BS EN 50524:2009

BSI Standards Publication

Data sheet and name plate for photovoltaic inverters

raising standards worldwide™

National foreword

This British Standard is the UK implementation of EN 50524:2009.

The UK participation in its preparation was entrusted to Technical Committee GEL/82, Solar photovoltaic energy systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 63340 9

ICS 27.160

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2010

Amendments issued since publication

Amd. No.	Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50524

July 2009

ICS 27.160

English version

Data sheet and name plate for photovoltaic inverters

Fiche technique et plaque d'identification pour les onduleurs photovoltaïques

Datenblatt- und Typschildangaben von Photovoltaik-Wechselrichtern

This European Standard was approved by CENELEC on 2009-06-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 50524:2009 E

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 82, Solar photovoltaic energy systems.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50524 on 2009-06-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2010-06-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2012-06-01

Contents

Figures

1 Scope

This European Standard describes data sheet and name plate information for photovoltaic inverters in grid parallel operation.

The intent of this document is to provide minimum information required to configure a safe and optimal system with photovoltaic inverters.

In this context, data sheet information is a technical description separate from the photovoltaic inverter. The name plate is a sign of durable construction at or in the photovoltaic inverter. The name plate may be inside the photovoltaic inverter only if the name plate is visible once a door is opened in normal use.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 60529, *Degrees of protection provided by enclosures (IP Code)* (IEC 60529)

EN 60664-1, *Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests* (IEC 60664-1)

EN 61683, *Photovoltaic systems - Power conditioners - Procedure for measuring efficiency* (IEC 61683)

EN 62109-1 [1)], *Safety of power converters for use in photovoltaic power systems - Part 1: General requirements* (IEC 62109-1[1)])

IEC 60721-2-1, *Classification of environmental conditions - Part 2-1: Environmental conditions appearing in nature - Temperature and humidity*

IEC 62103, *Electronics equipment for use in power installations*

3 Terms and definitions

3.1 Input side (PV - Generator)

3.1.1
maximum input voltage (V_{dcmax})
allowed maximum voltage at the inverter input

3.1.2
minimum input voltage (V_{dcmin})
minimum input voltage for the inverter to energize the utility grid, independent of mode of operation

3.1.3
start-up input voltage ($V_{dcstart}$)
input voltage at which the inverter starts energizing the utility grid

---

1) At draft stage.

3.1.4
rated input voltage ($V_{dc,r}$)
input voltage specified by the manufacturer, to which other data sheet information refers

3.1.5
maximum MPP voltage (V_{mppmax})
maximum voltage at which the inverter can deliver its rated power

3.1.6
minimum MPP voltage (V_{mppmin})
minimum voltage at which the inverter can deliver its rated power

3.1.7
maximum input current (I_{dcmax})
maximum current at which the inverter can operate. If the inverter has multiple MPP inputs, I_{dcmax} is related to each single input

3.2 Output side (Grid connection)

3.2.1
maximum grid voltage (V_{acmax})
maximum voltage at which the inverter can energize the grid

3.2.2
minimum grid voltage (V_{acmin})
minimum voltage at which the inverter can energize the grid

3.2.3
rated grid voltage ($V_{ac,r}$)
utility grid voltage to which other data sheet information refers

3.2.4
maximum output current (I_{acmax})
maximum output current that the inverter can deliver

3.2.5
rated power ($P_{ac,r}$)
the active power the inverter can deliver in continuous operation

3.2.6
rated frequency (f_r)
utility grid frequency at which the inverter performs as specified

3.2.7
maximum frequency (f_{max})
maximum frequency at which the inverter can energize the grid

3.2.8
minimum frequency (f_{min})
minimum frequency at which the inverter can energize the grid

3.2.9
night-time power loss
power loss of the inverter, which is supplied from the public grid, when no solar generator power is present

3.2.10
cosphi
power factor at rated power $P_{ac,r}$

4 Data sheet information

4.1 General

Technical products are usually brought into the market with a documentation providing information to the user regarding the operating conditions and its intended purpose. A data sheet specifies a product to the extent that the contained data could be consulted for planning or dimensioning. The size and organization of the data sheet are left to the manufacturer. It is however recommendable to be limited to a double-side printed on DIN-A4 sheet whereby a topic-specific separation is favourable.

