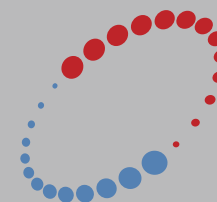




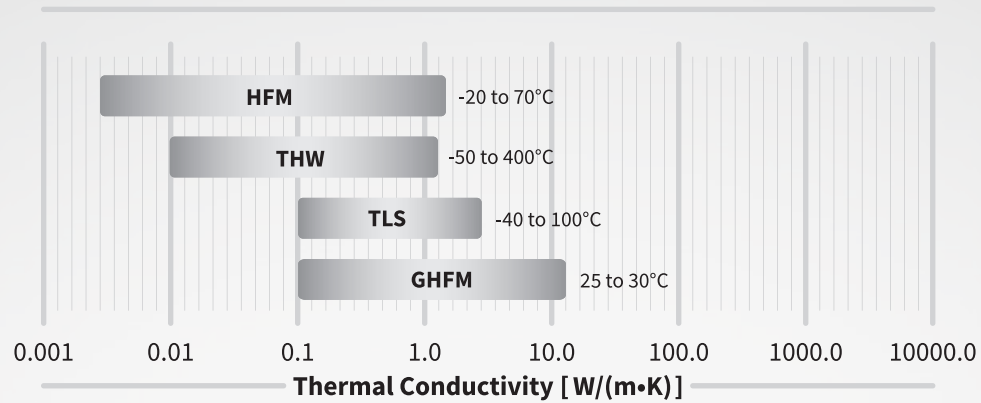
# THW-L1

Conforms to standard ASTM D7896-19

Thermal conductivity, thermal diffusivity, and specific heat instrument for measurement of liquids and pastes.



Thermtest  
INSTRUMENTS



**THERMAL CONDUCTIVITY:**

- HFM-100** (Heat Flow Meter)
- THW-L1** (Transient Hot Wire)

**THERMAL ANALYSIS:**

- DSC-L600** (Differential Scanning Calorimeter)
- TGA-1000** (Thermogravimetric Analyzer)
- TGA-1500** (Thermogravimetric Analyzer)



- TLS-100** (Transient Line Source)
- THW-L2** (Transient Hot Wire)
- TPS-EFF** (Transient Plane Source)
- GHFM-02** (Guarded Heat Flow Meter)

Thermtest has been advancing the measurement of thermal conductivity, thermal diffusivity, and specific heat for more than a decade. With more than 2000 satisfied customers worldwide, our unique combination of advanced thermal conductivity instrumentation for the laboratory, portable meters for the field, and accessories, enables us to provide ideal solutions to fit any material testing application and budget.



