

## *Manual*

### *Panelmeter EX20xx, EX30xx*



**EN**

#### ***Attention! Read this first!***

Read through the Instructions manual carefully. The guarantee becomes null and void if damage or injury results from non-compliance with these instructions. We cannot assume any liability for consequential damage or injury.

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## Introduction

Dear Customer,

Thank you for buying the EX-Panelmeter. Your EX-Panelmeter is a product which was manufactured with state-of-the-art technology.

**CE** **This product conforms to valid European and national safety guidelines. Conformity has been certified; the relevant documents are in the manufacturer's possession.**

To maintain this standard and ensure safe operation, you as user must comply with the Instructions manual.

Our Internet site at [www.bue.de](http://www.bue.de) will help you answer Frequently Asked Questions and provide tips and updated handbooks.



This symbol indicates important instructions which must be followed.

### Imprint

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### Revision history

Date	Rev	Reason
30.06.05	0	first release
03.05.10	1	Explanation for setting decimal point
09.01.15	2	Added changes for EX32xx (voltage protection)

## Safety Information

Please observe the following when using the product:

- *This Panelmeter left our factory in perfect technical condition. To preserve this state and ensure safe operation, the user must observe the safety instructions and warnings.*
- *Electronic components and accessories do not belong into child hands.*
- *Accident prevention regulations issued by the industrial trade associations and pertaining to the safe use of electrical appliances and equipment on registered commercial premises must be complied with.*
- *A responsible person, trained in the use of electrical equipment, must be present when this product is used in schools, further education classes, DIY and self-help groups.*
- *Turn power OFF before making any changes to the hardware-configuration.*
- *Use in adverse environmental conditions is prohibited.*  
*Such adverse conditions may include:*
  - *areas exposed to moisture or high levels of humidity,*
  - *environments containing dust and combustible gases, vapours or solvents*
  - *during lightning or weather likely to induce strong electrical fields.*
- *The user is obliged to ascertain whether the product is suitable for the purpose for which he intends to use it.*
- *Parts leading high voltage (e.g. inverter for backlight) must be secured against unintentionally contact.*
- *Electrostatic sensitive devices – observe precautions for handling.*

## Warranty

- *The warranty covers the cost-free replacement or repair of faulty parts which can be proved to have resulted from the use of defective material or errors in production. Parts subject to normal wear and tear are specifically excluded from this guarantee.*
- *We cannot accept any responsibility for any damage or injury resulting from the use of this product.*
- *The customer accepts all costs for delivery and return of goods, and any charges which may apply in the event of machine failure or modifications to the device undertaken by us.*
- *Additional claims are excluded.*

## Description

Digital panel meters EX with and w/o illumination. The modules of the EX series were specially designed for build-in situations of housings and panels. Simple mounting and no need of galvanic separated support-voltage, those meters with high voltage and current precision are the real alternative for analog meters. They are useful in all areas where it is necessary to deliver reliable physical Data to operator.

Measure and test engineering, solar technique and electronics, as well as machine- and apparatus engineering are typical area of application.

## Functions

The modules of the EX-Series offer following functions:

**Measure** digital snap-in instrument of the EX-series are designed to measure directly electrical and non-electrical physical metrics.

**Reading** Digital-Instruments are used to avoid parallax error of analog instruments, to have a far higher resolution and ability to view the values from further distances.

## Initial Operation

Please check the wiring before switching ON.

## Maintenance, proper disposal

Please consider as well following advices:

- ***For cleaning do not use carbon containing cleaners, nor benzine, alcohol or similar.***
- ***Damages caused by disregard of advices from instruction manual lapses warranty claims.***

