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COMMISSION REGULATION (EU) No 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
(Text with EEA relevance)
(OJ L 239, 6.9.2013, p. 162)

Amended by:

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		No	page	date
► <u>M1</u>	Commission Regulation (EU) 2016/2282 of 30 November 2016	L 346	51	20.12.2016

**COMMISSION REGULATION (EU) No 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****(Text with EEA relevance)***Article 1***Subject matter and scope**

1. This Regulation establishes ecodesign requirements for the placing on the market and/or putting into service of water heaters with a rated heat output ≤ 400 kW and hot water storage tanks with a storage volume $\leq 2\,000$ litres, including those integrated in packages of water heater and solar device as defined in Article 2 of Delegated Regulation (EU) No 812/2013.

2. This Regulation shall not apply to:

- (a) water heaters specifically designed for using gaseous or liquid fuels predominantly produced from biomass;
- (b) water heaters using solid fuels;
- (c) water heaters within the scope of Directive 2010/75/EU of the European Parliament and of the Council ⁽¹⁾;
- (d) combination heaters as defined in Article 2 of Commission Regulation (EU) No 813/2013 ⁽²⁾;
- (e) water heaters which do not meet at least the load profile with the smallest reference energy, as specified in Annex III, Table 1;
- (f) water heaters designed for making hot drinks and/or food only;
- (g) heat generators designed for water heaters and water heater housings to be equipped with such heat generators placed on the market before 1 January 2018 to replace identical heat generators and identical water heater housings. The replacement product or its packaging shall clearly indicate the water heater for which it is intended.

*Article 2***Definitions**

In addition to the definitions set out in Article 2 of Directive 2009/125/EC, the following definitions shall apply for the purposes of this Regulation:

- (1) ‘water heater’ means a device that

⁽¹⁾ OJ L 334, 17.12.2010, p. 17.

⁽²⁾ See page 136 of this Official Journal.

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- (a) is connected to an external supply of drinking or sanitary water;
 - (b) generates and transfers heat to deliver drinking or sanitary hot water at given temperature levels, quantities and flow rates during given intervals; and
 - (c) is equipped with one or more heat generators;
- (2) ‘heat generator’ means the part of a water heater that generates the heat using one or more of the following processes:
- (a) combustion of fossil fuels and/or biomass fuels;
 - (b) use of the Joule effect in electric resistance heating elements;
 - (c) capture of ambient heat from an air source, water source or ground source, and/or waste heat;

whereby a heat generator designed for a water heater and a water heater housing to be equipped with such a heat generator shall be also considered a water heater;

- (3) ‘water heater housing’ means the part of a water heater designed to have a heat generator fitted;
- (4) ‘rated heat output’ means the declared heat output of the water heater when providing water heating at standard rating conditions, expressed in kW;
- (5) ‘storage volume’ (*V*) means the rated volume of a hot water storage tank or a storage water heater, expressed in litres;
- (6) ‘standard rating conditions’ means the operating conditions of water heaters for establishing the rated heat output, water heating energy efficiency, sound power level and nitrogen oxide emissions, and of hot water storage tanks for establishing the standing loss;
- (7) ‘biomass’ means the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste;
- (8) ‘biomass fuel’ means a gaseous or liquid fuel produced from biomass;
- (9) ‘fossil fuel’ means a gaseous or liquid fuel of fossil origin;
- (10) ‘conventional water heater’ means a water heater that generates heat using the combustion of fossil and/or biomass fuels and/or the Joule effect in electric resistance heating elements;

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- (11) ‘heat pump water heater’ means a water heater using ambient heat from an air source, water source or ground source, and/or waste heat for heat generation;
- (12) ‘solar water heater’ means a water heater equipped with one or more solar collectors, solar hot water storage tanks, heat generators and possibly pumps in the collector loop and other parts; a solar water heater is placed on the market as one unit;
- (13) ‘hot water storage tank’ means a vessel for storing hot water for water and/or space heating purposes, including any additives, which is not equipped with any heat generator except possibly one or more back-up immersion heaters;
- (14) ‘back-up immersion heater’ means a Joule effect electric resistance heater that is part of a hot water storage tank and generates heat only when the external heat source is disrupted (including during maintenance periods) or out of order, or that is part of a solar hot water storage tank and provides heat when the solar heat source is not sufficient to satisfy required comfort levels;
- (15) ‘water heating energy efficiency’ (η_{wh}) means the ratio between the useful energy provided by a water heater and the energy required for its generation, expressed in %;
- (16) ‘sound power level’ (L_{WA}) means the A-weighted sound power level, indoors and/or outdoors, expressed in dB;
- (17) ‘standing loss’ (S) means the heating power dissipated from a hot water storage tank at given water and ambient temperatures, expressed in W;
- (18) ‘conversion coefficient’ (CC) means a coefficient reflecting the estimated 40 % average EU generation efficiency referred to in Directive 2012/27/EU of the European Parliament and of the Council (1); the value of the conversion coefficient is $CC = 2,5$.

For the purposes of Annexes II to VI, additional definitions are set out in Annex I.

*Article 3***Ecodesign requirements and timetable**

1. The ecodesign requirements for water heaters and hot water storage tanks are set out in Annex II.
2. Each ecodesign requirement shall apply in accordance with the following timetable:

(1) OJ L 315, 14.11.2012, p. 1.

