IPETRONIK

M-THERMO 96

96-channel universal thermocouple inputs type B, C, E, J, K, N, R, S, T

- Cold junction compensation per channel
- Status LED at each measurement channel
- Measurement data output to Ethernet
- Galvanic isolation (inputs, CAN, supply, enclosure)
- Compliant to requirements of the aerospace industry
- Ruggedized modules for harsh environments
- Cable relief

General channel properties	
Special functions	Sensor breakage detection (activation via software setting)
AD converter	24 bit (Sigma/Delta)
Channel sampling rates	1/ 2/ 5/ 10/ min -- 1/ 2/ 5/ 10/ 20/ 50/ 100 Hz
Aggregate sample rate	9600 Hz
Hardware filter (fixed)	11 Hz, filter type RC low pass
Channel impedance	15.0 MΩ
Channel LED	Channel LED is flashing during configuration Sensor break detection
Channel temperature	
Measurement range temperature	Type R (Pt13Rh/Pt) -50 … 1700 °C (-58 … 3092 °F) Type J (Fe/CuNi) -180 … 750 °C (-292 … 1352 °F) Type S (Pt10Rh/Pt) -50 … 1750 °C (-58 … 3182 °F) Type N (NiCrSi/NiSi) -270 … 1300 °C (-454 … 2372 °F) Type E (NiCr/CuNi) -200 … 900 °C (-328 … 1652 °F) Type K (NiCr/NiAl) -200 … 1300 °C (-328 … 2372 °F) Type T (Cu/CuNi) -250 … 400 °C (-418 … 752 °F) Type B (PtRh30/PtRh6) 0 ... 1820 °C (32 ... 3308 °F) Type C (W5Re/W26Re) 0 ... 2320 °C (32 ... 4208 °F)
Linearization of sensor characteristic line	Numerical interpolated
Cold junction compensation (CJC)	PT100 for each channel
Measurement range thermo voltage	±78125µV
Cold junction measurement range	0 ... 167.8 Ω
Total error thermocouple type E	
Ambient temperature -40 °C	@TInput= 0 °C / 700 °C (±0.183 K / ±0.214 K)
Ambient temperature 5 °C	@TInput= 0 °C / 700 °C (±0.145 K / ±0.225 K)
Ambient temperature 25 °C	@TInput= 0 °C / 700 °C (±0.129 K / ±0.161 K)
Ambient temperature 45 °C	@TInput= 0 °C / 700 °C (±0.170 K / ±0.251 K)
Ambient temperature 85 °C	@TInput= 0 °C / 700 °C (±0.204 K / ±0.235 K)
Total error thermocouple type J	

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Ambient temperature -40 °C	@TInput= 0 °C / 600 °C (±0.191 K / ±0.220 K)
Ambient temperature 5 °C	@TInput= 0 °C / 600 °C (±0.154 K / ±0.226 K)
Ambient temperature 25 °C	@TInput= 0 °C / 600 °C (±0.137 K / ±0.167 K)
Ambient temperature 45 °C	@TInput= 0 °C / 600 °C (±0.180 K / ±0.252 K)
Ambient temperature 85 °C	@TInput= 0 °C / 600 °C (±0.212 K / ±0.241 K)
Total error thermocouple type K	
Ambient temperature -40 °C	@TInput= 0 °C / 800 °C (±0.206 K / ±0.257 K)
Ambient temperature 5 °C	@TInput= 0 °C / 800 °C (±0.173 K / ±0.287 K)
Ambient temperature 25 °C	@TInput= 0 °C / 800 °C (±0.153 K / ±0.203 K)
Ambient temperature 45 °C	@TInput= 0 °C / 800 °C (±0.199 K / ±0.313 K)
Ambient temperature 85 °C	@TInput= 0 °C / 800 °C (±0.227 K / ±0.278 K)
Total error thermocouple type N	
Ambient temperature -40 °C	@TInput= 0 °C / 800 °C (±0.243 K / ±0.254 K)
Ambient temperature 5 °C	@TInput= 0 °C / 800 °C (±0.219 K / ±0.278 K)
Ambient temperature 25 °C	@TInput= 0 °C / 800 °C (±0.190 K / ±0.201 K)
Ambient temperature 45 °C	@TInput= 0 °C / 800 °C (±0.245 K / ±0.304 K)
Ambient temperature 85 °C	@TInput= 0 °C / 800 °C (±0.264 K / ±0.275 K)
Total error thermocouple type R	
Ambient temperature -40 °C	@TInput= 0 °C / 1300 °C (±0.664 K / ±0.403 K)
Ambient temperature 5 °C	@TInput= 0 °C / 1300 °C (±0.738 K / ±0.481 K)
Ambient temperature 25 °C	@TInput= 0 °C / 1300 °C (±0.611 K / ±0.349 K)
Ambient temperature 45 °C	@TInput= 0 °C / 1300 °C (±0.763 K / ±0.507 K)
Ambient temperature 85 °C	@TInput= 0 °C / 1300 °C (±0.685 K / ±0.424 K)
Total error thermocouple type S	
Ambient temperature -40 °C	@TInput= 0 °C / 1300 °C (±0.653 K / ±0.438 K)
Ambient temperature 5 °C	@TInput= 0 °C / 1300 °C (±0.724 K / ±0.527 K)
Ambient temperature 25 °C	@TInput= 0 °C / 1300 °C (±0.600 K / ±0.384 K)
Ambient temperature 45 °C	@TInput= 0 °C / 1300 °C (±0.750 K / ±0.553 K)
Ambient temperature 85 °C	@TInput= 0 °C / 1300 °C (±0.674 K / ±0.459 K)
Total error thermocouple type T	
Ambient temperature -40 °C	@TInput= 0 °C / 300 °C (±0.200 K / ±0.200 K)
Ambient temperature 5 °C	@TInput= 0 °C / 300 °C (±0.175 K / ±0.182 K)
Ambient temperature 25 °C	@TInput= 0 °C / 300 °C (±0.154 K / ±0.147 K)