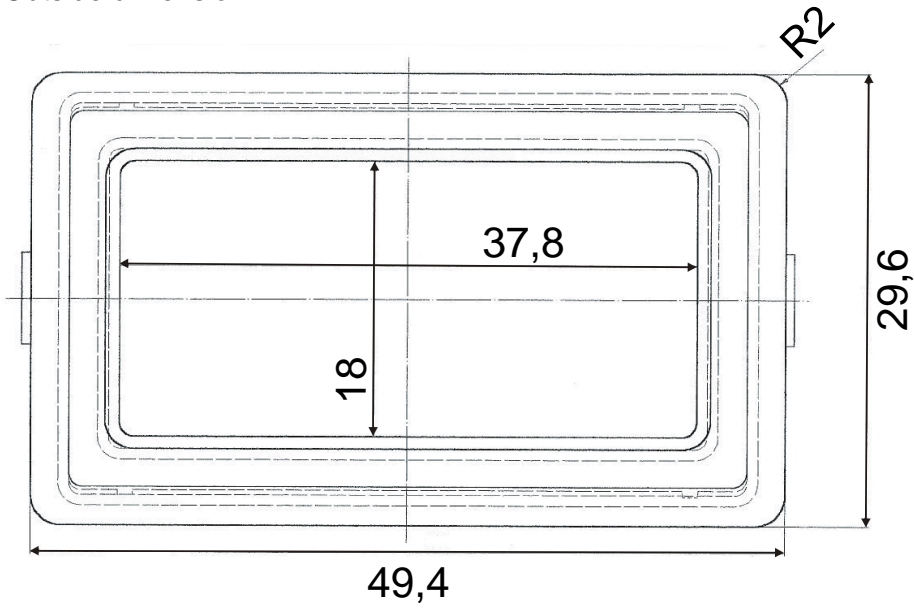
## Specifications

Auxiliary Voltage	The instruments do not need galvanic separated auxiliary voltage (common ground).
Polarity	(does not apply for EX2030 to EX2034!) The instruments display polarity automatically
Decimal point	The position of the decimal point can be adjusted by option..
Exceedance of range	Exceedance of range are displayed by a single 1 or -1 (Overflow display).
Lightning	The modules of the series EX30xx have an built-in green-yellow LED-light(12V).
Mounting	Snap-In mounting for fixing and simple finish for housings and panels.
Housing color	The housing color is black.

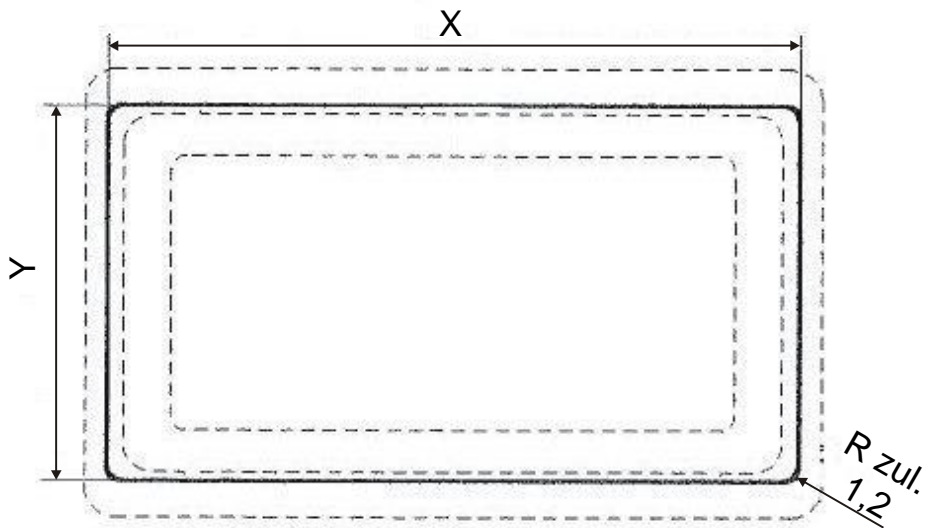
**Dimensions**

All dimensions in Millimeter.

