to be connected!

Half bridge connection with BRIDGE-COMPL-4 connector



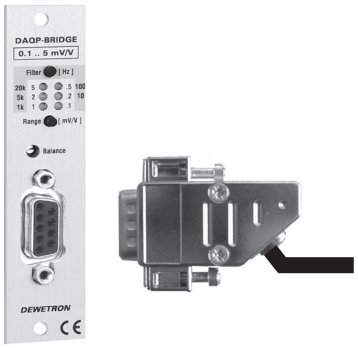
BRIDGE-COMPL-4 is available as an option and not included with standard shipment!

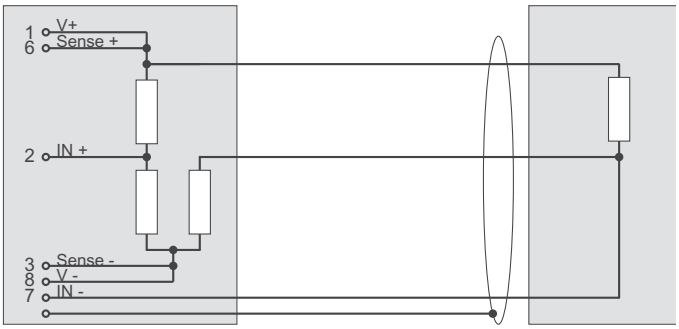
Symbols	Explanation
●	Soldered wire from sensor
⬬	Jumper closed; W1 and W2 are used for internal sense connection
R1	Bridge completion resistor
R2	Bridge completion resistor

The BRIDGE-COMPL-4 comes together with 3 resistors, either for 120 Ohm or 350 Ohm bridges (to be defined at time of order) and one matching calibration resistor.

Quarter bridge signal connection

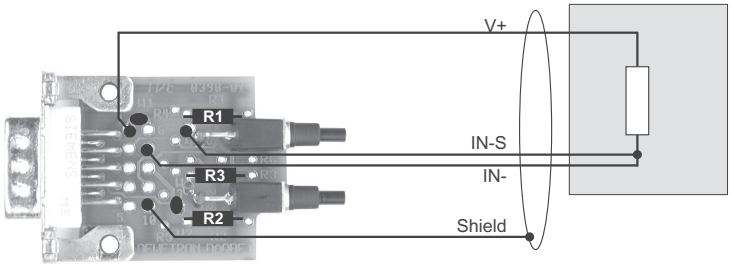
3-wire sensor connection





Sense leads (Pin 3 and 6) have to be connected!

Quarter bridge connection with BRIDGE-COMPL-4 connector



BRIDGE-COMPL-4 is available as an option and not included with standard shipment!

Symbols	Explanation
●	Soldered wire from sensor
⬬	Jumper closed; W1 and W2 are used for internal sense connection
R1	Bridge completion resistor
R2	Bridge completion resistor
R3	Bridge completion resistor

The BRIDGE-COMPL-4 comes together with 3 resistors, either for 120 Ohm or 350 Ohm bridges (to be defined at time of order) and one matching calibration resistor.

BRIDGE-COMPL-4 description

The BRIDGE-COMPL-4 combines four functions in one connector. It is available as an option and not included with standard shipment!

1. Quarter- and half bridge completion

The BRIDGE-COMPL-4 comes together with 3 resistors, either for 120 Ohm or 350 Ohm bridges (to be defined at time of order) and one matching calibration resistor. This resistors allows connection of ¼ and ½ bridge sensors. Wiring details on the previous pages.

2. Internal sense wiring

¼ and ½ bridge sensors are normally connected in 3-wire technology, full bridge sensors are sometimes connected in 4-wire technology instead of 6-wire.

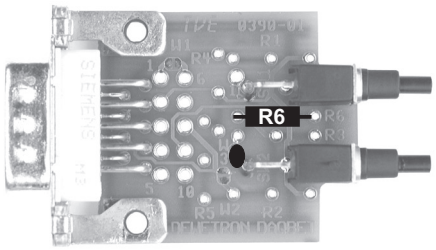
In this case the sense leads (pin 3 and 6 of the DAQP-BRIDGE module) have to be connected internal. This can be done directly on the BRIDGE-COMPL-4 by closing jumper W1 and W2.

Compare full bridge and half bridge connection on previous pages.

