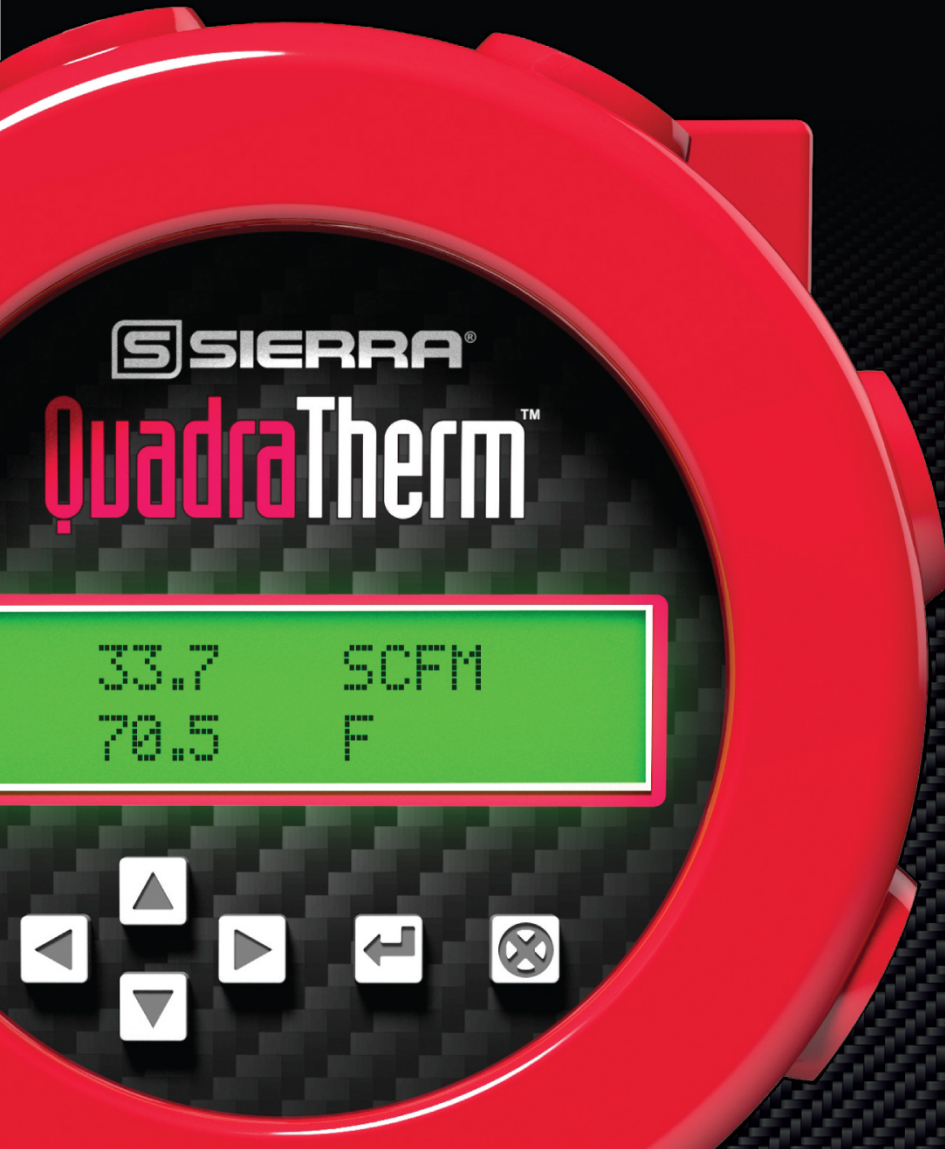# Welcome.
We will begin shortly.

- **Important: Please put your phone on MUTE, if you have called in using your phone to eliminate background noise.**

- **Please TURN OFF your video.**

- **The Q&A session will be after the presentation.**

- **You can submit your questions using the CHAT box.**

QuadraTherm™ 640i / 780i

THERMAL MASS FLOW METER

NEVER
before possible.

SIERRA®

QuadraTherm™

33.7   SCFM
70.5   F

World's Most Accurate Thermal Mass Flow Meter

- Accuracy: +/- 0.5% of Reading
- Multivariable: Mass flow rate, T, and P
- QuadraTherm™ four-sensor design
- DrySense™ no-drift sensor with lifetime warranty
- iTherm™ "Brain" manages changes in gas, T, P, Outside Temp
- Dial-A-Pipe™: Change pipe size
- Dial-A-Gas™: Change gas type
- iTherm Gas Library: 18 gases & mixtures (growing & improving)
- ValidCal™ Diagnostics: Assure performance
- Smart Interface Program: Computer interface software
- Foundation Fieldbus, Profibus DP, HART (pending)

Realizing The Vision

▪My lifelong quest for the world's most accurate thermal sensor

▪The traditional design wasn't perfect

▪The culmination of my life's work

How it started.

