Content

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Warranty Information

A copy of the specific warranty terms applicable to your DEWETRON product and replacement parts can be obtained from your local sales and service office.

Support

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

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The telephone hotline is available
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The telephone hotline is available
Monday to Friday between
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DEWETRON GesmbH
Parkring 4
A-8074 Graz-Grambach / Austria

Printing History

Please refer to the page bottom for printing version.

Safety instructions

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.

For safety reasons max. 50 V may be applied to the BNC input-connectors!
Refer to the regulation of maximum allowable touch potential.

Safety instructions for all DEWETRON systems

- The DEWETRON data acquisition systems may only be installed by experts.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- 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 and do not bring the system in contact with water.
- 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 instrument. The fuse in the power module has to be replaced by the same type. For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type. DO NOT use repaired fuses or short-circuited fuse holder labels and print on the power module may not be removed.
- 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.
- Before opening the instrument (experts only) or exchanging the fuse in the power module disconnect power!
- Don’t touch internal wiring!
- Don’t use higher supply voltage than specified and take care of the correct polarity, otherwise the system will be damaged!
- Use only original plugs and cables for harnessing.
- Install filler-panels in unused slots.
- The power-cable and -connector serve as Power-Breaker. The cable must not exceed 10 feet, disconnect function must be possible without tools.
- Keep the ventilation slots free and check them frequently to avoid an overheating of the system. The cleaning interval of the filter pads depends on the environmental conditions.
- Safety of the operator and the unit depend on following these rules.
- DEWETRON is not responsible for any damage or injury that could result from improper connection or misuse!

General Information

CAUTION

- The system BIOS is protected by password. Any change in the BIOS may cause a system crash. When the system is booting, do not press ESC-button on keyboard. This may clear the BIOS settings and cause system faults.
- Any change in the file structure as deleting or adding files or directories might cause a system crash.
- Before installing software updates contact DEWETRON or your local distributor. Use only software packages which are released by DEWETRON. Further informations are also available in the internet (http://www.dewetron.com).
- After power off the system wait at least 10 seconds before switching the system on again. Otherwise the system may not boot correct. This prolongs also the life of all system components.

Environmental Considerations

Information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling a DEWETRON system:

System and Components Recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at it's end of life! Please recycle this product in an appropriate way to avoid an unnecessary pollution of the environment and to keep natural resources.

This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further informations about recycling on the DEWETRON web site www.dewetron.com

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment, and is outside the scope of the 2002/95/EC RoHS Directive. This product is known to contain lead.

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)

For self calibration, there is a seperate calibration kit available. The CAL-KIT contains the required cables, software and instructions.

General module specifications

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)
Enhanced temp. range:	on request	
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.

RS-232/485 interface

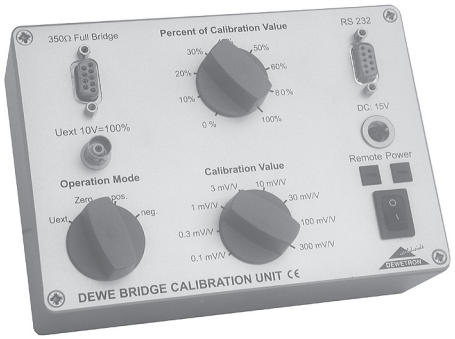
All EPAD series modules can be configured via RS-485 interface. An additional RS-232/485 or USB/RS-485 converter is required to connect the EPAD series modules to any PC or notebook, for example the EPADBASE module.

To communicate with the EPAD 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

Notes

Bridge calibration unit



- Simulates 350 Ohm full and half bridge sensors
- Calibration steps from 0.01 mV/V to 300 mV/V
- Accuracy class 0.005
- External control voltage for bandwidth test
- Remote control function for automatic calibration process
- Usable also with carrier frequency bridge amplifiers
- Internal battery for mains-independent operation

Specifications

All specifications refered to 5 V_{DC} excitation voltage of the bridge amplifier @ 6-wire connection.

	BRIDGE CALIBRATION UNIT
Accuracy class:	0.005
Permissible frequency range for the external excitation voltage:	DC to 5000 Hz
Substitute for strain gage full bridges:	350 Ohm
Nominal value of the excitation voltage:	5 V_{DC}
Maximum permissible excitation voltage:	10 V_{DC}
Calibration steps:	
8 ranges:	0.1, 0.3, 1, 3, 10, 30, 100, 300 mV/V
9 steps within the ranges:	0, 10, 20, 30, 40, 50, 60, 80, 100 %
Mode switch:	Positive or negative output signal, zero, external control voltage
External control voltage:	
Voltage range:	-10 to +10 V
Frequency range*:	DC to 500 kHz
Calibration value:	10 V = 100 % of actual range
Input resistance (differential):	200 kOhm
Input resistance (to ground):	100 kOhm
Absolute calibration of range span:	
3 mV/V range at 23 °C (73 °F):	< ±0.005 %
Grading errors for the ranges:	
Related to the respective range (full scale):	< ±0.002 %
Grading errors for the percent steps (linearity):	
Related to the respective range (full scale):	< ±0.002 %
Calibration error using control voltage input:	0.12 %
Temperature effect of the absolute calibration:	2 ppm/K
With offset correction:	1 ppm/K
Serial interface:	RS-232 (9600 baud, 8 data bits, 1 stop bit, no parity)
Supply voltage**:	15 V_{DC}
Battery:	12 V / 0.8 Ah
Battery operation time:	Typ. 5 h
Dimensions (H x W x D):	70 x 173 x 121 mm (2.76 x 6.81 x 4.76 in.)
Weight:	Typ. 1.2 kg (2.6 lbs)

* please refer to page 3-4
** mains adapter shipped together with DEWE BRIDGE CALIBRATION UNIT

BRIDGE CALIBRATION UNIT

Range of application

Like many other amplifiers, a bridge amplifier is used to measure mechanical quantities. Therefore it is very important to know the relation between the mechanical quantity and the electrical result indicated at the end of the complete measurement chain.

One way is to check the sensor together with the amplifier in one step. But in that case the calibration is only valid if the amplifier is always connected to the same sensor. A recalibration has to be done if the sensor is used with another amplifier. The other way is to calibrate all sensors with a high accuracy amplifier and all amplifiers with high accuracy sensor simulator. The advantage is that you can mix the sensors with the amplifiers still having a high accurate measurement chain.

The DEWE BRIDGE CALIBRATOR UNIT simulates a 350 Ohm (other values on request) full bridge, supplies the bridge amplifier with exactly defined electrical values and simulates the mechanical effect of a sensor.

The calibrator can be adjusted from ±0.1 mV/V to ±300 mV/V in 8 steps with a basic accuracy of 0.005 %. In addition to this, each step can be divided in 10, 20, 30, 40, 50, 60, 80 or 100 % of the currently used calibration range. That means you can also inspect the linearity of an amplifier. The DEWE BRIDGE CALIBRATION UNIT is equipped with an additional voltage input to define the calibration value of the calibrator with an external control voltage of ±10 V. The frequency range of the control voltage input is up to 500 kHz. Therefore the DEWE BRIDGE CALIBRATION UNIT is perfectly suitable to check the bandwidth of amplifiers up to 100 kHz. With this function it is also possible to use carrier frequency amplifiers.

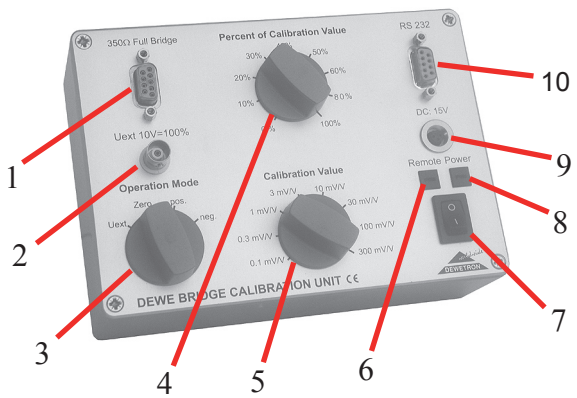
For a full automatic calibration procedure all the described functions can be set via isolated RS-232 interface without decreasing the high accuracy. Another unique feature of the compact DEWE BRIDGE CALIBRATION UNIT is the integrated battery, which allows a power independent usage of up to 5 hours. Therefore the system is not only working in calibration labs. The DEWE BRIDGE CALIBRATION UNIT is perfect to test the whole measuring sequence directly within your application.

