BS EN 13203-1:2015

BSI Standards Publication

Gas fired domestic appliances producing hot water

Part 1: Assessment of performance of hot water deliveries

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National foreword

This British Standard is the UK implementation of EN 13203-1:2015. It supersedes BS EN 13203-1:2006 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GSE/29, Gas-fired central heating boilers (domestic and non-domestic) and domestic gas-fired water heaters.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2015

ISBN 978 0 580 88553 2

ICS 91.140.65

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2015.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13203-1

September 2015

ICS 91.140.65

Supersedes EN 13203-1:2006

English Version

Gas fired domestic appliances producing hot water - Part 1: Assessment of performance of hot water deliveries

Appareils domestiques produisant de l'eau chaude sanitaire utilisant les combustibles gazeux - Partie 1 : Évaluation de la performance en puisage d'eau chaude

Gasbeheizte Geräte für die sanitäre Warmwasserbereitung für den Hausgebrauch - Teil 1: Bewertung der Leistung der Warmwasserbereitung

This European Standard was approved by CEN on 14 August 2015.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 13203-1:2015 E

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European foreword

This document (EN 13203-1:2015) has been prepared by Technical Committee CEN/TC 109 “Central heating boilers using gaseous fuels”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2016, and conflicting national standards shall be withdrawn at the latest by March 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13203-1:2006.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

The main changes in this revision are the following:

— The title of this standard has been changed to: "Gas fired domestic appliances producing hot water — Part 1: Assessment of performance of hot water deliveries";

— "heat input not exceeding 70 kW" was removed from the title but remains unchanged in the scope;

— "300 litres water storage" has been removed from the title and the scope is changed as following: hot water storage capacity (if any) not exceeding 500 l;

— A new Clause 7 is added: "7 Eco design Related Products Data";

— An informative Annex ZA is added for the relationship between this European Standard and the requirements of Commission Regulation (EU) n° 814/2013.

NOTE Useful standards are EN 26, EN 89, EN 15502-1, EN 15502-2-1 and EN 15502-2-2.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard is applicable to gas-fired appliances producing domestic hot water. It applies to both instantaneous and storage appliances; water-heaters and combination boilers that have:

— heat input not exceeding 70 kW; and

— hot water storage capacity (if any) not exceeding 500 l.

In the case of combination boilers, with or without storage tank, domestic hot water production is integrated or coupled, the whole being marketed as a single unit.

This European Standard sets out in qualitative and quantitative terms the performance in delivery of domestic hot water for a selected variety of uses. It also gives a system for presenting the information to the user.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Not applicable.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
control cycle
time cycle for keeping components and/or the hot storage water tank (if any) of the domestic hot water circuit at predetermined temperature level, consists of an «ON» duration time during which the heating of the domestic hot water (by gas energy and auxiliary energy) is operating, and an «OFF» duration time during which no heating occurs

3.2
domestic water mean temperature
average temperature of the water delivered during the time Δt

$$T_m = \frac{1}{\Delta t}\int T \cdot dt$$

Note 1 to entry: SYMBOL = T_m

3.3
domestic water test temperature
temperature of the delivered water at which the tests are conducted

3.4
storage tank
reservoir for domestic hot water

3.5
kitchen specific rate
domestic hot water rate corresponding to a mean temperature rise of 45 K that the appliance can supply

Note 1 to entry: SYMBOL = D_c

Note 2 to entry: D_c is expressed in litre per minute (l/min)

3.6
minimum declared water rate
lowest water rate stated by the manufacturer maintaining a stable temperature

Note 1 to entry: SYMBOL = D_m

Note 2 to entry: D_m is expressed in litre per minute (l/min)

3.7
nominal domestic hot water heat input
value of the heat input stated by the manufacturer for the production of domestic hot water

Note 1 to entry: SYMBOL = Q_{nw}

Note 2 to entry: Q_{nw} is expressed in kilowatt (kW)

3.8
overall performance factor
numerical value used to quantify the overall performance associated with domestic hot water use, corresponding to the sum of the products of the particular performance factors multiplied by the weighting coefficients

Note 1 to entry: SYMBOL = F

$$F = \sum_{i=1}^{n} a_i . f_i$$

3.9
particular performance factor
numerical value which quantifies each of the performance criteria listed in Table 1

Note 1 to entry: SYMBOL = f_i

3.10
specific rate
domestic hot water rate declared by the manufacturer corresponding to a mean temperature rise of 30 K that the appliance can supply in two successive delivery periods

Note 1 to entry: SYMBOL = D

Note 2 to entry: D is expressed in litre per minute (l/min)

3.11
summer mode
conditions during which the appliance supplies energy only for the production of domestic hot water

3.12
tapping capability
hot water delivery rate, declared by the manufacturer, at which water can be drawn off for a specified time or times (5 min; 10 min; 20 min or continuous) with a predetermined temperature rise

Note 1 to entry: SYMBOL = R

Note 2 to entry: R is expressed in litre per minute (l/min)

3.13
temperature fluctuation at a constant water rate
difference between the minimum and maximum water temperatures that can occur during delivery at a constant water rate with a constant inlet temperature

Note 1 to entry: SYMBOL = ΔT_2

Note 2 to entry: ΔT_2 is expressed in Kelvin (K)

3.14
temperature fluctuation between successive deliveries
maximum domestic hot water temperature difference between successive deliveries

Note 1 to entry: SYMBOL = ΔT_3

Note 2 to entry: ΔT_3 is expressed in Kelvin (K)

3.15
temperature stabilization time following a variation of the water flow rate
time taken to obtain a predetermined fluctuation, following a rapid variation of the water flow rate

Note 1 to entry: SYMBOL = t_s

Note 2 to entry: t_s is expressed in second (s)

3.16
temperature variation according to water rate
variation of the mean hot water temperature consequent upon variations of the water flow rate

Note 1 to entry: SYMBOL = ΔT_1

Note 2 to entry: ΔT_1 is expressed in Kelvin (K)

3.17
waiting time
time taken to reach, at appliance outlet**,** 90 % of the domestic hot water temperature rise of 45 K without subsequently falling below 34 K

Note 1 to entry: SYMBOL = t_m

Note 2 to entry: t_m is expressed in second (s)

3.18
weighting coefficient
numerical coefficient used to quantify the importance given to each particular performance factor in connection with the use of domestic hot water

Note 1 to entry: SYMBOL = a_i

3.19
rapid response thermometer
measuring instrument with a response time such that 90 % of the final temperature rise, from 15 °C to 100 °C, is obtained within about 1 s, when the sensor is plunged into still water

4 General test conditions

4.1 Reference conditions

Unless otherwise stated, the general test conditions are as follows:

— cold water temperature: 10 °C;

  — maximum average variation over the test period: ± 2 K

— cold water pressure: (2 ± 0,1) bar;

— ambient air temperature: 20 °C;

  — maximum average variation over the test period ± 1 K

  — maximum variation during the tests ± 2 K

— electrical supply voltage: (230 ± 2) V (single phase).

4.2 Measurement uncertainties

Except where otherwise stated in the clauses describing the tests, the uncertainties of measurements carried out shall not be greater than the maximum uncertainties indicated below.

The standard deviations take account the various sources of uncertainty: contribution from the instrument, repeatability, calibration, ambient conditions, etc.

— water rate: ± 1 %;

— gas rate: ± 1 %;

— time: ± 0,2 s;

— temperatures:

  — ambient: ± 1 K;

  — water: ± 0,5 K;

  — gas: ± 0,5 K;

— mass: ± 0, 5 %;

— gas pressure: ± 1 %;

— gas calorific value: ± 1 %;

— gas density: ± 0,5 %;

— electrical energy: ± 2 %.

The stated measurement uncertainties relate to individual measurements. For measurements that combine a number of individual measurements, smaller uncertainties on the individual measurements may be necessary to ensure a total uncertainty within ± 2 % under the steady state conditions.

