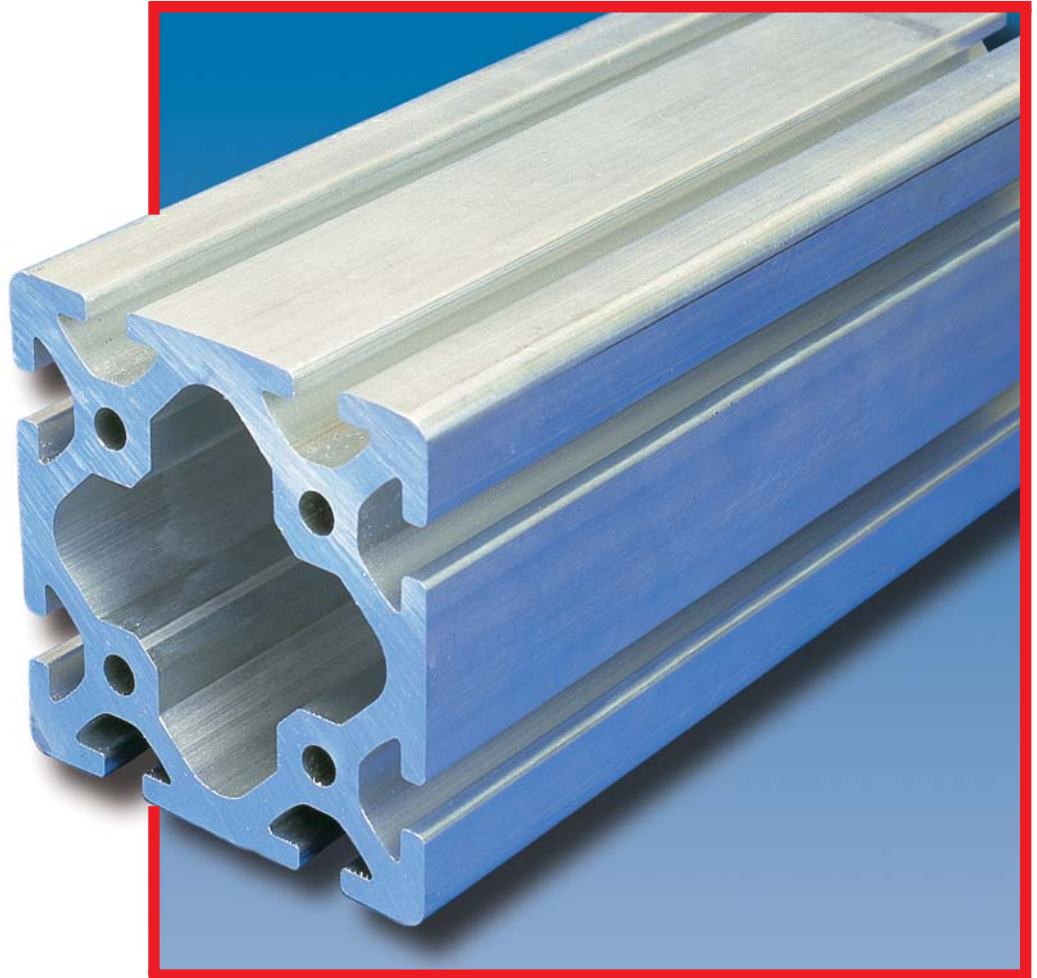


# LAND



## Infrared Temperature Measurement Systems

Designed for the  
Aluminium Extrusion Industry

An **AMETEK**® Company

OneTemp Pty Ltd  
Adelaide | Melbourne | Sydney | Brisbane

[www.onetemp.com.au](http://www.onetemp.com.au)

Ph: 1300 768 887

# LAND

*Land Instruments International is the world's No.1 supplier of infrared temperature measurement solutions for the aluminium extrusion industry*

Product quality and operating profit increasingly rely on efficient press operation in the aluminium extrusion industry. Press efficiency is increased greatly with accurate, reliable temperature measurement at critical points in the process:

- The preheated die, prior to installation in the press
- The billet as it enters the press
- The extrusion exiting the die
- The extrusion at the quench exit

Land Instruments International is now able to offer a completely new integrated range of thermometer systems specifically for aluminium extrusion temperature measurement.

