

# H&D Fitzgerald

## Pressure Pyknometry System Mark 5



Simple



Portable



Traceable

*Remember! Your density meter is only as good as its last calibration!*

A fundamental calibration method for hydrocarbon density meters  
Fully compliant with ISO 9857, API Chapter 9.4, and GOST 8.024, MI 2816



## The H&D Pyknometer

The H&D Pressure Pyknometry System Mark 5 (PPS5) is designed to allow pyknometry measurements in a laboratory or on site to MI 2816

The standard system is suitable for sampling oils with densities from 700 to 1600 kg/m<sup>3</sup>, at pressures up to 6.5 MPa and liquid temperatures from 3°C to 50°C. We can also supply systems meeting pressure ranges up to 10 MPa, and temperature ranges up to 90°C.

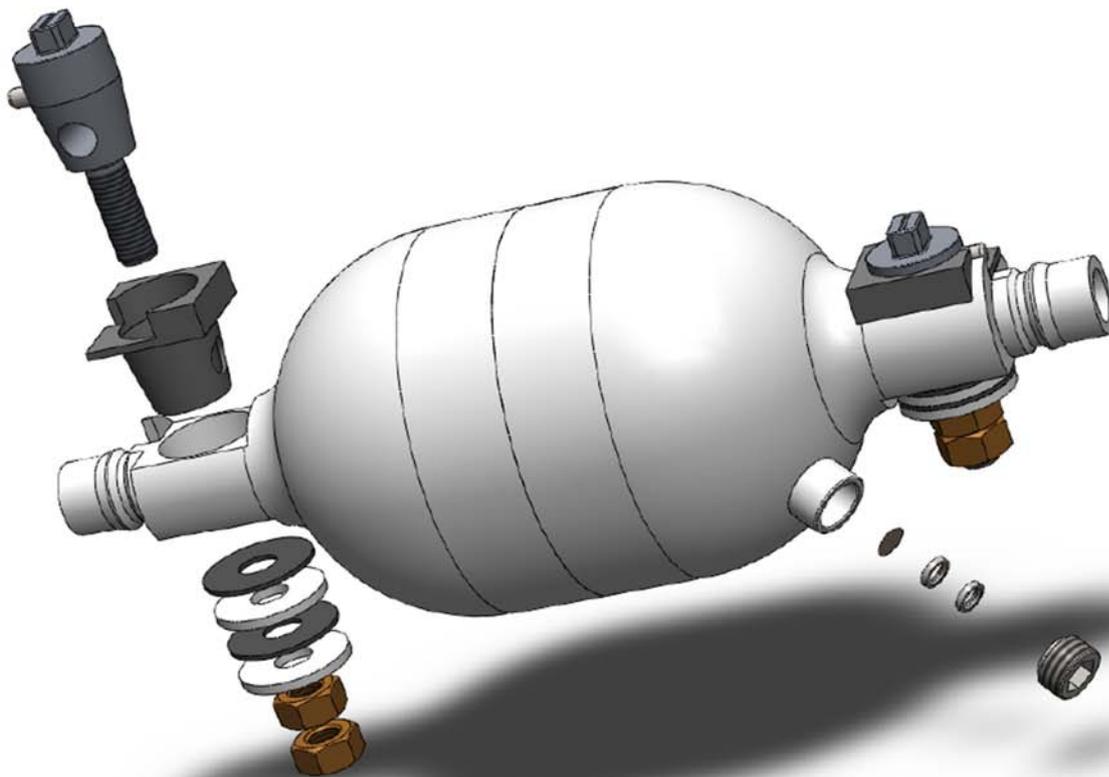
The PPS5 has type approval certificate 30919, registered in the State Register of Measuring Instruments under 37320-08, and is manufactured under our ISO 9001 accreditation.

A pyknometer is a stainless steel pressure vessel which is used to calibrate and validate density meters for oil and oil products. Pyknometry gives direct verification of the density meter's reading, and so enables very accurate calibration of the instrument in-situ. Unlike secondary techniques, such as transfer densitometers, pyknometry is a fundamental calibration method which allows traceable calibration of on-line density meters at their on-line conditions.

## Features:

- 11.5 mm diameter valve ports to enable high flow rates through the vessel, and give rapid temperature stabilisation.
- Internal shape designed to give good mixing with no low-velocity zones. This mitigates against the collection of gas bubbles or water droplets.
- Simple, low-maintenance valves, and integral clip-on connectors.
- A working pressure of up to 100 bar, with test certificates from DNV (similar to Lloyds and Rostechnadzor). The vessel is also fitted with a rupture disc to guard against the build up of excess pressure.
- Built under European PED approval from DNV.