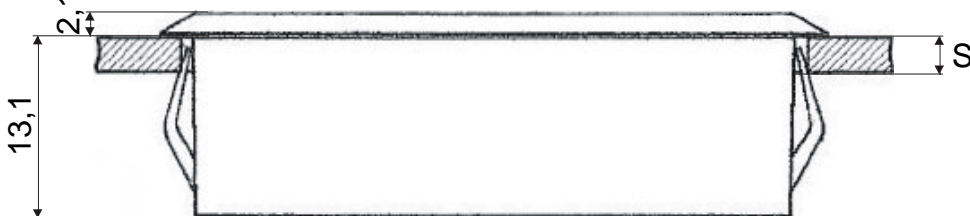
Outside dimension:



Frontplate Opening:



Side View:



Please consider the following table for frontplate opening :

S	X ± 0,1	Y ± 0,1
1,5 - 3	46	25,7
3,5 - 6	46,5	25,7

S = frontplate thickness  
 X = frontplate opening width  
 Y = frontplate opening height

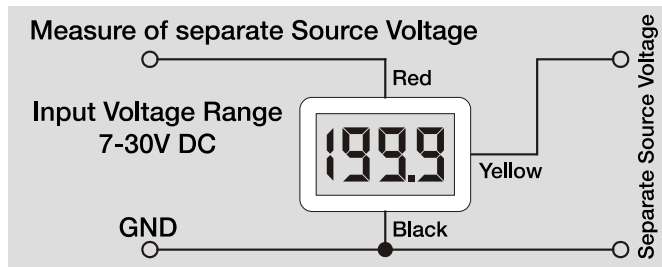
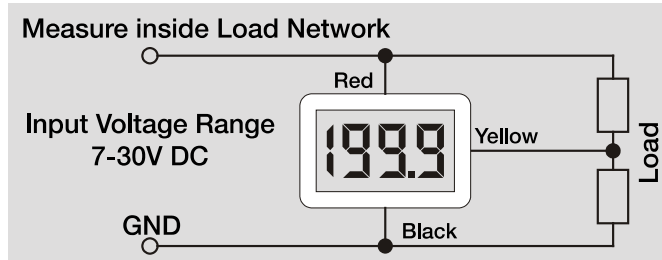
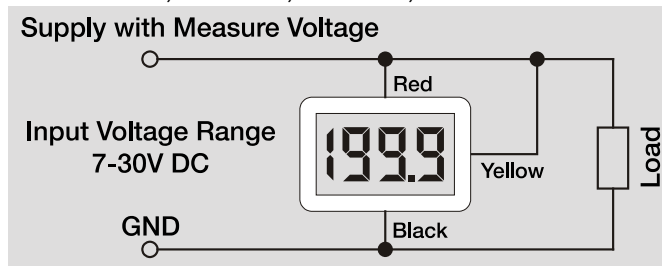
## EX-Voltage Modules (Voltmeters)

Modules of the EX Series were specially designed for use in front panels and housings. Due to ease of mounting and no need of a galvanic separated auxiliary voltage, these exceedingly precise meters are a true alternative to conventional analog meters. Thus they are very useful in all applications where it is important to obtain reliable physical data to users.

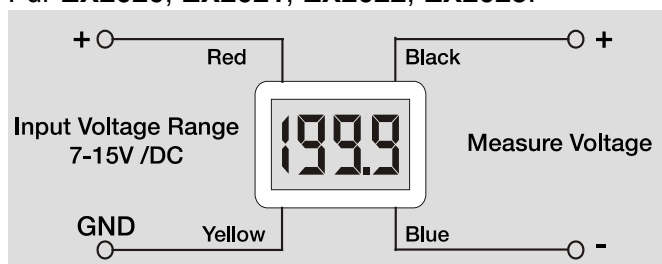
<b>Type:</b>	<b>EX2068</b> <b>EX3068</b> <b>EX2020</b>	<b>EX2069</b> <b>EX3069</b> <b>EX2021</b>	<b>EX2070</b> <b>EX3070</b> <b>EX2022</b>	<b>EX2071</b> <b>EX3071</b> <b>EX2023</b>
<b>Range:</b>	199,9mV	1,999V	19,99V	199,9V
<b>Resolution:</b>	100µV	1mV	10mV	100mV
<b>Input Resistance:</b>	>1000MΩ	>1MΩ	>1MΩ	>1MΩ

### Sample schematics

For **EX2068, EX2069, EX2070, EX2071** and **EX3068, EX3069, EX3070, EX3071**:



