PD CEN/TS 16892:2015

BSI Standards Publication

Plastics — Welding of thermoplastics — Specification of welding procedures

bsi.

...making excellence a habit.™

National foreword

This Published Document is the UK implementation of CEN/TS 16892:2015.

The UK participation in its preparation was entrusted to Technical Committee PRI/80, Welding thermoplastics.

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 89466 4

ICS 25.160.10

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

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 December 2015.

Amendments issued since publication

Date	Text affected

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 16892

December 2015

ICS 25.160.10

English Version

Plastics - Welding of thermoplastics - Specification of welding procedures

Plastiques - Soudage des matériaux termoplastiques - Spécification de modes opératoires de soudage

Kunststoffe - Schweißen von thermoplastischen Kunststoffen - Anforderung von Schweißverfahren

This Technical Specification (CEN/TS) was approved by CEN on 13 November 2015 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. CEN/TS 16892:2015 E

Contents

Page

European foreword

This document (CEN/TS 16892:2015) has been prepared by Technical Committee CEN/TC 249 “Plastics”, the secretariat of which is held by NBN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This Technical Specification provides guidance for the minimum content of welding procedure specifications for the following welding processes:

— hot gas welding: round nozzle, high speed nozzle, wedge;

— extrusion welding;

— heated tool welding: butt, socket, wedge;

— solvent welding: socket;

— electrofusion welding: socket, saddle.

This Technical Specification applies to the welding of the following products and semi-finished products made of thermoplastic materials:

— sheet;

— pipe;

— fittings;

— lining membrane.

2 Normative references

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

EN ISO 6947, *Welding and allied processes - Welding positions (ISO 6947)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
welding procedure
specified course of action to be followed in making a weld, including the welding process(es), reference to materials, welding consumables, preparation, preheating (if necessary), method and control of welding and necessary equipment to be used

3.2
welding process
technique characterized by the method of softening to obtain permanent assembly

3.3
welding procedure specification
WPS
document that has been qualified and provides the required variables of the welding procedure to ensure repeatability during production welding

3.4
work instruction
simplified welding procedure specification (WPS), suitable for direct application

3.5
welding procedure qualification record
WPQR
record comprising all necessary data needed for qualification of a welding procedure specification

3.6
welding consumable
materials consumed in the making of a weld, including filler material

3.7
essential variable
welding condition that influences the quality of the welded joint and requires qualification

3.8
non essential variable
welding condition addressed in the WPS, but not requiring qualification

3.9
parent material
parts to be joined by welding

3.10
welding organization
organization responsible for the welding production

4 Technical content of welding procedure specification (WPS)

4.1 General

A Welding Procedure Specification (WPS) shall provide all the necessary information required to make a weld.

The minimum information required in a WPS is given in 4.2 to 4.5.

Welding procedure specifications cover a certain range for each essential / non-essential variable.

A work instruction can be prepared for each specific job as part of detailed production planning.

Examples of the WPS format are shown in Annexes A, B, C, D, E, F, G, H, I.

The procedure for measuring each variable should be according to agreed specifications.

4.2 Related to the welding organization

— Identification of the welding organization;

— WPS number;

— Welding Procedure Qualification Record (WPQR) number, if applicable;

— signature of the person responsible for approval, appointed by the welding organization.

4.3 Related to the parent material(s)

4.3.1 Parent material(s) type

— Designation of the material(s) and reference standard(s), if any.

An alternative identification shall be used if a reference standard does not exist.

4.3.2 Parent material(s) dimensions

— Thicknesses (Standard Dimension Ratio (SDR) for pipes and spigot fittings);

— nominal diameters (for pipes and fittings).

4.4 Common to all welding procedures

4.4.1 Joint preparation

— Cutting and surface preparation method (e.g. machining or scraping);

— initial cleaning (chemical or mechanical);

— jigging, fixtures, clamping.

4.4.2 Welding process

4.4.3 Joint design

— Joint and weld type;

— a sketch of the joint design/configuration and dimensions or reference to standards which provide such information.

4.4.4 Welding position

— Welding positions (in accordance with EN ISO 6947, where applicable).

