

Steel pipes for pipelines for combustible fluids — Technical delivery conditions

Part 2. Pipes of requirement class B

The European Standard EN 10208-2 : 1996 has the status of a
British Standard

ICS 23.040.10

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- British Iron and Steel Producers Association
- Energy Industries Council
- Engineering Equipment and Materials Users Association
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National foreword

This British Standard has been prepared by Subcommittee PSE/17/1 and is the English language version of EN 10208-2 : 1996 — *Steel pipes for pipelines for combustible fluids — Technical delivery conditions — Part 2. Pipes of requirements class B* published by the European Committee for Standardization (CEN).

EN 10208-2 : 1996 was produced as a result of international discussions in which the United Kingdom took an active part. It has the same scope as the International Standard ISO 3183-2, and the principal differences in content are summarized in the foreword to EN 10208-2 : 1996.

Cross-references

Publication referred to	Corresponding British Standard
CR 10260	DD 214 : 1993 <i>Designation system for steel: additional symbols for steel names (ECLISS Information Circular 10 : 1992)</i>
EN 473	BS EN 473 : 1993 <i>General principles for qualification and certification of NDT personnel</i>
EN 10002-1	BS EN 10002 <i>Tensile testing of metallic materials</i> BS 10002-1 : 1990 <i>Part 1. Method of test at ambient temperature</i>
EN 10003-1	BS EN 10003 <i>Metallic materials. Brinell hardness test</i> BS EN 10003-1 : 1995 <i>Part 1. Test method</i>
EN 10020	BS EN 10020 : 1991 <i>Definition and classification of grades of steel</i>
EN 10021	BS EN 10021 : 1993 <i>General technical delivery requirements for steel and iron products</i>
EN 10027-1	BS EN 10027 <i>Designation systems for steel</i> BS EN 10027-1 : 1992 <i>Part 1. Steel names, principal symbols</i>
EN 10027-2	BS EN 10027-2 : 1992 <i>Part 2. Steel numbers</i>
EN 10045-1	BS EN 10045 <i>Charpy impact test on metallic materials</i> BS EN 10045-1 : 1990 <i>Part 1. Test method (V- and U-notches)</i>
EN 10052	BS EN 10052 : 1994 <i>Vocabulary of heat treatment terms for ferrous products</i>
EN 10079	BS EN 10079 : 1993 <i>Definition of steel products</i>
EN 10109-1	BS EN 10109 <i>Metallic materials. Hardness test</i> BS EN 10109-1 : 1996 <i>Part 1. Rockwell test (scales A, B, C, D, E, F, G, H, K) and Rockwell superficial test (scales 15 N, 30 N, 45 N, 15 T, 30 T and 45 T)</i>
EN 10204	BS EN 10204 : 1991 <i>Metallic products. Types of inspection documents</i>
EN 10233	BS EN 10233 : 1994 <i>Metallic materials. Tube. Flattening test</i>
EN ISO 9000	BS EN ISO 9000 <i>Quality management and quality assurance standards</i>
EN ISO 9001	BS EN 9001 : 1994 <i>Quality systems. Model for quality assurance in design, development, production, installation and servicing</i>
EN ISO 9002	BS EN ISO 9002 : 1994 <i>Quality systems. Model for quality assurance in production, installation and servicing</i>
ENV 10220	DD ENV 10220 : 1994 <i>Seamless and welded steel tubes. Dimensions and masses per unit length</i>
EN 910	BS EN 910 : 1996 <i>Destructive tests on welds in metallic materials — Bend test</i>

Publication referred to	Corresponding British Standard
EN 10246-7	BS EN 10246 <i>Non-destructive testing of steel tubes</i> BS EN 10246-7 : 1996 <i>Part 7. Automatic full peripheral ultrasonic testing of seamless and welded (except submerged arc welded) steel tubes for the detection of longitudinal imperfections</i>

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, the EN title page, pages 2 to 36, an inside back cover and a back cover.

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Descriptors: Steel tubes, pressure pipes, fluid pipelines, fuels, classifications, designation, delivery, manufacturing, chemical composition, mechanical properties, dimensions, dimensional tolerances, tests, acceptance, marking

English version

Steel pipes for pipelines for combustible fluids — Technical delivery conditions — Part 2. Pipes of requirement class B

Tubes en acier pour conduites de fluides
combustibles — Conditions techniques de livraison
— Partie 2. Tubes de la classe de prescription B

Stahlrohre für Rohrleitungen für brennbare Medien
— Technische Lieferbedingungen — Teil 2. Rohre
der Anforderungsklasse B

This European Standard was approved by CEN on 1996-02-23. CEN 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 CEN member.

