AC 420

Amplifier for pyranometers.

User manual

Important user information

Reading this entire manual is recommended for full understanding of the use of this product.

The exclamation mark within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance instructions in the literature accompanying the instrument.

Should you have any comments on this manual we will be pleased to receive them at:
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Leiderdorp Instruments reserve the right to make changes in the specifications without prior notice.

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Leiderdorp Instruments guarantees that the product delivered has been thoroughly tested to ensure that it meets its published specifications. The warranty included in the conditions of delivery is valid only if the product has been installed and used according to the instructions supplied by Leiderdorp Instruments.

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1. GENERAL INFORMATION

1.1 INTRODUCTION

The AC420 amplifies the output voltage of radiation sensors to a level suited for data acquisition equipment and transmission over long cables. The AC420 amplifier has technical specifications that match the radiation sensors' accuracy and signal levels. The amplifier can be adapted to the sensitivity of the sensor so that a calibrated output current is obtained. The amplification factor is factory set. If not specified when ordered it is set to 1.6 mA/mV so that a reasonable signal level results for an average sensor. The user can change the amplification factor if required. This manual describes the details of how to do this.

1.2 ADDITIONAL EQUIPMENT REQUIREMENTS

The AC420 must be powered with a DC voltage of 8..28 VDC. A complete measuring set-up consists of a sensor, the AC420 amplifier, a power source, a 100 Ohms resistor and a read-out device (e.g. a DC voltmeter).

2. TECHNICAL SPECIFICATIONS

- input voltage range:	
- minimal full scale input:	3 mV
- maximum full scale input:	1200 mV
- conversion factor range:	16 mA / 1200 mV... 16 mA / 3 mV
- converter output range:	approx. 2.5...30 mA
- factory gain setting:	10 mV input gives 20 mA output, 0 mV input gives 4 mA output
- calibration resistor:	for an output of 4...20 mA FS, calculate the required amplification as follows: A = (10/user resistor in kOhms) [mA output per mV input]
- input impedance:	100 kOhms
- ambient temperature:	operating:-20...50 ^{o}C storage: -30...70 ^{o}C
- zero drift:	<0.25 µA/^{o}C
- range drift:	<0.01%/^{o}C
- initial accuracy:	range factory setting 0.1% zero factory setting 4 mA +/- 1µA
- supply voltage to output ratio:	<10 µA/V
- maximum loop voltage:	28 Volt
- minimum loop voltage:	8 Volt
- response time:	<1 s
- internal fuse	100 mAT

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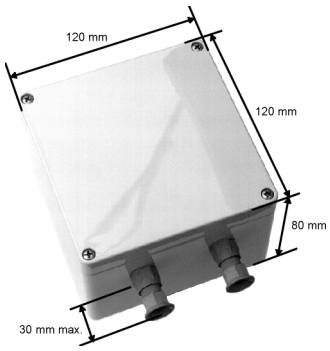
The dimensions of the amplifier are shown in the figure below.



3. INSTALLATION

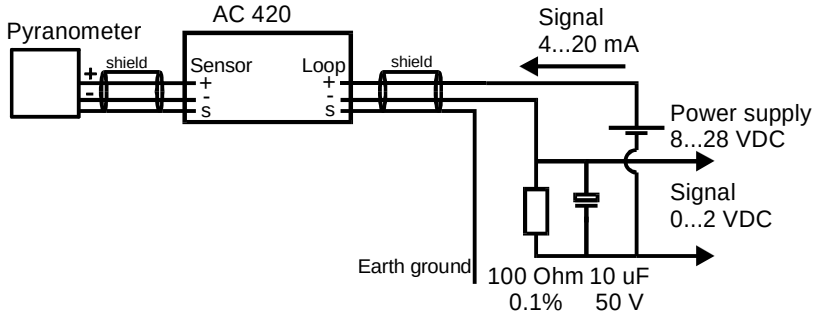
3.1 LOCATION

The housing of the AC420 is IP65 protected. This means that the amplifier may be placed outside without special protection. However, some precautions are recommended:
- do not mount the AC420 on a dark background in direct sunshine (wall/roof)
- if possible shelter the amplifier from rain and snow
- avoid mechanical stress

3.2 CABLING

Make sure that the diameter of the connection cables matches the cable glands (3.5..6 mm). Avoid mechanical stresses on the cables.