These uncertainties correspond to two standard deviations (2σ).

4.3 Test conditions

4.3.1 General

Except where otherwise stated, the appliance shall be tested under the following conditions.

4.3.2 Test room

The appliance shall be installed in a well-ventilated, draught-free room (air speed less than 0,5 m/s).

The appliance shall be protected from direct solar radiation and radiation from heat generators.

4.3.3 Water supply

For the tests:

— domestic water pressure is the static inlet pressure under dynamic conditions measured as close as possible to the appliance;

— inlet and outlet temperatures of the domestic water shall be measured in the centre of the flow and as close as possible to the appliance.

The inlet temperatures shall be measured immediately upstream of the water inlet connection. Except where otherwise stated, the outlet temperatures shall be measured immediately downstream of the outlet connection or, in the case of an appliance with spout delivery, by means of an immersed temperature measuring device, e.g. a u-tube fitted at the outlet of a tube of the same length as the minimum length of the spout normally supplied by the manufacturer.

The hot water temperature shall be measured with a rapid response thermometer.

"Rapid response thermometer" means a measuring instrument with a response time such that 90 % of the final temperature rise, from 15 °C to 100 °C, is obtained within about 1 s, when the sensor is plunged into still water.

4.3.4 Steady state

Steady state operating conditions shall be regarded as established when the appliance operates for sufficient time to reach thermal stabilization. The steady state is reached when the water temperature at the outlet does not vary by more than ± 0,5 K.

NOTE This condition can be reached with a gas which is different from the specified test gas, provided that the appliance is supplied with the specified test gas at least 5 min before the requirements are verified.

4.3.5 Initial adjustment of the appliance

The appliance shall be installed in accordance with the manufacturer's instructions.

The heat input shall be adjusted to within ± 2 % of the nominal domestic hot water heat input.

The delivered water temperature at the appliance outlet is defined as follows (see Figures A.1 and A.2):

a) appliances with an adjustable temperature: the tests shall be carried out at a temperature not greater than 65 °C, with a minimum temperature increase equal to or greater than 45 K above water inlet temperature.

b) appliances with a fixed temperature: the tests shall be carried out at the temperature specified by the manufacturer, with a minimum temperature increase equal to or greater than 45 K.

The same conditions of initial adjustment stated in the appliance documentation shall be used for all the tests.

These conditions shall be included in the test report.

4.3.6 Initial state conditions

All the tests of this standard shall be conducted as follows (see Figures A.3 and A.4):

— when there is no control cycle to consider: at least one hour after the previous delivery;

— when there is a control cycle to consider : after a time corresponding to 20 % (but not exceeding 1 h) of the "OFF" time of the burner. The time is taken from the time the burner turns off in the control cycle.

The same initial state conditions shall be used for all the tests. These conditions shall be included in the test report.

For appliances with a central heating function, tests shall be conducted in summer mode.

4.3.7 Electrical supply

The appliance shall be supplied with the nominal voltage or a voltage included within the range of nominal voltages stated in the installation instructions

5 Characterisation of the domestic hot water function of appliances

5.1 General

The domestic hot water function shall be characterised in two different ways:

— firstly, according to the domestic hot water specific rates, the tapping capability and the corresponding uses (see 5.2);

— secondly, according to the quality of the domestic hot water produced (see 5.3); obtaining a number of stars corresponding to a determined level of performance.

5.2 Characterisation according to the domestic hot water rates

5.2.1 Specific rate

5.2.1.1 Requirement

The measured value of the specific rate shall be not lower than 95 % of that stated by the appliance documentation.

5.2.1.2 Test

The appliance shall be adjusted to deliver hot water at the rate stipulated by the installation instructions for this test.

The pressure loss across the appliance shall not exceed 2 bar.

During the measurement of the specific rate, the minimum temperature increase shall be equal to or greater than 30 K.

Before the test, the appliance shall be adjusted in accordance with 4.3.5. A first delivery shall be carried out over a period of 10 min, followed by 20 min with no delivery and then by a second delivery over a period of 10 min (see Figures A.5 and A.6).

Measurements of temperature and flow rate shall be made and recorded, at intervals not exceeding 2 s. A plot of temperature against time is made to obtain the mean water temperature rise during each delivery.

For each delivery the following shall be calculated by the formula:

$$D_i = \frac{m_{i(10)}}{10} \cdot \frac{\Delta T}{30} \quad (1)$$

where

D_i is the calculated rate for each delivery; D_1 and D_2 are determined respectively during the first and second deliveries, in litre per minute (l/min)

$m_{i(10)}$ is the quantity of water collected during the first or second delivery with a minimum temperature rise of 30 K, in litre (l);

ΔT is the mean temperature rise of the collected water, in Kelvins (K) during the first and second deliveries

If the difference between D_1 and D_2 does not exceed numerically 10 % of their average value then

$$D = \frac{D_1 + D_2}{2} \quad (2)$$

where D is the determined specific rate.

If the difference between D_1 and D_2 exceeds numerically 10 % of their average value, then D is the lower value.

The kitchen specific rate (D_c) shall be calculated by the formula:

$$D_C = D \cdot \frac{30}{45} \quad (3)$$

NOTE When the water temperature is adjustable, additional measurement of the specific rate with a delivery temperature can be specified by the appliance documentation.

5.2.2 Tapping capability

5.2.2.1 Requirement

The appliance shall be capable of delivering water at the rate stated in the appliance documentation with a temperature rise not less than 30 K, for the standard time of 10 min and continuously. Additional flow rate times of 5 min and 20 min can be used in accordance to the appliance documentation.

The tapping capability corresponding to these time periods shall be available to the consumer.

The measured tapping capability shall not be more than 5 % below the value stated by the appliance documentation.

5.2.2.2 Test

The appliance shall be adjusted to deliver water at the flow rate and temperature stated by the appliance documentation for this test.

The pressure loss across the appliance shall not exceed 2 bar.

Before starting the tapping test, the appliance shall be in the initial state conditions and in the initial adjustment conditions defined in 4.3.5 and 4.3.6. The flow rate and temperature of the delivery are recorded at intervals not exceeding 2 s. The domestic water mean temperature is calculated.

Tapping capability shall be measured during the standardized times 10 minutes and continuously (with the additional options of 5 min and/or 20 min).

For the test with a non-continuous delivery, the test shall be run for the standardized time(s) with a tolerance of ± 30 s. During the test, the temperature rise shall not fall below 30 K (see Figures A.7 and A.8).

The tapping capability shall be calculated by the formula:

$$R = R_S \cdot \frac{\Delta T_a}{30} \cdot \frac{t}{t_t} \tag{4}$$

where

t	time recorded during the test
t_t	standardized time
ΔT_a	mean water temperature increase (3.17)
R	tapping capability stated by the appliance documentation
R_S	mean rate recorded during the test

t should be t_t ± 30 s.

For the test with a continuous delivery, the measurement of the rate shall be carried out following the test for the tapping capability with the standardized time of 10 min. Without stopping the appliance, the delivery rate shall be adjusted to the value stated by the technical instructions for the continuous rate (see Figures A.7 and A.8).

The tapping capability shall be calculated by the formula:

$$R = R_S \cdot \frac{\Delta T_a}{30} \tag{5}$$

The burner remains in operation and the temperature rise shall not vary by more than ± 2 K.

5.2.3 Classification according to the quantity of available domestic hot water

Depending on the value obtained, the tapping capability within 10 min is used to classify the quantity of available domestic hot water, as indicated below.