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CEN

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

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Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 29, Steel tubes and fittings for steel tubes, the secretariat of which is held by UNI.

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 December 1996, and conflicting national standards shall be withdrawn at the latest by December 1996.

The differences between EN 10208-2 and ISO 3183-2 [1] are mainly restricted to the following:

- normative references (see clause 2);
- this European Standard uses steel numbers in accordance with EN 10027-2 (see table 1);
- basis of the calculation of hydrostatic test pressure (minimum wall thickness; ISO 3183- 2 offers the use of the specified wall thickness by agreement);
- this European Standard uses the standardized code numbers and terms of EURONORM 168 for the structure and the content of inspection documents.

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.

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Introduction

In the preparation of this European Standard the competent committee was unanimous in seeking to avoid specifying the quality of line pipe to be used for a particular application. However, the committee recognized that there are several broad quality levels commonly used, and has differentiated between these quality levels as follows.

Firstly, the committee recognized the need to provide a basic quality level broadly similar to that specified in the main part of ANSI/API 5L [2]. This is designated requirement class A and considered in EN 10208 Part 1.

Secondly, many purchasers impose requirements additional to the basic standard, for instance concerning toughness and non-destructive testing. This approach is common, for example, for transmission pipelines. Such enhanced requirements are addressed in requirement class B and considered in this Part 2 of EN 10208.

Thirdly, there are certain particularly demanding applications where very stringent requirements on quality and testing are imposed. Such requirements are reflected in requirement class C and considered in EN 10208 Part 3.

The Charpy energy requirements for this Part 2 of EN 10208 have been derived from established data to avoid long running shear fracture in pipelines transporting lean, dry natural gas in accordance with EPRG recommendations [3]. It is the responsibility of the designer to decide whether these energy requirements suffice for the intended application. For example, rich gas or two-phase fluids may require enhanced properties.

For pipes of requirement class B, a weld efficiency factor of 1,0 can be used in design calculations, due to the conditions specified for the manufacture of the pipes and for the testing of the welds.

The selection of the requirement class depends on many factors. The properties of the fluid to be conveyed, the service conditions, design code and any statutory requirements should all be taken into consideration. Therefore this standard gives no detailed guidelines. It is the ultimate responsibility of the user to select the appropriate requirement class for the intended application.

NOTE. This European Standard combines a wide range of product types, dimensions and technical restrictions. In some areas of application, the absence of a single European pipeline design standard has resulted in differing national regulations imposing conflicting requirements on the users, thus making technical harmonization difficult.

Consequently, it may be necessary to amend certain requirements of this European Standard to satisfy various national design codes. However, this European Standard shall be the basic reference document. Such amendments should be specified at the time of enquiry and order. (See clause 5 and the note to 8.2.3.3.1).

1 Scope

1.1 This European Standard EN 10208-2 specifies the technical delivery conditions for unalloyed and alloyed (except stainless) seamless and welded steel pipes. It includes quality and testing requirements higher than those specified in EN 10208 Part 1. EN 10208-2 applies to pipes which are normally used for the transmission of combustible fluids. The maximum allowable operating pressure is given in the corresponding design code.

NOTE. This European Standard does not apply to cast steel pipe. Other parts of this European Standard are:

- EN 10208-1 *Steel pipes for pipelines for combustible fluids — Technical delivery conditions — Part 1. Pipes of requirement class A*
- EN 10208-3 *Steel pipes for pipelines for combustible fluids — Technical delivery conditions — Part 3. Pipes of requirement class C*

1.2 In addition to the requirements of this European Standard the general technical delivery conditions specified in EN 10021 apply.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

The requirements of this European Standard rule when they differ from those in the standards and documents referred to below.

