DEWETRON

DEWE-MDAQ SERIES

TECHNICAL REFERENCE MANUAL

WELCOME TO THE WORLD OF DEWETRON!

Congratulations on your new device! It will supply you with accurate, complete and reproducible measurement results for your decision making.
Look forward to the easy handling and the flexible and modular use of your DEWETRON product and draw upon more than 25 years of DEWETRON expertise in measurement engineering.

ISO9001

EN ISO 14001

CUSTOMIZED

MODULAR

COMPETENT

COMMITTED

APPROVED

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.

For Asia and Europe, please contact:

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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.

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.
- 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.
- 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!
- Use only original plugs and cables for harnessing.
- The power-cable and -connector serve as Power-Breaker.
- For safety reasons max. 50 V may be applied to modules with BNC input-connectors!
  Refer to the regulation of maximum allowable touch potential.
- Safety of the operator and the unit depend on following these rules.

Notes

Calibration information

All DEWETRON MDAQ-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.

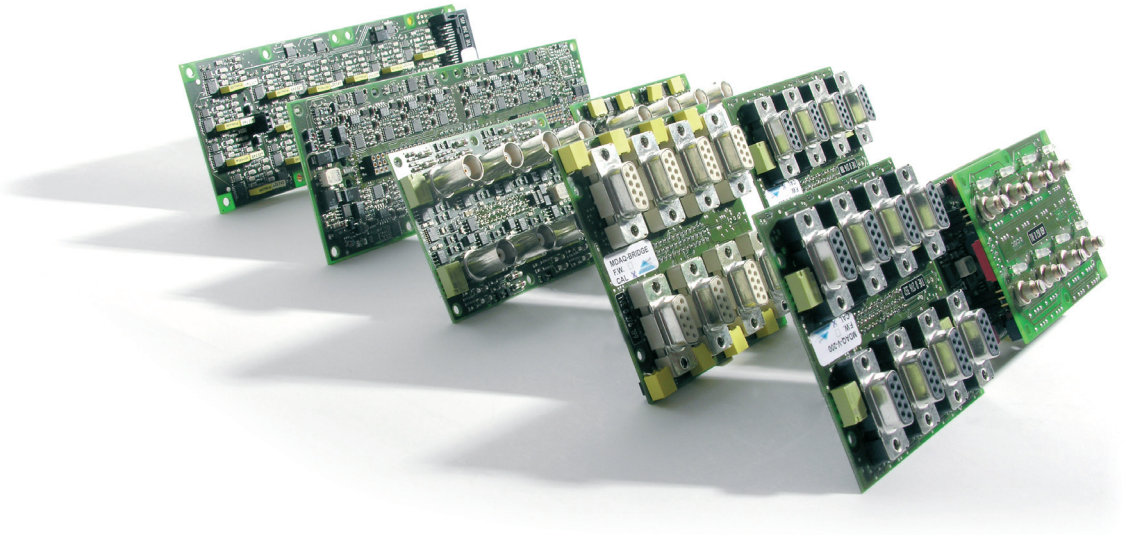
Calibration certificates are available from DEWETRON as an option. DEWETRON offers two types:

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

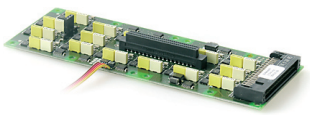
This manual contains no calibration information. For self calibration, there is a separate Calibration Manual available.

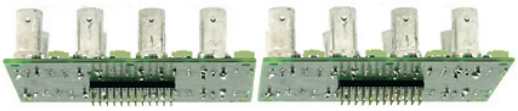
Notes

Composite configurations of MDAQ series



Direct voltage input		
	Channel 0 - 15	
Input	MDAQ-DIRECT	

Filters (optional)		
	Channel 0 - 15	
	MDAQ-FILT-5-xx [1)] MDAQ-AAF4-5-BU	

Signal Conditioning Amplifiers with 5V output			
	Channel 0 - 7	**Channel 8 - 15**	
Input	MDAQ-SUB-V-200-D MDAQ-SUB-V-200-BNC MDAQ-SUB-ACC-BNC MDAQ-SUB-ACC-A-BNC MDAQ-SUB-ACC-A-MD MDAQ-SUB-BRIDGE-D MDAQ-SUB-STG-D	MDAQ-SUB-V-200-D MDAQ-SUB-V-200-BNC MDAQ-SUB-ACC-BNC MDAQ-SUB-ACC-A-BNC MDAQ-SUB-ACC-A-MD MDAQ-SUB-BRIDGE-D MDAQ-SUB-STG-D	
BASE	MDAQ-BASE-5 (MDAQ-BASE-10)		
Filter (optional)	MDAQ-FILT-5-xx [1)] MDAQ-AAF4-5-BU		
1) BU..Butterw orth, BE..Bessel characteristics			

MDAQ-SUB-Module function overview

MDAQ-SUB-Module Function Overview										
Single Channel Functions	Module Type				ACC	ACC-A	V200-BNC	V200-D	BRIDGE	STG
	Typical application				ICP® Sensors		Voltage Signal conditioning		Strain Gage Amplifier	
	Input Ranges:									
	2,5	5	10	20 mV					✓	✓
	25	50	100	200 mV					✓	✓
	0,125	0,25	0,5	1 V	✓	✓	✓	✓	✓	✓
	1,25	2,5	5	10 V	✓	✓	✓	✓	✓	✓
	2,5	5	10	20 V			✓	✓		
	25	50	100	200 V			✓	✓		
	High Pass Filter 1				3.4 Hz	0.15 Hz			0.15Hz	
	High Pass Filter 2					3.4 Hz				
	Differential Input				✓		✓	✓	✓	✓
	Full Bridge								✓	✓
	Half Bridge								✓	✓
	Quarter Bridge 350 Ohm									✓
	Quarter Bridge 120 Ohm									✓
	Internal Shunt									50k/100k
	MDAQ-FILT-xx Support				✓	✓	✓	✓	✓	✓
	TEDS				✓	✓		✓	✓	✓
Group Channel Functions	Constant Current				4 or 8 mA	4 or 8 mA				
	Bandwidth				300 kHz	300 kHz	300 kHz	300 kHz	30 kHz	30 kHz
	Programmable Excitation							0 to 12 V	0 to 12 V	0 to 12 V

Single channel functions: can be set for each channel seperate
Group channel functions: can be set for one SUB module

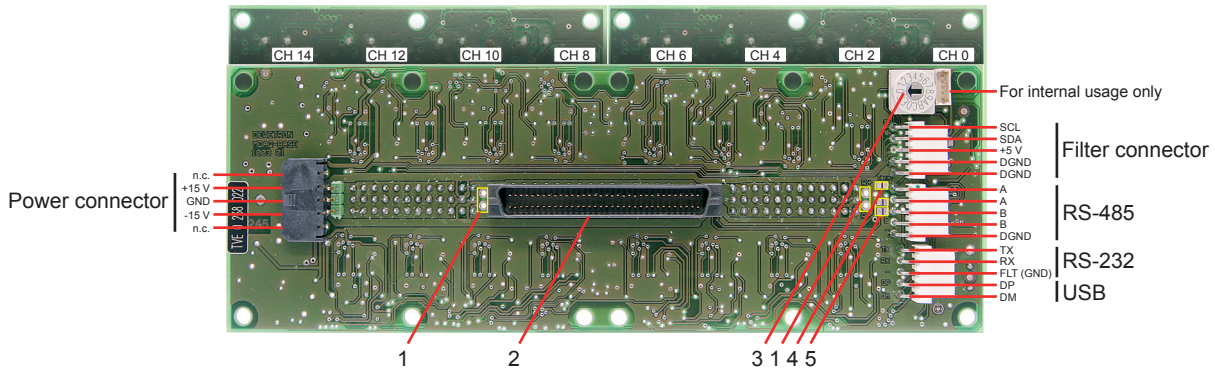
Filter code table of optional MDAQ-Filters

Optional Mdaq Filter				
-3dB	2nd Order			4th Order
Frequency	FILT-5-BU	FILT-5-BU-S1	FILT5-BE	AAF4-5
10	Bu		Be	
25				
30	Bu		Be	
35				
50				
100	Bu	Bu	Be	Bu
250				
300	Bu		Be	
350				
500				
1k	Bu	Bu	Be	Bu
3k				
10k	Bu	Bu	Be	Bu
30k		Bu		Bu
100k		Bu		Bu
300k				
bypass	> 700 kHz	> 700 kHz	> 700 kHz	> 700 kHz

Be .. Bessel characteristics
Bu .. Butterworth characteristics

Connectors and solder jumpers

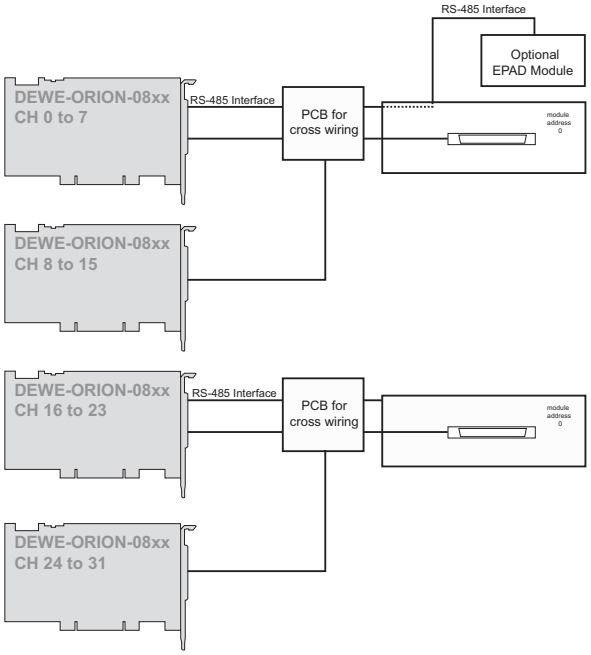
1 Additional sensor supply for sub-amplifier
2 16 channel single ended analog output
3 Base address selection
4 RS-485 termination (short if this is the last board)
5 Short this solder jumper if RS-485 from DEWE-ORION-1624 is used (set base address to 0).

