WORKING DOCUMENT

ON A POSSIBLE COMMISSION REGULATION AMENDING
COMMISSION REGULATION (EC) No 641/2009
of 22 July 2009 with regard to ecodesign requirements for glandless standalone circulators and glandless circulators integrated in products

Article 7 of Commission Regulation 641/2009/EC foresees that: "The Commission shall review the methodology for calculating the energy efficiency index set out in Annex II, point 2 to this Regulation, for glandless circulators integrated in products before 1 January 2012."

For these purposes, the European Commission issued a Mandate M469. A Europump (European Pump Manufacturer Association) Working Group was formed under the Europump Standards Commission in order to deliver the technical basis for necessary standardisation work. The WG consisted of European circulator, boiler and heat pump manufacturers with consultation of the European Heating Industry (EHI), European Heat Pump Association (EHPA) and European Solar Thermal Industry Federation (ESTIF). Based on the finalised Working Document of the WG, CEN/TC197/WG1 developed a pre-standard consisting of three parts:

- Pumps — Rotodynamic pumps – Glandless circulators — Part 1: General requirements and procedures for testing and calculation of energy efficiency index (EEI), CEN work item WI0197081;
- Pumps — Rotodynamic pumps – Glandless circulators — Part 2: Calculation of energy efficiency index (EEI) for standalone circulators, CEN work item WI0197082;
- Pumps — Rotodynamic pumps – Glandless circulators — Part 3: Energy efficiency index (EEI) for circulators integrated in products, CEN work item WI0197083.

CEN is about to issue a prEN standard. The final measurement standard will be harmonised for the purposes of the Commission Regulation 641/2009/EC.

In conjunction with the development of the efficiency calculation and measurement method for circulators integrated in products, Europump brought to the attention of the Commission the fact that the wording of the Regulation leaves an unintended loophole for a large number of non-complying circulators without pump housing to enter the market.

EXPLANATORY NOTE

I. Loophole in the COMMISSION REGULATION (EC) No 641/2009 of 22 July 2009 with regard to ecodesign requirements for glandless standalone circulators and glandless circulators integrated in products

Regulation 641/2009/EC sets minimum energy efficiency and information requirements on circulators. The Regulation 641/29009/EC specifies a 'circulator' as being 'an impeller pump, which has the rated hydraulic output power of between 1 W and 2500 W and is designed for use in central heating systems or in secondary circuits of cooling distribution systems'. A circulator is composed of two main parts, one part which consist of the motor, motor control

(or terminal box) and the impeller, a second part which is the 'pump housing'. The pump housing is a casting that includes the volute (outer part) of the pump, which is connected to the pipework of a heating or secondary circuit of a cooling distribution system.

The Regulation does not specify whether circulators placed on the market without pump housing are covered or not despite the initial intention of the Regulation. This matter, having been initially thought to be more critical for circulators integrated in products, is tackled in Article 1, point 2(b) of the Regulation. Standalone circulators without pump housing intended to be incorporated into old circulator pump housings in the installed base would not be subject to ecodesign requirements. This would risk creating a large artificial replacement-market of standalone circulators.

II. Necessity to close the loophole

The 'repair market'[1] for circulators without pump housing is estimated at 200 000-300 000 per year. The placing on the market of circulators with pump housing is estimated at 14 million per year. Out of these sales, 75% are via the replacement[2] market on the installed basis of 140 million circulators.

Article 1, point 2(b), gives a timeframe of five years for manufacturers to place on the market circulators intended to be incorporated into products after the coming into force of the requirements. This time period was necessary for boiler manufacturers to redesign boilers to fit with the new high-efficiency circulators.

Since the adoption of Regulation 641/2009/EC, the industry has identified that some individual manufacturers have the intention of using the replacement market as a loophole for sales of non-compliant low-efficiency standalone circulators without pump housing. Currently, due to the loophole identified by the industry, individual manufacturers are not yet making the necessary investments for the production of high-efficiency circulators in the fear of not getting a return to their investments. This would undermine the objective of the Regulation in leaving the sales of an estimated 75% of standalone circulators out of the scope of the Regulation.

