

# Technical Note



## Photrix™ Series Temperature Ranges, Configuration Options, Spot Sizes and other ordering information

This Technical Note provides detailed technical information regarding specifications, options, and ordering information for Mikron's Photrix™ Series of pyrometers. Photrix offers industry the most precise short wavelength (1.5µm and below) infrared thermometry solution.

The Photrix can be configured with four (4) different spectral responses and the collection optics can be configured in four (4) forms. Pages 2 through 5 of this technical note describe performance specifications for the different wavelength and optics configurations. The pages after provide system options and mechanical dimensioned drawings.

### Four Collection Optics Options

Mikron's Photrix Series of infrared thermometers can be integrated into diverse applications by using one of the four distinct optical configurations. Optics are suitable for measuring objects in high vacuum, harsh EMI, chemically corrosive and hard-to-access industrial environments. Each of the four collection optics configurations offers unique advantages:

#### Integrated Lens

- For viewing a small spot on target
  - ~from a distance,
  - ~through viewport, or
  - ~through a window.
- Spot sizes as small as 0.5mm
- Measures as low as 65 °C with 700-1650nm spectral response
- Measures as low as 270 °C with 900nm spectral response
- Standard working distance between 50mm and 2000mm that are factory focused to minimize spot size.

#### Direct Lightpipe

- Sapphire lightpipe is designed for direct insertion into process chamber through standard vacuum fittings
- Measures as low as 30 °C with 700–1650nm spectral response
- Measures as low as 210 °C with 900nm spectral response

#### Fiber Optics to Lens

- For applications with high ambient temperatures or flammable/combustible hazards. The fiber optics allow the electronics to be safely located separate from measurement area.
- If mechanical space is limited near the measurement area, then fiber optics can offer more flexible integration and mounting options.
- Measures as low as 65 °C with 700-1650nm spectral response
- Measures as low as 270 °C with 900nm spectral response

#### Fiber Optics to Lightpipe

- Similar to the case above, this configuration is also considered for applications with high ambient temperatures or flammable/combustible hazards. The use of a lightpipe is usually in conjunction with a process chamber or reactor.
- Measures as low as 60 °C with 700–1650nm spectral response
- Measures as low as 240 °C with 900nm spectral response



## Photrix Integrated Lens Configuration

Configuration P/N	Spectral Response	Collection Optics	Mounting Threads	Spot Size Chart Column	Temperature Range			
					Celsius (°C)		Fahrenheit (°F)	
ML-GAPX-XXX-M	700-1650nm	Lens, XXX working distance	M36-15	A	65	1000	149	1832
ML-GAPX-XXX-E	700-1650nm	Lens, XXX working distance	1-3/8" -28	A	65	1000	149	1832
ML-GAPX-HXXX-M	700-1650nm	Lens, XXX working distance	M36-15	B	135	2400	275	4352
ML-GAPX-HXXX-E	700-1650nm	Lens, XXX working distance	1-3/8" -28	B	135	2400	275	4352
ML-AAPX/088-XXX-M	880nm	Lens, XXX working distance	M36-15	C	280	2150	536	3902
ML-AAPX/088-XXX-E	880nm	Lens, XXX working distance	1-3/8" -28	C	280	2150	536	3902
ML-AAPX/090-XXX-M	900nm	Lens, XXX working distance	M36-15	C	270	2150	518	3902
ML-AAPX/090-XXX-E	900nm	Lens, XXX working distance	1-3/8" -28	C	270	2150	518	3902
ML-GAPX/155-XXX-M	1550nm	Lens, XXX working distance	M36-15	D	125	2600	257	4712
ML-GAPX/155-XXX-E	1550nm	Lens, XXX working distance	1-3/8" -28	D	125	2600	257	4712
ML-AAPX/088-HXXX-M	880nm	Lens, XXX working distance	M36-15	E	310	2600	590	4712
ML-AAPX/088-HXXX-E	880nm	Lens, XXX working distance	1-3/8" -28	E	310	2600	590	4712
ML-AAPX/090-HXXX-M	900nm	Lens, XXX working distance	M36-15	E	300	2600	572	4712
ML-AAPX/090-HXXX-E	900nm	Lens, XXX working distance	1-3/8" -28	E	300	2600	572	4712
ML-GAPX/155-HXXX-M	1550nm	Lens, XXX working distance	M36-15	F	180	2600	356	4712
ML-GAPX/155-HXXX-E	1550nm	Lens, XXX working distance	1-3/8" -28	F	180	2600	356	4712

Table 1. Temperature ranges for Photrix configurations with integrated lens collection optics.

