

**Rubber hoses and hose
assemblies —
Textile reinforced hydraulic
type —
Specification**

The European Standard EN 854 : 1996 has the status of a
British Standard

ICS 23.040.70

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PRI/66, Hoses, upon which the following bodies were represented:

Association of Metropolitan Authorities
British Coal Corporation
British Compressed Gases Association
British Rubber Manufacturers' Association Ltd.
Chief and Assistant Chief Fire Officers' Association
Energy Industries Council
Fire Extinguishing Trades Association
Home Office
LP Gas Association
London Fire and Civil Defence Authority
Ministry of Defence
Society of Motor Manufacturers and Traders Limited

The following body was also represented in the drafting of the standard, through subcommittees and panels:

British Fluid Power Association

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National foreword

This British Standard has been prepared by Technical Committee PRI/66 and is the English language version of EN 854 : 1996 *Rubber hoses and hose assemblies — Textile reinforced hydraulic type — Specification*, published by the European Committee for Standardization (CEN). It supersedes BS 4749 : 1991 which is withdrawn.

EN 854 : 1996 has been approved by CEN Member Bodies under the weighted voting procedures introduced in 1988 to coincide with the introduction of 'New Approach' Directives from the Commission of the European Community.

Cross-references

Publication referred to	Corresponding British Standard
EN 24671 : 1993	BS EN 24671 : 1993 <i>Rubber and plastics hose and hose assemblies. Methods of measurement of dimensions</i>
EN 24672 : 1993	BS EN 24672 : 1993 <i>Rubber and plastics hoses. Sub-ambient temperature flexibility tests</i>
EN 27326 : 1993	BS EN 27326 : 1993 <i>Rubber and plastics hoses. Assessment of ozone resistance under static conditions</i>
EN 28033 : 1993	BS EN 28033 : 1993 <i>Rubber and plastics hose. Determination of adhesion between components</i>
EN ISO 1402 : 1996	BS EN ISO 1402 : 1996 <i>Rubber and plastics hoses and hose assemblies — Hydrostatic testing</i>
EN ISO 6945 : 1996	BS EN ISO 6945 : 1996 <i>Rubber hoses. Determination of abrasion resistance of the outer cover</i>
EN ISO 7233 : 1995	BS EN ISO 7233 : 1995 <i>Rubber and plastics hoses and hose assemblies. Determination of suction resistance</i> BS 903 <i>Physical testing of rubber</i>
ISO 1817 : 1985	Part A16 : 1987 <i>Determination of the effect of liquids</i> BS 6413 <i>Lubricants, industrial oils and related products (class L)</i>
ISO 6743-4 : 1982	Part 4 : 1983 <i>Classification for family H (hydraulic systems)</i> BS 5173 <i>Methods of test for rubber and plastics hoses and hose assemblies</i>
ISO 6803 : 1984	Part 102 <i>Hydraulic pressure tests</i> Section 102.5 : 1985 <i>Pressure impulse test for high pressure hydraulic hoses</i>

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 6, an inside back cover and a back cover.

ICS 23.040.70

Descriptors: Rubber hoses, hoses, weaves, hydraulic systems, hydraulic fluids, specifications, dimensions, dimensional tolerances, tests, marking

English version

Rubber hoses and hose assemblies — Textile reinforced hydraulic type — Specification

Tuyaux et flexibles en caoutchouc — Type
hydraulique avec armature de textile —
Spécification

Gummischläuche und-schlauchleitungen —
Hydraulischschläuche mit Textileinlage —
Spezifikation

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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

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 218, Rubber and plastics hoses and hose assemblies, the Secretariat of which is held by BSI.

This standard is based on ISO 4079.

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.

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 United Kingdom.

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1 Scope

This European Standard specifies requirements for five types of textile reinforced rubber hoses and hose assemblies of nominal bore from 5 to 100. They are suitable for use with:

- hydraulic fluids in accordance with ISO 6743-4 with the exception of HRD R, HFD S and HFD T at temperatures ranging from –40 °C to +100 °C;
- water-based fluids at temperatures ranging from –40 °C to +70 °C;
- water at temperatures ranging from 0 °C to +70 °C.

The standard does not include requirements for end fittings. It is limited to the performance of hoses and hose assemblies.

NOTE 1. The hoses are not suitable for use with castor oil-based and ester-based fluids.

