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[WORKING DOCUMENT ON A] COMMISSION DELEGATED REGULATION (EU) …/…

of XXX

supplementing Regulation (EU) 2017/1369 of the European Parliament and of the Council with regard to energy labelling of photovoltaic modules

(Text with EEA relevance)

WORKING DOCUMENT ON A POTENTIAL COMMISSION DELEGATED REGULATION (EU) …/...

of XX.YY.ZZZ

supplementing Regulation (EU) 2017/1369 of the European Parliament and of the Council with regard to energy labelling of photovoltaic modules

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU[1], and in particular Article 11(5) and Article 16 thereof,

Whereas:

(1) Regulation (EU) 2017/1369 empowers the Commission to adopt delegated acts as regards the labelling or re-scaling of the labelling of product groups representing significant potential for energy savings and, where relevant, other resources.

(2) The Communication from the Commission COM(2016)773 final[2] (ecodesign working plan) established by the Commission in application of Article 16(1) of Directive 2009/125/EC[3] of the European parliament and of the Council sets out the working priorities under the ecodesign and energy labelling framework for the period 2016-2019. The ecodesign working plan identifies the energy-related product groups to be considered as priorities for the undertaking of preparatory studies and eventual adoption of implementing measures, among which the solar panels and inverters.

(3) The Commission has carried out a preparatory study[4] to analyse the technical, environmental and economic aspects of solar photovoltaic modules, inverters and systems. The study has been carried out with stakeholders and interested parties from the Union and third countries, and the results have been made publicly available.

(4) The preparatory study identified a number of areas for regulatory intervention, aimed to a) foster module and inverter designs that have improved long-term energy yield, circularity and smart readiness, b) take products off the market that are of a low

[1] OJ L 198, 28.7.2017, p. 1.

[2] Communication from the Commission Ecodesign working plan 2016-2019 (COM(2016)773 final, 30.11.2016).

[3] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (OJ L 285, 31.10.2009, p. 10).

[4] 'Preparatory study for solar photovoltaic modules, inverters and systems', DOI: 10.2760/852637

quality and that have higher life cycle costs and c) inform users in a comparable and repeatable way about the module performance and footprint of the manufacturing phase.

(5) In general terms, 'energy efficiency', when related to energy conversion processes, represents the conversion efficiency, such as the ratio of generated end-use energy in proportion to the primary energy. When related to energy-consuming products, the energy efficiency can be regarded as the ratio between the product performance, provided that it is possible to quantify it, and the energy used to obtain it, such as the light emitted by a light bulb for a given amount of energy. When applying the same approach to photovoltaic modules, a change of perspective is needed, as we are dealing with energy-generating products rather than energy-consuming ones. The 'energy efficiency' of energy-generating products can be conceptually conceived to be the ratio of the generated energy available for the final application to the incoming energy (i.e. the amount of solar radiation reaching the surface area covered by the relevant module). The higher the energy efficiency of a photovoltaic module, the higher will be the amount of generated energy. Thus, improvements on energy efficiency of a photovoltaic module bring a positive impact on the environmental performance of the product itself.

(6) The energy labelling of photovoltaic modules enable users to make informed choices towards more energy and resource efficient appliances. The understanding and relevance of the information provided on the label have been confirmed through a specific consumer survey in line with Article 14(2) of Regulation (EU) 2017/1369.

(7) In particular, the energy label for photovoltaic modules aims at giving information on the energy yield of the module, allowing on the one side installers and designers, and on the other side private individuals considering investment in photovoltaic systems, to have immediate and comparable information on the product performance and to be easily able to use this in a purchasing decision.

(8)

(9) The annual electricity production of new capacity installed in 2021 in the EU27 of photovoltaic modules and inverters subject to this Regulation is estimated at around 643 TWh in their lifetime. In total this new capacity installed in Europe will consume in their manufacturing around 59.5 TWh. The combined effect of an ecodesign and energy labelling regulation will increase the electricity generation of photovoltaics by 3-5% (by additional 11-14 TWh in 2030), and will help saving up to 25% of the primary energy consumption for their manufacturing.

(10) Photovoltaic modules that are displayed at trade fairs should bear the energy label if the first unit of the model has already been placed on the market or is placed on the market on the trade fair.

(11) The relevant product parameters should be measured or calculated using reliable, accurate and reproducible methods. Those methods should take into account recognised state-of-the-art measurement methods including, where available, harmonised standards adopted by the European standardisation bodies, as listed in Annex I to Regulation (EU) No 1025/2012 of the European Parliament and of the Council**Fel! Bokmärket är inte definierat.**.

(12) Recognising the growth of sales of energy-related products through web-stores and internet sales platforms, rather than directly from suppliers, it should be clarified that

hosting service providers of web-stores and internet sales platforms should be responsible for displaying the label provided by the supplier in proximity to the price. They should inform the supplier of that obligation, but should not be responsible for the accuracy or content of the label and the product information sheet provided. However, in application of Article 14(1)(b) of Directive 2000/31/EC[5] of the European Parliament and of the Council on electronic commerce, such internet hosting platforms should act expeditiously to remove or to disable access to information about the product in question if they are aware of the non-compliance (e.g. missing, incomplete or incorrect label or product information sheet) for example if informed by the market surveillance authority. A supplier selling directly to end-users via its own website is covered by dealers' distance selling obligations referred to in Article 5 of Regulation (EU) 2017/1369.

