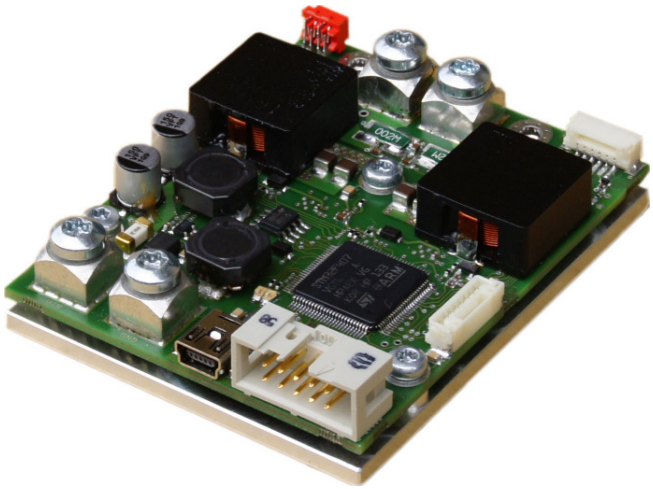
Thermo Electric Cooling Temperature Controller

TEC Controller / Peltier Driver ±10 A / ±19 V

TEC-1089D

OEM Precision TEC Controller



Features

DC Input Voltage:	12 – 24 V nominal
TEC Controller / Driver:	Autonomous Operation
Output Current:	0 to ±10 A, <1% Ripple
Output Voltage:	0 to ±19 V (max. V_{IN} - 3.5 V)
Temp. Sensor Types:	Pt100, Pt1000, NTC
Temperature Precision:	<0.01 °C
Temperature Stability:	<0.01 °C
Thermal Power Control:	PID, Performance-optimized
Configuration / Diagnosis:	via USB / RS485 (Software)
Dimensions (L x W x H):	75 mm x 60 mm x 18 mm
Efficiency:	>90% (@ >50% Load)
Cooling:	over Base Plate

Advanced Operation

Operation Modes:	
- Stand-Alone	w/o Live Control Interface
- Remotely-Controlled	USB; RS485; RS422; I/O
- Script-Controlled	Lookup Table Read-Out
Driver Modes:	
- Power Supply	Current / Voltage Settings
- Temperature Control	Temperature / PID Settings
- Heat Only / Cool Only	only Pos. or Neg. Currents
- Master/Slave (2 paired TEC-1089 devices)	One Temp. Controller for Two Current Drivers (up to ±20 A / ±19 V)
Control Interfaces:	Isolated USB 2.0, 2x RS485 / RS422 4x Digital I/O (3.3 V / 5 V)
Aux. Temp. Sensor Type:	NTC (on Heat Sink Peltier)

Further Information

Please contact us for additional information, or consult the current TEC Controller User Manual (Document 5134).

General Description

The TEC-1089 is a specialized TEC controller / power supply able to precision-drive Peltier elements.

It features a true bipolar current source for cooling / heating, two temperature monitoring inputs (1x high precision, 1x auxiliary) and intelligent PID control with auto tuning. The TEC-1089 is fully digitally controlled, its hard- and firmware offer various communication and safety options.

The included PC-Software allows configuration, control, monitoring and live diagnosis of the TEC controller via USB and RS485. All parameters are saved in non-volatile memory.

For the most straightforward applications, only a power supply, a Peltier element and one temperature sensor need to be connected to the TEC-1089. After power-up the unit will operate according to pre-configured values. (In stand-alone mode no control interface is needed.)

The TEC-1089 can handle Pt100, Pt1000 or NTC temperature probes. For highest precision and stability applications a Pt1000 / 4-wire input configuration is recommended. (Temperature acquisition circuitry of each individual device is factory-calibrated to ensure optimal accuracy and repeatability.)

An auxiliary temperature input allows the connection of an NTC probe that is located on the heat sink of the Peltier element. This additional data is used to compensate for parasitic thermal conduction of Peltier elements.

The heating and cooling power is optimized by proprietary thermal management routines based on power balance models (for Peltier elements and resistive heaters).

TEC-1089s function either autonomously (stand-alone) or remotely controlled. Two devices can be linked together to operate in master/slave fashion and to deliver twice the current.

Further functionality includes: smooth temperature ramping, thermal stability indication, auto gain (NTC probes) and residual current detection. The PC-Software allows data logging and configuration import/export.