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- (a) from 26 September 2015:
- (i) water heaters shall meet the requirements set out in Annex II, points 1.1(a), 1.2, 1.3, 1.4 and 1.6;
 - (ii) hot water storage tanks shall meet the requirements set out in Annex II, point 2.2;
- (b) from 26 September 2017:
- (i) water heaters shall meet the requirements set out in Annex II, point 1.1(b);
 - (ii) hot water storage tanks shall meet the requirements set out in Annex II, point 2.1;
- (c) from 26 September 2018:
- (i) water heaters shall meet the requirements set out in Annex II, point 1.1(c);
 - (ii) water heaters shall meet the requirements set out in Annex II, point 1.5(a).

3. Compliance with ecodesign requirements shall be measured and calculated in accordance with the requirements set out in Annexes III and IV.

*Article 4***Conformity assessment**

1. The conformity assessment procedure referred to in Article 8(2) of Directive 2009/125/EC shall be the internal design control set out in Annex IV to that Directive or the management system set out in Annex V to that Directive.
2. For the purposes of conformity assessment, the technical documentation shall contain the product information set out in point 1.6 of Annex II to this Regulation.

*Article 5***Verification procedure for market surveillance purposes**

When performing the market surveillance checks referred to in Article 3(2) of Directive 2009/125/EC to ensure compliance with the requirements set out in Annex II to this Regulation, the Member States' authorities shall apply the verification procedure set out in Annex V to this Regulation.

*Article 6***Indicative benchmarks**

The indicative benchmarks for best-performing water heaters and hot water storage tanks available on the market at the time of entry into force of this Regulation are set out in Annex VI.

▼B*Article 7***Review**

1. The Commission shall review this Regulation in the light of technological progress with water heaters and hot water storage tanks and present the result of that review to the Ecodesign Consultation Forum no later than five years from the date of entry into force of this Regulation. In particular, the review shall include an assessment of the following aspects:

- (a) the appropriateness of setting ecodesign requirements for greenhouse gas emissions related to refrigerants;
- (b) on the basis of the measurement methods under development, the level of the ecodesign requirements for emissions of carbon monoxide and hydrocarbons that may be introduced;
- (c) the appropriateness of setting stricter ecodesign requirements for emissions of nitrogen oxides;
- (d) the appropriateness of setting ecodesign requirements for water heaters specifically designed for using gaseous or liquid fuels predominantly produced from biomass;
- (e) the validity of the conversion coefficient value;
- (f) the appropriateness of third party certification.

2. The Commission shall also review this Regulation in the light of technological progress with water heaters and present the result of that review to the Ecodesign Consultation Forum no later than three years from the date of entry into force of this Regulation. The review shall only include an assessment of the appropriateness of setting separate ecodesign requirements for different types of water heaters.

*Article 8***Transitional provisions**

1. Until 26 September 2015 Member States may allow the placing on the market and/or putting into service of water heaters which are in conformity with the national provisions in force when this Regulation is adopted regarding water heating energy efficiency and sound power level.

2. Until 26 September 2018 Member States may allow the placing on the market and/or putting into service of water heaters which are in conformity with the national provisions in force when this Regulation is adopted regarding emissions of nitrogen oxides.

3. Until 26 September 2017 Member States may allow the placing on the market and/or putting into service of hot water storage tanks, which are in conformity with the national provisions in force upon adoption of this Regulation regarding standing losses.

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Article 9

Entry into force

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

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ANNEX I

Definitions applicable for Annexes II to VI

For the purposes of Annexes II to VI the following definitions shall apply:

- (1) ‘storage water heater’ means a water heater equipped with hot water storage tank(s), heat generator(s) and possibly other parts, which are contained in a single housing;
- (2) ‘load profile’ means a given sequence of water draw-offs, as specified in Annex III, Table 1; each water heater meets at least one load profile;
- (3) ‘water draw-off’ means a given combination of useful water flow rate, useful water temperature, useful energy content and peak temperature, as specified in Annex III, Table 1;
- (4) ‘useful water flow rate’ (f) means the minimum flow rate, expressed in litres per minute, for which hot water is contributing to the reference energy, as specified in Annex III, Table 1;
- (5) ‘useful water temperature’ (T_m), means the water temperature, expressed in degrees Celsius, at which hot water starts contributing to the reference energy, as specified in Annex III, Table 1;
- (6) ‘useful energy content’ (Q_{tap}) means the energy content of hot water, expressed in kWh, provided at a temperature equal to, or above, the useful water temperature, and at water flow rates equal to, or above, the useful water flow rate, as specified in Annex III, Table 1;
- (7) ‘energy content of hot water’ means the product of the specific heat capacity of water, the average temperature difference between the hot water output and cold water input, and the total mass of the hot water delivered;
- (8) ‘peak temperature’ (T_p) means the minimum water temperature, expressed in degrees Celsius, to be achieved during water draw-off, as specified in Annex III, Table 1;
- (9) ‘reference energy’ (Q_{ref}) means the sum of the useful energy content of water draw-offs, expressed in kWh, in a particular load profile, as specified in Annex III, Table 1;
- (10) ‘maximum load profile’ means the load profile with the greatest reference energy that a water heater is able to provide while fulfilling the temperature and flow rate conditions of that load profile;
- (11) ‘declared load profile’ means the load profile applied for conformity assessment;
- (12) ‘daily electricity consumption’ (Q_{elec}) means the consumption of electricity over 24 consecutive hours under the declared load profile, expressed in kWh in terms of final energy;
- (13) ‘daily fuel consumption’ (Q_{fuel}) means the consumption of fuels over 24 consecutive hours under the declared load profile, expressed in kWh in terms of GCV ;
- (14) ‘gross calorific value’ (GCV) means the total amount of heat released by a unit quantity of fuel when it is burned completely with oxygen and when the products of combustion are returned to ambient temperature; this quantity includes the condensation heat of any water vapour contained in the fuel and of the water vapour formed by the combustion of any hydrogen contained in the fuel;

