

# ООО ТЭК-Тех

**Ведущий поставщик**

**метрологического оборудования**

**на Российском рынке**

# Наши основные партнеры



GE  
Measurement & Control



CRYSTAL  
engineering corporation

ISOTECH



TESCOM



# Метрология и КИП

- ✓ Давление
- Температура
- Влажность
- Электрические измерения



# Fluke Calibration

Introduction by Mike Collins

Technical Sales Manager Pressure & Flow – Emerging Markets

Joined Ruska in 1988

Acquired By Druck in 1996

Acquired By GE in 2002

Acquired By Fluke in 2010



# Differential Piston Gauge

Model 2482



# Applications

**FLUKE®**

Calibration

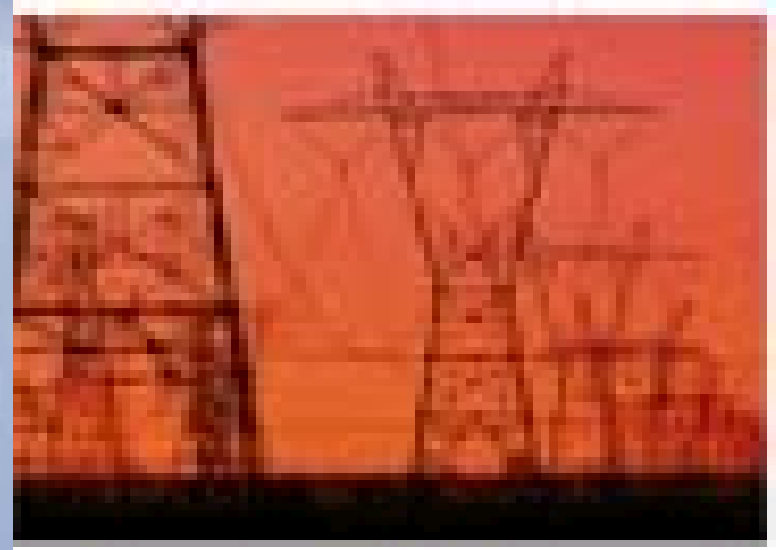
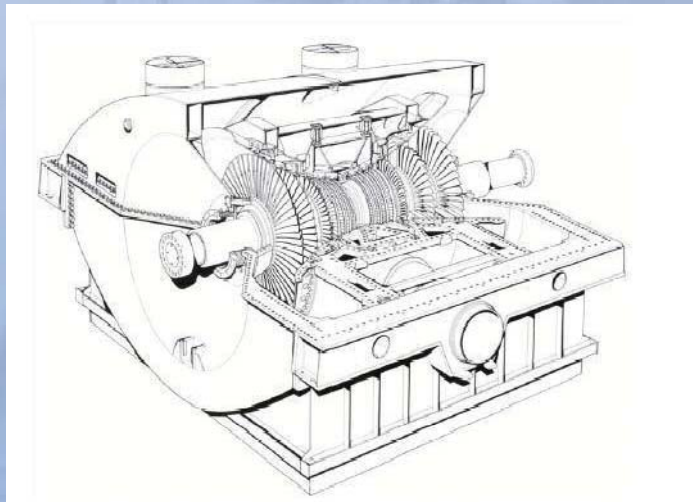
Differential Pressure Transmitters used for calculating precise flow rates for Custody Transfer measurements in the Oil & Gas Industry





## Turbine Efficiency Testing

Increased efficiency lowers  
cost of operation



Critical pressure/flow  
measurements on:

- Boiler feed pumps
- Condensate and cooling water pumps
- Steam flow rate



# Line/Static Pressure Effects

**FLUKE**®

Calibration



**Varying line pressures create a distortion on the body and diaphragms of a DP transmitter resulting in a static pressure effect on zero and span.**

**To reduce this offset and maximize the accuracy of the transmitter calibrations should be made at the expected static line pressure of the process.**

