

MAL-U10/5/1

Miniature Amplifiers for Voltage

Perfectly Conditioned. For Voltage.

Voltage signals can optimally be adjusted to the input of a PC data acquisition system with the miniature measuring amplifiers MAL-U10, MAL-U5, and MAL-U1. They feature a 5V sensor supply for connected sensors.

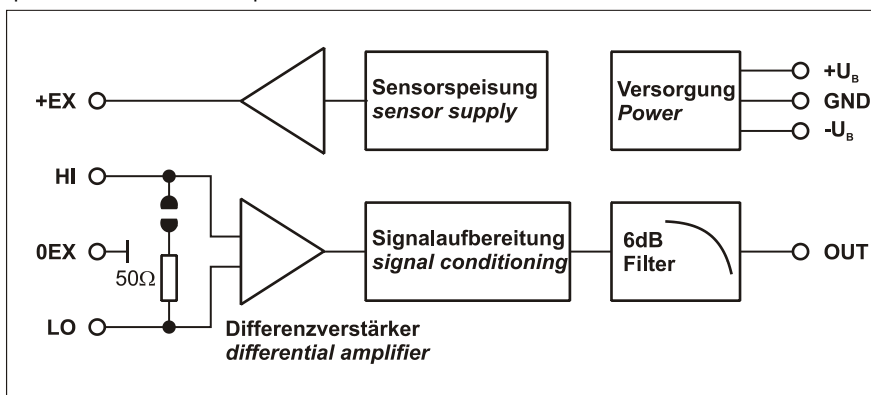
Minimum Size. Great Performance. Small Price.

The miniature format of the MAL-U10/5/1 is ideal to realize measurement applications even if the installation is in problematic locations. Despite the small size, the measuring amplifier features great functionality. All this at a reasonable price.

$\pm 10V$, $\pm 5V$, $\pm 1V$ IN. $\pm 5V$ OUT.

The amplifier types differ in their input voltage range of $\pm 10V$ (MAL-U10), $\pm 5V$ (MAL-U5), and $\pm 1V$ (MAL-U1).

A $\pm 5V$ signal proportional to the input signal is provided at the output.



Functional diagram



Compatibility.

The MAL series provides a great variety of measuring amplifiers, measuring converters, or filter modules. They can be used in any combination allowing for the solution of the most individual measuring tasks.

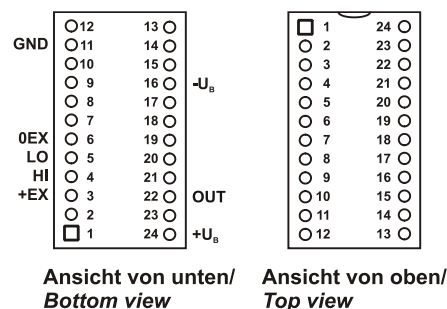
Get Connected.

With the backplanes of the BP series varying in size and design, signal connection is easy. The modules just have to be plugged on the relevant slot of the backplane.

1 Installation

The measuring amplifier is plugged onto a 24-pin socket. If the marking of the socket is on the left, pin 1 is bottom left.

Check for correct poling. Change modules only at no load!



2 Pin Assignment

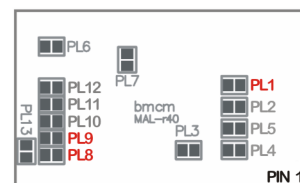
The pin assignment of the MAL-U10/5/1 is illustrated in the figure above and in the following table.

Pin	Name	Function	Pin	Name	Function
1, 2	n. c.	-	13, 14, 15	n. c.	-
3	+EX	sensor supply 1mA	16	-UB	supply -7.5V...15V
4	+IN	HI signal input	17, 18	n. c.	-
5	-IN	LO signal input	19, 20	n. c.	-
6	0EX	sensor supply 0mA	21	n. c.	-
7, 8, 9, 10	n. c.	-	22	OUT	amplifier output 0..5V
11	GND	power supply ground	23	n. c.	-
12	n. c.	-	24	+UB	supply +7.5V...15V

3 Jumper Configuration

The cut-off frequency of the MAL-U10/5/1 is set via the solder bridges PL8 and PL9, its value varying in dependence of the chosen measuring range (default setting marked in red).

With PL1 closed, a 5V power supply for active sensors is provided at the +EX pin of the measuring amplifier. It can be used, for example, in the back-planes of the BP series (see chapter 5) of bmcM.



MAL Version	Input Range	Cut-off Frequency fg		
		PL8 closed , PL9 open	PL8 closed , PL9 open	PL8 closed , PL9 open
MAL-U10	±10V	140Hz	15Hz	340Hz
MAL-U5	±5V	75Hz	8Hz	340Hz
MAL-U1	±1V	15Hz	2Hz	340Hz

- Only close one solder bridge at a time to configure the cut-off frequency (PL8 or PL9).
- Except for PL1 all other jumpers are for internal use only and must not be changed!

4 Interfacing Examples

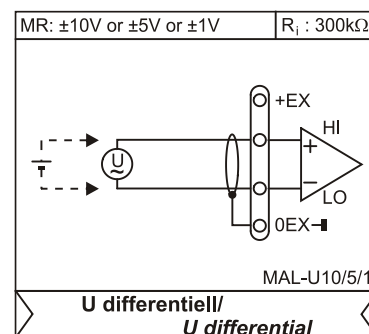
The module output is proportional to the input voltage in all operating modes and ranges. Apply cable shield at one end only. If earthing is required, connect the screen only at one end, otherwise there is a risk of hum pick-up.

