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# TEC-1161

Hardware Version 1.20

The TEC-1161 Series is a high-precision dual-channel thermoelectric controller designed for driving and monitoring Peltier elements with exceptional accuracy & stability. Featuring fully digital control, intelligent PID auto-tuning, and comprehensive communication interfaces, it offers a complete solution for demanding temperature-regulated applications.

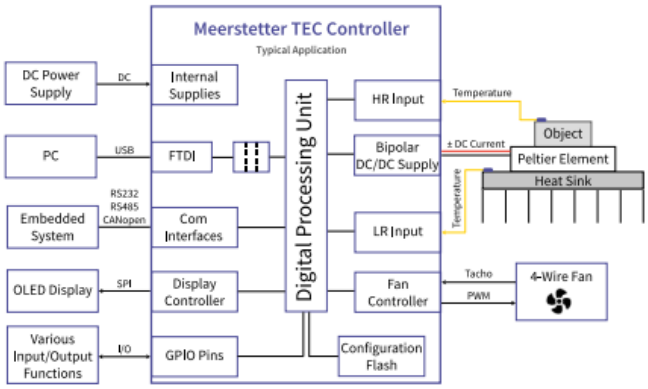
## HIGHLIGHTS

- **Output Stage:** ±4 A / ±10 A, ±21 V
- **Input Voltage:** DC 5 – 24 V
- Precision < 0.01°C stability
- Digital PID control with auto-tuning
- Smooth temperature ramping and thermal stability indicator
- Stand-alone or remote-controlled via USB, RS485 (HalfDuplex), CANopen CiA 301
- PC software for configuration and data logging
- Supports Pt100, Pt1000, NTC or Voltage sensors (4-wire precision input)
- Available as screw-terminal or PCB-mount OEM module

RoHS compliant

### Trial Device & Technical Support

Trial devices and technical support are available for evaluation projects.
Please contact support@meerstetter.ch or visit our support center.




## RELATED PRODUCTS

| Model | Output | Channels | Description |
|---|---|---|---|
| TEC-1091 | ±4 A / ±21 V | 1 | Small, single channel |
| TEC-1162 | ±5 A / ±56 V | 1 | Medium-high, single channel |
| TEC-1161-4A | 2×(±4 A / ±21 V) | 2 | Small, dual channel |
| TEC-1161-10A | 2×(±10 A / ±21 V) | 2 | Medium, dual channel |

See the full product overview in the Meerstetter Engineering's Product Compatibility section.

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# 1 ORDERING AND CONFIGURATION

## 1.1 TEC-1161 Ordering Information & Configuration

**Example Configuration:**
TEC-1091 (NTC; PIN) FW6.20

| Requirement | Variant Name | Description | Options / Single choic |
|---|---|---|---|
| **Required** | High Resolution Sensor Type | Defines compatibility with temperature sensor on HR input. | PT100 (4 Wire); PT1000 (4 Wire); NTC (2 Wire Rmax of NTC); VIN1; VIN2; |
| Required | Terminal Configuration | Choose connector type. | NC; SCREW; PIN; |
| Optional | FW Version | Enter a compatible FW if you choose not to use the latest version (default). Check software change log for details. | FW vX.YY |
| Advanced | Customer Specific Modifications | Usually hardware modifications, available only on demand and quote. | Empty; or example: CS3 |
| Advanced | Customer Specific Profile | Preset parameters/configuration, available only on demand and quote. | Default; or example: P15 |
| - | Hardware Version | For reference, specifies the HW version (latest by default, subject to future change). | Example: HW v3.51 |

## 1.2 Ordering Confirmation Example

TEC-1091 (NTC; PIN; HW3.50) FW6.20
Profile: default

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contact@meerstetter.ch
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# 2 ALL MEERSTETTER PRODUCTS

## 2.1 Meerstetter Engineering's Product Compatibility

The Laser Diode Drivers and TEC Controllers from Meerstetter have been developed to work along with each other. They share the same platform bus, communication protocol and hardware architecture. See the following table for an overview of the Laser Diode Drivers and TEC Controllers from Meerstetter Engineering:

| Model | Output | Description |
|---|---|---|
| **Laser Diode Drivers** | | |
| LDD-1321 | 0-1.5 A / 0-14 V | CW, Add on TEC Controller available |
| LDD-1301 | 0-20 A / 0.5-45 V | 1 ms - CW |
| LDD-1303 | 0-20 A / 1-120 V | 1 ms - CW |
| LDD-1137 | 0-75 A / 0-70 V | 0.5 $\mu$s - CW, modulated, QCW and pulsed modes |
| LDD-1124-SV | 0-1.5 A / 0-15 V | 1 $\mu$s - CW, modulated, QCW and pulsed modes |
| LDD-1121-SV | 0-15 A / 0-15 V | 1 $\mu$s - CW, modulated, QCW and pulsed modes |
| LDD-1125-HV | 0-30 A / 0-27 V | 1 $\mu$s - CW, modulated, QCW and pulsed modes |
| **TEC Controllers** | | |
| TEC-1092 | ±1.2 A / ±9.6 V | Micro, single channel |
| TEC-1091 | ±4 A / ±21 V | Small, single channel |
| TEC-1089-SV | ±10 A / ±21 V | Medium, single channel |
| TEC-1162 | ±5 A / ±56 V | Medium-high, single channel |
| TEC-1090-HV | ±16 A / ±30 V | Large, single channel |
| TEC-1163 | ±25 A / ±56 V | Extra-large, single channel |
| TEC-1161-4A | 2 x (±4 A / ±21 V) | Small, dual channel |
| TEC-1161-10A | 2 x (±10 A / ±21 V) | Medium, dual channel |
| TEC-1122-SV | 2 x (±10 A / ±21 V) | Medium, dual channel |
| TEC-1166 | 2 x (±5 A / ±56 V) | Medium-high, dual channel |
| TEC-1123-HV | 2 x (±16 A / ±30 V) | Large, dual channel |
| TEC-1167 | 2 x (±25 A / ±56 V) | Extra-large, dual channel |

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# 3 CHANGE HISTORY

| Date of change | Version | Changed/Approved | HW-Version |
|---|---|---|---|
| 14 October 2024 | G | XF / ML | v1.20 / v1.21 |
| **Change/Reason** | | | |
| • Add: Measurement Inputs freely assignable<br>• Add: Bipolar channels can be split into unipolar<br>• Add: Unipolar voltage/current specs updated<br>• Add: Max Input Current (IIN) added<br>• Del: “Important note” about GPIO 9/10 removed | | | |
| 16 November 2024 | G | XF / ML | v1.20 / v1.21 |
| **Change/Reason** | | | |
| • Add: Measurement Inputs freely assignable<br>• Add: Bipolar channels can be split into unipolar<br>• Add: Unipolar voltage/current specs updated<br>• Add: Max Input Current (IIN) added<br>• Del: “Important note” about GPIO 9/10 removed | | | |

# 4 HOW TO USE THIS TEMPLATE

## 4.1 Structure

The template has few folders:

- **./templates**: which stores the **.cls** file (configuration and packages)
- **./templates/logos**: which stores the logo and template pictures
- **./content**: which stores the .tex files—they are loaded in the main .tex file (called **datasheets.tex**)
- **./figures**: which stores the Figures used in text.

It is worth to mention that the content of **FrontPage** and **Table of Contents** were automated. Said that, the information to be placed on FrontPage can be typed in preamble once. Moreover, the content of sections (e.g., Ordering and Configuration, Change History, ME Products, etc.) are typed in separated **.tex** files. Then, they are loaded in the main **.tex** file by using the **input** command. Based on this, the document environment would be as follows:

```
\begin{document}

% Ordering and Config.
\input{contents/OrderingConfig}
% All Meerstetter Products
\input{contents/MeerstetterProducts}
% Change History
\input{contents/ChangeHistory}
% Usage
\input{contents/HowToUse}

\end{document}
```

## 4.2 Preamble variables

Some information can be typed in preamble so that LaTeX handle their position over the document. They are:

- Device Code (e.g., *TEC-1161*)
- Device Version (e.g., *HW v1.20*)
- Subtitle
- Document Number (the footer information)
- ProductPicture
- ProductDiagram
- Description text
- Highlights text
- RelatedProducts text

Hence, their definition occurs after the **documentclass** command, as follows:

```
%  documentclass...
% -------- Product Details:
\DeviceCode{TEC-1161}
\DeviceVersion{HW v1.20}
\Subtitle{Hardware Version 1.20}
\DocumentNumber{5231G}
```

```
\ProductPicture{Picture}
\ProductDiagram{Diagram}
% -------- Product Description:
\Description{
Product description goes here...
}
% -------- Highlights text:
\Highlights{
    \item \textbf{Output Stage:} $\pm$4 A / $\pm$10 A, $\pm$21 V
    \item \textbf{Input Voltage:} DC 5 - 24 V
    \item Precision $<$ 0.01°C stability
    \item Digital PID control with auto-tuning
    \item and so forth...
}
%
% -------- Related Products:
\RelatedProducts{
  \href{}{} hyperlinked product & $\pm$4 A / $\pm$21 V & 1 & Small, single channel \\ \hline
  \href{}{} hyperlinked product & $\pm$4 A / $\pm$21 V & 1 & Small, single channel \\ \hline
  \href{}{} hyperlinked product & $\pm$4 A / $\pm$21 V & 1 & Small, single channel \\
}
```

