



MIKRON[®]

M67/67S SERIES INFRADUCERS Infrared Temperature Transmitters for Non-contact Temperature Measurement

M67



M67S
(through-lens sighting)

Features

- 4 - 20mA linear output
- 2-wire connection
- Through-lens sighting (M67S)
- Variable focus distance (M67S)
- 0.50% accuracy
- 2-year warranty

The M67, M67S Infraducers

The most dramatic design innovation (Patent No. 4,527,896) in infrared temperature measurement for process control in decades is now available in 2 different versions.

Innovative Design

The M67 and M67S *Infraducers* are 2-wire temperature transducers/transmitters for non-contact temperature measurement. The *Infraducers* represent the latest in innovative technology, integrating exclusive, advanced electronic design with optical and mechanical precision that are the essence of Mikron's infrared products. Their design from concept to finish is based on simplicity of installation and maintenance. The *Infraducers* with their matchless array of options and accessories, demonstrate Mikron's continuing leadership in infrared temperature measuring technology.

Universal Application

Completely self-contained, the M67 and M67S *Infraducers* can be used as true 2-wire temperature transducer/transmitters which produce a standard 4-20mA linear output. Powered by its current loop, each *Infraducer* is completely compatible with any existing instrumentation for recording or process control. A rugged, stainless steel housing, miniature size and light weight made the *Infraducers* suitable for many applications which up to now were the exclusive domain of contact type temperature transmitters, such as thermocouples, resistance thermometers, etc. To insure minimum maintenance and utmost reliability, the *Infraducers* have absolutely no moving parts. When contained within its companion cooling jacket and air purge assembly, each *Infraducer* can withstand the most

punishing conditions found in industry. The *Infraducers* have universal application in virtually any type of industry. Typical application areas where infrared has successfully been used include: cement, ceramics, chemicals, food, glass, heat treating, metals, paper, plastics, power, printing, petrochemicals, robotics, rubber, semiconductors, textiles, vacuum systems...

Field Interchangeability

Superior design not only insures accuracy and long term reliability, it also insures interchangeability between *Infraducers* of the same model with $\pm 0.50\%$ accuracy. For especially demanding applications, the *Infraducers* have a digital emissivity control that can be set with a resolution of 0.01. This insures that, should one of the *Infraducers* need to be replaced, the replacement unit can be preset in every aspect before installation.

Application Assistance

Many years of experience in solving unusual and difficult infrared temperature measurement and control problems qualify our sales and application engineering staffs to offer solutions to the most challenging applications encountered in industry.

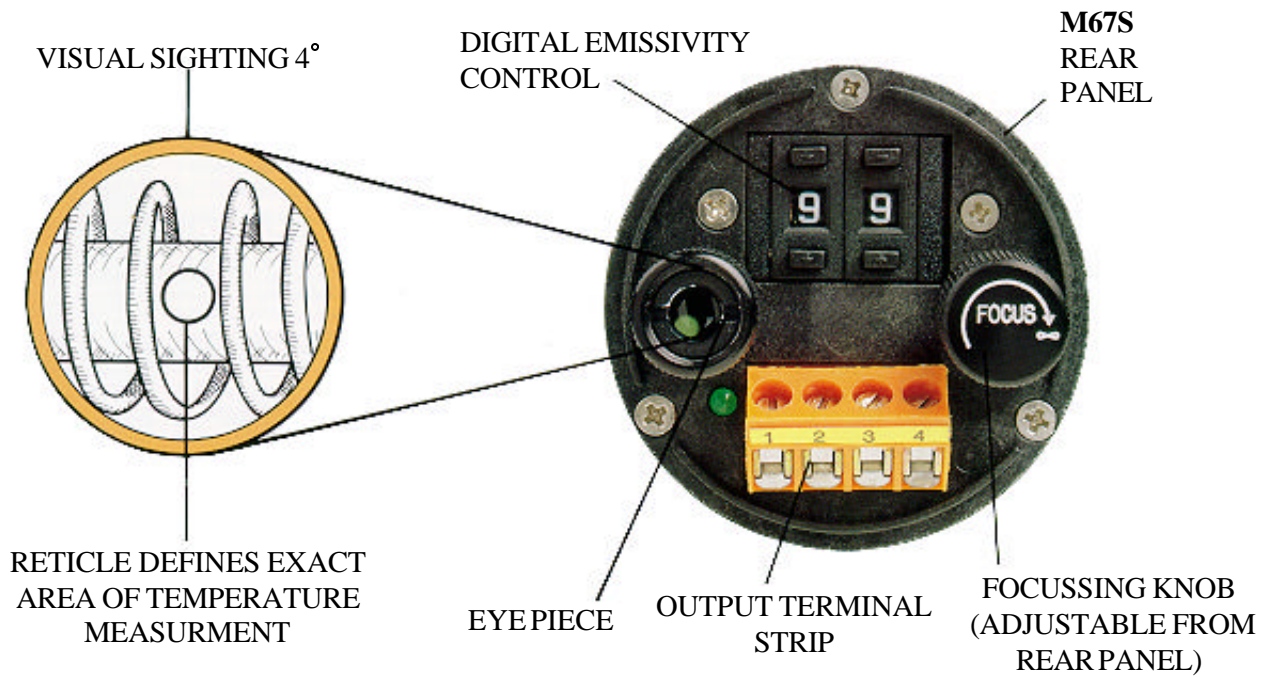
Quality Assurance

Reliability is never taken for granted at Mikron. After final calibration, every *Infraducer* is tested and burned-in for a week and rigorously subjected to a period of thermal cycling and vibration to verify calibration data.

