

# HBO 434.173



# HBO PI-controller

The HBO PI-mode controller is generally working as a PID-controller, this section will explain how this works.

T = Temperature  
SP = Pre – set value  
XP = Band Width  
tn = Integration Time  
td = Differential Time

## 1. Proportional Mode (Heating)

When T is lower than  $SP - \frac{1}{2} \cdot XP$ , the current constant is 20 mA (100 %).

Between  $SP - \frac{1}{2} \cdot XP$  &  $SP + \frac{1}{2} \cdot XP$ , the output will change from 20 mA (100 %) → 4 mA (0 %) if T is changing from the bottom towards the top of XP. Consequently, when  $T = SP$ , the output will be 12 mA (50 %).

Depending on the size of the signal required for maintaining the target temperature, the proportional mode will settle T as a constant between the bottom and the top limits of the band. This results in a proportional deviation of maximum  $\pm XP$ .  $T = SP$  only when exactly 50 % of the signal is required to maintain the temperature.

## 2. Proportional & Integrational Mode (PI-Mode)

The main purpose of the integral parameter is to remove the proportional error. This is achieved by means of an integrator. The output signal is controlled by the deviation  $\Delta T = SP - T$ .

Only when  $\Delta T = 0$  ( $T = SP$ ) the output signal of the integrator will remain constant.

Tn is the lapse of time required by the output signal to remove the error,  $\Delta T$ , assuming T remains constant during the period.

As a result of this, the velocity of which the integrator parameter will correct deviations from SP is proportional to the deviation.

I.e., T will approach SP according to an exponential curve with a steepness determined by tn.

## 3. PID Mode / HBO PI Mode

E.g., when time T has remained below XP for some time, it becomes desirable for the controller to start the adjustment of the signal sufficiently early for T to readjust as quickly as possible – in some cases without oscillating above the target temperature.

Normally, this will be achieved by adding a differential parameter to the controller. The differential parameter will measure the velocity with which T is changing and will adjust the signal accordingly.

The effect of the differential parameter is adjusted by the means of td.

Thus, the PID mode is determined by three parameters:

- Proportional band
- Integration time  $t_n$
- Differential time  $t_d$

In practice, because of these three interdependent parameters the PID mode is difficult to set for a specific task. In most cases, a better adjustment is achieved by the HBO PI-controller operating with only two parameters:  $X_P$  &  $t_n$ .

The improved adjustment is accomplished by compulsory steering of the integrator signal (integrator limitation) during the sequence of setting. By a suitable and rather indiscriminating choice of  $X_P$  and  $t_n$  the controller will 'catch' the temperature before reaches the value of SP. As a result, the transitory period will be brief with small or no oscillations above SP.

**The HBO 434.173** is a sturdy, reliable, and versatile indicator, especially suited to operate in industrial environments.

The metal housing complies with the German Industrial Standard. It is sealed by an acrylic front and a neoprene seal between panel and front.

LED display allows for easy and accurate reading at distances of up to 6 meters.

The knob in front will let you change the set point.

According to input amplifier and sensor type, the instrument will cover any indication range within the limits given by the specifications.

Requiring no special tools, installation is easily accomplished by means of screw terminals on the rear panel.

## Setting Instructions

### General

To achieve stable control, ' $X_P$ ' and ' $t_n$ ' is chosen to be sufficiently large. The fastest adjustment is achieved by NOT making ' $X_P$ ' and ' $t_n$ ' larger than necessary.

### Setting of ' $X_P$ ' (Proportional Band)

' $t_n$ ' is set to max. Now, oscillations of a frequency significantly shorter than ' $t_n$ ' are almost exclusively due to ' $X_P$ '. Set ' $X_P$ ' such that T will approach the pre-set value exponentially, without oscillations.

### Setting of ' $t_n$ ' (Integration Time)

A small ' $t_n$ ' will result in a brief transitory period. A single minor oscillation above pre-set value will give the fastest adjustment. Usually, oscillations caused by ' $t_n$ ' will have same half frequencies as ' $t_n$ '.

**Note:** The optimal setting of ' $X_P$ ' and ' $t_n$ ' makes the controller critical as to changes of pre-set value and load. Consequently, the setting should take place under the most extreme conditions of operation imaginable. (E.g., lowest and highest temperatures required. For ovens: Empty and full oven. For flow systems: Slowest and fastest flow). Finally, ' $X_P$ ' and ' $t_n$ ' should be chosen somewhat larger than the optimal values.

