



# TWR™-100 THERMAWATCH ROTOR

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Fast-Response Non-Contact Rotor Pole Temperature Monitoring  
User's Manual



## Safety Information

The following manual contains information and warnings. They must be followed in order to keep the instrument in a working condition and ensure safe operation.

### Safety and Electrical Symbols

	<b>Warning - Danger</b> - Identifies conditions or practices that could cause physical harm or death.
	<b>Caution</b> - Identifies conditions or practices that could result in a permanent loss of data or damage the measuring chain and/or other equipment to which it is connected.
	<b>Important Information</b> - Identifies important information, hints, and tips that must be read and applied.

### Safety Precautions

#### **Warning - Danger** **Caution**

- To use the described product correctly and safely, read and follow all safety instructions or warnings that appear throughout this manual.
- This product is intended to be used by qualified operators and maintenance personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read and follow all installation, operation, and maintenance information before using this product.
- Use this product only as specified in this manual or the protection provided by this product might be impaired.
- When in doubt that safety protection has been impaired, make this product inoperative and secure it against any unintended operation.
- Use caution when working with voltage levels above 30 VAC RMS or 42 VDC. These voltage levels are potential shock hazards.
- Follow all generally accepted safety practices and procedures when working with or around electricity.
- Do not use this product in wet environments.

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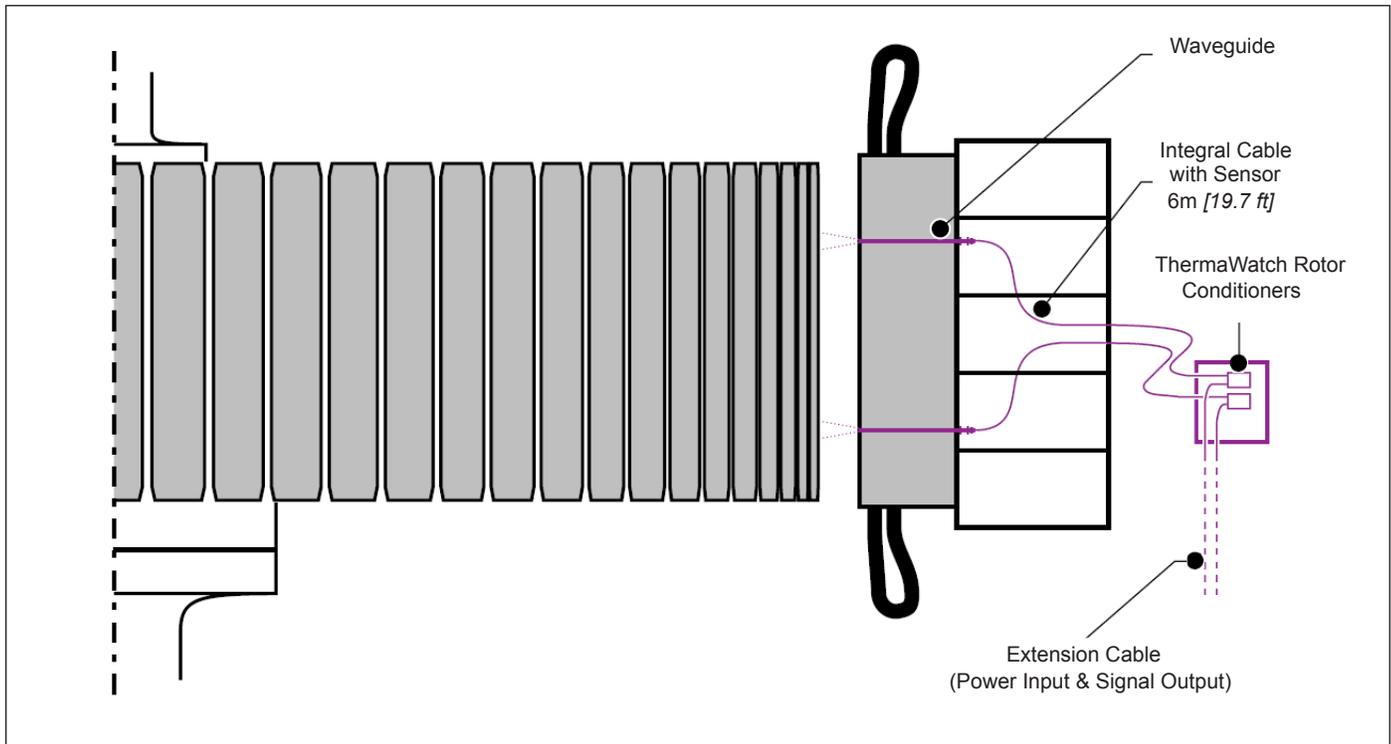
## 1. TWR-100 MEASURING CHAIN OVERVIEW

