

# LAND



## SYSTEM 4

STANDARD AND FIBROPTIC THERMOMETERS



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# SYSTEM 4

## INFRARED APPLICATIONS

Non contact temperature measuring systems are designed for continuous quality and process monitoring and control in a wide range of industries including:- Iron & Steel, Glass, Plastics, Rubber, Minerals, Paper... and many more.

With measurement capabilities from 0 to 2600°C, infrared thermometers measure both the product being processed and the plant and machinery used in the production. Here are just a few of the processes where **SYSTEM 4** can solve your measurement problems:-

### **Metal Production**

*Smelting, refining, pouring, continuous casting, slabbing, reheating, rolling, drawing, coiling, extruding, coating, annealing, stamping, pressing, forging, sintering, galvanising, heat treatment...*

### **Glass Production**

*Melting, refining, firing, gob formation, furnaces, floating, moulding, toughening, laminating, fibre drawing, vapour deposition, preforming...*

### **Mineral Processing**

*Firing, mixing, drying, storing, conveying, laying...*

### **Paper**

*Rolling, drying, calendering, coating, printing, photographic, curing..*

### **Plastics & Rubber**

*Thick & thin film plastics, blown film, thermoforming, calendering, orientation, extruding, mixing, shrinking, laminating, moulding...*

### **Chemical**

*Catalyst beds, powder drying, mixing, furnaces, thermal reactors...*

### **Food & Pharmaceuticals**

*Freezing, moulding, extruding, sterilising, tablet drying, labelling, sealing...*

### **Electronics**

*Wave soldering, glass coating, circuit board testing, doping...*

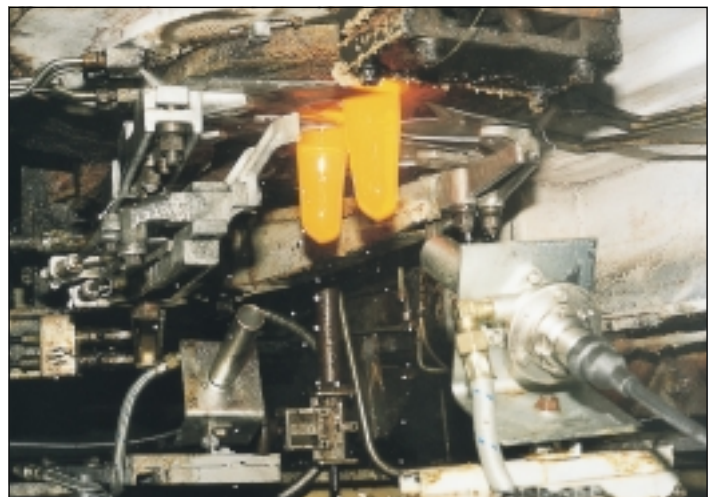
There is a choice of thermometer type to match your temperature requirements and process.

Single wavelength thermometers are intended for general purpose use as well as solving problems in specific applications.

Ratio thermometers are used in difficult environments containing steam, smoke, or dust, or where the target does not completely fill the field of view.

Fiberoptic thermometers are used to measure the temperature of materials where the target is difficult to access.

The use of fibre optics is most effective in high temperature, high magnetic fields etc. which would prevent location of other sensors.



## SYSTEM 4 THERMOMETERS

**SYSTEM 4** comprises an advanced range of high precision radiation thermometers, LANDMARK® processors and a range of mounting accessories which combine to form a complete temperature measurement system.

**SYSTEM 4** thermometers offer exceptional flexibility with a choice of single wavelength, ratio, fibroptic and fibroptic ratio models.

Thermometer type, temperature range, spectral response and optical characteristics are chosen to suit any application from 0 to 2600°C.

- Focusable optics - standard and short focus versions with through-the-lens sighting providing clear and guaranteed definition of target
- Optional close-up lenses - giving measurement of targets as small as 0.45mm
- Accurate, reliable, drift-free measurement
- Rugged design with a range of mounting options
- Flexible fibre optics light guide versions - with optional laser targeting system to define target spot
- High level linear output

### RADIATION THERMOMETERS

Proven, reliable electronics and a high quality optical system combine to give a thermometer which delivers accurate, dependable temperature measurement. A rugged die-cast aluminium body, with a high quality electrical connector, ensures reliable performance.