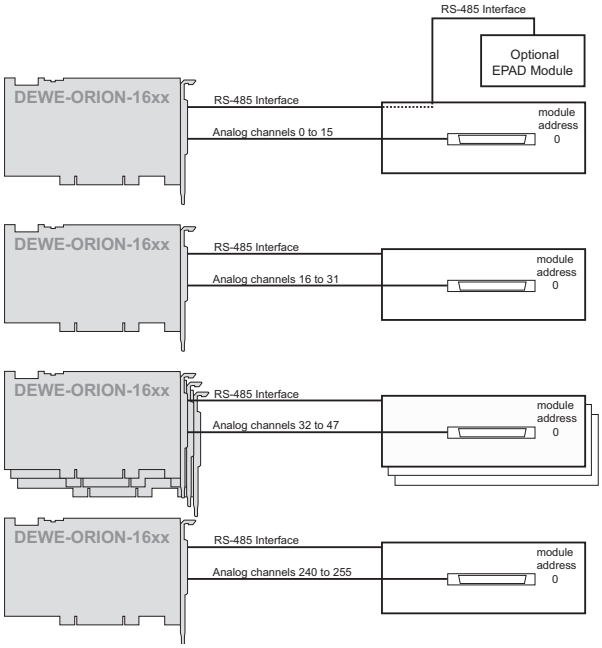


MDAQ Series overview

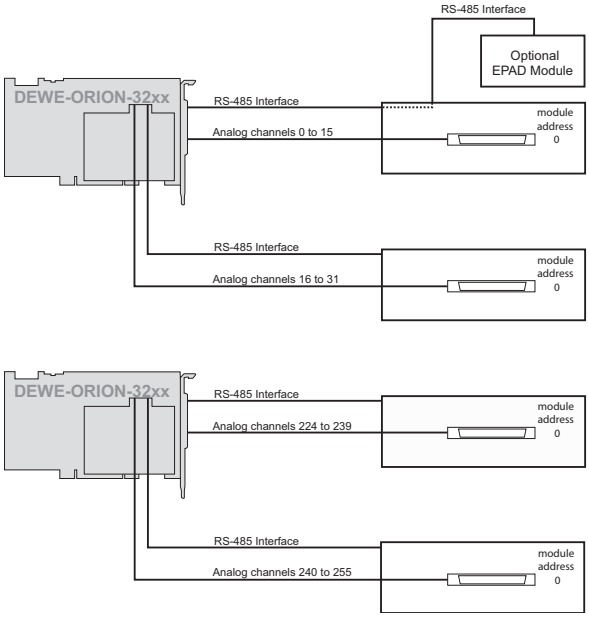
Address settings

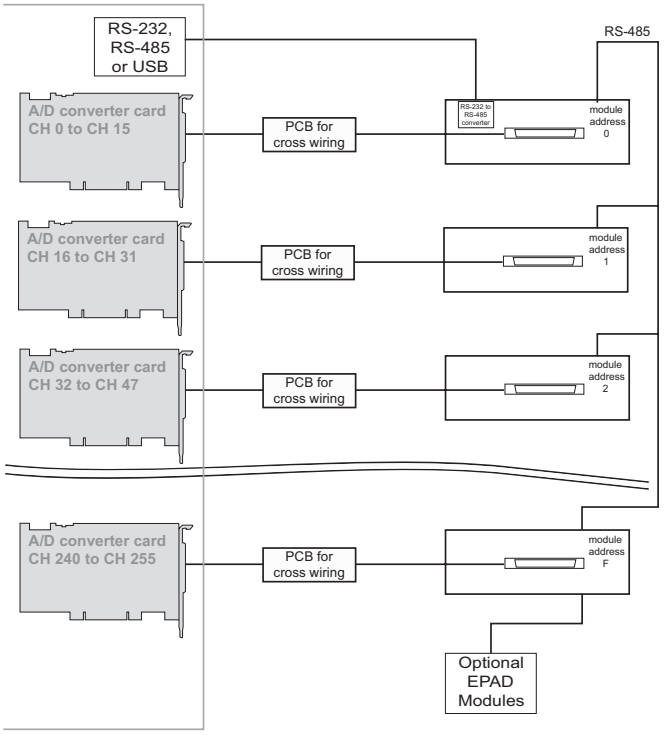
If you use DEWE-ORION-16xx cards, each MDAQ Module is controlled directly via the RS-485 interface of the associated card. When using DEWE-ORION-32xx cards each card controls and converts two MDAQ modules. Set all address selectors to 0. An additional EPAD module has to be connected to the first MDAQ Module. This simplifies the hardware settings in the data acquisition software.





The block diagram shows the address settings when using standard A/D converter cards. The communication can be done via RS-232, RS-485 or USB interface. You can connect an additional EPAD Module if you use the RS-485 interface. The onboard RS-232 to RS-485 converter is improperly to communicate with EPAD modules!





For special wiring see DEWE-xxxx systems manual appendix B3.

MDAQ Series overview

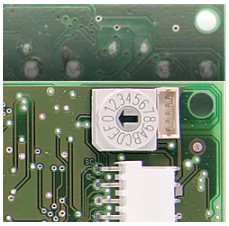
MDAQ channel addressing

Each MDAQ-V-xx module has 16 analog input channels, which can be independent configured. Since only the base address of the MDAQ-V-xx is changeable the access to the input channel configuration is in the range between (Module address x 16) to (Module address x 16) +15.

Example:

Module address:	channel number range:
00	Ch 0 - Ch 15 (Hex: 0x00..0x0F)
01	Ch 16 - Ch 31 (Hex: 0x10..0x1F)
02	Ch 32 - Ch 47 (Hex: 0x20..0x2F)
...	...
0F	Ch 240 - Ch 255 (Hex: 0x0F..0xFF)

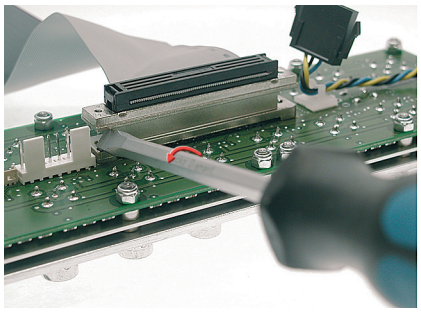
MDAQ-Base address switch

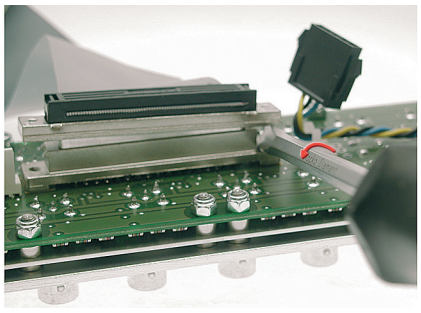


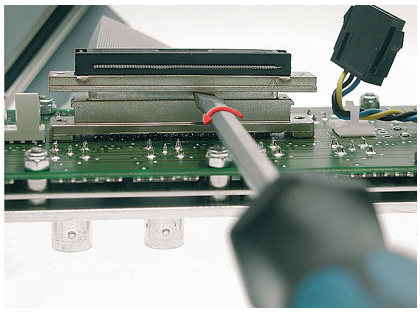
Changing the front panels

(DEWE-MDAQ-PCI-128 systems only)

Lift the connectors carefully with a screwdriver!



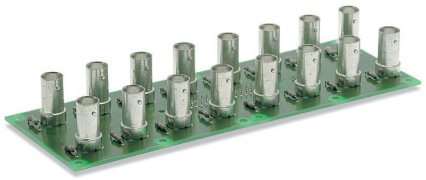




To avoid any damage please don't touch the PCB!

MDAQ-DIRECT

- 16 channel direct input connection to AD board
- BNC input connectors
- Size compatible with MDAQ-SUB-x amplifier series

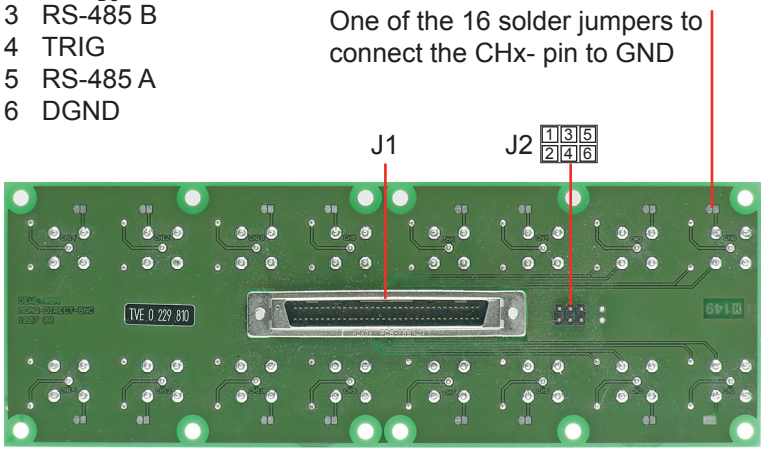


In MDAQ-DIRECT configuration, the input connectors are directly connected to the A/D converter.

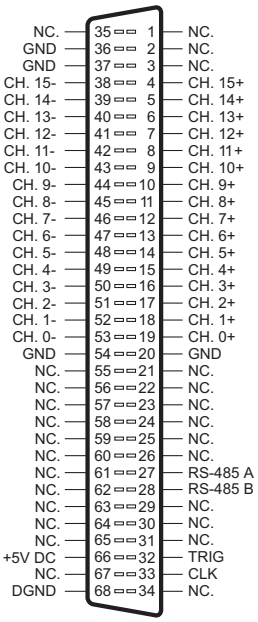
	MDAQ-DIRECT-BNC
Gain	1, direct input to A/D card
Input	16 channels
Sensor connection	BNC female
Output connector	68-pin Amplimite series (AMP Nr. 174339-6)
Dimensions (W x D x H)	175 x 61 x 24 mm (6.9 x 2.4 x 0.9 in.)

J2 is prepared for some dedicated signals of the DEWE-ORION-1624. The RS-485 interface, the clock and trigger signal can be easy wired to this connector. J2 pin assignment:

1 CLK
2 +5 V_{DC}
3 RS-485 B
4 TRIG
5 RS-485 A
6 DGND



MDAQ-DIRECT bottom view

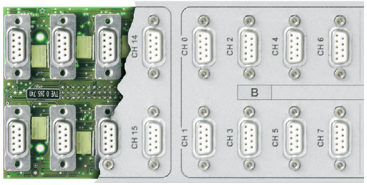


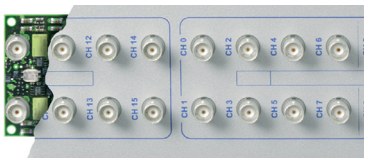
Output connector (J1)

Notes

Differential voltage amplifier

- 16 programmable ranges from ±0.125 V to ±200 V
- Bandwidth 300 kHz
- Programmable sensor supply 0.1 to 12 V
- High signal to noise ratio
- TEDS support





Amplifier specifications

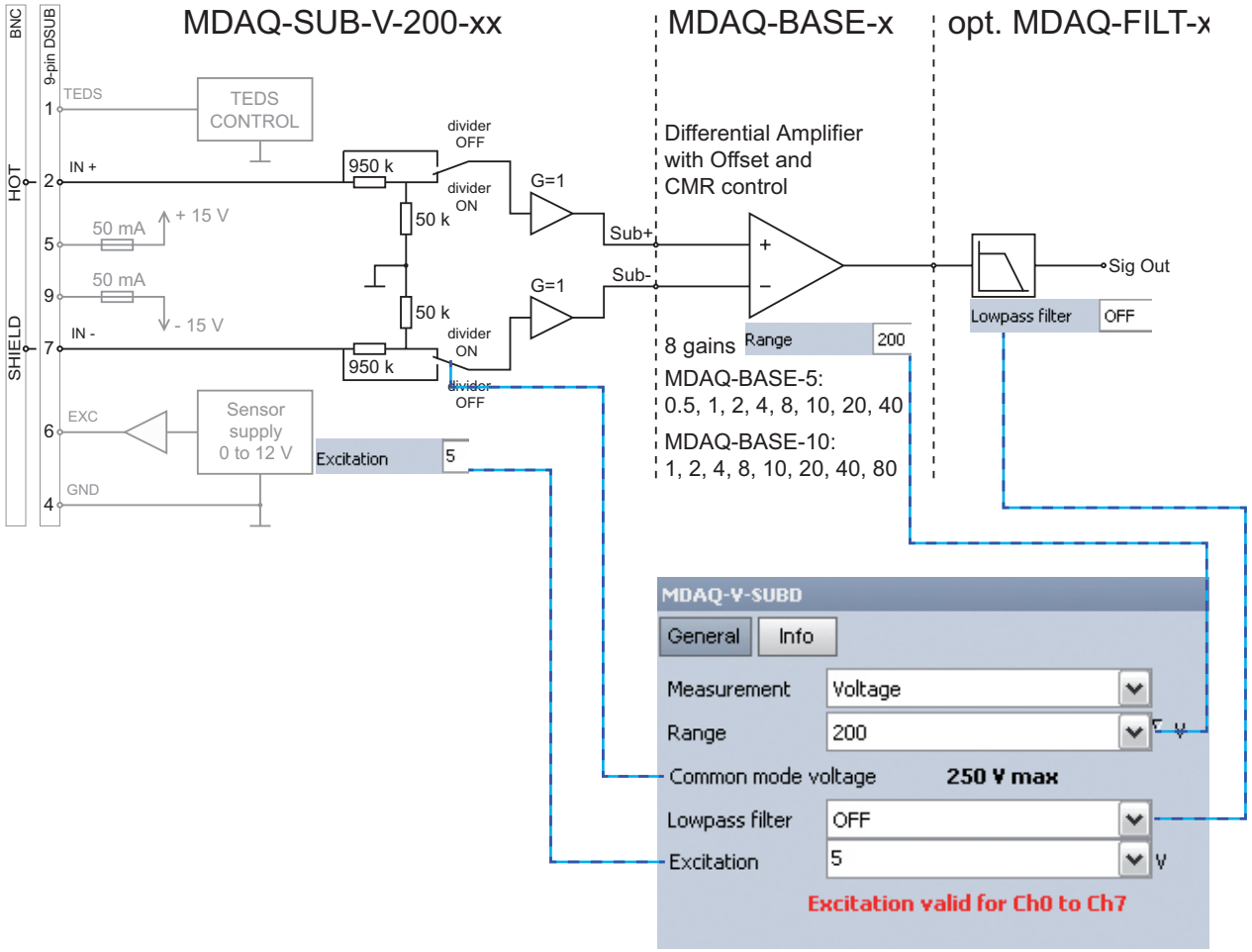
MDAQ-SUB-V-200-xx					
Input voltage range:	Divider Off	±0.125 V, 0.25 V, 0.5 V, 1 V, 1.25 V, 2.5 V, 5 V, 10 V (common mode voltage up to 12 V)			
	Divider On	±2.5 V, 5 V, 10 V, 20 V, 25 V, 50 V, 100 V, 200 V (common mode voltage up to 250 V)			
Input impedance		1 MOhm to GND, 2 MOhm differential			
DC accuracy	Divider Off			Without software correction table	
±0.125 to ±1 V		±0.03% of reading	±400 µV	±0.15% of reading	400 µV
±1.25 V; ±2.5 V		±0.03% of reading	±1 mV	±0.15% of reading	±1 mV
±5; ±10V		±0.02% of reading	±0.03% of range	±0.15% of reading	±0.03% of range
±2.5 to ±20 V	Divider On	±0.06% of reading	±8 mV	±0.25% of reading	±8 mV
±25 V; ±50 V		±0.03% of reading	±20 mV	±0.25% of reading	±20 mV
±100; ±200 V		±0.02% of reading	±0.03% of range	±0.25% of reading	±0.03% of range
Gain drift		Typ. 15 ppm/K (max. 40 ppm/K)			
Input offset drift					
125 mV to 10 V	Divider Off	Typ. 10 µV/K (max. 20 µV/K)			
2.5 V to 200 V	Divider On	Typ. 100 µV/K (max. 200 µV/K)			
Overvoltage protection		±250 V_{DC}			
Bandwidth (-3 dB)	Divider Off	300 kHz (200 kHz at range 0.125 V and 1.25 V)			
	Divider On	300 kHz (200 kHz at range 2.5 V and 25 V) (30 kHz with MDAQ-BASE-10)			
Channel separation @ 10 kHz		> 80 dB			
CMRR @ 50 Hz (@ 1 kHz)	Divider Off	> 94 dB (> 80 dB)			
	Divider On	> 70 dB (> 56 dB)			
Max. input current when exceeding CMR		2 mA			
Typ. SNR @ 50 kHz BW	Divider Off				
±0.125 V and ±0.25 V		> 87 dB			
±0.5 V to ±10 V		> 96 dB			
±2.5 V and ±10 V	Divider On	> 84 dB			
±10 V to ±25 V		> 88 dB			
±25 V to ±200 V		> 93 dB			
Programmable sensor supply (1)		0.1 to 12 V short circuit protected; 50 mA current limitation			
Sensor supply accuracy (1)		±0.05 % ±2 mV			
Fixed sensor supply (1)		±15 V (50 mA)			
Output voltage		±5 V (± 10 V with MDAQ-BASE-10)			
Output impedance		5 Ohm			
Output current		±20 mA			
Programming interface		RS-485, RS-232, USB			
Power supply		±15 V			
Power consumption		Typ. 4.5 W / 10 W (1)			
Sensor connection		BNC or DSUB (1) female			
Output connector		68-pin Amplimite series (AMP Nr. 174339-6)			
Supported TEDS chips (1)		DS2406, DS2430A, DS2432, DS2433			
Dimensions (W x D x H)		BNC: 175 x 61 x 30 mm (6.9 x 2.4 x 1.2 in.) DSUB: 175 x 82 x 22 (6.9 x 3.2 x 0.9)			
(1) MDAQ-SUB-V-200-D only!					