LIQUIDS



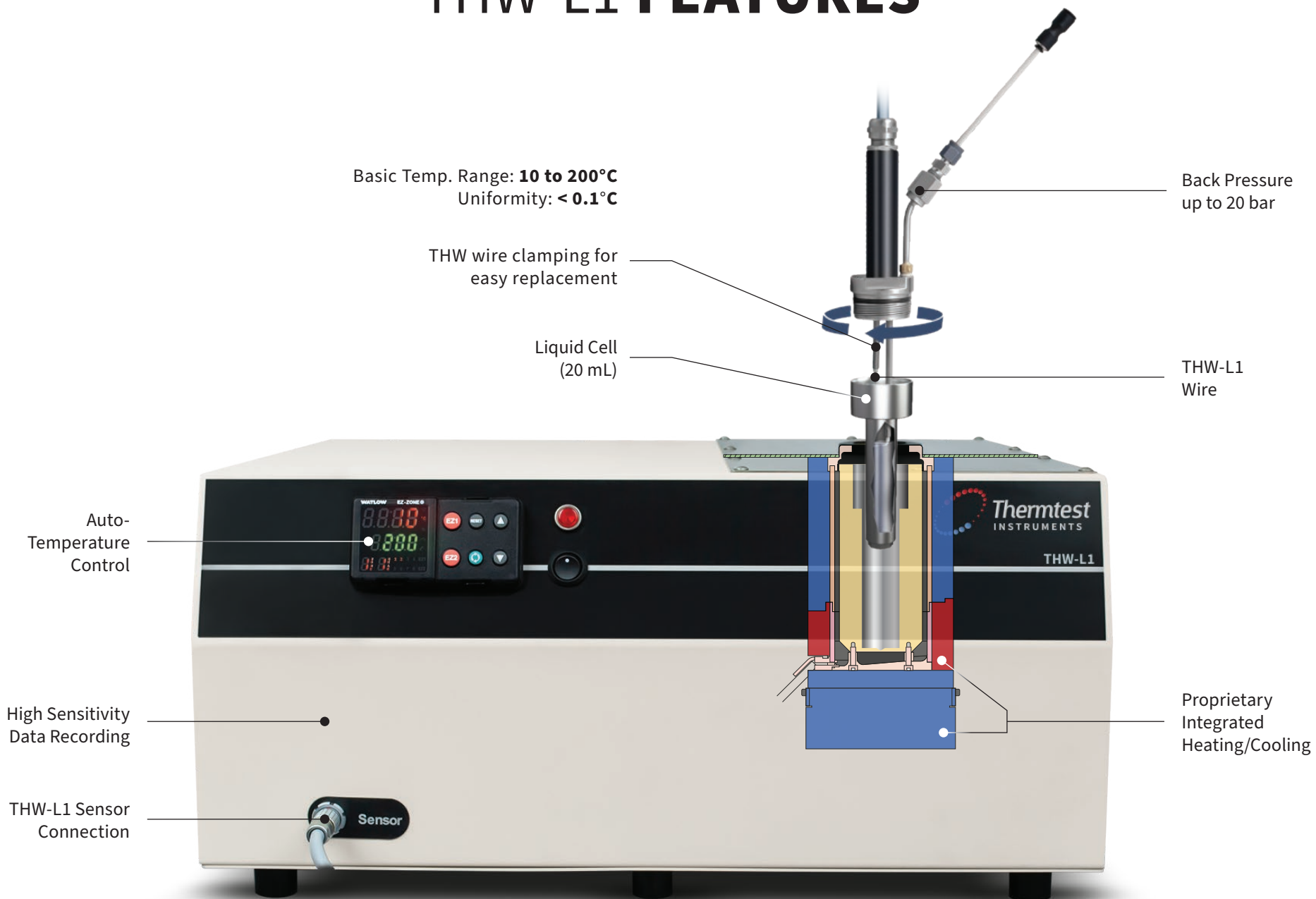
PASTES

# THW-L1 Transient Hot Wire

The THW-L1 following ASTM D7896-19, is widely used for the accurate measurement of thermal conductivity, thermal diffusivity and specific heat of liquids and pastes. This versatility is greatly expanded with the addition of Thermtest's proprietary Temperature Platform (TP) which is appreciated by academic and commercial users alike.

The transient hot wire (THW) has been used for the testing of liquids for more than 30 years, making it one of the most published methods for measuring thermal conductivity of liquids available.

