BRITISH STANDARD

BS EN ISO 6947:1997

Welds — Working positions — Definitions of angles of slope and rotation

The European Standard EN ISO 6947:1997 has the status of a British Standard

ICS 01.040.25; 25.160.40

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National foreword

This British Standard is the English language version of EN ISO 6947:1997. It is identical with ISO 6947:1990 (corrected and reprinted in 1993) and implements it as the UK national standard.

The UK participation in its preparation was entrusted to Technical Committee WEE/1, Definitions and symbols for welding, which has the responsibility to:

— aid enquirers to understand the text;

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN ISO title page, page 2, the ISO title page, pages ii to iv, pages 1 to 9 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.

Amendments issued since publication

Amd. No.	Date	Comments

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Contents

	Page
National foreword	Inside front cover
Foreword	2
Foreword	iii
Text of ISO 6947	1

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 6947

January 1997

ICS 01.040.25; 25.160.10

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English version

Welds — Working positions — Definitions of angles of slope and rotation

(ISO 6947:1990)

Soudures — Positions de travail — Définitions des angles d'inclinaison et de rotation
(ISO 6947:1993)

Schweißnähte — Arbeitspositionen — Definitionen der Winkel von Neigung und Drehung
(ISO 6947:1993)

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European Committee for Standardization
Comité Européen de Normalisation
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Central Secretariat: rue de Stassart 36, B-1050 Brussels

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Ref. No. EN ISO 6947:1997 E

Foreword

The text of the International Standard from Technical Committee ISO/TC 44 "*Welding and allied processes*" of the International Organization for Standardization (ISO) has been taken over as an European Standard by Technical Committee CEN/TC 121 "*Welding*" the secretariat of which is held by DS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 1997, and conflicting national standards shall be withdrawn at the latest by July 1997.

This document replaces prEN 1157.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 6947:1993 has been approved by CEN as a European Standard without any modification.

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EN ISO 6947 : 1997

INTERNATIONAL STANDARD

ISO 6947

Second edition
1990-02-01

Corrected and reprinted
1993-05-01

Welds — Working positions — Definitions of angles of slope and rotation

(Revision of ISO 6947 : 1980)

Soudures — Positions de travail — Définitions des angles d'inclinaison et de rotation

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ISO 6947 : 1990 (E)

Contents

	Page
Foreword	iii
Introduction	1
1 Scope	1
2 Definitions	1
3 Working positions	3
4 Designation	9
Figure 1 — Slope, S	2
Figure 2 — Rotation R	2
Figure 3 — Examples of rotation ($R = 90°$) of symmetrical butt welds with horizontal workpiece surface	3
Figure 4 — Examples of rotation, R, of asymmetrical butt welds with horizontal workpiece surface	3
Figure 5 — Examples of rotation, R, of symmetrical and asymmetrical fillet welds	3
Figure 6 — Main positions	4
Figure 7 — Examples of main positions for butt and fillet welds	6
Figure 8 — Inclined position for plates	7
Figure 9 — Examples of symbolization of inclination of pipes with inclined axes	7
Figure 10 — Examples of welding direction on fixed pipe with horizontal axis	8
Figure 11 — Examples of zenith, welding direction and symbolization of inclination for fixed pipes with inclined axes	8
Table 1 — Terms and symbols for main positions	5

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6947 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*.

This second edition cancels and replaces the first edition (ISO 6947:1980), of which it constitutes a technical revision; reasons for the revision are given in the "Introduction" (p. 1).

Descriptors: Welding, welded joints, butt welds, fillet welds, rotation, position (location).

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Introduction

The main reasons for the revision of ISO 6947:1980 are given below.

The working positions should be valid for welds in plates and pipes.

The direction of welding is an essential parameter for determining the working position, e.g. up or down; however, in ISO 6947:1980, the working direction was not dealt with.

The working position is not dependent on the geometrical arrangement of the joint, e.g. butt or fillet joint, or that of the semi-finished product.

The limitations for slope (within 0° to 90°) and for rotation (up to a maximum of 180°), as specified in ISO 6947:1980 (clockwise or counter-clockwise), prevent the complete specification of the weld and the direction of welding in space; it could not, therefore, be applicable for automatic and robotic welding. It is intended in this second edition of ISO 6947 that the whole sphere be included so that welds in all types and all directions are covered.