## 4.3 Tables

Tables can be produced by tools like **LaTeX Tables Generator**. The difference is that we need to set up the **[!ht]** next to the "*table*" environment. Moreover, there is the usage of the **header** command on the first line of tabular content. The "*highlight*" command can be used in the headers. It follows an example.

| Header1 | Header2 | Header3 |
|---|---|---|
| i11 | i12 | i13 |
| i21 | i22 | i23 |
| i31 | i32 | i33 |

That output is produced by:

```
\begin{ctable}{|Y|Y|Y|}
    Header1 & Header2 & Header3 \\ \hline
    i11 & i12 & i13 \\ \hline
    i21 & i22 & i23 \\ \hline
    i31 & i32 & i33 \\ \hline
\end{ctable}
```

If needed, a specified measure for each column could be used:

| Command | Description |
|---|---|
| m{measure} | left-aligned and vertical centered cell |
| C{measure} | centered cell (with specific measure) |
| L{measure} | left-aligned cell (with specific measure) |
| R{measure} | right-aligned cell (with specific measure) |

This output could be produced by the code below — note that the option of **60% of text width** was used in this example:

```
\begin{ctable}[0.7\textwidth]{|Y|Y|}
    Command & Description \\ \hline
    m\{measure\} & left-aligned and vertical centered cell \\ \hline
    C\{measure\} & centered cell (with specific measure) \\ \hline
    L\{measure\} & left-aligned cell (with specific measure) \\ \hline
    R\{measure\} & right-aligned cell (with specific measure) \\ \hline
\end{ctable}
```

**Observation:** at least one column must be set up as ”X” (it fill the text width without changing font size) or ”Y” (centered and textwidth-based).

## 4.4 Figures

Figures could be inserted via **figure** environment and/or **includegraphics** command. It follows an example below.

```
\begin{figure}
    \centering
    \includegraphics[width=0.45\linewidth]{figures/efficiency.png}
    \caption{Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed}
    \label{fig:efficiency}
\end{figure}
```

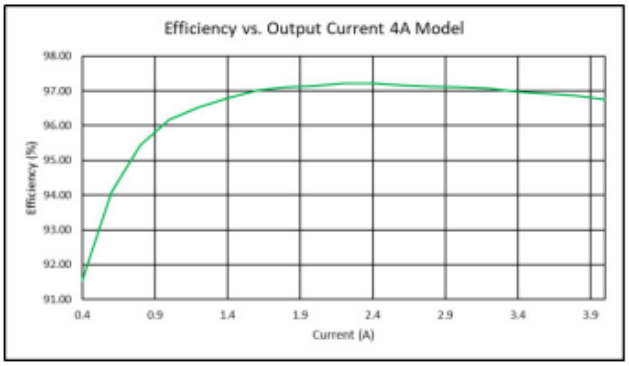


Figure 1: Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed

## 4.5 The MEcompanyinfo command

This command produces the final text block of page 3 (included in this materiall). It is usage is as follows:

```
\MEcompanyinfo
```

## 4.6 Change History

The first **ChangeHistory** command should inform the header. The remaining ones does not need it. So that the usage is as follows:

```
% First Change
\ChangeHistory[
Date of change & Version & Changed/Approved & HW-Version
]
{14 October 2024}
{G}
{XF / ML}
{
Add: Measurement Inputs freely assignable\\
Add: Bipolar channels can be split into unipolar\\
Add: Unipolar voltage/current specs updated\\
Add: Max Input Current (IIN) added\\
Del: ``Important note'' about GPIO 9/10 removed
}
% Second Change
\fixspace\ChangeHistory
{16 November 2024}
{G}
{XF / ML}
{
Add: Measurement Inputs freely assignable\\
Add: Bipolar channels can be split into unipolar\\
Add: Unipolar voltage/current specs updated\\
Add: Max Input Current (IIN) added\\
Del: ``Important note'' about GPIO 9/10 removed
}
```

If a new page is needed, the command **newpage** could be used and the process will be repeated.

## 4.7 Doubts / issues

Doubts or any issues could be reported via oviedo.vinicius@gmail.com.