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- (15) ‘smart control’ means a device that automatically adapts the water heating process to individual usage conditions with the aim of reducing energy consumption;
- (16) ‘smart control compliance’ (*smart*) means the measure of whether a water heater equipped with smart controls fulfils the criterion set out in point 4 of Annex IV;
- (17) ‘smart control factor’ (*SCF*) means the water heating energy efficiency gain due to smart control under the conditions set out in point 3 of Annex III;
- (18) ‘weekly electricity consumption with smart controls’ ($Q_{elec,week,smart}$) means the weekly electricity consumption of a water heater with the smart control function enabled, measured under the conditions set out in point 3 of Annex III, expressed in kWh in terms of final energy;
- (19) ‘weekly fuel consumption with smart controls’ ($Q_{fuel,week,smart}$) means the weekly fuel consumption of a water heater with the smart control function enabled, measured under the conditions set out in point 3 of Annex III, expressed in kWh in terms of *GCV*;
- (20) ‘weekly electricity consumption without smart controls’ ($Q_{elec,week}$) means the weekly electricity consumption of a water heater with the smart control function disabled, measured under the conditions set out in point 3 of Annex III, expressed in kWh in terms of final energy;
- (21) ‘weekly fuel consumption without smart controls’ ($Q_{fuel,week}$) means the weekly fuel consumption of a water heater with the smart control function disabled, measured under the conditions set out in point 3 of Annex III, expressed in kWh in terms of *GCV*;
- (22) ‘ambient correction term’ (Q_{cor}) means a term which takes into account the fact that the place where the water heater is installed is not an isothermal place, expressed in kWh;
- (23) ‘standby heat loss’ (P_{stby}) means the heat loss of a heat pump water heater in operating modes without heat demand, expressed in kW;
- (24) ‘mixed water at 40 °C’ (*V40*) means the quantity of water at 40 °C, which has the same heat content (enthalpy) as the hot water which is delivered above 40 °C at the output of the water heater, expressed in litres;
- (25) ‘average climate conditions’ mean the temperature and global solar irradiance conditions characteristic for the city of Strasbourg;
- (26) ‘annual energy consumption’ (Q_{total}) means the annual energy consumption of a solar water heater, expressed in kWh in terms of primary energy and/or kWh in terms of *GCV*;
- (27) ‘annual non-solar heat contribution’ (Q_{nonsol}) means the annual contribution of electricity (expressed in kWh in terms of primary energy) and/or fuel (expressed in kWh in terms of *GCV*) to the useful heat output of a solar water heater, taking into account the annual amount of heat captured by the solar collector and the heat losses of the solar hot water storage tank;

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- (28) ‘solar collector’ means a device designed to absorb global solar irradiance and to transfer the heat energy so produced to a fluid passing through it; it is characterised by the collector aperture area, the zero-loss efficiency, the first-order coefficient, the second-order coefficient and the incidence angle modifier;
- (29) ‘global solar irradiance’ means the rate of total incoming solar energy, both direct and diffuse, on a collector plane with an inclination of 45 degrees and southward orientation at the Earth’s surface, expressed in W/m^2 ;
- (30) ‘collector aperture area’ (A_{sol}) means the maximum projected area through which unconcentrated solar radiation enters the collector, expressed in m^2 ;
- (31) ‘zero-loss efficiency’ (η_0) means the efficiency of the solar collector, when the solar collector mean fluid temperature is equal to the ambient temperature;
- (32) ‘first-order coefficient’ (a_1) means the heat loss coefficient of a solar collector, expressed in $\text{W}/(\text{m}^2 \text{ K})$;
- (33) ‘second-order coefficient’ (a_2) means the coefficient measuring the temperature dependence of the first-order coefficient, expressed in $\text{W}/(\text{m}^2 \text{ K}^2)$;
- (34) ‘incidence angle modifier’ (IAM) means the ratio of the useful heat output of a solar collector at a given incidence angle and its useful heat output at an incidence angle of 0 degrees;
- (35) ‘incidence angle’ means the angle between the direction to the sun and the direction perpendicular to the solar collector aperture;
- (36) ‘solar hot water storage tank’ means a hot water storage tank storing heat energy produced by one or more solar collectors;
- (37) ‘heat generator water heating energy efficiency’ ($\eta_{wh,nonsol}$) means the water heating energy efficiency of a heat generator which is part of a solar water heater, expressed in %, established under average climate conditions and without using solar heat input;
- (38) ‘auxiliary electricity consumption’ (Q_{aux}) means the annual electricity consumption of a solar water heater that is due to the pump power consumption and the standby power consumption, expressed in kWh in terms of final energy;
- (39) ‘pump power consumption’ (sol_{pump}) means the rated electrical power consumption of the pump in the collector loop of a solar water heater, expressed in W;
- (40) ‘standby power consumption’ ($sol_{standby}$) means the rated electrical power consumption of a solar water heater when the pump and the heat generator of a solar water heater are inactive, expressed in W;
- (41) ‘equivalent model’ means a model placed on the market with the same technical parameters set out in the applicable product information requirements of Annex II as another model placed on the market by the same manufacturer.