4.2 Short description

In short the characteristics of the inverter are to be described. Special characteristics of the inverters can be mentioned. For better identification of the equipment, its photo or its true design drawing should be included on the data sheet. The internal design of the inverter should be represented in clear way (e.g. by means of a block diagram).

4.3 Conformity

The conformity to relevant norms and standards must be shown in the data sheet.

4.4 Electrical parameters

The electrical parameters from 4.4.1 to 4.4.2 are to be regarded as minimum requirement for a professional system integration of an inverter.

4.4.1 The following parameters of the input side must be indicated:

V_{dcmax}, V_{dcmin}, $V_{dcstart}$ [2)], $V_{dc,r}$, V_{mppmax}, V_{mppmin}, I_{dcmax}, number of independent MPP inputs (if applicable).

NOTE 1 The maximum voltage of the connected solar generator is to be determined in individual cases from the planner. The maximum input voltage of the inverter may not be exceeded at any time.

NOTE 2 The specification of maximum and minimum MPP voltage can also be indicated as ranges.

4.4.2 The following parameters of the output side must be indicated:

V_{acmax}, V_{acmin}, $V_{ac,r}$, I_{acmax}, $P_{ac,r}$, f_r, f_{min}, f_{max}, $cosphi_{ac,r}$.

Additionally the number of phases to be connected at the output and the number of phases fed in have to be noted.

NOTE The specification of the maximum and minimum output voltages and frequencies can also always be specified in each case as ranges If only one value is given, the default status at delivery has to be used.

4.5 Characterisation of the operating performance

4.5.1 The indication of the rated power ($P_{ac,r}$) refers to the respective rated values of the connected grid (e.g. 230 V/50 Hz). The rated power is given at the rated input voltage and the ambient temperature of (25 ± 3) °C.

NOTE In addition of this, the ability of the inverter, to supply the rated power even at higher ambient temperatures can be started together with the time the inverter can supply this power (e.g. 2 h or unlimited).

---

2) The indication of the start-up input voltage is necessary only if the input voltage is used as switching on criterion for the inverter.

4.5.2 Night-time power loss is to be specified.

4.5.3 The operating efficiency has to be specified at least for the three input voltages (V_{mppmax}, $V_{dc,r}$ and V_{mppmin}) in tabular form. A graphical representation is optional (example: Figure 1). In all cases the efficiency is referred to the standardized power output ($P_{ac}/P_{ac,r}$).