To avoid any misunderstanding, the main positions have been given symbols which can easily be used for designation purposes; these symbols were chosen independently of possible meaningful abbreviations, i.e. they are not derived from any particular language.

The centreline is normally identical with the position of the stick electrode. The main positions have been defined without any tolerances for slope and rotation. For some stick electrodes, it may be useful to add the required tolerances as necessary for their application. In such cases, the main position, e.g. flat position, can be supplemented by specifying limits of slope and rotation.

1 Scope

This International Standard defines working positions and makes it possible to locate welds in space with reference to the horizontal reference plane (usually parallel to the workshop floor) by means of angles of slope and rotation which are independent from surrounding construction.

2 Definitions

For the purposes of this International Standard, the following definitions apply.

2.1
working position

position determined by the position of the weld in space and by the working direction

2.2
slope, S

in the case of straight welds, the angle between the root line and the positive x-axis of the horizontal reference plane (see Figure 1); the slope is measured in the mathematically positive (i.e. counter-clockwise) direction

the co-ordinate system shall be arranged so that the root line lies in the vertical reference plane (x/z-plane; see Figure 1) and that the working direction radiates outwards from the co-ordinate origin

in the case of curved welds, the same stipulation applies: the slope is obtained from the tangent to the root line — at the particular cross-section of the weld in question — and the x-axis

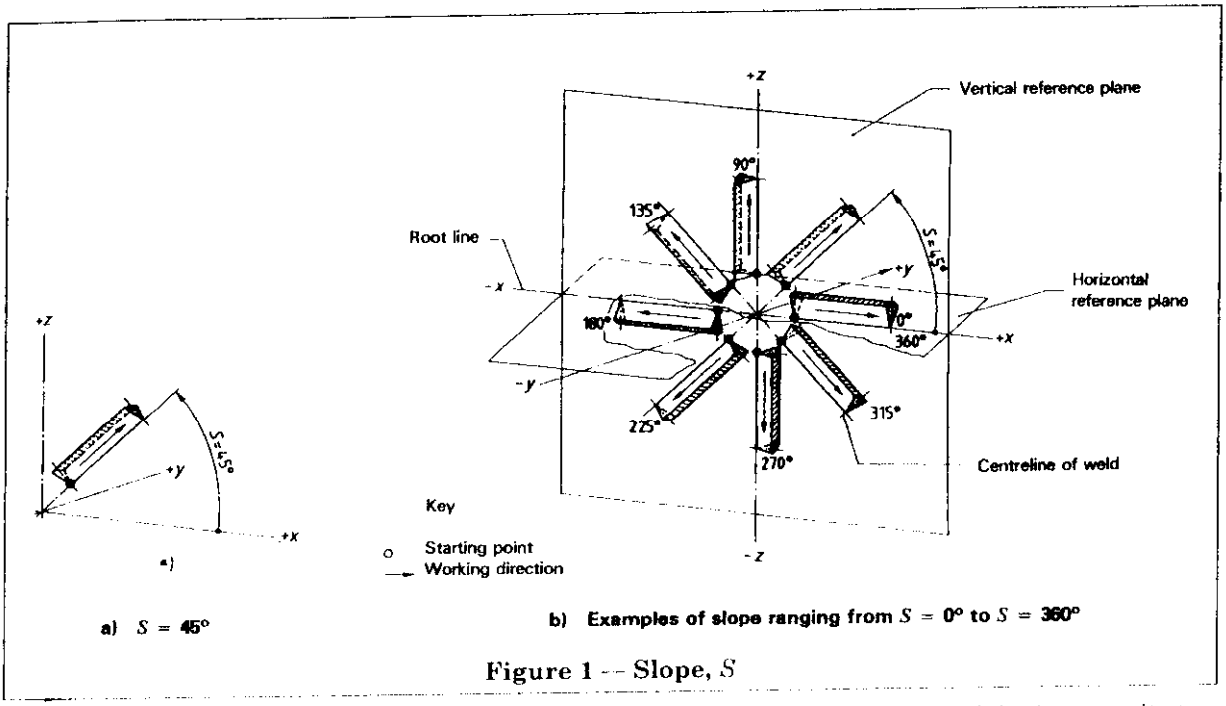
each particular cross-section has its own specific co-ordinate system

NOTE For pipes with inclined axes, the slope is intrinsically expressed by the welding direction (see 3.2).