4.4.5 Ambient temperature

4.5 Specific to a welding process

4.5.1 Hot gas round nozzle and high speed nozzle welding

— Initial joint geometry;

— weld rod/wire [cross-section geometry, e.g. round, triangular, designation of the material(s) and reference standard(s), dimensions (size)];

— welding speed;

— gas type;

— backing (method and type of backing, backing material and dimensions);

— nozzle diameter;

— gas flow rate;

— gas temperature;

— torch angle;

— rod/wire angle;

— distance between gas nozzle and workpiece (round nozzle welding only);

— interpass cleaning;

— back gouging (method to be used, depth and shape);

— weld run sequence.

4.5.2 Heated tool butt welding

— Heater plate temperature;

— initial bead-up (or alignment) interfacial pressure;

— initial bead size at end of bead-up (or alignment) time;

— heat soak (or heating up) interfacial pressure;

— heat soak (or heating up) time;

— heater plate removal (dwell or change-over) time;

— time to achieve interfacial fusion jointing pressure (or joining pressure build-up time);

— fusion jointing (or joining) interfacial pressure;

— minimum cooling time in the machine under pressure;

— minimum cooling time out of the machine without pressure.

NOTE The pressure on the welding machine needs to be calculated from the **interfacial** pressures and the surface areas of the parts to be welded.

4.5.3 Extrusion welding

— Initial joint geometry;

— welding shoe design;

— hot gas temperature;

— extrudate temperature;

— extrudate output;

— gas type;

— backing (method and type of backing, backing material and dimensions);

— gas flow rate;

— welding speed;

— cooling time;

— filler material (material designation, wire or pellet, wire diameter);

— interpass cleaning;

— welding equipment maximum output;

— weld run sequence.

4.5.4 Solvent socket welding

— Socket fitting material designation and standard;

— cement (production date, expiry date, standard reference, method and type of application, application, curing time);

— primer (type, production date, method and time of application);

— pipe chamfering angle and depth;

— pipe insertion depth;

— pipe and fitting insertion method (manual / mechanical, manufacturer and type for mechanical devices).

4.5.5 Heated tool wedge welding

— Overlap length;

— heated wedge temperature;

— welding speed;

— welding force;

— heated wedge type;

— nip roller type.

4.5.6 Hot gas wedge welding

— Overlap length;

— hot gas temperature;

— welding speed;

— welding force;

— nip roller type.

4.5.7 Socket fusion

— Heated tool temperature;

— pipe chamfering angle and depth;

— pipe insertion depth;

— heating time;

— changeover time;

— cooling time (fixed pipes);

— cooling time (before joint can be loaded);

— pipe and fitting insertion method (manual / machine).

4.5.8 Electrofusion socket

— Manual or automatic data input;

— fitting manufacturer;

— minimum external diameter of the unscraped element (e.g. for electrofusion socket welding, measured at pipe end);

— insertion depth;

— voltage;

— current type (AC/DC);

— preheating voltage and time (if applicable);

— single or multiple coil fitting;

— heating time;

— minimum cooling time (before removing clamps);

— minimum cooling time out of clamps (before joint can be loaded).

4.5.9 Electrofusion saddle

— Manual or automatic data input;

— fitting manufacturer;

— minimum external diameter of the unscraped pipe measured at the point of assembly;

— voltage;

— current type (AC/DC);

— single or multiple coil fitting;

— heating time;

— cooling time;

— assembling load method.

Annex A
(informative)

Welding Procedure Specification (WPS) - Hot gas round nozzle and high speed nozzle welding

Welding organization:
Welding Procedure Specification No./ Revision:
WPQR No./Revision:

Parent material
Material type / designation:
Thickness (mm) / SDR range:
Nominal diameter range (mm):

Joint preparation
Cutting and edge preparation method:
Initial cleaning method:
Backing (method and type):

Welding process(es):

Joint design
Joint and weld type:

Welding position:

Ambient temperature range

Filler material
Geometry, designation:

Welding technique
Gas type:
Nozzle diameter (mm):
Method of interpass cleaning:
Method of back gouging / backing:
Torch angle (°) range:
Rod / wire angle (°) range
Distance (mm) between gas nozzle and workpiece (range):