On request, DEWETRON provides ÖKD certificates (Austrian calibration authority) for DC, thus is guaranteeing the traceability.

Please contact DEWETRON for additional accessories and for automated calibration procedures.

Operation

Front view

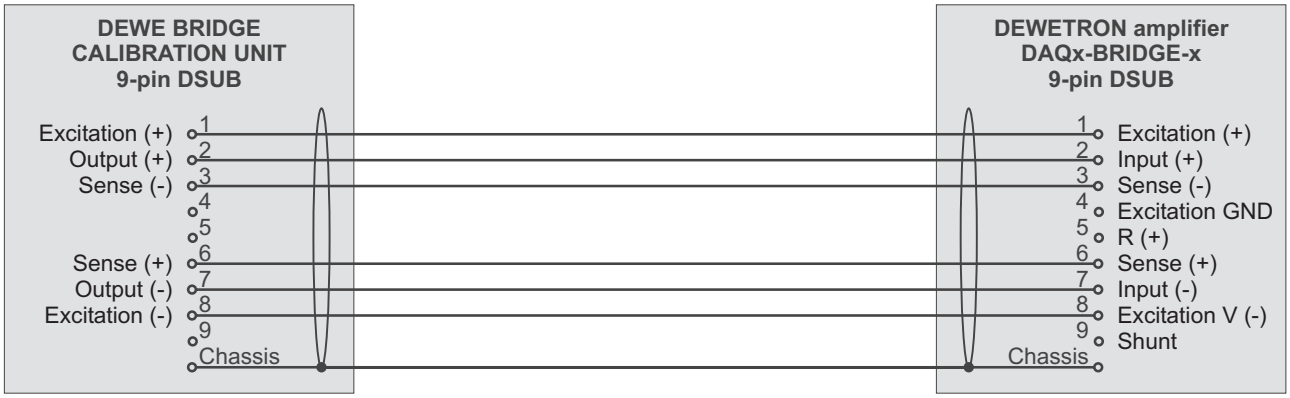


1 Output to bridge amplifier
2 Input for voltage control
3 Operation mode selection
4 Percent of range selection
5 Calibration value selection
6 Power state LED
7 Power switch
8 Remote control state LED
9 Power supply connector
10 RS-232 interface to PC

Signal connection

Wiring to a bridge amplifier

The DEWE BRIDGE CALIBRATION UNIT can be connected to any bridge amplifier. It works for direct current bridge amplifier and also for frequency carrier amplifiers. The high accuracy of the DEWE BRIDGE CALIBRATION UNIT can be only achieved using 6-wire connection to bridge amplifiers. Please note that also the used bridge amplifier has to support the 6-wire connection.

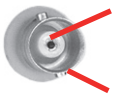


Example for connection to DEWETRON DAQx-BRIDGE-x amplifiers

To use the calibrator for simulating a half bridge, connect only one input line (Pin 2 or Pin 7) to the bridge amplifier. But please note that all actual calibration values are divided by two using the calibrator in this operation mode. For example if you select a calibration value of 3 mV/V, the bridge amplifier will only see 1.5 mV/V.

Wiring of control voltage

Any voltage supply can be used as the control voltage.



Hot: Control voltage (+)

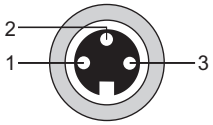
Shield: Control voltage (-)

NOTE: Be aware that this supply has to be within the required specifications!

Wiring of power supply

Please use the included power supply.

3-pin Binder 710 series connector

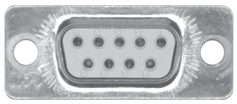


Schematic

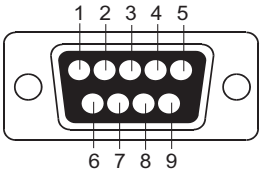
Pin assignment:
1 Power supply (+)
2 Not connected
3 Power supply (-)

BRIDGE CALIBRATION UNIT

Wiring to RS-232 host



9 pin SUB-D connector (male)



Schematic

Pin assignment

1: Not connected
2: RD (Received Data)
3: TD (Transmitted Data)
4: Not connected
5: GND (Ground)
6: Not connected
7: Not connected
8: Not connected
9: Not connected

To connect the DEWE BRIDGE CALIBRATION UNIT to a host computer, you can use any modem cable.

Calibration procedure of a bridge amplifier

General

Switch on the Calibrator at least for 15 minutes before the calibration. A permanent lighting of the Power-LED will indicate the supply voltage is driven by the external power supply unit. A slow flashing (approx. 0.7 Hz) will show you the operation from the internal battery. A low voltage of the battery is indicated by fast flashing of the Power-LED. Please do not use the unit during this condition. You have to charge the internal battery by connecting the external power supply.

Static Calibration

The first step is to connect the calibrator instead of the full bridge sensor to the bridge amplifier. Set the Calibration Value switch and the Percent of Calibration Value switch to the wished output signal. Please refer to following table.

Setting of Calibration Value Switch [mV/V]	Percent of Calibration [%]								
	0	10	20	30	40	50	60	80	100
0.1	0	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.1
0.3	0	0.03	0.06	0.09	0.12	0.15	0.18	0.24	0.3
1	0	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1
3	0	0.3	0.6	0.9	1.2	1.5	1.8	2.4	3
10	0	1	2	3	4	5	6	8	10
30	0	3	6	9	12	15	18	24	30
100	0	10	20	30	40	50	60	80	100
300	0	30	60	90	120	150	180	240	300
	Calibration Signal [mV/V]								

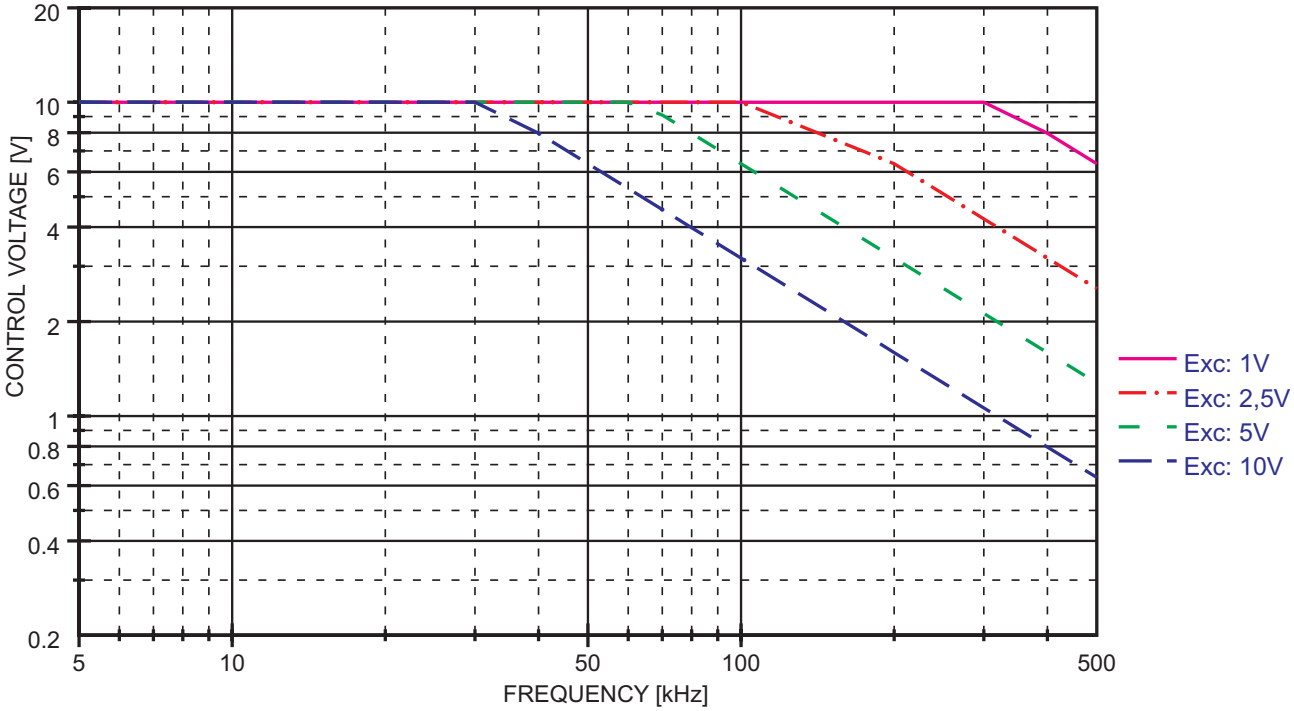
Zero the Bridge Calibrator with the Operation Mode switch to adjust the offset of the amplifier or only for defining the offset value. Use also the Operation Mode switch the Calibrator to the defined output value. By reading the output value of the bridge amplifier of both measurements (Zero measurement and Pos. output) you can exactly define the sensitivity of the bridge amplifier.