Value of the tapping capability at 10 min:

- R < 10 l/min Label : 1 tap
- 10 ≤ R (10 min) < 15 l/min Label : 2 taps
- 15 ≤ R (10 min) < 20 l/min Label : 3 taps
- R (10 min) ≥ 20 l/min Label : 4 taps

5.3 Classification according to the quality of the domestic hot water produced

5.3.1 Classification procedure

The classification of appliances according to the performance in delivery of the domestic hot water takes account of a certain number of particular performance criteria; these criteria are as follows:

— waiting time, t_m;

— variation of the temperature according to the water rate, ΔT_1;

— temperature fluctuation (during delivery at a constant water rate), ΔT_2;

— temperature stabilization time in case of variation of the water rate, t_s;

— minimum nominal water rate, D_m;

— temperature fluctuation between successive deliveries, ΔT_3.

Depending on the test results obtained, each particular performance criterion is given a score of between 0 and 3, called the "particular performance factor" f_i.

In addition, each criterion is associated with a weighting coefficient (a_i) corresponding to a ranking of importance.

An overall performance factor, F, is calculated to quantify the performance associated with the domestic hot water delivered.

This factor F is obtained by calculating the sum of the products of the particular performance factors multiplied by the corresponding weighting coefficients.

The particular performance factors and the weighting factors corresponding to each of the criteria considered are given in Table 1.

Table 1 — Symbols of particular performance and weighting criteria

Particular performance criterion	Symbol (as in Clause 3)	Particular performance factor (f_i)				Weighting coefficient a_i
		0	1	2	3	
Waiting time	t_m	> 60 s	≤ 60 s	≤ 35 s	≤ 5 s	4
Temperature variation according to water rate	ΔT_1	> 10 K	≤ 10 K	≤ 5 K	≤ 2 K	3
Temperature fluctuation at constant water rate	ΔT_2	> 5 K	≤ 5 K	≤ 3 K	≤ 2 K	3
Temperature stabilization time	t_s	≥ 60 s	< 60 s	< 30 s	< 10 s	2
Minimum nominal water rate	D_m	> 6 l/min	≤ 6 l/min	≤ 4 l/min	≤ 2 l/min	1
Temperature fluctuation between successive deliveries	ΔT_3	> 20 K	≤ 20 K	≤ 10 K	≤ 5 K	1

The overall performance factor F shall be calculated by the formula:

$$F = \sum_{i=1}^{n} a_i \cdot f_i \qquad (6)$$

Depending on the value obtained, the overall performance factor *F* is used to classify the performance of the domestic hot water delivered, as indicated in Table 2.

Table 2 — Classification according to factor F

Label	Value of the factor *F*
_ _ _	< 14 points
*_ _	14 to 27 points
* *_	28 to 39 points
* * *	≥ 40 points with particular factors ≥ 2

EXAMPLE:

— waiting time < 35 s ⇒ f_i = 2 ⇒ $a_i.f_i$ = 8 points;

— temperature variation according to the water rate ≤ 2 K ⇒ f_i = 3 ⇒ $a_i.f_i$ = 9 points;

— temperature fluctuation at a constant water rate ≤ 2 K ⇒ f_i = 3 ⇒ $a_i.f_i$ = 9 points;

— temperature stabilization time < 30 s ⇒ f_i = 2 ⇒ $a_i.f_i$ = 4 points;

— minimum nominal water rate ≤ 3,5 l/min ⇒ f_i = 2 ⇒ $a_i.f_i$ = 2 points;

— temperature fluctuation between successive deliveries ≤ 10 K ⇒ f_i = 2 ⇒ $a_i.f_i$ = 2 points.

By calculating the sum of the values $a_i.f_i$, we obtain *F* = 34 points, corresponding to ** is obtained.

5.3.2 Test for classification according to the performance in delivery of domestic hot water production

5.3.2.1 General

The appliance shall be put in the initial adjustment conditions and in the initial state conditions as defined in 4.3.5 and 4.3.6.

The appliance shall be adjusted at a delivery rate corresponding to a heat output equivalent to the one obtained with the kitchen specific rate and not exceeding 7 l/min.

5.3.2.2 Waiting time

The time shall be measured from the opening of the tap, reaching 90 % of 45 K, without subsequently falling below 34 K (see Figures A.9 and A.10).

Where the temperature rises to 45 K, but subsequently falls below 34 K but not below 30 K, the mean value between the time taken to reach 90 % of 45 K for the first time and the time taken to rise to 90 % of 45 K and remain permanently at or above this figure is calculated.

Where the temperature rises to 45 K but subsequently falls below 30 K, the waiting time is the time taken to reach 90 % of 45 K and remain permanently at or above this figure is calculated.

The value obtained is compared to the requirement of the particular criterion in Table 1.

5.3.2.3 Temperature variation according to water rate

The water rate of the appliance shall be adjusted to 70 % of the delivery rate as defined in 5.3.2.1; after a delay chosen by the manufacturer, of between 0 min and 2 min, the mean temperature T_{1m} obtained during the following two minutes is recorded.

The water rate shall be then adjusted to a delivery rate equal to 95 % of the delivery rate as defined in 5.3.2.1, after one minute, the mean temperature T_{2m} obtained during the following two minutes is recorded (see Figures A.11 and A.12).

The absolute value of the difference (T_{2m} - T_{1m}) is compared to the requirement of the particular criterion in Table 1.

5.3.2.4 Temperature fluctuation at constant water rate

The following two tests shall be carried out:

1st test: the appliance shall be adjusted to deliver hot water at the water rate corresponding to 95 % of the delivery rate defined in 5.3.2.1; after a delay stated by the technical instructions, of between 0 min and 2 min, the hot water temperature is recorded over the time necessary to obtain the energy corresponding to a shower (1,820 kWh) (see Table 3, and Figures A.13 and A.14).

2nd test: the appliance shall adjusted to deliver hot water at a rate of 5 l/min or if the rate of 5 l/min cannot be obtained, at the minimum rate of the appliance, with a minimum temperature rise of 45 K; after a delay stated by the technical instructions, of between 0 min and 2 min, the hot water temperature is recorded over the time necessary to obtain the energy corresponding to a shower (1,820 kWh) (see Table 3, and Figures A.13 and A.14).

The maximum temperature fluctuation observed during the two tests is recorded.

The maximum value obtained is compared to the requirement of the particular criterion given in Table 1.

In the case of appliances which can deliver only one rate for a temperature rise of 45 K, only the first test is conducted.

The 2nd test has to be carried out only if the rates differ by more than 1 l/min.

Table 3 — Test rates for the measurement of ΔT_2

Manufacturer's claim		**Test conditions**	
D_m (l/min)	**D_c (l/min)**	**Rate 1st test**	**Rate 2nd test**
≤ 5	≤ 5	95 % D_c	D_m
≤ 5	5 < D_c < 7	95 % D_c	5
≤ 5	> 7	95 % D_c	5
> 5	5 < D_c < 7	95 % D_c	D_m
> 5	> 7	95 % D_c	D_m

where

D_m is minimum rate

D_c is kitchen specific rate

5.3.2.5 Temperature stabilization time on variation of the water rate

With the appliance in the initial state conditions and in the initial adjustment conditions defined in 4.3.5 and 4.3.6, the following test is performed:

The test comprises three stages:

1st stage: the test begins at a domestic hot water rate corresponding to 95 % of the delivery rate defined in 5.3.2.1; after a delay stated by the technical instructions, of between 0 min and 2 min it is checked during the two minutes which follows the temperature fluctuation is not greater than ΔT = 5 K.

2nd stage: the domestic hot water rate is reduced to 70 % of the delivery rate defined in 5.3.2.1; the time required to obtain a temperature fluctuation equal to or less than the value of ΔT = 5 K is measured.

3rd stage: the value of the hot water rate of the first stage is re-established, and the time required to obtain a temperature fluctuation equal to or less than the value of ΔT = 5 K is measured.

The stabilization time is the greater of the two times measured in stage 2 and stage 3 (see Figures A.15 and A.16). In the absence of a temperature fluctuation, t_s is equal to zero.