Thus, beyond the revision foreseen in Article 7 of the Regulation, it is necessary to amend the Regulation to cover an unintended loophole to avoid losing a major part of the expected savings.

III. Proposed solution to close the loophole

After preparatory work during 2010 between Europump manufacturers and the Commission services, Europump made (on 23 March 2011) a final suggestion for an amendment to the Regulation to clarify some of the provisions of the Regulation.

Europump's proposals (I-V) are as follows (for Europump proposal, see Annex):

(I) Modify the definition of circulators in Article 1 by adding: "circulator" means an impeller pump, with or without pump housing,… and;

[1] Market solely for spares for existing circulators where the circulator without pump housing has failed.
[2] Market of new circulators replacing old circulators in the installed basis.

(II) add a new definition of 'pump housing' in Article 1.

It is suggested to implement the industry proposal in Article 2, points 3 and 6, by modifying the definition on "standalone circulators" and by adding a new definition of 'pump housing', as indicated below. When the loophole is closed, manufacturers will be able to be assured that there is a return to investments for the production of high-efficiency standalone circulators.

Article 2
Definitions

In addition to the definitions set out in Article 2 of Directive 2005/32/EC, the following definitions shall apply:

(1) "circulator" means an impeller pump, which has the rated hydraulic output power of between 1 W and 2500 W and is designed for use in heating systems or in secondary circuits of cooling distribution systems;

(2) "glandless circulator" means a circulator with the shaft of the motor directly coupled to the impeller and the motor immersed in the pumped medium;

(3) "standalone circulator" means a circulator, with or without "pump housing", designed to operate independently from the product;

(4) "product" means an appliance that generates and/or transfers heat;

(5) "drinking water circulator" means a circulator specifically designed to be used in the recirculation of drinking water as defined in Council Directive 98/83/EC;

(6) "pump housing" means the part of an impeller pump which is intended to be connected to the pipework of the heating system or secondary circuit of the cooling distribution system.

A practical outcome of the above change is that when repairing:

- standalone circulators placed on the market before 1 January 2013 and;
- circulators integrated into products placed on the market before 1 January 2020.

it is ensured that these are replaced with high-efficient circulators, with or without pump housing, that comply with the requirements of the Regulation.

If a standalone circulator fails during the guarantee period, the manufacturer would have to replace the old low-efficiency circulator with a high-efficiency circulator, with or without pump housing, which has to comply with the requirements of the Regulation.

(III) In line with the modifications proposed above, add clarification on the measurement method at the beginning of the Annex II of the Regulation.

It is suggested to add the clarification as suggested and as indicated below.

Standalone circulators with pump housing shall be measured as a complete unit;

Standalone circulators without pump housing shall be measured with the pump housing type in which they are intended to be used;

The above specifies the way to measure the efficiency of standalone circulators with and without pump housing.

Circulators integrated in products shall be dismantled from the product and measured with a reference pump housing;

Circulators without pump housing intended to be integrated in a product shall be measured with a reference pump housing;

where '*reference pump housing*' means a pump housing supplied by the manufacturer with inlet and outlet ports on the same axis and designed to be connected to the pipework of a heating system or cooling distribution system.

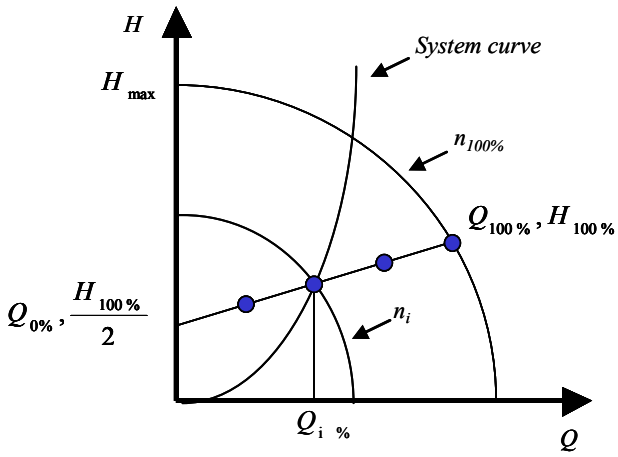
The above specifies the way to measure the efficiency of circulators with and without pump housing. For these purposes, a definition on the reference pump housing is necessary.

