Twinning Project "Strengthening the capacities of the Bureau of Metrology for internal market integration"
Twinning ref. MK 12 IPA EC 01 16 TWL

A Project funded by the European Union and Implemented and led by CMI

Fuel dispensers in practice (experience from MID certification, conformity assessment, subsequent verification, sealing

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Operating Procedure

Is apllied for measuring instruments and systems used for measurement of the flow of fuel or liquefied gases - fuel dispensers

Metrological and technical requirements, testing methods for verification

2 years

1 year

Specified working conditions

working temperatures between –25°C and 55°C as minimum

The minimum required flow ratio is Q_{max}: Q_{min} of the fuel dispenser is 10: 1 for fuel and 5: 1 for LPG

Further are specified

- **Measured liquid**
- **Minimum measured quantity (mmq)**

Accuracy classification

Fuel dispensers	Maximum permissible error (MPE)
Measuring systems (A) (fuel dispensers)	0.5%
Measuring instruments (B) (independent measuring instruments as parts for use in a dispenser)	0.3%

LPG dispensers	MPE
Measuring systems (A) (LPG dispensers)	1%
Measuring instruments (B) (independent measuring instruments as parts for use in a dispenser)	0.6%

Accuracy classification

For the smallest measured quantities equal to two litres or more, the following conditions apply:

1) E_{min} **shall meet the condition:** $E_{min} \geq 2R$**, where** R **is the smallest scale value of the indicator.**

2) E_{min} **is given by the relation:**

$$E_{min} = (mmq) \times (A/100),$$

where mmq **is the minimum measured quantity and** A **is the numerical value for measuring systems (A) in the table**

Accuracy classification

Measured volume *V*	MPE
V < 0.1l	4 × the value in Table 1 used for 0.1l
0.1l ≤ *V* < 0.2l	4 × the value in Table 1
0.2l ≤ *V* < 0.4l	2 × the value in Table 1 used for 0.4l
0.4l ≤ *V* < 1l	2 × the value in Table 1

The table gives MPE for volumes less than two litres

Maximum permissible error in use

When verifying measuring instruments in use pursuant to the Metrology Act, any party whose interests could be significantly damaged by incorrect measurement may request that the maximum permissible error during verification using the same procedure like by initial or subsequent verification.

	MPE
Measuring systems (A)	**0.5% fuel, 0,1 LPG**
Measuring instruments (B) (independent measuring instruments as parts for use in a fuel dispenser)	**0.3% fuel, 0,6 LPG**

Dispenser design

A measuring system that comprises a dispenser shall consist of at least the following main parts:

- **a flow meter;**
- **a counter;**
- **an indicator;**
- **a point of separation, usually the dispensing nozzle;**
- **a hydraulic circuit;**
- **a gas separator.**

Dispenser design

For proper operation, the following may need to be connected to the measuring system:

- **a filter;**
- **a pump;**
- **a conversion device.**

The measuring system may be equipped with other auxiliary and supplementary devices required for proper dispenser operation.

Initial and subsequent verification

- **Dispensers are tested with the liquid they are intended to measure.**
- **For dispensers with several independent dispensing locations (multiproduct dispensers), all dispensing locations shall be tested separately, and these tests shall be evaluated individually.**

Initial and subsequent verification

- **In case of two flow sensors installed in parallel, both flow sensors are first tested separately, and then the test of the entire system**
- **Dispensers with one hydraulic measuring part and several dispensing locations (satellite) will be tested according to a regular testing programme - maximum achievable flow rate will be performed from each other dispensing location (from each satellite dispensing nozzle).**

Initial and subsequent verification

Initial and subsequent verification applies only to measuring instruments that, at the given time, have a valid type approval certificate
The procedure used during initial verification is the same as for subsequent verification

Following activities and tests are performed:

- **a visual inspection;**
- **an accuracy test;**
- **tests of auxiliary and supplementary devices.**

Initial and subsequent verification

Specification of test flow rates

Q_1 = (1 to 1.1) × Q_{min},
Q_2 = (0.22 to 0.28) × Q_{max},
Q_3 = (0.6 to 1) × Q_{max}.

The test is performed at least twice for each of the three test flow rates

At each of the three test flow rates, measurement errors for the tested dispenser are calculated.

