

PTE-2 Handheld Calibrator

STANDARD BASE UNIT FEATURES

- **Data logging**
- **IP65 / NEMA 4X enclosure**
- **Onboard 24Vdc loop power supply (non-intrinsically safe version)**
- **Optional intrinsically safe approvals (FM, ATEX, CSA)**
- **SD memory card slot**
- **USB interface**
- **13 Engineering units of measure**
- **Large back lit display**
- **180 Degree flip display**
- **Programmable damping**
- **Switch test function**
- **Percent error function**
- **Min/max recall**
- **Push-button zero adjust**
- **Tare function**
- **Hot swap capability**

The Heise PTE-2 calibrator is designed to measure pressure, temperature, voltage or current. It includes the capability to display up to two modules and one electrical measurement simultaneously, along with logging data to internal memory or communicating directly to a PC via USB connection.

The PTE-2 has a wide selection of pressure modules, covering ranges from 0.25 inches H₂O through 10,000 psi. The base unit design allows the user to operate one or two modules. Modules are interchangeable, and can be changed without the need of tools, minimizing downtime.

The PTE-2 provides a large LCD display for ease of reading measurements and configuring the calibrator.

The unique product platform also includes data logging; with internal storage capacity for up to 16,000 records on up to 64 data log files that can be transferred to an SD card.

A wide range of approvals including UL, FM, ATEX and CSA make the PTE-2 a popular choice worldwide.



large, bright
display for ease
of use



LOOK FOR THESE MARKS
ON OUR PRODUCTS

PTE-2 Handheld Calibrator

PTE-2 STANDARD FUNCTIONS

- **Data logging** allows the user to save pressure, temperature and or electronic values displayed on the LCD to internal memory. Internal memory can hold up to 64 data log files and a total of up to 16,000 individual records. Manual logging is initiated with a single key press. Automatic data logging can be programmed to collect data at timed intervals between 0.1 second and 24 hours.
- **SD Memory Card Slot** gives the PTE-2 additional data storage capability limited only by the capacity of the SD card installed. Data logs stored on the SD card are saved in .csv format which can be read by most spreadsheet programs. Data can easily be transferred from the PTE-2 to a PC.
- **Loop Power Supply** is a standard feature on non-I.S. units and allows the user to conveniently power the device under test with 24Vdc up to 35mA.
- **Percent Error Function** can be used when calibrating pressure transducers. Calculations are performed by the PTE-2 eliminating potential for human errors. This function enables the user to program the full scale range and electrical output of the transducer under test, and will display the actual pressure and electrical output readings as well as a percentage value comparing the actual output to the theoretical output.
- **Switch Test Function** allows the operator to calibrate and document the pressure switch function. The onboard display will show pressure switch trip point, reset point and will calculate switch deadband. All calculations are performed by the PTE-2 eliminating potential for human errors.
- **Dual Mode Function** allows the operator to add or subtract the measured pressure values from two installed Quick-Select™ pressure modules. This allows for measurement of “high-line” or elevated static differential pressures. This feature also offers the ability to add barometric pressure from an absolute pressure module to the measured pressure from a gauge pressure module, giving the user the ability to measure a variety of absolute pressures without using designated modules.

BASE UNIT SPECIFICATIONS

Heise Model:

PTE-2

Dimensions:

8.7 in. (L) x 5.1 in. (W) x 3.8 in. (H)

Unit Weight (no modules):

2.4 lbs

Case Material:

High-impact PC-ABS

Enclosure:

IP65 / NEMA 4X

Sensor Module Capacity:

Two bays for Heise HM2 sensor modules

LCD Display:

2.5" (W) x 1.5" (H); displays three (3) simultaneous measurements, bar graph, back light and flip-screen capability

Electrical Connection:

4mm banana jacks – 1 set of test leads included with each PTE-2

Loop Power Supply:

24Vdc-35mA maximum (non I.S. only)

Available Engineering Units:

psi, in.H2O, in.Hg, ftSW, bar, mbar, kPa, MPa, mmHg, cmH2O, mmH2O, kg/cm2, User Programmable

Operating Temperature Range:

–4 to 120°F (–20 to 49°C)

Storage Temperature:

–4 to 158°F (–20 to 70°C)

Update Rate:

100ms – 1 module installed

200ms – 2 modules installed

300ms – 2 modules installed and external input

Resolution:

±0.001% span; 99,999 counts

Warm-Up Time:

5 minutes for rated accuracy

Electrical Measurements:

0-20mA or 0-30Vdc

Input	Volts	Accuracy
	0/10 Vdc	±0.025% fs
	10/30 Vdc	±0.10% fs
	0-20mA	±0.03% fs

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Programmable Filtering (Damping):

Levels 1 through 16

Temperature Effect Electrical Measurement:

$\pm 0.001\%$ of span per F over compensated range from reference temperature of 70°F ($\pm 3^\circ\text{F}$)

Serial Interface:

USB (Micro-B connector type)

Field Calibration:

Base Unit and pressure modules may be field-calibrated via keypad commands

Data Logging:

- Internal storage for up to 64 data logs and up to 16,000 records; transferrable to SD card
- Manual / automatic data logging capability
- Programmable data intervals (0.1 sec. to 24 hrs.)

Agency Approvals:

CE Mark, FCC (CFR47), UL 61010-1

OPTIONAL FEATURES

Hazardous Location Version

(Battery Powered Only):

FM Intrinsic Safety CL 1,
Div 1, Gr A, B, C, D
CSA Intrinsic Safety CL 1,
Div 1, Gr A, B, C, D
ATEX Ex ia ii c T4 Ga $-20^\circ\text{C} < \text{Ta} < +50^\circ\text{C}$

Note: Loop power supply is not included with Intrinsically Safe Units

Power Requirements:

(4) AA Batteries or via USB power supply
USB universal AC adapter 100-240Vac, 50/60 Hz

Battery Life:

Up to 40 hours battery with 2 modules installed

Certification:

N.I.S.T. traceable certification document provided for base unit and Quick-Select sensor modules.

HOW TO ORDER PTE-2 BASE UNIT

P/N	Description	Version
PTE2ST	HEISE Base Unit	(ST) Standard
PTE2IS	HEISE Base Unit	(IS) Intrinsically Safe



a large variety
of pressure and
temperature
modules are
available

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OPTIONAL PRESSURE MODULE FEATURES

- **HM2-1 Low Pressure Module**
- **HM2-2 Medium/High Pressure Module**
- **Hot Swap**
- **Accuracies from 0.025% to 0.1%**
- **Low Pressure Ranges from ± 0.25 inH₂O to 200 inH₂O**
- **Medium/High Pressure Ranges from 5 psi up to 10,000 psi**
- **Gauge, Absolute, Differential, Vacuum and Compound Ranges**

Quick-Select™ Pressure Modules

Available in full-scale ranges from 0.25 inches H₂O through 10,000 psi. Gauge, vacuum, absolute, differential or compound pressure ranges are available.

Select from multiple modules that can be quickly interchanged (“hot-swapped”) without the use of tools, and are automatically recognized once installed in the base unit.

Heise Low Pressure Module HM2-1

The HM2-1 Quick-Select low pressure module is based on a proprietary, variable-capacitance sensor. This sensor is available in ranges from 0.25 to 0/200 inches H₂O with accuracies from $\pm 0.1\%$ to $\pm 0.06\%$ of span, and are available for gauge, differential and compound pressures. They are suitable for use with dry, non-corrosive gases.

The variable-capacitance sensing element incorporates a micro-machined silicon diaphragm. Silicon provides optimum repeatability with minimal hysteresis. The sensor is extremely stable, due to the sputtered metal capacitance plates being molecularly bonded to the silicon. This design eliminates adhesives from the sensor assembly.

The HM2-1 sensor is also extremely rugged. It can withstand extreme overpressure, shock and vibration without significant error or calibration offset.

