https://www.halvorsen.blog

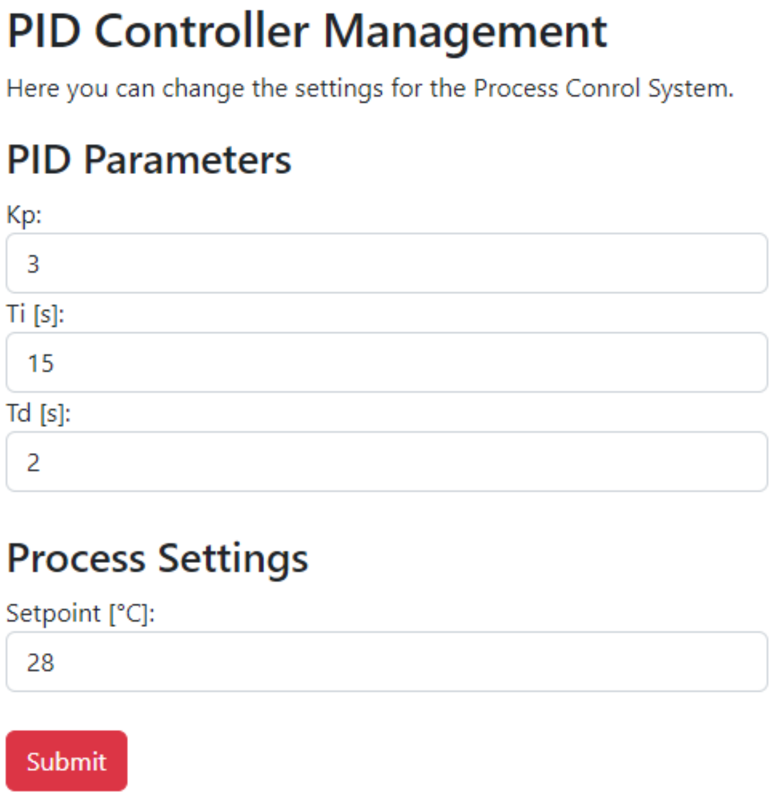
ThingSpeak

Change Values from a HTML Webpage

Hans-Petter Halvorsen

Contents

- Introduction
- ThingSpeak
- HTML Webpage
- Improvements



PID Controller Management

Here you can change the settings for the Process Conrol System.

PID Parameters

Kp:

3

Ti [s]:

15

Td [s]:

2

Process Settings

Setpoint [°C]:

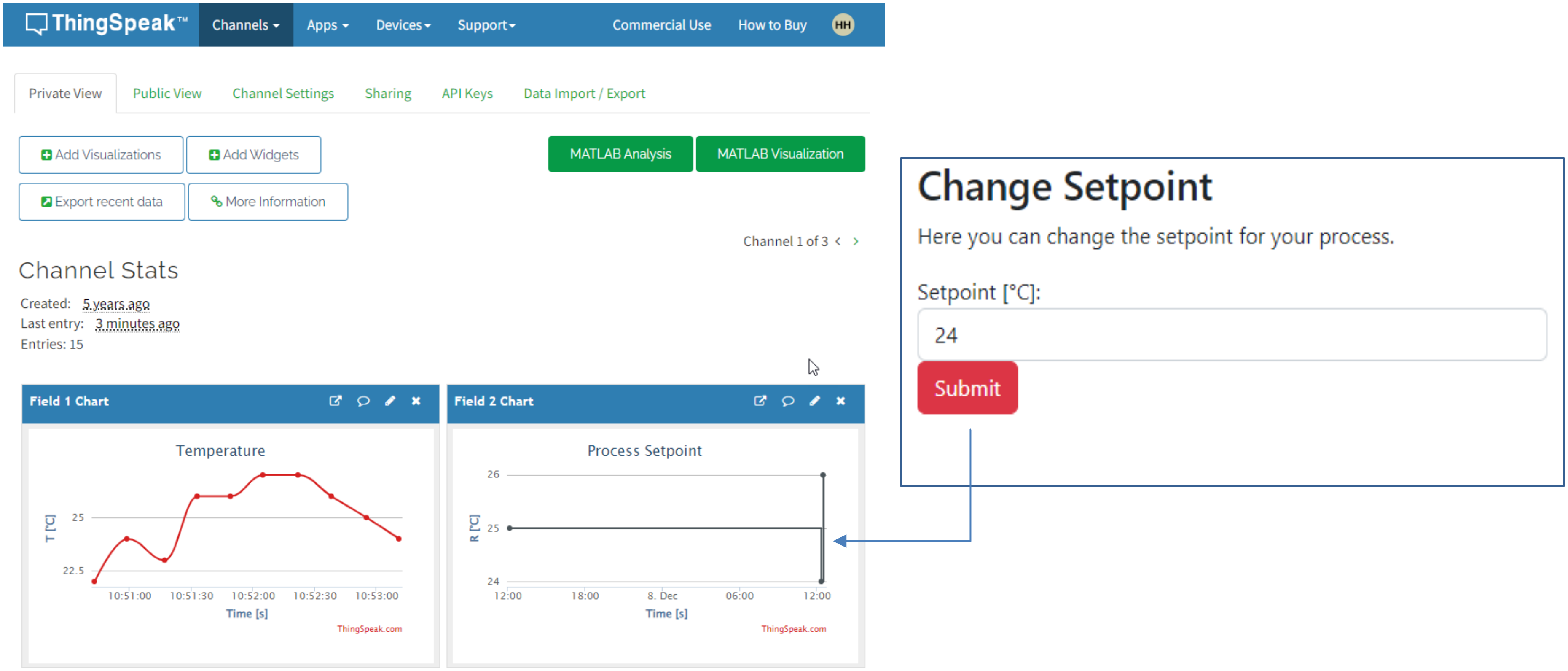
28

Introduction

Introduction

- In this Tutorial we will see how we can update values in ThingSpeak from a Webpage
- ThingSpeak is an IoT service that lets you collect and store sensor data in the cloud