- 1964: Stanford PhD Thesis

- 1968: TSI

- 1973: Sierra, "Industrial Grade" Sensor

- Early 80s: Metal Clad Sensor

- Mid 90s: Digital Drive

- Late 90s: Started Math Models

- 1999: DrySense Patent

How it finished.

- 2000s: Hyper-Fast Microprocessors

- 2005: QuadraTherm Patent

- 2008-2010: iTherm Math Completed

- July 2010: Code Writers

- 2012: Advanced QuadraTherm Patent

- 2012: Launch of 640i / 780i
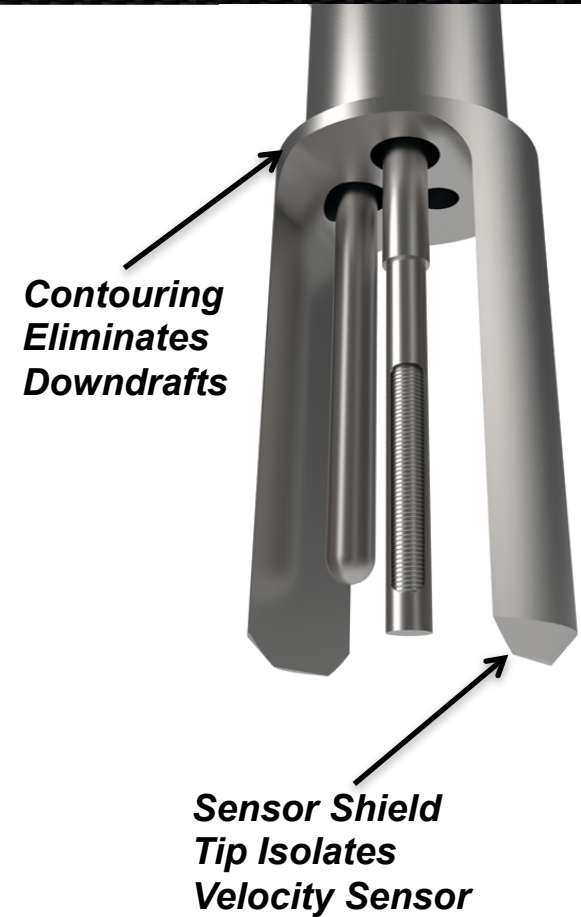
How we did it.

THE FOUR PILLARS OF SUCCESS:

1. AeroMax™ sensor head

2. DrySense™ velocity sensor

3. QuadraTherm™ four-sensor design

4. iTherm ™ "Brain"

How we did it.

THE FOUR PILLARS OF SUCCESS:

1.AeroMax™ sensor head

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3.QuadraTherm™ four-sensor design

4.iTherm ™ "Brain"

Contouring Eliminates Downdrafts

Sensor Shield Tip Isolates Velocity Sensor

How we did it.

THE FOUR PILLARS OF SUCCESS:

1.AeroMax™ sensor head

2.DrySense™ velocity sensor

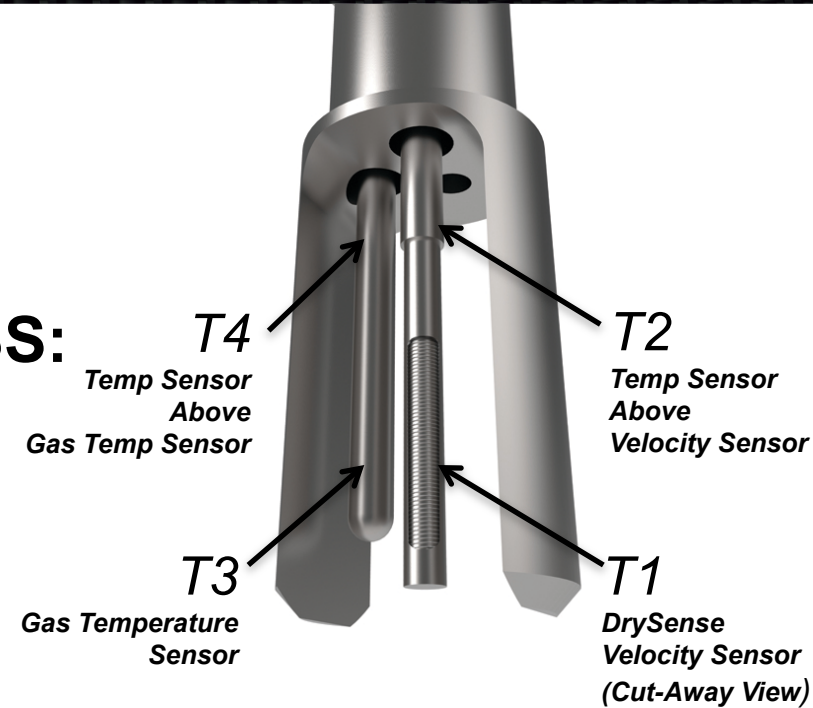3.QuadraTherm™ four-sensor design

4.iTherm ™ "Brain"

Patented DrySense Velocity Sensor (Cut-Away View)
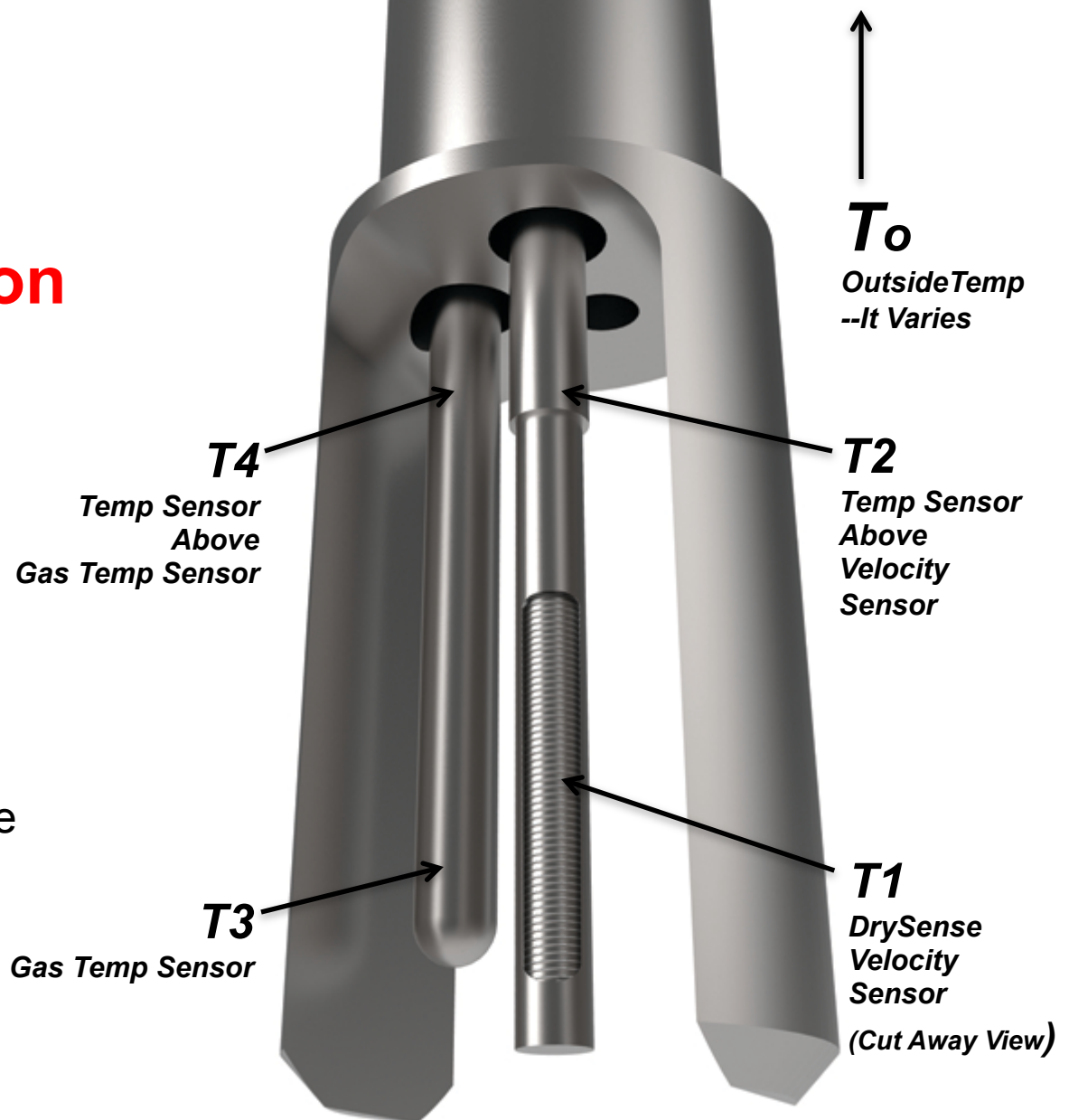
How we did it.