***Until now these calibrations have been very difficult and time consuming!***





# Transmitter Effects

FLUKE®

Calibration

A transmitter manufacturer states:

“ In the case of orifice meters, the differential pressure transmitter used to infer flow can be significantly affected by a high line pressure. To simulate this effect on the bench, the user should apply a small differential pressure across a transmitter. Then, add several hundred pounds of additional static pressure to both sides of the transmitter. In theory, the measured differential pressure should not change. **In reality, it does.**”

\*

\* [www.afms.org/scourse/00sc3.htm](http://www.afms.org/scourse/00sc3.htm)

DISCOVERY



# Financial Impact

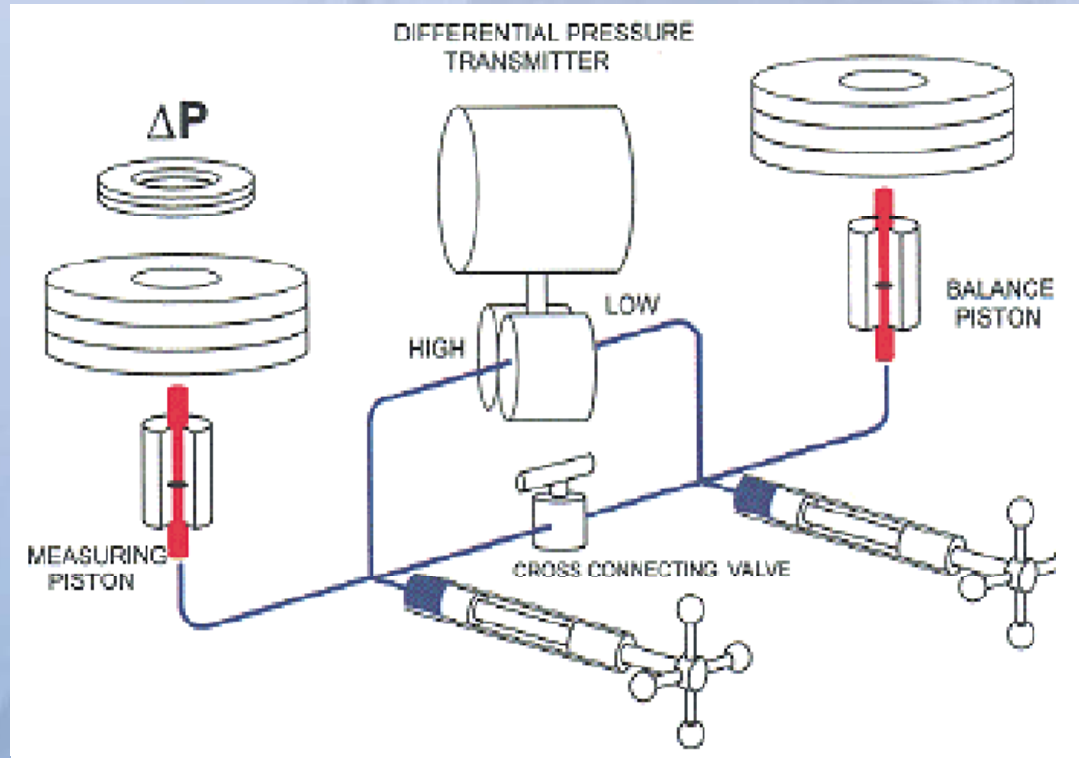
**FLUKE**®

Calibration

- *Relatively small measurement errors can have a relatively large economic effect in custody-transfer installations for high-value products, large pipelines, or both. For example, assuming the average annual steam flowrate is 100,000 lb/hr of steam valued at \$10.00 per 1,000 lbs., the flowmeter would pass approximately \$8,760,000 of steam per year ( $100,000 \text{ lb/hr} * 8,760 \text{ hrs/yr} * \$10.00/1,000 \text{ lb}$ ).*
- *The large economic value of the fluid over time means that even small measurement errors can be significant. In the above example, a 0.01 percent measurement error would result in a billing error of \$876 per year. Therefore, even small errors, such as rounding or unit conversion, can result in significant billing errors. Meanwhile, measurement errors of a few percent, can result in billing errors that can approach \$1,000,000 per year.*
- \* From Spitzer and Boyes newsletter:  
<http://www.flowcontrolnetwork.com/issuearticle.asp?ArticleID=235>



