

DAILY
THERMETRICS



Daily ImpermaWell™

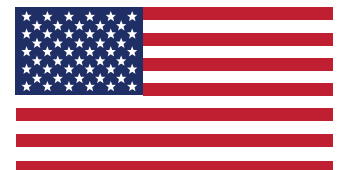
Sulfur Recovery Unit (SRU) & Gasification
Thermocouple Assembly

DAILY

THERMETRICS

DAILY THERMETRICS is a single source provider of superior temperature measurement systems and field services to make projects flow seamlessly from feasibility to construction. This unique capability allows **Daily** to provide design and technical support, as well as control the fabrication and testing schedule to ensure timely, consistent delivery.

Since 1973, **Daily Thermetrics Corporation** has provided the process industries with the tools for process optimization through precise temperature measurement instrumentation. We are known for the highest quality equipment, turnkey services, and emergency delivery services to meet the demands of our customers. Daily Thermetrics owns multiple patents in the field of temperature sensing instrumentation and is committed to pushing the limits of conventional temperature control through constant research and development. Our patented CatTracker® catalyst tracking system leads the industry in vessel temperature profiling and is the first flexible thermocouple system certified as SIL 3 capable. Proprietary CatTracker® manufacturing techniques have provided the building blocks for other Daily Thermetrics exclusive products, including Daily Premium™ Line and EZ-Pad™ replaceable skin thermocouples. Whatever the situation, from common thermocouple issues to complex hydrocracker catalyst profiling and fired heater issues, Daily Thermetrics' technical team is qualified to provide essential expertise and best-practice solutions. Throughout the refining, petrochemical, and power industries, Daily Thermetrics has provided thousands of plant operators with key process control data all over the world.



Manufacturing Headquarters
Houston TX, USA

1. Daily Thermetrics' U.S. and worldwide patents include USPN 8,870,455; USPN 6,599,011; USPN 6,550,963; CA 2,848,398; and CA 2,449,074. Additional patents are pending.

Daily ImpermaWell™ Product Brochure

US PATENT 10,989,606

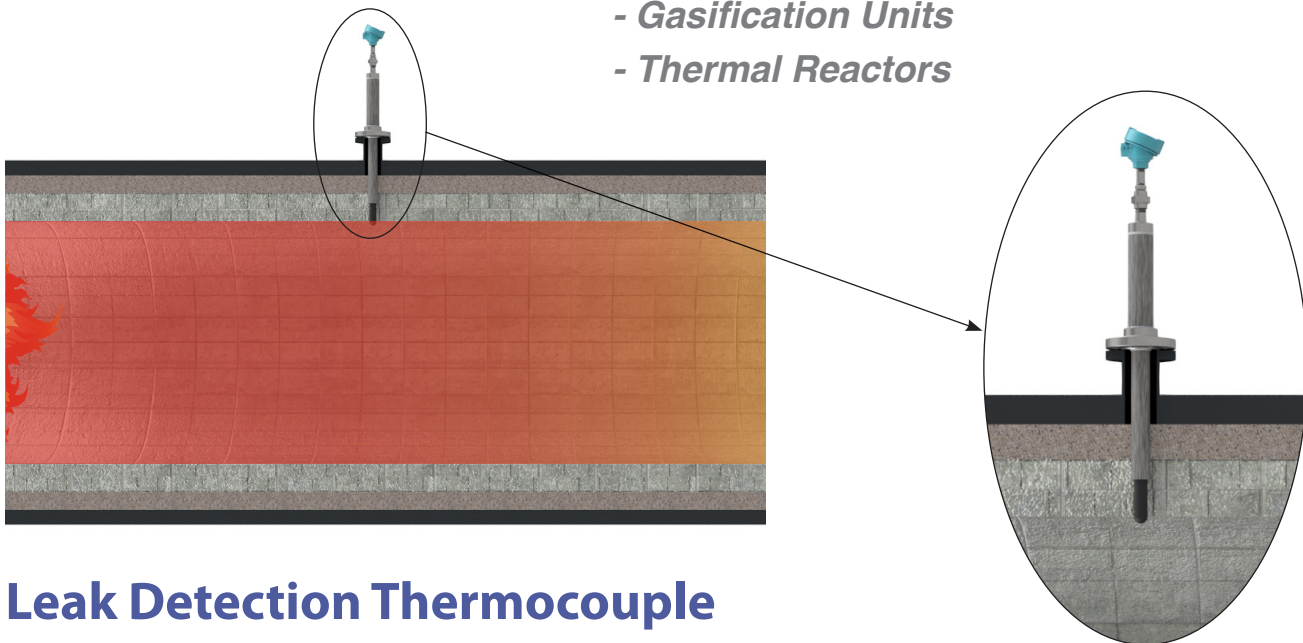
Your best choice for high temperature furnaces with hazardous gas atmospheres

