

EU Tapping Cycles for Energy Labelling of Water Heaters

Simulation with CARNOT

EU Tapping Cycles where are they?











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- ☐ Name ^
- ☒ Carnot2021_Hafner_EuTappingCycles.pdf
 - ☒ CELEX_32013R0814_EN_TXT.pdf
 - ☒ guidelinesspacewaterheaters_final.pdf
 - ☐ QAiST D3.6-7 HWC Method.pdf

EU Tapping Cycles

What's the idea?

Source: Working Document on a Draft
COMMISSION DELEGATED
REGULATION (EU) No [...] / [...] of [...] supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of water heaters, hot water storage tanks and packages of water heater and solar-only system. Given date: February 2nd 2012

Declared load profile	Pictogram	Typical usage
3XS	 35°C	Single basin at 35 °C
XXS	 40°C	Single basin at 40 °C
XS		Electric shower
S	 35°C	Shower and single basin at 35 °C
M	2x  55°C	Showers and sink at 55 °C
L	 55°C	Bath, shower and sink at 55 °C
XL	3x  55°C	Multiple baths and showers
XXL	3x  55°C	Simultaneous baths and showers
3XL	8x  55°C	Small collective housing
4XL	16x  55°C	Large collective housing

EU Tapping Cycles

EU regulations

- 811/2013
- 812/2013
- 813/2013
- 814/2013
- 1187/2015
- 1189/2015

Regulations (EU)

No 811 & 812/2013 with regard to **energy labelling of space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device, and of water heaters, hot water storage tanks and packages of water heater and solar device**

and

Regulations (EU) No 813 & 814/2013 with regard to **ecodesign requirements for space heaters and combination heaters, and for water heaters and hot water storage tanks**

and

Regulations (EU) 2015/1187 & 1189 with regard to **energy labelling and eco-design requirements for solid fuel boilers**



EU Tapping Cycles

L 239/162

EN

Official Journal of the European Union

6.9.2013

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)

Application of the Regulation 814/2013

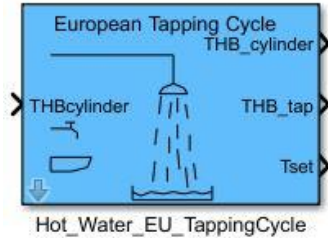
- 'storage water heater' means a water heater equipped with hot water storage tank(s), heat generator(s) and possibly other parts, which are **contained in a single housing**;
- 'useful water temperature' (T_m), means the water temperature, expressed in degrees Celsius, at which hot water starts contributing to the reference energy, ...
- 'peak temperature' (T_p) means the minimum water temperature, expressed in degrees Celsius, **to be achieved during water draw-off**, ...
- 'average climate conditions' mean the temperature and global solar irradiance conditions characteristic for the **city of Strasbourg**;
- 'useful water flow rate' (f) means the minimum flow rate, expressed in litres per minute, ...
- '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, ...
- 'mixed water at 40 °C' (V_{40}) 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;

EN 16147 (heat pumps)

- tapping is counted directly behind the storage (no mixer)
- **it is tapped with a flow rate f as given in the table**
- energy starts counting when outlet temp $> T_m$
- tapping stops when energy Q_{tap} is tapped
- tapping was **successful when average tapping temperature was $\geq T_p$**
- exception: tappings with an average temperature of 55°C :
Independently of the real tapping temperature, a temperature of 55° is always assumed. The missing energy between real temperature and 55° is calculated. An electric heater ($\eta = 1$) is assumed to deliver the energy.

XL			
Q_{tap}	f	T_m	T_p
kWh	l/min	$^\circ\text{C}$	$^\circ\text{C}$
4,42	10	10	40
0,105	3	25	
0,735	4	10	55