(IV) In line with Article 7 of Regulation 641/2009/EC, add specifications on the measurement of the efficiency of circulators integrated in products as follows.

Point 2(6) of Annex II: add specification as follows, including a definition and a graph on 'system curve':

For circulators integrated in products follow the reference control curve by adjusting the system curve and speed of the circulator.

'System curve' means a relationship between flow and head ($H = f(Q)$) resulting from friction in the heating system or cooling distribution system, as presented graphically below.



The above specifies the way to measure the efficiency of circulators integrated in products in line with Article 7 of Regulation 641/2009/EC. A graphical presentation of the system curve will ensure proper implementation of the efficiency measurement.

Point 2(9) of Annex II: specify the energy efficiency index for standalone circulators and for circulators integrated in products as follows.

For circulators, calculate the energy efficiency index[3] as:

$$EEI = \frac{P_{L,avg}}{P_{ref}} \cdot C_{20\%} \text{ , where } C_{20\%} = 0.49$$

The above specifies the way to measure the efficiency of circulators integrated in products in line with Article 7 of Regulation 641/2009/EC.

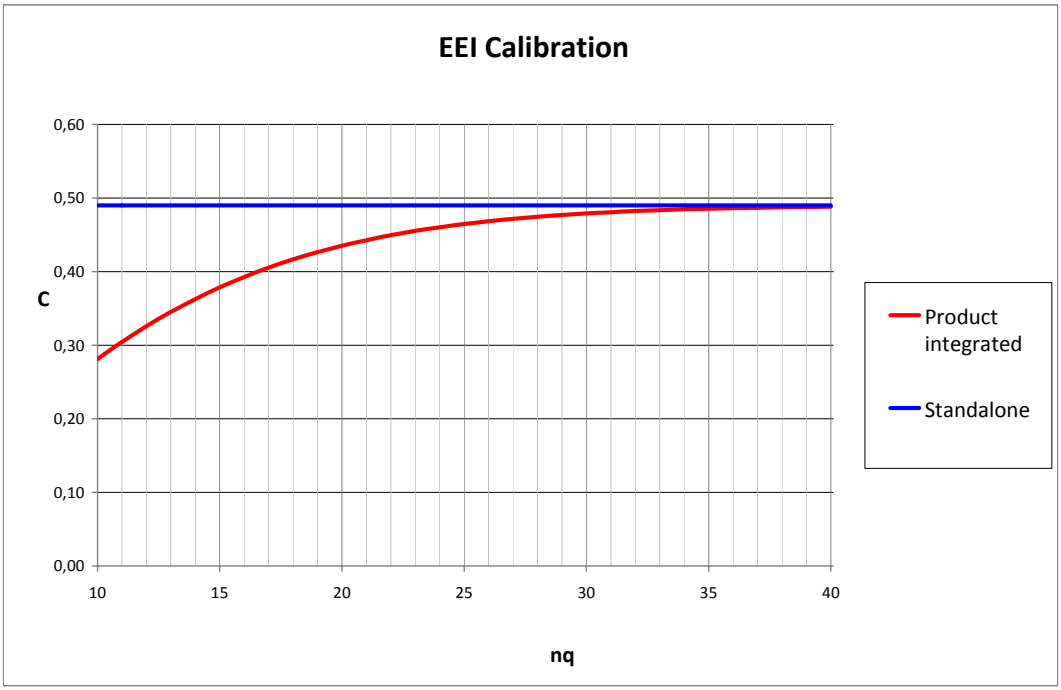
Except for circulators integrated in products designed for primary circuits of thermal solar systems and for heat pumps, where the energy efficiency index is calculated as:

[3] $C_{XX\%}$ means a scaling factor that ensures that at the time of defining the scaling factor only XX% of circulators of a certain type have an EEI ≤ 0.20.