Introduction



Channel Stats

Created: 5 years ago
Last entry: 3 minutes ago
Entries: 15

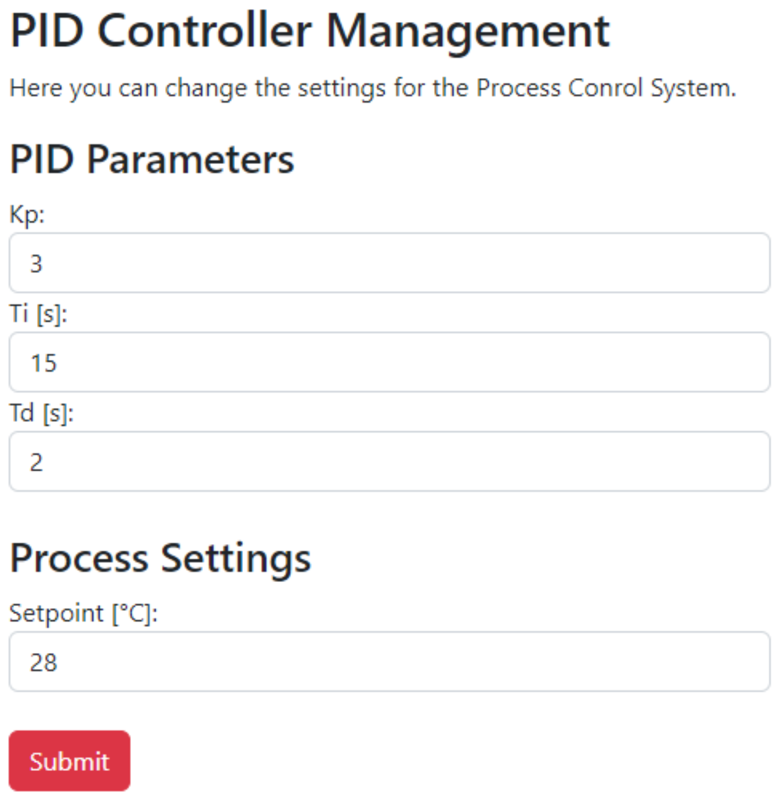
Change Setpoint

Here you can change the setpoint for your process.

Setpoint [°C]: 24

Final Solution

We create the Webpage step by step and end with the following:



PID Controller Management

Here you can change the settings for the Process Conrol System.

PID Parameters

Kp: 3

Ti [s]: 15

Td [s]: 2

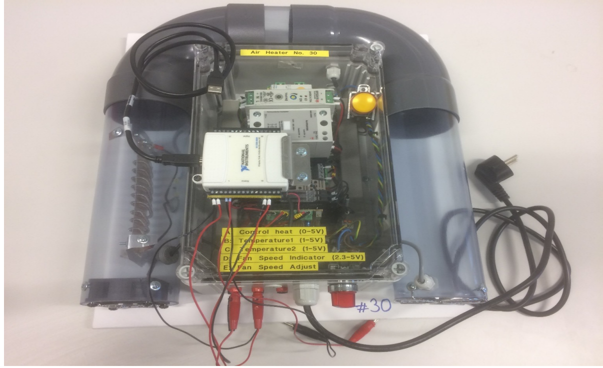
Process Settings

Setpoint [°C]: 28

In addition to the Webpage, we can, e.g., have a PID Controller running on an Arduino or Raspberry Pi (will not be shown in this Tutorial).

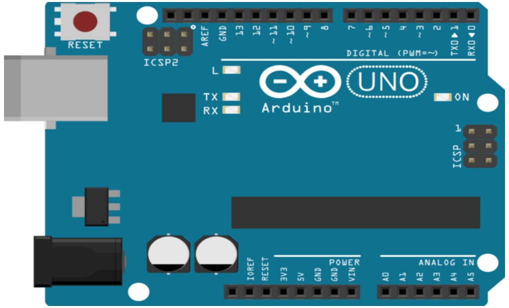
This Application then Controls a given Process and get updated PID Settings from ThingSpeak.

Example of Final Solution



Process

Arduino

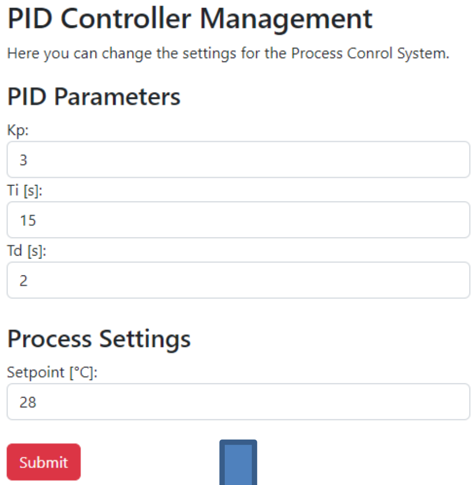


Embedded PID Controller with no GUI

Process Value and Control Value

Get updated Settings

Webpage



PID Controller Management

Here you can change the settings for the Process Conrol System.