Standard bodied thermometers all feature through-the-lens sighting with a 6° field of view. Adjustable focus with a circular graticule gives precise alignment on to the smallest of targets. Two optical variants are available: Standard focus - adjustable between 500mm and infinity, and Short-focus - viewing from 350mm to 1m. Close-up lenses are also available which can measure targets as small as 0.45mm from as close as 90mm.

### FIBROPTIC THERMOMETERS

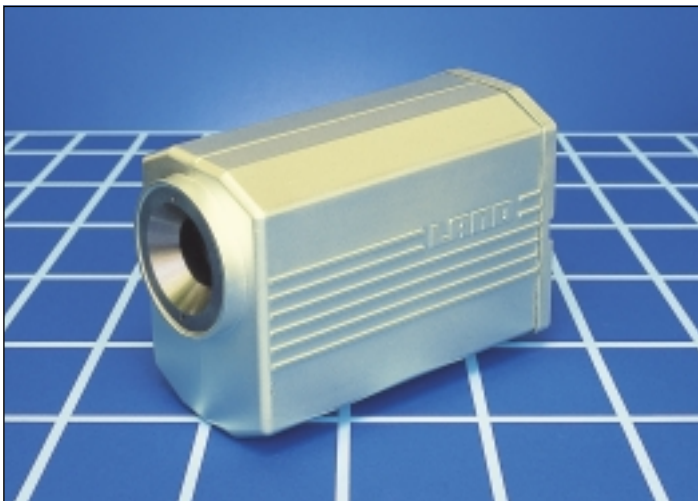
The use of flexible fibre optics light guides allows the detector and electronics enclosure to be located in a less hostile environment, and enables access to difficult targets.

The fibroptic thermometers are available with an optional integral laser targeting system which defines the target spot for accurate alignment.

The use of fibre optics permits viewing of normally inaccessible targets, where there are high magnetic fields or in high ambient temperatures up to 200°C without cooling of the optic head. There is a choice of three optic heads and three light guide lengths.