5.3.2.6 Minimum nominal water rate

The appliance shall be adjusted to deliver water at the domestic water test temperature and at the delivery rate corresponding to a heat output equivalent to the one obtained with the minimum rate specified in Table 1 and corresponding to the required performance.

The test begins at this minimum rate; after the delay stated by the technical instructions, of between 0 min and 2 min, it is checked that during the following 7 min, the domestic hot water temperature does not vary from the temperature specified by the technical instructions, in accordance with 4.3.5, by more than 5 K (see Figures A.17 and A.18).

5.3.2.7 Temperature fluctuation between successive deliveries

With the appliance adjusted at the delivery rate defined in 5.3.2.1, in steady state condition, the hot water delivery tap is closed quickly. After 10 s, the tap is opened quickly and the maximum temperature at the centre of the flow is measured, at the appliance outlet, by means of a rapid response thermometer.

The appliance shall be put back in its steady state condition.

The same measurement shall be carried out at intervals, increased each time by 10 s, until the increase in the flow temperature variation is less than + 1 K (see Figures A.19 and A.20).

The value obtained is compared to the requirement of the particular criterion in Table 1.

6 Information

The following data shall be available to the consumer.

— specific rate at 30 K, in l/min;

— tapping capability in l/min corresponding to several standard time periods with the corresponding number of taps (10 min and continuous compulsory; 5 min and 20 min optional);

— quantity of domestic hot water as indicated in 5.2.3;

— level of overall performances in delivery with the number of stars. For one star, add 2 dashes after the star, for two stars, add one dash.

No other information shall be carried on the appliance or the packaging if it is likely to create confusion in relation to the above information.

7 Eco design Related Products Data

7.1 Mixed water at 40 °C (*V40*)

This requirement applies only for storage water heaters according to EN 89.

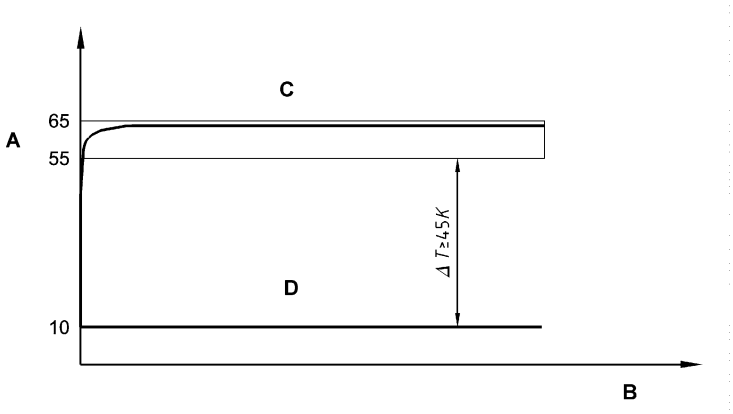
The mixed water at 40 °C is measured as tapping capability according to 5.2.2 by using the following formula:

$$V_R = R \times 10 \text{ (in litres)} \quad (7)$$

Annex A
(informative)[1)]

Test conditions

NOTE For the figures D_c means "Kitchen specific rate" according to 3.5.



Key

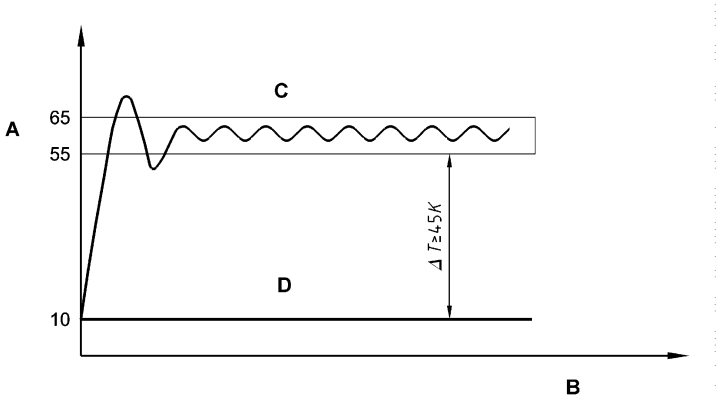
A temperature (°C)

B time (min)

C hot water

D cold water

Figure A.1 — Initial adjustment of the appliance with storage tank maintained in temperature



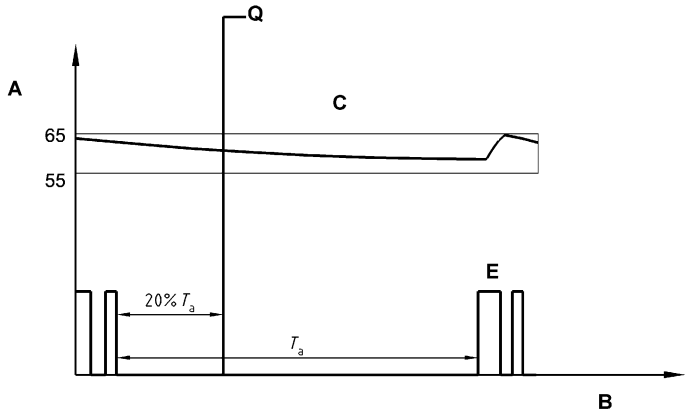
Key

A temperature (°C) C hot water

B time (min) D cold water

Figure A.2 — Initial adjustment of the appliance without storage tank maintained in temperature

1) These figures are purely informative and are given as examples.



Key

A temperature (°C)

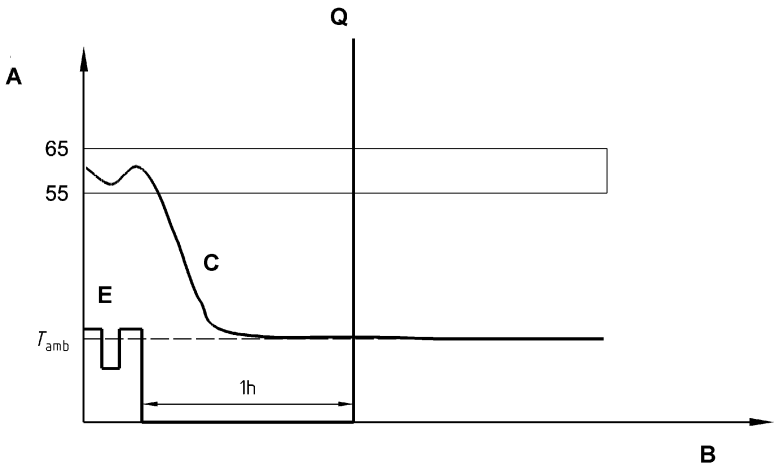
B time (min)

C hot water

E gas rate

Q initial state of appliance at the opening of the tap to achieve all the tests of this standard are conducted as follows

Figure A.3 — Initial state conditions of the appliance with control cycle maintained in temperature



Key

A temperature (°C)

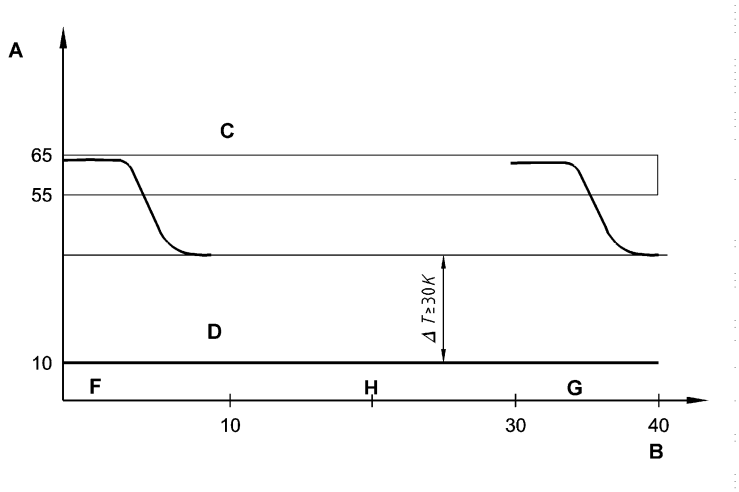
B time (min)