# THW-L1 FEATURES



# FEATURED TRANSIENT HOT WIRE CAPABILITIES

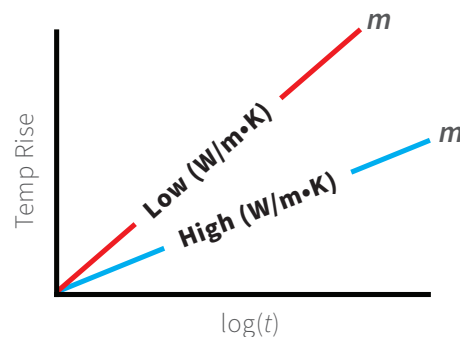
The Transient Hot Wire (THW-L1) Liquid Thermal Conductivity Meter is an advanced measurement system for direct determination of the thermal conductivity, thermal diffusivity, and specific heat instrument for measurement of liquids and pastes in accordance with ASTM D7896-19. The THW-L1 was designed with speed and operational simplicity in mind. With a single measurement of 1 second in duration, small volumes of liquids and pastes can be accurately and precisely measured for thermal conductivity, thermal diffusivity, and specific heat. The THW-L1 utilizes a non-stationary measurement approach and rapid test times to limit convective effects for samples with a wide range of viscosities. The THW sensor consists of a thin heating wire 40 mm in length and is completely inserted into the sample to be tested. The sensor wire is heated using a constant