ANNEX II

Ecodesign requirements

1. ECODESIGN REQUIREMENTS FOR WATER HEATERS

1.1. Requirements for water heating energy efficiency

- (a) From 26 September 2015 the water heating energy efficiency of water heaters shall not fall below the following values:

Declared load profile	3XS	XXS	XS	S	M	L	XL	XXL	3XL	4XL
Water heating energy efficiency	22 %	23 %	26 %	26 %	30 %	30 %	30 %	32 %	32 %	32 %
In addition, for water heaters with <i>smart</i> being declared as '1': water heating energy efficiency calculated for <i>smart</i> = 0, tested under the declared load profile	19 %	20 %	23 %	23 %	27 %	27 %	27 %	28 %	28 %	28 %

- (b) From 26 September 2017 the water heating energy efficiency of water heaters shall not fall below the following values:

Declared load profile	3XS	XXS	XS	S	M	L	XL	XXL	3XL	4XL
Water heating energy efficiency	32 %	32 %	32 %	32 %	36 %	37 %	37 %	37 %	37 %	38 %
In addition, for water heaters with <i>smart</i> being declared as '1': water heating energy efficiency calculated for <i>smart</i> = 0, tested under the declared load profile	29 %	29 %	29 %	29 %	33 %	34 %	35 %	36 %	36 %	36 %

- (c) From 26 September 2018 the water heating energy efficiency of water heaters shall not fall below the following values:

Declared load profile	XXL	3XL	4XL
Water heating energy efficiency	60 %	64 %	64 %

1.2. Requirements for storage volume of storage water heaters with declared load profiles 3XS, XXS, XS and S

From 26 September 2015:

- (a) for storage water heaters with declared load profile 3XS the storage volume shall not exceed 7 litres;
- (b) for storage water heaters with declared load profiles XXS and XS, the storage volume shall not exceed 15 litres;

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- (c) for storage water heaters with declared load profile S the storage volume shall not exceed 36 litres.

1.3. Requirements for mixed water at 40 °C of storage water heaters with declared load profiles M, L, XL, XXL, 3XL and 4XL

From 26 September 2015 the amount of mixed water at 40 °C shall not fall below the following values:

Declared load profile	M	L	XL	XXL	3XL	4XL
Mixed water at 40 °C	65 litres	130 litres	210 litres	300 litres	520 litres	1 040 litres

1.4. Requirements for sound power level

From 26 September 2015 the sound power level of heat pump water heaters shall not exceed the following values:

Rated heat output ≤ 6 kW		Rated heat output > 6 kW and ≤ 12 kW		Rated heat output > 12 kW and ≤ 30 kW		Rated heat output > 30 kW and ≤ 70 kW	
Sound power level (L_{WA}), indoors	Sound power level (L_{WA}), outdoors	Sound power level (L_{WA}), indoors	Sound power level (L_{WA}), outdoors	Sound power level (L_{WA}), indoors	Sound power level (L_{WA}), outdoors	Sound power level (L_{WA}), indoors	Sound power level (L_{WA}), outdoors
60 dB	65 dB	65 dB	70 dB	70 dB	78 dB	80 dB	88 dB

1.5. Requirements for emissions of nitrogen oxides

- (a) From 26 September 2018 emissions of nitrogen oxides, expressed in nitrogen dioxide, of water heaters shall not exceed the following values:

- conventional water heaters using gaseous fuels: 56 mg/kWh fuel input in terms of *GCV*,
- conventional water heaters using liquid fuels: 120 mg/kWh fuel input in terms of *GCV*,
- heat pump water heaters equipped with external combustion using gaseous fuels and solar water heaters using gaseous fuels: 70 mg/kWh fuel input in terms of *GCV*,
- heat pump water heaters equipped with external combustion using liquid fuels and solar water heaters using liquid fuels: 120 mg/kWh fuel input in terms of *GCV*,
- heat pump water heaters equipped with an internal combustion engine using gaseous fuels: 240 mg/kWh fuel input in terms of *GCV*,
- heat pump water heaters equipped with an internal combustion engine using liquid fuels: 420 mg/kWh fuel input in terms of *GCV*.

▼B**1.6. Requirements for product information related to water heaters**

From 26 September 2015 the instruction manuals for installers and end-users, free access websites of manufacturers, their authorised representatives and importers and technical documentation for the purposes of conformity assessment pursuant to Article 4 shall contain the following elements:

- (a) information identifying the model(s), including equivalent models, to which the information relates;
- (b) the results of the measurements for the technical parameters specified in point 6 of Annex III;
- (c) the results of the calculations for the technical parameters specified in point 2 of Annex IV;
- (d) any specific precautions that shall be taken when the water heater is assembled, installed or maintained;
- (e) for heat generators designed for water heaters and water heater housings to be equipped with such heat generators, their characteristics, the requirements for assembly, to ensure compliance with the ecodesign requirements for water heaters and, where appropriate, the list of combinations recommended by the manufacturer;
- (f) information relevant for disassembly, recycling and/or disposal at end-of-life.

2. ECODESIGN REQUIREMENTS FOR HOT WATER STORAGE TANKS**2.1. Requirement for standing loss**

From 26 September 2017 the standing loss S of hot water storage tanks with storage volume V , expressed in litres, shall not exceed the following limit:

$$16,66 + 8,33 \cdot V^{0,4} \text{ Watts}$$

2.2. Requirements for product information related to hot water storage tanks

From 26 September 2015 the instruction manuals for installers and end-users, the free access websites of manufacturers, their authorised representatives and importers and technical documentation for the purposes of conformity assessment pursuant to Article 4 shall contain the following elements:

- (a) information identifying the model(s), including equivalent models, to which the information relates;
- (b) the results of the measurements for the technical parameters specified in point 7 of Annex III;
- (c) any specific precautions that shall be taken when the hot water storage tank is assembled, installed or maintained;
- (d) information relevant for disassembly, recycling and/or disposal at end-of-life.

