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Plotting Data using Google Charts

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Hans-Petter Halvorsen

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- Google Charts
- MySQL Database (MySQL and phpMyAdmin tool)
- <u>Retrieving Data</u> (PHP server-side)
- <u>Plotting Data from Database</u> (Using Google Charts on Client-side)
- Improvements



Plotting Data using Google Charts

Introduction





Google Charts Example

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Plotting Temperature Data

Here is the temperature data from the TMP36 sensor.

We will create PHP Web Applications that plots data stored in a MySQL database. We will use Google Charts for the plotting features.



Final Application

When we are finished with this Step-by-Step Tutorial we have created the following:

- We have created a basic PHP Web Application.
- The Web Application retrieves Data from a MySQL Database.
- Google Chart is used to plot the Data in the Web page.
- The Data is also show in an HTML Table.
- It is also possible to select what kind of data you want to plot:
 - You can select a specific Sensor.
 - You can select a Date Interval (From and To Date and Time)



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Temperature Data

✓ Sensor Data

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#	Timestamp	Value [°C]
0	2025-02-05 12:00:00	22.5
1	2025-02-05 12:10:00	23.1
2	2025-02-05 12:20:00	22.3
3	2025-02-05 12:30:00	24.3

Introduction

- The purpose with this tutorial is to demonstrate how we can create plots, charts and diagram when creating PHP Web Applications.
- PHP has no built-in functionality for creating charts and plots.
- In this tutorial we will use **Google Charts** for that purpose.
- We will use MySQL for data storage and use PHP to retrieve data from the database (server-side). Then we will use Google Charts on the client-side to create plots/charts based on the data from the database.
- The focus is to show the basic principles, while code quality and robustness, etc. is not in focus in this tutorial.

Tools

- **PHP** a server scripting language for making dynamic web pages, typically communicating with a Database.
- I will host our PHP files on an existing **Web Server** that supports PHP and MySQL. You can create your own or use an existing hosting provider.
- We will use Visual Studio Code (you can use another IDE if you prefer).
- We will transfer the local files to the Web Server using **FTP** (File Transfer Protocol). We will use **WinSCP** (you can use another FTP tool if you prefer).
- **MySQL** a widely used relational database management system (RDBMS). MySQL is free and open-source.
- **phpMyAdmin** a free and open-source administration tool for MySQL (and MariaDB).
- **Google Charts** a free chart library (client-side) that can be used to show plots, charts and diagrams on web pages.
- **Bootstrap** CSS/JavaScript library for improvement of the visual appearance of the web pages.



Plotting Data using Google Charts

Google Charts

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Google Charts

- There exists many different libraries, APIs or frameworks for making charts and plots for your web pages, these are typically using JavaScript and are implemented client-side.
- This makes these chart libraries independent of the language that is used on the server-side.
- Google Charts is an API (or framework) for creating Charts in your web pages.
- It is free to use.
- It is a client-side framework/API.
- It is easy to use (when you first know how to use it).
- Google Charts offers many different types of charts: Line Chart, Bar Chart, Column Chart, Pie Chart, etc.
- You can get a detailed overview here: https://developers.google.com/chart

How to implement Google Charts

The most common way to use Google Charts is with simple JavaScript that you embed in your web page.

- 1. Load the Google Chart Libraries.
- 2. List the Data to be charted.
 - The Data typically comes from a Database and are retrieved and generated server-side.
- 3. Select different Options to customize your chart.
- 4. Create a Chart Object with an id that you choose.
- Display: Create a <div> tag with that id to display the Google Chart in the web page.

Google Chart libraries

First, you need to load the Google Chart libraries into your webpage:

<head>
<script src="https://www.gstatic.com/charts/loader.js"></script>
</head>
<script>
google.charts.load('current', {'packages':['corechart']});
google.charts.setOnLoadCallback(drawChart);

</script>

Plot Example



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			38 <body></body>
			39 <h1>Plotting Temperature Data</h1> 40 Here is the temperature data from the TMP36 sensor.
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Plotting Temperature Data

Here is the temperature data from the TMP36 sensor.