THE FOUR PILLARS OF SUCCESS:

1.AeroMax™ sensor head

2.DrySense™ velocity sensor

3.QuadraTherm™ four-sensor design

4.iTherm ™ "Brain"

T4
**Temp Sensor
Above
Gas Temp Sensor**

T2
**Temp Sensor
Above
Velocity Sensor**

T3
**Gas Temperature
Sensor**

T1
**DrySense
Velocity Sensor
(Cut-Away View)**

QuadraTherm Measures Stem Conduction

V-Sensor
T1 and T2
Acts as Heat-Flux Gauge

T-Sensor
T3 and T4
Acts as Heat-Flux Gauge

T_o
**OutsideTemp
--It Varies**

$T4$
**Temp Sensor
Above
Gas Temp Sensor**

$T2$
**Temp Sensor
Above
Velocity
Sensor**

$T3$
Gas Temp Sensor

$T1$
**DrySense
Velocity
Sensor**

(Cut Away View)

How we did it.

THE FOUR PILLARS OF SUCCESS:

1.AeroMax™ sensor head

2.DrySense™ velocity sensor

3.QuadraTherm™ four-sensors

4. iTherm ™ "Brain"

iTherm "Brain"

▪QuadraTherm provides inputs:
T1, T2, T3, T4, W

▪iTherm solves the First Law of Thermodynamics

▪iTherm delivers multivariable outputs:
Mass Flow Rate, T, P

▪iTherm manages changes in:
- ✓gas selection
- ✓gas temperature
- ✓gas pressure
- ✓outside temperature
- ✓pipe conditions (size and roughness)
- ✓flow profile

iTherm Gas Library

Screenshot: Smart Interface Software

▪iTherm stores gas property data for 18 pure gases and gas mixtures

▪Calculates dependence on T and P

▪Enables Dial-A-Gas

▪A learning, growing database— 100's of gases planned

Gas Properties Calculated By iTherm:
ρ = Mass density of the gas (kg/m3)
k = Thermal conductivity of the gas (watt/m/K)
μ = Absolute viscosity of the gas (kg/s/m)
Cp = Coefficient of specific heat (J/kg/K)
Pr = Prandtl number

iTherm Dial-A-Gas

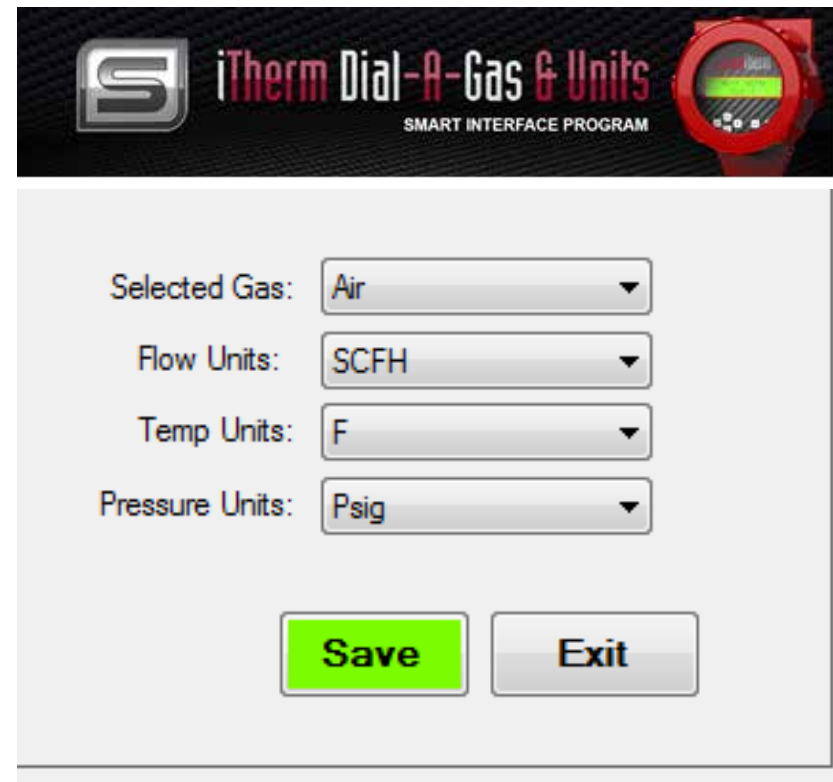▪Traditional thermal flow meters:
>**One Gas**
>**One T**
>**One P**
>**One Outside Temp**