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h	3XS			XXS			XS			S			
	Q_{tap}	f	T_m	Q_{tap}	f	T_m	Q_{tap}	f	T_m	Q_{tap}	f	T_m	T_p
	kWh	l/min	°C	kWh	l/min	°C	kWh	l/min	°C	kWh	l/min	°C	°C
08:30				0,105	2	25				0,105	3	25	
08:45													
09:00	0,015	2	25										
09:30	0,015	2	25	0,105	2	25				0,105	3	25	
10:00													
10:30													
11:00													
11:30	0,015	2	25	0,105	2	25				0,105	3	25	
11:45	0,015	2	25	0,105	2	25				0,105	3	25	
12:00	0,015	2	25	0,105	2	25							
12:30	0,015	2	25	0,105	2	25							
12:45	0,015	2	25	0,105	2	25	0,525	3	35	0,315	4	10	55
14:30	0,015	2	25										
15:00	0,015	2	25										
15:30	0,015	2	25										
16:00	0,015	2	25										
16:30													
17:00													
18:00				0,105	2	25				0,105	3	25	
18:15				0,105	2	25				0,105	3	40	
18:30	0,015	2	25	0,105	2	25							
19:00	0,015	2	25	0,105	2	25							
19:30	0,015	2	25	0,105	2	25							
20:00				0,105	2	25							
20:30							1,05	3	35	0,42	4	10	55
20:45				0,105	2	25							
20:46													
21:00				0,105	2	25							
21:15	0,015	2	25	0,105	2	25							
21:30	0,015	2	25							0,525	5	45	

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h	3XS			XXS			XS			S			
	Q_{tap}	f	T_m	Q_{tap}	f	T_m	Q_{tap}	f	T_m	Q_{tap}	f	T_m	T_p
	kWh	l/min	°C	kWh	l/min	°C	kWh	l/min	°C	kWh	l/min	°C	°C
21:35	0,015	2	25	0,105	2	25							
21:45	0,015	2	25	0,105	2	25							
Q_{ref}	0,345			2,100			2,100			2,100			

h	M				L				XL			
	Q_{tap}	f	T_m	T_p	Q_{tap}	f	T_m	T_p	Q_{tap}	f	T_m	T_p
	kWh	l/min	°C	°C	kWh	l/min	°C	°C	kWh	l/min	°C	°C
07:00	0,105	3	25		0,105	3	25		0,105	3	25	
07:05	1,4	6	40		1,4	6	40					
07:15									1,82	6	40	
07:26									0,105	3	25	
07:30	0,105	3	25		0,105	3	25					
07:45					0,105	3	25		4,42	10	10	40
08:01	0,105	3	25						0,105	3	25	
08:05					3,605	10	10	40				
08:15	0,105	3	25						0,105	3	25	
08:25					0,105	3	25					
08:30	0,105	3	25		0,105	3	25		0,105	3	25	
08:45	0,105	3	25		0,105	3	25		0,105	3	25	
09:00	0,105	3	25		0,105	3	25		0,105	3	25	
09:30	0,105	3	25		0,105	3	25		0,105	3	25	
10:00									0,105	3	25	
10:30	0,105	3	10	40	0,105	3	10	40	0,105	3	10	40
11:00									0,105	3	25	
11:30	0,105	3	25		0,105	3	25		0,105	3	25	
11:45	0,105	3	25		0,105	3	25		0,105	3	25	
12:00												
12:30												
12:45	0,315	4	10	55	0,315	4	10	55	0,735	4	10	55
14:30	0,105	3	25		0,105	3	25		0,105	3	25	
15:00									0,105	3	25	

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h	M				L				XL			
	Q_{tap}	f	T_m	T_p	Q_{tap}	f	T_m	T_p	Q_{tap}	f	T_m	T_p
	kWh	l/min	°C	°C	kWh	l/min	°C	°C	kWh	l/min	°C	°C
15:30	0,105	3	25		0,105	3	25		0,105	3	25	
16:00									0,105	3	25	
16:30	0,105	3	25		0,105	3	25		0,105	3	25	
17:00									0,105	3	25	
18:00	0,105	3	25		0,105	3	25		0,105	3	25	
18:15	0,105	3	40		0,105	3	40		0,105	3	40	
18:30	0,105	3	40		0,105	3	40		0,105	3	40	
19:00	0,105	3	25		0,105	3	25		0,105	3	25	
19:30												
20:00												
20:30	0,735	4	10	55	0,735	4	10	55	0,735	4	10	55
20:45												
20:46									4,42	10	10	40
21:00					3,605	10	10	40				
21:15	0,105	3	25						0,105	3	25	
21:30	1,4	6	40		0,105	3	25		4,42	10	10	40
21:35												
21:45												
Q_{ref}	5,845				11,655				19,07			

h	XXL				3XL				4XL			
	Q_{tap}	f	T_m	T_p	Q_{tap}	f	T_m	T_p	Q_{tap}	f	T_m	T_p
	kWh	l/min	°C	°C	kWh	l/min	°C	°C	kWh	l/min	°C	°C
07:00	0,105	3	25		11,2	48	40		22,4	96	40	
07:05												
07:15	1,82	6	40									
07:26	0,105	3	25									
07:30												
07:45	6,24	16	10	40								
08:01	0,105	3	25		5,04	24	25		10,08	48	25	

