

## Reliably sense hot objects in high ambient temperature and dirty conditions.

NAMCO Infra-Red (IR) Hot Metal Detectors not only survive in hot environments, they work because of them. When the IR energy level emitted from a hot object exceeds the HMD's internal set point, the sensor output energizes. Set points of 250°, 450°, 360°, or 800°C and lenses of different viewing angles adapt the HMD to application requirements. The unit's 2-wire AC or 3-wire DC discrete output directly interfaces with programmable controllers or relay coils. The optional pre-check feature allows for remote triggering of the sensor output to verify switching performance.

Available in self-contained and remote lens styles, the tubular stainless steel housing with glass lens is impervious to steam, water, dust, shock, and vibration common to heavy industrial environments.

The self-contained style HMD has a lower installed cost than the remote style HMD and is ambient temperature rated to 85°C. Units with optional cooling jacket increase this rating to 125°C.

The remote lens system is used in applications with high ambient temperatures and/or where system flexibility is invaluable. The sensor electronics are encapsulated in an oil- and water-tight control module. The remote lens is connected to the control module by a stainless steel-jacketed fiber optic cable. The remote lens, void of electronic circuitry, will survive ambient temperatures to 150°C. The fiber optic cable has a 260°C ambient temperature rating and can be used without a remote lens. (Consult factory for details.)

Hot Metal Detectors are ideally suited for continuous caster, hot strip, bar and wire, forge and foundry applications.

## Temperature response curve

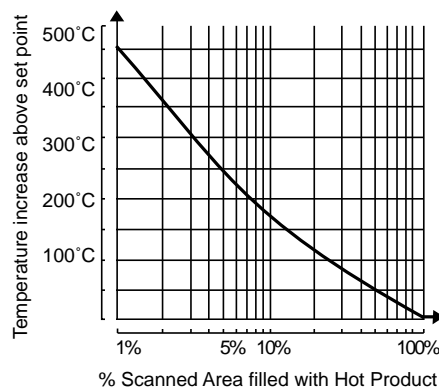
If the surface to be sensed is exactly at the set point temperature of the sensor, then 100% of the scanned area must be covered by the hot surface. As this surface is elevated in temperature, less of the scanned area needs to be covered. The Temperature Response Curve shows the % scanned area to be covered as temperature of sensed surface is elevated above set point.

Example: The IR Sensor ER920-13812 - Response temperature when scanned area is covered 100% by hot product = 450°C

However, if only 5% of scanned area contains hot product, the IR Sensor requires an additional (see chart) set point temperature (250°C).

Set Point Temperature of ER920-13812 = +250°C

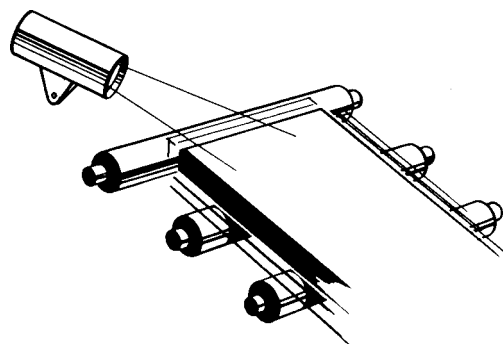
Effective response temperature is therefore = 700°C



## Hot Product Sensors Series ER 800 & 900

Call Namco 1-800-NAMTECH for ordering assistance, or consult your local Namco representative or distributor.

Temperature of Object Being Sensed	Remote or Self-Contained Style	Viewing Angle
≥ 800°C	• Remote control module with lens and fiber optic cable	• 25°
≥ 450°C	• Remote control module with only fiber optic cable (no lens)	• 7°
≥ 360°C	• Self contained	• 2°
≥ 250°C	• Self contained with water-cooled jacket	• 1°
		• 1/2°
		• 2° x 25°
		• 1° x 25°
		• 1/2° x 25°



## What role does product temperature play?

Namco offers four set point temperatures for its line of HMD's. The set point temperature is the minimum temperature level at which the sensor will detect the product. For example, if the HMD set point temperature is 360°C, it will not detect products with temperatures less than 360°C. The sensor will, however, sense all products hotter than 360°C that cross into its field of view. Available set point temperatures and basic application guidelines are as follows:

800°C - Used for continuous cast monitoring, ladle pour applications, and other operations where temperatures of the metal are between 800°C and molten.

450°C - This is the most frequently used HMD throughout hot strip mills, bar mills, forging presses, etc. It can also accommodate reasonable quantities of steam, water spray, etc. expected in the rolling or forging process.