Für **EX2020, EX2021, EX2022, EX2023**:



### Specialities (sample schematic)

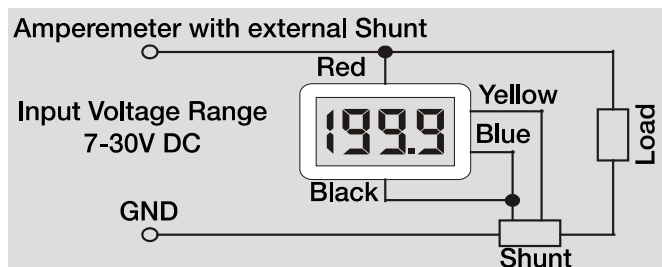
#### Current measuring with voltmeters (only with EX2068 / EX3068)

Basically current measure is as well possible with voltage meter modules. For such, a so called „shunt-resistor“ is necessary. This option is already integrated in the current meter modules. To use Voltmeter modules use below schematic to avoid damage to the modules.



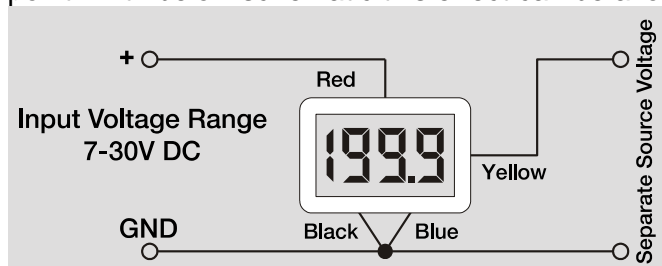
**Important:** The Measure-resistor (Shunt) has to be connected in the ground wire of the load!

Measure Range	Shunt Resistor Value
0..19,99 mA	10 Ohm
0..199,9 mA	1 Ohm
0..1,999 A	100 mOhm
0..19,99 A	10 mOhm
0..199,9 A	1 mOhm



#### Voltage measuring (only with EX2068 / EX3068)

Measuring with separated ground wire! The voltage drop in the measure wire can be up to 300 $\mu$ V, depending the length. This is resulting in a displacement of the zero-point. With below schematic this effect can be avoided.



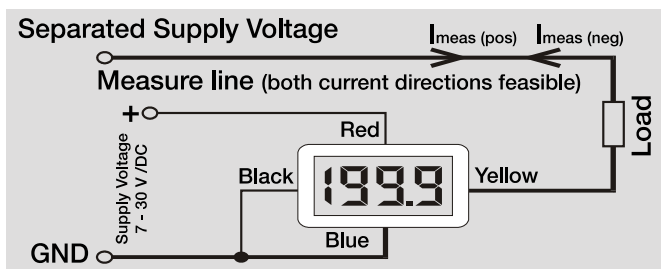
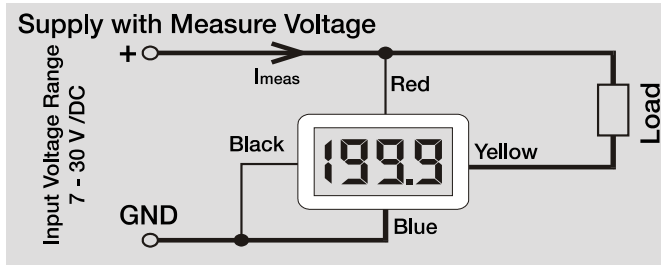
## EX-Current Modules (Currentmeters)

Modules of the EX Series were specially designed for use in front panels and housings. Due to ease of mounting and no need of a galvanic separated auxiliary voltage, these exceedingly precise meters are a true alternative to conventional analog meters. Thus they are very useful in all applications where it is important to obtain reliable physical data to users.