- CR 10260 *Designation systems for steel; Additional symbols for steel names (CEN Report)*
- EN 473 *Qualification and certification of NDT personnel — General principles*
- EN 10002-1 *Metallic materials — Tensile testing — Part 1. Method of test (at ambient temperature)*
- EN 10003-1 *Metallic materials — Hardness test — Brinell — Part 1. Test method*
- EN 10020 *Definition and classification of grades of steel*
- EN 10021 *General technical delivery conditions for steel and iron products*


Documents

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EN 10027-1	<i>Designation systems for steel — Part 1. Steel names, principal symbols</i>	prEN 910 ³⁾	<i>Welding — Welded butt joints in metallic materials — Bend test</i>
EN 10027-2	<i>Designation systems for steel — Part 2. Numerical system</i>	prEN 10246-3 ³⁾	<i>Non-destructive testing of steel tubes — Part 3. Automatic eddy current testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of imperfections</i>
EN 10045-1	<i>Metallic materials — Charpy impact tests — Part 1. Test method</i>		
EN 10052	<i>Vocabulary of heat treatment terms for ferrous products</i>	prEN 10246-5 ³⁾	<i>Non-destructive testing of steel tubes — Part 5. Automatic full peripheral magnetic transducer/flux leakage testing of seamless and welded (except submerged arc-welded) ferromagnetic steel tubes for the detection of longitudinal imperfections</i>
EN 10079	<i>Definition of steel products</i>		
EN 10109-1	<i>Metallic materials — Hardness test — Rockwell — Part 1. Test method (scales A, B, C, D, E, F, G, H, K, N, T)</i>		
EN 10204	<i>Metallic products — Types of inspection documents</i>	prEN 10246-7 ³⁾	<i>Non-destructive testing of steel tubes — Part 7. Automatic full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal imperfections</i>
EN 10233	<i>Metallic materials — Tube — Flattening test</i>		
EN ISO 9001	<i>Quality systems — Model for quality assurance in design/development, production, installation and servicing (ISO 9001 : 1994)</i>	prEN 10246-8 ³⁾	<i>Non-destructive testing of steel tubes — Part 8: Automatic ultrasonic testing of the weld seam of electric resistance and induction welded steel tubes for the detection of longitudinal imperfections</i>
EN ISO 9002	<i>Quality systems — Model for quality assurance in production, installation and servicing (ISO 9002 : 1994)</i>		
ENV 10220	<i>Seamless and welded steel tubes — Dimensions and masses per unit length</i>	prEN 10246-9 ³⁾	<i>Non-destructive testing of steel tubes — Part 9. Automatic ultrasonic testing of the weld seam of submerged arc-welded steel tubes for the detection of longitudinal and/or transverse imperfections</i>
EURONORM 168 ¹⁾	<i>Iron and steel products — Inspection documents — Contents</i>		
IC 2 ²⁾	<i>Weldable fine-grained structural steels; Recommendations for processing, in particular for welding</i>	prEN 10246-10 ³⁾	<i>Non-destructive testing of steel tubes — Part 10. Radiographic testing of the weld seam of submerged arc-welded steel tubes for the detection of imperfections</i>
ISO 1027	<i>Radiographic image quality indicators for non-destructive testing — Principles and identification</i>	prEN 10246-14 ³⁾	<i>Non-destructive testing of steel tubes — Part 14. Automatic ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of laminar imperfections</i>
ISO 2566-1	<i>Steel — Conversion of elongation values — Part 1. Carbon and low alloy steels</i>		
ISO/DIS 14284 ³⁾	<i>Steel and iron — Sampling and preparation of samples for the determination of chemical composition</i>		

¹⁾ Until this EURONORM is transformed into a European Standard it can either be implemented or the corresponding national standard shall be agreed at the time of enquiry order.

²⁾ Information Circular of the European Committee for Iron and Steel Standardization (ECISS), published by the members of CEN.

³⁾ In preparation; until this document is published as European Standard the corresponding national standard should be agreed at the time of enquiry and order.

prEN 10246-15 ³⁾	<i>Non-destructive testing of steel tubes — Part 15. Automatic ultrasonic testing of strip/plate used in the manufacture of welded steel tubes for the detection of laminar imperfections</i>
prEN 10246-16 ³⁾	<i>Non-destructive testing of steel tubes — Part 16. Automatic ultrasonic testing of the areas adjacent to the weld seam of welded steel tubes for the detection of laminar imperfections</i>
prEN 10246-17 ³⁾	<i>Non-destructive testing of steel tubes — Part 17. Ultrasonic testing of tube ends of seamless and welded steel tubes for the detection of laminar imperfections</i>
prEN 10256 ³⁾	<i>Non-destructive testing of steel tubes — Qualification and competence of level 1 and level 2 NDT personnel</i>
prEN 10274	<i>Metallic materials — Drop weight tear test</i>
prEN ISO 377 ³⁾	<i>Steel and steel products — Location of samples and test pieces for mechanical testing</i>

3 Definitions

3.1 General

For the purpose of this European Standard the definitions in 3.2 to 3.4 shall apply when additional to or differing from those given for the

- classification of steels in EN 10020;
- definition of steel products in EN 10079;
- heat treatment in EN 10052 and
- for types of sampling procedures, inspection and inspection documents in prEN ISO 377, EN 10021 and EN 10204.