Heise Medium / High Pressure Module HM2-2

The HM2-2 Quick-Select pressure module incorporates a piezoresistive, micro-machined silicon sensor. These sensors are available in ranges from 5 psi through 0-10,000 psi, and are also offered in absolute, vacuum and compound ranges with accuracies from 0.025% to 0.1% of span. 316 SS sensor isolation is provided on all ranges except for 10,000 psi which is 17-4 PH stainless steel, and is suitable for applications involving fluids or corrosive gases.

Optional enhanced accuracy eliminates temperature error over the entire compensated temperature range of high pressure modules.

OPTIONAL PRESSURE SENSOR MODULE SPECIFICATIONS

HM2-1 LOW PRESSURE MODULE

Pressure Types:

Gauge, differential and compound

Available Ranges:

Refer to Range Table

Available Accuracies:

± 0.06 (0/1-0/200" in.H₂O),
 ± 0.07 (0/0.25-0/0.5" in.H₂O), or 0.1% of Span

Compensated Temperature Range:

20 to 120°F (–7 to 49°C)

Temperature Effect:

$\pm 0.004\%$ of Span per °F over compensated range from reference temperature range of 70°F (± 3 degrees)

Repeatability:

$\pm 0.01\%$ of Span (range 0/1 in.H₂O or higher)
 $\pm 0.02\%$ of Span (range below 1.0 in.H₂O)

Sensitivity:

$\pm 0.002\%$ of Span (typical)

Media Compatibility:

Clean, dry, non-conductive, non-corrosive gas

Under / Overpressure Capability:

–15 to 50 psi

Maximum Static (line) Pressure:

100 psi

Process Connection:

Standard 1/8 NPT Female

Agency Approvals:

FCC (CFR47), UL61010-1, Not RoHS compliant

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HM2-2 MEDIUM/HIGH PRESSURE MODULE

Pressure Types:

Gauge, absolute, compound and vacuum

Available Ranges:

Refer to Range Table

Available Accuracies:

$\pm 0.025\%$, 0.05% or 0.1% of Span (10,000 psi only offered in psig and 0.1% accuracy)

Compensated Temperature Range:

20 to 120°F (-7 to 49°C)

Temperature Effect:

Standard:

$\pm 0.004\%$ of Span per °F over compensated range from reference temperature range of 70°F (± 3 degrees)

Optional:

Enhanced Accuracy Option.

No additional error due to ambient temperature from +20°F to +120°F

Sensitivity:

$\pm 0.002\%$ of Span (typical), ± 0.001 span (max)

Repeatability:

$\pm 0.01\%$ of Span

Media Compatibility:

Any medium compatible with 316 SS isolation;
10,000 psi range only available with 17-4 PH / 316 SS

Optional:

Cleaned to meet ASME B40-100 Level IV.
NOT marked for oxygen service.

Overpressure Compatibility:

200% for ranges to 1000 psi
150% for ranges > 1000 psi

Agency Approvals:

CE, FCC (CFR47), UL61010-1

Process Connection:

Standard: $\frac{1}{8}$ Female NPT

Optional: $\frac{1}{8}$ Female NPT with Flush Port

Optional: Welded VCR Fitting with Standard Finish
(up to 5000 psi)

HOW TO ORDER PRESSURE MODULES

Refer to Product Ordering Table on Pages 6 and 7



hot-swap
modules
without the
use of tools

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PRODUCT CODE - LOW PRESSURE MODULES