(13) [*The measures provided for in this Regulation were discussed by the Consultation Forum and with the Member States experts in accordance with Article 17 of Regulation (EU) 2017/1369.*]

HAS ADOPTED THIS REGULATION:

Article 1
Subject matter and scope

1. This Regulation establishes requirements for the labelling of, and the provision of supplementary product information on, photovoltaic modules.

2. This Regulation shall not apply to:

   (a) photovoltaic modules with a direct current (DC) output power of less than 50 Watts under Standard Test Conditions;

   (b) building integrated photovoltaics;

   (c) photovoltaic modules integrated into consumer electronic products, or other multifunctional applications requiring specialised designs for which energy production is not the only purpose/functionality such as, but not limited to, street furniture, large-area shading, specific agri-photovoltaic applications or other similar;

   (d) photovoltaic modules based on organic perovskite layers. Tandem solar cells made with silicon and these materials are inside the scope of this Regulation;

   (e) photovoltaic modules based on new technologies entering the market with a cumulative yearly global production less than 500 MW.

Article 2
Definitions

For the purposes of this Regulation, the following definitions shall apply:

[5] Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market (OJ L 178, 17.7.2000, p. 1).

(1) ‘photovoltaic module’ means a framed or unframed assembly of solar photovoltaic cells designed to generate DC power. A photovoltaic module consists of:

- strings of photovoltaic cells (crystalline technology) and/or semiconductor layers (thin film technology),
- a substrate, encapsulation and cover materials,
- the interconnections of the cells,
- the junction box and associated cabling, and
- the framing material (where applicable);

(2) ‘Direct current (DC) output power’ means the power measured at the DC output port;

(3) ‘Standard Test Conditions’ (STC) means a standard set of reference conditions used for the testing and rating of photovoltaic cells and modules. The standard test conditions are: photovoltaic cell temperature of 25 °C; irradiance in the plane of the PV cell or module of 1000 W/m^2 and light spectrum corresponding to an atmospheric air mass of 1.5g;

(4) ‘Building integrated photovoltaic’ means photovoltaic modules that incorporate solar photovoltaic cells and form a construction product providing a function as defined in the European Construction Product Regulation CPR 305/2011;

For the purposes of the annexes, additional definitions are set out in Annex I.

Article 3

Obligations of suppliers

1. Suppliers shall ensure that:

   a) each photovoltaic module is supplied with a printed label in the format as set out in Annex III;

   b) the values of the parameters included in the product information sheet, as set out in Annex V, are entered into the public part of the product database;

   c) if specifically requested by the dealer, the product information sheet shall be made available in printed form;

   d) the content of the technical documentation, set out in Annex VI, is entered into the product database;

   e) any visual advertisement for a specific model of photovoltaic module contains the energy efficiency class and the range of energy efficiency classes available on the label in accordance with Annex VII and Annex VIII;

   f) any technical promotional material concerning a specific model of photovoltaic module, including on the Internet, which describes its specific technical parameters includes the energy efficiency class of that model and the range of energy efficiency classes available on the label, in accordance with Annex VII;

   g) an electronic label in the format and containing the information as set out in Annex III is made available to dealers for each model of photovoltaic module;

   h) an electronic product information sheet, as set out in Annex V, is made available to dealers for each model of photovoltaic module.

2. The energy efficiency classes are defined in Annex II and shall be calculated in accordance with Annex IV.

Article 4
Obligations of dealers

Dealers of photovoltaic modules shall ensure that:

a) each photovoltaic module at the point of sale, including at trade fairs, bears the label provided by suppliers in accordance with point 1(a) of Article 3, with the label being displayed in such a way as to be clearly visible;

b) in the case of distance selling and sale through the internet, the label and product information sheet are provided in accordance with Annexes VII and VIII;

c) any visual advertisement for a specific model of photovoltaic module contains the energy efficiency class of that model and the range of energy efficiency classes available on the label, in accordance with Annex VII;

d) any technical promotional material concerning a specific model of photovoltaic module, including on the Internet, which describes its specific technical parameters, includes the energy efficiency class of that model and the range of energy efficiency classes available on the label, in accordance with Annex VII.

Article 5
Obligations of internet hosting platforms

Where a hosting service provider as referred to in Article 14 of Directive 2000/31/EC allows the direct selling of photovoltaic modules through its Internet website, the service provider shall enable the showing of the electronic label and electronic product information sheet provided by the dealer on the display mechanism in accordance with the provisions of Annex VIII and shall inform the dealer of the obligation to display them.

Article 6
Measurement methods

The information to be provided pursuant to Articles 3 and 4 shall be obtained by reliable, accurate and reproducible measurement and calculation methods, which take into account the recognised state-of-the-art measurement and calculation methods set out in Annex IV.

Article 7
Verification procedure for market surveillance purposes

Member States shall apply the procedure laid down in Annex IX when performing the market surveillance checks referred to in paragraph 3 of Article 8 of Regulation (EU) 2017/1369.

Article 8

Review

The Commission shall review this Regulation in the light of technological progress and present the results of this review including, if appropriate, a draft revision proposal, to the Consultation Forum no later than *[OP – please insert the date - five years after day of entry into force of this Regulation]*.

The review shall in particular assess the need to revise the scope definition to reflect market evolution.

Article 10

Entry into force and application

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

It shall apply from xx.yyzzz.