Acceptance criteria

The dispenser passes the accuracy test if none of the relative deviations of the indicated volume exceeds the MPE

The measuring system shall not exploit the MPEs or systematically favour any party

If all actual measurement errors have the same sign, at least one of the measurement errors at a typical flow rate between 0.25Q_{max} to Q_{max} must be less than half the MPE

Verification period for fuel – 2 yers, for LPG 1 year

Setting

Dispensers (dispensing nozzles) which fail the accuracy test can be set if it is obvious from values of errors in respective flow rates, that it is enough to move the error shift. The method and range of settings is described in the approval document of the dispenser and/or in operating manual.

In general, the dispenser may be set in two ways:

- **mechanically – e.g. using regulator on the measuring sensor;**
- **electronically – by changing the calibration constant saved in the memory of the electronic counter.**

Requirement after setting

Calibration process shall be such that the adjustment shall lead to measuring instrument error curves which are as much as possible near to zero with calibration tools, taking into account the technical opportunities of a measuring instrument.

The dispenser shall be set in order its relative deviation of the indicated volume E_v by the maximum achievable flow rate Q_3

Requirements in the Czech Republic

for fuel dispensers $E_v \leq 0{,}25$
for LPG dispensers $E_v \leq 0{,}5$

After the setting, the accuracy test shall be performed again in full.

Record keeping

In case of dispensers, records of specified measuring instruments shall be kept in the form of record sheets

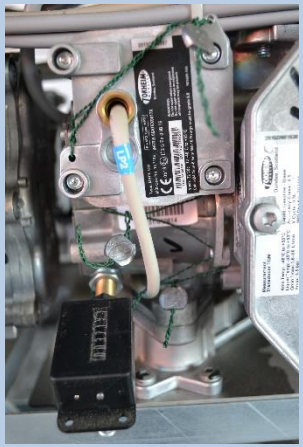
A master data or record sheet is a document intended to record technical information on the dispenser that is not provided on the label, especially the serial numbers of individual parts.

Each subsystem replacement, repair, servicing or verification of the measuring instrument is recorded in this document, which is provided during dispenser verification.

Protection against unauthorised manipulation

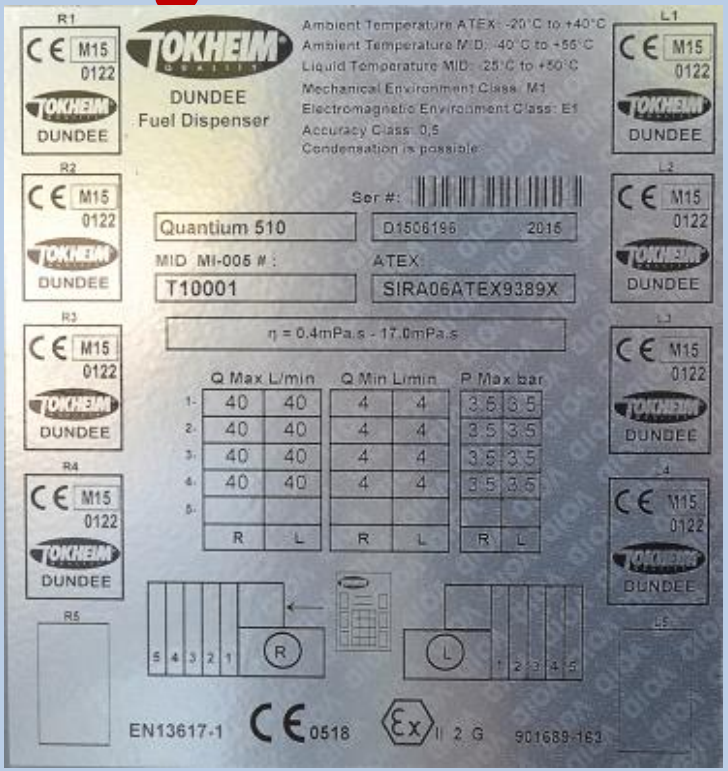
The dispenser has the required number of places for official seals.

The dispenser is designed so that the measuring instrument or indicator cannot be tampered with in a way that could affect the accuracy of the measurement without visible damage to an official seal.



