

# Photoelectric Amplifier

## 3-Channel, Master/Slave

### PAM03DB1RAU24



- Amplifier unit for 3 through-beam sensor sets
- Sensor types: MOFT... / MOFR... up to 50 m sensing range
- Test input for sensor verification
- Automatic Master / slave configuration
- Up to total 10 connected systems
- Fast multiplexed sensors – no crosstalk
- Diagnostics for emitter or receiver fault
- Alignment help for emitter and receiver
- Multi voltage 24 ... 42 VAC/DC
- Alarm output - single module or common
- Adjustment time delay, ON, OFF or ON+OFF
- LED indications for: Supply, outputs, signal quality, fault indication and alignment help
- 50 ... 100% selectable max. sensing range



### Description

The Carlo Gavazzi PAM03 amplification module can operate alone, controlling 3 MOF... sensor sets. Up to 10 amplifiers can also be connected automatically in a master/slave setup via the built-in communication port sharing power and controlling up to 30 MOF... sensor sets. All connected MOF... sensors are multiplexed, eliminating crosstalk. Due to their signal strength, the combination of MOF... sensor sets and PAM03 amplifiers are

suitable for environments with high amounts of dust or fog like automatic industrial doors, stone crushing conveyors, wood working machinery, car washes or other applications where a photoelectric sensor must work despite a build-up of dust and dirt or sense through fog, vapor or similar visibility hindrances. The Carlo Gavazzi photoelectric PAM03 amplifiers are available in a plastic (PC/ABS) IP20 approved housing material.

### Part selection key

<b>P</b>	-	Photoelectric sensor
<b>A</b>	-	Amplifier relay
<b>M</b>	-	Multiplexed sensors
<b>03</b>	-	Number of channels/sensors sets
<b>D</b>	-	Housing DIN-rail
<b>B</b>	-	Inter bus connection
<b>1</b>	-	Spring terminal connectors
<b>R</b>	-	Relay output
<b>A</b>	-	SPDT N.O. & N.C. contacts
<b>U24</b>	-	24 ... 42 VAC/DC power supply

### Part selection

Channels	Connections	Terminals	Output	Part number
3 channels	Inter Bus	Spring terminals	SPDT relays	<b>PAM03DB1RAU24</b>

## Features

### Main operational data

<b>Functional principal details</b>	Amplifier unit for 3 channels/3 MOFT... / MOFR... sensor sets
<b>Sensing mode</b>	Through-beam sensing
<b>Sensing</b>	
Rated operating distance ( $S_n$ )	MOFT20-MOFR... - 20 m MOFT50-MOFR... - 50 m
Sensitivity adjustment	Manual or automatic sensitivity adjustment. Manual: Single turn trimmer 240° Automatic sensitivity adjustment: Trimmer setting fully counterclockwise "A"
Hysteresis	Typically between 10% ... 30%, sensor dependent
Operating frequency	1 module - 55 Hz 2 modules - 27 Hz n modules - 55/n Hz
Temperature drift max (% of $S_n$ )	±10%
Repeatability	<5%, sensor dependent
Response time	1 module - 9 ms max 2 modules - 18 ms max n modules - n x 9 ms max
Automatic master/slave configuration	When two or more modules are connected
Test input	The emitters Channel 1 - 3 are switched off when voltage is applied to the test terminals (24...42 VAC/DC)
Mutual interference protection	All connected MOF.. sensors are multiplexed, eliminating crosstalk
Diagnostic functions	Indicate failures on the connected emitters and receivers
<b>Time delay</b>	
OFF delay	0 ... 10 sec., common for all 3 channels single turn trimmer, 240°
ON delay	0 ... 10 sec., common for all 3 channels single turn trimmer, 240°
<b>Optical information MOF... sensors</b>	
Light source	GaAIAs LED, 880 nm, infrared modulated
Optical angle	±2°, ±5° ±8°