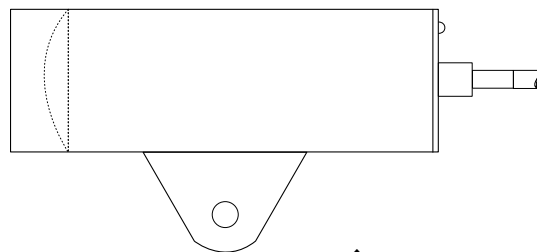
360°C - Used for lower temperature applications where background "noise" temperatures are less than 360°C but the product itself is still hotter than 360°C.

250°C - The lowest set point temperature is good for steel applications where the metal has cooled considerably over time, as in cooling beds and at downcoilers. The 250°C set point temperature is suitable for non-ferrous applications such as aluminum processing in which product temperatures are lower than those in steel operations.

## Three Styles of Hot Metal Detectors:

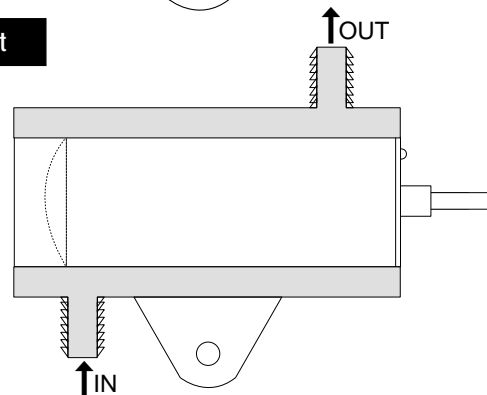
### Self-contained (ER900)

This standard unit integrates the lens and electronics in one housing and has an ambient temperature rating of 185°F (85°C).



### Self-contained with cooling jacket

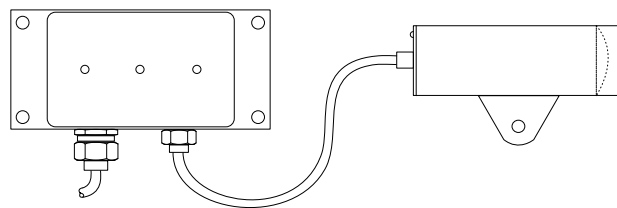
This is also an integrated unit but is surrounded by a sleeve that circulates either water or shop air around the sensor, cooling the sensor and increasing its ambient temperature rating to 257°F (125°C).



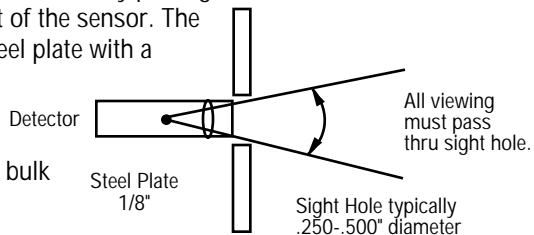
### Remote lens system (ER800)

This unit uses a remote lens that is connected to the control module using fiberoptic cable. Since the control module that houses the temperature-sensitive electronics can be placed in a cooler area, this system offers the highest ambient temperature ratings:

Fiberoptic cable 500°F (260°C)  
Remote lens 302°F (150°C)  
Control module 185°F (85°C)



If temperature levels cannot be maintained, additional protection can be obtained by placing a radiant heat shield in front of the sensor. The heat shield is a 1/8" thick steel plate with a sight hole up to .5" diameter that allows the sensor a full field of view while it is shielded from the bulk of the radiated heat energy.



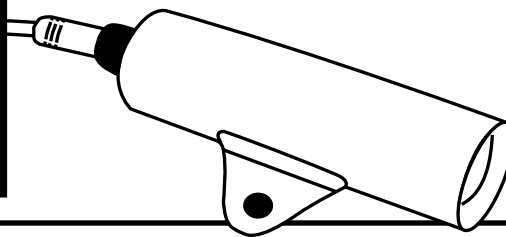
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**Q. "How far away from its target can a hot metal detector be placed?"**

- A.** Excessive heat and physical damage account for nearly 100% of all HMD failures. One of the many advantages of the Namco HMD is that up-close mounting is not a requirement, which adds flexibility to installation and application possibilities.

The Namco HMD responds only to IR energy within the viewing field of a given lens type regardless of distance. However, as mounting distance increases, the viewing field increases proportionally and may exceed the overall dimensions of the product and/or see other IR sources (adjacent pass lines, hot scale, background metal temperatures, etc.). In such cases, the HMD lens and minimum response temperature must be selected (see charts) to accommodate these factors.