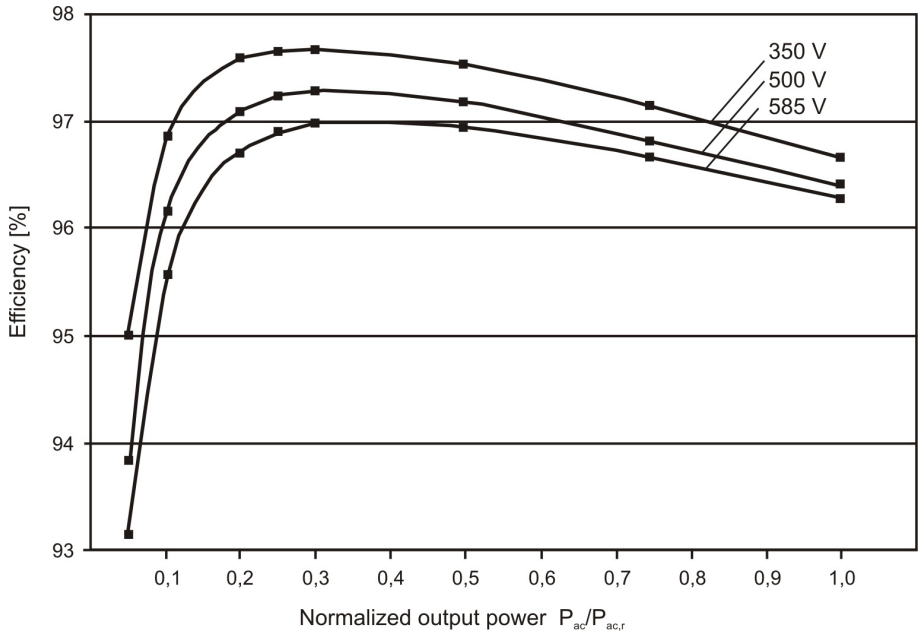

Figure 1 – Representation of the inverter efficiency

P_{ac} is output power at percentaged rated power (5 %, 10 %, 20 %, 25 %, 30 %, 50 %, 75 %, 100 %). As supplement to the EN 61683 additionally the value must be given at 20 % and 30 % of the rated power.

4.5.4 The computation of the European efficiency (weighted efficiency) η_{EU} is taken as the partial load efficiencies as indicated by (1) and the full load efficiency are weighted after the frequency of their occurrence.

$$\eta_{EU} = (0{,}03 \times \eta_{5\%}) + (0{,}06 \times \eta_{10\%}) + (0{,}13 \times \eta_{20\%}) + (0{,}1 \times \eta_{30\%}) + (0{,}48 \times \eta_{50\%}) + (0{,}2 \times \eta_{100\%}) \quad (1)$$

The partial efficiencies are to be determined at the rated input voltage of the inverter.

NOTE A standard on the efficiency is in consultation and will replace the definition of the η_{EU} given in this European Standard.

4.5.5 For the purpose of self-protection routines can be implemented into the inverter, which prevent a damage (current – power – temperature derating). Any self protection routine that causes derating must be described in tabular or graphical form over the entire permitted operation range (see example in Figure 2).

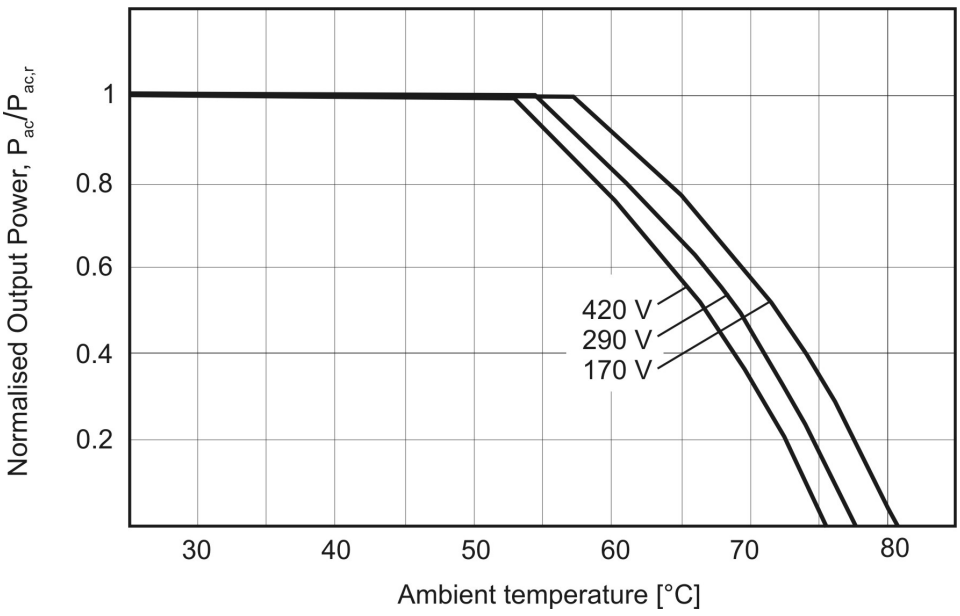

Figure 2 – Power reduction with increased ambient temperatures

4.6 Safety

The following data concerning the safety of inverters must be contained in the data sheet:

- safety class system according to IEC 62103;
- data for galvanic separation (with or without transformer);
- kind of integrated utility interface (indication of the sets of rules, regulations or laws: e.g. VDE V 0126-1-1)

4.7 Operating conditions

The operating conditions for the inverters are differentiated as (unprotected in the open, protected in the open, air-conditioned in interiors, without air-condition in interiors).

