The equipment under test (if other than the complete dispenser) shall be included in a simulation set-up representative of the normal operation of the dispenser. For example, the movement of liquid may be simulated by rotating the shaft of the pulse generator.

During these tests the equipment under test (EUT) shall be operational (i.e. the power shall be switched on) except for the damp heat cyclic (condensing) test (4.3).

4.1 Dry heat (non condensing) (Influence factor)

Object of the test:

To verify that the errors of volume and price indications do not exceed the maximum permissible errors under the effect of high temperature. All other functions shall operate correctly.

References:

IEC Publication 68-2-2, fourth edition, 1974, Basic environmental testing procedures, Part 2: Tests, Test Bd: Dry heat, for heat dissipating equipment under test EUT with gradual change of temperature.

Background information concerning dry heat tests is given in IEC Publication 68-3-1, first edition, 1974 and first supplement 68-3-1A, 1978, Part 3: Background information, section one; Cold and dry heat tests. General background information on basic environmental testing procedures is given in IEC Publication 68-1, sixth edition, 1988.

Test equipment:

Testing chamber capable of maintaining the specified temperatures within ± 2 °C.

Test procedure:

1 Maintain the EUT at 20 °C for at least two hours.

2 Set the unit price at an optional value between the minimum unit price and the maximum unit price, and select blending if applicable.

3 Adjust the flowrate or the simulated flowrate at an appropriate value between $0.5 \times Q_{max}$ et Q_{max}.

4 Reset the indications of the dispenser.

5 Operate the pump or the pulse generator at a rate equivalent to the volume flow for one minute at the maximum flowrate. (In general, 50 litres may be the appropriate value for the volume flow for normal dispensers).

6 Read P_u, V_i, P_i and V_n. (Read T only in the case of test by liquid flow).

7 Calculate P_c, V_{nc} (only in the case of test by liquid flow), E_v and E_p.

8 Change the temperature of the EUT to 55 °C at a rate not exceeding 1 °C/min. Maintain this temperature for at least two hours after it has reached stability. The humidity shall not exceed 20 g/m^3 or 19 % RH.

9 Repeat steps 4 to 7.

10 Return the temperature of the EUT to 20 °C at a rate not exceeding 1 °C/min. Maintain this temperature for at least 2 hours after it has reached stability.

11 Repeat steps 4 to 7.

4.2 Cold (Influence factor)

Object of the test:

To verify that the errors of volume and price indications do not exceed the maximum permissible errors under the effect of low temperature. All other functions shall operate correctly.

References:

IEC Publication 68-2-2, fourth edition, 1974, Basic environmental testing procedures, Part 2: Tests, Test Ad: Cold, for heat dissipating EUT with gradual change temperature.

Background information concerning cold tests is given in IEC Publication 68-3-1, first edition, 1974 and first supplement 68-3-1A, 1978, Part 3: Background information, section one: Cold and dry heat tests. General background information on basic environmental testing procedures is given in IEC Publication 68-1, sixth edition, 1988.

Test equipment:

Testing chamber capable of maintaining the specified temperatures within ± 2 °C.

Test procedure:

1 Maintain the EUT at 20 °C for at least two hours.
2 Set the unit price at an optional value between the minimum unit price and the maximum unit price, and select blending if applicable.
3 Adjust the flowrate or the simulated flowrate at an appropriate value between $0.5 \times Q_{max}$ and Q_{max}.
4 Reset the indications of the dispenser.
5 Operate the pump or the pulse generator at a rate equivalent to the volume flow for one minute at the maximum flowrate.
6 Read P_u, V_i, P_i and V_n. (Read T only in the case of test by liquid flow).
7 Calculate P_c, V_{nc} (only in the case of test by liquid flow), E_v and E_p.
8 Change the temperature of the EUT to – 25 °C at a rate not exceeding 1 °C/min. Maintain this temperature for at least two hours after it has reached stability.
9 Repeat steps 4 to 7.
10 Return the temperature of the EUT to 20 °C at a rate not exceeding 1 °C/min. Maintain this temperature for at least two hours after it has reached stability.
11 Repeat steps 4 to 7.

4.3 Damp heat, cyclic (condensing) (Influence factor)

Object of the test:

To verify that the errors of volume and price indications do not exceed the maximum permissible errors after exposing the EUT to the effect of high humidity, combined with cyclic temperature changes. All other functions shall operate correctly.

References:

IEC Publication 68-2-30, second edition, 1980, Basic environmental testing procedures, Part 2: Tests, test Db: Damp heat, cyclic (12 h + 12 h cycle), test variant 1.

Background information concerning damp heat tests is given in IEC Publication 68-2-28, second edition, 1980: Guidance for damp heat tests.

Test equipment:

Testing chamber capable of maintaining the specified temperature within ± 2 °C and the relative humidity within ± 3 %.

Test procedure:

1 Maintain the EUT at 20 °C and the relative humidity of 50 % for at least two hours.
2 Set the unit price at an optional value between the minimum unit price and the maximum unit price, and select blending if applicable.
3 Adjust the flowrate or the simulated flowrate at an appropriate value between $0.5 \times Q_{max}$ and Q_{max}.
4 Reset the indications of the dispenser.
5 Operate the pump or the pulse generator at a rate equivalent to the volume flow for one minute at the maximum flowrate.
6 Read P_u, V_i, P_i and V_n. (Read T only in the case of test by liquid flow).
7 Calculate P_c, V_{nc} (only in the case of test by liquid flow), E_v and E_p.
8 After switching off the power, change the temperature of the EUT from 20 °C to 25 °C and the relative humidity above 95 %.
9 Change the temperature of the EUT from 25 °C to 55 °C during three hours maintaining the relative humidity above 95 % during the temperature change and lower temperature phases. Condensation should occur on the EUT during the temperature rise.
10 Maintain the temperature of 55 °C and the relative humidity of 95 % until 12 hours from the start of the temperature rise.
11 Change the temperature of the EUT from 55 °C to 25 °C within three to six hours maintaining the relative humidity above 95 % during the temperature change and lower temperature phases. In the first half fall, the temperature should be lowered from 55 °C to 40 °C in one and a half hour.
12 Maintain the temperature of 25 °C and the relative humidity above 95 % until 24 hours from the start of the temperature rise.
13 Repeat steps 9 to 12.
14 Return the temperature of the EUT to 20 °C and the relative humidity to 50 %, and switch on the power. Maintain this temperature and relative humidity for at least two hours after it has reached stability.
15 Repeat steps 2 to 7.

4.4 Power voltage variations (Influence factor)

Object of the test:

To verify that the errors of volume and price indications do not exceed the maximum permissible errors under the effect of varying mains power supply. All other functions shall operate correctly.

