

AMPLIFIERS

MEASUREMENT AMPLIFIERS
 AND CONNECTION TECHNOLOGY

MESSVERSTÄRKER UND ANSCHLUSSSYSTEME



AMPLIFIERS

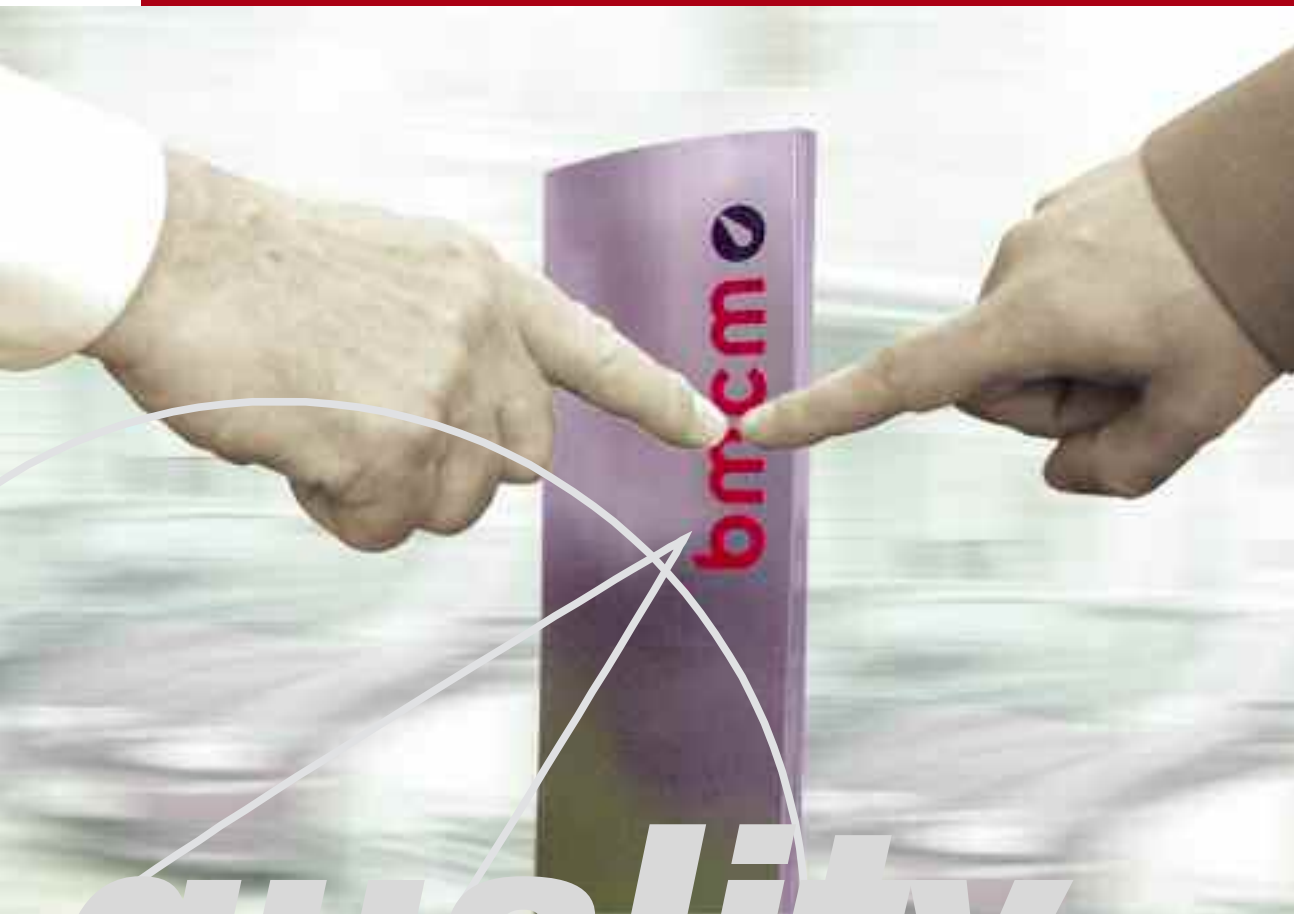
INTRODUCTION ABOUT US

Das Team von bmcm entwickelt und produziert messtechnische Produkte seit 1994. Zuverlässigkeit, Bedienerfreundlichkeit und ein hervorragendes Preis-Leistungs-Verhältnis stehen im Vordergrund.