Warranty

All *Infraducers* are covered by a two-year warranty period.





M67 Infraducer

The M67 is designed to handle most standard industrial applications. When powered by an 18 to 40VDC supply, it provides a 4-20mA linear output for interface with indication and recording instrumentation. Its two-wire design simplifies installation, operation and maintenance. Screw terminals allow easy yet secure connection. The M67 has a fixed optical system. That is, target size is determined by the distance between the sensor and the target area. It is recommended for applications where target size is known and operating distance is relatively constant.

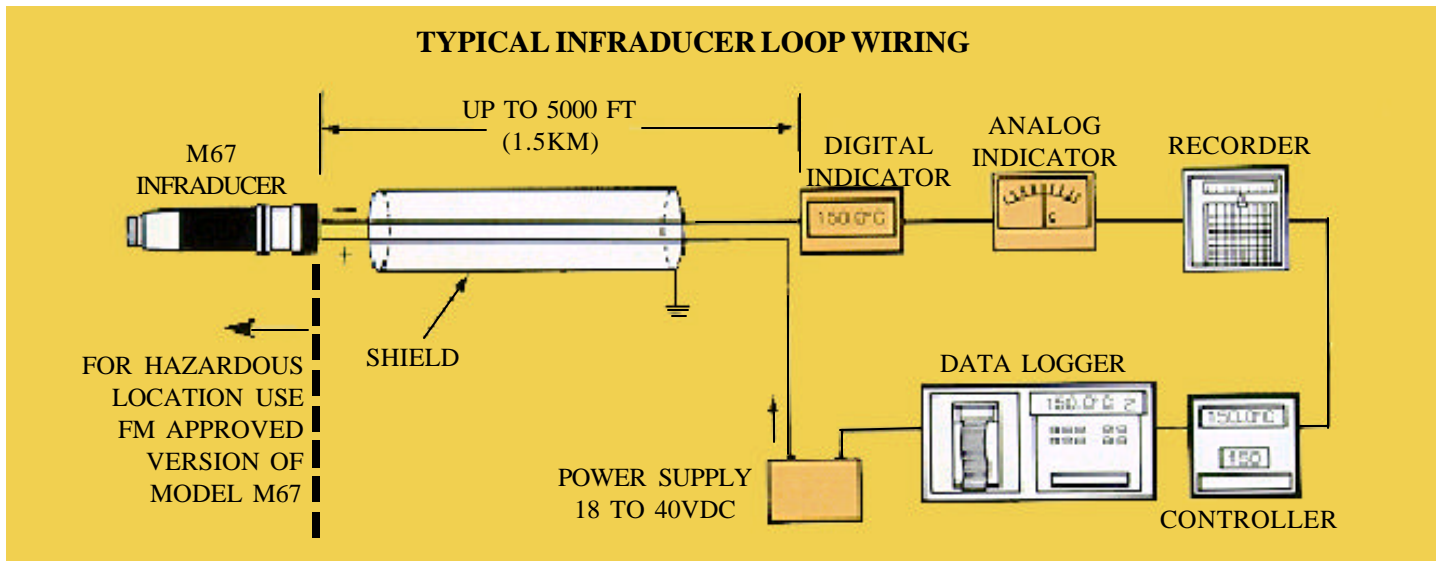
M67S Infraducer

The M67S contains all the features of the M67 with the added benefit of through-lens sighting. The M67S incorporates a high quality, high precision variable focus optical system that allows sharp focussing on the desired target from about 2" to infinity.

Focussing is executed by turning the focussing knob on the rear panel of the instrument. The M67S allows for precision pinpointing of small target areas. The user simply adjusts the instrument until the desired target is located within the reticle. The M67S is available in three distinct versions. The first will make accurate measurements at distances of 14" to infinity, the second has a working range of 6" to 14" and the third is designed to measure .06" (1.5mm) target at 2" distance. See the Selection Guide for details.

NIST Traceable Calibration Certificate

Mikron infrared thermometers are supplied with a final calibration certificate at no charge. The additional assurance of a calibration certificate traceable to National Institute of Science and Technology (NIST), is optionally available at additional cost. Please refer to Options in the Specifications.