References:

No reference to an international standard can be given at the present time.

Test equipment:

Voltage regulator

Test procedure:

1 Maintain the EUT at the reference conditions.
2 Set the unit price at an optional value between the minimum unit price and the maximum unit price, and select blending if applicable.
3 Adjust the flowrate or the simulated flowrate at an appropriate value between $0.5 \times Q_{max}$ and Q_{max}.
4 Reset the indications of the dispenser.
5 Operate the pump or the pulse generator at a rate equivalent to the volume flow for one minute at the maximum flowrate.
6 Read P_u, V_i, P_i and V_n. (Read T only in the case of test by liquid flow).
7 Calculate P_c, V_{nc} (only in the case of test by liquid flow), E_v and E_p.
8 Change the mains voltage to 110 % of the nominal value.
9 Repeat steps 4 to 7.
10 Change the mains voltage to 85 % of the nominal value.
11 Repeat steps 4 to 7.

4.5 Short-time power reductions (Disturbance)

Object of the test:

To verify, under the effect of short-time interruptions and reductions in mains voltage, that either significant faults do not occur or significant faults are detected and acted upon by means of a checking facility.

References:

No reference to international standard can be given at the present time.

Test equipment:

Test generator suitable to reduce the amplitude of one or more half cycles (at zero crossings) of the AC mains voltage.

Test procedure:

1 Maintain the EUT at the reference conditions.
2 Adjust the test generator to the specified conditions and connect it to the EUT.
3 Set the unit price at an optional value between the minimum unit price and the maximum unit price, and select blending if applicable.
4 Adjust the flowrate or the simulated flowrate at an appropriate value between $0.5 \times Q_{max}$ and Q_{max}.
5 Reset the indications of the dispenser.
6 Operate the pump or the pulse generator at a rate equivalent to the volume flow for about two minutes at the maximum flowrate.
7 Read P_u, V_i, P_i and V_n. (Read T only in the case of test by liquid flow).
8 Calculate P_c, V_{nc} (only in the case of test by liquid flow), E_v and E_p.
9 Reset the indications of the dispenser.

10 Start the pump or the pulse generator.

11 Reduce the mains voltage to 100 % for half a cycle and repeat nine times with an interval of at least 10 seconds.

12 Stop the pump or the pulse generator at the same volume flow or number of pulses as in step 6.

13 Repeat steps 7 and 8.

14 Repeat steps 9 and 10.

15 Reduce the mains voltage by 50 % for one cycle and repeat nine times with an interval of at least ten seconds.

16 Stop the pump or the pulse generator at the same volume flow or number of pulses as in step 6.

17 Repeat steps 7 and 8.

4.6 Electrical bursts (Disturbance)

Object of the test:

To verify, when electrical bursts are superimposed on the mains voltage, that either significant faults do not occur or significant faults are detected and acted upon by means of a checking facility.

References:

IEC Publication 801-4, first edition, 1988, Electromagnetic compatibility for industrial-process measurement and control equipment, Part 4: Electrical fast transient/burst requirements.

Test equipment:

Test generator having an output impedance of 50 Ω, and capable of superimposing electrical bursts, of which each spike has a peak value of 1 kV, a rise time of 5 ns, a burst length of 15 ms and a burst period (repetition time interval) of 300 ms, on the AC mains voltage.

Test procedure:

1 Maintain the EUT at the reference conditions.

2 Adjust the test generator to the specified conditions and connect to the EUT.

3 Set the unit price at an optional value between the minimum unit price and the maximum unit price, and select blending if applicable.

4 Adjust the flowrate or the simulated flowrate at an appropriate value between $0.5 \times Q_{max}$ and Q_{max}.

5 Reset the indications of the dispenser.

6 Operate the pump or the pulse generator at a rate equivalent to the volume flow for one minute at the maximum flowrate.

7 Read P_u, V_i, P_i and V_n. (Read T only in the case of test by liquid flow).

8 Calculate P_c, V_{nc} (only in the case of test by liquid flow), E_v and E_p.

9 Set the test generator in a non-symmetrical condition between the reference ground and one line of the AC mains power supply.

10 Reset the indications of the dispenser.

11 Start the pump or the pulse generator.

12 Apply ten positive, randomly-phased bursts, each of which has a length of 15 ms and a repetition time interval of 300 ms.

13 Stop the pump or the pulse generator at the same volume flow or number of pulses as in step 6.
14 Repeat steps 7 and 8.
15 Repeat steps 10 and 11.
16 Apply ten negative, randomly-phased bursts in the same way as in step 12.
17 Stop the pump or the pulse generator at the same volume flow or number of pulses as in step 6.
18 Repeat steps 7 and 8.
19 Set the test generator in a non-symmetrical condition between the reference ground and the other line of the AC mains power supply.
20 Repeat steps 10 to 18.

4.7 Electrostatic discharges (Disturbance)

Object of the test:

To verify, under the effect of electrostatic discharges, that either significant faults do not occur or significant faults are detected and acted upon by means of a checking facility.

References:

IEC Publication 801-2, second edition, 1991, Electromagnetic compatibility for industrial-process measurement and control equipment, Part 2: Electrostatic discharge requirements.

Test equipment:

Test equipment having a capacitor of 150 pF, which is able to be charged up to 8 kV DC voltage and then discharged through the EUT, or vertical or horizontal coupling plate (VCP or HCP) by connecting one terminal to the ground (earth reference plane) and the other via 330 Ω resistance to the surfaces of the EUT, or VCP or HCP.

Test procedure:

Both direct and indirect discharges shall be applied including the paint penetration method.

When contact discharges (test voltage: 6 kV) are not possible, air discharges (test voltage: 8 kV) shall be applied.

1 Maintain the EUT at the reference conditions.
2 Adjust the test equipment to the specified conditions.
3 Set the unit price at an optional value between the minimum unit price and the maximum unit price, and select blending if applicable.
4 Adjust the flowrate or the simulated flowrate at an appropriate value between $0.5 \times Q_{max}$ and Q_{max}.
5 Reset the indications of the dispenser.
6 Operate the pump or the pulse generator at a rate equivalent to the volume flow for about two minutes at the maximum flowrate.
7 Read P_u, V_i, P_i and V_n. (Read T only in the case of test by liquid flow).
8 Calculate P_c, V_{nc} (only in the case of test by liquid flow), E_v and E_p.
9 Reset the indications of the dispenser.

10 Start the pump or the pulse generator.

11 Apply at least ten discharges, at intervals of at least ten seconds, to a point on a surface which is normally accessible to the operator.

