BRITISH STANDARD

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12734:2000

Irrigation techniques — Quick coupling pipes for movable irrigation supply — Technical characteristics and testing

The European Standard EN 12734:2000 has the status of a British Standard

ICS 23.040.60; 65.060.35

National foreword

This British Standard is the official English language version of EN 12734:2000.

The UK participation in its preparation was entrusted to Technical Committee AGE/30, Irrigation and drainage equipment, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible 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

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English version

Irrigation techniques – Quick coupling pipes for movable irrigation supply – Technical characteristics and testing

Techniques d'irrigation – Tubes à raccords rapides pour amenées mobiles en irrigation – Caractéristiques techniques et essai

Bewässerungsverfahren – Schnellkupplungsrohre für ortsbewegliche Bewässerungseinrichtungen – Technische Eigenschaften und Prüfung

This European Standard was approved by CEN on 28 April 2000.

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 334, Irrigation techniques, the Secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by November 2000 and conflicting national standards shall be withdrawn at the latest by November 2000.

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

Within its programme of work the CEN/TC 334, Irrigation Techniques, charged CEN/TC 334/WG 6, Water supply –Buried and surface pipes, to elaborate the following standard:

EN 12734 Irrigation techniques – Quick coupling pipes for movable irrigation supply – Technical characteristics and testing.

1 Scope

This standard specifies the conditions of suitability for application of quick coupling pipes for movable irrigation supply made of steel, aluminium, PE or rigid PVC used in irrigation systems.

Standards for PE or PVC are not applicable for quick coupling pipes.

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 last edition of the publication referred to applies.

EN 10240, *Internal and/or external protective coatings for steel tubes – Specification for hot dip galvanized coatings applied in automatic plants*

EN 45001, *General criteria for the operation of testing laboratories*

ISO 4065, *Thermoplastic pipes – Universal wall thickness table*

ISO 11678, *Agricultural irrigation equipment – Aluminium irrigation tubes*

3 Terms and Definitions

For the purposes of the present standard, the following term and definition apply.

3.1 Quick coupling pipe

Portable pipe with coupling parts which give a safe connection with the pipe of the same kind in a few seconds mostly without a tool.

NOTE: The loosening is possible in the same easy way.

4 Technical characteristics

4.1 Material

Methods for the production of tubes depending upon the materials are indicated in Table 1.

Table 1: Material and production methods

Material	Method of production
Steel	welded
Aluminium alloy	welded or extruded
PE	extruded
PVC	extruded

4.2 Corrosional resistance and protection against corrosion

4.2.1 General
Quick coupling pipes have to be corrosional resistant against the application.

4.2.2 Pipes and couplings made of steel
All parts of quick coupling pipes made of steel shall conform to EN 10240.

4.2.3 Pipes and couplings made of aluminium alloy
Pipes and couplings made of aluminium alloy shall meet the requirements for tubes given in ISO 11678.

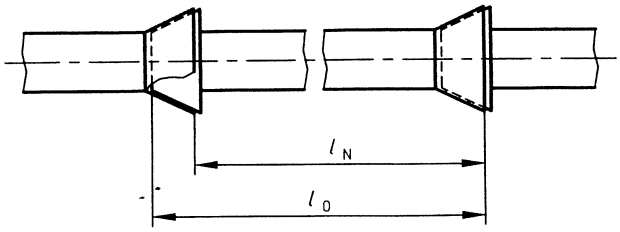
4.2.4 Pipes made of PE or PVC
No specific requirements (pipes made of such material are resistant against the chemical influence of soil and water).

4.3 Length

4.3.1 General
It is to distinguish between nominal length (l_N) and overall length (l_O).

4.3.2 Nominal length
The nominal length of a quick coupling pipe shall be declared by the manufacturer. It is measured after coupling of two identic pipes as the distance between two similar points on both pipes. The measurement should be carried out under nominal pressure at (20 ± 5) °C. Deviation of (0 to 0,4) % from the declared value is allowable (see Figure 1).

