

**FLUKE®**

**Process  
Instruments**

# Endurance® Series

Innovative High Performance Infrared Pyrometers



**Flexible**

**Durable**

**Visual**

| E1R  | E2R  | E1M  | E2M   | E3M  |
|--|--|--|---|--|
| <p><b>E1RL</b><br/>600 to 1800 °C<br/>(1112 to 3272 °F)<br/>(2 color mode)</p> <p>550 to 1800 °C<br/>(1022 to 3272 °F)<br/>(single color mode)<br/>100 : 1*</p> <p><b>E1RH</b><br/>1000 to 3200 °C<br/>(1832 to 5792 °F)<br/>150 : 1*</p> <p><b>1.0 μm nominal<br/>one/two color</b></p>  | <p><b>E2RL</b><br/>250 to 1200 °C<br/>(482 to 2192 °F)<br/>75 : 1**</p> <p><b>1.6 μm nominal<br/>one/two color</b></p>  | <p><b>E1ML</b><br/>400 to 1740 °C<br/>(752 to 3164 °F)<br/>160 : 1**</p> <p><b>E1MH</b><br/>540 to 3000 °C<br/>(1004 to 5432 °F)<br/>300 : 1**</p> <p><b>1.0 μm nominal<br/>single color</b></p>  | <p><b>E2ML</b><br/>250 to 1100 °C<br/>(482 to 2012 °F)<br/>160 : 1**</p> <p><b>E2MM</b><br/>250 to 1400 °C<br/>(482 to 2552 °F)<br/>160 : 1</p> <p><b>E2MH</b><br/>450 to 2250 °C<br/>(842 to 4082 °F)<br/>300 : 1**</p> <p><b>1.6 μm nominal<br/>single color</b></p>  | <p><b>E3ML</b><br/>50 to 1000 °C<br/>(122 to 1832 °F)<br/>100 : 1**</p> <p><b>E3MH</b><br/>150 to 1800 °C<br/>(302 to 3272 °F)<br/>300 : 1**</p> <p><b>2.4 μm nominal<br/>single color</b></p>  |

**The flexible, durable,  
visual solution...  
saving you time and money**



### Flexible

Designed to handle wider temperature ranges with superior optical resolution. Profinet, Ethernet, EtherNet/IP, RS-485 and analog output is available to meet your process requirements. Endurance® series sensors are rugged, small and easy to install.

### Durable

Built to withstand the harshest environments, the sensor is housed in a stainless steel IP65 (NEMA-4) housing. Accessories such as high temperature enclosures, cables, and totally sealed connectors, along with best in class 4 year warranty, Endurance series sensors are a snap to install.

### Visual

The video camera option provides remote verification of sighting as well as continuous monitoring of your process. The LED sighting option can be used in applications where it is important to “see” the actual spot size projected on the target. The laser sighting option for integrated and fiber optic heads is useful for local verification of sighting accuracy. By using the Endurance software or the built in web server, you can archive, monitor and troubleshoot with a total view to your process.

### Rugged sensors for harsh installations



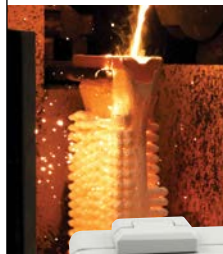

Endurance sensors have a rugged stainless steel housing designed to meet IP65 (NEMA 4) environmental requirements in high ambients up to 65 °C (149 °F) for integrated sensors and 315 °C (599 °F) for fiber-optic sensors without cooling.

Isolated analog outputs and sensor protection circuitry prevent sensor damage from mis-wiring at installation or unstable power supply line voltages.

### See more of your process

Using the onboard Ethernet option, you have access to a web server, Power over Ethernet, ASCII over Ethernet and video if the camera option is selected for the sighting method. The camera option can be used to stream a view of your process (while showing exactly where the pyrometer is aimed) right into a control room to see what is happening at the exact instant a temperature event occurs.

**Note:** Sighting options Integrated head sensors – video, laser, LED. Fiber-optic sensors – laser (option), no laser (standard)

| EF1R  | EF2R   | EF1M  | EF2M  |
|---|--|---|---|
| <p><b>EF1RL</b><br/>500 to 1100 °C<br/>(932 to 2012 °F)<br/>20:1*</p> <p><b>EF1RM</b><br/>700 to 1500 °C<br/>(1292 to 2732 °F)<br/>40:1*</p> <p><b>EF1RH</b><br/>1000 to 3200 °C<br/>(1832 to 5792 °F)<br/>65:1*</p> <p><b>1.0 µm nominal<br/>one/two color</b></p>  | <p><b>EF2RL</b><br/>275 to 1300 °C<br/>(527 to 2372 °F)<br/>20:1**</p> <p><b>EF2RH</b><br/>350 to 1300 °C<br/>(662 to 2372 °F)<br/>40:1**</p> <p><b>1.6 µm nominal<br/>one/two color</b></p>  | <p><b>EF1ML</b><br/>475 to 900 °C<br/>(887 to 1652 °F)<br/>20:1*</p> <p><b>EF1MM</b><br/>800 to 1900 °C<br/>(1472 to 3452 °F)<br/>100:1*</p> <p><b>EF1MH</b><br/>1200 to 3000 °C<br/>(2192 to 5432 °F)<br/>100:1*</p> <p><b>1.0 µm nominal<br/>single color</b></p>  | <p><b>EF2ML</b><br/>250 to 800 °C<br/>(482 to 1472 °F)<br/>20:1*</p> <p><b>EF2MH</b><br/>400 to 1700 °C<br/>(752 to 3092 °F)<br/>40:1*</p> <p><b>1.6 µm nominal<br/>single color</b></p>  |

\* 95% Energy \*\* 90% Energy

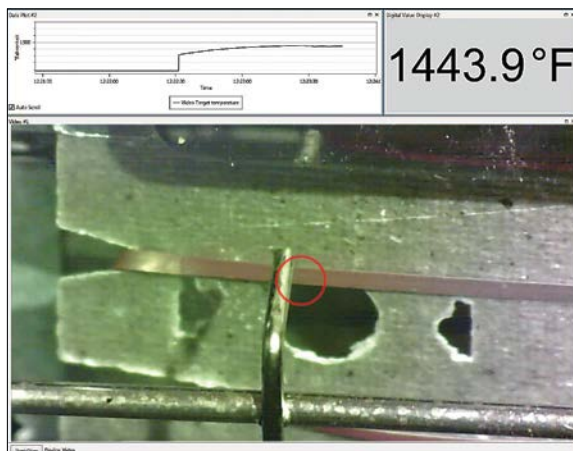


### Interface Options

Full access to all sensor settings is achievable from the backlit rear panel. This panel displays the indicated temperature, system alarm status, as well as all sensor parameters.

### Software

Plot the temperature values of an Endurance sensor with high resolution video image. High and low alarms are shown, making it easy to identify out-of-range conditions. Endurance software makes it easy to remotely configure Endurance sensors from the safety of the control room.