Some features of this OEM product are customizable: temperature measurement ranges, digital lines for control, diagnosis and communication protocols, etc.

The TEC-1089 is part of the TEC-Family of Meerstetter TEC controllers, which are designed to operate alongside devices of the LDD-Family of laser diode drivers. Both families of drivers share the same system bus protocol, design and technology.

Applications

Optics (Laser Diodes, Crystals, …)

Electronics (Detectors, RF References, …)

Instrumentation (Microscopy, Materials, Biochemistry, …)

Document Number: 5133E (10 January 2013)

Absolute Maximum Ratings	
Supply voltage (DC)	26.5 V
Supply current (DC)	10 A
Bipolar output voltage	±19 V
Bipolar output current	±10 A

Operating Ratings	
System base plate	< 50°C
Operation temperature	0 – 60°C
Storage	-30 – 70°C
Humidity	5 – 95%, non-condensing

Electrical Characteristics

Unless otherwise noted: T_A = 25°C, V_{IN} = 24 V, R_{load} = 1.75 Ω

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
DC Power Supply Input:						
V_{IN}	Supply voltage		11.5	24	26.5	V
V_{IN} Ripple	Ripple tolerance				300	mV_{PP}
Output:						
I_{OUT}	Bipolar current swing				±10	A
V_{OUT}	Bipolar voltage swing	V_{IN} at least 3.5 V greater than V_{OUT}		±15	±19	V
V_{OUT} Ripple	Voltage ripple	@ 10 A		90		mV_{PP}
System Characteristics:						
$\eta_{50\%}$	Power efficiency	@ 50% load		91		%
$\eta_{90\%}$	Power efficiency	@ 90% load		92		%
Output Monitoring:						
I_{OUT} Read	Precision	@ 0 A, 5.0 A, 10.0 A		100		mA
V_{OUT} Read	Precision	@ 0 V, 7.5 V, 15.0 V		50		mV

Temperature Monitoring Characteristics

T_A = 25°C, object measurement configuration = 23bit / 4-wire, object °T probe = Pt100, sink °T probe = NTC $B_{25/100}$ 3988K R_{25} 10k

