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TCI-1181

Hardware Version v1.20

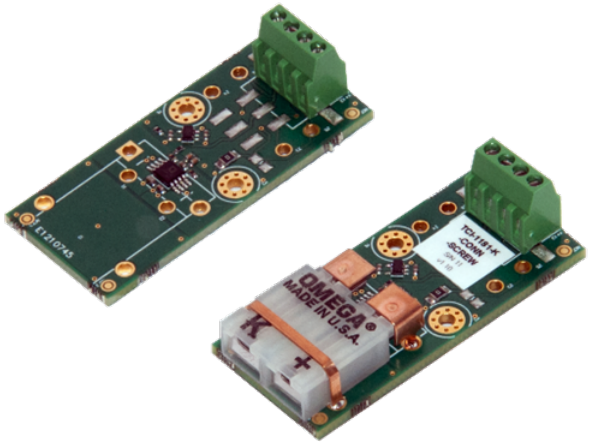
The TCI-1181 is a very small thermocouple readout circuit, which amplifies and linearizes the thermocouple output. It is designed to work in conjunction with our TEC Controllers products configured with a -VIN1 input, thus extending the palette of sensor types available.

HIGHLIGHTS

- Easy to use, minimal setup required.
- Provides a way to easily interface our TEC Controllers with thermocouple sensors for many typical applications.
- Dimensions: 45.1 × 20 × 8.67 mm
- Compatible with all -VIN1 controllers.
- Power supply is provided by the -VIN1 configuration of the TEC Controller, resulting in a very compact setup.
- Only a few software settings need to be adapted.

Applications:

- Interfacing thermocouple sensors with Meerstetter TEC Controllers configured with -VIN1 input.
- Analog readout of thermocouple sensors.
- **Please contact us for additional information or customization.**



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	Type	Matching Product	Description
TEC Controllers	Device	All	TEC controller, can use the TCI-1181
CAB-6155	Cable	TEC-1122, TEC-1123	6 pol sensor cable
CAB-6154	Cable	TEC-1089, TEC-1090, LDD-130x	6 pol sensor cable

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

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TABLE OF CONTENTS

1 SPECIFICATIONS

1.1 Absolute Maximum Ratings [1]

		Min	Max	Unit
Voltage	$U_{IN, DC}$		5.5	V

1 Operation at or beyond the absolute maximum ratings may result in permanent device damage. These limits are stress ratings only and functional operation of the device at these conditions is not guaranteed. Prolonged exposure to absolute maximum conditions can adversely affect long-term reliability and should be avoided during normal operation.

1.2 Operating Characteristics

		Min	Max	Unit
Temperature	T_{OP}	0	50	°C
Humidity	RH_{OP}, non-condensing	5	95	%

1.3 Electrical Characteristics

Unless otherwise noted: T_A = 25 °C, U_{IN} = 5 V

Symbol	Parameter	Test Conditions / Hints	Min	Typ	Max	Unit
DC Power Supply Input:						
U_{PWR}	Supply voltage	Single supply	2.7		5.5	V
Thermocouple Input:						
U_{TC}	Voltage Range		–0.2		U_{PWR} – 1.6	V
Output:						
U_{out}	Voltage Range		0.025		U_{PWR} – 0.1	V

1.4 Temperature Measurement Characteristics (-K option)

Range specifications valid with isolated TC only. T_{MJ} = temperature at the measurement junction. Actual accuracy can be greatly improved by one-point calibration.

Symbol	Parameter	Test Conditions / Hints	Min	Typ	Max	Unit
	Operating Temperature	For specified performance	0		50	°C
	Measurable Temperature	U_{PWR} = 4.5 V	–195		700	°C
	Ambient Temperature Rejection	0–50 °C			0.05	°C
	Temperature Offset/Initial Accuracy	<3 °C by design (excl. sensor's offset), all junctions at 25 °C			3	°C
	Linearization Error	T_{MJ} = 0 °C…40 °C			±0.4	°C
	Linearization Error	T_{MJ} = –25 °C … 400 °C			±2	°C
G_{err}	Gain Error	Error = $G_{err} \times (T_{MJ} - 25\ °C)$			0.3 %	°C/°C
$CnvF_{nom}$	Nominal Conversion Factor	$U_{out} = T_{MJ} \times CnvF_{nom}$		5		mV/°C

Ranges when used in combination with TEC Controllers (voltage input configuration):

TEC Model	ADC Supply (AVDD)	Min	Max	Unit
TEC-1089	3.3 V	–195	320	°C
TEC-1090				
TEC-1091 HW v1.80				
TEC-1122				
TEC-1123				
TEC-1091 HW v3.15	5 V	–195	400	°C
TEC-1092				
TEC-1161				

Characteristics when used in combination with TEC Controllers:

Symbol	Parameter	Test Conditions / Hints	Min	Typ	Max	Unit
$T_{OBJ,NOISE}$	Peak-to-Peak Noise	Example measurement with ADS1220, 400 mm cable to TCI-1181-K, 1500 mm cable to junction.		0.014		K

1.5 Temperature Measurement Characteristics (-KH option)

Note: temperature ranges are nominal, the linearization error grows greatly beyond 400 °C. Calibration at the desired setpoint for a limited range might be needed for reasonable accuracy.
Range specifications valid with isolated TC only. T_{MJ} = temperature at the measurement junction.