Dynamic Calibration

An external voltage input is implemented for checking the bandwidth of an bridge amplifier. Set simply the Operation Mode Switch to “Uext” to enable this function. This external control voltage has nearly the same function than the Percent of Calibration Switch. The advantage of using an external control voltage is the possibility to “adjust” the desired calibration value in infinity steps and in both polarity with up to 500 kHz. An input voltage of 10 V will set the output to 100 % of the calibration value. For example if the Calibration Value is set to 3 mV/V and the input voltage is -7.3 V the output of the calibrator will be set to 2.19 mV/V.

Although the bandwidth of the calibrator itself is more than 500 kHz there is one limitation to use this high input frequency. If the product of the control voltage and the excitation voltage is to high the calibrator can not handle this high frequency. Please refer to the following graph to find out the maximum input frequency of the control voltage versus different excitation voltages of the bridge amplifier.

Maximum Control Voltage versus Frequency



You will see in the diagram the bandwidth of the calibrator goes down to 60 kHz having an excitation voltage of the amplifier of 5 V and in an input voltage level of ±10 V. But if the input voltage level goes down to ±1 V the calibrator reach more the 500 kHz bandwidth. Therefore if it is necessary to have an 500 kHz signal with 1 mV/V simple set the Calibration Value to 10 mV/V and use an input voltage level of 1 V.

This input voltage can be driven from any common frequency generator. So it is possible to check the bandwidth of any bridge amplifier (also carrier frequency amplifiers) like an common voltage amplifier.

Notes

8 channel 2 pole low signal level multiplexer

- Especially designed for low level signal switching
- Two independent 4 channel configuration possible
- High isolation voltage between channels
- Extremely low thermal electromotive force (< 1µV)
- Possibility to switch thermocouple sensor signals
- Signal connection via 25-pin DSUB connector

Module specifications

	CAL-SCAN
Channel configuration:	2 times 2 pole multiplexer with 4 channels
25-pin DSUB contact material:	Gold (over Nickel)
Relay contact:	Gold-clad silver alloy
Contact life time:	Min. $10*10^6$ operations
Typ. contact resistance:	50 mOhm
Initial isolation resistance:	10 GOhm @ 200 V_{DC}
Max. switching voltage:	10 V_{DC}
Max. switching current:	10 mA
Channel Off break down voltage:	350 V_{RMS}
Channel to channel Isolation:	350 V_{RMS}
RS-485 interface:	Yes (9600 baud, 8 data bit, 1 stop bit, no parity)
Power supply voltage:	±9 V_{DC} (±1 %)
Power consumption:	0.3 W

LED state

The CAL-SCAN module has two LED's. The On LED is active as soon as one of the channels has been activated. The Status LED is flashing during the communication with the main system.

Push button

The push button can be used to define the module address within the configuration packages, e.g. DEWEConfig.

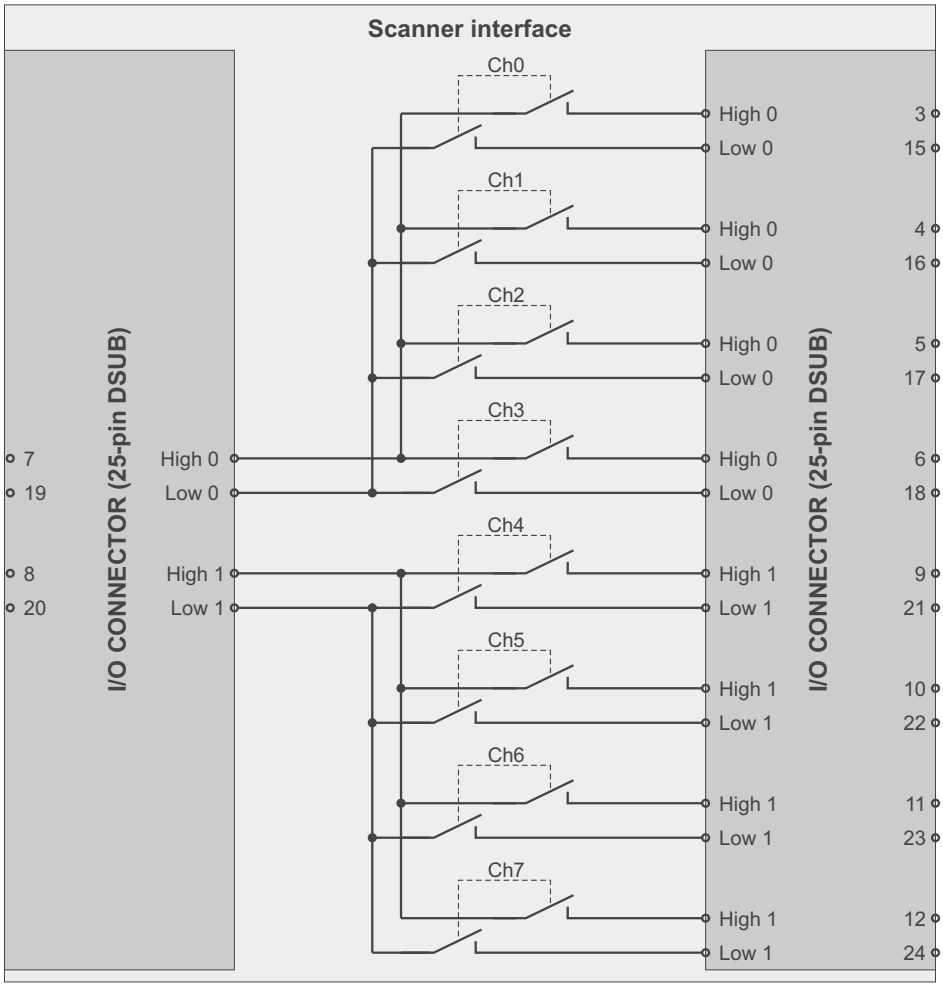
Range of application

The CAL-SCAN module is especially designed for low level switching, which is necessary for sensor signals and also during the calibration or test of high resolution multi-channel input amplifiers like our PAD-TH8-P module. This is the main reason of the low maximum switching level of 10 V.

Of course, the CAL-SCAN can resist much higher voltage levels if the scanner switch is off. Therefore it is possible to switch also higher voltage level. But make sure that the connected voltage level is below 10 V during the switching to keep the high quality of the relay contacts.

Please contact DEWETRON for additional accessories and for automated calibration procedures.