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

Done at Brussels,

For the Commission
The President
Ursula VON DER LEYEN

ANNEX I

Definitions applicable for the annexes

The following definitions shall apply:

(2) 'declared values' means the values provided by the supplier for the stated, calculated or measured technical parameters, pursuant to Article 3(3) of Regulation (EU) 2017/1369, and in accordance with Article 3(1)(d) and Annex VI of this Regulation, for the verification of compliance by the Member State authorities;

(3) 'equivalent model' means a model which has the same technical characteristics relevant for the technical information to be provided, but which is placed on the market or put into service by the same manufacturer, importer or authorised representative as another model with a different model identifier;

Definitions related to photovoltaic modules:

(4) 'Energy Efficiency Index' (EEI_M) of a photovoltaic module means the ratio of the DC energy yield delivered by one module ($EY_{M(DC)\_Y1\_c}$) over one year (considered the first year of installation) under a reference climate condition, expressed in kWh, divided by the module area (A_M), expressed in m^2;

(5) 'Energy conversion efficiency' means the ratio of electric power generated by a photovoltaic module per unit area to its incident irradiance as measured under STC;

(6) 'Monofacial photovoltaic module' means a photovoltaic module that generates power from only one side of its surface.

(7) 'Bifacial photovoltaic module' means a photovoltaic module that generates power from both sides of its surface (front and rear sides).

(8) 'Bifaciality' means the ratio between the main characteristics of the rear side and the front side of a bifacial photovoltaic module quantified by specific bifaciality coefficients (short-circuit current (φ_{Isc}), the open-circuit voltage (φ_{Voc}) and the maximum power bifaciality coefficient (φ_{Pmax}));

(9) 'Thin film photovoltaic module' means a photovoltaic module made by deposition of thin layers of photovoltaic materials onto different substrates;

(10) 'Heterojunction photovoltaic module' means a photovoltaic module that combines crystalline silicon solar cells with amorphous silicon thin film;

(11) 'Climatic Specific Energy Rating (CSER)' means the module performance ratio of the normalized energy collection for the reference climatic profile. The relevant reference climates for Europe are: Subtropical arid, Temperate continental and Temperate coastal;

(12) 'Lifetime performance degradation' means the average linear degradation rate expected over a notional service lifetime;

(13) 'Total energy generated over one year' of a photovoltaic module means the EEI_M multiplied by the module area(A_M);

ANNEX II

A. Energy efficiency classes

1. The energy efficiency class of a photovoltaic module shall be determined on the basis of its Energy Efficiency Index (EEI_M) as set out in Table 1.

The EEI of a photovoltaic module shall be calculated in accordance with Annex IV.

Table 1
Energy efficiency classes of photovoltaic modules

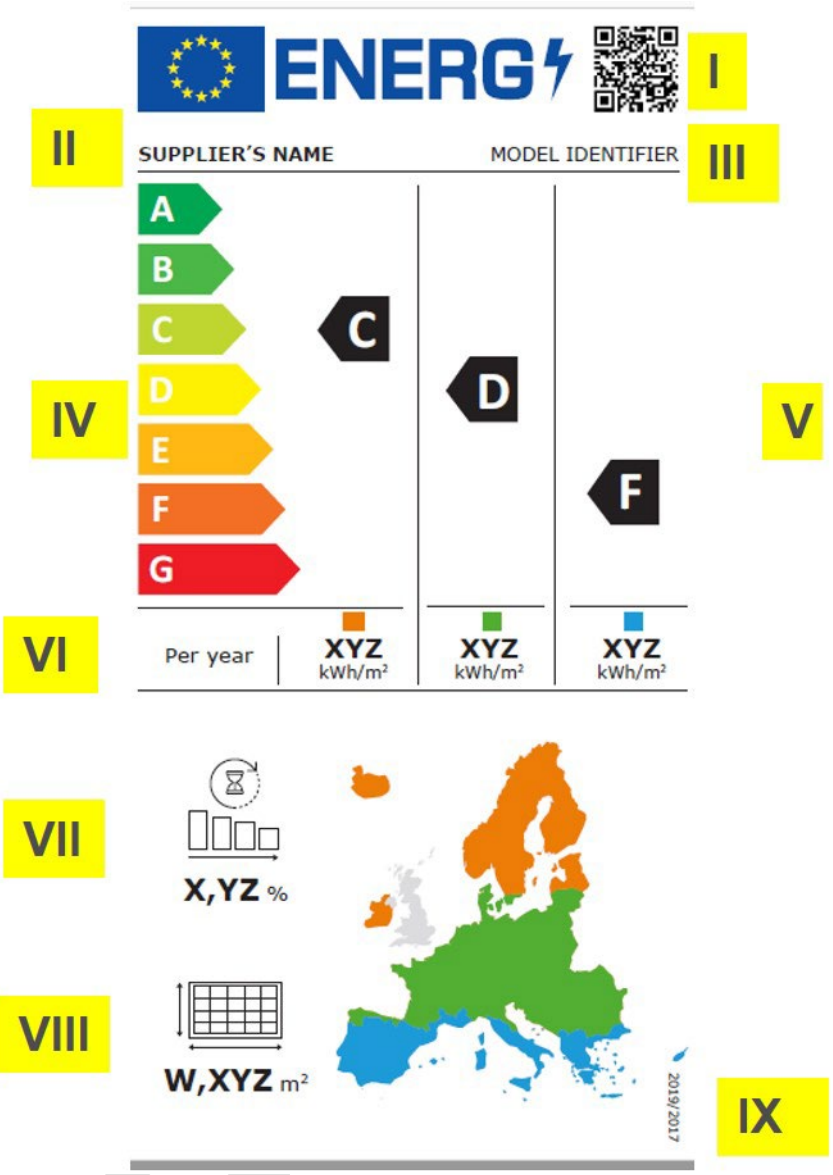
	Energy Efficiency Index (EEI_M), kWh/m²		
Energy Efficiency Class	**Subtropical arid**	**Temperate coastal**	**Temperate continental**
A	$\mathbf{EEI_M} > 566$	$\mathbf{EEI_M} > 257$	$\mathbf{EEI_M} > 330$
B	$496 < \mathbf{EEI_M} \leq 566$	$226 < \mathbf{EEI_M} \leq 257$	$291 < \mathbf{EEI_M} \leq 330$
C	$426 < \mathbf{EEI_M} \leq 496$	$195 < \mathbf{EEI_M} \leq 226$	$252 < \mathbf{EEI_M} \leq 291$
D	$356 < \mathbf{EEI_M} \leq 426$	$164 < \mathbf{EEI_M} \leq 195$	$213 < \mathbf{EEI_M} \leq 252$
E	$310 < \mathbf{EEI_M} \leq 356$	$140 < \mathbf{EEI_M} \leq 164$	$182 < \mathbf{EEI_M} \leq 213$
F	$265 < \mathbf{EEI_M} \leq 310$	$117 < \mathbf{EEI_M} \leq 140$	$151 < \mathbf{EEI_M} \leq 182$
G	$\mathbf{EEI_M} \leq 265$	$\mathbf{EEI_M} \leq 117$	$\mathbf{EEI_M} \leq 151$

