

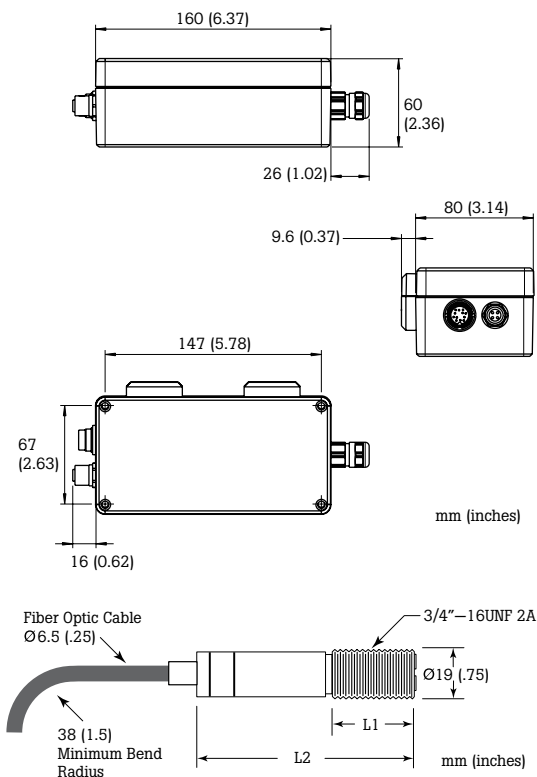
Endurance®

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

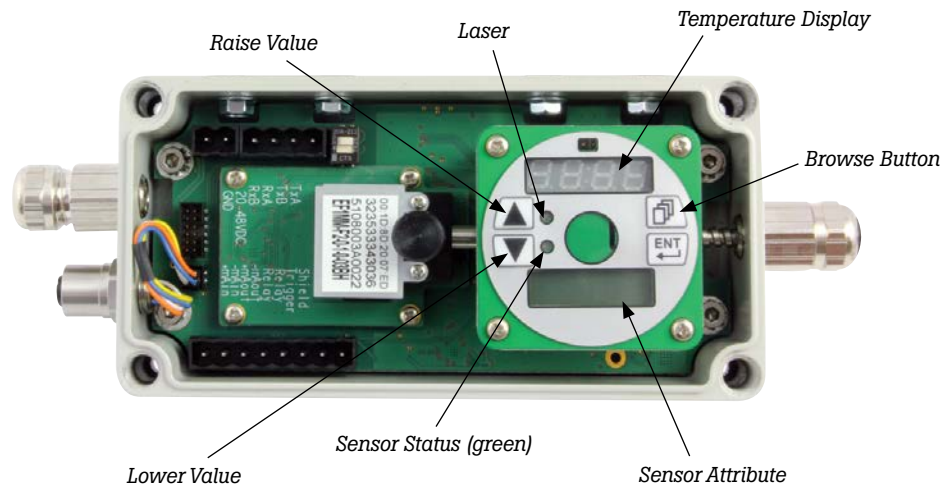
Shock IEC 68-2-27

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

Lens Options (All lenses fixed focus)	F0	F1	F2
20:1	5 mm (0.19") @ 100 mm (3.9")	15 mm (0.06") @ 300 mm (11.8")	250 mm (9.8") @ 5000 mm (196")
40:1	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")
65:1	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")
100:1	1 mm (0.04") @ 100 mm (3.9")	3 mm (0.11") @ 300 mm (11.8")	50 mm (1.9") @ 5000 mm (196")

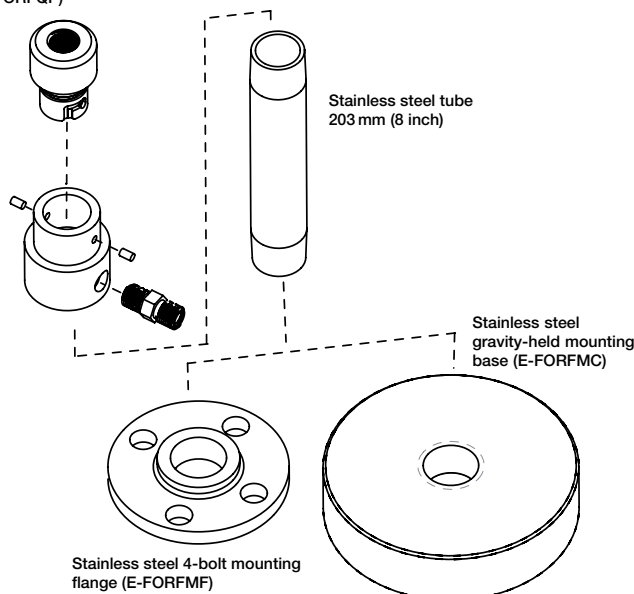
Accessories

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°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°F) (**E-FOXH6**)
- Electronics box cooling plate for ambient temperatures up to 150°C (300°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