BRITISH STANDARD

BS EN 61725:1997
IEC 61725: 1997

Analytical expression for daily solar profiles

The European Standard EN 61725:1997 has the status of a British Standard

ICS 27.160

National foreword

This British Standard is the English language version of EN 61725:1997. It is identical with IEC 61725:1997.

The UK participation in its preparation was entrusted by Technical Committee GEL/82, Solar photovoltaic energy, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 5 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on
15 December 1997

ISBN 0 580 29027 1

Amendments issued since publication

Amd. No.	Date	Comments

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61725

September 1997

ICS 27.160

English version

Analytical expression for daily solar profiles

(IEC 61725:1997)

Expression analytique des profils solaires journaliers
(CEI 61725:1997)

Analytische Darstellung für solare Tagesstrahlungsprofile
(IEC 61725:1997)

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CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Ref. No. EN 61725:1997 E

Foreword

The text of document 82/164/FDIS, future edition 1 of IEC 61725, prepared by IEC TC 82, Solar photovoltaic energy systems, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61725 on 1997-07-01.

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) 1998-04-01

— latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1998-04-01

Endorsement notice

The text of the International Standard IEC 61725:1997 was approved by CENELEC as a European Standard without any modification.

Contents

Introduction

This International Standard provides module manufacturers, installers and users with a means for synthesizing solar irradiance profiles. These profiles can be used as a reference in conjunction with user-supplied performance simulation programs for sizing and comparing photovoltaic systems. They can also be used in tenders or proposals.

NOTE To compare PV systems, perform system sizing and evaluate specific PV system performance, other parameters such as ambient temperature, wind speed, spectral irradiance distribution and PV device characteristics are required.

1 Scope

This procedure provides a normative equation for analytically deriving a set of data points or a curve of irradiance versus time of day for a synthetic solar day.

The coefficients of the normative equation for the analytical solar irradiance profiles are determined from measured or estimated values of maximum solar irradiance, daily solar irradiation and the number of daylight hours. These three input data define the curve of the analytical solar irradiance profiles. Depending on the objectives, these data may represent, for example, the worst winter day of a certain place, or the average day of a summer season, etc.

CAUTION — While the results from the normative equation match measured clear sky data reasonably well, it is not intended to predict or simulate a real day. A daily solar irradiance profile is defined based on user-selected values for peak irradiance, daily irradiation and total daylight hours.

2 Definitions

The following symbols are defined and illustrated in Figure 1:

G = solar irradiance, $W.m^{-2}$

G_{max} = the desired maximum solar irradiance at solar noon ($t = 0$), $W.m^{-2}$

H = daily solar irradiation, $Wh.m^{-2}$

H_d = the desired daily solar irradiation for the synthesized solar day profile, $Wh.m^{-2}$

t = time of day

$-t_0$ = time of sunrise

$+t_0$ = time of sunset

h = daylight hours ($2.t_0$), hours

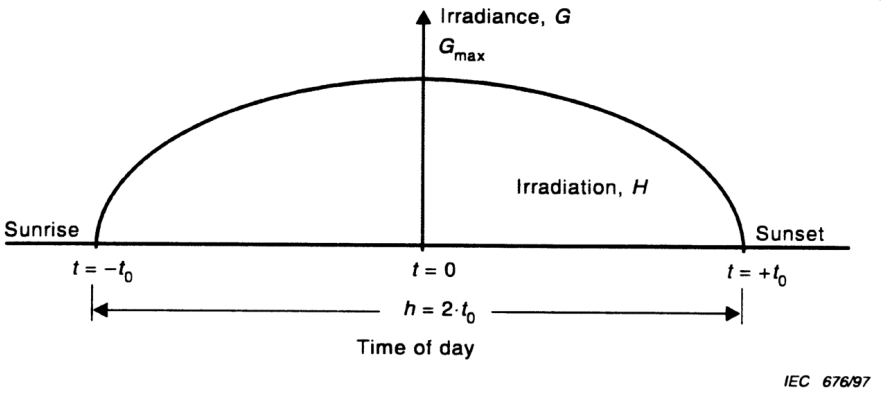

Figure 1 — Definition of symbols

3 Analytical solar irradiance profile

The normative equation defining the analytical solar irradiance profiles (see Figure 2) is:

$$\frac{G}{G_{max}} = \cos\left(\frac{t}{t_0}\cdot\frac{\pi}{2}\right)\left[1+s\left\{1-\cos\left(\frac{t}{t_0}\cdot\frac{\pi}{2}\right)\right\}\right] \quad (1)$$

where s, the shape factor, is given by:

$$s = \frac{d\cdot\frac{\pi}{2}-1}{1-\frac{\pi}{4}} \quad (2)$$

where d, the data set factor, is given by:

$$d = \frac{H_d}{G_{max}\times h} \quad (3)$$

The data set factor shall be within the range of validity specified in clause **4**. If the data set factor is not valid, then the input data shall be checked for plausibility.

NOTE If the daily solar irradiation value, H_d, is not available, set the shape factor, s, to zero. The resulting curve will then be a cosine distribution (type C, see Figure 2 and Figure 3).