### Fiber-Optic

Endurance fiber-optic pyrometers allow measurement of targets that would otherwise be inaccessible because of space constraints or harsh environments. Separated by a flexible fiber-optic cable, the optical head may be positioned near the target with the rugged electronics housing installed remotely in a convenient location.

Fiber-optic sensors are completely non-conductive and offers improved immunity to RFI and EMI interference.

### Applications

- Metals processing
- Molten metal/forging
- Hot rolling mills
- Rod/wire mills
- Heat treating & annealing
- Induction heating
- Lightbulb and halogen lamp production
- Glass melting
- Semiconductor furnaces
- Cement & lime kilns
- Refuse burning
- Carbon graphite production
- Foundry & welding
- Rubber & thick plastic

**Key Features**

- Broad temperature range from 50 °C to 3200 °C (122 °F to 5792 °F)
- Superior optical resolution to 300:1
- Spot sizes down to 0.6mm (0.02 inch)
- Fast response times down to 2 ms
- Easy adjustment with manual variable focus integrated head optics
- Through-the-lens sighting, with optional laser, LED or video aiming function
- Compact, rugged housings with IP65 (NEMA-4) rating
- Ethernet, Profinet and EtherNet/IP options
- Programmable relay output for control
- Simultaneous analog and digital outputs

**Highlights**

- Innovative optional camera feature allows you to continuously monitor your process visually
- LED sighting option allows you to see the spot size on the target and make sure you have a clean line of sight to the target.
- Match function takes the guess work out of setting the emissivity
- Endurance companion software allows you to archive your process temperatures for data analysis and sensor setup.
- Easy to upgrade from your existing Ircon Modline® 5, Modline 6, Modline 7 or Marathon MR, Marathon MM, Marathon FA/FR series installations. Adapter accessories and patch cables allow you to use existing accessories.
- Temperature measurement of inaccessible targets with rugged non-contact fiber-optic single and two color pyrometer measurement systems.



In the heat of the moment, what is the temperature? Not knowing can mean the investment and labor of everyone and every material involved in the manufacturing process, from the raw to the finished product, is at risk. We take the heat and tell you its temperature. Precisely, accurately, and with the greatest of detail, all to ensure our customers' promise of quality is delivered.

We are Raytek, Ircon, and Datapaq. Combined, we have over 150 years of experience in temperature measurement. Individually, we have earned the respect of manufacturing's most valued names.

Together, we are Fluke® Process Instruments - a triad of the top performing, innovative, most rugged and dependable noncontact temperature measurement and profiling equipment made - a complete line of infrared sensors, line scanners, thermal imagers and profiling systems for use in today's most demanding environments.

Raytek, Ircon, and Datapaq. The first names in temperature control have become the last word in manufacturing with confidence:

**Fluke Process Instruments**

**The Fluke Process Instruments Guarantee**

The Endurance Series is supported by a 4 year warranty. With a network of trained representatives and agents in over one hundred countries and offices located in the U.S., Germany and China, we provide local service and support.

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# Endurance®

## Datasheet

### Highlights

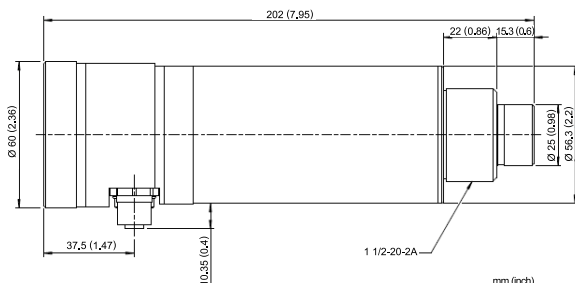
- 4 year warranty
- Wide temperature range:  
50 to 3200 °C (122 to 5792 °F)
- Sighting options:
  - Laser through the lens and Visible through the lens - Manual Variable focus
  - Video Camera through the lens and Visible through the lens - Manual Variable focus
  - LED through the lens and Visible through the lens - Manual Variable focus
- Superior optical resolution to 300:1
- LAN/Ethernet interface with PoE for communication with the sensor (ASCII, Video, and Webserver)
- Profinet and EtherNet/IP interface options
- Programmable relay output
- Fail safe alarm
- Isolated analog input/output
- Ambient temperatures to 315 °C (600 °F) with ThermoJacket enclosure
- Rugged stainless steel housing, IP65 (NEMA 4) rated
- Unique "dirty window" alarm
- Endurance software for remote configuration, remote monitoring and field calibration
- Single color and two colors models



### Electrical Specifications

|                     |   |
|---------------------|---|
| <b>Inputs</b>       | Contact input (peak/valley reset, Laser, LED), Analog input (emissivity, e-slope, background temperature) 0/4-20 mA                                 |
| <b>Outputs</b>      | Ethernet, Profinet, EtherNet/IP, 0/4-20 mA, max. load: 500 Ω<br>RS485 (2-wire half duplex), networkable<br>Relay, 48 V, 300 mA, response time < 2 m |
| <b>Power Supply</b> | 20 to 48 VDC, 500 mA<br>Power over Ethernet (PoE)   |

### Dimensions



### General Specifications

**Environmental Rating** IP65 (IEC529) / NEMA-4

|                            |  |
|----------------------------|--|
| <b>Ambient Temperature</b> | without cooling 0 to 65 °C (32 to 149 °F)<br>E2R without cooling 0 to 60 °C (32 to 140 °F) |
| with air cooling           | 0 to 120 °C (32 to 250 °F)   |
| with water cooling         | 0 to 175 °C (32 to 350 °F)   |
| with ThermoJacket          | 0 to 315 °C (32 to 600 °F)   |

**Storage Temperature** -20 to 70 °C (-4 to 158 °F)

**Relative Humidity** 10 to 95 %, non-condensing

**Shock** IEC 68-2-27

**Vibration** IEC 68-2-6

#### Weight

Optical head 1220 g (2.69 lbs)

With air/water cooled housing 2980 g (6.57 lbs)

