

**Changes to legislation:** There are outstanding changes not yet made to Commission Delegated Regulation (EU) No 812/2013. Any changes that have already been made to the legislation appear in the content and are referenced with annotations. (See end of Document for details) View outstanding changes

## ANNEX VII

### Measurements

1. For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements 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 reliable, accurate and reproducible measurement methods that take into account the generally recognised state-of-the-art methods. They shall meet the conditions and technical parameters set out in points 2 to 9.
2. General conditions for testing water heaters:
  - (a) measurements shall be carried out using the load profiles set out in Table 3;
  - (b) measurements shall be carried out using a 24-hour measurement cycle as follows:
    - 00:00 to 06:59: no water draw-off,
    - from 07:00: water draw-offs according to the declared load profile,
    - from end of last water draw-off until 24:00: no water draw-off;
  - (c) the declared load profile shall be the maximum load profile or the load profile one below the maximum load profile.

TABLE 3

#### Load profiles of water heaters

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
07:00	<b>0,015</b>	2	25	<b>0,105</b>	2	25				<b>0,105</b>	3	25	
07:05	<b>0,015</b>	2	25										
07:15	<b>0,015</b>	2	25										
07:26	<b>0,015</b>	2	25										
07:30	<b>0,015</b>	2	25	<b>0,105</b>	2	25	<b>0,525</b>	3	35	<b>0,105</b>	3	25	
07:45													
08:01													
08:05													
08:15													
08:25													
08:30				<b>0,105</b>	2	25				<b>0,105</b>	3	25	
08:45													
09:00	<b>0,015</b>	2	25										
09:30	<b>0,015</b>	2	25	<b>0,105</b>	2	25				<b>0,105</b>	3	25	

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10:00													
10:30													
11:00													
11:30	<b>0,015</b>	2	25	<b>0,105</b>	2	25				<b>0,105</b>	3	25	
11:45	<b>0,015</b>	2	25	<b>0,105</b>	2	25				<b>0,105</b>	3	25	
12:00	<b>0,015</b>	2	25	<b>0,105</b>	2	25							
12:30	<b>0,015</b>	2	25	<b>0,105</b>	2	25							
12:45	<b>0,015</b>	2	25	<b>0,105</b>	2	25	<b>0,525</b>	3	35	<b>0,315</b>	4	10	55
14:30	<b>0,015</b>	2	25										
15:00	<b>0,015</b>	2	25										
15:30	<b>0,015</b>	2	25										
16:00	<b>0,015</b>	2	25										
16:30													
17:00													
18:00				<b>0,105</b>	2	25				<b>0,105</b>	3	25	
18:15				<b>0,105</b>	2	25				<b>0,105</b>	3	40	
18:30	<b>0,015</b>	2	25	<b>0,105</b>	2	25							
19:00	<b>0,015</b>	2	25	<b>0,105</b>	2	25							
19:30	<b>0,015</b>	2	25	<b>0,105</b>	2	25							
20:00				<b>0,105</b>	2	25							
20:30							<b>1,05</b>	3	35	<b>0,42</b>	4	10	55
20:45				<b>0,105</b>	2	25							
20:46													
21:00				<b>0,105</b>	2	25							
21:15	<b>0,015</b>	2	25	<b>0,105</b>	2	25							
21:30	<b>0,015</b>	2	25							<b>0,525</b>	5	45	
21:35	<b>0,015</b>	2	25	<b>0,105</b>	2	25							
21:45	<b>0,015</b>	2	25	<b>0,105</b>	2	25							
$Q_{ref}$	0,345			2,1			2,1			2,1			

CONTINUED TABLE 3

## Load profiles of water heaters

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



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20:30	<b>0,735</b>	4	10	55	<b>0,735</b>	4	10	55	<b>0,735</b>	4	10	55
20:45												
20:46									<b>4,42</b>	10	10	40
21:00					<b>3,605</b>	10	10	40				
21:15	<b>0,105</b>	3	25						<b>0,105</b>	3	25	
21:30	<b>1,4</b>	6	40		<b>0,105</b>	3	25		<b>4,42</b>	10	10	40
21:35												
21:45												
$Q_{ref}$	5,845			11,655			19,07					