4.3.3 Overall length
The overall length of a quick coupling pipe is the total length of a pipe incl. coupling parts (see Figure 1).



l_N nominal length
l_O overall length

Figure 1: Nominal length and overall length of quick coupling pipes

4.4 Average outside diameter and wall thickness of tubes (measured in mm)

4.4.1 Pipes made of steel

Table 2: Minimum wall thickness of pipes made of steel tube depending on outside diameter

Average outside diameter [1] in mm measured at PN 10 = 1,0 MPa	50	60	70	80	89	100	108	120	133	150	159	200	216	250	300
Min. wall thickness without zinc in mm	0,7	0,7	0,7	0,7	0,8	0,8	0,9	0,9	1,0	1,0	1,2	1,2	1,5	1,8	1,8

[1] Tolerances of diameter are not necessary because the producer himself completes the tubes with coupling parts.

4.4.2 Pipes made of aluminium alloy

Table 3: Minimum wall thickness of welded pipes made of aluminium

Average outside diameter [1)] in mm measured at PN 10 = 1,0 MPa	50	60	70	76	80	89	100	108	120	127	133	150	152	159	200
Tolerances + / - (in mm)	0,60	0,75	0,75	0,75	0,75	0,75	0,80	0,90	0,90	0,90	0,90	1,00	1,00	1,00	1,00
Minimum wall thickness in mm	0,90	0,90	0,90	0,90	0,90	1,15	1,10	1,18	1,10	1,25	1,30	1,30	1,40	1,42	1,80
Tolerances + / - (in mm)	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,12	0,12	0,12	0,12	0,14	0,14	0,14	0,15
[1)]Instead of pipes specified in Table 3 also pipes of light metal in the normal inch dimension with corresponding wall thickness can be used.															

Table 4: Minimum wall thickness of extruded pipes made of aluminium

Average outside diameter[1)] in mm measured at PN 10 = 1,0 MPa	60	80	100	120	150
Minimum wall thickness in mm	0,9	0,9	1,0	1,0	1,1
[1)]Tolerances of the pipe diameters: 1 %. Tolerances of the wall thickness: 10 %.					

4.4.3 Pipes made of PE

For use in movable irrigation supply, quick coupling pipes made of PE under MRS PE 63, PE 80 or PE 100 shall be used.

The tubes shall have a minimum wall thickness as given in Table 5 taking into account that these wall thicknesses are calculated on the minimal basis of PE63 and that the nominal operating pressure of quick coupling pipes is derived from the nominal pressures of pipes in ISO 4065 with a derating factor of 1 series because of non permanent pressurization and shorter intended lifespan in movable irrigation systems.

For example PN10 (EN 12734) corresponds to PN 6 (ISO 4065).

Table 5: Minimum wall thickness of PE-pipes

Average outside diameter in mm	50	63	75	90	110	125	140	160	180	200
Minimum wall thickness in mm at PN 6 = 0,6 MPa (PE 63)	2,0	2,4	2,9	3,5	4,2	4,8	5,4	6,2	6,9	7,7
Minimum wall thickness in mm at PN 10 = 1,0 MPa (PE 63)	3,0	3,8	4,5	5,4	6,6	7,4	8,3	9,5	10,7	11,9
Minimum wall thickness in mm at PN 12,5 = 1,25 MPa (PE 63)	3,5	4,5	5,5	7,0	8,0	9,0	10,0	11,5	13,2	14,5
Minimum wall thickness in mm at PN 16 = 1,6 MPa (PE 63)	4,6	5,8	6,8	8,2	10,0	11,4	12,7	14,6	16,4	18,2
NOTE: Reference temperature for the wall thickness is 20 °C.										

4.4.4 Pipes made of PVC

Table 6: Minimum wall thickness of PVC-pipes

Average outside diameter in mm	50	63	75	90	110	125	140	160	200
Minimum wall thickness in mm at PN 6 = 0,6 MPa	1,2	1,6	1,8	2,2	2,6	3,0	3,3	3,8	4,7
Minimum wall thickness in mm at PN 10 = 1,0 MPa	2,4	3,0	3,0	3,5	4,3	4,4	4,9	5,6	6,9
Minimum wall thickness in mm at PN 16 = 1,6 MPa	2,8	3,5	4,2	4,9	6,0	6,8	7,8	8,7	10,9

4.5 Smoothness of the surface

The inner side of the pipe wall shall be smooth; welding residue and flashes are allowed to protrude not more than 2 mm. The protective coating on steel pipes must have such a strong adhesion so that hits caused during transportation or general use do not allow peeling off. The adhesion of the coating should also avoid hairline cracks caused by the test pressure.