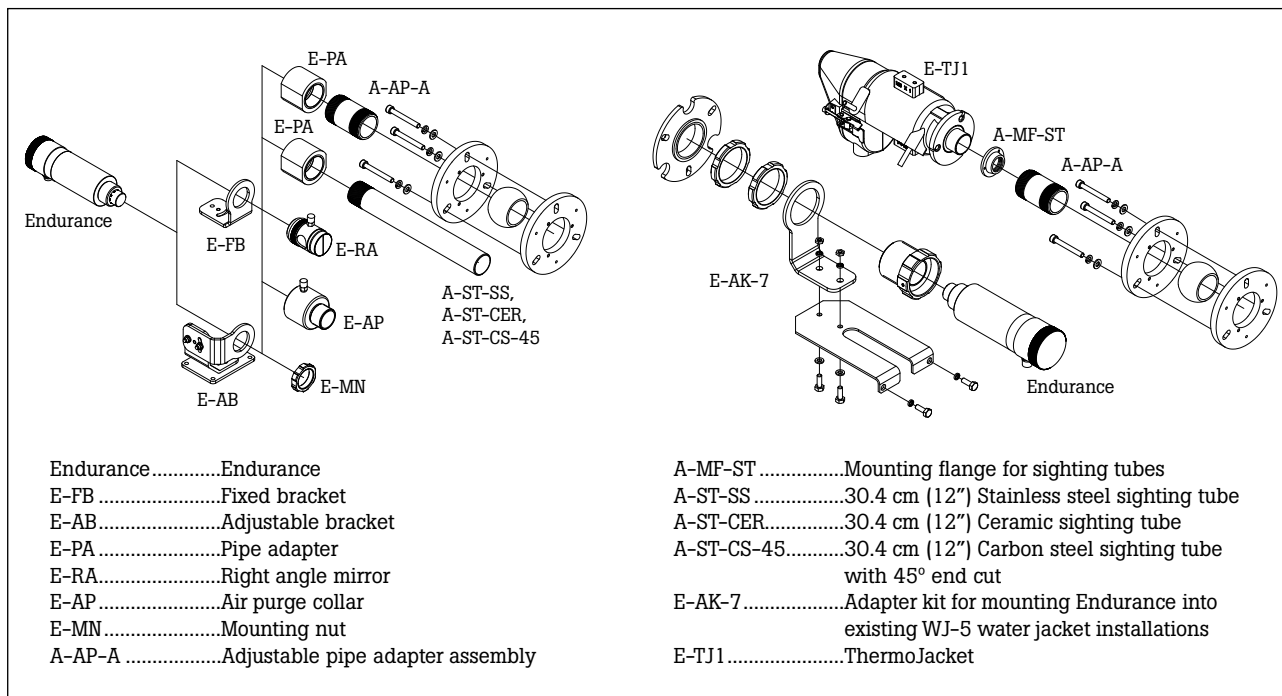
## User Interface



## Measurement Specifications

|  | <b>E1R</b>  | <b>E2R</b>  | <b>E1M</b>   | <b>E2M</b>  | <b>E3M</b>   |
|--|---|---|--|---|--|
| <b>Temperature Range and Optical Resolution (90% energy)</b> | <b>E1RL</b><br>600 to 1800 °C<br>(1112 to 3272 °F)<br>(2 color mode)<br><br>550 to 1800 °C<br>(1022 to 3272 °F)<br>(single color mode)<br>100 : 1 (95% energy)<br><br><b>E1RH</b><br>1000 to 3200 °C<br>(1832 to 5792 °F)<br>150 : 1 (95% energy) | <b>E2RL</b><br>250 to 1200 °C<br>(482 to 2192 °F)<br>75 : 1   | <b>E1ML</b><br>400 to 1740 °C<br>(752 to 3164 °F)<br>160 : 1   | <b>E2ML</b><br>250 to 1100 °C<br>(482 to 2012 °F)<br>160 : 1<br><br><b>E2MM</b><br>250 to 1400 °C<br>(482 to 2552 °F)<br>160 : 1<br><br><b>E2MH</b><br>450 to 2250 °C<br>(842 to 4082 °F)<br>300 : 1      | <b>E3ML</b><br>50 to 1000 °C<br>(122 to 1832 °F)<br>100 : 1<br><br><b>E3MH</b><br>150 to 1800 °C<br>(302 to 3272 °F)<br>300 : 1                                      |
| <b>Spectral Response</b>                                     | 1.0 μm nominal one/two color  | 1.6 μm nominal one/two color  | 1.0 μm nominal single color  | 1.6 μm nominal single color   | 2.4 μm nominal single color  |
| <b>Lens Options</b>  | 600 mm – ∞ (24" – ∞) ( <b>F2</b> ), 300 – 600 mm (12 – 24") ( <b>F1</b> ), 190–300 mm (7.5 – 12") ( <b>F0</b> )   |   |  |   |  |
| <b>Sighting</b>  | Visual/Laser, Visual/Camera, Visual/LED   |   |  |   |  |
| <b>Accuracy*</b>   | <b>E1RL</b><br>±(0.5% + 2 °C)<br>no attenuation<br><br><b>E1RH</b><br>±(0.5% + 2 °C) for<br>T <sub>meas</sub> < 3000°C (5432°F)<br>no attenuation<br>Temperature indication<br>only for T <sub>meas</sub> ≥ 3000°C<br>(5432 °F)                   | <b>E2RL</b><br>±(0.5% + 2 °C) for<br>T <sub>meas</sub> ≥ 270°C (518°F)<br>no attenuation<br><br>T <sub>meas</sub> in °C | <b>E1ML</b><br>±(0.3% + 1 °C) for<br>T <sub>meas</sub> ≥ 450°C (842°F)<br>±(2% + 2 °C) for<br>T <sub>meas</sub> < 450°C (842°F)<br><br><b>E1MH</b><br>±(0.3% + 1 °C) for<br>T <sub>meas</sub> ≥ 650°C (1202°F)<br>±(2% + 2 °C) for<br>T <sub>meas</sub> < 650°C (1202°F) | <b>E2ML</b><br>±(0.3% + 2 °C)<br><br><b>E2MM</b><br>±(0.3% + 2 °C) for<br>T <sub>meas</sub> ≥ 350°C (662°F)<br>±(1% + 2 °C) for<br>T <sub>meas</sub> < 350°C (662°F)<br><br><b>E2MH</b><br>±(0.3% + 1 °C) | <b>E3ML</b><br>±(0.3% + 1 °C) for<br>T <sub>meas</sub> ≥ 100°C<br>±(1% + 2 °C) for<br>T <sub>meas</sub> < 100°C<br><br><b>E3MH</b><br>±(0.3% + 1 °C)                 |
| <b>Repeatability*</b>  | ±(0.3% + 1 °C)<br>no attenuation<br><br>T <sub>meas</sub> in °C   | ±(0.3% + 1 °C) for<br>T <sub>meas</sub> ≥ 270°C (518°F)<br>no attenuation<br><br>T <sub>meas</sub> in °C                | <b>E1ML</b><br>±(0.1% + 1 °C) for<br>T <sub>meas</sub> ≥ 450°C (842°F)<br>±(1% + 1 °C) for<br>T <sub>meas</sub> < 450°C (842°F)<br><br><b>E1MH</b><br>±(0.1% + 1 °C) for<br>T <sub>meas</sub> ≥ 650°C (1202°F)<br>±(1% + 1 °C) for<br>T <sub>meas</sub> < 650°C (1202°F) | <b>E2ML</b><br>±(0.1% + 1 °C)<br><br><b>E2MM</b><br>±(0.1% + 1 °C) for<br>T <sub>meas</sub> ≥ 350°C (662°F)<br>±(1% + 1 °C) for<br>T <sub>meas</sub> < 350°C (662°F)<br><br><b>E2MH</b><br>±(0.1% + 1 °C) | <b>E3ML</b><br>±(0.1% + 1 °C) for<br>T <sub>meas</sub> ≥ 100°C (212°F)<br>±(1% + 1 °C) for<br>T <sub>meas</sub> < 100°C (212°F)<br><br><b>E3MH</b><br>±(0.1% + 1 °C) |
| <b>Temperature Resolution</b>                                | Digital Output 0.1 °C, Current Output <0.03 °C / 16 bit   |   |  |   |  |
| <b>Response Time</b>   | 10 ms (95%)   | 20 ms (95%)   | 2 ms (95%)   | 2 ms (95%)  | 20 ms (95%)  |
| <b>Emissivity</b>  | 0.100 to 1.100  |   |  |   |  |
| <b>E-Slope</b>   | 0.850 to 1.150  |   | N/A  |   |  |
| <b>Signal Processing</b>                                     | Peak Hold, Valley Hold, Averaging, Ambient background temperature compensation  |   |  |   |  |

\* at ambient temperature 23 °C ± 5 °C (73 °F ± 9 °F), emissivity = 1.0 and calibration geometry, T<sub>meas</sub> in °C



## Options

Options must be specified at time of order.