The H&D pressure pyknometer, through its unique design, ensures accurate measurements, and is simple to use.



## A fundamental calibration method for oil and oil products density meters

Pyknometry is the most reliable way of calibrating density meters. It is the only calibration method which overcomes possible measurement errors such as liquid viscosity, flow rate, temperature, mounting torque, pressure, position and vibration.

H&D Fitzgerald's Pressure Pyknometry System Mark 5 (PPS5) provides a foolproof way of calibrating crude oil density meters in-situ, and is fully compliant with ISO 9857 and API Chapter 9.4.

This measurement system is capable of determining density to better than  $0.1 \text{ kg/m}^3$  at the 95% confidence level.

All aspects of the PPS5 are calibrated traceably to recognised national standards. A full set of calibration certificates is provided.

## A fully portable calibration system



The PPS5 is fully portable, for easy transport by air.

All the equipment that you need is fitted into five toughened polypropylene cases.

|                       |              |
|-----------------------|--------------|
| Main System Case      | 21 kg        |
| Balance Case          | 10 kg        |
| Weights Case          | 7 kg         |
| Hoses Case            | 20 kg        |
| Pyknometer Carry Case | 13 kg        |
| <b>Total:</b>         | <b>71 kg</b> |

All cases are water resistant, dustproof, and crushproof, and can be locked for security.

# A Comprehensive Calibration System

## Main System Case

The main system case is connected to the plant during sampling. It contains all the equipment necessary to collect a representative sample of oil at the same temperature and pressure as that flowing through the density meter.

### Features:

- Two Wika CPT6210 pressure sensors with digital displays. These units have a resolution of 0.01bar and are intrinsically safe.
- Two Elemer TCM 9410-M1-H dual-input compact digital thermometers. One unit connects to two contact sensors in protective shoes which measure the temperature of the oil sample in the pyknometers. The other connects to two temperature probes which measure the temperature of the oil in the pipeline. Again, the units are intrinsically safe.
- A valve plate with flow indicator and self-sealing 'Dry Break' stems for connecting the hoses from the plant to the pyknometers.
- An insulated pyknometer box. This is mounted in an upright position during sampling.
- An integrated toolbox containing various tools required when operating and servicing the system, and sufficient spare parts for three years operation.



## Pyknometer Carry Case

The pyknometer carry case ensures the safe storage and transport of the calibrated pyknometers when not in use.



## Hose Case

The hose case contains all the necessary hoses and connectors to connect the system to the plant. All hoses have smooth ptfе liners, stainless steel braid for safety, a layer of insulating foam rubber, oil-resistant Viton sheaths, and are designed to guard against the build up of static electricity. The hoses are also equipped with 'Dry Break' connectors which are oil and gas leak-free when disconnected. An adaptor is provided to allow the hoses to be emptied and cleaned prior to transport.



## Balance Case

The system is supplied with a Mettler Toledo XS6002S Precision Balance. This is used to weigh the pyknometers. The balance has a working range of up to 6.1 kg, with a readability of 10 mg.



## Weights Case

The system comes complete with four stainless steel OIML Class E2 weights (2 × 2 kg and 2 × 1 kg) which are used to calibrate the balance. These precision weights are engraved for identification, and have ultra low magnetic field strength and permeability.

## Giving you confidence in your measurements

All instruments and weights supplied as part of the Pressure Pycnometry System Mark 5 are calibrated traceably to recognised national standards held by the UK National Physical Laboratory and other National Measurement Institutes.

Each system comes with a quality manual containing calibration certificates, test certificates, and a comprehensive operators' manual. All documentation is provided in Russian.



**СЕРТИФИКАТ КАЛИБРОВКИ**  
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Страница 1 из 2  
 Подпись поверителя  
**H. Fitzgerald**

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Клиент

Пикнометрическая система номер 20045

Описание  
Пикнометрический сосуд из нержавеющей стали номинальным объемом 1120 мл.

Идентификация  
Корпус отмаркирован: ИЗГОТОВИТЕЛЬ H&D FITZGERALD LTD  
СЕРИЙНЫЙ НОМЕР 324

Штоки кранов пикнометров имеют серийные номера 80 и 81. Все остальные детали кранов помечены двумя точками.

Основные испытания  
Этот сосуд был откалиброван путем взвешивания с использованием воды. Процедура выполнена в соответствии с методикой калибровки, рекомендованной Институтом Нефти Великобритании. Руководство по измерениям нефтепродуктов, часть VII, секция 2 Измерение Плотности На Поток, Приложение 5, издание 1997.