ANNEX III

A. Label for photovoltaic modules

1. LABEL FOR PHOTOVOLTAIC MODULES

1.1. Label for photovoltaic modules



1.2. The following information shall be included in the label:

I. QR code;

II. supplier's name or trade mark;

III. supplier's model identifier;

IV. scale of energy efficiency classes from A to G;

V. the module energy efficiency class EEI_M under 'temperate coastal', 'temperate continental' and 'subtropical arid' climate conditions determined in accordance with Annex II;

VI. the module energy efficiency index value EEI_M under 'temperate coastal', 'temperate continental' and 'subtropical arid' climate conditions, calculated according to Annex IV, expressed in kWh/m^2 and rounded to the unit;

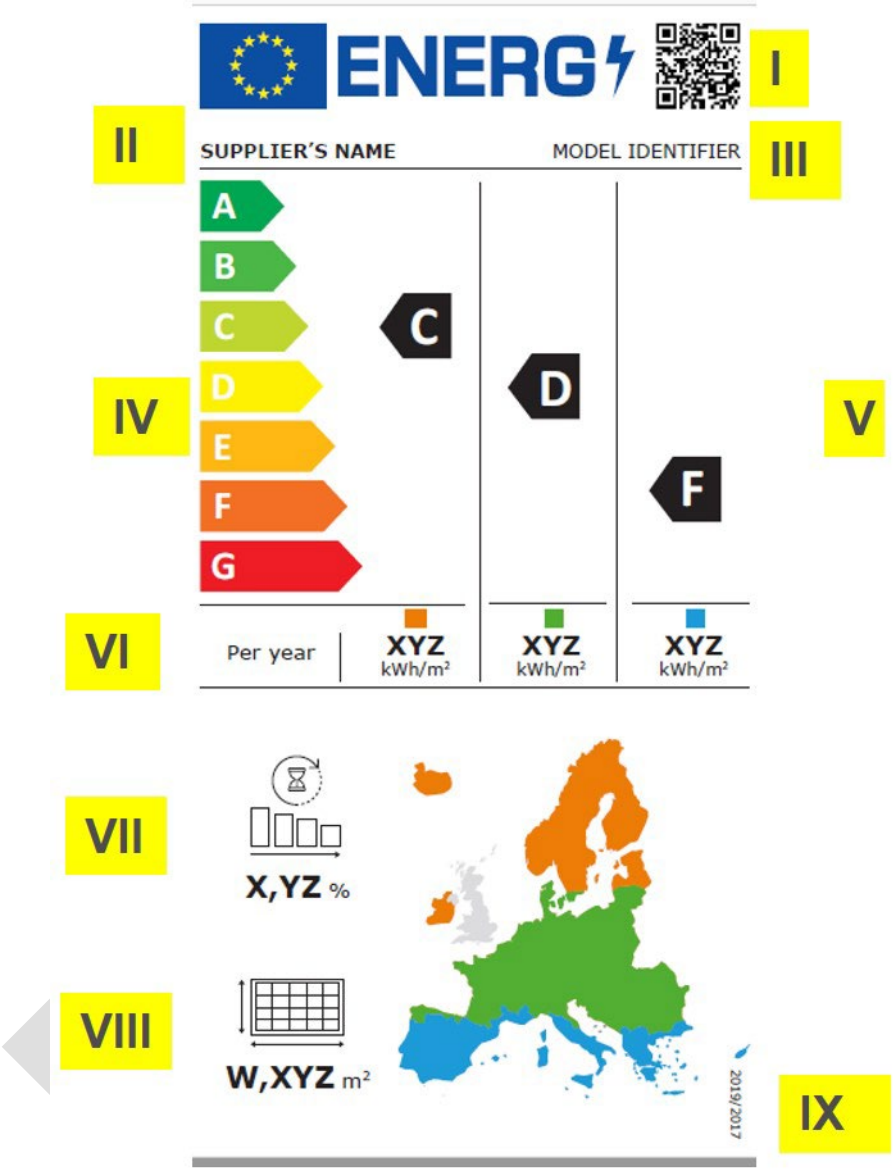
VII. the lifetime performance degradation rate, expressed in % and rounded to the second decimal place;

VIII. the photovoltaic module area (A_M), expressed in m^2 and rounded to the third decimal place;

IX. the number of this Regulation, that is '2022/XXX' *[PO- please insert the number of this Regulation in this point and in the right bottom corner of the label]*.