Joint design

Weld run sequence

Welding parameters

Run	Welding process	Size (mm) and cross section of filler material	Gas flow rate range (l/min)	Gas temperature (°C) range	Welding speed (mm/s) range

Welding organization

Name:	Signature:	Date:

Annex B
(informative)

Welding Procedure Specification (WPS) - Heated tool butt welding

Welding organization
Welding Procedure Specification No./ Revision:
WPQR No./Revision:

Parent material
Material type / designation:
Thickness e_n (mm) / SDR range:
Nominal diameter d_n range(mm):

Joint preparation
Cutting and edge preparation method:
Initial cleaning method:
Backing (method and type):

Welding equipment type:
Manual/semi-automatic/automatic

Joint design
Joint and weld type:

Welding position:

Ambient temperature (°C) range:

Joint design

Welding parameters ranges

Heater plate Temperature (°C)	Initial bead-up (alignment) pressure (MPa)	Initial bead size at end of bead-up (alignment) time (s)	Heat soak (heating-up) pressure (MPa)	Heat soak (heating-up) time (s)	Heater plate removal (dwell / change-over) time (s)	Joining pressure build-up time (s)	Fusion joining pressure (MPa)	Minimum cooling time	
								in the machine under pressure (s)	out of the machine without pressure (s)

Welding organization

Name:	Signature:	Date:

Annex C
(informative)

Welding Procedure Specification (WPS) - Extrusion welding

Welding organization:
Welding Procedure Specification No./ Revision:
WPQR No./Revision:

Parent material
Material type / designation:
Thickness e_n (mm) range / SDR range:
Nominal diameter range d_n (mm):

Joint preparation
Cutting and edge preparation method:
Initial cleaning method:
Backing (method and type):

Welding process(es):

Joint design
Joint and weld type:

Welding position:

Allowed ambient temperature (range):

Filler material
Type (wire / pellet), designation:
Designation:
Diameter (mm) range:

Welding technique:
Method of back gouging / backing
Method of interpass cleaning:
Gas type:

Welding equipment:
Shoe design / type:

Joint design

Weld run sequence

Welding parameters

Run	Gas flow rate (l/min) range	Gas temperature (°C) range	Extrudate output (g/s) range	Extrudate temperature (°C) range	Welding speed (mm/s) range	Minimum cooling time (s)

Welding organization

Name:	Signature:	Date:

Annex D
(informative)

Welding Procedure Specification (WPS) - Solvent socket welding

Welding organization:
Welding Procedure Specification No./ Revision:
WPQR No./Revision:

Parent material
Material type and designation [pipe(s)]:
Material type and designation [fitting(s)]:
Thickness e_n (mm) range / SDR range:
Nominal diameter d_n range mm:

Joint preparation
Cutting and edge preparation method:
Pipe chamfering angle (°) and depth (mm) range:
Cleaning method
Insertion depth (mm) range:

Joint design
Joint and weld type:

Pipe and fitting insertion method
Manual / mechanical:

Welding position:

Ambient temperature (°C) range:

Cement
Type:
Standard reference:
Method of application:
Maximum time (s) of application:
Minimum curing time (s) before the weld can be stressed:

Primer
Type:
Method of application:
Time (s) range before applying cement

Welding equipment
Pipe and fitting insertion method
(manual/machine):

Joint design

Welding organization

Name:	Signature:	Date:

Annex E
(informative)

Welding Procedure Specification (WPS) - Heated tool wedge welding

Welding organization:
Welding Procedure Specification No./ Revision:
WPQR No./Revision:

Parent material
Material type / designation:
Thickness e_n range (mm)

Joint preparation
Cutting and edge preparation method:
Initial cleaning method:

Joint design
Joint and weld type (single/double seam):
Minimum joint overlap length (mm)

Welding position:

Ambient temperature (°C) range:

Welding equipment:
Heated wedge type
Nip roller type:

Joint design

Welding parameters range

Heated wedge temperature (°C)	Welding speed (mm/s)	Welding force (N)

