

Continuously measure Furnace Exit-Gas Temperature (FEGT) using Non-Contact Infrared Sensors to optimize overall performance of boilers and furnaces under varying conditions of coal quality, load, ash fouling, and slagging

## FEGT

- Prevent failures by proactively monitoring the furnace temperature
- Determine precisely when to perform sootblowing
- Set trigger alarms to take quick corrective actions when gas temperatures approach slagging/fouling limits with continuous online monitoring
- Measure and quantify trade-offs of heat rate and NO<sub>x</sub> and SO<sub>2</sub> emissions
- Optimize heat transfer by controlling FEGT under varying conditions
- Prevent unwanted slag accumulation at inlet pendants by controlling FEGT below ash fusion temperatures
- Reduce down time due to failures by proactive monitoring
- Easily installed and maintained while boiler is online



LumaSense Technologies is a world leader in sensing solutions, with over 50 years of temperature and gas sensing expertise in various industries. LumaSense is well established in infrared temperature measurement developed by years of research and customer contact.

Our IMPAC pyrometers are temperature measurement instruments that operate on the principle of infrared radiation, i.e. they detect infrared radiation of objects to determine the temperature.

In many combustion processes, one of the main combustion gases is CO<sub>2</sub>. Therefore, mea-

suring the CO<sub>2</sub> gas temperature is a reliable measurement of the combustion temperature.

Our combustion monitoring solution is a cost effective system that utilizes the IPE 140/45 pyrometer. This is a pyrometer specifically designed for reliable "non-contact" temperature measurement of hot combustion gas containing CO<sub>2</sub>.

The system is easy to install and maintain even while the boiler is online. It allows for quick reaction to undesirable conditions with continuous online monitoring of the combustion temperature.

LumaSense's FEGT solution includes:

- Infrared Temperature Sensor
- Protective Sealed Jacket Assembly
- Protective Cooling Jacket
- Vortex Air Cooler
- Removable CaF<sub>2</sub> Window Assembly (Window Slide)
- Air Purge Assembly
- Extended Site Tube
- Mounting Flange (Ball Flange)
- Air Filter for Vortex Air Cooler

## Technical Data

Infrared Thermometer	
Temperature Range	400 to 2000 °C (MB 20)
Spectral Range	CO <sub>2</sub> absorption band for hot CO <sub>2</sub> gas
Uncertainty ( $T_{amb.} = 25\text{ °C}$ , $\varepsilon=1$ , $T_{90}=1s$ )	Up to 1300 °C: 0.6% of reading in °C Above 1300 °C: 0.8% of reading in °C
Repeatability	0.1% of reading in °C + 1 °C
Resolution	interface and display: 0.1 °C, analog output: < 0.03% of temperature range
Analog output	linear 0 to 20 mA or 4 to 20 mA, DC, switchable; load max. 500 Ohm
Power Supply	24 VAC/DC (14 to 30 VAC/DC) (AC: 48 to 62 Hz)
Power Consumption	6 VA
Protective Housing	Stainless steel enclosure with vortex air cooling (air only required for long-term monitoring)
IP Rating (pyrometer)	IP65 (DIN 40 050)

Note: The pyrometer is able to measure hot combustion gas (with typically approx. 10% CO<sub>2</sub>) with a thickness of 40 cm.

System	
Max. Temperature	75 °C (into cooler)
Purge Air	
Max. ambient temperature enclosure	90 °C
FEGT System Weight	approx. 6 kg
Air Filtering	5 µm filter
Environment	
Ambient temperature	0 to 53 °C at pyrometer housing
Storage temperature	-20 to 60 °C
Relative humidity	Non condensing conditions
Vortex Cooler	
Model	208-25-HSS
Material	Stainless Steel
Inlet	1/4 inch
Cooling Capacity	440 Watts
Air Consumption @ 6.9 bar	708 slpm / male inlet

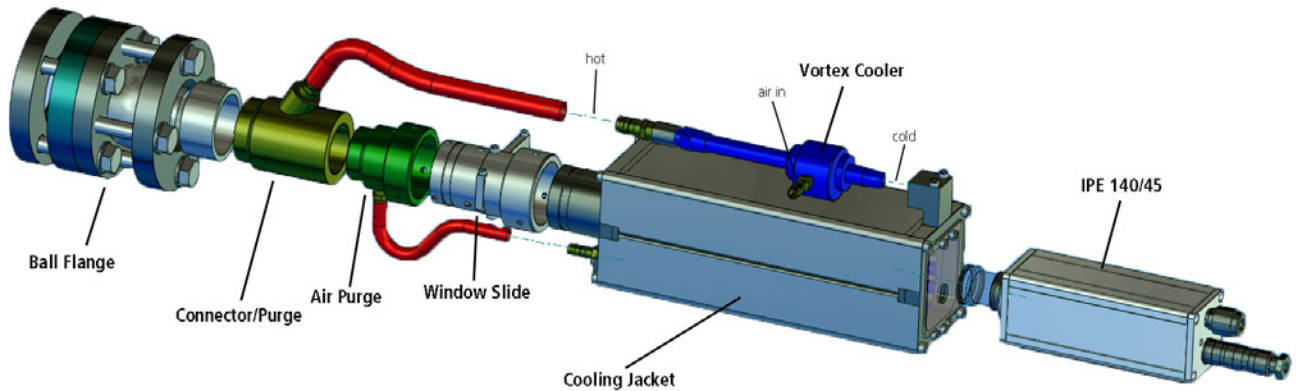
## Optics

The pyrometers are available with different focusable optics. They offer the smallest possible spot size at any distance. The adjustment can be done easily without additional tools with help of the "turn and clamp" mechanism (one hand). The spot sizes are shown in the following table (all distances are measured from the front of the lens).