current source ( $q$ ) and the temperature rise is recorded by monitoring the change in electrical resistance of the wire. The slope ( $m$ ) from the plot of temperature rise vs. logarithm of time is used in the calculation of thermal conductivity ( $\lambda$ ). For liquid samples of high thermal conductivity, the lower the slope. For liquid samples of low thermal conductivity, the higher the slope.

$$\lambda = \frac{q}{4\pi m}$$

$\lambda$  = thermal conductivity (W/m•K)

$q$  = heating power (W/m)

$m$  = slope



- Follows international standard **ASTM D7896-19**
- **Automated, powerful & accurate**
- **Minimum effects of convection**
- **Cell Pressure up to 20 bar**
- **Integrated temperature control**
- **Unique wire clamping for easy replacement**

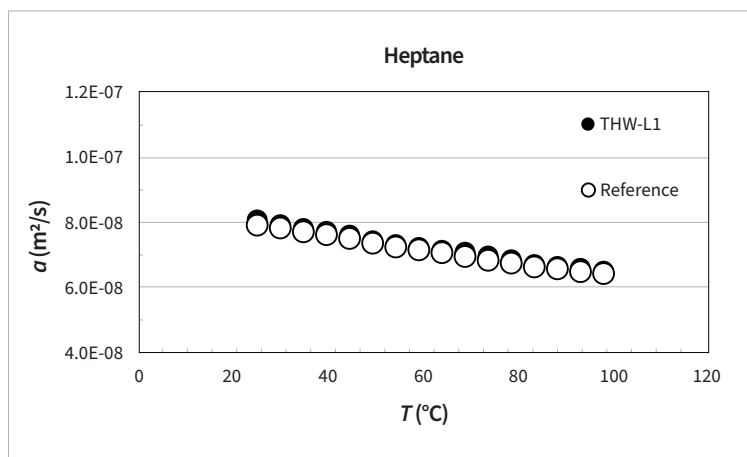
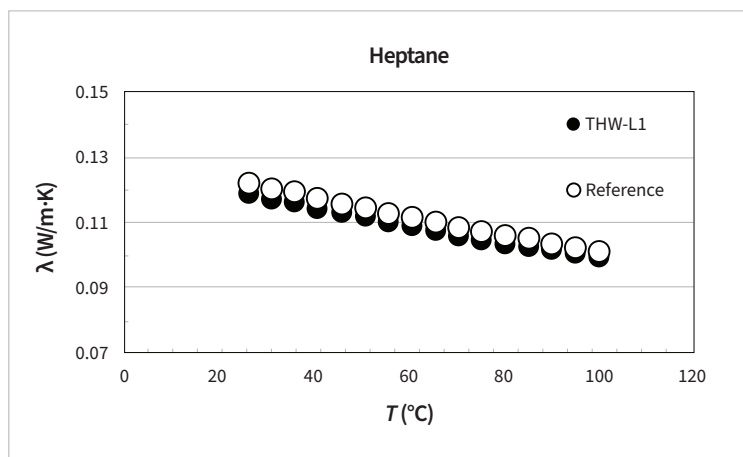
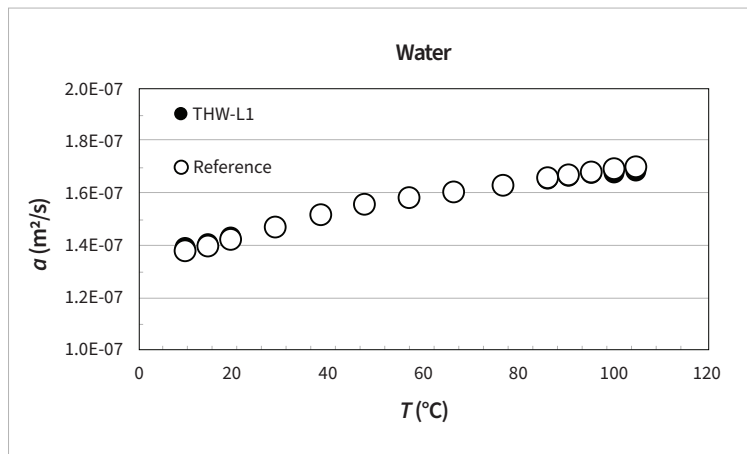
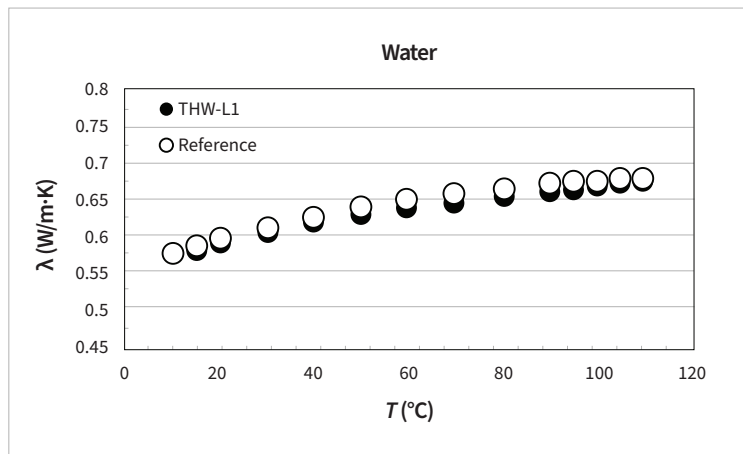
## THW-L1 SPECIFICATIONS