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

MDAQ-SUB-V-200-x

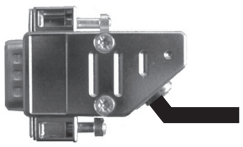
Internal signal processing

The picture below shows the block diagram of the MDAQ-SUB-V-200-xx

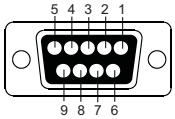


Pin assignment of the input connectors

MDAQ-SUB-V-200-D

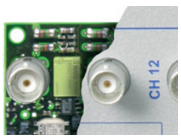


1	TEDS	6	Programmable sensor supply 0 to 12 V
2	IN +	7	IN -
3	Res.	8	Res.
4	GND	9	-15 V
5	+15 V		



If signals above 60 V may appear, don't use the metal housing of SUBD connector!

MDAQ-SUB-V-200-BNC

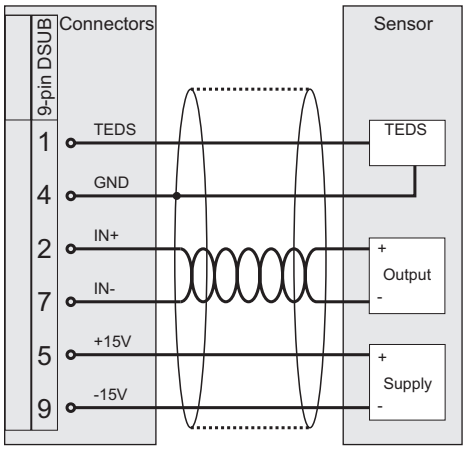


Hot: IN +

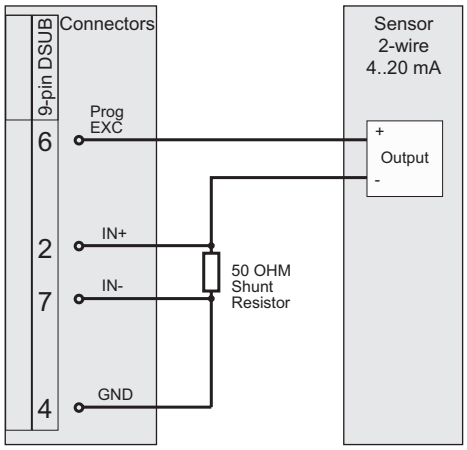
Shield: IN -

Typical sensor connection

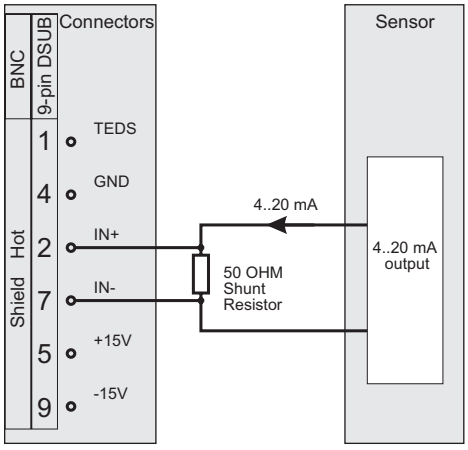
Sensor with differential output powered by the module



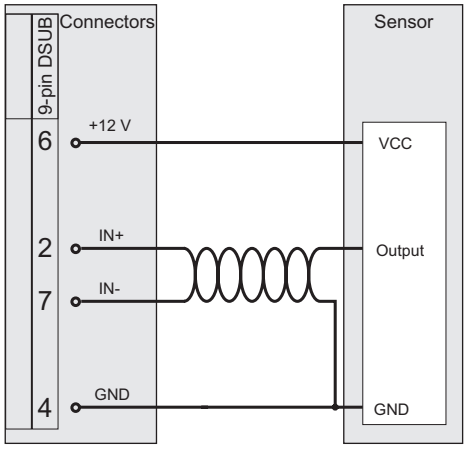
Loop powered sensor



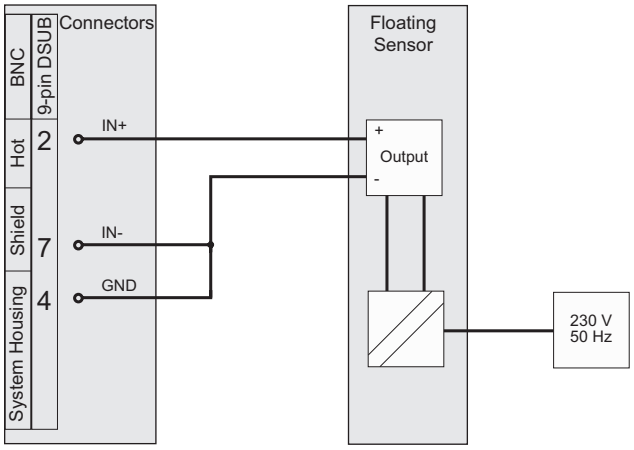
Current measurement



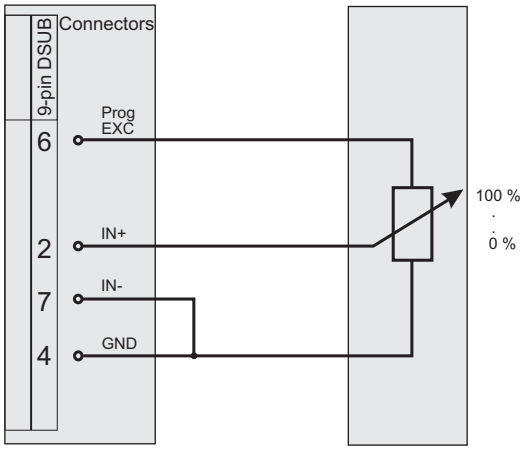
Sensor with common ground



Single ended connection

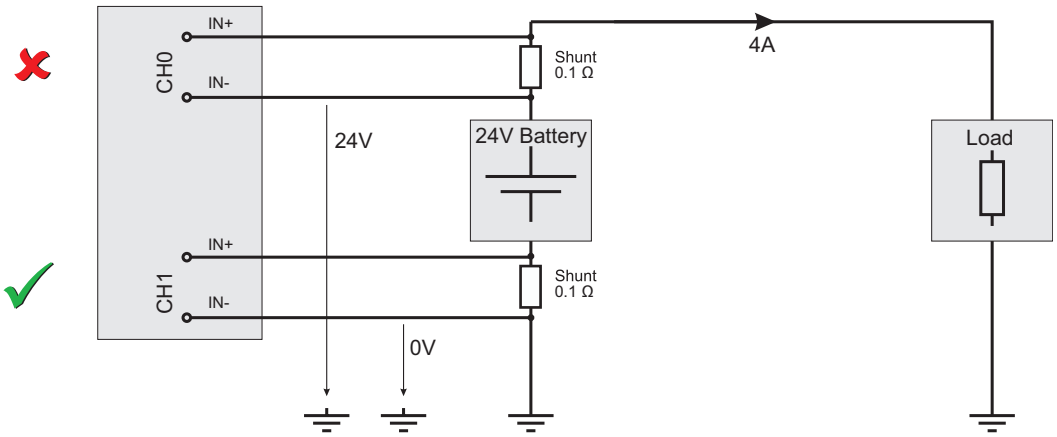


Potentiometric



Common mode voltage range

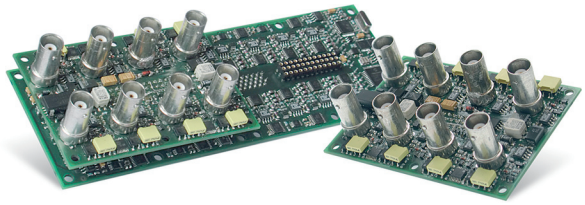
In contrast to isolated amplifiers the input common voltage range is limited at differential amplifiers. The measurement configuration below shows the possibilities to measure the current of a 24 V supplied system.



The optimum input range in that case is 500 mV. That will work fine for CH1 in the picture, but not for the CH0. This channel will exceed the maximum common mode voltage and goto overflow.