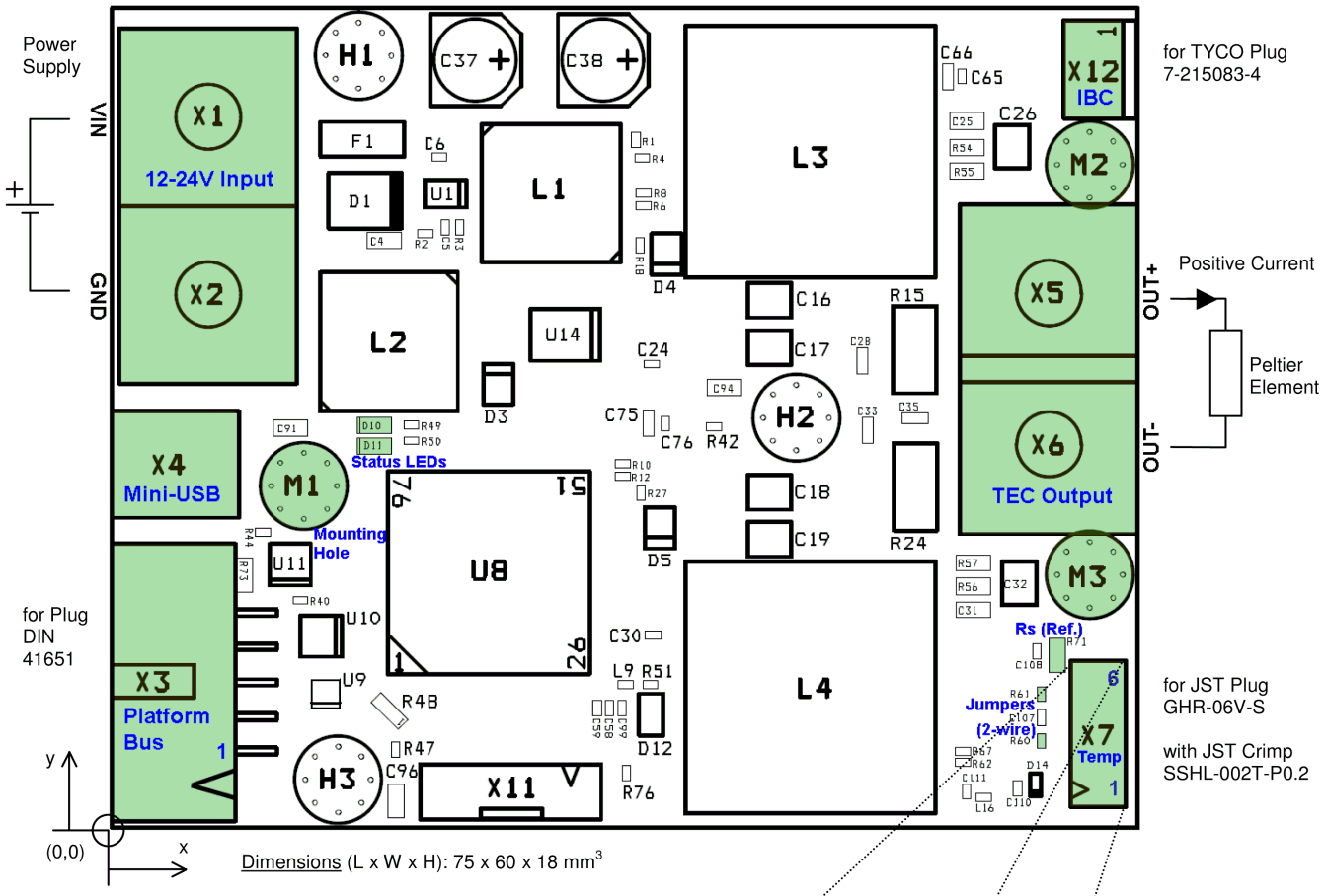
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Temperature Monitoring Range (Standard):						
T_{OBJ}	°T on object side	NTC $B_{25/100}$ 3988K [Higher °T Config, default]	+13		+150	°C
		NTC $B_{25/100}$ 3988K [Lower °T Config, upon request]	-9		+110	°C
		Pt100	-50		+200	°C
		Pt1000	-50		+200	°C
T_{SINK}	°T on heat sink side	NTC $B_{25/100}$ 3988K	-6		+150	°C
Temperature Monitoring Precision:						
T_{OBJ}	°T on object side	Fluctuation of reference measurement during power-supply operation @70% load		0.001	0.01	°C
T_{SINK}	°T on heat sink side			0.05	0.1	°C
Long-term Temperature Monitoring Repeatability:						
T_{OBJ}	°T on object side	Repeated measurements of reference resistors after up to 3 days		0.002		°C
T_{SINK}	°T on heat sink side			0.1		°C

Safety Characteristics

Unless otherwise noted: T_A = 25°C, V_{IN} = 24 V, R_{load} = 1.75 Ω

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Overvoltage and Reverse Polarity Protection:						
V_{IN} Trans.	Transients			28.2		V
V_{IN} Pol.	Polarity	built-in			-26.5	V
Protection Delays:						
t_{OFF} Short circuit		Full load condition		10	30	µs
t_{OFF} Power system limits		Current and voltage limits			200	µs
t_{OFF} System failure		System status or temperature faults		100		ms
t_{IMMUN} Immunity to transient noise		Duration of noise on temperature monitors	300			ms

Package Outline and Pin Configuration



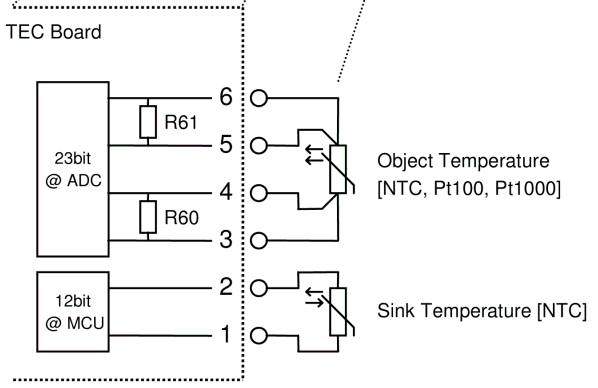
Dimensions (L x W x H): 75 x 60 x 18 mm^3

Mounting (M3-size Threads):
M1: x = 14.0 mm, y = 25.0 mm
M2: x = 71.5 mm, y = 48.5 mm
M3: x = 71.5 mm, y = 18.5 mm

Power Terminals: M4-size Screws

Pin Descriptions Platform Bus X3:

1:	24V (optional)	
2:	GND (fused, PTC)	
3:	RS485_A1	[*R72 = Termination (120Ω), N.A.]
4:	RS485_B1	*(*R72 not accessible from top)*
5:	RS485_A2	[R73 = Termination (120Ω), N.A.]
6:	RS485_B2	
7:	RES1	
8:	RES2	
9:	RES3	
10:	RES4	



R60, R61 = Jumpers (0Ω)
R71 = Rs (Shunt / Reference)

Peltier element, temperature probes, power supply and connectors not included.