4.6 Coupling

Three kinds of couplings are used:

- Spherical coupling with an O - ring - seal, mechanically closed.
- Coupling with a lip type seal, mechanically closed.
- Coupling with a lip type seal. Closed by water-pressure. The coupling that is closed by water pressure could be not tight at water pressures below 50 kPa.

NOTE: For special application lip type couplings may be required to be untight at pressures below 50 kPa by agreement.

The maximum bending angle shall be declared by the manufacturer in his documentation.

The coupling shall be water-tight if filled with water under nominal pressure. If quick coupling pipes are used as suction line the coupling shall be tight for water and air. The coupling shall withstand opening and closing for 2 000 times.

Examples for different kinds of connection for quick coupling pipes see in Figure 2.

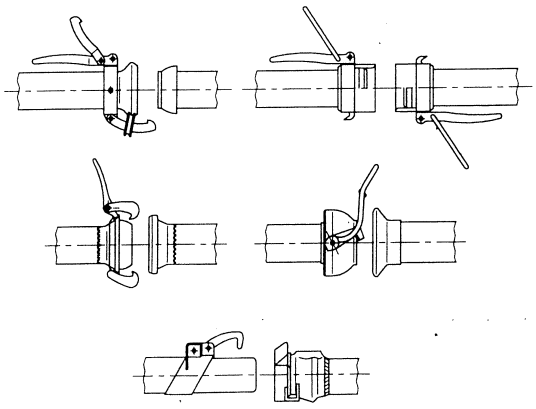


Figure 2: Examples for different connection kinds of quick coupling pipes

4.7 Replacement of pipes with spherical couplings

The replacement of one pipe in the middle of a pipeline with 100 m length shall be possible without moving the whole pipeline in longitudinal direction.

4.8 Fittings and accessories

The construction of piping systems may require the use of accessories such as elbows or T-pieces. In this case they shall show the same technical characteristics as the corresponding pipes and couplings. In some cases the installation of stabilizers may be recommended. They should be specified by the manufacturer in order to match the specified use and the risks undergone. The parts pertaining to the seal are considered as integral parts of the coupling and not as accessories.

4.9 Operating pressure

The operating pressure in quick coupling pipelines shall not exceed the nominal pressure of the pipes. The selection of pipes shall be made taking into account the possible pressure shocks

5 Marking

Quick coupling pipes according to this standard may be marked with the name or the sign of the producer in connection with length, diameter and nominal pressure.

6 Construction and operating tests

6.1 Sampling and test forms

For tests of quick coupling pipes the forms 1 and 2 are to be used (see Annexes A and B). These forms have to be filled in double. For the test pipes, moulded parts and documents according to the following table are necessary.

Table 7: Parts required for testing quick coupling piping systems

No.	Pipes - moulded parts - accessories - documents	Quantity
1	Complete quick coupling pipes with sealing elements	minimum 100 m
2	Stabilizer [1)]	–
3	Bend 90°	2
4	T-Piece	2
5	Threaded piece with female coupling or flange piece with female coupling	2
6	End plug with male-piece with female-piece	1 1
7	Optionally other accessories: Reduced cross, online hydrant, opening elbow	1 each
8	Pipe: length = 1 m without corrosion protection and without coupling	1
9	Sectional drawing of the coupling located on the pipe ends with main dimensions as well as details about the material, fabrication and corrosion protection.	2
10	Operating instructions	1
11	Inline gate valve (does not belong to the tested equipment)	2
[1)]by agreement		

6.2 Test procedure

The test shall be carried out according to test methods in clause 7 for the dimensions and properties listed from section 6.2.1 to 6.2.14.