*Typical System*



*Standard Bodied Thermometer*

*Fibroptic Thermometer*



# SYSTEM 4

<i>Thermometer Description</i>	<b>Model N°</b>	<b>Wavelength (µm)</b>	<b>Range</b>	<b>Minimum Target Dia* (mm)</b>
<p><b>M1 Thermometers</b></p> <p>M1 thermometers are intended for general purpose use in high temperature applications. They utilize a silicon cell detector and operate at short wavelengths around 1.0µm where emissivity errors are minimized. They have a fast response time of 5ms.</p>	<p><b>M1 450/1000C</b></p> <p><b>M1 600/1600C</b></p> <p><b>M1 800/2600C</b></p>	<p>1.0</p> <p>1.0</p> <p>1.0</p>	<p>450 to 1000°C</p> <p>600 to 1600°C</p> <p>800 to 2600°C</p>	<p>3.0</p> <p>0.9</p> <p>0.45</p>
<p><b>M2 Thermometers</b></p> <p>M2 thermometers use the latest generation of germanium detectors and operate at a wavelength of 1.6µm. They extend the measurement range of short wavelength thermometers down to 300°C and have a fast response time of 5ms.</p>	<p><b>M2 300/1100C</b></p>	<p>1.6</p>	<p>300 to 1100°C</p>	<p>0.9</p>
<p><b>M4 Thermometers</b></p> <p>M4 short wavelength thermometers are used on low temperature, low or uncertain emissivity surfaces such as bright or unoxidized metals. They use lead sulphide detectors in a unique null balance mode to guarantee stability. They have a response time of 100ms.</p>	<p><b>M4 50/250C</b></p> <p><b>M4 150/550C</b></p>	<p>2.4</p> <p>2.4</p>	<p>50 to 250°C</p> <p>150 to 550°C</p>	<p>3.2</p> <p>1.0</p>
<p><b>M5 Thermometers</b></p> <p>M5 thermometers are specifically designed for glass surface temperature measurement. Fast speed of response, coupled with small target size and accurate sighting facility make it ideal for all flat glass, glass toughening and optical fibre preform applications.</p>	<p><b>M5 400/1300C</b></p> <p><b>M5 1000/2500C</b></p>	<p>4.8 to 5.2</p> <p>4.8 to 5.2</p>	<p>400 to 1300°C</p> <p>1000 to 2500°C</p>	<p>1.0</p> <p>1.0</p>
<p><b>M6 Thermometers</b></p> <p>M6 thermometers are designed specifically for lower temperature applications. Unique short wavelength operation minimizes errors due to low or variable emissivity.</p>	<p><b>M6 0/300C</b></p> <p><b>M6 100/700C</b></p>	<p>3.0 to 5.0</p> <p>3.0 to 5.0</p>	<p>0 to 300°C</p> <p>100 to 700°C</p>	<p>3.2</p> <p>1.0</p>
<p><b>M7 Thermometers</b></p> <p>M7 thermometers operate at waveband selected especially for measurement on plastic films as thin as a few microns.</p>	<p><b>M7 25/375C</b></p>	<p>3.43</p>	<p>25 to 375°C</p>	<p>3.2</p>
<p><b>M8 Thermometers</b></p> <p>M8 thermometers measure from 0 to 1000°C and are ideal for applications such as food, textiles, paper and plastics. They operate at a waveband which avoids the effects of atmospheric absorption.</p>	<p><b>M8 0/1000C</b></p>	<p>8 to 14</p>	<p>0 to 1000°C</p>	<p>5.0</p>
<p><b>R1 Ratio Thermometers</b></p> <p>R1 ratio thermometers use dual silicon cell detectors operating at 0.85 to 1.1µm. They are intended for difficult, high temperature applications where the field of view is not fully filled or where the sight path is obscured. They can accurately measure temperature of targets with up to 95% obscuration.</p>	<p><b>R1 600/1600C</b></p> <p><b>R1 1000/2600C</b></p>	<p>0.85 to 1.1</p> <p>0.85 to 1.1</p>	<p>600 to 1600°C</p> <p>1000 to 2600°C</p>	<p>1.8</p> <p>0.45</p>
* When fitted with Close-up lens				
<p><b>Fiberoptic M1 Thermometers</b></p> <p>Fiberoptic M1 thermometers combine the flexibility of fibre optics with short wavelength operation. They can be used in high temperature applications such as metals, glass, coke ovens and induction heating.</p>	<p><b>M1 600/1600CYL</b></p> <p><b>M1 800/2600CYL</b></p>	<p>1.0</p> <p>1.0</p>	<p>600 to 1600°C</p> <p>800 to 2600°C</p>	<p>4.0</p> <p>1.3</p>
<p><b>Fiberoptic M2 Thermometers</b></p> <p>Fiberoptic M2 thermometers can be used in applications such as glass mould temperatures where access to the target is restricted, or limited to a few milliseconds.</p>	<p><b>M2 300/1100CYL</b></p>	<p>1.6</p>	<p>300 to 1100°C</p>	<p>4.0</p>
<p><b>Fiberoptic M3 Thermometers</b></p> <p>Fiberoptic M3 thermometers are designed for low temperature applications, with low or uncertain emissivity, such as secondary metals.</p>	<p><b>M3 50/250CQ</b></p>	<p>2.1</p>	<p>50 to 250°C</p>	<p>5.0</p>
<p><b>Fiberoptic R1 Ratio Thermometers</b></p> <p>Fiberoptic R1 ratio thermometers provide accurate high temperature measurement of small intermittent targets, such as rod and wire, and tube welding. Other applications include kilns and vacuum furnaces.</p>	<p><b>R1 600/1600CYL</b></p> <p><b>R1 1000/2600CYL</b></p>	<p>0.85 to 1.1</p> <p>0.85 to 1.1</p>	<p>600 to 1600°C</p> <p>1000 to 2600°C</p>	<p>4.0</p> <p>1.3</p>
Y denotes Laser Targeting Version				