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h	XXL				3XL				4XL			
	Q_{tap}	f	T_m	T_p	Q_{tap}	f	T_m	T_p	Q_{tap}	f	T_m	T_p
	kWh	l/min	°C	°C	kWh	l/min	°C	°C	kWh	l/min	°C	°C
08:05												
08:15	0,105	3	25									
08:25												
08:30	0,105	3	25									
08:45	0,105	3	25									
09:00	0,105	3	25		1,68	24	25		3,36	48	25	
09:30	0,105	3	25									
10:00	0,105	3	25									
10:30	0,105	3	10	40	0,84	24	10	40	1,68	48	10	40
11:00	0,105	3	25									
11:30	0,105	3	25									
11:45	0,105	3	25		1,68	24	25		3,36	48	25	
12:00												
12:30												
12:45	0,735	4	10	55	2,52	32	10	55	5,04	64	10	55
14:30	0,105	3	25									
15:00	0,105	3	25									
15:30	0,105	3	25		2,52	24	25		5,04	48	25	
16:00	0,105	3	25									
16:30	0,105	3	25									
17:00	0,105	3	25									
18:00	0,105	3	25									
18:15	0,105	3	40									
18:30	0,105	3	40		3,36	24	25		6,72	48	25	
19:00	0,105	3	25									
19:30												
20:00												
20:30	0,735	4	10	55	5,88	32	10	55	11,76	64	10	55

▼ B

h	XXL				3XL				4XL			
	Q_{tap}	f	T_m	T_p	Q_{tap}	f	T_m	T_p	Q_{tap}	f	T_m	T_p
	kWh	l/min	°C	°C	kWh	l/min	°C	°C	kWh	l/min	°C	°C
20:45												
20:46	6,24	16	10	40								
21:00												
21:15	0,105	3	25									
21:30	6,24	16	10	40	12,04	48	40		24,08	96	40	
21:35												
21:45												
Q_{ref}	24,53				46,76				93,52			

3. CONDITIONS FOR TESTING THE SMART CONTROL COMPLIANCE (*SMART*) OF WATER HEATERS

Where the manufacturer deems it appropriate to declare the value of *smart* as being '1', measurements of the weekly electricity and/or fuel consumption with or without smart controls shall be carried out using a two-week measurement cycle as follows:

- days 1 to 5: random sequence of load profiles chosen from the declared load profile and the load profile one below the declared load profile, and smart control disabled,
- days 6 and 7: no water draw-offs, and smart control disabled,
- days 8 to 12: repetition of the same sequence applied for days 1 to 5, and smart control enabled,
- days 13 and 14: no water draw-offs, and smart control enabled,
- the difference between the useful energy content measured during days 1 to 7 and the useful energy content measured during days 8 to 14 shall not exceed 2 % of Q_{ref} of the declared load profile.

4. CONDITIONS FOR TESTING SOLAR WATER HEATERS

The solar collector, solar hot water storage tank, pump in the collector loop (if applicable) and heat generator shall be tested separately. Where the solar collector and solar hot water storage tank cannot be tested separately, they shall be tested in combination. The heat generator shall be tested under the conditions set out in point 2 of this Annex.

The results shall be used for the calculations set out in point 3(b) of Annex IV under the conditions set out in Tables 2 and 3. For the purpose of establishing Q_{total} the efficiency of the heat generator using the Joule effect in electric resistance heating elements is assumed to be 100/CC.

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5. CONDITIONS FOR TESTING HEAT PUMP WATER HEATERS

- Heat pump water heaters shall be tested under the conditions set out in Table 4;
- heat pump water heaters which use ventilation exhaust air as the heat source shall be tested under the conditions set out in Table 5.

Table 2

Average daytime temperature [°C]

	January	February	March	April	May	June	July	August	September	October	November	December
Average climate conditions	2,8	2,6	7,4	12,2	16,3	19,8	21,0	22,0	17,0	11,9	5,6	3,2

Table 3

Average global solar irradiance [W/m²]

	January	February	March	April	May	June	July	August	September	October	November	December
Average climate conditions	70	104	149	192	221	222	232	217	176	129	80	56

Table 4

Standard rating conditions for heat pump water heaters, temperatures in dry bulb air temperature (wet bulb air temperature indicated in brackets)

Heat source	Outdoor air	Indoor air	Exhaust air	Brine	Water
Temperature	+ 7 °C (+ 6 °C)	+ 20 °C (maximum + 15 °C)	+ 20 °C (+ 12 °C)	0 °C (inlet)/ – 3 °C (outlet)	+ 10 °C (inlet)/ + 7 °C (outlet)

Table 5

Maximum ventilation exhaust air available [m³/h], at a temperature of 20 °C and with humidity of 5,5 g/m³

Declared load profile	XXS	XS	S	M	L	XL	XXL	3XL	4XL
Maximum ventilation exhaust air available	109	128	128	159	190	870	1 021	2 943	8 830

6. TECHNICAL PARAMETERS OF WATER HEATERS

The following parameters shall be established for water heaters:

- (a) the daily electricity consumption Q_{elec} in kWh, rounded to three decimal places;
- (b) the declared load profile, expressed by the appropriate letter in accordance with Table 1 of this Annex;
- (c) the sound power level L_{WA} , in dB, indoors, rounded to the nearest integer (for heat pump water heaters, if applicable);

▼B

in addition, for water heaters using fossil and/or biomass fuels:

- (d) the daily fuel consumption Q_{fuel} in kWh in terms of GCV , rounded to three decimal places;
- (e) the emissions of nitrogen oxides, expressed in nitrogen dioxide, in mg/kWh fuel input in terms of GCV , rounded to the nearest integer;

in addition, for water heaters for which the value of *smart* is declared as being '1':