Signal connection



Pin assignment:

1 Not connected
2 Not connected
3 High 0 (Ch0)
4 High 0 (Ch1)
5 High 0 (Ch2)
6 High 0 (Ch3)
7 High 0 (Ch0 - 3)
8 High 1 (Ch4 - 7)
9 High 1 (Ch4)
10 High 1 (Ch5)
11 High 1 (Ch6)
12 High 1 (Ch7)
13 Not connected
14 Not connected
15 Low 0 (Ch0)
16 Low 0 (Ch1)
17 Low 0 (Ch2)
18 Low 0 (Ch3)
19 Low 0 (Ch0 - 3)
20 Low 1 (Ch4 - 7)
21 Low 1 (Ch4)
22 Low 1 (Ch5)
23 Low 1 (Ch6)
24 Low 1 (Ch7)
25 Not connected

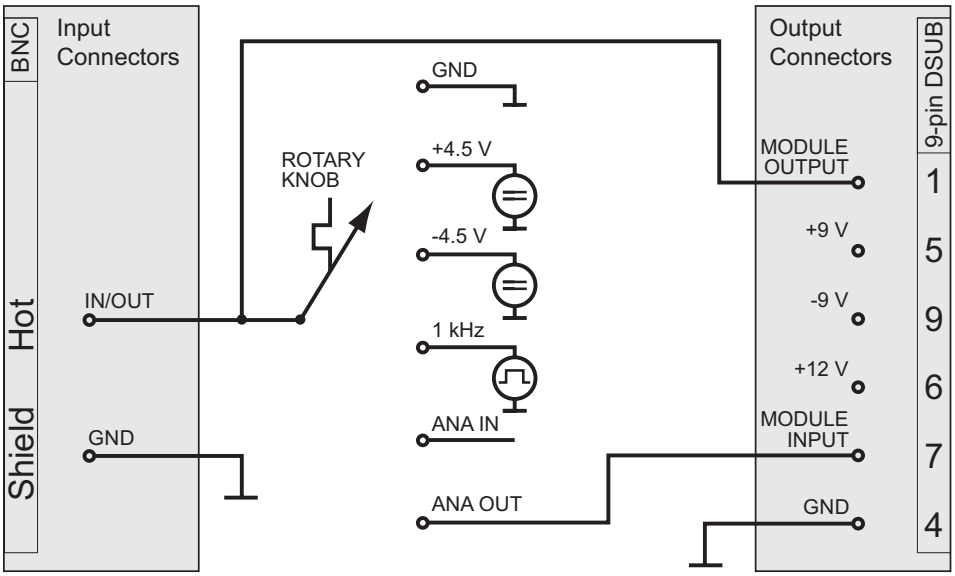
Test module for signal conditioning racks

- High precision 4,5 V and -4,5 V voltage source
- High precision 1 kHz TTL clock
- Analog out

Module specifications

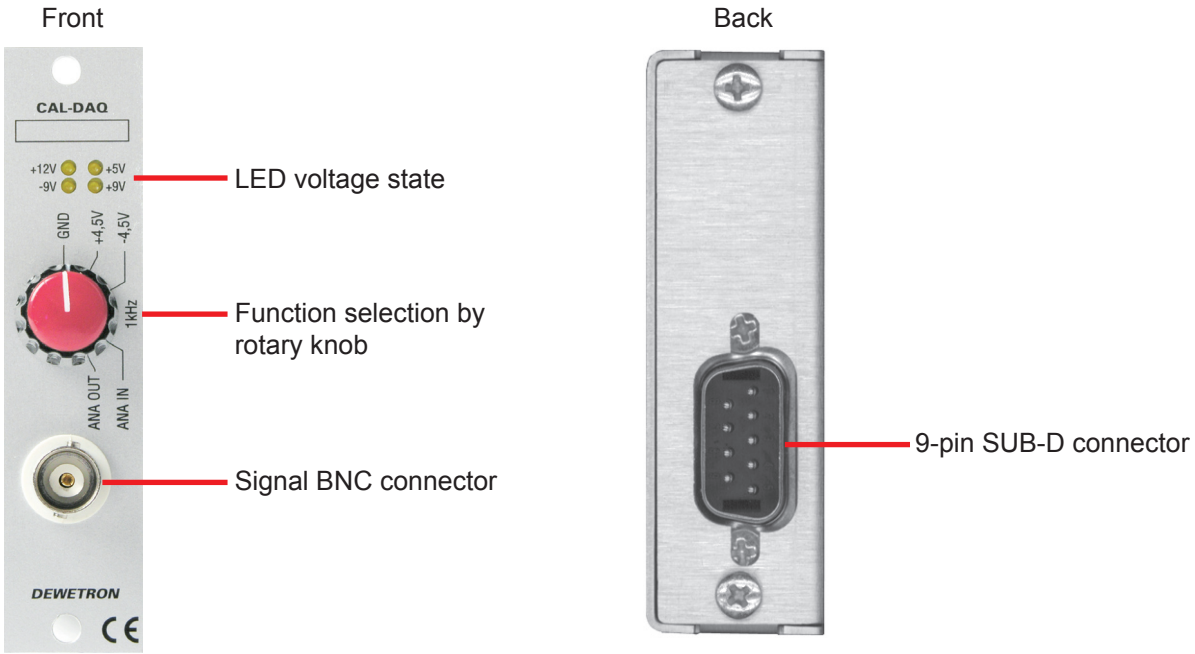
	CAL-SCAN
High precision voltage source +4.5 V	
DC accuracy:	0.02 %
Drift:	3 ppm
Vnoise typ.:	< 0.1 mV AC_{RMS}
High precision voltage source -4.5 V	
DC accuracy:	0.05 %
Drift:	5 ppm
Vnoise typ.:	0.9 mV_{pp}
High precision 1 kHz clock source	
Frequency accuracy:	100 ppm
Output level:	5V TTL
General	
Output current:	10 mA
Short circuit protection:	Yes
Supply voltage:	±9 V_{DC}
RS-485:	No

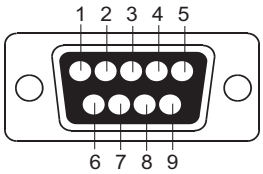
Signal connection



Operation

The CAL-DAQ module fits to the DEWE system signal conditioning racks series of DEWETRON. The test module provides a high precision ±4,5 V voltage source and a 1 kHz TTL clock, which can be selected by a rotary knob. The test signal is applied to the BNC connector in the front and to the SUB-D (interface to the DEWE system) connector on the back, hence it is easy to test the DEWE system. It is also possible to apply an external test signal at the BNC connector, therefore the knob must be set to “ANA IN”. In position “ANA OUT” the DAQ-CAL module supports analog output of A/D cards. The LED ±9 V and 12 V indicates the state of the supply voltages of the DEWE system. The 5 V LED indicates the state of the internal 5 V of the DAQ-CAL module. LED on -> OK.





Pin assignment:

1: Module output
2: n.c.
3: n.c.
4: GND
5: +9 V
6: +12 V
7: Module input
8: n.c.
9: -9 V

Range of application

The DAQ-CAL module has been designed for quick and easy testing of the signal conditioning racks and also for counter and synchronous testing of A/D cards.

- **Test of the rack and backplane**

Therefore the DAQ-CAL module is plugged in a slot and a test signal is selected. DEWESoft controlles if the test signal is measured correct. To test the complete functionality of the rack, the module must be plugged in every slot. Additionally the supply voltages must be checked by the LED state.

- **Testing other modules or devices**

Therefore the test signal is used at the BNC connector and can be applied to other modules or devices.

- **Synchronous tests of A/D cards**

Therefore the 1 kHz clock is selected and applied to other A/D cards via the BNC connector in the front. With Dewesoft you are able to control if the A/D cards works synchronous.

- **Counter test**

Therefore the 1 kHz test signal must be selected and applied to a counter input.

- **Analog Out**

Therefore the position “ANA OUT” must be selected. In this position the module supports the analog output of A/D cards.

NOTE: The DAQ-CAL module is not designed for calibration!

Notes

Bridge calibration

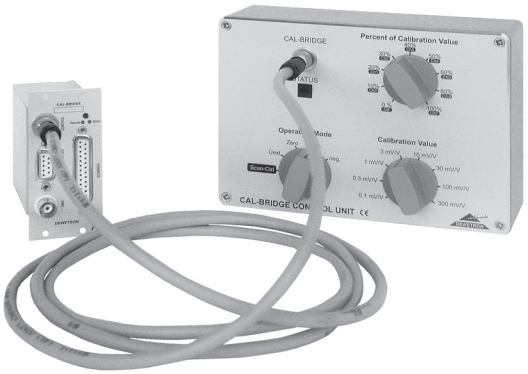
- Combines bridge amplifier calibrator with scanner
- Manual or remote operation

Bridge calibrator:

- Simulates 350 Ohm full and half bridge sensors
- Calibration steps from 0.01 mV/V to 300 mV/V
- Accuracy class 0.005
- External control voltage for bandwidth test
- Remote control function for auto-cal process
- Usable also with carrier frequency bridge amplifiers

Scanner:

- Special designed for low level signal switching
- Two independent 4 channel configuration possible
- High isolation voltage between channels
- Extremely low thermal electromotive force (< 1µV)
- Possibility to switch thermocouple sensor signals



Specifications

All specifications refered to 5 VDC excitation voltage of the bridge amplifier @ 6-wire connection.