# Traditional Differential System



**Time consuming and technique dependent**  
**Minute load adjustments are required to establish zero differential at each line pressure**





# Traditional Differential System



**Non contact capacitive displacement sensors are often used to measure piston position, monitor fall rate and ensure zero balance point**



# Model 2482 Differential Piston Gauge



Calibration





# Model 2482 Differential Pressure Piston Gauge

**FLUKE**<sup>®</sup>  
Calibration

Primary Pressure Standard for Calibrating Differential Pressure  
sensing instruments at elevated line pressures

Static line pressures to 2900 psi (200 bar)

Differential pressures to 850 inH<sub>2</sub>O (2100 mbar)

Uncertainty: 40 ppm + 0.0013 psi (0.009 kPa)

Hydraulic or Pneumatic operation

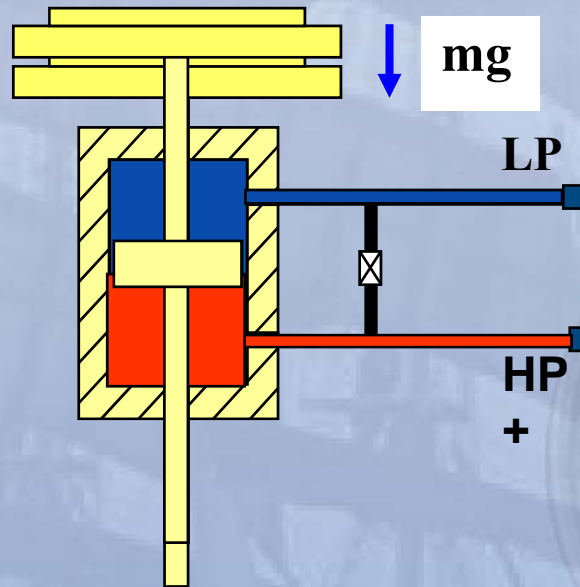
Automated DP control

Significant time savings



# 2482 Piston/Cylinder Assembly

US  
Patent



Patented true differential piston/cylinder assembly removes requirement for second deadweight piston. Piston diameter = ~25 mm

Provides direct identification of  $\Delta p$  as it is proportional to mass load