C hot water

E gas rate

Q initial state of appliance at the opening of the tap to achieve all the tests of this standard are conducted as follows

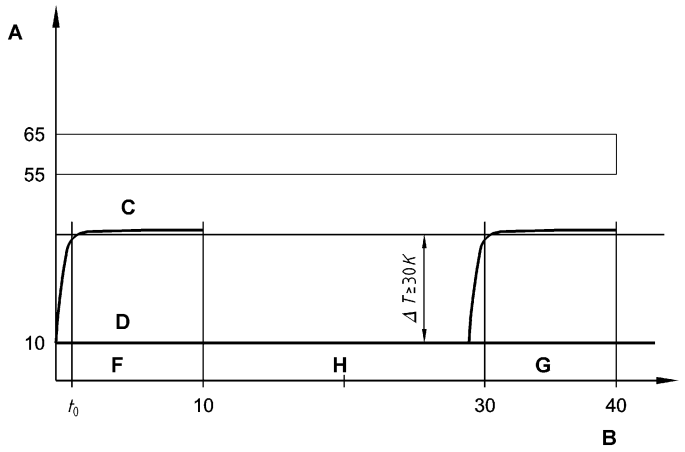
Figure A.4 — Initial state conditions of the appliance without control maintained in temperature



Key

A temperature (°C)
B time (min)
C hot water
E gas rate
F 1st delivery
G 2nd delivery
H stop

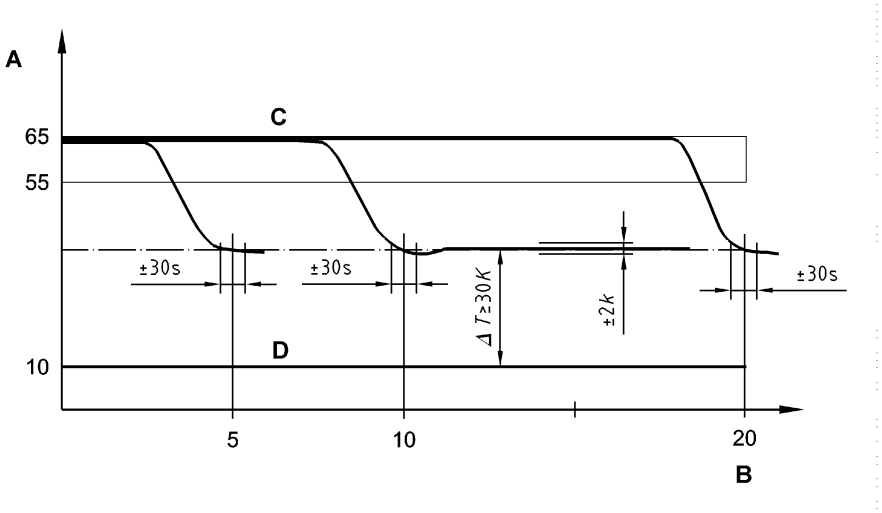
Figure A.5 — Specific rate of the appliance with storage tank maintained in temperature



Key

A temperature (°C)
B time (min)
C hot water
E gas rate
F 1st delivery
G 2nd delivery
H stop

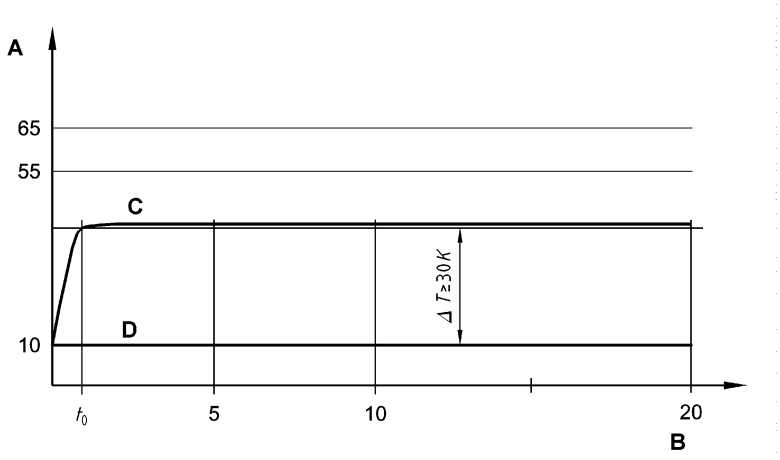
Figure A.6 — Specific rate of the appliance without storage tank maintained in temperature



Key

A temperature (°C)
B time (min)
C hot water
D cold water

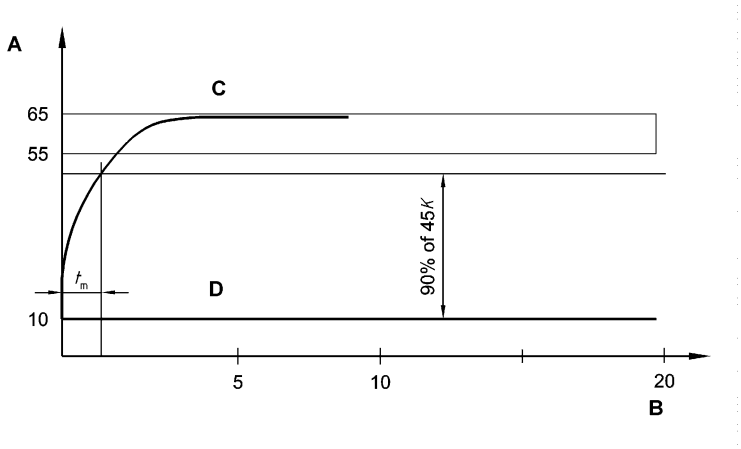
Figure A.7 — Tapping capability of the appliance with storage tank maintained in temperature



Key

A temperature (°C)
B time (min)
C hot water
D cold water

Figure A.8 — Tapping capability of the appliance without storage tank maintained in temperature



Key

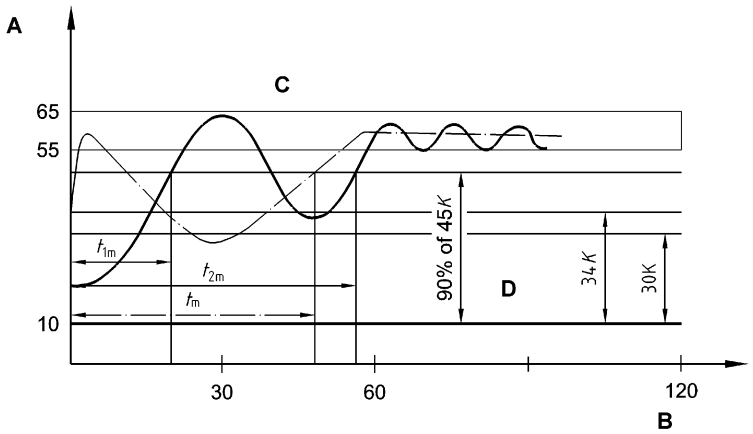
A temperature (°C)

B time (min)

C hot water

D cold water

Figure A.9 — Measurement of the waiting time t_m of the appliance with storage tank maintained in temperature



Key

A temperature (°C)

B time (min)

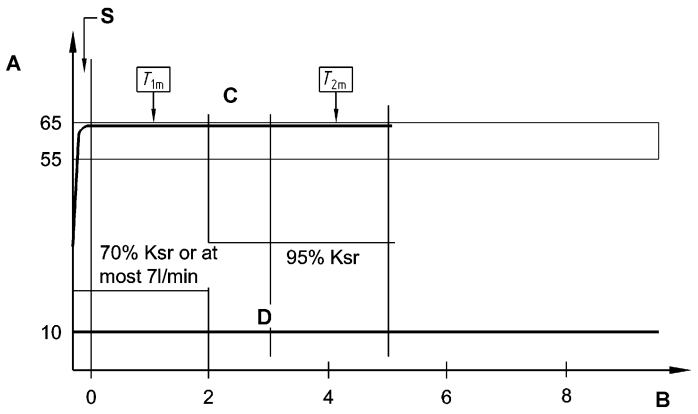
C hot water

D cold water

_____ 1st example $t_m=(t_{1m}+t_{2m})/2$

_.-._.-. 2nd example $t_m=t_m$

Figure A.10 — Measurement of the waiting time t_m of the appliance without storage tank maintained in temperature