How to select the right *Infraducer*

There are two basic *Infraducer* shell designs, one for the standard M67 and the other for the M67S. Each of these is available with a variety of temperature spans, spectral responses, and optical characteristics to meet specific applications. In addition each design is available in a three-wire version which provides a choice of a wide variety of optional outputs. A large selection of protective and mounting accessories is available to meet the customer's needs. The Mikron protective jacket is recommended whenever physical limitation allows. The protective jacket allows more rigid installation of the *Infraducer* and minimizes the influence of ambient thermal transients. When dust and other contaminants are present, the air purge assembly guarantees a clear viewing path for the optical systems. An auxiliary spring-loaded adjustable flange is also available when variable aiming capabilities are desired.

To order the unit just follow these simple steps and insert the proper codes in the boxes below.

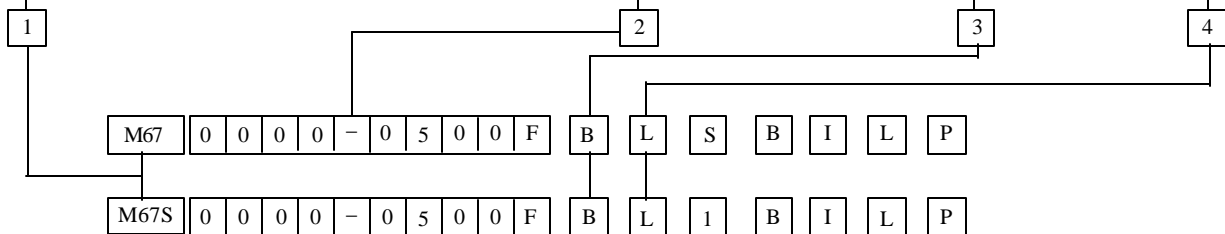
Step No.

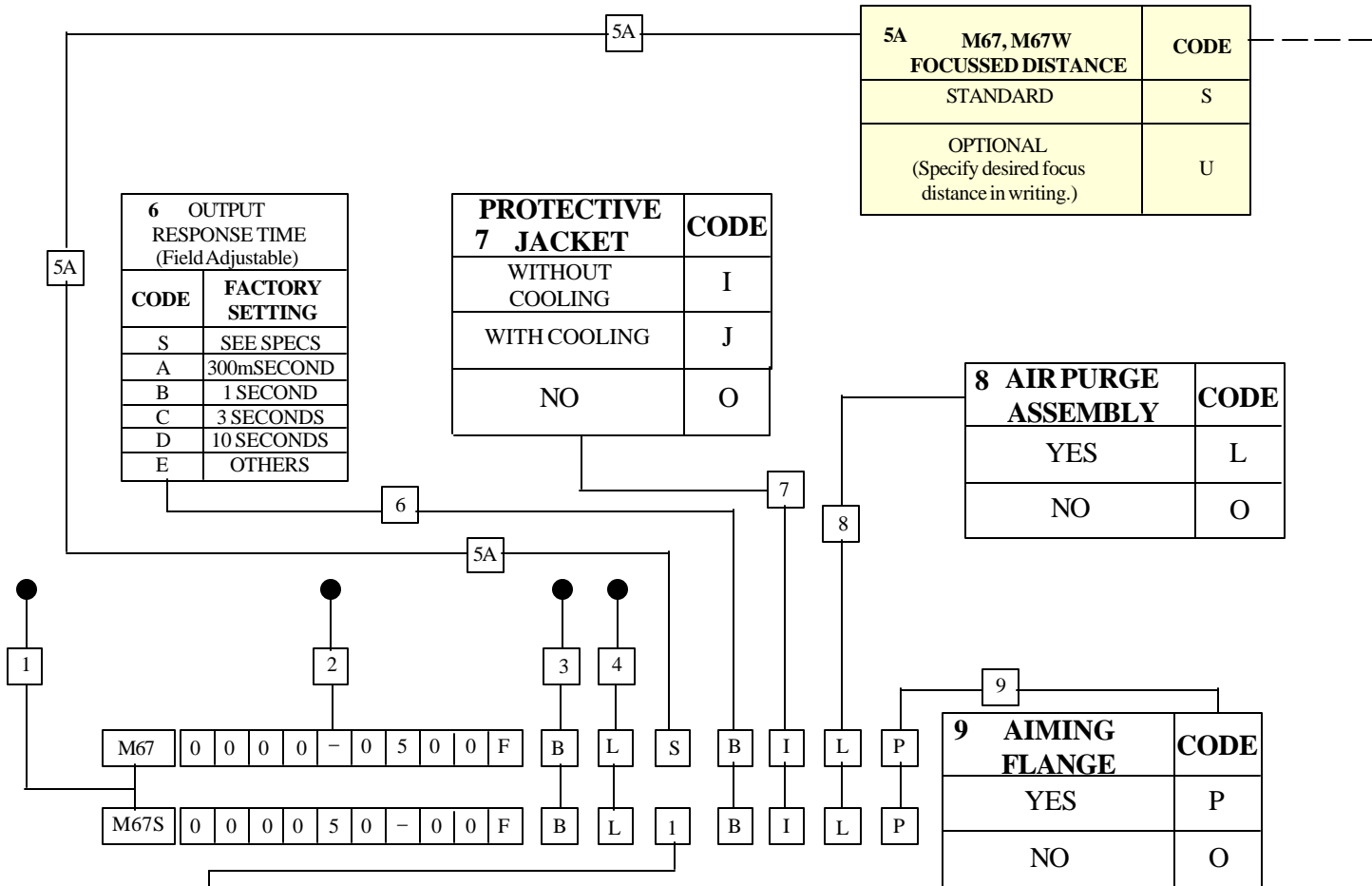
1. Determine the desired *Infraducer* version based on focussing and output requirements. Place the desired model number in box No. 1 below.
2. Select the application requirement in the second column of the chart, select temperature range and units (F or C) from ranges listed across from your application. Insert ranges and units in boxes marked No. 2, filling in all blanks with zeros.
3. Insert in the box No.3, the spectral response code previously selected.
