Instruction Manual ISM-1230

Introduction

The ISM-1230 is a special device for optical turbidity measurement or dust measurement. It is based on a modified infrared light barrier ISM-1200. The technical data, connection diagrams, installation instructions and safety instructions can be found in the "Operating instructions ISM-1200" document.

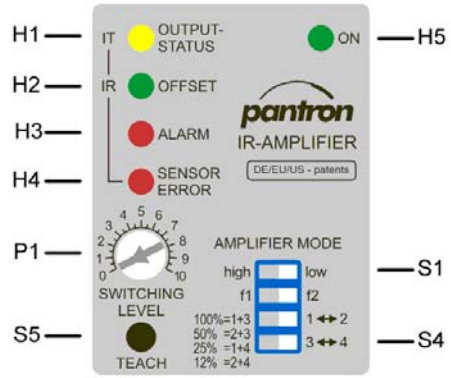
Mode of operation

An infrared transmitter and a receiver (sensors) are connected to the ISM-1230. The light beam passes through the medium to be monitored. The system operates with modulated infrared light, and regulates its transmitter power permanently so that the receiver gets a constant signal. The transmit power to be applied is output at the analog output 0-10 V and is dependent

- from the distance transmitter-receiver,
- the alignment of the sensors,
- pollution of the sensors
- and the current turbidity of the medium between the sensors

Assumed that the sensors are mechanically fixed, and the turbidity changes relatively quickly in time, the output signal is only dependent on the current turbidity. The contamination of the sensors e.g. due to dusting changes only slowly in time and can be equalized by an offset on the device.

Displays and controls



H1: Output status indicator - yellow, illuminated when the switching output is active

H2: Offset indicator - green, illuminated when a teach operation has taken place and the output range of the analog output is related to a certain basic pollution.

H3: Alarm indicator - red, illuminated when the transmit power has reached the maximum value

H4: Sensor error indicator - red, flashes when a sensor error has been detected

H5: Power indicator - green, is always on when power is supplied

P1: Threshold for the switching output
S1 - S4: DIP-switches
S5: Teach / Reset-switch, to set the offset to the current basic pollution.

Dip switch assignment

S1: Basic power of the device High / Low. When high, the receiver operates with a higher gain. The device can therefore penetrate even heavier soiling or opaquing than in setting Low, or can operate at the same turbidity with lower transmission power. It is recommended to start with the Low setting and to change to High only if the power is not sufficient or if the alarm output is active. The setting is independent of the scaling S3, S4.

S2: Frequency switching, changes the modulation frequency of the infrared light. If two ISM-1230 are operated in relative proximity, one device should be set to f1 and the other to f2.

S3, S4: Scaling of the analog output value. The setting allows double, quadruple or eightfold stretching of the measuring range, corresponding to 50%, 25% or 12.5% of the total range.

Teaching process / Setting the offset

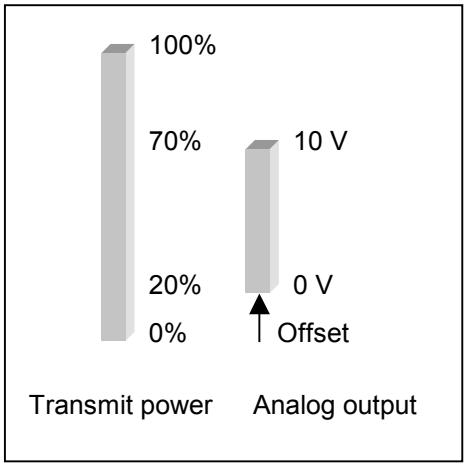
The teach process is initiated by briefly applying 24V to the test input. The voltage must be present for at least 50 ms. Shorter pulses are ignored. Alternatively, the teach process can also be initiated by briefly pressing the button S5 on the device.

When teached, the device saves the current transmit power as a new offset. The H2 offset LED is lit. The analog output voltage is 0V. As the turbidity increases, the output voltage increases. The offset remains stored for as long as the device is powered up. After an interruption of the power supply, the teaching process has to be carried out again.

For use in dedusting, it is recommended to carry out the teaching process after the ventilation / extraction has been completed. Thus, the device compensates the contamination of the sensors, and reacts only to a new pollution of the measuring area.

Measurement / Theory of operation

Depending on the turbidity, the transmit power of the infrared transmitter varies between 0% and 100% with a resolution of 1024 steps. The stronger the turbidity, the higher the transmit power. The corresponding measured value is output on the 0-10V analogue output and is a measure of the strength of the turbidity. Since the entire power bandwidth of the system is very high, it is possible to extend the measuring range and thus measure small changes of the turbidity with a higher resolution. In addition, the relative position of the 0-10V measuring range within the total working range can be shifted by the offset. There are 4 operating modes:



Mode 1: 100% of the total range correspond to 0-10V. In addition, the 0V point can be shifted by an offset.

Mode 2: 50% of the total range correspond to 0-10V, see graphic. The measuring range is stretched twice. Via the offset, the start of the range is set to e.g. 20% transmit power, in order to compensate for the contamination of the sensors. Below 20%, 0V is output, between 20% and 70% 0-10V is output (corresponds to 50% of the total area). Above 70% always 10V are output.

Mode 3: 25% of the total range correspond to 0-10V. The measuring range is stretched four times.

Mode 4: 12,5% of the total range correspond to 0-10V. The measuring range is stretched eight times. In this mode, a small change in turbidity results in the strongest change in the output voltage.

Switching output

The current measurement for the turbidity can be read from the 0-10V analogue output. In addition, the output turns on when the analog voltage exceeds the value set at potentiometer P1 (0-10). The output status LED lights up. Thus, for example, a simple fan control can be implemented. The output switches off when the set threshold is reached again, plus a hystheresis of approx. 0.2 V.

Alarm output

Whenever the transmit power reaches the maximum value due to excessive turbidity, the alarm output is activated, and the alarm LED H3 lights up. Depending on the selected measuring range and the present offset, it may happen that a 10V output voltage can no longer be reached. Therefore, the device automatically increases the output to 10V when the power limit is reached, so this state can be detected even if the alarm output is not connected.

Sensor monitoring

The ISM-1230 continuously monitors its sensors for wire breakage and short circuit. If errors occur, the sensor error LED H4 flashes; the LEDs H1 or H2 are also flashing to indicate that the transmitter (H1) or the receiver (H2) is faulty.

In the case of faulty sensors, a signal evaluation normally is also not possible. The system assumes a maximum turbidity in this case. The alarm output is set and the analog voltage is at 10V.

Reset

A reset is performed pressing the button S5 for more than 2s. The offset for the analog output is set to zero. The offset LED H2 remains off until a new teach process is triggered.