<html>

<head>

<script src="https://www.gstatic.com/charts/loader.js"></script>
</head>

<script>

google.charts.load('current', {'packages':['corechart']}); google.charts.setOnLoadCallback(drawChart);

function drawChart()

```
const data = google.visualization.arrayToDataTable([
['Time', 'TMP36 Sensor'],
```

```
['1', 22.5],
['2', 23.1],
['3', 24.4],
...
['9', 23.5],
['10', 23.9]
]);
```

```
const options = {
title: 'Temperature Data',
hAxis: {title: 'Time [s]'},
vAxis: {title: 'Temperature [°C]'},
curveType: 'function',
legend: { position: 'right' }
};
```

const chart = new google.visualization.LineChart(document.getElementById('mychart'));
chart.draw(data, options);

</script>

<body>

<h1>Plotting Temperature Data</h1>
Here is the temperature data from the TMP36 sensor.
<div id="mychart" style="width: 1200px; height: 600px"></div>
</body>
</html>

Options

```
const options = {
title: 'Temperature Data',
hAxis: {title: 'Time [s]'},
vAxis: {title: 'Temperature [°C]'},
curveType: 'function',
legend: { position: 'right' }
};
```

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This is just some examples of the different options that you can use to customize your plot.

Resources

- Google Charts: <u>https://developers.google.com/chart</u>
- Google Chart Tutorial w3Schools: <u>https://www.w3schools.com/js/js_graphics</u> <u>google_chart.asp</u>



Plotting Data using Google Charts

MySQL Database

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phpMyAdmin



phpMyAdmin is used to administrate your MySQL Database. Here you can create tables, run SQL queries, etc. phpMyAdmin is basically just a web application written in PHP. We will use phpMyAdmin to create a Database Table and insert some data into that table.

Create Database and Tables

We can create Databases and Database Tables using PHP. But typically, we create a Database and the necessary Tables in advance before we start coding the Web Application. We use the phpMyAdmin tool.



Example Data used for Plotting

We can also insert some data into the Table using phpMyAdmin, e.g.:

insert	into	TEMPERATURE	(TempValue,	TempDateTime)	values	(22.5,	2025.03.05	12:00');
insert	into	TEMPERATURE	(TempValue,	TempDateTime)	values	(23.1,	'2025.03.05	12:10');
insert	into	TEMPERATURE	(TempValue,	TempDateTime)	values	(22.3,	'2025.03.05	12:20');
insert	into	TEMPERATURE	(TempValue,	TempDateTime)	values	(24.3,	'2025.03.05	12:30');
insert	into	TEMPERATURE	(TempValue,	TempDateTime)	values	(25.4,	'2025.03.05	12:40');
insert	into	TEMPERATURE	(TempValue,	TempDateTime)	values	(21.3,	'2025.03.05	12:50');
insert	into	TEMPERATURE	(TempValue,	TempDateTime)	values	(22.3,	'2025.03.05	13:00');
insert	into	TEMPERATURE	(TempValue,	TempDateTime)	values	(23.4,	'2025.03.05	13:10');
insert	into	TEMPERATURE	(TempValue,	TempDateTime)	values	(24.3,	'2025.03.05	13:20');
insert	into	TEMPERATURE	(TempValue,	TempDateTime)	values	(23.3,	'2025.03.05	13:30');



Plotting Data using Google Charts

Retrieving Data

PHP Server-side

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Open Connection

In this tutorial we will use MySQLi. Here you see an example how we can connect to the database:

```
<?php
$servername = "localhost";
$dbname = "dbname";
$username = "username";
$password = "password";
// Create connection
$conn = mysqli connect($servername, $username, $password, $dbname);
// Check connection
if (!$conn) {
 die("Connection failed: " . mysqli connect error());
}
echo "Connected successfully.";
?>
                                                           mysqli close($conn);
  Close Connection after we have communicated with the database:
```

PHP Config File

Typically, we want to hide the Connection to the database, so, we can put it into a separate PHP file called, e.g., "config.php". The in the different PHP files we can include this file. This file will contain username, password, etc. for the MySQL Server database.

```
<?php
              $servername ="localhost";
              $username ="xxxxx";
              $password ="xxxxx";
              $dbname = "xxxxx";
              // Create Connection
              $conn = mysqli_connect($servername, $username, $password, $dbname);
              // Check Connection
              if(!$conn) {
                  die("Connection failed: ". mysqli_connect_error());
              }
              echo"Connected successfully.";
config.php
              ?>
```