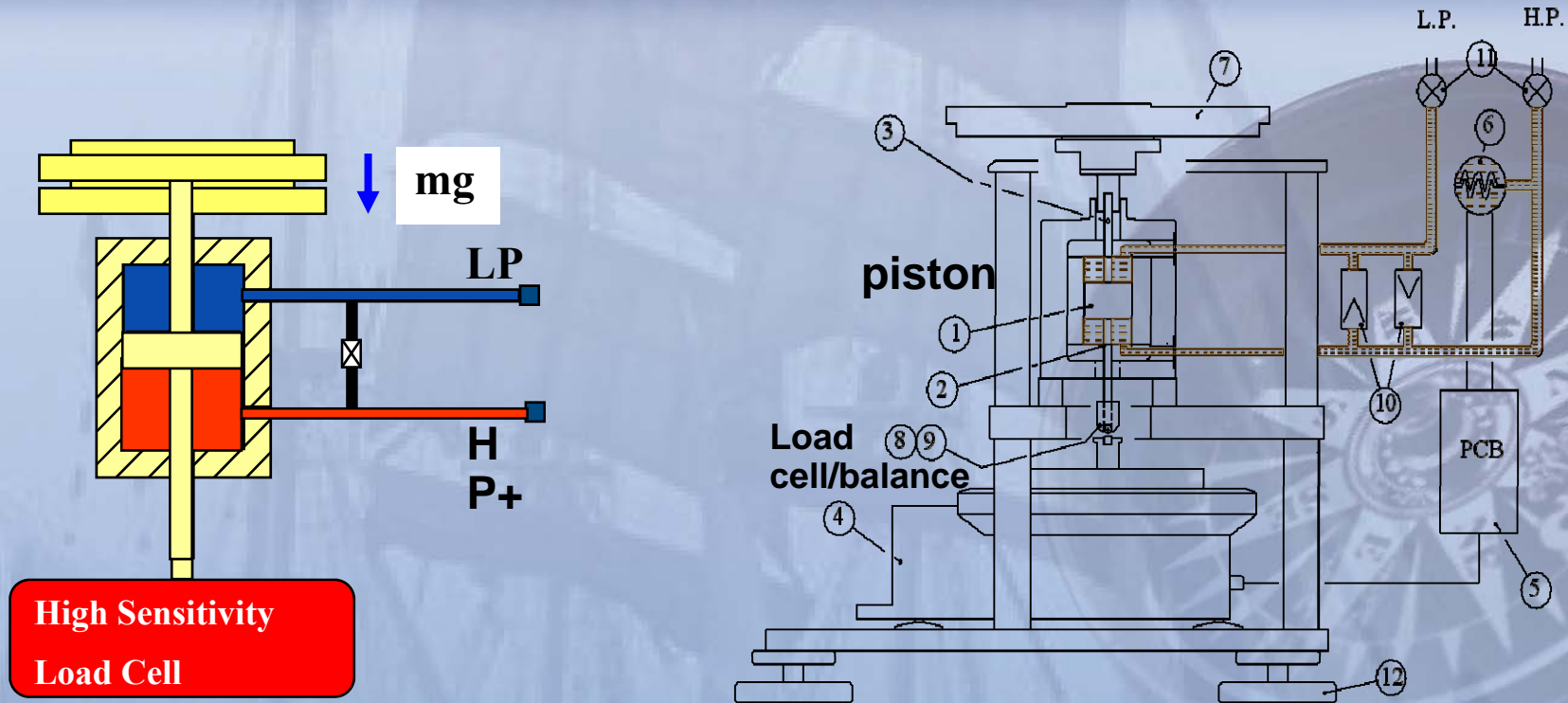
Straightness/roundness of better than  $0.1 \mu\text{m}$  ensures precise operation with minimal leakage