2.3
rotation, R

the angle between the centreline of the weld (i.e. the line joining the centres of the weld root and the capping layer) and the positive y-axis or a line parallel to the y-axis, measured in the mathematically positive (i.e. counter-clockwise) direction in the plane of the transverse cross-section of the weld in question

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a) S = 45°

b) Examples of slope ranging from S = 0° to S = 360°

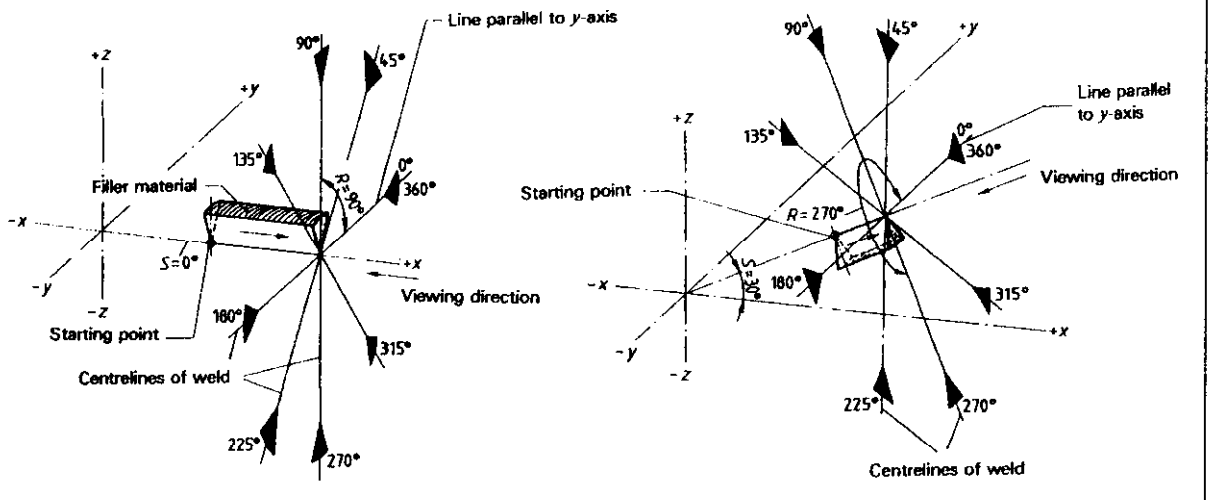
Figure 1 — Slope, S

the viewing direction for the weld cross-section is directed towards the co-ordinate origin, i.e. opposite to the working direction (see Figure 2)

in the case of slopes where $S = 90°$ or $S = 270°$ (see Figure 1), it is not necessary to determine the rotation because all angles may occur. Examples of how rotation is determined on symmetrical and asymmetrical butt and fillet welds are given in Figure 3 to Figure 5

NOTE 1 The centreline usually coincides with the position of the filler material, e.g. covered electrode.

NOTE 2 For pipes with inclined axes, the rotation is intrinsically expressed by the angle of inclination (see 3.3).



a) Working position where S = 0° (or 360°) and R = 90°

b) Working position where S = 30° and R = 270°

Figure 2 — Rotation R

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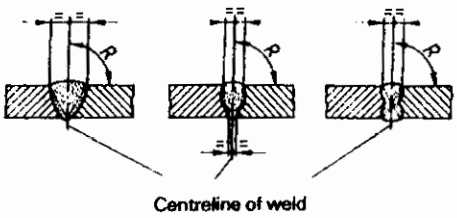


Figure 3 — Examples of rotation ($R = 90°$) of symmetrical butt welds with horizontal workpiece surface