6.2.1 Outside diameter (without corrosion protection).

6.2.2 Wall thickness.

6.2.3 Overall length of pipe.

6.2.4 Nominal length of pipe.

6.2.5 Bending angle in all directions.

6.2.6 Replacement of one pipe of a pipe-line.

6.2.7 Pressure loss, pipe-line laid down in a straight line.

6.2.8 Pressure loss, pipe-line laid down in a bended line.

6.2.9 Behaviour under pressure of a straight pipe-line.

6.2.9.1 Behaviour under nominal pressure (PN) using 7.9.2.

6.2.9.2 Behaviour up to 1,5 times nominal pressure (PN) using 7.9.2.

6.2.9.3 Burst resistance to internal pressure.

6.2.10 Behaviour of a bended pipe line under nominal pressure (PN) using 7.9.1.

6.2.11 Burst test using 7.9.3.

6.2.12 Bending of a pipe without water using 7.10.

6.2.13 Bending of a pipe filled with water under no pressure.

6.2.14 Bulging test, bulging deepness caused by a falling piece.

6.2.15 Effect of the bulging test.

6.2 Test equipment

6.3.1 For reading the adjusted nominal pressure or test pressure only calibrated pressure gauges are to be used. Pressure deviations shall not exceed ± 5 %.

For pressure measuring only fine-pressure gauges are to be used, which allow unobjectionable reading of 10 kPa.

For the test according to 6.2.9 a recording pressure gauge should be taken.

6.3.2 A calibrated flow-meter has to be used. The accuracy shall be within 2 %.

6.3.3 The bending is to be measured with a precision of 1 mm.

6.3.4 The bulging is to be measured with a precision of 0,1 mm.

6.4 Test conditions

6.4.1 The tests shall be carried out by people which have the required qualifications according to EN 45001.

6.4.2 The tests according to 6.2.1 to 6.2.4 have to be carried out with three pipes, the test according to 6.2.5 has to be carried out with two pipes.

6.2.2 For the tests according to 6.2.6 to 6.2.13 the equipment should be used which is shown in Figures 1 to 8.

6.4.4 The tests shall be carried out with water. Water similar to ground water or spring water is to be used. The water temperature should be between 3 °C and 25 °C for the tests according to 6.2.7 to 6.2.10 and 6.2.12.

6.4.5 The air temperature shall be between 15 °C and 35 °C for the tests according to 6.2.1 to 6.2.14.

7 Carrying out of test

The test results are to be listed in form 2 (see Annex B). One specimen is for the applicant, one specimen remains at the test laboratory.

The test facilities, used for the testing procedure, should be described in a way that the same tests could be repeated on another testing site.

All pipes and moulded parts have to be marked with the test number and in addition numbered continuously starting with number 1 (see Annexes A and B). The accordance to the given data in form 1 and the sectional drawing is to be checked.

The data according to 6.2.1 and 6.2.2 have to be measured on the pipe in Table 2, No. 8.

7.1 Pipe outside diameter is to be determined for example by measuring the circumference divided by π.

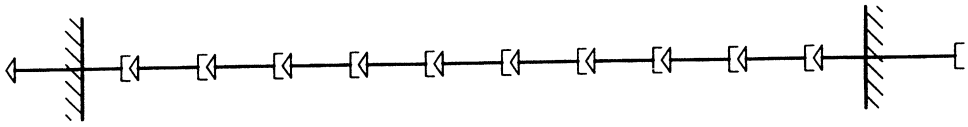
7.2 The wall thickness is to be measured at four places at a cut pipe. The distance between these measuring points on the pipe circumference should be equal. The average and the lowest value are to be listed. The measured wall thickness shall not be less than given in Tables 2 to 5.

7.3 For the total length the pipe length including coupling parts is to be measured.

7.4 The construction length of a quick-coupling pipe is measured after coupling of two pipes as the distance of similar (identical) reference points on both pipes.

7.5 The bending angle in relation to the pipe axle which is given by the producer, is to be tested in horizontal and vertical plane. The smallest value has to be written down.

7.6 It has to be tested, if it is possible to replace one pipe of an empty pipe-line, which is 100 m long and fixed at both ends according to Figure 3.