# THERMOMETER SPECIFICATIONS

	Model	Range	Wavelength	Field of View	Ambient Temperature	Response Time <sup>(1)</sup>	Interchangeability	Repeatability	Accuracy <sup>(2)</sup>	Stability
STANDARD THERMOMETERS	M1 450/1000C	450 to 1000°C	1µm	30:1	0 to 70°C	5ms	<1K	1K	0.4%K	<0.2K/K
	M1 600/1600C	600 to 1600°C	1µm	100:1	0 to 70°C	5ms	<1K	<1K	0.4%K	<0.2K/K
	M1 800/2600C	800 to 2600°C	1µm	200:1	0 to 70°C	5ms	<1K	2K	0.7%K	<0.3K/K
	M2 300/1100C	300 to 1100°C	1.6µm	100:1	0 to 50°C	5ms	<1K	<1K	0.25% + 1K	<0.2K/K
	M4 50/250C <sup>(3)</sup>	50 to 250°C	2.4µm	30:1	5 to 45°C	100ms	<1K	1K	3K	<0.1K/K
	M4 150/550C	150 to 550°C	2.4µm	100:1	5 to 45°C	100ms	<1K	1K	4K	<0.1K/K
	M5 400/1300C	400 to 1300°C	4.8 to 5.2µm	100:1	0 to 70°C	100ms	<2K	<1K	0.6%K <sup>(4)</sup>	<0.02%K/K
	M5 1000/2500C	1000 to 2500°C	4.8 to 5.2µm	100:1	0 to 70°C	100ms	<2.5K	1K	0.5%K	<0.02%K/K
	M6 0/300C	0 to 300°C	3 to 5µm	30:1	5 to 45°C	100ms	<1K	<1K	0.3% + 2.5K	<0.15K/K
	M6 100/700C	100 to 700°C	3 to 5µm	100:1	5 to 45°C	100ms	<1K	1K	0.3% + 2K	<0.2K/K
	M7 25/375C <sup>(3)</sup>	25 to 375°C	3.43µm	30:1	5 to 45°C	100ms	<1K	1.5K	3K	<0.1K/K
	M8 0/1000C	0 to 1000°C	8 to 14µm	100:1	0 to 70°C	100ms	2K	<1K	1%K + 1K	<0.3K/K
	R1 600/1600C	600 to 1600°C	0.85 to 1.1µm	50:1	0 to 50°C	15ms	0.25%K	1K	0.65% K	<0.05%K/K
R1 1000/2600C	1000 to 2600°C	0.85 to 1.1µm	200:1	0 to 50°C	15ms	0.45%K	2K	1.1% K	<0.1%K/K	
FIBROPTIC THERMOMETERS	M1 600/1600CYL	600 to 1600°C	1µm	25:1	0 to 70°C	5ms	<1K	<1K	0.4%K	<0.2K/K
	M1 800/2600CYL	800 to 2600°C	1µm	75:1	0 to 70°C	5ms	<1K	2K	0.7%K	<0.3K/K
	M2 300/1100CYL	300 to 1100°C	1.6µm	25:1	0 to 50°C	5ms	<1K	<1K	0.25% + 1K	<0.2K/K
	M3 50/250CQ <sup>(3)</sup>	50 to 250°C	2.1µm	20:1	0 to 50°C	<100ms	1K	1K	3K	<0.1K/K
	R1 600/1600CYL	600 to 1600°C	0.85 to 1.1µm	25:1	0 to 50°C	15ms	0.25%K	1K	0.65% K	<0.05%K/K
	R1 1000/2600CYL	1000 to 2600°C	0.85 to 1.1µm	75:1	0 to 50°C	15ms	0.45%K	2K	1.1% K	<0.1%K/K

<sup>(1)</sup> Time quoted to 95% of step change    <sup>(2)</sup> Accuracy quoted to ITS90    <sup>(3)</sup> Above 75°C    <sup>(4)</sup> Optimised for glass toughening = 3K at 630°C    Y Denotes laser targeting system available