4 Ranges of validity

To apply the normative equation (1) in a practical manner, the ratio, G/G_{max} shall be within the range:

$$0 \le \frac{G}{G_{max}} \le +1$$

The shape factor, s, shall be within the range: $-1 \le s \le +1$

and the data set factor, d, within the range: $0{,}5 \le d \le 0{,}77$ (see Figure 3).

5 Examples

Figure 2 illustrates three example distributions.

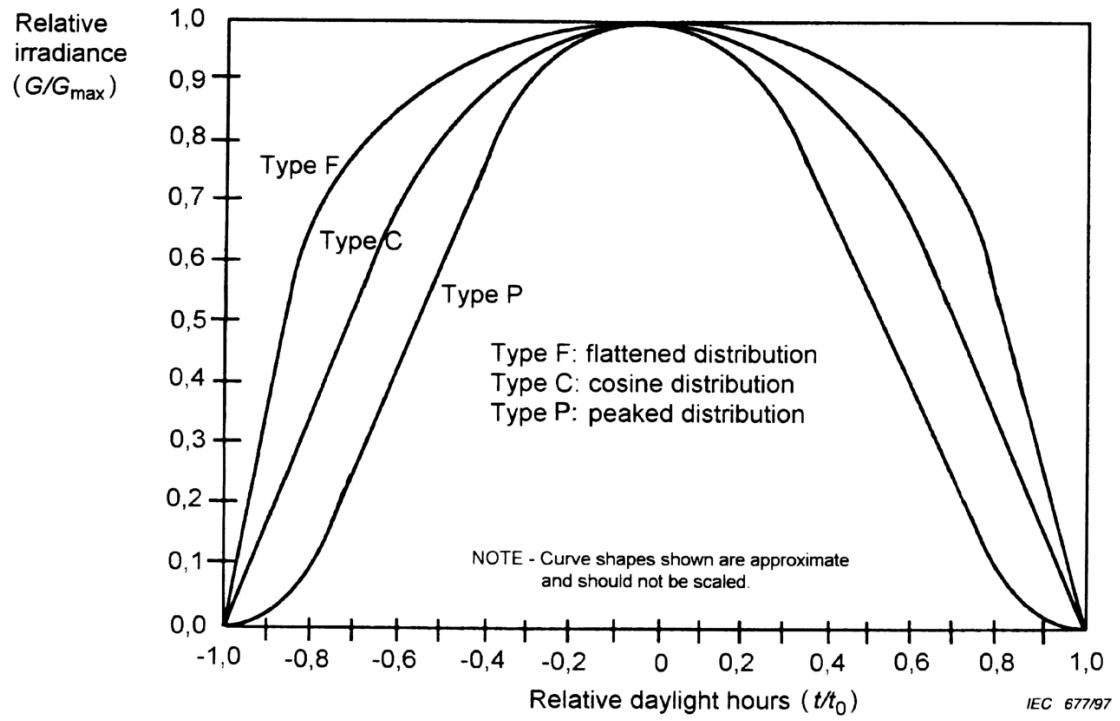

Figure 2 — Examples of analytical solar irradiance profiles

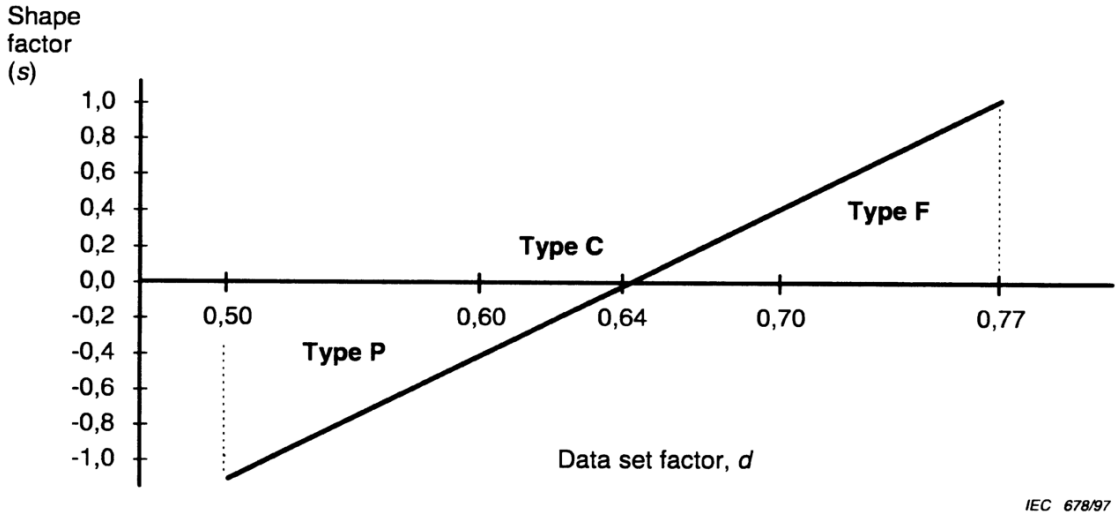

Figure 3 — Range of validity of the analytical solar irradiance profiles

BS EN 61725:1997 IEC 61725: 1997

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