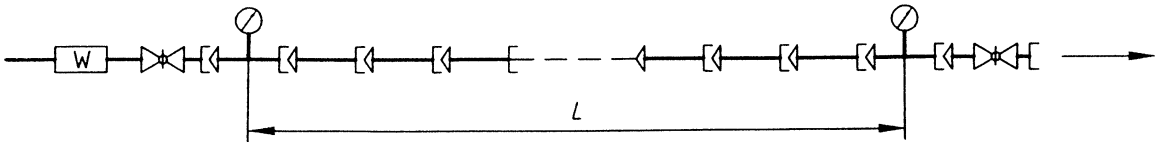
replaceable pipe

Figure 3: Replacement of one pipe in a pipe line

7.7 The pressure loss curve should be measured with at least 4 different flow rates (Q) up to a maximum pressure loss of 150 kPa.

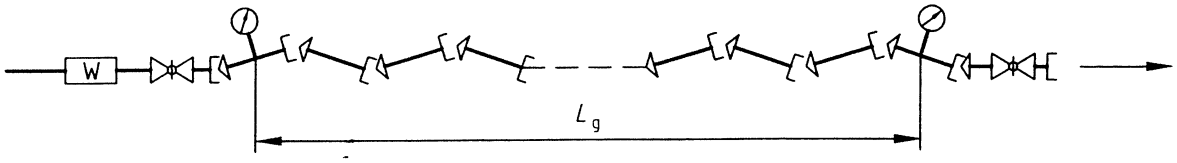
The pipe line has to be installed according to Figures 4 and 5. The pressure loss is the difference of the value of both pressure gauges. The pressure loss at the connection points of the pressure gauges shall not be considered.

Both pressure gauges should stand at the same height.



L = 100 m

Figure 4: Installation of a pipe line for the measurement of pressure loss



L_g = effective length 100 m

Figure 5: Installation of a bended pipe line for the measurement of pressure loss

7.8 The pipes shall be laid down with a bending angle, which is given by the applicant in form 1 under 4.5 (see Annex A). The pipes have to be laid down according to Figure 5 and the pipeline has to be fixed in its position.

With regard to the pressure loss see 7.7.

7.9 The pipe line including threaded fittings, elbows, T-pieces, end plugs and optional other accessories, as listed in Table 7, has to be laid down in a straight line (i.e. with no bending angles), according to Figure 6.

First the pipe line shall be filled with water and all air removed out of it. Then the pressure is increased slowly and steadily.

Pressure and time shall be monitored (recorded) continuously.

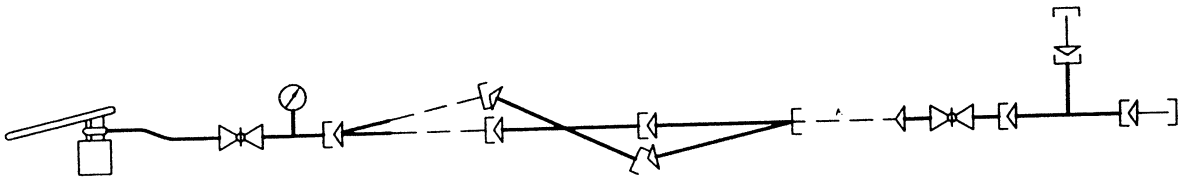


Figure 6: Installation of a pipe line for test under nominal pressure

7.9.1 Test under nominal pressure.

The pressure shall be increased gradually from 0 to the nominal pressure (PN) of the piping, with a pressure increase rate not greater than 100 kPa per minute.

The pressure then shall be maintained constant at the value of the nominal pressure (PN) at least for 24 hours.

During this period, the volume of water injected in the piping by the pump shall be recorded, and divided by time to give the average leakage rate (or the average swelling rate of the piping), in litres per minute.

The effects on pipes, couplings and accessories shall be reported.

7.9.2 Test pressures between 1,0 and 1,5 times the nominal pressure

The pressure shall be increased and maintained constant for 24 hours by steps of:

– 100 kPa if the nominal pressure of the piping is 0,6 MPa, or

– 200 kPa if the nominal pressure of the piping is greater than or equal to 1,0 MPa, while the test pressure is lower than or equal to 1,5 times the nominal pressure.

The last test pressure used in this test shall be 1,5 times the nominal pressure.

No burst shall occur.

