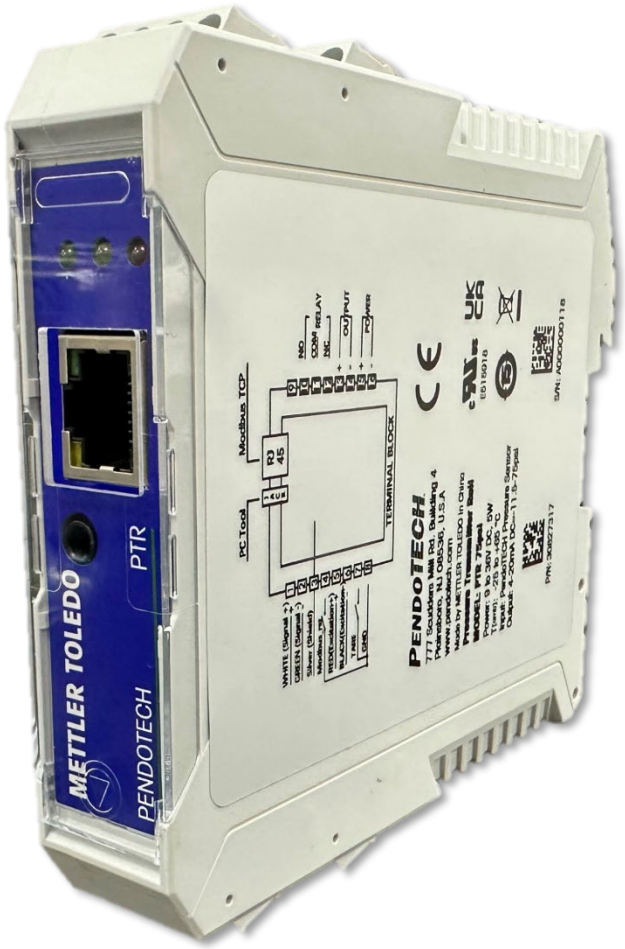
PENDOTECH
Leading Process Analytics

PENDOTECH® PTR
PRESSURE TRANSMITTER RAIL
USER'S MANUAL



Safety Instructions

Definition of Equipment and Documentation Symbols and Designations

⚠ **WARNING:** POTENTIAL FOR PERSONAL INJURY

⚠ **CAUTION:** Possible instrument damage or malfunction

☞ **NOTE:** Important operating information

⚠ **On the transmitter or in this manual text indicates** Caution and/or other possible hazards, including the risk of electric shock (refer to accompanying documents).

⚠ **Each prospective user must test the measurement unit for its proposed application to determine its suitability for the purpose intended prior to incorporating the sensor to any process or application. Proper safeguards must be put into place for the process in which the unit is used.**

The functioning and operational safety of the product can only be ensured if the user observes the usual safety precautions as well as the specific safety guidelines stated in these operating guidelines:

⚠ The PTR Transmitter must only be operated under the specified operating conditions.

⚠ The PTR Transmitter should be installed and operated only by personnel familiar with the Transmitter and who are qualified for such work.

⚠ Before connecting the device to a supply unit, ensure its output voltage cannot exceed 48 VDC. Do not use alternating current or a main power supply!

⚠ **Warning:** Product is supplied from safety extra low voltage 9-36VDC/5W power source which complied with the reinforced or double insulation to primary circuit certified by UL/CSA 61010-1 or equivalent standards by UL.

⚠ **Warning:** Do not submerge this product. Protect the product before cleaning with any liquids by covering openings that expose the internal components.

⚠ Install equipment as specified in this instruction manual. Follow appropriate local and national codes.

⚠ Power supply must be disconnected before servicing.

⚠ The safety of the user may be endangered if the instrument:

- is visibly damaged.
- no longer operates as specified.
- has been damaged in transport.

⚠ **Process upsets:** because process and safety conditions may depend on the consistent operation of this transmitter, provide appropriate means to maintain operation during sensor cleaning, replacement, or sensor or instrument calibration.

⚠ Except for routine maintenance and cleaning procedures, the PTR Transmitter must not be tampered with or altered in any manner.

⚠ Maintenance and repair work must only be carried out by PendoTECH.

⚠ METTLER TOLEDO/PendoTECH accepts no responsibility for damage caused by unauthorized modifications to the Transmitter.

⚠ Follow all warnings, cautions, and instructions indicated on and supplied with this product.

⚠ Install the unit inside proper housing with sufficient ventilation

⚠ Environmental temperature must be within -25 to +65°C (-13 to +149°F) with relative humidity within 0 to 95% RH

⚠ Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.

⚠ Electrical installation must be per the National Electrical Code and/or any other applicable national or local codes.

⚠ If this equipment is used in a manner not specified by the manufacturer, its protection against hazards may be impaired.

⚠ **Relay action:** the PTR Transmitter relays will always de-energize on the loss of power, equivalent to a normal state, regardless of the relay state setting for powered operation. Configure any control system using these relays with fail-safe logic accordingly.

⚠ The terminals are suitable for single wires / flexible leads 0.2 mm^2 to 2.5 mm^2 (AWG 14 – 24).

Contents

1 Disclaimer

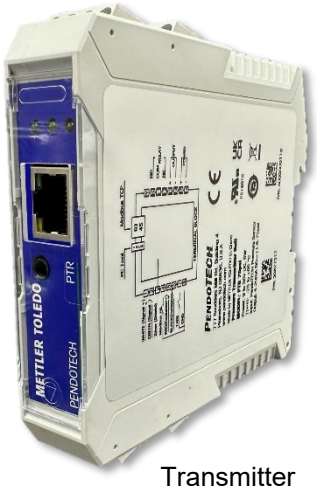
The information in this User Guide is believed to be accurate and reliable for the use and operation of the monitor; however, PendoTECH assumes no responsibility for the use of this product except for what is covered in the Limited Warranty and Terms and Conditions of Sale.