$$EEI = \frac{P_{L,avg}}{P_{ref}} \cdot C_{20\%} \cdot (1 - e^{\left(-3{,}8 \cdot \left(\frac{n_q}{30}\right)^{1{,}36}\right)})$$

where $C_{20\%}$=0,49 and n_q is the specific speed defined as

The above equation includes a 'compensation factor shown in the below graph. The objective is to create a function which asymptotically converges toward 0,49 which is the calibration factor for standalone circulators. A typical circulator for thermal solar and heat pump application has an nq between 15 and 20. A circulator with a low nq with the same high-efficiency motor as a standalone, would not meet the requirement without an nq compensation. With the compensation, also circulators used in thermal solar and heat pump applications will be able to meet the minimum efficiency requirements introduced on 1 August 2015. Without this calibration factor, these circulators would have to be oversized in order to comply with the requirements, leading to higher energy consumption.



$$n_q = \frac{n_{100\%}}{60} \cdot \frac{\sqrt{Q_{100\%}}}{H_{100\%}^{0,75}}$$

, where

n_q is specific speed of a circulator;

$n_{100\%}$ is rotational speed in r.p.m. in this instance defined at $Q_{100\%}$ and $H_{100\%}$.

(V) To ensure that the *maintained* circulators comply with the efficiency requirements in Annex I of the Regulation, add as follows:

> In case of maintenance of a circulator out of warranty the maintained circulator shall comply with the Energy Efficiency Requirements set out in sub-clause (1.) and (2.).
>
> In case of maintenance of a circulator non compliant with this regulation, it has to be replaced by a circulator including pump housing complying with this regulation.

It is not suggested to implement the industry proposal as indicated above.

As to the first proposed requirement in point (V), all circulators would be included, also those regulated in Article 1, point 2(b). On standalone circulators, the above requirement is not necessary as all circulators, with or without pump housing, are already covered with the modifications suggested under point (I) above; low-efficiency circulators, with or without pump housing, are banned from the 'replacement/maintenance' market on 1 January 2013.

As to the second proposed requirement in point (V), circulators integrated into products are already covered in Article 1, point 2(b). On standalone circulators, the above requirement is not necessary as low-efficiency circulators, with or without pump housing, whether for the purposes of placing on the market or for maintenance, will have to comply with the requirement of the Regulation on 1 January 2013 onwards.

The proposed amendments aim at clarifying the wording of the Regulation and thus guaranteeing that the expected savings from the Regulation are realised. This will ensure that harmonised ecodesign requirements apply for all circulators across the EU promoting their free movement within the internal market, regardless of whether the circulators are standalone or integrated in products, or with or without pump housing.

Additionally, the draft Mandate on circulators and the PrEN standard integrate these changes.

IV. Timing of the implementation of the solution

It is intended to launch the consultation of the Commission's internal services on the amendment of the Regulation on 23 May 2011. In order to be able to keep to this deadline, the members of the Ecodesign Consultation Forum are asked to provide their comments to the Commission on this explanatory note and the attached draft on elements amending the Regulation in four weeks counting from the receipt of these documents.

Annexes:
- Annex to amendments proposed to the Commission Regulation (EC) No 641/2009
- Europump request to amend Regulation 641/2009/EC

Annex to

AMENDMENTS PROPOSED TO THE REGULATION

COMMISSION REGULATION (EC) No 641/2009

of 22 July 2009

implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for glandless standalone circulators and glandless circulators integrated in products

Article 2

Definitions

In addition to the definitions set out in Article 2 of Directive 2005/32/EC, the following definitions shall apply:

(1) "circulator" means an impeller pump, which has the rated hydraulic output power of between 1 W and 2500 W and is designed for use in heating systems or in secondary circuits of cooling distribution systems;

(2) "glandless circulator" means a circulator with the shaft of the motor directly coupled to the impeller and the motor immersed in the pumped medium;

(3) "standalone circulator" means a circulator, with or without "pump housing", designed to operate independently from the product;

(4) "product" means an appliance that generates and/or transfers heat;

(5) "drinking water circulator" means a circulator specifically designed to be used in the recirculation of drinking water as defined in Council Directive 98/83/EC;

(6) “pump housing” means the part of an impeller pump which is intended to be connected to the pipework of the heating systems or secondary circuits of cooling distribution system.