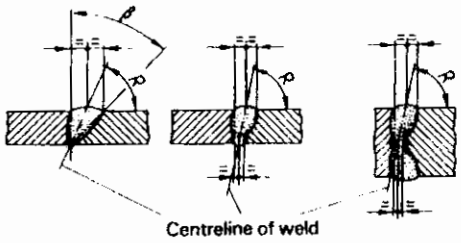


Figure 4 — Examples of rotation, R, of asymmetrical butt welds with horizontal workpiece surface

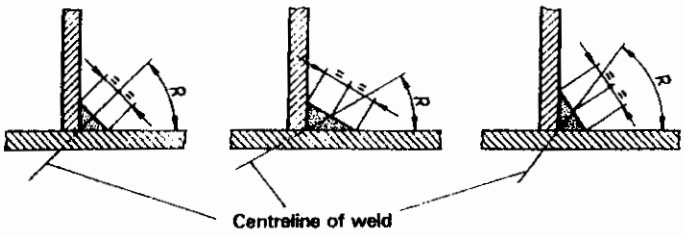


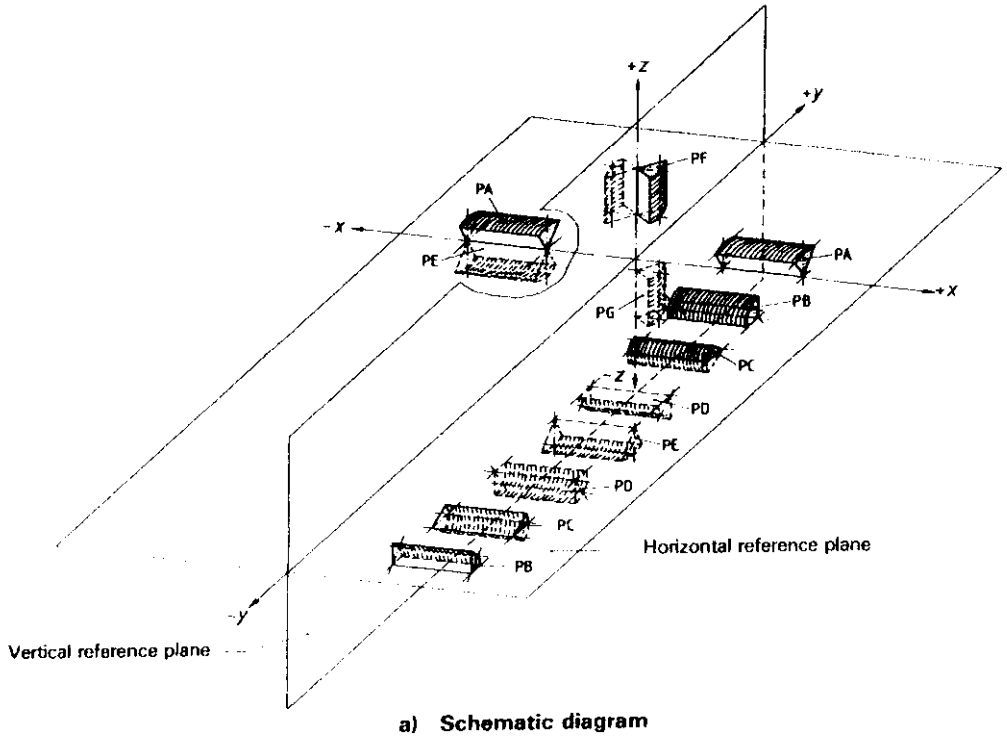
Figure 5 — Examples of rotation, R, of symmetrical and asymmetrical fillet welds

3 Working positions

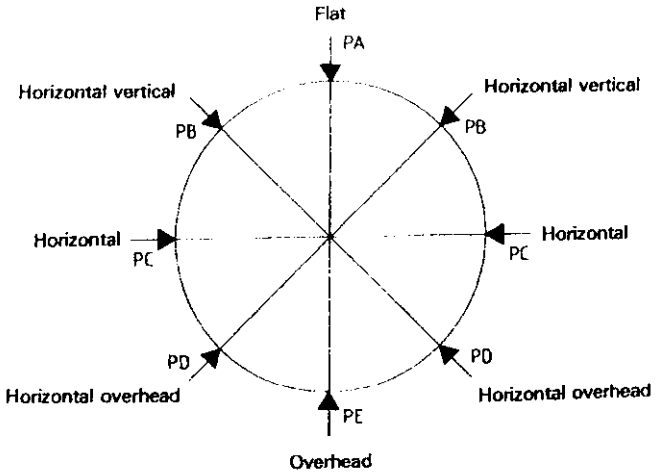
3.1 Main positions

The main positions, defined by slope and rotation, are given in Table 1 and illustrated in Figure 6. For the sake of clarity, symbols for the main working positions are given from the co-ordinate origin; the working direction is outwards.