## Specifications

|                            |   |
|----------------------------|---|
| <i>Housing</i>             | Metal designed for panel mounting<br>Acrylic front  |
| <i>Dimension</i>           | Front: 96 x 96 mm<br>Cut-out in panel: 91 x 91 mm<br>Recess: 120 mm behind panel  |
| <i>Supply Voltage</i>      | 24 VAC<br>110 VAC<br>115 VAC<br>230 VAC<br>(or otherwise specified)   |
| <i>Input Signal</i>        | Pt 100 or 4-20 mA   |
| <i>Indication Range</i>    | 0   |
| <i>Display</i>             | 0-100 °C (or otherwise specified)   |
| <i>Setting of SP</i>       | 10-turn potentiometer on front<br>SP indicated on separate 3½-digits LED-display, 10 mm, red  |
| <i>Control Mode</i>        | PI<br>Output 4-20 mA, max load 400 Ω.<br>Output can be inverted by removal of jumper in terminal screw.<br>Proportional band XP adjustable from the back of the instrument: 5-100 %<br>Integration time $t_n$ adjustable from the back of the instrument: .5-10 minutes.<br>Integration function can be inactivated by removal of short-circuit jumper in screw-terminal. |
| <i>Accuracy</i>            | ± .5 % of range   |
| <i>Ambient Temperature</i> | 0-50 °C   |

| Model             | Input   | Power      | Output  | Range Displayed | Front IP-Class |
|-------------------|---------|------------|---------|-----------------|----------------|
| 434.173-1         | Pt 100  | Read spec. | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-1b        | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-1c        | Pt 100  | -          | 4-20 mA | 0 - 120 °C      | 65             |
| 434.173-1d        | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-1e        | Pt 100  | -          | 0-20 mA | 0 - 100 °C      | 65             |
| 434.173-2         | Pt 100  | -          | 4-20 mA | 0 - 200 °C      | 65             |
| 434.173-3         | Pt 100  | -          | 4-20 mA | -10 - 50 °C     | 65             |
| 434.173-4         | 4-20 mA | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-4b        | Pt 100  | -          | 4-20 mA | 0 - 10 °C       | 65             |
| 434.173-4c        | 4-20 mA | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-4d        | 4-20 mA | -          | 4-20 mA | -40 - 60 °C     | 65             |
| 434.173-4e        | 4-20 mA | -          | 4-20 mA | 0 - 1.0 Bar     | 65             |
| 434.173-5         | Pt 100  | -          | 4-20 mA | -10 - 50 °C     | 65             |
| 434.173-6         | 4-20 mA | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-7         | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-7x        | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-8         | Pt 100  | -          | 4-20 mA | 0 - 30 °C       | 65             |
| 434.173-9         | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-9b        | Pt 100  | -          | 4-20 mA | 0 - 200 °C      | 65             |
| 434.173-10        | 4-20 mA | -          | 4-20 mA | 0 - 250 °C      | 65             |
| 434.173-10b       | 4-20 mA | -          | 0-10 V  | 0 - 25 °C       | 65             |
| 434.173-11        | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-12        | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-13...*b-d | 4-20 mA | -          | 4-20 mA | 0 - 6.0 Bar     | 65             |
| 434.173-13dy      | 4-20 mA | -          | 4-20 mA | 0 - 2.5 Bar     | 65             |
| 434.173-14        | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-15        | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-16        | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-17        | Pt 100  | -          | 4-20 mA | 0 - 500 °C      | 65             |
| 434.173-18        | Pt 100  | -          | 4-20 mA | -20 - 30 °C     | 65             |
| 434.173-19a       | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-19b       | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-20        | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-21        | 0-20 mA | -          | 4-20 mA | 0 - 100 %       | 65             |
| 434.173-22        | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-23        | Pt 100  | -          | 4-20 mA | 0 - 200 °C      | 65             |
| 434.173-24        | Feko    | -          | 4-20 mA | 0 - 200 °C      | 65             |
| 434.173-25        | 4-20 mA | -          | 4-20 mA | 0 - 1.6 Bar     | 65             |
| 434.173-26        | Pt 100  | -          | 4-20 mA | 0 - 200 °C      | 65             |
| 434.173-27        | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-27a       | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-27b       | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-27c       | Pt 100  | -          | 4-20 mA | 0 - 100 °C      | 65             |
| 434.173-28        | 4-20 mA | -          | 4-20 mA | 0 - 200 °C      | 65             |
| 434.173-28b       | 4-20 mA | -          | 4-20 mA | 0 - 2.0 Bar     | 65             |
| 434.173-29        | Pt 100  | -          | 4-20 mA | 0 - 200 °C      | 65             |
| 434.173-30        | Pt 100  | -          | 4-20 mA | 0 - 120 °C      | 65             |
| 434.173-31        | Pt 100  | -          | 4-20 mA | 0 - 50 °C       | 65             |