- Water-cooled housing, including air purge collar
- Profinet, EtherNet/IP communications

## Accessories

The model includes a mounting nut, fixed bracket, end cap for display, operator's manual and Endurance software. Additional accessories are available (refer to the Endurance Accessory datasheet).

- Adjustable bracket (**E-AB**)
- Air purge collar (**E-AP**)
- SpotScan™ Accessory (**SSA or SSB**) to allow Endurance sensors to scan over a line
- ThermoJacket enclosure for ambient temperatures to 315 °C (600 °F) (**E-TJ1**) – see *ThermoJacket* documentation.
- Polarizing filter end cap (**E-PFEC**)
- Terminal block (**E-TB**)
- Switching power supply 24 VDC 1.3 A industrial power supply, DIN rail mount (**E-SYSPS**)
- Switching power supply in NEMA 4 (IP65) enclosure 100/240 VAC to 24 VDC, 1.1 A (**E-PS**)
- Power over Ethernet (**PoE**) Injector provides power and also acts as a single Ethernet hub (100/240 VAC input) (**E-PoE**)
- USB/RS485 Converter (**E-USB485**)
- Protective front window including O-ring (**E-PW**)

## The Fluke Process Instruments Guarantee

The Endurance Series is supported by a 4 year warranty. With a network of trained representatives and agents in over one hundred countries and offices located in the U.S., Germany and China, we provide local service and support.

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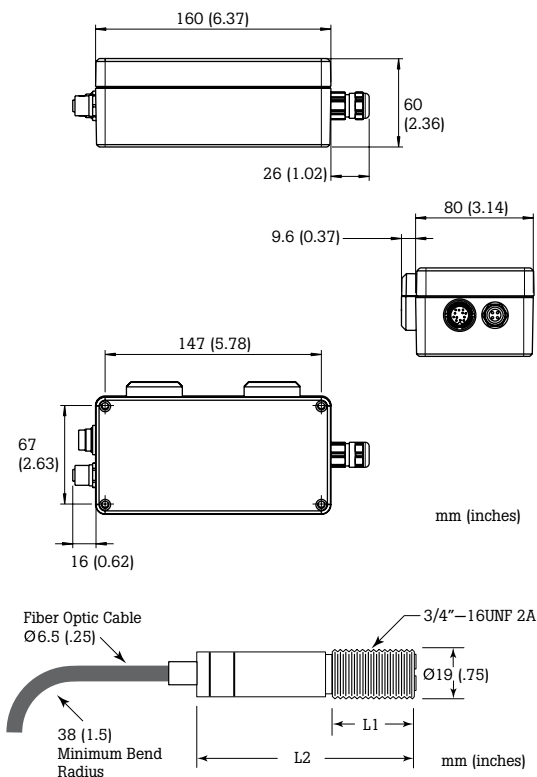
# Endurance®

## Fiber-Optic Datasheet

### Highlights

- Rugged non-contact fiber-optic pyrometer measurement systems
- 4 year warranty
- Wide temperature range: 250 to 3200 °C (482 to 5792 °F)
- Multiple fixed focus lens options for different mounting distances
- Sighting options: Laser aiming
- Superior optical resolution to 100:1
- LAN/Ethernet interface with PoE for communication with the sensor (ASCII and Webserver)
- Profinet and EtherNet/IP interface options
- Programmable relay output
- Fail safe alarm
- Isolated analog input/output
- Rugged electronics box housing, IP65 (NEMA-4) rated
- Endurance software for remote configuration, remote monitoring and field calibration
- Single color and two colors models

### Dimensions



| Model                             | L1           | L2           |
|-----------------------------------|--------------|--------------|
| EF1ML, EF1MM, EF1MH, EF2ML, EF2MH | 25 mm (1")   | 62mm (2.46") |
| EF1RL, EF2RL, EF2RH               | 28 mm (1.1") | 69 mm (2.7") |
| EF1RM, EF1RH                      | 36 mm (1.4") | 79 mm (3.1") |



### Electrical Specifications

**Inputs** Contact input (peak/valley reset, Laser), Analog input 0/4-20 mA (emissivity, e-slope, background temperature)

**Outputs** Ethernet, Profinet, EtherNet/IP, 0/4-20 mA, max. load: 500 Ω, RS485\* (2/4 wire half duplex), networkable relay, 48 V, 300 mA,

**Power Supply** 20 to 48 VDC, 500 mA  
Power over Ethernet (PoE)

### General Specifications

**Environmental Rating** IP65 (IEC529) / NEMA-4

**Ambient Temperature**  
Electronics housing 0 to 60 °C (32 to 140 °F)  
with water cooling 0 to 150 °C (32 to 302 °F) 2 liter (0.5 gal) per minute @ 16 °C (62 °F)

**Fiber cable/Optical head** 0 to 200 °C (32 to 392 °F) standard temperature rating; 0 to 315 °C (32 to 600°F) high temperature option

**Cable Protection** Rated up to 200 °C (392 °F); stainless steel armor; PTFE coating, rubber "boot", and IP65 (IEC529) NEMA-4 (not available on high temperature cable); provision for conduit to protect fiber cable

