

**FLUKE®**

**Calibration**

# E-DWT-H™ Electronic Deadweight Tester

Hydraulic deadweight tester performance  
with digital measurement convenience



# E-DWT-H Electronic Deadweight Tester™

## A modern alternative to the traditional deadweight tester

E-DWT-H breaks new ground, improving the hydraulic pressure calibration process. E-DWT-H is an electronic calibrator designed to replace mechanical, piston-cylinder and weight based deadweight testers. It's a lighter weight, easier-to-use deadweight tester alternative that is at home in the lab or instrument shop, as well as in the field performing in-situ calibrations and tests.

This complete hydraulic pressure calibration system combines the convenience and precision of continuous, real time electronic pressure measurement with the simple and direct operation of high quality operator controlled pressure generation hardware.

E-DWT-H one year measurement uncertainty is  $\pm 0.02\%$  of reading with ranges up to 30 000 psi. It can be configured to provide this uncertainty from its full scale down to 1% of its range. Built-in pressure generation and control hardware allow the operator to fill and prime the system under test and generate and precisely adjust pressure throughout the range with ease.

**AutoTest™ lets E-DWT operators quickly define test points and adjust all of the range-dependent settings with a single function.**

The resolution and stability test used by the RPM4-E-DWT are set according to the range of the device under test. The upper limit setting is also set and provides range-based warnings and overpressure protection. While running AutoTests, the operator is prompted to set each sequential test point and test data is stored

### Deadweight tester performance with digital measurement convenience

E-DWT-H offers precision, low measurement uncertainty and the stability over time of a conventional deadweight tester without the inconveniences associated with the piston-cylinders, weights, hand pumps, and interconnecting plumbing.

- No weights to load and unload or regularly send out for calibration
- No need to know and correct for local gravity or ambient temperature
- No piston-cylinder changes; switch Q-RPT ranges in seconds
- Not sensitive to level or vibration
- Able to set and read any pressure value exactly, no minimum increment limited by smallest available masses
- Operates in any unit of measure while deadweight tester is typically limited to the pressure unit stamped on the mass
- Perfect for applications that require setting a nominal pressure precisely on the

in the RPM4-E-DWT for recall or download. Typical test setup is quick and easy, but more complex tests can also be stored and reused.

### Broad workload coverage

The E-DWT-H has the operational versatility to calibrate and test a broad range of pressure measuring instruments including:

- Analog gauges
- Transducers
- Calibrators
- Sensors
- Transmitters

device under test and measuring it, such as analog gauge calibration

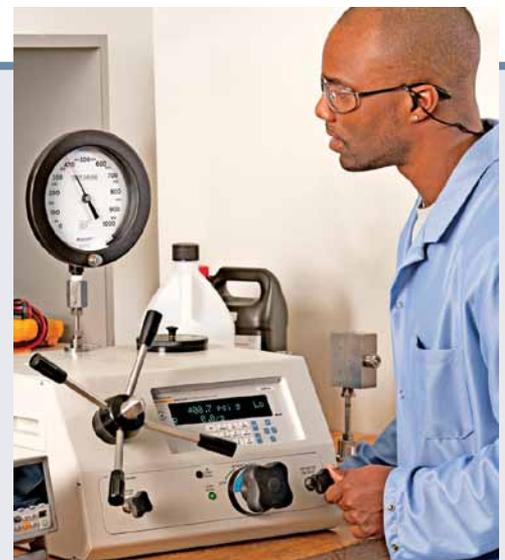
- On-board, AutoTest calibration routines and data acquisition
- Interfaceable with a PC or laptop to allow for automated data acquisition
- Two year calibration interval supported at measurement uncertainty of  $\pm 0.025\%$  of reading.
- Easily recalibrated without crossfloating. Automated calibration of E-DWT-H is possible using COMPASS® for Pressure software.

### Versatility to cover a broad workload in a variety of environments

The E-DWT-H is at home in metrology and calibration labs, on the production floor or in the field.

It operates with Sebacate calibration fluid, mineral oil, Skydrol® and other liquids.