|             |         |   |         |              |    |
|-------------|---------|---|---------|--------------|----|
| 434.173-32  | 4-20 mA | - | 0-20 mA | 0 - 400 °C   | 65 |
| 434.173-33  | Pt 100  | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-34  | Pt 100  | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-35  | Pt 100  | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-36  | Pt 100  | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-37  | Pt 100  | - | 0-10 V  | 0 - 100 °C   | 65 |
| 434.173-38  | 4-20 mA | - | 4-20 mA | 0 - 4.0 Bar  | 65 |
| 434.173-39  | 4-20 mA | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-40  | 4-20 mA | - | 4-20 mA | 0 - 5.00 %   | 65 |
| 434.173-41  | 4-20 mA | - | 4-20 mA | 0 - 100 %    | 65 |
| 434.173-42  | Feko    | - | 4-20 mA | 0 - 200 °C   | 65 |
| 434.173-43  | 4-20 mA | - | 4-20 mA | 0 - 150 °C   | 65 |
| 434.173-43b | 4-20 mA | - | 4-20 mA | 0 - 200 °C   | 65 |
| 434.173-43c | 4-20 mA | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-43d | 4-20 mA | - | 4-20 mA | 0 - 4 °C     | 65 |
| 434.173-43e | 4-20 mA | - | 4-20 mA | 0 - 14 °C    | 65 |
| 434.173-44  | 0-20 mA | - | 0-20 mA | 0 - 100 °C   | 65 |
| 434.173-45  | 4-20 mA | - | 0-20 mA | 0 - 200 °C   | 65 |
| 434.173-46  | 4-20 mA | - | 0-20 mA | 0 - 400 °C   | 65 |
| 434.173-47  | 4-20 mA | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-48  | Pt 100  | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-49  | Pt 100  | - | 4-20 mA | 0 - 200 °C   | 65 |
| 434.173-50  | 4-20 mA | - | 0-20 mA | 0 - 10 °C    | 65 |
| 434.173-50b | 4-20 mA | - | 0-20 mA | 0 - 10 °C    | 65 |
| 434.173-51  | Pt 100  | - | 4-20 mA | 0 - 300 °C   | 65 |
| 434.173-52  | Pt 100  | - | 4-20 mA | 0 - 300 °C   | 65 |
| 434.173-53  | Pt 100  | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-54  | Pt 100  | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-55  | 4-20 mA | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-56  | 4-20 mA | - | 4-20 mA | 0 - 100 %    | 65 |
| 434.173-57  | Pt 100  | - | 4-20 mA | -10 - 100 °C | 65 |
| 434.173-58  | 4-20 mA | - | 4-20 mA | 0 - 10 °C    | 65 |
| 434.173-59  | 4-20 mA | - | 4-20 mA | 0 - 2.00 Bar | 65 |
| 434.173-60  | Pt 100  | - | 4-20 mA | -10 - 90 °C  | 65 |
| 434.173-61  | Pt 100  | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-62  | 4-20 mA | - | 4-20 mA | 0 - 200 °C   | 65 |
| 434.173-63  | 4-20 mA | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-64  | Feko    | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-65b | 4-20 mA | - | 4-20 mA | 0 - 6.00 Bar | 65 |
| 434.173-66  | Pt 100  | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-67  | Pt 100  | - | 4-20 mA | 0 - 200 °C   | 65 |
| 434.173-67b | Pt 100  | - | 4-20 mA | 0 - 200 °C   | 65 |
| 434.173-68  | NiCr-Ni | - | 0-5 mA  | 0 - 1200 °C  | 65 |
| 434.173-68b | NiCr-Ni | - | 4-20 mA | 0 - 600 °C   | 65 |
| 434.173-69  | 4-20 mA | - | 4-20 mA | 0 - 30 °C    | 65 |
| 434.173-70  | Pt 100  | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-71  | Pt 100  | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-72  | 4-20 mA | - | 4-20 mA | 4 - 20 mA    | 65 |
| 434.173-73  | Pt 100  | - | 0-10 V  | 0 - 300 °C   | 65 |
| 434.173-74  | Pt 100  | - | 4-20 mA | 0 - 100 °C   | 65 |
| 434.173-75  | 4-20 mA | - | 4-20 mA | 0 - 150 °C   | 65 |