Applying Namco HMDs is normally a very simple and straightforward process. Well over 50% of all applications can be resolved with a 450°C, non-cooled, 2° lens. Additionally, reliable detection is possible with only 5% of the view field covered at 700°C.

In general, the application process should consider the following:

- Sensing objective (tracking, positioning, cut, etc.)
- Product to be sensed (size, temperature, distance, etc.)
- Sensing conditions (water, steam, scale, ambient temp., etc.)
- HMD selection (response temperature, lens, cooling requirements, etc.)

**Q. "How can sensing accuracy vs. distance be maintained?"**

- A.** Viewing angle and distance combine to determine the size of the scanned area (see chart). Therefore, different lenses can be selected to produce viewing angles ranging from 25° (broad) to 1/2° (tight). In general, pickup/dropout accuracy and repeatability will improve with a tighter lens. This will hold true up to the point where product size and viewing field size become equal. Once the viewing field size is within the product size, there are no additional gains in accuracy.

Where accuracy is not a primary factor, and the product size and temperature relationship will assure detection, it is not always necessary to select a tight lens.

**Q. "How does the size and shape of the product affect the choice of a hot product sensing system?"**

- A.** Namco's elongated (rectangular) viewing field lenses (1/2 x 25, 1 x 25, and 2 x 25) are designed to solve specialized hot product sensing applications. In general, repeatability and overall accuracy is

improved when the product abruptly enters or exits a vertical (straight line) viewing field boundary as compared to a circular field of the same total area (sharp turn ON/OFF).

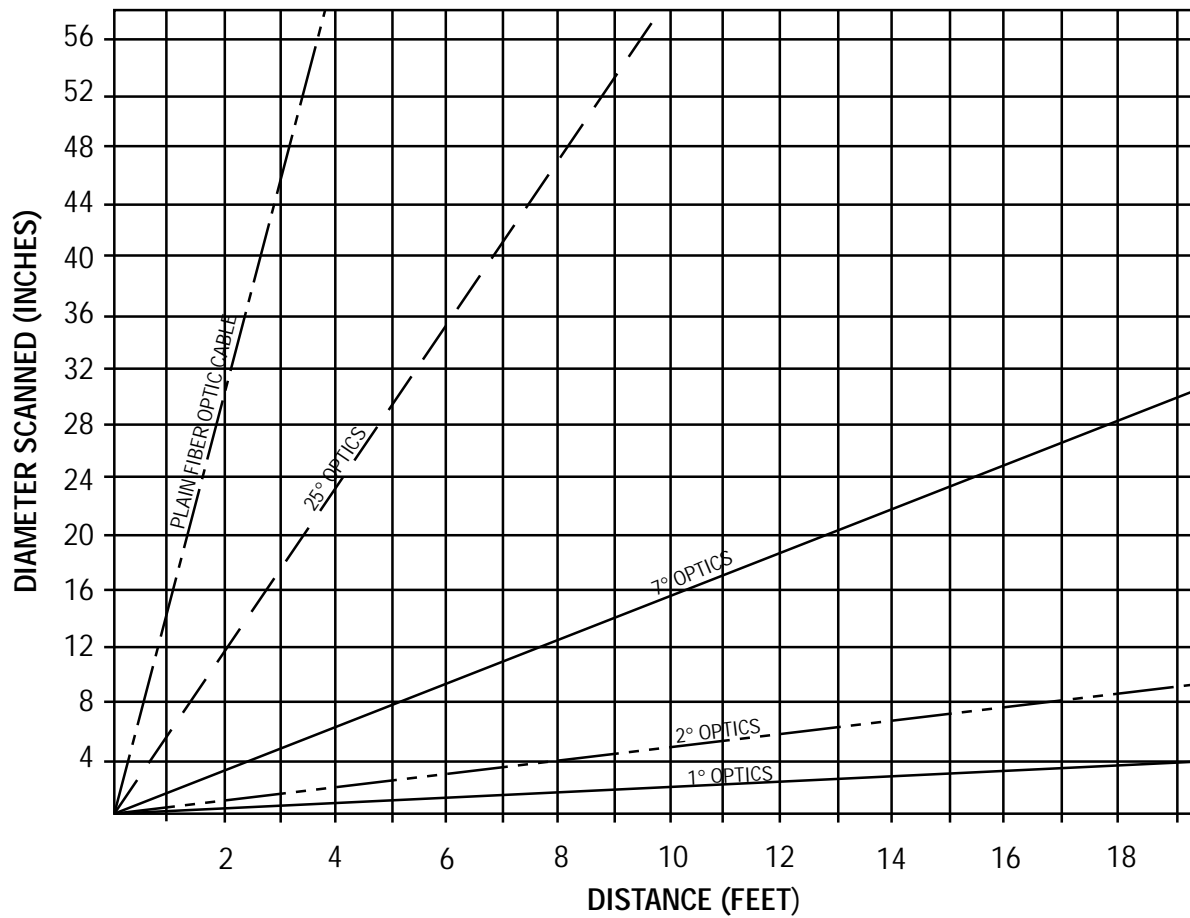
An elongated viewing field lens can be positioned to provide a long, narrow scan area across the length of a runout table, roll face, etc. Products with varying lateral position or irregular shapes will be sensed at the first point of entry/exit along the scan area. Vertical orientation of the field will permit similar detection of varying passline applications.