3. Reference level selection

The BRIDGE-COMPL-4 can be used to set the amplifier input to two defined levels. If jumper W3 is closed, the 'lower' push button S2 sets the amplifier input to zero.

The second level can be defined internal or external with a shunt resistor. The external shunt has to be connected to J9 and J3, the internal shunt is represented by R6. The 'higher' push button S1 sets the amplifier input to defined limit. The resistance of R6 depends on input range, bridge resistance and desired level.



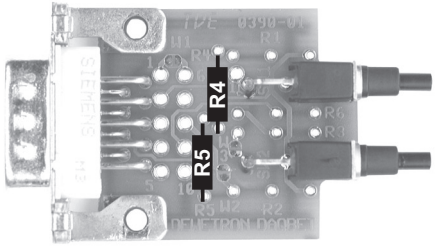
As a standard, following resistor is shipped together with BRIDGE-COMPL-4 (according to bridge resistance):

120 Ohm bridges:	R6 =	18k69	0.05 %	5 ppm	80 % level @ 2 mV/V range
350 Ohm bridges:	R6 =	54k51	0.05 %	5 ppm	80 % level @ 2 mV/V range

For details see also BRIDGE-COMPL-4 schematic on next page.

4. Offset correction

In some cases the internal offset capabilities are not sufficient. In this case the offset can be corrected with either R5 or R6 inserted. For details see also next page.



Changing excitation voltage

A recalibration after changing the excitation voltage is normally not necessary. Only for highest precision measurements, the calibration should be checked.

The excitation voltage is the sum of measured voltage between pin 6 (1) and 4 and pin 3 (8) and 4 ($V_{EX} = V_+ + | V- |$). It can be unsymmetric by a few millivolts. The total excitation voltage V_{EX} can be adjusted by P1 (see below).

	Module input	Excitation voltage				Module output
	(fixed)	5 V (default)	10 V	15 V	2,5	(fixed)
Measuring range	25 mV	5 mV/V	2,5 mV/V	1,667 mV/V	10 mV/V	5 V
Measuring range	10 mV	2 mV/V	1 mV/V	0,667 mV/V	4 mV/V	5 V
Measuring range	5 mV	1 mV/V	0,5 mV/V	0,333 mV/V	2 mV/V	5 V
Measuring range	2,5 mV	0,5 mV/V	0,25 mV/V	0,167 mV/V	1 mV/V	5 V
Measuring range	1 mV	0,2 mV/V	0,1 mV/V	0,067 mV/V	0,4 mV/V	5 V
Measuring range	0,5 mV	0,1 mV/V	0,05 mV/V	0,033 mV/V	0,2 mV/V	5 V