Symbol	Parameter	Test Conditions / Hints	Min	Typ	Max	Unit
	Operating Temperature	For specified performance; beyond this temperature the linearization error is not specified	0		50	°C
	Measurable Temperature	U_{PWR} = 4.7 V	5		920	°C
	Ambient Temperature Rejection	0 – 50 °C			0.05	°C
	Temperature Offset/Initial Accuracy	< 3 °C by design (excl. sensor's offset), all junctions at 25 °C; actual accuracy can be greatly improved by one-point calibration			3	°C
	Linearization Error	T_{MJ} = 0 °C … 40 °C			±0.4	°C
	Linearization Error	T_{MJ} = –25 °C … 400 °C			±2	°C
G_{err}	Gain Error	Error = $G_{err} \times (T_{MJ} - 25\,°C)$			0.3%	°C/°C
G_{err2}	Additional Gain Error	Error = $G_{err} \times T_{MJ}$	0 %		1.13 %	°C/°C
$CnvF_{nom}$	Nominal Conversion Factor	Nominal differential output voltage $U_{out} = T_{MJ} \times CnvF_{nom}$		2.17105		mV/°C

Ranges when used in combination with TEC Controllers (voltage input configuration):

TEC Model	ADC Supply (AVDD)	Min	Max	Unit
TEC-1089	3.3 V	5	540	°C
TEC-1090				
TEC-1091 HW v1.80				
TEC-1122				
TEC-1123				
TEC-1091 HW v3.15	5 V	5	760	°C
TEC-1092				
TEC-1161				

2 FUNCTIONAL DESCRIPTION

The device provides a nominally linear temperature-to-voltage conversion, by linearizing the TC curve. The linearization is optimized for a limited measurement range. This allows to connect K-type TC sensors to TEC Controllers with a -VIN1 configuration, by setting the appropriate voltage-to-temperature conversion factor (nominal conversion factor in the table, in V/°C) and offset (0 if no calibration data is available) in the TEC Controller.

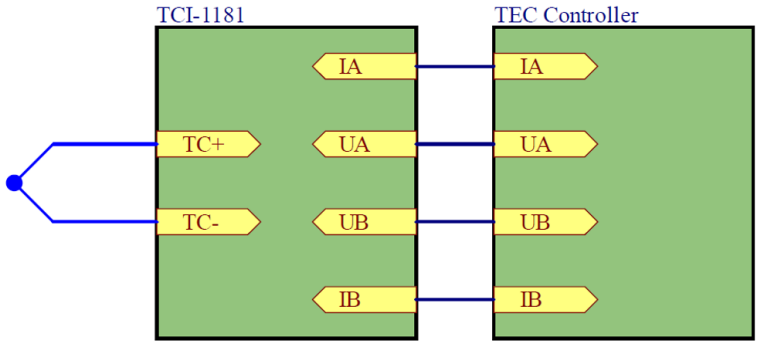


Figure 1: Typical application.

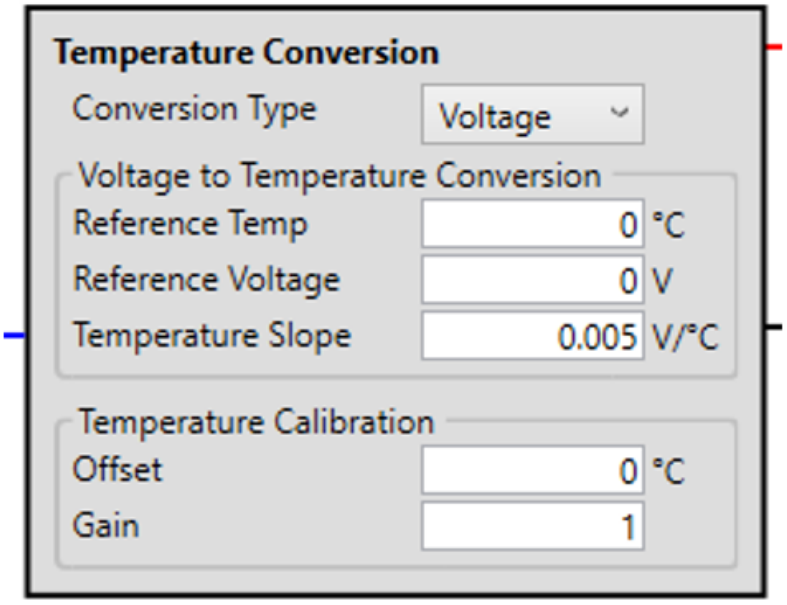
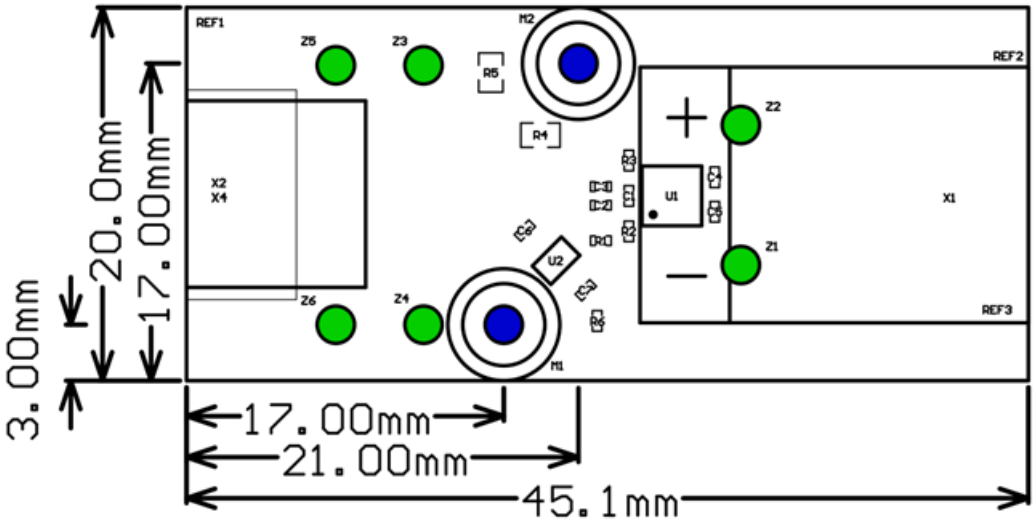