NOTE 2. Hoses and hose assemblies should not be operated outside the limits of this standard.

NOTE 3. Requirements for hydraulic hoses for underground mining are standardized in separate standards.

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 amendment 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.

- EN 24671 *Rubber and plastics hose and hose assemblies — Methods of measurement of dimensions* (ISO 4671 : 1984)
- EN 24672 *Rubber and plastics hoses — Sub-ambient temperature flexibility tests* (ISO 4672 : 1988)

- EN 27326 *Rubber and plastics hoses — Assessment of ozone resistance under static conditions* (ISO 7326 : 1991)
- EN 28033 : 1993 *Rubber and plastics hoses — Determination of adhesion between components* (ISO 8033 : 1991)
- EN ISO 1402 *Rubber and plastics hoses and hose assemblies — Hydrostatic testing* (ISO 1402 : 1994)
- EN ISO 6945 *Rubber hoses — Determination of abrasion resistance of the outer cover* (ISO 6945 : 1991)
- EN ISO 7233 *Rubber and plastics hoses and hose assemblies — Determination of suction resistance* (ISO 7233 : 1991)
- ISO 1817 *Rubber, vulcanized — Determination of the effect of liquids*
- ISO 6743-4 *Lubricants, industrial oils and related products (class L) — Classification — Part 4: Family H (Hydraulic systems)*
- ISO 6803 *Rubber and plastics hoses and hose assemblies — Hydraulic pressure impulse test without flexing*

3 Types of hose

Five types of hoses, Types 1TE, 2TE, 3TE, preferred for new applications, and Types R3, R6 are specified, distinguished by their maximum working pressure (see table 4) and minimum bend radius (see table 5).

NOTE. Hose types 1TE and R6 are preferentially used for low pressure applications, so they are not subjected to impulse test and vacuum resistance test.

Table 1. Bore diameter and outside diameter of hoses

Nominal bore	Internal diameter		Outside diameter of hoses									
	All types		Type 1TE		Type 2TE		Type 3TE		Type R6		Type R3	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
5	4,4	5,2	10,0	11,6	11,0	12,6	12,0	13,6	10,3	11,9	11,9	13,5
6	5,9	6,9	11,6	13,2	12,6	14,2	13,6	15,2	11,9	13,5	13,5	15,1
8	7,4	8,4	13,1	14,7	14,1	15,7	16,1	17,7	13,5	15,1	16,7	18,3
10	9,0	10,0	14,7	16,3	15,7	17,3	17,7	19,3	15,1	16,7	18,3	19,8
12	12,1	13,3	17,7	19,7	18,7	20,7	20,7	22,7	19,0	20,6	23,0	24,6
16	15,3	16,5	21,9	23,9	22,9	24,9	24,9	26,9	22,2	23,8	26,2	27,8
19	18,2	19,8	—	—	26,0	28,0	28,0	30,0	25,4	27,8	31,0	32,5
25	24,6	26,2	—	—	32,9	35,9	34,4	37,4	—	—	36,9	39,3
31	30,8	32,8	—	—	—	—	40,8	43,8	—	—	42,9	46,0
38	37,1	39,1	—	—	—	—	47,6	51,6	—	—	—	—
51	49,8	51,8	—	—	—	—	60,3	64,3	—	—	—	—
60	58,8	61,2	—	—	—	—	70,0	74,0	—	—	—	—
80	78,8	81,2	—	—	—	—	91,5	96,5	—	—	—	—
100	98,6	101,4	—	—	—	—	113,5	118,5	—	—	—	—

4 Materials and construction

4.1 Hoses

Hoses shall consist of an oil and water resistant synthetic rubber lining, one or more layers of suitable textile yarn and an oil and weather resistant rubber cover.

4.2 Hose assemblies

Hose assemblies shall only be manufactured with those hose fittings whose functionality has been verified in all tests according to this European Standard.

5 Dimensions

5.1 Diameters and concentricity

When measured in accordance with EN 24671, the diameters of the hoses shall conform to the values given in table 1.

When measured in accordance with EN 24671, the concentricity of hoses shall conform to table 2.

Dimensions in millimetres	
Nominal bore	Maximum variation in wall thickness
	Between internal diameter and overall diameter
Up to and including 6	0,8
Over 6 and including 25	1,0
Over 25	1,3

5.2 Length

5.2.1 Hoses

Hoses shall be supplied in lengths as specified by the purchaser, subject to a tolerance on the specified lengths of $\pm 2\%$.