4. If you selected either the M67 or M67S in box No.1, insert code letter L in box 4 for 4-20mA linear output. If you selected the M67W or M67SW, insert code letter U in box 4 and specify desired output in writing. See Note 2 for available optional outputs.
5. If you selected an M67 or M67W proceed to step 5A. if you selected an M67S or M67SW proceed to step 5B.
- 5A. Read the section titled "Optical Resolution" for the M67 to the right. If standard factory focusing is acceptable, insert code S in box No. 5A. if close focussing is required insert code U in box No.5A and specify desired focus distance and target size in writing. Proceed to step No.6.
- 5B. Read the section titled "Optical Resolution" as it relates to the M67S. Determine the desired working distance of the instrument and insert the code number in box No. 5B.
6. Specify desired initial factory set output response time by inserting the proper code letter in box No. 6. Output response time is field adjustable should factory setting need to be changed. When code letter E is selected, specify in writing desired output response time.
7. Designate the type of protective jacket required by code I for protective jacket without cooling capability of code J for protective jacket with cooling. Use of protective jacket in all cases where physical limitations do not exist is highly recommended. If no protective jacket is desired insert letter O.
8. Select the air purge assembly when dust or other airborne contaminants are present. Specify code L when industrial air is used or code N when high quality instrument air is available. Specify code letter O if the air purge is not required.
9. In the box labeled 8 specify letter P if adjustable aiming flange is desired, O if not.