At each value of the pressure, the effects observed on pipes, corrosion protection, couplings and accessories shall be reported.

7.9.3 Test of burst pressure

The pressure shall be increased and maintained constant for 24 hours by steps of:

– 100 kPa if the nominal pressure of the piping is 600 kPa, or

– 200 kPa if the nominal pressure of the piping is greater than or equal to 1,0 MPa, until a burst appears in a pipe or an accessory.

The burst pressure and the faulty component shall be recorded.

This component is then removed from the line and the test is continued in the following way until a second burst occurs:

All air shall be removed out of the pipeline and the pressure shall be increased again gradually from 0 to the ultimate pressure attained before the first burst, with a pressure increase rate not greater than 100 kPa per minute, and this pressure shall be maintained constant for 24 hours.

The pressure shall then be increased and maintained constant for 24 hours by steps of 100 kPa or 200 kPa as previously, until a second burst occurs in a pipe or accessory.

The burst pressure and the faulty component shall be recorded.

The test is then stopped.

7.10 Tightness under nominal pressure

The pipeline, including threaded fittings, elbows, T-pieces, end plugs and optional other accessories as listed in Table 7 No. 6, has to be laid down with the bending angles specified in form 1 (see 4.5 of Annex A).

First the pipe line shall be filled with water and all air removed out of it. Then the pressure is increased slowly and steadily.

Pressure and time shall be monitored continuously.

Test under nominal pressure:

The pressure shall be increased gradually from 0 to the nominal pressure of the piping, with a pressure increase rate not greater than 100 kPa per minute.

The pressure shall then be maintained constant at the value of the nominal pressure at least for 24 hours.

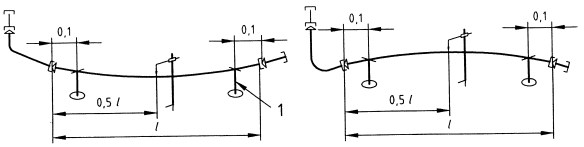
During this period, the volume of water injected into the piping by the pump shall be monitored and recorded for at least 10 minutes, and divided by time to give the average leakage rate (or the average swelling rate of the piping), in litres per minute.

The effects on pipes, couplings and accessories shall be reported.

7.11 Bending without water

The pipe is to be supported according to Figure 7. If the pipe is not straight the minimum and the maximum value of bending has to be reported. The measure points are to be marked.

The zero-line is the height of the support plus the outside diameter of the pipe.



1 support

Figure 7: Arrangement of pipe for bending test

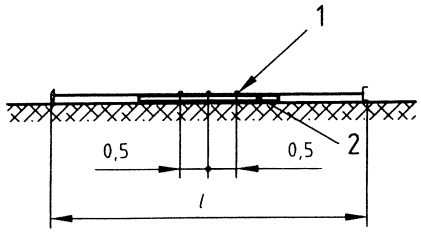
7.12 Bending with water

The same pipe tested according to 7.11 is now filled with water and at both same marked points the bending is measured. The bending during this test also has to be related to the zero-line according to 7.11.

7.13 Bulging test procedure

The pipe should have a wooden support at the points of impact (see Figure 8).

For welded pipes the points of impact should not be in the area of the line of weld. The drop piece should be a pipe of the same outside diameter as the quick coupling pipe to be tested and it should have 1/3 of the weight of quick coupling pipe. The drop piece should fall down in horizontal position 1 metre on three points with the distance of 0,5 m from each other and rectangular to the test pipe (see Figure 8). The three results of bulging depth are to be listed.



1 drop piece
2 wooden support

Figure 8: Arrangement of pipe for drop test

7.14 Bulging test results

The effects of a bulging test on the inner and outer surface are to be listed, e.g. damage of the corrosion protection or cracks. For the judgement of the points of impact it could be necessary to cut the pipe into pieces.

Annex A (informative)

Application for test of quick coupling pipes according to EN.... – Form 1

Test No.
to be filled in by the test station

A.1 General data

A.1.1 Applicant .....

Home address .....

A.1.2 Producer or supplier .....

A.2 Data of quick coupling pipe

A.2.1 Material, type and size of coupling .....

A.2.2 Field of application .....