Von Sensor bis zur Software stellen wir alle Komponenten der Messkette selbst her. Um höchste Kompatibilität zu gewährleisten, haben wir die einzelnen Produktbereiche genau aufeinander abgestimmt und unsere Produkte halten sich an die gängigen Industriestandards.

The team of bmcm has been developing and producing all kinds of measurement technology since 1994. Reliability, user-friendliness, and an extraordinary price-performance ratio have top priority.

From sensor to software, we produce all components of the measuring chain. To guarantee highest compatibility, we adjusted the various product groups carefully to each other, and our products comply with current industrial standards.



**quality
made in**

MEASUREMENT AMPLIFIERS AND BACKPLANES

5B AMPLIFIER TECHNOLOGY

5B Messverstärker ermöglichen die professionelle Anpassung von Signalen an ein Messsystem. Der Verstärkerausgang liegt im Bereich von $\pm 5V$ bzw. $0..5V$. Die meisten Module sind galvanisch trennend und bieten eine Sensorspeisespannung. Auf den folgenden Seiten 4-7 sind sowohl universelle Mehrbereichsverstärker (Erfassungsgrößen: Spannung, Strom, Widerstand, PT100, DMS, Thermoelement, LVDT) als auch Module mit spezieller Funktionalität (z. B. Filtermodule, Frequenz-Spannungs-Wandler, Impulsformer, Spannungsversorgung) erhältlich.

Passende Backplanes zum Anschluss und zur Stromversorgung der Module finden Sie auf Seite 10 und 11.

5B measuring amplifiers allow for the professional conditioning of signals to a measurement system. The amplifier output is in the range of $\pm 5V$ or $0..5V$. Most of the modules are electrically isolating and provide sensor supply. Multi-range amplifiers (measured quantities: voltage, current, resistance, PT100, strain gauge, thermocouple, LVDT), as well as modules with specific functionality (e.g. filter modules, frequency voltage converters, pulse shapers, power supplies) are available on the following pages 4-7.

You will find appropriate backplanes to connect and supply the modules on page 10 and 11.

MINIATURE AMPLIFIER TECHNOLOGY

Die Messverstärker der MAL-Serie zeichnen sich besonders durch geringe Größe und Preis aus. Der Verstärkerausgang liegt im Bereich von $\pm 5V$ bzw. $0..5V$. Die Miniaturverstärker eignen sich für die Erfassungsgrößen Spannung, Strom, Widerstand, PT100, DMS und Thermoelement (Typ K) und sind auf Seite 8 und 9 erhältlich. Zur galvanischen Trennung von Signalen stehen die isolierenden Miniaturmessverstärker der MAL-ISO Serie

zur Verfügung (s. S. 9). Nur die elektrische Isolation ermöglicht in vielen Fällen ein fehlerfreies Messergebnis bzw. macht potentialfreie Messungen möglich (Beispiel: Messungen an den einzelnen Zellen eines Akkumulators). Passende Backplanes zum Anschluss und zur Stromversorgung der Module finden Sie auf Seite 12 und 13.

The measuring amplifiers of the MAL series are especially characterized by its small size and price. The amplifier output is in the range of $\pm 5V$ or $0..5V$. The miniature amplifiers are suitable for the measured quantities voltage, current, resistance, PT100, strain gauge, and thermocouple (type K). They are available on page 8 and 9. The miniature amplifiers of the MAL-ISO series (see page 9) are provided to electrically isolate signals. In many cases, only the electrical isolation produces an accurate measuring result or makes potential-free measurements possible (example: measurements at the individual cells of an accumulator).

You will find appropriate backplanes to connect and supply the modules on page 12 and 13.