Ambient temperature 45 °C	@TInput= 0 °C / 300 °C (±0.201 K / ±0.208 K)
Ambient temperature 85 °C	@TInput= 0 °C / 300 °C (±0.228 K / ±0.221 K)
Total error thermocouple type B	
Ambient temperature -40 °C	@TInput= 600 °C / 1300 °C (±0.389 K / ±0.575 K)
Ambient temperature 5 °C	@TInput= 600 °C / 1300 °C (±0.507 K / ±0.710 K)
Ambient temperature 25 °C	@TInput= 600 °C / 1300 °C (±0.387 K / ±0.573 K)
Ambient temperature 45 °C	@TInput= 600 °C / 1300 °C (±0.533 K / ±0.735 K)
Ambient temperature 85 °C	@TInput= 600 °C / 1300 °C (±0.422 K / ±0.608 K)
Total error thermocouple type C	
Ambient temperature -40 °C	@TInput= 0 °C / 1700 °C (±0.291 K / ±0.417 K)
Ambient temperature 5 °C	@TInput= 0 °C / 1700 °C (±0.342 K / ±0.628 K)
Ambient temperature 25 °C	@TInput= 0 °C / 1700 °C (±0.290 K / ±0.415 K)
Ambient temperature 45 °C	@TInput= 0 °C / 1700 °C (±0.368 K / ±0.654 K)
Ambient temperature 85 °C	@TInput= 0 °C / 1700 °C (±0.325 K / ±0.450 K)
Total error PT100 input	
Ambient temperature -40 °C	± 30.79 mΩ
Ambient temperature 5 °C	± 18.53 mΩ
Ambient temperature 25 °C	± 13.10 mΩ
Ambient temperature 45 °C	± 20.74 mΩ
Ambient temperature 85 °C	± 30.20 mΩ
Total error thermovoltage	
Ambient temperature -40 °C	@0 mV / 30mV (± 2.8 µV / 4.8 µV)
Ambient temperature 5 °C	@0 mV / 30mV (± 3.5 µV / 7.8 µV)
Ambient temperature 25 °C	@0 mV / 30mV (± 2.8 µV / 4.8 µV)
Ambient temperature 45 °C	@0 mV / 30mV (± 3.5 µV / 7.8 µV)
Ambient temperature 85 °C	@0 mV / 30mV (± 2.8 µV / 4.8 µV)
Galvanic isolation	
Input ↔ module power supply	±100 V (indefinitely), ±500 V (pulse voltage)
Input ↔ CAN	±100 V (indefinitely), ±500 V (pulse voltage)
Input ↔ enclosure	±100 V (indefinitely), ±500 V (pulse voltage)
Input ↔ input	±100 V (indefinitely), ±500 V (pulse voltage)
Device	
Inputs	96

Maximum input protection voltage (channel)	±25 V (continuous), ±50 V (1 min), ±200 V (short-time, t < 2 ms)
Voltage supply	9 … 36 VDC
Supply voltage thresholds	On 9 ±0.3 VDC / Off 9 ±0.3 VDC
Power consumption, typical	<29 W; <25 W (without IPEhub2)
Working temperature range	-40 … 85 °C (-40 … 185 °F)
IP-Code	IP6K6 according to DIN EN 60529: 2014-09-01 ISO 20653
Relative humidity	5 ... 95 %
Operating altitude (above sea level)	55.000 Fuß / 16.764 m
Dimensions	W 500 mm x H130 mm x D 476 mm (19.69 in x 5.12 in x 18.74 in)
Weight	19.6 kg (43.21 lb)
Configuration interface	Ethernet
Data transfer rate	100 Mbit Ethernet (IEEE 802.3)
Test standards	DIN EN 61326-1:2013 (EMV) RTCA DO-160G 2010-12-08 (Pulse & Vibration) IEC 61010-2-201 (safety requirements) MIL-STD-810G w/Change 1 (Sound pressure) IEC-EN 60584-2 (PD accuracy - based on voltage / PT100 accuracy) ISO 9001:2015
Pressure compensation	Available
Desiccant	Available
Calibration intervall	12 months
Housing material	Aluminum, gold anodized
Input sockets	Screw terminal
Status LED	Yes
Schutz gegen aggressive Flüssigkeiten	Hyjet IV Hydraulik-Flüssigkeit
Accessories	
System cable	620-233 M-THERMO 96 cable IPEhub2-CAN/PWR, PWR-banana

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