Key

A temperature (°C)

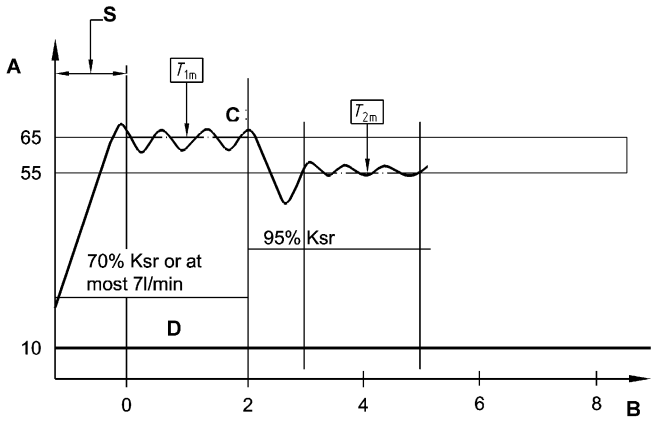
B time (min)

C hot water

D cold water

S delay chosen by the manufacturer, between 0 min and 2 min

Figure A.11 — Temperature variation according to water rate of the appliance with storage tank maintained in temperature



Key

A temperature (°C)

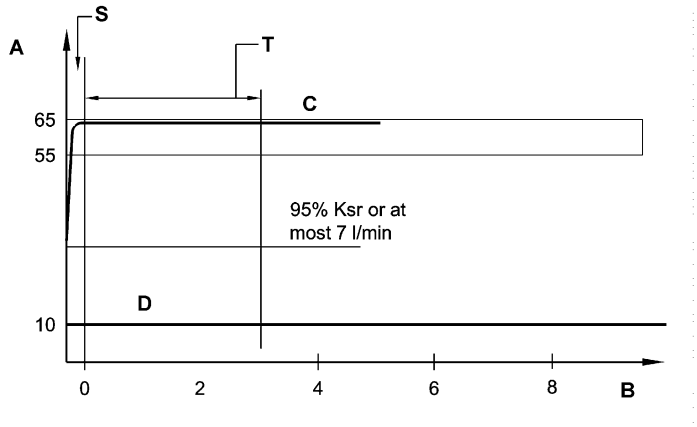
B time (min)

C hot water

D cold water

S delay chosen by the manufacturer, between 0 min and 2 min

Figure A.12 — Temperature variation according to water rate of the appliance without storage tank maintained in temperature



Key

A temperature (°C)

B time (min)

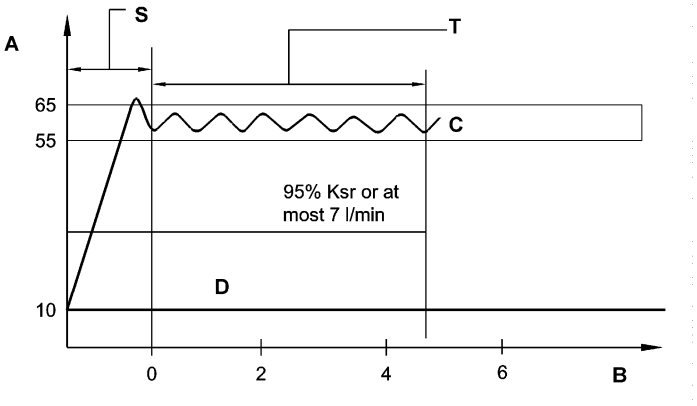
C hot water

D cold water

S delay chosen by the manufacturer, between 0 min and 2 min

T time necessary to recover an energy equal to 1,820 kWh

Figure A.13 — Temperature fluctuation at constant water rate of the appliance with storage tank maintained in temperature



Key

A temperature (°C)

B time (min)

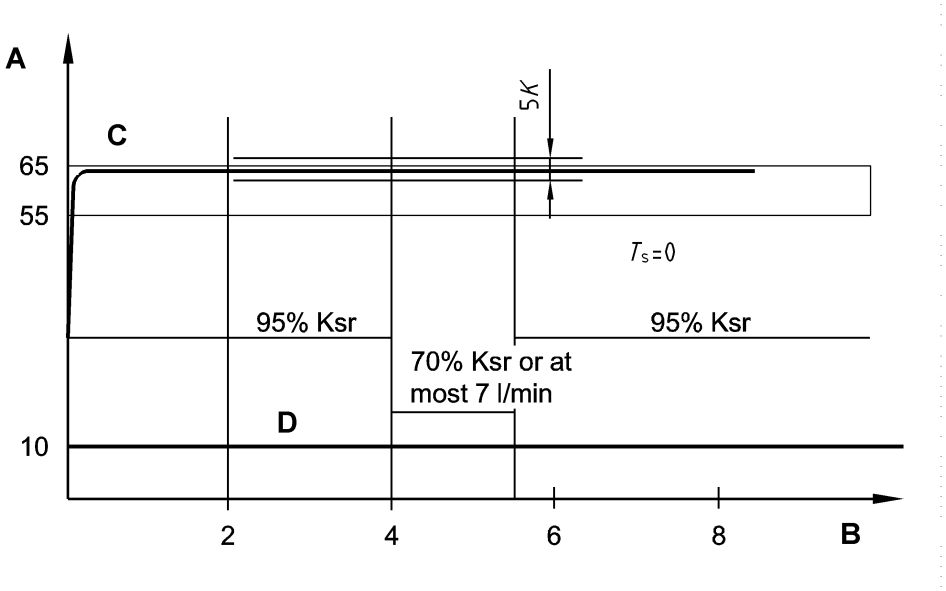
C hot water

D cold water

S delay chosen by the manufacturer, between 0 min and 2 min

T time necessary to recover an energy equal to 1,820 kWh

Figure A.14 — Temperature fluctuation at constant water rate of the appliance without storage tank maintained in temperature



Key

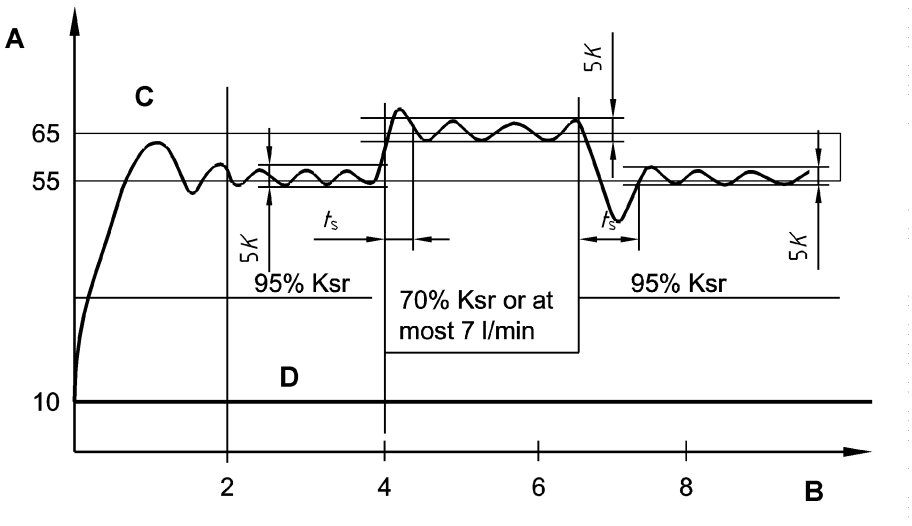
A temperature (°C)