2. LABEL DESIGN FOR PHOTOVOLTAIC MODULES

The design of the label shall be as in the figure below.



Whereby:

(a) The label shall be at least 96 mm wide and 192 mm high. Where the label is printed in a larger format, its content shall nevertheless remain proportionate to the specifications above.

(b) The background of the label shall be 100 % white.

(c) The typefaces shall be Verdana and Calibri.

(d) The dimensions and specifications of the elements constituting the label shall be as indicated in the label design for household washing machines.

(e) Colours shall be CMYK – cyan, magenta, yellow and black, following this example: 0,70,100,0: 0 % cyan, 70 % magenta, 100 % yellow, 0 % black.

(f) The label shall fulfil all the following requirements (numbers refer to the figure above):

❶ the colours of the EU logo shall be as follows:

– the background: 100,80,0,0;

– the stars: 0,0,100,0;

❷ the colour of the energy logo shall be: 100,80,0,0;

❸ the QR code shall be 100 % black;

❹ the supplier's name shall be 100 % black and in Verdana Bold, 9 pt;

❺ the model identifier shall be 100 % black and in Verdana Regular 9 pt;

❻ the A to G scale shall be as follows:

– the letters of the energy efficiency scale shall be 100 % white and in Calibri Bold 19 pt; the letters shall be centred on an axis at 4,5 mm from the left side of the arrows;

– the colours of the A to G scale arrows shall be as follows:

- A-class: 100,0,100,0;
- B-class: 70,0,100,0;
- C-class: 30,0,100,0;
- D-class: 0,0,100,0;
- E-class: 0,30,100,0;
- F-class: 0,70,100,0;
- G-class: 0,100,100,0;

❼ the internal dividers shall have a weight of 0,5 pt and the colour shall be 100 % black;

❽ the letter of the energy efficiency class shall be 100 % white and in Calibri Bold 33 pt. The energy efficiency class arrow and the corresponding arrow in the A to G scale shall be positioned in such a way that their tips are aligned. The letter in the energy efficiency class arrow shall be positioned in the centre of the rectangular part of the arrow which shall be 100 % black;

❾ the value of the weighted energy consumption per 100 cycles shall be in Verdana Bold font 28 pt; 'kWh' shall be in Verdana Regular font, 18 pt; the number '100' in the icon representing 100 cycles shall be in Verdana Regular 14 pt. The value and unit shall be centred and 100 % black;

❿ the pictograms shall be as shown as in the label design and as follows:

– the pictograms' lines shall have a weight of 1,2 pt and they and the texts (numbers and units) shall be 100 % black;

– the texts under the 3 top pictograms shall be in Verdana Bold 16 pt with the units in Verdana Regular 12 pt, they shall be centred under the pictograms;

⓫ the number of the regulation shall be 100 % black and in Verdana Regular 6 pt.

ANNEX IV

Measurement methods and calculations

For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements and 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 other reliable, accurate and reproducible methods, which takes into account the generally recognised state-of-the-art, and in line with the following provisions.

In the absence of existing relevant standards and until the publication of the references of the relevant harmonised standards in the Official Journal, the transitional testing methods set out in Annex IVa, or other reliable, accurate and reproducible methods, which take into account the generally recognised state-of-the-art, shall be used.

Where a parameter is declared pursuant to Article 3(3) of Regulation (EU) 2017/1369 and in accordance with Annex VI Table 7 for photovoltaic modules, its declared value shall be used by the supplier for the calculations in this Annex.

ENERGY EFFICIENCY INDEX OF A PHOTOVOLTAIC MODULE (EEI_M)

The EEI_M is expressed in kWh/m^2 and calculated as follows for each of the three European reference climatic conditions 'temperate coastal', 'temperate continental' and 'subtropical arid':

$$EEI_{M\_c} = {EY_{M(DC)\,Y1\,c}}\Big/{A_M}$$

Where:

- $EY_{M(DC)\_Y1\_c}$ is the DC energy yield from one photovoltaic module over one year under the climatic conditions in the reference climate *c*, assuming no degradation or losses, expressed in kWh.
- A_M is the area of the photovoltaic module expressed in m^2.

The photovoltaic module is assumed ground-mounted on a fixed-open rack facing the equator with an inclination angle of 20º. Degradation and other losses due to soiling or shadows from surrounding obstacles are not considered. Ground albedo is not considered for monofacial PV modules.

Photovoltaic modules containing micro-inverters integrated/embedded shall be tested before the integration occurs.