Mill housings, downcoilers, etc. provide limited vision areas for product sensing. A long narrow field can be applied to sight through these areas with little or no cropping of the viewing field.

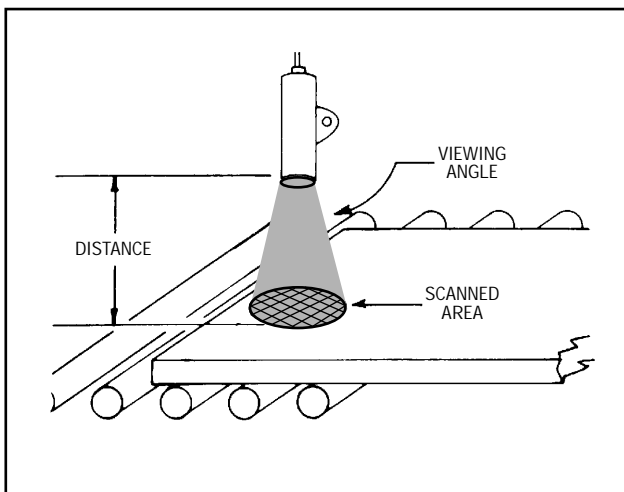
Note: The vertical (25°) viewing field of all Namco elongated field HMDs is in the same plane as the HMD mounting lug.

As previously stated, product temperature and percent of scan area covered within the viewing field combine to determine the "effective" minimum response temperature. Elongated viewing field applications for sensing small diameter rod, etc., should have the "effective" response temperature verified (see charts).