PID Parameters

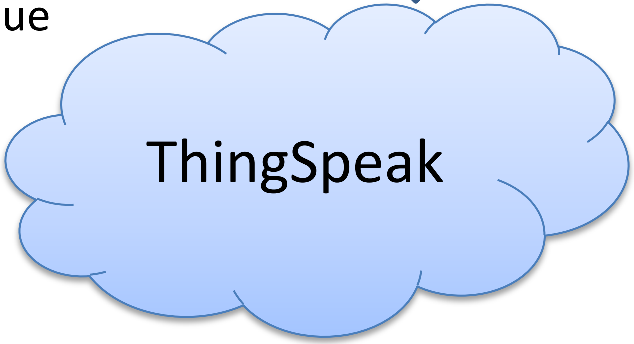
Kp: 3

Ti [s]: 15

Td [s]: 2

Process Settings

Setpoint [°C]: 28



ThingSpeak

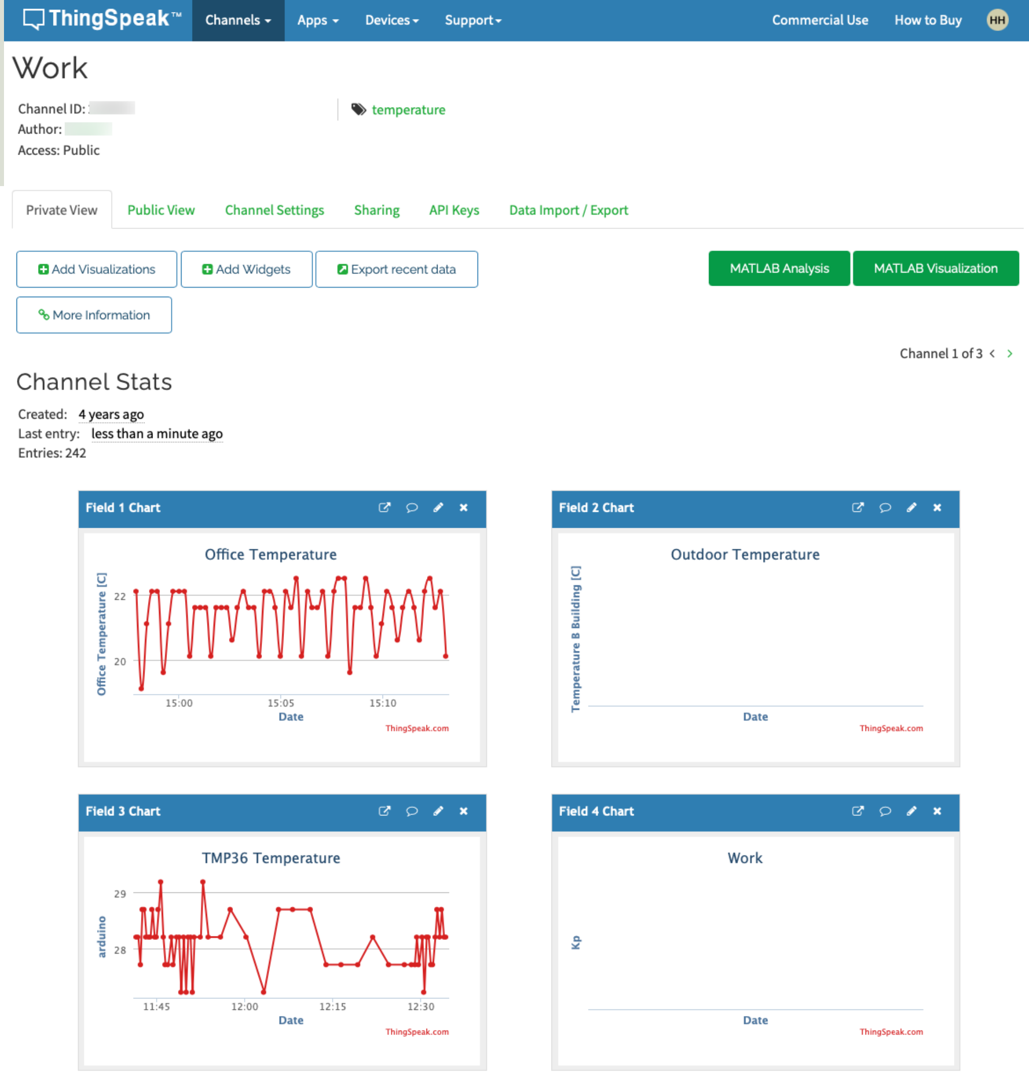
ThingSpeak

- ThingSpeak is an IoT service that lets you collect and store sensor data in the cloud and develop Internet of Things applications.
- ThingSpeak is free for small non-commercial projects
- https://thingspeak.com