## STANDARD OPTICAL SPECIFICATIONS

Focus range	0.5m to infinity (V version) 0.35 to 1.0m (S version)
Sighting	6° graticule-defined field of view 1.8x magnification 30mm eye relief (with or without spectacles/ safety glasses) 98% of energy detected is <i>guaranteed</i> to be within area defined by graticule

## ENVIRONMENTAL SPECIFICATIONS

Vibration	3g - 60 to 300Hz, 0.5mm - 10 to 60Hz
Humidity	0 to 99% non condensing
CE	EN 50-082-2 (immunity) EN 50-081-1 (emission)
Sealing	To IP54 requirements
Fiberoptic: Optic Head	200°C Maximum ambient temperature
Lightguide	200°C Maximum ambient temperature

## FIBROPTIC OPTICAL SPECIFICATIONS

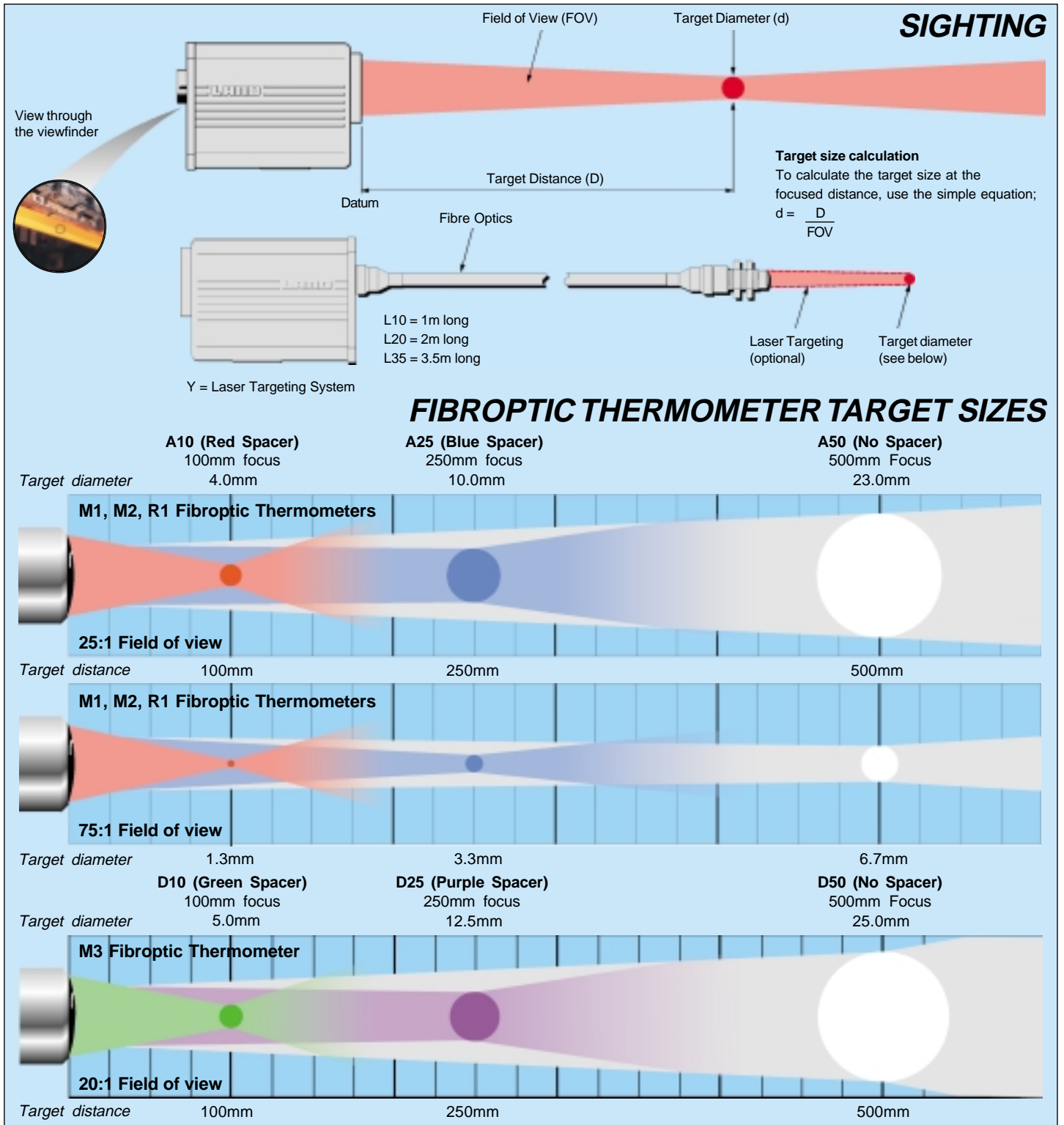
Focus range	Determined by Spacer fitted
None (A50 or D50)	500mm
Blue (A25), Purple (D25)	250mm
Red (A10), Green (D10)	100mm
Lightguide length	1.0m, 2.0m and 3.5m