Working Distance		Spot Size											
		A		B		C		D		E		F	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
50	2.0	1.5	0.06	0.5	0.02	1.5	0.06	1.5	0.06	0.7	0.03	0.5	0.02
75	3.0	2.0	0.08	0.8	0.03	2.0	0.08	2.0	0.08	0.9	0.04	0.8	0.03
100	3.9	2.5	0.10	1.0	0.04	2.5	0.10	2.5	0.10	1.3	0.05	1.0	0.04
150	5.9	4.0	0.16	1.3	0.05	3.5	0.14	3.5	0.14	1.8	0.07	1.3	0.05
200	7.9	5.0	0.20	1.5	0.06	4.5	0.18	4.5	0.18	2.3	0.09	1.5	0.06
250	9.8	6.0	0.24	1.8	0.07	5.5	0.22	5.5	0.22	2.8	0.11	1.8	0.07
300	11.8	7.5	0.30	2.0	0.08	7	0.28	7	0.28	3.5	0.14	2.0	0.08
500	19.7	12	0.47	3.5	0.14	11	0.43	11	0.43	5.5	0.22	3.5	0.14
750	29.5	17	0.67	4.5	0.18	16	0.63	16	0.63	8	0.32	4.5	0.18
1000	39.4	24	0.95	5.5	0.22	22	0.87	22	0.87	11	0.43	5.5	0.22
2000	78.7	47	1.85	11	0.43	44	1.73	44	1.73	22	0.87	11	0.43

Table 2. Spot sizes for Photrix configurations with integrated lens collection optics.

### Ordering Information

Specify lens working distance, XXX, in millimeters (mm) when ordering.

### Available Options

- Custom spot sizes
- Custom field of views



## Photrix Direct Lightpipe Configuration

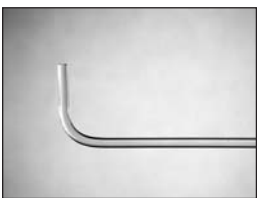
Configuration P/N	Spectral Response	Description of 2mm diameter Lightpipe Collection Optics	Temperature Range			
			Celsius		Fahrenheit	
			Min (°C)	Max (°C)	Min (°F)	Max (°F)
ML-GAPX-LP2-XXX	700-1650nm	XXX mm length	30	670	86	1238
ML-GAPX-LP2-XXX-SS-YYY	700-1650nm	XXX mm length, with sapphire sheath YYY mm length	30	670	86	1238
ML-GAPX-LP2-XXX-SQ-YYY	700-1650nm	XXX mm length, with quartz sheath YYY mm length	30	670	86	1238
ML-AAPX/088-LP2-XXX	880nm	XXX mm length	220	1300	428	2372
ML-AAPX/088-LP2-XXX-SS-YYY	880nm	XXX mm length, with sapphire sheath YYY mm length	220	1300	428	2372
ML-AAPX/088-LP2-XXX-SQ-YYY	880nm	XXX mm length, with quartz sheath YYY mm length	220	1300	428	2372
ML-AAPX/090-LP2-XXX	900nm	XXX mm length	210	1300	410	2372
ML-AAPX/090-LP2-XXX-SS-YYY	900nm	XXX mm length, with sapphire sheath YYY mm length	210	1300	410	2372
ML-AAPX/090-LP2-XXX-SQ-YYY	900nm	XXX mm length, with quartz sheath YYY mm length	210	1300	410	2372
ML-GAPX/155-LP2-XXX	1550nm	XXX mm length	70	1100	158	2012
ML-GAPX/155-LP2-XXX-SS-YYY-Y	1550nm	XXX mm length, with sapphire sheath YYY mm length	70	1100	158	2012
ML-GAPX/155-LP2-XXX-SQ-YYY	1550nm	XXX mm length, with quartz sheath YYY mm length	70	1100	158	2012

Note: Directly connected lightpipes have a ~120° viewing angle.