# Digital Mass Balance

**FLUKE**®

Calibration



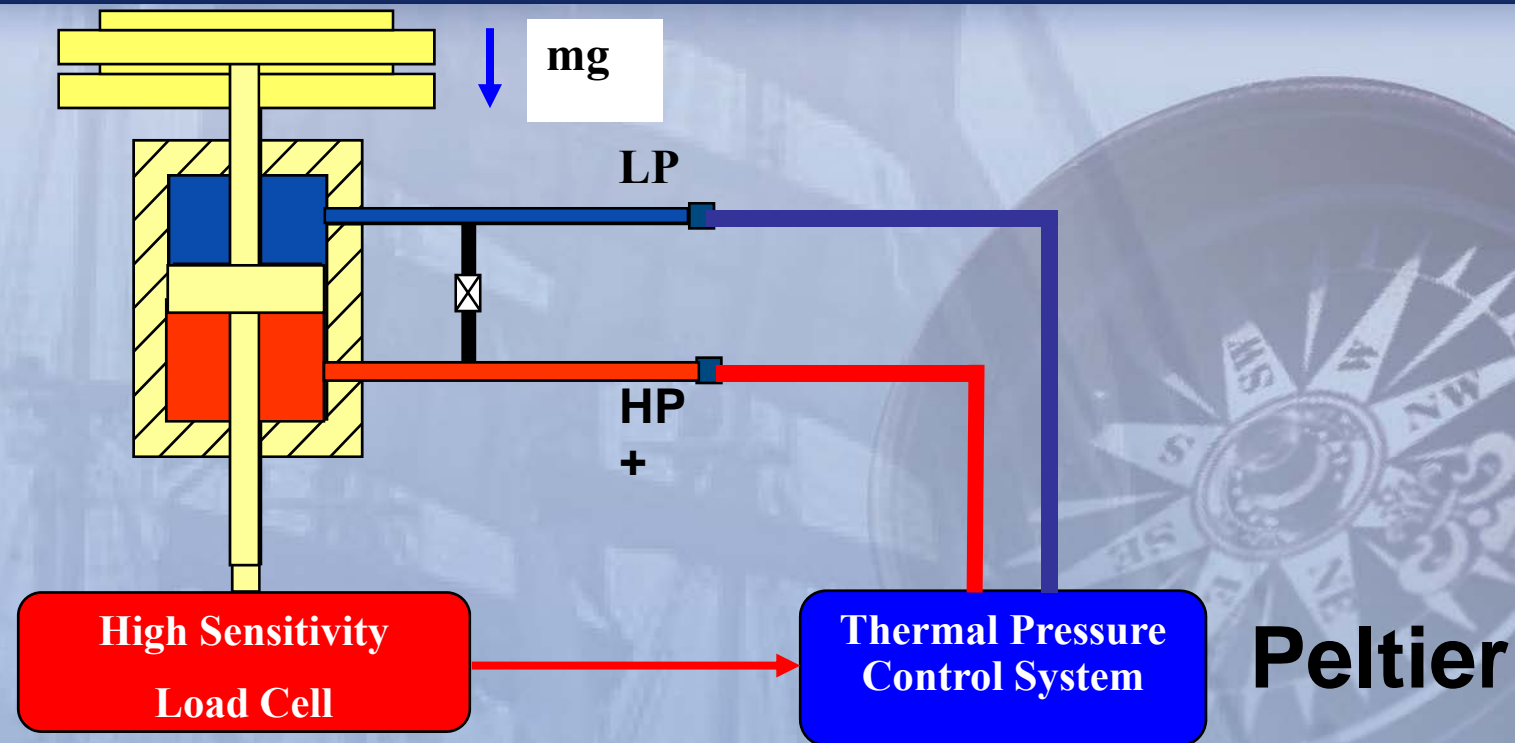
**Digital mass balance supports piston mass and serves as a null detector to allow 0 DP by removing piston mass**



# Control System

FLUKE®

Calibration



Masses applied to generate DP

Digital Balance provides feedback to thermal control system

Drive balance back to 0 (null detector)



# Why Oil?

**FLUKE**®

Calibration

- Eliminates slow pressurization rates
- Isolates contamination from DUT from piston
- Manufacturing efficiency
- Eliminates piston cleaning requirement
  - Reduces down time
- DUT can be calibrated on oil or gas (air or N2)