The degree of severity depends on the use of the inverter and is to be specified by the manufacturer. For inverters to be used in the outdoor the indication of the appropriate climatic class must be specified according to IEC 60721-2-1 by the manufacturer. Further data concerning the operating conditions of inverters should be contained in the data sheet:

- rated range of the ambient temperature in which the inverter is to be operated may be according to IEC 60721-2-1;
- permissible maximum value for the relative humidity (non-condensing);
- maximum noise emission, to be given if over 75 dB.

4.8 Fitting and construction

4.8.1 Physical characteristics

- Degree of protection according to EN 60529;
- Overvoltage category according EN 60664-1;
- Input and output side connection technology;
- Number of input DC connectors (pairs) and number of input DC connectors per MPP input;
- Physical dimensions (width, depth, height);
- Weight.

NOTE If applicable the type and manufacturer of the input and output connector are to be given.

4.8.2 Other characteristics

- Existing disconnecting device at the input side (if any);
- Cooling principle (convection, forced cooling);
- Name and address of the manufacturer and of market importer, if applicable.

5 Details on the name plate

The following list represents the minimum required information, which should be contained on a name plate for a photovoltaic inverter. Additional information can however be supplied by the manufacturer.

The minimum requirements for the production of a name plate are according to EN 62109-1:

- name and origin of the manufacturer;
- model or type name;
- serial number;
- electrical parameters: V_{dcmax}, V_{mppmin}, V_{mppmax}, I_{dcmax}, $P_{ac,r}$, $V_{ac,r}$, f_r, I_{acmax};
- degree of protection;
- overvoltage category;
- safety class.

With the electrical parameters must be differentiated between input and output values. The arrangement on the name plate should be in such a way that a clear separation is recognizable. The provided data should contain the minimum necessary information, to be able to operate the inverter at a given grid without damage. This must not substitute the use of the operating instructions.

The name plate (see example in Figure 3) and other inscriptions have to be attached durably on the inverter. All inscriptions must be written in English or in the national language or as understandable, standardized pictograms. The serial number of the product might be located outside of the name plate. In that case the serial number etiquette has to be fully visible around the name plate.