Analog input amplifier MDAQ-SUB-ACC

- 16 channel IEPE® amplifier
- Several voltage measurement modes (AC/DC Coupling, single ended/differential)
- Bandwidth up to 300 kHz
- Channel separation 96 dB
- TEDS support (IEEE 1451.4)
- Ideally suited for sound and vibration measurement

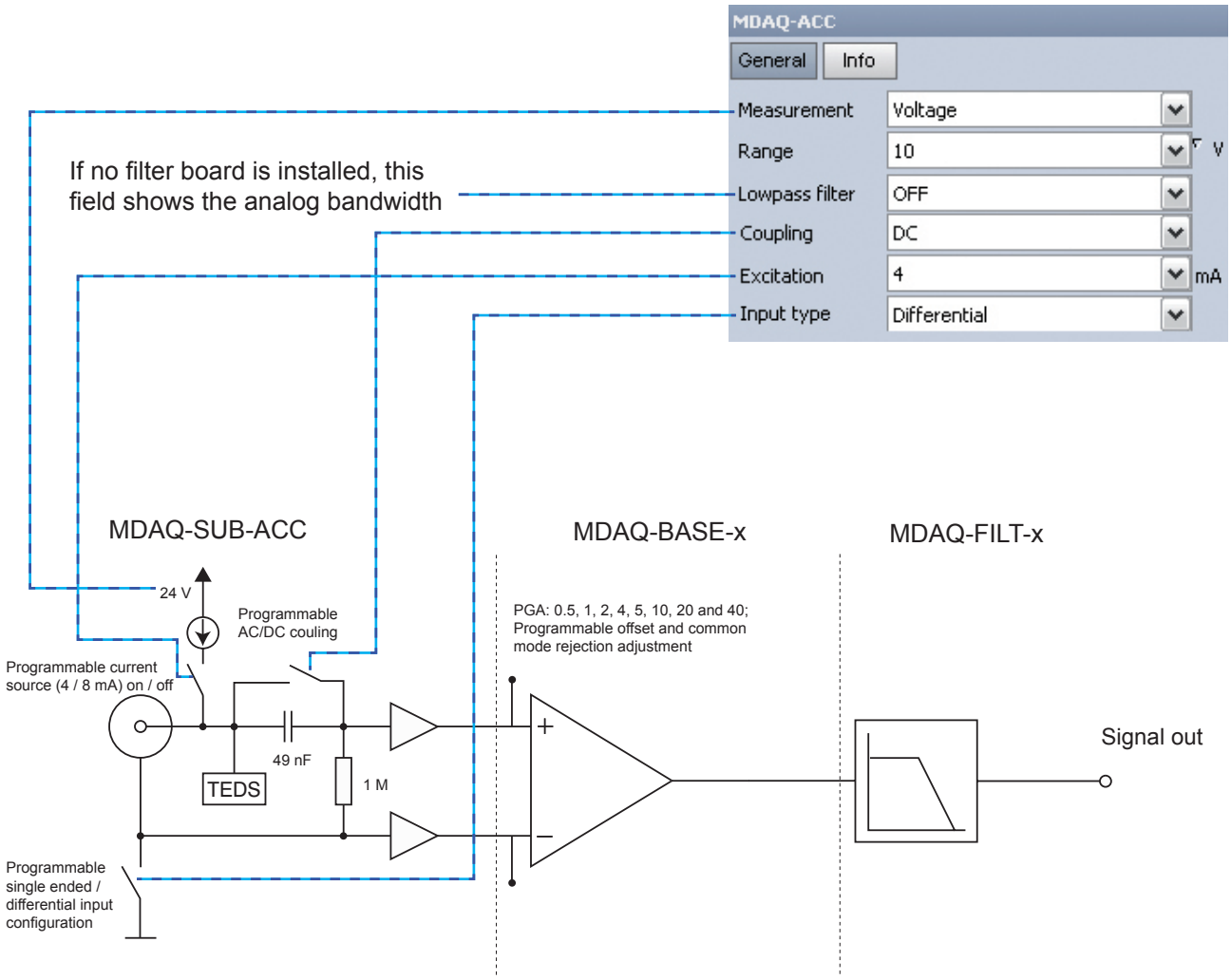


Amplifier specifications

MDAQ-SUB-ACC				
Input voltage range	±0.125 V, 0.25 V, 0.5 V, 1 V, 1.25 V, 2.5 V, 5 V, 10 V			
Gain	0.5, 1, 2, 4, 5, 10, 20, 40			
Input modes	IEPE® or voltage			
Voltage modes	Single ended or differential			
Input coupling	DC or AC			
AC coupling frequency standard option MDAQ-SUB-ACC ordering option MDAQ-SUB-ACC-S1 ordering option MDAQ-SUB-ACC-S2	 3 Hz 0.16 Hz 0.1 Hz			
Input impedance	1 MOhm			
DC accuracy			without software correction table	
±0.125 to ±1 V ±1.25 V; ±2.5 V ±5;10 V	±0.03% of reading ±0.03% of reading ±0.02% of reading	400 µV ±1 mV ±0.03% of range	±0.15% of reading ±0.15% of reading ±0.15% of reading	400 µV ±1 mV ±0.03% of range
Gain drift	typ. 10 ppm/K (max. 20 ppm/K)			
Input offset drift	typ. 3 µV/K (max. 12 µV/K)			
Over voltage protection	IN+ differential ±40 V IN- differential: max ±40 V IN- Single ended: max 300 mA			
Max. common mode voltage	IN differential mode: ±12 V			
Bandwidth (-3 dB)	300 kHz (200 kHz at range 1.25 V and 0.125 V) 30 kHz with MDAQ-BASE-10			
Channel separation @ 10 kHz	> 96 dB			
Typ. CMRR 0.125 V to 10 V 1.25 V to 10 V	 94 dB @ 50 Hz 80 dB @ 50 Hz	 80 dB @ 1 kHz 65 dB @ 1 KHz		
Typ. SNR @ 50 kHz bandwidth Range ±0.125 V Range ±0.25 V Range ±0.5 V to ±1.25 V Range ±2.5 V to ±10 V	 > 87 dB > 93 dB > 96 dB > 100 dB			
Sensor excitation	4 or 8 mA, 5 % up to 24 V_{DC}			
Current noise	150 nA * sqrt (Hz)			
Input connectors	BNC			
Output voltage	±5 V, ±10 V with MDAQ-BASE-10			
Output impedance	5 Ohm			
Output current	±20 mA			
Programming interface	RS-485, RS-232			
Power supply	±15 V_{DC}			
Power consumption:	Typ. 10 W (max 12 W @ 8 mA sensor excitation)			
Sensor connection:	BNC female			
Output connector	68-pin Amplimite series (AMP Nr. 174339-6)			
TEDS	DS 2406, DS 2430A, DS 2432, DS2433			

Input connection

The picture below shows the principal configuration of the amplifier circuit.



Input circuit

The main amplifier consists of a programmable gain amplifier (PGA) with differential inputs. Depending on the measurement mode (IEPE® sensors or voltage) the position of the switches at the input is changed. For all input channels the configuration can be changed individually except the level of the current source (4 mA or 8 mA). Changing the current range effects all eight sub channels. That means if the source level of channel 0 is set to 8 mA also channel 1 to channel 7 is switched to the same. But for channel 8 to channel 15 a different source level can be used.

For constant current powered sensors (IEPE® mode) the current source is switched on and also the minus input of the BNC is connected to GND. The input coupling is switched to AC. In that mode also the TEDS interface circuit is allowed to read out the sensor information out of IEEE 1451.4 compliant sensors.

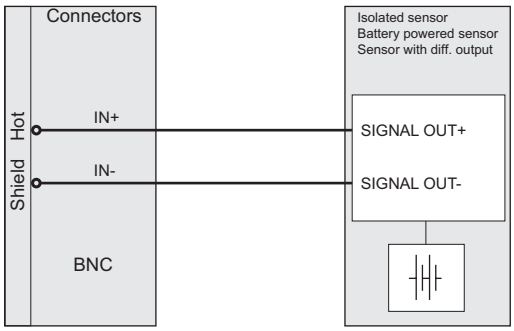
In all voltage measurement modes the current source is disconnected from the input signal. The position of the GND switch defines if the amplifier is used for differential or singled ended input configuration. The allowed input voltage range (common mode voltage) is limited to ±13 V.

NOTE: If floating input sources (like batteries) are connected to the MDAQ-SUB-ACC the amplifier has to be used in single ended configuration (GND-switch ON)! Otherwise the input may be out of the maximum input voltage range!

In differential mode as well as in single ended mode AC or DC coupling is possible. The standard high pass filter frequency is 3 Hz in AC-mode. Please contact DEWETRON for other frequencies.

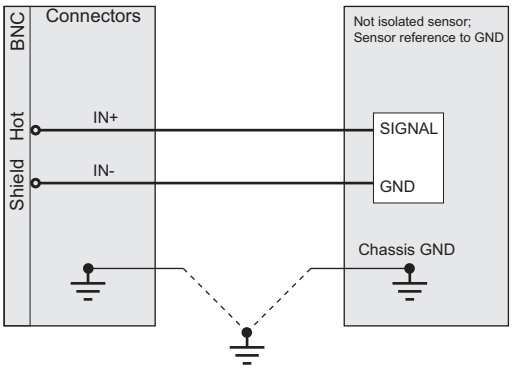
Typical sensor connection

Isolated sensor, battery powered sensor or sensor with differential output

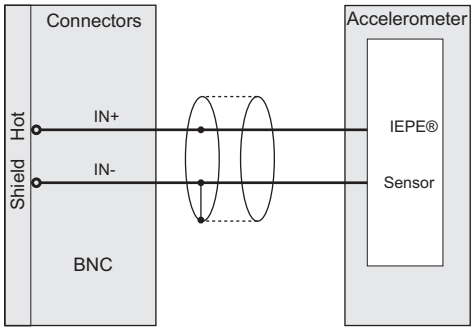


Measurement: Voltage
Input type: Single ended

Sensor referenced to ground, not isolated sensor



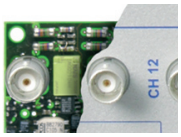
Measurement: Voltage
Input type: differential



Measurement: IEPE®

Pin assignment of the input connectors

MDAQ-SUB-ACC-BNC

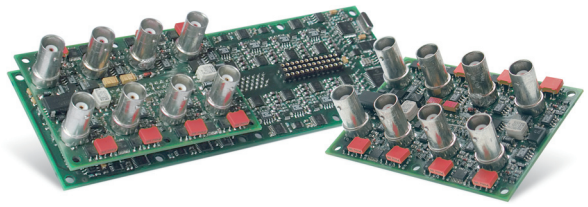


Hot: IN +
Shield: IN -

Notes

Analog input amplifier MDAQ-SUB-ACC-A

- 16 channel IEPE® amplifier
- AC ond DC coupled voltage measurement mode
- 2 programmable high-pass filters
- Bandwidth up to 300 kHz
- Channel separation 96 dB
- TEDS support (IEEE 1451.4)
- Ideally suited for sound and vibration measurement