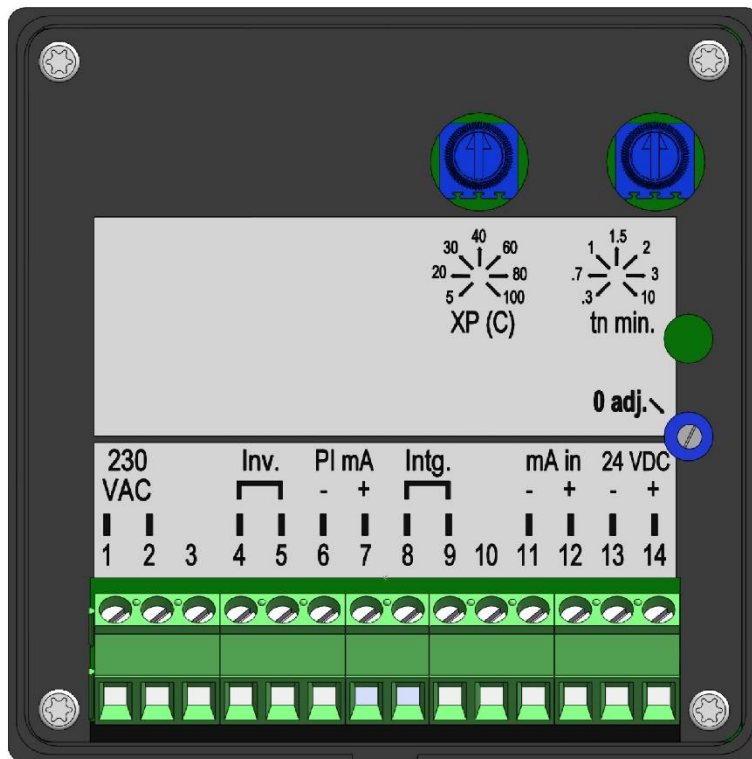
|                |            |   |         |               |    |
|----------------|------------|---|---------|---------------|----|
| 434.173-75b    | 4-20 mA    | - | 4-20 mA | 0 - 150 °C    | 65 |
| 434.173-75c    | 4-20 mA    | - | 4-20 mA | 0 - 110 °C    | 65 |
| 434.173-76     | Pt 100     | - | 4-20 mA | 0 - 150 °C    | 65 |
| 434.173-77 & b | Pt 100     | - | 4-20 mA | 0 - 100 °C    | 65 |
| 434.173-78     | 4-20 mA    | - | 4-20 mA | 0 - 26 °C     | 65 |
| 434.173-79     | Feko       | - | 0-20 mA | 0 - 600 °C    | 65 |
| 434.173-80     | Feko       | - | 4-20 mA | 0 - 400 °C    | 65 |
| 434.173-80b    | Feko       | - | 0-10 V  | 0 - 400 °C    | 65 |
| 434.173-81     | Pt 100     | - | 4-20 mA | 0 - 150 °C    | 65 |
| 434.173-82     | 4-20 mA    | - | 4-20 mA | 0 - 25 °C     | 65 |
| 434.173-83     | Pt 100     | - | 4-20 mA | 0 - 100 °C    | 65 |
| 434.173-84     | 4-20 mA    | - | 4-20 mA | 0 - 1500 °C   | 65 |
| 434.173-85     | 4-20 mA    | - | 4-20 mA | 0 - 16 °C     | 65 |
| 434.173-86     | Pt 100     | - | 4-20 mA | 0 - 200 °C    | 65 |
| 434.173-86b    | Pt 100     | - | 4-20 mA | 0 - 200 °C    | 65 |
| 434.173-86c    | Pt 100     | - | 4-20 mA | 0 - 200 °C    | 65 |
| 434.173-86d    | Pt 100     | - | 4-20 mA | 0 - 200 °C    | 65 |
| 434.173-87     | Pt 100     | - | 4-20 mA | -100 - 100 °C | 65 |
| 434.173-88     | Pt 100     | - | 4-20 mA | -100 - 100 °C | 65 |
| 434.173-89     | 2 x Pt 100 | - | 4-20 mA | 0 - 100 °C    | 65 |
| 434.173-90     | 4-20 mA    | - | 4-20 mA | 0 - 100 °C    | 65 |
| 434.173-91     | Pt 100     | - | 4-20 mA | 0 - 150 °C    | 65 |
| 434.173-92     | Pt 100     | - | 4-20 mA | 0 - 150 °C    | 65 |
| 434.173-93     | 4-20 mA    | - | 4-20 mA | 0 - 6.0 Bar   | 65 |