12 Stop the pump or the pulse generator at the same volume flow or number of pulses as in step 6.

13 Repeat steps 7 and 8.

14 Repeat steps 9 to 13. However, in step 11 apply the discharges to other points and surfaces which are normally accessible to the operator. The number of times this step is repeated will depend upon the type and configuration of the EUT, but as many surfaces as practical shall be tested.

15 Repeat steps 9 to 13. However, in step 11 apply the discharge to the VCP or HCP.

4.8 Electromagnetic susceptibility (Disturbance)

Object of the test:

To verify, under the effect of electromagnetic fields, that either significant faults do not occur or significant faults are detected and acted upon by means of a checking facility.

References:

IEC Publication 801-3, second edition, 1991, Electromagnetic compatibility for electrical and electronic equipment, Part 3: Immunity to radiated, radio frequency, electromagnetic fields.

Test equipment:

Signal generator(s) capable of generating 80 % AM 1 kHz sine wave with the frequency range from 26 to 1 000 MHz, power amplifier(s), antenna system capable of satisfying frequency requirements, a transverse electromagnetic (TEM) cell, field strength monitoring system, and a shielded room.

Test procedure:

With the antenna method, the test is normally performed with the EUT rotating on an insulated table. The polarization of the field generated by the antenna necessitates testing each position twice, once with the antenna positioned vertically and again with the antenna positioned horizontally.

With the TEM cell method, the EUT is normally tested in three mutually perpendicular axes. However, the test can be performed with the EUT in the most sensitive orientation, if applicable.

1 Maintain the EUT at the reference conditions.

2 Set the unit price at an optional value between the minimum unit price and the maximum unit price, and select blending if applicable.

3 Adjust the flowrate or simulated flowrate at an appropriate value between $0.5 \times Q_{max}$ and Q_{max}.

4 Reset the indications of the dispenser.

5 Operate the pump or the pulse generator at a rate equivalent to the volume flow for the estimated duration long enough for sweeping the frequency in step 12 (or in step 19).

6 Read P_u, V_i, P_i and V_n. (Read T only in the case of test by liquid flow).

7 Calculate P_c, V_{nc} (only in the case of test by liquid flow), E_v and E_p.

8 Keep the shielded room (or the TEM cell) at the reference conditions, and adjust the field strength to 3 V/m. When the shielded room (antenna method) is used, set the antenna at the height of 1 m and adjust the field strength to 3 V/m at the horizontal distance of 1 m from the antenna.

9 Set the EUT at the place where the field strength wad adjusted to 3 V/m in the shielded room (or the TEM cell).

10 Reset the indications of the dispenser.

11 Start the pump or the pulse generator.

12 Sweep the frequency from 26 MHz to 500 MHz. The sweep velocity shall not exceed 0.005 octave/s (1.5×10^{-3} decades/s).

13 Stop the pump or the pulse generator at the same volume flow or number of pulses as in step 5.

14 Repeat steps 6 and 7.

15 Remove the EUT from the shielded room (or TEM cell).

16 Adjust the field strength to 1 V/m. When the shielded room (antenna method) is used, set the antenna at a height of 1 m and adjust the field strength to 1 V/m at the horizontal distance of 1 m from the antenna.

17 Set the EUT at the place where the field strength was adjusted to 1 V/m in the shielded room (or TEM cell).

18 Repeat steps 10 and 11.

19 Sweep the frequency from 500 MHz to 1 000 MHz. The sweep velocity shall not exceed 0.005 octave/s (1.5×10^{-3} decades/s).

20 Repeat steps 13 and 14.

Notes

(1) When this test is performed with liquid flow in the actual operating conditions, the above detailed procedure must be modified accordingly.

(2) The above procedure may be modified according to the configuration of the EUT and of the test equipment.