The different optics are exchangeable without recalibration of the pyrometer. For spot sizes between those in the table, values can be found by interpolation.

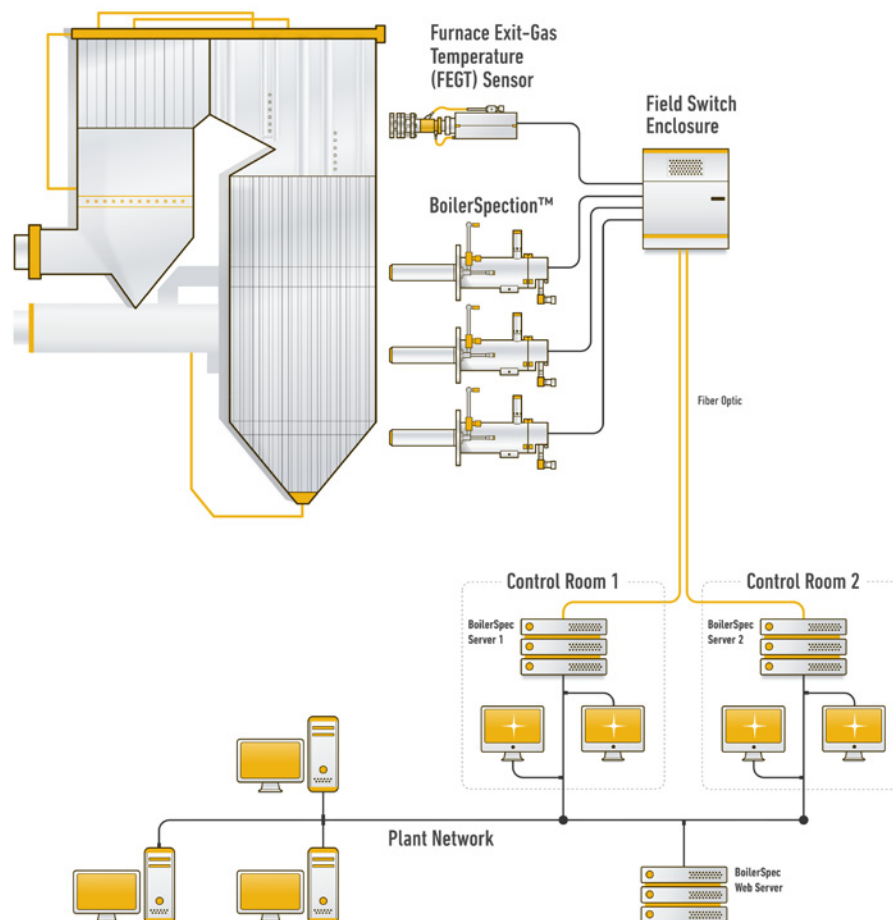
	Measuring Distance $a$ [mm]	Spot Size $M_{90}$ [mm]	Objective Length $S$ [mm]
Optics 1-PE	115	1.1	26
	135	1.3	13
	170	1.6	0
Optics 2-PE	210	1.8	26
	280	2.6	13
	500	4.9	0
Optics 3-PE	360	3	26
	625	5.6	13
	2000	20	4
	10000	100	0

## System Schematic



## FEGT & BoilerSpecion System Configuration

The FEGT system can be integrated directly into a plants control system or as part of a more complete solution, e.g. in combination with the LumaSense BoilerSpecion system as shown here.



## Ordering and Configuration Details

### Complete System

For a complete system, a minimum of three components must be ordered:

- **Pyrometer (IPE 140/45)**
- **FEGT Housing Assembly**
- **Connection Cable** - recommended is a high temperature cable with straight connector

In addition, a power supply for the pyrometer is needed. It is powered by a voltage of 24 V (14 to 30 V) DC or AC (48 to 62 Hz).

### Service Offerings

- Installation and commissioning
- Preventative maintenance
- Training
- Extended warranty

### Available Documentation

For FEGT System:

- Manual
- Application Note
- Datasheet

For BoilerSpecion:

- Datasheets
- Manuals
- Poster/eBook
- Application Notes

## Reference Numbers

3 875 880	IPE 140/45, MB 20, 400 to 2000 °C, laser targeting, focusable optics
3 875 890	IPE 140/45, MB 20, 400 to 2000 °C, through lens sighting, focusable optics
3 821 270	Electrical connection cable high temperature, 10 m, with straight plug
3 837 520	FEGT air cooling jacket for Series 140, Includes: vortex air cooler, tube, ball flange, air filtering system, window slide, CaF <sub>2</sub> window, hoses (for purge air flow within system)

## Accessories

3 852 290	Power supply NG DC, 24 VDC, 1 A, for C/Z-carrier rail mounting, Input 100 to 240 VAC
3 852 540	Power supply NG 0D; 85 to 265 VAC, 24 VDC 600 mA
3 852 550	Power supply NG 2D; 85 to 265 VAC, 24 VDC 600 mA, with dual limit switch

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## Awakening Your 6<sup>th</sup> Sense