Calculation of the DC energy yield of monofacial photovoltaic modules

For monofacial PV modules, the yearly DC energy yield ($EY_{M(DC)\_Y1}$, kWh) shall be calculated using the input data:

a. Matrix of Pmax versus irradiance (at AM1.5g) and versus module temperature which may be interpolated to obtain the instantaneous power at a given irradiance and module temperature. For linear modules, Pmax dependence on irradiance and on temperature are independent.
b. Thermal coefficients u_0, u_1 describing module operating temperature as a function of irradiance, ambient temperature and wind speed, which are used to calculate instantaneous module temperature.
c. Angle of incidence response a_r used to calculate the effective light transmission into the module at different incident angles.

d. Spectral responsivity, used to calculate spectral mismatch and hence to correct reference spectral conditions.
e. Standard reference climatic profiles for the reference climatic conditions relevant to Europe defined as 'Subtropical arid', 'Temperate continental' and 'Temperate coastal'.

where Pmax is the DC power output of a module under standard testing conditions (air mass 1.5g spectrum, 1000 W/m^2, 25°C).

The method does not include degradation or other losses other than those due to angle of incidence effect, spectral response or module efficiency dependence on irradiance and temperature. .

The DC energy yield of the module over its first year of installation $EY_{M(DC)\_Y1}$ is calculated according:

$$EY_{M(DC)\,Y1} = \sum_{j=1}^{j=8760} EY_{M,j}$$

Where

j ranges from 1 to 8760 in the reference period (one year)

$EY_{M,j}$ (kWh) is the energy output of the module in the period j (1h) and it is calculated as:

$$EY_{M,j} = P_{M,j} \cdot \left(G_{corr,j}, T_{M,j}\right) \cdot 1\ hour$$

$P_{M,j}$ is the module power output for jth hour (W)

$G_{corr,j}$ is the corrected global in-plane irradiance for jth hour (W/m^2)

$T_{M,j}$ is the module temperature for jth hour (°C)

The $EY_{M(DC)\_Y1}$ is one of the outputs along with the CSER (Climate Specific Energy Rating). Both are related as follows:

$$CSER = \frac{EY_{M(DC)Y1} \cdot G_{ref}}{P_{max,STC} \cdot H_p}$$

Where:

G_{ref} is 1000 W/m^2, the irradiance used to measure the $P_{max,STC}$ which is the maximum power output of the PV module under STC conditions.

H_p is the yearly total global in-plane irradiation, expressed in kWh/m^2 for the reference climatic conditions.

Calculation method of the energy yield of bifacial photovoltaic modules

Bifaciality is quantified with reference to bifaciality coefficients, for the short-circuit current (φ_{Isc}), the open-circuit voltage (φ_{Voc}) and the maximum power bifaciality coefficient (φ_{Pmax}), defined as:

$$\varphi_{Pmax}(\%) = \frac{P_{max\ Rear}}{P_{\max Front}} \cdot 100$$

Where:

Pmax $_{Rear}$ and Pmax $_{Front}$ are the module output power measured of rear and the front side at STC.

[A calculation method of the energy yield of bifacial photovoltaic modules will be added]

ANNEX IVa

Transitional Methods

Part 1 – References and qualifying notes

Table 1

References and qualifying notes for photovoltaic modules

Parameter	Source	Reference Test Method	Notes
Electrical performance at standard test conditions	CENELEC	EN IEC 60904-1	
Energy conversion efficiency	CENELEC	EN IEC 60904-1	Ratio between the maximum power at STC and the module area
Energy yield DC	CENELEC	EN 61853-1 EN 61853-2 EN IEC 61853-3 EN IEC 61853-4	Year zero excluding degradation, for each of the three climate zones defined in EN IEC 61853-4 that best represent the European climatic conditions (Subtropical arid, Temperate continental and Temperate coastal). *Modules with inseparable AC integrated inverters are not considered here.*
Reference climatic conditions		EN IEC 61853-4	The relevant reference climates for Europe are: Subtropical arid, Temperate continental and Temperate coastal
Bifaciality coefficient		IEC TS 60904-1-2	

Part 2 – Transitional methods for specific parameters

Definition of the photovoltaic module and photovoltaic system lifetime performance degradation rates

The degradation rate τ_{deg} for each PV module category is defined as the annual percentage decrease of the PV product's energy yield, when compared to the initial value, assuming the decrease to be constant in time and considering the same testing conditions under which the initial value was measured. If EY_0 is the initial value of the energy yield, τ_{deg} can thus be expressed by:

$$\tau_{deg} = \left(\left(\frac{EY_t}{EY_0}\right) - 1\right) \cdot \left(\frac{1}{t}\right)$$

Where:

EY_t is the value of the energy yield after an amount of years equal to t. The degradation rate τ_{deg} is expressed in %/year:

- Degradation rate for silicon photovoltaic modules: 0.70 %/year;
- Degradation rate for thin film and heterojunction photovoltaic modules: 1.00 %/year.

Lower values can be declared provided they are based on experimental data collected from the measurement of field deployed systems. These data shall:

- cover at least five consecutive years
- be collected at least in two separate geographic locations in each of the three reference climatic conditions
- contain open rack ground-mounted, roof-mounted and building added systems (at least 2 of the three options must be included).

The assigned degradation rate shall be the average of all collected degradation rates from above.

ANNEX V

Product information sheet

1. Photovoltaic modules

Pursuant to point 1(b) of Article 3, the supplier shall enter into the product database the information as set out in Table 5.

The user manual or other literature provided with the product shall clearly indicate the link to the model in the product database as a human-readable Uniform Resource Locator (URL) or as QR code or by providing the product registration number.