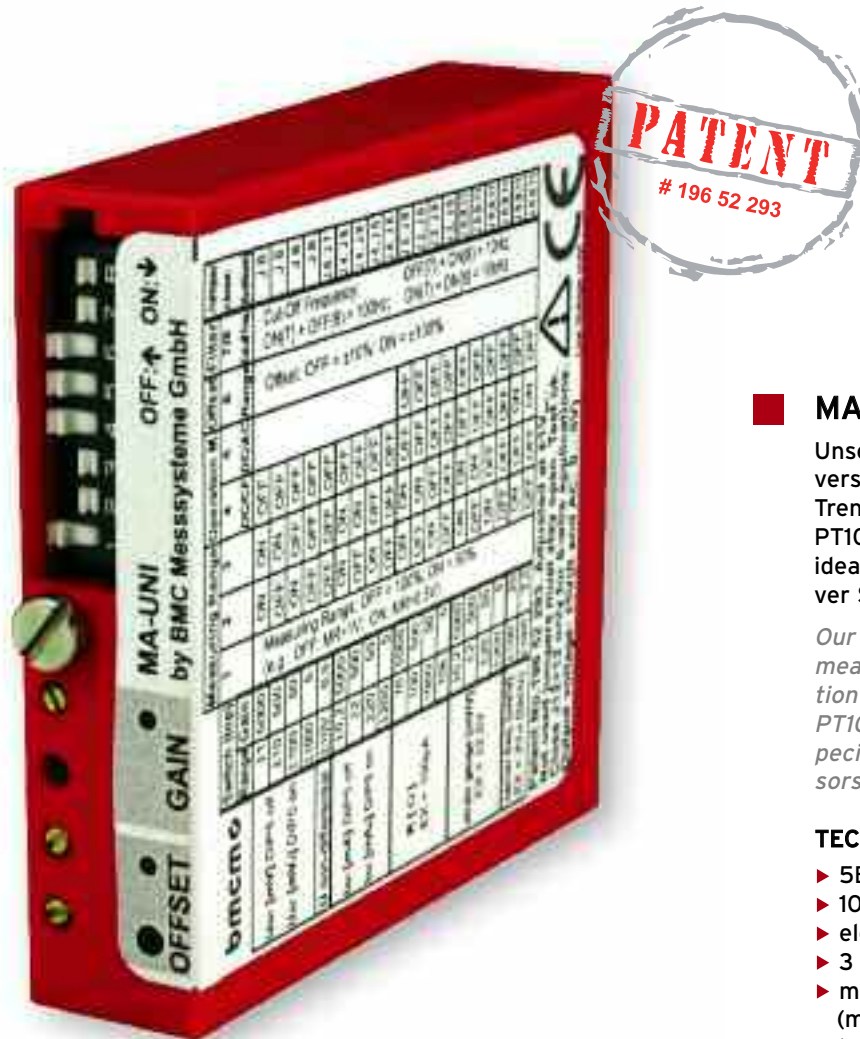
ACCESSORIES

Oft im Hintergrund stehen die Zubehörprodukte. Diese leisten jedoch wertvolle Dienste einerseits zur Ergänzung Ihres Produkts, andererseits als Ersatzteil. Verschaffen Sie sich einen Überblick über erhältlichem Zubehör für Messverstärker und Anslusstechnik auf Seite 14.

Accessory parts often melt in the background. They, however, do a good turn on one hand by supplementing your product and on the other hand as a spare part. Get an overview of available accessories for measuring amplifiers and connection technology on page 14.

5B AMPLIFIERS

INDUSTRIELLE MESSVERSTÄRKER KOMPATIBEL ZUM 5B STANDARD
INDUSTRIAL MEASURING AMPLIFIERS COMPATIBLE TO 5B STANDARD



AMPLIFIERS

+

MA-UNI

Unser patentierter, professioneller Universalmessverstärker mit galvanischer Trennung wird zur Messung von U, I, R, PT100, DMS und LVDTs eingesetzt und ist ideal insbesondere bei Verwendung passiver Sensoren.

Our patented, professional, universal measuring amplifier with electrical isolation is used for the acquisition of U, I, R, PT100, strain gauge, and LVDTs. It is especially perfect when using passive sensors.

TECHNICAL DATA

- ▶ 5B compatible
- ▶ 10kHz bandwidth
- ▶ electrical isolation
- ▶ 3 switchable filter cut-off frequencies
- ▶ many switchable measuring ranges (max. $\pm 10V$)
- ▶ integrated sensor supply $\pm 2.5V$ DC, 4mA or 100 μA DC, 2V_{eff} at 5Hz AC
- ▶ DC or AC decoupled
- ▶ adjustable with potentiometers

5b amplifi



MA-UI

Der isolierende Mehrbereichsverstärker ist ideal für Strom- und Spannungsmessungen und zur galvanischen Trennung von aktiven Sensoren.

The isolating multi-range amplifier is perfect for current and voltage measurement and for the electrical isolation of active sensors.