An optional battery/charger pack supports up to eight hours of operation away from line power.



E-DWT-H in lab environment

# leave the deadweight behind

## All the features you expect in today's state-of-the-art instruments, including:

### Accuracy and performance

- Can be configured to provide uncertainty of  $\pm 0.02\%$  of reading from 1% to 100% of full scale range
- Low torque variable volume allows for pressure generation up to 200 MPa (30 000 psi) with minimal physical effort
- Separate fine adjustment tool for maximum, superfine control resolution
- User defined resolution and ready limits enable user to optimize performance based on DUT specifications
- High pressure isolation valve and pressure relief valve protect the low pressure reference transducer from over pressure when high pressure reference transducer is active

### Ease of use

- AutoRange feature optimizes measurement and safety features for the specific range of the instrument being calibrated
- Simple rezeroing while vented at atmospheric pressure
- Simple, objective pressure "ready/not ready" indicator with user adjustable criteria to ensure repeatable results among operators
- Not dependent on local gravity or ambient temperature
- Sets and reads any pressure value directly in any unit of measure, without moving weights
- Built-in priming system to fill system with test fluid and purge unwanted air to assure smooth operation
- Optional foot switch accessory allows hands-free data collection when running AutoTests

### Portability

- Rechargeable battery pack option for eight hours of field operation
- Everything to set, adjust and read pressure in one compact, transportable package
- Optional shipping/carrying case with handles and wheels allows for easy transport to field application
- Proven rugged and weatherproof design with room for accessories.

### Automation

- RS-232 interface allows for real time automated data collection and customized report generation using DHI's COM-PASS for Pressure calibration software

### Free upgrades

- Flash memory for simple and free embedded software upgrades from [www.dhinstruments.com](http://www.dhinstruments.com)

### Reference pressure monitor and Q-RPT quartz reference pressure transducers

The E-DWT's electronic reference pressure monitor is a dedicated version of DHI's RPM4, designated RPM4-E-DWT. RPM4-E-DWT can be configured with one or two high precision quartz reference pressure transducers (Q-RPTs) with ranges from 7 MPa (1 000 psi) to 200 MPa (30 000 psi).

E-DWT's outstanding pressure measurement specifications are made possible by DHI's exclusive quartz reference pressure transducer (Q-RPT) modules.

Q-RPTs measure pressure by measuring the change in the natural oscillating frequency of a quartz crystal with pressure induced stress. To be qualified for use in a Q-RPT module, each transducer is individually evaluated and characterized using automated primary pressure standards. Only transducers exhibiting superior levels of linearity, repeatability and stability are selected. A proprietary compensation model, derived from 20+ years experience with thousands of quartz pressure transducers, is applied to optimize the metrological characteristics.

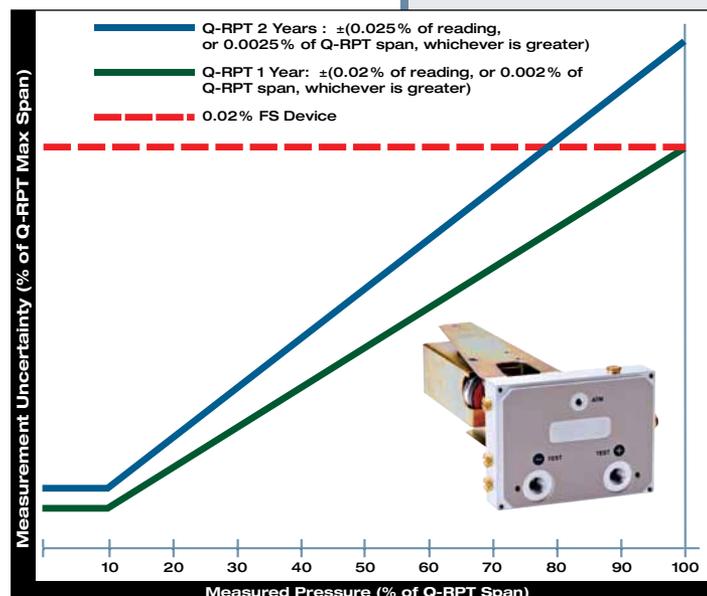
### Q-RPT module advantages

In addition to outstanding metrological characteristics, Q-RPT modules offer the advantages of:

- Negligible warm-up time
- Quartz element isolated from test medium
- Minimal sensitivity to orientation

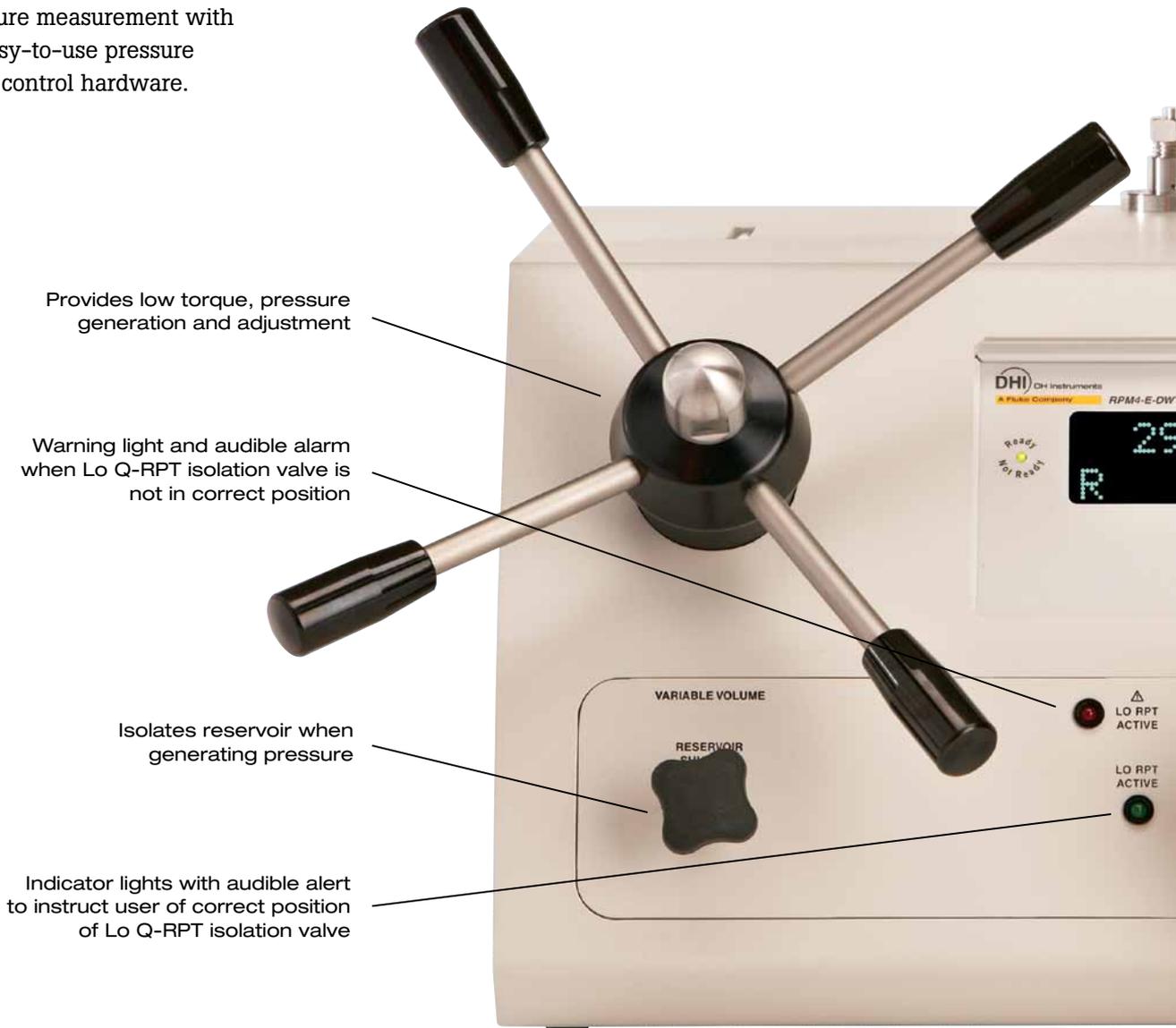
### Q-RPT measurement uncertainty

% of reading uncertainty gives tremendous rangeability.