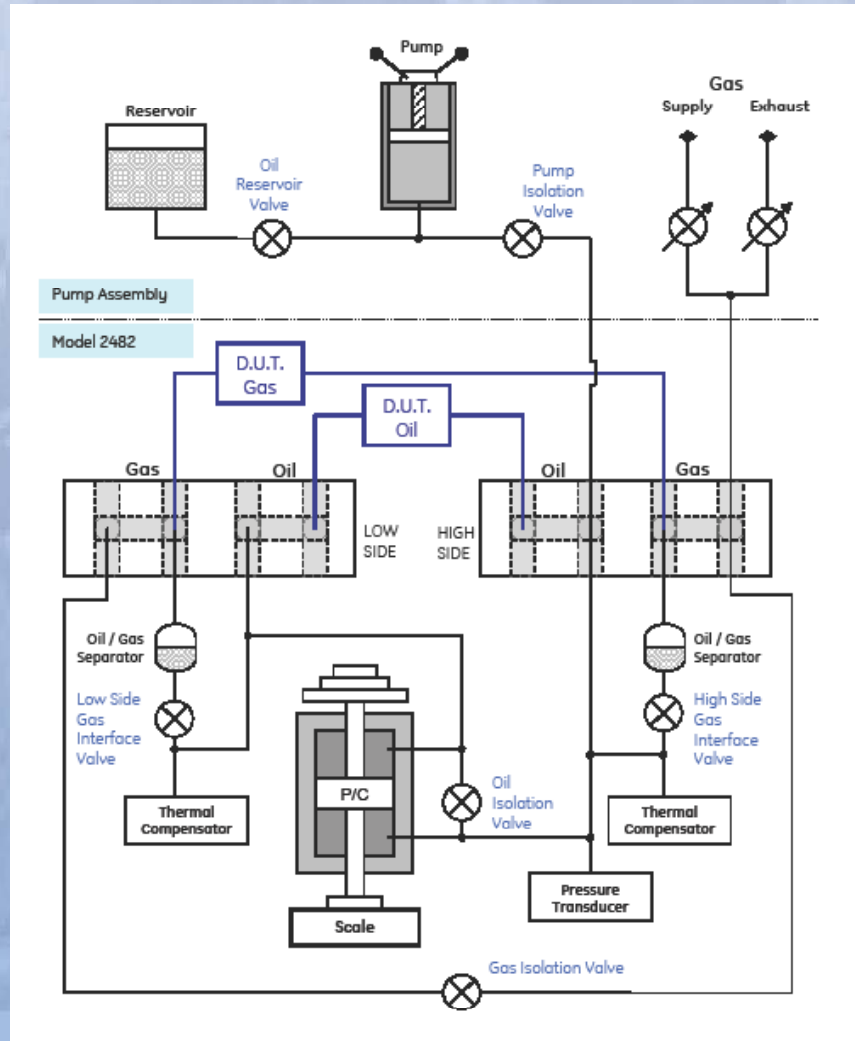




# System Schematic

**FLUKE**®

Calibration



# Mass Set

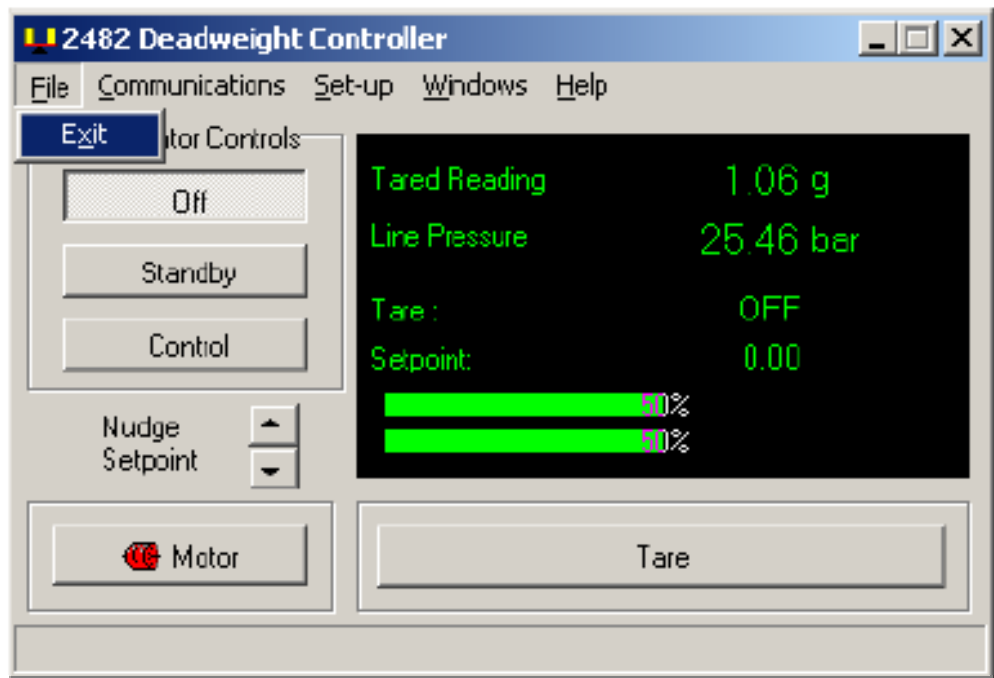
**FLUKE**®

Calibration

- Non magnetic stainless steel
- Largest mass: 4 kg
- Mass Set Total: 13.5 kg
- Minimum pressure increment: 0.5 inH<sub>2</sub>O (1.0 mbar)
- Wood storage case