## Electrical data

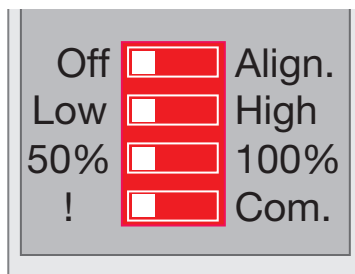
Power supply	
Rated operational voltage ( $U_o$ )	$U_B$ : 20.4...46.2 VAC/DC (Ripple included) $U_e$ : 24...42 VAC/DC (Ripple included) For UL508/UL325 certification: $U_e$ : 20.4...30 VAC/20.4...42.4 VDC (Supply Class 2)
Ripple ( $U_{rpp}$ )	-15%, +10%
Frequency range	45 ... 65 Hz
No load supply current ( $I_o$ )	DC: 120 mA @ $U_B$ min, 60 mA @ $U_B$ max AC: 170 mA @ $U_B$ min, 95 mA @ $U_B$ max
Rated operational power	4 VA, AC supply 3 W, DC supply
Power-ON delay ( $t_v$ )	$\leq 300$ ms
Inputs	
Sensor set 1...3	Up to 3 sets of sensors can be used, 3 x 4 terminal blocks
Test input	To be used for testing the connected sensors, 1x2 terminal block
Power Supply	Power from one system can supply all connected systems, 1x2 terminal block
Relay Outputs	
CH1...CH3 relay	SPDT output for sensor outputs, Make & Break, 3 x 3 terminal blocks
Warning relay	SPDT output, Make & Break 1x3 terminal blocks
Relay data	
Relay output	SPDT
Output switching function	N.O. and N.C. (Make & Break)
Relay contact materials	Au (Gold)
Minimum operational current ( $I_m$ )	$\geq 1$ mA @ 5 V (Gold contacts)
Mechanical lifetime contacts	$\geq 5\,000\,000$ cycles
Electrical Lifetime	$\geq 100\,000$ cycles @ Resistive load AC1 and DC1
Utilization category	AC-1: $\leq 0.5$ A / 30 VAC (EN IEC 60947-4-1)
	DC-1: $\leq 1.0$ A / 30 VDC (EN IEC 60947-4-1)
	AC-14: Control of small electromagnetic loads (EN IEC 60947-5-1)
	DC-13: Control of electromagnets (with freewheeling diode) (EN IEC 60947-5-1)

## Environmental data

<b>Ambient temperature</b>	
Operating	-25° ... +50°C (-13° ... +122°F)
Storage	-40° ... +85°C (-40° ... +185°F)
<b>Ambient humidity range</b>	
Operating / storage	35% ... 95% (With no icing or condensation)
<b>Ambient light immunity</b>	
MOFT.../MOFR... sensors	<ul style="list-style-type: none"> <li>• ≥ 100 000 lux incandescent light @ 3000 ... 3200 °K (EN iec 60947-5-2)</li> <li>• ≥ 10 000 lux incandescent light 3200 °K (EN IEC 61496-2). Failure to danger (worst case alignment)</li> <li>• ≥ 3 000 lux fluorescent light (EN IEC 61496-2). Failure to danger (worst case alignment)</li> <li>• 0.05 J @ 200 Hz to 0.5 J @ 5 Hz stroboscopic light (EN IEC 61496-2). Failure to danger (worst case alignment)</li> <li>• 3 ... 5 J @ 0.5 ... 2 Hz flashing beacon light (EN IEC 61496-2). Failure to danger (worst case alignment)</li> </ul>
<b>Mechanical influences</b>	
Vibration	10 ... 55 Hz, 1.0 mm/15 g (EN IEC 60068-2-6)
Shock	30G / 11ms, 3 pos and 3 neg (EN IEC 60068-2-27)
Drop test	2 x 1 m and 100 x 0.5 m (EN IEC 60068-2-31)
<b>Categorization</b>	
Pollution degree	2 (EN IEC 60664, 60664A; EN IEC 60941-1)
Overvoltage category	III (EN IEC 60664; EN IEC 60947-1)
Degree of protection	IP20 (EN IEC 60529; EN IEC 60947-1)
Nema enclosure types	1 (NEMA 250)
<b>Safety (electrical)</b>	
Protection	Reverse polarity
Rated insulation voltage (U <sub>i</sub> )	50VDC or 50VAC RMS
Dielectric insulation voltage	≥ 1kVAC rms (50/60 Hz for 1 min.)
Rated impulse withstand voltage (U <sub>imp</sub> )	≥2kV (1.2/50µs) with 500 Ω
<b>EMC immunity standard</b>	EN IEC 60947-5-2 / EN IEC 61000-6-2
<b>EMC immunity test</b>	
Electrostatic discharge	± 8 kV @ air discharge (EN IEC 61000-4-2) ± 4 kV @ contact discharge
Electromagnetic field	80...1000 MHz: 10 V/m (EN IEC 61000-4-3) 1.4...6.0 GHz: 3 V/m
Fast transient/burst	± 2 kV (EN IEC 61000-4-4)
Surge	1 kV (EN IEC 61000-4-5)
Wire-conducted disturbance	10 Vrms (EN IEC 61000-4-6)
Power frequency magnetic field	30 A/m (EN IEC 61000-4-8)
<b>EMC emission standard</b>	EN IEC 60947-5-2
<b>EMC emission test</b>	
Radio frequency disturbance	EN 55011 / CISPR 11 Class A (industrial) group 1 @ 10m: 30 ... 230MHz: 40dBµV/m 230 ... 1000MHz: 47dBµV/m