3.2 Types of pipes and welds

3.2.1 Seamless (S) pipe

The tubular product is manufactured in a hot forming process which may be followed by sizing (see 6.5) or cold finishing (see 3.3.4) to produce the desired dimensions.

3.2.2 High frequency welded (HFW) pipe

The tubular product is manufactured by forming from strip and welding the abutting edges without addition of filler metal. The longitudinal seam is generated by high frequency current applied by induction or conduction.

NOTE. High frequency implies in this European Standard a frequency of at least 100 kHz.

3.2.3 Submerged arc-welded (SAW) pipe

The tubular product is manufactured by forming from strip or plate and welding the abutting edges by addition of filler metal. The pipe having a longitudinal (SAWL) or helical (SAWH) seam is produced by the automatic submerged arc process (but see also 6.3). At least one pass is made on the inside and at least one pass on the outside of the pipe. An intermittent or continuous single pass tack weld made by the gas metal arc-welding process is permitted.

3.2.4 Combination gas metal arc and submerged arc-welded (COW) pipe

The tubular product is manufactured by forming from strip or plate and welding the abutting edges by addition of filler metal. The pipe having one longitudinal (COWL) or one helical (COWH) seam is produced by a combination of gas metal arc welding and submerged arc-welding. The gas metal arc-welding process is continuous and first, followed by the automatic submerged arc-welding process with at least one pass on the inside and at least one pass on the outside of the pipe.

3.2.5 Strip end weld

A weld that joins strip ends together.

3.2.6 Jointer

Two pieces of pipe joined together by a circumferential weld.

3.2.7 Pipe body

For welded pipe the entire pipe excluding the weld(s) and heat affected zone(s); for seamless pipe the entire pipe.

3.3 Treatment condition

3.3.1 Normalizing forming

A forming process in which the final deformation is carried out within a certain temperature range leading to a material condition equivalent to that obtained after normalizing so that the specified values of the mechanical properties are retained even after normalizing.

The abbreviated form of this delivery condition is N.

3.3.2 Thermomechanical forming

A forming process in which the final deformation is carried out in a certain temperature range leading to a material condition with certain properties which cannot be achieved or repeated by heat treatment alone. Subsequent heating above 580 °C may lower the strength values.

The abbreviated form of this delivery condition is M.

NOTE 1. Thermomechanical forming leading to the delivery condition M may include processes of increased cooling rates without or with tempering including self-tempering but excluding definitively direct quenching and quenching and tempering.

NOTE 2. As a consequence of lower carbon content and carbon equivalent values material in the delivery condition M has improved weldability properties.

³⁾ See page 4.

3.3.3 Quenching and tempering

A heat treatment consisting of quench hardening followed by tempering. Quench hardening implies austenitization followed by cooling, under conditions such that austenite transforms more or less completely into martensite and possibly into bainite. Tempering implies heating to a specific temperature ($< A_{c1}$) one or more times or holding at this temperature, followed by cooling at an appropriate rate so that the structure is modified and the specified properties are achieved. The abbreviated form of this delivery condition is Q.

3.3.4 Cold forming and cold finishing

In this context cold forming is a process by which a flat product is formed to a pipe without heating. Cold finishing is a cold working operation (normally cold drawing) with a permanent strain greater than 1,5 %, which differentiates it from sizing operations specified in 6.5.

3.4 Imperfections and defects

3.4.1 Imperfections are irregularities in the wall or on the pipe surfaces detectable by methods described in this European Standard. Imperfections with a size and/or population density that are within the acceptance criteria defined in this European Standard are considered to have no practical implication on the intended use of the product.

3.4.2 Defects are imperfections with a size and/or population density that are greater than the acceptance criteria defined in this European Standard. Defects are considered to adversely affect or limit the intended use of the product.

3.5 Agreement

Unless otherwise indicated ‘by agreement’ means ‘by agreement between manufacturer and purchaser at the time of enquiry and order’.

3.6 Margin symbols

The following symbols are used in the margin of pages or tables for indicating optional delivery conditions:

- M Mandatory agreement (see 5.2a);
- U Unless otherwise agreed left to the discretion of the manufacturer (see 5.2b);
- O Optional agreement (see 5.2c).