Notes:

1. *Infraducer* with M spectral band is only available in versions with fixed focussed distance.
2. For these ■ ranges, *Infraducer* ambient temperature is limited to 0-50°C (32-122°F) and use of protective jacket is recommended.
3. Available outputs for M67W and M67SW are 0-20mA, 0-1VDC, 0-5VDC, 0-1-VDC and simulated T/C corresponding to T/C curve specify desired output in writing.
4. Minimum target sizes shown are based on 98% of energy received from target area.
5. *Infraducer* with M spectral Band and target temperature less than 150°C(300°F) the response time is limited to 10 seconds and emissivity setting to minimum of 0.80.

1 BASIC MODEL (SEE NOTE 1.)	TYPICAL APPLICATION	2 TEMPERATURE RANGE (See note 2.)		3 SPECTRAL RESPONSE		4 OUTPUT TYPE (See note 3.)		FIELD OF VIEW RATIO	
		°F	°C	MICRONS	CODE	CODE	CODE		
M67 WITH FIXED FOCUSING AND 4-20mA OUTPUT M67W WITH FIXED FOCUSING AND SPECIAL OUTPUT M67S WITH THROUGH-LENS SIGHTING FOR VARIABLE FOCUSING AND 4-20mA OUTPUT M67SW WITH THROUGH-LENS SIGHTING AND SPECIAL OUTPUT THE M67W AND M67SW ARE IDENTICAL TO THE M67 AND M67S RESPECTIVELY EXCEPT THAT THEY OFFER OUTPUTS OTHER THAN 4-20mA LINEAR. AVAILABLE OUTPUTS INCLUDE 0-20mA, 0-1VDC, 0-5VDC, 0-10VDC AND SIMULATED T/C CORRESPONDING TO THERMOCOUPLE CURVE CHARACTERISTICS.	MOST COMMON FOR LOW TEMPERATURE APPLICATIONS	■ -4-200	■ -40-100	7-20	A			15:1	
	GENERAL PURPOSE APPLICATIONS INCLUDE TEXTILE, PRINTING, PAPER, FOOD, LAMINATING, RUBBER, THICK PLASTICS, PAINTS, ETC. REJECTS ENERGY FROM HIGH INTENSITY RADIANT HEATING SOURCES.	■ 0-200	■ 0-100	8-14	B				15:1
	LOW TEMPERATURE APPLICATIONS SPECIALLY SUITED FOR PLASTIC FILMS .004" (.1mm) OR THICKER, SEES THRU CALCIUM FLOURIDE WINDOW FOR VACUUM PROCESSES.	0-500 0-1000 200-1800	0-300 0-500 100-1000	8-14	B				30:1
	THIN PLASTIC FILM SUCH AS POLYESTER, FLOUROCARBONS, ETC. AND VERY THIN GLASS.	0-500	0-2300	7-10	K				15:1
	THIN PLASTIC FILMS, i.e. POLYETHYLENE, POLYSTYRENE, POLYURETHANE AND POLYPROPYLENE	■ 200-1000	■ 100-500	7-10	K				30:1
	GLASS SURFACE MEASUREMENT APPLICATIONS INCLUDE, BENDING, FORMING, TEMPERING, ANNEALING, SEALING & LAMINATING, ETC.	■ 0-500 200-800 300-1100	■ 0-300 100-400 150-600	7.9 7.9	F F				15:1 30:1
	SEES THRU CLEAN FLAMES & HOT COMBUSTION CASES, APPLICATIONS INCLUDE, REFORMER TUBES, CHEMICAL REACTORS, KILNS, ETC.	■ 120-400 ■ 200- 600 300-1000	■ 50-200 ■ 100-400 150-500	NARROW BAND CENTERED AT 3.43	M				5:1 8:1
	TEMPERATURE OF FLAME, FOR COMBUSTION AND POLLUTION INDUSTRIES, INCINERATORS, GLASS MELTING TANKS, KILNS, CHEMICAL REACTORS, ETC.	200-1000 500-1500 500-2500	100-600 300-800 300-1300	4.8-5.2 4.8-5.2	E E				15:1 30:1
	MOST COMMON FOR HIGH TEMPERATURE APPLICATIONS SUCH AS METALS, FOUNDRIES, HARDENING, FORGING, ANNEALING, GLASS MELTING TANKS, GLASS GOBS AND SEMICONDUCTOR PROCESSES.	■ 600-1800 800-2600 1200- 3200	300-100 450-1450 600-1750	NARROW BAND CENTERED AT 3.86	D				30:1
	MEDIUM TO HIGH TEMPERATURE APPLICATIONS FOR FERROUS AND NON FERROUS METALS, SEES THROUGH GLASS, FAST RESPONSE	700-2200 1500-4000	500-1100 600-2200	CO ₂ ABSORPTION BAND	L				30:1
	MEDIUM TO HIGH TEMPERATURE APPLICATIONS, FOR FERROUS AND NON FERROUS METALS.	■ 900-1400 1100-1800 1200-2000 1300-2500 1800-3200 2000-4000 2700-5400	■ 500-800 550-900 600-1000 700-1300 900-1600 1100-200 1500-3000	0.78-1.06 0.78-1.06	H H				90:1 180:1
		■ 450-800 500-1000	■ 220-400 300-600	1.0-1.6 1.0-1.6	Q Q				30:1 90:1
		■ 500-900 600-1000 700-1300 800-1600 1000-2200 1400-3000	■ 250-450 300-550 350-700 400-800 500-1100 750-1650	2.0-2.6	P				30:1



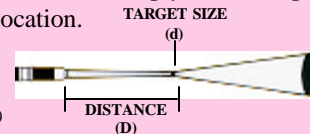


5B M67S, M67SW OPERATING DISTANCE	CODE
14" (350) TO INFINITY	1
6" (150) TO 14" (350)	2
2" (50) FIXED	3

OPTICAL RESOLUTION-M67S AND M67SW

Three different lenses are available for the M67S and M67SW. The one you should choose depends on the desired working distance of the unit. The first version is designed to measure temperature at distances of 14" to infinity. The second version has a working area of 6" to 14". The third version is fixed to measure temperatures at a 2" distance. Proper focussing is achieved by mounting the unit at the desired distance and adjusting the focussing knob on the rear panel of the instrument until the target comes into clear view in the reticle. When the target is in focus to the eye, it is also in focus to the detector. Should you wish to move the instrument, remember to stay within the prescribed working distance and simply refocus upon the target after counting the instrument in its new location.

A typical field of view diagram is shown at right:



Target size is determined by the formula:

$$\text{Target size (D)} = \frac{\text{Measuring Distance (D)}}{\text{Field of View Ratio}}$$

Example: M67S, version 1 with 30:1 FOV focussed at 15"

Minimum target sizes are shown in the table below:

Field of View	Version 1 Focus 14" to infinity	Version 2 Focus 6" to 14"	Version 3 Focus at 2"
15:1	Min target of 0.93" at 14" distance	Min target of 0.40" at 6" distance	Min target of 0.13" at 2" distance
30:1	Min target of 0.47" at 14" distance	Min target of 0.20" at 6" distance	Min target of 0.06" at 2" distance
90:1	Min target of 0.16" at 14" distance	Min target of 0.07" at 6" distance	Not Available
180:1	Min target of 0.07" at 14" distance	Not Available	Not Available