**Air purge** 0.5 to 1.5 l/s (1-3 CFM)

**Storage Temperature** Electronics housing -20 to 70 °C (-4 to 158 °F)

**Relative Humidity** 10 to 95 %, non-condensing

**Shock** IEC 68-2-27

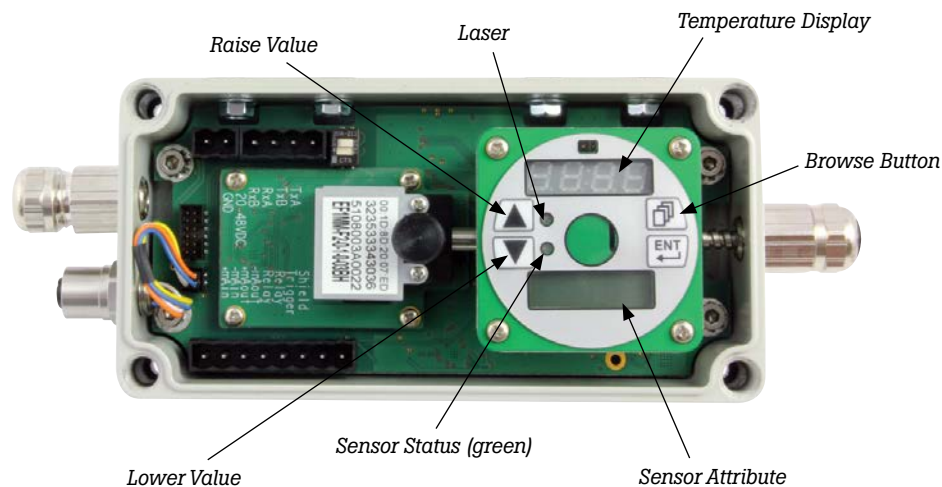
**Vibration** IEC 68-2-6

**Weight**  
Electronics housing 0.71 kg (25 oz)  
Optical head 0.10 kg (3 oz)

\*Note: RS485 4 wire only available when "Inside connector option" electronics box is used



## User Interface



## Measurement Specifications

|   | EF1R   | EF2R  | EF1M  | EF2M   |
|---|--|---|---|--|
| <b>Temperature Range and Optical Resolution</b><br>(95% energy)<br><br>(see table below for minimum spot sizes) | <b>EF1RL</b><br>500 to 1100 °C<br>(932 to 2012 °F)<br>20:1                     | <b>EF2RL</b><br>275 to 1300 °C<br>(527 to 2372 °F)<br>20:1 (90% energy) | <b>EF1ML</b><br>475 to 900 °C<br>(887 to 1652 °F)<br>20:1     | <b>EF2ML</b><br>250 to 800 °C<br>(482 to 1472 °F)<br>20:1  |
|   | <b>EF1RM</b><br>700 to 1500 °C<br>(1292 to 2732 °F)<br>40:1                    |   | <b>EF1MM</b><br>800 to 1900 °C<br>(1472 to 3452 °F)<br>100:1  |  |
|   | <b>EF1RH</b><br>1000 to 3200 °C<br>(1832 to 5792 °F)<br>65:1                   | <b>EF2RH</b><br>350 to 1300 °C<br>(662 to 2372 °F)<br>40:1 (90% energy) | <b>EF1MH</b><br>1200 to 3000 °C<br>(2192 to 5432 °F)<br>100:1 | <b>EF2MH</b><br>400 to 1700 °C<br>(752 to 3092 °F)<br>40:1 |
| <b>Spectral Response</b>  | 1.0 μm nominal<br>one/two color  | 1.6 μm nominal<br>one/two color   | 1.0 μm nominal<br>single color                                | 1.6 μm nominal<br>single color                             |
| <b>Sighting</b>   | Laser optional (depending on the model)  |   |   |  |
| <b>Accuracy</b>   | ±(0.3% T <sub>meas</sub> + 2 °C)<br>no attenuation                             | ±(0.5% T <sub>meas</sub> + 2 °C)<br>no attenuation                      | ±(0.3% T <sub>meas</sub> + 2 °C)                              |  |
| <b>Repeatability</b>  | ±1 °C (±2 °F)<br>no attenuation  | ±(0.3% + 1 °C)<br>no attenuation  | ±1 °C (±2 °F)   |  |
| <b>Temperature Resolution</b>   | Digital Output 0.1 °C, Current Output <0.03 °C / 16 bit                        |   |   |  |
| <b>Response Time</b>  | 10 ms (95%)  | 20 ms (95%)   | 2 ms (95%)  |  |
| <b>Emissivity</b>   | 0.100 to 1.100   |   |   |  |
| <b>E-Slope</b>  | 0.850 to 1.150   |   | N/A   |  |
| <b>Signal Processing</b>  | Peak Hold, Valley Hold, Averaging, Ambient Background Temperature Compensation |   |   |  |

| Lens Options<br>(All lenses fixed focus) | F0                             | F1                              | F2                             |
|--|--------------------------------|---------------------------------|--------------------------------|
| <b>20:1</b>                              | 5 mm (0.19") @ 100 mm (3.9")   | 15 mm (0.06") @ 300 mm (11.8")  | 250 mm (9.8") @ 5000 mm (196") |
| <b>40:1</b>                              | 2.5 mm (0.09") @ 100 mm (3.9") | 7.5 mm (0.29") @ 300 mm (11.8") | 125 mm (4.9") @ 5000 mm (196") |
| <b>65:1</b>                              | 1.5 mm (0.05") @ 100 mm (3.9") | 4.5 mm (0.17") @ 300 mm (11.8") | 77 mm (3.03") @ 5000 mm (196") |
| <b>100:1</b>                             | 1 mm (0.04") @ 100 mm (3.9")   | 3 mm (0.11") @ 300 mm (11.8")   | 50 mm (1.9") @ 5000 mm (196")  |

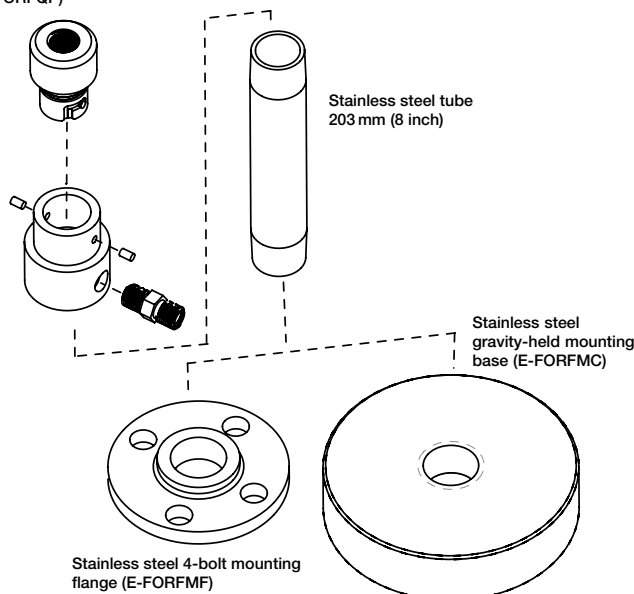
## Accessories

Additional accessories are available as shown below (refer to the Endurance Accessory datasheet).