## Functions

### DIP-switch settings



Alignment mode

Excess gain

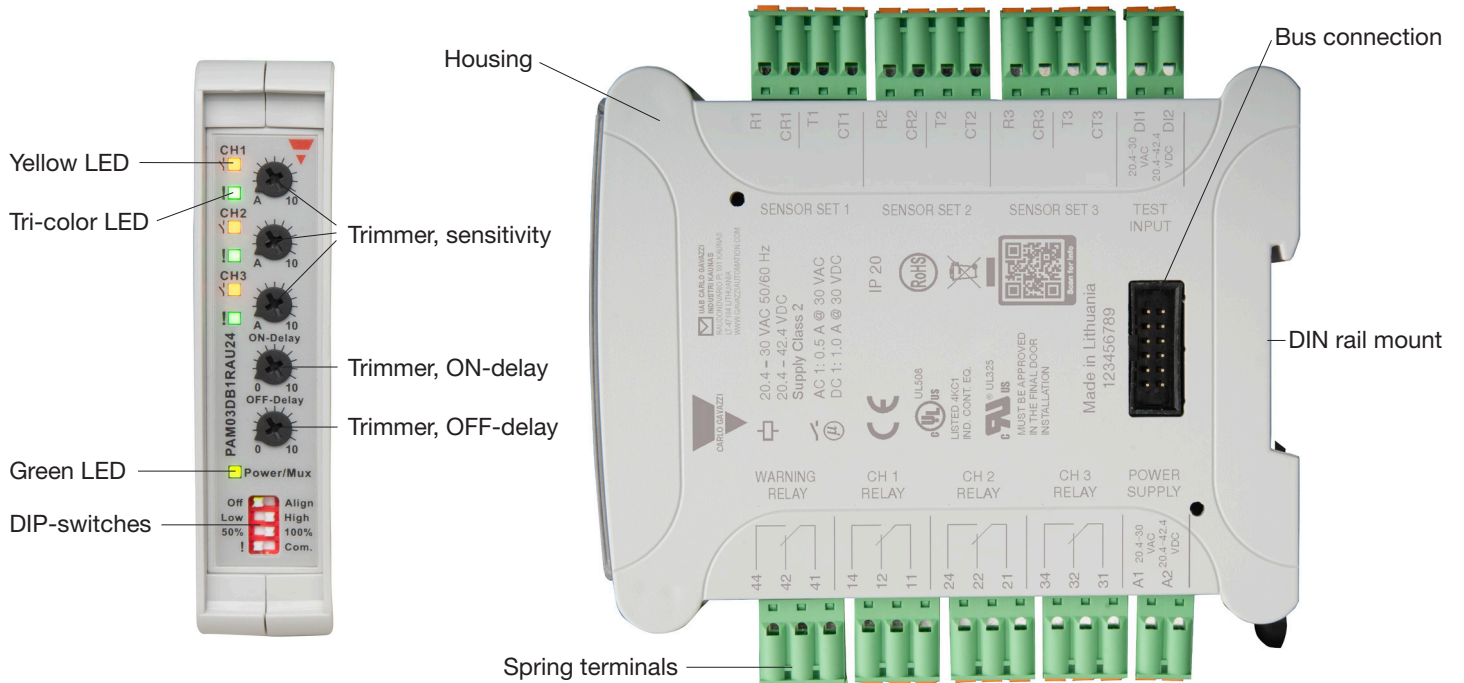
Sensitivity range

Warning relay

<b>Alignment mode</b>	Off or alignment mode for easy optical sensor alignment.
<b>Excess gain</b>	Low or High dust reserve. Common for CH1 - CH3.
<b>Sensitivity range</b>	50% or 100% of maximum sensitivity range. Common for CH1 - CH3.
<b>Warning relay</b>	<ul style="list-style-type: none"> <li>• “!” , warning for this specific module only.</li> <li>• “Common”, warning for all connected modules.</li> </ul>