- (f) the weekly fuel consumption with smart controls $Q_{fuel,week,smart}$ in kWh in terms of GCV , rounded to three decimal places;
- (g) the weekly electricity consumption with smart controls $Q_{elec,week,smart}$ in kWh, rounded to three decimal places;
- (h) the weekly fuel consumption without smart controls $Q_{fuel,week}$ in kWh in terms of GCV , rounded to three decimal places;
- (i) the weekly electricity consumption without smart controls $Q_{elec,week}$ in kWh, rounded to three decimal places;

in addition, for storage water heaters with declared load profiles 3XS, XXS and XS:

- (j) the storage volume V in litres, rounded to one decimal place;

in addition, for storage water heaters with declared load profiles M, L, XL, XXL, 3XL and 4XL:

- (k) the mixed water at 40 °C V_{40} in litres, rounded to the nearest integer;

in addition, for solar water heaters:

- (l) the collector aperture area A_{sol} in m², rounded to two decimal places;
- (m) the zero-loss efficiency η_0 , rounded to three decimal places;
- (n) the first-order coefficient a_1 in W/(m² K), rounded to two decimal places;
- (o) the second-order coefficient a_2 in W/(m² K²), rounded to three decimal places;
- (p) the incidence angle modifier IAM , rounded to two decimal places;
- (q) the pump power consumption sol_{pump} in W, rounded to two decimal places;
- (r) the standby power consumption $sol_{standby}$ in W, rounded to two decimal places;

in addition, for heat pump water heaters:

- (s) the sound power level L_{WA} in dB, outdoors, rounded to the nearest integer.

7. TECHNICAL PARAMETERS OF HOT WATER STORAGE TANKS

The following parameters shall be established for hot water storage tanks:

- (a) the storage volume V in litres, rounded to one decimal place;
- (b) the standing loss S in W, rounded to one decimal place.

▼ B*ANNEX IV***Calculations**

1. For the purposes of compliance and verification of compliance with the requirements of this Regulation, calculations shall be made using harmonised standards the reference numbers of which have been published for this purpose in the *Official Journal of the European Union*, or using other appropriate calculation methods that take into account the generally recognised state-of-the-art methods. They shall meet the technical parameters and calculations set out in points 2 to 5.

Technical parameters used for the calculations shall be measured in accordance with Annex III.

2. TECHNICAL PARAMETERS OF WATER HEATERS

The following parameters shall be calculated for water heaters under average climate conditions:

- (a) the water heating energy efficiency η_{wh} in %, rounded to one decimal place;

in addition, for solar water heaters under average climate conditions:

- (b) the annual non-solar heat contribution Q_{nonsol} in kWh in terms of primary energy for electricity and/or in kWh in terms of *GCV* for fuels, rounded to one decimal place;
- (c) the heat generator water heating energy efficiency $\eta_{wh,nonsol}$ in %, rounded to one decimal place;
- (d) the annual auxiliary electricity consumption Q_{aux} in kWh, rounded to one decimal place.

3. CALCULATION OF THE WATER HEATING ENERGY EFFICIENCY η_{wh}

- (a) Conventional water heaters and heat pump water heaters

The water heating energy efficiency is calculated as follows:

$$\eta_{wh} = \frac{Q_{ref}}{(Q_{fuel} + CC \cdot Q_{elec})(1 - SCF \cdot smart) + Q_{cor}}$$

For water-/brine-to-water heat pump water heaters, the electricity consumption of one or more ground water pumps shall be taken into account.

- (b) Solar water heaters

The water heating energy efficiency is calculated as follows:

$$\eta_{wh} = \frac{0,6 \cdot 366 \cdot Q_{ref}}{Q_{tota}}$$

Where:

$$Q_{tota} = \frac{Q_{nonsol}}{1,1 \cdot \eta_{wh,nonsol} - 0,1} + Q_{aux} \cdot CC$$

▼ B4. DETERMINATION OF THE SMART CONTROL FACTOR SCF AND OF SMART CONTROL COMPLIANCE $smart$

(a) The smart control factor is calculated as follows:

$$SCF = 1 - \frac{Q_{fuel,week,smart} + CC \cdot Q_{elec,week,smart}}{Q_{fuel,week} + CC \cdot Q_{elec,week}}$$

(b) If $SCF \geq 0,07$, the value of smart shall be 1. In all other cases, the value of smart shall be 0.

5. DETERMINATION OF THE AMBIENT CORRECTION TERM Q_{cor}

The ambient correction term is calculated as follows:

(a) for conventional water heaters using electricity:

$$Q_{cor} = -k \cdot (CC \cdot (Q_{elec} \cdot (1 - SCF \cdot smart) - Q_{ref}))$$

(b) for conventional water heaters using fuels:

$$Q_{cor} = -k \cdot (Q_{fuel} \cdot (1 - SCF \cdot smart) - Q_{ref})$$

(c) for heat pump water heaters:

$$Q_{cor} = -k \cdot 24h \cdot P_{stby}$$

Where:

the k-values are given in Table 6 for each load profile.

Table 6

k-values

	3XS	XXS	XS	S	M	L	XL	XXL	3XL	4XL
k	0,23	0,23	0,23	0,23	0,23	0,23	0,23	0,0	0,0	0,0

▼ M1*ANNEX V***Product compliance verification by market surveillance authorities**

The verification tolerances defined in this Annex relate only to the verification of the measured parameters by Member State authorities and shall not be used by the manufacturer or importer as an allowed tolerance to establish the values in the technical documentation or in interpreting these values with a view to achieving compliance or to communicate better performance by any means.