| 434.173-94     | 4-20 mA    | - | 0-10 V  | 0 - 600 °C    | 65 |
| 434.173-95     | 4-20 mA    | - | 4-20 mA | 0 - 150 °C    | 65 |
| 434.173-95b    | 4-20 mA    | - | 4-20 mA | 0 - 150 °C    | 65 |
| 434.173-96     | Pt 100     | - | 0-20 mA | 0 - 400 °C    | 65 |
| 434.173-96b    | Pt 100     | - | 4-20 mA | 0 - 400 °C    | 65 |
| 434.173-97     | Pt 100     | - | 4-20 mA | 0 - 150 °C    | 65 |
| 434.173-98     | 4-20 mA    | - | 4-20 mA | 0 - 260 °C    | 65 |
| 434.173-99     | 4-20 mA    | - | 0-10 V  | 0 - 4.00 Bar  | 65 |
| 434.173-100    | 4-20 mA    | - | 4-20 mA | 0 - 650 °C    | 65 |
| 434.173-101    | Pt 100     | - | 4-20 mA | 0 - 15 °C     | 65 |
| 434.173-102    | Pt 100     | - | 4-20 mA | -5 - 15 °C    | 65 |
| 434.173-103    | Pt 100     | - | 4-20 mA | 0 - 200 °C    | 65 |
| 434.173-104    | 4-20 mA    | - | 4-20 mA | 0 - 100 °C    | 65 |
| 434.173-105    | Pt 100     | - | 4-20 mA | 0 - 200 °C    | 65 |
| 434.173-106    | 4-20 mA    | - | 4-20 mA | 0 - 100 °C    | 65 |
| 434.173-106b   | 4-20 mA    | - | 4-20 mA | 0 - 120 °C    | 65 |
| 434.173-107    | 2 x Pt 100 | - | 4-20 mA | 0 - 200 °C    | 65 |
| 434.173-107b   | 2 x Pt 100 | - | 4-20 mA | 0 - 100 °C    | 65 |
| 434.173-108    | Pt 100     | - | 4-20 mA | -50 - 50 °C   | 65 |
| 434.173-109    | 2 x Pt 100 | - | 4-20 mA | 0 - 100 °C    | 65 |
| 434.173-110    | Pt 100     | - | 4-20 mA | 0 - 100 °C    | 65 |
| 434.173-111    | Pt 100     | - | 4-20 mA | 0 - 400 °C    | 65 |
| 434.173-112    | 4-20 mA    | - | 4-20 mA | -1 - 1 °C     | 65 |
| 434.173-113    | 4-20 mA    | - | 4-20 mA | 0 - 800 °C    | 65 |
| 434.173-114    | 4-20 mA    | - | 4-20 mA | 0 - 120 °C    | 65 |
| 434.173-115    | 4-20 mA    | - | 4-20 mA | 0 - 120 °C    | 65 |
| 434.173-115b   | 4-20 mA    | - | 4-20 mA | 0 - 150 °C    | 65 |