When no specific hose lengths have been ordered, the percentages of different lengths in any given delivery shall be as follows:

- over 20 m: not less than 80 % of total length;
- over 10 m to 20 m: not more than 20 % of total length;
- 1 m to 10 m: not more than 3 % of total length.

No hose length shall be less than 1 m.

5.2.2 Hose assemblies

The tolerances on the length of hose assemblies shall conform to the value given in table 3.

6 Requirements

6.1 Hydrostatic requirements

6.1.1 When tested in accordance with EN ISO 1402, the maximum working pressure, the proof pressure and burst pressure of the hoses and hose assemblies shall conform to the values given in table 4.

6.1.2 When tested in accordance with EN ISO 1402, the change in length of hose at the maximum working pressure shall not exceed $+2\%$ to -4% up to and including nominal bore 31 and 0% to $+5\%$ above nominal bore 31.

6.2 Minimum bend radius

When bent to the minimum bend radius in table 5 measured on the inside of the bend, the flatness shall not exceed 10 % of the original outside diameter.

Measure the hose outside diameter with a caliper before bending the hose. Bend the hose to the minimum bend radius and measure the flatness with the caliper.

6.3 Impulse test requirements (not applicable to type 1TE nor R6 hoses)

6.3.1 The impulse test shall be in accordance with ISO 6803. The test temperature shall be 100 °C.

6.3.2 For type 2TE hoses, tested at impulse pressure equal to 125 % of the maximum working pressure, shall withstand a minimum of 100 000 impulse cycles.

For types 3TE R3 hoses, when tested at impulse pressure equal to 133 % of the maximum working pressure for hoses of nominal bore up to and including 25 and at 100 % of the maximum working pressure for nominal bore above 25, the hose shall withstand a minimum of 200 000 impulse cycles.

6.3.3 There shall be no leakage nor other malfunction before reaching the specified number of cycles.

6.3.4 This test shall be considered a destructive test and the test piece shall be thrown away.

Dimensions in millimetres			
Hose assembly length	Nominal bore		
	Up to and including 25	Over 25 and including 50	Over 50
Up to and including 630	+7 -3	+12 -4	+25 -6
Over 630 and including 1250	+12 -4	+20 -6	
Over 1250 and including 2500	+20 -6	+25 -6	
Over 2500 and including 8000		+1,5 % -0,5 %	
Over 8000		+3 % -1 %	

Nominal bore	Maximum working pressure bar ¹⁾					Proof pressure bar					Burst pressure bar				
	Type					Type					Type				
	1TE	2TE	3TE	R6	R3	1TE	2TE	3TE	R6	R3	1TE	2TE	3TE	R6	R3
5	25	80	160	34	103	50	160	320	68	206	100	320	640	136	412
6	25	75	145	28	86	50	150	290	56	172	100	300	580	112	344
8	20	68	130	28	83	40	136	260	56	166	80	272	520	112	332
10	20	63	110	28	78	40	126	220	56	156	80	252	440	112	312
12	16	58	93	28	69	32	116	186	56	138	64	232	372	112	276
16	16	50	80	24	60	32	100	160	48	120	64	200	320	96	240
19	—	45	70	21	52	—	90	140	41	104	—	180	280	83	208
25	—	40	55	—	39	—	80	110	—	78	—	160	220	—	156
31	—	—	45	—	26	—	—	90	—	52	—	—	180	—	104
38	—	—	40	—	—	—	—	80	—	—	—	—	160	—	—
51	—	—	33	—	—	—	—	66	—	—	—	—	132	—	—
60	—	—	25	—	—	—	—	50	—	—	—	—	100	—	—
80	—	—	18	—	—	—	—	36	—	—	—	—	72	—	—
100	—	—	10	—	—	—	—	20	—	—	—	—	40	—	—

¹⁾ 1 bar = 0,1 MPa.

Nominal bore	Bend radius				
	Type 1TE	Type 2TE	Type 3TE	Type R6	Type R3
5	35	25	40	50	80
6	45	40	45	65	80
8	65	50	55	80	100
10	75	60	70	80	100
12	90	70	85	100	125
16	115	90	105	125	140
19	—	110	130	150	150
25	—	150	150	—	205
31	—	—	190	—	255
38	—	—	240	—	—
51	—	—	300	—	—
60	—	—	400	—	—
80	—	—	500	—	—
100	—	—	600	—	—

6.4 Leakage of hose assemblies

When tested in accordance with EN ISO 1402, there shall be no leakage or evidence of failure. This test shall be considered a destructive test and the test piece shall be thrown away.