Show Data from the Database

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empId: 1 - TempValue: 22.5 - TempDateTime: 2025-02-05 12:00:00 empId: 2 - TempValue: 23.1 - TempDateTime: 2025-02-05 12:10:00 empId: 3 - TempValue: 22.3 - TempDateTime: 2025-02-05 12:20:00 empId: 4 - TempValue: 24.3 - TempDateTime: 2025-02-05 12:30:00 empId: 5 - TempValue: 25.4 - TempDateTime: 2025-02-05 12:40:00 empId: 6 - TempValue: 21.3 - TempDateTime: 2025-02-05 12:50:00 empId: 7 - TempValue: 22.3 - TempDateTime: 2025-02-05 13:00:00 empId: 8 - TempValue: 23.4 - TempDateTime: 2025-02-05 13:10:00 empId: 9 - TempValue: 24.3 - TempDateTime: 2025-02-05 13:20:00 empId: 10 - TempValue: 23.3 - TempDateTime: 2025-02-05 13:30:00		 config. C: > Users 1 2 3 4 5 6 	<pre></pre>					
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Plotting Data using Google Charts

Plotting Data from MySQL Database

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Table of Contents

Data Format

Google Charts need to have the Data on the following Format:

```
const data = google.visualization.arrayToDataTable([
['Time', 'TMP36 Sensor'],
['1', 22.5],
                                  const data = google.visualization.arrayToDataTable([
                                  ['Time', 'TMP36 Sensor'],
['2', 23.1],
['3', 24.4],
                                  <?php
['4', 24.2],
                                  require once 'config.php';
['5', 25],
                                 // Get Data from Database
['6', 22],
                                  $sq1 - "SELECT TempId, TempValue, TempDateTime FROM TEMPERATURE";
['7', 23.4],
                                  $result - mysqli_query($conn, $sql);
['8', 24.7],
['9', 23.5],
                                  if (mysqli num rows($result) > 0) {
                                  // output data of each row
['10', 23.9]
                         while($row - mysqli_fetch_assoc($result)) {
    echo "[". $row["TempId"] . ", " . $row["TempValue"]. "],";
1);
```

◄ = **Plotting Database Data** ρ ç Þ \odot web01.usn.no/~hansha/plot ter × 88 web01.usn.no/~hansh/plot tempdata.php **Plotting Temperature Data** Here is the temperature data from the TMP36 sensor. Temperature Data 26 25 24 Temperature [°C] 23 22 21 20 2 3 4 5 6 7 8 9 10 1 8 Time [s] 3