## OPTIONAL EXTRAS

Standard Body	Close-up lenses
Fiberoptic	Laser targeting

Note: 'D' focal variants relate to M3 only

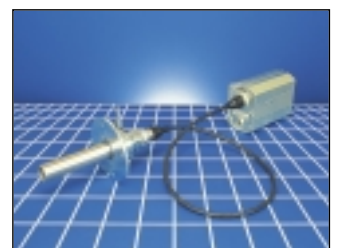
# SYSTEM 4



## THERMOMETER MOUNTINGS AND ACCESSORIES

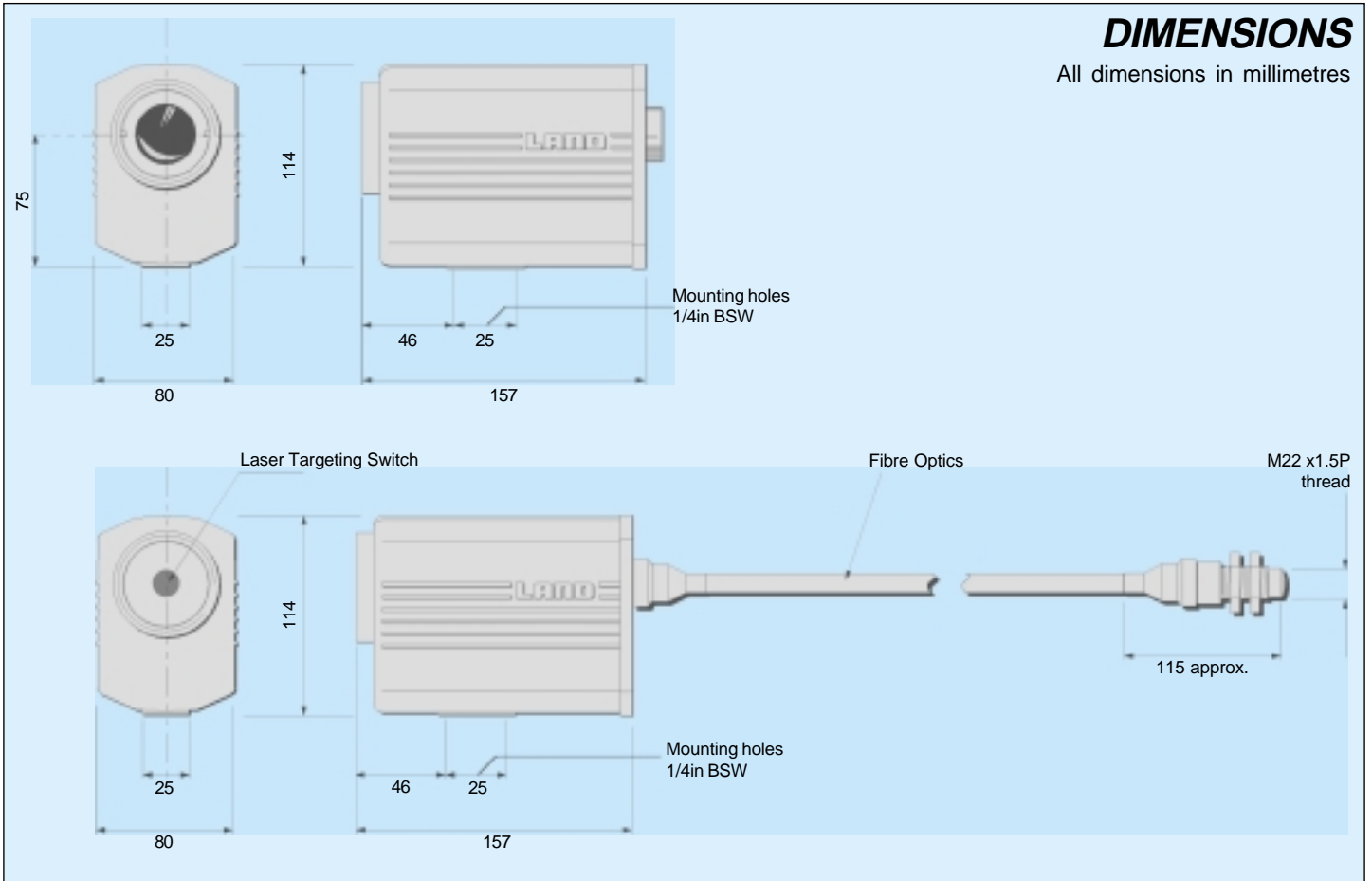
A complete range of thermometer protection and mounting accessories is available, which provides full mechanical and thermal protection for the thermometer and electrical connections, and ensures uninterrupted service with minimal maintenance, in even the most severe operating conditions.