These instruments are based on time proven and established systems in the aluminium industry with more than 300 installations world-wide.

They are high precision and provide measurement stability and reliability.

*The world's leading aluminium extruders choose Land - with over 300 aluminium extrusion thermometer systems installed around the world*

**NEW** **AET** Aluminium Extrusion and **AQT** Aluminium Quench Thermometers - complete with integral Laser Sighting as standard

**NEW** **ADT** Die Preheat Thermometer

**NEW** Electronic Actuator System for remote alignment of **AET** and **AQT** Thermometers

**NEW** Fully integrated multi-channel LMG AE signal processor incorporating billet profile snapshot and on-line quench rate calculation

#### Features

- Fully integrated temperature measurement of die, billet 'taper', extruded sections and quench rate
- Accuracy unaffected by alloy type or surface finish
- Stable, robust performance
- Accommodates all alloy types
- Provides indication of deteriorating surface finish (emissivity)

#### Benefits

- Reduced die wear
- Improved press efficiency
- Increased throughput
- Improved product quality and metallurgical consistency
- Improved traceability and quality records



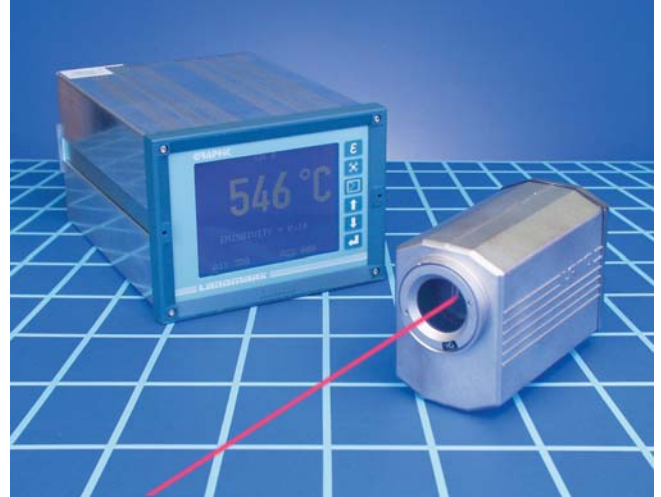
*Typical air quenching system on an aluminium extrusion line*