	CAL-BRIDGE
CAL-BRIDGE module:	
Accuracy class:	0.005
Permissible frequency range for the external excitation voltage:	DC to 5000 Hz
Substitute for strain gage full bridges:	350 Ohm
Nominal value of the excitation voltage:	5 V_{DC}
Maximum permissible excitation voltage:	10 V_{DC}
Calibration steps:	
8 ranges:	0.1, 0.3, 1, 3, 10, 30, 100, 300 mV/V
9 steps within the ranges:	0, 10, 20, 30, 40, 50, 60, 80, 100 %
Mode switch:	Positive or negative output signal, zero, external control voltage
External control voltage:	
Voltage range:	-10 to +10 V
Frequency range:	DC to 500 kHz
Calibration value:	10 V = 100 % of actual range
Input resistance (differential):	200 kOhm
Input resistance (to ground):	100 kOhm
Absolute calibration of range span:	
3 mV/V range at 23 °C (73 °F):	< ±0.005 %
Grading errors for the ranges:	
Related to the respective range (full scale):	< ±0.002 %
Grading errors for the percent steps (linearity):	
Related to the respective range (full scale):	< ±0.002 %
Calibration error using control voltage input:	0.12 %
Temperature effect of the absolute calibration:	2 ppm/K
With offset correction:	1 ppm/K
Channel configuration:	2 times 2 pole multiplexer with 4 channels
25-pin DSUB contact material:	Gold (over Nickel)
Relay contact:	Gold-clad silver alloy
Contact life time:	Min. $10*10^6$ operations

Specifications (continued)

CAL-BRIDGE module (continued):	
Typ. contact resistance:	50 mOhm
Initial isolation resistance:	10 GOhm @ 200 V_{DC}
Max. switching voltage:	10 V_{DC}
Max. switching current:	10 mA
Channel Off break down voltage:	350 V_{RMS}
Channel to channel Isolation:	350 V_{RMS}
Serial interface:	RS-485 (9600 baud, 8 data bits, 1 stop bit, no parity)
Supply voltage:	±9 V_{DC}
Power consumption:	typ. 3 W (incl. CAL-BRIDGE control unit)
Dimensions module (H x W x D):	65 x 40 x 105 mm (2.56 x 1.78 x 4.12 in.)
CAL-BRIDGE CONTROL UNIT:	
Power supply:	Supplied by CAL-BRIDGE module
Dimensions control unit (H x W x D):	70 x 173 x 121 mm (2.76 x 6.81 x 4.76 in.)
Weight control unit:	typ. 0.6 kg (1.2 lbs)

LED state

The CAL-BRIDGE module has two LED's. The remote LED is normally active. As soon as the CAL-BRIDGE CONTROL UNIT is connected to the module, a manual operation is allowed and the remote LED will be deactivated to indicate the manual operation. If the CONTROL UNIT is connected, the remote operation is still possible. In that case the Status LED of the CONTROL UNIT will be deactivated.

The Status LED is flashing during the communication with the main system.

Push button

The push button can be used to define the module address within the configuration packages, e.g. DEWEConfig.

Range of application

The CAL-BRIDGE module combines a high precision bridge calibration unit and a low level signal 8 channel multiplexer.

It is especially designed for the usage in a calibration lab. But because of the optional available CAL-BRIDGE CONTROL UNIT it allows also the operation together with a common DEWETRON measurement system. Just plug in the module in standard DEWE-RACK and do manual control without any software.

The bridge calibrator simulates a 350 Ohm (other values on request) full bridge and supplies the bridge amplifier with exactly defined electrical values and simulates the mechanical effect of a sensor.

The calibrator can be adjusted from ±0.1 mV/V to ±300 mV/V in 8 steps with a basic accuracy of 0.005 %. In addition to this each step can be divided in 10, 20, 30, 40, 50, 60, 80 or 100 % of the currently used calibration range. That means you can also inspect the linearity of an amplifier. The CAL-BRIDGE is equipped with an additional voltage input to define the calibration value of the calibrator with an external control voltage of ±10 V. The frequency range of the control voltage input is up to 500 kHz. Therefore the CAL-BRIDGE is perfectly suitable to check the bandwidth of amplifiers up to 100 kHz. This function is also possible using carrier frequency amplifiers.

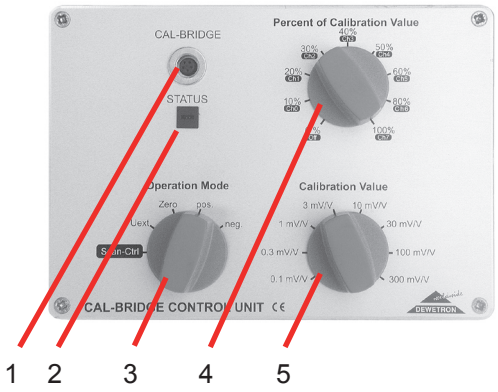
The scanner is special designed for low level switching which is necessary for sensor signals and also during the calibration or test of high resolution multi channel input amplifiers like our PAD-TH8-P modules. This is the main reason of the low maximum switching level of 10 V. Of course, the scanner can resist much higher voltage levels if the scanner switch is off. So it is possible to switch also higher voltage levels. But make sure that the voltage level is lower than 10 V during the switching to keep the high quality of the relay contacts.

On request, DEWETRON provides ÖKD certificates (Austrian calibration authority) for DC, thus is guaranteeing the trace ability.

Please contact factory for additional accessories and for automated calibration procedures.

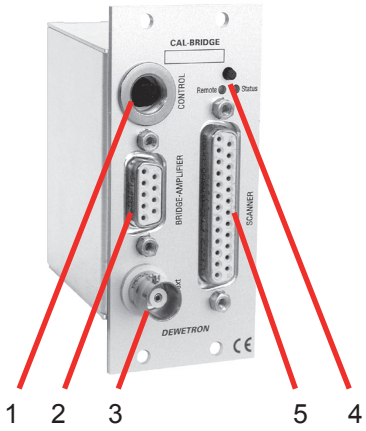
Operation

Front view CAL-BRIDGE control-unit



1 Interface to CAL-BRIDGE module
2 State LED
3 Operation mode selection
4 Percent of range selection
5 Calibration value selection

Front view CAL-BRIDGE module:

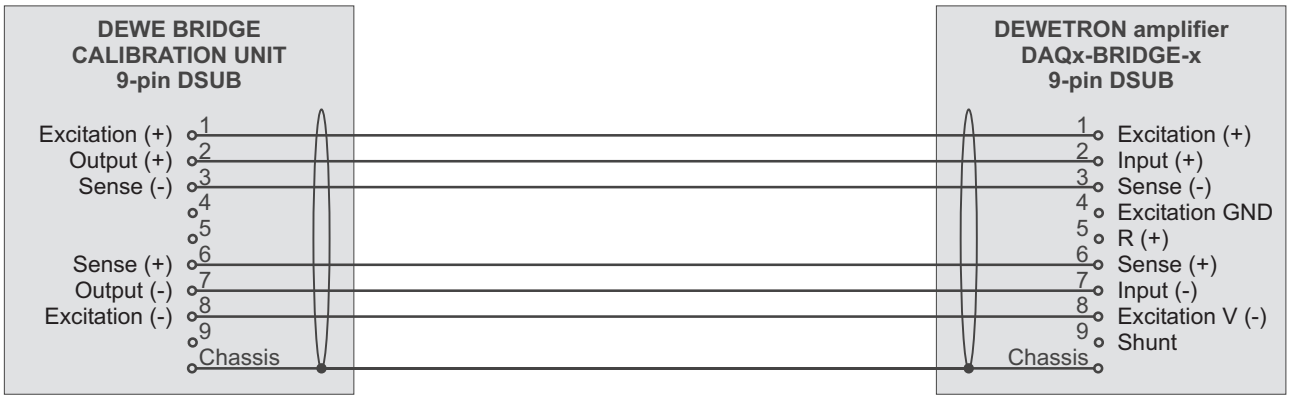


1 Interface to CAL-BRIDGE control unit
2 Output to bridge amplifier
3 Input for voltage control
4 State LEDs
5 Scanner connector

Signal connection

Wiring to a Bridge Amplifier

The CAL-BRIDGE can be connected to any bridge amplifiers. It works for direct current bridge amplifier and also for frequency carrier amplifiers. The high accuracy of the CAL-BRIDGE can be only achieved using 6-wire connection to the bridge-amplifier. Please note that also the used bridge amplifier have to support the 6-wire connection.