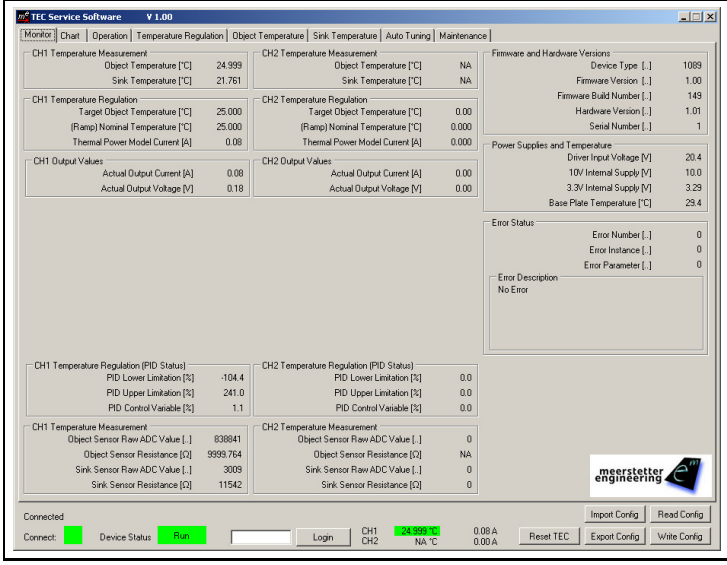
Operation-Modes and Communication Options

The TEC-1089 is an OEM precision TEC controller that is primarily designed to operate as a stand-alone device. Once configured and in operation, its basic status is visually indicated by on-board green and red LEDs and their blinking pattern. More detailed status information can be polled at any time by industry-standard RS485 connection or by USB (see box below). The TEC-1089 can also operate in a remotely-controlled manner, with parameters adjusted on the fly. The latest firmware upgrade introduced scripting capability by sequential lookup table read-out.

Configured as a power-supply, the TEC-1089 can handle current and voltage settings. In the remote-control case, temperature data may be passed on to be processed by the host.
Also, two TEC-1089 devices can be linked to operate in a 'Master/Slave' mode to double the output current.

Configurable parameters further include: sensor linearisation (PTC) and Steinhart-Hart modeling (NTC), temperature acquisition hardware calibration, Peltier element modeling, PID controller auto tuning, nominal temperature ramping, current, voltage and temperature limits, error thresholds, residual current detection, etc.
Please refer to the TEC Controller User Manual (Document 5134) for further information.

TEC Service Software



The included service software is a powerful tool that allows monitoring, data logging and full configuration of the TEC-1089 via a standard USB or an RS485 connection from a PC running Windows.
This tool is ideal for laboratory setups, product evaluation and commissioning. In conjunction with the comprehensive set of error codes and built-in descriptions, it facilitates diagnosis and debugging. The software also supplies a user-friendly interface for maintenance (*e.g.* firmware upgrades), device calibration and basic data logging.
Please refer to the user manual for more information on features and system requirements.

(Please note that the present service software is a tool that has been programmed by Meerstetter Engineering for internal use. It is being made available to customers 'as is'.)

TEC-1089 Ordering Information, Hardware Configuration

Part number*	Object °T Configuration	Object °T Sensor	Sink °T Sensor
TEC-1089	23bit, 4-wire	Pt100	NTC 3988 10k
TEC-1089	……..	……..	……..

** Line 1: Example Configuration, Please specify sensor types and configuration when ordering.*

Object temperature measurement high resolution input can be hardware-set to either 2- or 4-wire configuration.
Object temperature sensor [not supplied] can be either Pt100, Pt1000, or NTC. Please refer to the user manual for pre-set temperature range and default sensor type.
Sink temperature measurement 12bit input can cater for NTC sensors, or it can be omitted (budget version).
Please indicate temperature range and exact sensor type if different from standard.

Further customization can include digital lines for control or diagnosis and communication protocols. Please contact Meerstetter Engineering GmbH with your inquiry.

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