# E-DWT-H—high pressure hydraulic

E-DWT-H combines reliable, digital reference pressure measurement with high quality, easy-to-use pressure generation and control hardware.



Provides low torque, pressure generation and adjustment

Warning light and audible alarm when Lo Q-RPT isolation valve is not in correct position

Isolates reservoir when generating pressure

Indicator lights with audible alert to instruct user of correct position of Lo Q-RPT isolation valve

## RPM4 reference pressure monitor front panel display

A clean, simple front panel with a large display screen makes the E-DWT-H easy to learn and straightforward to use



1. Pressure "Ready" (green) "Not Ready" (red) based on real time measurement of pressure stability
2. Value of measured pressure
3. Pressure unit of measure
4. Measurement mode
5. Active Q-RPT module (Hi or Lo)
6. The Function/Data keys allow commonly used functions, such as unit of measure change, to be accessed directly by a single keystroke when pressed
7. Launch pre-recorded or quick set up automated calibration sequences



Test port for single device under test or connection to test system/manifold (2nd test port on rear)

Fill, purge and prime the test system

Calibration fluid reservoir

RPM4-E-DWT reference pressure monitor with user interface

In E-DWTs with dual Q-RPTs, half turn, spring loaded valve isolates the low pressure Q-RPT when the high pressure Q-RPT is in use

Shuts off test ports to refill variable volume if needed and provides superfine pressure adjustment

### E-DWT-H with single Q-RPT



## E-DWT-H in the field

E-DWT-H has been designed for ease of use in the field performing in-situ calibrations and tests. The optional rugged, wheeled case allows quick setup and makes transport easy and worry free. With the battery pack option, eight hours of field application is possible. No need to drain fluid or disassemble hardware for transport. Simply remove from case connect to test item.

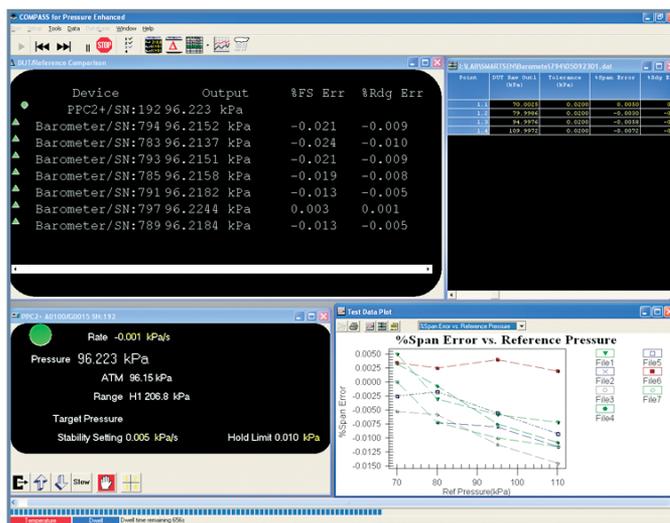


## Automate data collection and manage calibration assets with COMPASS for Pressure software

E-DWT can run stand-alone tests and collect test data. Test data can be downloaded over the RPM4-E-DWT's RS-232 interface.

The RPM4-E-DWT's RS-232 interface can also be used to run the E-DWT with COMPASS for Pressure software or user developed software.

COMPASS for Pressure software is universal pressure calibration software for the laboratory, which can be used to run simple or complex tests with multiple instruments. The user can create his/her own calibration report, and data can be exported to Fluke MET/CAL Plus Calibration Management Software.



## The support you need, when you need it

DHI's calibration, testing and repair services are dedicated to satisfying your needs quickly and at a fair cost while maintaining the unmatched level of quality that is our trademark.