# 2482 Software Controller Display



- Current Tared reading
- Line pressure reading
- Current tare value
- Targeted grams value for thermal compensator
- Power setting applied to Temp. Controllers



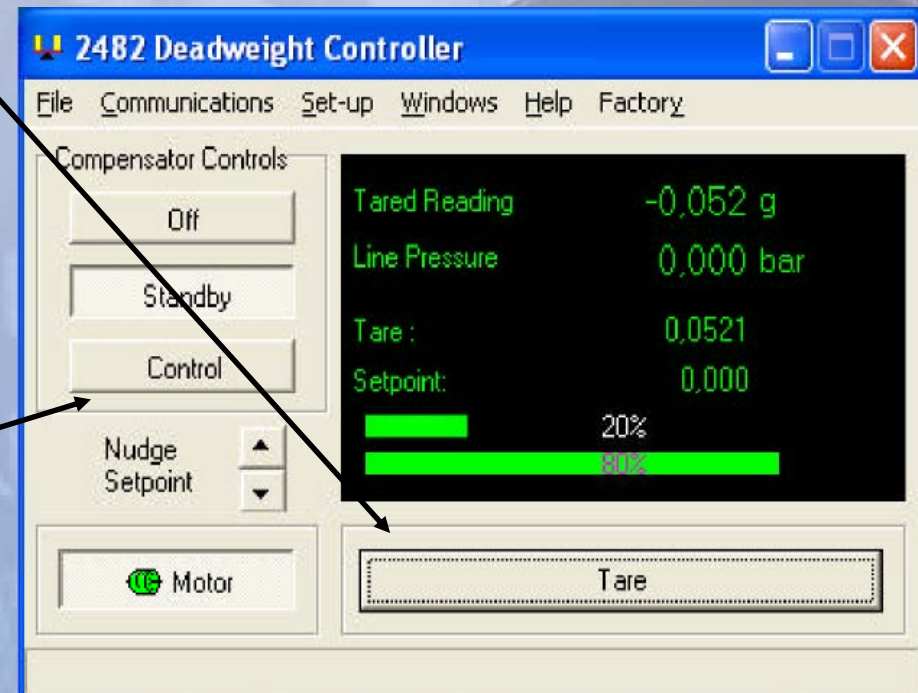
- Select standby to allow system to stabilize and optimize gain

- Activate motor



# Operation

- Press tare to zero balance
- Put valves in isolate mode
- Press control to activate the thermal control system
- Apply desired weight masses
- Take reading!



***Initial zero control can take up to 15 min.***



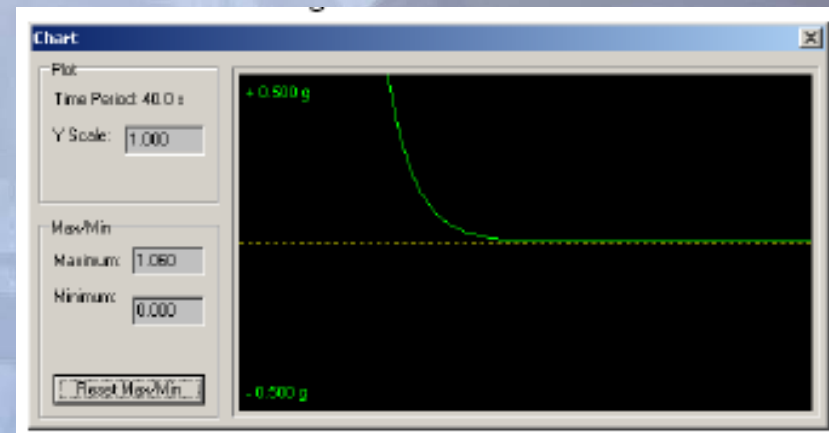


# Operation

**FLUKE**®

Calibration

- Control system drives tared reading to setpoint
- Software provides graphic view of tared reading