ThingSpeak

Here you see an example of how Data can be presented in the ThingSpeak Web page

https://thingspeak.com



Work

Channel ID: [redacted]
Author: [redacted]
Access: Public

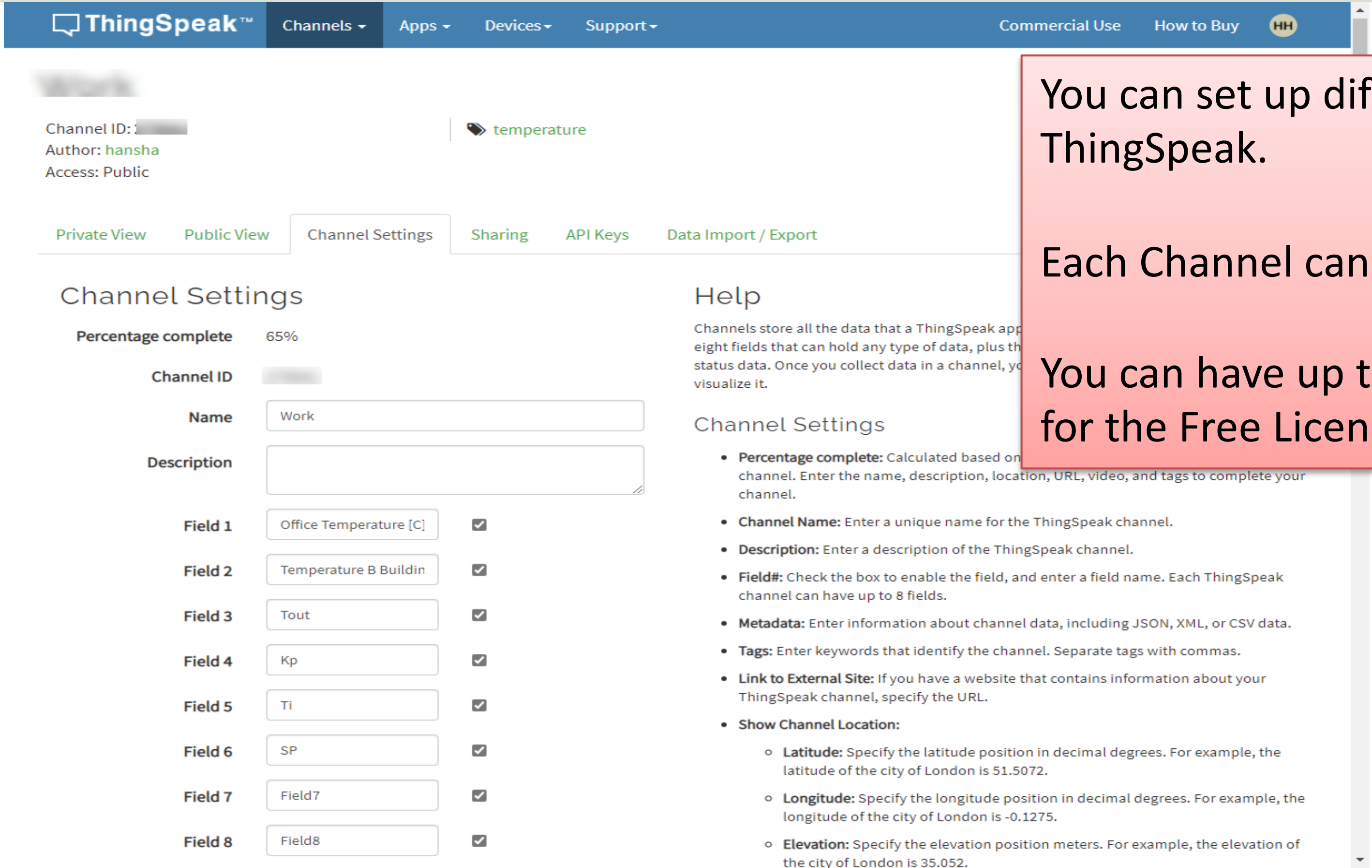
Channel Stats

Created: 4 years ago
Last entry: less than a minute ago
Entries: 242

ThingSpeak

- It works with Arduino, Raspberry Pi and MATLAB (premade libraries and APIs exists).
- But it should work with all kind of Programming Languages, since it uses a **REST API** and **HTTP**.
- **LabVIEW** has built-in **HTTP Client** functions that you can use for this purpose
- **MQTT** API also available

ThingSpeak – Channel Settings



[redacted]

Channel ID: [redacted]
Author: hansha
Access: Public

temperature

Private View | Public View | Channel Settings | Sharing | API Keys | Data Import / Export

Channel Settings

Percentage complete	65%	
Channel ID	[redacted]	
Name	Work	
Description		
Field 1	Office Temperature [C]	☑
Field 2	Temperature B Buildin	☑
Field 3	Tout	☑
Field 4	Kp	☑
Field 5	Ti	☑
Field 6	SP	☑
Field 7	Field7	☑
Field 8	Field8	☑

Help

Channels store all the data that a ThingSpeak app
eight fields that can hold any type of data, plus th
status data. Once you collect data in a channel, yo
visualize it.

Channel Settings

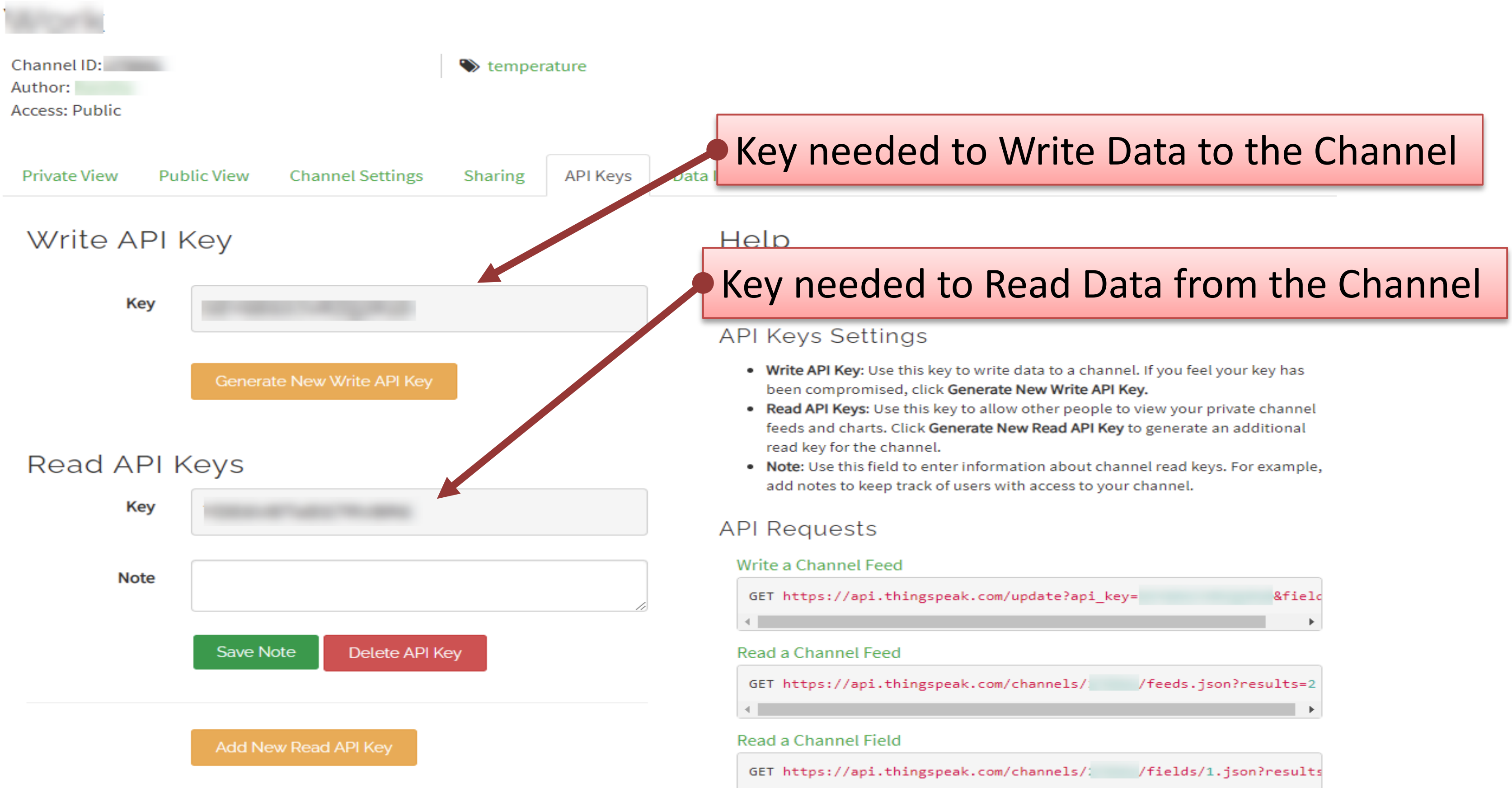
- **Percentage complete:** Calculated based on
channel. Enter the name, description, location, URL, video, and tags to complete your channel.
- **Channel Name:** Enter a unique name for the ThingSpeak channel.
- **Description:** Enter a description of the ThingSpeak channel.
- **Field#:** Check the box to enable the field, and enter a field name. Each ThingSpeak channel can have up to 8 fields.
- **Metadata:** Enter information about channel data, including JSON, XML, or CSV data.
- **Tags:** Enter keywords that identify the channel. Separate tags with commas.
- **Link to External Site:** If you have a website that contains information about your ThingSpeak channel, specify the URL.
- **Show Channel Location:**
  - **Latitude:** Specify the latitude position in decimal degrees. For example, the latitude of the city of London is 51.5072.
  - **Longitude:** Specify the longitude position in decimal degrees. For example, the longitude of the city of London is -0.1275.
  - **Elevation:** Specify the elevation position meters. For example, the elevation of the city of London is 35.052.