When verifying the compliance of a product model with the requirements laid down in this Regulation pursuant to Article 3(2) of Directive 2009/125/EC, for the requirements referred to in this Annex, the authorities of the Member States shall apply the following procedure:

- (1) The Member State authorities shall verify one single unit of the model.
- (2) The model shall be considered to comply with the applicable requirements if:
 - (a) the values given in the technical documentation pursuant to point 2 of Annex IV to Directive 2009/125/EC (declared values), and, where applicable, the values used to calculate these values, are not more favourable for the manufacturer or importer than the results of the corresponding measurements carried out pursuant to paragraph (g) thereof; and
 - (b) the declared values meet any requirements laid down in this Regulation, and any required product information published by the manufacturer or importer does not contain values that are more favourable for the manufacturer or importer than the declared values; and
 - (c) when the Member State authorities test the unit of the model, the determined values (the values of the relevant parameters as measured in testing and the values calculated from these measurements) comply with the respective verification tolerances as given in Table 7.
- (3) If the results referred to in point 2(a) or (b) are not achieved, the model and all models that have been listed as equivalent water heater models or hot water storage tanks models in the manufacturer's or importer's technical documentation shall be considered not to comply with this Regulation.
- (4) If the result referred to in point 2(c) is not achieved, the Member State authorities shall select three additional units of the same model for testing. As an alternative, the three additional units selected may be of one or more different models that have been listed as equivalent models in the manufacturer's or importer's technical documentation.
- (5) The model shall be considered to comply with the applicable requirements if, for these three units, the arithmetical mean of the determined values complies with the respective verification tolerances given in Table 7.
- (6) If the result referred to in point 5 is not achieved, the model and all models that have been listed as equivalent water heater models or hot water storage tanks models in the manufacturer's or importer's technical documentation shall be considered not to comply with this Regulation.
- (7) The Member State authorities shall provide all relevant information to the authorities of the other Member States and to the Commission without delay after a decision being taken on the non-compliance of the model according to points 3 and 6.

▼ **M1**

The Member State authorities shall use the measurement and calculation methods set out in Annex III and Annex IV.

The Member State authorities shall only apply the verification tolerances that are set out in Table 7 and shall only use the procedure described in points 1 to 7 for the requirements referred to in this Annex. No other tolerances, such as those set out in harmonised standards or in any other measurement method, shall be applied.

Table 7
Verification tolerances

Parameters	Verification tolerances
Daily electricity consumption, Q_{elec}	The determined value shall not exceed the declared value by more than 5 %.
Sound power level, L_{WA} , indoors and/or outdoors	The determined value shall not exceed the declared value by more than 2 dB.
Daily fuel consumption, Q_{fuel}	The determined value shall not exceed the declared value by more than 5 %.
Emissions of nitrogen oxides	The determined value shall not exceed the declared value by more than 20 %.
Weekly fuel consumption with smart controls, $Q_{fuel,week,smart}$	The determined value shall not exceed the declared value by more than 5 %.
Weekly electricity consumption with smart controls, $Q_{elec,week,smart}$	The determined value shall not exceed the declared value by more than 5 %.
Weekly fuel consumption without smart controls, $Q_{fuel,week}$	The determined value shall not exceed the declared value by more than 5 %.
Weekly electricity consumption without smart controls, $Q_{elec,week}$	The determined value shall not exceed the declared value by more than 5 %.
Storage volume, V	The determined value shall not be lower than the declared value by more than 2 %.
Mixed water at 40 °C, V_{40}	The determined value shall not be lower than the declared value by more than 3 %.
Collector aperture area, A_{sol}	The determined value shall not be lower than the declared value by more than 2 %.
Pump power consumption, sol_{pump}	The determined value shall not exceed the declared value by more than 3 %.
Standby power consumption, $sol_{standby}$	The determined value shall not exceed the declared value by more than 5 %.
Standing loss, S	The determined value shall not exceed the declared value by more than 5 %.



ANNEX VI

Indicative benchmarks referred to in Article 6

At the time of entry into force of this Regulation, the best available technology on the market for water heaters and hot water storage tanks in terms of water heating energy efficiency, sound power level, standing loss and emissions of nitrogen oxides was identified as follows:

1. BENCHMARKS FOR WATER HEATING ENERGY EFFICIENCY OF WATER HEATERS:

Declared load profile	3XS	XXS	XS	S	M	L	XL	XXL	3XL	4XL
Water heating energy efficiency	35 %	35 %	38 %	38 %	75 %	110 %	115 %	120 %	130 %	130 %

2. BENCHMARKS FOR SOUND POWER LEVEL (L_{WA}), OUTDOORS, OF HEAT PUMP WATER HEATERS WITH:

- (a) rated heat output ≤ 6 kW: 39 dB;
- (b) rated heat output > 6 kW and ≤ 12 kW: 40 dB;
- (c) rated heat output > 12 kW and ≤ 30 kW: 41 dB;
- (d) rated heat output > 30 kW and ≤ 70 kW: 67 dB.

3. BENCHMARK FOR STANDING LOSS OF HOT WATER STORAGE TANKS WITH STORAGE VOLUME V , EXPRESSED IN LITRES:

$$5 + 4,16 V^{0,4} \text{ Watts}$$

4. BENCHMARK FOR EMISSIONS OF NITROGEN OXIDES, EXPRESSED IN NITROGEN OXIDE, OF CONVENTIONAL WATER HEATERS USING GASEOUS FUELS:

$$35 \text{ mg/kWh fuel input in terms of } GCV$$

The benchmarks specified in points 1, 2 and 4 do not necessarily imply that a combination of these values is achievable for a single water heater.