TECHNICAL DATA

- ▶ 5B compatible
- ▶ 10kHz bandwidth
- ▶ electrical isolation
- ▶ 3 switchable filter cut-off frequencies
- ▶ many switchable measuring ranges (max. $\pm 50V$)
- ▶ integrated integrated sensor supply, $\pm 12V$ (unregulated), $+5V$ (regulated), or $4mA$ DC
- ▶ DC or AC decoupled
- ▶ adjustable with potentiometers



MA-U

Der isolierende Spannungsmessverstärker mit 50kHz Bandbreite bietet alle Funktionen des 5B Standards.

The isolating voltage amplifier with 50kHz bandwidth features all functions of the 5B standard.

TECHNICAL DATA

- ▶ 5B compatible
- ▶ 50kHz bandwidth
- ▶ electrical isolation
- ▶ 3 switchable filter cut-off frequencies
- ▶ 4 switchable measuring ranges (max. $\pm 10V$)
- ▶ integrated sensor supply, $\pm 12V$ (unregulated), $+5V$ (regulated), or $4mA$ DC
- ▶ DC or AC decoupled
- ▶ adjustable with potentiometers

5B MODULES

PROFESSIONELLE FUNKTIONSMODULE FÜR VERSCHIEDENE EINSATZBEREICHE
 PROFESSIONAL FUNCTION MODULES FOR DIFFERENT FIELDS OF APPLICATION

AMPLIFIERS

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MA-FU

Isolierender Frequenz-Spannungs-Wandler für Messungen im Bereich von 0..100kHz

Isolating frequency voltage converter for measurements in the range of 0..100kHz

TECHNICAL DATA

- ▶ 5B compatible
- ▶ electrical isolation
- ▶ 3 switchable filter cut-off frequencies
- ▶ 8 switchable measuring ranges
- ▶ integrated sensor supply, $\pm 12V$ (unregulated) or $+5V$ (regulated)
- ▶ DC or AC decoupled
- ▶ adjustable with potentiometers



MA-DFI

Universelles, galvanisch trennendes Filtermodul mit hoher Filtersteilheit

Universal, electrically isolating filter module with high filter steepness

TECHNICAL DATA

- ▶ 5B compatible
- ▶ electrical isolation
- ▶ 2 switchable filter cut-off frequencies
- ▶ 4 switchable voltage ranges, 2 current ranges
- ▶ continuously variable between 100Hz..20kHz with potentiometers
- ▶ Butterworth characteristics 60dB/oct.
- ▶ integrated sensor supply, $\pm 12V$ (unregulated), $+5V$ (regulated), or 4mA DC
- ▶ DC or AC decoupled

5b module



MA-IF

Impulsformer-Modul zur Anpassung unterschiedlicher Pegel an einen TTL-Eingang (z. B. Zähler-eingang)

Pulse-shaping module for the adjustment of different levels to a TTL input (e.g. counter input)

TECHNICAL DATA

- ▶ housing and pin assignment 5B compatible
- ▶ pulse input 1Hz..100kHz
- ▶ TTL output
- ▶ $\pm 15V$ DC power supply (unregulated, isolated)
- ▶ AC decoupled

MA-P09 | MA-P12 | MA-P15

Diese preisgünstigen Module liefern je nach Version verschiedene Spannungen zur Versorgung von aktiven Sensoren. Das analoge Signal wird ohne galvanische Trennung 1:1 weitergeleitet.

Depending on the version, these competitively-priced modules provide different voltages to supply active sensors. The analog signal is transmitted 1:1 without electrical isolation.

TECHNICAL DATA

- ▶ 5B compatible
- ▶ sensor supply with $\pm 9V/\pm 12V/\pm 15V$ (unregulated), +5V (regulated), or 4mA DC