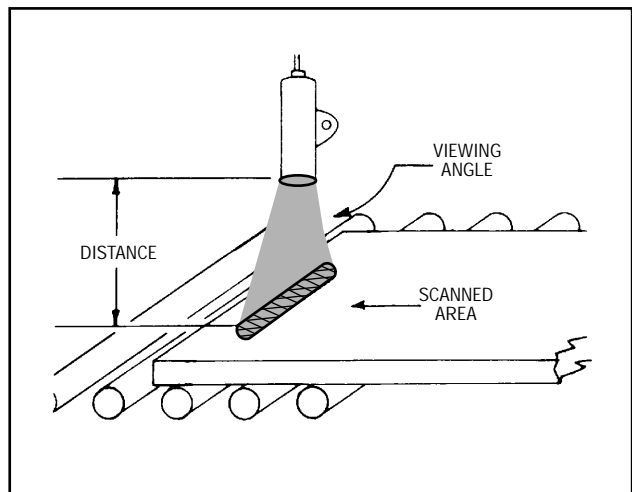
## Scanned Area vs. Viewing Angle



Scanned Area for 1/2°, 1°, 2°, 7° and 25° Lenses



Scanned Area for 1/2° x 25°, 1° x 25° and 2° x 25° Lenses



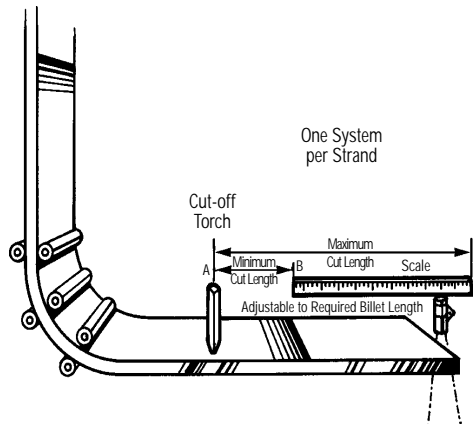
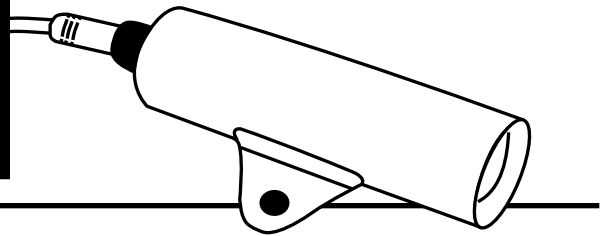
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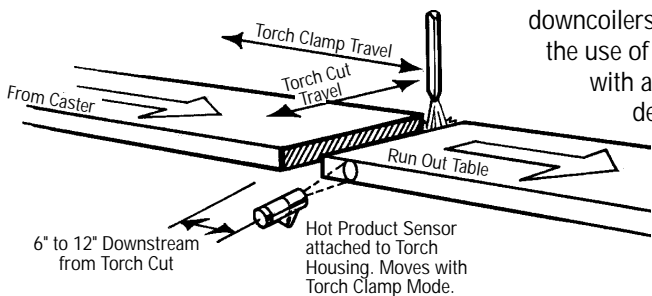
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## Regulate slab length in a continuous caster steel mill ▲

The process of cutting a slab into lengths is a hot process, requiring the use of a Namco 800°C set point HMD like the ER900.

Using a 1/2° lens will allow the HMD to be placed six feet away while still producing a refined viewing area of .8". The sensor can be mounted on a sliding scale which is relative to the cutting torch. The sensor detects the leading edge of the slab and initiates the torch clamp and cut sequence, which can occur anywhere between points A and B, depending on predetermined needs. An additional sensor may be mounted to the torch housing to relay information for control of the cutting process.



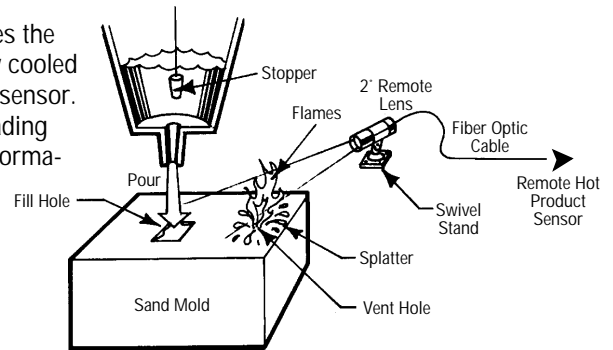
## Verify that a slab has been cut ▲

Another 800°C set point temperature HMD can be mounted on the torch housing 6-12" downstream from the torch cut. The cut sequence does not end until the HMD detects the separated slab.

## Automate the flash trimmer process ▼

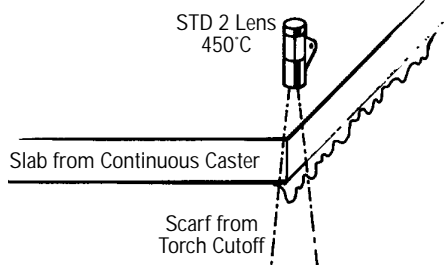
By the time the slab reaches the flash trimmer, it is sufficiently cooled to use a standard 450°C sensor.

The HMD detects the leading edge of the slab. The information is relayed to the control board, which initiates positioning of the slab farther down the line. The slab is stopped while the flash trimmer is moved up into position. The rollers bring the slab backward over the trimmer, which removes the scarf from the torch cutting process.



## Mold auto fill sequence ▲

For the harsh environment of a foundry's mold fill line, an 800°C remote lens and a sensor system will be required in order for the sensor to accurately view the process. A 2° lens monitors the fill level through the vent hole as the mold is filled by the stationary ladle. When the molten metal in the mold rises to the level of the vent hole, the sensor detects the metal and relays the information to the control board. The stopper is closed and the line is indexed for the next mold to be filled.