# Ideal Solutions through Flexible System Configurations



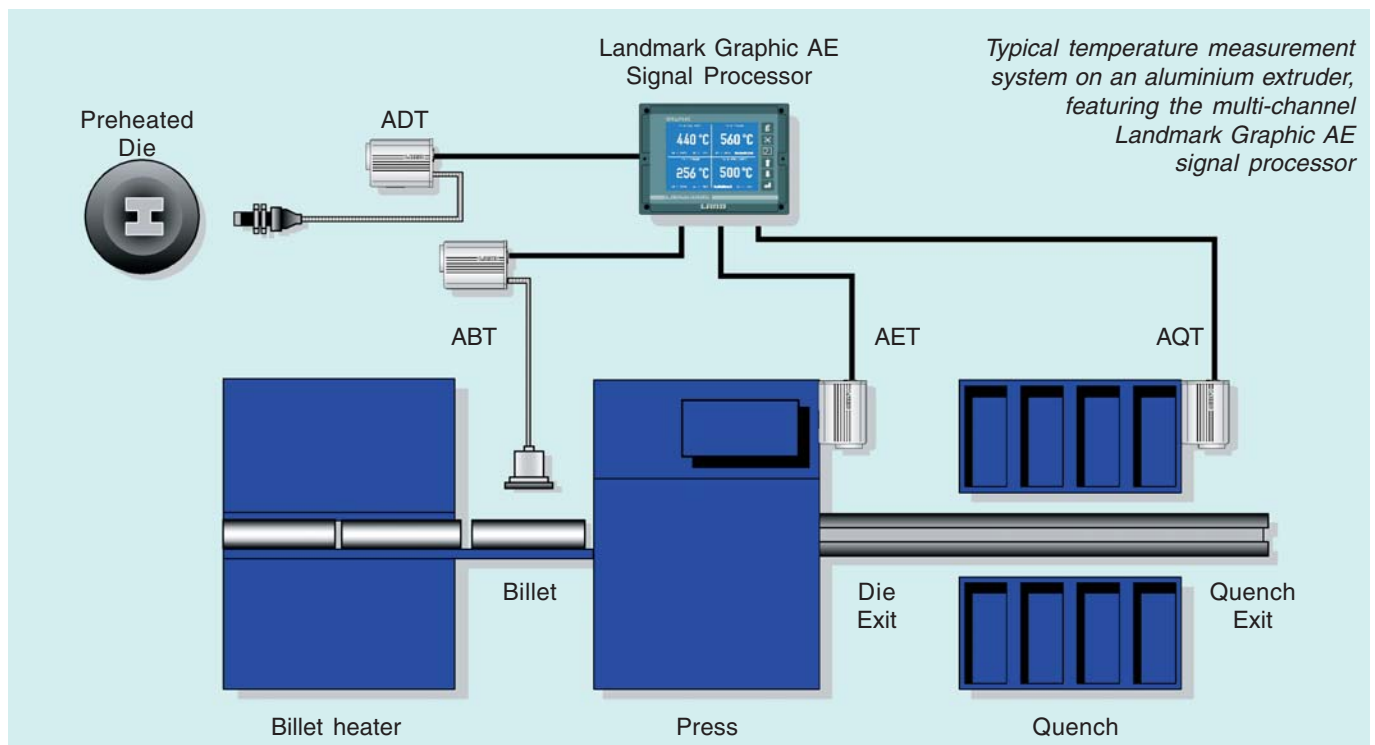
The **Aluminium Billet Thermometer (ABT)** provides continuous and highly accurate temperature measurement of the billet as it passes from the heater to the press.

The **Aluminium Die Thermometer (ADT)** assures the temperature of the preheated die before it is installed into the extrusion press.



The **Aluminium Extrusion Thermometer (AET)** provides responsive, continuous measurements of the extruded section at the die exit.

The **Aluminium Quench Thermometer (AQT)** uses the same technology as AET and has been designed specifically to provide accurate temperature measurement at the quench exit.



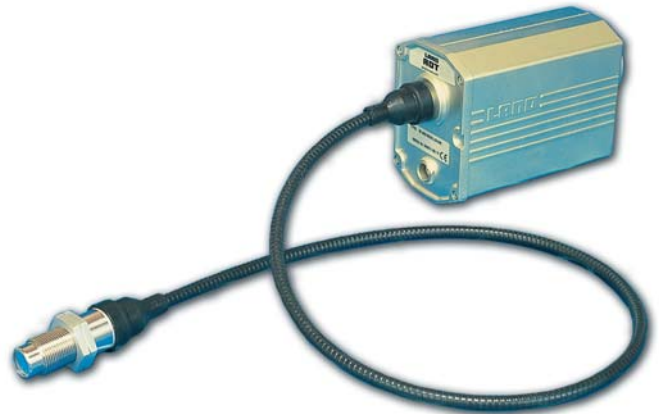


# Die Preheat Temperature

The **Aluminium Die Thermometer (ADT)** is designed specifically to provide temperature measurement of the die prior to being loaded into the press.