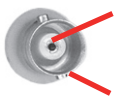
Example for connection to DEWETRON DAQx-BRIDGE-x amplifiers

CAL-BRIDGE

To use the calibrator for simulating a half bridge, connect only one input line (Pin 2 or Pin 7) to the bridge amplifier. But please note that all actual calibration values are divided by two using the calibrator in this operation mode. For example if you select a calibration value of 3 mV/V, the bridge amplifier will only see 1.5 mV/V.

Wiring of Control Voltage

Any voltage supply can be used as the control voltage. Be aware that this supply has to be within the required specifications!



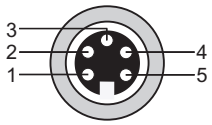
Hot: Control voltage (+)

Shield: Control voltage (-)

Remote control connector

This connector can be used to connect the module to the CAL-BRIDGE control unit.

5 pin Binder 710 series connector

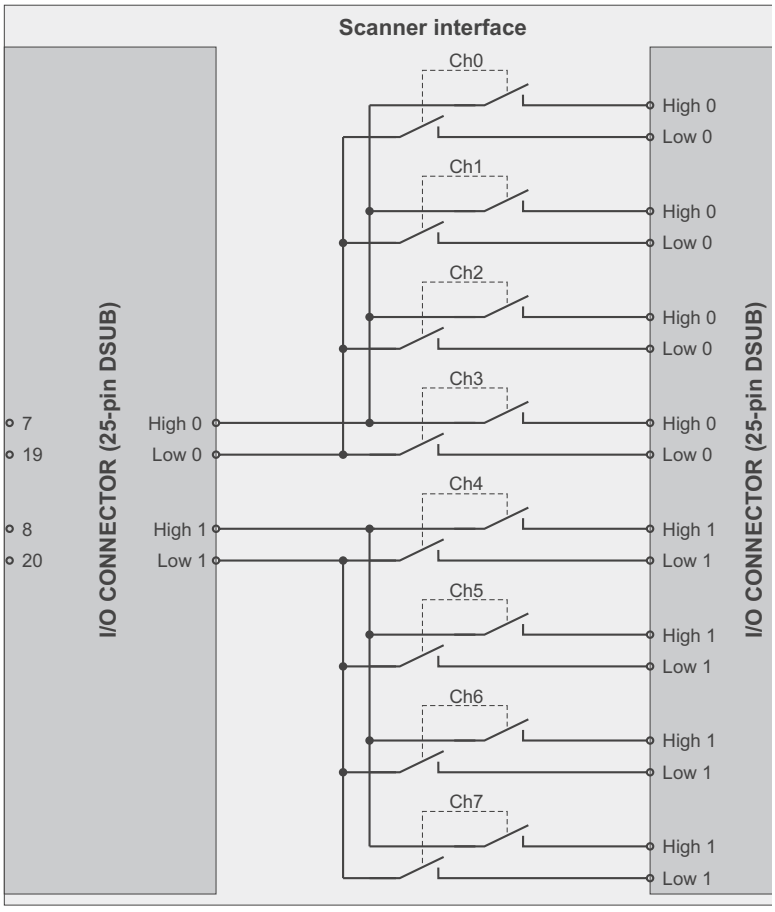


Schematic

Pin assignment

1	Dataline (A)
2	Dataline (B)
3	Power supply (+)
4	GND
5	Shield

Wiring of the scanner



1	Not connected
2	Not connected
3	High 0 (Ch0)
4	High 0 (Ch1)
5	High 0 (Ch2)
6	High 0 (Ch3)
7	High 0 (Ch0 - 3)
8	High 1 (Ch4 - 7)
9	High 1 (Ch4)
10	High 1 (Ch5)
11	High 1 (Ch6)
12	High 1 (Ch7)
13	Not connected
14	Not connected
15	Low 0 (Ch0)
16	Low 0 (Ch1)
17	Low 0 (Ch2)
18	Low 0 (Ch3)
19	Low 0 (Ch0 - 3)
20	Low 1 (Ch4 - 7)
21	Low 1 (Ch4)
22	Low 1 (Ch5)
23	Low 1 (Ch6)
24	Low 1 (Ch7)
25	Not connected

Calibration procedure of a bridge amplifier

General

Switch on the Calibrator at least for 15 minutes before the calibration. If also the CAL-BRIDGE Control Unit is connected a manual operation is possible. The Status LED will indicate the possibility of manual operation.

Static Calibration

The first step is to connect the calibrator instead of the full bridge sensor to the bridge amplifier. Set the Calibration Value switch and the Percent of Calibration Value switch to the wished output signal. Please refer to following table.

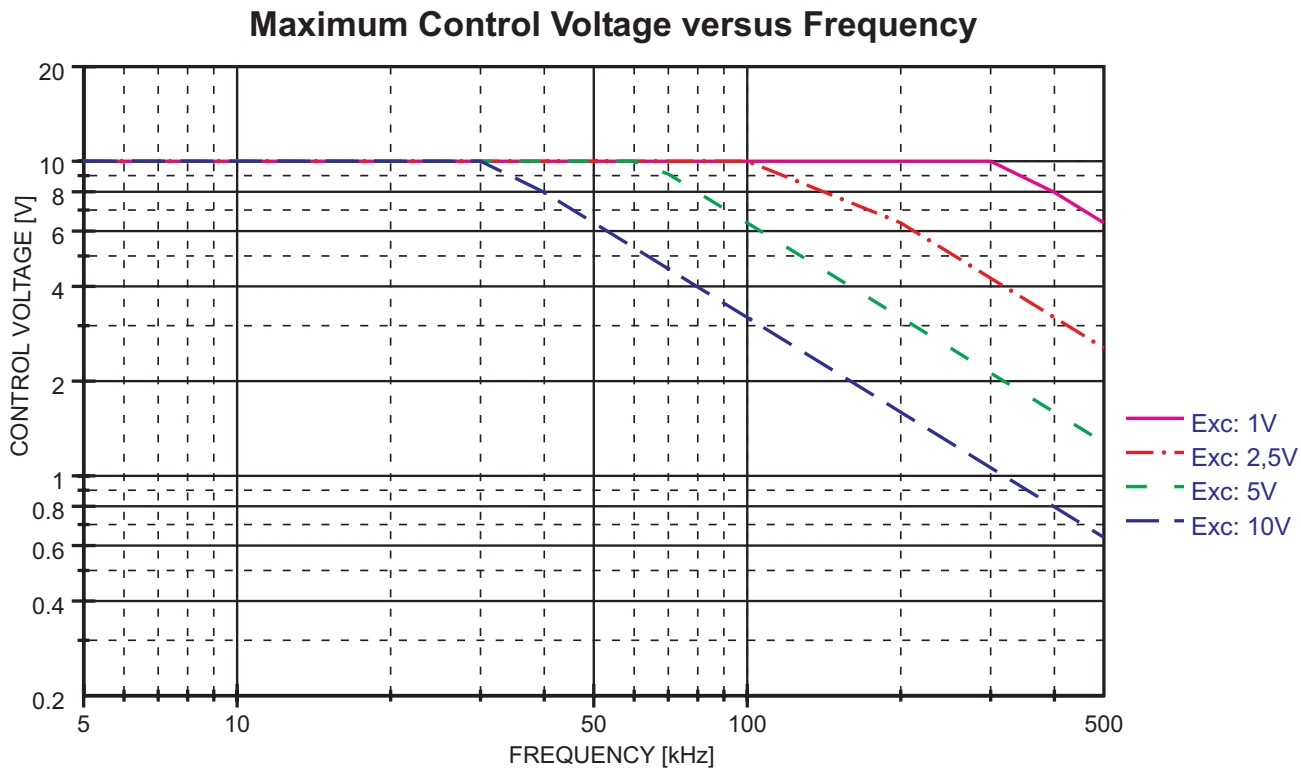
Setting of Calibration Value Switch [mV/V]	Percent of Calibration [%]								
	0	10	20	30	40	50	60	80	100
0.1	0	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.1
0.3	0	0.03	0.06	0.09	0.12	0.15	0.18	0.24	0.3
1	0	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1
3	0	0.3	0.6	0.9	1.2	1.5	1.8	2.4	3
10	0	1	2	3	4	5	6	8	10
30	0	3	6	9	12	15	18	24	30
100	0	10	20	30	40	50	60	80	100
300	0	30	60	90	120	150	180	240	300
	Calibration Signal [mV/V]								