### 1.1 Description

The TWR-100 ThermaWatch Rotor measuring chain provides a fast-response, on-line reading of the temperature of rotor field poles inside large rotating machines.

The TWR-100 sensor is typically installed perpendicular to the rotor pole faces, with the waveguide inserted into the stator core through a ventilation hole.

The 4-20 mA output from the ThermaWatch Rotor conditioner can be connected to the ZOOM<sup>®</sup> system or other instrumentation. The data from the TWR-100 measuring chains, when combined with other parameters under surveillance by the ZOOM system, serves to build a comprehensive analysis of the condition of the rotor.



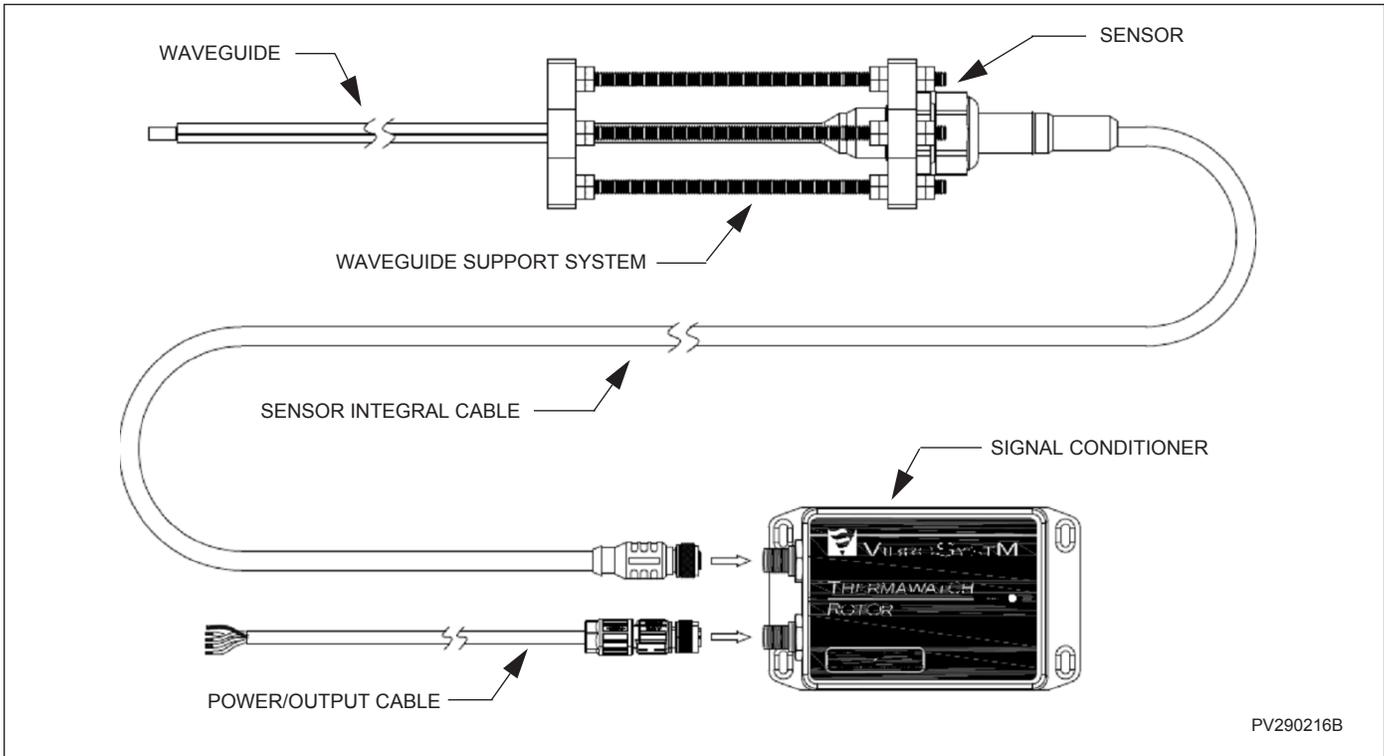
- Maximum distance from sensor to conditioner: 6 m [19.7 ft] (limit set by integral cable length)
- Maximum distance from conditioner to instrumentation: 300 m [984 ft]
- Minimum ventilation hole: 6 mm x 9.6 mm
- The waveguide is available in two lengths for adjustment to stator core thickness:
  - 25 to 35 cm [9.8 to 13.8 in.]
  - 35 to 45 cm [13.8 to 17.7 in.]
- Operating and storage temperature: refer to the datasheet.