## Why Measure Temperature?

- Dies are preheated because hot, extruding aluminium coming into contact with a cold die would solidify immediately causing the process to stop
- Many dies will be placed in a Die Oven to be preheated before being loaded into the press
- Occasionally, a die will be inadvertently removed for loading before it has fully preheated to the specified temperature, typically  $\sim 450^{\circ}\text{C}$
- An under-temperature die must be detected before it is loaded into the press and causes a significant process stoppage with resulting loss in process efficiency and profitability



# Billet Profile Temperature

The **Aluminium Billet Thermometer (ABT)** represents a major advance in the measurement of billet temperature. The thermometer is designed specifically to provide fast and accurate measurement of temperature on the cylindrical surface of billets - either a spot measurement or a complete lengthwise profile.

## Why Measure Temperature?

Accurate data on process variables, particularly billet and die exit temperatures, enables modern process optimisation and press control systems to achieve near isothermal extrusion operation.

During Aluminium extrusion, optimum billet temperature and taper characteristics lead to reduced die wear and improved press efficiency. To obtain the ideal billet heater settings, a fast and reliable measurement of billet temperature prior to loading into the press is essential.

The measurement system must also be able to cope with changes of alloy type and surface finish.

- Fast, accurate measurement of billet temperature including profile or 'taper'
- Reduced die wear and improved press efficiency
- Accuracy unaffected by change of alloy type or surface finish
- Continuous measurement without interruption to the process
- Simple installation with minimal maintenance
- Also available in stand alone format as ABT/U where functionality of the LMG AE processor is not required. Patent No. 1103801



Centre left: High efficiency purge to keep the window clean

## Extrusion temperatures

- Fast, accurate measurement of section temperature
- Accuracy unaffected by change of section shape
- Continuous measurement without process interruption
- Simple installation with minimal maintenance
- AET and AQT have an alignment laser built-in as standard, making realignment following a die change simple
- AET and AQT uses the proven unique-to-Land internal auto-calibration technique which give exceptional long term measurement stability.

## Extrusion press exit

The **Aluminium Extrusion Thermometer (AET)** is designed specifically to measure the temperature of aluminium extruded sections at the die exit. Once processed, the thermometer signals provide an accurate measurement of temperature and also an indication of surface finish. It is simple to install and configure in its basic mode of operation - which handles the majority of extrusion applications. It also has the flexibility to cope with even the most difficult of applications 'straight from the box'.

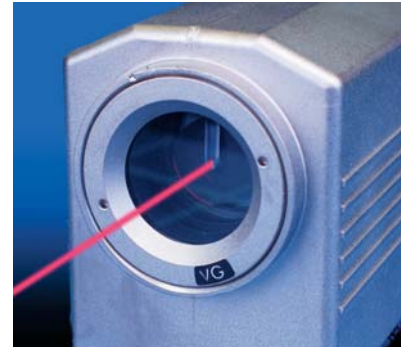
The AET can be mounted on the press face, slightly away from the extrusion press exit. The product does not need to fill the target area to make an accurate measurement. This makes for easy installation and avoids continual repositioning for different sections. The built-in alignment laser makes realignment following die change a simple procedure.



## Accurate alignment

The Electronic Alignment Actuator is a remotely controlled, motorised alignment unit which can be used at both the die exit (AET) and quench exit (AQT) of the extrusion press. It is used in conjunction with either the signal strength indication on the Landmark Graphic AE processor, or the built-in thermometer alignment laser, to control the position of the thermometer target spot.

This allows rapid and precise alignment following die changes, repositioning the thermometer on multicavity strands or to maximise the signal strength on narrow sections.



## Temperatures at the quench

The **Aluminium Quench Thermometer (AQT)** has been developed specifically to allow stable and accurate temperature measurement on extruded sections exiting a water or high-velocity air quench. Used in conjunction with the die exit measurement, it verifies the cooling rates required to achieve correct mechanical properties on temperature-critical alloys.

The system displays surface effective emissivity as well as temperature. The emissivity value provides a good indication of surface quality, therefore enabling the press operator to detect die wear, leading to a deteriorating finish, at an early stage. The system automatically compensates for all 6000 series and most other common extrusion alloys and product shapes over wide limits.