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2	require_once 'config.php';						
3	>>						
4	<html></html>						
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6	<script <="" src="https://www.gsta</td><td>ic.com/charts/loader.is" td=""><td><pre>></script</pre></td><td>></td><td></td><td></td><td></td></tr><tr><th>7</th><td></head></td><td></td><td>1.1</td><td></td><td></td><td></td><td></td></tr><tr><th>8</th><th><script></th><th></th><th></th><th></th><th></th><th></th><th></th></tr><tr><th>9</th><td><pre>google.charts.load('current', {'page 1 and 1 and</td><td>ckages':['corechart']});</td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>10</th><td colspan=10>10 google_charts.setOnloadCallback(drawChart):</td></tr><tr><th>11</th><td colspan=10>11</td></tr><tr><th>12</th><td>function drawChart()</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>13</th><td>{</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>14</th><td>const data = google.visualiza</td><td>ion.arrayToDataTable([</td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>15</th><td>['Time', 'TMP36 Sensor'],</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>16</th><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>17</th><td><?php</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>18</th><td>require once 'config.php':</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>19</th><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>20</th><td>// Get Data from Database</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>21</th><td><pre>\$sal = "SELECT TempId, TempVal</pre></td><td>ue, TempDateTime FROM TE</td><td>MPERATURE</td><td> · ·</td><td></td><td></td><td></td></tr><tr><th>22</th><td><pre>\$result = mysali guery(\$conn.</pre></td><td><pre>\$sal):</pre></td><td></td><td>·</td><td></td><td></td><td></td></tr><tr><th>23</th><td>*·····</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>24</th><td>if (mysali num rows(\$result)</td><td>. 0) {</td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>25</th><td>// output data of each row</td><td>-7 (</td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>26</th><td>while(\$row = mysali fetch ass</td><td>c(\$result)) {</td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>27</th><td>echo "[" . \$row["TempId"]</td><td>. ". " . \$row["TempValue"</td><td>n. n</td><td></td><td></td><td></td><td></td></tr><tr><th>28</th><td>}</td><td>, , , , , , , , , , , , , , , , , , , ,</td><td>1. 11.1</td><td></td><td></td><td></td><td></td></tr><tr><th>29</th><td>} else {</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>30</th><td>echo "0 results":</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>31</th><td>}</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>32</th><td>2></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>33</th><td>1);</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>34</th><td>373</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>35</th><td>const options = {</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>36</th><td>title: 'Temperature Data',</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>37</th><td>hAxis: {title: 'Time [s]'},</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>38</th><td>vAxis: {title: 'Temperature [</td><td>c1'},</td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>39</th><td>curveType: 'function',</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>40</th><td>//legend: { position: 'right'</td><td>}</td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>41</th><td>legend: 'none'</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>42</th><td>};</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>43</th><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>44</th><td>const chart = new google.visu</td><td>lization.LineChart(docum</td><td>ent.getEl</td><td>ementB</td><td>yId('mycha</td><td>rt'));</td><td></td></tr><tr><th>45</th><td>chart.draw(data, options);</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>46</th><td>}</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><th>47</th><td></script>						
48							
49	<body></body>						
50	<h1>Plotting Temperature Data</h1>	:/h1>					
51	Here is the temperature data	a from the TMP36 sensor.					
52	<pre><div <="" id="mychart" style="widt</pre></td><td>n: 1200px; height: 600px" td=""><td></td></div></pre>						
53							
54							
55	php</td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
56	// Close Connection						
57	<pre>mysqli_close(\$conn);</pre>						
58	?>						
59							
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Code



```
function drawChart()
```

{

}

```
const data = google.visualization.arrayToDataTable([
['Time', 'TMP36 Sensor'],
```

```
<?php
require_once 'config.php';</pre>
```

```
// Get Data from Database
$sql = "SELECT TempId, TempValue, TempDateTime FROM TEMPERATURE";
$result = mysqli_query($conn, $sql);
```

```
if (mysqli_num_rows($result) > 0) {
// output data of each row
while($row = mysqli_fetch_assoc($result)) {
    echo "[" . $row["TempId"] . ", " . $row["TempValue"]. "],";
}
else {
echo "0 results";
}
]);
```

```
const options = {
title: 'Temperature Data',
hAxis: {title: 'Time [s]'},
vAxis: {title: 'Temperature [°C]'},
curveType: 'function',
//legend: { position: 'right' }
legend: 'none'
};
```

```
const chart = new google.visualization.LineChart(document.getElementById('mychart'));
chart.draw(data, options);
```



Plotting Data using Google Charts

Improvements

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Improvements

Here are some examples of improvements to make for this basic PHP Web Application that plots Data using Google Charts:

- Different Types of x-axis formats.
- Show Data in a Chart and, in addition, show Data in a HTML Table with Bootstrap for better visual appearance.
- Show Data from Multiple Temperature Sensors in the same chart.
- Select which Sensor to show Data from. Here we can use a "Dropdown" menu (i.e., use the HTML select tag).
- Select "From Date" and "To Date" to specify data to show in the Plot.
- In general, improve user interface, code structure and quality.

Different x-axis



Plotting + Show Data in Table



<pre>67 <hi>Temperature Data</hi> 68 <div class="table-responsive"> 69 70</div></pre>		
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Plot Data from multiple Temperature Sensors?

So far, we have plotted data from one temperature sensor. What if we have multiple sensors? Here are some possible alternatives;

- Show Data from Multiple Temperature Sensors in the same Chart.
- Select which Sensor to show Data from. Here we can use a "Dropdown" menu (i.e., use the HTML select tag).

For both options we need to update our database structure to handle more than one temperature sensor.