### ! Important Information

- Keep in mind that only a general overview is presented, as this document is intended for planning purposes only. Concerns about safety issues or specific installation considerations are not included.
- For safe operation and to ensure that your system functions at its optimum capability, VibroSystM trained service specialists should handle the installation and adjustment process of all measuring chains.



## Measuring Chain and Signal Cable Layout



Components are calibrated. At installation, serial numbers of all components must be matched for each measuring chain.



## 1.2 Main Unit Interventions

- Adhesive resin and silicone will be used inside the unit.
- A protection box (or more) must be installed outside the stator core to house the conditioner(s).
- Protective conduits must be routed throughout the unit to protect the cables.

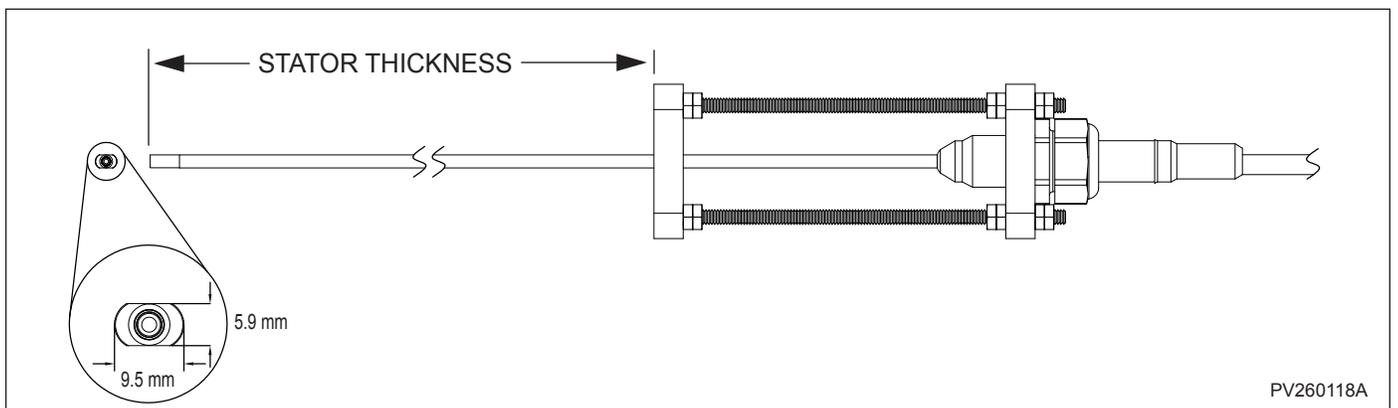
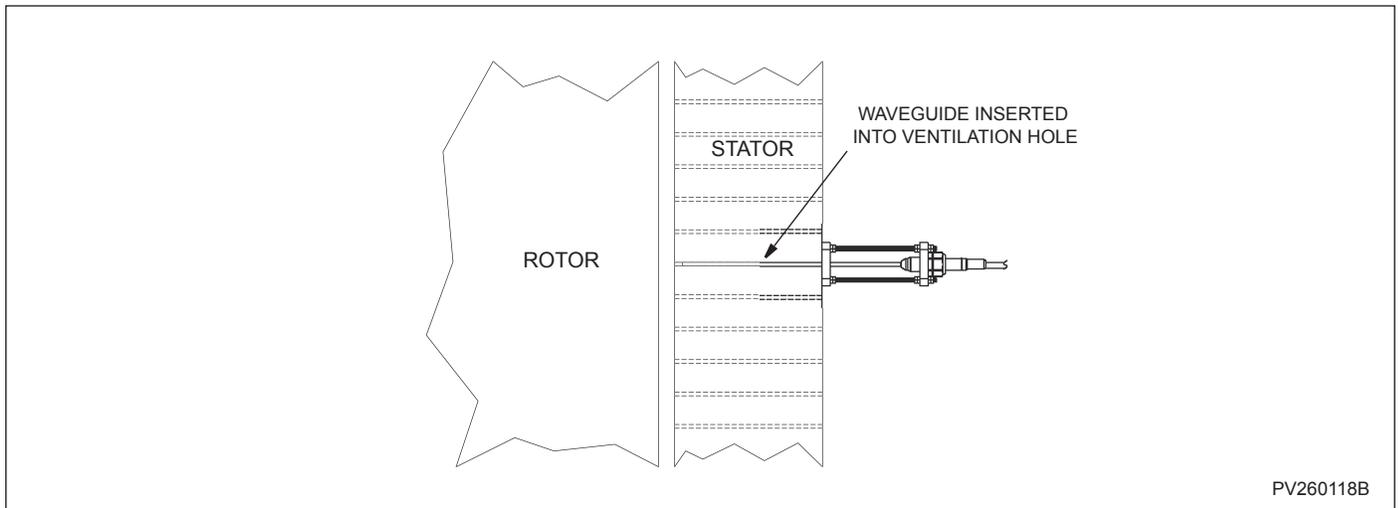