NOTE: *"NOTE" is used to notify the user of important but non-hazardous installation or operation information.*

2 Introduction and Unpacking

The PTR Transmitter connects to the PendoTECH Single-Use Pressure Sensor and produces a 4-20mA signal that is linear with pressure. It equips an alarm output function with a dry contact relay output. It also supports the comm protocol of Modbus TCP. It has a convenient DIN rail mounting design. Two options are available to deliver optimal performance based on pressure range. For lowest-pressure applications, there is a transmitter device with a default 4-20mA range of -11.5-7.5psi. For higher pressure applications, there is a full range -11.5-75psi transmitter available. Selecting the narrowest range that meets the application requirements achieves better accuracy and repeatability.

2.1 Identify the following components



Transmitter

Reusable sensor adapter cable

INPUT WIRING: The transmitter includes the re-usable pressure sensor monitor cable (part # PDKT-650-298). The length of the PendoTECH reusable monitor cables is 12ft/4M. However, the additional wire length can add resistance, which can impact accuracy, so the maximum extension recommended is 24ft (8M).

3 Unit Overview

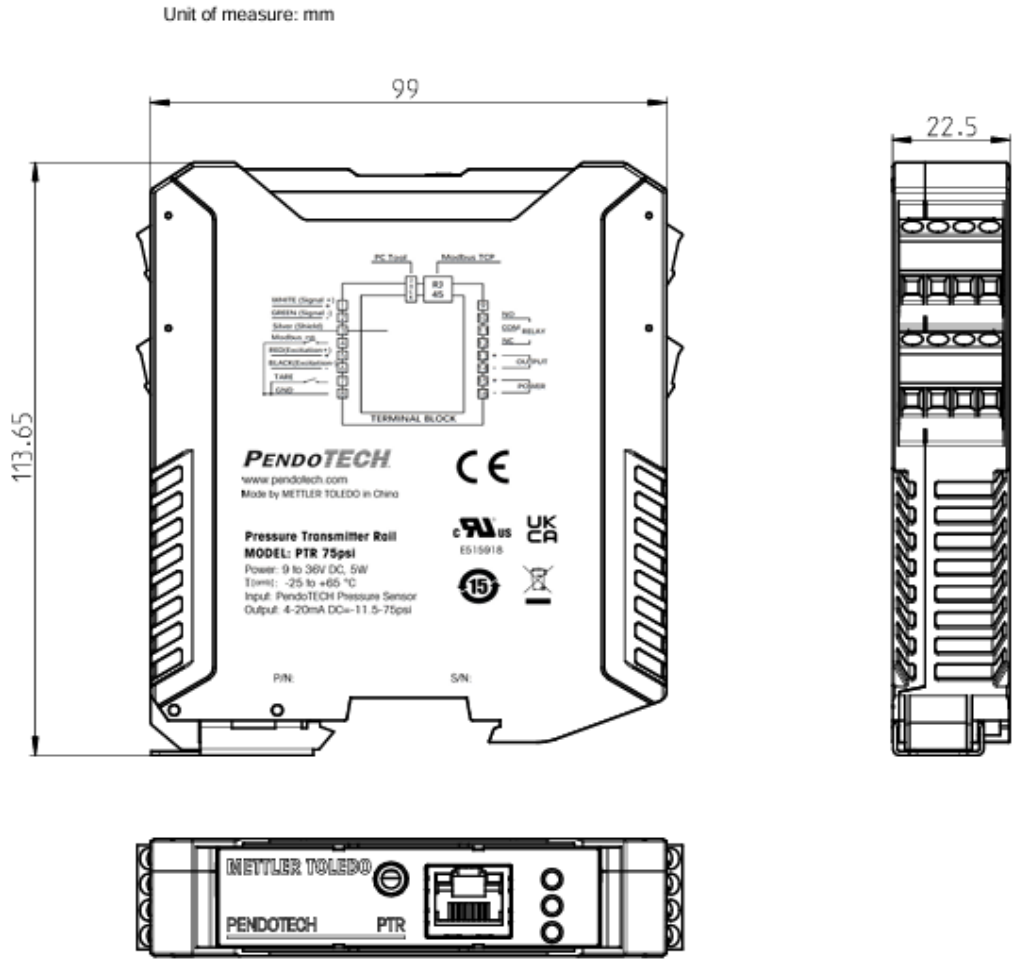


Fig 1: PTR transmitter dimensions in mm

4 Wiring

Please follow the outlined sections below as a guideline for installing the Transmitter and associated accessories. These guidelines apply to specific application installations or, in the case of OEM component installation, to installation onto a suitable panel.

4.1 Safety Instructions for Wiring

- Power off the transmitter during wiring.
- Connect wires firmly to the connection terminals.
- Power input: 9-36 VDC, 5W
- PTR is a 4-wire product with active 4-20 mA analog output. Do not connect power to Terminal 13-14.