Technical Brief and Technology

Daily Thermetrics' ImpermaWell™ is purpose built for the challenging applications in high temperature toxic gas applications such as the Sulfur Recovery Unit and gasification. Building on proven technology, the system provides secondary and tertiary containment for process isolation in the event of a breach, and eliminates the requirement for complicated and maintenance-intensive purging systems. A silicon carbide Hexoloy® outer protection tube with a low coefficient of thermal expansion and superior corrosion resistance minimizes failure due to damage from thermal shock during startup and in cyclic process states. A sapphire inner protection tube provides a gas impermeable seal to protect the thermocouple inside from hydrogen migration and process poisoning. Leak detection using a secondary thermocouple immediately alerts the operator of any primary seal breach. Simplify your high temperature monitoring equipment while maximizing accuracy and reliability with the ImpermaWell™.

Applications

- *Claus Reaction Furnace for SRU*
- *Gasification Units*
- *Thermal Reactors*

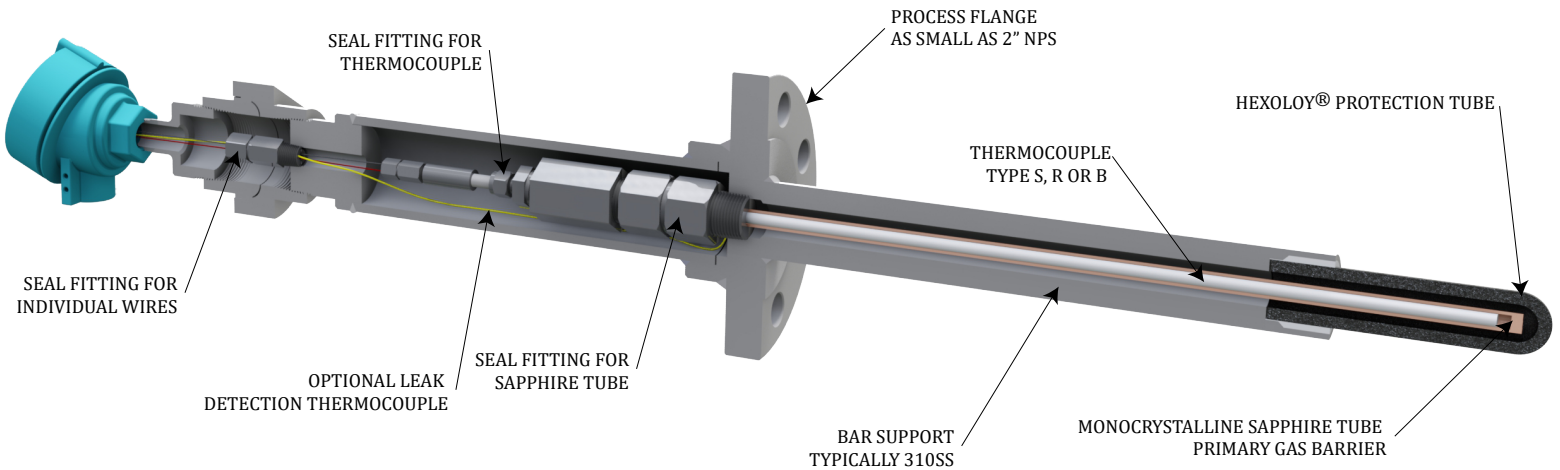


Leak Detection Thermocouple

This patented innovation notifies users of a breach in the outer protection tube or the sapphire without the need to use expensive and bulky gas detectors. In the event of a breach, conductive heat migrates inward into the thermocouple assembly and a thermocouple in the containment chamber will register a temperature increase. Monitoring this thermocouple informs operators if the protection tube or gas barrier has been compromised.