ANNEX II

Measurement methods and methodology for calculating the energy efficiency index

1. MEASUREMENT METHODS

For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements shall be made using a reliable, accurate and reproducible measurement procedure that takes into account the generally recognised state of the art measurement methods, including methods set out in documents the reference numbers of which have been published for that purpose in the Official Journal of the European Union.

2. METHODOLOGY FOR CALCULATING THE ENERGY EFFICIENCY INDEX

The methodology for calculating the energy efficiency index (EEI) for circulators is as follows:

Standalone circulators with pump housing shall be measured as a complete unit;

Standalone circulators without pump housing shall be measured with the pump housing type in which they are intended to be used;

Circulators integrated in products shall be dismantled from the product and measured with a reference pump housing;

Circulators without pump housing intended to be integrated in a product shall be measured with a reference pump housing;

where '*reference pump housing*' means a pump housing supplied by the manufacturer with inlet and outlet ports on the same axis and designed to be connected to the pipework of a heating system or secondary circuit of a cooling distribution system.

1. Where a circulator has more than one setting of head and flow, measure the circulator at the maximum setting.

'Head' (H) means head (in metres) produced by the circulator at the specified point of operation.

'Flow' (Q) means the volume flow rate of water through the circulator (m^3/hr).

2. Find the point where $Q \cdot H$ is maximum and define the flow and head at this point as: $Q_{100\%}$ and $H_{100\%}$.

3. Calculate the hydraulic power P_{hyd} at this point.

'Hydraulic power' means an expression of the arithmetic product of the flow (Q), Head (H) and a constant.

'P_{hyd}' means hydraulic power delivered by the circulator to the fluid being pumped at the specified point of operation (in watts).

4. Calculate the reference power as:

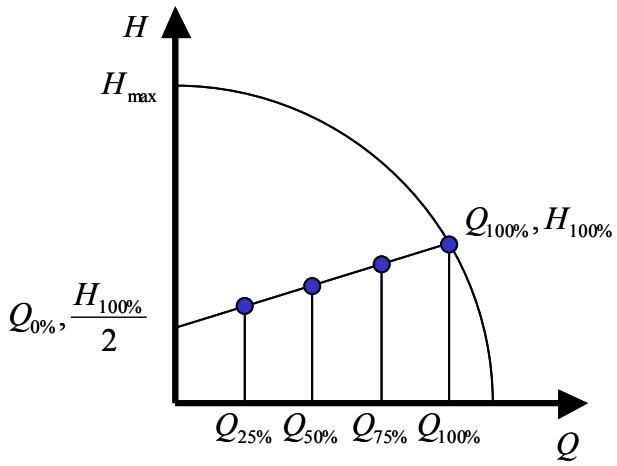
$$P_{ref} = 1.7 \cdot P_{hyd} + 17 \cdot \left(1 - e^{-0.3 \cdot P_{hyd}}\right), \quad 1\text{W} \le \text{P}_{\text{hyd}} \le 2500\text{W}$$

'Reference power' means a relation between hydraulic power and power consumption of a circulator, taking into account the dependency between circulator efficiency and size.

'P_{ref}' means the reference power consumption (in watts) of the circulator.