4.2 Terminal Block (TB) Definition

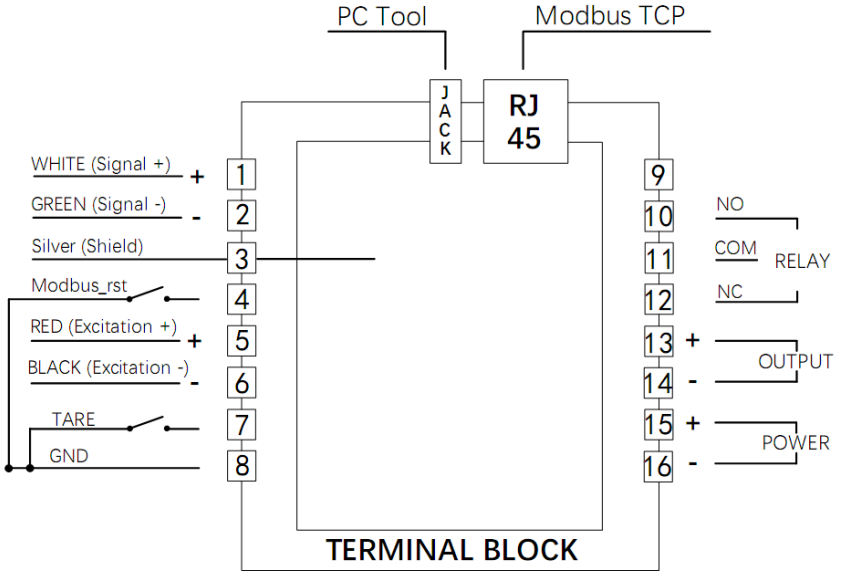


Fig 2: Terminal block (TB) definition PTR transmitter

Terminal		Description
1-3, 5-6	Strain gauge	Pressure sensor input, use only sensor and adapter cable from PendoTECH
4	Modbus rst	Modbus/TCP configuration reset
7	Tare	Short with terminal 8 to tare the transmitter
10-12	Relay	SPDT
13-14	Output	Analog output 4 to 20mA
15-16	Power	Power supply: 9-36 VDC
RJ45	Modbus TCP	Connection to Modbus TCP master
Jack	PC tool	Service use, e.g. firmware update

Table 1: Terminal block (TB) definition PTR transmitter

Status	Green LED	Amber LED	Red LED
Normal	blink	off	off
Input Saturated	blink	on	off
Output Saturated	blink	blink	off
System Error	off	off	blink
Ethernet Configuration Reset	off	blink	off

Fig 3: LED functionality

5 Operation

5.1 Tare (Sets present signal to 0 psi)

Each single-use pressure sensor must be tared upon connection. The measurement is set to 0psi. By default, the mA output is 6.127mA on PTR 7.5psi, and 13.684mA on PTR 75psi. This can be done via dry contact terminals 7 and 8 or Modbus command.
The corresponding mA output scaling could be configured by Modbus Register 504 and 506.

5.2 Ethernet Configuration Reset

While using Modbus, if the Ethernet configuration (including IP, gateway, subnet mask, and port) is forgotten, the transmitter cannot be communicated to anymore. This can be solved by resetting the Modbus configuration. Refer to Fig 2: Terminal block (TB) definition PTR transmitter. It's done by shorting terminals Nos. 4 and 8.
While shorting, the Amber LED blinks three times, and all the LED link three times, and then the transmitter is rebooted
automatically.
After reboot, the Ethernet configuration will be reset to default values – see Host configuration in Section 8.3.

5.3 Analog output

1x 4-20mA analog output is available as the default communication protocol. The 4-20mA output is linear with the minimum and maximum pressure measurement values. The default 4-20mA output scaling is listed below.

Range 4 - 20mA	Output drive 12V maximum at 22mA
Load resistance	500Ω maximum
Burnout	≈22mA (Output > 20mA with no sensor connected)

Table 2: 4-20mA specifications

Model	Default 4-20mA Range	Full Pressure Range
PTR 7.5psi	4mA=-11.5psi 20mA=7.5psi	-11.73 to 8.09 psi
PTR 75psi	4mA=-11.5psi 20mA=75psi	-12.58 to 77.7psi

Table 3: 4-20mA output scaling

5.4 Alarms

- Alarm Events
  - Sensor disconnected
  - Input Saturated
  - Output Saturated
  - System Error
- Pressure Alarm Point

Low-Pressure Alarm Point

If the pressure input value is less than the Low-Pressure Alarm Point, the Input Saturated Alarm will occur.
This value is set to a default of -12psi.

High-Pressure Alarm Point

If the pressure input value exceeds the High-Pressure Alarm Point, the Input Saturated Alarm will occur.
This value is set to a default of 75psi for PTR 75psi and 8psi for PTR 7.5psi.

5.5 Modbus communication

The PTR transmitter can be communicated via Modbus TCP protocol. All data is transferred using the Modbus holding registers. For more details on the Modbus specifications, see sections 6 - 8.

With the Modbus communication, additional features can be achieved, such as

- Obtaining the transmitter information, including serial number and FW version
- Configurable Units of Measure (psi, mbar, mV)
- Analog output re-scaling
- High- and low-pressure alarm setpoints
- Remote tare
- User-level setup

5.6 Relay

One dry contact relay output can be activated during alarm states while communicating via Modbus. The functions "Alarm Latch" and "Stop" are available via Modbus. For further information, see section 9.1.

6 Modbus Overview

6.1 Documentation of the Modbus protocol

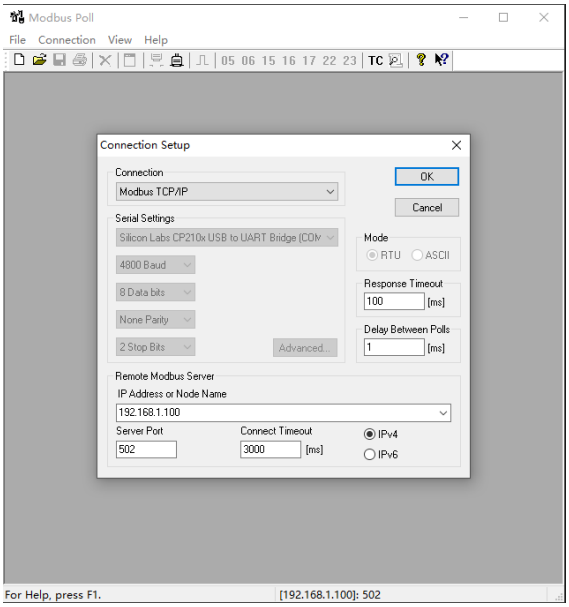
For detailed information about Modbus specifications, refer to the following documents:

- Modbus_Messaging_Implementation_Guide_V1_0b: MODBUS Messaging Implementation Guide 1 0 b
- Modbus_Application_Protocol_V1_1b3: MODBUS Application Protocol 1 1 b

For more information, refer to the Modbus website: www.modbus.org under the "Technical Resources" page.

