**Controlling the temperature by means of temperaturemeasurements using HARTprotocol**

We are going to control the temperature of a light bulb. We will measure the temperature by using HART protocol.

We will use three different temperature sensors: Pt100, thermocouple J and thermocouple K.

Check the differences of these sensors on the internet. How does a thermocouple work. How does the Pt100 work. What should we be aware of.

Now measure the temperatur of the light bulb using the different types of temperatur measurement.. What can you conclude already.

1. Adjusting the temperature

You always have to do the configuration in the system Mp 82710-H.

You adjust as follows

1)do ‘upload’

2) transmitter is adjusted

3) now do ‘download’

4)now again ‘upload’ and now should the values be adjusted correctly.

 B) Check the measured value by calculation, study the behavior of the different sensors

Compare the measured temperature and the measured current and check if this is correct by calculating the current.

Compare the reaction of the different temperaturesensors.

|  |  |  |
| --- | --- | --- |
| Thermocouple K |   |   |
|  | reactiontime |   |
| ΔT1 |   |   |
| ΔT2 |   |   |
| ΔT3 |   |   |

|  |  |  |
| --- | --- | --- |
| Thermocouple J |   |   |
|  | reactiontime |   |
| ΔT1 |   |   |
| ΔT2 |   |   |
| ΔT3 |   |   |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| Pt100 |   |   |
|  | reactiontime |   |
| ΔT1 |   |   |
| ΔT2 |   |   |
| ΔT3 |   |   |

1. Now use the controlloop to control the temperature of the lightbulb.

 Change the P,I and D values of the controller and look at how the system reacts. Do this for the three different temperaturesensors.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| P | I | D | stability | overshoot | settling time  | offset |
| 1 | 0 | 0 |   |   |   |   |
| 10 | 0 | 0 |   |   |   |   |
| 20 | 0 | 0 |   |   |   |   |
| 30 | 0 | 0 |   |   |   |   |
| 40 | 0 | 0 |   |   |   |   |
| 10 | 5 | 0 |   |   |   |   |
| 10 | 10 | 0 |   |   |   |   |
| 10 | 20 | 0 |   |   |   |   |
| 10 | 30 | 0 |   |   |   |   |
| 10 | 40 | 0 |   |   |   |   |
| 10 | 20 | 5 |   |   |   |   |
| 10 | 20 | 10 |   |   |   |   |
| 10 | 20 | 20 |   |   |   |   |
| 10 | 20 | 30 |   |   |   |   |
| 10 | 20 | 40 |   |   |   |   |

1. If you change the temperatureinterval of the HART system, look what happens with the controller when changing the temperature interval in the Hartsystem.