You can set up different Channels in ThingSpeak.

Each Channel can have up to 8 Fields.

You can have up to 4 different Channels for the Free License.

ThingSpeak - REST API



[redacted]

Channel ID: [redacted]
Author: [redacted]
Access: Public

temperature

Key needed to Write Data to the Channel

Key needed to Read Data from the Channel

Write API Key

Key: [redacted]

Read API Keys

Key: [redacted]

Note:

Help

API Keys Settings

- **Write API Key:** Use this key to write data to a channel. If you feel your key has been compromised, click **Generate New Write API Key.**
- **Read API Keys:** Use this key to allow other people to view your private channel feeds and charts. Click **Generate New Read API Key** to generate an additional read key for the channel.
- **Note:** Use this field to enter information about channel read keys. For example, add notes to keep track of users with access to your channel.

API Requests

Write a Channel Feed

```
GET https://api.thingspeak.com/update?api_key=[redacted]&fielc
```

Read a Channel Feed

```
GET https://api.thingspeak.com/channels/[redacted]/feeds.json?results=2
```

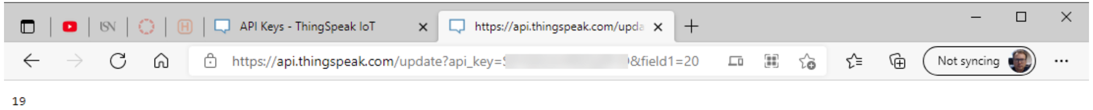
Read a Channel Field

```
GET https://api.thingspeak.com/channels/[redacted]/fields/1.json?results
```

REST API – Write Data

Use your standard Web Browser (e.g., Microsoft Edge, or Google Chrome) and enter the following:

https://api.thingspeak.com/update?api_key=XXXXXXXXXXXXXXXXX&field1=20



https://api.thingspeak.com/update?api_key=[redacted]&field1=20

```
19
```

Value

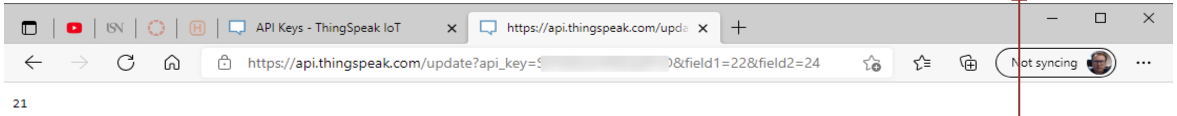
Field Number 1-8

Your **Write API Key**

REST API – Write Multiple Fields

Use your standard Web Browser (e.g., Microsoft Edge, or Google Chrome) and enter the following:

https://api.thingspeak.com/update?api_key=XXXXXXXXXXXXXXXX&field1=21&field2=24



```
https://api.thingspeak.com/update?api_key=[redacted]&field1=22&field2=24
```

```
21
```

Your **Write API Key**

Field + Value

Field + Value

Etc.

REST API – Read Data

Use your standard Web Browser (e.g., Microsoft Edge, or Google Chrome) and enter the following:

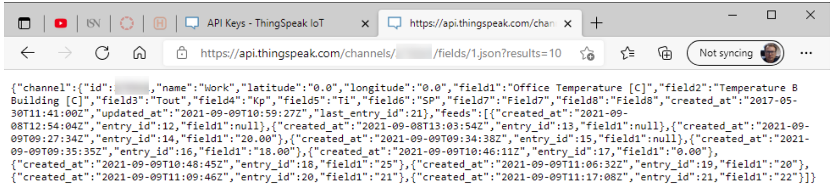
Data Format (JSON or XML)

https://api.thingspeak.com/channels/xxxxxx/fields/1.json?results=10

Your **Channel ID**

Field Number

Number of Data Points, e.g., 1 for only the last value, 10 for the last 10 values, etc.