▪iTherm Dial-A-Gas:
>**Any Gas**
>**Any T**
>**Any P**
>**Any Outside Temp**

Screenshot: Smart Interface Software
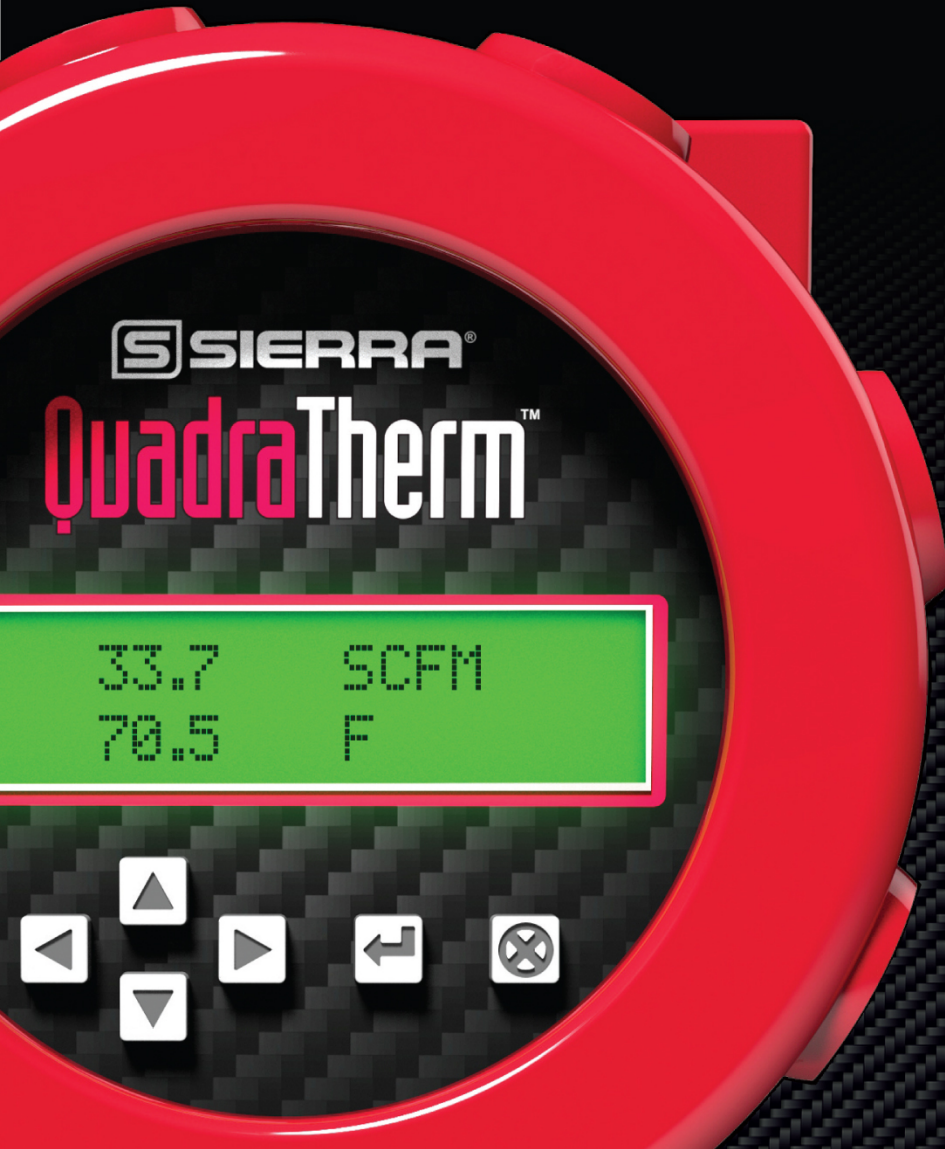
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Ask Dr. O Questions!

Use the CHAT Function

Thank you!

Series of Training Webinars:

- October 12th   8:15am PST   **Complete!**
- October 19th   8:15am PST   Next Friday!
- October 26th   8:15am PST
- November 2nd   8:15am PST