AQT does not require elaborate set-up procedures. It can be fitted 'straight from the box' and will measure with precision, provided care is taken to exclude ambient light reflections.





# CONTINUOUSLY MONITOR AND CONTROL YOUR PROCESS

**ADT, ABT, AET and AQT constitute a full range of instruments dedicated to satisfying the range of temperature measurement needs within the various applications in the aluminium extrusion process.**

The core of the system is the processor - the Landmark Graphic AE. Its multi-channel capability provides a basis for the integration of all thermometer information and permits the construction of powerful, flexible and sophisticated processing systems.

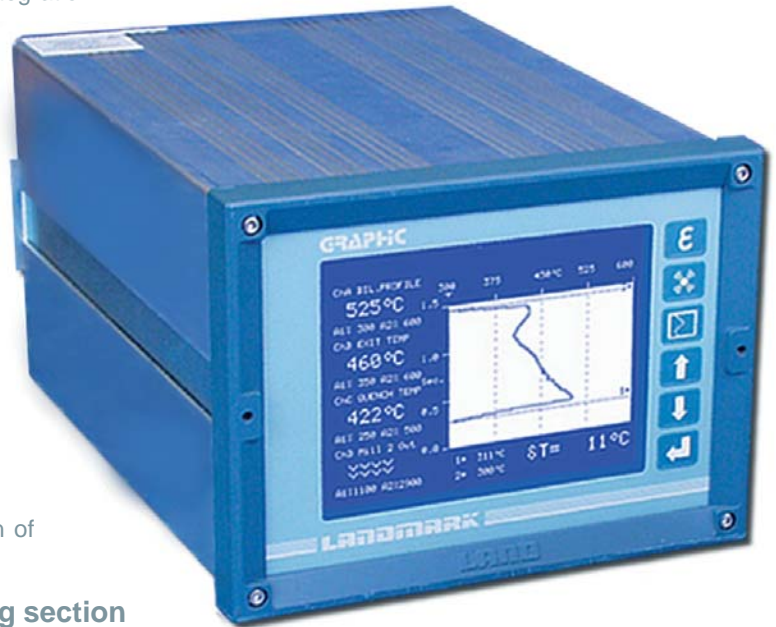
In example 1 (shown overleaf) the channels are allocated as follows:

Ch. A – ABT/S	(S4 I/O card fitted)
Ch. B – AET	(AET/AETS I/O card fitted)
Ch. C – AQT	(AQT/AQTS I/O card fitted)
Ch. D – Speed*	(S4 I/O card fitted)
System	(Maths card fitted)

\*Speed has been configured to be an on-line 4 to 20mA input from either an existing ram speed or section speed sensor.

Once an appropriate value for the distance (separation) of the AET and AQT thermometers has been entered, the LMG AE has all the information it requires to make an on-line, near real-time calculation of section 'Quench Rate' in °C/s or °F/s.

**By continuously monitoring and controlling section quench rate within specified limits, metallurgists can gain confidence that the correct grain structures have formed within the profiles, consistently providing the exacting mechanical properties demanded by their customers.**



## Temperature and emissivity

Both temperature and effective emissivity indication signals are available from the LMG AE processor which may be configured to interface simultaneously with ABT, AET, AQT, ADT and all System 4 thermometers.

## QUENCH RATE CALCULATION FUNCTION

**The cooling rate of the extruded section is of critical importance to manufacturers of high performance aluminium profiles, for example, in the automotive or aerospace industries.**

Profiles created for aerospace or automotive applications can have demanding mechanical and consistency specifications and manufacturers must be able to prove this to their customers. The mechanical properties of high-performance extruded sections are usually dependent upon the final metallurgical microstructure and so the cooling profile is critically important.

Manufacturers of high-performance extruded sections frequently have sophisticated quenching systems which permit a high degree of control over the quench rate. However, for consistent and repeatable control of cooling, such systems require the input of an accurate measurement of the quenching rate in real time.