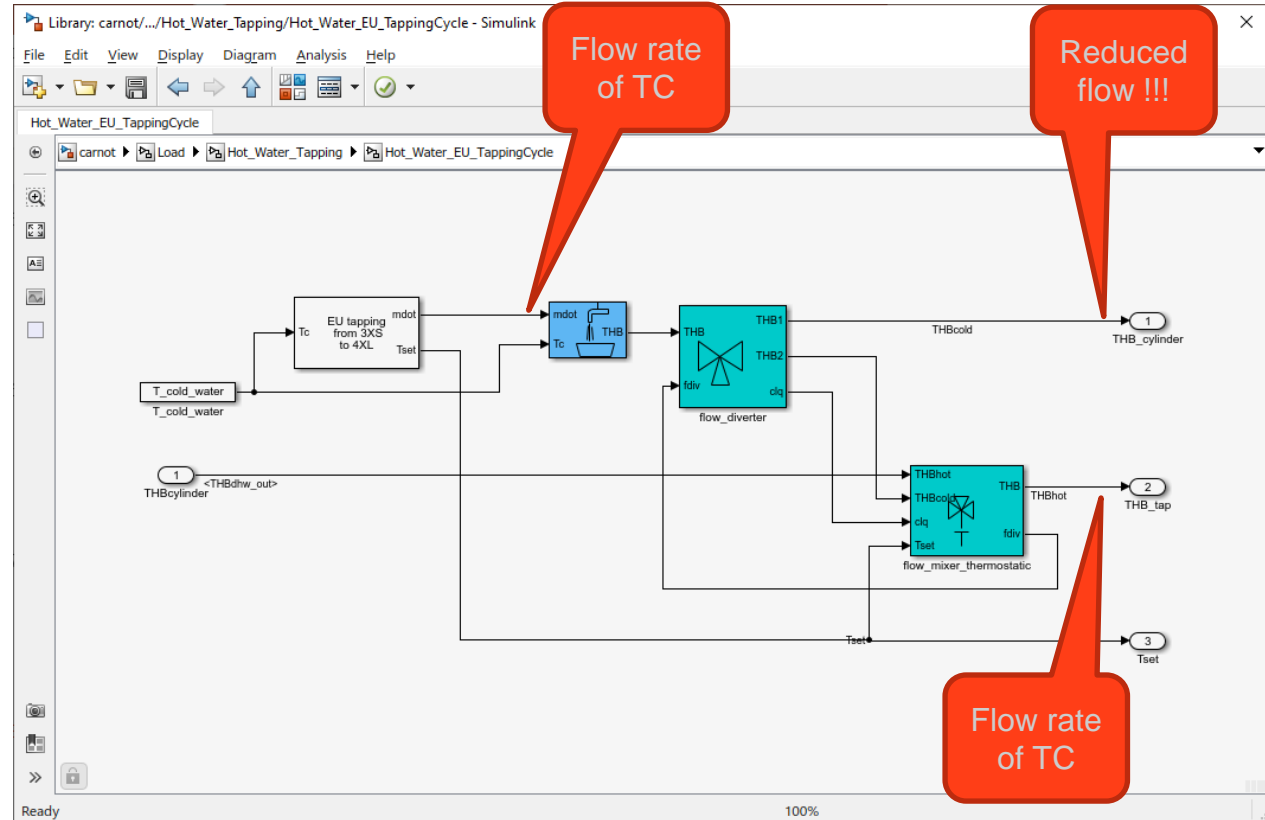
Model Hot_Water_EU_TappingCycle

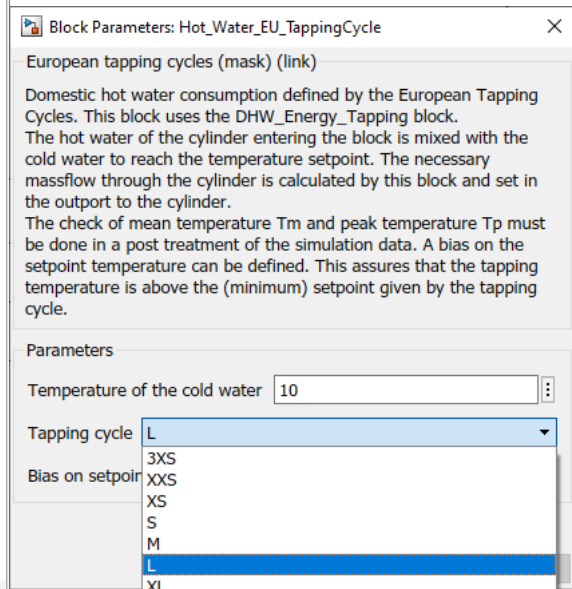


The model is looking at the flow rate from a user perspective: The flow rate is measured at the tap, independently of the hot water cylinder temperature.

Typically, during a test on a test bench, the flow rate of the tapping cycles is applied to the cylinder.

This may result in a difference to the model.





Application of the Regulation 814/2013

- 'smart control' means a device that automatically adapts the water heating process to individual usage conditions with the aim of reducing energy consumption;
- '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;
- '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;

4. DETERMINATION OF THE SMART CONTROL FACTOR SCF AND OF SMART CONTROL COMPLIANCE *smart*

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

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

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

Application of the Regulation 814/2013

- 'standby heat loss' (P_{stby}) means the heat loss of a heat pump water heater in operating modes without heat demand, expressed in kW;

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

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

	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

V40 acc. EN 16147

- DHW storage is fully charged
- tapping is started with the maximum flow rate of the COP profile (L or XL = 10 l/min)
- the tapped energy (rel. 10°C) is counted
- tapping ends when the tapped water temperature falls below 40 °C
- HP can start during tapping, but may be blocked due to COP considerations
- the V40 volume is calculated from the tapped energy
- Notes:
 - it is not required to start directly after the COP phase as long as the conditions are the same
 - IMHO, this means that one should get the same results independently of the time the test is started
 - this means that all blocking times from the COP cycle apply!
 - the tapping must take place with the same WP settings as in the COP cycle