DHI's calibration laboratories are accredited by the American Association for Laboratory Accreditation (A2LA) for conformance to ISO Guide 17025.

As a Fluke company, DHI has access to global calibration and repair facilities to keep your hardware in top working order.

If you need training for yourself or your staff, DHI offers a broad range of classes including: the principles and practices of pressure calibration, advanced pressure metrology, gas flow calibration using a DHI molbloc/molbox system, set up and operation of COMPASS for Pressure calibration assistance software, and much more.

Fluke's commitment to support provides additional benefits as well, including invitations to software user group meetings and conferences, periodic email bulletins and a pressure and flow newsletter.

# Specifications

General	
Power requirements	To RPM4-E-DWT: 12 V dc 1.2 A To ac to dc power supply: 100 V ac to 240 V ac, 50/60 Hz
Operating temperature	10 °C to 40 °C (50 °F to 104 °F)
Storage temperature	-20 °C to 70 °C (-4 °F to 158 °F)
Relative operating humidity	0 % to 70 %
Relative storage humidity	0 % to 100 %
Weight	1 Q-RPT: 12 kg (26 lb) approximate 2 Q-RPT: 14 kg (30 lb) approximate
Dimensions	E-DWT footprint (W x D): 41.4 cm x 37.1 cm (16.3 in x 14.6 in) E-DWT height: 26.9 cm (10.6 in), 33.6 cm (13.2 in) to max variable volume handle height)
Pressure ranges (Dependent on Q-RPT(s) included in RPM4-E-DWT.)	200 MPa (30 000 psi) maximum with standard variable volume 100 MPa (15 000 psi) maximum with high volume (-HV) variable volume
Operating medium	Delivered filled with oil (di-ethyl-hexyl sebacate) or dry. Standard E-DWT-H compatible with Sebacate, silicon oils, propylene glycol, fully fluorinated liquids, partially fluorinated liquids, isopropyl alcohol, and distilled water. Option for Skydrol or mineral oil preparation.
Reservoir capacity	300 cc (18 in <sup>3</sup> )
Variable volume displacement	Standard: 3 cc (0.18 in <sup>3</sup> ), 200 MPa (30 000 psi) maximum High: 7 cc (0.43 in <sup>3</sup> ), 100 MPa (15 000 psi) maximum
Filling and priming pump displacement	3.7 cc (0.23 in <sup>3</sup> )
TEST pressure connection	DH500 female. <i>Note: DH500 is a gland and collar type fitting for 6 mm (1/4 in) coned and left hand threaded tubes equivalent to AE F250C, HIP HF4, 9/16-18 UNF, etc..</i>
Pressure limits	Maximum working pressure: Range of RPM4-E-DWT monitor's Hi Q-RPT 200 MPa (30 000 psi) with standard variable volume 100 MPa (15 000 psi) with high volume variable volume
	Maximum priming pump pressure: 700 kPa (100 psi)
	Maximum working pressure with Lo Q-RPT selected: Range of RPM4-E-DWT monitor's Lo Q-RPT
Communication ports	RS-232 (COM1, COM2)

Pressure measurement	
Warm up time	15 minute temperature stabilization recommended from cold power up
Normal operating temperature range	10 °C to 40 °C (50 °F to 104 °F)
Resolution	Default: 0.01 % of active range. User adjustable to 1 ppm of Q-RPT maximum or 10 ppm of active AutoRange, whichever is larger
Precision <sup>1</sup>	± 0.018 % of reading or 0.0018 % of Q-RPT span, whichever is greater
Predicted stability <sup>2</sup>	One year: ± 0.0075 % of reading Two year: ± 0.015 % of reading
Measurement uncertainty <sup>3</sup>	One year: ± 0.02 % of reading or 0.002 % of Q-RPT span, whichever is greater Two year: ± 0.025 % of reading or 0.0025 % of Q-RPT span, whichever is greater

<sup>1</sup> Combined linearity, hysteresis, and repeatability. Precision does not include stability or calibration reference uncertainty.

<sup>2</sup> Predicted Q-RPT measurement stability limit (k=2) assuming regular use of AutoZero function and short term stability between rezeroing.