Updated Database

*	=	$\leftarrow \rightarrow$ \bigcirc Search \textcircled{C} \lor \square \square \square \square \square \square	×						
ф	Sensor	Tables.sql ×							
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Q	1	CREATE TABLE SENSOR							
1	2	(
የዖ	3	SensorId int PRIMARY KEY AUTO INCREMENT.							
6	1	SensorName varchar(100) NOT NULL UNTOUE							
	5			Edit Selectio	Notewing the two the two the two terms of the two terms of the terms of	,∕⊂ Search	8 ~		o ×
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_0	6			> Users > han:	p > OneDrive > Courses > Webutvikling > Tut	orials > PHP > Development > Google Charts > Database >	🛢 Sensor Tables Test	Data.sql	
Ш	/	CREATE TABLE SENSORDATA		1 inse	ert into SENSOR (SensorName)	<pre>values ('Termocouple Sensor'); values ('TMP25 Sensor');</pre>			
	8			3	art Into Sensor (Sensor Name)	Values (IMPS0 Sensor);			
	9	DataId int PRIMARY KEY AUTO_INCREMENT,		4 ins	ert into SENSORDATA (Sensor]	[d, SensorValue, SensorDateTime) va	lues (1, 22.5	, '2025.02.05 1	L2:00');
	10	SensorId int NOT NULL,		5 ins	ert into SENSORDATA (Sensor]	[d, SensorValue, SensorDateTime) va	lues (1, 23.1	, '2025.02.05 1	.2:10');
	11	SensorValue float NOT NULL,		6 1ns	ert into SENSORDATA (Sensor)	ld, SensorValue, SensorDatelime) Va.	lues (1, 22.3)	2025.02.05 1	.2:20');
6	12	SensorDateTime datetime NOT NULL		8 ins	ert into SENSORDATA (Sensor]	Id, SensorValue, SensorDateTime) va	lues (1, 25.4	, '2025.02.05 1	12:40');
8	12	ECDETCH KEV (Conceptd) DEFEDENCES (ENCOD(Conceptd)		9 inse	ert into SENSORDATA (Sensor]	[d, SensorValue, SensorDateTime) va	lues (1, 21.3	, '2025.02.05 1	L2:50');
	15	FOREIGN REY (SENSOFIL) REFERENCES SENSOR(SENSOFIL)		10 ins	ert into SENSORDATA (Sensor]	[d, SensorValue, SensorDateTime) va	lues (1, 22.3	, '2025.02.05 1	13:00');
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-	~		-	12 1ns	ert into SENSORDATA (Sensor)	ld, SensorValue, SensorDatelime) Va. Id SensorValue SensorDateTime) va	lues (1, 24.3)	2025.02.05 1	.3:20'); [3:30'):
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				15 ins	ert into SENSORDATA (Sensor]	[d, SensorValue, SensorDateTime) va	lues (2, 21.5	, '2025.02.05 1	12:00');
				16 ins	ert into SENSORDATA (Sensor]	[d, SensorValue, SensorDateTime) va	lues (2, 22.1	, '2025.02.05 1	.2:10');
				17 ins	ert into SENSORDATA (Sensor]	Id, SensorValue, SensorDateTime) va.	iues (2, 24.3)	, '2025.02.05 1	12:20');
				18 1050 10 inst	ert into SENSORDATA (Sensor)	Id, SensorValue, SensorDatelime) va.	(2, 23.3)	, 2025.02.05 J	.2:30);
				20 ins	ert into SENSORDATA (Sensor]	Id, SensorValue, SensorDateTime) va	lues (2, 22.3	, '2025.02.05 1	12:50');
				21 ins	ert into SENSORDATA (SensorI	Id, SensorValue, SensorDateTime) va	lues (2, 21.3	, '2025.02.05 1	L3:00');
			$\overline{\mathbb{O}}$	22 ins	ert into SENSORDATA (Sensor]	Id, SensorValue, SensorDateTime) va	Lues (2, 22.4	, '2025.02.05 1	13:10' <mark>);</mark>
			8	23 ins	ert into SENSORDATA (Sensor]	Id, SensorValue, SensorDateTime) va	lues (2, 25.3)	, '2025.02.05 1	13:20');
		Ę	553 553	24 1 N S	ert into sensordata (Sensori	u, sensorvalue, sensorvatelime) va.	.ues (2, 24.3	, 2025.02.05 1	.3:30);
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Plot Data from multiple Temperature Sensors



Temperature Data

#	DateTime	Sensor1 [°C]	Sensor2 [°C]
0	12:00	22.5	21.5
1	12:10	23.1	22.1
2	12:20	22.3	24.3
3	12:30	24.3	23.3
4	12:40	25.4	24.4
5	12:50	21.3	22.3
6	13:00	22.3	21.3
7	13:10	23.4	22.4
8	13:20	24.3	25.3
9	13:30	23.3	24.3

Here is the updated example where we show data from 2 different sensors in the same plot.