Zero the Bridge Calibrator with the Operation Mode switch to adjust the offset of the amplifier or only for defining the offset value. Use also the Operation Mode switch the Calibrator to the defined output value. By reading the output value of the bridge amplifier of both measurements (Zero measurement and Pos. output) you can exactly define the sensitivity of the bridge amplifier.

Dynamic Calibration

An external voltage input is implemented for checking the bandwidth of an bridge amplifier. Set simply the Operation Mode Switch to “Uext” to enable this function. This external control voltage has nearly the same function than the Percent of Calibration Switch. The advantage of using an external control voltage is the possibility to “adjust” the desired calibration value in infinity steps and in both polarity with up to 500 kHz. An input voltage of 10 V will set the output to 100 % of the calibration value. For example if the Calibration Value is set to 3 mV/V and the input voltage is -7.3 V the output of the calibrator will be set to 2.19 mV/V.

Although the bandwidth of the calibrator itself is more than 500 kHz there is one limitation to use this high input frequency. If the product of the control voltage and the excitation voltage is to high the calibrator can not handle this high frequency. Please refer to the following graph to find out the maximum input frequency of the control voltage versus different excitation voltages of the bridge amplifier.



You will see in the diagram the bandwidth of the calibrator goes down to 60 kHz having an excitation voltage of the amplifier of 5 V and in an input voltage level of ±10 V. But if the input voltage level goes down to ±1 V the calibrator reach more the 500 kHz bandwidth. Therefore if it is necessary to have an 500 kHz signal with 1 mV/V simple set the Calibration Value to 10 mV/V and use an input voltage level of 1 V.

This input voltage can be driven from any common frequency generator. So it is possible to check the bandwidth of any bridge amplifier (also carrier frequency amplifiers) like an common voltage amplifier.

BRIDGE CALIBRATION UNIT

The BRIDGE CALIBRATION UNIT can be set also via RS-232 commands. The Remote LED will indicate that all manual settings are disabled and the device only allows remote commands.

Instruction set

Command	Syntax
Read configuration	??SET\r
Set configuration	##(CalValue)(Percent)(Mode)\r
Go to local operation	##R1\r
Go to remote operation	##R0\r
Read calibration date	##SETR\r
Read serial number	##SETB\r

Commands in detail

Read configuration

Command: ??SET\r

Response: !(ModulType)(CalValue)(Percent)(Mode)(Remote)\r

Description:

!	Response leading code
(ModulType)	Fixed code number “1C” for the Bridge Calibrator
(CalValue)	Code for Calibration Value (2 characters, according table)
(Percent)	Code for Percent of Calibration Value (2 characters, according table)
(Mode)	Code for Operation Mode (1 character, according table)
(Remote)	“0” for local operation and “1” for remote operation
\r	Carriage return (0D hex)

Example:

Command ??SET\r

Response !1C030820\r

Description

!:	Response leading code
1C:	Code for Bridge Calibrator
03:	Calibration Value is 3 mV/V
08:	100% of Calibration Value
2:	Positive output voltage
0:	Local operation
\r:	Carriage return (0D hex) for end of response

Function table

Calibration Value	Code	Percent of calib. value	Code	Operation Mode	Code
0.1mV/V	00	0%	00	Uext	0
0.3 mV/V	01	10%	01	Zero	1
1 mV/V	02	20%	02	positiv	2
3 mV/V	03	30%	03	negativ	3
10 mV/V	04	40%	04		
30 mV/V	05	50%	05		
100 mV/V	06	60%	06		
300 mV/V	07	80%	07		
		100%	08		

Programming

Set configuration

Syntax:	##(CalValue)(Percent)(Mode)\r	
Description:	##	Command leading code
	(CalValue)	Code for Calibration Value (2 characters, according table)
	(Percent)	Code for Percent of Calibration Value (2 characters, according table)
	(Mode)	Code for Operation Mode (1 character, according table)
	\r	Carriage return (0D hex) for end of command
Response:	!ACK	Calibrator has accepted the command
Example:	Command	##03082\r
	Description	##: Command leading code
		03: Calibration Value is 3 mV/V
		08: 100 % of Calibration Value
		2: Positive output voltage
		\r: Carriage return (0D hex) for end of command
	Response:	!ACK

Please note the calibrator is automatically switched to “remote operation” after receiving a “Set configuration” command!

Go to local operation

Command:	##R0\r
Description:	Calibrator can be set with the rotary switches on the front panel
Response:	none

Go to remote operation

Command:	##R1\r
Description:	Calibrator accept only setting via the serial interface
Response:	none

Read calibration date

Command:	##SETR\r	
Response:	!(dd).(mm).(yy)\r	
Example:	Command	##SETR\r
	Response	!02.04.03\r

This command reads out the date of the last inspection of the Bridge Calibrator.

Read serial number

Command:	##SETB\r	
Response:	!(SNo)\r	
Example:	Command	##SETB\r
	Response	!01231201234\r

CAL-SCAN

Instruction set

Command	Syntax
Set module configuration	##(Addr)(Channel)\r
Set module adress	##(Addr)SETD\r
Read module configuration	??(Addr)\r
Read calibration date	##(Addr)SETR\r
Read serial number	##(Addr)SETB\r

Commands in detail

Set module configuration

Syntax: ##(Addr)(Channel)r

Description:

##	Command leading code
(Addr)	Module address (2 characters hex from 00 to FF)
(Channel)	Binary coded value for channel On/Off state (2 characters hex from 00 to FF)
\r	Carriage return (0D hex) for end of command

Response: !ACK (Notice: an incorrect command get no response from module!)

Example:

Command: ##036A\r

Description:

##:	Command leading code
03:	Module address
6A:	Ch6, Ch4, Ch3, and Ch1 are On, others are Off
\r:	Carriage return (0D hex) for end of command

Response: !ACK

Set module address

This command has to be send as long as the button has been pressed on the module. After that, the new address is permanently stored in the module and it sends a response to the system.

Syntax: ##(NewAddr)SETD\r

Description:

##	Command leading code
(NewAddr)	New module address (2 characters hex from 00 to FF)
SETD	Set address command
\r	Carriage return (0D hex) for end of command

Response: !(NewAddr)(ModuleType)(Channel)\r

Description:

!	Response leading code
(NewAddr)	New module address (2 characters hex from 00 to FF)
(ModuleType)	Fixed code number “1D” for the CAL-SCAN module
(Channel)	Binary coded value for channel On/Off state (2 characters hex from 00 to FF)
\r	Carriage return (0D hex) for end of response

Example:

Command: ##01SETD\r

Response: !011DA6\r

Description:

!:	Response leading code
01:	New module address
1D:	Module code for CAL-SCAN
A6:	Ch7, Ch5, Ch2, and Ch0 are On, others are Off
\r:	Response leading code

Read module configuration

Command: ??(Addr)\r

Description:

??	Command for read configuration
(Addr)	Module address (2 characters hex from 00 to FF)
\r	Carriage return (0D hex) for end of command

Response: ! (Addr)(ModuleCode)(Channel)\r

Description:

!	Response leading code
(Addr)	Module address (2 characters hex from 00 to FF)
(ModuleType)	Fixed code number “1D” for the CAL-SCAN module
(Channel)	Binary coded value for channel On/Off state (2 characters hex from 00 to FF)
\r	Carriage return (0D hex) for end of response

Example:

Command	??01\r
Response	!011DA6\r

Description:

!:	Response leading code
01:	New module address
1D:	Module code for CAL-SCAN
A6:	Ch7, Ch5, Ch2, and Ch0 are On, others are Off
\r:	Response leading code

Read calibration date

This command reads out the date of the last inspection of the CAL-SCAN module.