Materials	Liquids and Pastes
Measurement Capabilities	Bulk Properties
Thermal Conductivity	0.01 to 2 W/m•K
Additional Properties	Thermal Diffusivity and Specific Heat
Viscosity Range	0.001 to 10,000,000 cP
Measurement Time	1 second
Reproducibility	1%
Accuracy	5%
Temperature Range	-50   -35   10 to 200°C
Pressure	Up to 20 bar
Smallest Volume	20 mL
Standards	ASTM D7896-19

# THW-L1 APPLICATIONS

## THERMAL CONDUCTIVITY

## THERMAL DIFFUSIVITY



Low back pressure was applied to the fluids, to allow measurements over their boiling point.

**Thermal Conductivity** deviations from reference values:  
 Water < 2%  
 Heptane < 3%

**Thermal Diffusivity** deviations from reference values:  
 Water < 2%  
 Heptane < 2%

**Calculated Specific Heat Capacity** deviations from reference values:  
 Water < 2%  
 Heptane < 5%

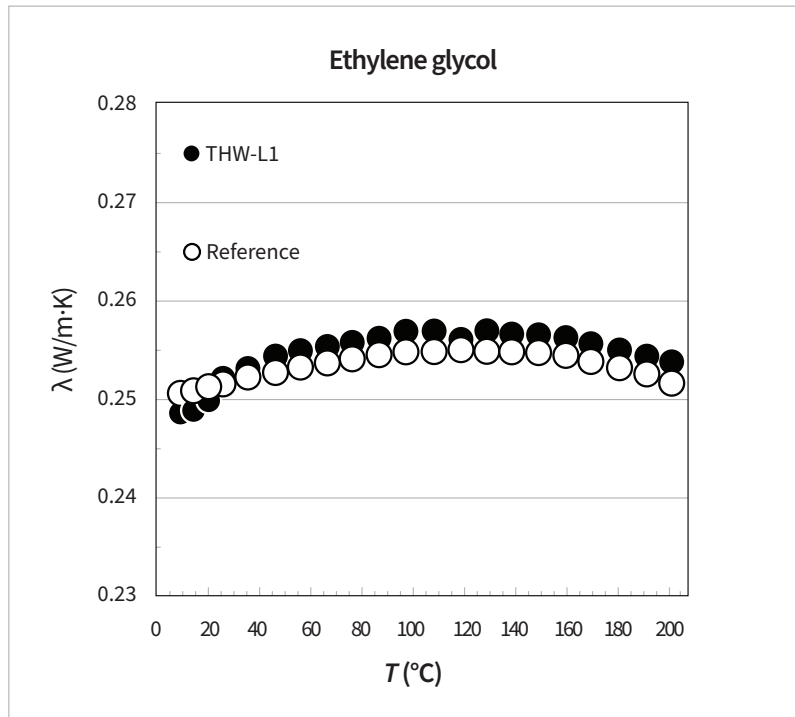
Output results of THW-L1 are thermal conductivity, thermal diffusivity and calculated specific heat

Citation:

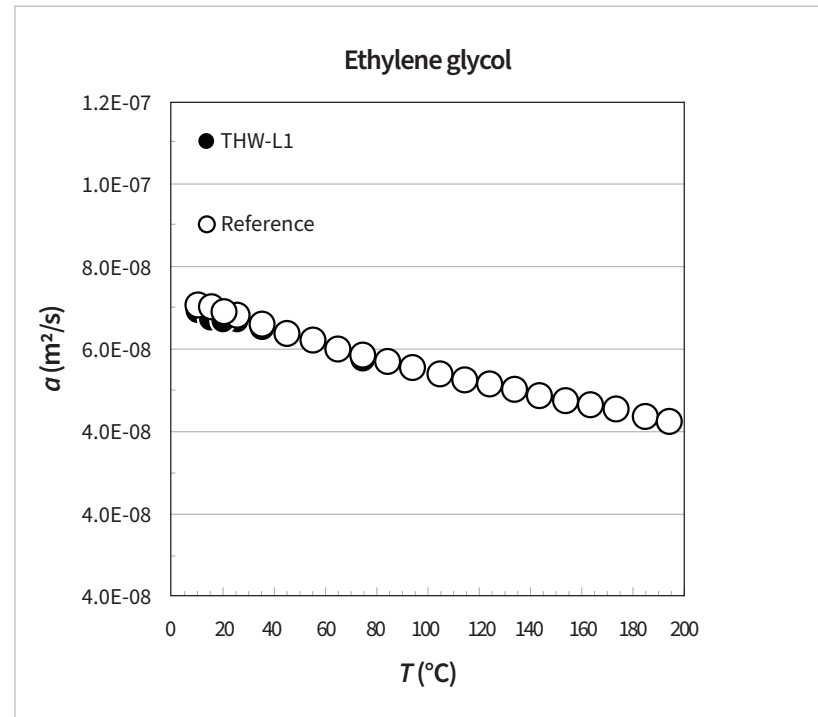
Lemmon, E.W., Bell, I.H., Huber, M.L., McLinden, M.O. (2018). *NIST Standard Reference Database 23: Reference Fluid Thermodynamic and Transport Properties-REFPROP, Version 10.0*. National Institute of Standards and Technology, Standard Reference Data Program, Gaithersburg.

# THW-L1 APPLICATIONS

## THERMAL CONDUCTIVITY



## THERMAL DIFFUSIVITY



Low back pressure was applied to allow measurements over their boiling point.

**Thermal Conductivity** deviations from reference values: Ethylene glycol < 1%

**Thermal Diffusivity** deviations from reference values: Ethylene glycol < 1%

**Calculated Specific Heat Capacity** deviations from reference values: Ethylene glycol < 2%

Citation:

Lemmon, E.W., Bell, I.H., Huber, M.L., McLinden, M.O. (2018). *NIST Standard Reference Database 23: Reference Fluid Thermodynamic and Transport Properties-REFPROP, Version 10.0*. National Institute of Standards and Technology, Standard Reference Data Program, Gaithersburg.