4 Classification and designation

4.1 Classification

The steels specified in this European Standard are non-alloy quality or alloy special steels. Their classification in accordance with EN 10020 is indicated in table 1.

4.2 Designation

The steels specified in this European Standard are designated with steel names and steel numbers. Their designation in accordance with EN 10027-1, EN 10027-2 and CR 10260 is given in table 1.

NOTE. A comparison of the basic steel names with those specified in ANSI/API 5L [2] using the basis of minimum yield strength values, is given in annex A.

Table 1. Classification and designation of the steels			
Heat treatment condition	Steel class in accordance with EN 10020	Steel name	Steel number
Normalized or normalizing formed	Non-alloy quality steel	L245NB L290NB L360NB	1.0457 1.0484 1.0582
	Alloy special steel	L415NB	1.8972
Quenched and tempered	Alloy special steel	L360QB L415QB L450QB L485QB L555QB	1.8948 1.8947 1.8952 1.8955 1.8957
Thermomechanically rolled	Non-alloy quality steel	L245MB L290MB L360MB	1.0418 1.0429 1.0578
	Alloy special steel	L415MB L450MB L485MB L555MB	1.8973 1.8975 1.8977 1.8978

5 Information to be supplied by the purchaser

5.1 Mandatory information

The purchaser shall state in his enquiry and order the following minimum information:

- a) quantity ordered (e.g. total tonnage or total length of pipe);
- b) product form (i.e. pipe);
- c) type of pipe (see table 2, column 1);
- d) number of this part of this European Standard;
- e) steel name or number (see table 1);
- f) pipe outside diameter and wall thickness in millimetres (see 7.6.1.2);
- g) random length group or, if a fixed length is required, the length in millimetres (see 7.6.3.3 and table 11);
- h) which impact requirements, table 6 or table 7, shall apply;
- i) type of inspection document (see 8.1.1).

5.2 Other information

This European Standard offers to the purchaser and manufacturer the possibility to agree additional information (see note 1 to 7.3) or in addition to the normally applicable delivery conditions other conditions, in accordance with items a) to c) as follows. The need for additional information or the options required shall be clearly indicated at the enquiry stage and stated in the order and in the confirmation of the order.

- a) Mandatory agreement - option which shall be agreed when applicable (indicated in the margin by M):
 - 1) chemical composition of pipe with wall thickness > 25 mm (see table 3, footnote 2);
 - 2) mechanical properties of pipe with wall thickness > 25 mm (see table 5, footnote 1);
 - 3) impact and DWT test requirements for pipe with outside diameter > 1 430 mm and/or wall thickness > 25 mm (see tables 6 and 7, footnote 2);
 - 4) diameter tolerances for seamless pipe with wall thickness > 25 mm (see table 9, footnote 2);
 - 5) diameter tolerances for pipe with outside diameter > 1 430 mm (see table 9, columns 2/3);
 - 6) party to issue the inspection document 3.2 (see 8.1.1, note 2).
- b) Unless otherwise agreed left to the discretion of the manufacturer (indicated in the margin by U)
 - 1) method of verification of dimensional and geometrical requirements (see 8.2.3.10.4);
 - 2) timing of NDT of seamless and HFW pipe (see D.2.2);
 - 3) radiographic inspection for the detection of longitudinal imperfections (see D.5.4a).
- c) Optional agreement - option which may be agreed (indicated in the margin by O)
 - 1) approval of the quality system or verification of the manufacturing procedure (see 6.1 and annex B);