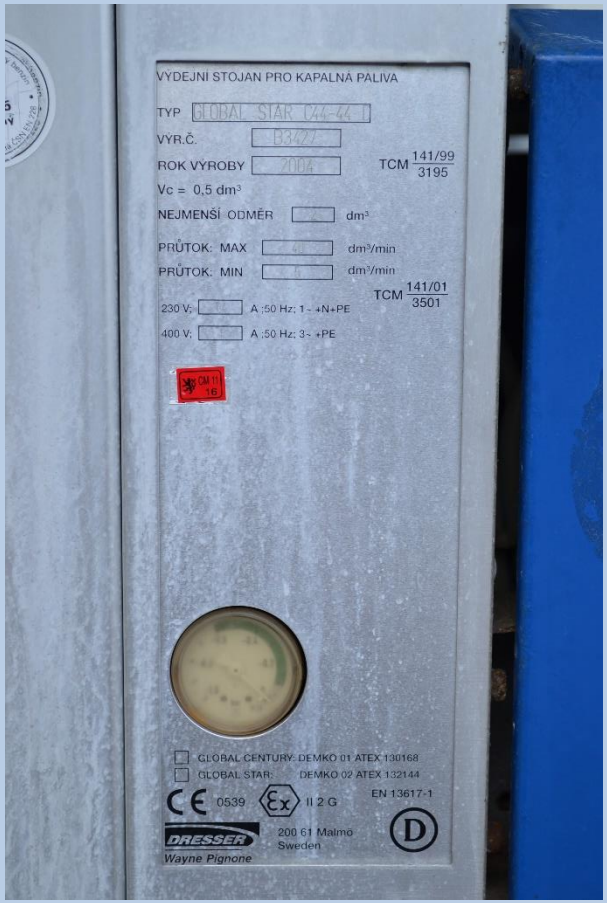
Dispenser labelling

The label shall be affixed to the body of the dispenser in a visible place and sealed.
All information on the label on the dispenser shall be legible.
Each separate metrologically relevant part of a dispenser, such as the flow sensor, measurement converter, counter or gas separator shall contain at least the following information (for example on another label):



Information on the label

- the serial number; number of type approval certificate, CE marking
- manufacturer’s name or brand;
- other relevant characteristics for the specific device type like:
  - the name or type of the measured liquid,
  - Range of the temperature
  - the mechanical and electromagnetic class
  - the nominal AC voltage value,accuracy class;
  - Indentification position



Information on the indicator

The indicator shall contain the following information:

- **the unit "Litre" or the symbol "L", "l" or "dm³" after indication of the amount;**
- **the unit of national currency near the indication of the price to be paid;**
- **information on the minimum measured quantity.**

If the conversion function is active and the amount under basic conditions is displayed, the measurement result must be accompanied by this information, for example "volume at 15°C".

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Used liquid

Dispensers are tested with the liquid they are intended to measure.

In case of dispensers intended to measure several liquids with various properties, for example for diesel fuel and petrols, verification applies only to the liquid for which the verification was performed in the installation location, unless otherwise stated in the type approval certificate or in the conformance assessment documentation.

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Further performed tests

Auxiliary and supplementary devices are checked for correct functioning

Zeroing test - The volume counter values and, if applicable, the price values are read after the dispenser is zeroed.

Price counter test

Auxiliary volume counter test

Pre-set test

Self-service facility test

Automatic temperature compensation (ATC)

If the dispenser is equipped with the automatic temperature compensation (ATC) and has a label indicating "T_b = 15°C" then the ATC function must be switched on, tested during verification, and this position must be secured with an official seal.
This requirement also applies to dispensers that have had the ATC function installed after being put into operation.

During the test of the thermometer is tested separately in advance with the MPE of ±0.4°C

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Used testing facility

Test equipment used to perform accuracy tests must have an extended uncertainty of measurement less than 1/3 of the MPE

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Safety procedures

Guideline for occupational safety and fire protection in the verification or calibration of fuel dispensers.
The purpose of the Safety Guideline is to ensure the safety and protection of health of the staff during metrological activities.
All the staff performing metrological activities must be demonstrably acquainted with the contents of the Safety Guideline



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Thank you for your attention!

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