MODEL	SENSOR TYPE	ACCURACY	MEDIA COMPATABILITY	PRESSURE TYPE	PRESSURE UNITS	INH ₂ O	mmHG	kPa	mbar	cmH ₂ O	mmH ₂ O	INLET FITTING
HM2	1	C	A	D	INH₂O	DIFFERENTIAL PRESSURE RANGES						A
HM2- HEISE MODULE	1 - CAPACITIVE SENSOR	B - .1% STD. ACCURACY	A - NON-ISOLATED SENSOR	C - COMPOUND	INH ₂ O	0.25	0.5	0.2	0.6	0.6	6	A - 1/8 NPT INTERVAL
		C - .06% STD. ACCURACY		D - DIFFERENTIAL	mmHG	0.5	1	0.5	1	1.5	15	
		C - .07% STD. ACCURACY			kPa	1	2	1	2.5	3	30	
					mBar	2	3	2.5	4	5	50	
					cmH ₂ O	3	5	4	6	6	60	
					mmH ₂ O	5	10	6	10	15	150	
						10	20	10	25	30	300	
						15	30	25	40	60	600	
						25	50	40	60	150	1500	
						50	100		100	200	2000	
						100	200		250	500	5000	
						150	300		400			
						200			500			
COMPOUND PRESSURE RANGES (All prefixed by +/- sign)												
						0.125	0.2	0.1	0.25	0.3	3	
						0.25	0.5	0.25	0.6	0.6	6	
						0.5	1	0.4	1	1.5	15	
						1	2	0.6	2.5	3	30	
						1.5	3	1	4	5	50	
						2.5	5	1.6	6	6	60	
						5	10	2.5	10	15	150	
						7.5	15	6	16	20	200	
						12.5	20	10	25	30	300	
						25	50	25	60	60	600	
						50	75		100	150	1500	
						75	100		160	200	2000	
						100	150		250	300	3000	
						200						

Note: Pressure range codes which contain a decimal point will be designated with a letter "P". For example 0.5 code is P5

Note: "C" accuracy is 0.06% for ranges 1.0 inH₂O and higher.
"C" accuracy is 0.07% for ranges below 1.0 inH₂O (shaded values).

Product Code Example:

H	M	2	C	D	I	N	H	2	0	/	1	0	0	A
Model		Sensor Type	Accuracy	Media Compatibility	Pressure Units					Pressure Range	Inlet Fitting			

Product Code Example:

[illegible]

Note: Pressure range codes which contain a decimal point will be designated with a letter "P". For example 0.5 code is P5

* = Gauge pressure only (no absolute)

The diagram illustrates the components of the HM2-1500-A pressure sensor. It is a long, thin rectangular device with several labeled sections:

- Model:** HM2
- Sensor Type:** 2
- Accuracy:** H
- Media Compatibility:** I
- Pressure Units:** PSI
- Pressure Range:** 1500
- Inlet Fitting:** A

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OPTIONAL TEMPERATURE MODULE FEATURES

- Measures temperature with most RTD probes
- Supports 2, 3 & 4-wire RTDs
- Displays measurement for Fahrenheit, Celsius, Kelvin, Rankine and ohms
- Easy configurability to meet application requirements

The Heise PTE-2 provides accurate temperature measurement when using the HM2-RT module with an RTD probe. This system supports the most common RTD's without requiring operator input of probe characterization data; each module comes factory-programmed with standard curves for Pt100 (385 & 392), Ni 120, Cu 10 and temperature probes.

The setup menu allows the operator to choose configurations for 2, 3 or 4 wire RTD probes and decimal resolution. The temperature measurement system includes the ability to automatically track minimum / maximum values.

RTD TEMPERATURE MODULE SPECIFICATIONS:

Following specification is based on use of 4 wire RTD probe; accuracy does not include contribution from RTD

Part Number:

HM2-RT1, HM2-RT2

HM2-RT1 MODULE		
Used with RTD Probe Type	Measurement Range and Accuracy	Resolution*
Pt100 (385 & 392)	-200 to 550°C: $\pm 0.15^\circ\text{C}$ 550 to 850°C: $\pm 0.2^\circ\text{C}$	0.01°C or F
Ni 120	-80 to 260°C: $\pm 0.1^\circ\text{C}$	0.1°C or F
Cu 10	-70 to 150°C: $\pm 0.6^\circ\text{C}$	0.1°C or F
Ohms	$\pm 0.01\%$ reading ± 0.02 ohms	0.004 ohms

HM2-RT2 MODULE		
Used with RTD Probe Type	Measurement Range and Accuracy	Resolution*
Pt1000	-200 to 550°C: $\pm 0.15^\circ\text{C}$	0.01°C or F
Ohms	$\pm 0.01\%$ reading ± 0.02 ohms	0.004 ohms

* Select from 1, 0.1, 0.01 and 0.001 degrees or ohms. Resolution for a given probe is dependent on the output of the probe. Maximum resolution is 1 part in 100,000 of full scale ohms Select from 1, 0.1, 0.01 and 0.001 degrees or output for the probe.