- 2) steelmaking process (see 6.2.1);
- 3) manufacture of SAWL pipes with two seams (see 6.3);
- 4) acceptance of strip end welds in SAWH/COWH pipe (see 6.6.1);
- 5) Mo content (see table 3, footnote 7);
- 6) lower CEV (see table 3, footnote 4);
- 7) DWT test (see tables 6 and 7, footnote 4);
- 8) weldability data or weld tests (see 7.4.2);
- 9) application of the diameter tolerance to the inside diameter (see table 9, footnote 3);
- 10) application of the diameter tolerance to the outside diameter (see table 9, footnote 4);
- 11) special bevel configuration (see 7.6.4.2);
- 12) offset of strip end welds (see table 13, footnote 1);
- 13) impact test for the heat affected zone (see 8.2.1.2);
- 14) test piece direction (see table 18, footnote 2);
- 15) use of round test pieces (see 8.2.2.2.2);
- 16) use of flattened and heat treated test coupons (see 8.2.2.2.2);
- 17) impact and DWT test temperatures other than 0 °C (see 8.2.3.3.1 and 8.2.3.4);
- 18) substitution of the macrographic examination of the weld by alternative test methods (see 8.2.3.7.1);
- 19) hardness test during production for seam heat treated HFW pipe (see 8.2.3.7.2);
- 20) hydrostatic test pressures greater than 250 or 500 bar and up to 100 % of specified minimum yield strength respectively (see 8.2.3.8.1);
- 21) use of special devices for measuring the pipe diameter (see 8.2.3.10.1);
- 22) use of (cold) die stamping (see 9.1.3);
- 23) special marking (see 9.2);
- 24) coating and lining (see clause 10);
- 25) acceptance level U2/C or F2, respectively for NDT of seamless pipe (see D.3.1, D.3.2);
- 26) use of the flux leakage test (for seamless and HFW pipe) or the eddy current test (for HFW pipe) (see D.3.2 and D.4.1.2);
- 27) acceptance level U2/C (U2) for NDT of HFW pipe (see D.4.1.1);
- 28) acceptance level F2 for NDT of HFW pipe (see D.4.1.2a);
- 29) verification of quality requirement for laminar imperfections (see D.2.4, D.4.2 and D.4.3, D.5.2 and D.5.3);
- 30) use of fixed depth notches for equipment calibration (see 5.1.1d);
- 31) use of hole penetrameters instead of ISO Wire Penetrometer (see D.5.5.1a);
- 32) use of fluoroscopic inspection (see D.5.5.1b).

5.3 Example for ordering

The information should preferably be given in the way indicated in the following example of ordering:

10 000 m pipe SAWL EN 10208-2-L415MB- 61X12,5-r2, impact properties in accordance with table 7, with DWT- test, inspection document EN 10204-3.1.C.

6 Manufacturing

6.1 General

6.1.1 The pipe manufacturer and the stockist, where products are supplied through a stockist, shall operate a quality system in accordance with EN ISO 9002⁴⁾.

O Approval of the quality system by one of the following parties may be agreed:

- the purchaser;
- the purchaser's representative;
- an independent third party;
- or a regulatory authority.

O NOTE. In special cases the verification of the manufacturing procedure either by available data or in accordance with annex B may also be agreed.

6.1.2 All non-destructive testing (NDT) activities shall be carried out by qualified and competent Level 1 and/or Level 2 NDT personnel approved by the employer⁵⁾. At the discretion of the manufacturer these personnel may be qualified in accordance with prEN 10256 or certificated in accordance with EN 473. All Level 1 and 2 NDT personnel and NDT operations shall be authorized by a Level 3 NDT individual, approved by the employer and certificated in accordance with EN 473 (see **8.2.3.12** and annex D).

6.2 Steelmaking

6.2.1 The steels covered by this European Standard shall be made using the basic oxygen process or the electric furnace process.

O Other equivalent steelmaking processes may be used by agreement.

6.2.2 The steels shall be fully killed and shall be made according to fine grain practice.

6.3 Pipe manufacturing

Acceptable types of pipe are described in **3.2** and listed together with acceptable manufacturing routes in table 2. The type of pipe and the type of heat treatment as given in the steel name shall be specified by the purchaser.

SAWL pipe may be manufactured with two seams by agreement. O

SAWH pipe shall be manufactured using strip with a width not less than 0,8 or more than 3,0 times the pipe outside diameter.

6.4 Heat treatment condition

The pipes shall be delivered in one of the forming and heat treatment conditions given in table 2.

6.5 Sizing

The pipes may be sized to their final dimensions by expanding or reducing. This shall not produce excessive permanent strain. Where no further heat treatment or only a heat treatment of the weld area is carried out, the sizing ratio s_r achieved by this cold working shall not exceed 0,015. It shall be calculated according to the formula:

$$s_r = \frac{|D_a - D_b|}{D}$$

where

- D_a = outside diameter after sizing;
- D_b = outside diameter before sizing;
- D = specified outside diameter.

6.6 Strip end welds

6.6.1 For helical seam welded pipe, the strip end weld may be retained in the pipe, by agreement. Where O accepted, the strip end weld shall be located at least 200 mm from the pipe end.

6.6.2 For welded pipe with a longitudinal seam strip end welds are not permitted in the pipe.

6.7 Jointers

The delivery of jointers is not permitted.

⁴⁾ This requirement is also fulfilled by a quality system in accordance with EN ISO 9001.

⁵⁾ Employer - is the organization for which the person works on a regular basis. The employer may be either the tube manufacturer or a third party organization providing NDT services.