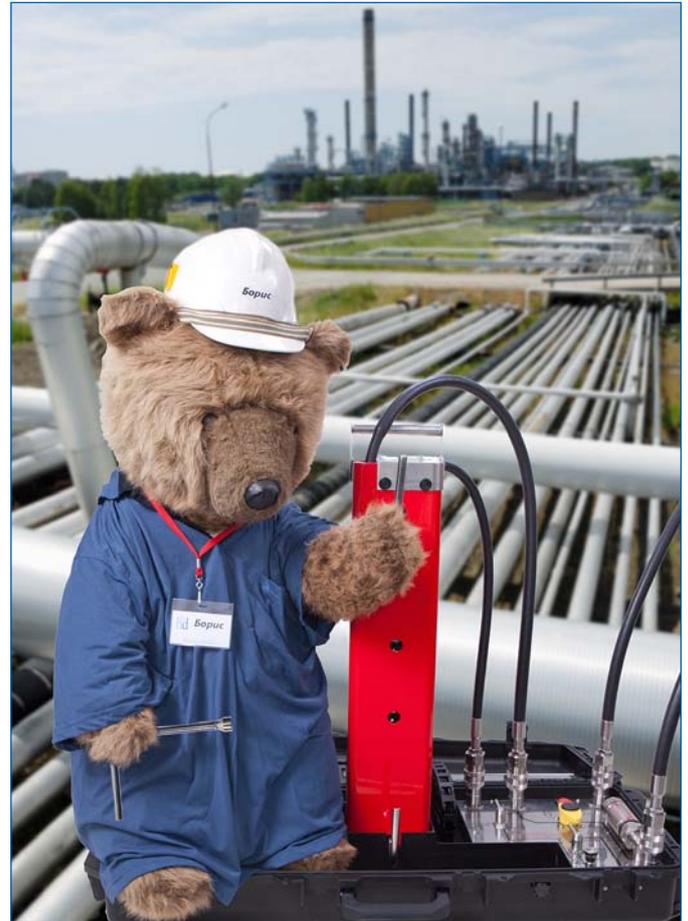
|   | Измерено |                                   | Неопределенность                          |
|---|----------|-----------------------------------|---|
| Масса корпуса пикнометра  | 4058,253 | г                                 | ±0.005 г                                  |
| Масса корпуса пикнометра с предохранительным диском                     | 4070,396 | г                                 | ±0.005 г                                  |
| Масса полностью собранного пикнометра                                   | 4597,904 | г                                 | ±0.005 г                                  |
| Объем при 25.00°C и 1.01325 бар   | 1128.47  | см <sup>3</sup>                   | ±0.025 см <sup>3</sup>                    |
| Среднее изменение объема в диапазоне изменения давления от 1 до 65 бар  | 0,0074   | см <sup>3</sup> бар <sup>-1</sup> | ±0.0003 см <sup>3</sup> бар <sup>-1</sup> |
| Среднее изменение объема в диапазоне изменения температуры от 3 до 50°C | 0,0590   | см <sup>3</sup> К <sup>-1</sup>   | ±0.0008 см <sup>3</sup> К <sup>-1</sup>   |

Неопределенность установлена при доверительной вероятности не менее 95 %.

## Couldn't be easier!

Pyknometry is a simple and foolproof calibration method.

- Two empty and clean pyknometers are weighed and connected in series to the flowing oil directly downstream of the density meter to be calibrated.
- The pyknometers are then filled with a representative sample of oil at the same temperature and pressure as the oil flowing through the density meter. The system measures the pressure immediately upstream and downstream of the pyknometers so that the average value gives the pyknometer pressure.
- Once the pyknometers have stabilised at the oil temperature, the valves are closed. The pyknometers are then removed from the pipeline, the outsides are cleaned, and they are reweighed.
- The oil density at density meter conditions is then calculated from the mass of oil in the pyknometers, the volume of the pyknometers at the measured temperature and pressure, and the air density.
- An independent density is calculated for each pyknometer. The two independent results can then be checked against each other, as per the GOST requirements.
- The illustrated operators' manual describes this process in detailed, easy-to-follow steps.
- Pyknometry measurements made in this way ensure compliance with ISO 9857, API Chapter 9.4, and GOST 8.024 and MI 2816.





Designed, built, and calibrated by:

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H&D Fitzgerald is recognised as a world authority on density metrology. For more information about our other products and services please visit [www.density.co.uk](http://www.density.co.uk)



*Setting the standard in density*