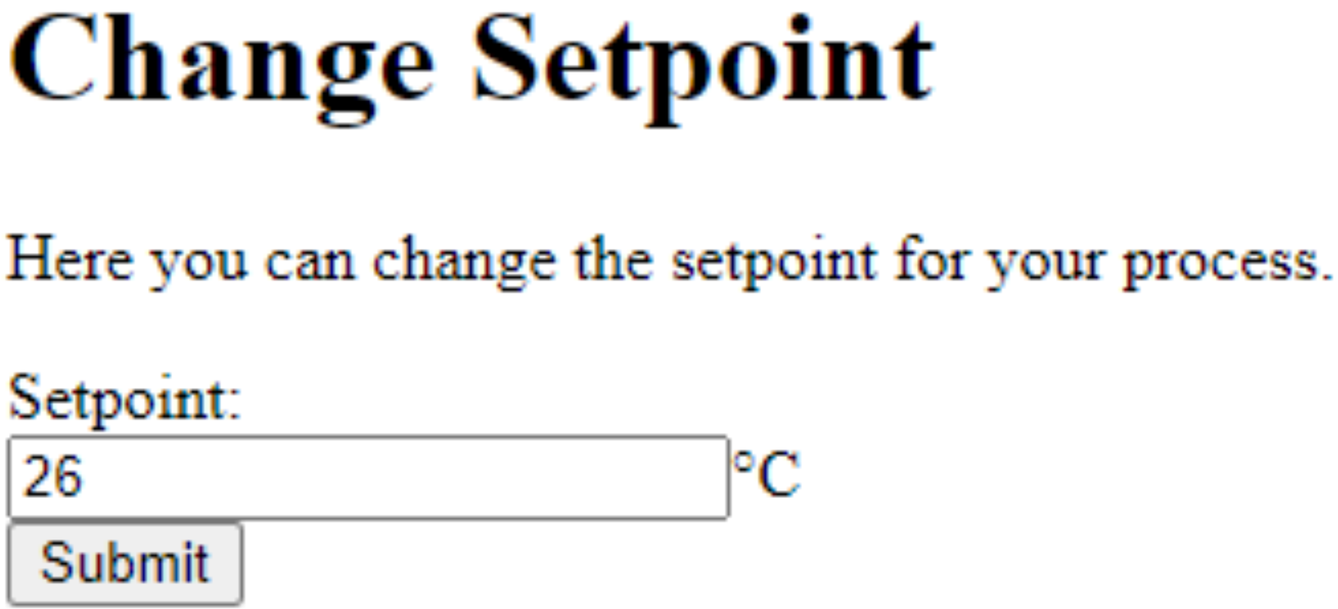

API Keys - ThingSpeak IoT
https://api.thingspeak.com/chan
https://api.thingspeak.com/channels/[redacted]/fields/1.json?results=10
Not syncing

```
{"channel":{"id":[redacted],"name":"Work","latitude":"0.0","longitude":"0.0","field1":"Office Temperature [C]","field2":"Temperature B
Building [C]","field3":"Tout","field4":"Kp","field5":"Ti","field6":"SP","field7":"Field7","field8":"Field8","created_at":"2017-05-
30T11:41:00Z","updated_at":"2021-09-09T10:59:27Z","last_entry_id":21},"feeds":[{"created_at":"2021-09-
08T12:54:04Z","entry_id":12,"field1":null},{"created_at":"2021-09-08T13:03:54Z","entry_id":13,"field1":null},{"created_at":"2021-09-
09T09:27:34Z","entry_id":14,"field1":"20.00"},{"created_at":"2021-09-09T09:34:38Z","entry_id":15,"field1":null},{"created_at":"2021-
09-09T09:35:35Z","entry_id":16,"field1":"18.00"},{"created_at":"2021-09-09T10:46:11Z","entry_id":17,"field1":"0.00"},
{"created_at":"2021-09-09T10:48:45Z","entry_id":18,"field1":"25"},{"created_at":"2021-09-09T11:06:32Z","entry_id":19,"field1":"20"},
{"created_at":"2021-09-09T11:09:46Z","entry_id":20,"field1":"21"},{"created_at":"2021-09-09T11:17:08Z","entry_id":21,"field1":"22"}]}
```

Resulting JSON String with Data

HTML Webpage

Webpage



Change Setpoint

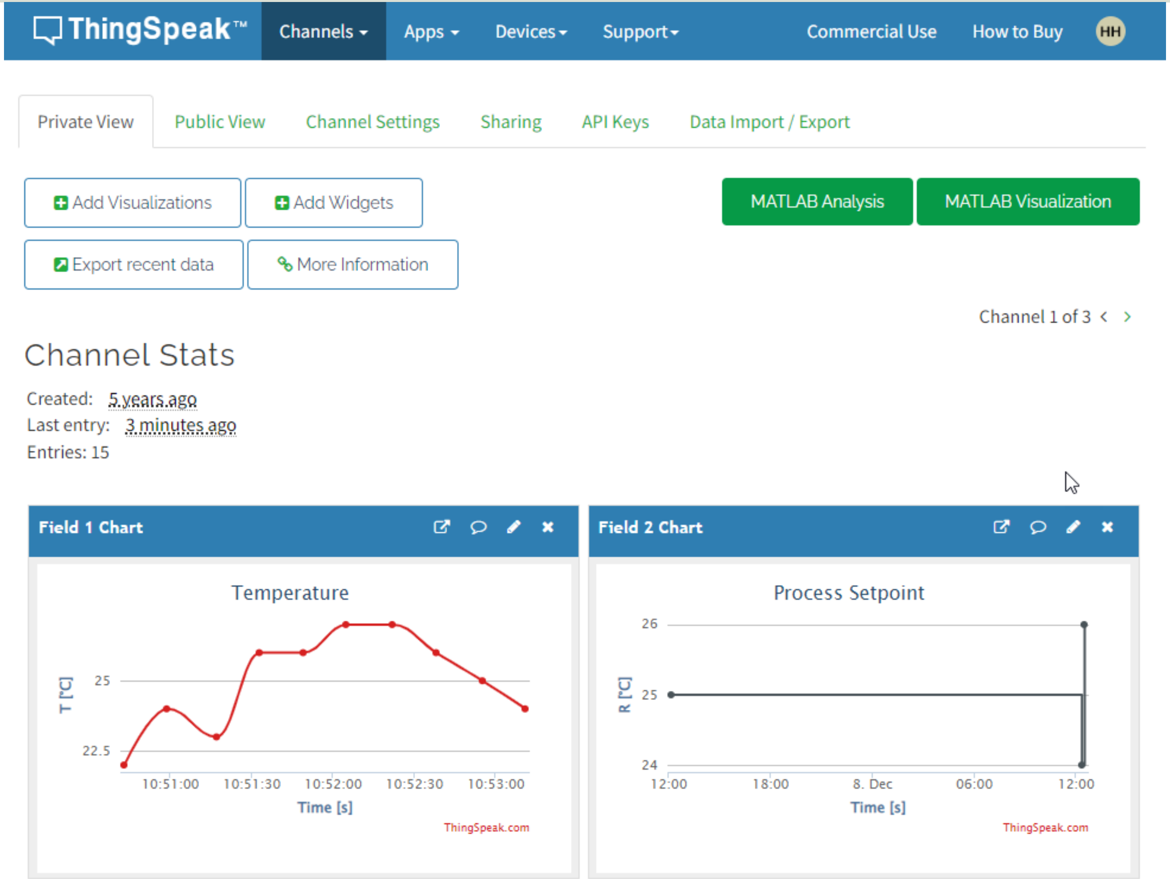
Here you can change the setpoint for your process.