MA-KIT

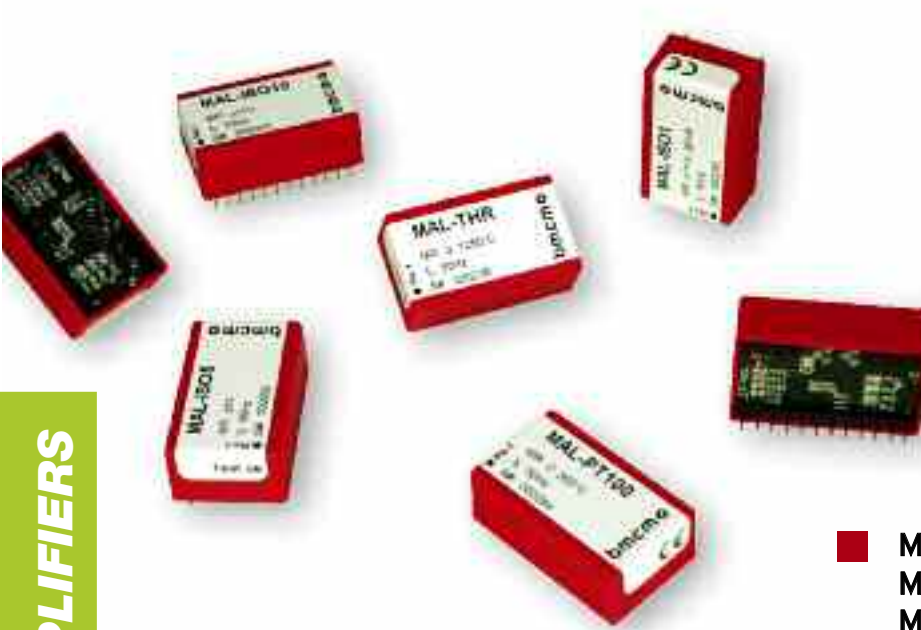
Zur individuellen Entwicklung eines 5B Moduls bietet BMC Messsysteme GmbH den Bausatz MA-KIT an, der in Bauform und Pinbelegung kompatibel zur 5B Modulserie ist. Sie erhalten unter anderem eine Leerplatine mit Lochrasterfeldern und SMD-PADs, die sowohl konventionell als auch mit SMD-Bauteilen bestückbar ist.

To individually develop a 5B module, BMC Messsysteme GmbH offers the construction kit MA-KIT. It is compatible to the 5B module series in type of construction and pin assignment. A blank card with breadboard fields and SMD pads is included amongst other things. It can be equipped both conventionally and with SMD components.



MINIATURE AMPLIFIERS MAL

KOSTENGÜNSTIGE MINIATURMESSVERSTÄRKER IM IC-FORMAT
COST-EFFICIENT MINIATURE MEASURING AMPLIFIERS IN IC FORMAT



AMPLIFIERS

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**MAL-UI | MAL-PT100 | MAL-R1K |
MAL-SEIKA | MAL-SG2 | MAL-SG5 |
MAL-THR**

Miniaturmessverstärker für verschiedene physikalische Größen

Miniature measuring amplifiers for different physical quantities

TECHNICAL DATA

- ▶ size: like 24-pole DIL IC
- ▶ 50Hz bandwidth
- ▶ differential input
- ▶ output filter 6dB/oct.
- ▶ integrated sensor supply

Miniature Amplifiers	MAL-UI	MAL-PT100	MAL-R1K	MAL-SEIKA	MAL-SG2/SG5	MAL-THR
Physical quantity	voltage, current	temperature (PT100)	resistance	for SEIKA sensors	strain gauge (DMS)	thermocouple (type K)
Measuring range	±10V, ±5V, ±1V, ±20mA	0..300°C	0..1kΩ	±0.5V (offset: 2.5V)	±2mV/V or ±5mV/V sensitivity	0..1250°C
Additional features	5V excitation	linearized, 1mA current source	1mA current source	2.5V mid-position	5V DC excitation	(non-linearizing)

miniatur

ISOLATING AMPLIFIERS MAL-ISO

KOSTENGÜNSTIGE MINIATURMESSVERSTÄRKER MIT GALVANISCHER TRENNUNG
COST-EFFICIENT MINIATURE MEASURING AMPLIFIERS WITH ELECTRICAL ISOLATION



■ MAL-ISO50 | MAL-ISO10 | MAL-ISO5 | MAL-ISO1

Miniaturmessverstärker mit galvanischer Trennung und verschiedenen Eingangsspannungsbereichen zur Spannungs- und Strommessung (nur MAL-ISO1)

Miniature measuring amplifiers with electrical isolation and different input ranges for voltage and current (MAL-ISO1 only) measurements

TECHNICAL DATA

- ▶ size: like 24-pole DIL IC
- ▶ electrical isolation
- ▶ 50Hz bandwidth
- ▶ differential input

Miniature Amplifiers	MAL-ISO50	MAL-ISO10	MAL-ISO5	MAL-ISO1
Physical quantity	voltage	voltage	voltage	voltage, current
Measuring range	±50V	±10V	±5V	±1V or ±20mA
Additional features	electrical isolation	electrical isolation	electrical isolation	electrical isolation

BACKPLANES FOR 5B MODULES

5B MODULE BENÖTIGEN EINE TRÄGERPLATINE ZUR STROMVERSORGUNG UND ZUM SIGNALANSCHLUSS.
5B MODULES REQUIRE A BACKPLANE FOR POWER SUPPLY AND SIGNAL CONNECTION.