For more information, refer to the Mountings and Accessories Brochure - ref S4M100



## DIMENSIONS

All dimensions in millimetres



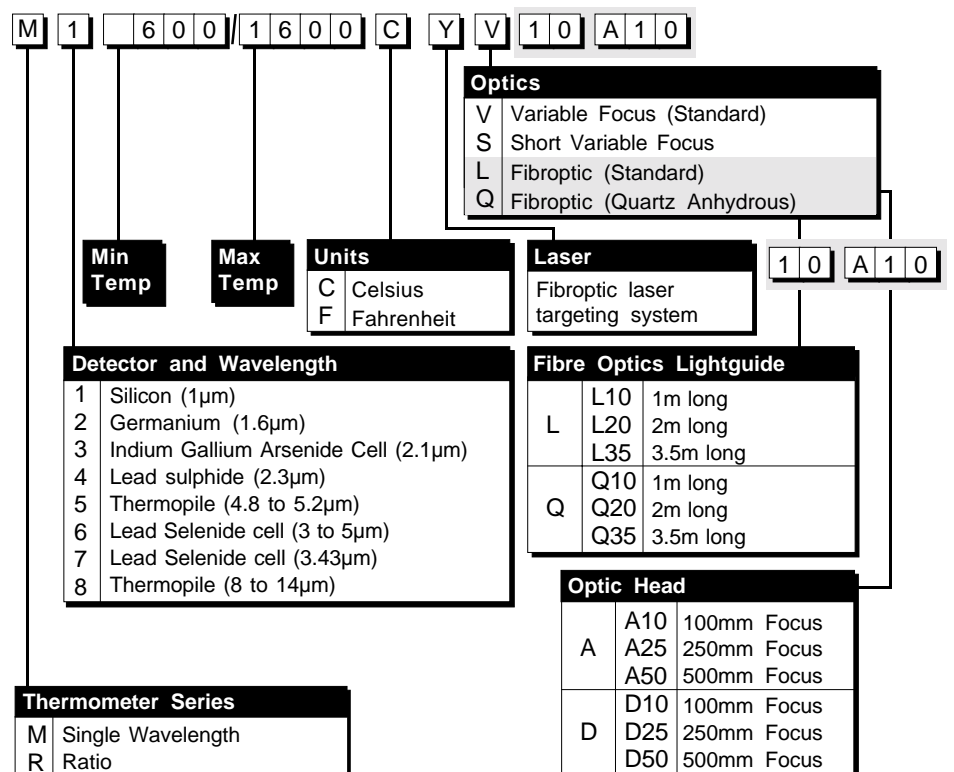
## ORDERING INFORMATION

**SYSTEM 4** thermometers have a unique part number to suit the particular combination of features which make up the model.

The model number, consisting of the various options available, describes the exact **SYSTEM 4** thermometer type required.