Daily ImpermaWell™ Product Brochure

US PATENT 10,989,606



Daily ImpermaWell™ Special Features

No Purging Required

Sapphire tube prevents gas migration and thermocouple poisoning, eliminating the need for inert gas purge while improving accuracy.

Simple Installation

Installation is similar to a normal thermowell. No special tooling or installation equipment is required.

Three Gas Barriers

Three impermeable gas barriers to prevent process release (one primary with dual redundant safety mechanisms).

Refurbishable

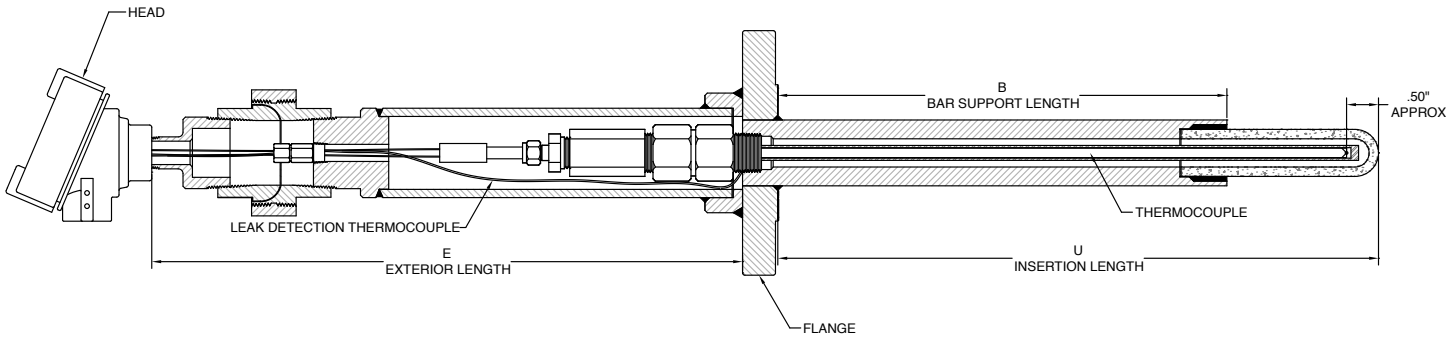
Most components are replaceable and can be refurbished at a fraction of the initial cost. Keep a rotating stock to minimize downtime.

Leak Detection Thermocouple

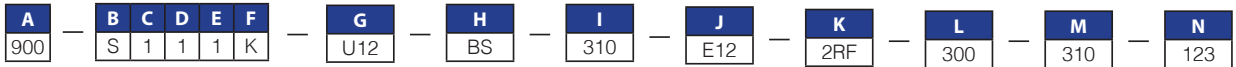
Optional leak detection thermocouple detects a breach through the primary process boundary.

Daily ImpermaWell™ How to Order

US PATENT 10,989,606



EXAMPLE:



• INDICATES COMMON SELECTION

A	Model
900	Daily ImpermaWell™

B	Thermocouple Type
S	Type S
R	Type R
B	Type B

C	Limits of Error
1	Standard Limits of Error (Class 2)
2	Special Limits of Error (Class 1)

For Type B, Standard Limits (Class 2 only)

D	Size of Thermocouple Wire
1	24 AWG
2	20 AWG

E	Number of Sensors
1	Single
2	Duplex

F	Leak Detection Thermocouple
N	None
K	Type K
S	Type S

G	U Dimension (Insertion Length)
U12	12"
UXX	Custom

H	B Dimension (Bar Support Length)
BS	Standard
B9	9"
BXX	Custom

B Dimension is typically determined by Daily Thermetrics Engineering. Select standard unless you have specific requirements.