■ AP2 | AP8a

Trägerplatine für zwei (AP2) bzw. acht (AP8a)
5B Module

*Backplane for two (AP2) or eight (AP8a)
5B modules*

TECHNICAL DATA

- ▶ 2 (AP2) or 8 (AP8a) channels
- ▶ 5B compatible
- ▶ 7-pole input terminals
- ▶ integrated wide-range power supply unit 9..40V
- ▶ 8 direct switches for operation without modules (AP8a)
- ▶ with carrier for DIN rail mounting



■ AAB-II

Äußerst kompaktes Messverstärkergehäuse für acht
5B Module

*Extremely compact measuring amplifier box for eight
5B modules*

TECHNICAL DATA

- ▶ 8 channels
- ▶ 5B compatible
- ▶ 5-pole Binder connectors for input signals
- ▶ integrated wide-range power supply unit 9..40V
- ▶ 7 direct switches for operation without modules
- ▶ aluminum housing
- ▶ installable in two 5 1/4" bays of a PC placed upon each other
- ▶ utility patent-protected



OPTIONAL CASSETTES:

- ▶ AMS-K-BIN5
- ▶ AMS-K-BNC
- ▶ AMS-K-CO5
- ▶ AMS-K-THK



mount 5B amplifier
on the cassette



AMS42 | AMS84

Modulares Messverstärkersystem mit individuellen Steckverbindern. Ermöglicht die professionelle Benutzung von 5B Messverstärkern in einem 19"-Rack. Erhältlich in halber (42TE) oder voller (84TE) Baubreite.

Modular measuring amplifier system with individual plug connectors for professional use of 5B measuring amplifiers in a 19" rack. Available in half (42HP) or full (84HP) construction width.

TECHNICAL DATA

- ▶ 5B compatible
- ▶ AMS42: ½ x 19" 3U aluminum housing (42HP), skid-proof, tip-up feet
- ▶ AMS84: 19" 3U aluminum housing (84HP), fastening brackets for rack mounting
- ▶ 8 (AMS42) or 16 (AMS84) slots for plug-in cassettes
- ▶ optionally extendable to 16 (AMS42) or 32 (AMS84) slots
- ▶ 9-40V power supply
- ▶ individual plug-in cassettes installable per channel



insert cassette in the plug-in
position of the amplifier rack



optional: handle



also available as an all-in-one solution with integrated DAQ system (USB or LAN)

BACKPLANES FOR MAL MODULES

DIE TRÄGERPLATINEN ERMÖGLICHEN DEN FLEXIBLEN EINSATZ DER MAL-MESSVERSTÄRKER FÜR DIE UNTERSCHIEDLICHSTEN ANWENDUNGEN.

THE BACKPLANES ALLOW FOR THE FLEXIBLE USE OF THE MAL MEASURING AMPLIFIERS FOR THE MOST DIFFERENT APPLICATIONS.



■ BP2

Kleine Trägerplatine für zwei MAL-Module

Small backplane for two MAL modules

TECHNICAL DATA

- ▶ 2 DIL sockets for MAL amplifiers
- ▶ connection via screw terminals
- ▶ isolating power supply 9..40V DC
- ▶ DIN rail carrier



■ BP2-BOX

Kleine Trägerplatine für zwei MAL-Module im wasser-dichten IP65 Gehäuse mit PG-Verschraubungen

Small backplane for two MAL modules in waterproof IP65 box with PG cable glands

TECHNICAL DATA

- ▶ 2 DIL sockets for MAL amplifiers
- ▶ connection via screw terminals
- ▶ isolating power supply 9..40V DC
- ▶ IP65 housing