This model number can be used for selection and ordering purposes.

For example: M1 600/1600 C - V describes a single wavelength thermometer, operating at 1.0µm, with a measurement span of 600 to 1600°, celsius version, with standard variable focus optics.



For more than fifty years LAND have supplied temperature measuring and process imaging systems to many different industries all over the world. Now the world leader in non contact thermometry, our expert advice and support is never far away.



## WORLD LEADERS

LAND is the world leader in the manufacture of non contact temperature measurement systems, thermal imagers and linescanners.

## WORLDWIDE SUPPORT

In addition to the companies established in Europe, USA, Mexico and Japan, LAND is represented by distributors in most of the major industrial countries throughout the world.

Our customers benefit, on a global basis, from practical and expert advice from fully trained technicians who are aware of specific requirements for their country and industry.

## APPLICATIONS

LAND have solved many different temperature measurement problems in a wide variety of industries from food to atomic energy, some of which are list below:

- Iron & Steel
- Petrochemical
- Heat Treatment
- Minerals
- Glass
- Maintenance
- Power & Utilities
- Aerospace
- Electronics
- Pharmaceuticals
- Plastics
- Paper
- Rubber
- Textiles
- Non-ferrous Metals

For further information or free advice on specific temperature measurement problems within these or any other industry, contact your nearest Land office.

## PRODUCT ASSURANCE

When you specify LAND products you are assured of receiving a completely pretested, calibrated working product. Each instrument is carefully checked to ensure complete compliance with specification and is fully guaranteed. LAND was the first manufacturer of infrared instruments to successfully obtain ISO 9001 Quality Management System Approval for both design and manufacture of non contact infrared temperature measuring equipment.

 These products comply with current European directives relating to electromagnetic compatibility and safety (EMC directive 89/336/EEC; Low voltage directive 73/23/EEC).

The Quality Management System of Land Instruments International Ltd. Is approved to BS EN ISO9001:2000 for the design and manufacture, stockholding, in-house repair and site servicing of non contact temperature measuring instrumentation. Associated software designed and developed in accordance with TickIT. Calibration certificates are available from our UKAS accredited Calibration Laboratory No. 0034. The Land calibration laboratory complies with the requirements of the international standard BS EN ISO/IEC 17025.



# LAND

instruments international

Infrared Temperature Measurement

Land Instruments International • Dronfield S18 1DJ • England • Tel: (01246) 417691 • Fax: (01246) 410585  
Email: [infrared.sales@landinst.com](mailto:infrared.sales@landinst.com) • Internet: [www.landinst.com](http://www.landinst.com)

Land Instruments International • 10 Friends Lane • Newtown, PA 18940-1804 • U.S.A. • Tel: (215) 504-8000  
Fax: (215) 504-0879 • Email: [irsales@landinstruments.net](mailto:irsales@landinstruments.net) • Internet: [www.landinstruments.net](http://www.landinstruments.net)

**France**  
Land Instruments Sarl  
Tel: (1) 34 62 05 45 • Fax: (1) 30 56 51 12  
Email: [commercial@landinst.fr](mailto:commercial@landinst.fr)

**Japan**  
Land KK  
Tel: 06 6330 5153 • Fax: 06 6330 5338  
Email: [ikeland@silver.ocn.ne.jp](mailto:ikeland@silver.ocn.ne.jp)

**Germany**  
Land Instruments GmbH  
Tel: 02171/7673-0 • Fax: 02171/7673-9  
Email: [infrarot@landinst.de](mailto:infrarot@landinst.de)

**Spain**  
Land Instruments International  
Tel: 91 630 0791 • Fax: 91 630 2918  
Email: [land-infrared@landinst.es](mailto:land-infrared@landinst.es)

**Italy**  
Land Instruments Srl  
Tel: 02/99040423 • Fax: 02/99040418  
Email: [infrared@landinst.it](mailto:infrared@landinst.it)

**Mexico**  
Land Instruments International  
Tel: 52 55 9171 1466 • Fax: 52 55 9171 1477  
Email: [ventas@landinstruments.net](mailto:ventas@landinstruments.net)