I	Bar Support Material
310	310SS
347	347SS
HASTX	Hastelloy X

See Page 6 for Additional Materials

J	E Dimension (Exterior Length)
E12	12"
EXX	Custom

K	Flange Size and Type
2RF	2" RF
2RTJ	2" RTJ
6RF	6" RF
6RTJ	6" RTJ
XRF	Custom Size RF
XRTJ	Custom Size RTJ

L	Flange Rating
150	150#
300	300#
600	600#
900	900#
1500	1500#
2500	2500#

M	Flange Material
310	310SS
347	347SS
HASTX	Hastelloy X

See Page 6 for Additional Materials

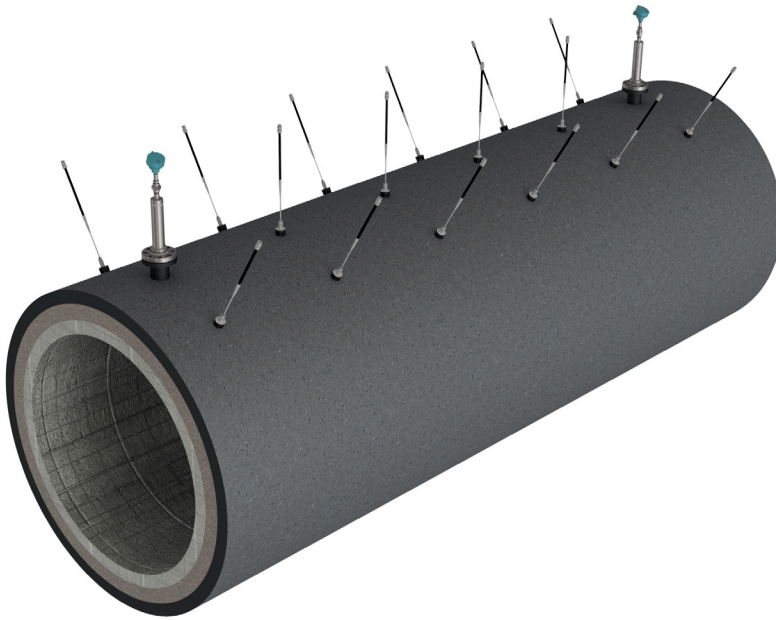
N	Optional Test Reports (String Numbers Together for Multiple)
1	Positive Material Identification Report
2	Material Test Reports
3	Dye Penetrant Test with Report
4	212F Calibration Test Report
5	3-Point Calibration ⁵ with Report
6	5-Point Calibration ⁵ with Report
N	None

1. See Page 6 for more information on testing and reports.
2. Unique and simplified item number will be generated and issued to every customized thermowell for ease of reordering.
3. The majority of options are customizable. Please contact sales if your requirements are not met by this catalog.
4. Flange face finish is 125-250 RMS for raised face and 63 AARH for RTJ sealing surface.
5. Specify calibration temperature points with order.

Daily ImpermaWell™ Full Coverage

US PATENT 10,989,606

Daily ImpermaWell™ and Patented Magnetic VSS's™ to ensure full coverage of your furnace

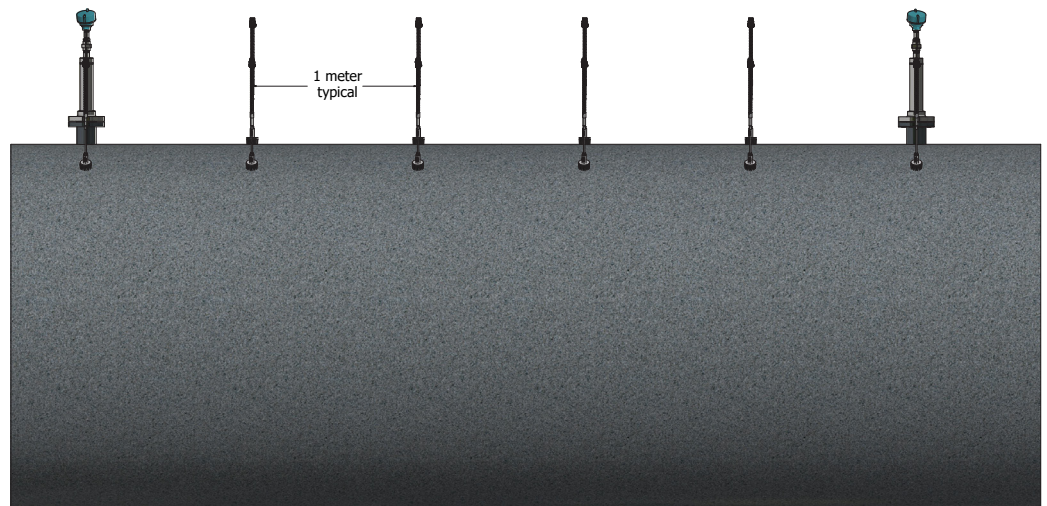
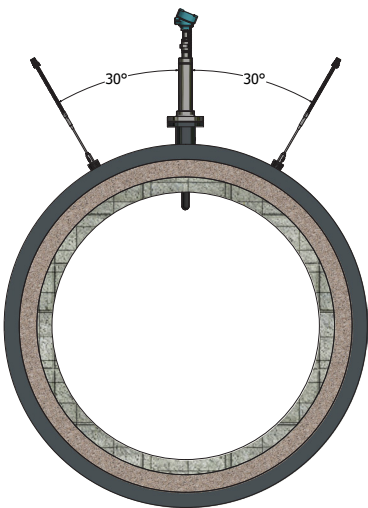