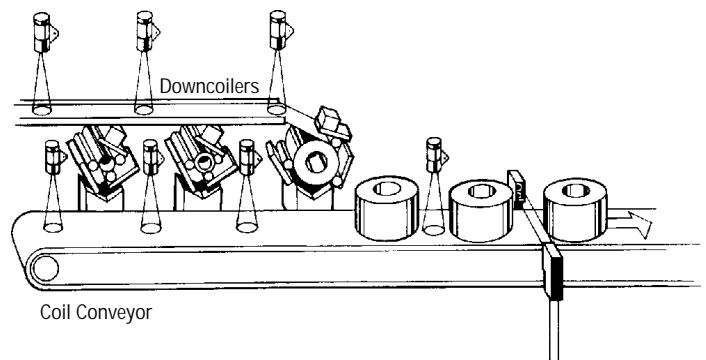


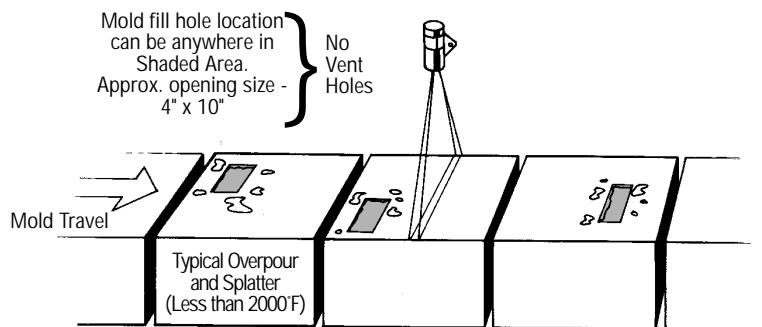
## Automate the down-coiling process in a steel mill ▼

Although the steel has cooled considerably by the time it reaches the downcoilers, the automation of the downcoilers is a hot process requiring the use of a Namco ER900 HMD sensor with a 250°C or 360°C set point. By detecting whether there is

already a coil on the conveyor leading to the storage area and relaying

that information, a low set point sensor can help automate the process by eliminating the need for an operator to manually control the operation.



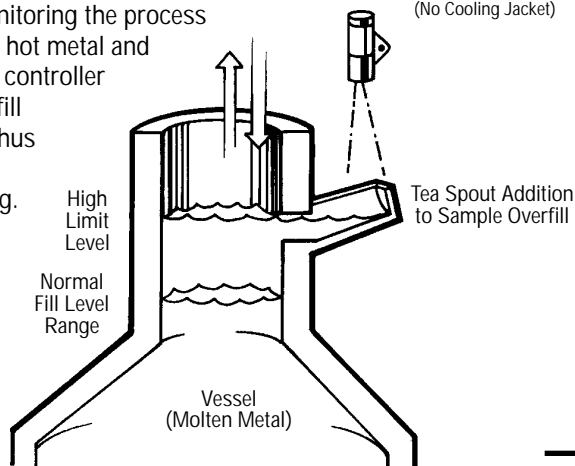


## Detect filled molds even if the fill hole isn't always in the same spot ▲

Even if fill holes are located in a different position on each mold, an 800°C set point HMD can still provide accurate detection when it is used with an elongated lens. A lens with a 2° x 25° scan area, for example, will cover the full width of the mold, detecting fill holes as the molds cross the viewing field. This system allows accurate detection of filled molds such as would be needed for a production count.

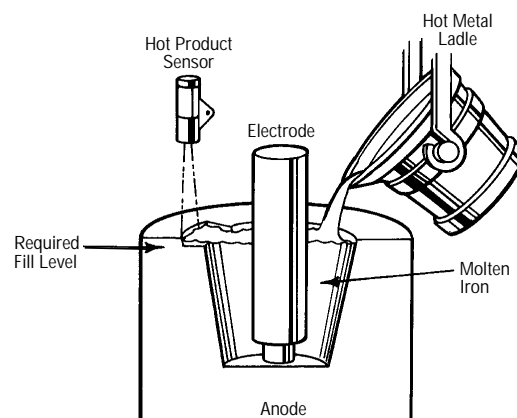
## A sensor for high level limit control ▼

If a tea spout overflow area is added at the high level mark of the vessel, a 800°C HMD can be used as the primary level control system. Indexed over the tea spout during the fill cycle, it will sense the molten metal as it reaches the fill level and spills into the tea spout. The sensor monitoring the process detects the hot metal and signals the controller to end the fill cycle and thus prevent overpouring.



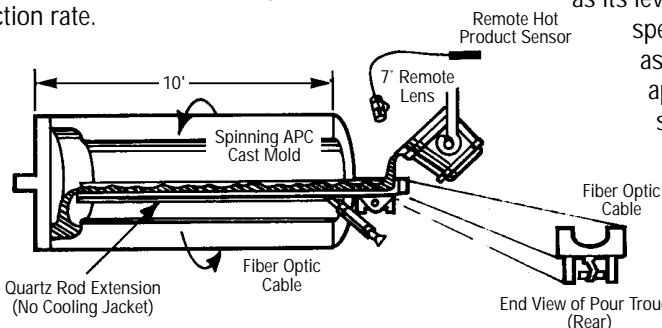
2 x 25° scan area of Hot Product Sensor at about 48" from mold

Occasionally large overpours may occur. Could be nearly equal to temperature of metal at pour hole and larger in area.