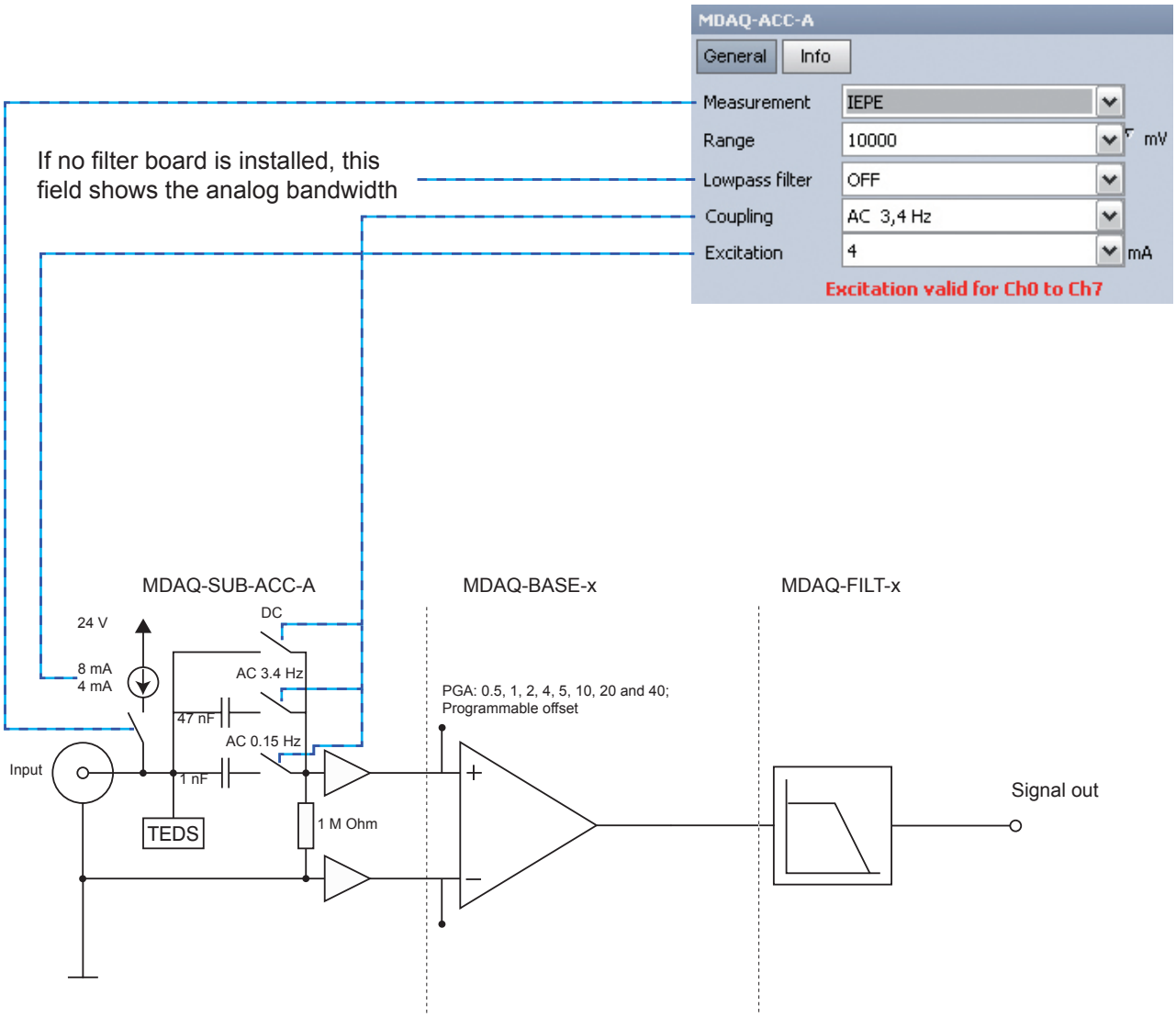


Amplifier specifications

MDAQ-SUB-ACC-A				
Input voltage range	±0.125 V, 0.25 V, 0.5 V, 1 V, 1.25 V, 2.5 V, 5 V, 10 V			
Gain	0.5, 1, 2, 4, 5, 10, 20, 40			
Input modes Voltage modes	IEPE® or voltage Single ended DC or AC coupled with two selectable high pass filter (0.15 and 3.4 Hz as standard, others on request)			
Input impedance	1 MOhm			
DC accuracy [1]			Without software correction table	
±0.125 V and ±0.25 V	±0.03% of reading	350 µV	±0.15% of reading	350 µV
±0.5 V to ±1.25 V	±0.03% of reading	±0.04% of range	±0.15% of reading	±0.04% of range
±2.5 V to ±10 V	±0.02% of reading	±0.03% of range	±0.15% of reading	±0.03% of range
Gain drift	Typ. 10 ppm/K (max. 20 ppm/K)			
Input offset drift	Typ. 3 µV/K (max. 12 µV/K)			
Over voltage protection	IN+ ±40 V IN- Single ended: max 300 mA			
Bandwidth (-3 dB)	300 kHz (200 kHz at range 1.25 V and 0.125 V) 30 kHz MDAQ-BASE-10			
Channel separation @ 10 kHz	> 96 dB			
CMR @ 50 Hz (@ 1 kHz)	> 94 dB (> 80 dB)			
Typ. SNR @ 50 kHz bandwidth Range ±0.125 V Range ±0.25 V Range ±0.5 V to ±1.25 V Range ±2.5 V to ±10 V	 > 87 dB > 93 dB > 96 dB > 100 dB			
Sensor excitation	4 or 8 mA, 5 % up to 24 V_{DC}			
Current noise	150 nA * sqrt (Hz)			
Input connectors	BNC			
Output voltage	±5 V, ±10 V MDAQ-BASE-10			
Output impedance	5 Ohm			
Output current	±20 mA			
Programming interface	RS-485, RS-232			
Power supply	15 V_{DC}			
Power consumption:	Typ. 10 W (max 12 W @ 8 mA sensor excitation)			
Sensor connection:	BNC female			
Output connector	68-pin Amplimite series (AMP Nr. 174339-6)			
Dimensions (W x D x H)	175 x 61 x 30 mm (6.9 x 2.4 x 1.2 in.)			

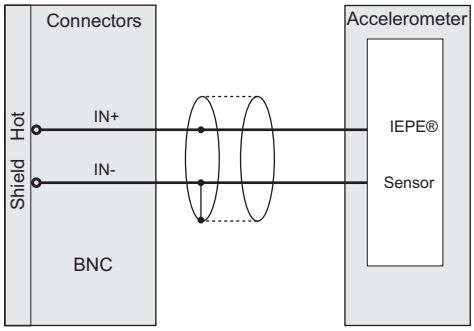
Input connection

The picture below shows the principal configuration of the amplifier circuit.

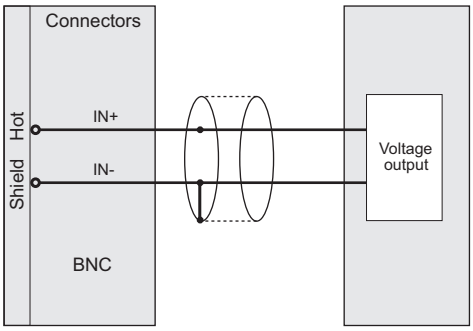


Input circuit

Typical sensor connection



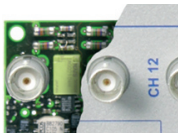
Measurement: IEPE®



Measurement: Voltage

Pin assignment of the input connectors

MDAQ-SUB-ACC-A-BNC



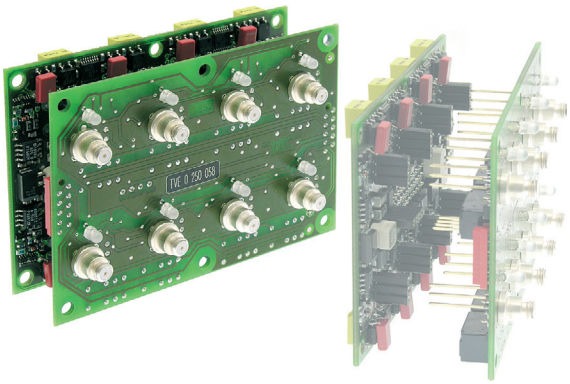
Hot: IN +

Shield: IN -

Notes

MDAQ-SUB-ACC-x-MICRODOT option

- Add on for MDAQ-SUB-ACC and MDAQ-SUB-ACC-A
- Microdot sensor input connector
- LED sensor check indication
- Input multiplexer for calibration signal



Specifications

MDAQ-SUB-ACC-x-MICRODOT	
Input connectors	Microdot No. 031-0059-0001
Sensor check (IEPE® mode only) Open Valid Short circuit	 Uexc > 22 V: LED off 3 V < Uexc < 21 V: LED green Uexc < 2 V: LED red
Calibration multiplexer	Mechanical relais (NAIS TXS2)
Control connector	10-pin AMP Micro Mate
Power supply	+5 V / +12 V
Power consumption	Typ. 2 W

The MDAQ-SUB-ACC-x-MICRODOT board is an add-on for the MDAQ-SUB-ACC series. It provides Microdot input connectors and the possibility to switch the input channels to a free definable reference signal. Eight LEDs show the status of the IEPE® supply of every channel.

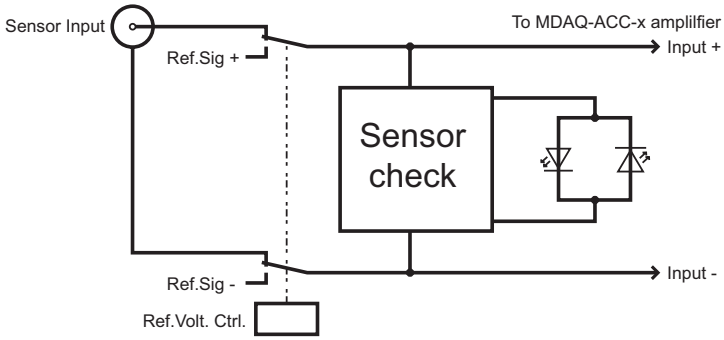
The input multiplexer is realized with a mechanical relay to avoid signal distortions. The status of the mechanical relay is controlled via a reference voltage control. Low level on the reference voltage control is for measuring mode, high level on the reference voltage control switches the input channels to the reference signal. Changing the reference voltage control input affects all eight sub-channels.

Every channel is equipped with a status-LED. It shows the status of the IEPE® excitation voltage and also the sensor supply. If the input channel is open - if there is no sensor connected to the input or the connection is defective (open circuit) - the IEPE® excitation voltage is near the upper limit. In this case the sensor check unit gives out no voltage and the LED is off. If the input channel is short-circuited the IEPE® excitation voltage is very low and the sensor check unit controls the LED to shine red. Is the IEPE® excitation voltage in the valid range a correct connected IEPE® sensor is assumed, the sensor check unit controls the LED to shine green.

The sensor check unit isn't able to check if the sensor measures correct values!

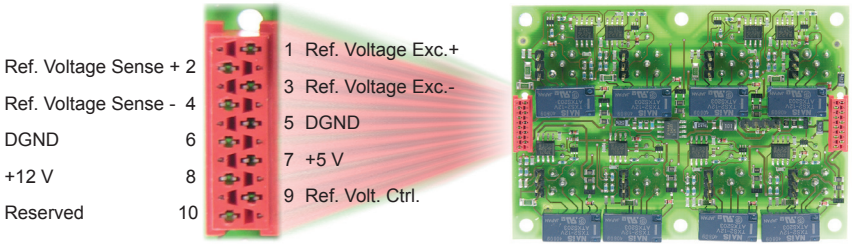
Input connection

The picture below shows the principal configuration of the input multiplexer and the sensor check function.



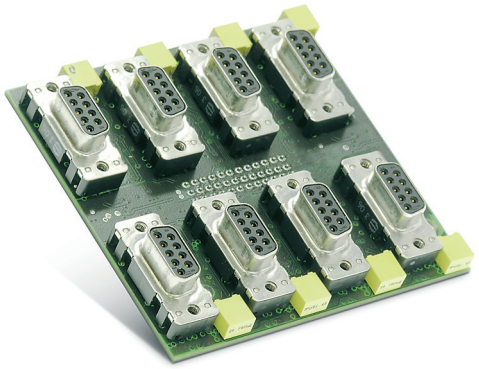
Pin assignment

The table below shows the pin assignment of the control connector.



Analog input amplifier MDAQ-SUB-BRIDGE-D

- High accuracy (0.05%) full bridge amplifier
- Internal half bridge completion
- Input short-circuit function for measuring absolute strain
- Bridge and voltage measurement mode
- AC/DC coupling (0.16 Hz high pass filter)
- TEDS support