CONTINUED TABLE 3

**Load profiles of water heaters**

h	XXL			
	$Q_{tap}$	$f$	$T_m$	$T_p$
	kWh	l/min	°C	°C
07:00	<b>0,105</b>	3	25	
07:05				
07:15	<b>1,82</b>	6	40	
07:26	<b>0,105</b>	3	25	
07:30				
07:45	<b>6,24</b>	16	10	40
08:01	<b>0,105</b>	3	25	
08:05				
08:15	<b>0,105</b>	3	25	
08:25				
08:30	<b>0,105</b>	3	25	
08:45	<b>0,105</b>	3	25	
09:00	<b>0,105</b>	3	25	
09:30	<b>0,105</b>	3	25	
10:00	<b>0,105</b>	3	25	
10:30	<b>0,105</b>	3	10	40
11:00	<b>0,105</b>	3	25	
11:30	<b>0,105</b>	3	25	
11:45	<b>0,105</b>	3	25	
12:00				

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12:30				
12:45	<b>0,735</b>	4	10	55
14:30	<b>0,105</b>	3	25	
15:00	<b>0,105</b>	3	25	
15:30	<b>0,105</b>	3	25	
16:00	<b>0,105</b>	3	25	
16:30	<b>0,105</b>	3	25	
17:00	<b>0,105</b>	3	25	
18:00	<b>0,105</b>	3	25	
18:15	<b>0,105</b>	3	40	
18:30	<b>0,105</b>	3	40	
19:00	<b>0,105</b>	3	25	
19:30				
20:00				
20:30	<b>0,735</b>	4	10	55
20:45				
20:46	<b>6,24</b>	16	10	40
21:00				
21:15	<b>0,105</b>	3	25	
21:30	<b>6,24</b>	16	10	40
21:35				
21:45				
$Q_{ref}$	24,53			

### 3. Conditions for testing the smart control compliance (*smart*) of water heaters

Where the supplier deems it appropriate to declare the value of *smart* as being ‘1’, measurements of the weekly electricity and/or fuel consumption with smart controls and the weekly electricity and/or fuel consumption 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.

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#### 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 VIII under the conditions set out in Tables 4 and 5. 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, expressed in %.

#### 5. Conditions for testing heat pump water heaters

- Heat pump water heaters shall be tested under the conditions set out in Table 6,
- Heat pump water heaters which use ventilation exhaust air as the heat source shall be tested under the conditions set out in Table 7.

#### 6. Conditions for testing solar devices

The solar collector, solar hot water storage tank and pump in the collector loop (if applicable) 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 results shall be used for the calculations of  $Q_{nonsol}$  for the load profiles M, L, XL and XXL under the average climate conditions set out in Tables 4 and 5 and  $Q_{aux}$ .

TABLE 4

#### Average daytime temperature [°C]

	January	February	March	April	May	June	July	August	September	October	November	December
<b>Average climate conditions</b>	2,8	+ 2,6	+ 7,4	+ 12,2	+ 16,3	+ 19,8	+ 21,0	+ 22,0	+ 17,0	+ 11,9	+ 5,6	+ 3,2
<b>Colder climate conditions</b>	3,8	- 4,1	- 0,6	+ 5,2	+ 11,0	+ 16,5	+ 19,3	+ 18,4	+ 12,8	+ 6,7	+ 1,2	- 3,5
<b>Warmer climate conditions</b>	9,5	+ 10,1	+ 11,6	+ 15,3	+ 21,4	+ 26,5	+ 28,8	+ 27,9	+ 23,6	+ 19,0	+ 14,5	+ 10,4

TABLE 5

#### Average global solar irradiance [W/m<sup>2</sup>]

	January	February	March	April	May	June	July	August	September	October	November	December
<b>Average climate conditions</b>	90	104	149	192	221	222	232	217	176	129	80	56
<b>Colder climate conditions</b>	22	75	124	192	234	237	238	181	120	64	23	13