Examples of main positions for butt and fillet welds are illustrated in Figure 7.



a) **Schematic diagram**



b) **Simplified view**

Figure 6 — Main positions

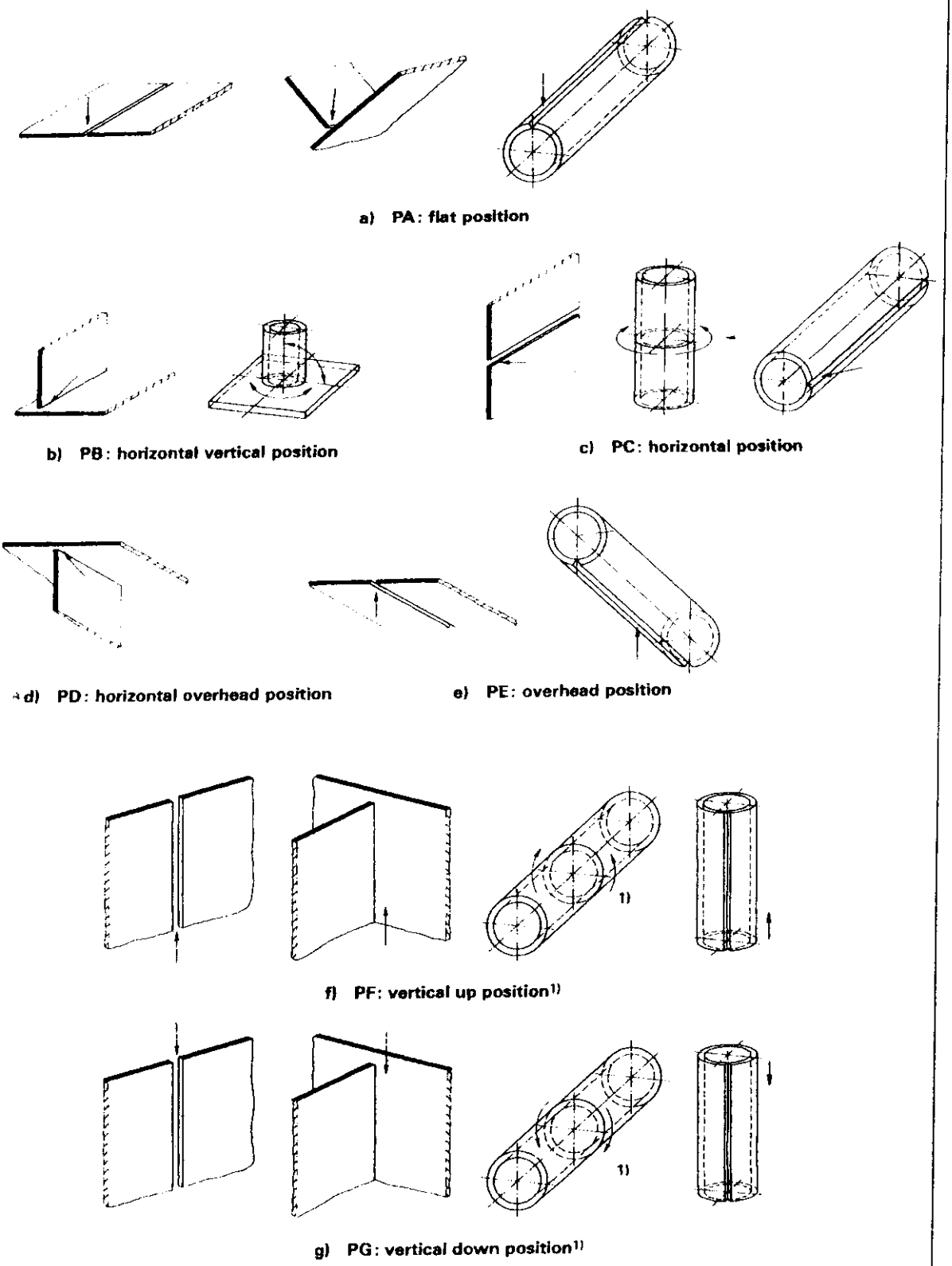
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Table 1 — Terms and symbols for main positions