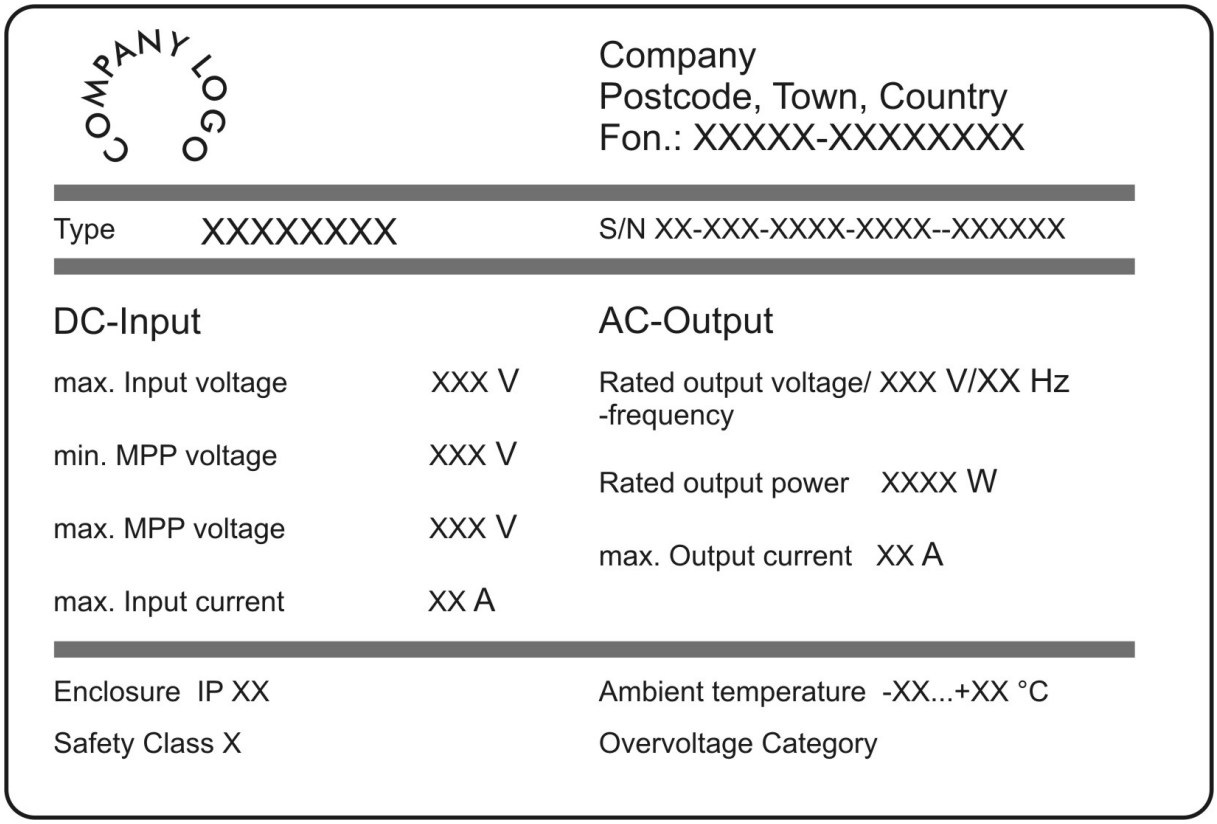

Figure 3 – Example for a name plate

Bibliography

EN 50438, *Requirements for the connection of micro-generators in parallel with public low-voltage distribution networks*

EN 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)* (IEC 62262)

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the independent national body responsible for preparing British Standards and other standards-related publications, information and services.
It presents the UK view on standards in Europe and at the international level.

It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover.

Tel: +44 (0)20 8996 9001 Fax: +44 (0)20 8996 7001

BSI offers Members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Tel: +44 (0)20 8996 7669 Fax: +44 (0)20 8996 7001
Email: plus@bsigroup.com

Buying standards

You may buy PDF and hard copy versions of standards directly using a credit card from the BSI Shop on the website **www.bsigroup.com/shop.** In addition all orders for BSI, international and foreign standards publications can be addressed to BSI Customer Services.

Tel: +44 (0)20 8996 9001 Fax: +44 (0)20 8996 7001
Email: orders@bsigroup.com

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Knowledge Centre.

Tel: +44 (0)20 8996 7004 Fax: +44 (0)20 8996 7005
Email: knowledgecentre@bsigroup.com

Various BSI electronic information services are also available which give details on all its products and services.

Tel: +44 (0)20 8996 7111 Fax: +44 (0)20 8996 7048
Email: info@bsigroup.com

BSI Subscribing Members are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration.

Tel: +44 (0)20 8996 7002 Fax: +44 (0)20 8996 7001
Email: membership@bsigroup.com

Information regarding online access to British Standards via British Standards Online can be found at **www.bsigroup.com/BSOL**

Further information about BSI is available on the BSI website at **www.bsigroup.com/standards**

Copyright

Tel: +44 (0)20 8996 7070
Email: copyright@bsigroup.com

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Tel +44 (0)20 8996 9001
Fax +44 (0)20 8996 7001
www.bsigroup.com/standards

raising standards worldwide™