6.2 Modbus testing tool

There are several Modbus testing software tools and libraries available for C++, Python, or other programming languages. For example, the software tool "Modbus Poll" (available at www.modbustools.com) can access the PTR transmitter.



There is another popular and widely used open-source software for communication with Modbus devices: pre-compiled binary for Windows. No installation is required; unzip and run. It can be downloaded from https://sourceforge.net/projects/qmodmaster/

Note all rights and obligations regarding the use of open-source software, and read the license terms carefully before you agree.

6.3 Protocol definitions, as implemented in PTR

Connect the active Modbus TCP using an Ethernet patch cable and a hub on your network or directly to the unit with an Ethernet crossover cable. Creating a new connection or modifying an existing one may be necessary. Values relating to the connection configuration can be found in registers 3096~3102.

The default connection configuration is below:

Modbus mode:	TCP
IP Address:	192.168.1.100 (default)
Gateway:	192.168.1.1 (default)
Subnet Mask:	255.255.255.0 (default)
Port:	502 (default)

Modbus is an open Master/Slave application protocol that can be used on several physical layers. Modbus TCP means the Modbus protocol is used on top of Ethernet-TCP/IP. PTR transmitter acts as a Modbus TCP server and supports 10/100 Mbps. Common read/write single and multiple register function codes are supported.

Note: The max response time for PTR is 100ms.

6.4 Modbus TCP function codes implemented in PTR

Function Code	Detail
#3	Read Holding Registers
#4	Read Input Registers
#6	Write Single Register
#16	Write Multiple Registers

For a detailed description of these functions, refer to the document "Modbus_Application_Protocol_V1_1b3.pdf".

With the PTR, reading any register is performed by either command #3 or #4.

Handling the information between these two commands is the same.

6.5 Data representation

Each Modbus register contains two bytes. The data length of a command and an answer is always a multiple of two registers.
For a given register of interest:

- A register's high byte (first byte) contains the last digit of a value or string.
- The last register's low byte (second byte) contains the first digit of a value or string.

The first byte of a register always contains the higher-order bits, while the second byte contains the lower-order bits.

Decimal values:
Integer decimal values are translated to hexadecimal numbers.
Non-integer decimal values are represented as single-precision float values.
See below for examples.

Data Type	Example in Decimal	Example in Hex	First Register	Second Register	Modbus Poll Mode
Integer 16 bits	22,354	0x5752	0x5752	n/a	Signed/Unsigned
Integer 32 bits	12,345,678	0xBC614E	0x00BC	0x614E	Long ABCD
Float 32 bits	2.50	0x40200000	0x4020	0x0000	Float ABCD
ASCII-text	"Text"	0x54 0x65 0x78 0x74	0x5465	0x7874	

Additional information
Our usual transfer mode for Modbus is Big-Endian.

6.6 Addressing scheme

The addressing scheme of PTR is "Base 0". The first register number is 0.
A register offset is available in register number 0000. The register offset can be adjusted to the register bank's absolute starting point to integrate with existing implementations. The register offset is unsigned with a range of 0…65535.
By default, the register offset is set to 0. Thus, the first user register is on number 100.
By setting the offset to 1, for example, the registers will be shifted up by one ("Base 1"); thus, the first user register will be found on number 101.

Note: The register offset is always found on register number 0000, independent of its value. The offset affects only register numbers 0001 and up.

The register numbers given on the following pages are always relative.
The absolute number of a register is calculated by adding the register offset to the relative address.

Examples:
Register offset as default (999); the host address shall be read:
The relative register number of the host address is 3096.
The effective absolute register number to be transmitted in the command is 4095.

6.7 Error handling

The PTR transmitter detects transmission errors (corrupt messages). It discards corrupt messages and waits for the next, correctly formatted message.

Errors on the application layer are answered with an error message. The response signals error conditions by setting the leading bit (0x80) of the function code.

The following error codes are implemented in the PTR Transmitter:

Error code in hex	Error type
0x00	No error
0x01	Illegal function code
0x02	Illegal data address (invalid register number, access denied)
0x03	Illegal data value (value out of range)
0x04	Slave device error (operation not completed)
0x05	(Reserved)
0x06	(Reserved)

Note:
For single register read and write (function codes #3, #4, #6), error code priority is 0x01 > 0x02 > 0x04 > 0x03.
For multi-register read and write (function codes #3, #4, #16), the transmitter will check each register in sequence (from small address to big address). Once one of the registers encounters an error (error code priority is the same as a single register), the error code will be returned, and the remaining registers will not be checked.

- ### Error code 0x01

  Error code 0x01 is returned when a function code other than #3, #4, #6, and #16 is sent to the transmitter.

- ### Error code 0x02

  Error code 0x02 is returned in the following cases:

  - Any attempts to access undefined register
  - Any attempts to access registers on a higher operator level than actually selected (access denied)
  - When attempting to read or write registers where the user level is "-."
  - When data in written registers is less than or more than the required length.

  Note: When writing multiple continuous registers using command #16 in one command, if one of the above situations occurs, all the registers are not changed by command #16.