The LMG AE Processor can provide this information with the levels of accuracy, consistency and repeatability required.

Using temperature measurements from the AET and AQT thermometers, in conjunction with an on-line input of ram or section speed, the LMG AE

can accurately calculate quenching rates and provide this information:

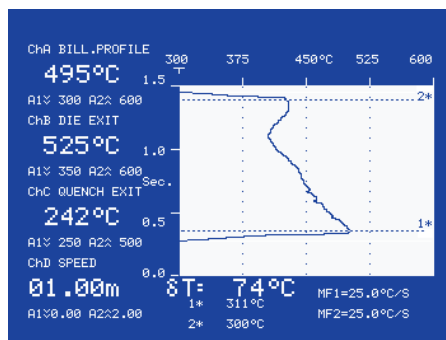
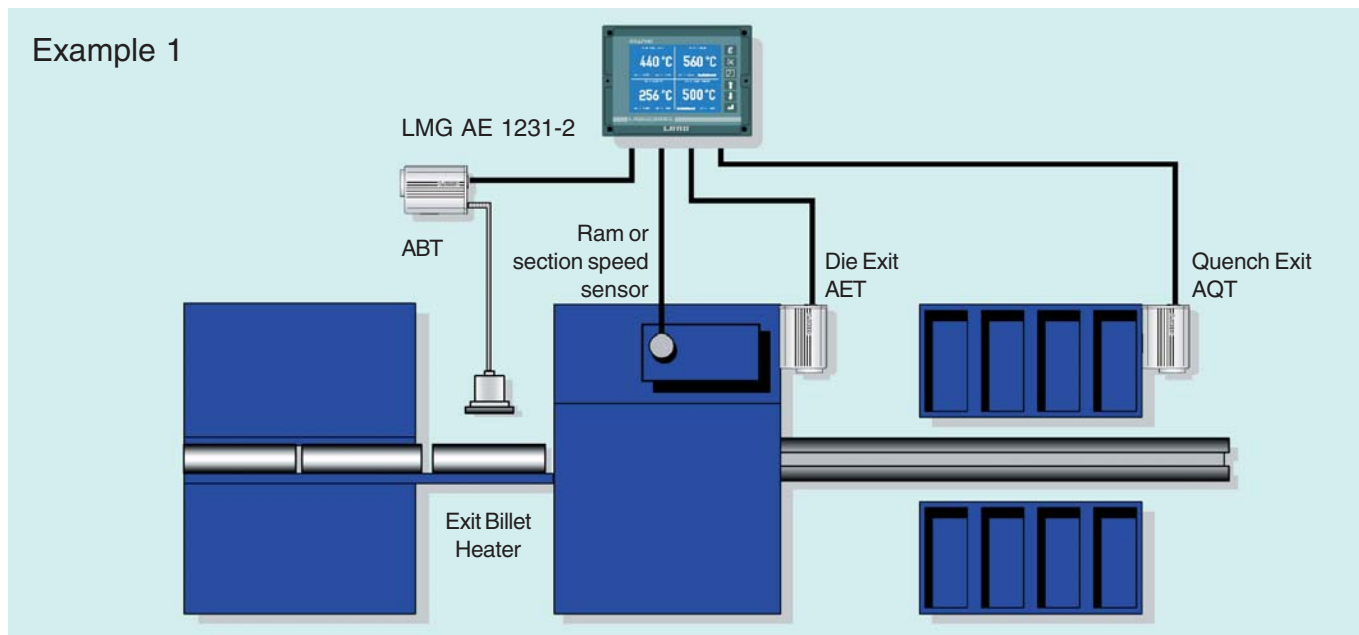
- to the operator in a variety of display formats
- to the press/quench control system via analog output with user-configurable quench rate alarms.

Sophisticated two-stage quenching systems can also be accommodated.