Welding organization

Name:	Signature:	Date:

Annex F
(informative)

Welding Procedure Specification (WPS) – Hot gas wedge welding

Welding organization:
Welding Procedure Specification No./ Revision:
WPQR No./Revision:

Parent material
Material type / designation:
Thickness e_n range (mm)

Joint preparation
Cutting and edge preparation method:
Initial cleaning method:

Joint design
Joint and weld type (single/double seam):
Minimum joint overlap length (mm):

Welding position:

Ambient temperature (°C) range:

Welding equipment
Nip roller type:

Joint design

Welding parameters range

Hot gas temperature (°C)	Welding speed (mm/s)	Welding force (N)

Welding organization

Name:	Signature:	Date:

Annex G
(informative)

Welding Procedure Specification (WPS) – Socket fusion welding

Welding organization:
Welding Procedure Specification No./ Revision:
WPQR No./Revision:

Parent material
Material type / designation:
Thickness e_n range (mm)
Nominal diameter d_n range (mm):

Joint preparation
Cutting and edge preparation method:
Pipe scraping if any:
Initial cleaning method:
Pipe chamfer angle (°) range:
Pipe chamfer depth (mm) range:
Pipe insertion depth (mm) range:

Joint design
Joint and weld type:

Welding position:

Ambient temperature (°C) range:

Welding equipment
Pipe and fitting insertion method (manual / machine):

Joint design

Welding parameters range

Heated tool temperature (°C)	**Heating time (s)**	**Change-over time (s)**	**Cooling time (fixed pipes) (s)**	**Cooling time (before stressing the joint) (s)**

Welding organization

Name:	Signature:	Date:

Annex H
(informative)

Welding Procedure Specification (WPS) – Electrofusion socket welding

Joint design

Welding organization:
Welding Procedure Specification No./ Revision:
WPQR No./Revision:

Pipe/spigot material
Material type / designation:
Thickness e_n range (mm) / SDR:
Nominal diameter d_n range (mm):

Electrofusion fitting
Material type / designation:
Design application SDR:
Applicable SDR fusion range:
Manufacturer:
Voltage:
Single / multiple coil:
Preheating voltage (V) and time (s) (if applicable):
Voltage/current control:

Joint preparation
Cutting method:
Initial cleaning method:
Scraping method:
Minimum scraped layer thickness
Minimum outside mean diameter (mm) of the scraped pipe/spigot
Maximum out of roundness (%) of pipe inserted into the socket
Insertion depth range (mm):

Welding data input
Manual / automatic:

Joint design
Joint and weld type:

Welding position

Welding equipment
Clamping: yes/no

Welding technique
Current type (AC / DC):

Welding parameters

Ambient temperature range (°C)	Heating time (s)	Minimum cooling time (s) (before removing clamps)	Minimum cooling time out of clamps (before joint can be loaded) (s)

Welding organization

Name:	Signature:	Date:

Annex I
(informative)

Welding Procedure Specification (WPS) – Electrofusion saddle welding

Joint design

Welding organization:
Welding Procedure Specification No./ Revision:
WPQR No./Revision:
Pipe material
Material type / designation:
Thickness e_n range (mm) / SDR:
Nominal diameter d_n range (mm):
Electrofusion fitting
Material type / designation:
Design application SDR:
Manufacturer:
Voltage (V):
Single / multiple coil:
Assembling load and method:
Voltage/current control:
Preheating voltage (V) and time (s) (if applicable):
Joint preparation
Initial cleaning method:
Scraping method:
Minimum outside mean diameter (mm) of the unscraped pipe measured at the point of assembly
Welding data input
Manual / automatic:
Joint design
Joint and weld type:
Welding position:
Welding equipment
Pipe and fitting clamp device:
Welding technique
Current type (AC / DC):

Welding parameters

Ambient temperature range (°C)	Heating time (s)	Minimum cooling time (s) (before removing clamps)	Minimum cooling time before pressurizing the joint (s)

Welding organization

Name:	Signature:	Date:

Bibliography

EN 13067, *Plastics welding personnel - Qualification testing of welders - Thermoplastics welded assemblies*

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™