Table 5
Content, order and format of the product information sheet

<table>
<tr><td colspan="6">Supplier’s name or trade mark:</td></tr>
<tr><td colspan="6">Supplier’s address[b]:</td></tr>
<tr><td colspan="6">Model identifier:</td></tr>
<tr><td colspan="6">General product parameters:</td></tr>
<tr><td>Parameter</td><td colspan="2">Value</td><td>Parameter</td><td colspan="2">Value</td></tr>
<tr><td rowspan="3">Module area (m^2)</td><td colspan="2" rowspan="3">x,xxx</td><td rowspan="3">Dimensions in cm</td><td>Height</td><td>x</td></tr>
<tr><td>Width</td><td>x</td></tr>
<tr><td>Depth</td><td>x</td></tr>
<tr><td rowspan="3">Climate Specific Energy Rating (CSER)</td><td>temperate coastal</td><td>x,xxx</td><td rowspan="3">Energy efficiency class[a]</td><td colspan="2" rowspan="3">[A/B/C/D/E/F/G][c]</td></tr>
<tr><td>temperate continental</td><td>x,xxx</td></tr>
<tr><td>subtropical arid</td><td>x,xxx</td></tr>
<tr><td rowspan="3">Module Energy efficiency Index (EEI_M)</td><td>temperate coastal</td><td>xxx</td><td>Yearly total DC energy yield produced</td><td>temperate coastal</td><td>x,x</td></tr>
<tr><td>temperate continental</td><td>xxx</td><td>Yearly total DC energy yield produced</td><td>temperate continental</td><td>x,x</td></tr>
<tr><td>subtropical arid</td><td>xxx</td><td>Yearly total DC energy yield produced</td><td>subtropical arid</td><td>x,x</td></tr>
</table>

Lifetime performance degradation rate	x,xx	Maximum power at STC conditions	x,xx

Minimum duration of the guarantee offered by the supplier[b]:

Additional information:

Weblink to the supplier's website, where the information in point 3 of Annex II to Commission Regulation (EU) 2019/XXX[6] *[OP – please insert the number of the Ecodesign Regulation on PV]*[b] is found:

[b] changes to these items shall not be considered relevant for the purposes of paragraph 4 of Article 4 of Regulation (EU) 2017/1369.

[c] if the product database automatically generates the definitive content of this cell the supplier shall not enter these data.

[6] Commission Regulation (EU) 2019/XXX *[OP - please enter the full OJ-L reference of Regulation C(2019)2124]*.

ANNEX VI

Technical documentation

1. For photovoltaic modules, the technical documentation referred to in point 1(d) of Article 3 shall include:

   a) a general description of the model allowing it to be unequivocally and easily identified;

   b) references to the harmonised standards applied or other measurement standards used;

   c) specific precautions to be taken when the model is assembled, installed, maintained or tested;

   d) the values for the technical parameters set out in Table 7; these values are considered as the declared values for the purpose of the verification procedure in Annex IX;

   e) the details and the results of calculations performed in accordance with Annex IV;

   f) testing conditions if not described sufficiently in point (b);

   g) equivalent models, if any, including model identifiers;

These elements shall also constitute the mandatory specific parts of the technical documentation that the supplier shall enter into the database, pursuant to point 5 of Article 12 of Regulation 2017/1369.

Table 7
Information to be included in the technical documentation for photovoltaic modules

PARAMETER	UNIT	VALUE
Module area	m^2	X,XXX
EEI_M temperate coastal	kWh/ m^2	XXX
EEI_M temperate continental	kWh/ m^2	XXX
EEI_M subtropical arid	kWh/ m^2	XXX
Total energy generated over one year temperate coastal	kWh	X,XXX
Total energy generated over one year temperate continental	kWh	X,XXX
Total energy generated over one year subtropical arid	kWh	X,XXX
Lifetime performance degradation rate	%	X,X

ANNEX VII

Information to be provided in visual advertisements, in technical promotional material in distance selling and in telemarketing, except distance selling on the internet

1. In visual advertisements for photovoltaic modules, for the purposes of ensuring conformity with the requirements laid down in point 1(e) of Article 3 and point 1(c) of Article 4, the energy efficiency class and the range of energy efficiency classes available on the label shall be shown as set out in point 4 of this Annex.

2. In technical promotional material for photovoltaic modules, for the purposes of ensuring conformity with the requirements laid down in point 1(f) of Article 3 and point 1(d) of Article 4, the energy efficiency class and the range of energy efficiency classes available on the label shall be shown as set out in point 4 of this Annex.

3. Any paper-based distance selling of photovoltaic modules must show the energy efficiency class and the range of energy efficiency classes available on the label as set out in point 4 of this Annex.

4. The energy efficiency class and the range of energy efficiency classes shall be shown, as indicated in Figure 1, with:

   a) for photovoltaic modules: an arrow, containing the letter of the energy efficiency class in 100 % white, Calibri Bold and in a font size at least equivalent to that of the price, when the price is shown;

;

   b) the colour of the arrow matching the colour of the energy efficiency class;

   c) the range of available energy efficiency classes in 100 % black; and,

   d) the size shall be such that the arrow is clearly visible and legible. The letter in the energy efficiency class arrow shall be positioned in the centre of the rectangular part of the arrow, with a border of 0,5 pt in 100 % black placed around the arrow and the letter of the energy efficiency class.

By way of derogation, if the visual advertisement, technical promotional material or paper-based distance selling is printed in monochrome, the arrow can be in monochrome in that visual advertisement, technical promotional material or paper-based distance selling.