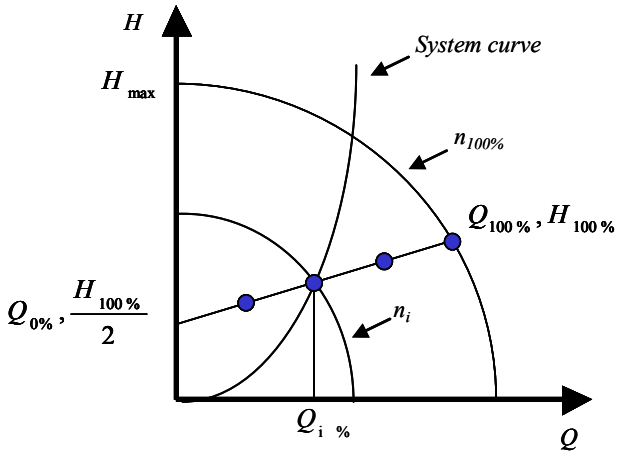
5. Define the reference control curve as the straight line between the points:

$(Q_{100\%}, H_{100\%})$ and $\left(Q_{0\%}, \frac{H_{100\%}}{2}\right)$



6. Select a setting of the circulator ensuring that the circulator on the selected curve reaches $Q \cdot H$ = max point. For circulators integrated in products follow the reference control curve by adjusting the system curve and speed of the circulator.

   'System curve' means a relationship between flow and head (H = f(Q)) resulting from friction in the heating system or cooling distribution system, as presented graphically below.



7. Measure P_1 and H at the flows:

   $Q_{100\%}, 0.75 \cdot Q_{100\%}, 0.5 \cdot Q_{100\%}, 0.25 \cdot Q_{100\%}$.

   'P1' means the electrical power (in watts) consumed by the circulator at the specified point of operation.

8. Calculate at these flows

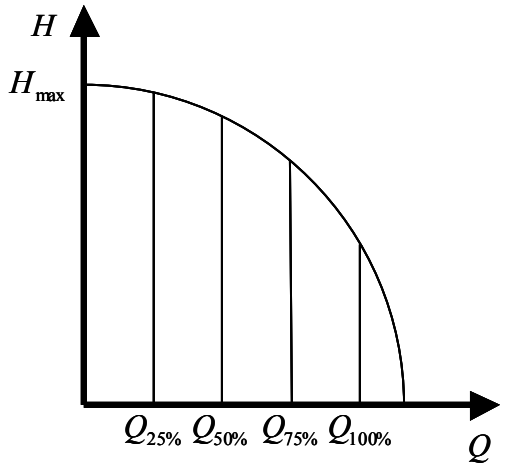
$$P_L = \frac{H_{ref}}{H_{meas}} \cdot P_{1,meas} \quad , if \quad H_{meas} \leq H_{ref}$$

$$P_L = P_{1,meas} \quad , if \quad H_{meas} > H_{ref}$$

where H_{ref} is the head on the reference control curve at the different flows.

9. Using P_L and this load profile:

Flow [%]	Time [%]
100	6
75	15
50	35
25	44



Calculate the weighted average power $P_{L,avg}$ as:

$P_{L,avg} = 0.06 \cdot P_{L,\,100\%} + 0.15 \cdot P_{L,75\%} + 0.35 \cdot P_{L,\,50\%} + 0.44 \cdot P_{L,25\%}$

For standalone circulators, calculate the energy efficiency index[4] as:

$$EEI = \frac{P_{L,avg}}{P_{ref}} \cdot C_{20\%} \text{ , where } C_{20\%} = 0.49$$

Except for circulators integrated in products designed for primary circuits of thermal solar systems and for heat pumps, where the energy efficiency index is calculated as:

$$EEI = \frac{P_{L,avg}}{P_{ref}} \cdot C_{20\%} \cdot (1 - e^{\left(-3{,}8 \cdot \left(\frac{n_q}{30}\right)^{1{,}36}\right)})$$

where $C_{20\%}$=0,49 and n_q is the specific speed defined as

$$n_q = \frac{n_{100\%}}{60} \cdot \frac{\sqrt{Q_{100\%}}}{H_{100\%}^{\;0{,}75}}$$

[4] $C_{XX\%}$ means a scaling factor that ensures that at the time of defining the scaling factor only XX% of circulators of a certain type have an EEI ≤ 0.20.

where

n_q is specific speed of a circulator;

$n_{100\%}$ is rotational speed in r.p.m. in this instance defined at $Q_{100\%}$ and $H_{100\%}$.