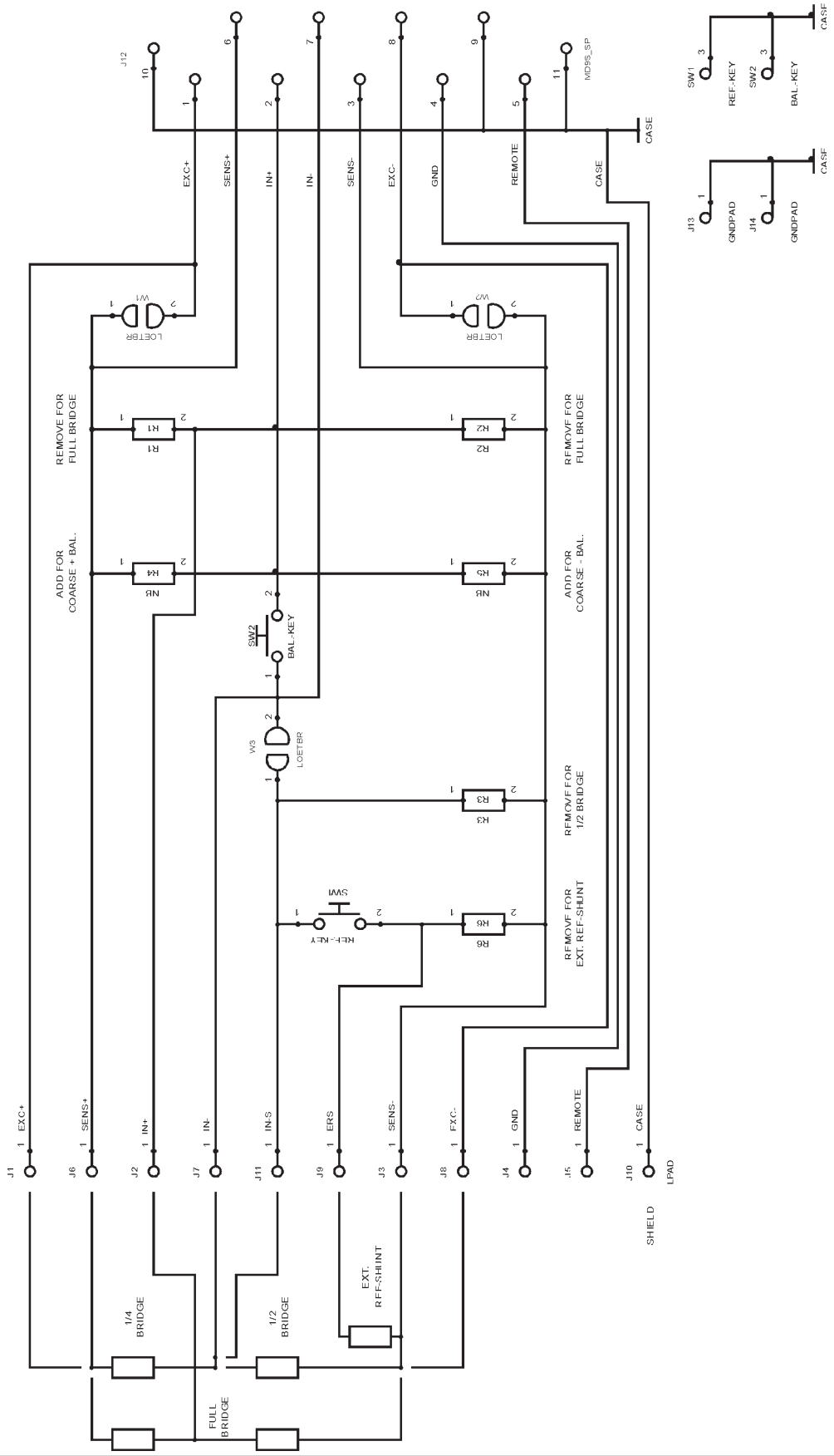
(, = decimal point)

Other ranges can be calculated with the following formula:

The *module input* stays always the same, the *measuring range* mentioned on the amplifiers front panel shows always the measuring range at 5 V *excitation voltage*.

$$\textit{Measuring range}\,[mV/V] = \frac{\textit{Module input}\,[mV]}{\textit{Excitation voltage}\,[V]}$$

BRIDGE-COMPL-4 schematic



Calibration information

All DAQx-BRIDGE modules are within specifications when leaving the factory. The time interval for recalibration depends on environmental conditions. Typically, the calibration should be checked once a year and has to be done by certified persons only. There is a seperate calibration kit available from DEWETRON.

Adjustment information

If you change the excitation voltage, the excitation voltage has to be checked and - if neccessary - adjusted.

CAUTION: Be aware that DEWETRON is not reliable for any damage or injury if module is opened for calibration or jumper setting changes, or incorrect measurement results after selfmade calibrations.

Set excitation voltage

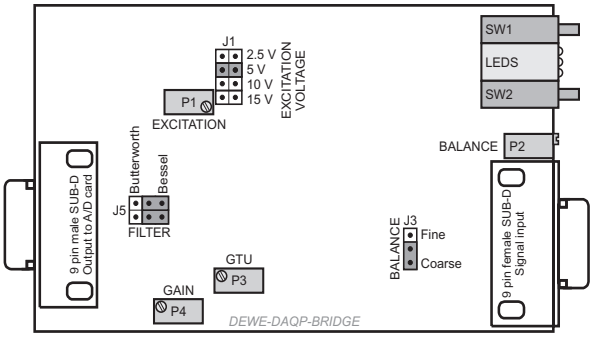
1. Set jumper J1 to the desired excitation voltage
2. Adjust the excitation voltage to the desired excitation voltage (±0.1 mV) using the excitation trimmer P1
3. Put a sticker with excitation voltage on the amplifier to mark it

Potentiometer and jumper positions

Use the excitation voltage jumper to change the excitation voltage from 5 V_{DC} to 2.5, 10 or 15 V_{DC}. To change the filter characteristics, both filter jumpers have to be changed.

The Balance jumper can be used to change the sensitivity of the balance trimmer between fine and coarse.

CAUTION: Changes of the jumper positions may require a recalibration!



Notes