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<b>Warmer climate conditions</b>	128	137	182	227	248	268	268	263	243	175	126	109
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TABLE 6

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

Heat source	Outdoor air			Indoor air	Exhaust air	Brine	Water
Climate conditions	Average climate conditions	Colder climate conditions	Warmer climate conditions	Not applicable	All climate conditions		
Temperature	+ 7 °C (+ 6 °C)	+ 2 °C (+ 1 °C)	+ 14 °C (+ 13 °C)	+ 20 °C (maximum + 15 °C)	+ 20 °C (+ 12 °C)	0 °C (inlet)/– 3 °C (outlet)	+ 10 °C (inlet)/+ 7 °C (outlet)

TABLE 7

**Maximum ventilation exhaust air available [m<sup>3</sup>/h], at a temperature of 20 °C and with humidity of 5,5 g/m<sup>3</sup>**

Declared load profile	XXS	XS	S	M	L	XL	XXL
Maximum ventilation exhaust air available	109	128	128	159	190	870	1 021

**7. 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 3 of this Annex;
- (c) the sound power level in dB, indoors, rounded to the nearest integer (for heat pump water heaters, if applicable);

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;

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

- (e) the weekly fuel consumption with smart controls  $Q_{fuel,week,smart}$  in kWh in terms of  $GCV$ , rounded to three decimal places;

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

in addition, for solar water heaters:

- (i) the collector aperture area  $A_{sol}$  in  $m^2$ , rounded to two decimal places;
- (j) the zero-loss efficiency  $\eta_0$ , rounded to three decimal places;
- (k) the first-order coefficient  $a_1$  in  $W/(m^2 K)$ , rounded to two decimal places;
- (l) the second-order coefficient  $a_2$  in  $W/(m^2 K^2)$ , rounded to three decimal places;
- (m) the incidence angle modifier  $IAM$ , rounded to two decimal places;
- (n) the pump power consumption  $solpump$  in W, rounded to two decimal places;
- (o) the standby power consumption  $solstandby$  in W, rounded to two decimal places;

in addition, for heat pump water heaters:

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

## 8. 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.

## 9. Technical parameters of solar devices

The following parameters shall be established for solar devices:

- (a) the collector aperture area  $A_{sol}$  in  $m^2$ , rounded to two decimal places;
- (b) the zero-loss efficiency  $\eta_0$ , rounded to three decimal places;
- (c) the first-order coefficient  $a_1$  in  $W/(m^2 K)$ , rounded to two decimal places;
- (d) the second-order coefficient  $a_2$  in  $W/(m^2 K^2)$ , rounded to three decimal places;
- (e) the incidence angle modifier  $IAM$ , rounded to two decimal place;
- (f) the pump power consumption  $solpump$  in W, rounded to two decimal places;
- (g) the standby power consumption,  $solstandby$  in W, rounded to two decimal places.



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### Changes and effects yet to be applied to the whole legislation item and associated provisions