Command: ##(Addr)SETR\r

Response: !(dd).(mm).(yy)\r

Example:

Command	##01SETR\r
Response	!02.04.03\r

Read serial number

Command: ##(Addr)SETB\r

Response: !(SNo)\r

Example:

Command	##01SETB\r
Response	!01231201234\r

CAL-BRIDGE

The CAL-BRIDGE can be set also via RS-232 commands. The Remote LED will indicate that all manual settings are disabled and the device only allows remote commands.

Instruction set

Command	Syntax
Set module configuration	##(Addr)(CalValue)(Percent)(Mode)(Channel)\r
Set module address	##(Addr)SETD\r
Read module configuration	??(Addr)\r
Go to local operation	##(Addr)R1\r
Go to remote operation	##(Addr)R0\r
Read calibration date	##(Addr)SETR\r
Read serial number	##(Addr)SETB\r

Commands in detail

Set module configuration

Syntax: ##(Addr)(CalValue)(Percent)(Mode)(Channel)\r

Description:

##	Command leading code
(Addr)	Module address (2 characters hex from 00 to FF)
(CalValue)	Code for Calibration Value (2 characters, according following table)
(Percent)	Code for Percent of Calibration Value (2 characters, according following table)
(Mode)	Code for Operation Mode (1 character, according following table)
(Channel)	Binary coded value for channel On/Off state (2 characters hex from 00 to FF)
\r	Carriage return (0D hex) for end of command

Response: !ACK Calibrator has accept the command

Example: Command ##01030826A\r

Description:

##:	Command leading code
01:	Module address
03:	Calibration Value is 3 mV/V
08:	100% of Calibration Value
2:	Positive output voltage
6A:	Ch6, Ch4, Ch3, and Ch1 are On, others are Off
\r:	Carriage return (0D hex) for end of command

Response: !ACK

Please note the calibrator is automatically switched to "remote operation" after receiving a "Set module configuration" command!

Function code table:

Calibration Value	Code	Percent of calib. value	Code	Operation Mode	Code
0.1mV/V	00	0%	00	Uext	0
0.3 mV/V	01	10%	01	Zero	1
1 mV/V	02	20%	02	positiv	2
3 mV/V	03	30%	03	negativ	3
10 mV/V	04	40%	04		
30 mV/V	05	50%	05		
100 mV/V	06	60%	06		
300 mV/V	07	80%	07		
		100%	08		

Set module address

This command has to be send as long as the button has been pressed on the module. After that, the new address is permanently stored in the module and it sends a response to the system.

Syntax: ##(NewAddr)SETD\r

Description:		
	##	Command leading code
	(NewAddr)	New module address (2 characters hex from 00 to FF)
	SETD	Set address command
	\r	Carriage return (0D hex) for end of command

Response: !(NewAddr)(ModuleType)(CalValue)(Percent)(Mode)(Channel)(Remote)\r

Description:		
	!	Response leading code
	(NewAddr)	New module address (2 characters hex from 00 to FF)
	(ModuleType)	Fixed code number “20” for the CAL-BRIDGE module
	(CalValue)	Code for Calibration Value (2 characters, according table)
	(Percent)	Code for Percent of Calibration Value (2 characters, according table)
	(Mode)	Code for Operation Mode (1 character, according table)
	(Channel)	Binary coded value for channel On/Off state (2 characters hex from 00 to FF)
	(Remote)	Indicates local “0” or remote “1” operation
	\r	Carriage return (0D hex) for end of response

Example:			
	Command	##01SETD\r	
	Response	!012003082A61\r	
	Description	!:	Response leading code
		01:	New module address
		1D:	Module code for CAL-BRIDGE
		03:	Calibration Value is 3 mV/V
		08:	100% of Calibration Value
		2:	Positive output voltage
		A6:	Ch7, Ch5, Ch2, and Ch0 are On, others are Off
		1:	Remote operation
		\r:	Response leading code

Read configuration

Command: ??(Addr)\r

Description:		
	??	Command for read configuration
	(Addr)	Module address (2 characters hex from 00 to FF)
	\r	Carriage return (0D hex) for end of command

Response: !(Addr)(ModuleType)(CalValue)(Percent)(Mode)(Channel)(Remote)\r

Description:		
	!	Response leading code
	(ModuleType)	Fixed code number “20” for the CAL-BRIDGE
	(CalValue)	Code for Calibration Value (2 characters, according table)
	(Percent)	Code for Percent of Calibration Value (2 characters, according table)
	(Mode)	Code for Operation Mode (1 character, according table)
	(Channel)	Binary coded value for channel On/Off state (2 characters hex from 00 to FF)
	(Remote)	“0” for local operation and “1” for remote operation
	\r	Carriage return (0D hex)

Example:			
	Command	??01\r	
	Response	!2003082A60\r	
	Description	!:	Response leading code
		01:	Module Address
		20:	Code for CAL-BRIDGE

03:	Calibration Value is 3 mV/V
08:	100% of Calibration Value
2:	Positive output voltage
A6:	Ch7, Ch5, Ch2, and Ch0 are On, others are Off
0:	Local operation
\r:	Carriage return (0D hex) for end of response

Go to local operation

Command: ##(Addr)R0\r

Description:

##	Command leading code
(Addr)	Module address (2 characters hex from 00 to FF)
R0	Command for local operation
\r	Carriage return (0D hex)

Response: none

Go to remote operation

Command: ##(Addr)R1\r

Description:

##	Command leading code
(Addr)	Module address (2 characters hex from 00 to FF)
R1	Command for remote operation
\r	Carriage return (0D hex)

Response: none

Read calibration date

Command: ##(Addr)SETR\r

Description:

##	Command leading code
(Addr)	Module address (2 characters hex from 00 to FF)
SETR	Command for getting calibration date
\r	Carriage return (0D hex)

Response: !(dd).(mm).(yy)\r

Example:

Command	##SETR\r
Response	!02.04.03\r

This command reads out the date of the last inspection of the CAL-BRIDGE.

Read serial number

Command: ##(Addr)SETB\r

Description:

##	Command leading code
(Addr)	Module address (2 characters hex from 00 to FF)
SETB	Command for getting module serial number
\r	Carriage return (0D hex)

Response: !(SNo)\r

Example:

Command	##AASETB\r
Response	!01231201234\r

Notes

EC-Certificate of conformity

Manufacturer: **DEWETRON Elektronische Messgeraete Ges.m.b.H.**

Address: **Parkring 4**
A-8074 Graz-Grambach Austria

Tel.: +43 316 3070 0
Fax: +43 316 3070 90
e-mail: sales@dewetron.com
http://www.dewetron.com

Name of product: **DEWE-CAL**

Kind of product: *Calibration hardware*

The product meets the regulations of the following EC-directives:

73/23/EEC
"Directive on the approximation of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits amended by the directive 93/68/EEC"

89/336/EEC
"Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility amended by the directives 91/263/EEC, 92/31/EEC, 93/68/EEC and 93/97/EEC

The accordance is proved by the observance of the following standards:

LV	**Safety**	IEC/EN 61010-1:1992/93 IEC/EN 61010-2-031	IEC 61010-1:1992/300 V CATIII Pol. D. 2 IEC 1010-2-031
EMC	**Emissions**	EN 61000-6-4	EN 55011 Class B
	Immunity	EN 61000-6-2	Group standard

Graz, October 14, 2008
Place / Date of the CE-marking

Dipl.-Ing. Roland Jeutter / Managing director

Notes