Type:	EX2072 EX3072 EX2030	EX2073 EX3073 EX2031	EX2074 EX3074 EX2032	EX2075 EX3075 EX2033	EX2076 EX3076 EX2034	EX2077 EX3077
Range:	199,9 $\mu$ A	1,999mA	19,99mA	199,9mA	1,999A	19,99A
Resolution:	100nA	1 $\mu$ A	10 $\mu$ A	100 $\mu$ A	1mA	10mA
Input Resistance:	1kOhm	100Ohm	10Ohm	1Ohm	0,1Ohm	0,01Ohm

### Sample schematics

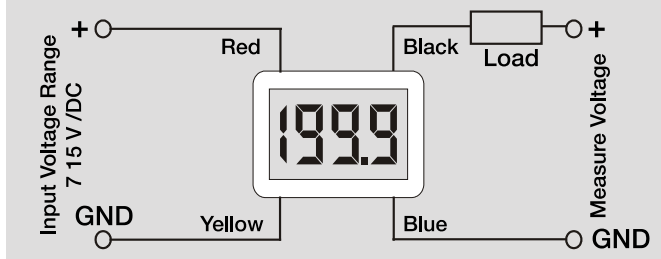
For **EX2072, EX2073, EX2074, EX2075, EX2076** and **EX3072, EX3073, EX3074, EX3075, EX3076**:



For **EX2030, EX2031, EX2032, EX2033, EX2034**:

### Connection Sample

(Supply Voltage has to be separated from Measure Voltage)



The modules **EX2077** and **EX3077** are not equipped with an integrated Shunt. Thus is valid the same schematic as for „Current Measuring with external shunt“ (Specialities page 7).



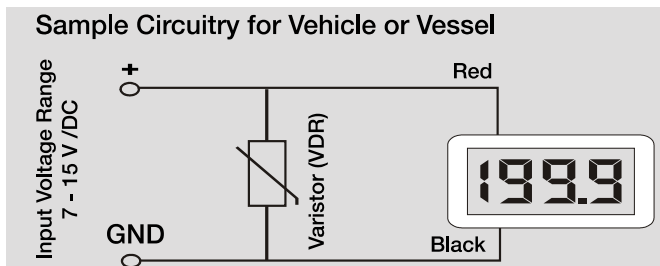
## Adaption and Adjustment

### Vehicle and Vessel Installation

The maximum input voltage of the modules is up to 30V. Whereas in vehicles with 12V on-board voltage occasionally higher voltages appear (mostly short term), but may result in damage of the module.

The use of a so called VDR (voltage depending resistor) parallel to the supply voltage at the module will avoid damage.

Those components are available at standard electronic distributors, sample type: EPCOS Type S05K17.



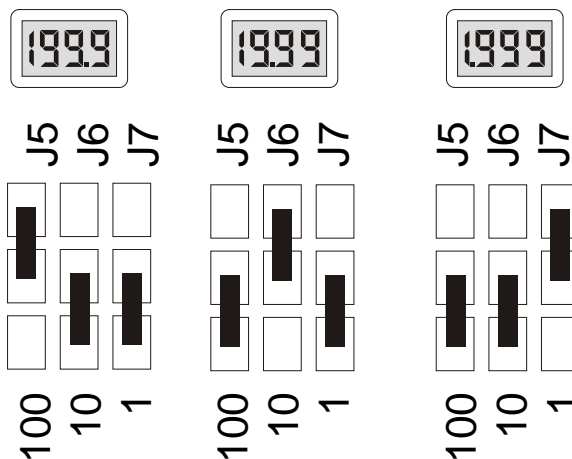
The EX30xx from production >01/2015 already include a overvoltage and reverse voltage protection circuit !

### Supply Voltage for the Illumination of the 30xx

The illumination supply voltage of the modules EX 30xx is designed for 12V; the current consumption is about 7mA. Shall the modules be used with other supply voltage (i.e. 24V), a series-resistor need to be applied.

$R_v = U_v / I_b$  with  $U_v = (\text{applied supply voltage} - 12V)$  and  $I_b = \text{current consumption illumination} = 7mA$ , thus at a supply voltage of 24V the series-resistor shall be 1,7kOhm. Whereas the used value can be between 1 und 2 kOhm, depending the desired brightness).