### Ordering Information

- Specify length of lightpipe, XXX, in millimeters (mm)
- Specify length of optional sheath, YYY, in millimeters (mm)

### Available configuration options



Bent Lightpipe Tip



Custom Lightpipe and Sheath Diameters



Purging Gas Vacuum Sleeves



## Fiber Optics to Lightpipe Configuration

Configuration P/N	Spectral Response	Description of 2mm diameter Lightpipe Collection Optics	Temperature Range			
			Celsius		Fahrenheit	
			Min (°C)	Max (°C)	Min (°F)	Max (°F)
ML-GAPX-LO-SZ-LP2-XXX	700-1650nm	XXX mm length, Z m fiber optic cable with 200µm core	100	1400	212	2552
ML-GAPX-LO-MZ-LP2-XXX	700-1650nm	XXX mm length, Z m fiber optic cable with 600µm core	65	950	149	1742
ML-GAPX-LO-LZ-LP2-XXX	700-1650nm	XXX mm length, Z m fiber optic cable with 1000µm core	60	900	140	1652
ML-AAPX/088-LO-SZ-LP2-XXX	880nm	XXX mm length, Z m fiber optic cable with 200µm core	300	2600	572	4712
ML-AAPX/088-LO-MZ-LP2-XXX	880nm	XXX mm length, Z m fiber optic cable with 600µm core	265	1900	509	3452
ML-AAPX/088-LO-LZ-LP2-XXX	880nm	XXX mm length, Z m fiber optic cable with 1000µm core	250	1600	482	2912
ML-AAPX/090-LO-SZ-LP2-XXX	900nm	XXX mm length, Z m fiber optic cable with 200µm core	290	2600	554	4712
ML-AAPX/090-LO-SMZ-LP2-XXX	900nm	XXX mm length, Z m fiber optic cable with 600µm core	255	1900	491	3452
ML-AAPX/090-LO-LZ-LP2-XXX	900nm	XXX mm length, Z m fiber optic cable with 1000µm core	240	1600	464	2912
ML-GAPX/155-LO-SZ-LP2-XXX	1550nm	XXX mm length, Z m fiber optic cable with 200µm core	155	2600	311	4712
ML-GAPX/155-LO-MZ-LP2-XXX	1550nm	XXX mm length, Z m fiber optic cable with 600µm core	115	2400	239	4352
ML-GAPX/155-LO-LZ-LP2-XXX	1550nm	XXX mm length, Z m fiber optic cable with 1000µm core	100	1800	212	3272

Note: Lightpipes when used with fiber optics have a ~45° viewing angle.

### Ordering Information

- Specify length of lightpipe, XXX, in millimeters (mm) with order
- Specify length of fiber optic cable, Z, in meters (m) with order

### Available configuration options



Bent Lightpipe Tip



Custom Lightpipe and Sheath Diameters



Custom Fiber Optic Cable Assemblies



Purging Gas Vacuum Sleeves



## Fiber Optics to Lens Configuration

Configuration P/N	Spectral Response	Collection Optics Description	Spot Size Chart Column	Temperature Range			
				Celsius		Fahrenheit	
				Min (°C)	Max (°C)	Min (°F)	Max (°F)
ML-GAPX-LO-SZ-RPY-XXX	700-1650nm	XXX mm lens working distance, Z m fiber optic cable with 200µm core	A	115	2600	239	4712
ML-GAPX-LO-MZ-RPY-XXX	700-1650nm	XXX mm lens working distance, Z m fiber optic cable with 600µm core	B	80	1300	176	2372
ML-GAPX-LO-LZ-RPY-XXX	700-1650nm	XXX mm lens working distance, Z m fiber optic cable with 1000µm core	C	65	1100	149	2012
ML-AAPX/088-LO-SZ-RPY-XXX	880nm	XXX mm lens working distance, Z m fiber optic cable with 200µm core	D	345	2600	653	4712
ML-AAPX/088-LO-MZ-RPY-XXX	880nm	XXX mm lens working distance, Z m fiber optic cable with 600µm core	E	300	2500	572	4532
ML-AAPX/088-LO-LZ-RPY-XXX	880nm	XXX mm lens working distance, Z m fiber optic cable with 1000µm core	F	280	2150	536	3902
ML-AAPX/090-LO-SZ-RPY-XXX	900nm	XXX mm lens working distance, Z m fiber optic cable with 200µm core	D	335	2600	635	4712
ML-AAPX/090-LO-MZ-RPY-XXX	900nm	XXX mm lens working distance, Z m fiber optic cable with 600µm core	E	290	2500	554	4532
ML-AAPX/090-LO-LZ-RPY-XXX	900nm	XXX mm lens working distance, Z m fiber optic cable with 1000µm core	F	270	2150	518	3902
ML-GAPX/155-LO-SZ-RPY-XXX	1550nm	XXX mm lens working distance, Z m fiber optic cable with 200µm core	G	160	2600	320	4712
ML-GAPX/155-LO-MZ-RPY-XXX	1550nm	XXX mm lens working distance, Z m fiber optic cable with 600µm core	H	145	2600	293	4712
ML-GAPX/155-LO-LZ-RPY-XXX	1550nm	XXX mm lens working distance, Z m fiber optic cable with 1000µm core	I	125	2600	257	4712

Table 3. Temperature ranges for Photrix configurations with fiber optics to lens collection optics.