Terms	Description	Symbol	Slope *S*	Rotation *R*
Flat position	Horizontal working, centreline of weld vertical, capping layer on capping	**PA**	0° 180°	90° 90°
Horizontal vertical position	Horizontal working, capping layer towards the capping	**PB**	0° 0° 180° 180°	45° 135° 45° 135°
Horizontal position	Horizontal working, centreline of weld horizontal	**PC**	0° 0° 180° 180°	0° 180° 0° 180°
Horizontal overhead position	Horizontal working, overhead, capping layer towards the bottom	**PD**	0° 0° 180° 180°	225° 315° 225° 315°
Overhead position	Horizontal working, overhead, centreline of weld vertical, capping layer underneath	**PE**	0° 180°	270° 270°
Vertical up position	Working upwards	**PF**	90°	—
Vertical down position	Working downwards	**PG**	270°	—

NOTE 1 To avoid confusion with existing abbreviations, e.g. F for flat, in principle the letter "P" (for position) has been placed in front of the symbol to indicate "main position".

NOTE 2 Tolerances for the main positions are not specified in this International Standard because they depend on the different welding procedures used.



1) For special purposes, e.g. testing welders; this position is regarded as a main position.

Figure 7 — Examples of main positions for butt and fillet welds

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3.2 Inclined positions

3.2.1 *Plates and longitudinal welds in pipes*

The inclined positions shall be defined by slope and rotation (see Figure 8 and Table 1).

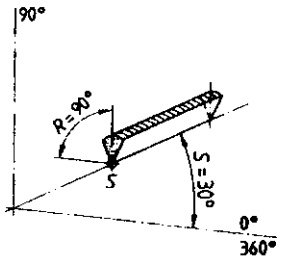


Figure 8 — Inclined position for plates

3.2.2 *Circumferential welds in pipes*

For weld positions on pipes with inclined axes, the indication of slope and rotation shall be simplified as follows:

a) The indication of rotation is replaced by the letter "L" and the angle of inclination (see Figure 9).

NOTE Angles between 180° and 360° are normally not used except for robotic welding where a fixed reference plane is necessary.

b) The indication of slope is replaced by the appropriate letter of the welding direction (see examples in Figure 10):

— H for welding up

— J for welding down

— K for orbital welding

For welds on fixed pipes with inclined axes, the zenith shall be taken as the point at right angles to the reference plane (see examples in Figure 11).