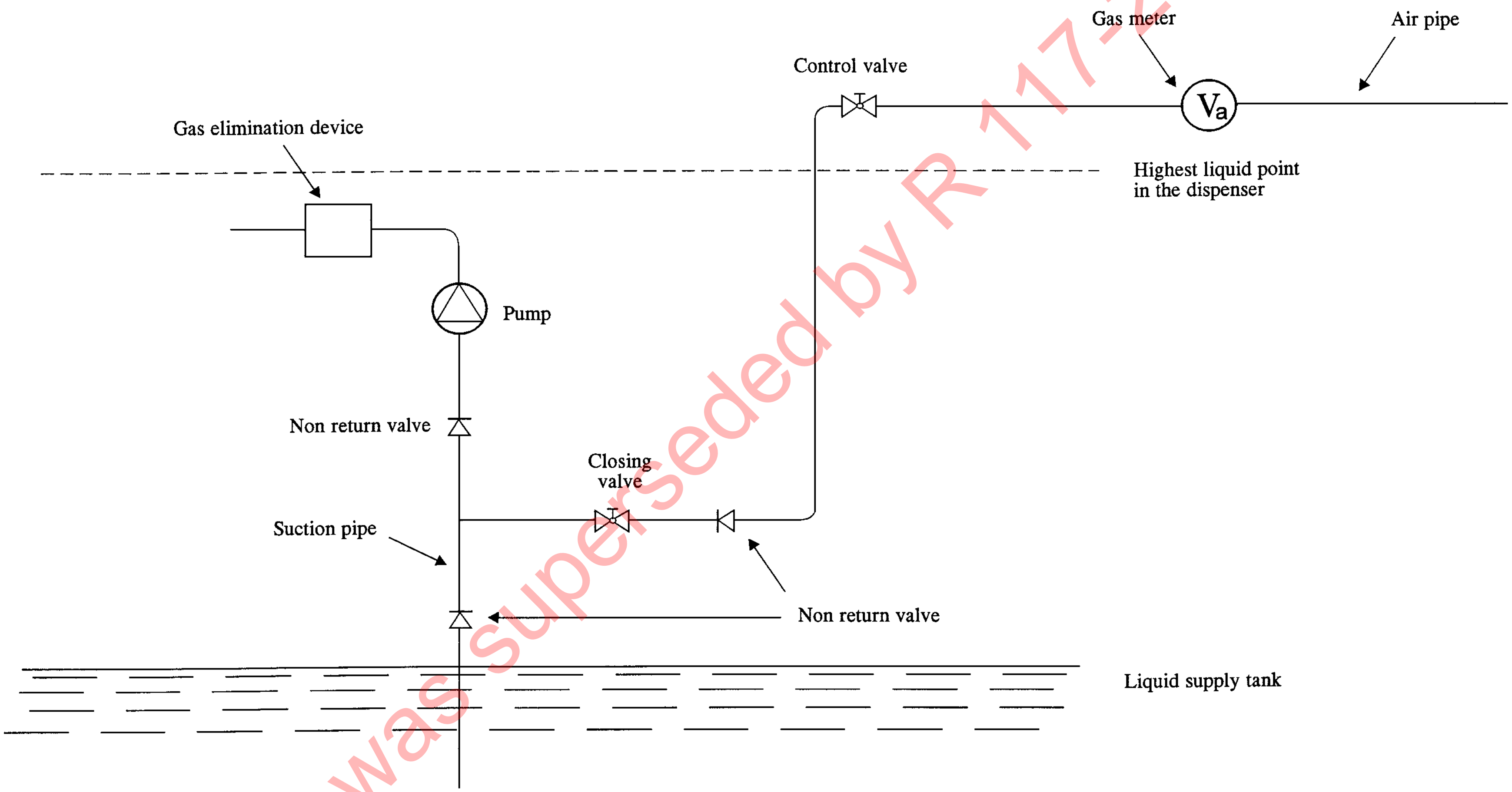

Figure 1 - Installation for gas elimination device test

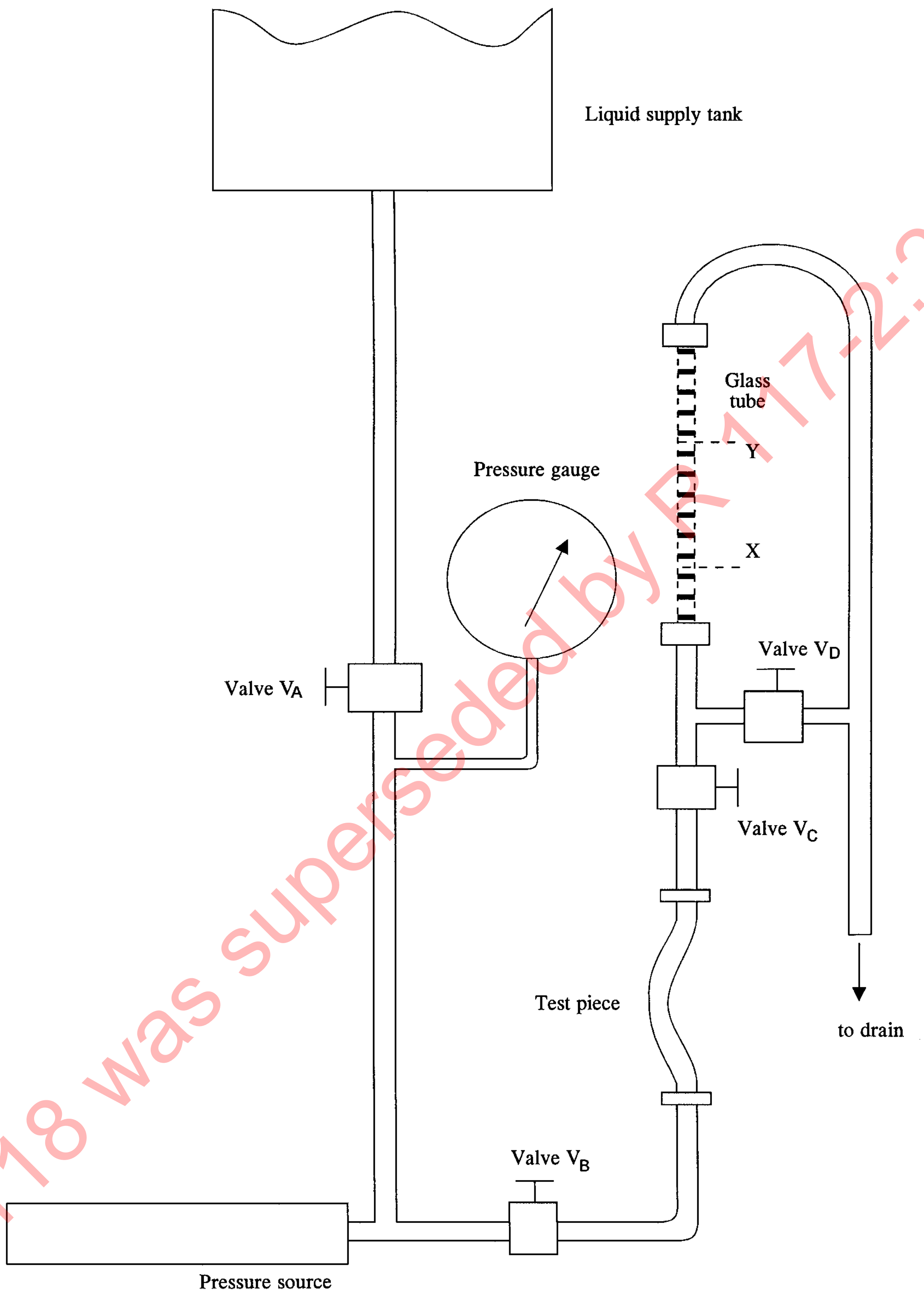

Figure 2 - Test apparatus for variation in the internal volume of hose

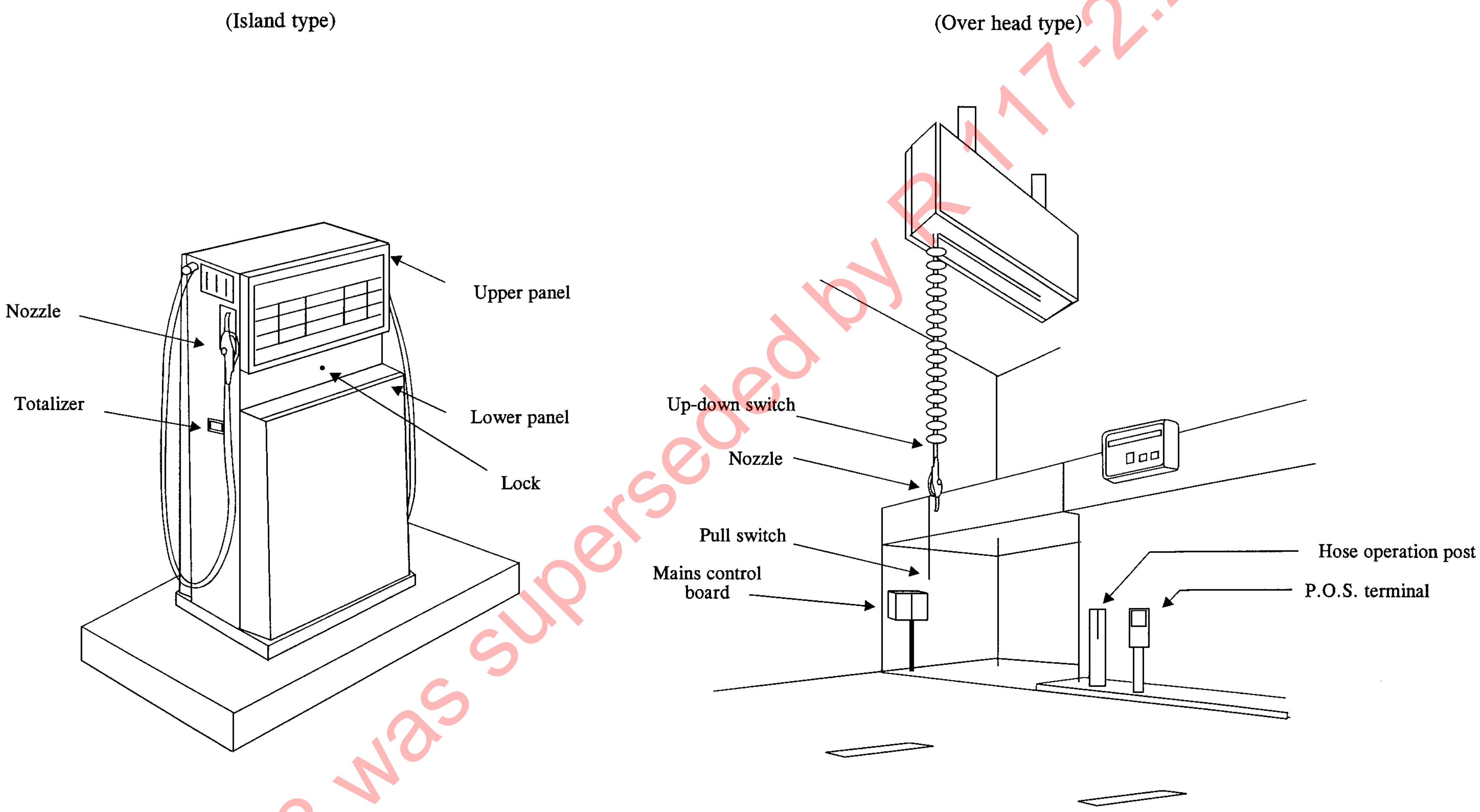

Figure 3 - Schematic installation of fuel dispensers

ANNEX A

TEST REPORT FORMAT

Note: This Annex is informative with regard to the implementation of OIML R 117 and of the present Recommendation in national regulations; however, use of the test report format is mandatory for application of OIML R 117 and of the present Recommendation within the OIML Certificate System.

The test report given in this Annex aims at presenting, in a standardized format, the results of the various tests described in this Recommendation, and to which a pattern of a fuel dispenser for motor vehicles shall be submitted with a view to its approval according to the requirements of the International Recommendation OIML R 117 *Measuring systems for liquids other than water.*

The symbols used in this Annex are:

+	=	Passed
–	=	Failed
mpe	=	Maximum permissible error
MMQ	=	Minimum measured quantity
MSVD	=	Minimum specified volume deviation
MSPD	=	Minimum specified price deviation

For each test, the "check list shall be completed according to this example:

+	–	
×		if the instrument has passed the test
	×	if the instrument has failed
/	/	if the test is not applicable

GENERAL INFORMATION CONCERNING THE PATTERN

Application No.: (new/modification)

Manufacturer:

Applicant:

Representative:

Measuring system

Pattern designation:

Maximum flowrate: Minimum flowrate:

Minimum measured quantity:

Maximum unit price (number of digits):

Maximum price to pay (number of digits):

Temperature range:

Liquids (or viscosity range):

Mains power:

Voltage: Frequency: Consumption:

Type of display: mechanical/electromechanical/electronic

Meter

Manufacturer:

Pattern designation: Pattern approval mark:

Maximum flowrate: Minimum flowrate:

Minimum measured quantity:

Gas elimination device

Manufacturer:

Pattern designation: Pattern approval mark:

Volume:

Maximum flowrate: Minimum flowrate:

Maximum pressure: Minimum pressure:

Measuring transducer

Manufacturer:

Pattern designation: Pattern approval mark:

Number of pulses per revolution:

General information on other devices, e.g. calculator, indicating device, printing device, delivery unit (hose, nozzle), etc., which have been subject to testing, and a description of the configuration of the complete dispenser shall be given.

CHECK LIST

Note: Item numbering refers to International Recommendation OIML R 117 *Measuring systems for liquids other than water*.

§ (R 117)	Requirement	+	–	Remarks
	GENERAL PROVISIONS			