6.5 Cold flexibility

When tested in accordance with method B of EN 24672 at a temperature of -40°C , there shall be no cracking of the lining or cover. The test piece shall not leak or crack when subjected to a proof pressure test after regaining ambient temperature.

6.6 Adhesion between components

When tested in accordance with EN 28033, the adhesion shall be as follows:

- a) between lining and reinforcement:
 - up to and including nominal bore 8: min. 1,5 N/mm;
 - over nominal bore 8: min. 2,5 N/mm;
- b) between cover and reinforcement:
 - up to and including nominal bore 8: min. 2,0 N/mm;
 - over nominal bore 8: min. 2,5 N/mm.

Test pieces shall be type 5 for lining and reinforcement and type 2 or type 6 for cover and reinforcement as described in table 1 of EN 28033 : 1993.

6.7 Vacuum resistance (not applicable to type 1TE nor R6)

When tested in accordance with EN ISO 7233, the hoses and hose assemblies shall conform to the values given in table 6.

Table 6. Degree of vacuum		
Nominal bore	Negative gauge pressure, bar ¹⁾ max.	
	Type 2TE	Types 3TE and R3
5	-0,6	-0,8
6		
8		
10		
12	-	-
16		
19		
25	-	-0,6
31		
38		
51		
60	-	-
80		
100		

¹⁾ 1 bar = 0,1 MPa.

6.8 Abrasion resistance

When tested in accordance with EN ISO 6945, with a vertical force of (25 ± 0,5) N, the loss of mass after 2000 cycles shall not be greater than 1 g.

6.9 Fluid resistance

6.9.1 Test pieces

The fluid resistance test shall be carried out on moulded sheets of lining and cover compound, 2 mm thickness, of an equivalent cure state of the vulcanized hose.

6.9.2 Oil resistance

When tested in accordance with ISO 1817, the lining immersed in Oil No. 3 for 168 h at a temperature of 100 °C shall show no shrinkage nor volume swelling greater than 25 %.

When tested in accordance with ISO 1817, the cover immersed in Oil No. 3 for 168 h at a temperature of 70 °C shall show no shrinkage nor volume swelling greater than 100 %.

6.9.3 Water fluid resistance

When tested in accordance with ISO 1817, the lining and cover immersed in a test liquid made up of equal volumes of 1,2-ethanediol and distilled water for 168 h at a temperature of 70 °C shall show no shrinkage. The volume swelling shall not be greater than 25 % for lining nor 100 % for cover.

6.9.4 Water resistance

When tested in accordance with ISO 1817, the lining and cover immersed in water for 168 h at a temperature of 70 °C shall show no shrinkage. The volume swelling shall not be greater than 25 % for lining nor 100 % for cover.

6.10 Ozone resistance

When tested in accordance with method 1 or 2 of EN 27326, depending on the nominal bore of the hose, no cracking or deterioration of the cover shall be visible under × 2 magnification.

7 Designation

Hoses shall be designated as the following example.

Designation of a type 1TE textile reinforced hydraulic hose and a nominal bore of 10:

Hose EN 854 - 1TE 10

8 Marking

8.1 Hoses

Hoses shall be marked at a maximum spacing of 500 mm with at least the following information:

- a) the manufacturer's name or identification, e.g. XXX;
- b) the number of this European Standard 'EN 854';
- c) type, e.g. 1TE;
- d) nominal bore, e.g. 16;
- e) quarter and last two digits of year of manufacture, e.g. 4Q96.

Example: XXX/EN 854/1TE/16/4Q96

NOTE. Other information, as agreed between the purchaser and the manufacturer, can be included, if requested.

8.2 Hose assemblies

Hose assemblies shall be marked preferably at the assemblies with at least the following information:

- a) the manufacturer's name or identification, e.g. XXX;
- b) maximum working pressure, of the assemblies, in bar, e.g. 16;
- c) month and last two digits of year of assembly, e.g. 9612.

Example: XXX/16/9612

NOTE. Other information as agreed between the purchaser and the manufacturer, can be included, if requested.

List of references

See national foreword.

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