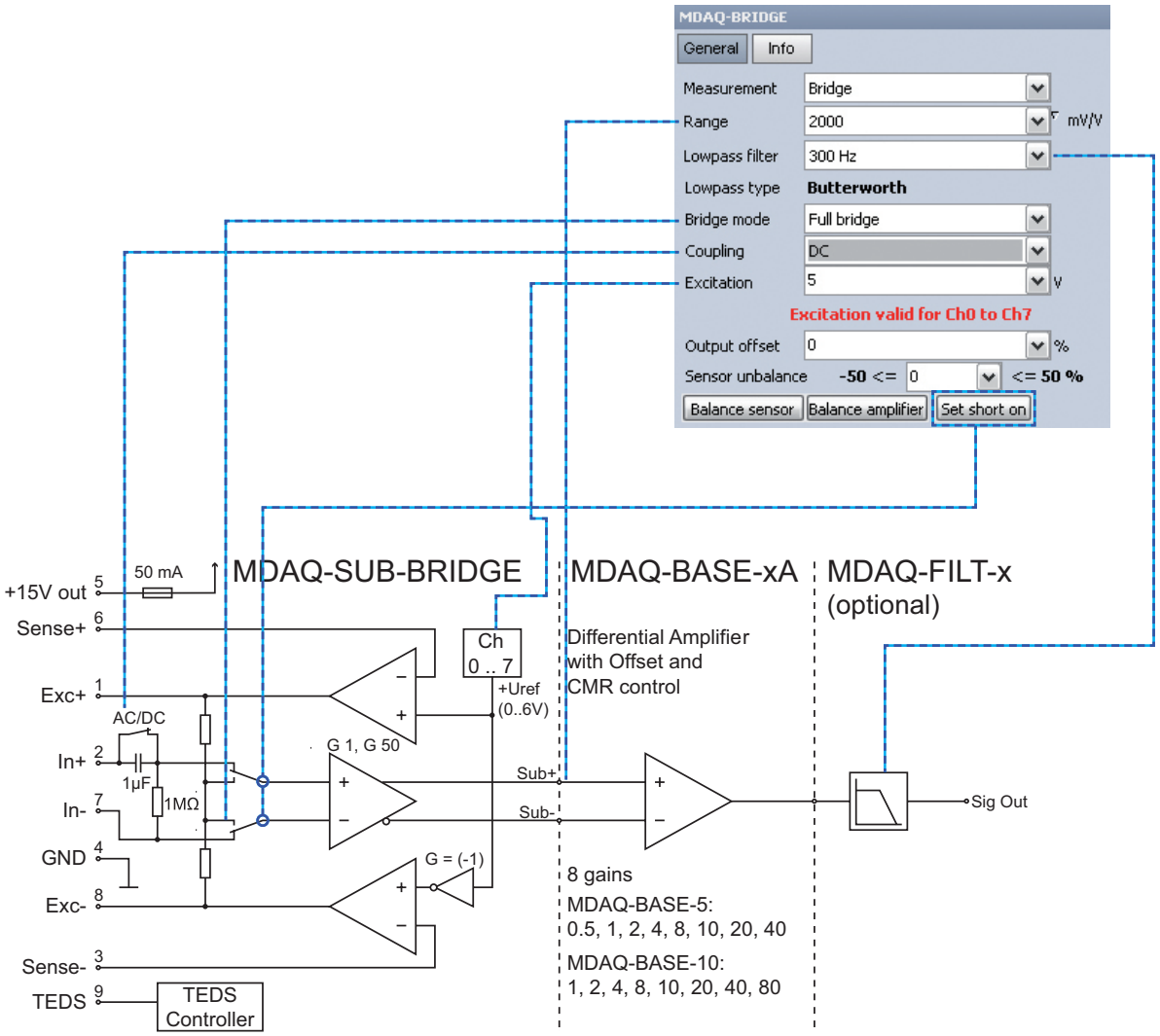
Specifications

MDAQ-SUB-BRIDGE-D combined with MDAQ-BASE-5				
Gain	0.5 to 2000			
Input ranges	±2.5, 5, 10, 20, 25, 50, 100, 200, 250, 500, 1000, 1250, 2500, 5000, 10 000 mV			
@ 5 V_{DC} excitation	±0.5, 1, 2, 4, 5, 10, 20, 40, 50, 100, 200, 250, 500, 1000 mV/V			
Input impedance	1 Mohm			
Input noise	3.5 nV * √Hz			
Typ. input offset drift	0.5 µV/K (for ranges < 200 mV)			
DC Accuracy High Gain			Without software correction table	
±2.5 mV;5 mV/V;10 mV/V;±25 mV	±0.03% of reading	±15 µV [±3 µV/V@5 V_{EXC}]	±0.25% of reading	±15 µV [±3 µV/V@5 V_{EXC}]
20 mV	±0.03% of reading	±0.12% of range	±0.25% of reading	±0.12% of range
50 mV	±0.03% of reading	±0.06% of range	±0.25% of reading	±0.06% of range
±100 mV to ±200 mV	±0.03% of reading	±0.03% of range	±0.25% of reading	±0.03% of range
±0.250 to ±1V Low Gain	±0.03% of reading	400µV [±80 µV/V@5V_{EXC}]	±0.15% of reading	400 µV [±80 µV/V@5V_{EXC}]
±1.25V; ±2.5V	±0.03% of reading	±1 mV	±0.15% of reading	±1 mV
±5;10V	±0.02% of reading	±0.03% of range	±0.15% of reading	±0.03% of range
Gain drift @ 5 V_{DC} excitation	10 ppm/K of range ±0.02 µV/V/K			
Excitation voltage	0.25, 0.5, 1, 2.5, 5V (default) and 10 V_{DC} software programmable			
Excitation accuracy	±0.05 % ±0.7 mV			
Excitation drift	±10 ppm/K ±50 µV/K			
Excitation current limit	50 mA/Channel			
Excitation protection	Continuous short to ground			
Sensor supply (+15 V)	Accuracy: -5% to +2%; Each output separately fused; max. current 50 mA/channel			
Bridge types	4- or 6-wire full bridge			
	3- or 5-wire ½ bridge with internal completion (software programmable)			
Bridge resistance	120 Ohm to 10 k Ohm			
Automatic bridge balance [1]	Absolute voltage	mV/V @ 5V $_{EXC}$	µm/m @ 5 V_{EXC} k=2 Quater bridge	
2.5 mV to 20 mV	±10 mV	±2 mV/V	±4000 µm/m	
25 mV to 200 mV	±100 mV	±20 mV/V	±40000 µm/m	
250 mV to 1 V	±0.5 V	±100 mV/V	±200,000 µm/m	
2 V to 10 V	± 5 V	±1000 mV/V	±2,000,000 µm/m	
Bandwidth (-3 dB)				
2.5 mV to 200 mV Range	30 kHz			
250 mV to 2.5 V Range	190 kHz			
5 V and 10 V Range	100 kHz (190 kHz small signal bandwidth)			
Filters (lowpass)	In combination with MDAQ-FILT-xx or MDAQ-AAF			
Typ. SNR @ 30 kHz [1 kHz]	64 dB [82 dB] @ 1 mV/V			
and 5 V_{DC} excitation	82 dB [96 dB] @ 50 mV/V			
Typ. CMR @ 0.1 mV/V [1 mV/V]	125 dB [120 dB] @ DC			
and 5 V_{DC} excitation	115 dB [110 dB] @ 400 Hz			
	110 dB [105 dB] @ 1 kHz			
Max. common mode voltage range	±12 V			
Input overvoltage protection	±25 V_{DC}			
Output voltage	±5 V, ±10 V with MDAQ-BASE-10			
Output resistance	< 10 Ohm			
Output current	Max. 5 mA			
Output protection	Continuous short to ground			
TEDS	Hardware support for TEDS (Transducer Electronic Data Sheet)			
Supported TEDS chips	DS2406, DS2430A, DS2432, DS2433			
Power consumption for 16 channels				
@ 5 V_{DC} excitation	350 Ohm @ 10 V Exc. typ. 15 W			
	120 Ohm @ 5 V typ. 15 W			
	350 Ohm max. @ 15 W max.			
@ 10 VDC	120 Ohm @ 15 W			
Standard operating temperature	0 °C to 70 °C (32 °F to 158 °F)			

[1] MDAQ-BASE-10A has the half offset adjustment range

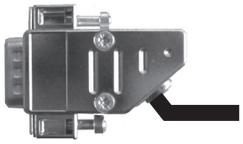
MDAQ-SUB-BRIDGE-D

Internal signal processing

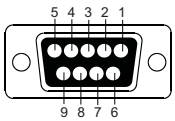


Pin assignment of the input connectors

MDAQ-SUB-BRIDGE-D



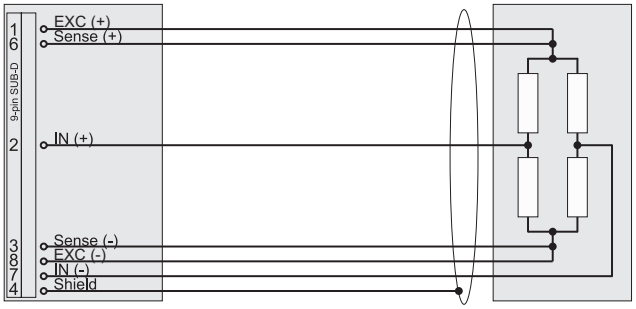
1	EXC+	6	Sense+
2	IN +	7	IN -
3	Sense	8	EXC-
4	GND	9	TEDS
5	+15 V (50 mA)		



Full bridge signal connection

6-wire sensor connection

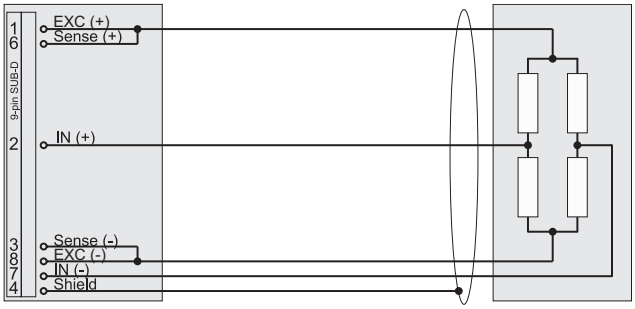
(Sense wired at the sensor)



Bridge mode: Full bridge

4-wire sensor connection

(Sense wired at the connector)



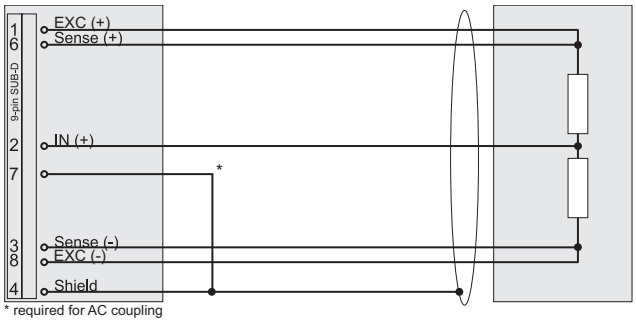
Bridge mode: Full bridge

Sens leads (SUB-D: pin 3 and 6) have to be connected!

Half bridge signal connection

5-wire sensor connection

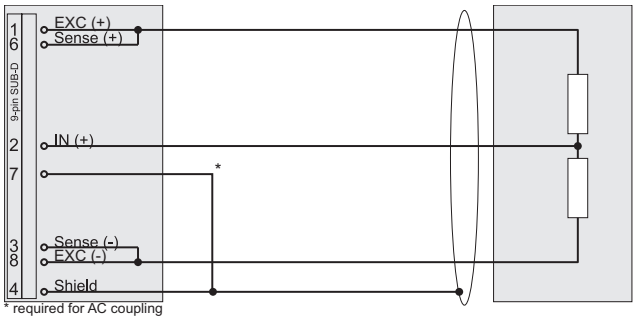
(Sense wired at the sensor)



Bridge mode: Half bridge

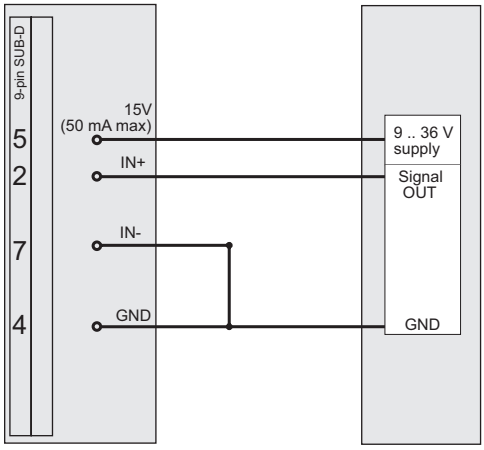
3-wire sensor connection

(Sense wired at the connector)



Bridge mode: Half bridge

15 V sensor supply



Measurement: Voltage

The table on the next page shows how the mV/Vranges are calculated. The ranges depend on the gain and the excitation voltage.

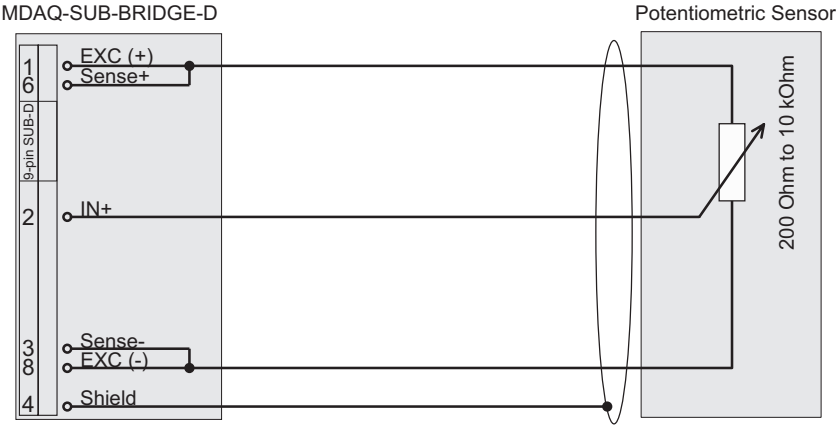
MDAQ-SUB-BRIDGE-D

Excitation	0.25 V	0.5 V	1.00 V	2.5 V	5.00 V	10.00 V
Input range	**Bridge module range [mv/V]**					
±10000 mV						
±5000 mV						500
±2500 mV					500	250
±1250 mV				500	250	125
±1000 mV				400	200	100
±500 mV			500	200	100	50
±250 mV	1000	500	250	100	50	25
±100 mV	400	200	100	40	20	10
±50 mV	200	100	50	20	10	5
±25 mV	100	50	25	10	5	2,5
±10 mV	40	20	10	4	2	1
±'2.5 mV	10	5	2,5	1	0,5	0,25

Typical Sensor connection

Potentiometric sensor

MDAQ-SUB-BRIDGE-D

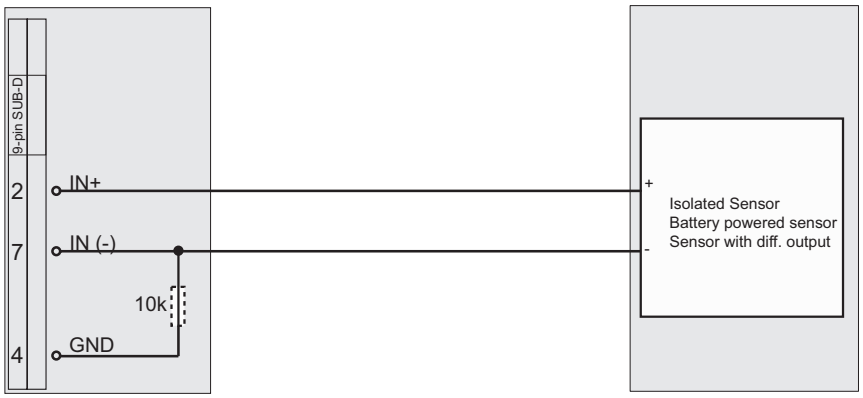


Bridge mode: Half bridge
Range: 500 mV/V

Always change the excitation voltage before changing the input range, otherwise you will not get the required 500 mV/V range.