A.3 Samples for test and documents

No.	Pipes/moulded parts/documents		Quantity	Weight of each piece kg	Year of production	Comments
1	Quick coupling pipe: length 6 m with sealing elements					
2	Stabilizer					
3	Bend 90°					
4	T-piece					
5	Inline gate valve (Size...)					
6	Threaded piece with female coupling or flange piece with female coupling (type of thread... or flange diameter...)					
7	Endplug	with male piece				
		with female piece				
8	Pipe: length = 1 m without corrosion protection and without couplings					
9	Sectional drawing of the coupling at the pipe ends with main dimensions as well as details about the material, fabrication and corrosion protection					
10	Operating instructions			-	-	

(continuation form 1)

A.4 Dimensions

A.4.1 Outside diameter of pipe (without corrosion protection) .....mm

A.4.2 Wall thickness of pipe (without corrosion protection) .....mm

A.4.3 Overall length of pipe .....mm

A.4.4 Nominal length of pipe .....mm

A.4.5 Bending ..... °

A.5 Other comments . . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

City ..... Date .....

Signature of the applicant .....

Annex B (informative)

Results of test of quick coupling pipes carried out in accordance to EN... – Form 2

Test No.
_____
to be filled in by the test station

B.1 General data

B.1.1 Applicant ..... Date of registration .....

.....

B.1.2 Producer or supplier

B.2 Data of quick coupling pipe

B.2.1 Notation, type and size

B.2.2 Field of application

B.3 Samples for test and documents to the declarations determination in form 1 (Annex A) point A.3 No. 1 to 10

No.	Pipes/moulded parts/documents		Quantity	Weight of each piece kg	Year of production	Comments
1	Quick coupling pipe: length 6 m with sealing elements					
2	Stabilizer					
3	Bend 90°					
4	T-piece					
5	Distance valve (Size...)					
6	Threaded piece with female coupling or flange piece with female coupling (type of thread... or flange diameter...)					
7	Endplug	with male piece				
		with female piece				
8	Pipe: length = 1 m without corrosion protection and without couplings					
9	Sectional drawing of the coupling at the pipe ends with main dimensions as well as details about the material, fabrication and corrosion protection			-	-	
10	Operating instructions			-	-	

tested from ..... until ..... 19 .....

(continuation form 2)

B.4 Tests

B.4.1	Outside diameter of pipe (without corrosion protection)		.....mm
B.4.2	Wall thickness of pipe (without corrosion protection)	average value	.....mm
		smallest value	.....mm
B.4.3	Overall length of pipe		.....mm
B.4.4	Nominal length of pipe		.....mm
B.4.5	Bending		..... °
B.4.6	Exchange of one pipe in the middle of a 100 m long pipe line		yes (short description) ..... no
B.4.7	Pressure loss curve for 100 m pipe line set up in a straight line		given as enclosure
B.4.8	Pressure loss curve for 100 m pipe line set up in a bended line with ° angle		given as enclosure
B.4.9	Check at working pressure of 1,0 MPa for one hour		.....
B.4.9.1	with straight line		....
B.4.9.2	with bended line		....
B.4.10	Check at a test pressure of 1,5 MPa for a 10 min duration		....
B.4.11	Bending of a pipe without water		.....mm
B.4.12	Bending of a pipe filled with water		.....mm
B.4.13	Bulging depth, resulted through the drop piece		.....mm ..... mm.....mm
B.4.14	Effects of the bulging test (e.g. corrosion protection, tears)		....
B.4.14.1	Outside		....
B.4.14.2	Inside		....

City .....Date .....

Test station .....Signature .....

Bibliography

In the preparation of this European Standard, use was made of a number of documents for reference purposes.

These informative references are cited at the appropriate places in the text and the publications are listed hereafter.

ISO 209–1, *Wrought aluminium and aluminium alloys – Chemical composition and forms of products; Part 1: chemical composition*

ISO 209–2, *Wrought aluminium and aluminium alloys – Chemical composition and forms of products; Part 2: Forms of products*

ISO 3522, *Cast aluminium alloys – Chemical composition and mechanical properties*

ISO 8779, *Polyethylene (PE) pipes for irrigation laterals – Specifications*

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