Temperature Error:

Better than $\pm 0.0005\%$ of reading per degree Fahrenheit from a reference temperature of $70^\circ \pm 3^\circ$ degrees F°

Input Receptacle:

TA4F type RTD connector

HOW TO ORDER RTD PROBES

Probes are all 4 wire RTD's with 304 stainless steel sheath and a TA4F electrical connector for compatibility with HM2-RT1 interface modules. They are provided in DIN Class A accuracy.

HOW TO ORDER THERMOCOUPLE CONNECTOR	
Part No.	Description
840X010-01	Pt100 (385), 0.125 diameter, 12 inch length, handle and 5 ft. coiled cable
840X010-02	Pt100 (385), 0.25 diameter, 12 inch length, handle and 5 ft. coiled cable
840X010-05	Pt100 (385), 0.125 diameter, 6 inch length, handle and 5 ft. coiled cable
840X010-06	Pt100 (385), 0.25 diameter, 6 inch length, handle and 5 ft. coiled cable
840X010-11	Pt100 (385), 0.125 diameter, 8 inch length, handle and 5 ft. coiled cable
840X010-03	Pt100 (385), 0.125 diameter, 12 inch length, 10 ft. straight extension lead with plug (no handle)
840X010-04	Pt100 (385), 0.25 diameter, 12 inch length, 10 ft. straight extension lead with plug (no handle)
840X010-07	Pt100 (385), 0.125 diameter, 6 inch length, 10 ft. straight extension lead with plug (no handle)
840X010-08	Pt100 (385), 0.25 diameter, 6 inch length, 10 ft. straight extension lead with plug (no handle)
828X136-01	TA4F mating connector for use with HM2-RT1 module and user supplied RTD probe



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HM2-TC1 QUICK-SELECT OPTIONAL THERMOCOUPLE MODULE FEATURES

- Allows PTE-2 to measure temperature with a thermocouple
- Pre-programmed to accept 8 most common thermocouple types
- Selectable units of measure: Celsius, Fahrenheit, Kelvin, Rankine and millivolts
- Reference junctions: automatic internal or manual external



With the HM2-TC1 interface module installed, the PTE-2 contains programming to read types J, K, T, E, R, S, B and N thermocouples and display the measurement in units of temperature measure or millivolts. Other types of thermocouples may also be read by using the direct millivolt readout.

THERMOCOUPLE TEMPERATURE MODULE SPECIFICATIONS

Part Number:

HM2-TC1

Unit of Measure (selectable):

°C, °F, °K, °R and millivolts

Reference Junction (selectable):

Automatic Mode: The HM2-TC1 module incorporates an internal resistor/thermistor based reference junction, which may be selected for use in the temperature readout mode.

Manual Mode: An external reference junction may be used in place of the internal junction. External reference junctions may be applied in the temperature or direct millivolt readout modes.

Resolution Reading in Temperature Units (selectable):

1, .1 or .01 degrees. "Auto" mode selection that allows the PTE-2 to automatically configure the readout to the highest significant resolution (resolution closest to the tolerance) for the thermocouple type selected.

Resolution Reading in Millivolts:

.001 millivolts

Thermocouple Connection (to interface module):

Requires a "miniature thermocouple connector" (Omega type SMP), specifically matched to the thermocouple type to be used. These connectors may be purchased as an accessory under the following part numbers:

HOW TO ORDER THERMOCOUPLE CONNECTOR

Part No.	Description
828X161-01	Type J Connector
828X161-02	Type K Connector
828X161-03	Type T Connector
828X161-04	Type E Connector
828X161-05	Type R Connector
828X161-06	Type S Connector
828X161-07	Type B Connector
828X161-08	Type N Connector

SYSTEM ACCURACY

(READING IN TEMPERATURE UNITS):

Includes the base unit and HM2-TC1 interface module. (Does not include inaccuracy of the thermocouple device. Consult thermocouple manufacturer or ANSI MC96.1 for thermocouple accuracy specifications. Typical inaccuracies range from ± 1 to $\pm 2.2^\circ\text{C}$.)