- Signature words omitted by [S.I. 2019/539 Sch. 5 para. 10\(6\)](#)
- Annex 1(13) substituted by [S.I. 2019/539 Sch. 5 para. 10\(7\)](#)
- Annex 5 s. 1(c) word inserted by [S.I. 2019/539 Sch. 5 para. 10\(9\)](#)
- Annex 5 s. 2(c) word inserted by [S.I. 2019/539 Sch. 5 para. 10\(9\)](#)
- Annex 5 s. 3(c) word inserted by [S.I. 2019/539 Sch. 5 para. 10\(9\)](#)
- Annex 5 s. 4(c) word inserted by [S.I. 2019/539 Sch. 5 para. 10\(9\)](#)
- Annex 3 para. 1.2.1 image substituted by [S.I. 2020/1528 Sch. 5 para. 9\(2\)](#)
- Annex 3 para. 1.2.2 image substituted by [S.I. 2020/1528 Sch. 5 para. 9\(3\)](#)
- Annex 3 para. 1.2.3 image substituted by [S.I. 2020/1528 Sch. 5 para. 9\(4\)](#)
- Annex 3 para. 2.2 image substituted by [S.I. 2020/1528 Sch. 5 para. 9\(5\)](#)
- Annex 3 para. 3 image substituted by [S.I. 2020/1528 Sch. 5 para. 9\(6\)](#)
- Annex 3 para. 4 image substituted by [S.I. 2020/1528 Sch. 5 para. 9\(7\)](#)
- Annex 3 para. 5 image substituted by [S.I. 2020/1528 Sch. 5 para. 9\(8\)](#)
- Annex 3 para. 6 image substituted by [S.I. 2020/1528 Sch. 5 para. 9\(9\)](#)
- Annex 3 para. 7 image substituted by [S.I. 2020/1528 Sch. 5 para. 9\(10\)](#)
- Annex 3 para. 8 image substituted by [S.I. 2020/1528 Sch. 5 para. 9\(11\)](#)
- Annex 3 s. 1.1.3(b) words inserted by [S.I. 2019/539 Sch. 5 para. 10\(8\)](#)
- Annex 3 para. 4(d) words substituted by [S.I. 2020/1528 Sch. 5 para. 9\(12\)\(a\)](#)
- Annex 3 para. 5(d) words substituted by [S.I. 2020/1528 Sch. 5 para. 9\(12\)\(a\)](#)
- Annex 3 para. 6(d) words substituted by [S.I. 2020/1528 Sch. 5 para. 9\(12\)\(a\)](#)
- Annex 3 para. 7(d) words substituted by [S.I. 2020/1528 Sch. 5 para. 9\(12\)\(a\)](#)
- Annex 3 para. 8(d) words substituted by [S.I. 2020/1528 Sch. 5 para. 9\(12\)\(a\)](#)
- Annex 3 para. 4(d) words substituted by [S.I. 2020/1528 Sch. 5 para. 9\(12\)\(b\)](#)
- Annex 3 para. 5(d) words substituted by [S.I. 2020/1528 Sch. 5 para. 9\(12\)\(b\)](#)
- Annex 3 para. 6(d) words substituted by [S.I. 2020/1528 Sch. 5 para. 9\(12\)\(b\)](#)
- Annex 3 para. 7(d) words substituted by [S.I. 2020/1528 Sch. 5 para. 9\(12\)\(b\)](#)
- Annex 3 para. 8(d) words substituted by [S.I. 2020/1528 Sch. 5 para. 9\(12\)\(b\)](#)
- Annex 3 s. 1.1.3(b) words substituted in earlier amending provision [S.I. 2019/539, Sch. 5 para. 10\(8\)](#) by [S.I. 2020/1528 reg. 4](#)
- Annex 7 para. 1 words substituted by [S.I. 2019/539 Sch. 5 para. 10\(10\)](#)
- Annex 8 para. 1 words substituted by [S.I. 2019/539 Sch. 5 para. 10\(11\)](#)
- Annex 9(7) omitted by [S.I. 2019/539 Sch. 5 para. 10\(12\)\(b\)](#)
- Art. 1(2)(c) words inserted by [S.I. 2019/539 Sch. 5 para. 10\(2\)\(a\)](#)
- Art. 1(2)(c) words inserted by [S.I. 2019/539 Sch. 5 para. 10\(2\)\(b\)](#)
- Art. 1(2)(c) words substituted in earlier amending provision [S.I. 2019/539, Sch. 5 para. 10\(2\)\(a\)](#) by [S.I. 2020/1528 reg. 4](#)
- Art. 1(2)(c) words substituted in earlier amending provision [S.I. 2019/539, Sch. 5 para. 10\(2\)\(b\)](#) by [S.I. 2020/1528 reg. 4](#)
- Art. 3(1)(c) words substituted by [S.I. 2019/539 Sch. 5 para. 10\(3\)](#)
- Art. 3(2)(c) words substituted by [S.I. 2019/539 Sch. 5 para. 10\(3\)](#)
- Art. 3(3)(b) words substituted by [S.I. 2019/539 Sch. 5 para. 10\(3\)](#)
- Art. 3(4)(c) words substituted by [S.I. 2019/539 Sch. 5 para. 10\(3\)](#)