- Adjustable bracket (**E-FOMB**)
- Air purge collar and stainless steel sighting tube, 150 mm (6 in.) long, 25 mm (1 in.) diameter. (**E-FOHAPA**)
- Rooftop Mounting/Purging available with flange or gravity-held base (**E-FORFMC**) and quick-release fitting for optical head, sapphire window, stainless steel pipe-cap or flanged mounting base (**E-FORFMF**)
- Aiming-light (battery powered) for fiber-optic front end (ships standard with all units). This is best suited for "L" range models. Includes adapter to fiber cable (**E-FAFAL**)
- Rugged fiber-optic roof mount air purge, with quick-release fitting and sapphire window (**E-FORFQP**)
- Protective Sapphire window mounted in stainless steel bezel (**E-BF1WINDOW**)
- High temperature fiber-optic housing with air-knife purge and sapphire protective window, 3 meter air/protection hose. For extreme environments. Ambient temperature  $\leq 450^\circ\text{C}$  ( $842^\circ\text{F}$ ) (**E-FOXH3**)
- High temperature fiber-optic housing with air-knife purge and sapphire protective window, 6 meter air/protection hose. For extreme environments. Ambient temperature  $\leq 450^\circ\text{C}$  ( $842^\circ\text{F}$ ) (**E-FOXH6**)
- Electronics box cooling plate for ambient temperatures up to  $150^\circ\text{C}$  ( $300^\circ\text{F}$ ) (**E-CP**)
- Terminal block (**E-TB**)

- Switching power supply 24 VDC 1.3 A industrial power supply, DIN rail mount (**E-SYSPS**)
- Switching power supply in NEMA-4 enclosure 100 / 240 VAC 24 VDC, 1.1 A (**E-PS**)
- Power over Ethernet (PoE) Injector provides power and acts as a single Ethernet hub (100/240 VAC input) (**E-PoE**)
- USB/RS485 Converter (**E-USB485**)

Stainless steel air purge with quick release fitting and sapphire window, Air connector: 1/4" NPT (**E-FORFQP**)



## The Fluke Process Instruments Guarantee

The Endurance Series is supported by a 4 year warranty. With a network of trained representatives and agents in over one hundred countries and offices located in the U.S., Germany and China, we provide local service and support.

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6/2022 6009689C1



# Endurance® Series

## Accessories

### Electrical Accessories

#### Multi-conductor cables\* with M16 connector



The 12-wire cables are used for wiring the Endurance sensors with the 24 VDC power supply, all inputs, outputs, and the RS485 interface. A terminal strip is not included.

| High temperature cable:  |                | E-2CCB4        |  | Ambient temperatures:<br>UL-rated at -80 °C to 200 °C<br>(-112 °F to 390 °F)<br><br>Material:<br>cable is Teflon coated                                |
|--|----------------|----------------|--|--|
|   |                | 4 m (13 ft.)   |  |  |
|  |                | E-2CCB8        |  |  |
|  |                | 8 m (26 ft.)   |  |  |
|  |                | E-2CCB15       |  |  |
|  |                | 15 m (50 ft.)  |  |  |
| Low-temperature cable  |                | E-2CCB30       |  |  |
|  |                | 30 m (100 ft.) |  |  |
|  |                | E-2CCB60       |  |  |
|  |                | 60 m (200 ft.) |  |  |
|  |                | E-2CLTCB4      |  |  |
|  |                | 4 m (13ft.)    |  | Ambient temperatures:<br>-40 °C to 85 °C (-40 °F to 185 °F)<br><br>Material:<br>cable is PUR-11Y (Polyurethane)<br>coated (Halogen free, Silicon free) |
|  |                | E-2CLTCB8      |  |  |
|  |                | 8 m (26 ft.)   |  |  |
|  |                | E-2CLTCB15     |  |  |
|  |                | 15 m (50 ft.)  |  |  |
|  | E-2CLTCB30     |                |  |  |
|  | 30 m (100 ft.) |                |  |  |
|  | E-2CLTCB60     |                |  |  |
|  | 60 m (200 ft.) |                |  |  |

Note: Power supply maximum distance 60 m (200') from unit

\* Cable doesn't include a terminal block. Please order E-TB or E-TBN4, if you want to include a terminal block.

#### Ethernet cables with M12, RJ45 connector for access to PoE, Ethernet

|   |             |  |                |  |
|---|-------------|--|----------------|--|
|  | E-ETHCB     |  | 7.5 m (25 ft.) | Ambient temperatures:<br>-80 °C to 180 °C (-112 °F to 356 °F)<br><br>Material:<br>cable is Teflon coated.          |
|   | E-ETHCB10   |  | 10 m (33 ft.)  |  |
|  | E-ETHLTCB   |  | 7.5 m (25 ft.) | Ambient temperatures:<br>-40 °C to 80 °C (-40 °F to 176 °F)<br><br>Material:<br>cable is PUR (Polyurethane) coated |
|   | E-ETHLTCB25 |  | 25 m (80 ft.)  |  |
|   | E-ETHLTCB50 |  | 50 m (160 ft.) |  |

#### Fiber-optic cables (for fiber-optic sensors only)

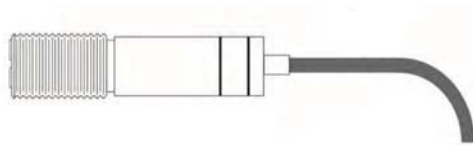
The fiber-optic cable is a sealed, stainless-steel armor sheath covering the fiber optic bundle. It withstands ambient temperatures up to 200 °C (390 °F), optional up to 315 °C (599 °F).

|                  | EF1R and EF1M models |               | EF2R and EF2M models |               |
|------------------|----------------------|---------------|----------------------|---------------|
| Low temperature  | O1BL                 | 1 m (3 ft.)   | O1BL                 | 1 m (3 ft.)   |
|                  | O3BL                 | 3 m (10 ft.)  | O3BL                 | 3 m (10 ft.)  |
|                  | O6BL                 | 6 m (20 ft.)  | O6BL                 | 6 m (20 ft.)  |
|                  | 10BL                 | 10 m (33 ft.) | 10BL**               | 10 m (33 ft.) |
|                  | 22BL                 | 22 m (72 ft.) |                      |               |
| High temperature | O1BH                 | 1 m (3 ft.)   | O1BH                 | 1 m (3 ft.)   |
|                  | O3BH                 | 3 m (10 ft.)  | O3BH                 | 3 m (10 ft.)  |
|                  | O6BH                 | 6 m (20 ft.)  | O6BH                 | 6 m (20 ft.)  |
|                  | 10BH                 | 10 m (33 ft.) | 10BH**               | 10 m (33 ft.) |
|                  | 22BH                 | 22 m (72 ft.) |                      |               |

\*\* Not available with EF2ML and EF2RL

## (Electrical accessories)

### Spare Parts (for fiber-optic sensors only)



### EF1R Spare optical heads and fiber-optic cable assemblies

| EF1R Spare optical heads |          |          | (Focus options)   |
|--------------------------|----------|----------|---|
| EF1RL-F2                 | EF1RM-F2 | EF1RH-F2 | sensor head with F2 (Standard Focus) focused at infinity ( $\infty$ ) |
| EF1RL-FO                 | EF1RM-FO | EF1RH-FO | sensor head with FO (Narrow Focus) focused at 100 mm (4")             |
| EF1RL-F1                 | EF1RM-F1 | EF1RH-F1 | sensor head with F1 (Close Focus) focused at 300 mm (12")             |