- ### Error code 0x03

  Error code 0x03 is returned in the following cases:

  - When writing invalid data to a register, invalid data means any value outside the range of the specific register (value below or above limits, value not part of a list of possible values). In this case, the last valid data is restored on the specific Modbus register, and no change is active.
  - When reading over 125 registers in one command (>125 register numbers). Follow Modbus response command format: The total data of all registers is 251 bytes, so the maximum number of registers that can be read is 251 / 2 = 125.
  - When writing over 120 registers in one command (>120 register numbers). See the following request command format: The total data of all registers is 247 bytes, so the maximum number of registers that can be written is 247 / 2 = 123. For reservation, the data length is limited to 120.

  Note: When writing multiple continuous registers like command #16 in one command, but one or several registers experience the above situations, then command #16 does not change all of the registers indicated in the command.

- ### Error code 0x04

  Error code 0x04 is typically returned when:

  - Trying to log in to a user level with a wrong password or to a non-existent user level. In these cases, the log-in fails, and the operation is not completed.
  - Reading or writing registers which user lever is "**" without the EEPROM unlocked.

6.8 User levels, password protection

PTR transmitters implement three user levels: Level 0, Level 1, and Level 2.

Reading registers is possible on any user level.
Writing the transmitter's registers typically means changing the configuration, which also changes the transmitter's behavior. To prevent any unwanted configuration changes, most writing attempts are possible only on user level 2.

For all user levels, default passwords are stored in the transmitter's non-volatile memory. The user can change these passwords.

User Levels and default passwords of PTR transmitter:

User level	Code in hex	Default password in hex
0	0x03	0x00000000
1	0x0C	0x01145DEA
2	0x30	0x00F479CE

- After each power-up, the PTR transmitter is reset to user level 0.
- When attempting to change the user level to an invalid level or when supplying an incorrect password, the transmitter remains on the last valid user level, and error code 0x04 is returned.
- User level 2 can operate all registers with user level 1.
- If the user level is "-," that means the register cannot be read or written. If read or write attempts are made to the register, error code 0x02 should be returned.

Note: If a user changes the default password and then loses or forgets the new password, the transmitter may become unusable.

6.9 Writing registers, data retention

In nearly all cases, writing any PTR registers means changing the transmitter's configuration. Any configuration data are stored in the transmitter's non-volatile memory (EEPROM). Thus, the changed configuration will not be lost by a PTR power-down.

- ### EEPROM lock

Each time when the transmitter is powered up, the value of register 3999 is 0, that means the EEPROM is always locked.

For persistent changes in registers, PTR EEPROM has to be unlocked first.
To unlock PTR, write 0x5752 to register 3999. Otherwise, changed values will be lost after the next power cycle.
To lock PTR, write any values except 0x5752 to register 3999.
Note: An unlocked EEPROM becomes automatically locked after 2 minutes, and the value in register 3999 will be reset to 0. In addition, any value changed in the register 3999 will be reset to 0 after 2 minutes.

- ### EEPROM State

There are three EEPROM states for each register, as shown below:

- A user level (0 ~ 2) with a "*" means the register value can be changed whether the EEPROM is locked or not. With EEPROM locking, change is volatile, and a power-down of PTR will cause the change to be lost. With EEPROM unlocking, the change is persistent.
- If a user level (0 ~ 2) has a "**," it means the register value cannot be changed without EEPROM unlocking.
- A user level (0 ~ 2) without "*" and "**" means the register value cannot be stored in EEPROM, and the change will be lost when the PTR is powered down. For example, Tare (register 500) and Latch Stop (register 519) are not written into the EEPROM.

- ### EEPROM write cycles

Note:

The number of write cycles to an EEPROM is limited. D**o not** permanently use automatic write accesses to the EEPROM. The critical number of write cycles is above 500,000.

7 Implemented Modbus registers in PTR

7.1 PTR Modbus registers

Except for register 0000, all registers' addresses are related to the offset stored in register 0000.

Example:
The register offset is 999, as by default. Register 3288 shall be read.

The controller must read from register 4287. The default register offset is 0.

Explanation of data types:

Data type	Description	Range
uChar8	Unsigned char 8-bit	0 … 255
uInt16	Unsigned integer 16-bit	0 … 65535
Int16	Signed integer 16-bit	–32768 … 32767
uInt32	Unsigned integer 32-bit	0 … 4294967295
Float32	Signed floating point number	3.4E-38 … 3.4E+38
String	ASCII-encoded byte array	–

Registers sorted in ascending register number order:

Register			Access Levels			For writable Register			Comments
Start Register	Name	Count	Read	Write	Type	Min Value	Max Value	Default Value	
0000 fix	Register Offset	1	0	2	uInt 16bit	0	65535	0	See 8.2 Modbus register offset
Measuring Value Page of the attached Sensor									
100	Primary Measuring Channel	2	0	–	Float 32bit	N/A	N/A	N/A	See 8.4 Measurement channel registers
102	Secondary Measuring Channel	2	0	–	Float 32bit	N/A	N/A	N/A	
104	Tertiary Measuring Channel	2	0	–	Float 32bit	N/A	N/A	N/A	