2.19.1	MARKINGS Markings applied legibly and indelibly on the dial of the indicating device or on a special data plate: • Pattern approval sign • Manufacturer's identification mark or trade mark designation • Serial number • Year of manufacture • Minimum measured quantity (MMQ) • Maximum flowrate (Q_{max}) • Minimum flowrate (Q_{min}) • Maximum pressure • Minimum pressure • Liquids • Temperature range			
2.9.1 2.9.5	INDICATIONS Unit of volume: litre (l or L) Difference between volume indications of more than one indicating device ≤ 1 scale interval of indicating device with the greatest scale interval			
2.16.1	BRANCHES AND BY-PASSES Branches downstream of meter: diversion to any receiving receptacle(s) other than that intended is impossible			
2.20.1	SEALING DEVICES AND STAMPING PLATE Seals easily accessible and preventing access to components which allow alteration of the measurement result without damaging the seals including the stamping plate			
	REQUIREMENTS FOR ANCILLARY DEVICES OF A MEASURING SYSTEM			
3.1.4	ADJUSTMENT DEVICE Difference between consecutive values of the ratio ≤ 0.001 Adjustment by means of a by-pass of the meter impossible			

§ (R 117)	Requirement	+	–	Remarks
	VOLUME INDICATING DEVICE			
3.2.1.1	Reading precise, easy and unambiguous by simple juxtaposition Decimal sign clear			
3.2.1.2	Scale interval: 1×10^n, 2×10^n or 5×10^n			
3.2.1.4	Continuous indicating device: MSVD ≥ volume corresponding to 2 mm on the scale, and ≥ 1/5 of scale interval Discontinuous indicating device: MSVD ≥ 2 scale intervals			
3.2.2.1	Element with graduation entirely visible (except element corresponding to the maximum range of the indicator): one revolution corresponds to 10^n authorized units of volume			
3.2.2.2	Element with graduation entirely visible: one revolution of the element corresponds to scale interval of the following element			
3.2.2.3	Element with only part of graduation visible through a window (except first element): discontinuous movement			
3.2.2.4	Advance by one figure of following element when preceding element passes from 9 to 0			
3.2.2.5	Dimension of the window for the first element ≥ 1.5 × (distance between two graduated scale marks)			
3.2.2.6	Width of scale mark ≤ 1/4 of scale spacing Apparent scale spacing ≥ 2 mm			
3.2.3	Electronic indicating device: continuous display of volume during the period of measurement			
3.2.4.2	Zero setting device not permitting any alteration of the result			
3.2.4.3	No indication of any result during zeroing			
3.2.4.4	Continuous indicating device: residual indication after zeroing ≤ 1/2 of MSVD			
3.2.4.5	Discontinuous indicating device: indicate zero without any ambiguity			
	PRICE INDICATING DEVICE			
3.3.2	Unit price adjustable and indicated before measurement by a displaying device; valid for the whole transaction Elapsed time between changing unit price and before next measurement starts: at least five seconds			