### EF1R Spare fiber-optic cables (non-laser only)

| Low-temperature cables | High-temperature cables | Length        |
|------------------------|-------------------------|---------------|
| EF1RCB1BL              | EF1RCB1BH               | 1 m (3 ft.)   |
| EF1RCB3BL              | EF1RCB3BH               | 3 m (10 ft.)  |
| EF1RCB6BL              | EF1RCB6BH               | 6 m (20 ft.)  |
| EF1RCB10BL             | EF1RCB10BH              | 10 m (33 ft.) |
| EF1RCB22BL             | EF1RCB22BH              | 22 m (72 ft.) |




### EF2R Spare optical heads and fiber-optic cable assemblies

| EF2R Spare optical heads |          | (Focus options)   |
|--------------------------|----------|---|
| EF2RL-F2                 | EF2RH-F2 | sensor head with F2 (Standard Focus) focused at infinity ( $\infty$ ) |
| EF2RL-FO                 | EF2RH-FO | sensor head with FO (Narrow Focus) focused at 100 mm (4")             |
| EF2RL-F1                 | EF2RH-F1 | sensor head with F1 (Close Focus) focused at 300 mm (12")             |



### EF2R Spare fiber-optic cables (non-laser only)

| EF2RL<br>Low-temperature cables | EF2RL<br>High-temperature cables | Length        |
|---------------------------------|----------------------------------|---------------|
| EF2RLCB1BL                      | EF2RLCB1BHH                      | 1 m (3 ft.)   |
| EF2RLCB3BL                      | EF2RLCB3BH                       | 3 m (10 ft.)  |
| EF2RLCB6BL                      | EF2RLCB6BH                       | 6 m (20 ft.)  |
| EF2RLCB10BL                     | EF2RLCB10BH                      | 10 m (33 ft.) |
| EF2RH<br>Low-temperature cables | EF2RH<br>High-temperature cables | Length        |
| EF2RHCB1BL                      | EF2RHCB1BH                       | 1 m (3 ft.)   |
| EF2RHCB3BL                      | EF2RHCB3BH                       | 3 m (10 ft.)  |
| EF2RHCB6BL                      | EF2RHCB6BH                       | 6 m (20 ft.)  |
| EF2RHCB10BL                     | EF2RHCB10BH                      | 10 m (33 ft.) |

**(Electrical accessories)**

|   |          |  |
|---|----------|--|
|    | E-TB     | <p><b>Endurance terminal block accessory</b><br/>for connecting the Endurance sensor with the customer's industrial environment</p>  |
|    | E-TBN4   | <p><b>Endurance terminal block in an IP65 (NEMA 4) enclosure</b> with sealed cable inlets<br/>The inside the enclosure installed terminal block is equal to the above-described E-TB type.</p>   |
|    | E-SYSPS  | <p><b>Industrial power supply, DIN rail mount</b><br/>delivers isolated dc power and provides short circuit and overload protection</p> <p>Protection class            prepared for class II equipment<br/>Environmental protection IP20<br/>Operating temperature    -25 °C to 55 °C (-13 °F to 131 °F)<br/>AC input                      100 – 240 VAC, 44 - 66 Hz<br/>DC output                    24 VDC / 1.3 A</p> |
|  | E-PS     | <p><b>Power supply &amp; Endurance terminal block mounted in an IP65 (NEMA 4) enclosure</b></p> <p>AC input                      100 – 240 VAC, 50 - 60 Hz<br/>DC output                    24 VDC / 1.1 A<br/>Ambient temperatures    0 °C to 50 °C (32 °C to 120 °F)<br/>Humidity                     20 to 90%, non-condensing</p>  |
|  | E-POE    | <p><b>PoE Injector</b><br/>provides power and also acts as a single Ethernet hub.</p> <p>AC input                      100 – 240 VAC, 50 - 60 Hz<br/>PoE power                    up to 15.4 W<br/>PoE output ports            1<br/>RJ-45                          10/100/1000 Mbps<br/>Standards                    IEEE 802.3, IEEE 802.3u,<br/>                                      IEEE 802.3af (PoE standard)</p> |
|  | E-2CCON  | <p><b>12-socket DIN Cable connector</b> for multi-conductor cable</p>  |
|  | E-M5PK   | <p><b>Ircan® Modline® 5 patch cable kit</b><br/>allows Endurance use with existing Modline 5 cables.</p>   |
|  | E-M5PKMC | <p><b>Endurance patch cable kit</b><br/>allows Modline 5 use with existing Endurance cables</p>  |

**(Electrical accessories)**

|   |          |   |
|---|----------|---|
|  | E-USB485 | <b>USB to RS232/422/485 converter</b><br>for the direct adaptation of an Endurance series device to a standard PC via the USB-interface |
|  | E-CP     | <b>Cooling platform for electronics housing</b><br>can be used for ambient temperatures up to 150 °C (302 °F)                           |




**Mechanical/Optical Accessories for Integrated Sensors only**

|   |      |  |
|---|------|--|
|    | E-AP | <b>Air purge collar</b><br>to keep dust, moisture, airborne particles and vapors away from the lens  |
|  | E-PA | <b>Pipe adapter</b><br>to adapt a 300 mm (12") sighting tube to the Endurance device   |
|  | E-MN | <b>Mounting nut</b> (spare)<br>to fix and secure the Endurance device to any kind of mounting brackets (inner thread of 36.9 mm (1.5") UNC)  |
|  | E-FB | <b>Fixed bracket</b> (spare)<br>to mount the Endurance sensor in a fixed location (swivel range of about 45°)  |
|  | E-AB | <b>Adjustable bracket</b><br>to mount the Endurance sensor in a moveable position. It allows pitch and swivel of the sensor-sighting axis in a range of approximately 45° per axis |
|  | E-SB | <b>Swivel bracket</b><br>to mount the Endurance sensor in a moveable position. It allows pitch (0° – 45°) and swivel (0° – 360°) of the sensor-sighting axis                       |
|  | E-RA | <b>Right angle mirror</b><br>for targets at right angles to sensor axis<br>The right angle mirror has an air-purge adapter.  |

**(Mechanical/Optical Accessories for Integrated Sensors only)**

|   |          |   |
|---|----------|---|
|    | E-M5WJAK | <p><b>Modline 5 WaterJacket (WJA) adapter kit</b><br/>is required to modify the WJA to allow the Endurance sensor to be secured in the Modline 5 WJA.</p>   |
|    | E-UAA    | <p><b>Endurance universal adapter accessory</b><br/>clamps around the Endurance sensor and can be used to mount it to an existing Modline 5 installation, where a RAM (Right Angle Mount) is used, a tripod, or any device using a 1/4–20 UNC threaded mounting hardware</p>  |
|    | E-AK-7   | <p><b>Adapter kit</b><br/>for mounting Endurance into existing WJ-5 water jacket installations</p>  |
|    | E-MF-7   | <p><b>Mounting flange</b><br/>allows an Endurance sensor to be mounted into an existing Ircon flange mount installation<br/><br/>This accessory needs to be used in conjunction with the E-MFA-7 flange adapter.</p>  |
|  | E-MFA-7  | <p><b>Flange adapter</b><br/>to allow Endurance sensor to mount to MF-7 mounting flange</p>   |
|  | E-PC     | <p><b>Protection cap kit</b><br/>for Endurance sensor M12 and M16 sockets</p>   |
|  | E-ECAP   | <p><b>Replacement glass end-cap</b><br/>is the replacement of a defect or damaged Endurance end cap</p>   |
|  | E- PW    | <p><b>Protective front window, including O-Ring</b><br/>The protective front window with the needed O-ring is orderable as a spare part.</p>  |
|  | E-PFEC   | <p><b>Polarizing filter end cap</b><br/>The filter protects the eyes when sighting on bright, high temperature targets through the visual sighting port. The filter does not affect measured energy.<br/><br/>The polarizing filter will not fit in the standard end cap.</p> |