## Structure

### Housing

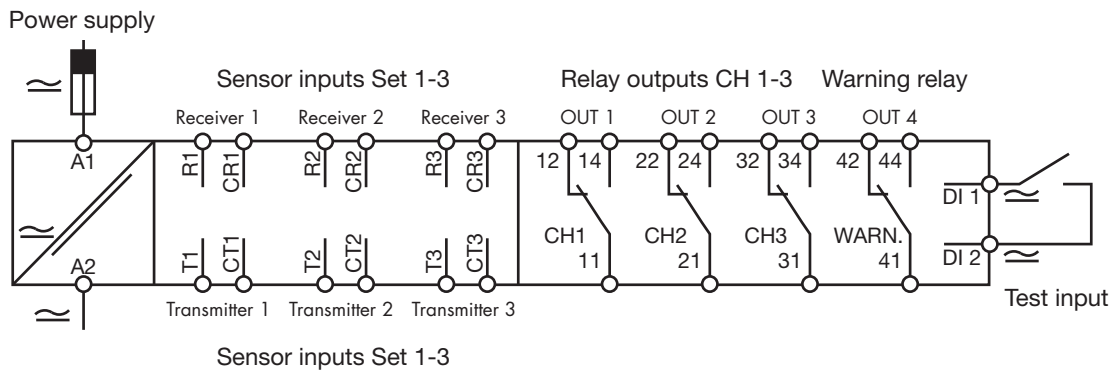
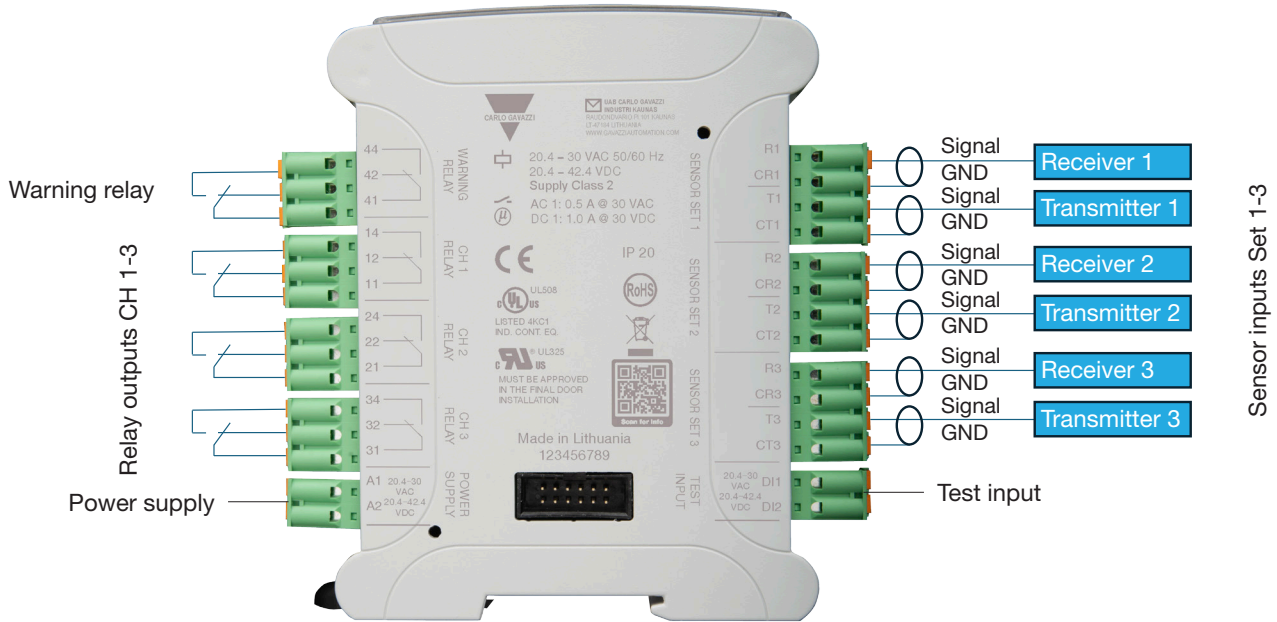


<b>Housing</b>	PC/ABS
<b>Front</b>	PC/ABS
<b>Trimmer shaft</b>	PA
<b>Dimensions</b>	97 x 22.5 x 121 mm (H x W x D) (Without terminal blocks)
<b>Weight</b>	185 g