|              |         |   |         |                |    |
|--------------|---------|---|---------|----------------|----|
| 434.173-116  | 0-10 V  | - | 4-20 mA | 0 - 30.5 °C    | 65 |
| 434.173-117  | Pt 100  | - | 4-20 mA | 0 - 500 °C     | 65 |
| 434.173-118  | Pt 100  | - | 4-20 mA | 0 - 400 °C     | 65 |
| 434.173-119  | Pt 100  | - | 4-20 mA | 0 - 400 °C     | 65 |
| 434.173-120  | Pt 100  | - | 4-20 mA | 0 - 100 °C     | 65 |
| 434.173-121  | Pt 100  | - | 4-20 mA | 0 - 100 °C     | 65 |
| 434.173-122  | 4-20 mA | - | 4-20 mA | 0 - 100 °C     | 65 |
| 434.173-122b | 4-20 mA | - | 4-20 mA | 0 - 100 %      | 65 |
| 434.173-122c | 4-20 mA | - | 4-20 mA | 0 - 100 °C     | 65 |
| 434.173-123  | 4-20 mA | - | 4-20 mA | 0 - 10 °C      | 65 |
| 434.173-124  | NiCr-Ni | - | 4-20 mA | 0 - 400 °C     | 65 |
| 434.173-125  | 4-20 mA | - | 4-20 mA | -1 - 0 °C      | 65 |
| 434.173-126  | Pt 100  | - | 4-20 mA | 0 - 50 °C      | 65 |
| 434.173-127  | 4-20 mA | - | 4-20 mA | 0 - 22 °C      | 65 |
| 434.173-128  | 4-20 mA | - | 4-20 mA | 0 - 40 °C      | 65 |
| 434.173-129  | 4-20 mA | - | 4-20 mA | 0 - 30 °C      | 65 |
| 434.173-130  | 4-20 mA | - | 4-20 mA | 0 - 100 °C     | 65 |
| 434.173-130b | Pt 100  | - | 4-20 mA | 0 - 100 °C     | 65 |
| 434.173-131  | 4-20 mA | - | 4-20 mA | 0 - 2.00 Bar   | 65 |
| 434.173-132  | 4-20 mA | - | 4-20 mA | 0 - 100 °C     | 65 |
| 434.173-133  | 4-20 mA | - | 4-20 mA | 0 - 6.00 Bar   | 65 |
| 434.173-133b | 4-20 mA | - | 4-20 mA | 0 - 4.00 Bar   | 65 |
| 434.173-133c | 4-20 mA | - | 4-20 mA | 0 - 4.00 Bar   | 65 |
| 434.173-133d | 4-20 mA | - | 0-10 V  | 0 - 6.00 Bar   | 65 |
| 434.173-133g | 4-20 mA | - | 4-20 mA | 50 - 160 °C    | 65 |
| 434.173-134  | 4-20 mA | - | 4-20 mA | -10 - 50 °C    | 65 |
| 434.173-135  | 4-20 mA | - | 4-20 mA | 0 - 100 %      | 65 |
| 434.173-136  | 0-10 V  | - | 4-20 mA | 0 - 100 %      | 65 |
| 434.173-137  | Pt 100  | - | 4-20 mA | 0 - 100 °C     | 65 |
| 434.173-138  | Pt 100  | - | 4-20 mA | 0 - 100 °C     | 65 |
| 434.173-139  | 4-20 mA | - | 4-20 mA | 0 - 200 °C     | 65 |
| 434.173-140  | Pt 100  | - | 4-20 mA | 0 - 200 °C     | 65 |
| 434.173-141  | 4-20 mA | - | 4-20 mA | 0 - 100 °C     | 65 |
| 434.173-142  | 4-20 mA | - | 4-20 mA | 0 - 6.0 Bar    | 65 |
| 434.173-142b | 4-20 mA | - | 4-20 mA | 0 - 10.0 Bar   | 65 |
| 434.173-143  | 4-20 mA | - | 4-20 mA | 0 - 100 °C     | 65 |
| 434.173-144  | 4-20 mA | - | 4-20 mA | 100 - 250 °C   | 65 |
| 434.173-145a | 4-20 mA | - | 4-20 mA | 0 - 16 xx      | 65 |
| 434.173-145b | 4-20 mA | - | 4-20 mA | 0-10 xx        | 65 |
| 434.173-145c | 4-20 mA | - | 4-20 mA | 0-6 xx         | 65 |
| 434.173-146  | 20-4 mA | - | 4-20 mA | 1000 - 0 bara  | 65 |
| 434.173-147  | 4-20 mA | - | 4-20 mA | 0 - 250 °C     | 65 |
| 434.173-148  | 4-20 mA | - | 4-20 mA | 0 - 100 %      | 65 |
| 434.173-149  | 4-20 mA | - | 4-20 mA | 1000 - 1200 °C | 65 |
| 434.173-150  | Pt 100  | - | 4-20 mA | 0-100 °C       | 65 |
| 434.173-151  | 0-10 V  | - | 0-10 V  | -1 - 24 Bar    | 65 |
| 434.173-152  | Pt 100  | - | 0-10 V  | -50 - 50 °C    | 65 |
| 434.173-153  | 4-20 mA | - | 4-20 mA | 0 - 700 °C     | 65 |
| 434.173-154  | 4-20 mA | - | 4-20 mA | 0 - 450 °C     | 65 |