Setpoint: 26 °C

HTML Code

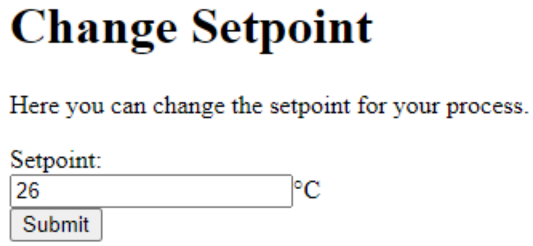
```html
<!DOCTYPE html>
<html lang="en">

<script>
function updateSetpoint()
{
  var sp = document.getElementById("setpoint").value;
  var website = "https://api.thingspeak.com/update?api_key=IEQ6WFMNE99LNLIS&field2=" + sp;
  window.location.href = website;
}
</script>

<head>
  <meta charset="UTF-8">
  <title>Change Setpoint</title>
</head>

<body>

  <div>

  <h1>Change Setpoint</h1>
  <p>Here you can change the setpoint for your process.</p>

    <form action="javascript: updateSetpoint()">
      <label for="setpoint">Setpoint:</label><br>
      <input type="text" id="setpoint" name="setpoint" value="25">°C
      <br>

      <input type="submit" value="Submit">
    </form>

  </div>

  </body>
</html>
```

Results



Channel Stats

Created: 5 years ago
Last entry: 3 minutes ago
Entries: 15



Change Setpoint

Here you can change the setpoint for your process.

Setpoint:
26 °C

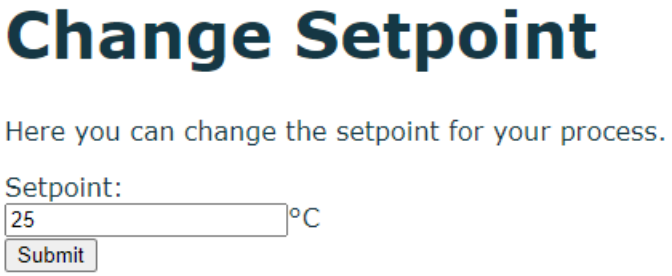
Improvements

Improvements

- Add Stylesheet
- Add Bootstrap
- Add type=“Number”
- Update PID Settings + Setpoint
- ..

Stylesheet

```
..

<head>
  <meta charset="UTF-8">
  <title>Change Setpoint</title>
  <link rel="stylesheet" href="stylesheet.css">
</head>

..
```



Change Setpoint

Here you can change the setpoint for your process.

Setpoint:

25 °C

stylesheet.css

```css
body {
    font-family: "Sans-serif", Verdana;
    color: #153744;
    text-align: left;
}

h1 {
    font-size: 40px;
    font-family: "Sans-serif", Verdana;
    color: #153744;
    text-align: left
}
```

Bootstrap

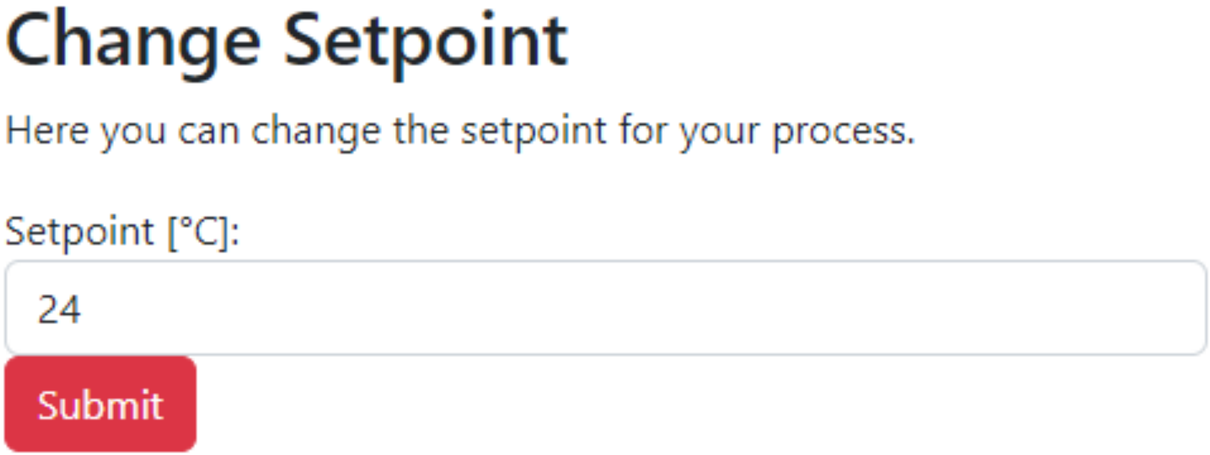
- Bootstrap is a popular HTML, CSS, and JavaScript framework
- Bootstrap is free to download and use
- Resources
  - https://getbootstrap.com
  - https://www.w3schools.com/bootstrap5/index.php

```html
<!DOCTYPE html>
<html lang="en">

<script>
function updateSetpoint()
{
  var sp = document.getElementById("setpoint").value;
  var website = "https://api.thingspeak.com/update?api_key=IEQ6WFMNE99LNLIS&field2=" + sp;
  window.location.href = website;
}
</script>

<head>
  <title>Change Setpoint</title>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.3/dist/css/bootstrap.min.css" rel="stylesheet" integrity="sha384-
rbsA2VBKQhggwzxH7pPCaAqO46MgnOM80zW1RWuH61DGLwZJEdK2Kadq2F9CUG65" crossorigin="anonymous">
</head>

<body>

<div class="container-fluid">

  <h1>Change Setpoint</h1>
  <p>Here you can change the setpoint for your process.</p>

  <form action="javascript: updateSetpoint()">
    <label for="setpoint">Setpoint [°C]:</label><br>
    <input type="number" id="setpoint" name="setpoint" class="form-control" value="25" min="0" max="50">

    <input type="submit" value="Submit" class="btn btn-danger">
  </form>

</div>

</body>
</html>
```