Figure 2: Example settings with K-type of the device and a K-type thermocouple, with no calibration applied.

3 INTERFACE AND CONNECTORS

3.1 Pin Configuration and Mechanical Data

Top view of the board.



- The PCB can be mounted with the mounting holes (shown in blue, distances shown in picture) with M2 screws and spacers. The bottom of the board has no components.
- X1 Thermocouple connector (optional): Omega PCC-SMP-K Miniature Thermocouple Connector, mates with common thermocouples;
  No Connector version: solder the negative terminal to hole Z1 and the positive terminal to hole Z2.
- X4 Device connector: screw header. Alternate connector available on request.

Pinout (pin 1 is at the bottom in the above picture):

Hole	Pin Name	Function	Connect to TEC Controller Pin
4	TOIA	Positive Supply	IA
3	TOIB	GND	IB
2	TOUA	Positive Output Terminal	UA
1	TOUB	Negative Output Terminal	UB

Direct wire soldering (compatible with connectors):

Hole	Pin Name	Function	Connect to TEC Controller Pin
Z3	TOIA	Positive Supply	IA
Z4	TOIB	GND	IB
Z5	TOUA	Positive Output Terminal	UA
Z6	TOUB	Negative Output Terminal	UB

4 ALL MEERSTETTER ENGINEERING PRODUCTS

4.1 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	1 ms – CW
LDD-1124		0–1.5 A / 0–15 V	CW, modulated modes
LDD-1121		0–15 A / 0–15 V	1 µs – CW, modulated, QCW and pulsed modes
LDD-1125		0–30 A / 0–27 V	1 µs – CW, modulated, QCW and pulsed modes
TEC Controllers			
Single-Channel Models	TEC-1092	±1.2 A / ±9.6 V	Micro
	TEC-1091	±4 A / ±21 V	Small
	TEC-1089	±10 A / ±21 V	Medium
	TEC-1162	±5 A / ±56 V	Medium-high
	TEC-1090	±16 A / ±30 V	Large
	TEC-1163	±25 A / ±56 V	Extra-large
Dual-Channel Models	TEC-1161-4A	2 x (±4 A / ±21 V)	Small
	TEC-1161-10A	2 x (±10 A / ±21 V)	Medium
	TEC-1122	2 x (±10 A / ±21 V)	Medium
	TEC-1166	2 x (±5 A / ±56 V)	Medium-high
	TEC-1123	2 x (±16 A / ±30 V)	Large
	TEC-1167	2 x (±25 A / ±56 V)	Extra-large

5 ORDERING AND CONFIGURATION

5.1 TCI-1181 Ordering Information & Configuration

Example Configuration:
TCI-1181 (K, MC, SCREW)

Variant Name	Requirement	Description	Options / Single choice
Thermocouple Range Type	**Required**	**Select temperature sensor type/range.**	**K, KH**
Thermocouple Connector [1]	**Required**	**Select connector type.**	**MC, NC**
Terminal Configuration [1]	**Required**	**Select board connector type.**	**SCREW, NC**
Customer Specific Modifications	Advanced	Usually hardware modifications, available only on demand and quote.	Empty, or example: CS3
Hardware Version	-	For reference, specifies the hardware version (latest by default, subject to future change).	Example: HW1.20

1 See also Chapter 3.1: Pin Configuration and Mechanical Data

5.2 Ordering Confirmation Example

TCI-1181 (K, NC, SCREW, HW1.20)

String can additionally contain:
Profile: Default

6 CHANGE HISTORY

Date of change	Version	Changed / Approved	HW Version
April 17, 2026	D	RS / NJ	v1.20
Change / Reason • Add: settings information for TEC Configuration Software • Mod: Renew template • Mod: Update order string format • Add: Change history			

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