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2	1 php</td <td>39</td> <td>chead</td> <td></td> <td>C: > Users</td> <td>> hansp > OneDrive > Cour</td> <td>ses > Webutvikling > Tutorials > PHP > Developme</td> <td>nt > Google Charts > 🏘 sensordata.php</td>	39	chead		C: > Users	> hansp > OneDrive > Cour	ses > Webutvikling > Tutorials > PHP > Developme	nt > Google Charts > 🏘 sensordata.php
	<pre>2 require once 'config.php';</pre>	41	<title>Sensor Data</title>	\mathcal{Q}	01	chodys		
Se .	3	> 42	<meta charset="utf-8"/>	0.0	01	(bouy)	and the second second	
	4 // Get Data from Database for Sensor 1	o 43	<meta content="width=device-width, initial-scale=1" name="viewport"/>	8	82	<div class="</td><td>container-fluid pt-5"></div>		
ð	5 \$sql - "SELECT SensorValue SensorDateTime EPOM SENSORDATA WHEE	44	<pre><link bootstrap.<="" bootstrap@5.3.3="" cdn.jsdelivr.net="" dist="" href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.3/dist/css/bootstrap.</pre></td><td></td><td>83</td><td></td><td></td><td></td></tr><tr><td>80</td><td>6 frequit = muscli queru(freque focil):</td><td>45</td><td><pre><script src=" https:="" js="" npm="" pre=""/></pre>	8	84	<h1>Plotting</h1>	Temperature Data	
ш	o presure = mysqri_query(pcom, psqr),	40	<pre></pre> <pre></pre> <pre></pre> <pre></pre> <pre></pre> <pre></pre> <pre></pre> <pre></pre>	<u>д</u> 0	85	Here is t	he temperature data from	the TMP36 sensor.
		48		ш	86	<div id="mvc</td><td>hart" style="width: 100%;</td><td>height: 600px"></div>		
	8 if (mysqli_num_rows(\$result) > 0) {	49	<script></script>					

115

116 117

118 119 </div>

120

121

63

(/table>

</div>

</body>

</html>

Here is the updated code to make it possible to show data from 2 different sensors in the same plot. It works, but both SQL queries and PHP can be further improved.

Plot Data from multiple Temperature Sensors



#	Timestamp	Value [°C]
0	2025-02-05 12:00:00	21.5
1	2025-02-05 12:10:00	22.1
2	2025-02-05 12:20:00	24.3
3	2025-02-05 12:30:00	23.3
4	2025-02-05 12:40:00	24.4
5	2025-02-05 12:50:00	22.3
6	2025-02-05 13:00:00	21.3

Here is another example where we need to select a specific sensor and then the data for that specific sensor is shown in the plot and in the table.

HTML Select

```
Select Sensor
    <form action="" method="POST">
79
                                                                         Select Sensor
80
                                                                         Termocouple Sensor
    Select the sensor you want to see data for:
81
                                                                         TMP36 Sensor
82
    <select name="selectedsensor" id="selectedsensor" class="form-control" onChange="this.form.submit()">
83
84
      <option value="0">Select Sensor</option>
85
      <?php
86
      // Get list of Sensors from the Database
87
      $sql = "SELECT SensorId, SensorName FROM SENSOR ORDER BY SensorName";
88
      $result = mysqli_query($conn, $sql);
89
      if (mysqli_num_rows($result) > 0) {
90
91
        // output data of each row
92
        while($row = mysqli_fetch_assoc($result)) {
          echo "<option value='" . $row["SensorId"] . "'>" . $row["SensorName"] . "</option>";
93
94
95
      ?>
96
    97
98
99
   </form>
```

Retrieve Data for a specific Sensor



From/To Date

Here we have added "From DateTime" and "To DateTime" to make it possible to limit the data and show data only for a specific interval. This is important if we ,e.g., have data for many years.