## 2. WAVEGUIDE AND WAVEGUIDE SUPPORT INSTALLATION OVERVIEW

- The waveguide must be perpendicular to the target's surface.
- The TWR-100 sensor must be installed with its tip at a maximum distance of 12.7 cm [5 in.] from its target.
- The integral cable must be protected.

### Caution

- Integral cables are factory calibrated and must **NEVER** be cut or altered.
- Never exert traction on the integral cable or connector.
- The tip of the waveguide must remain clean and unobstructed.



For optimal operation when installed through a ventilation hole, the tip of the waveguide must be flush with the stator wall, without sticking out into the air gap. A depth tool (stator core dimension gauge) is provided with the waveguide to measure the stator thickness. The holding system needs to be adjusted to the stator thickness by turning the hex nuts on the threaded rods. Once the holding system has been adjusted, thread locking compound is applied to the hex nuts to prevent loosening, and the TWR-100 sensor is glued to the stator wall.

The integral cable is routed through protective tubing to the signal conditioner location.



### 3. THERMAWATCH ROTOR SIGNAL CONDITIONER OVERVIEW

#### 3.1 Description

The ThermaWatch Rotor signal conditioner requires a 24 Vdc supply and delivers a 4 to 20 mA linearized raw output signal.



The ThermaWatch Rotor signal conditioner features two sockets. Note that connectors and sockets are keyed.

The TWR-100 sensor's integral cable connects to the 8-pin M12 socket. The power input and signal output extension cable connects to the 5-pin M12 socket.

#### 3.2 Installation Overview

- The ThermaWatch Rotor conditioners must be installed on a properly grounded mounting panel, inside a grounded protection box.
- Protective conduit (semi-rigid or flexible) should be run from the protection box housing the conditioners to the location of the cabinet housing power supply and instrumentation.
- Possible conditioner locations are limited by the length of the sensor's integral cable.
- Any remaining length of the sensor's integral cable is stored in the protection box.
- The power/signal cable is limited to a maximum length of 300 m [984 ft].