120	Primary Measuring Channel Unit	2	0	–	uInt 32bit	N/A	N/A	0x00060000	See 8.4 Measuring Channel Units Also, see unit code
122	Secondary Measuring Channel Unit	2	0	–	uInt 32bit	N/A	N/A	0x00060001	
124	Tertiary Measuring Channel Unit	2	0	–	uInt 32bit	N/A	N/A	0x00060002	
PTR Transmitter Information Page									
280	Part Number	8	0	–	String	N/A	N/A	"30827316"	See 8.5 Transmitter Information Page
288	User End Firmware Version	8	0	–	String	N/A	N/A	N/A	
296	Tag Name	8	0	0**	String	N/A	N/A	""	
304	Serial Number	8	0	–	String	N/A	N/A	N/A	
312	Manufacturer	8	0	–	String	N/A	N/A	"METTLER TOLEDO"	
PTR Application Page									
500	Tare	1	–	1	uChar 8bit	0	1	N/A	See 8.6 PTR Application Page
501	Tare result	1	0	–	uChar 8bit	0	1	0	
502	Tare offset	2	0	–	Float 32bit	N/A	N/A	0.0	
504	Low-Pressure Point	2	0	1**	Float 32bit	N/A	N/A	-11.5	
506	High-Pressure Point	2	0	1**	Float 32bit	N/A	N/A	PTR 7.5psi:7.5 / PTR 75psi:75	
PTR Alarm Page									
519	Latch Stop	1	–	1	uChar 8bit	0	1	N/A	See 8.7 PTR Alarm Page
520	Latch Mode	1	0	1**	uChar 8bit	0x00	0x01	0x00	
521	Relay Mode	1	0	1**	uChar 8bit	0x00	0x01	0x00	
522	Low-Pressure Alarm Point	2	0	1**	Float 32bit	N/A	N/A	-12	
524	High-Pressure Alarm Point	2	0	1**	Float 32bit	N/A	N/A	PTR 7.5psi:8/PTR 75psi:75	
526	Alarm Valid	1	0	1**	uInt 16bit	0	999	0	
528	Flag Sensor Disconnected	1	0	–	uChar 8bit	N/A	N/A	N/A	
529	Input Saturated	1	0	–	uChar 8bit	N/A	N/A	N/A	
530	Output Saturated	1	0	–	uChar 8bit	N/A	N/A	N/A	
531	System Error	1	0	–	uChar 8bit	N/A	N/A	N/A	
PTR Setup Page									
3096	Host Address	2	0	2**	uInt 32bit	N/A	N/A	192.168.1.100	See 8.3 Host Configuration
3098	Host Gateway	2	0	2**	uInt 32bit	N/A	N/A	192.168.1.1	
3100	Host Netmask	2	0	2**	uInt 32bit	N/A	N/A	255.255.255.0	
3102	Host Port	1	0	2**	uInt 16bit	1	65535	502	
3288	User Level	4	0	0	N/A	N/A	N/A	0x00000003, 0x00000000	See 8.1 set user level and 6.8 user lever code
3292	User Level Passwords	4	–	2*	N/A	N/A	N/A	N/A	See 8.1 change password
3300	Device Reboot	1	–	2	uChar 8bit	0	1	N/A	See 8.8 Device Reboot
3400	Config Reset	1	–	1**	uChar 8bit	0	1	N/A	See 8.9 Config Reset
3999	Unlock PTR EEPROM	1	0	0	uInt 16bit	0x00	0xffff	0	See 6.9 EEPROM Lock
PTR Status									
6000	PTR Status	2	0	–	uInt 32bit	N/A	N/A	0x00000000	See 8.10 PTR status

6002	Extended code for status	2	0	–	uInt 32bit	N/A	N/A	0x00000000	

8 Detailed Description of the Implemented Modbus Registers

8.1 User levels and passwords

Log in with a password to select user levels 1 or 2. The user can change the password of each access level.

Set user level

To change or check the user level, write or read relative register number 3288:

Register		Register Usage		Access User Level	
Start	Count	Register 1/2	Register 3/4	Read	Write
3288	4	User Level Code	Password	0	0
Example		0x0000, 0x0030	0x00F4, 0x79CE		

The selected user level remains active until PTR's next power-down/reboot. After power-up or reboot, user level 0 is active. Invalid login trials are discarded, and the current user level is maintained.

Change passwords for user levels.

To change the password of a user level, write relative register number 3292:

Register		Register Usage		Access User Level	
Start	Count	Register 1/2	Register 3/4	Read	Write
3292	4	User Level Code (hex)	Password (hex)	–	2
Example		0x0000, 0x0030	0x1905, 0x0202		

Invalid user-level settings (user lever code is wrong) are discarded, and no password will be changed.
Checking for valid passwords is performed by reading the user level.
Note: If user-level code is wrong, error code 0x03 will be returned.

8.2 Modbus register offset

By default, the Modbus register offset is defined to 0. If necessary, this offset can be changed to any number in the range of 0…65535.
To change or check the Modbus register offset, write or read absolute register number 0000:

Register		Register Usage	Access User Level	
Start	Count	Register 1/2	Read	Write
0000	1	Modbus Register Offset (unsigned integer)	0	2
Example		999 (hex-value on register #1: 0x03E7, register #2: 0x0000)		

8.3 Configuration of the TCP/IP protocol on the Ethernet interface

The factory settings of the Ethernet interface are as follows:

IP Address: 192.168.1.100 (default)

Gateway: 192.168.1.1 (default)
Subnet Mask: 255.255.255.0 (default)
Port: 502 (default)

Please verify the new settings by reading them back before powering the unit off. The settings will be in effect after the next power cycle, and if set incorrectly, no further communication will be possible.

The supported Max Connection number is 2.

Host Configuration

Register		Register Usage	Access User Level	
Start	Count	Register 1/2	Read	Write
3096	2	Host Address (unsigned int) The 1st byte cannot be set as 0/127 The 4th byte cannot be set as 0/255 Take the default address 192.168.1.100 as an example, the 1st byte is "192", the 4th byte is "100" Write these illegal values will return error code 0x03	0	2**
3098	2	Host Gateway (unsigned int)	0	2**
3100	2	Host Netmask (unsigned int)	0	2**
3102	1	Host Port (unsigned int) Write value 0 will return error code 0x03	0	2**

8.4 Measuring value page

- ### Measuring channel registers

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
100	2	Process value of the primary measuring channel from the sensor	0	-
102	2	Process value of the secondary measuring channel from the sensor	0	-
104	2	Process value of the tertiary measuring channel from the sensor	0	-

For all measuring channel units, the filter is "Average" (filtering/smoothing for registers 100, 102, 104).