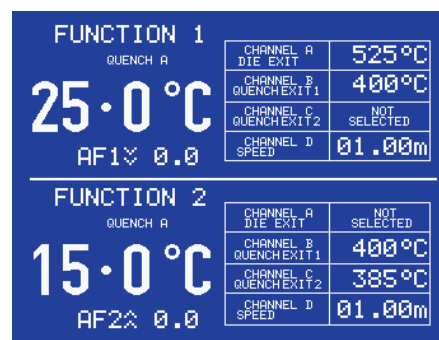
In example 2 (shown overleaf), the four-channel LMG AE processor accepts inputs from an AET, an AQT at both the first quench stage exit and at the second quench stage exit, and an input of ram or section speed.

The LMG AE can then process, display and output two quench rate calculations simultaneously, allowing both first and second stage quenches to be continuously and independently monitored and controlled.

## Example 1

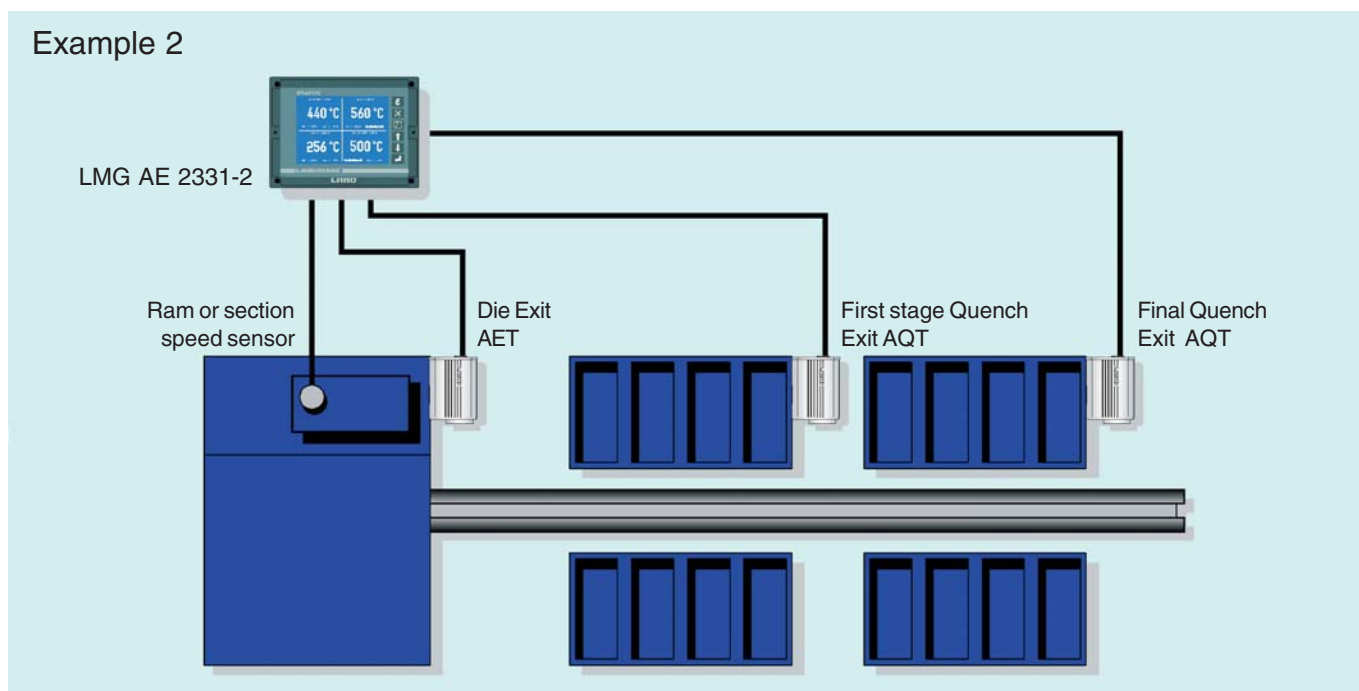


In example 1 (schematic diagram and screen above) the operator has decided to configure the screen to show a graphical display of billet taper from the ABT/S, AET and AQT, instantaneous temperature displays and instantaneous readouts of up to two quench rates as Maths Function 1 and Maths Function 2.