Typical view of Claus SRU Furnace with ImpermaWells™ and Magnetic VSS™

*Magnetic VSS™
[US Patent US 2014/0105248 A1]*

Full Coverage of Your High Temperature Furnace

Daily Thermetrics' product offerings complement the typical Claus Reaction Furnace by adding magnet vessel skin sensors alongside the Daily ImpermaWell™ high temperature thermowell. Consider adding additional temperature sensors to the shell of the vessel to ensure proper coverage of your furnace and to access more actionable information to keep your furnace safe.



Typical orientation and spacing of magnetic vessel skin sensors on furnace.

Daily ImpermaWell™ Reference Guide

MATERIAL SELECTION GUIDE				
Ordering Code	Material	UNS Number	Welding P-Number	Recommended Maximum Operating Temperature
310	310SS	S31000	8	2100°F (1149°C)
321	321SS	S32100	8	1600°F (871°C)
347	347SS	S34700	8	1600°F (871°C)
I800H	Incoloy® 800H	N08810	45	2000°F (1093°C)
I800HT	Incoloy® 800HT	N08811	45	2000°F (1093°C)
HASTX	Hastelloy® X	N06002	43	2200°F (1204°C)

CERAMIC SPECIFICATION			
Material	Composition	Recommended Maximum Operating Temperature	Description
Hexoloy® Sintered Carbide	SiC Single Phase	3452° F (1900°C)	Corrosion Resistant Erosion Resistant Thermal Shock Resistant
Sapphire	Al ₂ O ₃ Monocrystalline	3632° F (2000°C)	100% Gas Tight High Thermal Conductivity Electrical Resistivity

THERMOCOUPLE SELECTION GUIDE							
Thermocouple Calibration	Sensor Metallurgy		Color Code		Temperature Range	Limits of Error (Accuracy)	
	Positive	Negative	Positive	Negative		Standard (whichever is greater)	Special (whichever is greater)
S	Platinum - 10Rh	Platinum	Black	Red	32 to 2700°F (0 to 1480°C)	±2.7°F (1.5°C) or ±.25%	1.1°F (0.6°C) or ±.1%
R	Platinum - 13Rh	Platinum	Black	Red	32 to 2700°F (0 to 1480°C)	±2.7°F (1.5°C) or ±.25%	1.1°F (0.6°C) or ±.1%
B	Platinum - 30Rh	Platinum - 6Rh	Gray	Red	1600 to 3100°F (870 to 1704°C)	±.5%	±.25%

STANDARD TESTING FOR ALL IMPERMAWELL™ THERMOWELLS

- Positive Material Identification (PMI) per ASTM E 1085 and ASTM E 1086
- Leak Testing per ASME Section V Article 10

ADDITIONAL TESTING AVAILABLE

- Dye Penetrant Test per ASME Section V Article 6

OPTIONAL TEST REPORTS / CERTIFICATES

Reports available for tests:

- Positive Material Identification (PMI) Report per ASTM E 1085 and ASTM E 1086
- Positive Material Identification (PMI) Certificate per ASTM E 1085 and ASTM E 1086
- Calibration Report per ASTM E220
- NACE Compliant Certificate per MR0103
- Material Test Reports
- Test Reports reviewed by NDT Level II Inspectors
- Test Procedures reviewed and approved by ASNT NDT Level III



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