Conversion Factors to convert °C specifications to other units of measure:

To convert from C to F; $F = (1.8 \times C) + 32$

To convert from C to K; $K = C + 273.15$

To convert from C to R; $R = (1.8 \times C) + 427.67$

Additional thermocouple information on the following page.

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Thermocouple Type	Measurement Range (°C)	Accuracy @ 25°C (Not Including Internal Reference Junction)	Accuracy @ 25°C (Including Internal Reference Junction) Expressed as ±°C	Max Additional Error Due to Ambient Temperature Deviation From 25°C. Expressed as Additional °C Deviation from 25°C
J	-210 to -151	0.7	1.1	0.02
	-150 to 1200	0.3	0.4	0.01
K	-240 to -201	1.5	2.2	0.05
	-200 to -101	1.0	1.5	0.03
	-100 to 999	0.5	0.8	0.02
T	-250 to -201	1.5	2.2	0.05
	-200 to -101	0.8	1.2	0.03
	-100 to 400	0.5	0.8	0.02
E	-250 to -201	1.2	2.0	0.04
	-200 to -101	0.6	1.1	0.02
	-100 to 400	0.3	0.6	0.01
R & S	-50 to 299	3.4	3.6	0.10
	300 to 1768	1.2	1.3	0.04
B	100 to 199	14.0	14.0	0.44
	200 to 499	5.0	5.0	0.16
	500 to 999	3.0	3.0	0.08
	1000 to 1820	1.2	1.2	0.04
N	-250 to -226	4.3	5.7	0.14
	-225 to -101	2.1	2.8	0.07
	-100 to 1300	1.0	1.4	0.02

AMBIENT TEMPERATURE EFFECT:

To calculate, multiply degrees deviation from 25°C times the value listed in the far right column of the listed table. Only applied when using the internal reference junction, within the ambient window of 0-50°C.

TO CALCULATE TOTAL SYSTEM/MEASUREMENT ACCURACY:

Accuracy = System Accuracy @ 25°C + System Ambient Temperature Effect + Inaccuracy of Thermocouple Device

SYSTEM ACCURACY (BASED ON DIRECT MILLIVOLT READING FROM THERMOCOUPLE):

Includes the base unit and HM2-TC1 interface module. (Does not include inaccuracy due to the thermocouple device. Reference junction not applicable to direct millivolt readings.)

Input Range of Module	Accuracy @ 25°C	Max. Additional Error Due to Ambient Temperature Deviation From 25°C. Expressed As Additional Millivolt Error Per Each °C Deviation From 25°C
10 to 100mV	±0.01 to 100mV	.001

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OPTIONS

Carrying, Transport and Protective Cases:



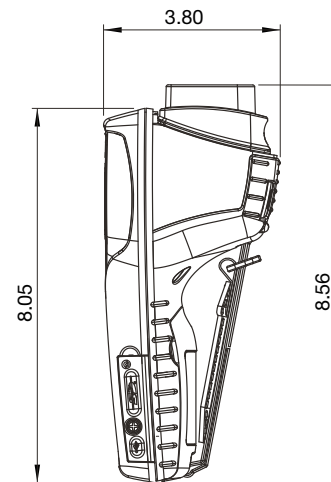
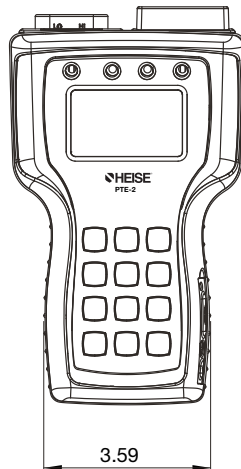
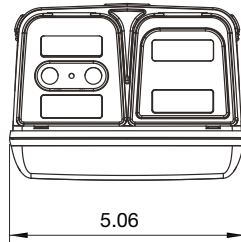
Contoured: Protective Instrument Case with Shoulder Strap. P/N 864D079-01



Heavy Duty, Watertight Instrument Carrying / Transport Case. P/N PTE2-CASE

DIMENSIONS

Base Unit



Carrying Case