Working Distance		Spot Size																	
		A		B		C		D		E		F		G		H		I	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
50	2.0	0.8	0.03	1.3	0.05	1.5	0.06	0.4	0.016	0.9	0.035	1.5	0.06	0.4	0.016	0.9	0.035	1.5	0.06
75	3.0	1.0	0.04	1.5	0.06	2.0	0.08	0.5	0.020	1.2	0.047	2.0	0.08	0.5	0.020	1.2	0.047	2.0	0.08
100	3.9	1.2	0.05	2.0	0.08	2.5	0.10	0.6	0.024	1.5	0.06	2.5	0.10	0.6	0.024	1.5	0.06	2.5	0.10
150	5.9	1.5	0.06	2.8	0.11	4.0	0.16	0.8	0.031	2.0	0.08	3.5	0.14	0.8	0.031	2.0	0.08	3.5	0.14
200	7.9	1.8	0.07	3.3	0.13	5	0.20	1.0	0.039	2.7	0.11	4.5	0.18	1.0	0.039	2.7	0.11	4.5	0.18
250	9.8	2.0	0.08	4.0	0.16	6	0.24	1.2	0.047	3.3	0.13	5.5	0.22	1.2	0.047	3.3	0.13	5.5	0.22
300	11.8	2.5	0.10	5	0.20	7.5	0.30	1.4	0.055	4.0	0.16	7.0	0.28	1.4	0.055	4.0	0.16	7.0	0.28
500	19.7	4.0	0.16	8	0.32	12	0.47	2.2	0.087	6.5	0.26	11	0.43	2.2	0.087	6.5	0.26	11	0.43
750	29.5	5.5	0.22	12	0.47	17	0.67	3.2	0.126	9.5	0.37	16	0.63	3.2	0.126	9.5	0.37	16	0.63
1000	39.4	7.0	0.28	16	0.61	24	0.95	4.2	0.165	12.5	0.49	22	0.87	4.2	0.165	12.5	0.49	22	0.87
2000	78.7	14	0.55	30	1.18	47	1.85	8.3	0.327	25	0.98	44	1.73	8.3	0.327	25	0.98	44	1.73

Table 4. Spot sizes for Photrix configurations with fiber optics to lens collection optics.

### Ordering Information

- Specify length of lightpipe, XXX, in millimeters (mm)
- Specify length of fiber optic cable, Z, in meters (m)

### Available Options

- Custom spot sizes
- Custom field of views
- Fiber bundles
- Vacuum compatible fiber optic cables

## All system orders include to following standard components

In addition to pyrometer, collection optics and user's manual, all orders include the following standard components:



DIN-rail mount Communications Interface Module (CIM)



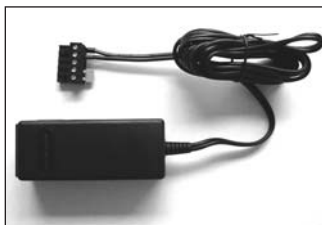
Electrical cable (4m) to connect from instrument to CIM



RS232 cable (3m) to connect from CIM to PC



Temperasure™ Graphical User Interface (GUI) software for PC



Universal Power Supply (AC input, 12VDC output). Included connector to plug into CIM