Type="Number"

```
<input type="number" id="setpoint" name="setpoint" value="25" min="0" max="50">
```

Webpage

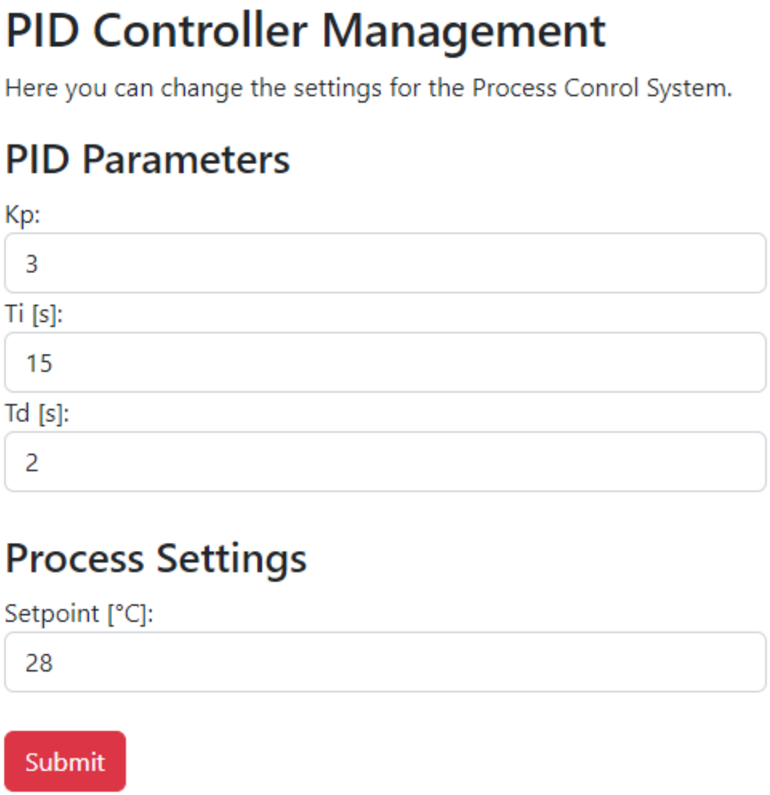


Change Setpoint

Here you can change the setpoint for your process.

Setpoint [°C]: 24

Update PID Settings



PID Controller Management

Here you can change the settings for the Process Conrol System.

PID Parameters

Kp:

3

Ti [s]:

15

Td [s]:

2

Process Settings

Setpoint [°C]:

28

```html
<!DOCTYPE html>
<html lang="en">

<script>
function updatePid()
{
  var Kp = document.getElementById("Kp").value;
  var Ti = document.getElementById("Ti").value;
  var Td = document.getElementById("Td").value;
  var sp = document.getElementById("setpoint").value;
  var website = "https://api.thingspeak.com/update?api_key=IEQ6WFMNE99LNLIS&field2=" + sp +"&field3=" + Kp +"&field4=" + Ti +"&field5=" + Td;
  window.location.href = website;
}
</script>

<head>
  <title>PID Controller Management</title>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.3/dist/css/bootstrap.min.css" rel="stylesheet" integrity="sha384-rbsA2VBKQhggwzxH7pPCaAqO46MgnOM80zW1RWuH61DGLwZJEdK2Kadq2F9CUG65" crossorigin="anonymous">
</head>

<body>

<div class="container-fluid">

  <h1>PID Controller Management</h1>
  <p>Here you can change the settings for the Process Conrol System.</p>

  <form action="javascript: updatePid()">

    <h2>PID Parameters</h2>

    <label for="Kp">Kp:</label><br>
    <input type="number" id="Kp" name="Kp" value="1" min="0" max="50" class="form-control">

    <label for="Ti">Ti [s]:</label><br>
    <input type="number" id="Ti" name="Ti" value="10" min="0" max="1000" class="form-control">

    <label for="Td">Td [s]:</label><br>
    <input type="number" id="Td" name="Td" value="0" min="0" max="100" class="form-control">

    <br/>
    <h2>Process Settings</h2>

    <label for="setpoint">Setpoint [°C]:</label><br>
    <input type="number" id="setpoint" name="setpoint" value="25" min="0" max="50" class="form-control">

    <br/>
    <input type="submit" value="Submit" class="btn btn-danger">
  </form>

</div>

</body>
</html>
```

Hans-Petter Halvorsen

University of South-Eastern Norway

www.usn.no

E-mail: hans.p.halvorsen@usn.no

Web: https://www.halvorsen.blog