Keep the cables as short as possible and keep them away from obvious sources of electrical fields such as power lines, mains outlets etc. The following figure shows how the amplifier is connected:



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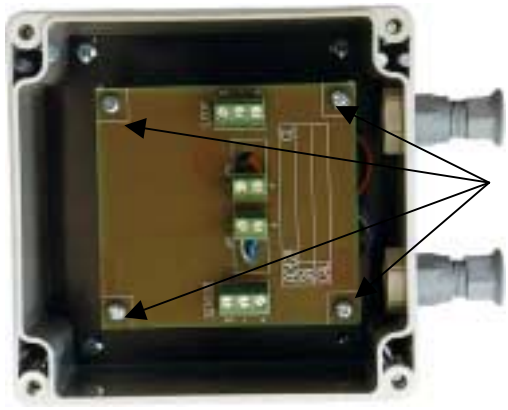
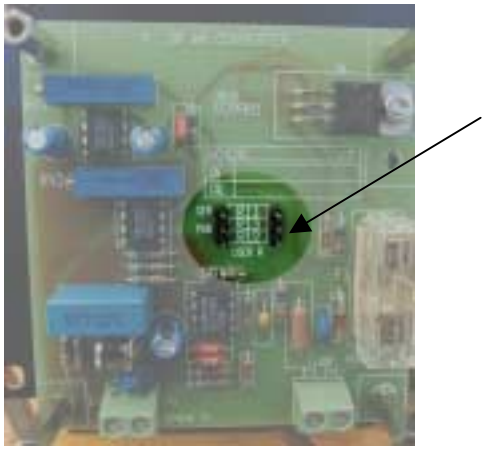
4. GAIN SETTING

The converter has a factory set amplification of 1.6 mA/mV (within 0.1%) unless specified otherwise when the amplifier was ordered. This factor may be changed to get a calibrated output of the converter. Three 'user resistors' may be placed in the converter. The resistors can be accessed by opening the converter and removing the connection board as shown below.



Unscrew and remove connection board to access user resistors.

The position of the user resistors is shown in the figure below.



User resistors.
Three resistors can be placed in series to obtain the desired value.

The amplification is calculated as follows:

$$A = \frac{10\ \text{kOhm}}{\text{user resistor (in kOhms)}}\ \text{mA/mV}$$

So, if a resistor of 1kOhm is installed, the output will be 10 mA per mV input.

The resistor that determines the amplification may consist of two resistors in parallel, and one in series. This allows the user to install a resistor value that matches the sensor

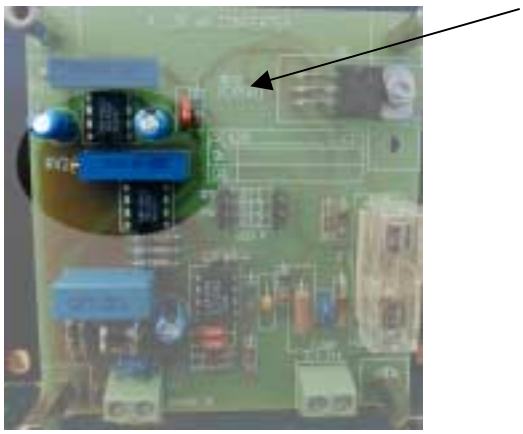
calibration factor. The resistors must have a temperature coefficient of +/- 50 ppm/K (regular low-cost metal film resistors). The accuracy of the resistor value is directly reflected in the output accuracy of the converter.

For example:
If a sensor with a full scale output of 5.16 mV is used and an output current of 16 mA (from 4 to 20 mA) full scale is required, the user resistor is calculated as follows:
Required amplification = 16 mA/5.16 mV = 3.101 mA/mV
A = 10/user resistor, or user resistor = 10/A
user resistor = 10/3.101 so
user resistor = 3.224 kOhm = 3224 Ohms

A resistor of 3224 Ohms is obtained from:
2k75+475 or
2k21+1k+15 or
1k5+1k5+221 etc.

The amplifier has an input resistance of 100 kOhm. It may be necessary to compensate for this resistance in the amplification factor if the output impedance of the sensor is too high (generally not required for pyranometers).

If the amplification is changed it may be necessary to re-adjust the zero setting. To do this, short-circuit the input terminals '+' and '-' with a short wire (do not connect them to ground) and adjust the output with the potentiometer (see figure below).



The output should be 4 mA +/- 1 µA. Wait for at least 30 minutes after soldering the user resistors before adjusting the zero level (the heated resistor leads, and the terminals they are soldered to, form a thermo-couple that generates an offset voltage in the amplifier circuit).

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APPENDIX A Ordering information

A.1 DELIVERY

- AC420 amplifier
- 100 Ohms 0.1% resistor
- 10 uF 50V capacitor
- Mounting brackets
- Calibration certificate
- Manual

A.2 ORDERING SPECIFICATIONS

- AC420, standard with amplification of 1600 mA/V
- AC420, with amplification adjusted to a specified sensor (to give 16 mA/1000W/m^2):
  specify desired gain or sensor output
  voltage at full scale.

A.3 OPTIONS

The amplifier can be ordered without the standard housing.

A.4 SPARE PARTS

There are no spare parts for this product.

A.5 ACCESSORIES

There are no accessories for the AC420.

A.6 RELATED PRODUCTS

AC-100	0...1V amplifier for pyranometers
AC-1000	0…1V, 0…20 mA and 4…20 mA digital amplifier
PRO-NET	modular data acquisition and control network suited for telemonitoring
LI-18	hand held integrator/read-out unit for radiation sensors
CM11	secondary standard pyranometer
CM21	secondary standard pyranometer with improved specifications
CM6B	first class pyranometer
CM3	second class pyranometer

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