- ### Measuring channel unit registers

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
120 122 124	2	Primary, secondary, and tertiary measuring channels.	0	-

- ### Measurement unit of pressure sensor

Measurement channel	Fixed Unit	Fixed Unit Code
Primary Measuring Channel	pressure Value mV	0x0006'0000
Secondary Measuring Channel	pressure psi	0x0006'0001
Tertiary Measuring Channel	pressure mbar	0x0006'0002

8.5 Transmitter Information Page

- ### Part Number

Register		Register Usage	Access User Level	
Start	Count	Register 1 - 8	Read	Write
280	8	The Part Number includes "30827316" for PTR	0	–

		7.5psi and "30827317" for PTR 75psi. String value		

- ## User End Firmware Version

This version of data is implemented as 16-character ASCII strings using the following format: #.#.##.##

The first and second groups have only one digit. The third group has fixed two digits; the remaining space has to be filled with spaces (ASCII 0x20).

Spaces are only allowed as "trailing spaces" to fill the remainder of the field. Spaces may not be used inside the version part. In addition, padding the version numbers with zeroes is not allowed. See the examples below for further clarification.

The meaning of the groups is as follows:

First Major version number (0 – 9) Denotes a product generation or similar.

Second Minor version number (0 – 9) Denotes a version with functional changes.

Third Bugfix version (0 – 99): No functional changes, just bug fixes or other **corrections.**

Examples

In the following examples, space characters (ASCII 0x20) are represented by a □-symbol.

Valid versions:

0.0.00□□□□□□□□□□

1.1.01□□□□□□□□□□

Invalid versions:

1.□0.□□□□□□□□□□0

1.0.0□□□□□□□□□□

- ## Tag Name

Register		Register Usage	Access User Level	
Start	Count	Register 1 - 8	Read	Write
296	8	The Tag Name is up to sixteen characters.	0	0**

- ## Serial Number

Register		Register Usage	Access User Level	
Start	Count	Register 1 - 8	Read	Write
304	8	The Serial Number is "CXXXXXXXXX". String value	0	–

- ## Manufacturer

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
312	8	Currently is fixed to "METTLER TOLEDO." String value	0	–

Note:

For Part Number, Tag Name, Serial Number, and Manufacturer:

If the string length does not reach the max count number, the rest of the data are filled with "0x20".

8.6 PTR Application Page

- Tare

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
500	1	1: for starting the tare process 2: for resetting the tare process Writing any other value except 1 and 2 will return error code 0x03	–	1

- Tare Result

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
501	1	Get tare result value. uChar 8bit value 0: Tare successful 1: Tare failed Tare will fail if the sensor is disconnected or the ADC input is saturated. Reset Tare operation has no strings attached and will always be successful.	0	–

- Tare Offset

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
502	2	When the units' software executes the tare routine, the tare offset is stored to create the zero value at the measurement when the tare routine was executed. When the tare function is initiated, the software subtracts the current value from the raw reading, so a zero reading is displayed, and that value is used for all raw readings displayed. The unit is psi.	0	–

- Low Pressure Point

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
504	2	Low/High-Pressure Point is used to adjust the 4-20mA scaling. This point is related to the 4mA. Writing value lower than -11.5 or larger than/equal High-Pressure Point will return error code 0x03	0	1**

- High Pressure Point

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
506	2	Low/High-Pressure Point is used to adjust the 4-20mA scaling.	0	1**

		This point is related to the 20mA. Writing value lower than/equal to Low Pressure Point or larger than 7.5(PTR 7.5psi)/75(PTR 75psi) will return error code 0x03		

8.7 PTR Alarm Page

- Latch Stop

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
519	1	write 0x01 to register 519. If the alarm latch is turned on, alarm conditions will remain after an alarm state occurs but are no longer present until the STOP function is implemented. Write other values except 1 will return error code 0x03	–	1

- Latch Mode

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
520	1	Indicate whether Latch mode is enabled or not. uChar 8bit value 0: Latch off, 1: Latch on Write other values except 0 and 1 will return error code 0x03	0	1**

- Relay Mode

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
521	1	Indicate whether the Relay mode is enabled or not. uChar 8bit value 0: Relay mode off, 1: Relay mode on Write other values except 0 and 1 will return error code 0x03	0	1**

- Low-Pressure Alarm Point

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
522	2	If the pressure input value is less than the Low-Pressure Alarm Point, the Input Saturated Alarm will occur. Writing value lower than -12 or larger than High-Pressure Alarm Point will return error code 0x03	0	1**

- High Pressure Alarm Point

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
524	2	If the pressure input value exceeds the High-Pressure Alarm Point, the Input Saturated Alarm will occur. Writing value lower than Low-Pressure Alarm	0	1**

		Point or larger than 8(PTR 7.5psi)/75(PTR 75psi) will return error code 0x03		

- Alarm Valid

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
526	1	This is the time an alarm occurs/disappear condition must be present. This value can be changed in specific processes with rapidly changing pressures to prevent undesired false alarms. The unit is second, and the value is set to a default of 0 seconds. Writing value lower than 0 or larger than 999 will return error code 0x03	0	1**

- Flag Sensor Disconnected

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
528	1	Get the sensor connection status value. uChar 8bit value 0: means the sensor is connected 1: this means sensor is disconnected When the event happens, the analog output value will be 22mA	0	–

- Input Saturated

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
529	1	The input-saturated alarm condition will occur if the pressure input value is less than the Low-Pressure Alarm Point or greater than the High-Pressure Alarm Point. Get input saturated status value. uChar 8bit value 0: means input is within the defined range 1: means input is saturated	0	–

- Output Saturated

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
530	1	The output saturated alarm condition will occur if the analog output value is less than 3.8mA or greater than 20.5mA. Get output saturated status value. uChar 8bit value 0: means output is within the defined range 1: means output is saturated	0	–

- System Error

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
531	1	Get the system error status value. uChar 8bit value 0: means the system is running normally 1: means the system is in an error state When the event happens, the analog output value will be 22mA	0	–

8.8 Device Reboot

By default, the device reboot register 3300 is defined to 0.