# Winprompt® & 2482 Control Software



WinPrompt →

The screenshot displays the WinPrompt software interface with several windows:

- Pressure to Mass:** A table with columns for Pressure and Mass.
- Calibration:** A table with columns for ID, Type, Actual, and Standard.
- 2482 P Deadweight Controller:** A control panel with a graph showing a balance signal fluctuating around a setpoint.
- Control/Filter parameters:** A window showing various control parameters such as Loop Parameters and Time constants.

2482 Balance graph

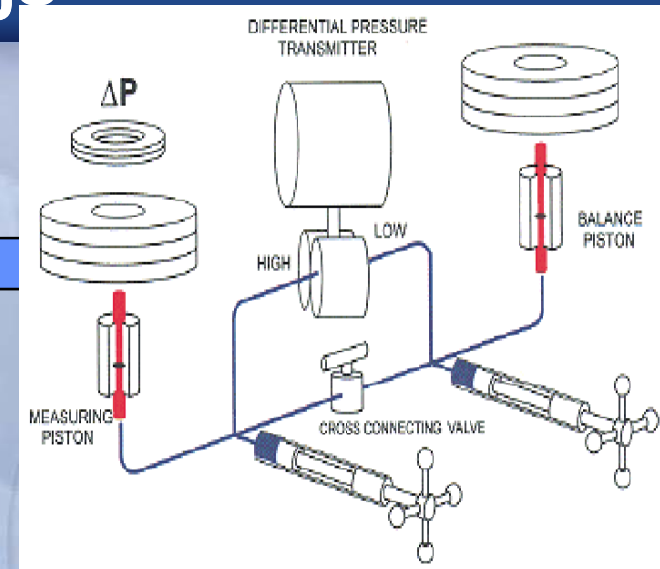
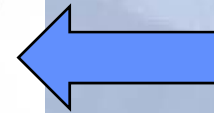
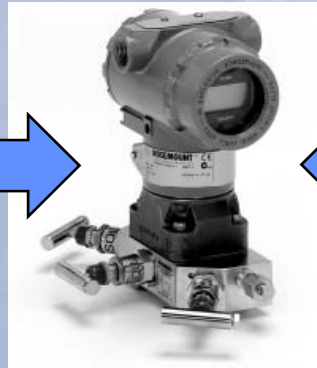
2482 Controller

2482 Control/Filter parameters

Software package drives the control system, displays the readings, performs pressure-to-mass calculations and can be used to correct for environmental influences



# 2482 vs. Twin Post Cost Savings



**Price ~\$ 50/60K**

**Price ~\$75-85k+**

**10 point cal at single static line pressure**

**Time/labor**

**Time/labor**

**2 hours @ \$ 100 per hour**

**9 hours @ \$ 100 per hour**

**\$ 200**

**Vs.**

**\$ 900**



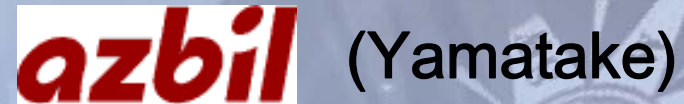
**Initial Investment Savings of \$ 30-40k with ROI after 64 calibrations!!!**

# 2482 Customers

**FLUKE**®

Calibration

- Welltech, China
- CEZ Nuclear, Czech Rep.
- ACK, Romania
- Rolls Royce, UK
- Yamatake, Japan
- Romgaz, Romania
- Measurement Canada
- Endress & Hauser
- Boeing, USA





# 2482 Differential Piston Gauge

Thank you  
Visit us at booth G-4