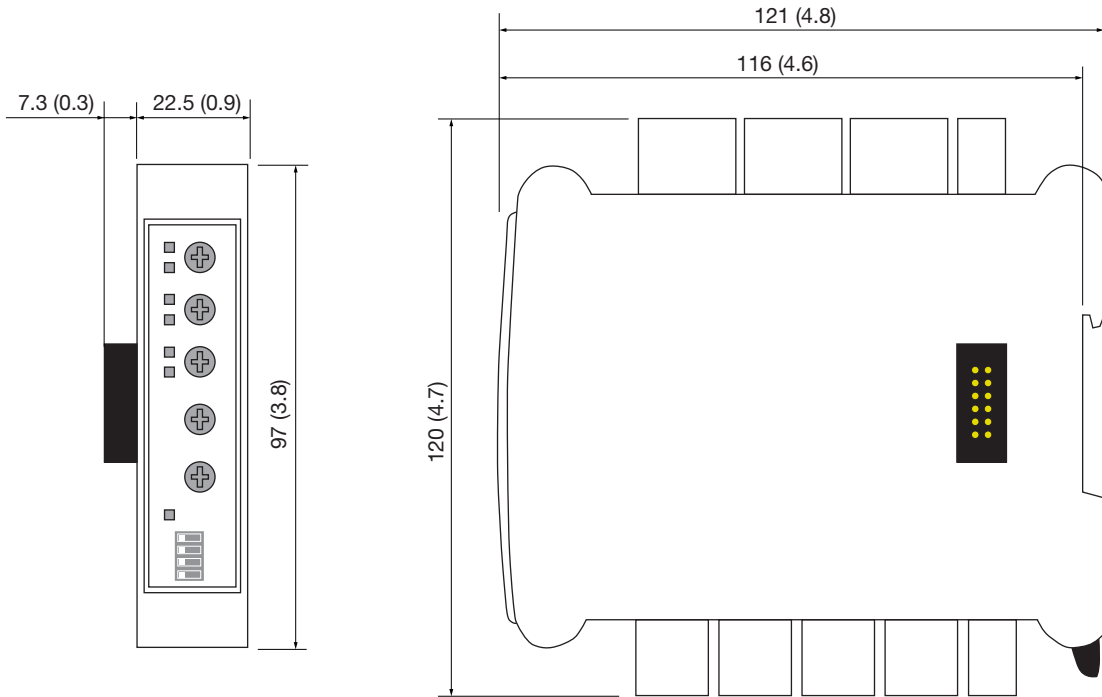
### LED indication

<b>Yellow LEDs</b>	Relay output active
<b>Green LED</b>	Power ON or Master/slave function
<b>Tri-colour LEDs</b>	
Green	Channel is in Automatic Sensitivity Adjustment mode
Yellow	Alignment mode. Flashing according to the signal strength
Red	Max. Automatic Sensitivity Adjustment level reached
Yellow and red, alternating	Receiver error
Green and red, alternating	Transmitter error

## Connection and wiring





## Dimensions in mm (inches)



## Compatibility and conformity

### Approvals and markings

<b>General reference</b>	Sensor designed according to EN IEC 60947-5-2
MTTF <sub>d</sub> related to product lifetime	216.8 years (EN ISO 13849-1, SN 29500)
MTTF <sub>d</sub> related to safety device, performance level	1003.7 years
CE-marking	
Approvals	
ESPE type	2
Performance level (PL)	d
PFH <sub>d</sub>	1.14 x 10 <sup>-7</sup> error per hour
Mission Time	20 years

## Delivery contents and accessories

### Delivery contents

- Photoelectric amplifier set: PAM03DB1RAU24
- Accessory bag (Spring terminal blocks 3x4, 4x3, 2x2)
- Packaging: Cardboard box

### Accessories

- MOFT... / MOFR... sensors to be purchased separately
- AMO-MB5 mounting bracket

### Further information

<b>User manual</b>	<a href="http://cga.pub/?5f294c">http://cga.pub/?5f294c</a>	
<b>MOFT... / MOFR... sensors</b>	<a href="http://cga.pub/?effd5">http://cga.pub/?effd5</a>	
<b>Mounting brackets</b>	<a href="http://cga.pub/?6fa29a">http://cga.pub/?6fa29a</a>	
<b>Carlo Gavazzi website</b>	<a href="http://www.gavazziautomation.com">www.gavazziautomation.com</a>	

Please refer to the user manual for in-depth explanations.