North American Line Cord

## Available options and system accessories



DIN-rail mount Analog Output Module, supports both 4-20mA and 0-10 V outputs

*NOTE: Analog output update speed limited to 100-Hz*



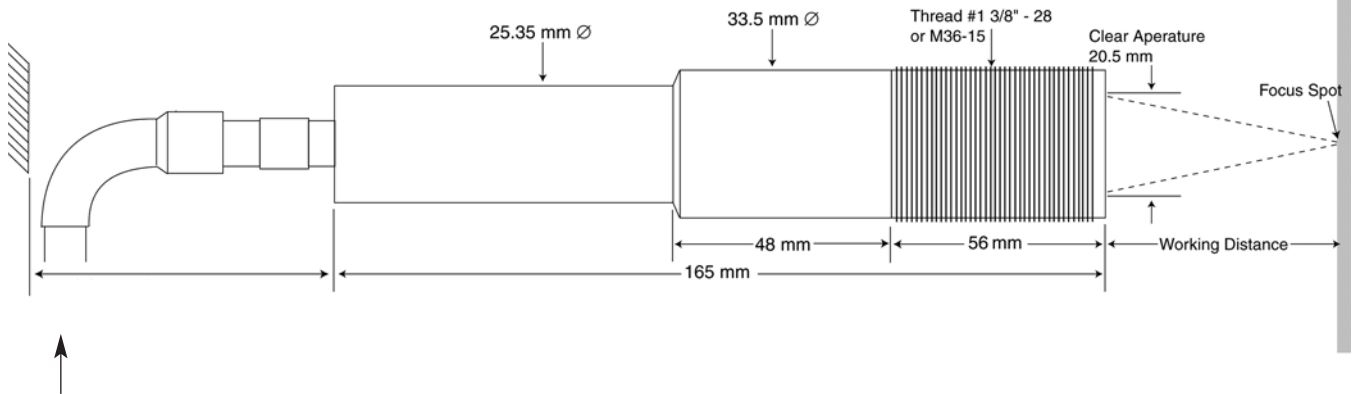
Right angle connector for cable from CIM to pyrometer instrument



Multi Channel interface module 8-channels

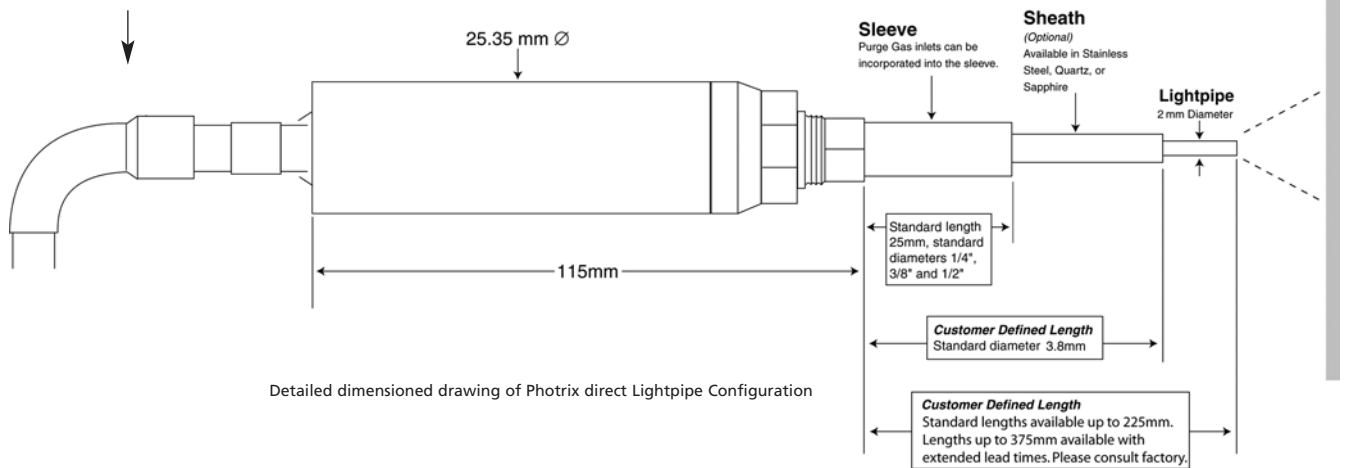


Custom Electrical Cable Lengths



Detailed dimensioned drawing of Photrix Integrated Lens Configuration

65 mm clearance required for straight connector (shown).  
32 mm clearance required for optional right-angle connector



Detailed dimensioned drawing of Photrix direct Lightpipe Configuration

## Lightpipe Ordering information

When ordering any Photrix system with a lightpipe as part of the collection optics, please fill out all the information below and email or fax this page with the purchase order.

### Customer Defined Dimensions

1. Circle your units of measurement:      mm                      inch

2. Lightpipe Length: \_\_\_\_\_

Select between 85mm (3-3/8") and 225mm (9") for standard leadtimes. Standard sleeve straight length is 25.4 mm ( 1" ) and standard diameter is 6.35 mm ( 1/4" ). If you would like dimensions other than standard, then please consult with your account manager or contact factory to discuss details.

3. Optional sheath (circle):                      yes                      no

a) If yes, sheath material (circle):                      sapphire                      quartz                      other: \_\_\_\_\_

b) If yes, Sheath Length: \_\_\_\_\_

Standard sheath diameter is 3.8mm (0.150"). Consult factory for non-standard sizes.

Customer Name (print): \_\_\_\_\_ Customer Signature: \_\_\_\_\_

Customer title: \_\_\_\_\_ Date: \_\_\_\_\_

## Photrix™ Series Temperature Ranges, Configuration Options, Spot Sizes and other ordering information



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