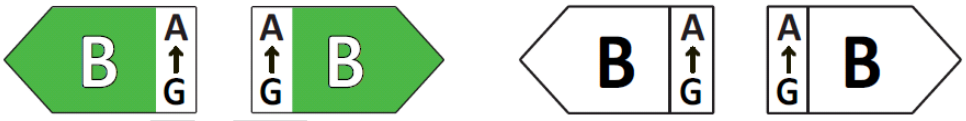


Figure 1: Coloured/monochrome left/right arrow, with range of energy efficiency classes indicated

5. Telemarketing-based distance selling must specifically inform the customer of the energy efficiency classes of the product and of the range of energy efficiency classes available on the label, and that the customer can access the label and the product information sheet through the product database website, or by requesting a printed copy.

6. For all the situations mentioned in points 1 to 3 and 5, it must be possible for the customer to obtain, on request, a printed copy of the label and the product information sheet.

ANNEX VIII

Information to be provided in the case of distance selling through the internet

1. The appropriate label made available by suppliers in accordance with point 1(g) of Article 3 shall be shown on the display mechanism in proximity to the price of the product. The size shall be such that the label is clearly visible and legible and shall be proportionate to the size specified in Annex III. The label may be displayed using a nested display, in which case the image used for accessing the label shall comply with the specifications laid down in point 2 of this Annex. If a nested display is applied, the label shall appear on the first mouse click, mouse roll-over or tactile screen expansion on the image.

2. The image used for accessing the label in the case of nested display, as indicated in Figure 2, shall:

   (g) be an arrow in the colour corresponding to the energy efficiency class of the product on the label;

   (h) indicate the energy efficiency class of the product on the arrow in 100 % white, Calibri Bold and in a font size equivalent to that of the price;

   (i) have the range of available energy efficiency classes in 100 % black; and,

   (j) have one of the following two formats, and its size shall be such that the arrow is clearly visible and legible. The letter in the energy efficiency class arrow shall be positioned in the centre of the rectangular part of the arrow, with a visible border in 100 % black placed around the arrow and the letter of the energy efficiency class:

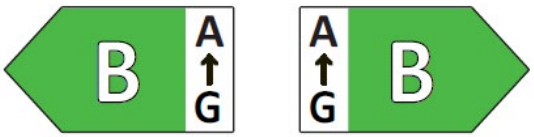


Figure 2: Coloured left/right arrow, with range of energy efficiency classes indicated

3. In the case of nested display, the sequence of display of the label shall be as follows:

   (k) the images referred to in point 2 of this Annex shall be shown on the display mechanism in proximity to the price of the product;

   (l) the images shall link to the label set out in Annex III;

   (m) the label shall be displayed after a mouse click, mouse roll-over or tactile screen expansion on the image;

   (n) the label shall be displayed by pop up, new tab, new page or inset screen display;

   (o) for magnification of the label on tactile screens, the device conventions for tactile magnification shall apply;

   (p) the label shall cease to be displayed by means of a close option or other standard closing mechanism;

   (q) the alternative text for the graphic, to be displayed on failure to display the label, shall be the energy efficiency classes of the product in a font size equivalent to that of the price.

4. The electronic product information sheet made available by suppliers in accordance with point 1(h) of Article 3 shall be shown on the display mechanism in proximity to the price of the product. The size shall be such that the product information sheet is clearly visible and legible. The product information sheet may be displayed using a nested display or by referring to the product database, in which case the link used for accessing the product information sheet shall clearly and legibly indicate 'Product information sheet'. If a nested display is used, the product information sheet shall appear on the first mouse click, mouse roll-over or tactile screen expansion on the link.

ANNEX IX

Verification procedure for market surveillance purposes

The verification tolerances defined in this Annex relate only to the verification by Member State authorities of the declared values and shall not be used by the supplier 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. The values and classes published on the label or in the product information sheet shall not be more favourable for the supplier than the values declared in the technical documentation.

Where a model has been designed to be able to detect it is being tested (e.g. by recognising the test conditions or test cycle), and to react specifically by automatically altering its performance during the test with the objective of reaching a more favourable level for any of the parameters specified in this Regulation or included in the technical documentation or included in any of the documentation provided, the model and all equivalent models shall be considered not compliant.

A. Verification procedure for photovoltaic modules

As part of verifying the compliance of a product model with the requirements laid down in this Regulation, the authorities of 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 Article 3(3) of Regulation (EU) 2017/1369 (declared values), and, where applicable, the values used to calculate these values, are not more favourable for the supplier than the corresponding values given in the test reports; and
    b) the values published on the label and in the product information sheet are not more favourable for the supplier than the declared values, and the indicated energy efficiency class is not more favourable for the supplier than the class determined by 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 9.
3. If the results referred to in points 2(a) or (b) are not achieved, the model and all equivalent models 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 equivalent models.
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 tolerances given in Table 9.
6. If the result referred to in point 5 is not achieved, the model and all equivalent models 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, 6 or the second paragraph of this Annex.

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

The Member State authorities shall only apply the verification tolerances that are set out in Table 9 and shall only use the procedure described in points 1 to 7 for the requirements referred to in this Annex. For the parameters in Table 9, no other tolerances, such as those set out in harmonised standards or in any other measurement method, shall be applied.

Table 9
Verification tolerances

Parameter	Verification tolerances
Energy yield DC	The determined value (*) shall not be less than XX times the declared value

* In the case of three additional units tested as prescribed in point 4, the determined value means the arithmetical mean of the values determined for these three additional units.