## Mechanical/Optical Accessories for Fiber-optic Sensors only



|  |   |   |
|--|---|---|
|   | E-FOMB  | <b>Adjustable mounting bracket</b><br>to mount the Endurance fiber-optic head<br>(incl. 2 mounting nuts)  |
|   | E-FOHAPA  | <b>Air purge collar</b><br>to keep dust, moisture, airborne particles, and vapors<br>away from the optical head's lens<br><br>It includes a stainless steel sighting-tube that threads<br>onto the front of the air purge collar. |
|  | <b>Fitting System</b><br>Flexible accessory selections allow you to pick and choose the accessories<br>you need<br><br>E-FORFQP | <b>Stainless steel air purge with quick release fitting<br/> and sapphire window</b><br>air connector (1/4" NPT)  |
|  | E-FORFAP  | <b>Stainless steel air purge with quick release fitting,<br/> sapphire window (E-FORFQP) and stainless steel tube</b><br>(203 mm/8 in)  |
|  | E-FORFMF  | <b>Stainless steel air purge with quick release fitting,<br/> sapphire window (E-FORFQP) and stainless steel 4-bolt<br/> mounting flange</b>  |
|  | E-FORFMC  | <b>Stainless steel air purge with quick release fitting,<br/> sapphire window (E-FORFQP) and stainless steel<br/> gravity-held mounting base</b>  |
|  | E-BF1WINDOW   | <b>Sapphire protective window</b><br>mounted in stainless steel bezel   |
|  | E-FOXH3   | <b>High temperature fiber-optic housing with air-knife<br/> purge and sapphire protective window</b><br>3 m (10 ft.) air/protection hose, for extreme environments<br>with ambient temperature <= 450 °C (842 °F)                 |
|  | E-FOXH6   | <b>High temperature fiber-optic housing with air-knife<br/> purge and sapphire protective window</b><br>6 m (20 ft.) air/protection hose, for extreme environments<br>with ambient temperature <= 450 °C (842 °F)                 |



**ThermoJacket and Related Accessories**

|  |                 |  |
|--|-----------------|--|
|   | <p>E-TJ1</p>    | <p><b>ThermoJacket housing</b><br/>to use Endurance series sensing heads in ambient temperatures up to 315 °C (600 °F)<br/>The ThermoJacket provides water and/or air-cooling and air purging in one unit.<br/>Ambient temperatures:<br/>water cooling 315 °C (600 °F)<br/>air cooling 115 °C (240 °F)</p> |
|   | <p>A-TJ-MF</p>  | <p><b>Mounting flange for ThermoJacket</b><br/>to mount the ThermoJacket to walls, existing ports or flanges.</p>  |
|   | <p>A-TJ-MB</p>  | <p><b>Adjustable mounting base for ThermoJacket</b><br/>provides stable, permanent placement of the ThermoJacket while allowing the ThermoJacket to swivel 360° and pitch 90° forward.</p>   |
|    | <p>A-TJ-GTQ</p> | <p><b>Blast gate assembly with quartz window (HT model)</b><br/>to protect the sensor, and perform tasks without exposure to hot or explosive target areas.<br/>Specification: max. 870 °C (1600 °F)</p>   |
|   | <p>A-PA-A</p>   | <p><b>Adjustable pipe adapter assembly</b><br/>can be placed permanently on a surface and aimed in any direction within a 45° radius</p>   |
|   | <p>A-MF-ST</p>  | <p><b>Mounting flange for use with sighting tubes</b><br/>to adapt different kind of sighting tubes to the Endurance sensor in ThermoJacket installation</p>   |
|             | <p>A-ST-CER</p> | <p><b>30 cm (12") sighting tube, ceramic</b><br/>Use the A-ST-CER ceramic sighting tube in conjunction with the A-MF-ST tube-mounting flange in temperature measurement environments where reflected energy is a problem<br/>Specification: up to 1500 °C (2730 °F)</p>                                    |
|  | <p>A-ST-SS</p>  | <p><b>30 cm (12") sighting tube, stainless steel</b><br/>Use the A-ST-SS stainless steel sighting tube in conjunction with the A-MF-ST tube-mounting flange in temperature measurement environments where reflected energy is a problem<br/>Specification: up to 800 °C (1470 °F)</p>                      |

**(ThermoJacket and Related Accessories)**

|   |                   |   |
|---|-------------------|---|
|  | <p>A-ST-CS-45</p> | <p><b>30 cm (12") sighting tube, carbon steel</b> with 45 degree end cut and slotted weep hole at base. Use the A-ST-CS-45 carbon steel sighting tube in conjunction with the A-MF-ST tube-mounting flange in temperature measurement environments where reflected energy is a problem. Specification: up to 800 °C (1470 °F)</p> |
|  | <p>E-TJET</p>     | <p><b>Extraction tool</b> eases the removal of an Endurance sensor from the ThermoJacket protective enclosure</p>   |

**Flow Regulator Accessories** (for use with cooling/purging options)

|   |                 |  |
|---|-----------------|--|
|   | <p>A-TJ-APR</p> | <p><b>Air purging flow regulator assembly</b> with air filter to control air purging</p>                                 |
|  | <p>A-TJ-AFR</p> | <p><b>Cooling air flow regulator</b> (high capacity) to control air-cooling in high ambient temperature environments</p> |
|  | <p>A-TJ-WFR</p> | <p><b>Water flow regulator</b> to control water-cooling</p>  |

**Line Scanning Accessory**



SSA

**SpotScan™**

When mounted to the front of the Endurance sensor, the SpotScan accessory allows the user to gather temperature information over a larger area on the target, due to the scanning mechanism inside the accessory.

|                       |   |
|-----------------------|---|
| Scan angle            | 2 - 15°                                   |
| Scan Frequency        | 0.5 - 5 Hz                                |
| Operating Temperature | 0 °C - 60 °C (32 °F - 140 °F)             |
| Power Supply          | 18 - 32 VDC, 12W                          |
| Enclosure Rating      | IP65 (when sensor is fitted in accessory) |
| Window material       | N-BK7                                     |

**The Fluke Process Instruments Guarantee**

The Endurance Series is supported by a 4 year warranty. With a network of trained representatives and agents in over one hundred (100) countries and offices located in the U.S., Germany and China, we provide local service and support you can rely on time after time.

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