B time (min)

C hot water

D cold water

Figure A.15 — Temperature stabilization time on variation of the water rate of the appliance with storage tank maintained in temperature



Key

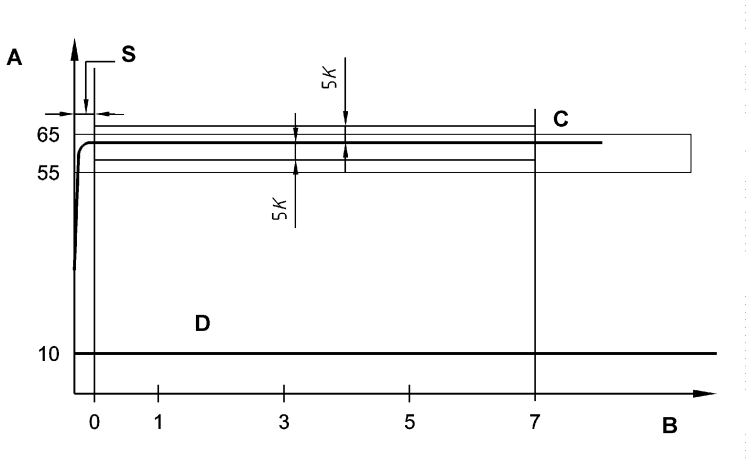
A temperature (°C)

B time (min)

C hot water

D cold water

Figure A.16 — Temperature stabilization time on variation of the water rate of the appliance without storage tank maintained in temperature



Key

A temperature (°C)

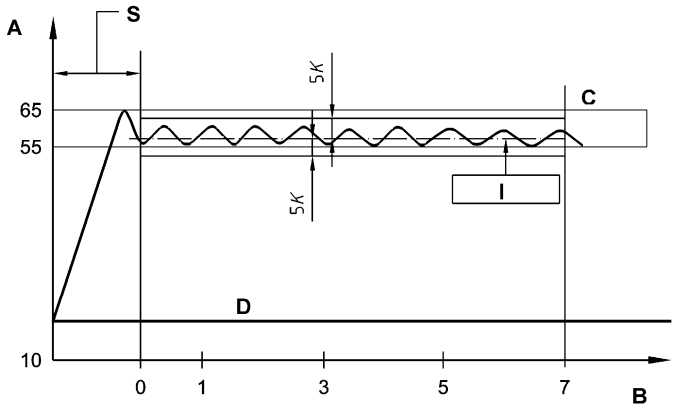
B time (min)

C hot water

D cold water

S delay chosen by the manufacturer, between 0 min and 2 min

Figure A.17 — Minimum nominal water rate of the appliance with storage tank maintained in temperature



Key

A temperature (°C)

B time (min)

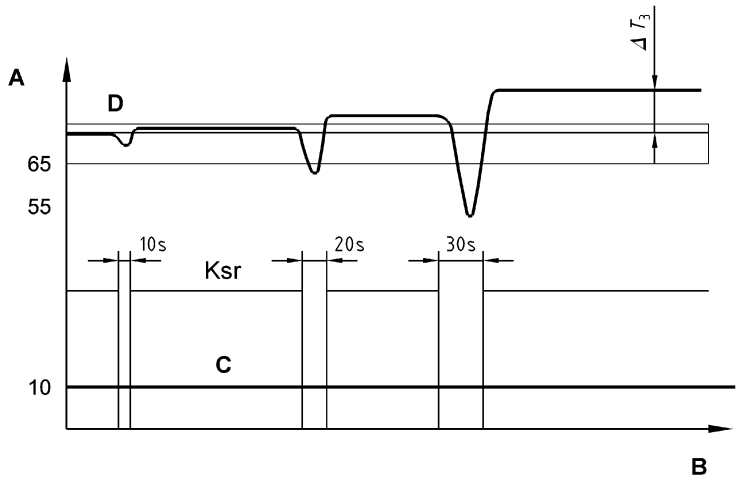
C hot water

D cold water

I mean T

S delay chosen by the manufacturer, between 0 min and 2 min

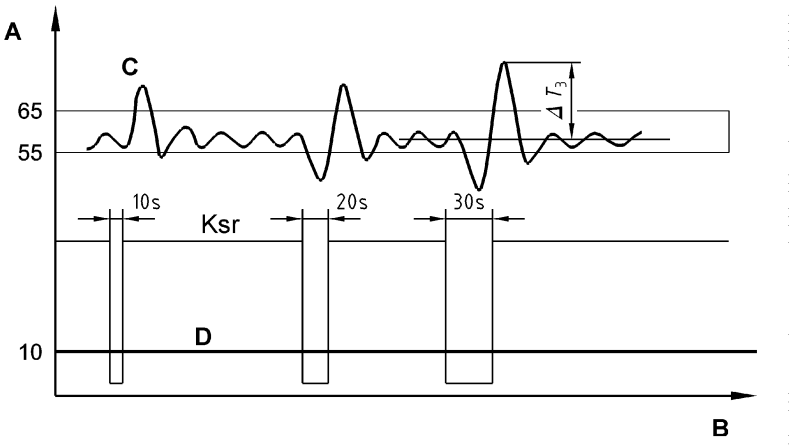
Figure A.18 — Minimum nominal water rate of the appliance without storage tank maintained in temperature



Key

A temperature (°C)
B time (min)
C hot water
D cold water

Figure A.19 — Temperature fluctuation between successive tapping of the appliance with storage tank maintained in temperature



Key

A temperature (°C)
B time (min)
C hot water
D cold water

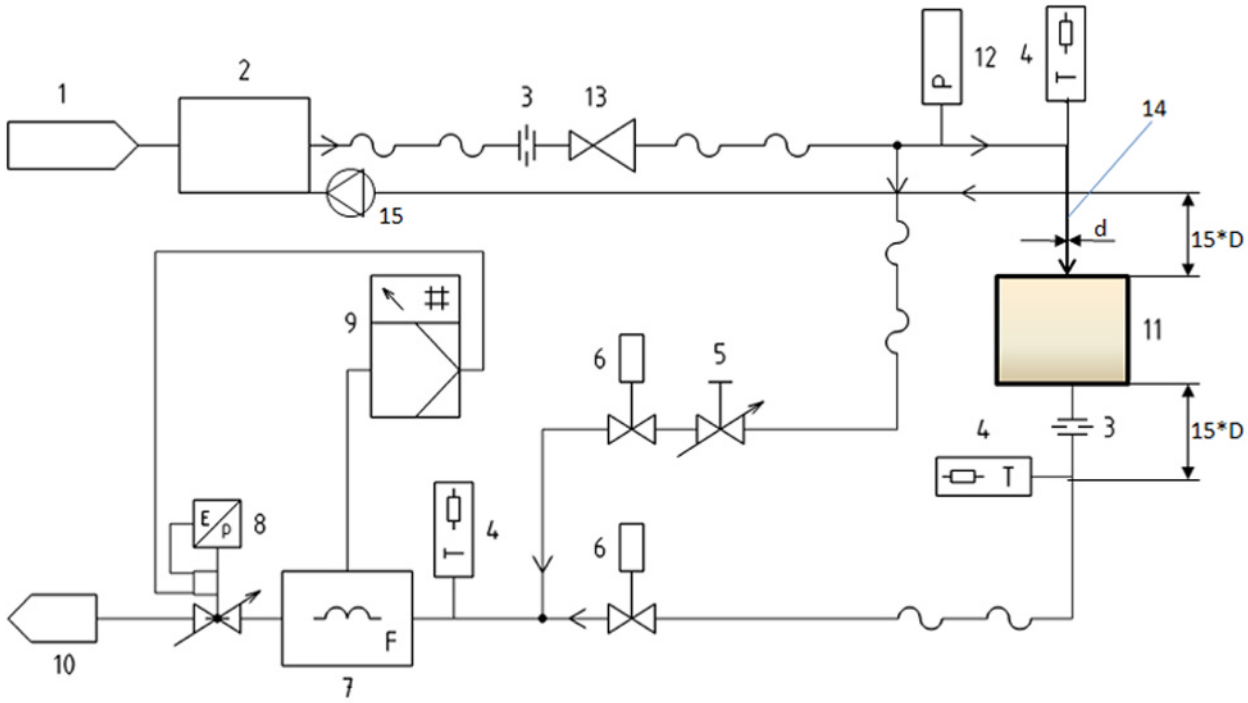
Figure A.20 — Temperature fluctuation between successive tapping of the appliance without storage tank maintained in temperature

Annex B
(informative)

Test rig and measurement devices

B.1 General

A general diagram of a possible test rig is shown in Figure B.1.