§ (R 117)	Requirement	+	–	Remarks
3.3.3	(mutatis mutandis)			
(3.2.1.1)	Reading precise, easy and unambiguous			
(3.2.2.4)	Advance by figure of following element when preceding element passes from 9 to 0			
(3.2.4.2)	Zero setting device not permitting any alteration of the result			
(3.2.4.3)	No indication of any result during zeroing			
3.3.4	Monetary unit or its symbol in the immediate vicinity of the indicating device			
3.3.5	Zero setting devices of price indication and volume indication: zeroing of either of them automatically involves zeroing the other			
3.3.6	Continuous indicating device: MSPD ≥ price corresponding to 2 mm on the scale, and ≥ price corresponding to 1/5 of scale interval Discontinuous indicating device: MSPD ≥ price corresponding to 2 scale intervals			
3.3.8	Continuous indicating device: residual indication after zeroing ≤ 1/2 of MSPD			
3.3.9	Discontinuous indicating device: indicate zero without any ambiguity			
	PRINTING DEVICE			
3.4.1	Printed volume scale interval: 1×10^n, 2×10^n or 5×10^n, and ≤ MSVD, and ≥ smallest scale interval of indicating device			
3.4.2	Unit of volume: litre (l or L) Figures, unit or symbol, (and decimal sign) of volume printed on ticket			
3.4.3	If connected to more than one measuring system: print identification			
3.4.4	If repetition of printing: copies are marked clearly			
3.4.5	If volume determination by difference between two printed values: withdrawal of ticket during measurement impossible			
3.4.6	Zeroing device of printer and volume indicator: zeroing of one of them involves zeroing the other			
3.4.7	Figures, monetary unit or symbol, (and decimal sign) of price printed on ticket			

§ (R 117)	Requirement	+	–	Remarks
3.4.8	Printed price scale interval: 1×10^n, 2×10^n or 5×10^n monetary unit, and $\leq$ MSPD			
	PRE-SETTING DEVICE			
3.6.2	If several independent controls: scale interval corresponding to one control equals range of control of the next lower order			
3.6.4	Figures of pre-setting display clearly distinguishable from those of volume indicator			
3.6.5	Indication of the selected quantity during delivery remains unaltered or returns progressively to zero			
3.6.6	Difference between pre-set volume and indicated volume $\leq$ MSVD			
3.6.7	Unit of pre-set volume same as that of volume indicator Marking of unit of volume or its symbol on pre-setting mechanism			
3.6.8	Scale interval of pre-setting device $\geq$ scale interval of volume indicator			
3.6.10	(mutatis mutandis for price pre-setting devices)			
(3.6.2)	If several independent controls: scale interval corresponding to one control equals range of control of the next lower order			
(3.6.4)	Figures of pre-setting display clearly distinguishable from those of price indicator			
(3.6.5)	Indication of the selected quantity during delivery remains unaltered or returns progressively to zero			
(3.6.6)	Difference between pre-set price and indicated price $\leq$ MSPD			
(3.6.7)	Unit of pre-set price same as that of price indicator Marking of monetary unit or its symbol on pre-setting mechanism			
(3.6.8)	Scale interval of pre-setting device $\geq$ scale interval of price			

§ (R 117)	Requirement	+	–	Remarks
	SPECIFIC REQUIREMENTS FOR MEASURING SYSTEMS EQUIPPED WITH ELECTRONIC DEVICES			
4.3.2.1	CHECKING FACILITIES FOR MEASUREMENT TRANSDUCER When each pulse represents elementary volume, at least security level B defined by ISO 6551 Checking facilities of type P Checking interval not exceeding the duration of measurement of amount of liquid equal to MSVD Possibility of testing the operation of checking facilities during pattern approval and verification			
4.3.3.1 4.3.3.2	CHECKING FACILITIES FOR CALCULATION Checking facilities for operation of type P or I Checking interval for type I at each delivery Checking facilities for validity of calculation of type P Existence of a means for controlling continuity			
4.3.4.1 4.3.4.2 4.3.4.3	CHECKING FACILITIES FOR INDICATING DEVICE Checking facilities of type P or I if indication can be reconstituted Tests "all displaying" - "all blanking" - "all zeros" test with duration of each sequence ≥ 0.75 s Possibility of testing the operation of checking facilities during verification			
4.3.5	CHECKING FACILITIES FOR PRINTING DEVICE Checking facilities of type I or P Checking includes presence of paper and of electronic control circuits Possibility of testing the operation of checking facilities during pattern approval and verification Where action is a warning: given on or by the printing device			

§ (R 117)	Requirement	+	–	Remarks
	OTHER SPECIFIC REQUIREMENTS FOR FUEL DISPENSERS			
5.1.1	Ratio between maximum flowrate and minimum flowrate: at least ten			
5.1.2	If integral pump: gas elimination device placed immediately upstream of the meter inlet			
5.1.3	If no integral pump: check that the installation schemes provide for necessary securities			
5.1.4	Device for resetting the volume indicator to zero present Height of figures of volume indicator with zero setting device ≥ 10 mm If price indicator, presence of zero setting device			
5.1.5	Next delivery inhibited until nozzle(s) replaced and indicator reset to zero			
5.1.6	When maximum flowrate (Q_{max}) ≤ 3.6 m^3/h, MMQ ≤ 5 L			
5.1.8	Fuel dispenser interruptible			
5.1.9	Minimum duration of operation of display after power failure ≥ 15 min continuously and automatically, or ≥ 5 min in one or several periods controlled manually during 1 h Delivery interrupted by power failure: impossible to continue delivery if power failure has lasted more than 15 s			
5.1.10	Delay time between measurement value and indicated values ≤ 500 ms			
5.1.12	Hidden volume at the beginning of the delivery ≤ 2 × MSVD Hidden price at the beginning of the delivery ≤ 2 × MSPD			