■ BP16

Trägerplatine im Alugehäuse für 16 MAL
Messverstärker

*Backplane in aluminum housing for 16 MAL
measuring amplifiers*

TECHNICAL DATA

- ▶ 16 DIL sockets for MAL amplifiers
- ▶ compatible to DAQ systems from bmcm
- ▶ signal connection at 37-pole D-Sub female
- ▶ amplifier outputs at 37-pole D-Sub female
- ▶ power supply directly from bmcm devices
or 9..40V



■ BP16-PC

Trägerplatine im Euroformat für 16 MAL-Module

Euro-sized backplane for 16 MAL modules

TECHNICAL DATA

- ▶ 16 DIL sockets for MAL amplifiers
- ▶ for PC mounting
- ▶ signal connection at 37-pole D-Sub female
- ▶ amplifier outputs at 37-pole D-Sub female
- ▶ compatible to DAQ systems from bmcm
- ▶ isolating power supply 12V DC from PC

ACCESSORIES



■ **ZU-PW10W**
Steckernetzteil mit 3-poliger DIN-Buchse
Plug power supply with 3-pole DIN female

TECHNICAL DATA

- ▶ electrically isolated from 230V AC mains supply
- ▶ IN: 200-240V AC, max. 20VA
- ▶ OUT: 12V DC, 1A (unregulated), 12W

USE FOR

- ▶ AAB-II
- ▶ BP16



■ **ZU-PW70W**
Tischnetzteil mit 3-poliger DIN-Buchse und Netzkabel
Desk power supply with 3-pole DIN female and power cable

TECHNICAL DATA

- ▶ electrically isolated from 230V AC mains supply
- ▶ overload protected
- ▶ IN: 90-260V AC, max. 60VA
- ▶ OUT: 24V DC, 2.92A (regulated), 70W

USE FOR

- ▶ AMS42
- ▶ AMS84



■ **AMS-K**
Kassetten für 5B Module mit Blenden und individuellen Anschlussbuchsen
Cassettes for 5B modules with panels and individual connector sockets

TECHNICAL DATA

- ▶ AMS-K-BIN5: with 5-pole Binder female connector
- ▶ AMS-K-BLANK: blank front panel
- ▶ AMS-K-BNC: with BNC female connector
- ▶ AMS-K-CO5: with 5-pole terminal connector
- ▶ AMS-K-THR: with thermocouple connector, type K

USE FOR

- ▶ AMS42
- ▶ AMS84



■ **ZU5S712**
Binder Stecker
Binder male connector

TECHNICAL DATA

- ▶ 5-pole

USE FOR

- ▶ AAB-II, AMS-K-BIN5



■ **ZU5ST | ZU7ST**
8 steckbare Anschlussklemmen
8 pluggable terminal blocks

TECHNICAL DATA

- ▶ ZU5ST: 5-pole, screw-type
- ▶ ZU7ST: 7-pole, spring-clamp

USE FOR

- ▶ AMS-K-CO5
- ▶ AP8a



■ **ZU-TR**
Temperaturreferenzsensor für Thermoelementmessungen mit Ausgleichstelle
Temperature reference sensor for thermocouple measurements with compensation

TECHNICAL DATA

- ▶ LM35DZ semiconductor sensor
- ▶ $\pm 1^\circ\text{C}$ absolute accuracy

USE FOR

- ▶ BP16
- ▶ MAL-THR



■ **AAB-KAPC**
Kabelsatz zur internen Verkabelung der AAB-II mit interner PC-Messkarte und PC-Netzteil
Cable kit for internal cabling of the AAB-II with internal PC measuring card and PC power supply