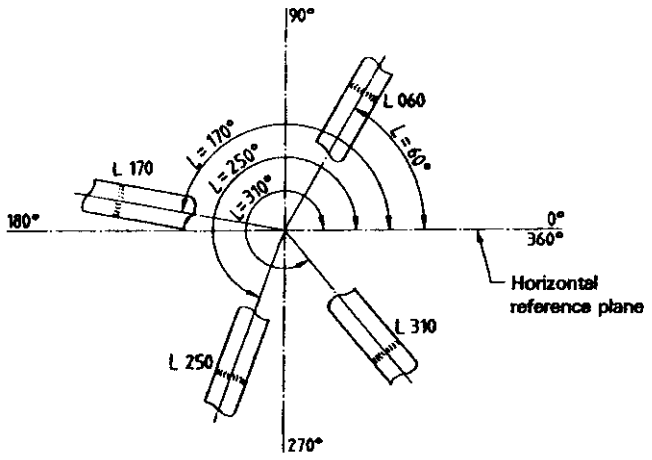
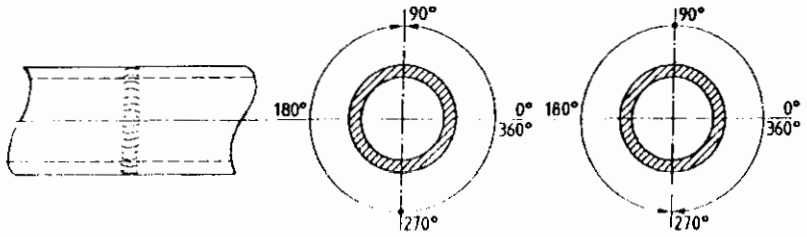
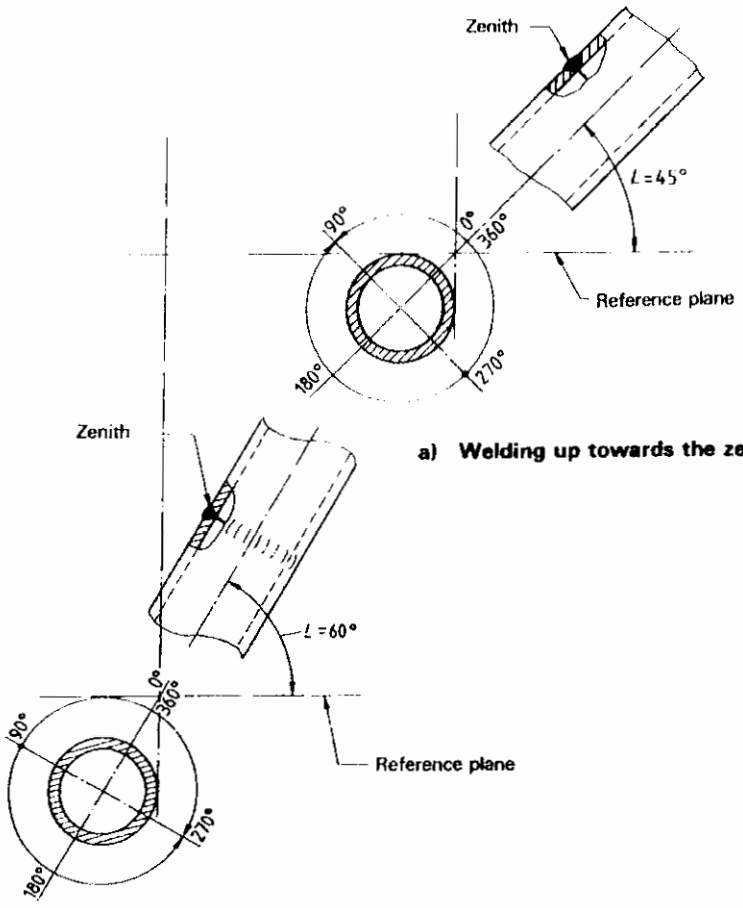


Figure 9 — Examples of symbolization of inclination of pipes with inclined axes



a) Welding direction up (H) b) Welding direction down (J)

Figure 10 — Examples of welding direction on fixed pipe with horizontal axis



a) Welding up towards the zenith: H-L045

b) Welding down from the zenith: J-L060

Figure 11 — Examples of zenith, welding direction and symbolization of inclination for fixed pipes with inclined axes

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4 Designation

Main positions shall be designated by the appropriate symbol specified in Table 1 (see example 1); the symbol for the main position may be supplemented by the values for slope and rotation, given in three digits (see example 2).

Inclined positions shall be designated by slope and rotation in accordance with **3.2.1**, except for pipes with inclined axes (see example 3).

For circumferential welds in pipes with inclined axes, the indication of slope and rotation shall be simplified in accordance with **3.2.2** (see examples 4 and 5).

Examples: plates

1) The main position "horizontal vertical" (PB) shall be designated as follows:

PB

2) The main position "horizontal vertical" (PB), with slope of 130° and rotation of 45°, shall be designated as follows:

PB 130-045

3) The inclined position, with slope of 30° and rotation of 90°, shall be designated as follows:

Examples: pipes

030-090

4) The weld position on pipes with inclined axes, with welding direction "welding up" (H) and an inclination angle of 30°, shall be designated as follows:

H-L030

5) The weld position on pipes with inclined axes, with welding direction "welding down" (J) and an inclination angle of 60°, shall be designated as follows:

J-L060

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