CONCLUSION OF TESTS

Application No.: Date:

Certificate of Conformity No.: Date:

N°	Test description	+	–	Remarks
1	Accuracy			
2	Minimum measured quantity			
3	Flow interruption			
4	Gas elimination device			
5	Variation in the internal volume of hose			
6	Endurance test			
7	Dry heat (non-condensing)			
8	Cold			
9	Damp heat, cyclic (condensing)			
10	Power voltage variations			
11	Short-time power reductions			
12	Electrical burst			
13	Electrostatic discharges			
14	Electromagnetic susceptibility			

Notes:

+	–	
×		if the instrument has passed the test
	×	if the instrument has failed
/	/	if the test is not applicable

Remarks:

Observer: ________________________________

TEST REPORT

Symbols, units and equations:

P_u	Unit price (price/L)
t	Time (s)
Q	Flowrate of liquid (L/min)
V_i	Volume indication of dispenser (L)
P_i	Price indication (or printed if not fitted with a price indicator) of dispenser (price)
P_c	Calculated price (price)
V_n	Volume indication of test measure or computed volume from simulated pulses (L)
T	Temperature of liquid in the test measure (°C)
T_r	Reference temperature of test measure (°C)
T_m	Temperature of liquid passing through the meter (°C)
E_v	Error of volume indication (%)
E_p	Error of price indication (price)
Q_a	Flowrate of air (L/min)
V_a	Volume of air (L)
α	Cubic expansion coefficient of test liquid due to temperature (°C^{-1})
β	Cubic expansion coefficient of test measure due to temperature (°C^{-1})
V_{nc}	Volume of test measure, compensated for deviation from reference temperature (L)
V_{mc}	Volume passing through the meter compensated for deviation from reference temperature (L)
$\bar{E}$	Mean value of error of indication (% or price)
n	Number of tests at the same condition

$P_c = V_i \times P_u$

$E_v = (V_i - V_n) / V_n \times 100$ V_n may be replaced by V_{nc}, if appropriate

$E_p = P_i \times P_c$

$Q = (V_i \times 60) / t$

$V_{nc} = V_n \times [1 + \beta (T - T_r)]$

$\bar{E} = [E(1) + E(2) + ... + E(n)] / n$

Range = Maximum error – minimum error (% or price)

Note: If significant differences are recorded between the temperature of the liquid in the meter and the test measure, a correction on the liquid volume passing through the meter is computed as follows:

$V_{mc} = V_{nc} \times [1 + \alpha (T_m - T)]$

and in this case V_{nc} is to be replaced by V_{mc} in the whole text.

If β is not known, the following values can be used.

Material	β (°C^{-1}) (uncertainty: 5×10^{-6} °C^{-1})
Borosilica glass	10×10^{-6}
Glass	27×10^{-6}
Mild steel	33×10^{-6}
Stainless steel	51×10^{-6}
Copper, Brass	53×10^{-6}
Aluminium	69×10^{-6}

1 Accuracy

Q( ) L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
$\bar{E}_v$	%		Range	%		$\bar{E}_p$					

Q( ) L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
$\bar{E}_v$	%		Range	%		$\bar{E}_p$					

Q( ) L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
$\bar{E}_v$	%		Range	%		$\bar{E}_p$					

Remarks:

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Application N°:_______

Date:_______________

Signature:__________

Test measures used: _____________

β: _____________

Reference temperature: _______ °C

Liquid: _________________________

Viscosity: ____________ mPa.s

Grade: _______________

Ambient conditions

Temperature: ________ °C

Humidity: ___________ % RH

Pressure: ____________ hPa

2 Minimum measured quantity

Q L/min	V_i L	V_n L	T °C	V_{nc} L	E_v %	mpe %

Q L/min	V_i L	V_n L	T °C	V_{nc} L	E_v %	mpe %

Remarks:

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Application N°:_______

Date:_______________

Signature:__________

Test measures used: _____________

β: _____________

Reference temperature: _______ °C

Liquid: _________________________

Viscosity: ____________ mPa.s

Grade: _______________

Ambient conditions

Temperature: ________ °C

Humidity: ___________ % RH

Pressure: ____________ hPa

3 Flow interruption

Grade	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
$\bar{E}_v$		%	$\bar{E}_p$								

Grade	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
$\bar{E}_v$		%	$\bar{E}_p$								

Grade	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
$\bar{E}_v$		%	$\bar{E}_p$								

Remarks:

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Application N°:_______

Date:_______________

Signature:__________

Test measures used: _____________

β: _____________

Reference temperature: _______ °C

Liquid: _________________________

Viscosity: ____________ mPa.s

Grade: _______________

Ambient conditions

Temperature: ________ °C

Humidity: ___________ % RH

Pressure: ____________ hPa

4 Gas elimination device

V_a L	V_i L	V_n L	T °C	V_{nc} L	E_v %	mpe %	V_a/V_n V_a/V_{nc} %	Air bubble (yes or no)

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Application N°:_______

Date:_______________

Signature:__________

Test measures used: _____________

β: _____________

Reference temperature: _______ °C

Liquid: _________________________

Viscosity: ____________ mPa.s

Gas meter used: ________________

Suction height: _____ m
(for the liquid)

Diameter: ______ mm

Length: ______ m

Ambient conditions

Temperature: ________ °C

Humidity: ___________ % RH

Pressure: ____________ hPa

Remarks:

5 Variation in the internal volume of hose

X	Y	Y – X	Scale division mL	Variation mL
Mean value of variation mL		Without hose reel		MSVD mL
		With hose reel		2 × MSVD mL

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Application N°:______

Date:_____________

Signature:_________

Model of hose: ______________________________

Lenght: ________ m

Inner diameter: ________ mm

Maximum operating pressure: ______ MPa

Ambient conditions

Temperature: _______ °C

Humidity: _________ % RH

Pressure: __________ hPa

Remarks:

6 Endurance test (page 1)

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Application N°:_______

Date:_______________

Signature:__________

Date of accuracy test before endurance test: ____

Liquid: ______________________

Viscosity: ____________ mPa.s

Volume per delivery: ________ L

Total time of endurance test: ________ h

Total volume per meter: ________ L

Resetting between deliveries: Yes/No

Number of stops: ________

Change of grade: Yes/No

Date of accuracy test after endurance test: ________________

Remarks:

6 Endurance test (page 2)

Q( ) L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
$\bar{E}_v$ (A) – $\bar{E}_v$ (B)					%	$\bar{E}_p$ (A) – $\bar{E}_p$ (B)					