In example 2, schematic diagram below (screen above) section speed is 1m/s. AET=>AQT1 as Quench Rate Function in Maths Function 1 and AQT1=>AQT2 as Quench Rate Function in Maths Function 2 are selected. The resulting continuously updating display of Dual Quench Rate provides a very powerful tool for both process operators and metallurgists/process engineers.

## Example 2



## THERMOMETER SPECIFICATIONS

	ADT	ABT	AET	AQT
Temperature range				
Operating:			350 to 600°C/ 650 to 1100°F	200 to 500°C/ 400 to 900°F
Specified:	300 to 1100°C/ 600 to 2000°F	300 to 600°C/ 600 to 1100°F	400 to 600°C/ 750 to 1100°F	220 to 450°C*/ 430 to 850°F*
Wavelength:	1.6µm	-	-	-
Response time:	5ms 0 to 95%	5ms 0 to 95%	1s 0 to 98%	
Emissivity:	0.20 to 1.00	-	-	
Resolution:	1°C/2°F	1°C/2°F	<1°C/2°F**	
Field of view:	22:1	-	30:1	
Min. target diameter:	23mm/0.90in	-	-	20mm/0.79in
Focus distance:	500mm/19.5in	-	infinity	600mm/23.62in
Sighting:	-	-	Built-in laser	
Operating distance:	-	15 to 20mm from billet	-	
Laser alignment:	-	-	< ± 0.25° angle	
Absolute accuracy:	0.25%K + 1K****	0.5%K	2°C/4°F	
Accuracy in application				
Temperature:	<±5°C/±9°F****	<±5°C/±9°F	±5°C/±9°F***	±10°C/±18°F***
Calculated emissivity:	-	-	±0.02***	
Stability				
Temperature:	0.2° indicated/1° ambient	0.2° indicated/1° ambient	<0.2° indicated/1° ambient	
Time:	2°C/4°F per year	2°C/4°F per year		
Calculated emissivity:	-	-	2% of value/10°C ambient	
Sealing:	IP65			
Vibration:	3G any axis, 10 to 300Hz			
Ambient temperature				
Specified:	0 to 50°C/32 to 122°F	0 to 50°C/32 to 122°F	5 to 45°C/41 to 113°F	
Operating:	-10 to 60°C/14 to 140°F	-10 to 60°C/14 to 140°F	0 to 50°C/32 to 122°F	
Optic head/light guide:	200°C/392°F	165/200°C or 330/392°F	-	
CE:	EN 50-08-2 (immunity), EN 50-08-1 (emissions), IEC 1010 (electrical safety)			

\* Subject to emissivity <1.00 at temperatures above 375°C/700°F

\*\* Subject to appropriate averager at temperatures <250°C/480°F

\*\*\* Not applicable at very low signal levels as indicated by flashing display on the processor

\*\*\*\* On oxidised steel surfaces

## LMG AE SPECIFICATIONS

<b>Signal processor:</b>	LMG AE		
<b>Processor I/O card:</b>	System 4 I/O card	AET I/O card	AQT I/O card
<b>System specifications</b>			
<b>Temperature:</b>	0 to 20mA or 4 to 20mA		
<b>Emissivity:</b>	-	0 to 20mA = 0 to 1.00 value	
<b>I/O card update time:</b>	10ms	30ms	
<b>Recommended signal processing function:</b>	Time average	Snapshot	Time average
<b>Power requirement:</b>	110 to 120V a.c. or 220 to 240V a.c., 48 to 62Hz, 35VA (290VA max. with 4 thermometers)		

The Quality Management System of Land Instruments International Ltd. is approved to BS EN ISO 9001:2000 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.



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



# LAND

Infrared Temperature Measurement

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