\*The only difference between 434.173-13 + b-d is the effect of xp.



## Input & Connection Specifications



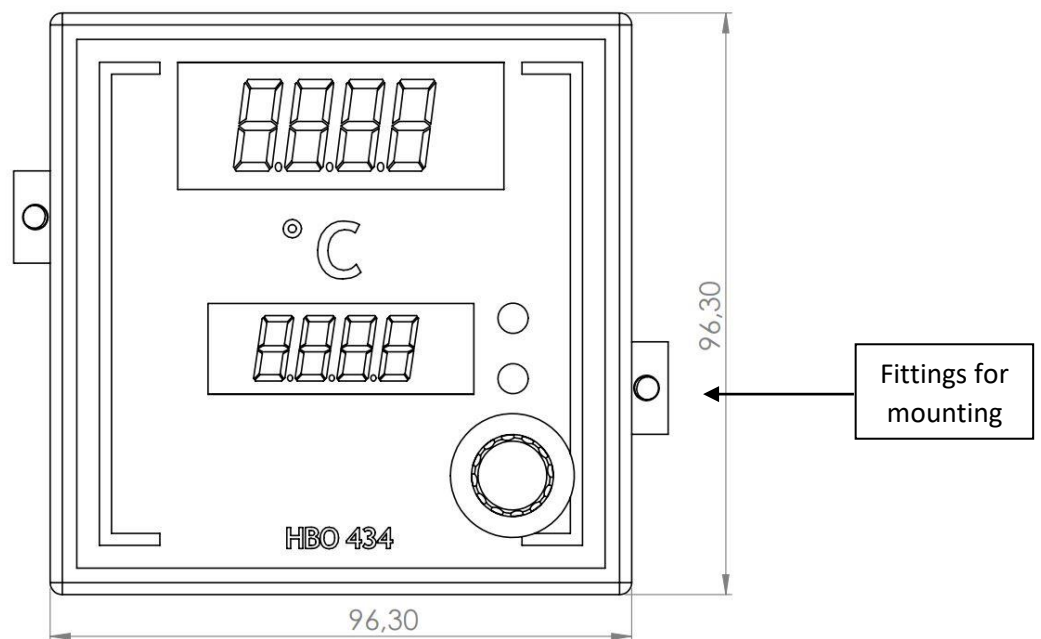
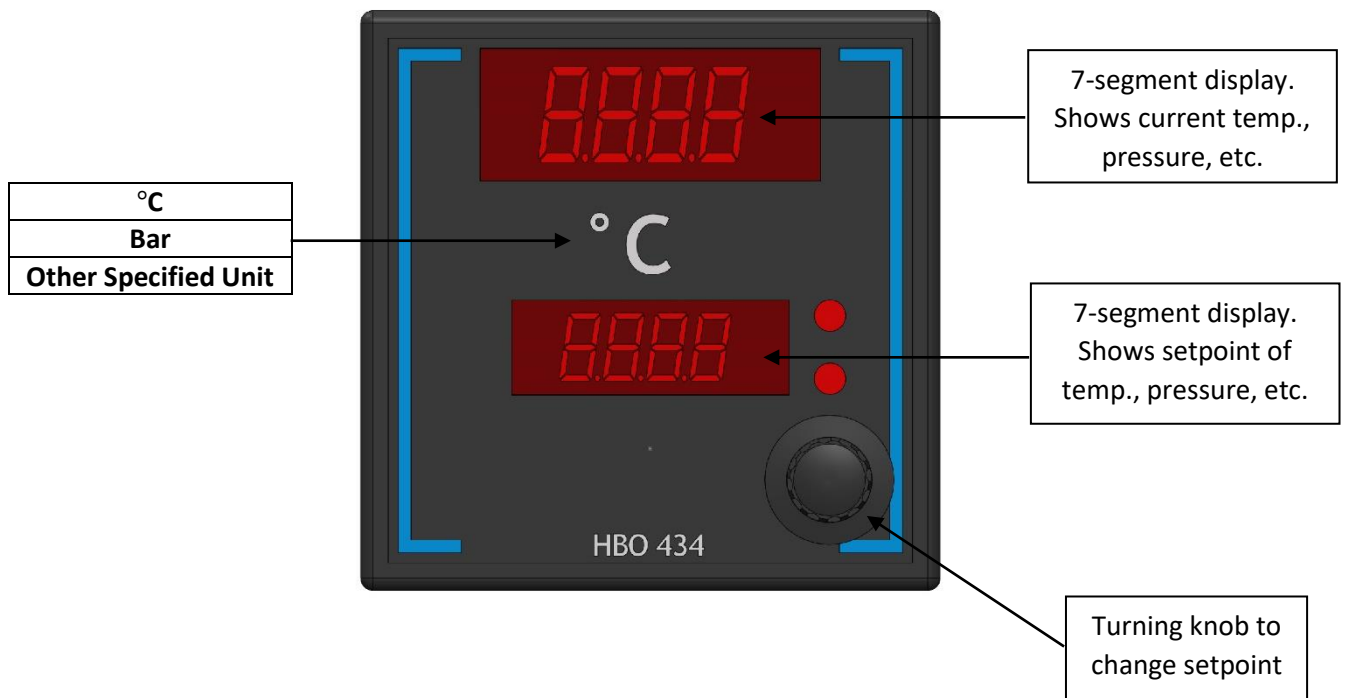
Between input 4 & 5 and input 8 & 9 a bonding jumper is put. The bonding jumper between input 4 & 5 activates the inverting circuit. The bonding jumper between input 8 & 9 is activating the integrator limitation.