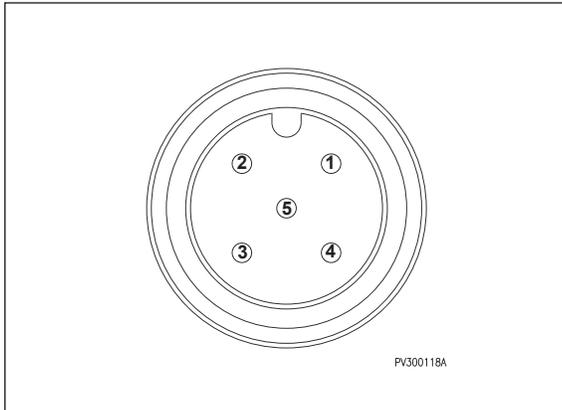
 **Caution**

- It is recommended to use a VibroSystM protection box, since it is equipped with vibration dampers and offers excellent grounding. Using a generic box may affect the measuring chain's performance.



### 3.3 Power Input and Signal Output Cable - Connector Pinout

The illustration below shows the power input and signal output 5-Pin M12 male connector pinout.



The cable provided by VibroSystM may be replaced by any cable having similar characteristics. The table below shows the color codes, designations and specifications for VibroSystM's signal cable.

M12 Connector Pin #	Corresponding Color Code	Designation	Specifications
1	Brown	Power Supply	+24 VDC
2	White	Current Output	4-20 mA (proportional to sensor's full range)
3	Blue	Common	0 V
4	Black	Not Used	
5	Not Used		

### 3.4 Power Input and Signal Output Cable - Ground-to-Shield Connection

It is important that the shield on the power and signal cable be grounded on one end only to avoid creating a ground loop. If the M12 connector at the end of the signal cable is insulated from the shield, the shield on the power and signal cable must then be grounded on the acquisition unit side. However, if the M12 connector at the end of the signal cable is connected to the shield, connecting the signal cable to the ThermaWatch Rotor conditioner will automatically ground the shield. In this case, the shield must not be grounded on the acquisition unit side.

### 3.5 Validation of the Output Signal Value

In theory, the conditioner produces a linear 4 to 20 mA current output over a 0 to 200°C [32 to 392°F] temperature range. However, the conditioner is calibrated in accordance with specifications over a 40 to 200°C [104 to 392°F] temperature range, which corresponds to a 7.2 to 20 mA signal output.

The temperature value can be verified against the output signal value by applying the following transfer formula:

$$T\text{ }^{\circ}\text{C} = (I_{\text{out}}(\text{mA}) - 4) \times 12.5 \quad (\text{calibrated for: } 7.2\text{ mA} \leq I_{\text{out}} \leq 20\text{ mA})$$



### 3.6 Status LED Functionality

Once the sensor is connected, apply power to the ThermaWatch Rotor conditioner and verify the 3-color LED indicator's flash sequence upon start-up.



A normal boot sequence should be as follows:

- One orange flash, followed by green flashes.

Once the boot sequence is completed, the LED indicator will continue flashing green while the conditioner scans the measuring chain. Once the scan is completed, the LED reflects the chain's overall condition:

- **Continues Flashing Green:** Indicates a normal operation (**Status OK**).
- **Flashes Orange:** indicates that the internal temperature of the ThermaWatch Rotor conditioner has risen above the upper limit (75 °C). The measuring chain will continue normal operation, and the high temperature will not affect its performance, but this issue must be addressed by providing ventilation to cool the ThermaWatch Rotor conditioner, because a continued high temperature will reduce its life expectancy.
- **Flashes Red:** Indicates an error condition. The following flash sequences are the most likely to occur:
  - **Error Condition #1:** The LED is red for one second, followed by one brief flash. This indicates a «CHANNEL ERROR», which means that the connection between the sensor and the ThermaWatch Rotor conditioner is compromised, and the cabling should be checked.
  - **Error Condition #2:** The LED is red for one second, followed by two brief flashes. This indicates a «SYSTEM ERROR», which means that the firmware is unable to treat the signal.
  - **Combined Errors:** If a «CHANNEL ERROR» and «SYSTEM ERROR» are present at the same time, the LED will display a combined sequence, where the LED is red for one second, followed by three brief flashes.

If one of the described LED indicator error sequences occurs and the cause is not obvious (usually a disconnected cable, or a power supply not providing adequate power), please contact VibroSystM.