Key

1 water
2 preparator of water at 10 °C
3 diaphragm to homogenise the temperature and pressure profile across the tube diameter
4 temperature measurement device
5 equilibrium valve
6 electrovalve
7 flowmeter
8 control valve
9 rate control
10 drain
11 appliance in test
12 pressure measurement device
13 pressure control
14 cold water connection part consist of stainless steel
15 circulator of cold water circuit

Figure B.1 — Example of test rig

B.2 Pressure measurement

An example of the pressure measurement device is shown in Figure B.2. The lengths of the pipe upstream and downstream of the pressure measurement device are 15 *D* and 5 *D*, where (*D*) is the diameter of the pipe.

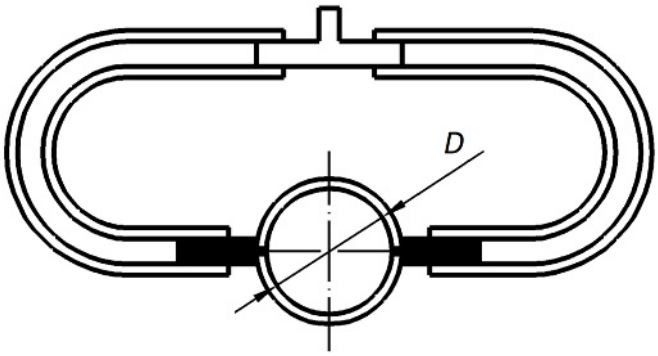


Figure B.2 — Example of pressure measurement device

B.3 Temperature measurement

Temperature sensors used in the test rig could be:

— Thermocouples of type T, class 1, diameter of 0,5 mm;

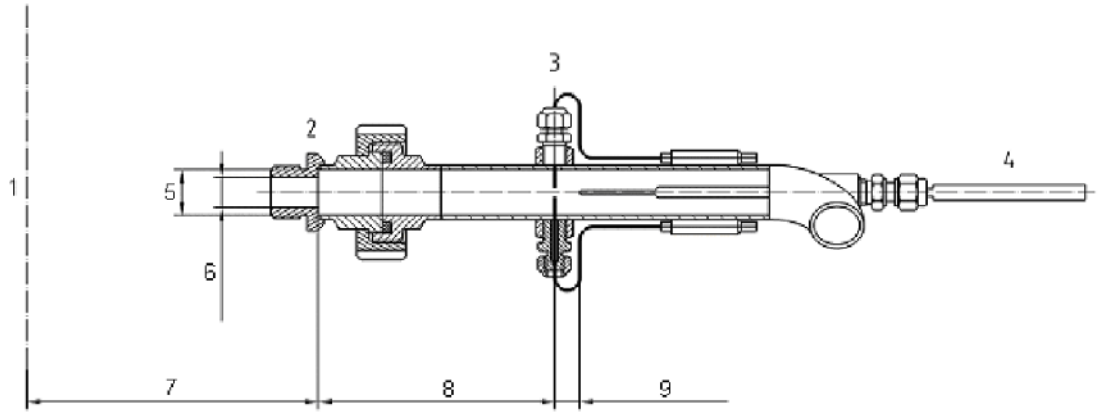
— Low inertia Pt 100 probe, diameter of 2 mm.

The temperature measurement device could be equipped with:

— 3 thermocouples + 1 Pt 100 probe, diameter 2 mm; or

— 4 thermocouples + 1 Pt 100 probe, diameter 2 mm.

An example of a temperature measurement device is shown in Figure B.3.



Key

1 outlet of the appliance in test (hole with Ø*D*)

2 diaphragm to homogenise the temperature and pressure profile across the tube diameter

3 thermocouple

4 platine probe

5 Ø*D*

6 0,7 x Ø*D*

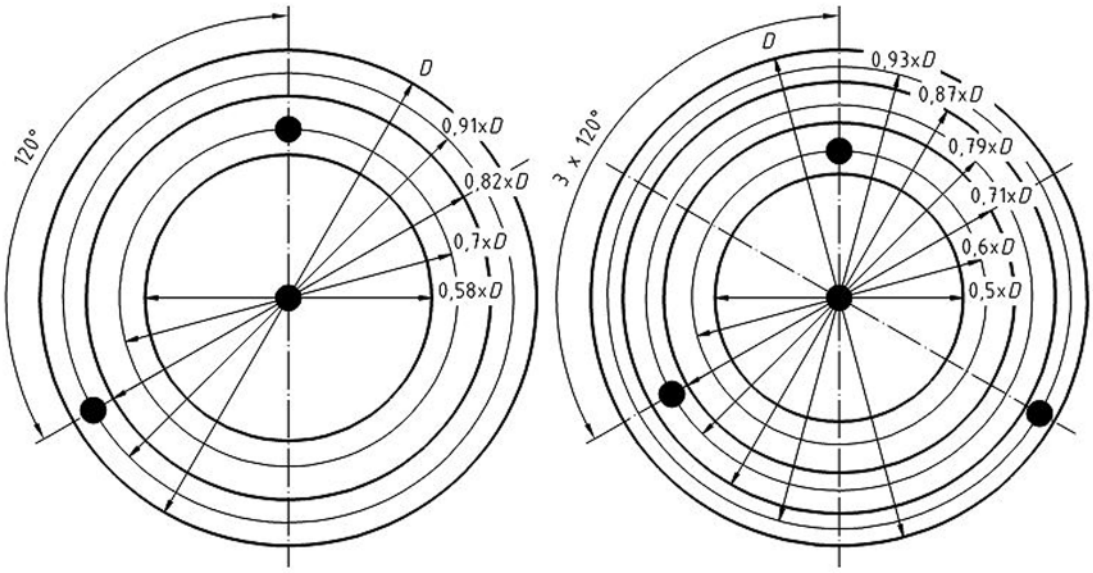
7 < 10 x Ø*D*

8 5 x Ø*D*

9 > 0,5 *D* and < *D*

Figure B.3 — Example of temperature measurement device

The position of the thermocouples (three or four with one thermocouple at the centre of the flow) could be as shown in Figure B.4.



Key

- thermocouples

Figure B.4 — Example of position of thermocouples - Method of surfaces

Other measuring instruments may be used provided the results required in the standard are obtainable.

Annex ZA
(informative)

Relationship between this European Standard and the requirements of Commission Regulation (EU) n° 814/2013

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to requirements of Commission Regulation (EU) n° 814/2013 of 2 August 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for water heaters and hot water storage tanks.

Once this standard is cited in the Official Journal of the European Union under that Commission Regulation, compliance with the clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding requirements of that and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Commission Regulation (EU) n° 814/2013

Clauses and subclauses of this EN	Requirements of Commission Regulation (EU) n° 814/2013	Qualifying remarks/Notes
7.1	Annex II, 1.3 Requirements for mixed water at 40 °C of storage water heaters with declared load profiles M, L, XL, XXL, 3XL and 4XL	

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

[1] EN 13203-2, *Gas-fired domestic appliances producing hot water — Part 2: Assessment of energy consumption*

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