Q( ) L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
$\bar{E}_v$ (A) – $\bar{E}_v$ (B)					%	$\bar{E}_p$ (A) – $\bar{E}_p$ (B)					

Q( ) L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
$\bar{E}_v$ (A) – $\bar{E}_v$ (B)					%	$\bar{E}_p$ (A) – $\bar{E}_p$ (B)					

Remarks:

Report page ___/___

Application N°:_______

Date:_______________

Signature:__________

Test measures used: _____________

β: _____________

Reference temperature: _______ °C

Liquid: _________________________

Viscosity: ____________ mPa.s

Grade: _______________

Ambient conditions

Temperature: ________ °C

Humidity: ___________ % RH

Pressure: ____________ hPa

$\bar{E}_v$ (A) : Error after endurance test

$\bar{E}_v$ (B) : Error before endurance test

7 Dry heat (non-condensing)

Test condition	Q L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
20 °C												
55 °C												
20 °C												

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Application N°:_____

Date:_______________

Signature:_________

Remarks:

Note: Normally, this test is carried out in a simulation set-up. However, in the case of test by liquid flow, the following items should be filled in and the tests at each test condition are recommended to be done at least three times.

Test measures used: _________________

β: _____________

Reference temperature: ___________ °C

Liquid: ____________________________

Viscosity: ____________________ mPa.s

8 Cold

Test condition	Q L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
20 °C												
– 25 °C												
20 °C												

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Application N°:_____

Date:______________

Signature:_________

Remarks:

Note: Normally, this test is carried out in a simulation set-up. However, in the case of test by liquid flow, the following items should be filled in and the tests at each test condition are recommended to be done at least three times.

Test measures used: ________________

β: _____________

Reference temperature: ___________ °C

Liquid: ___________________________

Viscosity: ____________________ mPa.s

9 Damp heat, cyclic (condensing)

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Application N°:_____

Date:_______________

Signature:__________

Test condition	Q L/min	P_u Price/L	H_i %	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
20 °C 50 % RH													
Damp heat, cyclic (24 hours × 2 cycles)													
20 °C 50 % RH													

H_i : Relative humidity indication

Remarks:

Note: Normally, this test is carried out in a simulation set-up. However, in the case of test by liquid flow, the following items should be filled in and the tests at each test condition are recommended to be done at least three times.

Test measures used: _________________

β: _____________

Reference temperature: ___________ °C

Liquid: ____________________________

Viscosity: ____________________ mPa.s

10 Power voltage variation

Test condition	U_i V	Q L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	mpe %	E_p Price	MSPD Price
U													
1.1 U													
0.85 U													

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Application N°:_____

Date:_______________

Signature:__________

U : Mains voltage

U_i : Indicated mains voltage

Remarks:

Note: Normally, this test is carried out in a simulation set-up. However, in the case of test by liquid flow, the following items should be filled in and the tests at each test condition are recommended to be done at least three times.

Test measures used: _________________

β: _____________

Reference temperature: ___________ °C

Liquid: ___________________________

Viscosity: _____________________ mPa.s

11 Short-time power reductions

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Application N°:_____

Date:_______________

Signature:_________

Test condition	Q L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	S.F. %	E_p Price	MSPD Price	Checking facility	
No reduction													______	
100 % reduction 1/2 cycle, 10 times													Yes	No
50 % reduction 1 cycle, 10 times													Yes	No

Remarks:

Note: Normally, this test is carried out in a simulation set-up. However, in the case of test by liquid flow, the following items should be filled in and the tests at each test condition are recommended to be done at least three times.

Test measures used: ________________

β: _____________

Reference temperature: ___________ °C

Liquid: ____________________________

Viscosity: ____________________ mPa.s

12 Electrical bursts

Test condition	Q L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	S.F. %	E_p Price	MSPD Price	Checking facility	
Noiseless													______	
Line 1 Positive													Yes	No
Line 1 Negative													Yes	No
Line 2 Positive													Yes	No
Line 2 Negative													Yes	No

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Application N°:_____

Date:_______________

Signature:_________

Line 1 : Phase/Neutral
Line 2 : Phase/Neutral

Remarks:

Note: Normally, this test is carried out in a simulation set-up. However, in the case of test by liquid flow, the following items should be filled in and the tests at each test condition are recommended to be done at least three times.

Test measures used: ________________

β: ____________

Reference temperature: __________ °C

Liquid: ___________________________

Viscosity: ___________________ mPa.s

13 Electrostatic discharges (page 1)

Test condition			Q L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	S.F. %	E_p Price	MSPD Price	Checking facility	
Non-discharge															______	
Discharged point		C/A													Yes	No
		C/A													Yes	No
		C/A													Yes	No
		C/A													Yes	No
		C/A													Yes	No
		C/A													Yes	No
		C/A													Yes	No

Report page ___/___

Application N°:_____

Date:_______________

Signature:__________

Ambient conditions

Temperature: _____ °C

Humidity: ____ % RH

Pressure: _______ hPa

C/A: Contact discharge/Air discharge

Remarks:

Note: Normally, this test is carried out in a simulation set-up. However, in the case of test by liquid flow, the following items should be filled in and the tests at each test condition are recommended to be done at least three times.

Test measures used: _____________

β: __________

Reference temperature: _________ °C

Liquid: ______________________

Viscosity: ________________ mPa.s

13 Electrostatic discharges (page 2)

Drawing showing where the discharges have been applied on the surface of the dispenser.

14 Electromagnetic susceptibility

Test condition			S.V. decade/s	Q L/min	P_u Price/L	V_i L	P_i Price	V_n L	T °C	P_c Price	V_{nc} L	E_v %	S.F. %	E_p Price	MSPD Price	Checking facility	
Noiseless																____	
Antenna method	F.S. 3 V/m 26~500 MHz	V														Yes	No
		H														Yes	No
	F.S. 1 V/m 500~1000 MHz	V														Yes	No
		H														Yes	No
TEM cell method	F.S. 3 V/m 26~500MHz															Yes	No
	F.S. 1 V/m 500~1000 MHz															Yes	No

Report page ___/___

Application N°:_____

Date:______________

Signature:_________

Ambient conditions

Temperature: _____ °C

Humidity: ____ % RH

Pressure: _______ hPa

S.V.: Sweep Velocity
F.S.: Field Strength
V: Vertical
H: Horizontal

Remarks:

Note: Normally, this test is carried out in a simulation set-up. However, in the case of test by liquid flow, the following items should be filled in and the tests at each test condition are recommended to be done at least three times.

Test measures used: ____________

β: __________

Reference temperature: ________ °C

Liquid: ______________________

Viscosity: ________________ mPa.s