### Setting of Decimal Point

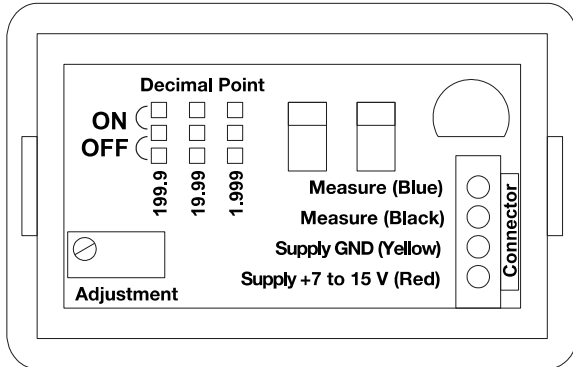


Module Revision 2009 and later

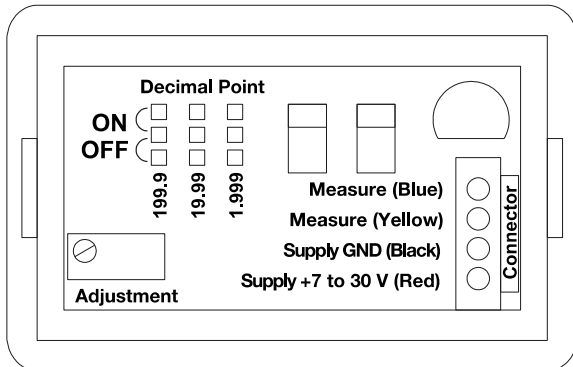


**Pin Assignment**

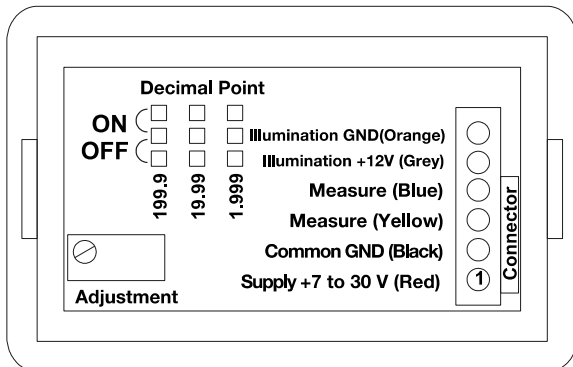
For **EX2020, EX2021, EX2022, EX2023** and **EX2030, EX2031, EX2032, EX2033, EX2024:**



For **EX2068, EX2069, EX2070, EX2071** and **EX2072, EX2073, EX2074, EX2075, EX2076:**



For **EX3068, EX3069, EX3070, EX3071** and **EX3072, EX3073, EX3074, EX3075, EX3076:**



## Technical Data

	EX2020 to EX2023	EX2030 to EX2034	EX2068 to EX2071	EX2072 to EX2077	EX3068 to 3071	EX3072 to 3077
<b>Measurement Category</b>	Voltage	Current	Voltage	Current	Voltage	Current
<b>Precision of Measure</b>	Up to 0,2 % +/- Digit					
<b>Interval of Measure</b>	500 ms					
<b>Leading Sign</b>	automatic negative signal					
<b>Decimal Point</b>	configuration via soldering bridges					
<b>Supply Voltage</b>	7,0 to 15 V /DC		7,0 to 30 V /DC			
<b>Power Consumption</b>	7 mW at 7,0 V /DC	35 mW at 7,0 V /DC			35mW at 7,0 V /DC	
					14mW from Prod.Lot > 01/2015	
<b>Illumination (EX30xx)</b>	-				100 mW at 12,0 V	
<b>Reverse/overvoltage protection</b>					Included from Prod.Lot > 01/2015	
<b>Operating Temperature</b>	0 .. +60 °C					
<b>Storage Temperature</b>	-20 .. +85 °C					
<b>Display</b>	3 ½-digits					
<b>Visible Window</b>	37,8 mm x 18 mm					
<b>Digit Height</b>	11,5 mm					
<b>Front Plate</b>	49,4 mm x 29,6 mm					
<b>Front Plate Thickness</b>	2,1 mm					
<b>Mounting Depth</b>	without plug 15,2 mm					