## Monitor a spin cast process ▼

The same 800°C sensing system used to detect overflow of molten metal can also be used to detect the initial pour sequence of molds for products like pipe. A second sensor placed at the opening of the mold can detect the fill level of the mold, sensing when the mold is full and relaying the message to the controller, which retracts the mold. Presently, the pour and fill sequences are timed from when the ladle first begins to pour, which is inaccurate and leads to a high rejection rate.



## Automate an anode assembly process ▲

For anode assembly in aluminum or other nonferrous industries, hot metal is poured around the electrode in order to firmly cast the electrode to the anode. In order to automate this process, the chance for overpour must be eliminated so that an operator does not have to visually monitor the process. This can be accomplished by using a sensor with a narrow viewing angle to sense the metal as its level reaches a

specified point, just as in a vessel fill application. The sensor detects the molten metal when it spills into a notch cut at the required fill level and signals the ladle to cease pouring.

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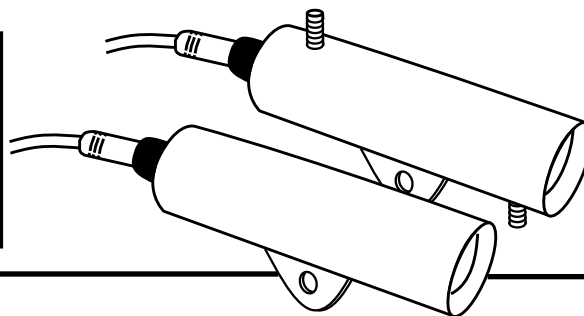
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## Self-Contained Systems

# Hot Metal Detectors



Namco Hot Metal Detectors (HMD's) were designed to be simple and cost effective in applications requiring dependable detection. Available trigger set points include a 250°, 360°, 450°, or 800°C range. Whether the application is in a steel mill or for flame detection in a burner application, the Namco IR sensor can be counted on for many years of reliable operation.

These devices work on the principle that all heated objects emit infra-red energy. Using a sophisticated optic and internal baffling system, the infra-red energy is collected and precisely focused

on a photo detector inside of the stainless steel housing. When the energy level is sufficient to meet the set point of the HMD, a digital output signal is generated.

The HMD's are totally self-contained in a rugged 4541 stainless steel housing with high quality electronics and glass optic components.

The water jacket models add an additional measure of heat resistance. These water cooled HMD's are specifically designed to be used where temperatures exceed the ambient rating of the standard HMD's.

Both standard and water cooled HMD's are impervious to the effects of steam, water, dust, shock and vibration associated with heavy industrial environments.

## Typical Applications:

Continuous casters, hot strip mills, bar mills, shape mills, pipe mills, forges & foundries, coke plants, glass industries, cutoff and measuring of hot product.

360°C* Model No.	450°C Model No.	800°C Model No.	Housing Length	Viewing Angle	Circuit Description	Connector	Minimum Load Current	Leakage Current	Voltage Drop	Maximum Switching Frequency
<b>AC MODELS</b>										
ER920-12817	ER920-13817	ER920-14817	170mm	25°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-12813	ER920-13813	ER920-14813	170mm	7°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-12812	ER920-13812	ER920-14812	170mm	2°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-22811	ER920-23811	ER920-24811	254mm	1°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-22819	ER920-23819	ER920-24819	300mm	1/2°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-12814	ER920-13814	ER920-14814	170mm	2 X 25°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-22818	ER920-23818	—	300mm	1 X 25°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-22815	ER920-23815	ER920-24815	300mm	1/2 X 25°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
<b>AC MODELS WITH WATER COOLED JACKETS</b>										
—	ER920-43813	—	170mm	7°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
—	ER920-43812	ER920-44812	170mm	2°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-52811	ER920-53811	ER920-54811	250mm	1°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
—	ER920-53819	—	300mm	1/2°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
—	ER920-43814	ER920-44814	170mm	2 X 25°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
<b>AC MODELS WITHOUT WATER COOLED JACKETS WITH PRECHECK</b>										
ER920-16812	ER920-17812	—	170mm	2°	2W, AC, NO	5-pin Mini	20mA	5mA	12 volts	20Hz
—	—	ER920-28811	254mm	1°	2W, AC, NO	5-pin Mini	20mA	5mA	12 volts	20Hz
—	ER920-27819	ER920-28819	300mm	1/2°	2W, AC, NO	5-pin Mini	20mA	5mA	12 volts	20Hz

\*Note: 250°C setpoint versions and DC powered versions are also available. All versions are available with optional pre-check. Consult the factory for ordering information.