# SAMPLE MEASUREMENT



## THE SAMPLE

The liquid is poured into the sample cell, the required volume is 20 ml. The THW-L1's ability to limit convection, using short test times, allows accuracy measurements of a large range of samples, widely varying viscosities. The sample cell can then be back filled to pressures up to 20 bar, for testing liquids past their boiling points.



1 min.



## INSERT SENSOR

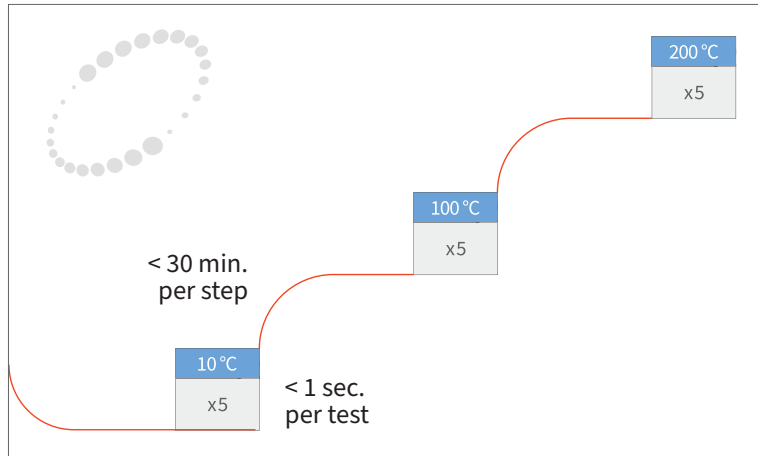
For testing with temperature, the liquid cell is inserted into the integrated temperature platform.



< 1 min.



# EFFICIENCY WITH EASE

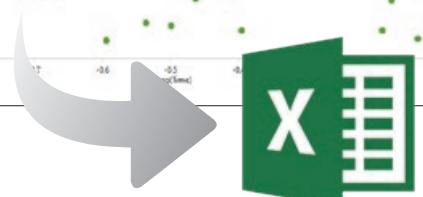
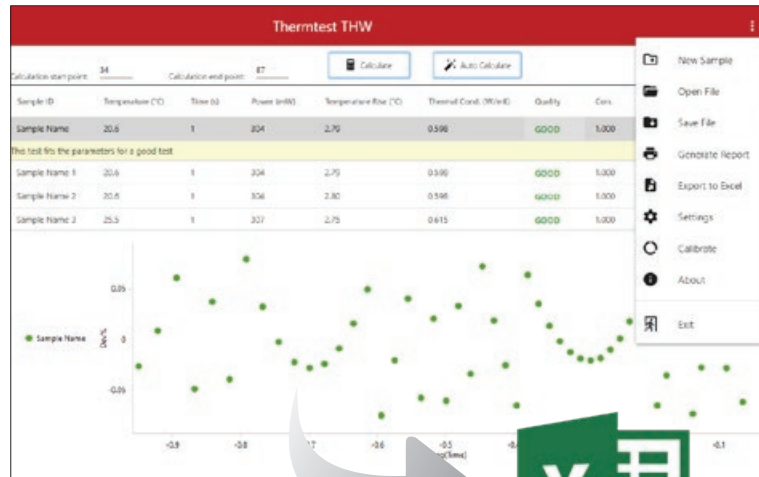


## RUN EXPERIMENT

The THW-L1 Software automatically controls isothermal steps of temperature from 10°C to 200°C. The lower range may be expanded to -50°C if needed.



< 1 min.



## EXPORTING RESULTS

Smart THW-L1 Windows Software verifies quality of results and recommends changes if needed. Results report can be generated, saved and exported to excel. For convenience results may also be emailed.



1 min.





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