From DateTime: 01/02/2025 13:14 28/0 February 2025 - \wedge \downarrow 13 14 Tu We Th Fr Sa Su 14 15 27 28 29 30 31 2 15 16 7 8 9 6 16 17 15 12 13 14 20 21 22 23 19 17 18 24 25 26 27 28 1 2 18 19 0 6 8 9 20 19 Clear Today 2 3



22.5

23.1

22.3

24.3

2025-02-05 12:00:00

2025-02-05 12:10:00

2025-02-05 12:20:00

2025-02-05 12:30:00

1

Code

```
<form action="" method="POST">
 92
 93
     Select the sensor you want to see data for:
 94
95
     <label for="selectedsensor" class="form-label">Sensor:</label>
 96
     <select name="selectedsensor" id="selectedsensor" class="form-control" onChange="this.form.submit()">
 97
       <option value="0">Select Sensor</option>
 98
       <?php
 99
       // Get list of Sensors from the Database
100
       $sq1 = "SELECT SensorId, SensorName FROM SENSOR ORDER BY SensorName";
101
       $result = mysqli_query($conn, $sql);
102
103
       if (mysqli num rows($result) > 0) {
104
         // output data of each row
105
         while($row = mysqli fetch assoc($result)) {
106
           echo "<option value='" . $row["SensorId"] . "'>" . $row["SensorName"] . "</option>";
107
108
109
110
       ?>
     111
112
     Here is the temperature data from the selected sensor <b><?php echo $sensorName?></b>:
113
114
115
     <div class="row">
116
       <div class="col">
117
        <label for="fromdate" class="form-label">From DateTime:</label>
118
        <input type="datetime-local" id="fromdate" name="fromdate" class="form-control" value="<?php echo $fromdate?>">
119
       </div>
120
       <div class="col">
         <label for="todate" class="form-label">To DateTime:</label>
121
122
         <input type="datetime-local" id="todate" name="todate" class="form-control" value="<?php echo $todate?>">
         </div>
123
124 </div>
125
126 </form>
```

127

```
4 $sensorid = 0;
                               5 if (isset($ POST["selectedsensor"]))
Code
                                   $sensorid = $_POST["selectedsensor"];
                               6
                                 if (isset($ POST["fromdate"]))
                                   $fromdate = $ POST["fromdate"];
                             10
                                 else
                              11
                                   $fromdate = "";
                              12
                                 if (isset($_POST["todate"]))
                              13
                              14
                                   $todate = $_POST["todate"];
                              15 else
                                   $todate = "";
                              16
                             17
                             18 $sensorName = "";
                                 // Get selected SensorName from the Database
                              19
                                 $sql = "SELECT SensorName FROM SENSOR WHERE SensorId = $sensorid";
                              20
                             21 $result = mysqli query($conn, $sql);
                              22
                             23 if (mysqli_num_rows($result) > 0) {
                                   $row = mysqli_fetch_assoc($result);
                              24
                              25
                                   $sensorName = $row["SensorName"];
                              26 }
                             28 // Get Data from Database for specific Sensor
                             29 if ($fromdate!="" && $todate!="")
                                  $sql = "SELECT SensorValue, SensorDateTime FROM SENSORDATA WHERE SensorId = $sensorid and SensorDateTime BETWEEN '$fromdate' AND '$todate';
                              31 else
                                   $sql = "SELECT SensorValue, SensorDateTime FROM SENSORDATA WHERE SensorId = $sensorid";
                              32
                             34 $result = mysqli query($conn, $sql);
                              35
                             36 $sensorvalues = []:
                             37 if (mysqli num rows($result) > 0) {
                                   // output data of each row
                              38
                                   while($row = mysgli fetch assoc($result)) {
                              39
                                     $sensorvalues[] = $row["SensorValue"];
                              40
                                     $timestamps[] = $row["SensorDateTime"];
                              41
                              42
                              43
```

44 ?>

Summary

- We have created a basic PHP Web Application.
- The Web Application retrieves Data from a MySQL Database.
- Google Chart is used to plot the Data in the Web page.
- The Data is also show in an HTML Table.
- It is also possible to select what kind of data you want to plot:
 - You can select a specific Sensor.
 - You can select a Date Interval (From and To Date and Time)



Temperature Data

#	Timestamp	Value [°C]
0	2025-02-05 12:00:00	22.5
1	2025-02-05 12:10:00	23.1
2	2025-02-05 12:20:00	22.3
3	2025-02-05 12:30:00	24.3

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