OPTICAL RESOLUTION M67 and M67W

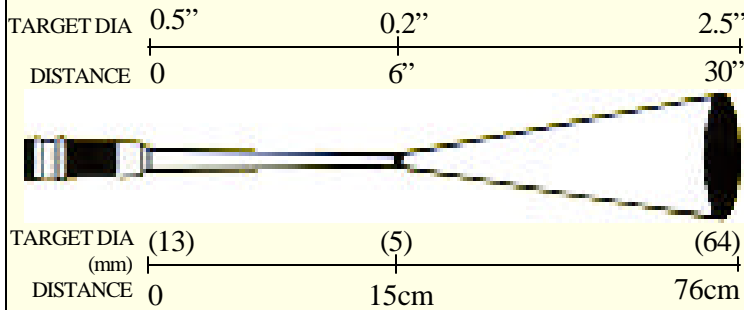
The M67 and M67W feature fixed optical systems in which the target size is determined by the distance between the target area and the sensor. The field of view of the instrument is determined by the spectral response and temperature range that you have already selected and has been pre-determined for you. Each instrument is factory focused for the most frequently used distances and follows its corresponding field of view diagram depicted in the chart to the right. Close focus distances are available to facilitate accurate measurements of target areas smaller than 1" (25mm). Minimum target size is determined by the formula:

$$\text{Min. Target Size} = \frac{\text{Focussed distance to the M67}}{\text{Field of View Ratio}}$$

A typical close focussing example and corresponding field of view diagram are shown below.

Example: determine minimum target size for focus distance of 6" and FOV ratio of 30:1

$$\text{Min. Target Size} = 6'' / 30 = 0.2''$$

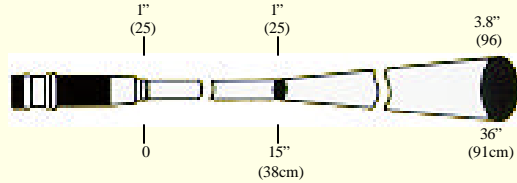


(Minimum focussable distance for each FOV is shown to the right.)

Standard Field of View (FOV) Diagrams (See note 3)

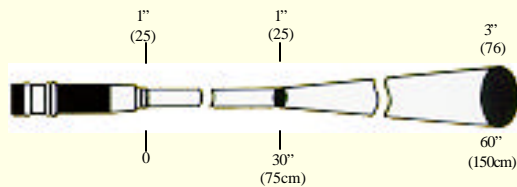
MIN
FOCUSSABLE
DISTANCE
FOR
CLOSE
FOCUS

FOV RATIO = 15:1
min target diameter



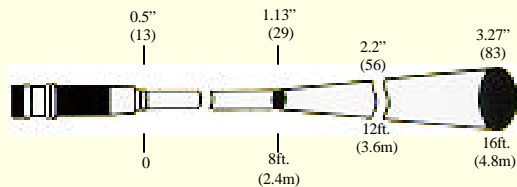
Distance from M67

FOV RATIO = 30:1
min target diameter



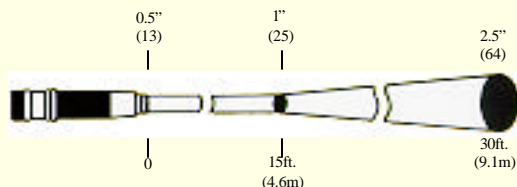
Distance from M67

FOV RATIO = 90:1
min target diameter



Distance from M67

FOV RATIO = 180:1
min target diameter



Distance from M67

1"
(2.5 cm)

3"
(7.6 cm)

6"
(15 cm)

12"
(30 cm)

Accuracy: ** $\pm 0.5\%$ of full scale or 1.0°C (1.8°F) whichever is greater.
Resolution: $\pm 0.1\%$ of full scale span (FSS)
Repeatability: $\pm 0.2\%$ of full scale span (FSS)
Emissivity: Digital setting 0.10-0.99 with 0.01 step
Optical System: M67S, M67SW: Non-parallax refractive optics focussable from rear panel.
Field of View: M67S, M67SW: Visual sighting 4° . Infrared see FOV diagram for M67 and optical resolution for M67S.
Focussing Distance: M67S, M67SW: Diopertype
Input Voltage: 24VDC nominal
Input Voltage Range: 18-40VDC
Output Current Span: 4-20mA linear standard
 Minimum Output Current 3.8mA
 Maximum Output Current 32mA
 Others see selection chart
Response Time: 50mS for codes H and Q spectral response, 100mS for all others. Response time defined as time required for output to reach 95% of its final value. (See note 5)
Load Resistance Max: 100ohms for 20V input voltage, 300ohms for 24 input voltage.
Electrical Connections: 1) M67-two terminal screws molded into high strength, high temperature thermoplastic 2) M67S, M67 and M67SW- Four terminals