## Common Sensor Characteristics

SELF-CONTAINED INFRA-RED SYSTEMS WITH AND WITHOUT WATER COOLED JACKETS	
Supply Voltage	105-132 VAC, 50/60 Hz
Output	500mA
Switching Delay Activation Release	1 ms 10 ms
Short Circuit Protected	Yes
Precheck Current Consumption (optional)	20 mA
NEMA Rating	3, 4, 12, 13
Connector With optional Pre-check	3-pin mini 5-pin mini
Output	Thyristor, NO
Ambient Temperature (water cooled HMD)	Determined by temperature, specific heat capacity and flow rate of coolant.  Precautions must be taken to insure that water does not freeze in cooling jacket and that coolant flow is maintained when working above +55°C.
Ambient Temperature (standard HMD)	360°C: -30°C to +55°C 450°C: -30°C to +75°C 800°C: -30°C to +85°C

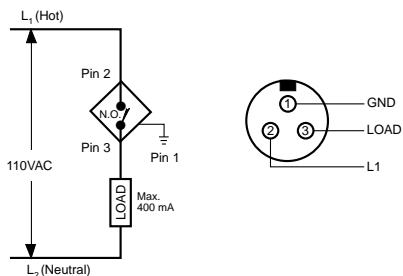
## Wiring Diagrams

### AC UNITS - with and without Precheck

Mail views shown

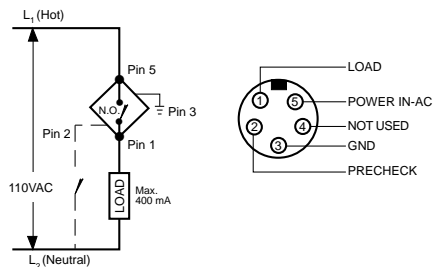
#### 3 Pin Without Precheck

(Use on all 2 wire AC's)



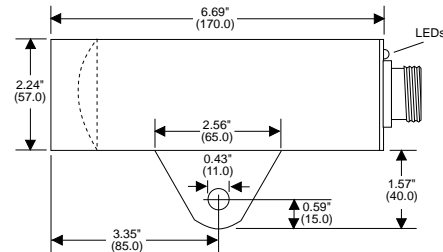
#### 5 Pin With Precheck

(Use on all AC Devices with IR Precheck)

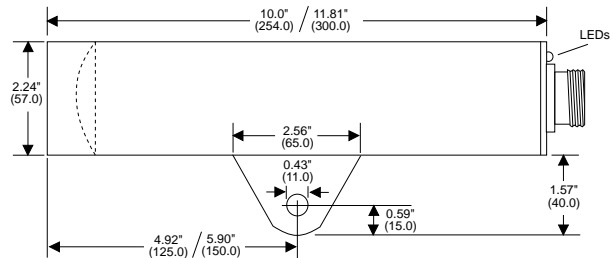


## Dimensional Drawings

### SHORT HOUSING - 170mm

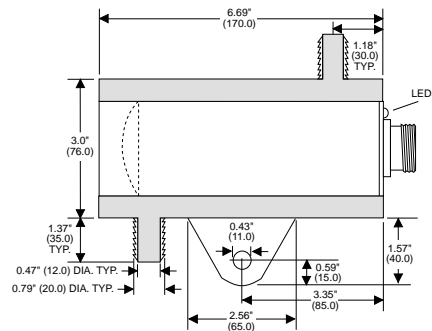


### LONG HOUSINGS - 254mm/300mm

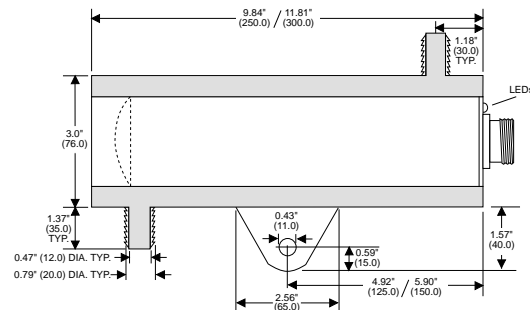


### SHORT HOUSING (WATER COOLED) - 170mm

Either air or water may be used for cooling.



### LONG HOUSING (WATER COOLED) - 250mm/300mm



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