<sup>3</sup> Maximum deviation of the Q-RPT indication from the true value of applied pressure including precision, predicted stability with rezeroing, temperature effect from 10 °C to 40 °C (50 °F to 104 °F) and calibration uncertainty (assumes calibration reference uncertainty of ± 0.005 % of reading, k=2), combined and expanded (k=2) following the ISO "Guide to the Expression of Uncertainty in Measurement."

## Configuring an E-DWT-H Electronic Deadweight Tester

1. Determine the maximum pressure desired and select the Hi Q-RPT from the E-DWT-H Q-RPTs chart.
2. If uncertainty better than  $\pm 0.02\%$  reading is needed below 10% of the span of the Hi Q-RPT, add a Lo Q-RPT from the E-DWT-H Q-RPTs chart. Lo Q-RPT cannot be higher than A40M.
3. If desired, specify the high volume variable volume rather than the standard volume variable volume (limits maximum pressure to 100 MPa).
4. Standard preparation for unit is filled with Sebacate oil calibration fluid. See specifications for compatibility with other liquids. If other preparation is needed, must specify either "Shipped Dry, Std Prep," "Shipped Dry, Skydrol Ready," or "Shipped Dry, Mineral Oil Ready." The fill kit accessory is recommended for units that are shipped dry and for refilling in the field.

The configured E-DWT-H instrument designation is: E-DWT-H-HV AhhhM/AlllM

Where:

- E-DWT-H: Hydraulically operated electronic deadweight tester (E-DWT)  
 HV: High volume variable volume if desired (limits max pressure to 100 MPa). Do not include if high volume variable volume is not desired.  
 AhhhM: Hi Q-RPT designator  
 AlllM: Lo Q-RPT designator. Do not include if Lo Q-RPT is not desired.

### E-DWT-H Quartz Reference Pressure Transducers (Q-RPTs)

Q-RPT Designator	SI Version Maximum Range [MPa] Gauge	US Version Maximum Range [psi] Gauge
A200M <sup>1</sup>	200	30 000
A140M <sup>1</sup>	140	20 000
A100M <sup>1</sup>	100	15 000
A70M <sup>1</sup>	70	10 000
A40M	40	6 000
A20M	20	3 000
A14M	14	2 000
A10M	10	1 500
A7M	7	1 000

<sup>1</sup> Available as Hi Q-RPT only. Lo Q-RPT must be A40M or lower.



Battery Pack/Charger. With the optional battery pack/charger, E-DWT-H can be used remotely for up to eight hours without the need for line power.

## Accessories

**E-DWT Liquid Fill Kit** To fill E-DWT delivered dry or to refill. E-DWT that has drawn in air.

**Fluid, Sebacate** Sebacate oil, 1 qt.

**Case** Rugged, wheeled, reusable molded shipping case

**Battery Pack/Charger** 12 V dc battery with charger

**Foot Switch** Remote [ENTER] foot switch

**Interconnect Kit** Connect E-DWT rear test port to test devices

**NPT Adaptor Kit** Adaptors to 1/8, 1/4, 1/2 NPTF

**BSP Adaptor Kit** Adaptors to 1/8, 1/4, 3/8, 1/2 BSP

## Total solutions in calibration

In 2007 DHI joined Fluke Calibration. This exciting change allows us to provide our customers with enhanced services and the convenience of one-stop shopping.

Fluke Calibration provides the broadest range of calibrators and standards, software, service, support and training in electrical, temperature, pressure and flow calibration. Visit [www.fluke.com/fpmcat](http://www.fluke.com/fpmcat) for more information about Fluke Calibration solutions.

## Pressure and flow calibration

- High performance pressure and gas flow standards
- Accredited pressure and gas flow calibration services
- Calibration process software
- Services and training

## Electrical calibration

- DC/LF electrical calibration
- Power calibration
- Time and frequency
- RF calibration
- Calibration software
- Services and training

## Temperature calibration

- Temperature and humidity calibration
- Calibration software
- Services and training

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