4.1 Voltage Measurement (DC)

DC voltages within the allowed input range are provided at the output as a $\pm 5V$ signal to be connected to a PC data acquisition system.

- MAL-U10: $\pm 10V$ (input) $\approx \pm 5V$ (output)
- MAL-U5: $\pm 5V$ (input) $\approx \pm 5V$ (output)
- MAL-U1: $\pm 1V$ (input) $\approx \pm 5V$ (output)

Connect LO and 0EX for unipolar measurement.



5 Other MAL Amplifiers and Connection Technology (BP Series)




A great variety of miniature measuring amplifiers with or without galvanic isolation is available. The backplanes of the BP series from bmc differ in size and design allow the comfortable connection to the data acquisition system and for the amplifier supply. The MAL measuring converters can be plugged on the backplanes in any combination.

The following MAL modules and BP backplanes from bmc are available:

Product	Description
MAL-ISO1/5/10/50	Galvanically isolating miniature amplifier for voltage ($\pm 1V/\pm 5V/\pm 10V/\pm 50V$)
MAL-ISO20mA	Galvanically isolating miniature amplifier for current ($\pm 20mA$)
MAL-FU	Frequency-voltage converter in miniature format
MAL-I20mA	Miniature amplifier for current ($\pm 20mA$), 5V sensor supply
MAL-PT100	Miniature amplifier for temperature (PT100, 0..300°C)
MAL-PT1000	Miniature amplifier for temperature (PT1000, 0..300°C)
MAL-SG2/5	Miniature amplifier for strain gauge ($\pm 2mV/V$ or $\pm 5mV/V$)
MAL-THR	Miniature amplifier for temperature (thermocouple, type K, 0..1250°C)
MAL-R1K	Miniature amplifier for resistance (0..1k Ω)
BP16	16 slots, external device in aluminum housing, 5V sensor supply, connections: 2x Sub-D37
BP2	2 slots, for DIN rail mounting, 5V sensor supply, connections: screw terminals
BP2-BOX	2 slots, external device in IP65 box, 5V sensor supply, connections: screw terminals

6 Important Notes for Using the MAL-U10/5/1

- The MAL-U10/5/1 is only suitable for extra-low voltages - please observe the relevant regulations!
- Only use an electrical isolated power supply unit (with CE).
- Turn off the power before mounting the module onto the carrier board.
- All accessible pins are electrostatic sensitive devices. Provide for a grounded conductive work place.
- MAL-U10/5/1 must only be operated in closed housings (for reasons relating to EMC).
- Only use non-solvent detergents for cleaning. The product is designed to be maintenance-free.
- The module must not be used for safety-relevant tasks. With the use of the product, the customer becomes manufacturer by law and is therefore fully responsible for the proper installation and use of the product. In the case of improper use and/or unauthorized interference, our warranty ceases and any warranty claim is excluded.

 Do not dispose of the product in the domestic waste or at any waste collection places. It has to be either duly disposed according to the WEEE directive or can be returned to bmcm at your own expense.

7 Technical Data

(typical at 20°C, after 5min., +7.5V supply)

• Input Range

Measuring range DC:	±10V (MAL-U10), ±5V (MAL-U5), ±1V (MAL-U1)
Input resistance diff.:	300kΩ (for U) or 50Ω (for I)
Input suppressor circuit for 1sec:	max. 200V (not in case of current measurement)

• Output Range

Output voltage:	±5V DC
Output load:	>1kΩ; recommended for higher accuracy: >10kΩ
Amplifier accuracy // Temperature drift:	typ. 0.2% // 50ppm/°C
Output interference or output ripple:	typ. 5mV _{eff} at app. 100kHz (from DC/DC converter of the backplane)
Current supply sensitivity:	typ. ±10mV/V
Output filter // Filter cut-off frequency f _g :	1-pole (6dB/oct.) // 2-340Hz (configurable with solder bridges PL8 + PL9)

The values for accuracy always relate to the respective measuring range. Errors might add at worst.

• General

Power supply // Current consumption:	±7.5V DC .. ±15V DC // 1mA (without connected sensor)
Sensor supply:	+5V DC supply voltage 8p! CLOSED9 with ±5% accuracy (typ.)
CE standards:	EN61000-6-1, EN61000-6-3, EN61010-1; for decl. of conformity (PDF) visit www.bmcm.de
ElektroG // ear registration:	RoHS and WEEE compliant // WEEE Reg.-No. DE75472248
Max. permissible potentials:	60V DC acc. to VDE , max. 1kV ESD on open lines
Dimensions // Protection type:	plastic housing 33mm x 20mm x 15mm // IP30
Temperature ranges:	operating temp.: -25°C..+50°C, storage temp.: -25°C..+70°C
Relative humidity:	0-90% (not condensing)
Delivery:	product, description
Available accessories:	module backplanes: BP16, BP2, BP2-BOX
Warranty:	2 years from date of purchase at bmcm, claims for damages resulting from improper use excluded