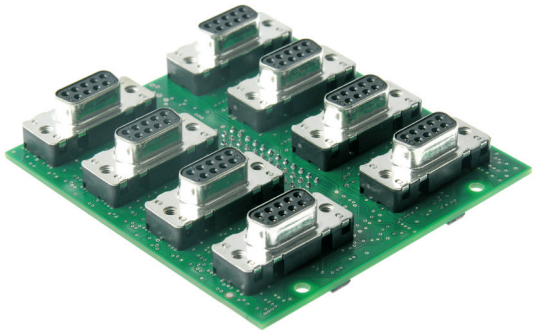
Isolated sensor, battery powered sensor or sensor with differential output

MDAQ-SUB-BRIDGE-D



Measurement: Voltage

Strain gage amplifier



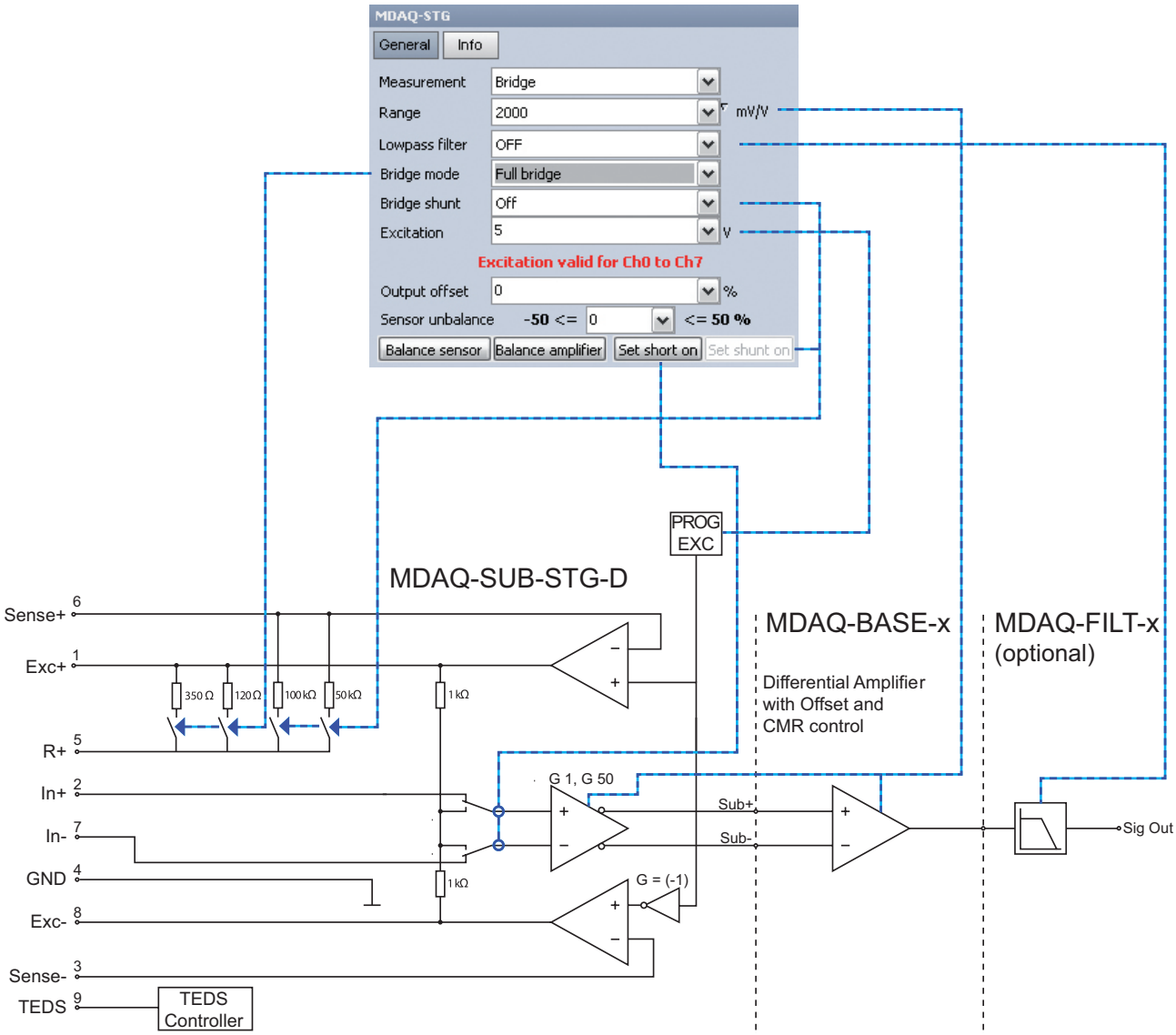
- 15 input ranges from ±2.5mV to ±10V
- 1mV steps program able excitation from 0 to 12V
- Internal Bridge Completion for ½ and ¼ Bridge
- Internal 50k and 100k Shunt resistor
- TEDS support

Specifications

MDAQ-SUB-STG-D combined with MDAQ-BASE-5				
Gain	0.5 to 2000			
Input ranges	±2.5, 5, 10, 20, 25, 50, 100, 200, 250, 500, 1000, 1250, 2500, 5000, 10 000 mV			
@ 5 V_{DC} excitation	±0.5, 1, 2, 4, 5, 10, 20, 40, 50, 100, 200, 250, 500, 1000 mV/V			
Input impedance	>100 MOhm			
Input noise	3.5 nV * √Hz			
Typ. input offset drift	0.5 µV/K (for ranges < 200 mV)			
DC Accuracy High Gain			Without software correction table	
±2.5 mV;5 mV/V;10 mV/V;±25 mV	±0.03% of reading	±15 µV [±3 µV/V @5 V_{EXC}]	±0.25% of reading	±15 µV [±3 µV/V @5 V_{EXC}]
20 mV	±0.03% of reading	±0.12% of range	±0.25% of reading	±0.12% of range
50 mV	±0.03% of reading	±0.06% of range	±0.25% of reading	±0.06% of range
±100 mV to ±200 mV	±0.03% of reading	±0.03% of range	±0.25% of reading	±0.03% of range
±0.250 to ±1 V Low Gain	±0.03% of reading	400 µV [±80µV/V@5 V_{EXC}]	±0.15% of reading	400 µV [±80µV/V @5V_{EXC}]
±1.25 V; ±2.5 V	±0.03% of reading	±1mV	±0.15% of reading	±1 mV
±5;10 V	±0.02% of reading	±0.03% of range	±0.15% of reading	±0.03% of range
Gain drift @ 5 V_{DC} excitation	10 ppm/K of range ±0.02 µV/V/K			
Excitation voltage	0 to 12 V programable in 1 mV steps. (5 V default)			
Excitation accuracy	±0.05 % ±0.7 mV			
Excitation drift	±10 ppm/K ±50 µV/K			
Excitation protection	Continuous short to ground			
Excitation current limit	50 mA/Channel			
Bridge Types	4- or 6-wire full bridge 3- or 5-wire ½ bridge with internal completion (software programmable) 3- wire Quarter bridge with internal 120 Ohm and 350 Ohm completion (software programmable)			
Shunt Resistor	Internal 100 k and 50 k Resistor (software programable)			
Completion and Shunt resistor accuracy	0.05% 5ppm/°K			
Bridge resistance	120 Ohm to 10 k Ohm			
Automatic bridge balance [1)]	absolute Voltage	mV/V @ 5 V_{EXC}	µm/m @ 5V_{EXC} k=2 Quarter bridge	
2.5 mV to 20 mV	±10 mV	±2 mV/V	±4000 µm/m	
25 mV to 200 mV	±100 mV	±20 mV/V	±40000 µm/m	
250 mV to 1 V	±0.5 V	±100 mV/V	±200,000 µm/m	
2 V to 10 V	± 5 V	±1000 mV/V	±2,000,000 µm/m	
Bandwidth (-3 dB)				
2.5 mV to 200 mV	30 kHz			
250 mV to 2.5 V	190 kHz			
5 V and 10 V	100 kHz (190 kHz small signal bandwidth)			
Filters (lowpass)	In combination with MDAQ-FILT-xx			
Typ. SNR @ 30 kHz [1 kHz]	64 dB [82 dB] @ 1 mV/V			
and 5 V_{DC} excitation	82 dB [96 dB] @ 50 mV/V			
Typ. CMR @ 0.1 mV/V [1 mV/V]	125 dB [120 dB] @ DC			
and 5 V_{DC} excitation	115 dB [110 dB] @ 400 Hz			
	110 dB [105 dB] @ 1 kHz			
Max. common mode voltage range	±12 V			
Input overvoltage protection	±25 V_{DC}			
Output voltage	±5 V (±10V with MDAQ-BASE-10)			
Output resistance	< 10 Ohm			
Output current	Max. 5 mA			
Output protection	Continuous short to ground			
TEDS	Hardware support for TEDS (Transducer Electronic Data Sheet)			
Supported TEDS chips	DS2406, DS2430A, DS2432, DS2433			
Power consumption				
@ 5 VDC excitation	350 Ohm 16 Channels typ. 8 W			
	120 Ohm 16 Channels typ. 15 W			
@ 10 VDC	350 Ohm 16 Channels typ. 15 W			
Standard operating temperature	0 °C to 70 °C (32 °F to 158 °F)			

[1)] MDAQ-BASE-10A has the half offset adjustment range

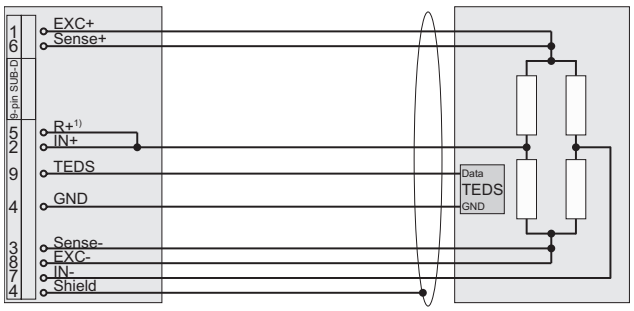
Internal signal processing



Full bridge signal connection

6-wire sensor connection

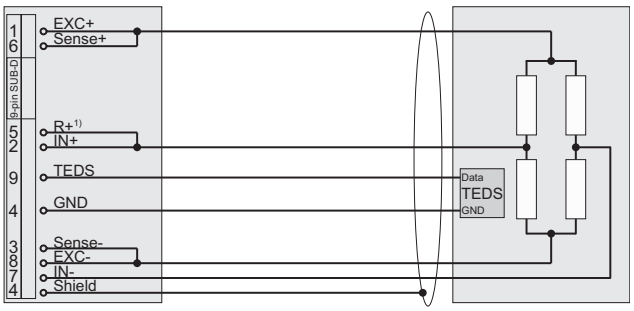
(Sense wired at the sensor)



Bridge mode: Full bridge

4-wire sensor connection

(Sense wired at the connector)



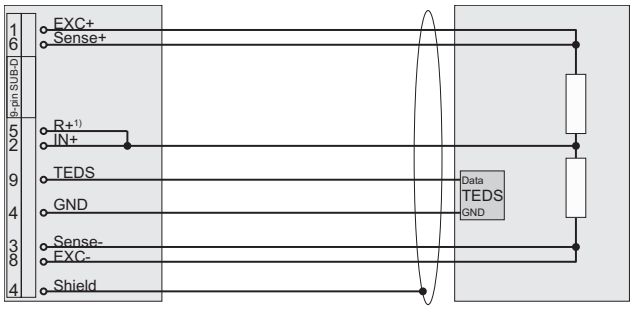
Bridge mode: Full bridge

Sense leads (SUB-D: pin 3 and 6) have to be connected!