Operating Ambient Temperature:
 Without Cooling Jacket: 0 to 60°C (32 to 140°F)
 With Air Purge Assembly: 120°C (250°F)
 With Cooling Jacket: Up to 315°C (600°F)
Storage Ambient Temperature: -30 to 80°C (-20 to 160°F)
Relative Humidity: 90% Non-condensing
Vibration: M67, M67W- 3 g's any axis continuous
Shock: M67, M67W- 50 g's
Housing Material: Stainless steel
Dimensions: 1) M67 and M67W - 2.0" dia. x 7.9" long (50mm x 200mm) 2) M67S and M67SW - 2.0" dia. x 8.0" long (50mm x 203mm)
Weight: 1.9 lbs. (0.9kg)
Mounting: Support block with four 0.200" (5mm) dia. holes and "U" clamp. For more secure mounting, use of protective jacket is recommended.
Optical Features:
NIST Traceable Calibration Certificate: Minimum of three points on instrument temperature scale. Additional points as required at extra cost per point.
FM Approved Version: See accessories (electrical)
Peak/Valley Picker: See accessories (electrical)
 **1. Accuracy is stated for target emissivity of 1.0 at specified focussed distance and target having sufficient diameter to eliminate background influence.
 **2. Accuracy is stated for input voltage of 24VDC and load resistance of 250 ohms.

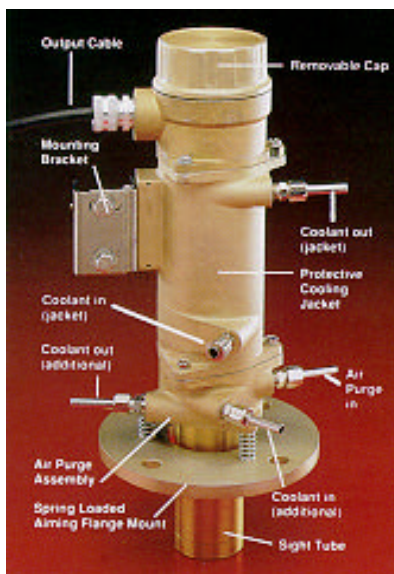
Accessories (Mechanical)

Protective Jacket and End Cap

The cast aluminum jacket and end cap protects the **Infraducer** from physical damage when located in environments of heavy industry and also dampens the effect of rapid ambient changes. The precision machining of the protective jacket allows for easy removal and replacement of the sensor head with no loss of alignment. In high ambients when temperature exceeds the maximum rated temperature of the **Infraducer**, the use of a protective jacket with cooling capability is mandatory. Extensive research and testing of the jacket assures uniform cooling along its entire length and simultaneously isolates the **Infraducer** from thermal influence. While airflow alone is sufficient for light cooling, water must be used for moderate and heavy cooling.

Ambient temp.		Gal./Hr.	Liters/Hr.
$^{\circ}\text{F}$	$^{\circ}\text{C}$		
150	65	0.2	0.8
200	95	0.6	2.3
250	120	1.0	3.8
300	150	2.0	7.6
350	175	3.0	11.4
400	205	4.0	15.2
450	230	6.0	22.7
500	260	10.0	37.8
600	315	20.0	76.0

Inlet coolant temperature assumed at 68°F (20°C)



Air Purge and Cooling Assembly

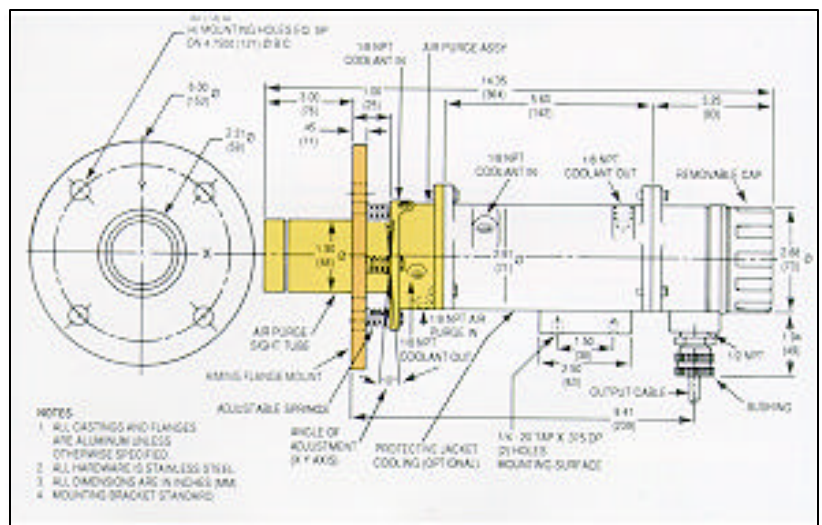
Though simple in outward appearance, this assembly performs three very important functions- purging, aiming and localized cooling. Air purging of the optics is extremely important when airborne contaminants can build up on the lens and eventually "blind" the sensor head. In contrast to many air purge systems currently in use which actually develop a negative pressure vortex and contribute to the build up of contaminants, the Mikron air purge assembly has been carefully engineered to prevent this build-up of from occurring. A flow of only 75 CFH (2CMH) of normally clean industrial air will keep the optics clean indefinitely.