QUICK SELECTION GUIDE

5B AMPLIFIERS	MA-UNI	MA-UI	MA-U	MA-FU	MA-DFI	MA-IF	MA-P09/12/15
Voltage measurement DC	±0.5mV..±10V 10 MR	±5mV..±50V 9 MR	±0.5V..±10V 4 MR	100mV..60V (sensitivity)	±1V..±50V 4 MR	±1V..±15V (TTL/CMOS)	-
Voltage measurement AC	±0.5mV..±10V 10 MR	±5mV..±50V 9 MR	±5V, ±10V	-	-	-	-
Current measurement DC	±0.1..±200mA 8 MR	±1..±200mA 6 MR	-	-	±20mA, ±100mA	-	-
Current measurement AC	±0.1..±200mA 8 MR	±1..±200mA 6 MR	-	-	-	-	-
Resistance measurement	5..10000Ohm, 8 MR	-	-	-	-	-	-
Potentiometer meas.	±0.5mV..±10V 8 MR	-	-	-	-	-	-
Strain gauge meas. bridge	±1..±200mV/V 8 MR	-	-	-	-	-	-
LVDT measurement	±0.05..±1V/V 4 MR	-	-	-	-	-	-
Calibration	3 potentiometers	2 potentiometers	2 potentiometers	4 potentiometers	4 potentiometers	-	-
Excitation (voltage output)	±2.5V; 0.1mA, 4mA	5V, ±12V, 4mA	5V, ±12V, 4mA	5V, ±12V	5V, ±12V, 4mA	-	5V, ±9V/±12V/ ±15V, 4mA
Frequency input	-	-	-	0..100kHz 8 MR	-	1Hz..100kHz	-
Filter	10Hz, 100Hz, 10kHz	10Hz, 100Hz, 10kHz	1kHz, 20kHz, 50kHz	1Hz, 10Hz, 1kHz	0.1.. 20kHz adjustable	-	-
Electrical isolation	+	+	+	+	+	-	-
Amplifier output	±5V	±5V	±5V	0..5V	±5V	TTL	-

MINIATURE AMPLIFIERS	MAL-UI	MAL-PT100	MAL-R1K	MAL-SEIKA	MAL-SG2/5	MAL-THR	MAL-ISO1/5/10/50
Voltage measurement DC	±1V, ±5V, ±10V	-	-	2..2.5..3V	-	-	±1V, ±5V, ±10V, ±50V
Current measurement DC	±20mA	-	-	-	-	-	MAL-ISO1:±20mA
Resistance measurement	-	-	0..1kOhm	-	-	-	-
Strain gauge meas. bridge	-	-	-	-	±2mV/V / ±5mV/V	-	-
Excitation (output)	-	1mA	1mA	-	5V	-	-
Thermocouple (type K)	-	-	-	-	-	0..1250°C	-
PT100	-	0..300°C	-	-	-	-	-
Filter	2-340Hz	8Hz, 80Hz	15Hz	70Hz, 550Hz	1kHz	25Hz, 160Hz	160Hz
Electrical isolation	-	-	-	-	-	-	+
Amplifier output	±5V	0..5V	0..5V	±5V	±5V	0..5V	±5V

BACKPLANES	AP2	AP8a	AAB-II	AMS42	AMS84	BP2/BP2-BOX	BP16/BP16-PC
Slots	2x 5B	8x 5B	8x 5B	8x 5B	16x 5B	2x MAL	16x MAL
Supply (DC)	5V; 9-40V	5V; 9-40V	5V; 9-40V	9-40V	9-40V	9-40V	BP16: 5V; 9-40V BP16-PC: 12V
Inputs	terminals	terminals	Binder connectors	user-defined	user-defined	terminals	37-pole D-Sub female
Outputs	terminals	16-pole pin connector	37-pole D-Sub female	37-pole D-Sub female	37-pole D-Sub female	terminals	37-pole D-Sub female
Override	-	8 direct switches	7 direct switches	-	-	-	16 jumpers
Installation	DIN rail	DIN rail	PC mounting possible	standalone	standalone or rack mounting	BP2: DIN rail BP2-BOX: standalone	BP16: standalone BP16-PC: PC mounting
Housing	-	-	5 ¼" aluminum housing	½ x 19" aluminum housing	19" aluminum housing	BP2-BOX: plastic case (IP65)	BP16: aluminum housing

MR: Messbereich / measuring range

AMPLIFIERS

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Made in Germany

Quality made in Germany

Entwickelt und designed in Deutschland

Developed and designed in Germany

Vom Sensor bis zur Auswertung

From sensor to analysis

Hard- und Software aus einer Hand

Single-source hardware and software solutions

Schnelle und langsame Datenerfassung

High-speed and low-speed data acquisition

Mobile und stationäre Messsysteme

Mobile and stationary measuring systems

PC-gestützte Messtechnik

PC-based measurement technology

Viel Leistung für wenig Geld

High performance – low costs

Produktspektrum vom professionellen

Industrieinsatz bis zur Hobbyanwendung

Multi-purpose products from professional industrial use to private applications

**WEITERE
PRODUKTKATALOGE
DER BMC MESSSYSTEME GMBH:**



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