Half bridge signal connection

5-wire sensor connection

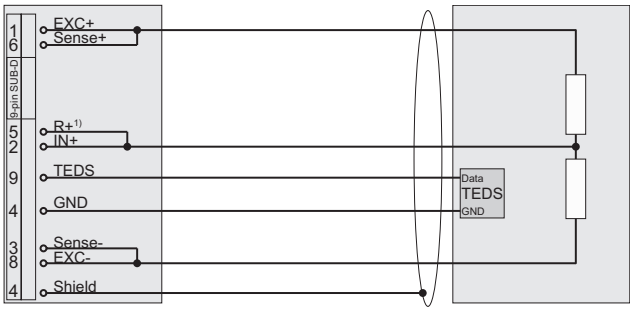
(Sense wired at the sensor)



Bridge mode: Half bridge

3-wire sensor connection

(Sense wired at the connector)



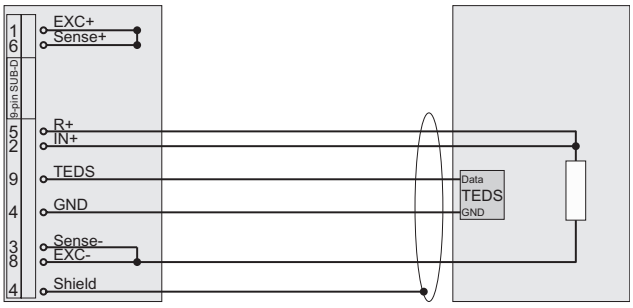
Bridge mode: Half bridge

Sense leads (SUB-D: pin 3 and 6) have to be connected!

Quarter bridge signal connection

3-wire sensor connection

(Sense wired at the connector)



Bridge mode: Quarter bridge

Sense leads (SUB-D: pin 3 and 6) have to be connected!

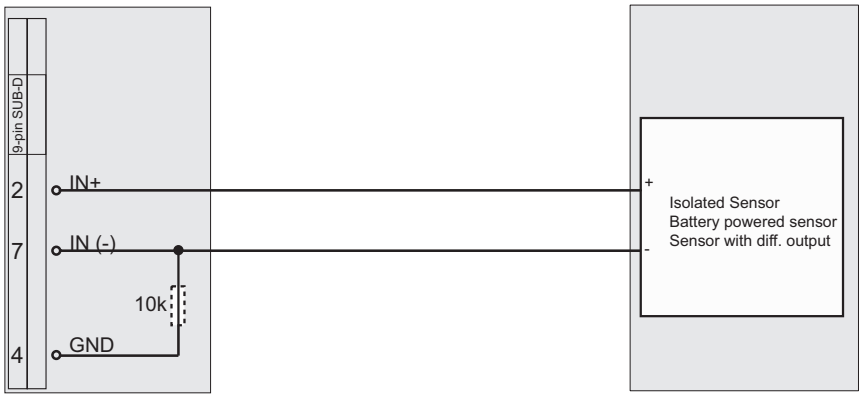
1) 'R+' has to be connected only if shunt calibration is required, otherwise it can be left unconnected.

MDAQ-SUB-STG-D

Typical Sensor connection

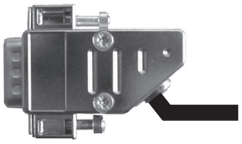
Isolated sensor, battery powered sensor or sensor with differential output

MDAQ-SUB-STG

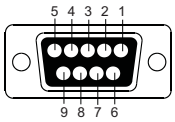


Pin assignment of the input connectors

MDAQ-SUB-STG-D



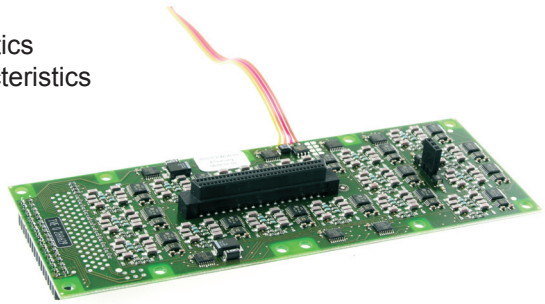
1	EXC+	6	Sense+
2	IN +	7	IN -
3	Sense	8	EXC-
4	GND	9	TEDS
5	R+		



If signals above 60 V may appear, don't use the metal housing of SUBD connector!

Filter board MDAQ-FILT-5-Bx

E .. Bessel characteristics
U .. Butterworth characteristics

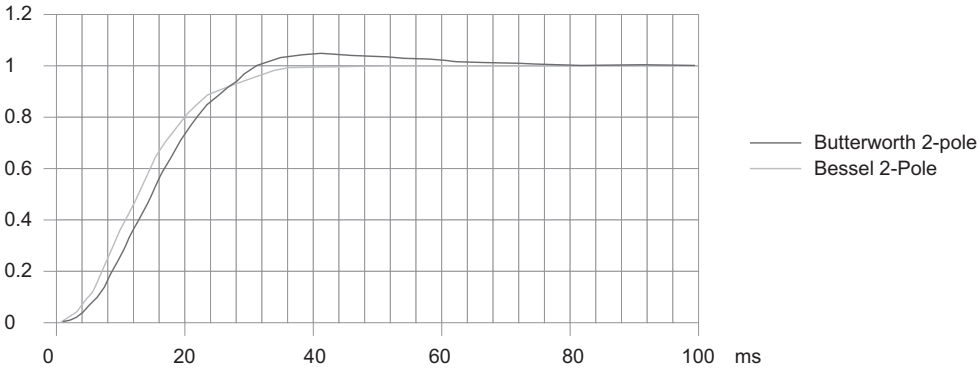


- 16 Channel 2nd order low pass filter
- 5 selectable filters including bypass function
- 5 different cut off frequencies
- Discrete low noise filter design
- Independent filter settings for each channel
- Direct control from MDAQ-xx Amplifier series

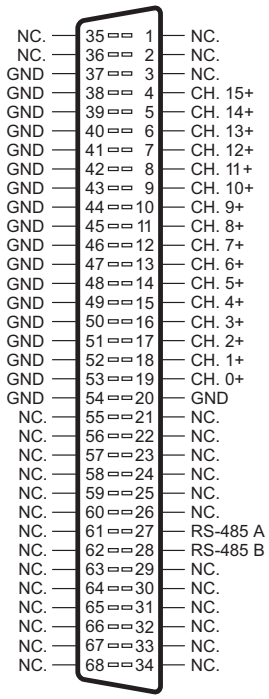
Filter specifications

MDAQ-FILT-5-Bx		
Filter range (-3 dB) Standard Ordering option	 MDAQ-FILT-5-Bx MDAQ-FILT-5-BU-S1	 30 Hz, 100 Hz, 300 Hz, 1 kHz, 10 kHz, bypass 100 Hz, 1 kHz, 10 kHz, 30 kHz, 100 kHz, bypass other frequencies on request
Bypass bandwidth		> 700 kHz
Filter characteristics		2-Pole Bessel characteristic 2-Pole Butterworth characteristic
Attentuation slope		40 dB/decade (12 dB/octave)
Filter accuracy		±1.5 dB @ f_c
DC gain		1 (0 dB)
Offset Error		Max. 1 mV (typ <0.2 mV) Max. 0.01% of range with MDAQ-BASE-10 Max. 0.02% of range with MDAQ-BASE-5
Input voltage range		±10 V_{PP}
Channel separation @ 50 kHz		> 96 dB
Input configuration		Single ended, designed for use with MDAQ-V; MDAQ-BASE-5 and MDAQ-BASE-10
Output configuration		Single ended
SNR @ bandwidth		> 100 dB
Output impedance		5 Ohm
Output current		Max. ±20 mA
Output connector		68-pin Amplimite series (AMP Nr. 174339-6), SCSI II Type
Power supply		±7.5 V to ±15 V direct via MDAQ-BASE or -V
Power consumption		Typ. 3 W
Dimensions (W x D x H)		175 x 61 x 14 mm (6.9 x 2.4 x 0.9 in.)

Step response of 100 Hz filter



Output connector

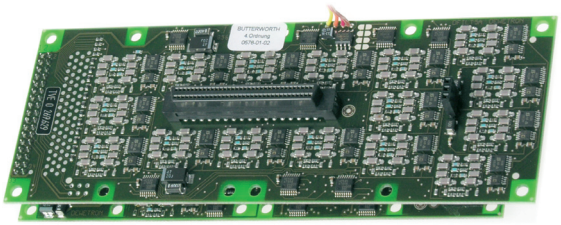


Input connector
(same pin assignment
for the output connector)

Filter board MDAQ-AAF4-5-Bx

U .. Butterworth characteristics
E .. Bessel characteristics

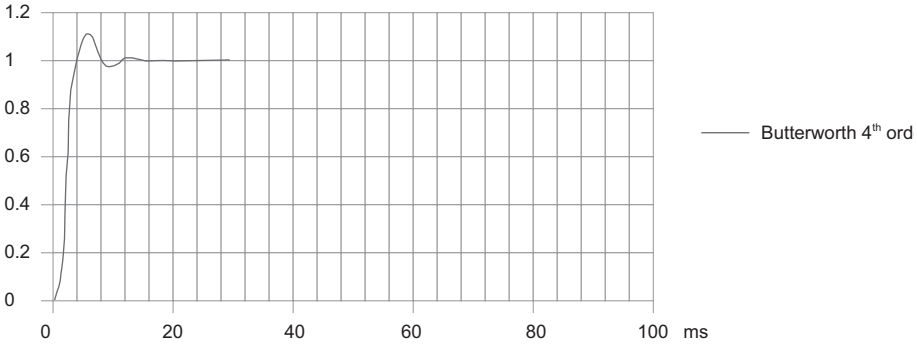
- 16 Channel 4th order low pass filter
- 5 selectable filters including bypass function
- 5 different cut off frequencies
- Discrete low noise filter design



Filter specifications

MDAQ-AAF4-5-Bx	
Filter range (-3 dB) standard ordering option MDAQ-AAF4-5-BU-S1 ordering option MDAQ-AAF4-5-BU-S2 ordering option MDAQ-AAF4-5-BE-S1	 100 Hz, 1 kHz, 10 kHz, 30 kHz, 100 kHz, bypass 163 Hz, 500 Hz, 2.5 kHz, 10 kHz, bypass, bypass 10 Hz, 100 Hz, 1 kHz, 10 kHz, 20 kHz, bypass 100 Hz, 1 kHz, 10 kHz, 20 kHz, 30 kHz, bypass other frequencies on request
Bypass Bandwidth	> 700 kHz
Filter characteristics	Ordering option BE: 4-Pole Bessel characteristic Ordering option BU: 4-Pole Butterworth characteristic
Attentuation slope	80 dB/decade (24 dB/octave)
Filter accuracy	±1.5 dB @ f_0
DC gain	1 (0 dB)
Offset Error	Max. 1 mV (typ <0.2 mV) max. 0.01% of range with MDAQ-BASE-10 max. 0.02% of range with MDAQ-BASE-5
Input voltage range [2)]	±10 V_{PP}
Channel separation @ 50 kHz	> 96 dB
Input configuration	Single ended; designed for use with MDAQ-V; MDAQ-BASE-5 and MDAQ-BASE-10
Output configuration	Single ended
SNR @ full Bandwidth	> 100 dB
Output impedance	5 Ohm
Output current	Max. ±20 mA
Output connector	68-pin Amplimite series (AMP Nr. 174339-6), SCSI II Type
Power supply	±7.5 V to ±15 V direct via MDAQ-BASE or -V
Power consumption	Typ. 3 W
Dimensions (W x D x H)	175 x 61 x 25 mm (6.9 x 2.4 x 1 in.)

Step response of 100 Hz filter



- **Butterworth**

  - maximally flat in the pass band frequency response
  - There is some overshoot in the time domain
  - Butterworth rolls off faster than the Bessel filter

CE-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-MDAQ SERIES**

Kind of product: *Signal conditioning*

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