The metal sight tube is designed for installations where it is desirable to augment the air purge and facilitate approximate aiming of the **Infraducer**.

The cooling plate section of the air purge assembly allows the coolant to circulate in a stainless steel chamber, which allows cooling of **Infraducer** up to ambient temperature of 120°C (250°F). The air purge assembly depends upon the protective jacket for mounting.

Aiming Flange Assembly

For installations requiring durable mounting of the sensor head while allowing for adjustment of the optical path to a maximum of 5° in any direction from normal to the mounting plate. Specify PN 11649-2 when ordered separately.



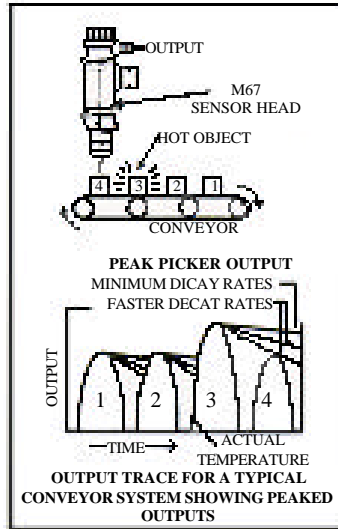
Accessories (Electrical)

FM Approved Model

The modes M67 *Infraducer* has been approved by Factory Mutual (FM) for usage in hazardous environments. When used in conjunction with the optional barriers, the entire system will be rated intrinsically safe. Approvals are for Class I, II or III, Division I, Group A B, C, D, E, F and G. At the time of order please specify that the FM Approved version is required.

Peak/Valley Picker

The M67 with optional built-in peak/valley picker circuitry allows a fast response to temperature rise and adjustable slow decay of output when temperature falls. This feature is invaluable in applications where wide temperature variations are encountered.



M67EM Electronic Module

The M67EM is a basic electronic module designed to support the M67 *Infraducer* on those installations where a remote peak/valley picker is the dominant electronic requirement. The M67EM operates from 115VAC current (220VA optional) and provides a 24 VDC voltage for a loop current.

M67EM Specifications

Input Signal Requirements: 4-20mA linear from M67 output

Response Time Adjust: 10mS to 10 sec. Field adjustable

Peak/Valley Picker Decay Rate: (Valley picker optional) Continuously adjustable between 0.01 and 10% of full scale/second.

Peak Picker Controls: (Valley Picker optional) On, Cancel and Reset from front panel. Remote Reset actuated by external SPST switch (customer supplied).

Standard Outputs (Linear): 0-1V full scale; 0-50mVDC full scale; 1mV/°F or C; 4-20mADC, 650 ohms max.

Output Supply Voltage: +24VDC to power M67

Ambient Temperature Range: 0°C to 50°C (32°F to 120°F)

Size: 64mm(W) x 128mm(H) x 230mm(D) (2.5 in. x 5.0 in. x 9.0 in.)

Panel Cutout: 58mm x 108mm (2.25 in. x 4.25 in.)

Power: 115VAC ±10% 50/60Hz (230VAC optional) 30 watts

Precision Digital Process Meters

Mikron M60TS

The M60TS is a 1/8 DIN digital process meter with front panel keyboard programmability. The M60TS is available in both 3 1/2 digit (for temperature below 2000°) and 4 digit (for temperature above 2000°) versions. It provides monitoring and display of the minimum and maximum process value input with keypad reset as a standard feature. The M60TS contains a built-in 20VDC power supply which simplifies connection to the *Infraducer*.

Mikron M60TD

The M60TD offers all of the features of the M60TS as well as adjustable high and low set points. Set point adjustments are made on the front panel keypad. The keypad requires coded entry to protect against accidental and unauthorized changes.

For more information about any of these meters, please request Mikron Accessories Bulletin Number 1



Power Supplies

These power supplies provide either a 24 or 40V current to power the sensor head. The low profile, sealed and rugged package is designed for chassis mounting. The front-mounted terminal barrier strip is perfect for isolation between input and output voltages. A current limiting feature protects the power supply when short circuit occurs. Four tapped holes are provided for mounting. Available in both 115 and 230VAC versions.



Input Voltage ±10% 50-60Hz	Output Voltage	Max. Load Current	Part No.
115VAC	24VDC	100mA	11846-1
230VAC	24VDC	100mA	11846-1
115VAC	40VDC	60mA	11846-2
230VAC	40VDC	60mA	11846-4

Made in U.S.A.

The M67 Series is designed and built by Mikron, the leading innovator in infrared thermometry.



MIKRON INSTRUMENT COMPANY, INC., 16 Thornton Road, Oakland, New Jersey 07436 USA
 TEL., 201-405-0900 FAX: 201-405-0090 TOLL FREE HOT-LINE: 800-631-0176