The 434.173-xxx is a PI-controller and therefore is dependent on two parameters, 'xp' and 'tn'. Instead of using a differentiation parameter an integration limiter is used. By choosing a suitable and rather indiscriminating choice of 'xp' & 'tn', the controller will 'catch' the temperature or pressure before it reaches the chosen setpoint.

As a result, the transitory period will be brief with small or no oscillations above the setpoint.

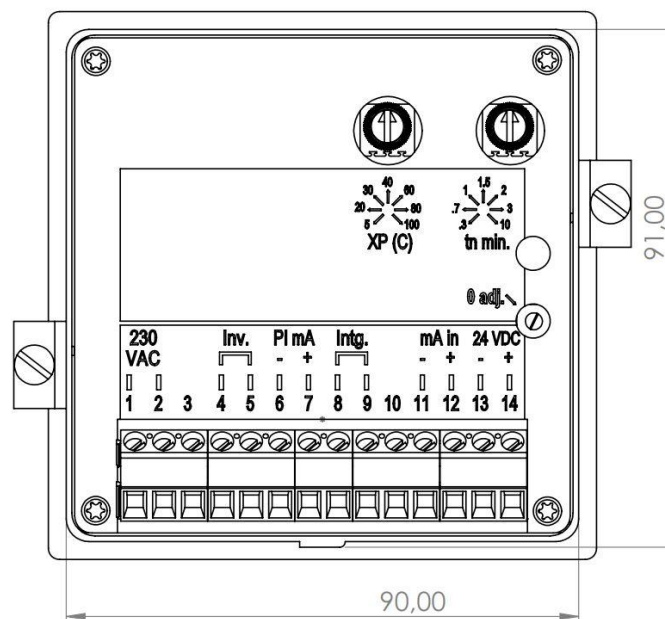
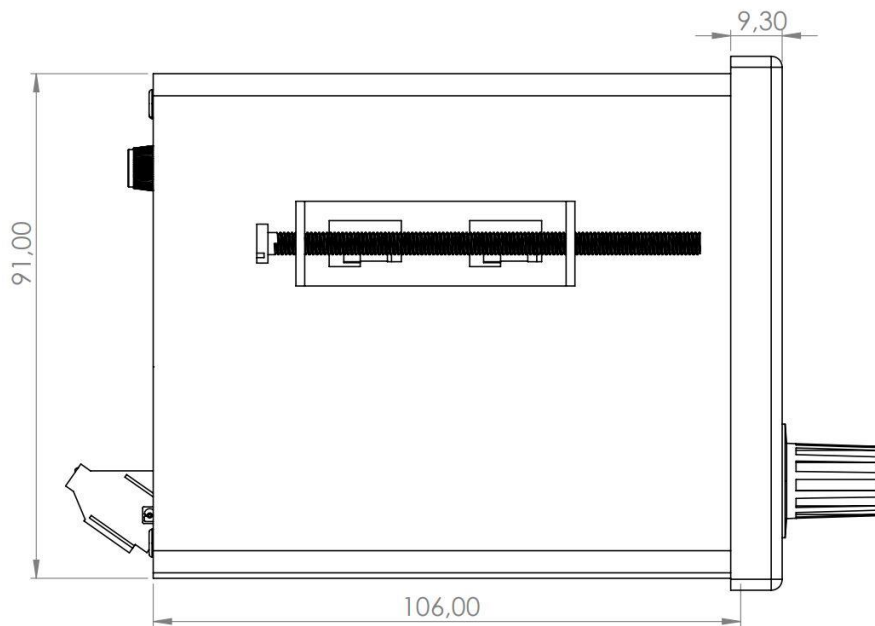
| Terminal Ratings (not input ratings)    |       |
|---|-------|
| Current Rating                          | 24 A  |
| Rated Voltage                           | 400 V |
| Isolation Voltage                       | 250 V |
| Operating Voltage (III/2)               | 400 V |
| Operating Voltage (II/2)                | 630 V |
| Rated Isolation Holding Voltage (III/3) | 4 kV  |
| Rated Isolation Holding Voltage (III/2) | 4 kV  |
| Rated Isolation Holding Voltage (II/2)  | 4 kV  |

## Front Specifications



| Front Dimensions |         |
|------------------|---------|
| Width            | 96.3 mm |
| Height           | 96.3 mm |

## Mounting



| Cabinet Dimensions |        |
|--------------------|--------|
| Width              | 90 mm  |
| Height             | 91 mm  |
| Length             | 106 mm |

The cutting for the mounting of the cabinet needs some space. Therefore, some space is added:

| Mounting Cut-out Dimensions |                |
|-----------------------------|----------------|
| Panel Cut-out               | 90.7 x 91.7 mm |