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
3300	1	After writing 0x01 to register 3300, after the response is sent, the PTR will reboot automatically. The reboot progress will take about 20 seconds. The error code 0x03 will be returned if the user attempts to write any other values except 0x01.	–	2

8.9 Config Reset

By default, the config reset register 3400 is defined as 0.

Register		Register Usage	Access User Level	
Start	Count	Register 1	Read	Write
3400	1	After writing 0x01 to register 3400, the config of Register 504, 506, 520, 521, 522, 524, and 526 will be reset to the default value. The error code 0x03 will be returned if the user attempts to write any other values except 0x01.	–	1**

PTR Status

- ### PTR status (initialization)

If PTR encounters an unrecoverable error during initialization progress, it will not respond to any read/write command (like #3, #4, #6 & #16), but the user can only use the #3 command to read register 6000 to get the detailed status of PTR and read register 6002 to get the extended

Code for status.

Note:

The following communication setting will be used as below ONLY when an error happens during initialization progress:

IP Address:	192.168.1.100 (default)
Gateway:	192.168.1.1 (default)
Subnet Mask:	255.255.255.0 (default)
Port:	502 (default)

- ### PTR status (running)

If PTR encounters an error (such as EEPROM read/ write error) during running, it will still run normally, and user can still read the register 6000 to see the status.

PTR detail status	all/RO	Comment
Configuration data initial error	0x0000'0001	Error in initial
EEPROM read or write initial error 1	0x0000'0002	Error in initial
EEPROM read or write initial error 2	0x0000'0004	Error in initial
EEPROM read or write initial error 3	0x0000'0008	Error in initial
EEPROM read or write initial error 4	0x0000'0010	Error in initial
EEPROM read or write initial error 5	0x0000'0020	Error in initial
EEPROM read or write initial error 6	0x0000'0040	Error in initial
EEPROM read or write initial error 7	0x0000'0080	Error in initial
EEPROM read or write running error	0x0000'0100	Error in normal running
Reserved	0x0000'0200	
Reserved	0x0000'0400	
Reserved	0x0000'0800	
Reserved	0x0000'1000	
Reserved	0x0000'2000	
Reserved	0x0000'4000	
Reserved	0x0000'8000	
Reserved	0x0001'0000	
Reserved	0x0002'0000	
Reserved	0x0004'0000	
Reserved	0x0008'0000	
Reserved	0x0010'0000	
Reserved	0x0020'0000	
Reserved	0x0040'0000	
Reserved	0x0080'0000	
Reserved	0x0100'0000	
Reserved	0x0200'0000	
Reserved	0x0400'0000	
Reserved	0x0800'0000	
Reserved	0x1000'0000	
Reserved	0x2000'0000	
Reserved	0x4000'0000	
Reserved	0x8000'0000	

9 Specifications & Information

9.1 Specifications

Performance Accuracy	Input accuracy + output accuracy
Input accuracy	PTR 7.5psi: 0-2 psi: ±0.012psi; others: ±[0.01 + 0.1% of reading] psi PTR 75psi: ±0.15psi
Output accuracy	±[0.021 + 0.15% of reading] mA
Temperature coefficient	±0.015%/°C (±0.008%/°F) of max. range at -5 to +55°C [23 to 131°F]; ±0.03%/°C (±0.02%/°F) at <-5°C, >+55°C
Response time	≤100 milliseconds (0 – 90%)
Line voltage effect	±0.1% over voltage range
Insulation resistance	≥100MΩ with 500VDC
Relay Output	• Normally OPEN or CLOSED via wiring • 28 Volt AC/DC Maximum • 1 amp closure, 2 amps maximum current • 20 mS max turn on/off time
Suitable DIN rail systems	35 mm wide
Weight	140g (0.31lbs)
Material	PA-FR
Enclosure rating	IP20
Storage temperature	- 40 to + 70 °C (- 40 to +158 °F)
Operating temperature	-25 to +65°C (-13 to +149°F) Max. 55°C (131°F)
Relative humidity	0-95% non-condensing
Dielectric strength	1500VAC @ 1-minute (input to output or power to ground) 500VAC @ 1 minute (output to power)
Regulatory Compliances	CE Mark EN 61326-1:2021; EN61010-1:2010/A1:2016/C:2019 ISO EN 13849-1:2023; UL and cUL are recognized; UKCA RoHS and REACH are compliant.

9.2 Ordering information

Model	Description
30827316	Transmitter PTR 7.5psi 4-20mA Din
30827317	Transmitter PTR 75psi 4-20mA Din
PDKT-650-298	Cable Adapter for PendoTECH Single-Use Pressure Sensor (12 feet)
PDKT-650-298-24F	Cable Adapter for PendoTECH Single-Use Pressure Sensor (24 feet)

Table 5: Ordering information

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9.3 Service Information

Any product under warranty must be returned to PendoTECH for repair. If out of warranty, the user should call PendoTECH for over-the-phone assistance, and our service staff will help determine whether the unit should be returned for repair.

Contact PendoTECH at request@pendotech.com or call +1-609-799-2299 for a return authorization number for factory service.

Then pack the unit carefully, preferably in the original shipping container, insure it, and ship it to PendoTECH.